Contents

Compressed Air System

Eliminate the type of trouble named below only by exchanging pertinent components. Compressed air units may be repaired only by authorized brake service stations.

Trouble	Cause	Remedy
Anti-freeze protection		
Compressed air escapes at actuating rod.	Oil sealing ring leaks.	Renew oil sealing ring. Check sealing surface at rod.
Compressed air escapes at actuating flange of reservoir.	Round cord ring leaks.	Renew round cord ring.
Anti-freeze continuously used up in closed position.	O-ring leaks.	Renew O-ring.
Anti-freeze system not operating well in operating position.	Anti-freeze used up. Reservoir contains more water than anti-freeze.	Drain water and fill up with specified anti-freeze only.
Drain valve		
Drain valve leaks.	Actuating valve or valve seat dirty or defective.	Operate actuating valve for a short moment, clean valve or valve seat and renew, if required.
Diaphragm brake cylinder (Westinghouse)		
Response pressure too high.	Diaphragm defective.	Renew diaphragm.
Diaphragm brake cylinder leaks when pressurized.	Diaphragm defective. Clamping ring or housing leaks.	Renew diaphragm. Tighten clamping ring; check housing, if required.
Drop in air pressure when fully braking exceeds legal specifications.	Diaphragm stroke too high.	Adjust wheel brakes.
Relay valve		
Compressed air escapes in released position from bleed connection (E).	Intake valve leaks. Round cord ring defective.	Clean valve and valve seat. Renew round cord ring or exchange.
Compressed air escapes during partial or full braking at bleed connection (E).	Exhaust valve leaks.	Make valve and valve seat operable.
Valve not sufficiently sensitive.	Piston binds. Round cord ring defective.	Make piston operable. Renew round cord ring.
Response step too high.	Round cord ring and piston bind.	Make piston operable. Renew round cord ring.

Trouble	Cause	Remedy
Automatic brake force regulator (Westinghouse)		
Compressed air escapes at breather bore while braking (e).	Slotted ring or diaphragm leaking.	Renew slotted ring or diaphragm.
In braking position, compressed air escapes at bleed connection (E).	Exhaust valve, O-rings leaking.	Renew pertinent sealing elements.
Regulator not sufficiently sensitive.	Control piston or actuating shaft or piston stuck. Lever length not acc. to our specifications.	Check possibilities named under "Cause". Renew damaged parts. Replace unit, if required. Adjust lever length.
Control valve (adjustable) (Westinghouse)		
Retaining pressure cannot be adjusted.	O-ring swollen. Diaphragm leaking. Spring broken. Threads of adjusting screw damaged.	Renew O-ring. Renew diaphragm. Renew spring. Renew screw, check threads in housing.
Unit not holding pressure.	Diaphragm leaking.	Renew diaphragm.
During all-out braking, unit does not transmit full pressure.	Piston binds.	Check piston or renew.
In released position, unit withholds pressure.	Disc valve defective.	Clean disc valve or renew.
Air-controlled trailer control valve (1 line) (Westinghouse)		
In driving position, compressed air escapes at bleed connection (E).	Exhaust valve leaking.	Clean exhaust valve or exchange.
In driving position, compressed air flows into chamber (Z) and escapes through connected control line at bleed conn. (E) of tractor brake valve.	Compressed air escapes through sealing rings on stepping piston in chamber (Z).	Renew sealing rings of stepping piston.
In driving or braking position, compressed air escapes at breather bore of pressure limiter.	Bottom sealing ring on pressure limiter leaking.	Exchange bottom sealing ring of pressure limiting piston.
In braking position, compressed air escapes at bleed conn. (E).	Intake valve or upper sealing ring of pressure limiting piston leaking. Cup sleeve of trailer valve (in trailer) defective.	Renew intake valve or upper sealing ring of pressure limiting piston. Exchange cup sleeve of trailer valve.
Pressure in trailer control line not acc. to specified value.	Pressure limiter wrongly adjusted or pertinent spring defective.	Adjust to specified reduced pressure at adjusting screw of pressure limiter or renew compression spring of pressure limiting piston.

Notes on preparing plastic and metal pipelines

A. Plastic pipelines

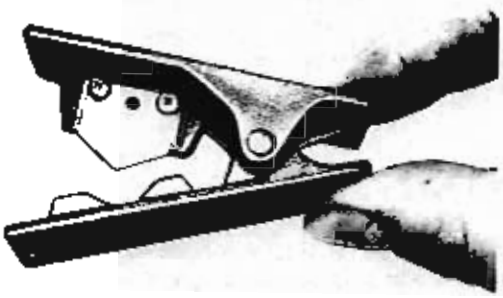
I. Material

The plastic pipelines are made of polyamide 11 w LT. Polyamide is flexible and resistant against all substances to be found in a motor vehicle such as petroleum products, oils and grease. In addition, the plastic pipes are resistant against alkalines, solvents not containing chlorine, organic and anorganic acids and diluted oxidants. The melting point of plastic pipes is +185° C, with a permissible working range between −40° C and +100° C.

Protect or remove plastic pipes when carrying out drilling or welding work

II. Screw fitting and assembly

The plastic pipe must be cut at right angles using the cutting tool for every new screw fitting.



R42-6593

Fig. 1
Cutting tool 000 589 12 28 00

After cutting, press the sleeve into the end of the pipe as far as it will go and slide the union nut and bite ring onto the plastic pipe. Screw the union nut by hand to the stop on the pipe socket and tighten a further 1½ to 1¾ turns using a wrench. Loosen the union nut once again and check whether the bite ring is firmly located on the plastic pipe and the pipe is visibly raised in front of the bite ring. Finally tighten the union nut in the usual manner.

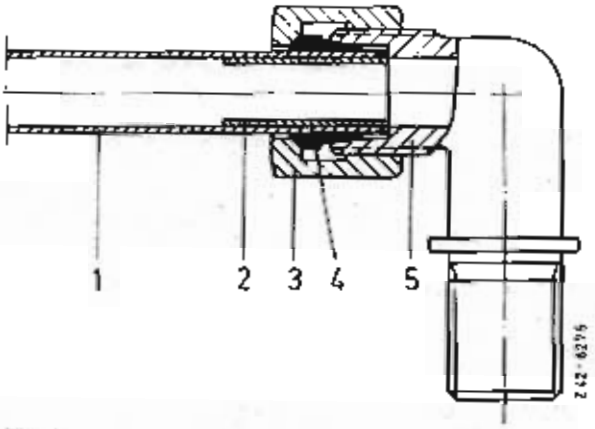


Fig. 2

1 Plastic pipe
2 Sleeve
3 Union nut
4 Bite ring
5 Pipe socket

Inlet union screw fitting

In the case of this type of screw fitting, the plastic pipe is held in a clamp and the inlet union or a pipe elbow is driven into position by means of a plastic-headed hammer.

42 Trouble Diagnosis Chart – Possible Sources

Trouble	Cause	Remedy
Dual-Circuit Tractor Valve (Westinghouse)		
In driving position, compressed air escapes at bleed connection (E) into the open air.	Intake valve leaks. Lower O-ring on spring-loaded valve body leaks. Compressed air escapes from trailer control valve connection Z. Tristop cylinder leaks. Piston of relay valve binds.	Check intake valve. Exchange O-ring. Renew sealing rings of stepped piston. Renew piston ring of spring-loaded cylinder. Check piston of relay valve.
In braking position, compressed air escapes at bleed connection (E).	Exhaust valve leaks.	Check exhaust valve.
Tractor brake valve not sufficiently sensitive.	Compensating bore clogged. Guide or stepping piston binds. Spring broken.	Clean compensating bores. Check piston or renew. Check piston slide surfaces. Renew spring.
Tristop Cylinder (Westinghouse)		
Rear wheel brake heats up while driving. Compressed air escapes via bleed connection (E) on tractor brake valve or on relay valve (service brake).	Front sealing ring on push rod leaking. Compressed air will now flow from spring-loaded chamber into diaphragm chamber.	Exchange front sealing ring.
In released position, compressed air escapes via closing cap of mechanical release.	Rear sealing ring on push rod leaks.	Exchange rear sealing ring.
In released position, compressed air escapes through bleed bores on diaphragm cylinder.	Piston ring leaks. This will cause compressed air to escape through bleed line from spring-loaded chamber into diaphragm chamber.	Renew piston ring of spring-loaded section.
Pressure drop during full braking exceeds legal specifications.	Diaphragm stroke too high.	Adjust wheel brakes.
Response stage of spring-loaded cylinder too high.	Cylinder running surface rusted. Piston sleeve swollen.	Renew spring-loaded cylinder. Replace piston sleeve. **Caution!** A special device is required for disassembling spring-loaded brake cylinder.
Response pressure too high.	Diaphragm defective.	Renew diaphragm.
Overflow valve		
Overflow valve cannot be perfectly adjusted.	Diaphragm leaks, spring is defective, breather bore clogged.	Clean diaphragm or renew, renew spring, clean bore.

It must still be possible to shift the plastic pipe in the tightened cable clip. When bending the pipe, a minimum radius must be observed, otherwise the pipe may be kinked.

Pipe size Outer diameter × wall thickness	Minimum permissible bending radius (r) in mm
4×1	20
6×1	30
8×1	40
12×1.5	60

When laying plastic pipelines, a certain minimum clearance to the exhaust system must be maintained.

Minimum clearance of plastic pipelines to the exhaust system

200 mm for exhaust systems without screen
80 mm for black painted screens
40 mm for screens coated with inorganic zinc.

IV. Spare parts

Plastic pipe with accessories

Plastic pipe part number	Color	Outside dia.	Wall thickness	Inside dia.	Nut	Bite ring	Sleeve
010 997 54 82	sw	4	1	2	003 870 004 102	003 861 004 001	000 992 05 05
008 997 60 82	sw	6	1	4	003 870 006 105	003 861 006 006	000 992 01 05
008 997 90 82	sw	8	1	6	003 870 008 104	003 861 008 004	000 763 00 43
010 997 59 82	sw	12	1.5	9	003 870 012 104	003 861 012 006	000 992 15 05

sw = black

Note: Order plastic pipes by running meters.

42 Trouble Diagnosis Chart – Possible Sources

Trouble	Cause	Remedy
Air inlet valve (pressurizing valve)		
In released position, compressed air escapes at bleed bore (E).	Valve plate leaking.	Clean valve or renew.
In pressurizing position, compressed air keeps escaping at bleed bore (E).	Valve or seal defective.	Clean valve or renew. Exchange seal.
In released position, pressurizing plunger not perfectly returning.	Spring defective. Plunger binds.	Renew spring. Check plunger, refinish or renew.
Compressed air cylinder (power cylinder)		
Response pressure too high.	Cylinder running surface rusty. Cup sleeve swollen.	Renew power cylinder. Renew cup sleeve.
In pressurizing position, power cylinder leaks.	Cup sleeve defective.	Renew cup sleeve. Check cylinder running surface.
In bleed position, piston rod not perfectly returning.	Spring defective. Cup sleeve swollen.	Check springs and cup sleeve or renew.
Pressure warning lamp		
Pressure warning lamp lights up while driving.	No or not enough supply pressure.	Observe double pressure gauge, fill-up supply pressure, check brake system for leaks.

Note: For checking leaks in line system and on compressed air units, use soap solution free of residue or a conventional checking compound.

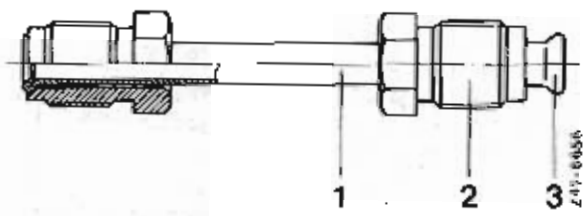


Fig. 10

1 Hydraulic line
2 Screw
3 Bead

Length sections

From 200 to 2.000 mm, in steps of 50 mm
From 2.000 to 6.000 mm, in steps of 200 mm

A double beading device (Sykes Pickavant or Stahlwille 165) can be used for self-made pipelines.

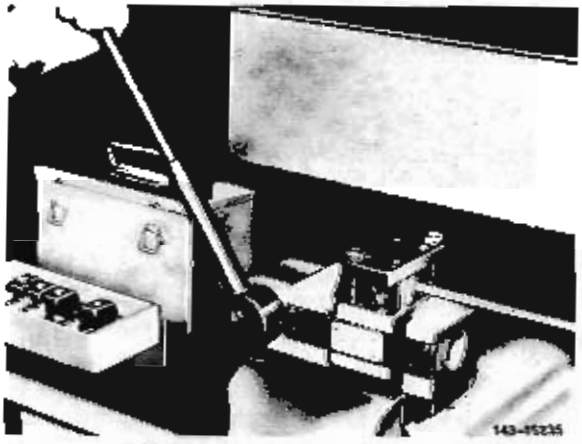


Fig. 11

With the device, beads (F and E in accordance with DIN 74234) can be produced on lines up to (12 mm dia. or 10 mm dia.) and up to a wall thickness of 1 mm.

