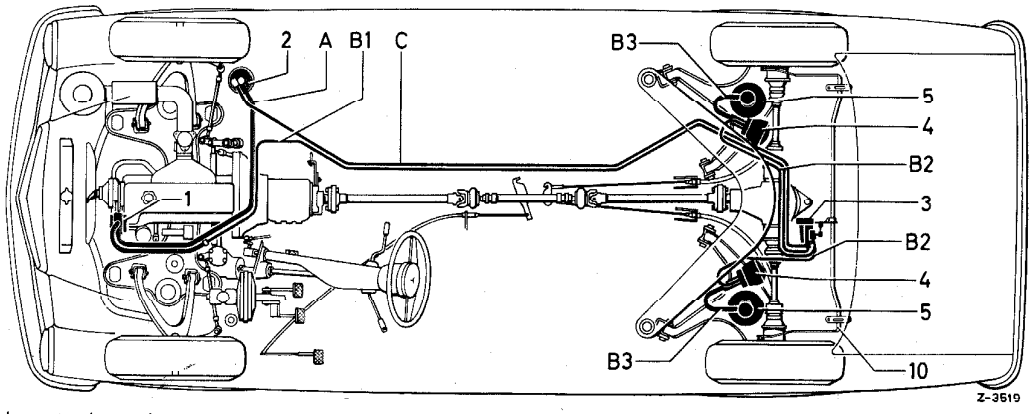
A. General function

Level control on rear axle is a hydropneumatic auxiliary suspension which engages automatically starting at a given deflection. On sedans, e.g., the level control will start approximately at a load of 2 persons on front seats and approx. 40 kg luggage in trunk. In each respective case, the control point for the loaded vehicle is the level which conforms to the design position of the respective vehicle model with the respective spring variant.

The level control system on rear axle operates hydropneumatically and comprises essentially the following three main components:

1. The suspension elements, comprising spring struts (5) and pressure reservoirs (4);
2. The pressure oil system, comprising pressure oil pump (1) and fluid reservoir (2);
3. The control unit, comprising level controller (3) with respective actuating linkage.



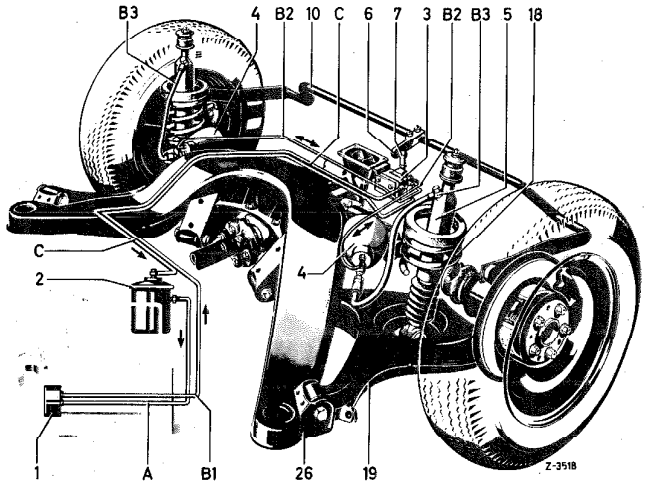
Layout sedans and coupes

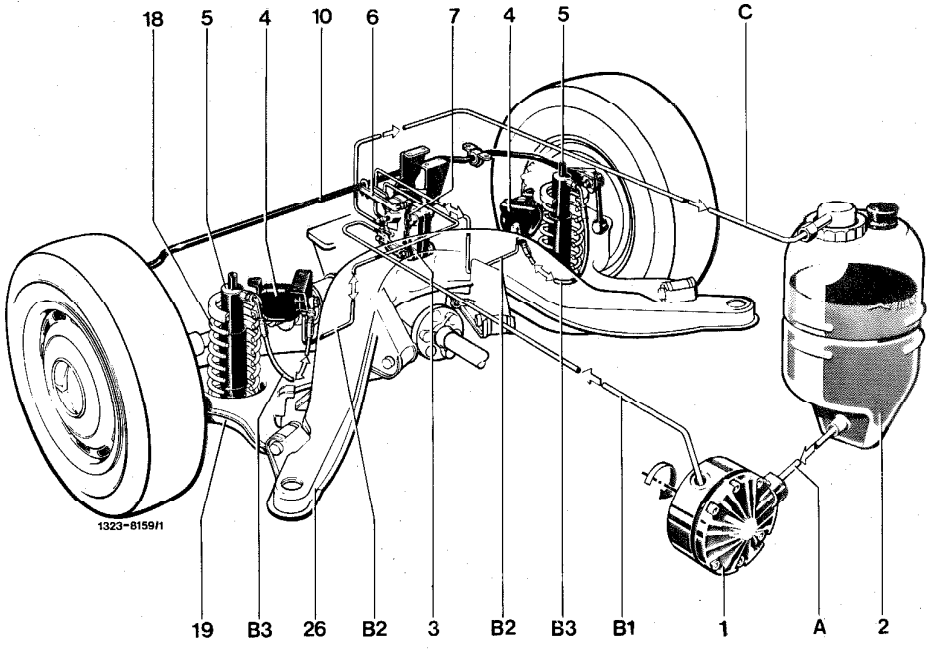
1 Pressure oil pump
2 Fluid reservoir
3 Level controller
4 Pressure reservoir
5 Spring strut
10 Torsion bar

