Section B
Brakes

e - **Type 2 vehicles with dual circuit brakes from August 1967:**

A larger number of pedal strokes is necessary for these vehicles as the brake fluid can only be siphoned from the refill container. The fluid in the line between refill container and reservoir and in the reservoir must be changed by "pumping".

Front, right bleeder screw open –
45 pedal strokes = approx. 270 cc of fluid
Front, left bleeder screw open –
25 pedal strokes = approx. 150 cc of fluid
Rear, right bleeder screw open –
40 pedal strokes = approx. 320 cc of fluid
Rear, left bleeder screw open –
30 pedal strokes = approx. 240 cc of fluid

f - **Type 2 vehicles with disc brakes from August 1970:**

On Type 2 vehicles with disc brakes, the entire brake system must first be emptied. Only then can new brake fluid be filled in and the brake system bled. The calipers are equipped with an additional bleeder screw on the bottom to aid the bleeding operation. To empty the system the upper as well as the lower bleeder screw should be opened and remain open until all the brake fluid has been completely removed.

Caution

Some Type 2 vehicles with disc brakes are manufactured without the second bleeder screw. On these vehicles the calipers must be removed after pumping them empty and with the bleeder screw open, tilted in such a way that the brake fluid can completely drain out.

Replace the brake fluid and bleed brake system.

Types 3 and 4 vehicles with disc brakes from August 1971:

The calipers on these vehicles have a second bleeder screw. This ensures that the system is emptied more thoroughly when changing the fluid. Proceed as follows on these vehicles:

1 - Open screws on rear wheel cylinders and pump until no more fluid emerges.

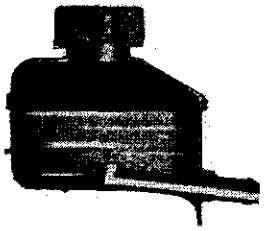
2 - Open lower screws on calipers and pump until no more fluid emerges.

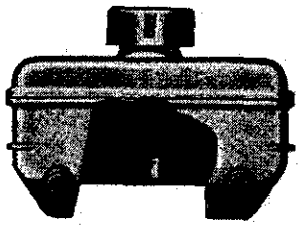
3 - Open upper screws on calipers and leave open until fluid no longer drips out of lower screws.

4 - Put fresh fluid in and bleed system either by pumping or with a pressure bleeder.

Brake fluid reservoir

Types 1, 3 and 4





On vehicles with dual circuit brakes the brake fluid reservoir is divided into two chambers so that if one brake circuit fails there is still sufficient fluid for the brake circuit that is still intact. Pipes onto which connecting hoses are pushed are cast onto the brake fluid reservoir. Inside the reservoir there is a shoulder around the exit ports that prevents deposits from entering the fluid lines. Type 4 vehicles with manual transmissions have reservoirs with two dividing walls, the third chamber serving as reservoir for the hydraulically operated clutch.

Brake fluid reservoir and tandem brake master cylinder or clutch master cylinder are connected to each other by hoses and elbows. On Types 1 and 3 vehicles 8 mm diameter lines are used.

On Types 1, 3 and 4 the fluid reservoir is in the front luggage compartment. On Type 1 / Model 181, it is in the front foot well below the instrument panel. The filler neck is accessible from the luggage compartment.

Type 2

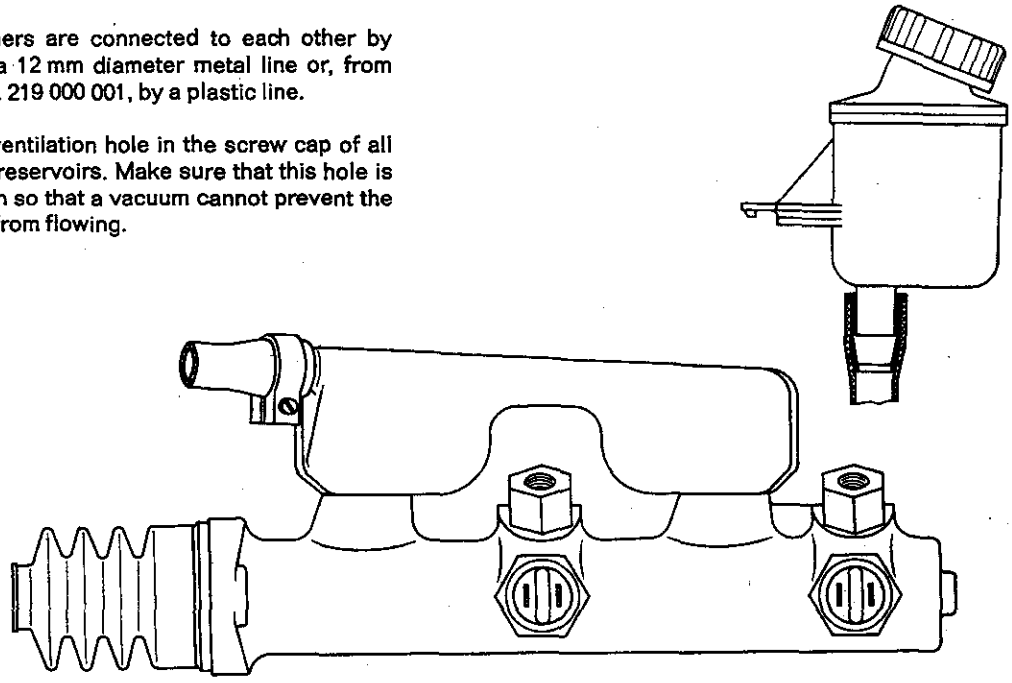
There are two containers for the brake fluid:

1 - The twin-chamber reservoir on the tandem brake master cylinder.

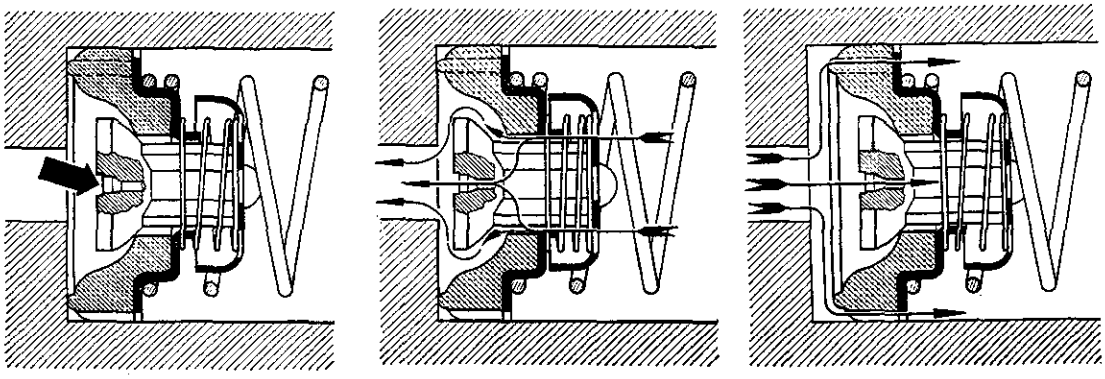
2 - The refill container on the cross panel in front of the driver's seat.

The containers are connected to each other by hoses and a 12 mm diameter metal line or, from Chassis No. 219 000 001, by a plastic line.

There is a ventilation hole in the screw cap of all brake fluid reservoirs. Make sure that this hole is always open so that a vacuum cannot prevent the brake fluid from flowing.



Important
Master cylinders with the special check valve are marked with a blue sticker bearing the words
"Anschluss mit Spezial-Bodenventil".

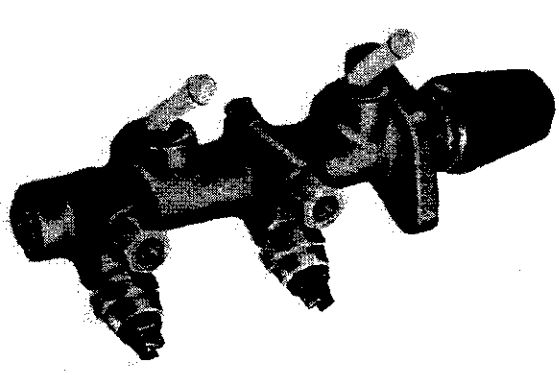


Rest position | Braking position | Return position

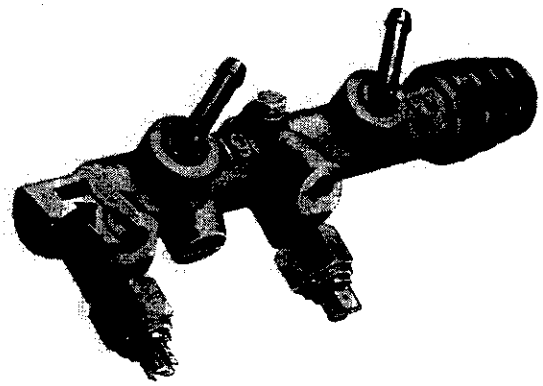
Tandem brake master cylinder

Design

The basic design of the tandem master cylinder is comparable with two normal master cylinders fitted one behind the other. The check valves, however, are replaced with residual pressure valves. They are screwed into the tandem brake master cylinder. The brake lines are connected to the residual pressure valves. Tandem brake master cylinders for vehicles with disc brakes have no residual pressure valves. The braking system of these vehicles must be free of pressure when the brakes are off as there are no return springs for the friction pads in the brake calipers. However to be able to build up a brief pressure differential for bleeding purposes, there are restriction drillings (arrow) at the outlets to the brake lines.



Tandem brake master cylinder with residual pressure valves



Tandem brake master cylinder with restriction drillings

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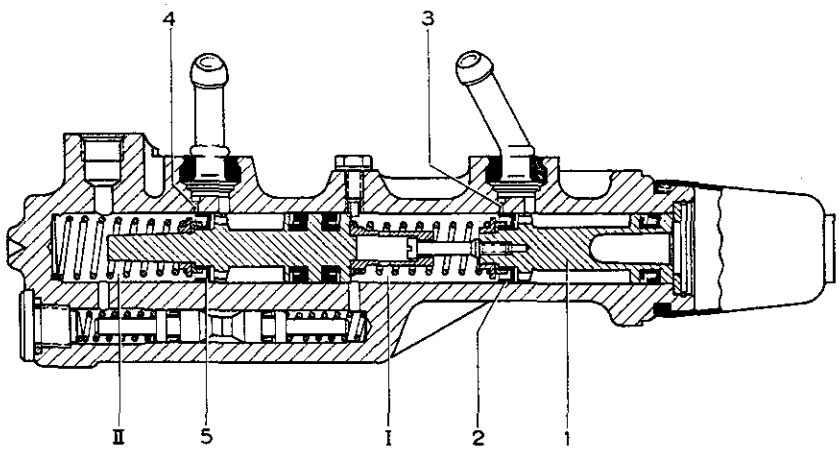
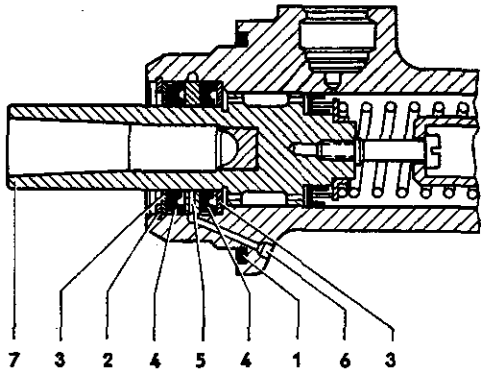
Operation

When the brake pedal is depressed the push rod moves the rear brake circuit piston (1) forward. As soon as the primary cup (2) covers the compensating port (3), pressure builds up in the closed pressure chamber (I) of the rear brake circuit. This pressure moves the piston of the front brake circuit forward. When the primary cup (5) covers the compensating port (4), and the front brake circuit pressure chamber (II) is also closed, an equal brake fluid pressure is built up in each of the pressure chambers. The brake fluid is then forced through the brake lines to the wheel brake cylinders.

The operation of the warning device is described on page B 1.1/2.





Tandem brake master cylinder for vehicles with brake servo

This tandem brake master cylinder differs from the normal tandem brake master cylinder in the following details:

1 - Modified piston for rear brake circuit.

2 - A piston housing with a cast shoulder for sealing piston chamber and vacuum chamber of brake servo.

1 - Seal
2 - Circlip
3 - Washer
4 - Cup
5 - Plastic washer
6 - Breather drilling
7 - Rear brake circuit piston

The left-hand cup seals the vacuum chamber and the right-hand cup seals the piston chamber. The space between the cups is vented to the atmosphere by a drilling. A plastic washer with radially drilled holes is used as a spacer.

Operation

If both brake circuits are intact, the same pressure exists in both brake circuits and also in both pressure chambers of the warning device due to the fact that a force applied to a fluid in an enclosed space is transferred uniformly in all directions. The pistons remain ineffective. If, for some reason or other, the pressure in one of the two brake circuits drops, the pistons of the warning device will be moved. When this occurs, the pin of the warning device switch is pushed over the angled surface of the piston and into the warning device switch thereby energizing it so that the warning lamp on the instrument panel lights up.

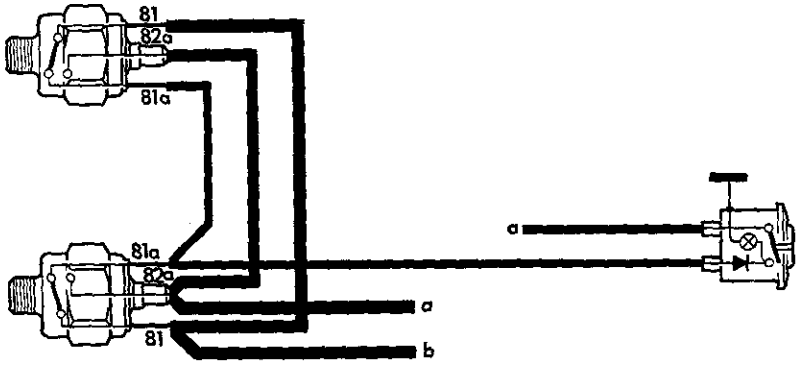
2- Combined warning device switch and brake light switch

For this type of warning device, two brake light switches with change-over contact (three-point switch) are used.

Operation

If the brake system is intact, both brake circuits and the contact pins of the brake light switches are under equal pressure. When the brake is operated and the contacts of both switches are closed, there is no circuit to contacts 81 a and the warning lamp is not energized.

Should, for some reason, the pressure in one of the two brake circuits drop, the contact pin of the brake light switch is no longer depressed. The warning lamp is energized via contact 82 a–81 of the operative brake light switch (intact brake circuit) and contact 81–81 a of the inoperative brake light switch (defective brake circuit) and lights up.



a = to terminal 15
b = to brake lights

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Front wheel brakes Types 1, 2, 3 and 4

The front wheel brakes of Type 1 vehicles have one wheel brake cylinder that operates both brake shoes (simplex brakes). The upper shoe (front shoe on Type 113) acts as leading shoe, and the lower shoe (rear shoe on Type 113) as trailing shoe. These shoes are also known as primary and secondary shoes.

The brake shoes are freely mounted and self-centering in the slots in the pistons and adjusting screws. This minimizes the tendency of the brakes to lock to a minimum. The shoe ends are angled.

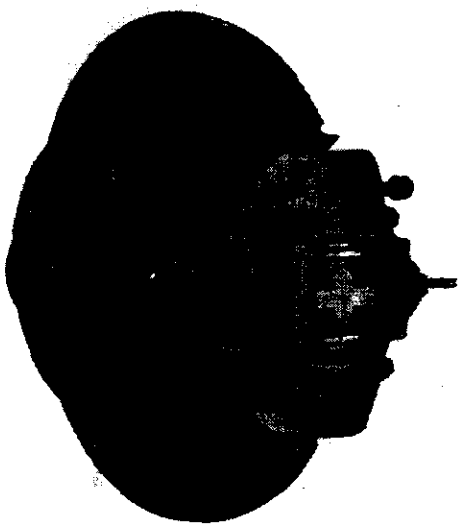
Type 1 (Karmann Ghia), Type 2 from Chassis No. 211 2 000 001, and Types 3 and 4 have disc brakes on the front wheels. The main parts of these brakes are the brake disc and the brake caliper which contains the hydraulically operated components of the brake system. A splash shield protects the inner side of the brake disc from damage caused by dirt or gravel.

The wheel cylinder and anchor block are bolted to the backing plate directly on the steering knuckle. This gives rigid and positive location to the wheel brakes. The backing plate also serves as a cover to keep out dirt and water and to give lateral support to the brake shoes. Two springs which are attached to the backing plate by cups and pins keep the brake shoes in constant contact with the backing plate. After braking, the shoes are returned to the rest position by two return springs.

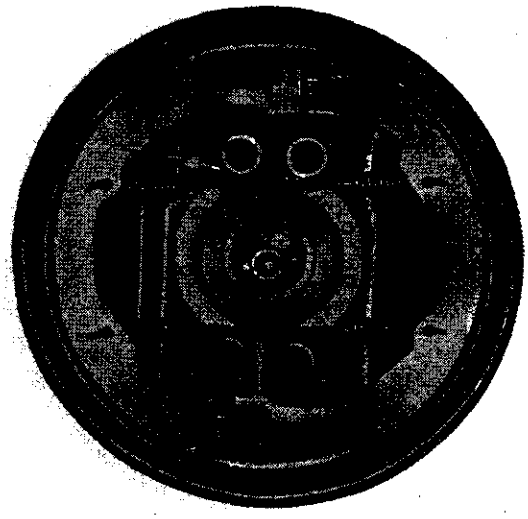
The brakes of Type 2 vehicles are of the duplex type. Due to the two wheel brake cylinders, both brake shoes act as leading shoes.

The outer side of the brake disc is protected from damage by the wheel. Viewed in driving direction, the brake caliper is positioned behind the wheel axis.

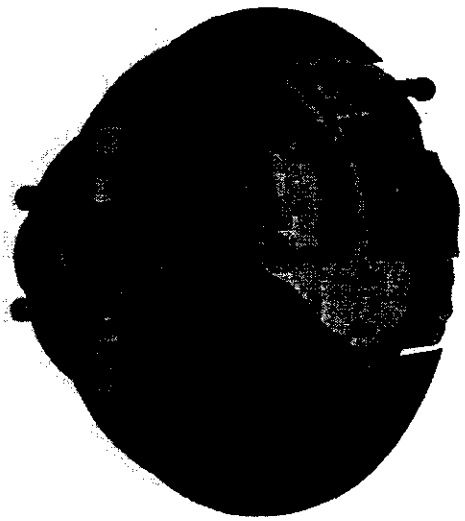
Type 1



Type 1 (Karmann Ghia) and Types 3 and 4



Type 2 up to Chassis No. 210 2 248 837



Type 2 from Chassis No. 211 2 000 001

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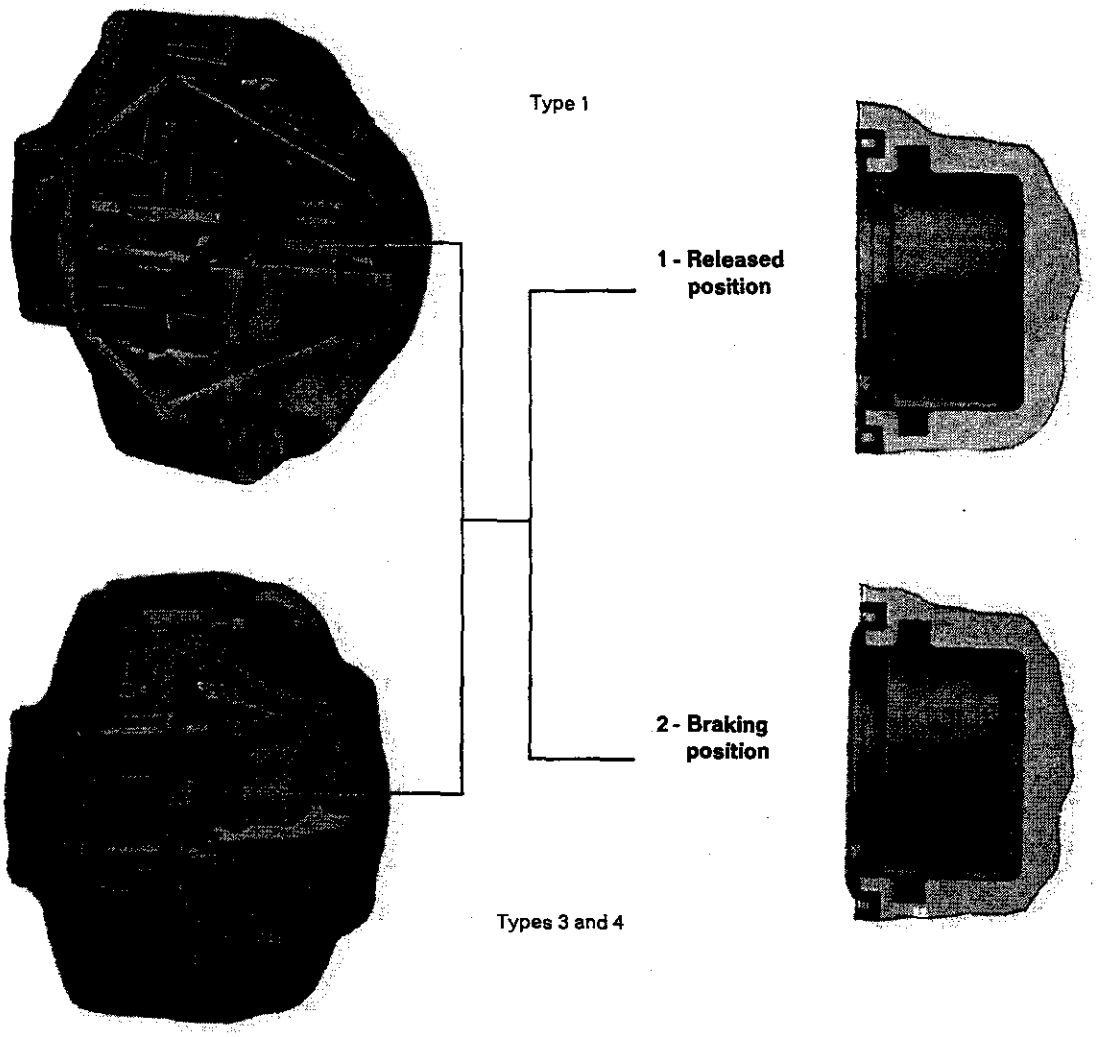
Brake caliper

The brake caliper consists of the inner and the outer housing on either side of the brake disc. The caliper is secured to the steering knuckle by two bolts. Four bolts hold the two caliper housings firmly together. A cylinder is machined into each caliper housing and each cylinder contains a piston and a rubber seal. The rubber seal, which has a square cross section, is positioned in an annular groove in each of the cylinders and prevents fluid leakage past the piston. Cylinder, piston and rubber seal are protected against moisture and dirt by a seal which is held in the recess at the front end of the cylinder by a spring ring and against the piston skirt by the inherent tension of the seal.

