

INSTALLATION AND MAINTENANCE MANUAL



**DISC BRAKE TRAILER AXLE
- WABCO CALIPERS -**

INTRODUCTION

The purpose of this manual is to familiarize yourself with an IMT axle.

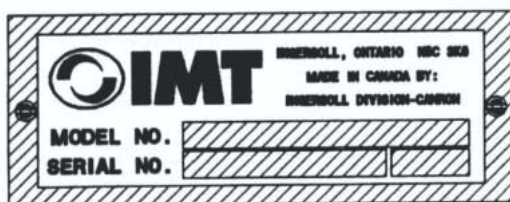
Topics included will cover :

- Installation
- Adjustments
- Maintenance
- Inspections

This manual also contains information in chronological order to get your axle working as soon as possible. Tables, diagrams, and charts for a common sense approach are included to make this package as complete as possible.

Your IMT nameplate on any axle is located on the center of the beam. It contains the model and serial number. Your invoice number will also help to identify your axle. (Fig 1)

Fig 1



Safety

This manual is intended to retain the safety, dependability, and performance engineered into IMT Axle Products. Study this manual carefully before you perform any installation or maintenance procedures.

CAUTIONS and WARNINGS will be used to point out any circumstances that can cause personal injury or damage components.



Before any repair or maintenance work that requires raising a vehicle, secure it with lift stands that are properly rated. Also make sure wheel chocks are accurately inserted. Do not depend on wheel jacks alone for support of vehicle.

Without proper training, safety equipment, and tools, serious if not fatal accidents can occur. Read and understand procedures in this manual before attempting any work.

Do not sand, chisel, hammer, or alter linings in any way. Do not blow brake assemblies with high pressure air lines. Dust from linings should not be inhaled. Do not weld on wheel or heat wheel nuts with tire on. A potentially explosive tire failure called "Pyrolysis" can occur.

Do not use a chisel to remove/install spindle nuts. Always use the right socket size and torque wrench, following torque procedures.

GENERAL INFORMATION

Before installation can begin, now is the time to inspect your IMT axle for any flaws or damage that has occurred at the factory or during shipping.

WELDING HARDWARE TO AXLES

Methods

Four methods may be used to weld hardware to trailer axles:

- Shielded metal arc (stick electrodes)
- Gas metal arc (MIG, solid wire)
- Gas tungsten arc (TIG)
- Flux cored arc (tubular wire)

American Welding Society (AWS) classifications and specifications for these four methods are shown in **Table 1**.

Method for Welding Carbon & Low Alloy Steels	AWS Electrode Classification	AWS Specifications
Shielded Metal Arc	E70XX	A5.1 / A5.5
Gas Metal Arc	ER70S-X	A5.18
Gas Tungsten Arc	ER70S-X	A5.18
Flux Cored Arc	E70T-X	A5.20

Table 1.
AWS WELDING SPECIFICATIONS

The weld tensile strength must be 70,000 psi as per AWS specifications. Weld tensile strengths which either higher or lower than this rating are not acceptable.

The best fusion and strength will be obtained using the voltage, current and shielding medium recommended by the electrode manufacturer. If the shielded metal arc method is used, electrodes must be clean, dry and have been stored per AWS specifications (AWS Section 4.5.2).

AXLE PREPARATION

The area to be welded must be free of grease, dirt, paint, slag and other contaminants. These contaminants may affect weld quality.

Never weld when the axle is cold. The axle and brackets to be welded should be stored overnight in a heated room, and be at a temperature of at least 60°F prior to welding. This will reduce the chance of forming an area of brittle material adjacent to the weld.

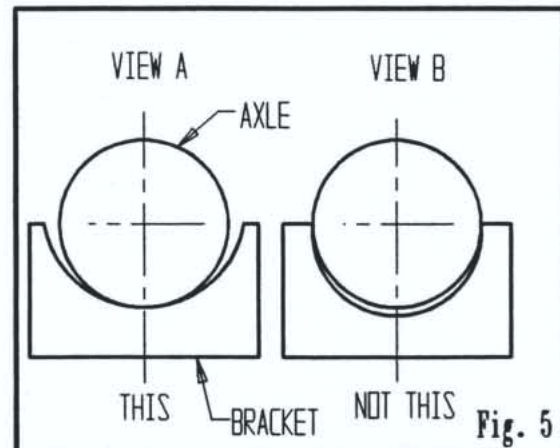
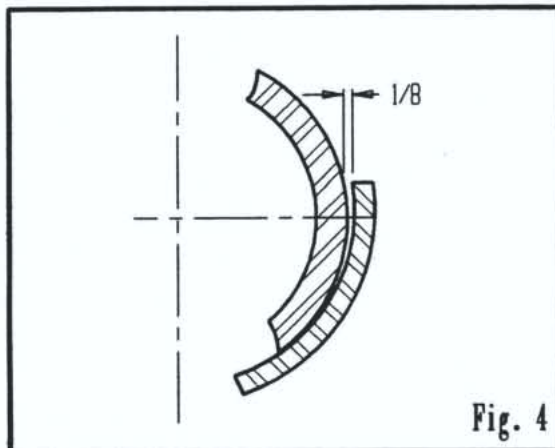
If temperature requirements are not met, moderately pre-heat the weld area to a maximum temperature of 200°F using a "Rosebud". Do not concentrate heat in one area. Rather, slowly heat a wide area around the joint to be welded. Verify axle temperature using a temperature sensitive crayon or other appropriate means.

HARDWARE FIT

Hardware at the weld site should fit as close as possible to the axle. A maximum gap of 1/8-inch (3.18mm) should exist between the bracket and the axle tube. This will avoid the necessity for excessive welding. (See Fig.4)

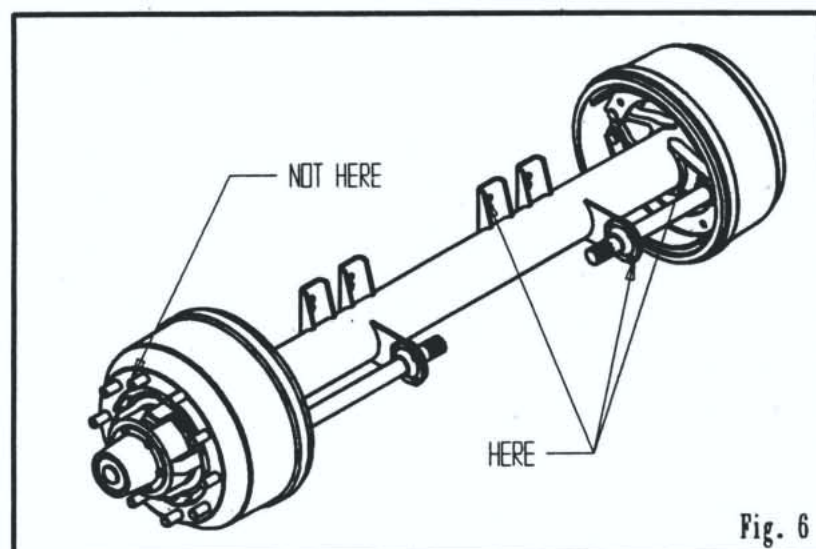
Hardware such as suspension spring seats and trailing arms must be accurately positioned parallel to each other. Use the top-center mark-when available-for reference in locating this hardware, then C-clamp in position prior to welding.

Brackets on axles should fit the axle such that the point of contact is at the base of the bracket as shown in "Fig. 5, VIEW A". Here the fit is such that loads imposed on the bracket are transferred directly to the axle. A fit as shown in Fig. 5 "View B," is such that loads imposed on the bracket are transferred to the axle through the weld. This may cause the weld to crack.



WELDING PREPARATION

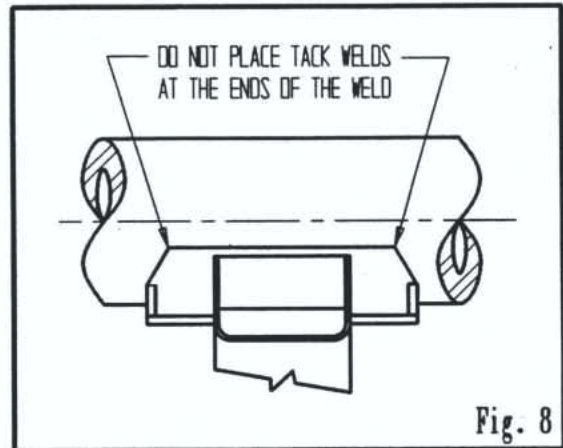
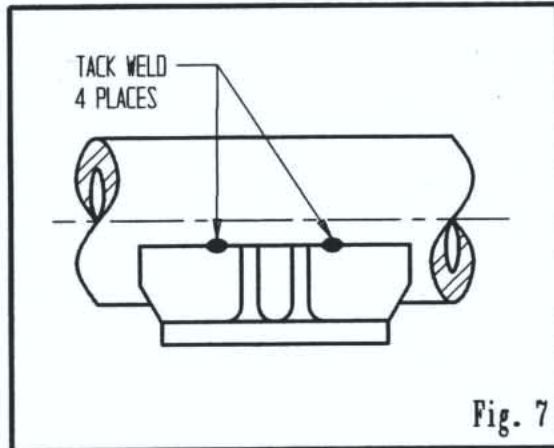
The welding equipment should be grounded to the axle through a cable connection that is both clean and tight. The connection should be located at one of the parts welded to the axle, such as the camshaft bracket, air chamber bracket, or brake spider. The connection should not be located at a suspension spring, U-bolt, or at a point that will place a wheel bearing between the ground cable connection and the weld area, since the wheel bearing can be damaged by electric arcing. (See Fig.6)



Prior to applying the final welds, hardware should be tack-welded to the axle as per recommendations provided by the component supplier. This will help minimize axle distortion and residual stresses caused by the final welds. After tack-welding, clean up the weld slag and then fuse the tack-welds into the final welds.

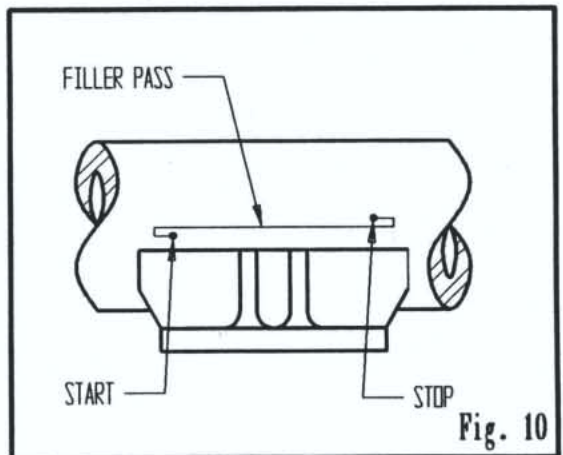
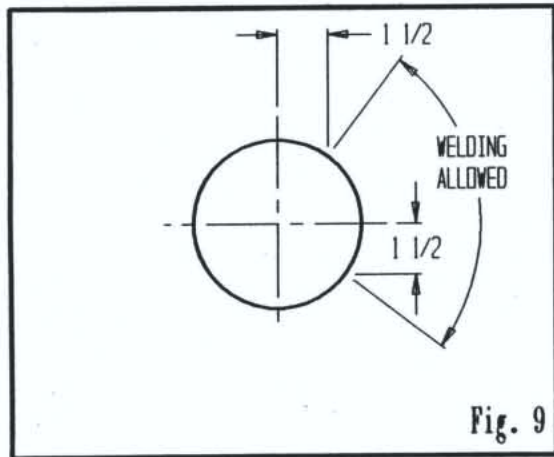
(See Fig. 7). Tack welds should never be located at the ends of the weld pass.

(See Fig. 8).



LOCATION

Axles are more likely to crack at a weld location since welds reduce the strength of the axle material adjacent to the weld location. It is, therefore, essential that welding be confined to areas of relatively low stress near the center of the beam. These welding locations apply to all welds including both full attachment welds and tack welds. Additionally, the arc weld should not be tested on the axle-especially on the bottom half. This, too, can cause a material change that can reduce axle service life. (See Fig. 9).



WELDING PROCEDURE

Welds should not be started or stopped at the end of the weld pass. Rather, they should be started and stopped away from the ends as shown in Fig. 10. This will ensure that the stress riser-which occur when either starting or stopping a weld-are located away from the ends of the weld.

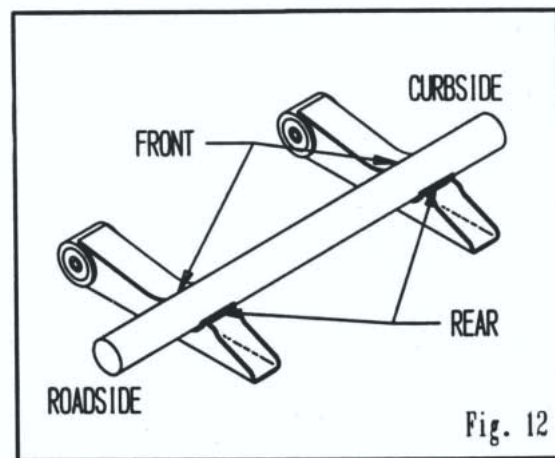
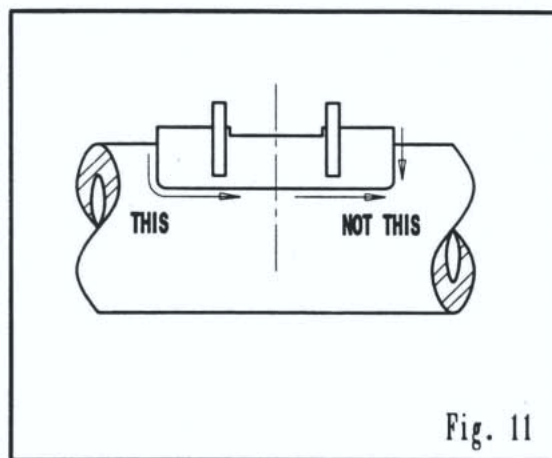
All welds should be made in one continuous pass rather than stopping and starting the weld passes as shown in **Fig.11**.