A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller
B2 Pressure line level controller – pressure reservoir
B3 Pressure line pressure reservoir – spring strut
C Return line level controller – fluid reservoir

Layout sedans
and coupes

1 Pressure oil pump
2 Fluid reservoir
3 Level controller
4 Pressure reservoir
5 Spring strut
6 Lever on torsion bar
7 Connecting rod
10 Torsion bar
18 Rear spring
19 Semi-trailing arm
26 Rear axle carrier
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller
B2 Pressure line level controller – pressure reservoir
B3 Pressure line pressure reservoir – spring strut
C Return flow level controller – fluid reservoir





Layout T-sedans

1 Pressure oil pump
2 Fluid reservoir
3 Level controller
4 Pressure reservoir
5 Spring strut
6 Lever on torsion bar
7 Connecting rod
10 Torsion bar
18 Rear spring
19 Semi-trailing arm
26 Rear axle carrier
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller
B2 Pressure line level controller – pressure reservoir
B3 Pressure line pressure reservoir – spring strut
C Return line level controller – fluid reservoir

On vehicle with level control on rear axle, spring struts (5) are partially supporting members, that is, they are used for carrying rear end of vehicle in addition to rear springs. The spring struts are installed instead of rear shock absorbers and are connected to a gas-filled pressure reservoir (4) each. In addition to level control they are simultaneously serving as shock absorbers. (For closer details refer to section B. „Suspension elements").

With the engine running, the pressure oil pump (1) sucks hydraulic oil from fluid reservoir (2) via suction line (A), so that the oil will flow to level controller (3) via pressure oil line (B1).

The level controller is connected by means of a linkage to torsion bar (10) on rear axle. When set to positions „neutral" or „return flow" the delivered oil will flow back without pressure into fluid reservoir. This circuit of the hydraulic oil is interrupted when rear end of the vehicle drops below vehicle level, since the control disk of the level controller is now keeping the return flow duct to fluid reservoir closed, which in turn results in moving the level controller to position „filling". (For details refer to section D „Control equipment").

The oil delivered in this manner is now flowing into pressure unit (4) and spring struts (5) via check valve in level controller and pressure oil lines (B2) and (B3) while maintaining the required pressure. The resulting pressure increase will raise rear end of vehicle until the specified vehicle level has been attained. The level controller will simultaneously change to position „neutral" and once again establish the condition of pressureless circuit delivery described further above.

When the vehicle is unloaded or when its rear end is raised beyond level position, the level controller is set to „return flow". In such a case, in addition to the oil delivered by the pressure oil pump, the oil initially required for increasing the pressure and also for raising the lowered rear end of the vehicle will return to fluid reservoir from pressure reservoirs and spring struts.

As a result of the outflowing oil, the vehicle level will drop until the level controller is once again in „neutral" position.

Oil pressure in spring struts should not drop below a given basic pressure, so that the spring struts can fully meet their additional jobs of shock absorbers acting independent of positions of level controller. Making sure of that basic pressure is attained by means of a compression spring which pushes the return flow valve in level controller out of reach of control disk when the available pressure is below a given mark.

As a protection against overloading the system, the level controller is additionally provided with a pressure relief valve, which permits the oil delivered by the pressure oil pump to flow back into the fluid reservoir when the pressure in the pressure element is too high, even in „filling" position of level controller.

A distributor with bleed screw located in line system between level controller and suspension elements or a level controller with integrated bleed screw (2nd version starting March 1977) serves for draining the basic pressure resulting independent of the position of the level controller.

Note

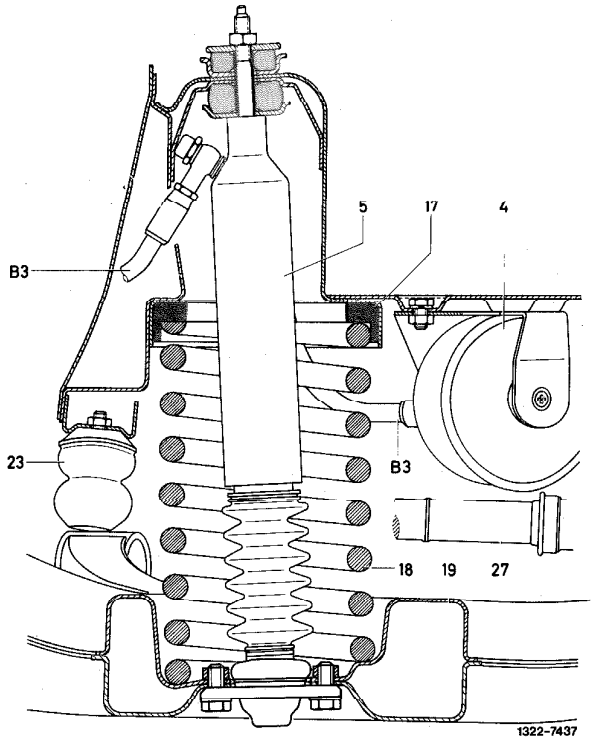
A prerequisite for correct operation of level control as well as for obtaining good riding comfort and optimal riding characteristics is a vehicle level set according to specifications both in condition ready-for-driving and under load.