To prevent the pistons from rotating when braking, they are provided with retaining plates which are pushed into the piston crowns and held in the caliper recesses. The brake calipers on Type 2 vehicles are basically the same as those on Type 3 vehicles except that they do not have the run-out compensating device (see page B 1.1/ 3–3).



Operation

When the brake pedal is depressed, hydraulic pressure from the tandem master cylinder piston is transferred to the brake caliper pistons. The pistons move toward each other and press the friction pads against the friction surfaces of the disc with equal pressure on both sides. The rubber seals which bear on the skirts of the pistons are then deflected in the direction of the piston movement.

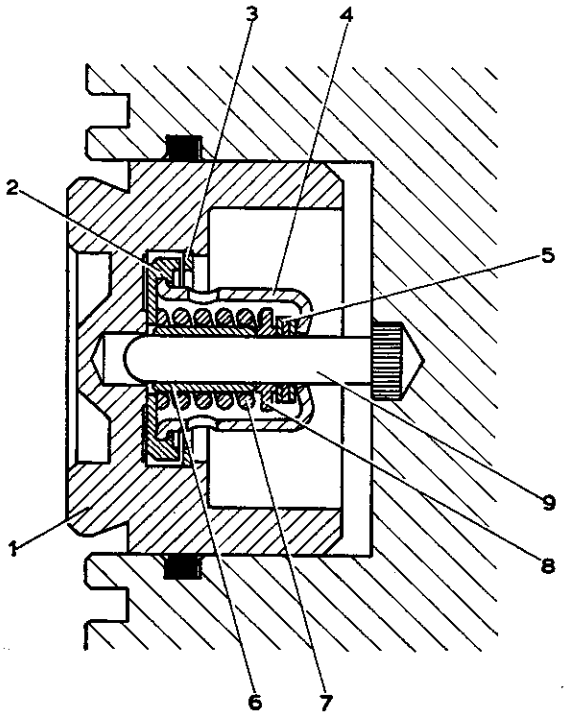
On releasing the brake pedal, the springs force the tandem master cylinder pistons back to their original positions and the complete system is relieved of pressure due to the pressure relief port in the tandem master cylinder. Simultaneously, the pistons in the brake caliper are retracted by the rubber seals resuming their normal condition.

The friction pads, which are pressed against the pistons by the spreader springs, move away from the brake disc, thus allowing the disc to rotate freely again. The amount of clearance between the friction pads and the brake disc depends upon the elasticity of the rubber seal. The clearance is approximately 0.05–0.2 mm (0.002–0.008 in.). This clearance does not increase as the friction pads wear, because the piston slip through the rubber seals when they have to move farther than the lateral deflection of the rubber seal would permit. The friction pads adjust themselves automatically according to the amount of wear.

Adjuster and brake disc deflection compensator

Type 3 only

The adjuster and brake disc deflection compensator has the task of maintaining a constant clearance between friction pads and brake disc even when the pistons have to cover a longer distance toward the brake disc as is necessary, for example, when the friction pads wear or the brake disc is deflected. The compensator consists of the spring housing, the stop ring, the spring, the spacer sleeve, the distance piece and the friction washers. The spring housing is peened to the stop ring. The compensator is so arranged that it can slide along the cylindrical pin which is firmly pressed into the base of the cylinder and it is held in the piston with a predetermined clearance between the underside of the piston crown and the retaining disc.



1 - Piston
2 - Stop ring
3 - Retaining disc
4 - Spring housing
5 - Friction washer
6 - Spacer sleeve
7 - Spring
8 - Distance piece
9 - Cylindrical pin

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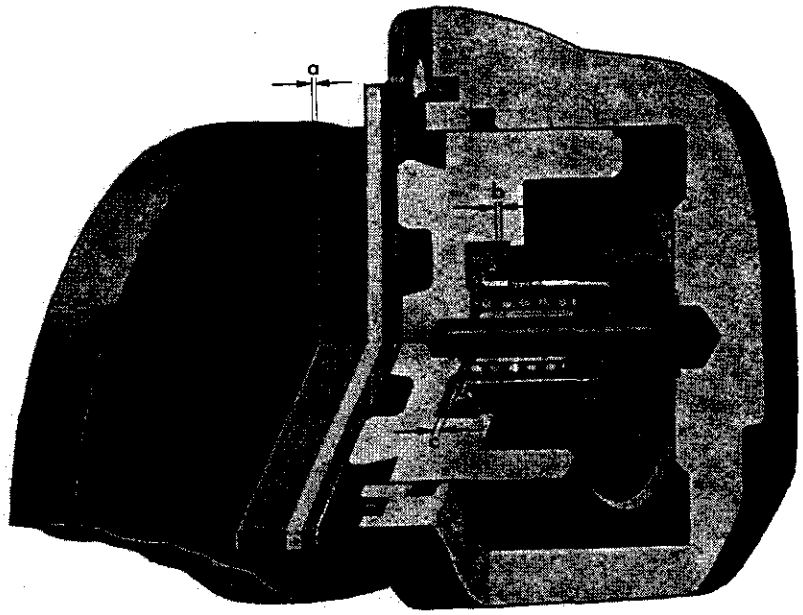
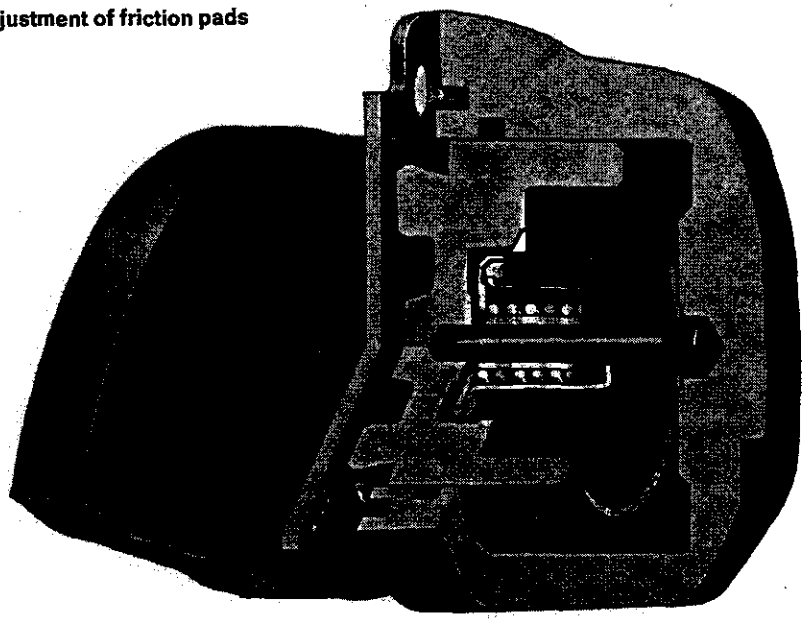


Clearance a is the clearance between friction pads and brake disc as already mentioned.

Clearance b between retaining disc and stop ring is required for the automatic adjustment of the pistons.

Clearance c between underneath of piston crown and end of spacer sleeve is required for the brake disc deflection compensator.

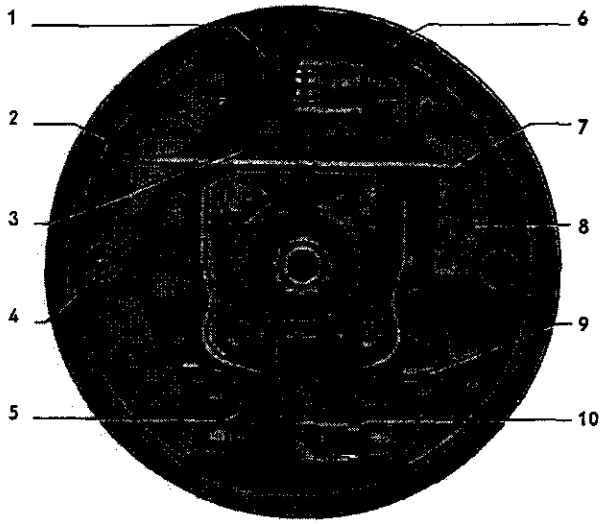
Automatic adjustment of friction pads
Type 3 only



When the brake pedal is depressed, the piston is forced toward the brake disc by the hydraulic pressure, thus eliminating clearances a and b. If, when braking hard, the friction pad wear is so great that the piston has to move farther toward the brake disc than clearance b permits, the piston slides through the laterally deflected rubber seal and, via the retaining disc, pulls the stop ring and the spring housing with it. The friction washers are forced along the cylindrical pin appropriately (arrow = direction of force).

Rear wheel brakes

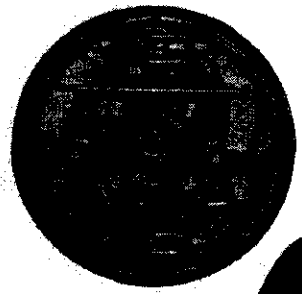
1 - Wheel brake cylinder
2 - Brake shoe and lining
3 - Upper return spring
4 - Spring with cup and pin
5 - Lower return spring
6 - Backing plate
7 - Connecting link
8 - Lever
9 - Brake cable
10 - Adjusting nut



The layout of the rear wheel brakes can be seen in the illustration. The design of the brakes is in principle the same for all vehicle types. There is a difference in the number of return springs, the attachment of the backing plates and the shape of the ends of the brake shoes. The shoe ends of Type 1, 2, 3 and 4 vehicles are angled, but on Type 2 up to Chassis No. 210 2 248 837 they are straight. In addition to this the attachment of the brake drums is also different. On Types 1 and 2 vehicles (Type 2 up to Chassis No. 210 2 248 837) the cast type brake drum is splined to the axle or wheel shaft. On Type 2 (from Chassis No. 211 2 000 001), 3 and 4 vehicles the composite type brake drums are secured to the wheel hubs by wheel bolts (or nuts as on Type 2). To prevent the brake drums from being removed unintentionally when a wheel is removed, the drums are additionally secured to the hubs with two screws,

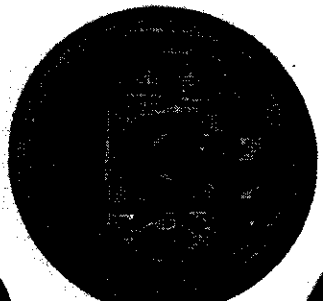
The brake shoes are freely mounted and self-centralizing in the slots in the pistons and adjusting screws. This reduces the tendency of the brakes to lock to a minimum.

The wheel cylinder and anchor block are bolted to the backing plate. The backing plate is bolted to the rear axle bearing housing and it also serves as a cover to keep out dirt and water and to give lateral support to the brake shoes. Two springs attached to the backing plate by cups and pins, keep the brake shoes in constant contact with the backing plate. The brake shoes are returned to the rest position after braking by two return springs.
The brake linings are riveted to the brake shoes. The thickness of the brake linings can be checked during the maintenance service through the two inspection holes in the brake backing plate.
The adjusting nuts and screws are accessible through the holes in the brake backing plate. They provide a means of setting and adjusting the brake shoes.
The parking brake is adjusted at the brake lever in the vehicle after the foot brake has been adjusted. The pull of the parking brake cable is transmitted via a lever which is attached to the primary shoe and then through a connecting link to the second shoe.



Type 1

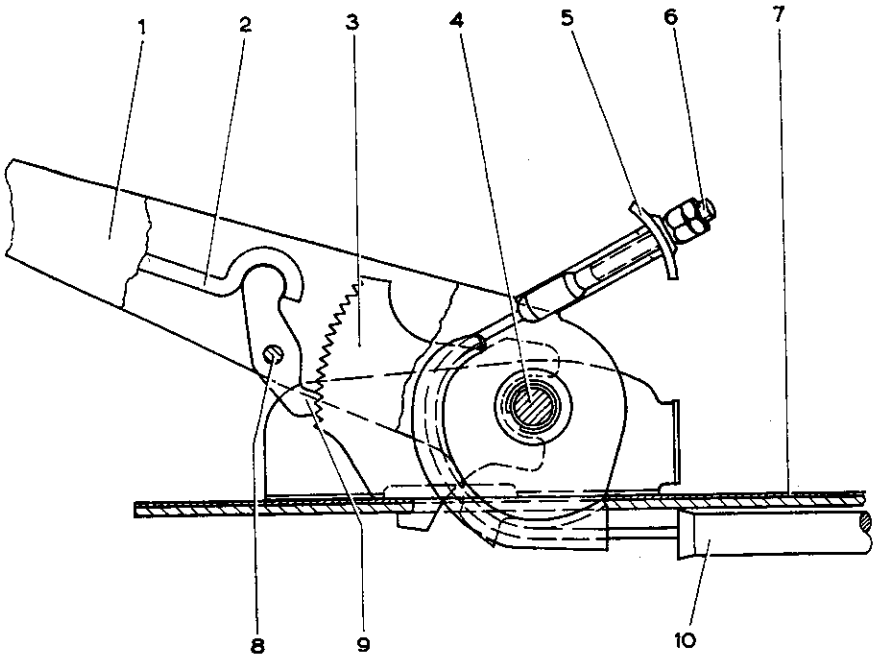
Type 3



Type 2
up to Chassis No.
210 2 248 837

Type 4

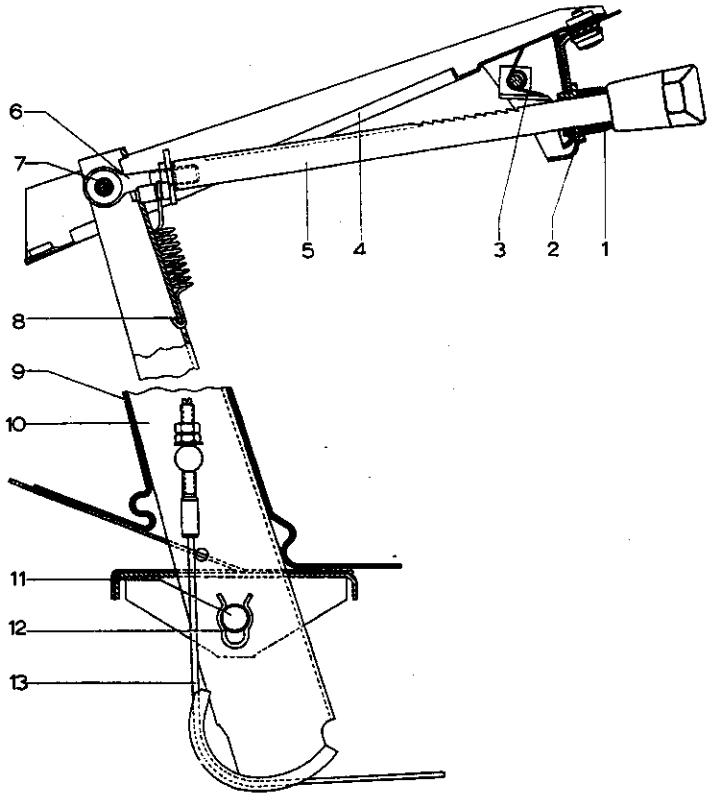
Type 2
from Chassis No.
211 2 000 001



Parking brake Types 1, 3 and 4

The two brake cables are routed around two curved guides to the cable compensator on the brake lever which is held in a support on the frame. The cable compensator ensures that both brake cables are always equally tensioned when the brake is applied, resulting in even braking of both wheels. When the brake is applied it is automatically held by a ratchet segment and a pawl. The brake is released by depressing the button in the end of the parking brake lever.

1 - Parking brake lever
2 - Pawl rod
3 - Ratchet segment
4 - Lever pin
5 - Cable compensator
6 - Brake cable
7 - Frame
8 - Pawl pin
9 - Pawl
10 - Cable guide tube



Type 2

The umbrella type parking brake comprises the hand brake lever itself and also a horizontal toothed rod. A spring and pawl in the support holds the lever when the parking brake is applied.

1 - Ratchet bar stop
2 - Guide sleeve
3 - Spring and pawl
4 - Ratchet bar bracket
5 - Ratchet bar
6 - Eye bolt
7 - Pin
8 - Spring
9 - Boot
10 - Parking brake lever
11 - Pin
12 - Spring clip
13 - Parking brake cable

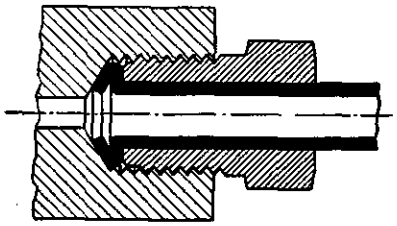
Brake lines and hoses

Brake lines

The brake lines are steel tubes electrolytically copper plated on the inside and outside. In addition, all brake lines are galvanized on the outside, thus giving increased protection against corrosion. The outside diameter of the lines is 4.75 mm, the wall thickness 0.7 mm and they can withstand all pressures developing when braking. The lines are routed so that they will not be damaged and are secured by clips to prevent vibration and chafing.

Brake line connections

The line connections are of the conical type with union nuts which grip the double flared tubing.



Brake hoses

Brake hoses are used to connect moving parts. As they must always follow all movements, they must be installed so that even at the end of the maximum possible movement of the parts concerned, the hose material does not stretch. The hoses must not be twisted.

Brake hoses must not come into contact with oil and grease. If parts of the vehicle near the hoses are to be painted or the vehicle is to be undercoated, first cover the hoses up.