When attaching a bracket using multiple welds, axle distortion can be minimized by sequencing the welds. This involves alternating weld passes between the front and rear of an individual bracket and between the brackets located on the axle roadside and curbside. (See **Fig.12**). This is in contrast to applying all the welds at one bracket location.

Note further that the first weld pass should be made on the front side of the bracket. This will help ensure that any warping will result in the more desirable “toe-in” condition, rather than the less desirable “toe-out” condition.

WELD BEAD SIZE

The maximum weld bead size allowed-regardless of whether the weld is achieved with a single or multiple pass-is 1/2 inch (12.7mm) on round axles.





INSTALLATION

ORIENTATION

Because of the many variations of IMT axles, orientation is important. The Wabco caliper installed is rotational. The arrow painted on the caliper housing **MUST** be pointing in the direction of wheel rotation.

INSTALLING AXLES AND ASSOCIATED EQUIPMENT

Axle Top-Center Location

Some trailer axle models are built with some type of mark, such as a drilled hole or a punch mark, which locates the top center of the beam. These markers can be used to orient the axle assembly on the suspension and identify the center of the beam so the suspension brackets can be located from a central reference point.

ALLOWABLE AXLE ROTATION

WARNING: This section provides information on the allowable rotation of trailer axles. It does not, however, attempt to evaluate any possible interference between the axle assembly and other trailer components resulting from this rotation. Responsibility for maintaining adequate clearance between various components lies with the vehicle manufacturer.

WARNING: Installation of axles with the top-center other than as specified will void the warranty and could result in premature fatigue damage to the axle.

AXLE INSTALLATION PROCEDURE

NOTE: Due to the many variations in suspension design, proper suspension installation is the responsibility of the trailer or suspension manufacturer.

1. Position the suspension components on the axle. Check to ensure that they fit the axle properly. Refer to the guidelines on welding contained within this Recommended Practice.
2. Locate the axle top-center and follow guidelines regarding allowable axle rotation as stated in this Recommended Practice.
3. Weld the suspension components to the axle according to suspension manufacturer's guidelines and this Recommended Practice.
4. Position the axle in place under the suspension while ensuring that the proper spacing and alignment requirements are met.
5. Snug the U-bolts with an impact tool. Torque the U-bolts to manufacturer's published requirements using a calibrated torque wrench. Tighten the U-bolts in a crisscross pattern. Be careful not to overtighten the U-bolts since this may damage the axle at the point which the U-bolts contact the axle.
6. Following axle installation and alignment, inspect the assembly to ensure the following:
 - All suspension springs are properly located on the wear pad.
 - Adequate clearance exists between the axle and the trailer frame and suspension components, both when the axle is loaded and unloaded.
 - All bolts have been tightened to proper torque values.

Cambered trailer axles must be installed so that the top-center mark is located at the exact top of the axle.

Non-cambered trailer axles can be installed so that the top-center mark is not located at the exact top of the axle. If rotation of the axle is allowed, the top center mark can be rotated $22\frac{1}{2}$ degrees away from the exact top position.

(See Fig. 15).

IMT axles are supplied as non-cambered and are within the limits of a 2 minute negative setting and a 10 minute positive setting.

NOTE:

If top-center rotation is allowed, the hardware for the specific brake model must remain within the rotational limitation shown in Fig. 16.

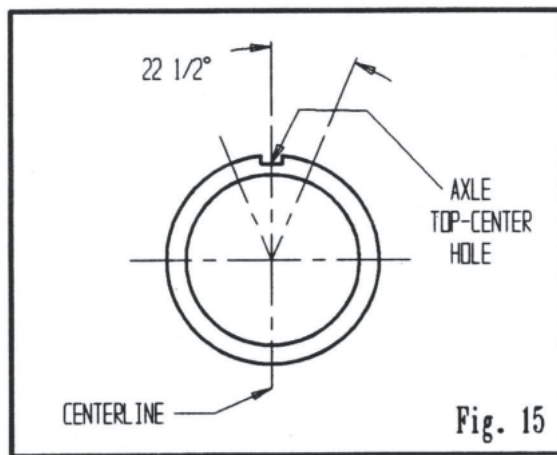


Fig. 15

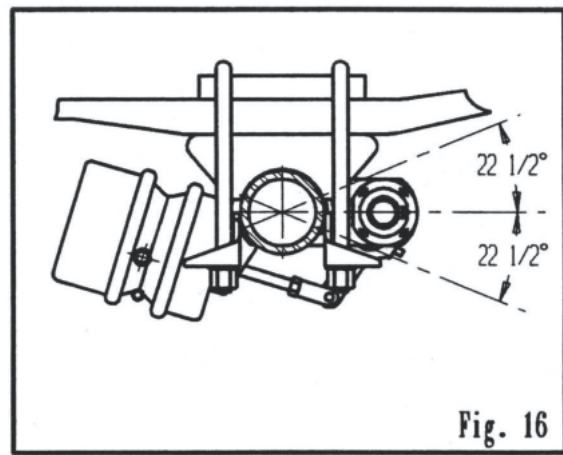


Fig. 16

DRILLING INTO THE AXLE

NOTE: This document makes recommendations as to the most logical location in which to drill a hole into an axle tube. Any components altered on an axle are the responsibility of the manufacturers who modify them.

Auxiliary trailer equipment such as central tire inflation systems may require drilling of a hole into the axle tube. In order to minimize the effect of hole drilling on axle strength, the hole should be located in an area of the tube that experiences the least stress. Therefore, good design practice dictates that the hole be located as per the following guidelines:

1. As close to the neutral axis of the axle tube as possible. (See Fig. 17)

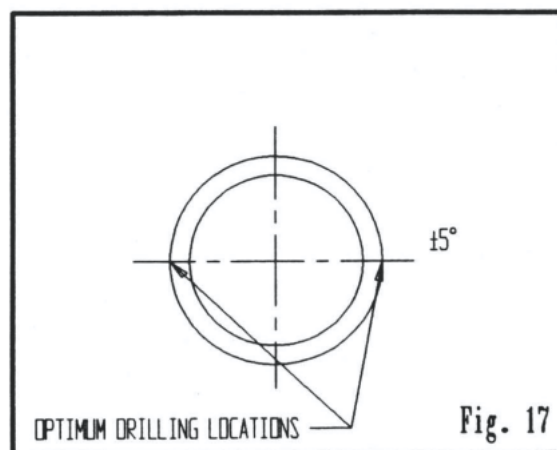


Fig. 17

MAINTENANCE

Oil and grease change – suggested intervals:

Due to the varying load and driving conditions, service intervals will vary. Below is a generally accepted guideline on which maintenance scheduling can be observed.

- Always clean parts thoroughly with proper solvents and equipment.
- Do not use gasoline or steel brushes. Never refill the hub with old oil.
- Extra attention should be given to seals. Contaminated lubricants can quickly destroy the entire wheel assembly.

Oil properties:

Original equipment supplied with 'CALTEX SYNSTAR TL50'
Fully synthetic SAE50 grade
Flashpoint 235° Celsius

Grease properties:

Original equipment supplied with 'CALTEX STARPLEX 2'
Lithium complex, NLG1 No. 2
Dropping point - 232° Celsius
Additives – corrosion and oxidization inhibitors, EP additives

SERVICE SCHEDULE

FOR IMT DISC BRAKE AXLE TYPE F22 with WABCO CALIPERS

SERVICE SCHEDULE Which ever comes first	Mileage intervals Time intervals	After first 5,000km After first Month	Periodic checks		
			Every 30,000km Every 3 months	Every 100,000km Every 12 months	Every 250,000km Every 24 months

Visual inspection - for wear / damage

OIL FILLED HUBS				
Regular visual inspection of oil levels,	weekly			
Inspection for oil leaks	monthly			
Drain and replace oil				●

GREASE FILLED HUBS - for wear / damage				
Remove hub cap and inspect grease around outer bearing and in hub cap			●	
Clean and repack bearings and hub with fresh grease				●
Check condition of taper roller bearings, Replace if necessary				●

GENERAL - for wear / damage				
Check brake pads for wear **	●	●		
Check brakes for correct adjustment **	●	●		
Check braking system for air leaks	●	●		
Check truck-trailer combination for brake compatibility	●		●	

** Refer to following pages for detailed service information on the Wabco brake calipers

Special service conditions;

Vehicles operating in off highway / harsh conditions; service at suitably reduced time intervals

BRAKE FORCE DISTRIBUTION

It is important that the distribution of brake force (*between axles/vehicles*) in a vehicle combination is adapted so that the brake force for each axle/vehicle is proportioned in accordance with the legally applied braking calculations.

If the brake force is not correctly distributed it can lead to excessive braking of a vehicle and/or one or more axles in the combination. This can result in overheating, accelerated wear and damage to the rotors, pads, hubs, tyres and wheel components.

Before a trailer is taken into use it must be set up according to the specified values in the relevant brake calculation. After the pads/rotors have been run in for a period of around 3,000 – 5,000 km the brake force distribution between the truck/tractor and trailer may require adjustment.

Contact the vehicle supplier for information on the appropriate action.

Following replacement of any essential components or spare parts in the brake operating system (*such as brake valves or control units*), the brake operating system must also be checked and adjusted (*if necessary*) in accordance with the relevant braking calculations.

Failure to follow these instructions could lead to damage or repeated damage to the axle components and/or brake components.

ATTENTION

BRAKE BALANCE

To obtain maximum performance from the disc-brakes fitted to this trailer, brake balance between the truck and trailer must be carried out before going into service and again at 5000km service, and then every 12 months thereafter.

**Maximum lead to trailer must not exceed
0.14 bar (2 psi).**

GREASE PACKING PROCEDURE

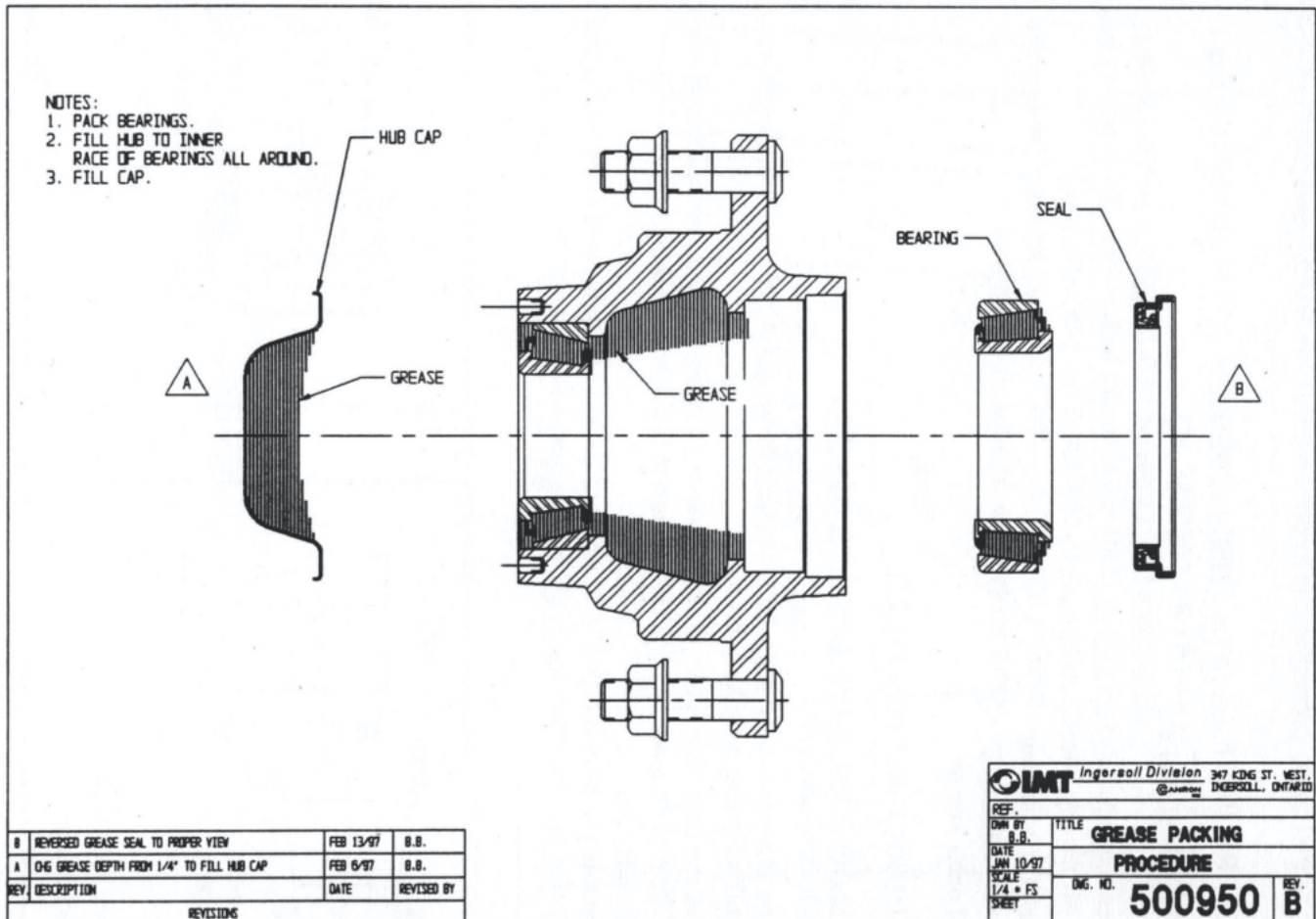


Fig 23

WHEEL BEARING ADJUSTMENT PROCEDURE

IMT Endorses TMC's Recommended Wheel Bearing Adjustment Procedure RP 618.
The objective of these procedures is to obtain 0.001" to 0.005" end play