III. Laying

Excess lengths should be arranged in slightly sagging arched sections – this is not difficult in the longitudinal support beams of the frame –. The supply lines 8, 9 and 10 mm from the equalizing tank to the master cylinder are still supplied in the specified lengths. In order to avoid the formation of air bubbles, supply lines must always be arranged ascending from the master cylinder to the equalizing tank. Supply lines and brake lines must always be layed with **extreme care** especially when working in confined spaces.

All screw fittings must be tightened **free of stress.**

D. Special tools

Designation	part number
Cutting tool	000 589 12 28 00
Cable clip pliers	352 589 02 37 00
Clamp	387 589 02 37 00
Assembly tool	387 589 03 63 00
Pipe bending tool	000 589 39 31 00

Available from: NEW – 60 (Wörth)

Double beading device

Supplier: 1 Fritz Wegner GmbH & Co.
Stormsweg 12
2000 Hamburg 76

Sykes-Pickavant Ltd., Warwick Works Kilnhouse Lane, Lytham St. Annes Lancashire, FY8 3DU, England

Supplier: 2
Eduard Wille GmbH und Co.
Lindenallee 27, 5600 Wuppertal-Cronenberg

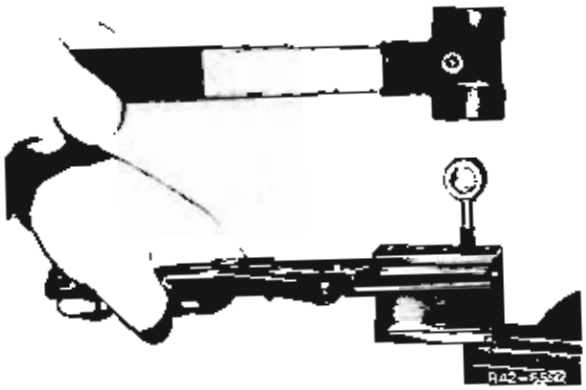


Fig. 3
Clamp 387 589 02 37 00

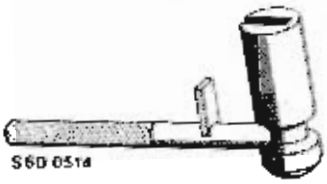


Fig. 4
Assembly tool 387 589 03 63 00

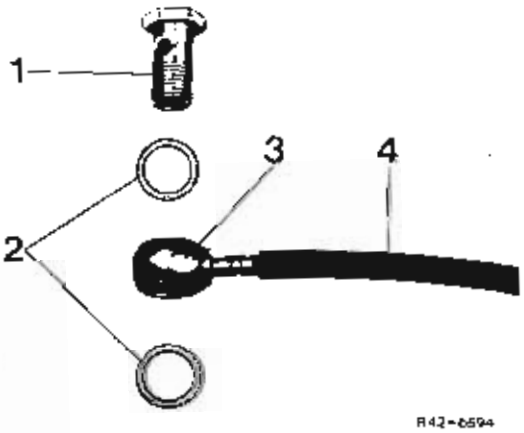


Fig. 5
Inlet union screw fitting

1 Banjo bolt
2 Sealing rings
3 Inlet union
4 Plastic pipe

If a plastic pipeline is damaged, it is not necessary to renew the entire length. The damaged area can be cut out and a double union inserted.

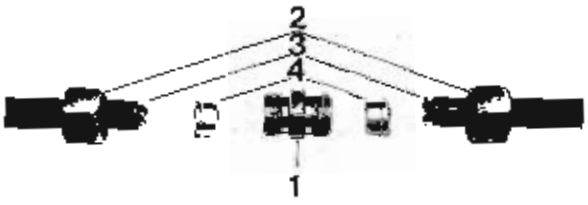


Fig. 6

1 Double union
2 Nut
3 Sleeve
4 Bite ring

The screw fitting can be checked for leaks (with the plastic pipe under working pressure) with soap water; if necessary,l retighten union nut. If leaks cannot be eliminated the plastic pipe must be renewed toghether with the bite ring and sleeve.

III. Laying

Plastic pipes must be arranged in such a way as to ensure chafing cannot occur and secured with cable clips at 50 cm intervals.

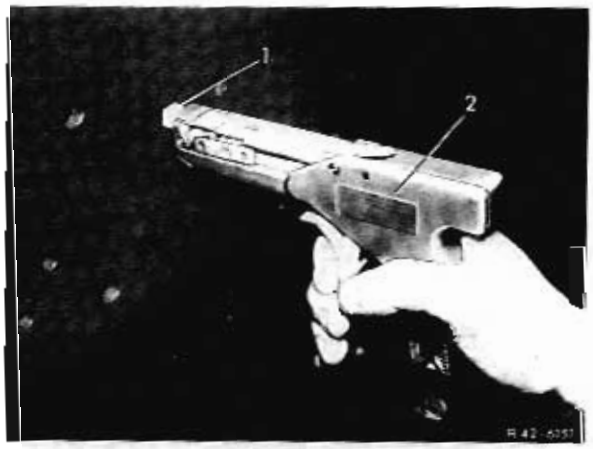


Fig. 7
Cable clip pliers 352 589 02 37 00

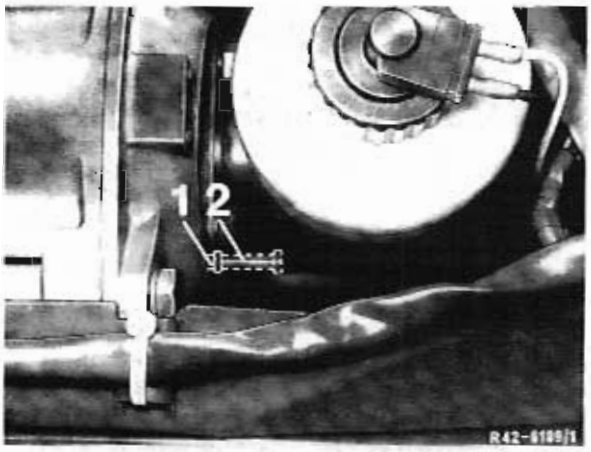


Fig. 2

1 Indicating pin in starting position
2 Indicating pin actuated

Automatic load dependent brake

Models 608 to 1013 (314, 316, 318)
These vehicles are provided with an automatic, load dependent brake force regulator on rear axle as standard equipment.

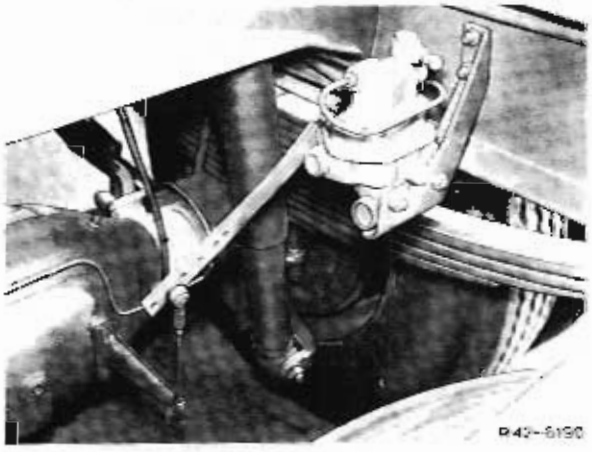


Fig. 3 Automatic brake force regulator on rear axle

In combination with a trailer brake, the front axle of models 808, 913, 1013 is also included in automatic brake force regulator system.

Models 1013 to 2224/6 x 4 (380–385)
These vehicles are also provided with an automatic, load dependent brake on rear axle as standard equipment. Starting at 14 t perm. total weight, the front axle of air suspended vehicles is included in load dependent system by means of a hydraulic pressure control valve (except LS-vehicles).

The applied pressure and the brake force are adapted to the respective load condition so that any over-braking of an empty vehicle will be avoided.

Spring-loaded parking brake

The spring-loaded brake cylinders of the parking brake located on frame are acting on rear axle brakes via linkages and shafts.

Actuation is without a linkage by means of compressed air which can be steplessly controlled by a manually operated valve, so that the parking brake can also be used as an auxiliary brake. An engine brake is available as a third brake actuated by an air valve.

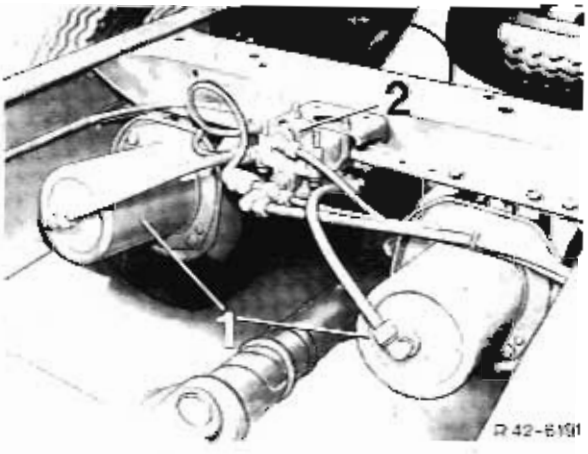


Fig. 4

1 Spring-loaded brake cylinder
2 Relay valve

Trailer brake

For trailer operation, a double line brake connection or a combined single and double line brake connection can be installed.

B. Metal pneumatic pipelines

I. Laying

The pipelines must be layed in such a way as to ensure they are free of tension and chafing cannot occur. Use the same mounting points for the new pipelines as for the removed pipes.

Use a pipe bending tool for bending. Use the removed pipeline as the bending pattern. Under no circumstances must the pipeline be heated up for bending purposes, since this would destroy the surface protection and the resulting oxidation would lead to faults in the brake units.

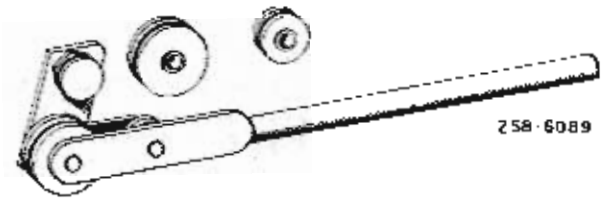


Fig. 8
Pipe bending tool 000 589 39 31 00

With exchangeable rollers for bending metal lines with a diameter from 8 to 18 mm.

II. Screw fitting and assembly

The end of the pipe must be cut at right angles and deburred for assembly. The union nut, bite ring and thrust ring must be pushed over the cut-off pipe collar and screwed to the pipe socket while pressing the pipeline.

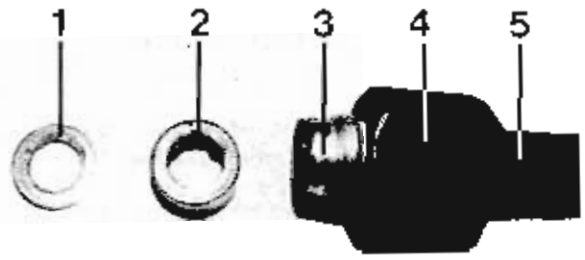


Fig. 9

1 Sealing ring
2 Thrust ring
3 Bite ring
4 Union nut
5 Steel pipeline

Prevent the pipeline from turning when screwing onto the socket. The union nut must then once again be loosened in order to check whether the cutting edge of the bite ring has penetrated into the outer skin of the pipe and whether the raised collar is visilbe in front of the cutting edge.

The pipeline must be cleaned with compressed air before final assembly

C. Hydraulic brake lines

I. Material

The hydraulic brake lines consist of a steel strap copper-plated on both sides in accordance with DBL 4040 (double-walled wrapped piping) and galvanized depending on version.

II. Screw fitting and assembly

Hydraulic brake lines with a dia. of 6 mm are no longer preshaped, but rather they are now supplied in the following length sections ready beaded together with the relevant union nuts.

At a pressure of 0.1 to 0.5 bar (kp/cm²), the 3/2-way valve (33.2) is switched over by the pressure switch (10.2) in rear axle.

The controlled braking pressure from rear axle can now flow into control connection 4 of load/no-load valve (25.1).

3 Braking position – front wheel brake circuit

From tractor brake valve (13.2) connection 21, the braking pressure flows to load/no-load valve (25.1) connection 1 and is reduced in accordance with control pressure at connection 4.

When the control pressure on connection 4 of load/no-load valve (25.1) attains the level of the braking pressure at connection 1, the pressure reduction will be cancelled.

Loss of one brake circuit

When the **front wheel brake circuit** fails, the rear wheel braking pressure will be controlled in accordance with load condition.

When the **rear wheel brake circuit** fails, the 3/2-way valve (33.2) remains in rest position under influence of interrupted circuit. The front wheel braking pressure enters the front axle in unreduced condition.