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	Type 3		Type 4		Remarks
	Dimensions and adjustment data	Wear limit	Dimensions and adjustment data	Wear limit	
Tandem brake master cylinder					
Bore	19.05 mm (0.75 in.)		19.05 mm (0.75 in.)		
Intermediate piston stroke	15 mm (0.590 in.)		15 mm (0.590 in.)		
Push rod piston stroke	15 mm (0.590 in.)		15 mm (0.590 in.)		
Ratio at brake pedal	6.4 : 1		6.4 : 1		
Push rod length	adjustable		adjustable		
Pedal travel	min. 205 mm (8.0 in.)		min. 205 mm (8.0 in.)		
Clearance, push rod / piston	1 mm (0.04 in.)		1 mm (0.04 in.)		
Brake pedal free play	4–7 mm (0.016–0.28 in.)		4–7 mm (0.016–0.28 in.)		
Adjustment of stop screw	–		24.5 mm (0.96 in.)		
Differential switching pressure of warning device [1]	8–16 kg/cm² (114–227 psi)		–		
Front wheel brakes					
Brake disc diameter	281 mm (11.06 in.) [2]		281 mm (11.06 in.)		
Thickness new	11.0–0.1 mm (0.433–0.004 in.) [3]		11–0.1 mm (0.433–0.004 in.)		
Material may be removed per side, max.	0.5 mm (0.02 in.)		0.5 mm (0.02 in.)		
Min. thickness after reworking	10.0 mm (0.4 in.) [4]	9.5 mm (0.374 in.)	10 mm (0.4 in.)	9.5 mm (0.374 in.)	
Thickness tolerance, max.	0.02 mm (0.0008 in.)		0.02 mm (0.0008 in.)		
Lateral runout, max.	0.2 mm (0.008 in.)		0.2 mm (0.008 in.)		
Brake caliper (piston diameter)	42 mm (1.654 in.)		42 mm (1.654 in.)		
Friction pad thickness	10 mm (0.394 in.)	2 mm (0.08 in.)	14 mm (0.551 in.) [5]	2 mm (0.08 in.)	
Running clearance	0.05–0.2 mm (0.002–0.008 in.)		0.05–0.2 mm (0.002–0.008 in.)		
Surface area of four friction pads	100 cm² (15.5 sqin.) [6]		100 cm² (15.5 sqin.)		
Rear wheel brakes					
Brake drum diameter	248.1 +0.2 mm (9.768 +0.008 in.)	249.5 mm (9.823 in.)	248.1 +0.2 mm (9.768 +0.08 in.)	249.5 mm (9.823 in.)	
Permissible turned drum diameter	249 mm (9.803 in.)	249.5 mm (9.823 in.)	249 mm (9.803 in.)	249.5 mm (9.823 in.)	
Taper	0.1 mm (0.004 in.)		0.1 mm (0.004 in.)		
Ovality	0.1 mm (0.004 in.)		0.1 mm (0.004 in.)		
Wheel brake cylinder diameter	22.2 mm (0.874 in.)		22.2 mm (0.874 in.)		
Brake lining					
Thickness new	4–3.8 mm (0.16–0.15 in.)	2.5 mm (0.1 in.) [7]	4–3.8 mm (0.16–0.15 in.)	2.5 mm (0.1 in.) [7]	
Thickness new (oversize)	4.5–4.3 mm (0.18–0.17 in.)	2.5 mm (0.1 in.) [7]	4.5–4.3 mm (0.18–0.17 in.)	2.5 mm (0.1 in.) [7]	
Width	45 mm (1.77 in.)		45 mm (1.77 in.)		
Total lining surface, rear	450 cm² (69.8 sqin.)		450 cm² (69.8 sqin.)		

[1] Only for tandem brake master cylinders with cast on cylinders for hydraulic warning device

[2] up to Chassis No. 311 2 277 190: 277 mm (10.904 in.) diameter

[3] up to Chassis No. 311 2 277 190: 9.5–0.1 mm (0.374–0.004 in.)

[4] up to Chassis No. 311 2 277 190: 8.5 mm (0.335 in.) wear limit 8 mm (0.315 in.)

[5] up to August 1972: 10 mm (0.4 in.)

[6] up to Chassis No. 311 2 277 190: 80 cm² (12.4 sqin.)

[7] Bonded linings 1 mm (0.04 in.)

	Type 1			Type 2
	Dimensions and adjustment data			Dimensions and adjustment data
	Sedans	Karmann Ghia	Model 181	
Brake pressure regulator				
Piston diameter	–	–	–	–
Regulating commences	–	–	–	–
Test pressure				–
1st test: in front of valve/behind valve	–	–	–	100/55–65 kg/cm² [1]
2nd test: in front of valve/behind valve	–	–	–	(1422/782–925 psi)
Exit pressure must not drop when input pressure remains constant for 10 sec. minimum				
Quantity of brake fluid in brake system or brake system and clutch system with fluid reservoir correctly filled (reservoir filled to upper edge of annular welding seam)				
a - vehicles with manual transmissions	approx. 400 cc	approx. 400 cc	approx. 400 cc	approx. 500 cc
b - vehicles with automatic transmissions	–	–	–	–
Wheel and tires				
Wheel size	4½ J x 15 [2]	4½ J x 15	5 JK x 14	5½ x 14 [5]
Offset	34 mm (1.338 in.) [3]	46 mm (1.81 in.)	32.5 mm (1.27 in.)	46 mm (1.81 in.)
Bolt hole pitch circle dia.	130 mm (5.1 in.)	130 mm (5.1 in.)	205 mm (8.07 in.)	112 mm (4.4 in.) [6]
Runout				
Lateral runout max.	1.5 mm (0.06 in.)	1.5 mm (0.06 in.)	1.5 mm (0.06 in.)	1.5 mm (0.06 in.)
Radial runout max.	1.25 mm (0.05 in.)	1.25 mm (0.05 in.)	1.25 mm (0.05 in.)	1.25 mm (0.05 in.)
Wheel bolts	M 14 x 1.5 x 19	M 14 x 1.5 x 19	M 12 x 1.5 x 13	M 14 x 1.5 x 19 [7]
Wheel nuts		–	–	M 14 x 1.5
Front wheel bearing play	0.03–0.12 mm (0.001–0.004 in.)	0.03–0.12 mm (0.001–0.004 in.)	0.03–0.12 mm (0.001–0.004 in.)	0.03–0.12 mm (0.001–0.004 in.)
Conventional tires (tubeless)				
Tire size	6.00 x 15 L 4 PR [2]	6.00 x 15 L 4 PR [4]	–	7.00 x 14 8 PR
Radial runout max.	1.5 mm (0.06 in.)	1.5 mm (0.06 in.)	–	1.5 mm (0.06 in.)
Dimensions:				
Outside diameter	650±6 mm (25.6±0.23 in.)	650±6 mm (25.6±0.23 in.)	–	668±6 mm (26.3±0.23 in.)
Operating width max.	154 mm (6.06 in.)	195 mm (7.68 in.)	–	189 mm (7.44 in.)
Effective radius, static	304±3 mm (11.97±0.12 in.)	304±3 mm (11.97±0.12 in.)	–	307±3 mm (12.09±0.12 in.)
Effective radius, dynamic	309±3 mm (12.16±0.12 in.)	309±3 mm (12.16±0.12 in.)	–	313±3 mm (12.32±0.12 in.)
Radial ply tires (tubeless)				
Tire size	155 SR 15	155 SR 15	185 SR 14 M+S (with tube)	185 SR 14 C Reinforced
Radial runout, max.	– 1.5 mm (0.06 in.)	– 1.5 mm (0.06 in.)	1.5 mm (0.06 in.)	1.5 mm (0.06 in.)
Dimensions:				
Outside diameter	630±8 mm (24.8±0.31 in.)	630±8 mm (24.8±0.31 in.)	650±8 mm (25.59±0.31 in.)	654±8 mm (25.74±0.31 in.)
Operating width max.	162 mm (6.37 in.)	162 mm (6.37 in.)	190 mm (7.48 in.)	183 mm (7.20 in.)
Effective radius, static	285±4 mm (11.22±0.16 in.)	285±4 mm (11.22±0.16 in.)	296±4 mm (11.65±0.16 in.)	295±4 mm (11.61±0.16 in.)
Rolling circumference	1905±25 mm (75±0.98 in.)	1905±25 mm (75±0.98 in.)	1965±30 mm (77.36±1.18 in.)	1980±30 mm (77.94±1.18 in.)
Tire pressures				
(see list of tires, page B 1.8/1)				

Remarks:

[1]) with inclined brake pressure regulator (see page B 5.2/1)
[2]) up to March 1972: 4 J x 15 5.60 x 15 4 PR
[3]) up to March 1972: 40 mm (1.57 in.)
[4]) up to July 1972: 5.60 S x 15 4 PR
[5]) up to Chassis No. 210 2 248 837: 5 JK x 14
[6]) up to Chassis No. 210 2 248 837: 205 mm (8.07 in.)
[7]) up to Chassis No. 210 2 248 837

Type	Model	Model year	Tire sizes (tubeless, cross ply)	Rims	Tire pressures psi to ¾ payload front	Tire pressures psi to ¾ payload rear	Tire pressures psi fully loaded front	Tire pressures psi fully loaded rear
2	Trucks	1968 1969 1970	7.00 x 14 8 PR	5 JK x 14	28	36	28	40
		1971	7.00 x 14 8 PR	5½ JK x 14				
	Wagons	1968 1969	7.00 x 14 6 PR	5 JK x 14	28	36	28	36
		1970	7.00 x 14 8 PR	5 JK x 14	28	36	28	40
		1971	7.00 x 14 8 PR	5½ JK x 14				
	Campmobile	1968 1969 1970	7.00 x 14 8 PR	5 JK x 14	28	36	28	40
		1971	7.00 x 14 8 PR	5½ JK x 14				

Note

Conventional and snow (M & S) tires: For prolonged high speed travel, increase tire pressures on vehicles with conventional (cross) ply by 3 psi. Never exceed the maximum tire inflation pressure marked on the tire.

Type	Model	Model year	Tire sizes	Rims	Tire pressures psi 1–2 persons front	1–2 persons rear	fully loaded front	fully loaded rear
1	Sedan 111	1968 1969 1970	155 SR 15	4 J x 15	18	27	18	27
		1971 1972 1973	165 SR 15	4½ J x 15 [1]				
	Sedan 113	1971	155 SR 15	4 J x 15	18	27	18	27
		1972 1973	165 SR 15	4½ J x 15 [1]				
	Convertible	1968 1969 1970	155 SR 15	4 J x 15	18	27	18	27
		1971 1972 1973	165 SR 15	4½ J x 15 [1]				
	Karmann Ghia	1968 1969 1970	155 SR 15	4½ J x 15	18	27	18	27
		1971 1972 1973	165 SR 15	4½ J x 15				
	Model 181	1973	185 SR 14 M+S (with tube)	5 JK x 14	18	27	18	27
3	Sedan	1968 1969 1970 1971 1972 1973	165 SR 15	4½ J x 15	18	28	18	28
	Squareback Sedan	1968 1969 1970 1971 1972 1973	165 SR 15	4½ J x 15	18	28	18	35

[1]) up to March 1972: 4 J x 15

Warning!

If radial tires are used, they must be mounted on all four wheels. The different handling characteristics of these tires require this uniformity.

The following operations should be carried out in accordance with the existing instructions:

Brake system

1 - **Checking brake lines**

Check brake lines in the vehicle interior from the pedal cluster to the driver's seat on Type 1 and 3 vehicles. (To do this, lift front left floor mat.) Check all visible brake lines, and connections underneath vehicle for leaks, corrosion and other damage.

> **Caution**
>
> Brake lines that are bent, flattened, badly corroded, chafed or show other signs of damage must be replaced. Brake hoses that are swollen, leaky or otherwise damaged are no longer safe and must also be replaced.

2 - **Foot brake**

Check clearance and pedal free play. If necessary, adjust brake shoes.

3 - **Parking brake**

Check parking brake lever free play and adjust cables if necessary.

4 - **Brake fluid reservoir**

Check brake fluid level. Use only genuine VW brake fluid and fill to 15–20 mm (.6–.8 in.) below shoulder of filler cap. If a large quantity of fluid is lost **do not only top up.** Determine the cause of the fluid loss first and, if necessary, repair the brake system.

5 - **Brake linings**

Check thickness of brake linings through inspection holes in back plates (on Type 2 vehicles to Chassis No. 218 109 823, the brake lining thickness can only be checked with VW 753 after the brakes have been adjusted).

The thickness of the linings is measured with the wheels installed with VW 774.

6 - **Brake servo unit**

To test the brake servo unit, depress the brake pedal firmly several times with engine off to remove the vacuum in the system. Then, while keeping the pedal depressed with medium foot pressure start engine. If the pedal gives slightly when the engine starts then the servo unit is working properly.

7 - **Brake fluid**

The brake fluid should be changed in accordance with the special instructions issued by the factory.

> **Caution**
>
> For refilling, always use fresh brake fluid. Do not use fluid which has been pumped from the system.

8 - **Brake warning light system**

The operation of the brake warning light system should be checked when changing the brake fluid (see B 2.5/1).

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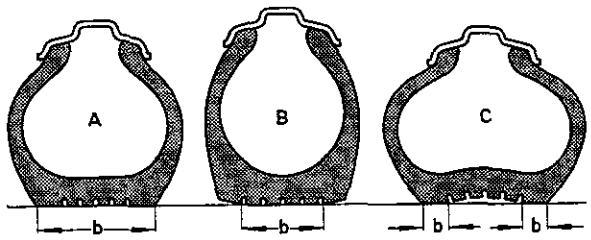
Wheels and tires

1 - Wheels

Check wheel bolts for tightness. Tighten to correct torque.

2 - Tires

Part of the maintenance and care of the tires is the regular checking of tire pressures and a visual check for tread wear and tire damage. The tread depth should be at least 1 mm (1/16 in.) across the full width of the tire.



A = normal pressure B = overinflated C = underinflated
b = road contact

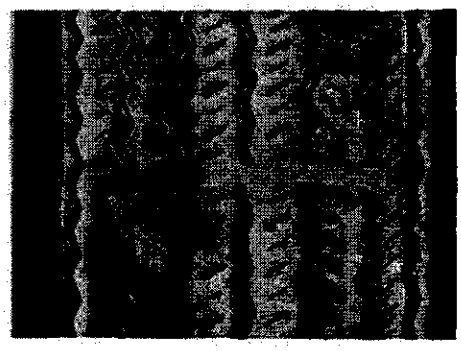
Beginning with the 1969 models, the tires are provided with tread depth indicators. These indicators are molded into the tread grooves and will appear as bands accross the tire when the tread depth reaches 1/16 of an inch.

As the tread wears, the traction of the tires is also reduced. It is therefore recommended that the tires be replaced before the molded indicators appear fully at the surface.

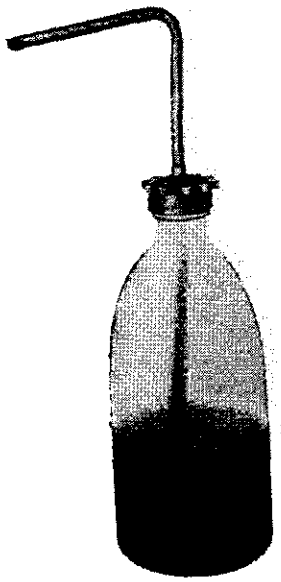
Tires should not come in contact with fuel or oil.

To reduce premature wear keep wheels balanced and the front axle aligned.

Tread good



Tread worn out



No.	Description	Tool	Remarks
	Plastic bottle		

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First empty brake fluid reservoir. To do this, use a siphon or a plastic bottle. These must be used for brake fluid only.

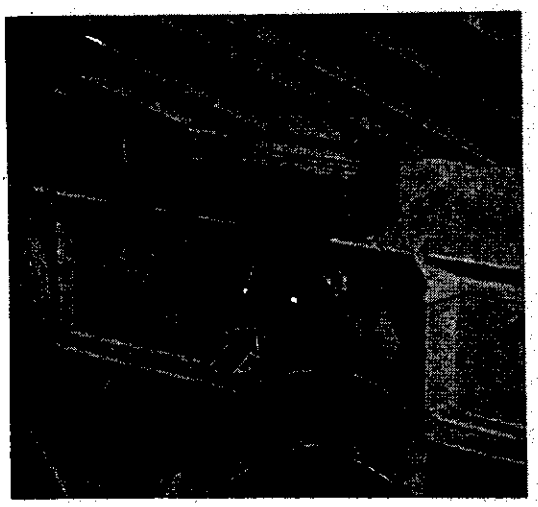
Caution

Brake fluid is poisonous. It also contains a solvent that is damaging to most paint finishes.

Removing

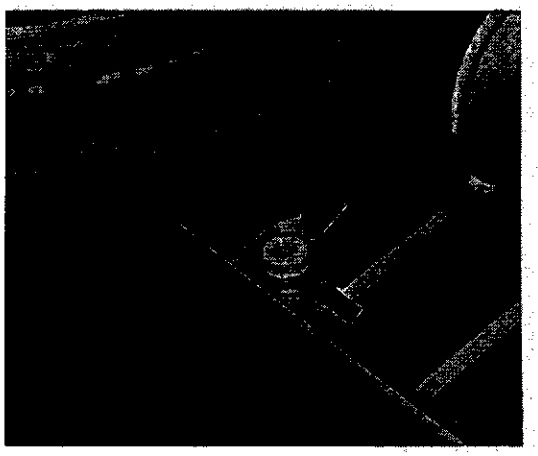
1 - Detach connecting hoses from brake fluid reservoir. Catch any escaping brake fluid in a cloth.

2 - Remove reservoir from retaining plate.



Model 181

3 - Before disconnecting hoses, remove fluid reservoir protective plate (A) (arrow).



4 - When removing brake fluid reservoir, remove cover (B) (arrow) from luggage compartment.

Installing

1 - After installing reservoir, fill with new brake fluid. Brake fluid level is 15–20 mm (0,6–0.8 in.) below shoulder of screw cap.

2 - If necessary, bleed brake system (see B 8.1/1).

Model 181

3 - When installing brake fluid reservoir, install collar (C) (arrow).

Removing and installing

Before removing brake master cylinder, drain brake fluid from reservoir. To do this use a siphon or a plastic bottle. These must only be used for draining off brake fluid.

Caution

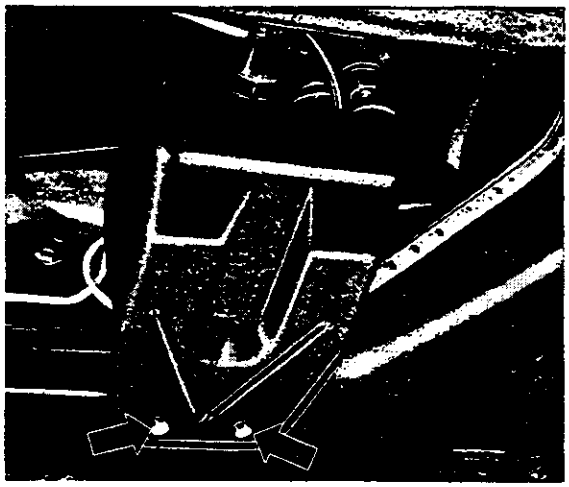
Brake fluid is poisonous. Because of its acidity it must not come into contact with paintwork.

Removing, Types 1 and 3

1 - Type 3 only: Remove cover plate.

2 - Carefully pull elbows out of sealing plugs and detach brake lines from master cylinder. Catch any escaping brake fluid. Close lines with dust caps to prevent entry of dirt.

3 - Remove brake master cylinder from frame.



Note

On Type 1 vehicles, there are spacers in the cross member. When removing the screws, ensure that the spacers (arrow) do not fall into the cavity.

Installing, Types 1 and 3

1 - Secure brake master cylinder to frame.

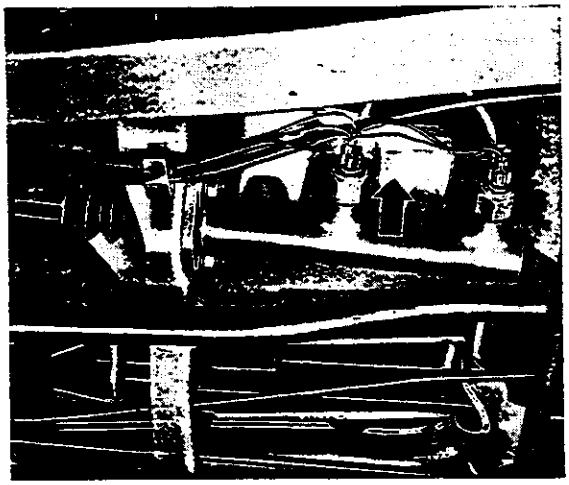
Note
Do not forget spacers on Type 1 vehicles.

2 - Moisten elbows and sealing plugs with brake fluid to facilitate installation of elbows.

3 - If necessary, adjust brake pedal free travel. See "Adjusting push rod" (B 2.6/1). Check clutch pedal play.

4 - Ensure that push rod boot is correctly installed. Dirt can damage the seal and cause brake failure. The vent hole in the boot must always face downward.

5 - Bleed brakes. See page B 8.1/1.



Removing Type 2

1 - Remove cover plate.

2 - First press brake fluid reservoir out of rear sealing plug and catch escaping brake fluid. Then pull fluid reservoir out of second sealing plug. Detach brake lines from brake master cylinder and close with dust caps to prevent entry of dirt.

3 - Remove brake master cylinder from support.

Installing Type 2

1 - Secure brake master cylinder to support and tighten screws to prescribed torque.

2 - Connect brake lines.