PROCEDURE IN018 (See Fig 24)

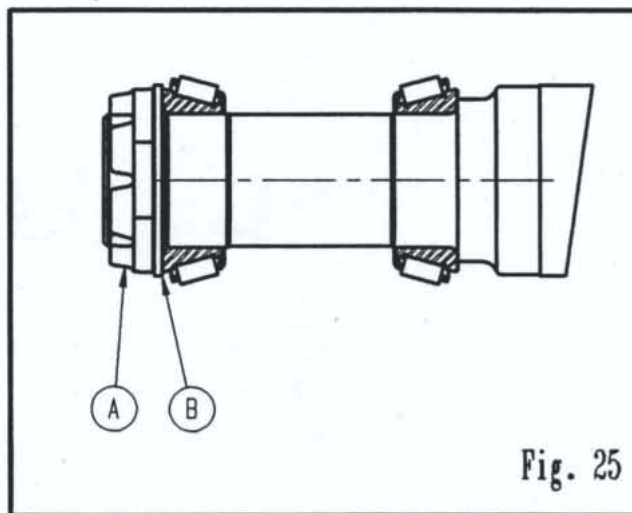
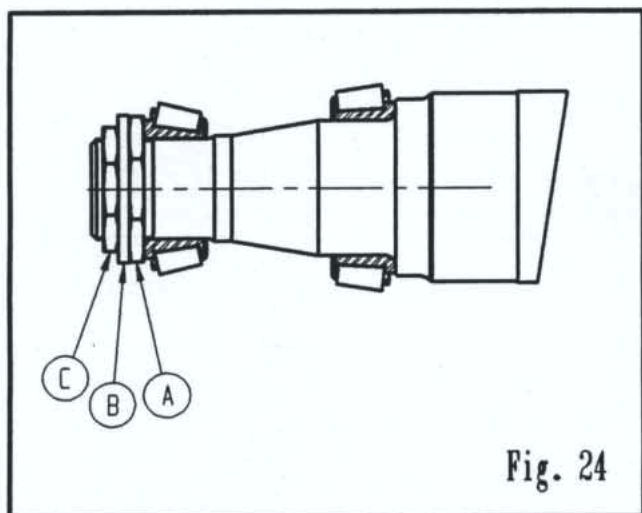
Double Adjusting Nut System: F19, A21, F22, F23, A26

1. Tighten the adjusting nut (A) to a torque of 200 ft-lbs. (271 N·m) while rotating the wheel.
2. Back off the adjusting nut (A) one full turn.
3. Tighten the adjusting nut (A) to a final torque of 50 ft-lbs (68N·m) while rotating the wheel.
4. Back off adjusting nut (A) 1/4 to 1/3 turn and install lock washer (B) to nearest hole.
5. Install outer jam nut (C) and torque to 300-400 ft-lbs. (407-542 N·m).
6. **Acceptable end play is 0.001" (0.025mm) to 0.005" (0.13mm) measured with a dial indicator**
7. Verify that the wheel rotates freely when adjustment is complete.

PROCEDURE IN019 (See Fig 25)

For Single Adjusting Nut System: F23, A24, F24

1. Install lock washer (B).
2. Tighten adjusting nut (A) to a torque of 200 ft-lbs. (271N·m) while rotating wheel.
3. Back off adjusting nut (A) 1 full turn.
4. Tighten the adjusting nut to a final torque of 50 ft-lbs. (68N·m) while rotating the wheel.
5. Back off adjusting nut (A) 1/16 to 1/8 turn to the nearest locking hole.
6. Install cotter pin.
7. **Acceptable end play is 0.001" (0.025mm) to 0.005" (0.13mm) measured with a dial indicator**
8. Verify that the wheel rotates freely when adjustment is complete.



PROCEDURE IN023

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IMT STRAIGHT AXLE TOE-IN, TOE-OUT VERIFICATION

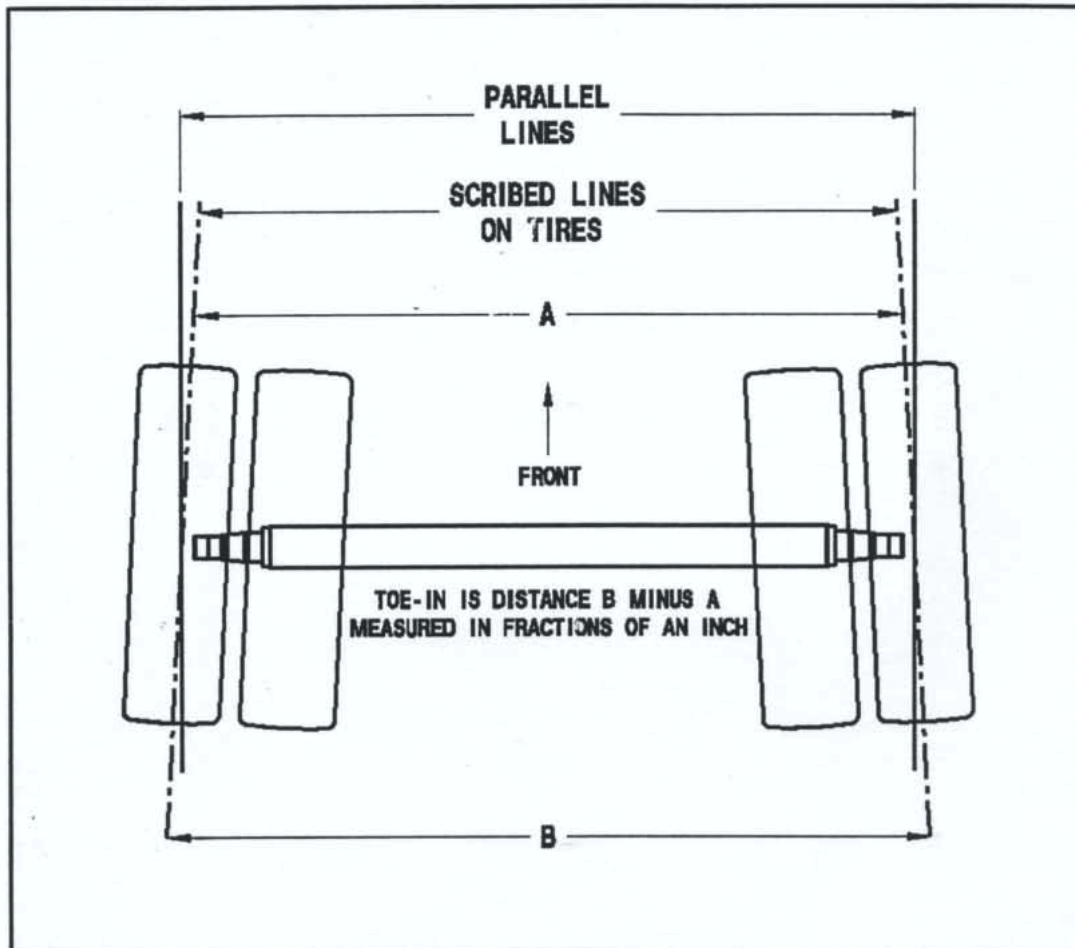


Figure A
WHEEL TOE-IN
(TOP VIEW OF AXLE WITH DUALS)

Note: With wheels off the ground, scribe a fine line on the tire tread all around the tire to aid in the measurement of "A" and "B".

Toe-in: "A" is smaller than "B".

Toe-out: "A" is larger than "B".

(See Figure A.)

To be correctly aligned, wheel toe-in or toe-out must be within the limits of .25", 6.35 mm, 0.358 degree, or 21 minutes toe-in, and .063", 1.59 mm, 0.09 degree, or 5 minutes toe-out. Toe-in or toe-out which exceeds these limits will cause increased tire wear.

INSPECTING AXLES AND ASSOCIATED EQUIPMENT

Proper Inspection Intervals

Trailer axles should be inspected for cracks, wear and leaks every six months or 50,000 miles.

Cracks

The entire axle tube should be visually inspected for cracks. Any cracks found in the tubing indicate immediate axle replacement is necessary. Repair welding of the axle tube is prohibited.

Welds attaching brake spiders, camshaft brackets, air-chamber brackets and suspension components should be inspected for cracks. If a crack is detected, determine if it penetrates into the tubing. If a crack penetrates into the axle tubing, repair welding is not permitted and the axle must be replaced.

Axle Straightness

The axle should meet the trailer manufacturer's specifications for straightness. Refer to RP 708 regarding this inspection. Obvious signs of improper axle straightness include premature and excessive tire wear. Trailer axle manufacturer's do not approve of straightening axles in the shop. Overloaded or bent axles should be replaced.

Spindle Wear, Scratches, Rust and Pitting

Any cracks found in the spindle require immediate axle replacement. Repair is not allowed.

Surface rust, scratches, or slight pitting on the wheel spindle bearing or seal journals may be polished or sanded out with emery or crocus cloth. Do not reduce the diameters of the journals beyond the axle manufacturer's specifications. Excessive pitting, scratches or fretting on the spindle bearing or seal journals-covering more than 50 percent of the surface-require immediate axle replacement.

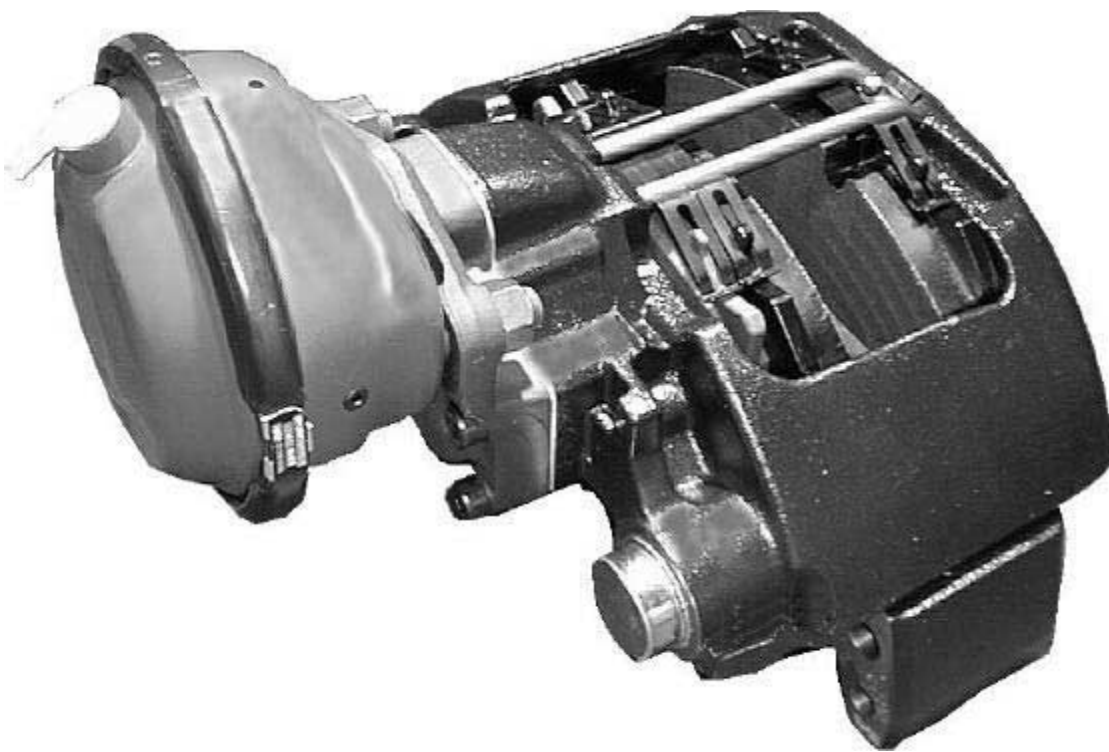
Spindle threads may be cleaned with a wire brush or chased with a die.

Repair welding of spindle threads are not permitted. Consult **IMT** if any wear is questionable.



Mechanical Sliding Caliper Disc Brake Type PAN 19-1

Assembly and Maintenance Instructions



1. Description of the Mechanical Sliding Caliper Disc Brake

1.1 Introduction

The brake **"PAN 19-1"** is special intended for use in trailers on front and rear axles for 19,5" or 22,5" wheel rims as service, auxiliary 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. This enables optimal utilisation of the installation situations.