In condition ready-for-driving the rear end of the vehicle is carried by the rear springs and the basic pressure in the suspension elements only. The basic pressure is maintained by drain valve in level controller independent of position of lever. If rear end of vehicle is too low in condition ready-for-driving, raising of rear end should never be attempted by adjusting connecting rod of level controller, since in such a case the vehicle level would be continuously regulated at too high a level under load. The result would be poor riding characteristics, oil flow and knocking noises during deflection, as well as an essentially too highly placed ball head when operating a trailer. In addition, under high load as well as during acceleration, the max. pressure in suspension elements limited by level controller, would be attained so that during such driving conditions the opening noise of the pressure relief valve would be constantly heard as a whistling and knocking noise. If the level is too low in ready-for-driving condition, corrections should therefore be made on rear springs. A prerequisite for evaluating the ready-for-driving level is, however, that the full pressure in suspension elements is available. Prior to measuring the semi-trailing arm position in ready-for-driving condition, the level controller should therefore be moved for a short moment in upward direction into „filling' position and then downwards in „emptying" position with the connecting rod disconnected and the engine running (for „checking vehicle level" refer to 40–300 and 40–310).

B. Suspension elements

The spring strut is mounted below on semi-trailing arm and at top on dome of frame floor. The spring strut is connected to the pressure reservoir (4) attached to frame floor by means of the pressure line (B3) on housing.

The pressure line (B2) in turn connects the pressure reservoir to level controller. Raising of lowered rear end of vehicle is attained by increasing the oil quantity in oil chamber (a) of spring strut, which results in increased extension of piston rod. The mechanical design of the spring strut is similar to that of a normal shock absorber.



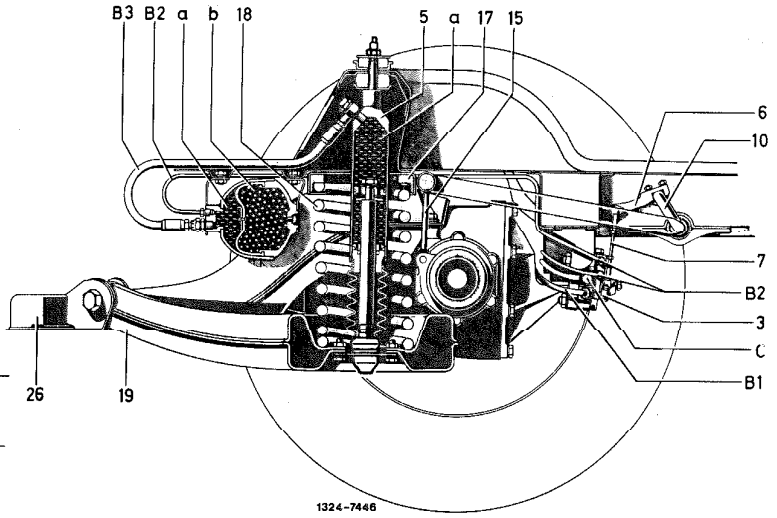
4 Pressure reservoir
5 Spring strut
17 Rubber mount
18 Rear spring
19 Semi-trailing arm
23 Supplementary rubber spring (rebound stop)
27 Rear axle shaft
B3 Pressure line pressure reservoir – spring strut

The pressure reservoir applied is of ball shape. Oil chamber (a) and gas chamber (b) of reservoir are separated by a diaphragm.

The gas chamber is filled with a specified pressure.