From chassis no. 211 2 000 001 the tandem master cylinder has only one outlet (formerly two) for the front wheel cylinders. A T-piece is installed from which brake lines lead to each front wheel.

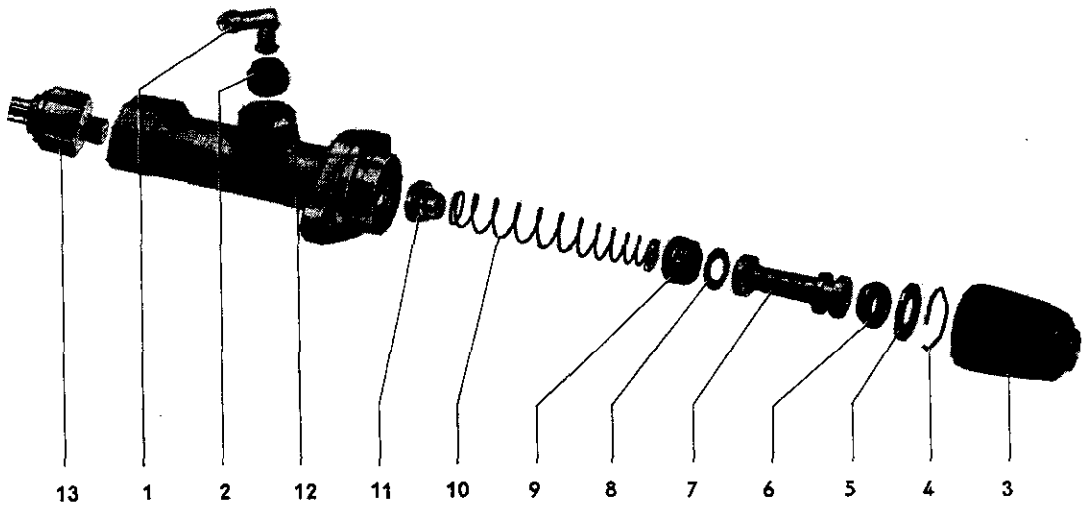
Warning

Do not install the previous type tandem master cylinder in vehicles from chassis no. 211 2 000 001 on. Even if the outlet for the second front brake line is plugged, an air cushion will form in the resultant cavity which could possibly lead to **brake failure.**

3 - Check brake pedal free travel. See "Adjusting push rod" (B 2.6/1). Ensure that boot is correctly installed. Dirt can damage the seal and can cause brake failure. The vent hole in the boot must always face downward.

4 - Moisten sealing plug with brake fluid and carefully press brake fluid reservoir connections into sealing plugs.

5 - Bleed brakes. See page B 8.1/1.



No.	Description	Qty.	When disassembling	When assembling	Detailed instructions
1	Elbow, 105°	1		moisten with brake fluid	
2	Sealing plug	2		moisten with brake fluid; ensure correct installation position	
3	Boot	1		vent hole faces downward	
4	Spring ring	1			
5	Stop washer	1			
6	Seal	1		replace; install with VW brake cylinder paste	
7	Piston	1			
8	Piston washer	1			
9	Cup	1		replace; install with VW brake cylinder paste	B 2.3/1–2
10	Spring	1			
11	Check valve	1			
12	Brake master cylinder housing	1			
13	Brake light switch	2		torque to 14–18 lb. ft. (2–2.5 mkg)	

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Important

The master cylinders are supplied by two different manufacturers. The **complete** master cylinders of the respective vehicles are interchangeable irrespective of the manufacturer, but it is not possible, however, to interchange individual parts of these master cylinders.

To avoid malfunction of the brakes use only the repair kit which contains all individual parts fitting both types of master cylinders. When carrying out repairs on the master cylinder, **all** the parts of a repair kit must be installed **together,** even if only one internal part of the master cylinder is damaged. The complete contents of the repair kit must always be used up when carrying out a repair.

Disassembling

1 - Remove internal parts of brake master cylinder.

2 - Remove brake light switch.

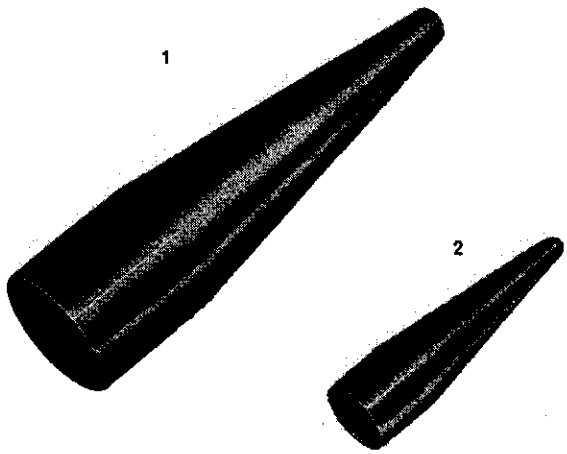
Assembling

1 - All parts must be cleaned in methylated spirits or brake fluid only.

2 - Check parts for wear. The compensating ports must not be blocked or burred.

3 - Install cups with VW brake cylinder paste.

4 - Install boot so that vent hole faces downward.



No.	Description	Tool	Remarks
1	Cup installing sleeve	US 4425	Types 1, 3 and 4 19.05 mm diameter
		US 4426	Type 2 22.20 mm diameter 23.81 mm diameter
2	Warning device installing sleeve	–	Types 1, 2 and 3 10.50 mm diameter

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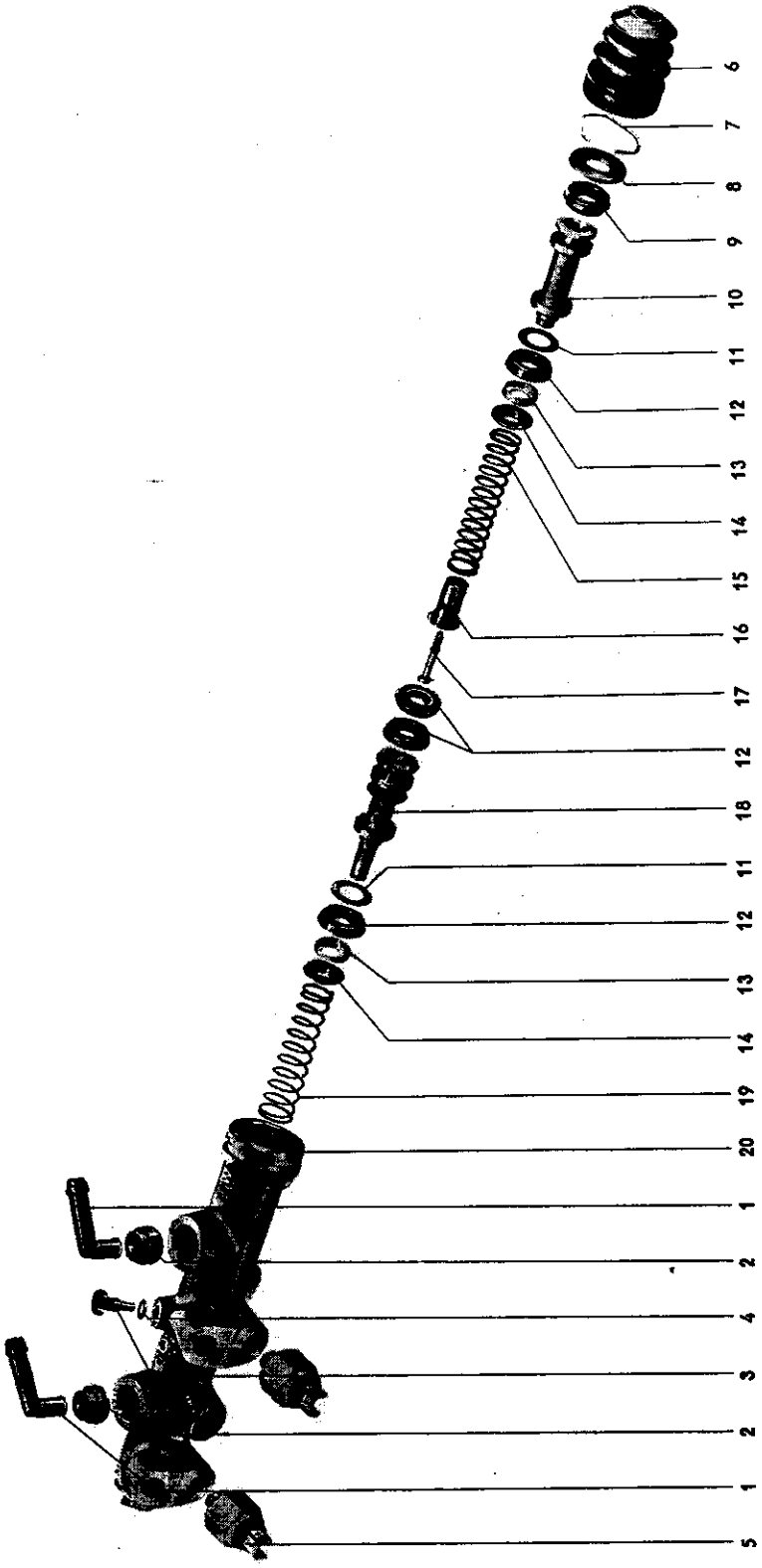
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No.	Description	Quantity	Note when disassembling	Note when assembling	Special Instructions see
1	Brake light switch	2		torque to 1.5–2 mkg (11–14 lb. ft.)	
2	Elbow	2		moisten with brake fluid; when replacing elbow, ensure prescribed angle	B 2.4/1
3	Sealing plug	2		moisten with brake fluid; ensure correct installation position	
4	Stop screw	1	unscrew before removing spring ring	if necessary, move intermediate piston in cylinder	B 2.4/1
5	Seal	1		replace	
6	Master cylinder housing	1			
7	Intermediate piston spring	1			
8	Spring retainer	2			
9	Support washer	2			
10	Primary cup	4		replace; apply VW brake cylinder paste; install with sleeve	B 2.4/1
11	Cup washer	2			
12	Intermediate piston	1		replace	
13	Stroke limiting screw	1		tighten fully	
14	Stop sleeve	1			
15	Push rod piston spring	1			
16	Push rod piston	1		replace	
17	Secondary cup	1		replace; apply VW brake cylinder paste; install with sleeve	B 2.4/1
18	Stop washer	1			
19	Lock ring	1			
20	Rubber boot	1			

Note

The master cylinders and the repair kits are supplied by two different manufacturers, Messrs. Teves and Messrs. Schäfer. They are marked "ATE" (Teves) and "S" (Schäfer). The **complete** master cylinders of the respective vehicles are interchangeable irrespective of the manufacturer. It is not possible, however, to interchange individual parts of these master cylinders.

To avoid any possibility of brake malfunction, only a repair kit supplied by the manufacturer of the particular master cylinder is to be used. When performing repairs on the master cylinder **all** the parts of the repair kit must be installed **together,** even if only one internal part of the master cylinder is damaged or worn.

Disassembling

1 - Unscrew stop screw.

2 - Remove cylinder internal parts.

Assembling

1 - All parts must be cleaned in alcohol or brake fluid only.

2 - Check parts for wear.

The compensating ports must not be blocked or burred.

Note

Teves master cylinder

With exception of the secondary cup for the push rod piston all the cups are of the same shape and size and are, therefore, interchangeable.

Schäfer master cylinder

All cups are the same size and shape.

previous

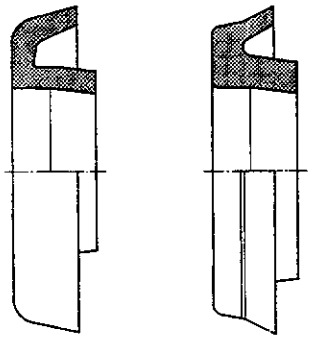
new

Modification

From August 1970, the Teves master cylinders have cups with stepped angled lips for the intermediate piston.

Repair kits contain cups with the modified lip.

They are marked on the outside with a 1 mm (0.040 in.) wide colored ring (illustration).



1 - Primary cup
2 - Cup with modified lip

3 - Install cups on pistons with installing sleeve.

4 - Place cup washer, primary cup, support washer, spring retainer and spring onto intermediate piston and insert piston vertically into master cylinder housing which should be held with the opening downward. This is necessary because if an attempt is made to put the piston in horizontally, the various parts will fall off the piston.

5 - Assemble push rod piston, cup washer, primary cup, support washer, spring retainer, stop sleeve, spring and stroke limiting screw and insert into master cylinder.

6 - Install stop washer and lock ring.

7 - Install stop screw and seal after checking that the hole for the screw is not covered by the intermediate piston. If the hole is covered, the parts inside the cylinder must be pushed farther in with the push rod as the stop screw is being screwed in.

The angles of the elbows for the lines from reservoir differ according to type and model.

In an elbow is replaced, make sure that the correct part is installed (see table).

Replacement cylinders with 135° elbows for both circuits are supplied. These cylinders can be installed in vehicles built after April 1971. When this is done, make sure that the slope of the supply lines between the reservoir and master cylinder is uniform.

The elbows of Type 3 vehicles must not be confused with each other.

Type	Brake circuit	Elbow angle 95°	105°	135°
1	Push rod piston			×
	Intermediate piston			×
1 [1])	Push rod piston		×	
	Intermediate piston			×
3	Push rod piston	×		
	Intermediate piston			×
4	Push rod piston		×	
	Intermediate piston		×	

[1]) from April 1971

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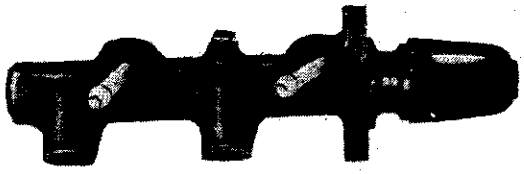


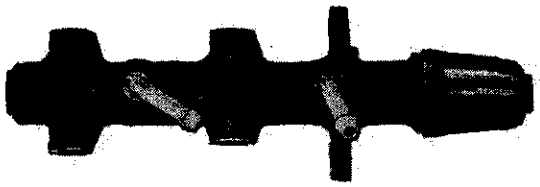
Type 1 from August 1970

Type 1 from August 1971

Note

The tandem master cylinders manufactured by Teves (marked with ATE) for Types 1 and 3 1972 model vehicles are longer and the shape and diameter of the sealing plugs have been changed. At the same time the elbows for the new plugs have been provided with a shoulder.

Type 3 from August 1970



Type 3 from August 1971

Note

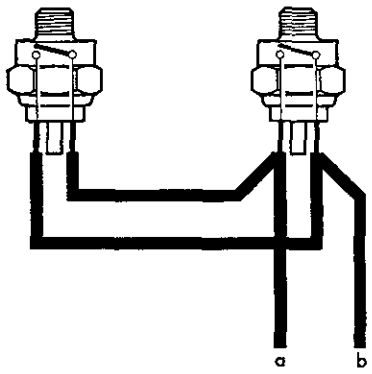
When selecting repair kits for the tandem master cylinder, check first of all, if the cylinder concerned is from model year 1971 or 1972. The correct repair kit can then be found in the Parts List.

Testing brake light switch

1 - Disconnect cables from brake light switch for front brake circuit. Switch ignition on and operate foot brake. Brake lights must light up.

2 - Connect cables and repeat test on brake light switch for rear brake circuit.

3 - If, during one of the tests, the brake lights do not light up, replace the appropriate switch with a new one.

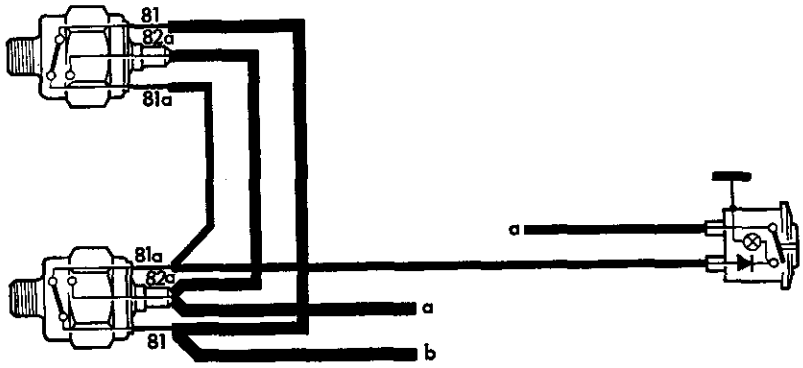


a = to terminal 15
b = to brake lights

Testing brake light switch with warning device

A - Contact for brake light

1 - Disconnect cables from brake light switch for front brake circuit (contacts 81–82 a, black-red and black cable).



a = to terminal 15
b = to brake lights

2 - Switch ignition on and depress brake pedal. Brake lights must light up.

3 - Connect cables and repeat test on rear brake circuit switch.

4 - If, during one of the tests, the brake lights do not light up, replace the appropriate switch with a new one.

B - Contact for warning lamp

1 - Switch ignition on and test warning lamp by pressing push button in. Warning lamp must light up.

2 - Open a bleeder valve in the front brake circuit. Catch escaping fluid.

3 - Switch ignition on and depress brake pedal. Warning lamp must light up.

Important
Release brake pedal only after bleeder valve has been closed.

4 - Repeat test on rear brake circuit.

5 - Check fluid level in brake fluid reservoir.

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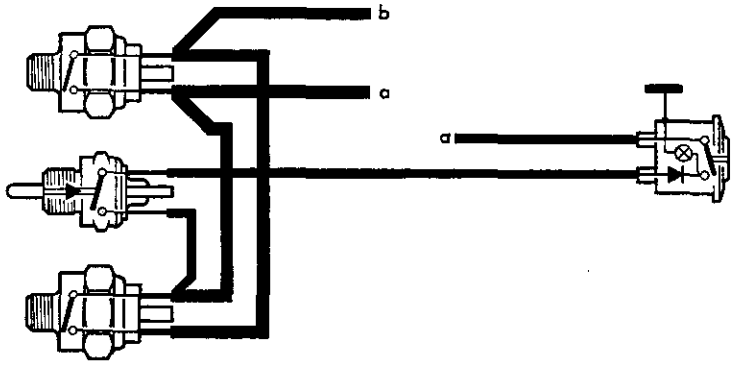
Removing and installing brake light switch/ warning device switch

1 - Disconnect cables from brake light switch or warning device switch and unscrew switch. Catch any escaping fluid with a cloth.

2 - Install new brake light switch / warning device switch and connect cables according to wiring diagram.

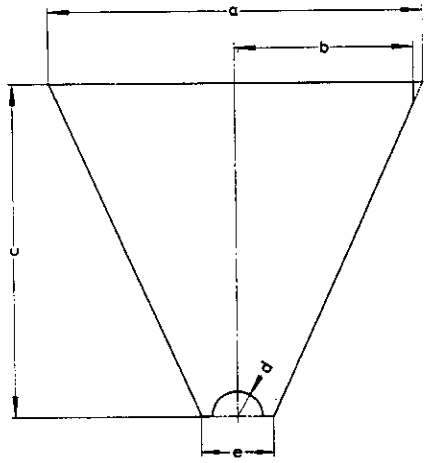
3 - After installing switch, bleed appropriate brake circuit. This is not necessary for the warning device switch.



a = to terminal 15

b = to brake lights

Tools



Type 1
a = 8.27 in. (210 mm)
b = 3.94 in. (100 mm)
c = 7.48 in. (190 mm)
d = .55 in. (14 mm)
e = 1.57 in. (40 mm)
Sheet metal thickness = .06 in. (1.5 mm)

Type 1 from Chassis No. 119 480 130 / Type 3
a = 8.86 in. (225 mm)
b = 4.23 in. (107.5 mm)
c = 7.48 in. (190 mm)
d = .55 in. (14 mm)
e = 1.57 in. (40 mm)
Sheet metal thickness = .06 in. (1.5 mm)

Important

The templates for Types 1 and 3 must not be confused when carrying out the adjustment. For this reason, the Type 1 template should be marked with yellow paint and the Type 3 template with violet paint.