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

- Brake Caliper (1)

- Brake Carrier (2)

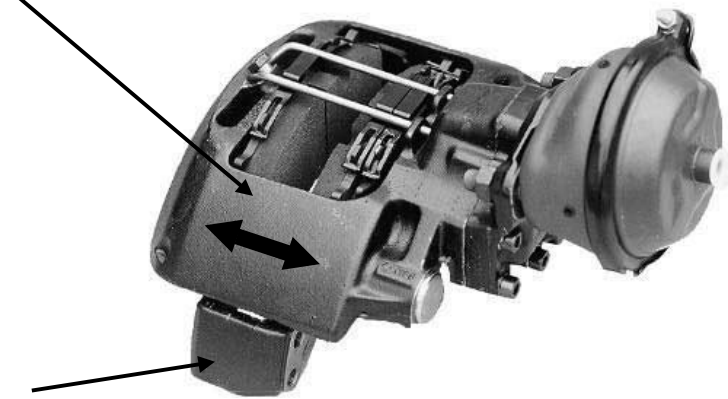


Fig. 1

The brake caliper (1) slides axially on guide pins (8, 9) mounted in 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 Fig. 1, 2 & 3.

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

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

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 predetermined 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.

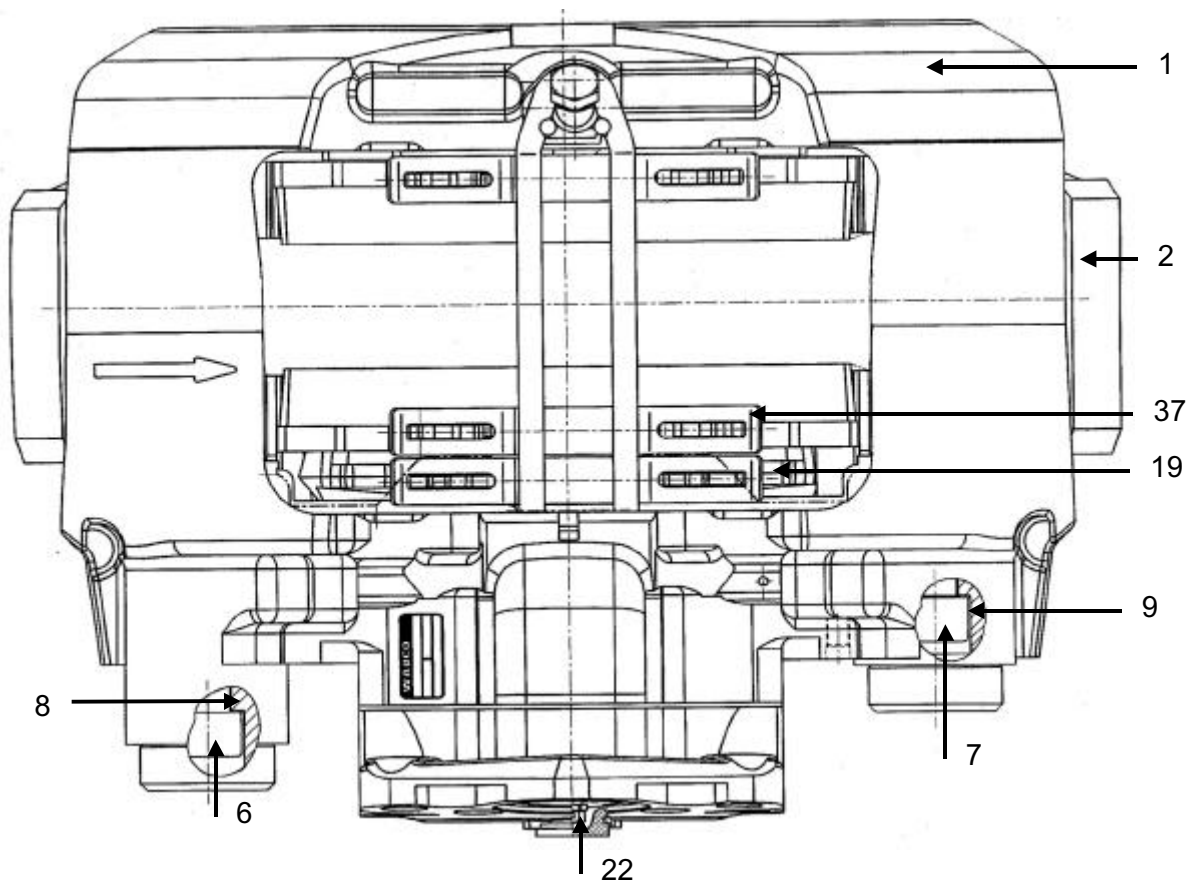


Fig. 2 Plan View

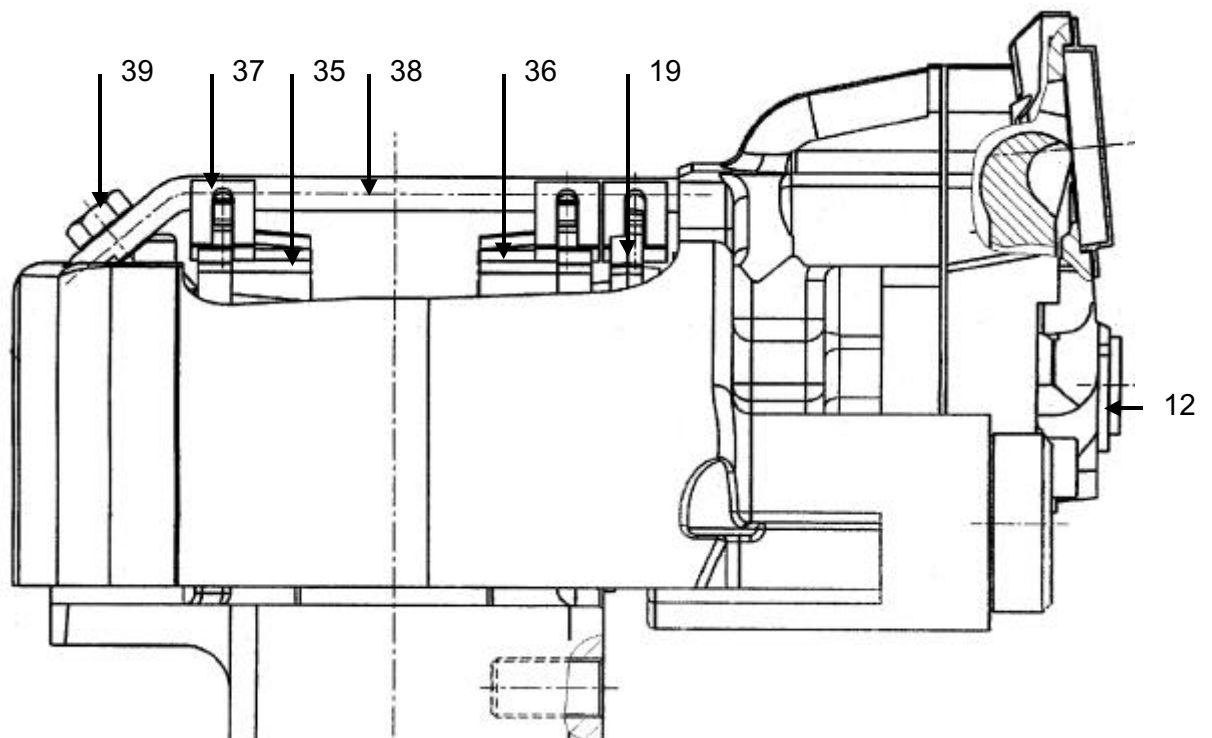


Fig. 3 Side View

2. Service Instructions

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

2.1 Safety Tips to be considered during Repair

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 brake pads or brake disc are damaged, or worn beyond their specified minimum thickness, brake effectiveness will diminish and possibly result in an accident. Burned, glazed or oil contaminated brake pads must be replaced immediately. **Always replace brake pads on a per axle basis!**

During repairs on the brake 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 brake it must be ensured that the brake can not be actuated inadvertently. Do not actuate the brake when brake pads are removed. Danger of Bodily Injury!

Do not clean the brake with pressurised air or other high pressure cleaning apparatus. Danger of Bodily Injury!

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

A second technician must assist during removal and installation of the brake. Heavy Load - Danger of Bodily Injury!

During repairs outside of the vehicle, the brake must be secured in a fixture, such as a heavy vise, as high torque is required during removal and installation of the bolts. Danger of Bodily Injury!

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

Only original and genuine WABCO Service Parts and approved brake pads are to be used.

During repairs use only recommended tools. Do not use a power-driven socket or tools! Tighten Nuts and Bolts only to specified torque limits.

With newly installed brake pads avoid emergency stops and long braking cycles during the first 50 km to prevent excessive temperatures.

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

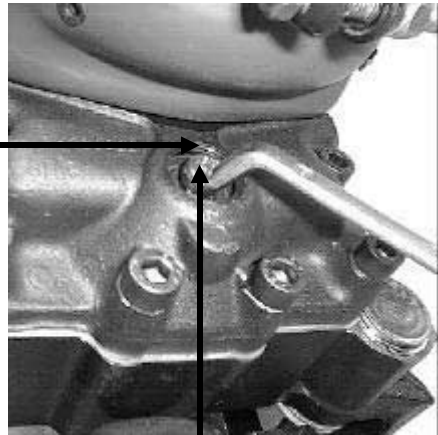
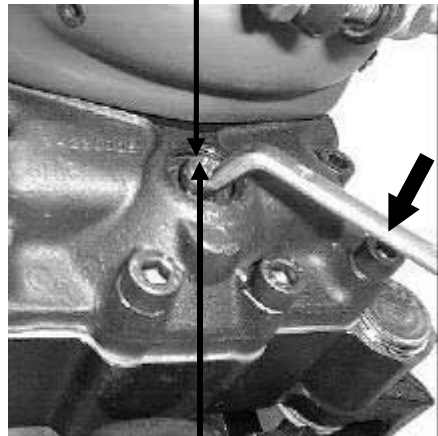
Upon completion of repairs the vehicles braking system must be tested on a roller dynamometer. If no roller dynamometer is available a driving test with brake applications must be performed.

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!

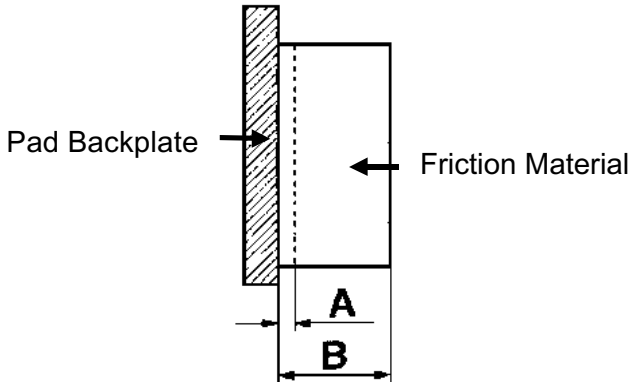
2.2.1 Checking Adjuster Function:

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

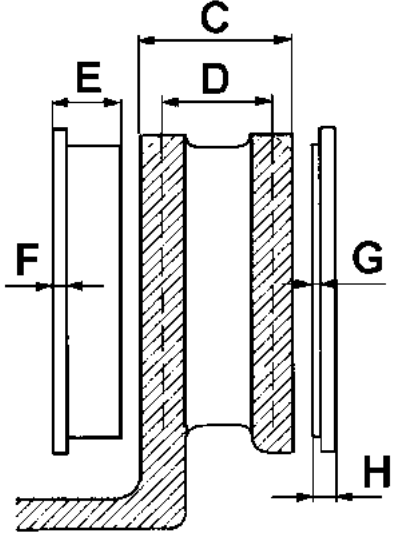
Work Sequences	Figures
<ul style="list-style-type: none"> Remove plug 12 for the adjuster 22 from the caliper. Using a ring spanner (Table 1, Position I), turn the adjuster hexagon. c. 1/2 turn in the clockwise direction. <p>Caution: Do not overload the adjuster 22 hexagon. Do not use an open ended spanner.</p> <p>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!</p> <ul style="list-style-type: none"> 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. <p>Note: With increasing adjustment increments the angular movement of the ring spanner becomes smaller.</p> <p>The adjuster is in order when the ring spanner rotates as described above.</p> <ul style="list-style-type: none"> Remove ring spanner (arrow). Refit plug 12, ensure that the plug sits properly. <p>Possible faults: The adjuster 22 respectively ring spanner (arrow)</p> <ol style="list-style-type: none"> does not turn turns only with the first actuation turns backwards and forwards with every actuation, then the adjuster is not in order. <p>Then replace brake!</p>	 <p>Fig. 4</p>  <p>Fig. 5</p>

2.3 Checking Brake Pads

Notice: 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
<p>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.</p> <p>The thickness of the residual friction material should not be less than 2 mm.</p> <p>A = Residual friction material thickness 2 mm. B = Total friction material thickness - new 21 mm.</p> <p>At residual friction material thickness A < 2 mm, renew brake pads (according to Section 3).</p>	 <p>Fig. 6</p>