Checking solenoid valve (33.2) and pressure switch (10.2) for function

1 Interrupt circuit by pulling plug from pressure switch (10.2) or solenoid valve (33.2).

The pressure switch (10.2) is located on tractor brake valve (13.2) in brake circuit 2.

2 Apply all brakes, the available supply pressure will enter front wheel brake circuit in unreduced condition.

3 Close circuit again. When the brakes are now fully applied, the braking pressure entering the front axle will now be in accordance with load condition only.

42 General description – Light and medium trucks (hydraulic brake with compressed air support)

Brake system

Light trucks 608 to 1013 (314–318) starting chassis end No. 4 282 708

Medium trucks 1013 to 2224/6 x 4 (380–385)

On light trucks modernization and adaptation of brake system to medium heavy models. Simultaneous redesignation of vehicles 608 to 709 and 808 to 809.

Start of revision

Model 709, 809, 813 starting chassis end No. 4 383 114
Model 913, 1013 starting chassis end No. 4 373 947

The following revisions were mainly involved:

1. On LP 608 (without trailer brake) change from lever-type to spring-loaded brake.

2. New hand brake valve with test position (during trailer operation), with resulting elimination of formal 3/2-way valve (rotary knob valve).

3. Installation of a relay valve into spring-loaded circuit.

4. Use of a new trailer control valve with integrated 2/2-way valve. As a result, former, separate 2/2-way valve is no longer required.

Service brake

In accordance with EEC regulations, the service brake is designed as dual circuit hydraulic brake with dual circuit compressed air support.

Brake actuation

Model 608 to 1013 (314, 316, 318)

The service brake is mechanically actuated by means of a linkage.

Model 1013 to 2224/6 x 4 (380–385)

The dual circuit brake unit is actuated either mechanically by means of a linkage and cable control or hydraulically by means of a dual circuit master and slave cylinder system.

The brake pedal together with compressed air tanks and control instruments is mounted on an equipment carrier located at the left on vehicle frame.

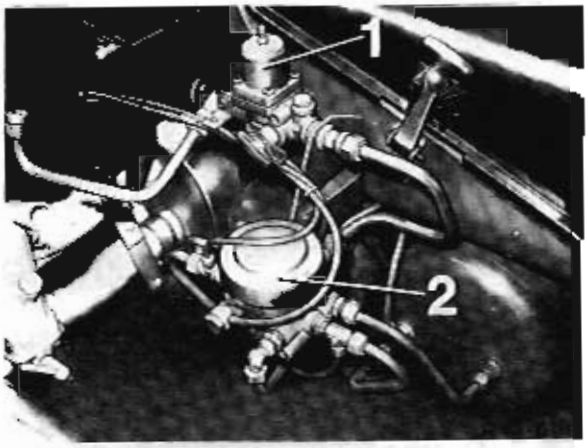


Fig. 1
1 Pressure regulator
2 Four-circuit protective valve

The brake fluid in filling-up tanks on hydraulic main cylinder is controlled via an electric warning system. An inadequate filling condition in filling-up tank is indicated to driver by a warning lamp on instrument panel.

The brake lining can be checked for wear by means of a mechanical stroke control on brake unit. At 2/3 stroke of brake unit, either an indicating pin on brake unit will be actuated or a warning lamp in cab will light up.

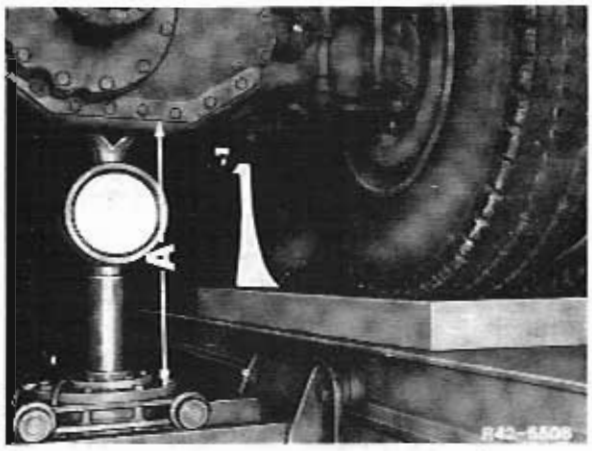


Fig. 1
A Dimension A with rear axle not raised

4 Raise inspection pit lift until the wheels of the raised rear axle (fig. 2) turn freely.

Note: The rear axle must be raised horizontally.

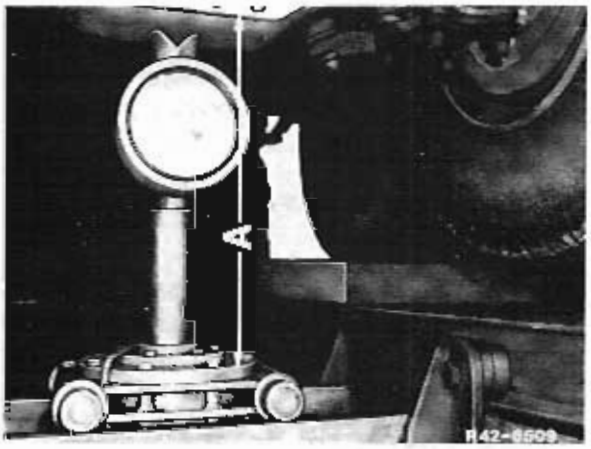


Fig. 2
A Distance A must correspond to the dimension in fig. 1, however, with the blocks of wood removed.

5 Remove blocks of wood from under the free moving wheels.

6 Move inspection pit lift back to the distance "A" and read off the rear axle load from the pressure gauge of the test scales.

7 Lower rear axle, drive vehicle from blocks of wood and adjust brake pressure regulator corresponding to the determined load (refer to Workshop Manual Brakes Volume II, Group 42.4).

Brake system

Service brake

The brake system is a dual circuit compressed air system designed according to EEC regulations.

The foot pressure is transmitted to the brake valves by means of the suspended pedal in cab via a dual circuit hydraulic system with master and slave cylinders and separate compensating tanks, which are integrated in the three-piece compensating tank (third tank for hydraulic clutch actuation).

The supplied pressure is on a higher level than up to now and permits the use of smaller tank volumes and diaphragm brake cylinders. Both the front and the rear axles are provided with a new rotary shoe brake and a uniform brake drum diameter of 410 mm. The brake design is that of a Simplex brake. By placing the fixed points of the brake shoes closer to each other, a higher inner ratio has been attained. All brake parts can be preassembled and are then screwed on axle. In addition to facilitating assembly, a universal applicability of this partial unit has now been attained.

Automatic load dependent brake

All heavy-duty vehicles are provided with an automatic load dependent brake (ALB) as standard equipment.

In addition to actuating the rear wheel brake of heavy-duty trucks delivered up to now, the ALB system also and additionally acts on the front wheel brake.

The distance between the frame and the rear axle will change in accordance with the vehicle load. This change serves as a control factor for the ALB system. It is transmitted from the rear axle by means of a linkage to the regulator, which is mounted on the frame and is connected to the compressed air line of the rear brake circuit between the brake valve and the diaphragm brake cylinders. When the vehicle is fully loaded, the regulator will transmit the pressure coming from the brake valve unchanged to the diaphragm brake cylinders on rear wheels, when the vehicle is partially loaded or empty, the pressure is pertinently reduced. The front wheel brake is influenced by the load-controlled rear axle. The controlled rear axle brake pressure is taken as control pressure via a solenoid valve to a load-no load valve installed between the brake valve and the diaphragm brake cylinders in compressed air line of front brake circuit and is attached to frame close to front axle.

Depending on level of control pressure — that is, on the respective loading condition — the pressure coming from the brake valve is transmitted to the diaphragm brake cylinders on front wheels either unchanged or reduced in accordance with the load. If the rear brake circuit and thereby the control pressure are not available, the solenoid valve will switch over and will guide the pressure coming from the brake valve in front brake circuit to the load-no load valve to serve as control pressure. As a result, the pressure coming from the brake valve will become fully effective on diaphragm brake cylinders of front wheels.

On air suspended vehicles, the automatic load dependent brake is controlled by means of the air bellows.

Engine brake and parking brake

All vehicles are provided with a pneumatically actuated engine brake and an air-controlled no-linkage spring loaded parking brake.

7 In this full-load position, actuate brake pedal up to level of test pressure and compare applied braking pressure with pressure shown on ALB-plate.

8 If the adjusting data specified on ALB-plate are not attained, first compare installed wheel springs, brake force regulator and lever length with data on ALB-plate for correctness. Only then look for faults in brake system and remove.

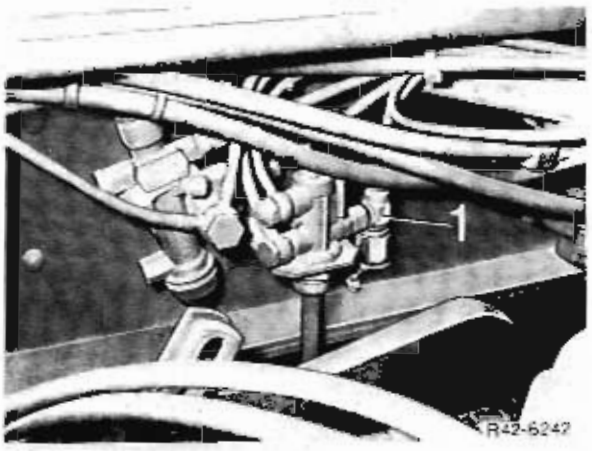


Fig. 2

1 Test valve on air-suspended vehicles

42 Information on testing

In the interest of the road safety, inspection and maintenance of the brake system is of the utmost importance. The brake system must therefore be checked on a regular basis.

Scope of inspection work:

1. Examination of brake shoes
2. Inspection of rubber dust caps on wheel and pressure cylinders
3. Inspection of brake drums
4. Examination of lines and pipes for corrosion, chafed areas and stone clip
5. Checking the brake fluid level in the brake fluid reservoir
6. Checking the brake system for leaks (including the hydraulic system)
7. Checking idle travel of brake pedal
8. Examination of handbrake
9. Checking brake deceleration

Checking compressed air systems for leaks:

With engine stationary and system filled:
Pressure drop in 10 minutes not greater than 0.15 bar (overpressure)

At partial brake pressure of 3 bar (overpressure):
No recognizable change in pressure in the supply and brake cylinder within 3 minutes.

Data

Vehicle type	Trucks with air assisted hydraulic brake system	Trucks with pneumatic brake system
Clearance between brake lining and brake drum	0.4–0.6 mm	0.7 mm
Clearance between plunger and tappet of the master cylinder	max. 1 mm	–
Brake fluid level in hydraulic brake system	10–20 mm below upper edge of teh brake fluid reservoir	–
Pressure (residual pressure) in the hydraulic brake system	0.5–1.7 bar overpressure	–

The following points must be observed when carrying out repairs of the brake system:

Only works approved spare parts may be installed. In the Federal Republic of Germany for example, brake parts such as the brake pressure regulator, pressure control valves, plastic pipes and brake linings are specified in the Allgemeine Betriebserlaubnis (ABE) (general road approval). If parts other than those specified for the respective type are installed ABE is no longer applicable.

Vehicle type	Model	Brake drum inner diameter			
		Axle	Normal	Repair stage 1	Repair stage 2
1928	621	Front axle Rear axle Trailing axle	$410^{+0.2}$	$411{,}5^{+0.2}$	$413^{+0.2}$
1932	389				
2028/6x2	622				
2032/6x2/4	391				
2219/6x2/4 2219/6x2 2219/6x4 2224/6x2 2224/6x4	385				
2226/6x2 2226/6x4	393				
2228 2228/6x4	623				
2232/6x2 2232/6x4	393				
2626/6x4 2626/6x6	395				
2628/6x4 2628/6x6	624				
2632/6x4 2632/6x6	395				
3328/8x4/4	624				

42 Automatic load dependent brake (ALB)

Layout

All heavy-duty vehicles are provided with an automatic load dependent brake on front and rear axle as standard equipment. On semi-trailer vehicles. the ALB on front axle will no longer be installed.

The rear axle is controlled by an automatic brake force regulator.

The front axle is controlled by the automatic brake force regulator via a load/no-load valve.

Models 2226/6x2, 2232/6x2
On these vehicles, the trailing axle is additionally controlled by the brake force regulator of the rear axle via an intermediate control valve (with straight characteristic).