No.	Description	Tool	Remarks
	Template		

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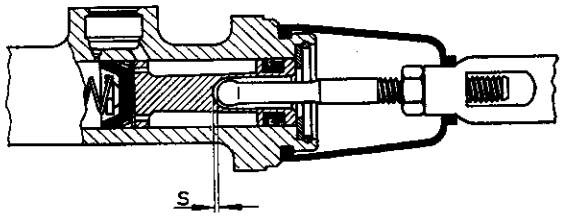
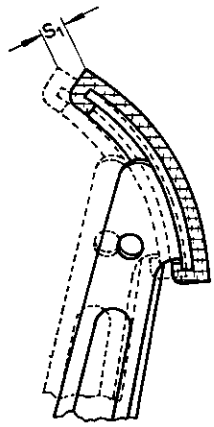
Adjusting push rod

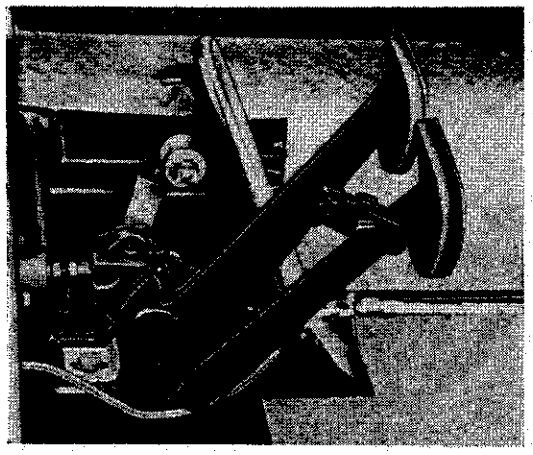
The push rod must always be adjusted so that there is a clearance of s = .04 in. (1 mm) between push rod and bottom of piston. This play can also be measured as free play at the brake plate. The free play is s_1 = .20–.28 in. (5–7 mm).



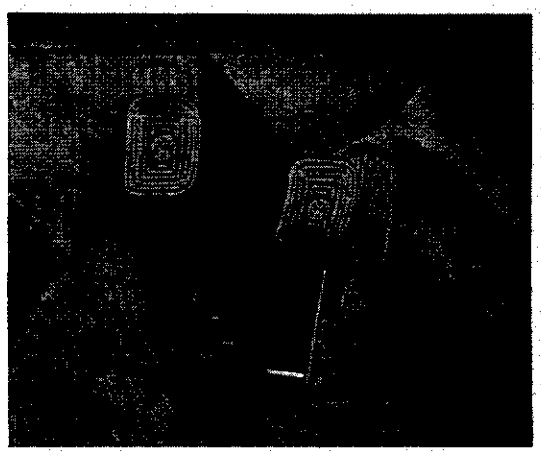


Types 1 and 3

1 - Adjust pedal free play at pedal stop.



Important
The pedal free play must be large enough so that when one brake circuit fails sufficient retardation can be attained with the intact brake circuit without the brake pedal touching the cross panel. A template enables the pedal play to be determined quickly and accurately.



2 - Adjust push rod until the necessary play "s" is attained.

3 - Tighten locknut and push boot over hexagon.

Types 1 and 3

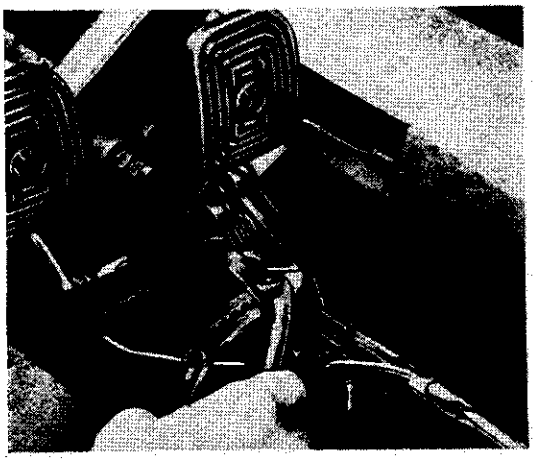
Removing

1 - Remove accelerator pedal (see K 4.1/1).

2 - Remove push rod lock plate.

3 - Detach brake pedal return spring.

4 - Detach pedal cluster from frame and remove push rod.



Installing

1 - Install push rod, tighten pedal cluster bolts and attach return spring. Install lock plate on push rod pin.

2 - Install accelerator pedal (see K 4.1/1).

3 - Check pedal free travel with template and, if necessary, adjust.

Type 2

Removing

1 - Remove cover plate.

2 - Pull cotter pin out of retaining pin and remove push rod.

Installing

1 - Make sure that pin is locked with **new** cotter pin.

2 - If necessary, align brake pedal stop.

Type 2 with brake servo

Removing

1 - Remove cover plate.

2 - Back off locknut of servo push rod.

3 - Disconnect push rod from brake pedal by twisting fork clear of pedal. Unscrew out of threaded part of servo.

Installing

When installing, make sure that the length of the push rod is set accurately (see B 2.6/1).

Type 4

Removing and installing

To remove the push rod it is necessary first to remove the complete pedal support (see B 2.7/1).

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Removing

1 - Detach clutch cable at clutch lever.

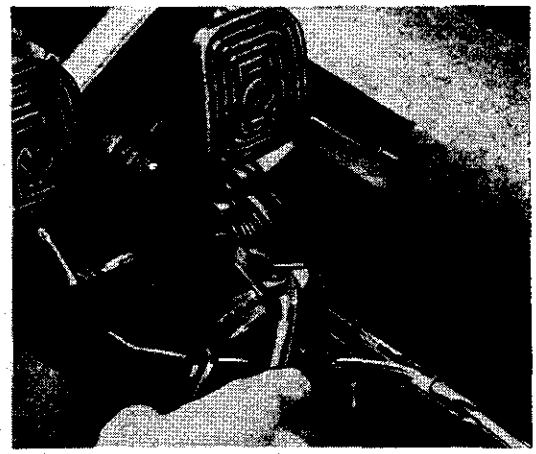
2 - Remove accelerator pedal.

3 - Detach accelerator cable.

4 - Remove push rod lock plate.

5 - Detach brake pedal return spring at push rod pin.

6 - Remove pedal cluster mounting bolts. Carefully pull out pedal cluster together with clutch cable so that cable is not detached. At the same time take master cylinder push rod off pin. Detach clutch cable.



Installing

1 - After attaching clutch cable, hold clutch pedal as vertical as possible, otherwise the cable will easily come off again.

2 - Insert both pedal cluster attaching bolts.

3 - Position push rod on brake pedal pin, then tighten both bolts to prescribed torque.

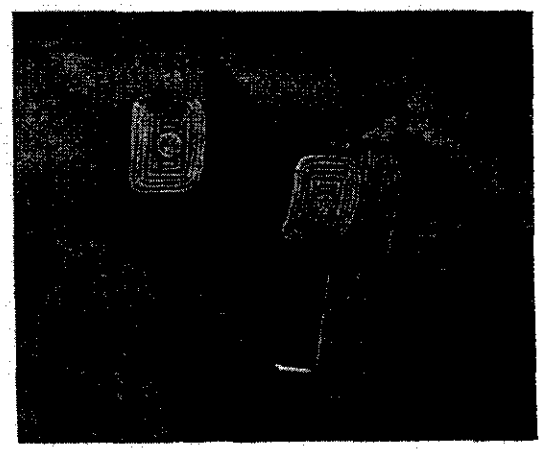
4 - Make sure that the brake pedal return spring is correctly positioned.

5 - Attach brake pedal return spring. Install master cylinder push rod lock plate.

6 - Check brake pedal free play with template. If necessary, adjust pedal play and length of push rod (see B 2.6/1).

Note

From August 1970 the angle of the clutch and brake pedals on Type 1/Sedan 113 vehicles was altered to bring the brake pedal more into line with the accelerator pedal. The pedal travel is still limited by a depression in the front partition.

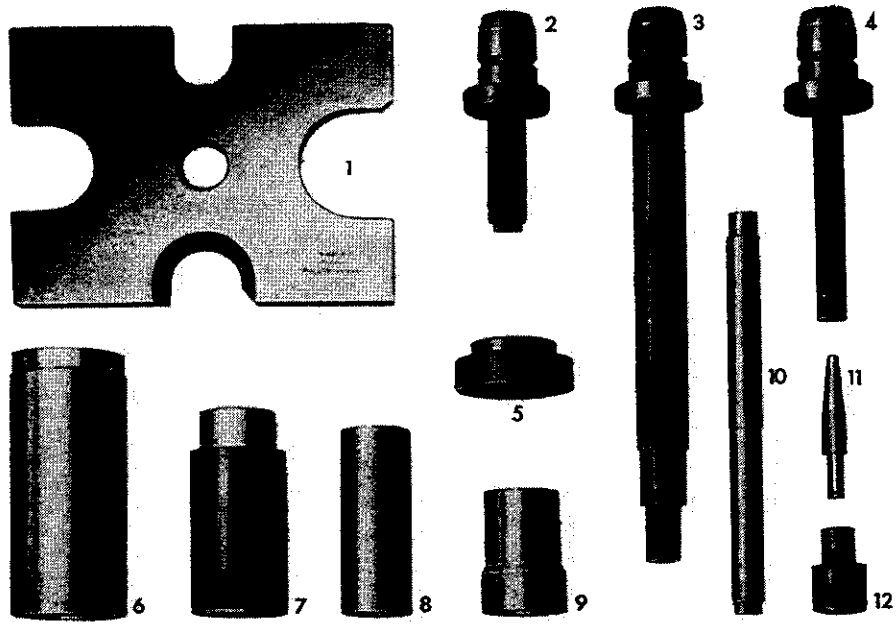


7 - Attach accelerator cable to connecting lever.

8 - Install accelerator pedal.

9 - Adjust clutch play (see M 8.3/4).

Removing and installing pedal cluster Types 1 and 3 **1-1**



No.	Description	Tool	Remarks
1	Thrust plate	VW 401	
2	Punch	VW 409	
3	Punch	VW 408 a	
4	Punch	VW 411	
5	Thrust pad	VW 433	
6	Tube	VW 415 a	
7	Arbor	VW 432	
8	Tube	VW 416 b	
9	Tube	VW 454	
10	Guide pin, shouldered	VW 439	
11	Guide pin, conical	VW 437 a	
12	Thrust pad	VW 431	

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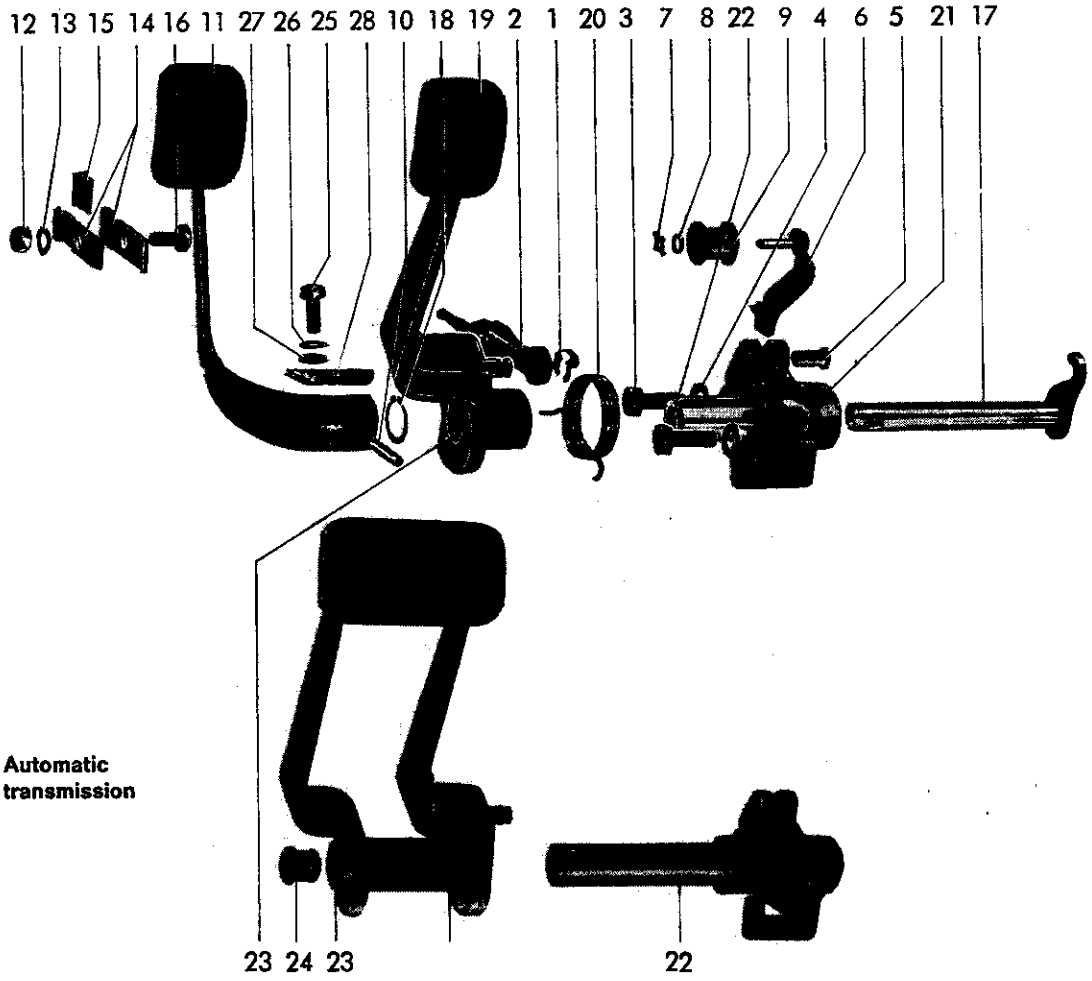
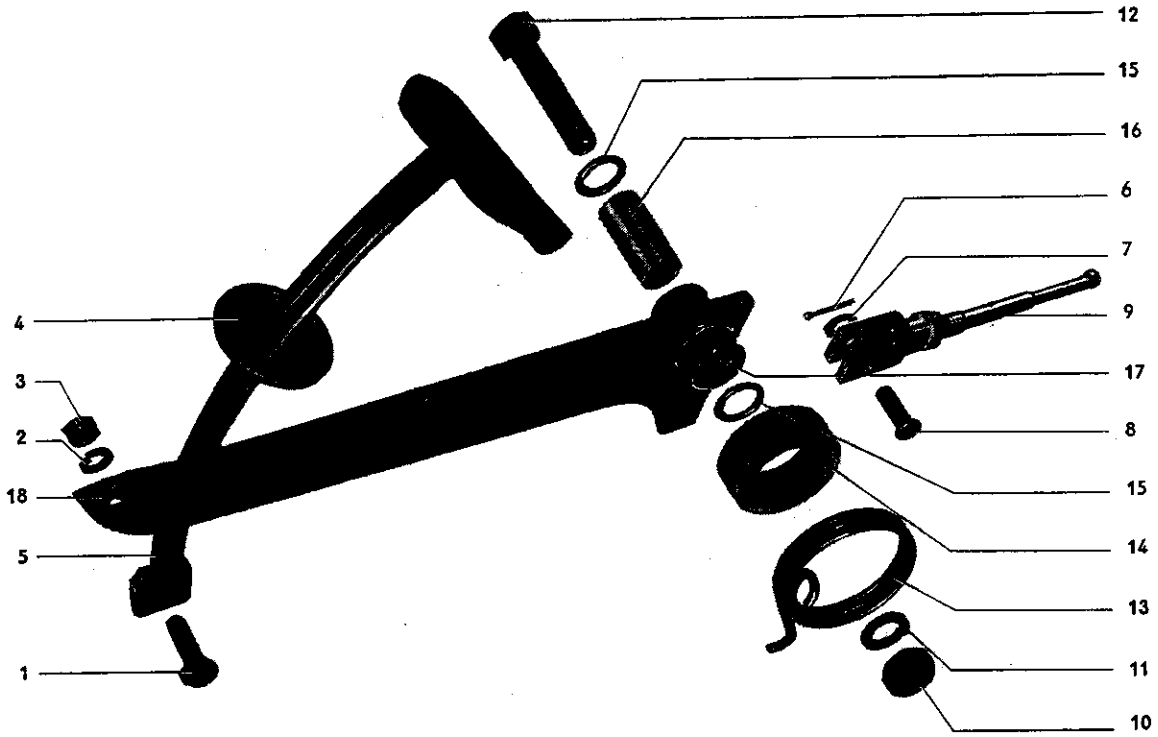
Manual transmission



Automatic transmission

No.	Description	Qty.	Note when removing	Note when installing	Special-instruc-tions see:
1	Clip	1	detach return spring at same time		
2	Push rod	1		adjust	B 2.6/1
3	Bolt	2			
4	Spring washer	2			
5	Pin	1		lubricate	
6	Accelerator pedal lever	1			
7	Lock plate	1			
8	Washer	1			
9	Roller	1			
10	Spring pin	1			
11	Clutch pedal	1	with VW 401, VW 411 and VW 437 a	with VW 401 and VW 411	B 2.7/3
12	Nut	1			
13	Spring washer	1			
14	Clamp	2			
15	Rubber stop	1			
16	Bolt	1			
17	Clutch pedal shaft	1		install with grease	
18	Circlip	1			
19	Brake pedal	1		check bushings for wear	
20	Return spring	1			
21	Mounting and brake pedal shaft	1		check bushings for wear install with grease	
22	Bushing	2		with VW 401, VW 409, VW 431 and VW 432	B 2.7/3
23	Bushing	2		with VW 401, VW 409 and VW 416 b	B 2.7/3
24	Plug	1			
25	Bolt	1			
26	Spring washer	1			
27	Washer	1			
28	Stop plate	1			

B 2.7 Pedal Cluster



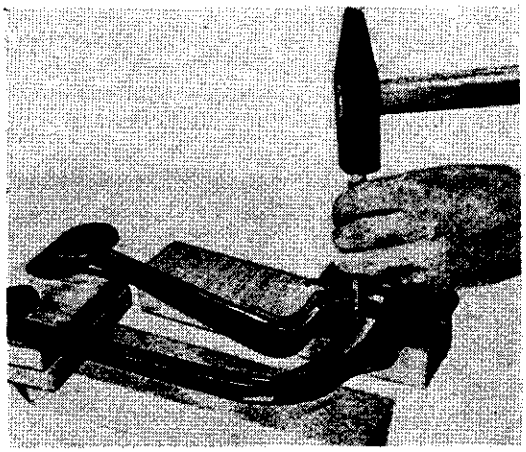
No.	Description	Qty.	Note when disassembling	Note when assembling	Special-instruc-tions see:
1	Bolt	1			
2	Lock washer	1			
3	Nut	1			
4	Seal	1			
5	Brake pedal	1			
6	Cotter pin	1		replace	
7	Washer	1			
8	Pin	1		lubricate sparingly	
9	Push rod	1		check play	B 2.6/1
10	Nut	1		tighten to 2.5–3 mkg (18–22 lb. ft.)	
11	Lock washer	1			
12	Bolt	1			
13	Return spring	1			
14	Plastic ring	1			
15	Seal	2			
16	Mounting tube	1		lubricate sparingly	
17	Bushing	1		check for wear press old bushing out with new bushing and VW 401, VW 409, VW 415 a and VW 433	B 2.7/3
18	Brake pedal lever	1		check bushing	

2-4 **Disassembling and assembling pedal cluster Type 2**

Disassembling

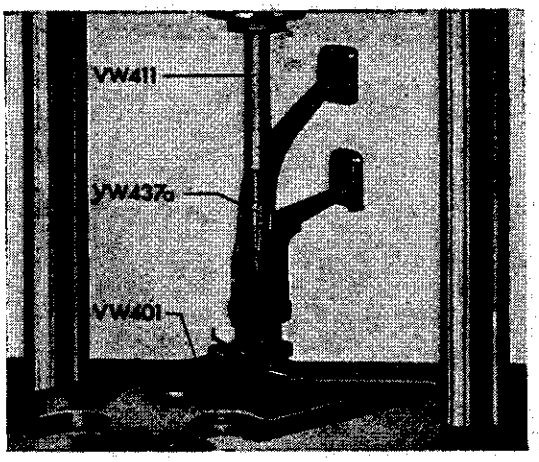
1 - Press pin for accelerator cable connecting lever out of pedal cluster mounting and remove accelerator cable connecting lever.

2 - Drive spring pin out of clutch pedal and clutch pedal shaft.



3 - Press clutch pedal shaft out of clutch pedal on repair press, using VW 411, VW 437a and VW 401.

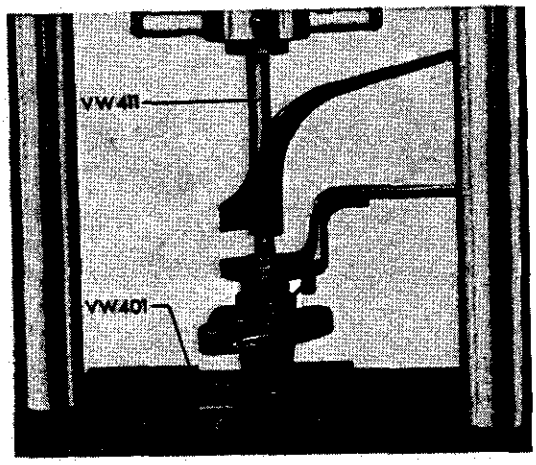
4 - Pull clutch pedal shaft out of pedal cluster mounting.