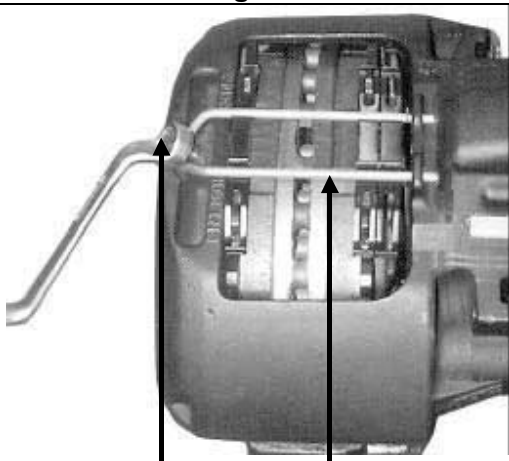
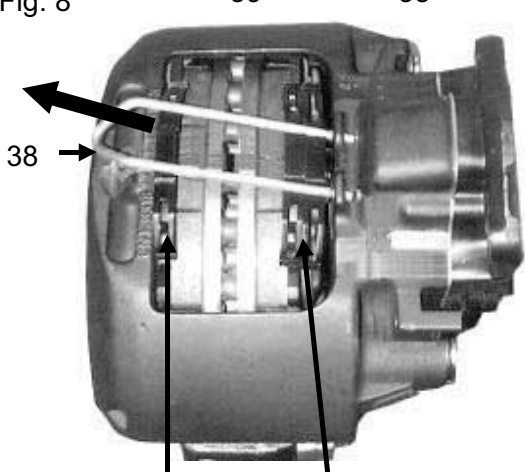
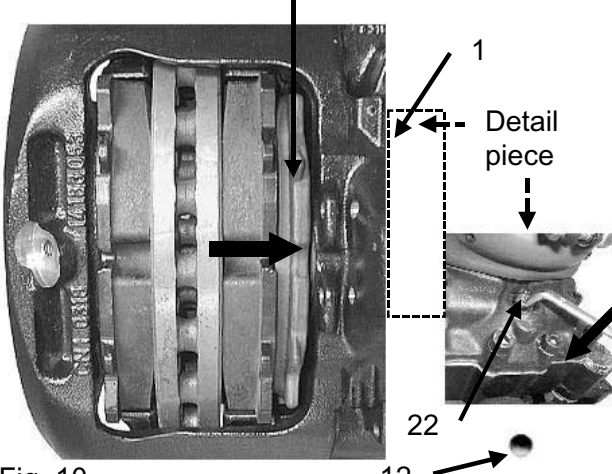
2.4 Checking Brake Disc

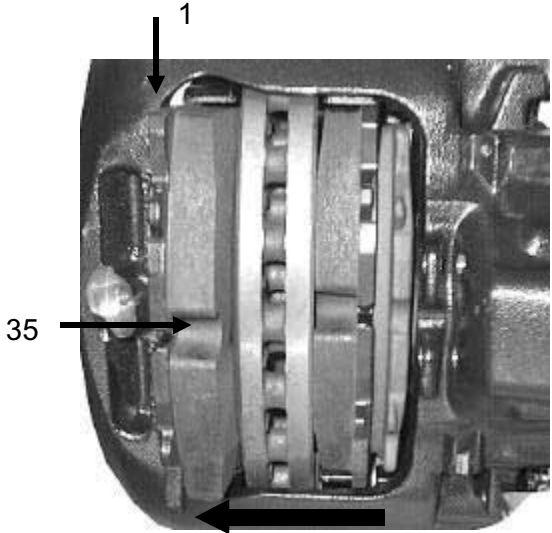
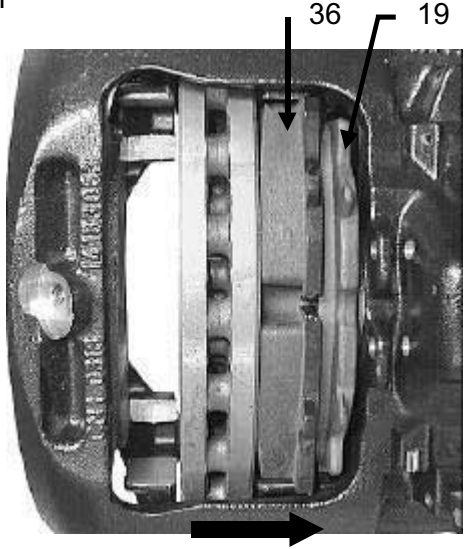
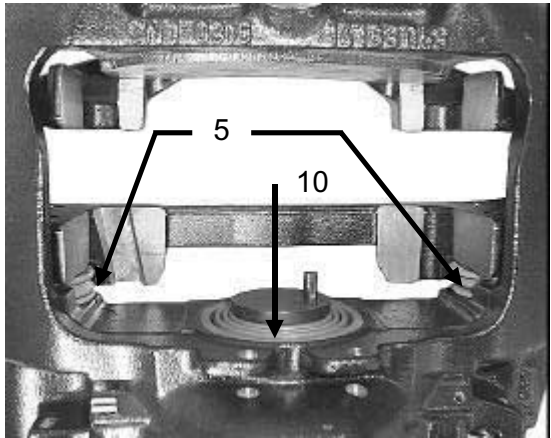
Work Sequences	Figures
<ul style="list-style-type: none"> Remove brake pads according to Section 3., and measure thickness of disc over the rubbing faces. <p>C = Total disc thickness - new 45 mm D = Wear allowance limit 37 mm The brake disc must be renewed. The renewal is recommend on a per axle basis.</p> <p>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.</p> <p>Caution: Observe brake pad and disc wear limits. Worn-out pads and discs reduce the brake effectiveness and can cause brake failure! Accident danger!</p>	 <p>Fig. 7</p>

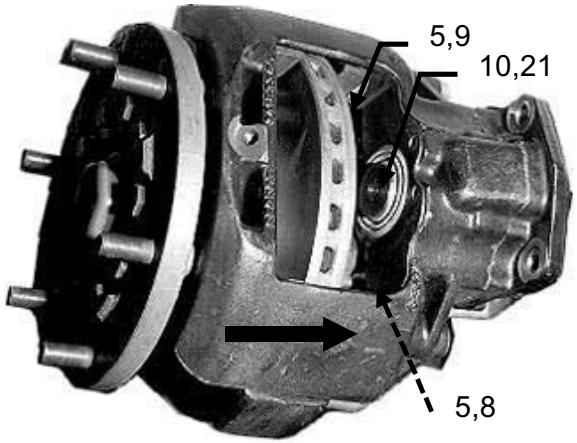
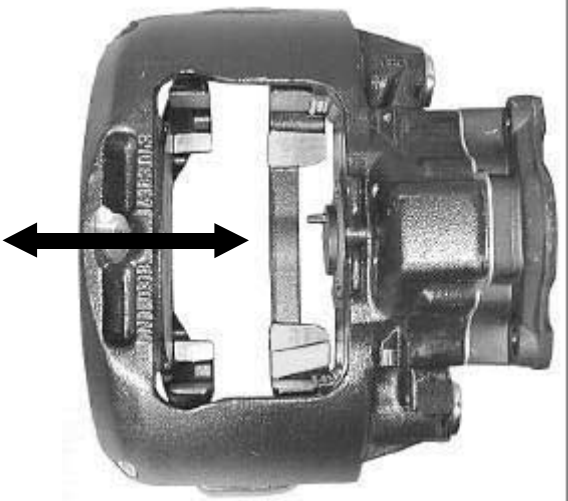
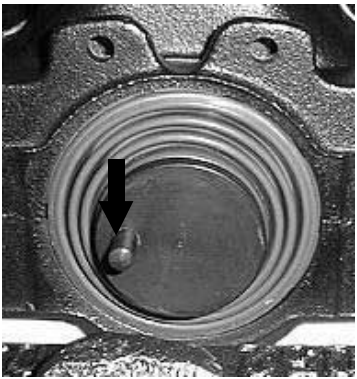
3. Renewing Brake Pads

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 Pads:

Work Sequences	Figures
<ul style="list-style-type: none"> Remove hexagon bolt 39 from pad hold-down hoop 38 with spanner (Table 1, Position II). 	 <p>Fig. 8</p>
<ul style="list-style-type: none"> 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. 	 <p>Fig. 9</p>
<ul style="list-style-type: none"> 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. <p>Note: The turning direction to de-adjust is to the right, i.e. clockwise.</p> <p>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!</p>	 <p>Fig. 10</p>

Work Sequences	Figures
<ul style="list-style-type: none"> Slide the caliper 1 by hand towards the wheel side (arrow) and remove the brake pad 35. 	 <p>Fig. 11</p>
<ul style="list-style-type: none"> Slide the caliper 1 by hand towards the cylinder side (arrow) and remove the brake pad 36 and the spreader plate 19. <p>Caution: Do not actuate the brake when brake pads are removed!</p>	 <p>Fig. 12</p>
<ul style="list-style-type: none"> Using a wire brush remove any corrosion from the spreader plate, brake pad slot, and spreader plate and brake pads guide surfaces. <p>Caution: Take care not to damage the dust caps (gaiters) 5, 10. The guide surfaces must be free of grease!</p>	 <p>Fig. 13</p>

Work Sequences	Figures
<p>Inspecting the Dust Caps (Gaiters) and Checking Brake Caliper Movement:</p> <ul style="list-style-type: none"> 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! <p>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.</p>	 <p>Fig. 14</p>
<ul style="list-style-type: none"> 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. <p>Caution: Do not squeeze the dust caps of the guide pins against the torque plate!</p>	 <p>Fig. 15</p>
<p>Checking the Adjuster Unit (Clamping Unit):</p> <ul style="list-style-type: none"> Prevent the adjuster screw turning by e.g. holding the pin (arrow) during the test and whilst rotating the adjuster hexagon. 	 <p>Fig. 16</p>

Work Sequences

- 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.

- 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

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.

Figures



Fig. 17

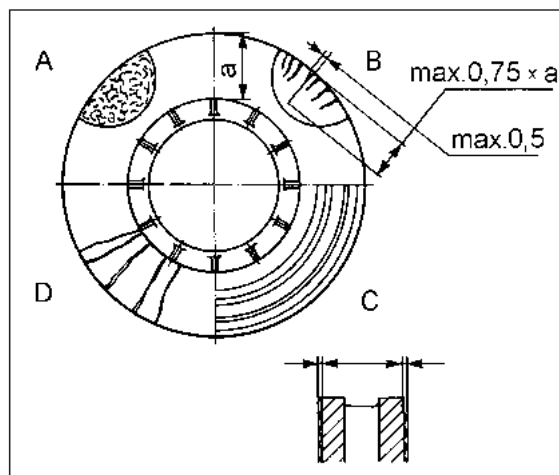


Fig. 18

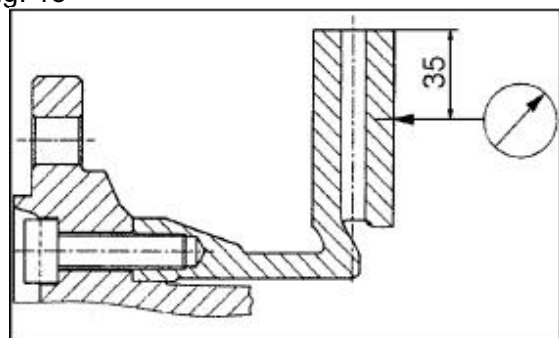
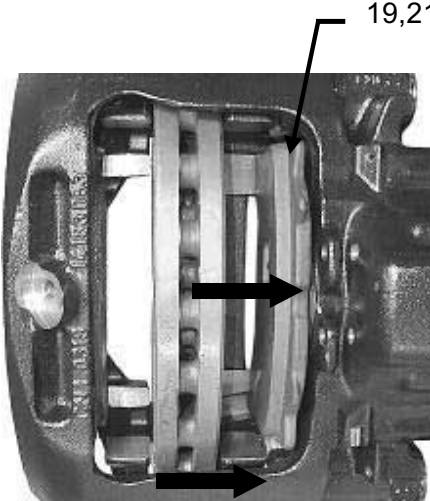
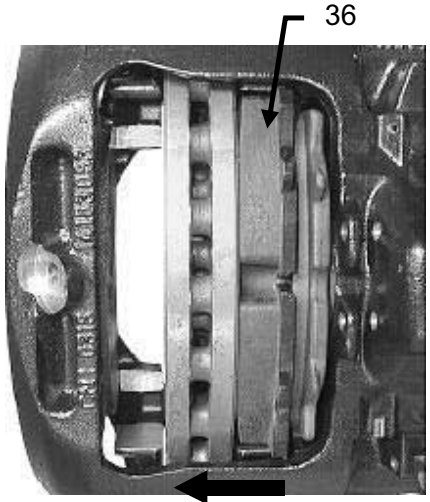
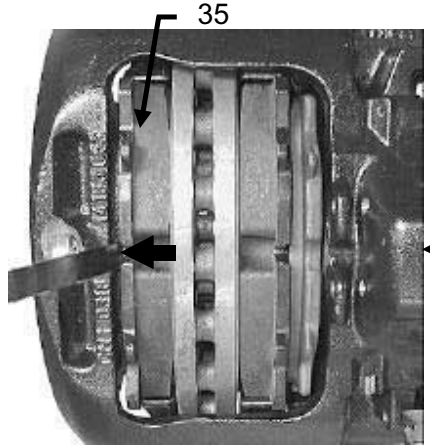
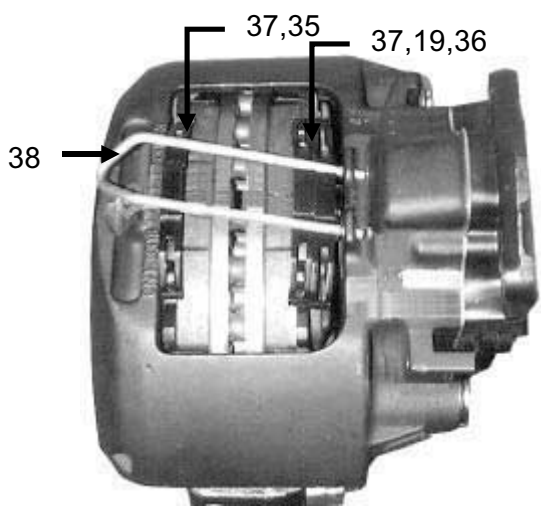
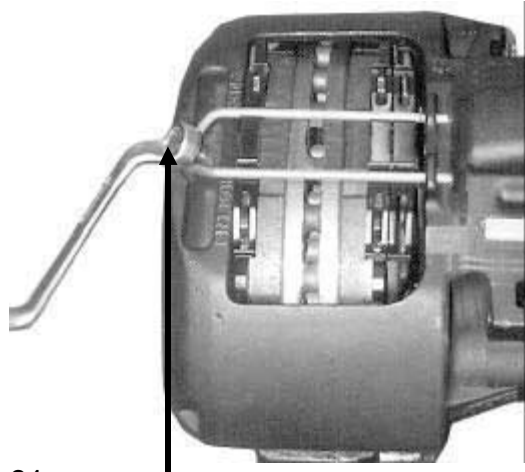
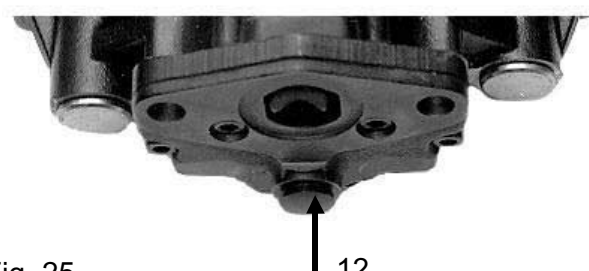