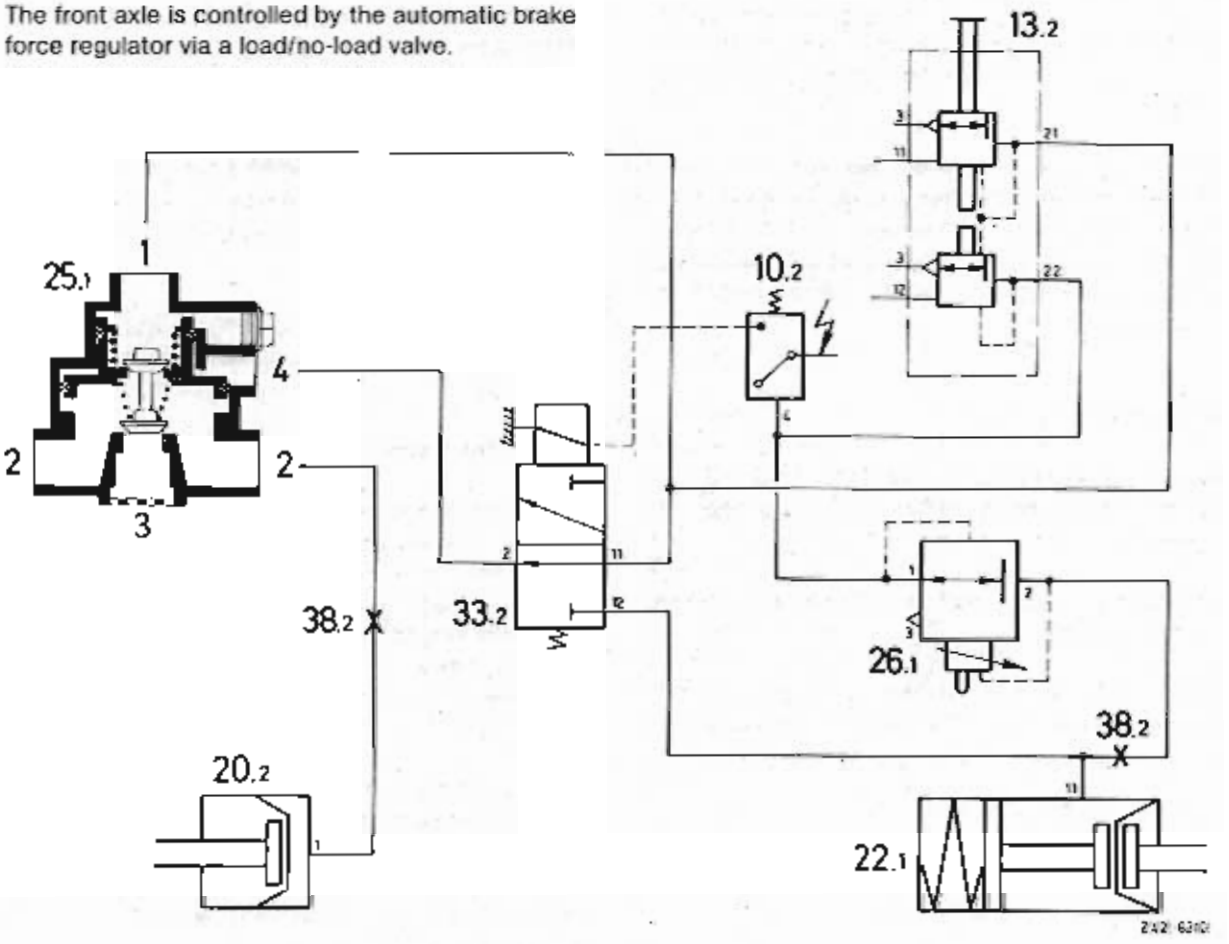


Fig. 1: ALB functional diagram of two-axle vehicles

10.2 Pressure switch, cut-in
13.2 Dual circuit tractor brake valve
20.2 Diaphragm cylinder (front axle)
22.1 Diaphragm pressure reservoir (rear axle)
25.1 Loading-load valve
26.1 Automatic brake force regulator, mechanically actuated
38.2 3/2-way valve, electrically actuated

Functional description

1 Release position
Both brake circuits are pressureless and the 3/2-way valve (33.2) is in rest position (as shown in Fig. 1).

2 Braking position – rear wheel brake circuit
From tractor brake valve (13.2) connection 22, braking pressure flows to automatic brake force regulator (26.1) of rear axle. The pressure is reduced according to load and enters diaphragm section of tristop cylinder (22.1).

Model 314–318

Axle model	Lining width	Lining thickness (drum dia.) Normal	Repair 1	Repair 2	Minimum lining thickness
730.702 742.001 002	90	11,0 (300)	11,8 (301,5)	12,5 (303)	4,5
730.703 704 742.100 201–204 230	135				
730.705 744.310 311	135	13,3 (304)	13,8 (305)	14,3 (306)	5

Note: When renewing the brake linings the approved rivet qualities must be observed.

42 Determining the rear axle load for setting the automatic load-dependent brake (ALB)

A. Triple axle vehicles with hinged springs and all two-axle vehicles

B. Triple axle vehicles with trailing axle or with two steered front axles and LP 2224/6x4 (361)

Special tool

Designation	Part number
Test scales (complete)	385 589 01 21 00

Obtainable from: NEW – 60 (Wörth)

By inserting the test scales 385 589 01 21 00 into the inspection pit lift, they can be used for determining the rear axle load for setting the automatic load-dependent brake (ALB).

At this point we would once again like to draw your attention to the fact that a test of the ALB after installing an attachment is mandatory as stipulated in our attachment specifications for attachment manufacturers.

In order to avoid damage to the axle housing, only unladen vehicles may be weighed with the test scales.

Scope of work

A. Triple axle vehicles with hinged springs and all two-axle vehicles

1 Secure vehicle at front axle against rolling, release handbrake and shift in neutral gear.

2 Remove stamp of the inspection pit lift and insert test scales.

3 Position inspection pit lift with test scales under the center of the rear axle and raise vehicle until the wheels can be turned freely.

Note: The rear axle must be raised horizontally.

4 Read off rear axle load from the pressure gauge of the test scales, lower rear axle and adjust brake pressure regulator corresponding to the determined load (refer to Workshop Manual Brakes Volume II, Group 42.4).

Note: Weigh both axles of triple axle vehicles and adjust the brake pressure regulator to the sum of both loads.

B. Triple axle vehicles with trailing axle or two steered front axles and LP 2224/6x4 (361)

1 Drive vehicle with **all** wheels on approx 50–60 mm high supports (blocks of wood) the vehicle must be positioned horizontally.

2 Secure vehicle at the front axle against rolling, release handbrake and shift in neutral gear.

3 Position inspection pit lift with test scales under the center of the rear axle (power axle – in model 361 1st rear axle) and maintenance distance "A" from lower edge of axle bridge to upper edge of inspection pit lift (fig. 1).

Model 387–395

Axle model	Lining width	Lining thickness (drum dia.) Normal	Repair 1	Repair 2	Minimum lining thickness
730.006 732.104/704 740.001/004 105 744.807 808 749.003/004 103/201	140	18 (410)	18,8 (411,5)	19,5 (413)	5,5*)
730.005 731.0 739.100/102 104/110 133/134 136/ 740.000/002 003 005–007 031–036 100/104 107/108 111 131–135 138 740.301/307 339/341 500/502 530/531 749.001/102	160				
740.101/109 110 112–114 130 136 139 147–148 302–306 308–314 330–338 340/342 501	180				

*) Step on both sides of lining equals minimum lining thickness.

When renewing the brake linings the approved rivet qualities must be observed.

42 Adjustment of automatic load dependent brake

Trucks with compressed air-supported hydraulic brake or compressed air brake

Special tool

Combination pressure tester* (hydraulic brake)	ATE No. 3.9305–1020.4
Pneumatic test kit (compressed air brake)	MB No. 360 589 00 21 00

* Available from Alfred Teves GmbH, Guerickestraße 7, 6000 Frankfurt/Main 2

No-load test

The information plate required for ALB adjustment is attached to righthand driver's door.

1 Determine (weigh) rear axle load with tractor empty and ready for driving. Semi-trailer tractor without semi-trailer, but with fifth wheel.

On vehicles with trailing axle, weigh driving axle only (with trailing axle lowered).

2 Connect two test pressure gauges to test connections in front of and behind automatic brake force regulator of rear axle.

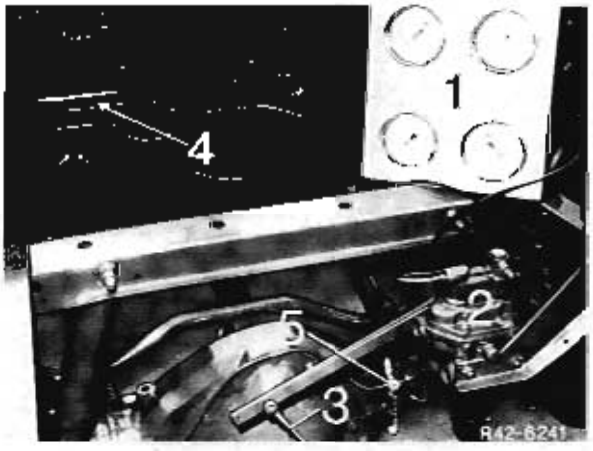


Fig. 1 Vehicle with hydraulic brake

1 Combination pressure tester
2 Automatic brake force regulator
3 Actuating linkage (adjustable)
4 Test connection (test pressure)
5 Test connection (braking pressure)

If the front axle is controlled in dependence of load, also connect a test pressure gauge to test connection after pressure reduction valve or load/no-load valve.

3 Run braking system up to operating pressure.

4 Actuate brake pedal until the test pressure in front of brake force regulator and named on ALB plate is attained.

5 In this brake pedal position, read applied, reduced braking pressure of rear axle (and front axle) on tester and compare with braking pressure on ALB plate.

Adjustments can be made on linkage of brake force regulator.

Air-suspended vehicles: No adjustments can be made, since the brake force regulator is controlled by the air bellows pressure.

The bellows pressures can be checked on test connections on control valve. For checking, switch control valve to driving position.

Full-load test

6 Disconnect lever from brake force regulator and set in upward direction by path "f" shown (refer to ALB-plate).

Air-suspended vehicles: The respective full load control pressure (refer to air bellows pressure on ALB-plate) can be applied to brake force regulator from an external air source via test valve.

Renewing brake linings

Brake linings which are oil-stained, hardend or worn down to the minimum lining thickness must be renewed.

Before new brake linings (repair stages) are selected, check the brake drums for thermal cracks scoring and wear, reface or renew brake drums if necessary. When refacing observe the operating instructions for the brake drum refacing machine.

Observe the minimum lining thickness and repair stages of brake linings as well as the diameter and repair stages for the brake drums.

Brake drums should never be turned beyond the permitted dimension. Both brake drums of one axle must have the same diameter.

Only brake linings of the same quality should be installed on one axle.

1 Drill out holding rivet of the brake linings using a twist drill.

2 Clean the brake lining bearing surface on the brake shoes, check and smooth off with file or emery cloth if necessary.

3 Determine brake linings according to repair stages of the brake drums and rivet linings onto the brake shoes.

Note: A riveting machine may be used.

Riveting Instructions for brake shoes

1 Riveting steps

Riveting step I

Press together rivet, brake shoe and brake lining with 300 ± 100 N pretension. Maintain pretension up to the end of riveting step II.

Riveting step II.

Press the rivet punch at 24000 ± 2000 N onto the rivet head (closing head side) in order to form the closing head.

Pressure application: Closing head

Pressure relief: Set-head

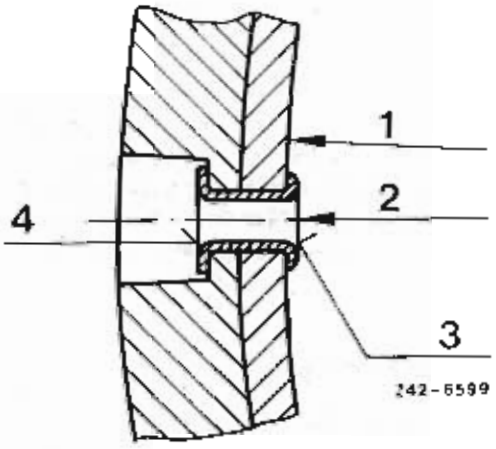


Fig. 1

1 Pretension
2 Riveting force
3 Closing head
4 Set-heard

2 Riveting sequence for one half lining

Always rivet by starting at the center of the brake lining and working outwards to the end of the lining. Riveting: Cross wise or in pairs. It is good practice to secure the brake lining and brake shoe by means of two rivets.

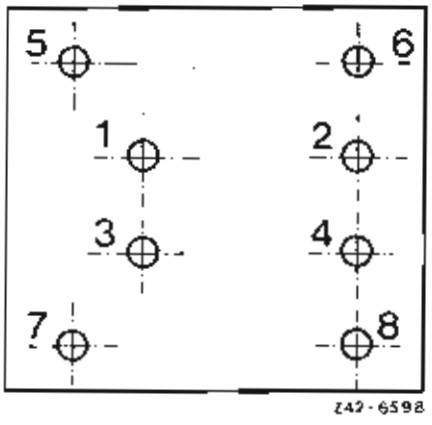


Fig. 2 Riveting sequence

The brake lining must rest flush over entire surface of the shoe. Corners of the lining must not be broken and the lining must not be cracked in the vicinity of the rivet.