5 - Using circlip pliers, remove circlip from mounting tube.

6 - Remove brake pedal and return spring from mounting tube by turning them by hand.

7 - Check bushing for wear and, if necessary, replace (see page B 2.7/3).



Assembling

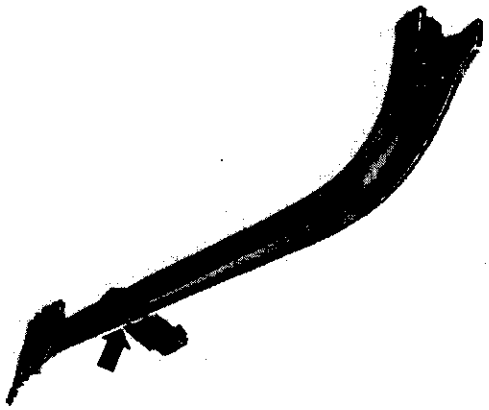
1 - Push brake pedal onto mounting tube, ensuring that brake pedal return spring is correctly positioned.

2 - Do not forget brake pedal circlip.

3 - Press clutch pedal onto clutch pedal shaft on repair press, using VW 411 and VW 401.

4 - Use new spring pin for clutch pedal.

5 - Install accelerator cable connecting lever correctly.



Note

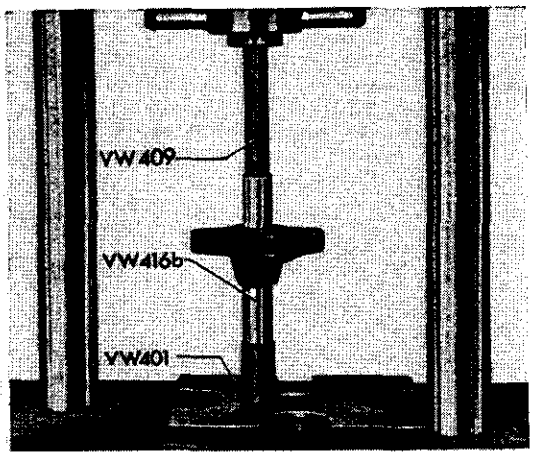
From August 1970, Types 1 and 3 vehicles are equipped with clutch pedals which only differ in the welded-on pedal travel stop (Type 1).

As a spare part only the Type 1 pedal with stop is supplied for both vehicles. When installing the pedal to a Type 3 vehicle, cut the stop off as shown (arrow).

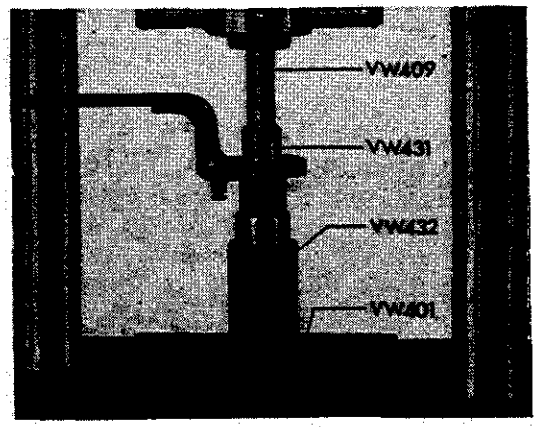
The rest of the stop should be deburred and painted black.

Types 1 and 3

1 - If necessary, drive clutch pedal shaft bushings out of mounting tube. Press new bushings in with tools VW 401, VW 416 b and VW 409.

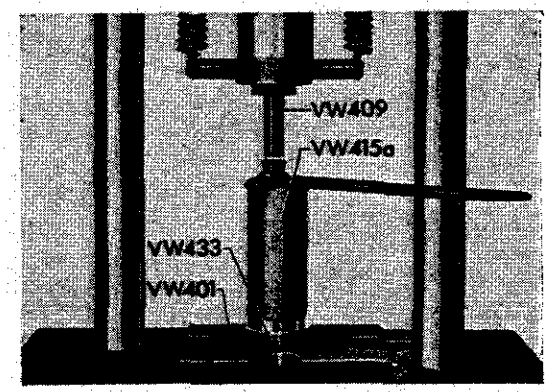


2 - If necessary, drive bushings out of brake pedal. Press new bushings in with tools VW 409, VW 431, VW 432 and VW 401.



Type 2

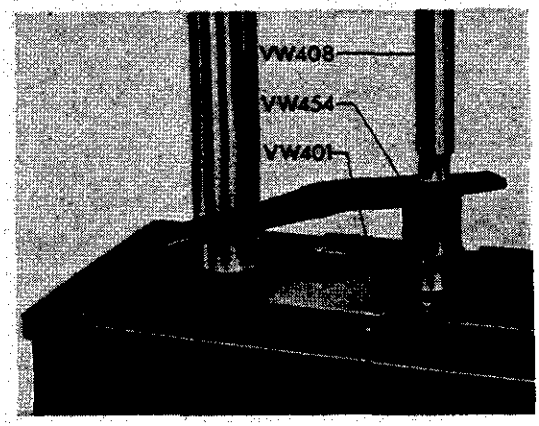
Press old metal bushing out with new bushing using tools VW 401, VW 409, VW 415 a and VW 433.



Type 4

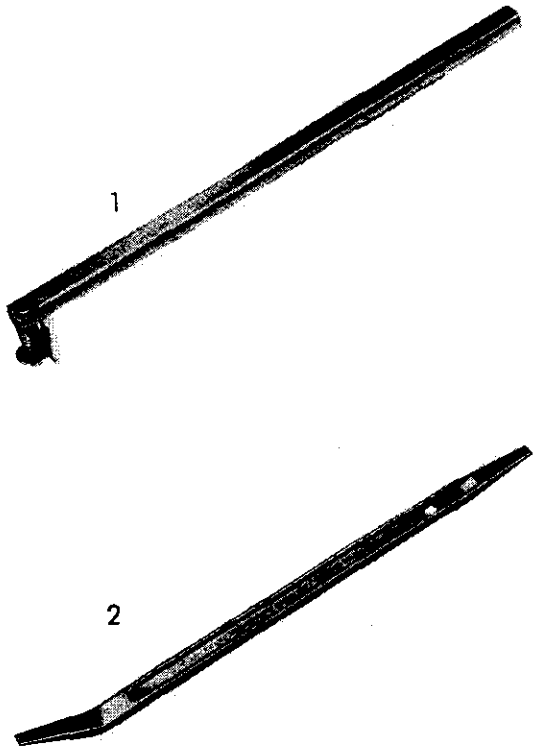
Press old metal bushing out with new bushing and tools VW 408 a, VW 454 and VW 401.

When doing this, the longer end of the pedal tube into which the bushing is pressed must face downward. The bushing must be flush at the shorter end of the pedal tube.



Pressing bushings out and in pedal cluster Types 1, 2, 3 and 4 **3-3**

Tools



No.	Description	Tool	Remarks
1	Appliance for checking brake lining wear	VW 753	
2	Brake shoe adjuster		

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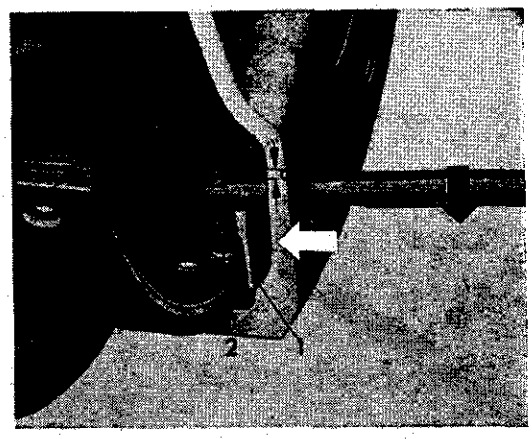
Checking brake linings



The thickness of the brake linings can be checked with the brake drums installed. For this purpose there are inspection holes in the backing plates that are closed with plugs.

The brake backing plates of Type 2 vehicles to chassis no. 218 109 823 have no inspection holes. The thickness of the brake linings can be checked with tool VW 753 through the adjusting hole in the brake drum. Before checking, the brake shoes must be adjusted as prescribed.

Press tool outwards (black arrow) so that the fixed pin (1) is located on the friction surface of the brake drum. The pin (1) must also be pressed against the brake shoe (white arrow) so that the turning radius of the drum is not included in the measurement in error. The measurement "a", by which the moving pin (2) is lifted, is equal to the existing lining thickness left to wear.

Example: If measurement "a" = 1 mm it means that the linings can be worn down a further 1 mm before they reach the wear limit of 2.5 mm.

The linings are completely worn out if the pin (2) does not lift at all.

Adjusting brakes

With an adjusting lever or using a screwdriver as a lever, turn the adjusting nuts until a slight drag is noticed when the wheel is turned by hand. Back off adjusting nuts 3 to 4 teeth to allow the wheel to turn freely.

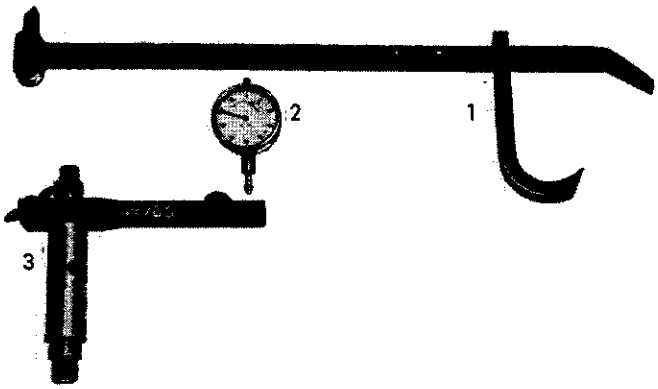
The adjusting nuts on Type 1 vehicles are accessible from the backing plate. The holes are closed with plugs.

Repeat the procedure on the other adjusting nuts. Note that the two nuts turn in opposite directions.

Note:

On the front wheels of Type 2 vehicles, the adjusting nuts are opposite each other.

Tools



No.	Description	Special tool	Remarks
1	Hub cap puller	VW 637/2	
2	Dial gauge		Local purchase item
3	Dial gauge bracket	VW 769	

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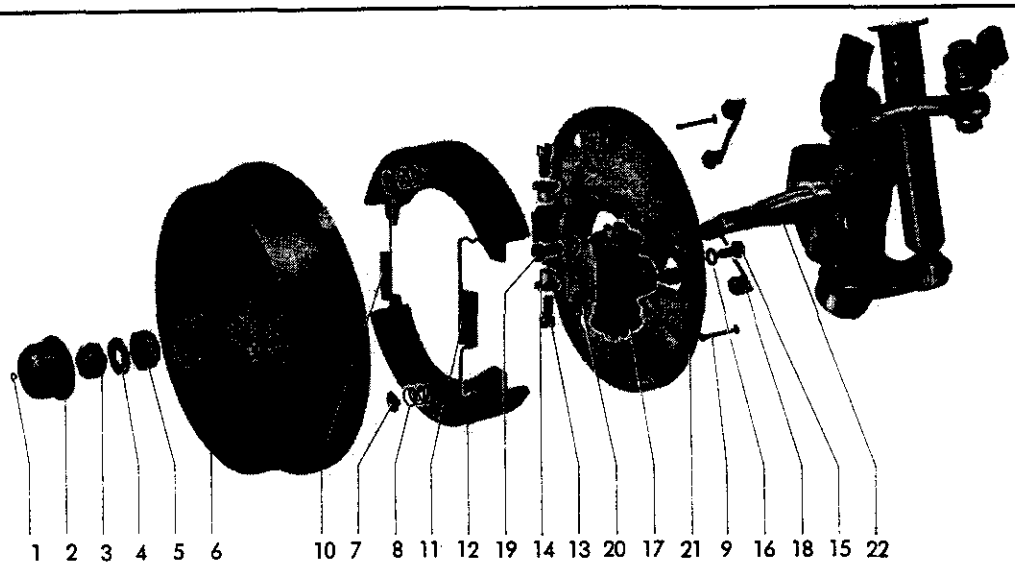


No.	Description	Quantity	Note when disassembling	Note when assembling	Special instructions see
1	C-washer	1			
2	Hub cap	1	pull off with VW 637/2		
3	Clamp nut	1		torque to 1–max. 1.3 mkg (7–max. 9 lb. ft.)	B 3.1/2
4	Thrust washer	1			
5	Wheel bearing	1		adjust play (0.03–0.12 mm / .001–.005 in.)	B 3.1/2
6	Brake drum Sedan, Convertible Coupé 4 hole	1	check for wear; if necessary, turn down or replace		B 3.1/2
7	Spring plate	2			
8	Spring	2			
9	Retaining pin	2			
10	Return spring	1			
11	Return spring	1			
12	Brake shoe	2	check brake lining thickness; if necessary, replace		B 3.1/2
13	Adjusting screw	2		lubricate lightly	
14	Adjusting nut	2		lubricate lightly	
15	Bolt	1		torque to 2.5 mkg (18 lb. ft.)	
16	Lock washer	1			
17	Wheel brake cylinder	1	check dust seals and cups for wear		B 3.1/3
18	Sealing bridge	2			
19	Bolt	3		torque to 5 mkg (36 lb. ft.)	
20	Lock washer	3			
21	Back plate	1			
22	Steering knuckle	1			

Removing and installing brake drums

Removing

1 - Remove C-washer for speedo cable (left only) and pull hub cap off with VW 637/2.

2 - Remove clamp nut and take drum off.

Installing

When installing, it is important that the wheel bearing is correctly adjusted.

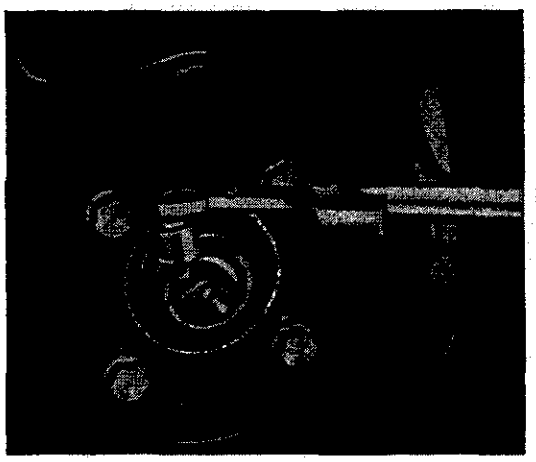
1 - Install brake drum, bearing and clamp nut. Install wheel. When tightening clamp nut, rotate wheel.

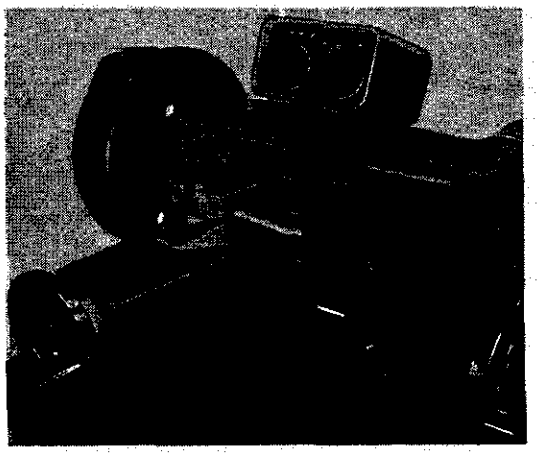
2 - Position dial indicator and adjust bearing play.

Nominal play: 0.03–0.12 mm (.001–.005 in.).

Note:
The play should be measured at several locations on the circumference.

3 - Tighten socket head screw to prescribed torque.





Reconditioning brake drums

Brake drums that are worn, scored or out-of-round can often be made serviceable by turning. The turning dimensions as well as all other tolerances are given in the technical data on page B 1.8/1.

Caution
Oversize linings must be used on brake shoes for reconditioned drums as these are matched with the radius of the turned drums.

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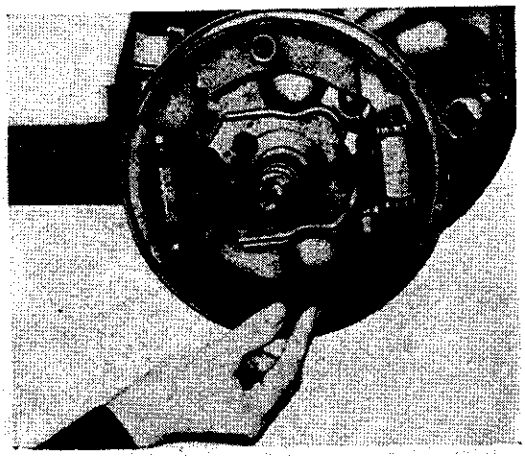
Removing and installing brake shoes



Type 1

Removing

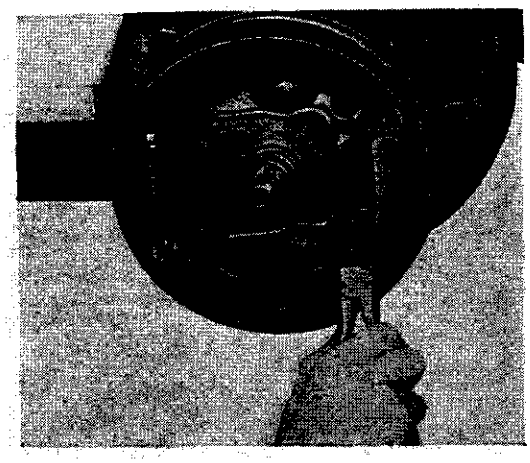
1 - Remove brake drum.

Note

Before removing brake shoes, the wheel brake cylinder should be checked for proper operation.

To do this, a mechanic depresses the brake pedal carefully while a second mechanic watches to see that the pistons press the brake shoes apart evenly. To prevent the shoes from opening too far, insert two screwdrivers between the backplate flange and brake shoes. If necessary, repair wheel brake cylinder. At the same time, check bleeder valve for freeness.

2 - Remove spring plates, springs and retaining pins for brake shoes.



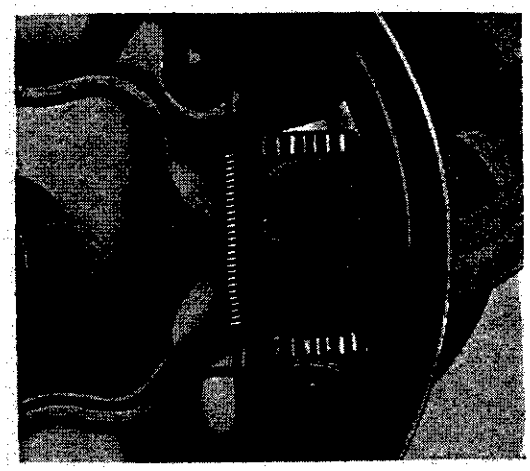
3 - Detach return springs and take brake shoes off.

4 - Check that adjusting screws and nuts are free. Free up if necessary.

Installing

Note:

When replacing brake shoes, make sure that the same type of lining is used for both wheels of one axle.



1 - Install brake shoes correctly. The stronger return spring and the cut-out for the push rod in the brake shoe web should be near the wheel cylinder.

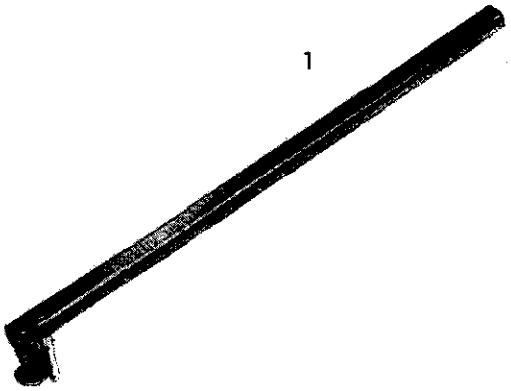
Caution

Make sure that the slots in the adjusting screws are properly seated **on the angled shoe ends.**

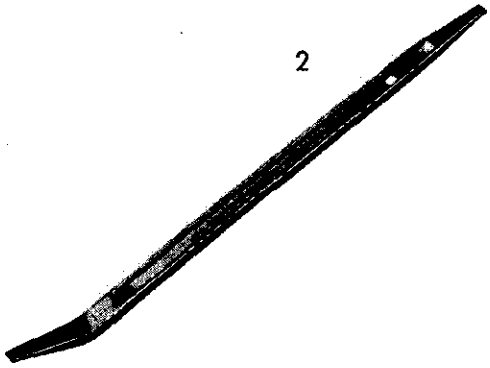
2 - Install brake drum and adjust bearings (see B 3.1/2).