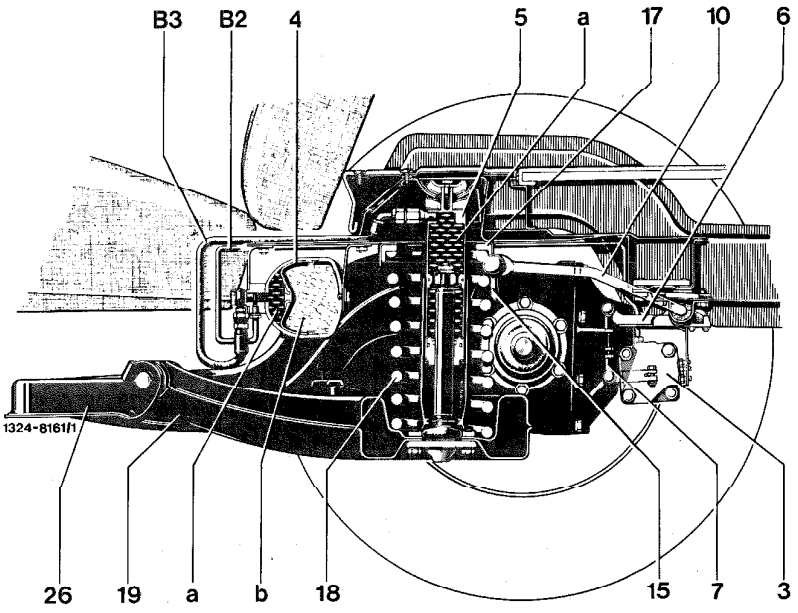
As a result of the oil pressure within the system, which is constantly changing in the driven vehicle, for example under the influence of deflections, the diaphragm will adapt itself continuously to the required chamber volume of the oil. The diaphragm will change its shape accordingly inside the ball-shaped housing of the pressure reservoir.

The pressure reservoir can meet these expectations only when the gas-filling pressure remains above a given value.



Layout sedans and coupes

3 Level controller
5 Spring strut
6 Lever on torsion bar
7 Connecting rod
10 Torsion bar
15 Torsion bar connecting rod
17 Rubber mount
18 Rear spring
19 Semi-trailing arm
26 Rear axle carrier
a Oil chamber
b Gas chamber
B1 Pressure line pressure oil pump – level controller
B2 Pressure line level controller – pressure reservoir
B3 Pressure line pressure reservoir – spring strut
C Return line level controller – fluid reservoir



Layout T-sedans

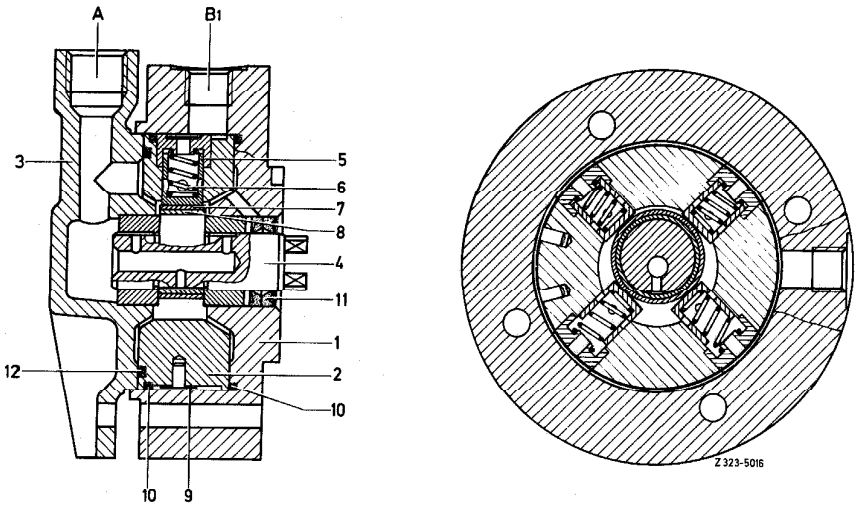
3 Level controller
4 Pressure reservoir
5 Spring strut
6 Lever on torsion bar
7 Connecting rod
10 Torsion bar
15 Torsion bar – connecting rod
17 Rubber mount
18 Rear spring
19 Semi-trailing arm
26 Rear axle carrier
a Oil chamber
b Gas chamber
B2 Pressure line level controller – pressure reservoir
B3 Pressure line pressure reservoir – spring strut

C. Pressure oil system

Pressure oil pump

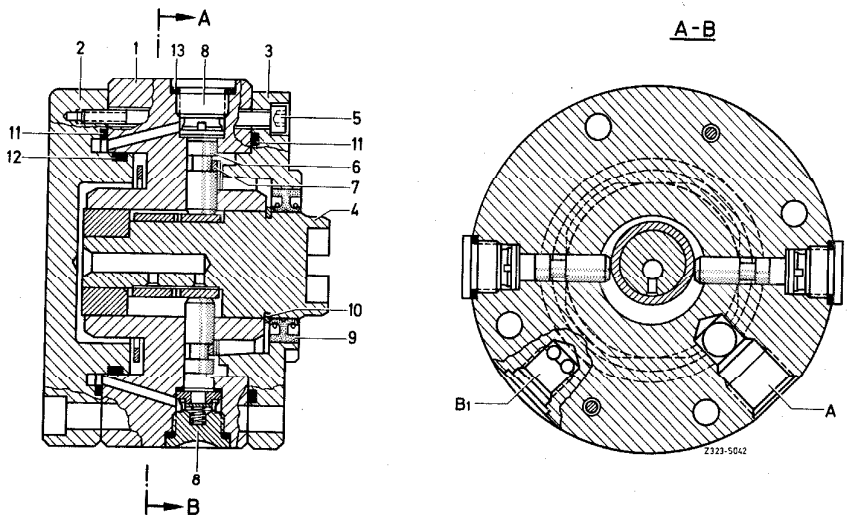
The pressure oil pump applied is a radial piston pump with four pistons arranged radially in relation to pump shaft.