Fig. 19

Work Sequence for Pad Installation:

Work Sequences	Figures
<ul style="list-style-type: none"> 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. <p>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!</p>	 <p>Fig. 20</p>
<ul style="list-style-type: none"> Insert new brake pad 36 into the actuation side. Slide caliper towards the wheel side until brake pad 36 contacts the disc. 	 <p>Fig. 21</p>
<ul style="list-style-type: none"> 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. <p>Caution: Do not overstress the hex nut of the adjuster screw!</p> <p>Note: The turning direction to close up the pads is anti-clockwise. Do not fit pad hold-down hoop before setting clearance!</p>	 <p>Fig. 22</p>

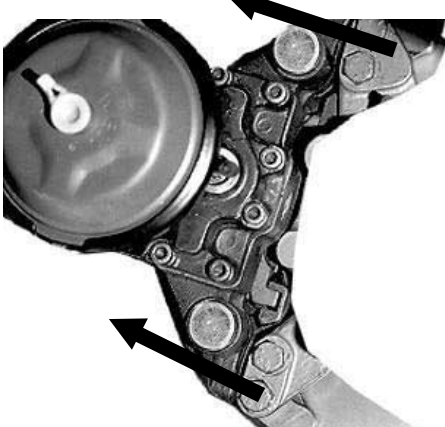
Work Sequences	Figures
<ul style="list-style-type: none"> Place new hold-down springs 37 on the brake pads 35, 36 and the spreader plate 19. Insert new pad hold-down hoop 38 in the holes in the brake caliper and press down so that the extensions on the spring engage with the hoop. 	 <p>Fig. 23</p>
<ul style="list-style-type: none"> Fit new hexagon bolt 39 to the brake caliper (Table 1, Position II). 	 <p>Fig. 24</p>
<ul style="list-style-type: none"> Fit new plug 12 to the opening in the brake caliper! Check that the hub rotates freely. <p>Caution: Upon completion test the brakes on the roller dynamometer!</p>	 <p>Fig. 25</p>

4. Renewing Brake

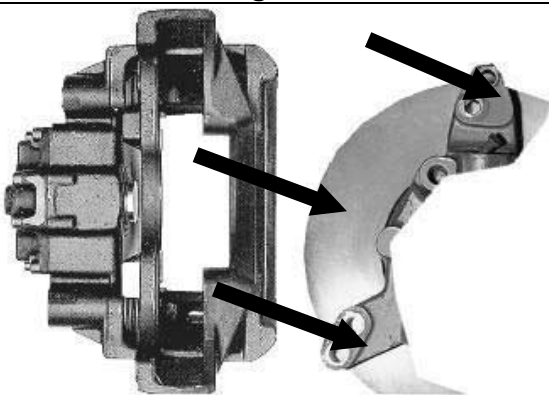
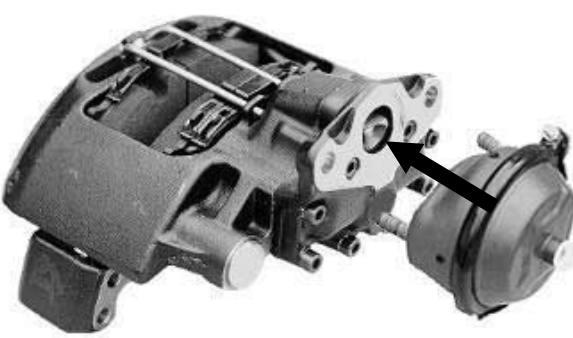
Caution: Do not use a power-driven socket! Keep hands and fingers out of the inside of the caliper to avoid injury!

Note: New brakes are assembled and together with the brake carrier can be fitted in the assembled state to the axle. **Make sure the brakes are mounted onto the correct side on the vehicle in forward direction (left hand brake/vehicle left side; right hand brake/vehicle right 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
<ul style="list-style-type: none"> 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. 	 <p>Fig. 26</p>

Work Sequences for Installing Brake:

Work Sequences	Figures
<ul style="list-style-type: none"> Mount the new brake over the brake disc on the axle. Tighten hexagon bolts with spanner (Table 1, Position III). <p>Note: Special assembly instructions of the vehicle manufacturer have to be noted.</p>	 <p>Fig. 27</p>
<ul style="list-style-type: none"> 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). <p>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!</p>	 <p>Fig. 28</p>

5. Renewing Gaiters

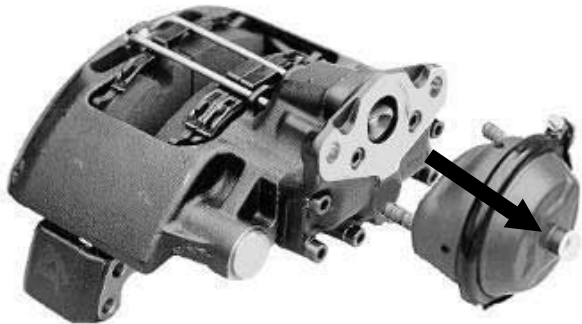
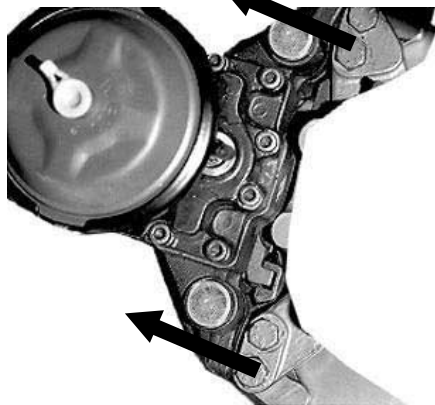
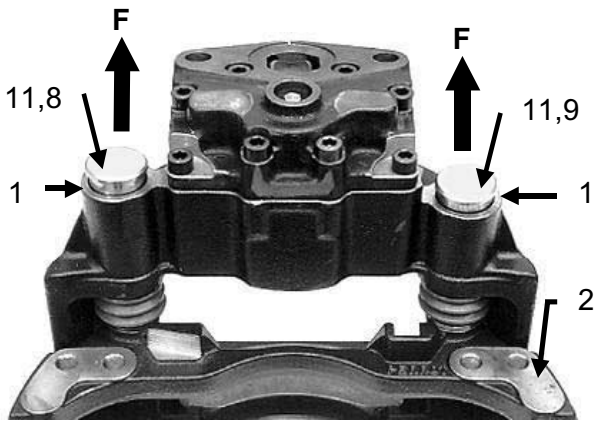
Caution: Do not use a power-driven socket! Keep hands and fingers out of the inside of the caliper to avoid injury!

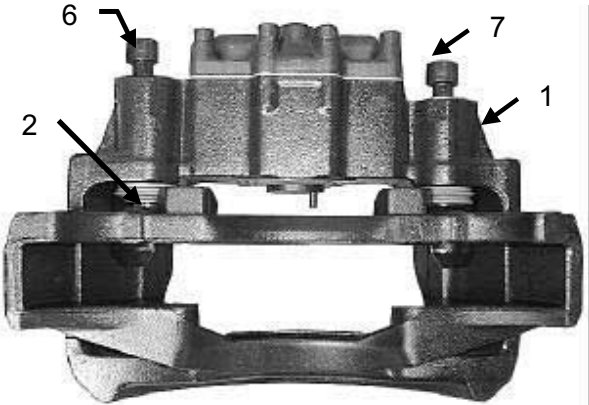
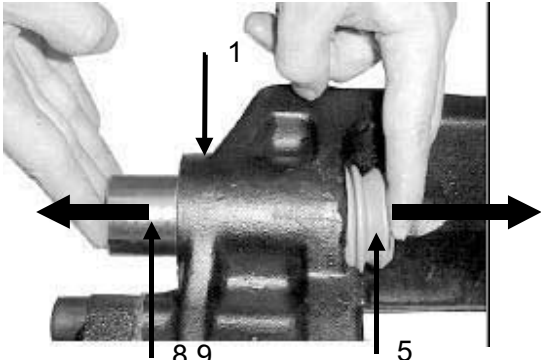
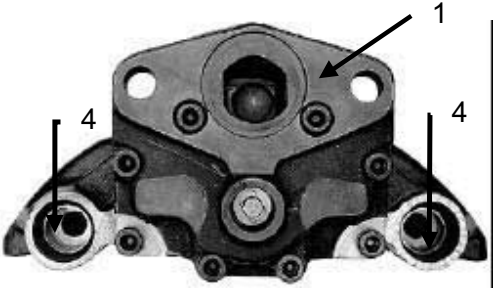
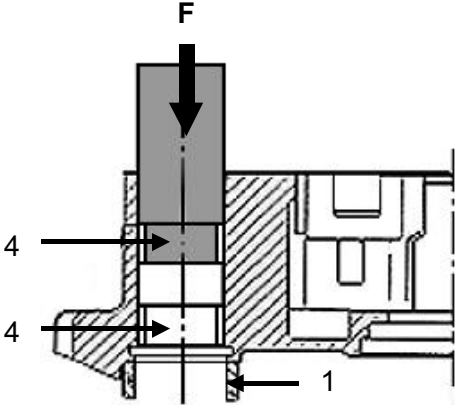
Note: When replacing all of the gaiters in the caliper, the work sequences 5.1 and 5.2 should be combined so as not to repeat some operations.

When replacing individual gaiters, follow the corresponding work sequences of the sections 5.1 and 5.2.