Vehicle type	Model	Brake drum inner diameter			
		Axle	Normal	Repair stage 1	Repair stage 2
709	314	Front axle Rear axle	300 ± 0,1	301.5 ± 0,1	303 ± 0,1
809	316				
813 913 1013	318				
1013 1017 1019	380		410+0.2	411,5+0,2	413+0.2
1113	318		304	305	306
1213 1217 1219	381		410+0.2	411,5+0.2	413+0.2
1413 1417 1419 1424	383				
1613 1617 1619 1624	385				
1626	387				
1628	620				
1632 1719	387				
1919 1926	389				

Refacing brake linings

The new brake linings must be turned on the axle to ensure that they make even and immediate contact.

Refer to the operating instructions supplied with the brake lining turning devices.

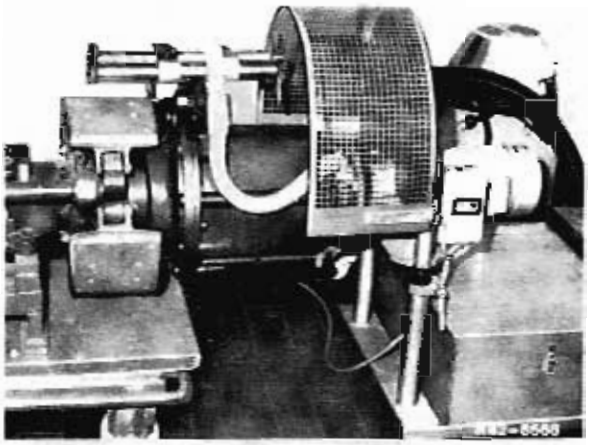


Fig. 5 Brake lining turning device
Messrs. Kindermann

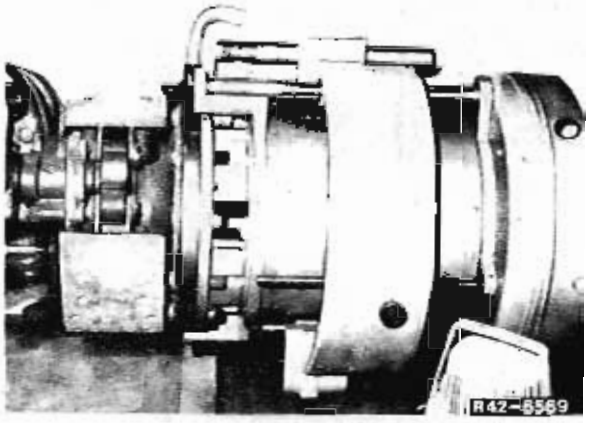


Fig. 6 Brake lining turning device
Messrs. Hunger

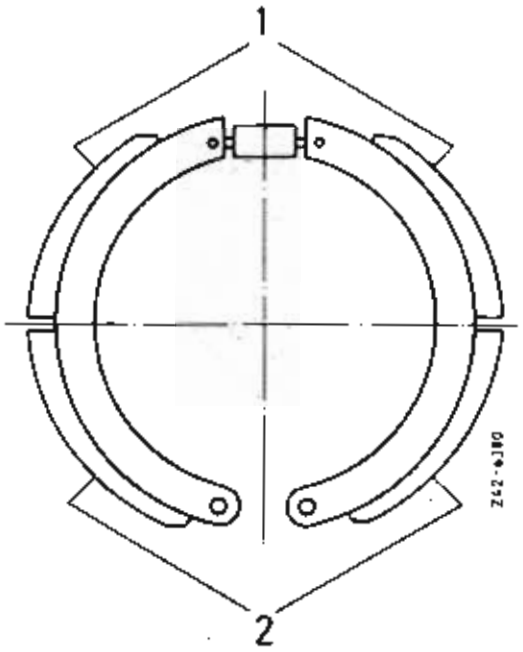
Übersetzung fehlt!

410 mm dia. wheel brake squeaking
Medium-duty trucks 1013-2224/6x4 (380-385) with hydraulic brake system

Brake noises can be eliminated by fitting the brake linings specified in the following. An essential prerequisite is that the brake linings themselves are the cause of the noisy brake and not other technical deficiencies.

Repair notes

1. The upper and lower brake linings differ in quality and color. This must be borne in mind when riveting.



Brake shoes front and rear axle

1 Upper brake lining material
Dark brake linings
2 Lower brake linings
Light brake lining material

2. The plastic film must not be removed if adhered to the underside of the brake lining.

3. After installing the brake shoes, they **must** be turned on the axle to the brake drum diameter using a brake shoe turning device. This is necessary to ensure that the brake linings make immediate contact with the drum over their entire area. The specified clearance from 0.4 to 0.6 mm must be set after installing the brake drum.

The connection from brake pedal to dual circuit brake unit is mechanical by means of a linkage.

Basic adjustment on brake unit

1 Push the thrust piece of dual circuit brake unit by means of double lever manually up to noticeable first stop (pressure point) and hold in place.

2 In this position, adjust stop screw in such a manner that a 0.5 mm slip gauge can be easily moved in-between double lever and screw.

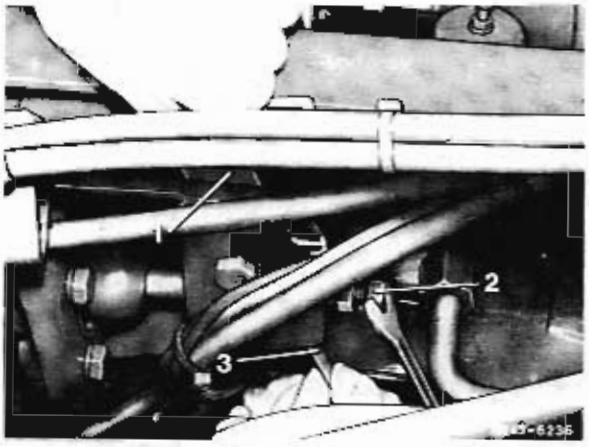


Fig. 1 Basic adjustment on brake unit

1 Double lever
2 Stop screw
3 Check clearance with 0.5 mm slip gauge (with brake unit actuated up to pressure point)

3 Counterlock stop screw.

4 Check clearance (0.5 mm).

Pedal adjustment

5 Turn linkage until brake pedal rests free of play against stop in pedal bracket.

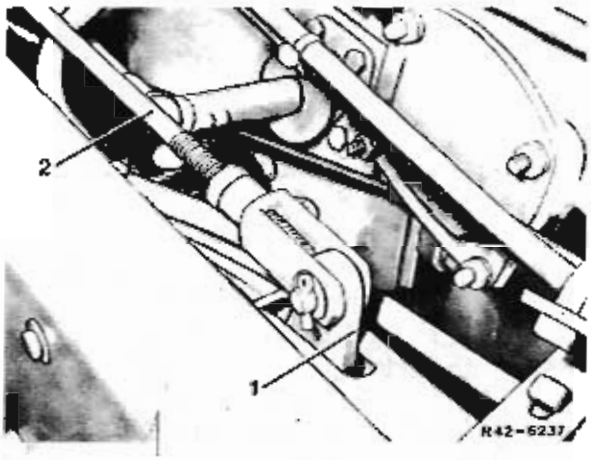


Fig. 2

1 Double lever
2 Linkage (adjustable)

The double lever on brake unit should still rest against stop screw.

6 Counterlock linkage.

7 **Checkup:** Actuate dual circuit brake unit on double lever manually up to pressure point and check clearance in this position with 0.5 mm slip gauge.

This adjustment will provide a given idle travel on brake pedal until the compressed air is applied.

Model 380–385

Axle model	Lining width	Lining thickness (drum dia.) Normal	Repair 1	Repair 2	Minimum lining thickness
730.801 742.300	100	18 (410)	18,8 (411,5)	19,5 (413)	5,5*)
730.008/009 731.301–304 330–332 744.300/309 330–333 341/342 344–346 348–350	120				
730.007/010 731.401 404–406 431 600 632–634 740.115/117 159–165 169/175 180 744.401/405 407/431 830/832 845/854 856 745.605 830–632	140				
730.012/034 740.102/106 140/142 146/149 151/152 157 170–172 744.501/504 530 745.600/602 633–635	160				

*) Step on both sides of lining equals minimum lining thickness.

When renewing the brake linings the approved rivet qualities must be observed.

Technical Data

Clearance between brake lining and brake drum	0.4–0.6 mm
Minimum lining thickness	4.5 mm

LP, LPL 1113 – Adjustment of the service brake is **automatic** with this vehicle type as standard.

Note: Before adjusting the brake, the lining thickness is to be inspected through the hole provided or by removing the brake drum. If minimum lining thickness has been reached, the linings are to be replaced immediately. The brake shafts are also to be checked to ensure they move easily.

Adjusting Service Brake

When the brake unit reaches 2/3 stroke, the service brake must be adjusted.

To test: Brake fully at operating pressure with test pin pressed in. If the test pin moves outward, 2/3 stroke at the brake unit has been reached and the service brake **must be adjusted.**

Note: The test pin does not return automatically and must therefore be pressed in following each brake adjustment.

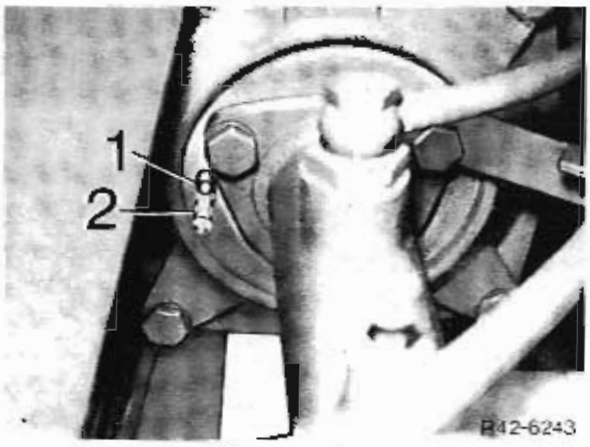


Fig. 1: **Dual-circuit brake unit**
1 Test pin in initial position
2 Test pin actuated (Brakes must be adjusted)

A special version with a pressure switch mounted at the brake unit can be supplied. A red warning light is illuminated when the brake unit reaches approximately 2/3 stroke.

1 Prevent vehicle from rolling using wheel chocks, then release parking brake completely (full operating pressure) until wheels turn freely.

2 Unscrew adjusting cams until the brake shoes lie against the brake drum and the wheel can no longer be turned.

3 Screw in adjusting cam until the wheel can be turned freely.

4 Every brake shoe is adjusted individually.

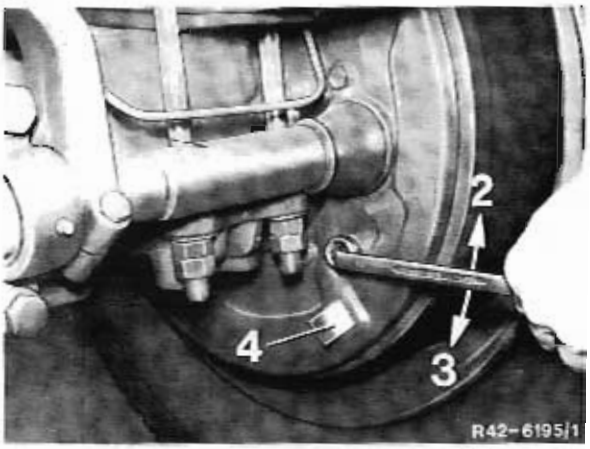


Fig. 2
2 Release brake
3 Tighten brake
4 Plug for inspection hole

5 Press in test pin at brake unit again. Apply brake fully following adjustment. If the test pin still moves outward or if the red warning light is illuminated, the hydraulic system must be bled.

Model 383-385 and 620–624

Axle model	Lining width	Lining thickness (drum dia.) Normal	Repair 1	Repair 2	Minimum lining thickness
730.006 740.104 + SA 20116/1 744.807/808 858–863 745.606/607 636/637 749.003/103	140	18 (410)	18,8 (411,5)	19,5 (413)	5,5*)
730.005/041 043 731.031/033 731.111/137 144/145 151–157 739.161 740.037/039 040/042 104/176 178/179 183/189 367/536 745.601/603 638/639 730–733 749.031/131	160				
740.181/182 184 348 353/354 356/357 366/370 374 380–383 385–386 748.430–436	180				

*) Step on both sides of lining equals minimum lining thickness.

When renewing the brake linings the approved rivet qualities must be observed.

If the stroke indicator light for the parking brake illuminates on vehicles with automatic service brake adjustment (warning light – brake fluid), the brake lever must also be moved back when the parking brake is adjusted.