The pressure oil pump is designed to raise the lowered rear end of vehicle relatively quickly after loading and to make sure that during the following pressureless circuit delivery (circulation) power requirements will be very low.



Pressure oil pump MB

1 Housing
2 Center piece
3 Bearing cover
4 Eccentric shaft
5 Piston
6 Compression spring
7 Outer race
8 Inner race
9 Reaction sealing strip
10 O-ring
11 Radial sealing rings
12 O-ring
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

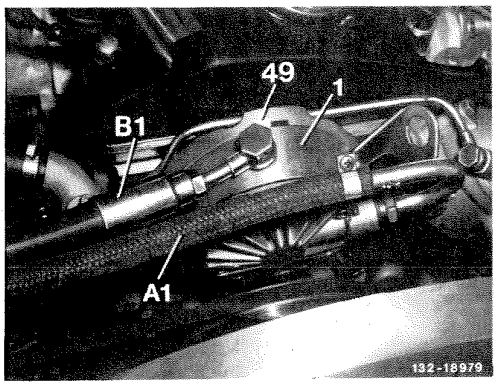


Pressure oil pump Teves

1 Housing
2 Cover, front
3 Cover, rear
4 Cam
5 Hex. socket screws
6 Piston
7 Coupling ring
8 Pressure valve
9 Radial sealing ring
10 Thrust ring
11 O-ring
12 Round-cord ring
13 Sealing ring
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

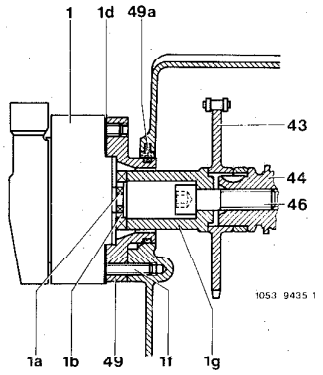
Engine 102

The pressure oil pump (1) is driven directly by camshaft and attached to cylinder head by means of a flange (49).



1 Pressure oil pump
49 Flange
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

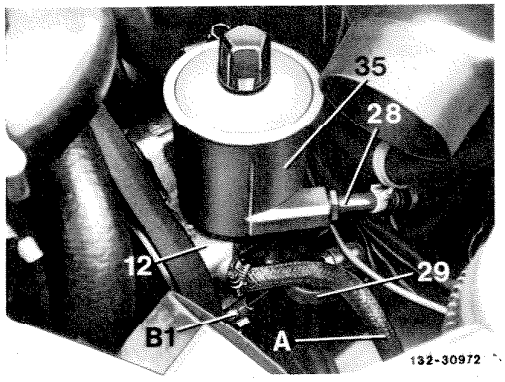
The pump is driven by camshaft (44) by means of driving sleeve (1g) and driver (1b).



1 Pressure oil pump
1a Camshaft
1b Driver
1d Gasket
1f Hex. socket screw
1g Driving sleeve
43 Camshaft gear
44 Camshaft
46 Hex. socket screw
49 Flange
49a O-ring

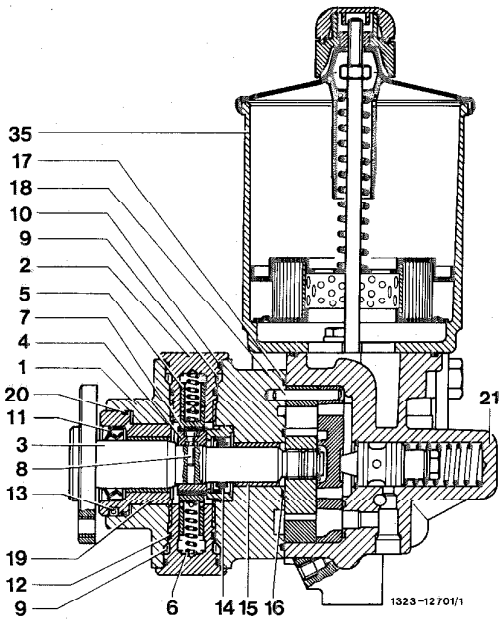
Engine 103

On vehicles with engine 103 the pressure oil pump and the power steering pump are a single unit, the tandem pump. The tandem pump comprises the radial piston pump for level control and the vane-type pump for power steering. The tandem pump is attached to the engine by means of a support and is driven by way of a poly-V-belt.