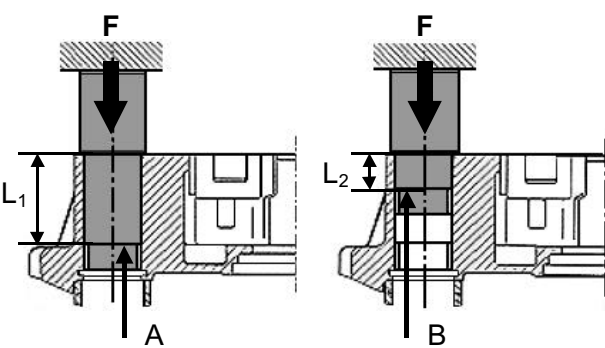
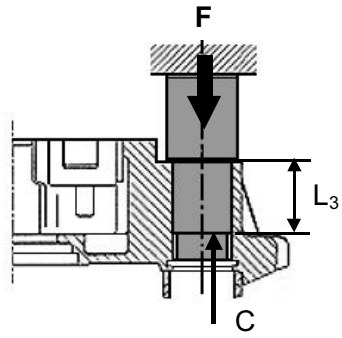
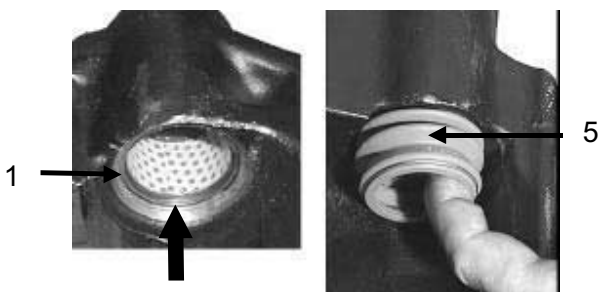
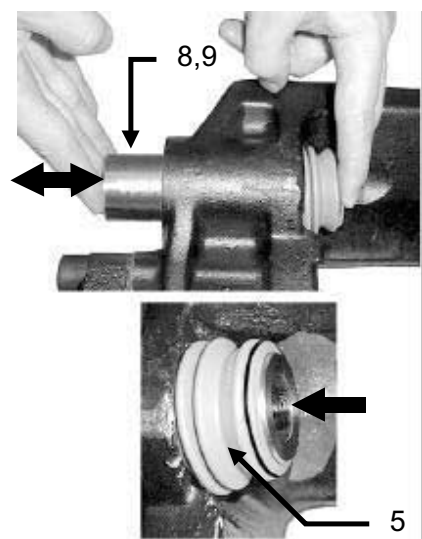
5.1 Renewing Guide Pin Gaiters and Bushes

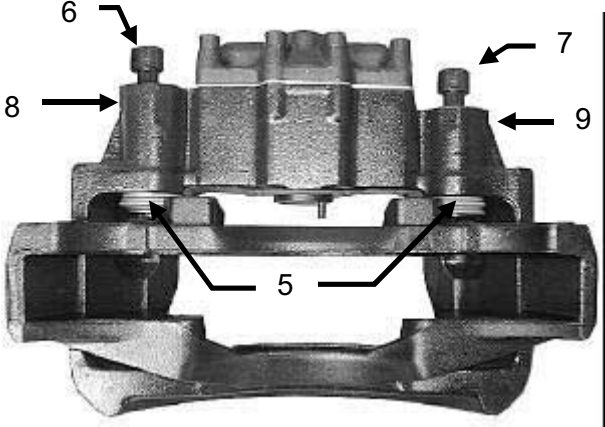
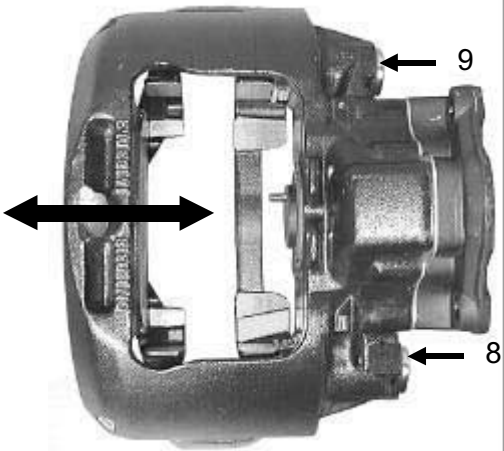
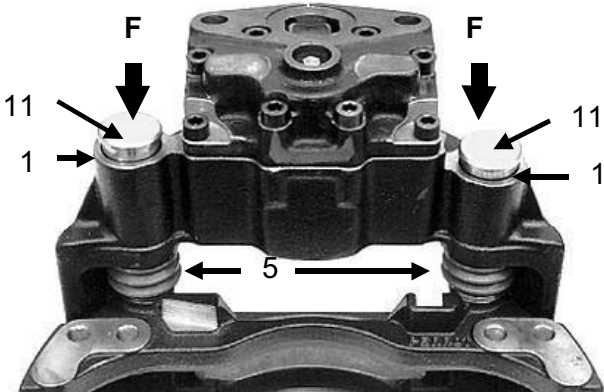
Work Sequences for Removal:

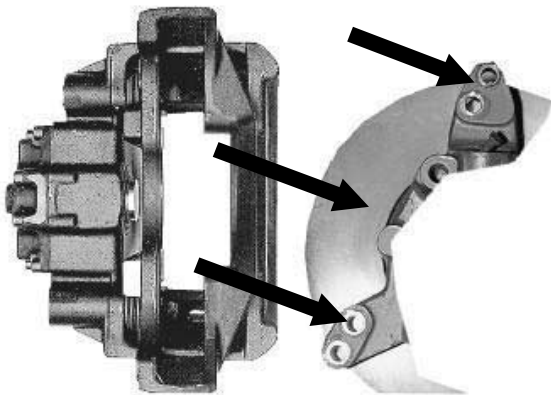
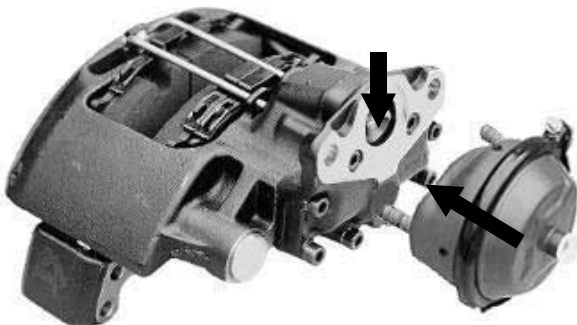
Work Sequences	Figures
<ul style="list-style-type: none"> Remove brake pads according to Section 3. Remove brake cylinder from the brake caliper by releasing cylinder nuts (Table 1, Position V). 	 <p>Fig. 29</p>
<ul style="list-style-type: none"> Dismantle the caliper with the carrier from the axle (Table 1, Position III). 	 <p>Fig. 30</p>
<ul style="list-style-type: none"> 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. <p>Caution: Take care not to damage cover bores in housing.</p>	 <p>Fig. 31</p>

Work Sequences	Figures
<ul style="list-style-type: none"> Release the bolts 6, 7 with a male socket (Table 1, Position IV) and separate the caliper 1 from the carrier 2. <p>Caution: Moving Brake Caliper. Danger of Bodily Injury!</p> <ul style="list-style-type: none"> Clean the mating surfaces (collars) of the carrier 2. 	 <p>Fig. 32</p>
<ul style="list-style-type: none"> Withdraw the guide pins 8, 9 and remove the gaiters 5. <p>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.</p>	 <p>Fig. 33</p>
<ul style="list-style-type: none"> Place the caliper 1 on a firm base to push out the bushes 4, so that the caliper opening is facing upwards. 	 <p>Fig. 34</p>
<ul style="list-style-type: none"> Press the bushes 4 out of the caliper 1 using a mandrel. Clean the bores in the caliper. 	 <p>Fig. 35</p>

Work Sequences for Installation:

Work Sequences	Figures
<ul style="list-style-type: none"> Press in two new bushes 4 for the longer guide pin 8. Firstly (A) fit the inner bush with the special fitting tool ($L_1 = 52.2 \pm 0.2$ mm) and secondly (B) the outer bush with the special fitting tool ($L_2 = 13.2 \pm 0.2$ mm) by pressing in as far as the mandrel abutment. Grease the bushes and the space between them. 	 <p>Fig. 36</p>
<ul style="list-style-type: none"> Press in new bush 4 for the shorter guide pin 9. Fit the bush (C) with the special fitting tool ($L_3 = 25.7 \pm 0.2$ mm) by pressing in as far as the mandrel abutment. Grease the bush. 	 <p>Fig. 37</p>
<ul style="list-style-type: none"> Fit new gaiters 5 in the gaiter seats (arrow) in the brake caliper 1. <p>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!</p>	 <p>Fig. 38</p>
<ul style="list-style-type: none"> 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. <p>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!</p>	 <p>Fig. 39</p>

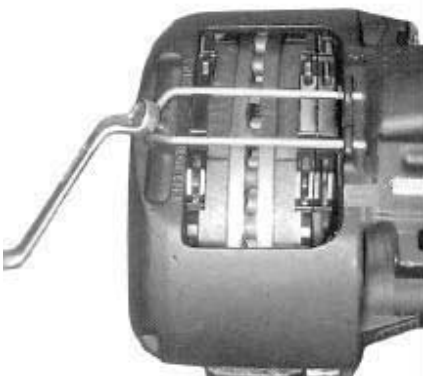
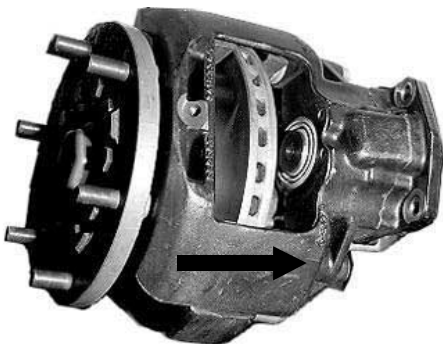
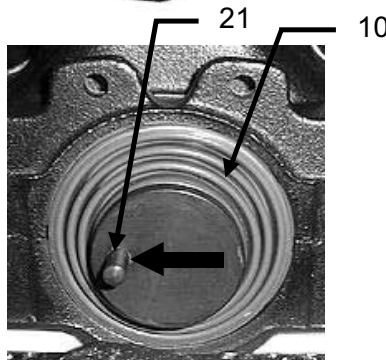

Work Sequences	Figures
<ul style="list-style-type: none"> Place the caliper 1 on the carrier 2 and insert the guide pins 8, 9 into the collars in the carrier. Insert new bolts 6 (long for close fit pin 8), 7 (short for clearance fit pin 9) into the guide pins in the brake caliper. Screw bolts to the brake carrier 2 with spanner (Table 1, Position IV). <p>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.</p> <p>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!</p>	 <p>Fig. 40</p>
<ul style="list-style-type: none"> Move brake caliper backwards and forwards on guide pins 8, 9 several times. Check for ease of movement. <p>Caution: Do not squeeze guide pin dust caps against brake caliper!</p>	 <p>Fig. 41</p>
<ul style="list-style-type: none"> 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. <p>Note: Take care to avoid damaging the covers.</p>	 <p>Fig. 42</p>

Work Sequences	Figures
<ul style="list-style-type: none"> • Mount brake over the brake disc on the axle. Tighten hexagon bolts with spanner (Table 1, Position III). <p>Note: Special assembly instructions of the vehicle manufacturer have to be noted.</p> <ul style="list-style-type: none"> • 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). <p>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!</p>	 <p>Fig. 43</p>  <p>Fig. 44</p>


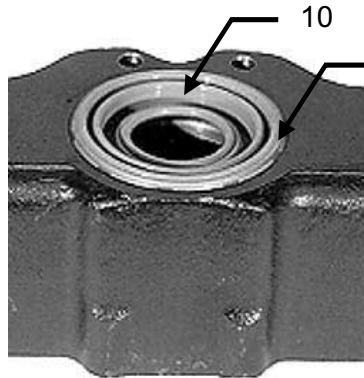
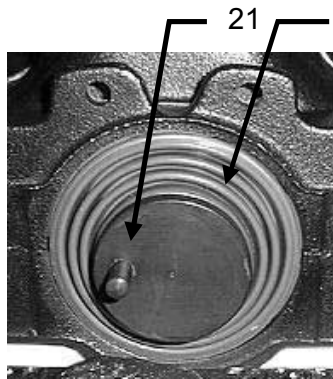
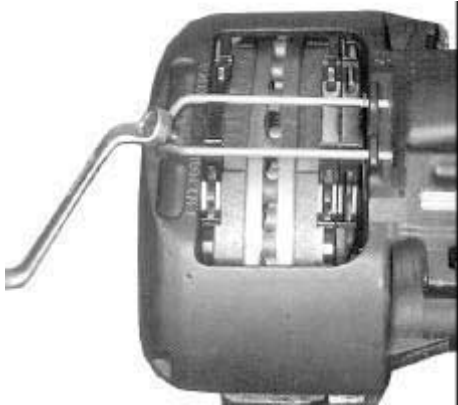
5.2 Renewing Adjuster Screw Gaiter

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

Work Sequences for Removal:

Work Sequences	Figures
<ul style="list-style-type: none"> Remove brake pads and spreader plate according to Section 3. 	 <p>Fig. 45</p>
<ul style="list-style-type: none"> 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. 	 <p>Fig. 46</p>
<p>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.</p>	 <p>Fig. 47</p>
<ul style="list-style-type: none"> 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. <p>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.</p> <ul style="list-style-type: none"> After examination grease the thread and partly screw back the adjuster screw in clockwise sense. 	 <p>Fig. 48</p>

Work Sequences for Installation:

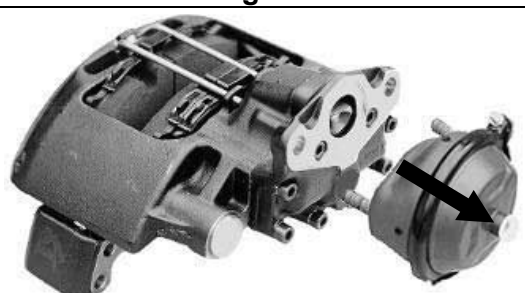
Work Sequences	Figures
<ul style="list-style-type: none"> Clean the gaiter 10 seat (arrow) in the caliper. (Shown in Figure without adjuster screw). 	 <p>Fig. 49</p>
<ul style="list-style-type: none"> Push the new gaiter 10 over the adjuster screw. Centralise the fitting tool on the gaiter 10 and press the gaiter into the seat in the caliper. (Shown in Figure without adjuster screw). 	 <p>Fig. 50</p>
<ul style="list-style-type: none"> Fit gaiter 10 into its seat in the adjuster screw 21. Lubricate gaiter lip to ease fitment. <p>Note: Ensure that the gaiter lip in the annular groove in the adjuster screw sits free of folds!</p>	 <p>Fig. 51</p>
<ul style="list-style-type: none"> Install brake pads and set clearance. Carry out according to Section 3 and pay attention to Notes. 	 <p>Fig. 52</p>

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 vehicle manufacturer. The following work sequences only inform in principle about the assembly and disassembly of the brake cylinder. Detailed assembly and check instructions have to be used according to the cylinder type and the instructions of the cylinder manufacturer.