Riveting tool for all types of commercial vehicle axle including units for installation companies

Within the framework of further technical development, a special riveting tool has been developed for the Jurid pneumatic riveting press widely used in our organisation.

A pretension force of 300 ± 100 N can be applied due to the spring in the riveting tool. This ensures that the brake lining is pressed evenly onto the brake band enabling a large closing head to be produced free of cracks by the shape of the riveting set.

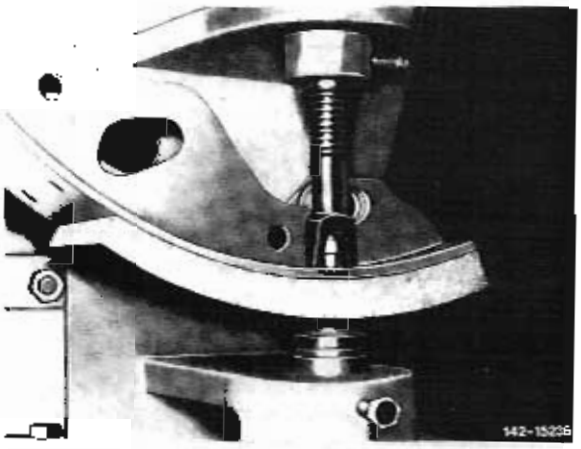


Fig. 3 Riveting tool

Note: In order to ensure satisfactory formation of the closing head lightly grease the riveting die from time to time.

Dimensions of the riveting tool

Insert	12 mm dia.
Guide lenght	18 mm

Commercially available tools

Designation	order No.	Available from
Riveting tool for 6 mm rivet	6052	Messrs. Wilhelm Bäcker D-5630 Remscheid 1
Riveting tool for 8 mm rivet	6053	
For use with pneumatic riveting press	80 200 01 100 0156	Jurid-Werke GmbH, Postfach 1249 D-2057 Reinbek

The riveting tool can also be used in conjunction with other riveting presses. A self-made adapter for the insert may be necessary for this purpose.

The riveting force of the Jurid-press should be set to
2.7 bar = 6 mm rivet at 15 000 ± 2 000 N
4.3 bar = 8 mm rivet at 24 000 ± 2 000 N

When renewing the brake linings, only use the approved rivet qualities in accordance with the spare part documentation (Microfiche). The rivet sizes are the same in all brake lining repair stages.

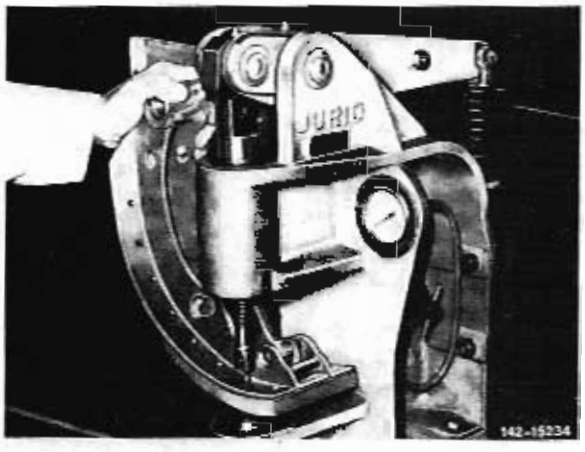


Fig. 4
Jurid pneumatic riveting press

Repair notes

Renewing brake linings

When renewing the brake linings, press pistons of the wheel brake cylinders uniformly back into the initial position using a screw clamp.

When **refacing the brake linings** press brake shoes apart with a screw driver and insert stepped drifts (or round bar of corresponding dia.) between thrust pieces and brake shoes (Fig. 4).

Tighten the brake shoe clamping bolt until the springs plates (with springs installed) rest on the web. After carrying out the necessary work, turn back the brake shoe clamping bolt so that a clearance from 0.5 to 1.0 mm is available between the spring plate and brake shoe web.

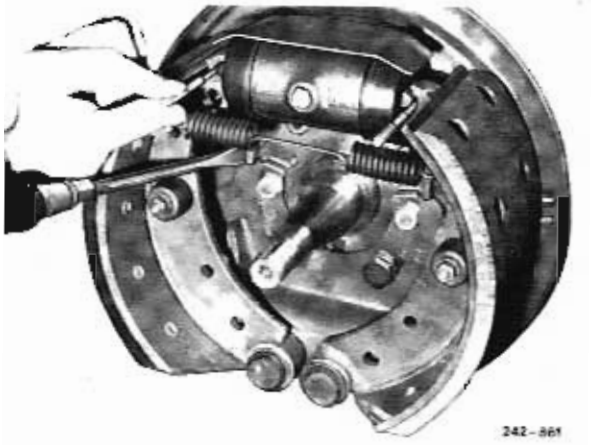


Fig. 3
Front wheel brake with stepped drifts inserted

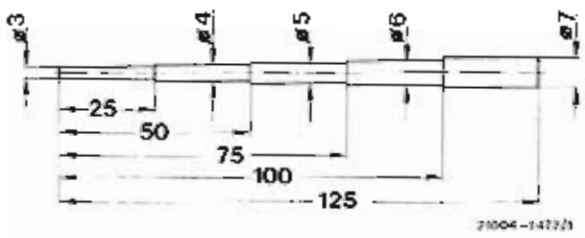


Fig. 4
Stepped drift (self-made)

Note: Actuate service brake several times during trial run to ensure the clearance is correctly adjusted.

Before **removing the wheel brake cylinders at the rear axle** spread brake shoes by actuating the parking brake.

Before **removing the wheels brakes cylinders at the front axle** remove outer brake shoe return spring and insert support for spreading shoes (Fig. 6).

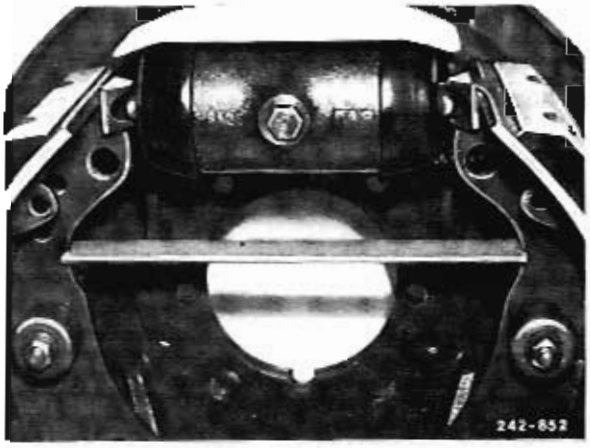


Fig. 5
Front wheel brake with support inserted

42 Sucking off dust on brake linings

General notes

Asbestos-holding dust which shows up when machining the brake linings or when blowing out the brakes must be sucked off on principle. In the Federal Republic of Germany, the removal of mineral dust is specified in the pertinent safety regulations.

To meet these regulations, dust collecting bags are available in two sizes. They are pulled over the brake backing plate, a gate permits blowing off with air gun. Dust and abrasives are then sucked off by means of a conventional industrial vacuum cleaner.

Fig. 1

The large dust collecting bag for brakes above 300 mm dia. can also be used for the celaning of dry air filter elements for commercial vehicles (Fig. 1), which would otherwise cause considerable dust when cleaning with compressed air (also refer to service information No. 09/12-NFZ of July 29, 1976).

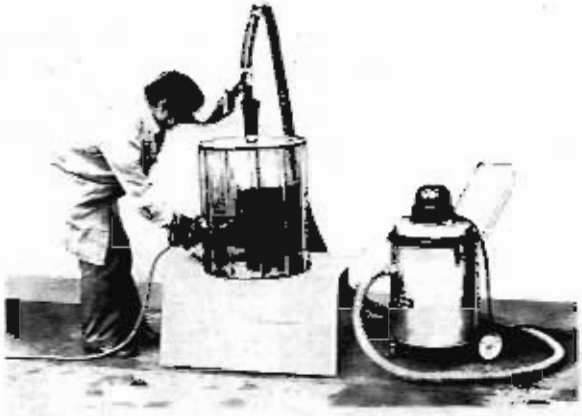


Fig. 2

The small dust bag for brakes up to 300 mm dia. can also be used for cleaning passenger car brakes.

Fig. 3

Dirty dust collecting bags can be blown out with the air gun and the vacuum cleaner connected, and are then wiped with a rag or washed in the respective washing unit. The transparent envelope is oil-proof and temperature-resistant up to 100°C.

Dust collecting bag and spare parts can be acquired from the companies named below. They are available in two sizes, for brakes up to and above 300 mm dia. including axles with planetary wheel hubs.

Gather KG
Postfach 100 609
D-4020 Mettmann

Oppermann KG
Postfach 29
D-7901 Domstadt

Technical data

Clearance between brake lining and brake drum	0.4–0.6 mm
Minimum brake lining thickness	5.5 mm

Note: Before adjusting the brake, check the lining thickness through the inspection hole or by removing the brake drum. The brake linings must be renewed immediately if the minimum lining thickness has been reached. In addition, check the brake shafts on the rear axle for ease of movement.

Adjusting service brake

If the red warning lamp lights up on the instrument panel when braking, this indicates that the brake booster has reached ⅔ travel and the service brake **must be readjusted.**

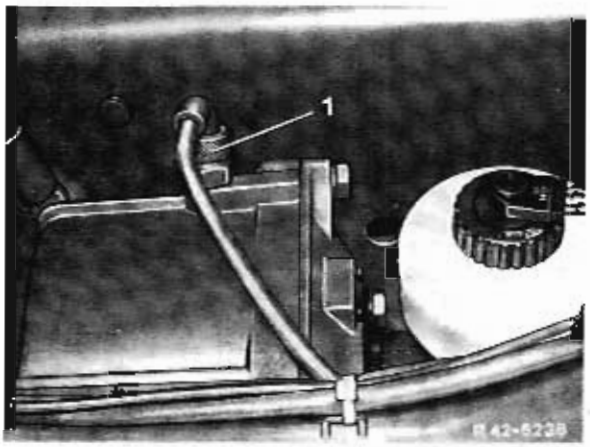


Fig. 1 dual-circuit brake booster
1 Pressure switch

Note: Vehicles to chassis end No. 306 946 are equipped with a control pin on the dual-circuit brake booster (Fig. 2).

Test: Apply full brake at working pressure and with the control pin pressed in. ⅔ travel has been reached on the brake booster and the service brake **must be readjusted** if the control pin moves to the outside.

The control pin does not return automatically and it must therefore be pressed in again after readjusting the brake.

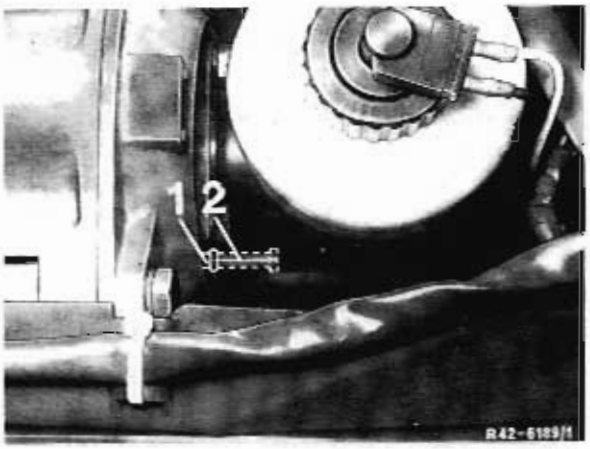


Fig. 2 Dual-circuit brake booster
1 Control pin in initial position
2 Control pin actuated (Brake must be adjusted)

1 Jack up vehicle, then completely release the parking brake so that the wheels turn freely.

2 Loosen the locking screw for the retaining plate.

3 Position adjusting eccentric to the outside, until the brake shoe rests on the brake drum and the wheel can no longer be turned.