12 Tandem pump
28 Return flow hose
29 High-pressure expanding hose } for power steering
35 Reservoir
A Suction line from fluid reservoir
B1 Pressure line to level controller } for level control

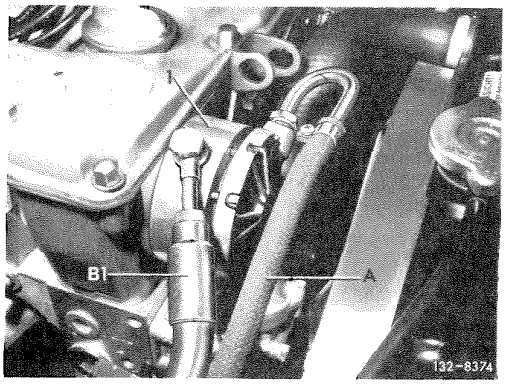
Both pumps operate as before with ATF for power steering or with hydraulic oil for level control. Both pumps are driven by **one** shaft. The eccentric (4) of the radial piston pump is connected with the input shaft (3) of the vane-type pump by way of a shearing pin (8), which shears off in the event of an overload. In such a case, the vane-type pump for power steering remains operational.



1 Housing
2 Piston inserts
3 Drive shaft
4 Eccentric
5 Piston
6 Compression spring
7 Race
8 Shearing pin
9 Reaction sealing strip
10 O-ring
11 Radial seal
12 O-ring
13 Locating pin
14 Sealing ring carrier with radial sealing ring
15 Bearing
16 O-ring
17 O-ring
18 Fitted bolt
19 Bearing bushing with plain bearing
20 O-ring
21 Power steering pump
35 Reservoir for power steering

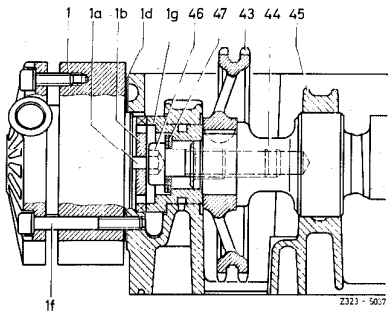
Engine 110

Pressure oil pump is flanged to front of camshaft housing.



1 Pressure oil pump
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

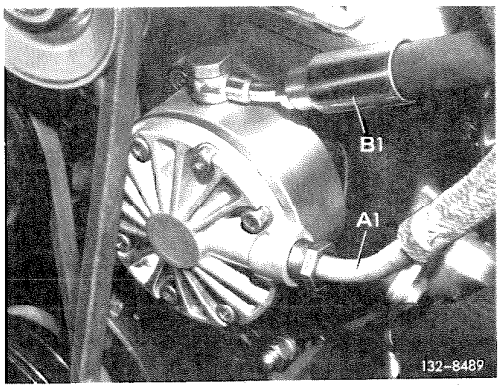
Drive is by means of exhaust camshaft (44) via spacing sleeve (1g) and driver (1b).



1 Pressure oil pump
1a Camshaft
1b Driver
1d Gasket
1f Hex. socket screw
1g Spacer sleeve
43 Camshaft gear
44 Camshaft
45 Camshaft housing
46 Hex. socket screw
47 Disk washer

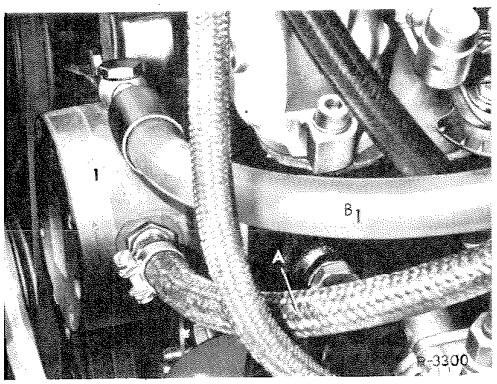
Engines 114, 115, 123, 130, 180

Pressure oil pump is flanged to cylinder crankcase.



Pressure oil pump MB

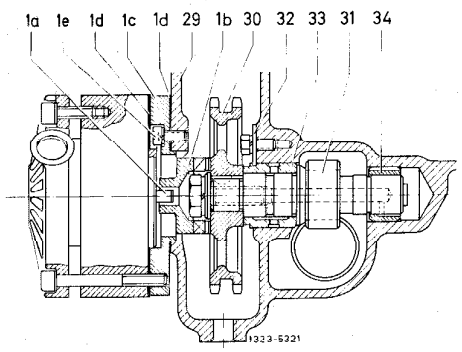
A1 Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller



Pressure oil pump Teves

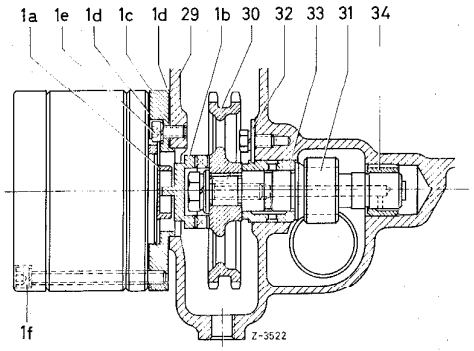
1 Pressure oil pump
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

Drive is effected via intermediate gear (30) and driver (1b).