Work Sequences for Removal:

Work Sequences	Figures
<ul style="list-style-type: none"> • Disconnect air line to cylinder (according to cylinder manufacturer's data). • Remove brake cylinder from caliper by releasing cylinder nuts (Table 1, Position V). 	 <p>Fig. 53</p>

Work Sequences for Fitment:

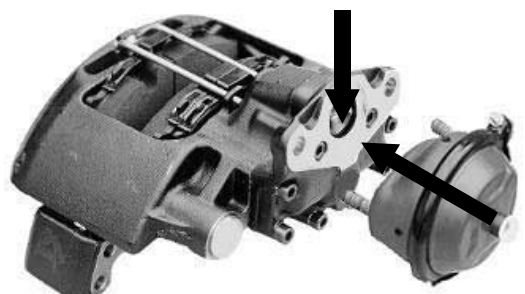
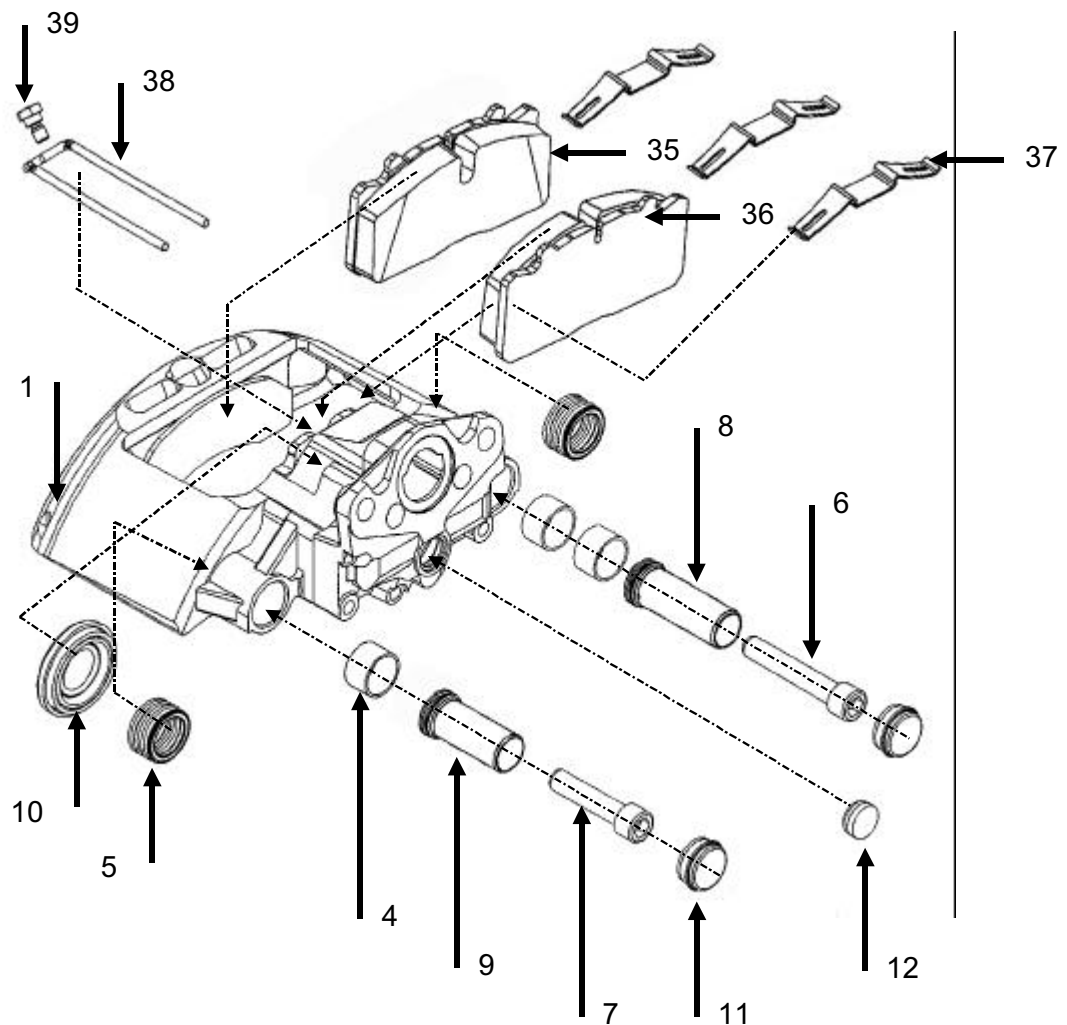
Work Sequences	Figures
<p>Caution: With the brake cylinder in its installed position ensure that the lower drainage hole facing the ground is open! All other holes must be plugged!</p> <ul style="list-style-type: none"> • Before fitting the brake cylinder clean the mounting flange on the caliper and 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). <p>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.</p> <ul style="list-style-type: none"> • Test air connection for leaks (according to cylinder manufacturer's data). • Carry out function and effectiveness tests (according to cylinder manufacturer's data). 	 <p>Fig. 54</p>

Table 1

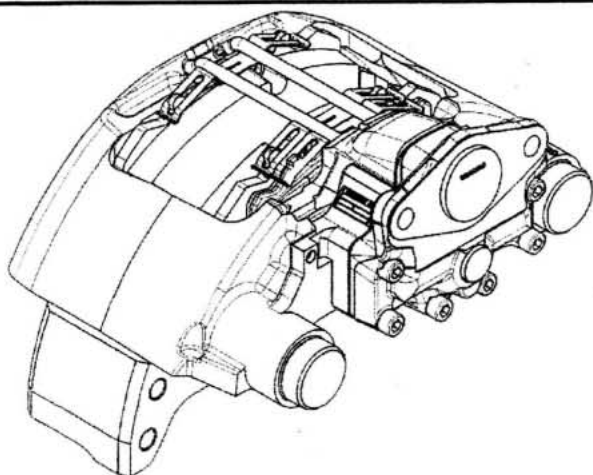
Position	Spanner Width [SW]	Hexagon		Tightening Torque [Nm]
		External	Internal	
I	8	X	--	Turning direction of hexagon: Adjust, anti-clockwise (left), maximum 3, air gap decrease. De-adjust, clockwise (right), maximum 12, air gap increase. Do not use a power-driven socket!
II	17	X	--	30 + 15
III	24	X	--	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

Explosive Diagram of the PAN 19-1 Replacement Parts



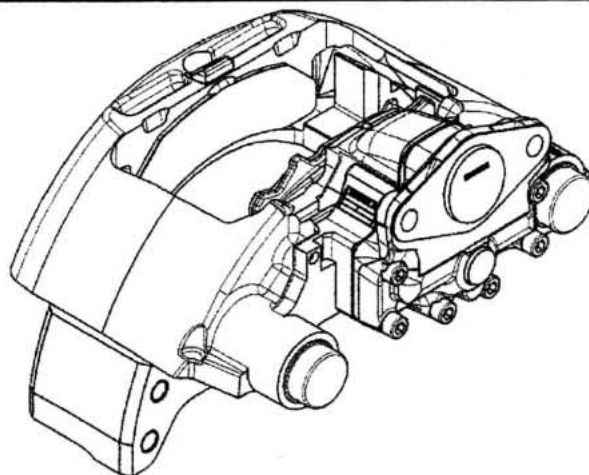
Legend:

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		



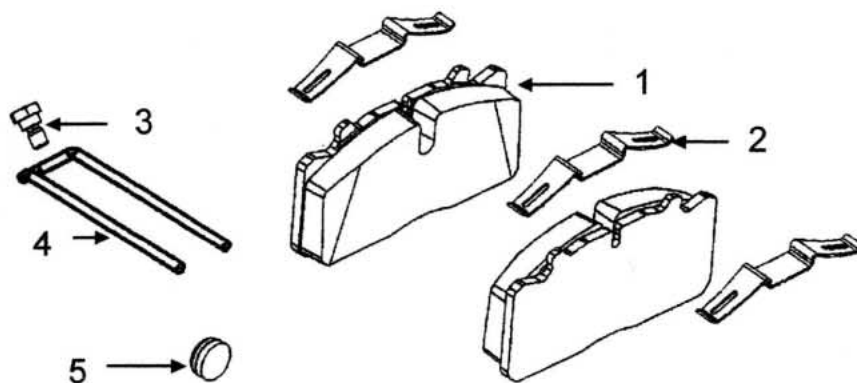
Brake with Pad

Part no. 40 195 001 or 40 195 002
(left or right hand brake)



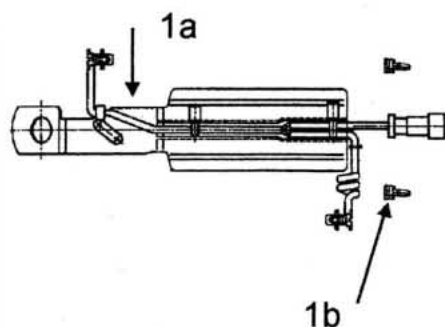
Exchange Brake without pad

Part no. 40 195 003 or 40 195 004
(left or right hand brake)

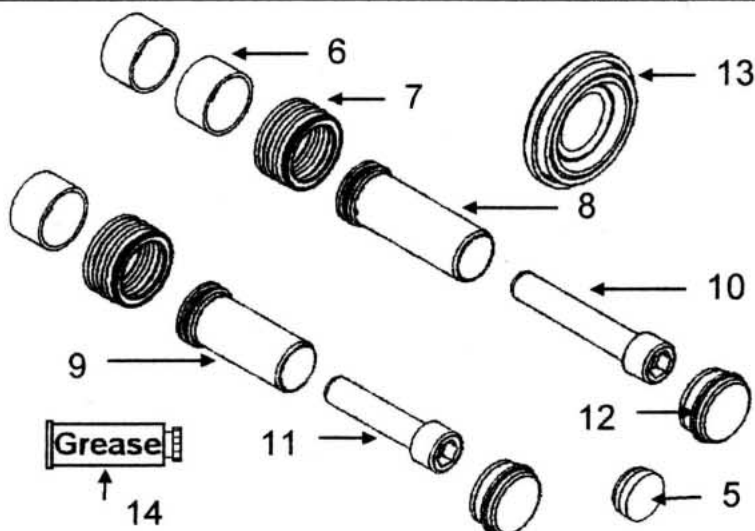


Repairset pads

Part no. 12 999 737
(per axle)



supplementary- equipment –
kit wear indicator
Part no. 12 999 755
(per axle)



Repairset seals and guide pins

Part no. 12 999 738
(per brake)

Ersatzteilliste/Spare parts list/Liste pièces de rechange
Bildtafel/Picture/Planche
Ersatz für/Replacement for/Rechange

Nr. 40 195 001/002
B B 1951
Nr. Ausgabe vom 16.03.2001

WABCO

Bremsen-/Brake-/Frein-Type PAN 19-1

Datum/date 07.09.2001

Pos. Nr.	Benennung	Nummer Number Nr. Repère	Stück/Bremse Qty./Brake Nbr. de pièce par frein	Designation	Désignation	Bemerkung Comment Observation
	Bremse	40 195 001		brake	frein	
	Bremse	40 195 002		brake	frein	
	Reparatursatz Beläge, bestehend aus:	12 999 737		repair set of brake pads, consisting of:	pochette de rép.de garniture de frein, se compose de:	Austausch muß achsweise erfolgen
1	Scheibenbremsbelag		4	brake pad	garniture de frein	
2	Blattfeder		6	leaf spring	ressort à lame	
3	Sechskantschraube		2	hexagon screw	vis à tête hexagonale	
4	Bügel		2	strap plate	étrier	
5	Verschlußstopfen		2	rubber plug	bouchon de fermeture	
	Nachrüstsatz bestehend aus:	12 999 755		supplementary-equipment kit, consisting of:	pochette de rattrapage se compose de:	pro Achse
1a	Verschleißanzeige		2	wear indicator	indicateur d'usure	
1b	Rohrklammer		4	pipe support	agrafe de tuyau	
	Reparatursatz Dichtungen und Führungsbolzen, bestehend aus:	12 999 738		repair set of seals and guide bolt consisting of:	pochette de rép. des joints et axe-guide se compose de:	pro Bremse
5	Verschlußstopfen		1	rubber plug	bouchon de fermeture	
6	Buchse		3	bush	douille	
7	Schutzkappe		2	boot	capuchon de protection	
8	Bolzen		1	bolt	goujon	
9	Bolzen		1	bolt	goujon	
10	Zylinderschraube		1	fillister socket head screw	vis à tête cylindrique	
11	Zylinderschraube		1	fillister socket head screw	vis à tête cylindrique	
12	Deckel		2	cover	couvercle	
13	Schutzkappe		1	boot	capuchon de protection	
14	Tube Fett		1	tube of grease	tube de graisse	
	Austauschbremse	40 195 003		exchange brake	échange frein	linke Bremse
	Austauschbremse (ohne Belag)	40 195 004		exchange brake (without lining)	échange frein (sans patin)	rechte Bremse

Bitte beachten Sie:

Der Austausch von Bremsbelagträgern muß immer pro Achse erfolgen!

Please note:

When replacing a brake, all brake linings on that axle must be changed!





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