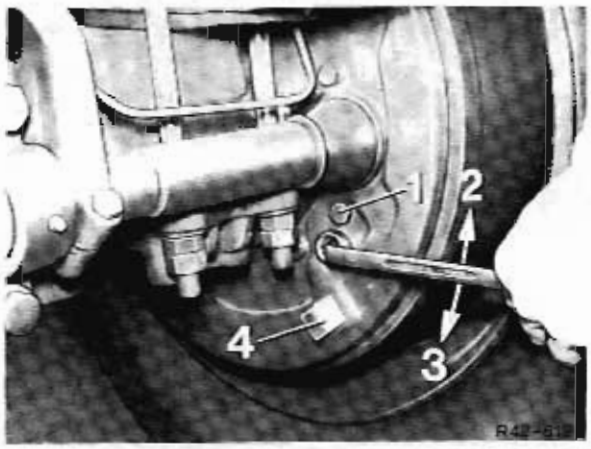


Fig. 3 Adjusting service rakes
1 Locking screw for retaining plate
2 Release brake
3 Determine brake
4 Plug for inspection hole

42 Adjustment of mechanical brake actuation – Medium heavy trucks

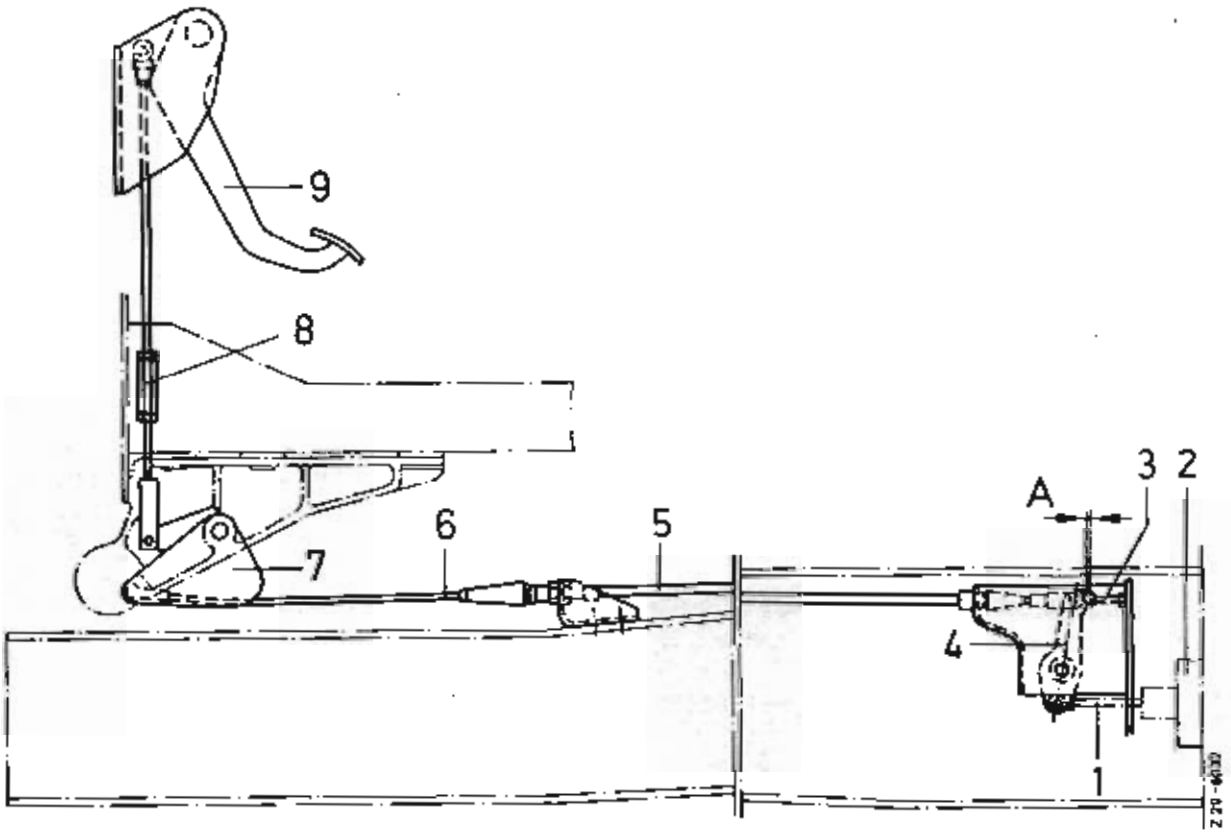


Fig. 1

1 Push rod
2 Brake unit
3 Stop screw
4 Double lever
5 Cable control jacket
6 Cable control
7 Guide lever
8 Tensioning nut
9 Brake pedal
A Clearance 0.5 mm (with push rod (1) actuated up to pressure point of brake unit (2))

The following adjustment provides a given idle travel on brake pedal until compressed air is applied.

Basic adjustment on equipment carrier

1 Disconnect cable control (6) on double lever (4).

2 Completely screw-in stop screw (3).

3 Disconnect restoring spring on double lever (4).

4 Check double lever (4) for easy operation.

5 Push-in push rod (1) up to first pressure point and hold in place.

6 Unscrew stop screw (3) until clearance (A) of 0.5 mm between double lever (4) and stop screw (3) is attained.

7 Counterlock stop screw (3).

8 Attach restoring spring and cable control.

Adjusting brake pedal

9 Check whether brake pedal (9) rests against upper stop and simultaneously double lever (4) against stop screw (3).

10 Adjustment can be made at tensioning nut (8).

11 Check clearance between bearing of tilting cab and guide lever (7).

Adjusting spring-loaded parking brake (air-suspended vehicles)

The parking brake on air-suspended vehicles is adjusted directly at the two brake levers of the rear axle.

1 Set compressed air system to cutout pressure to release spring-loaded cylinders.

2 Loosen both counter-nuts of stop and adjusting screw and adjusting lever.

3 Turn back stop screw.

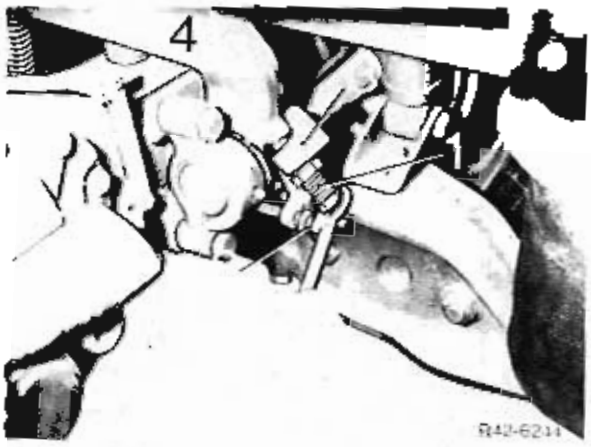


Fig. 5 Readjusting parking brake

1 Adjusting screw with counter-nut
2 Stop screw with counter-nut
3 Adjusting lever
4 Brake lever

4 Screw-in adjusting screw until brake levers are free of play. Turn adjusting screws back by 1/4 turn and counter-lock.

5 Screw-in stop screws and counter-lock.

Note: If threads of adjusting screw are no longer adequate, displace adjusting lever on brake shaft by one tooth.
Make sure of adequate thickness of lining.

42 Adjustment of Service and Parking Brake – Light Trucks (compressed air controlled hydraulic brake)

Adjusting Parking Brake

Adjust service brake prior to adjusting parking brake.

A Pull-type Parking Brake

Pull-type parking brake must be adjusted if,

a) braking action at rear axle wheels is not uniform, or

b) travel at the handbrake lever is excessive or the braking action is insufficient.

1 Pull parking brake to sixth tooth.

2 Release lock nuts at turnbuckle.

3 Twist turnbuckle until the rear wheels begin to be braked uniformly.

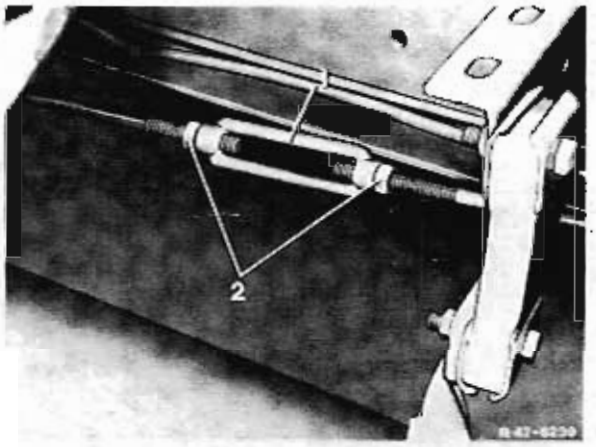


Fig. 3 **Adjusting Pull-type Parking Brake**
1 Turnbuckle
2 Lock nuts

Note: If braking action is not uniform, adjust the two rear pull rods (left and right-hand threads) as necessary.

4 Tighten both turnbuckle lock nuts.

Note: If adjustment at turnbuckle is insufficient, move back both brake levers by one tooth at the brake shafts.

Ensure that brake lining thickness is adequate.

B Spring-loaded Parking Brake

Vehicles	Spring loaded cylinder stroke
with adjusting cam	70 mm
with automatic service brake adjustment	100 mm

The spring-loaded parking brake is to be adjusted if,
a) braking action at the rear wheels is not uniform, or,
b) the stroke of the push rod of the spring-loaded brake cylinder is more than 50 mm, or
c) for vehicles with automatic service brake adjustment, the stroke indicator light for the parking brake (warning light – brake fluid) illuminates.

1 Bring compressed air system to cut-out pressure, so that the spring-loaded cylinder is released.

2 Release lock nuts from both rear pull rods.

3 Turn pull rods until slight application of handbrake lever (approx. 1/3 travel) causes uniform braking action to begin at both rear wheels.

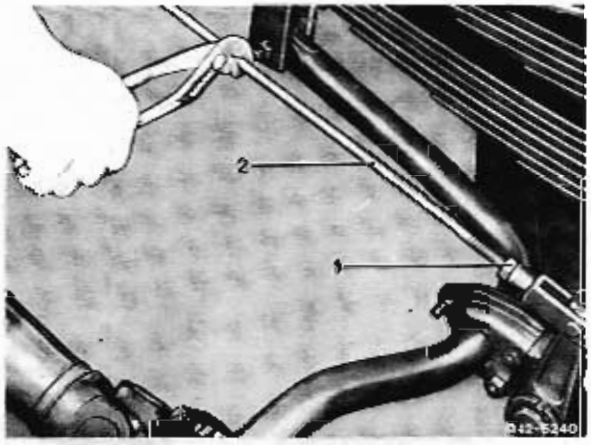


Fig. 4 **Adjusting Spring-loaded Parking Brake**
1 Lock nut
2 Pull rod

4 Retighten pull rod lock nuts.

Note: If the adjustment at the pull rods is insufficient, move both brake levers back one tooth at the brake shafts.

Technical data – Pneumatic brake system

Wrench size / release screw	SW 24

Tightening torques Nm

Release screw to spring-type diaphragm cylinder	Wabco Knorr	Bosch
	30–36	60

A Pneumatic brake system

1 Secure vehicle against rolling.

2 Using a 24 mm wrench, unscrew the release screw until the wheels turn freely.

Note: After repairing, bleed spring-type diaphragm cylinder. Screw in release screw up to stop and tighten to specified tightening torque.

42 Adjusting service and parking brake – light-duty trucks (pneumatically-controlled hydraulic brake)

Vehicle type 1113 (318)

A. Automatic service brake adjustment

B. Parking brake adjustment

A. Automatic service brake adjustment

The service brake in type 1113 (318) is adjusted automatically as standard at the front and rear axle.

For types 813, 913, 1013 (318) with reinforced rear axle, the automatic service brake adjustment facility at the rear axle is offered as a special version.

The automatic adjustment takes place as a result of the frictional resistance between the clamping ring (Fig. 1, item 9) and the two pistons (3) in the wheel brake cylinder.

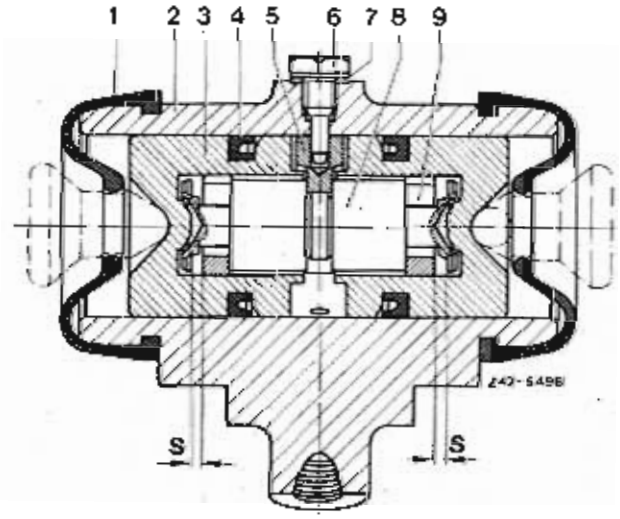


Fig. 1
Wheel brake cylinder with automatic adjustment

1 Dust cap
2 Housing
3 Piston
4 Sealing ring
5 Clamping ring support
6 Stop screw
7 Sealing ring
8 Pin
9 Clamping ring
S Clearance 3 ± 0.2 mm

When the service brake is actuated, the pistons (3) are pressed outwards by the brake fluid and the frictional resistance is overcome by the high pressure. The return force provided by the return spring is set in such a way that it cannot overcome the frictional resistance. The pistons therefore do not return to the initial position, but only move back by the amount "S" (clearance).

Removal of the drum hub

Due to the formation of steps on excessively worn brake drums, the drum hub can only be removed after firstly releasing the brake shoes.

Releasing the front wheel brake

Holes are provided in the brake support plate (Fig. 2, item 1) and in the webs of the brake shoes for releasing the brake shoes.

Insert round bar (approx. 400 mm long, 14 mm dia, flatened on one side) and press back brake shoes.