Tools

1



2



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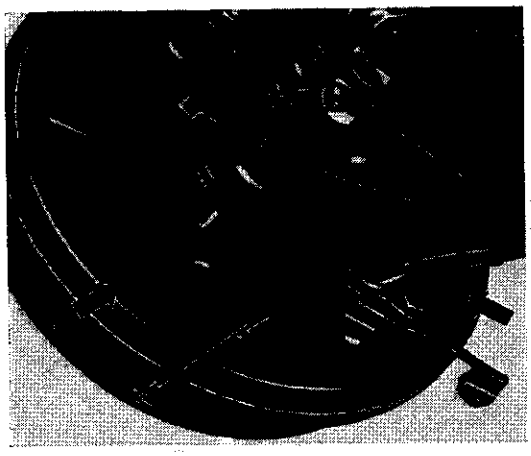
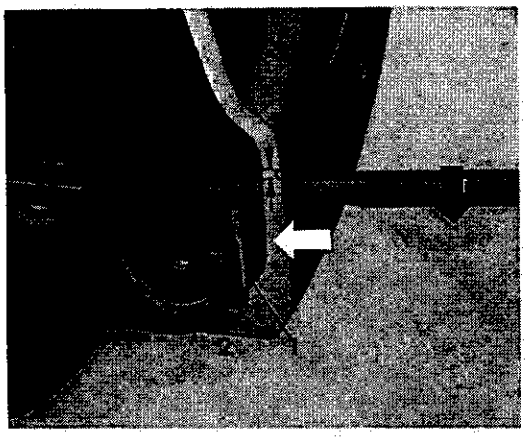
Checking brake linings

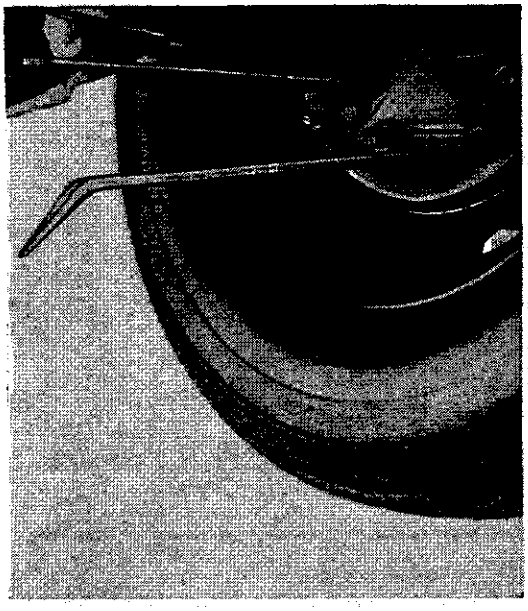


The thickness of the brake linings can be checked with the brake drums installed. For this purpose there are inspection holes in the backing plates that are closed with plugs.



The brake backing plates of Type 2 vehicles to Chassis No. 218 109 823 have no inspection holes. The thickness of the brake linings can be checked with tool VW 753. This tool is inserted into the adjusting hole in the brake drum. Before checking, the brake shoes must be adjusted as prescribed. (The use of tool VW 753 is shown on page 3.1/1–2.)

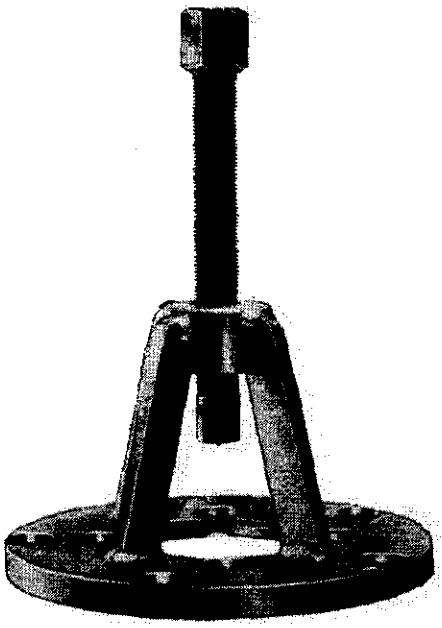
Adjusting brakes



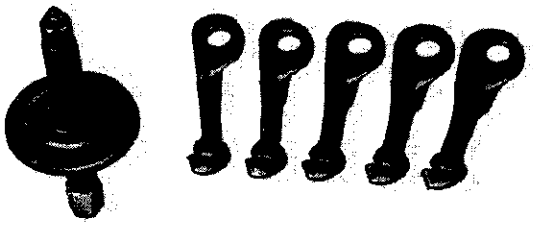
Before adjusting the brake shoes, back off the hand brake completely.

With an adjusting lever, or using a screwdriver as a lever, turn the adjusting nuts until a slight drag is noticed when the wheel is turned by hand. Back off adjusting nuts 3 to 4 teeth to allow the wheel to turn freely.

Repeat the procedure on the other adjusting nuts. Note that the two nuts turn in opposite directions.

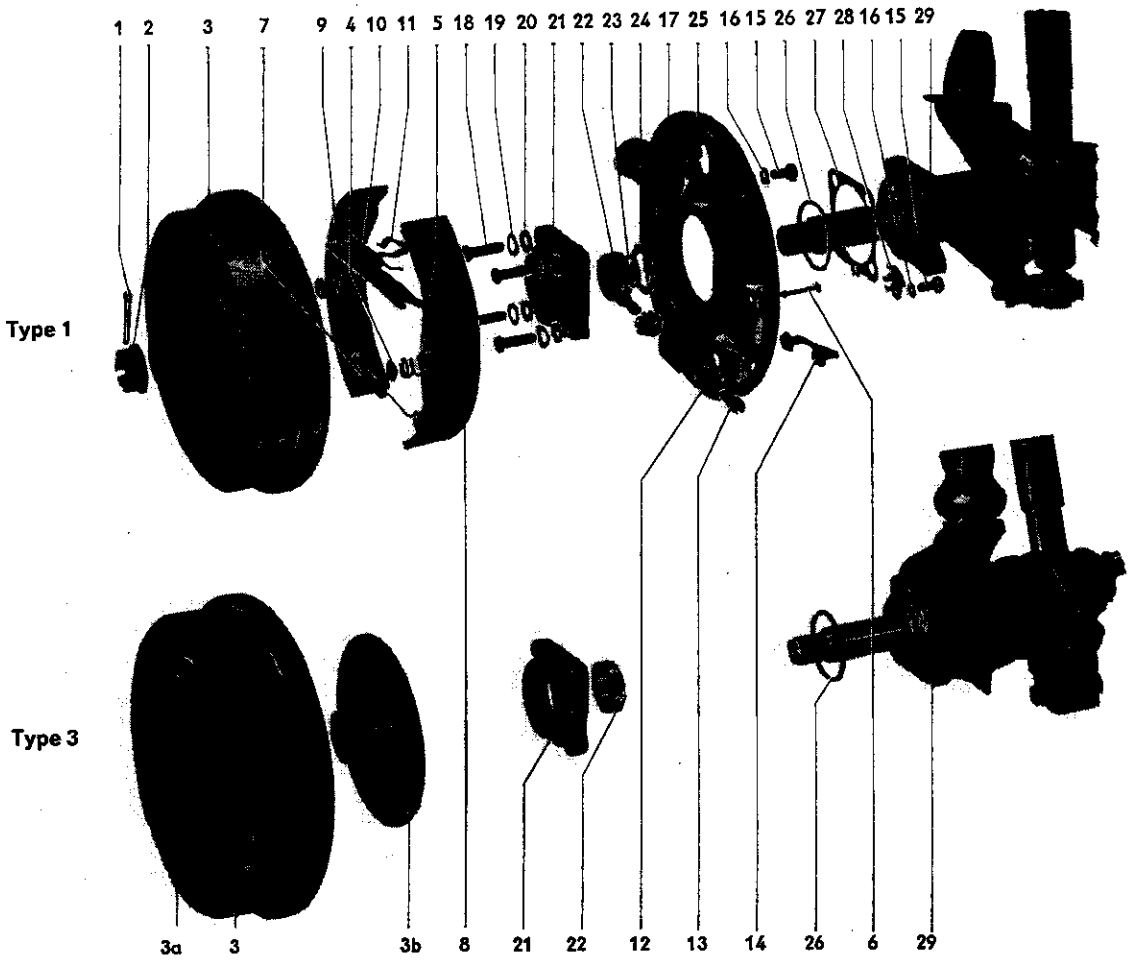


1



2

No.	Description	Special tool	Remarks
1	Brake drum puller	VW 202 BZ	
2	Brake drum puller		local purchase item



No.	Description	Quantity	Note when disassembling	Note when assembling	Special instructions see
1	Cotter pin	1		use new cotter pin	
2	Slotted nut	1		torque to 35 mkg (253 lb ft) [1]	
3	Brake drum Model 181: five bolt brake drum	1	if necessary use puller; back off brake shoes	check for wear	B 4.1/2
3a	Bolt	2			
3b	Rear wheel hub	1			
4	Spring cup	2			
5	Spring	2			
6	Retaining pin	2			
7	Return spring	2			
8	Brake shoe (one with brake lever)	2		check brake linings; if necessary, replace	B 4.1/2
				use only brake linings of the same type on one axle; install lever correctly	B 4.1/2

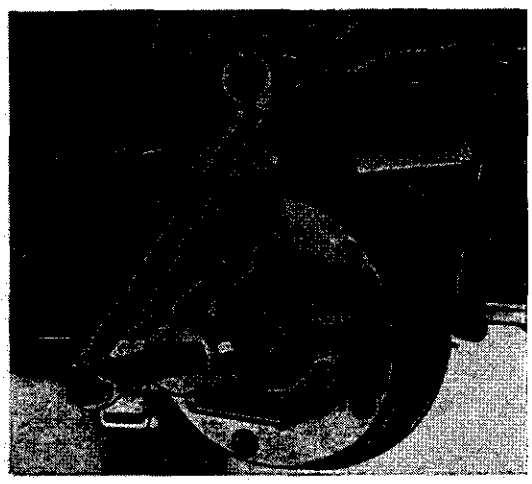
Removing

Warning

It is dangerous to remove and install slotted nut with the vehicle on a hoist. Lower vehicle to perform this work.

Before removing brake drums, back off brake shoe adjustment.

On older Type 1 and 3 vehicles the brake drum, or on later Type 3 vehicles the wheel hub, is sometimes corroded on the splines of the axle shaft. In such cases it can be removed with a puller.



Note

On Type 2 vehicles from August 1970, Chassis No. 211 2 000 001, the rear wheel hub complete with brake drum is pulled off the axle shaft splines with a five-arm puller.

Installing

1 - Before installing brake drum, lubricate splines lightly.

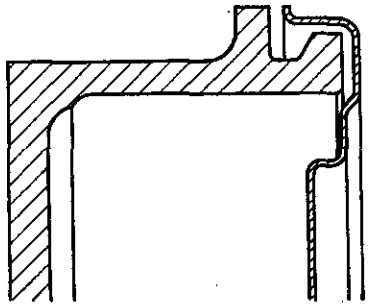
2 - Tighten slotted nut to correct torque. If necessary, turn farther to align cotter pin with hole.

3 - Insert cotter pin.

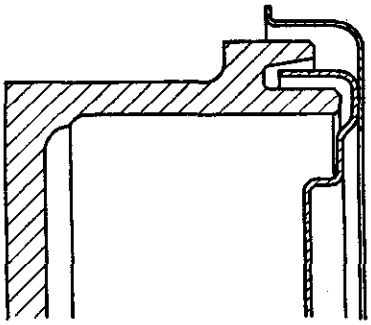
Note

All Type 2 vehicles from Chassis No. 218 109 824 have brake drums and backing plates installed on the rear axle with a double labyrinth type of sealing.

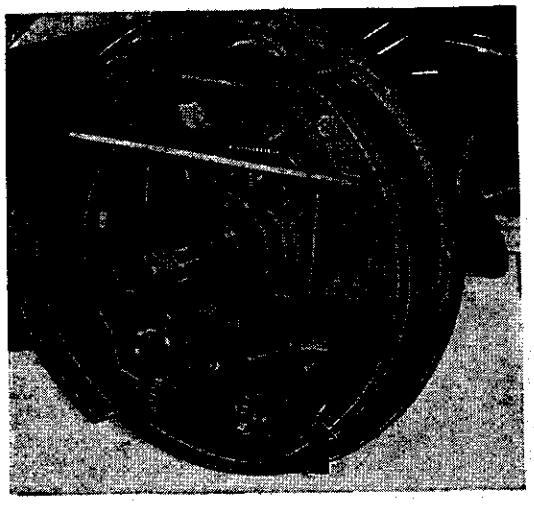
When these parts are being service installed the brake drums and backing plates of both sides must be exchanged together.

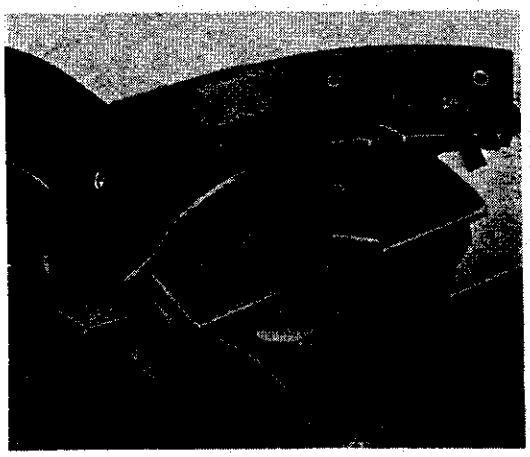


up to Chassis No. 218 109 823



from Chassis No. 218 109 824





1 - Pin
2 - Spring washer
3 - Lever
4 - Shoe
5 - Clip

Removing

1 - Remove both shoe retaining springs.

2 - Disconnect lower return springs.

3 - Disconnect parking brake cable from lever (arrow).

4 - Remove brake shoes, connecting link, upper return spring and clip.

5 - Detach brake lever from shoe (arrow).

Installing

When installing new brake shoes, make sure that the same type of linings is used for both wheels on one axle.

Caution

On vehicles equipped with a brake servo, only TEXTAR brake linings are to be used on the front axle. Both TEXTAR and ENERGIT linings can be installed on the rear axle.

1 - Install brake lever correctly.

2 - Lubricate adjusting nuts and screws lightly and back them off.

3 - Install brake shoes, connecting link and upper return spring as well as clip.

Caution

Make sure that the brake shoes are correctly positioned in the adjusting screws.

Angled brake shoe ends, Type 1 and 3

Straight brake shoe ends, Type 2

Angled brake shoe ends, Type 2 from Chassis No. 211 2 000 001

4 - Install lower return springs and retaining springs.

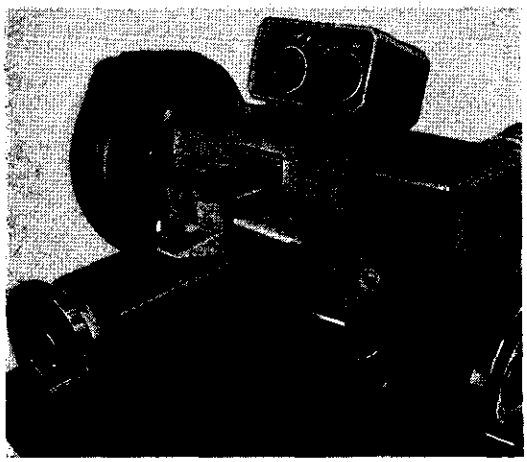
5 - Attach parking brake cable.

6 - Install brake drum

Turning brake drums

Brake drums that are out-of-round or worn or scored can often be made serviceable by machine turning or grinding.

The turning dimensions as well as all other tolerances are given in the technical data on page B 8.1/1.



Note

Brake shoes for reconditioned drums must be installed with oversize linings. These linings are ground to match the turned drum.

For this purpose, the brake drums of Type 3 vehicles should be removed together with the rear wheel hub. Brake drums of Type 4 vehicles must be bolted to the rear wheel hub of a Type 3 vehicle for turning.

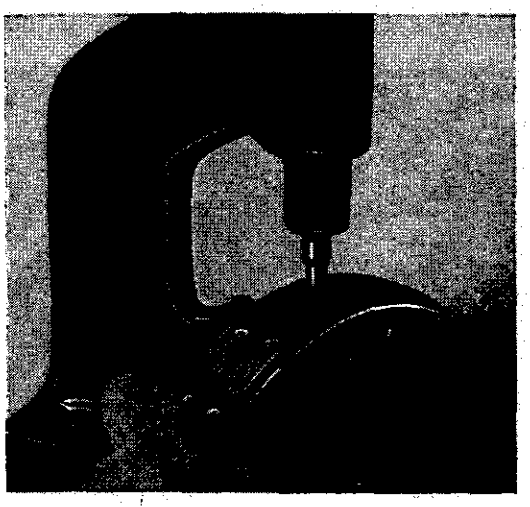
Relining brake shoes

When removing brake shoe linings from brake shoes, the linings on both rear wheels should be replaced at the same time to ensure uniform braking. Linings of the same type should also be used on both sides of each axle for the same reason. Oil soaked linings must be replaced.

1 - Carefully remove linings to avoid damage and distortion to shoes .

2 - Clean brake shoes and remove burrs from rivet holes.

3 - Rivet new linings from the center outward.



The linings must not overhang at the sides. They must also properly contact the shoe over the entire area, otherwise noises will occur as well as a loss in braking efficiency.

Press rivets in vertically to avoid tension in linings.

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Removing

1 - Remove brake drum, brake shoes and wheel brake cylinder. Then take brake shoe adjusting nuts out of support on backing plate.

2 - Remove brake cable bracket.

3 - Remove rear wheel bearing cover and take brake backing plate off.

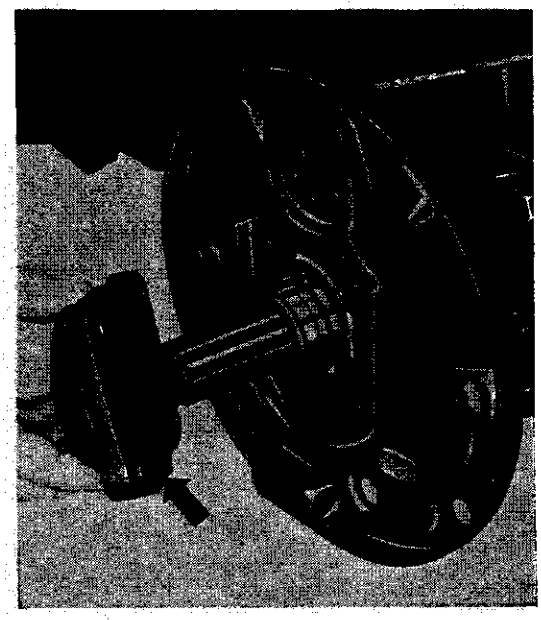
Installing

A - Vehicles with swing axle

1 - Clean dirt and traces of old sealing compound off contacting surfaces of backing plate, bearing flange and bearing cover.

2 - Position back plate, gasket and large seal on bearing flange. Then push washer and small seal onto axle shaft.

3 - Install spacer.



4 - Install bearing cover. Make sure that hole (arrow) faces downward.

5 - Tighten bearing cover bolts to correct torque.

6 - Install other parts and bleed brake system (see page B 8.1/1).

B - Vehicles with double joint rear axle

1 - Push spacer onto axle shaft.

2 - Install brake backing plate.

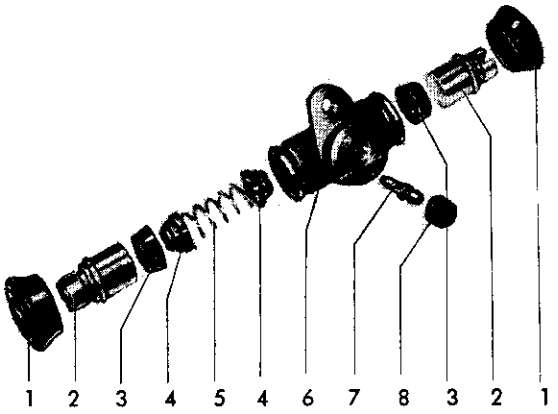
3 - Push seal against backing plate and install bearing cover.

4 - Tighten bearing cover bolts to torque.

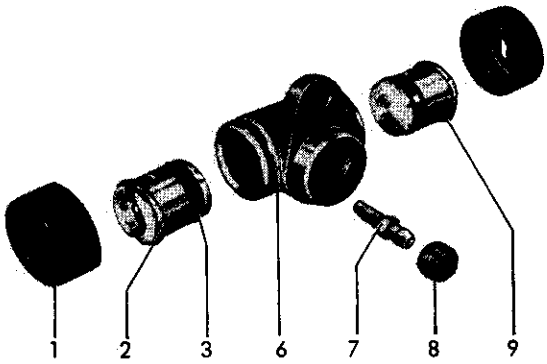
5 - Install other parts and bleed brake system (see page B 8.1/1).