Pressure oil pump MB

1a Cam
1b Driver
1c Intermediate flange
1d Gasket
1e Hex. socket screw with special head
29 Cyl. crankcase
30 Intermediate gear
31 Intermediate gear shaft
32 Washer
33 Front bearing bushing
34 Rear bearing bushing

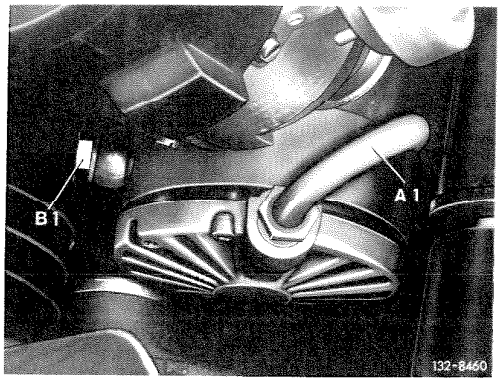


Pressure oil pump Teves

1a Cam
1b Driver
1c Intermediate flange
1d Gasket
1e Hex. socket screw with special head
1f Hex. socket screw
29 Cyl. crankcase
30 Intermediate gear
31 Intermediate gear shaft
32 Washer
33 Front bearing bushing
34 Rear bearing bushing

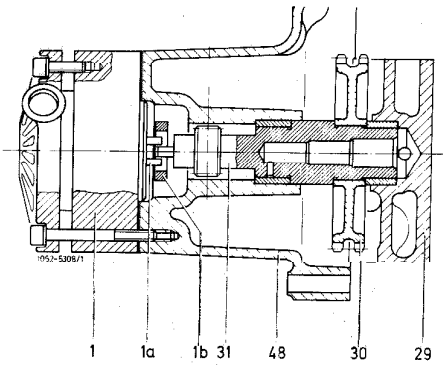
Engines 116, 117

Pressure oil pump is flanged to timing housing cover.



A1 Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

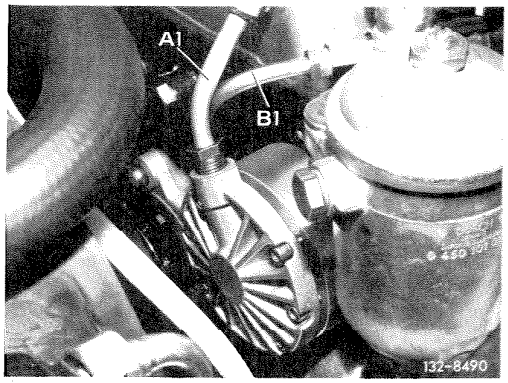
Drive is effected via intermediate gear, intermediate gear shaft and driver.



1 Pressure oil pump
1a Camshaft
1b Driver
29 Cyl. crankcase
30 Intermediate gear
31 Intermediate gear shaft
48 Timing housing cover

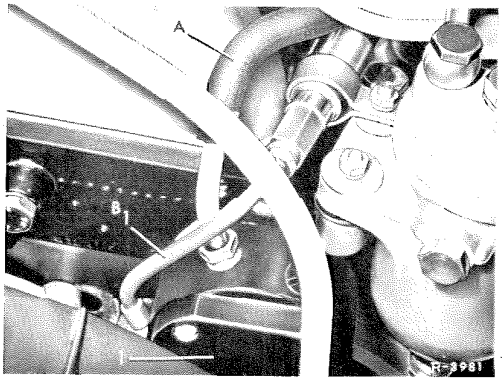
Engines 615, 616, 617

Pressure oil pump is flanged to cylinder head.



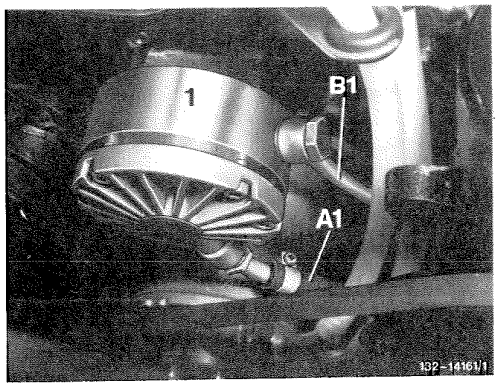
Layout on model 115.1
Pressure oil pump MB