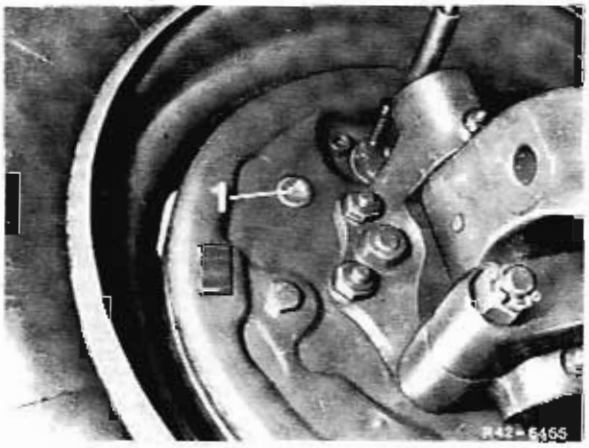


Fig. 2
1 Front hole (pluged with rubber stopper)

Releasing rear wheel brake

The brake is released by knocking the brake lever of the handbrake shaft (in opposite direction of travel) after detaching the handbrake linkage.

Adjusting Stroke Indicator at the Spring-loaded Brake Cylinder (compressed air controlled hydraulic brake) 42

Stroke spring-loaded brake cylinder	100 mm
Actuation switch for stroke indicator	after 94 ± 3 mm piston stroke

Adjusting Stroke Indicator für Parking Brake

Vehicles with automatic adjustment of the service brake have a stroke indicator at the spring-loaded brake cylinder. The stroke indicator is connected to the warning light for the brake fluid.

1 Switch parking brake valve to braking position.

2 Charge spring-loaded brake cylinder with at least 7 bar.

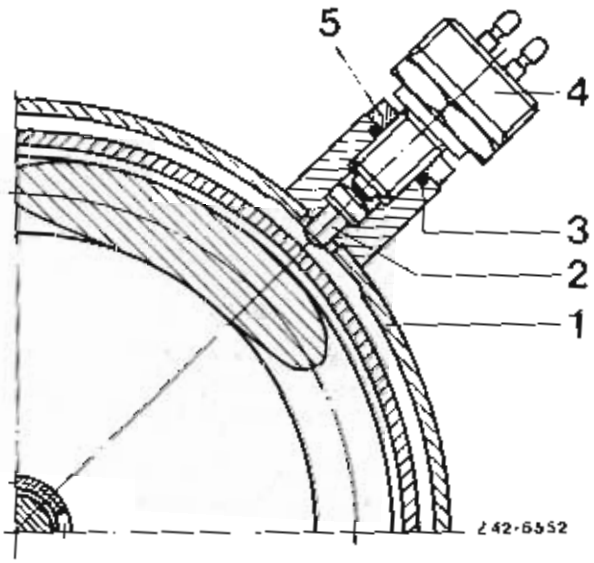


Fig. 5

1 Spring-loaded brake cylinder
2 Thrust pin
3 O-ring
4 Warning switch
5 Nut

3 Screw in switch slightly and connect to 24 V (direct current) together with test lamp. Test lamp must illuminate.

4 Switch parking brake valve to driving position (spring-loaded brake cylinder charged with air).

5 Screw in switch until the lamp is extinguished.

6 Screw in a further half to full turn.

7 Hold switch and lock nut.

8 Switch parking brake valve to braking position.

If the indicator light illuminates, measure piston stroke of the brake cylinder.

Test Value: Lamp illuminates after 94±3 mm brake stroke.

If adjustment is necessary, release lock nut and adjust switch:

If the lamp illuminates prematurely, screw switch in slightly.

If the lamp illuminates too late, unscrew switch further.

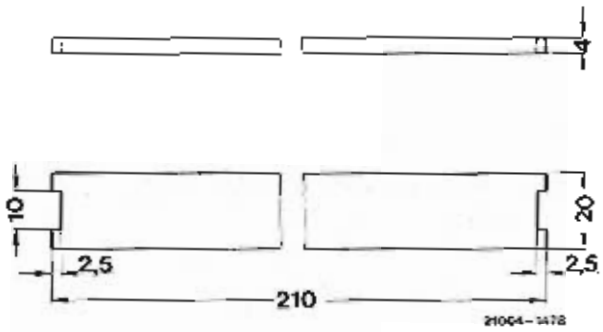


Fig. 6
Support (self-made)

Renewing the piston sealing rings in the wheel brake cylinder

After removal of the stop screw (Fig. 1, item 6), both pistons (3) can be easily removed together with the clamping ring support (5) at one side of the wheel brake cylinder.

Note: Use FAG assembly fluid or ATE brake cylinder paste when assembling and renew copper sealing ring on the stop screw.

B. Readjusting the parking brake

If, as a result of wear of the brake linings, the piston in the spring-type brake cylinder reaches a certain stroke, the indicator lamp on the instrument panel lights up and the parking brake must be readjusted as described on page 057/2.

In this case, the brake is filled and bled via clutch actuation. If the bleeding is effected only by actuating the brake, too much time would be required. A bleed hose of approx. 1 m in length and a 9-mm open end or box wrench are required for opening bleed valves.

1 Slip bleed hose on bleed valve of clutch slave cylinder, the other hose end on one of the two bleed valves of brake slave cylinder. Fill refilling tank completely with brake fluid.

2 Now open both bleed valves which are connected by hose.

3 Let a second person slowly actuate the clutch pedal. Prior to pulling clutch pedal back, one of the two open bleed valves must be closed and opened again prior to actuation.

Caution! Watch snap effect of clutch pedal!

To prevent the snap effect caused by the dead center spring (snap spring), hold clutch pedal with hand and then depress against stop.

4 The air escapes out of the hydraulic brake system through the three-chamber refilling tank. Make sure of adequate brake fluid level in refilling tank.

5 After 15–20 actuations with clutch pedal, one circuit of the brake actuation is filled and bled.

6 Filling and bleeding of second circuit is similar to that of first circuit.

Checkup: Step on brake pedal for about 105 mm (measured in center of pedal). This pedal travel corresponds to a transmitted pneumatic pressure at tractor brake valve of approx. 5 bar (kp/cm²), at full storage pressure.

For inspection, a pressure gauge can be connected to test connection of service brake circuit on tri-stop cylinder (connection 1). Disconnect linkage of ALB regulator and move lever into full load position.

Simplified adjustment instructions for the master cylinders of the hydraulic clutch and brake actuation system, types 1013–2632 (380–395), 1628–3328 (620–624)

The main prerequisite for satisfactory function of the hydraulic clutch and brake actuation system is the correct setting of the piston rod at the master cylinder. Simplified adjustment instruction have been compiled for this purpose. Before starting the adjustment work, check the corresponding pedal for ease of movement.

Scope of work

1 Remove cover.

2 Slide back dust cap on the master cylinder.

3 Release lock nut on piston rod.

4 Unscrew piston rod until it touches the piston without tension.

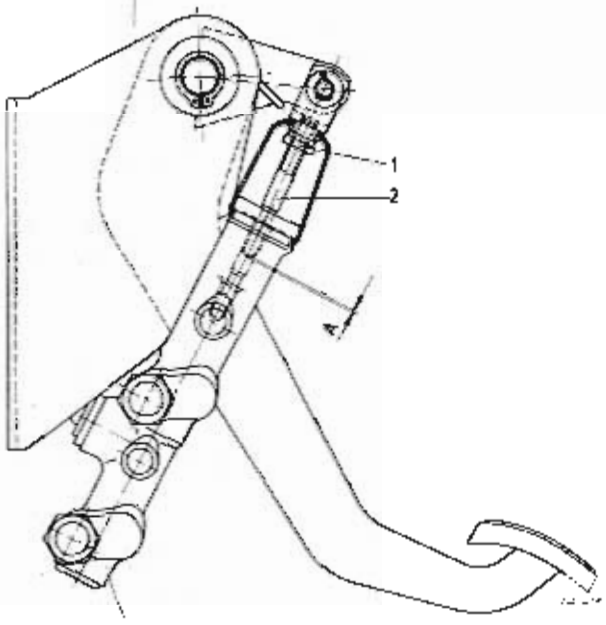
Note: The piston of the master cylinder must be in the neutral position (stop at circlip).

5 Screw piston rod max. ¼ turn back into the fork or joint head.

6 Hold and lock piston rod.

7 Refit dust cap on master cylinder.

8 Install cover.



1 Lock nut
2 Piston rod
A ¼ turn corresponds to approx. 0.25 mm clearance

Important!

Only use brake fluids approved in accordance with service product specifications – sheet 333.1 or 331.2 for the hydraulic clutch and brake actuation system.

Under no circumstances must mineral oils be used since even small quantities cause the sleeves to swell.

Testing the wheel and master brake cylinders
Commercial vehicles with hydraulic brakes

Visual inspection of the wheel and master brake cylinders is not an adequate basis for assessing their condition as regards leaks. Moist dust caps provide no information on the condition of the component. The actual condition can be determined only by carrying out a low and high pressure test.

An essential prerequisite for hydraulic pressure testing is a perfectly bled brake system.

With the exception of vehicles with tandem master cylinders, carry out the required tests individually on each brake circuit (refer to sections A and B).

In the case of vehicles with ALB, the brake pressure regulator must be set to full brake force.

Before testing, check the brake fluid level in the expansion reservoir. The vent hole in the expansion reservoir screw fitting must be kept clear.

Special tool

Designation	part-number
Brake pedal winch	000 589 18 31 00

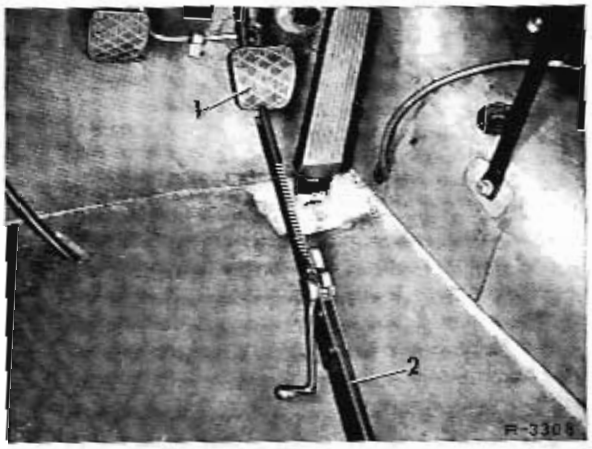
Available from: Werk 50 (PEW-Sindelfingen)

A. Low pressure test

1 Connect pressure tester to a wheel brake cylinder or test connection of one of the brake circuits. Bleed pressure tester.

2 Slowly actuate brake pedal winch until an overpressure of approx. 3 bar is reached on the pressure gauge.

3 The pressure must not drop within a test duration of 5 minutes.



1 Brake pedal
2 Brake pedal winch

B. High pressure test

1 Produce an overpressure of 50–100 bar in the brake system using the brake pedal winch.

2 At a test duration of 10 minutes, the pressure may drop a maximum of 10% with the pedal travel held constant.

3 If a higher pressure drop rate is determined, renew damaged parts.

4 For brake systems with pneumatic brake power units (actuating cylinder), carry out the test at full supply pressure. Monitor supply pressure with a pressure gauge.

Note: Before the pressure test, actuate the brake pedal several times corresponding to full brake application.

C. Checking prepressure (residual pressure)

Actuate brake pedal and reset in released position. The pressure tester should now indicate an overpressure of 0.5–0.7 bar.

42 Brake Fluid

Brake Fluid

Beginning on May 1, 1975 an American safety law requires that all glycol-based brake fluids be tinted so that they are a shade **between colourless and yellow.** This is intended to prevent their being confused with other fluids used in motor vehicles. All manufacturers of brake fluids conform with this change in colouring.

The changed colours of brake fluids correspond to the specifications SAE J 1703 d and DOT 3 or DOT 4. The boiling point is 290° C. A mixture of blue and yellow brake fluids, resulting in a green fluid, is possible.

Our regulation requiring that brake fluid be replaced annually remains in force.

All new vehicles leave the plant filled with DOT 3 brake fluid. DOT 3 or DOT 4 brake fluid can be added (see also operating regulations). They can be mixed.

It is absolutely necessary to ensure that no mineral oil and no fluids containing mineral oils or greases get into the brake system during servicing jobs such as bleeding, adding brake fluid, changing brake fluid and repairing brake components. If brake fluid is to be checked or added in the course of an oil change or lubrication, the hands must first be cleaned of oil and grease. Even slight traces of these cause the swelling of the seals in the main cylinder within a short period. The seals loose their initial tension at the piston skirt, and accumulation of pressure in the brake system is no longer possible.

If there is reason to suspect the presence of mineral oil, e.g. the seal in the cover is swollen, the entire system must be flushed out with brake fluid and the main cylinder replaced. The expansion tank must also be thoroughly cleaned with brake fluid before reusing.