Disassembling and assembling wheel brake cylinders

Types 1 and 3



Type 2



No.	Description	Quantity	Note when disassembling	Note when assembling	Special instructions see
1	Boot	2		install new	
2	Piston	2		apply VW brake cylinder paste	
3	Cup	2		install new; apply VW brake cylinder paste	
4	Cup expander	2			
5	Spring	1			
6	Housing	1			
7	Bleeder valve	1			
8	Dust cap	1			
9	Circlip	2			

When assembling note the following:

1 - Only alcohol or brake fluid may be used to clean all parts.

2 - Check parts for wear. The sliding surfaces of the pistons and cylinder must not be machined.

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Removing and installing brake hoses

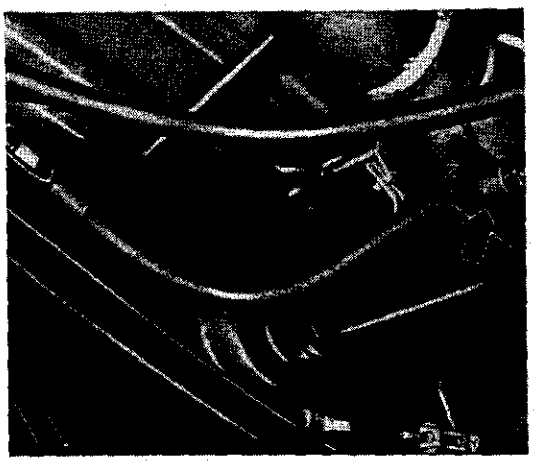
Removing

1 - Unscrew union nut and remove hose bracket.

2 - Take brake hose off.

Installing

Do not twist hoses when installing.



Note:

All Type 1 and Type 3 vehicles with double joint rear axles have shorter brake hoses.

When fitting new brake hoses ensure that only the correct type is used. Longer brake hoses (for vehicles with swing axle) can chafe on the vehicle body when the suspension bottoms on vehicles with double joint rear axle.

Removing and installing brake lines

As stocks were kept to a minimum, some brake lines can no longer be supplied as replacement parts in the original length. In such cases, use a brake line of the same or approximate length and, if necessary, bend it slightly to suit. When doing this, ensure that the line is not routed in tight bends and that it cannot chafe on the vehicle chassis or body when the suspension bottoms.

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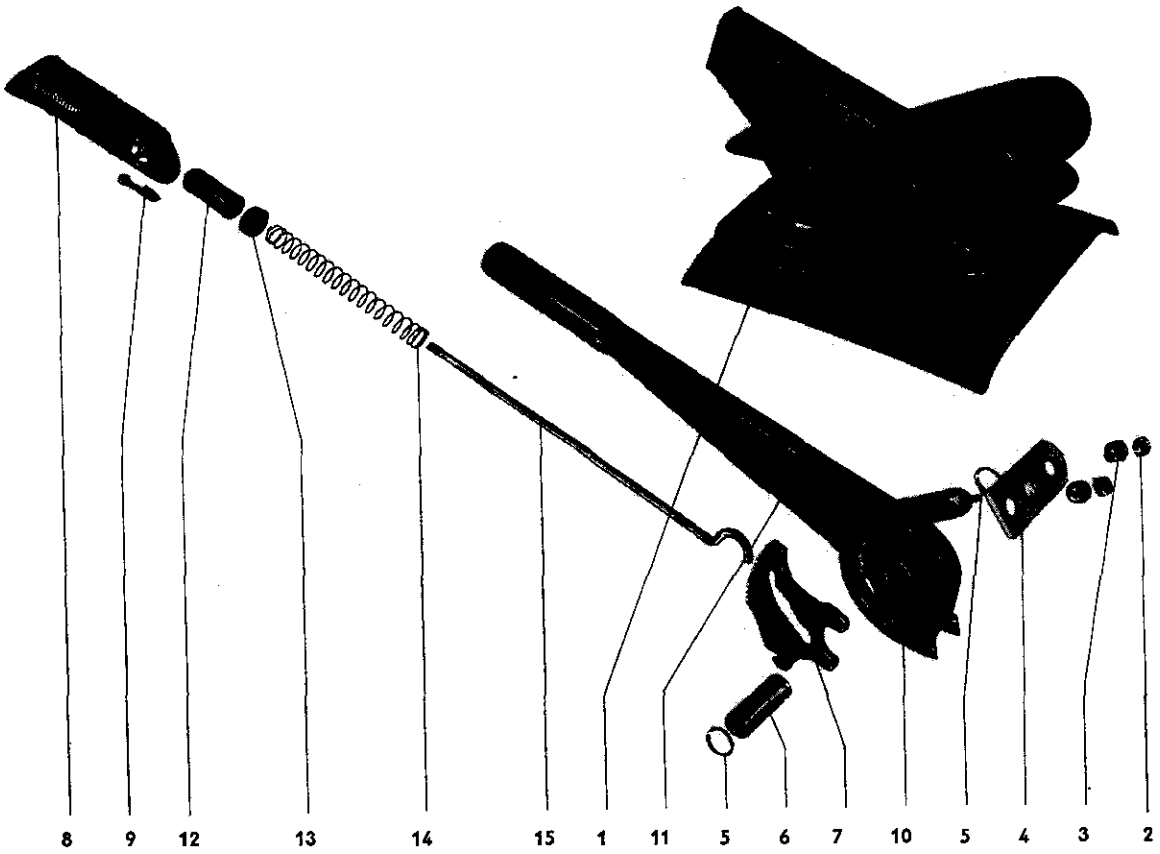
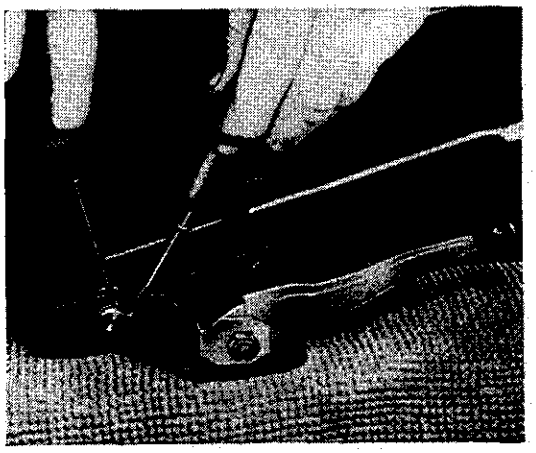


No.	Description	Qty.	Note when disassembling	Note when assembling	Special instructions see
1	Parking brake lever boot	1			
2	Nut M 6	2			
3	Brake cable adjusting nut M 6	2		prevent cable from turning with a screwdriver	
4	Compensator	1			
5	Circlip	2			
6	Pin	1		lubricate sparingly	
7	Ratchet	1			
8	Parking brake lever handle	1	press handle retainer in	install retainer in handle	
9	Handle retainer	1			
10	Parking brake lever	1		lubricate curved guides sparingly	
11	Pawl	1			
12	Release button	1			
13	Rubber washer	1			
14	Spring	1			
15	Pawl rod	1		connect to pawl	

Disassembling and assembling parking brake lever Types 1, 3 and 4 **1-1**

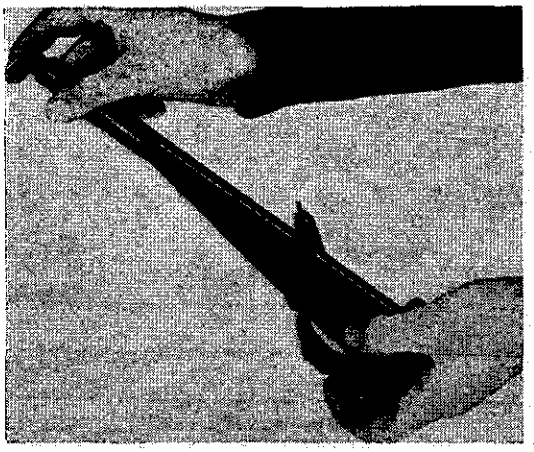


Removing

1 - Remove locknuts and adjusting nuts from cables.

2 - Remove circlip from lever pin and take pin out.

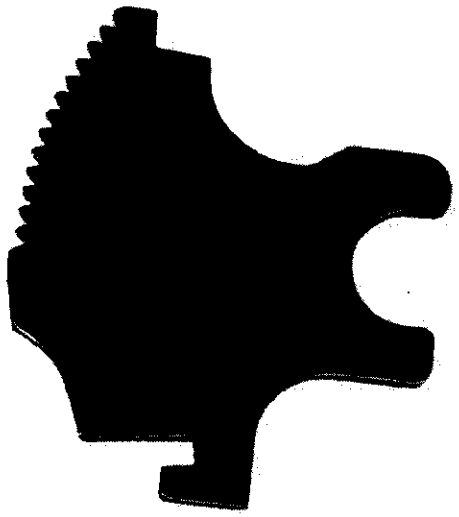
3 - Press lever toward rear until it can be lifted out with the ratchet segment. Do not press the release button when doing this.



4 - Press button and take ratchet segment out.

Installing

1 - Insert ratchet segment so that the recess fits over the tube in the lever and the teeth engage in the pawl. Ensure that the rounded end of pawl is positioned correctly.



From August 1972

The parking brake lever has a modified ratchet. The ratchet has 3 teeth less at the bottom and 2 more at the top. The back of the parking brake lever has a slot for the ratchet.

Note

The slot in the ratchet segment must engage the frame edge when the lever is inserted.

2 - Insert lever from above, guiding threaded ends of cables laterally.

3 - Lubricate lever pin with universal grease and install.

Do not forget circlips.

4 - Attach cables and adjust parking brake.

Note

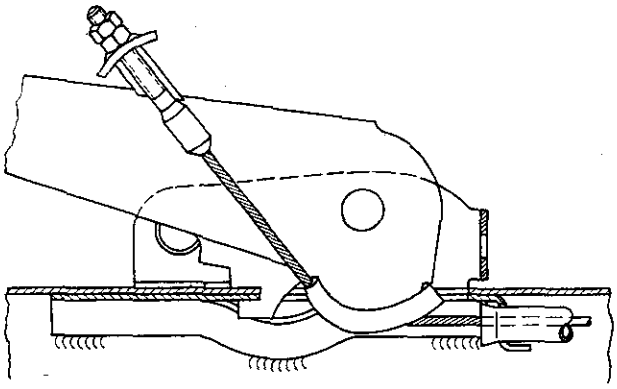
From April 1972.

Types 1, 3 and 4 vehicles are equipped with a parking brake lever with a different leverage. The reinforcement plate welded to the frame tunnel or floor plate for the parking brake mounting has also been modified. The reinforcement plate now has a lip (cable guide "A") which locates the cable properly in the guide tube.

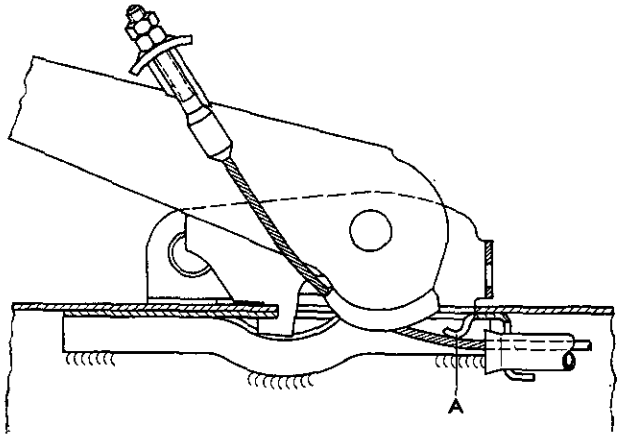
The two modifications were not introduced at the same time. On a number of Types 1, 3 and 4 vehicles, the new parking brake lever was installed in old type frames or floor plates. In a few cases the parking brake cable was too long and as a temporary solution 1–2 washers were installed between cable and guide tube.

Service installation

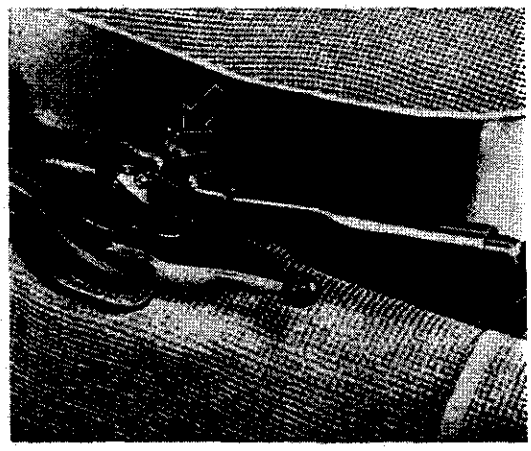
When stocks of the previous type parking brake lever have been used up, only the new type lever will be supplied. The previous type lever will not fit in new frames or floor plates. When replacing the frame on Type 1 and 3 or the floor plate on Type 4, check if a new reinforcement plate with cable guide is installed. On parts with the cable guide, a new parking brake lever should be used, otherwise the previous type levers can be used up.



previous version



new version (A = cable guide)



Removing

1 - Detach cable from parking brake lever and pull out of guide toward rear.

2 - Remove brake drum, detach cable at lever and remove brake cable bracket from brake backing plate.

Installing

1 - Position brake cable and bracket correctly and secure to brake backing plate. The curved guide must face upward at an angle, toward vehicle center.

2 - Attach brake cable to lever and install brake drum.

Caution

Lower vehicle onto wheels when tightening the slotted nuts.

3 - Route brake cable around curved guides on parking brake lever and screw adjusting screw onto cable. Apply screwdriver to slotted end of cable to prevent cable from turning.

4 - Adjust parking brake (see B 4.1/1).

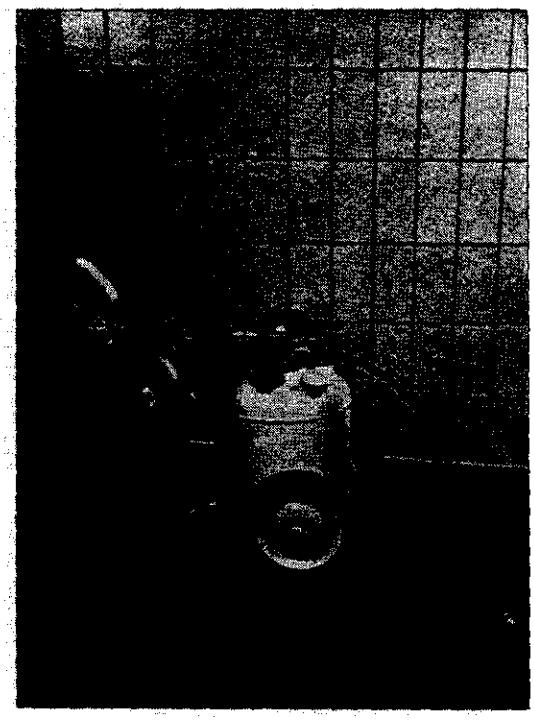
Warning

Always note the following when dealing with brake fluid:

1 - Brake fluid is poisonous. It is also damaging painted surfaces.

2 - Brake fluid must always be stored in air-tight containers.

3 - Used brake fluid must never be re-used.



1

2

No.	Description	Special tool	Remarks
1	Hydro brake tester		Local purchase item
2	Bleeder bottle		Local purchase item

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Bleeding the brake system

The brake system must be bled each time any repair requires opening of the system. When working on only one brake circuit, you only have to bleed the circuit (front or rear) that is being worked on.

Caution

Only use fresh and unused brake fluid. Do not re-use fluid pumped from the system.

Bleeding with pressure bleeder

If possible, brake bleeding should be done with a pneumatic device similar to the one shown on the left side of page B 8.1/1. A pressure of 3 kg/cm² (43 psi.) is pushed through a connector attached to the brake fluid reservoir. While the bleeder valve is open, depress brake pedal firmly and quickly several times. The brake pedal is released slowly each time. This makes sure that no air is left in the system.

Bleeding by "pumping"

If the brake system is bled by "pumping" with a bleeder bottle, (shown on the right side of page B 8.1/1) a second mechanic is needed to operate the brake pedal. This will build up the necessary pressure in the system.

When bleeding brakes note the following:

1 - If the complete brake system has to be bled, bleed and fill each wheel cylinder first. Start with the front brake circuit.

2 - The procedure should be repeated to make sure that there is no air in the system.

3 - Pressurize the system by "pumping" several times. With a hose and bleeder bottle installed, open valve on wheel cylinder. Close valve while pedal is depressed. Repeat this procedure until no more air comes out.

4 - When bleeding brakes make sure that the brake fluid reservoir is not emptied completely. If this happens air will be drawn into the system.

5 - After bleeding, fill reservoir to upper edge of circular welding seam.

Caution

Used brake fluid must never be re-used.

Note

On Type 2 vehicles, the bleeder valve on the brake pressure regulator must not be opened. This bleeder valve is used only during production, and requires a special bleeder and filler.

When bleeding Type 2 vehicles, it is possible that under certain conditions an air bubble can form in the line between the refill container and the brake fluid reservoir. In this instance and when the vehicle is level, the brake fluid flows into the reservoir at a very slow rate.

It is therefore very important to keep the refill container full when bleeding the brake system to prevent air from entering the brake fluid reservoir.

When replacing the brake fluid reservoir, first fill up the refill container and raise the vehicle at the front so that any trapped air can escape. After having done this, start bleeding the brake system.

If a pressure bleeder is used, this operation is not necessary.

When bleeding the hydraulically operated clutch system, Type 4 note the following:

Basically the same procedure applies for the bleeding of the clutch hydraulic system as applies for the brake system.

1 - With the vehicle raised, bleed from underneath. The bleeder valve is located on top of the slave cylinder and faces forward.

2 - As the pressure line has a diameter of 6 mm (0.236 in.), the bleeder valve must be opened wide, if no pneumatic appliance is used.

Changing brake fluid

Heat generated while braking is not only transferred to the brake drums or brake discs, but also to the wheel cylinders or calipers and thus to the brake fluid.

Brake fluid is hygroscopic, meaning that it has a tendency to absorb moisture from the atmosphere. Brake fluid used over an extended period of time may accumulate a high enough water content to reduce the boiling point of the brake fluid. This condition influences the viscosity of the fluid at low outside temperatures. It also may promote corrosion in the brake system.

It is therefore necessary to change the brake fluid in accordance with the special instructions issued by the factory.

1 - Drain as much brake fluid as possible from the reservoir with a siphon or plastic bottle. After this add fresh brake fluid. (A siphon or a plastic bottle should be used for brake fluid only.)

2 - Change fluid in cylinders and lines. To do this the pedal has to be depressed quite a number of times and the bleeder screws opened and closed each time.

Caution

A brake fluid change can be carried out with a pressure bleeder on all Volkswagens except Type 2 vehicles with disc brakes.

Make sure that the fluid level in the refill container never reaches the bottom during bleeding operation.

When replacing the brake fluid, the used brake fluid should be caught in a measuring glass. The quantity that must be pumped from the various bleeder screws is given after the number of pedal strokes to ensure that new brake fluid fills the entire system.

a - **Type 1 vehicles with single circuit brakes:**

Rear, right bleeder screw open –
12 pedal strokes = approx. 80 cc of fluid

Rear, left bleeder screw open –
8 pedal strokes = approx. 70 cc of fluid

Front, right bleeder screw open –
8 pedal strokes = approx. 70 cc of fluid

Front, left bleeder screw open –
8 pedal strokes = approx. 70 cc of fluid

b - **Types 1, 3 and 4 vehicles with dual circuit brakes:**

Front, right bleeder screw open –
30 pedal strokes = approx. 100 cc of fluid

Front, left bleeder screw open –
15 pedal strokes = approx. 50 cc of fluid

Rear, right bleeder screw open –
25 pedal strokes = approx. 80 cc of fluid

Rear, left bleeder screw open –
10 pedal strokes = approx. 30 cc of fluid

c - **Type 2 vehicles with single circuit brakes:**

Rear, right bleeder screw open –
20 pedal strokes = approx. 260 cc of fluid

Rear, left bleeder screw open –
10 pedal strokes = approx. 130 cc of fluid

Front, right bleeder screw open –
10 pedal strokes = approx. 130 cc of fluid

Front, left bleeder screw open –
10 pedal strokes = approx. 130 cc of fluid

d - **Type 2 vehicles with dual circuit brakes up to July 1967:**

Front, right bleeder screw open –
20 pedal strokes = approx. 160 cc of fluid

Front, left bleeder screw open –
20 pedal strokes = approx. 160 cc of fluid

Rear, right bleeder screw open –
40 pedal strokes = approx. 240 cc of fluid

Rear, left bleeder screw open –
15 pedal strokes = approx. 90 cc of fluid

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