A1 Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller



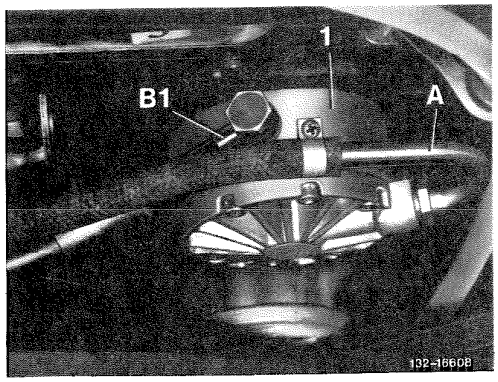
Pressure oil pump Teves

1 Pressure oil pump
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller



Layout on model 123.1
1st version up to May 1979

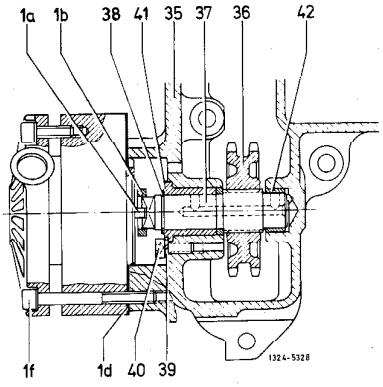
1 Pressure oil pump
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller



Layout on model 123.1
2nd version starting June 1979

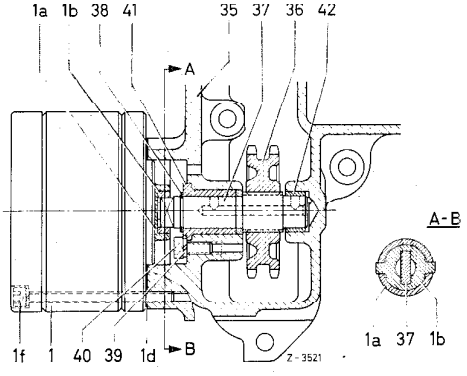
1 Pressure oil pump
A Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller

Driven by guide wheel (36) in cylinder head on shaft (37) and driver (1b).



Pressure oil pump MD

1a Cam
1b Driver
1d Gasket
1f Hex. socket screw
35 Cyl. head
36 Guide wheel
37 Shaft
38 Locking ring
39 Snap ring
40 Hex. socket screw with special head
41 Front bearing bushing
42 Rear bearing bushing



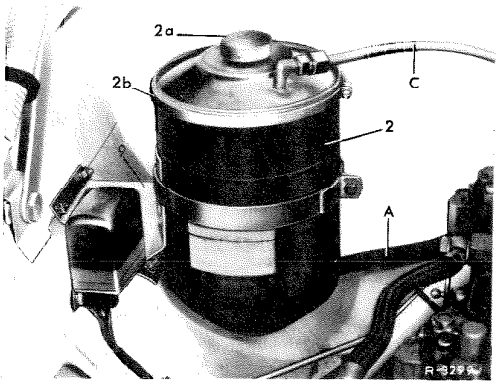
Pressure oil pump Teves

1a Cam
1b Driver
1d Gasket
1f Hex. socket screw
35 Cyl. head
36 Guide wheel
37 Shaft
38 Locking ring
39 Snap ring
40 Hex. socket screw with special head
41 Front bearing bushing
42 Rear bearing bushing

Fluid reservoir

The fluid reservoir of models 107, 114, 115, 116 is attached to bracket (9) on the righthand side of the engine compartment by means of a strap.

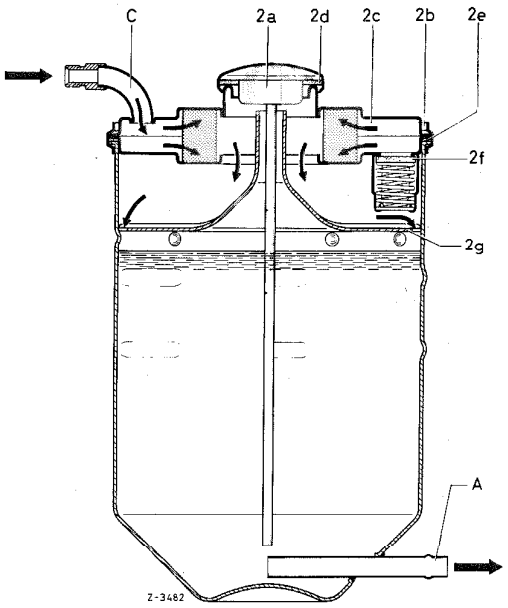
The fluid reservoir is connected to pressure oil pump by means of suction line (A) and to level controller by means of return flow line (C).



Fluid reservoir metal version
Models 107, 114, 115, 116

2 Fluid reservoir
2a Closing cover with oil dipstick
2b Clamping strap
A Suction line fluid reservoir – pressure oil pump
C Return line level controller – fluid reservoir

Cover (2c) of fluid reservoir (metal version) is designed as a filter element and also houses the bypass valve (2f) which serves as a protection against overpressure in the event of a clogged filter element. The breather cap (2g) serves to prevent any foaming of the oil.

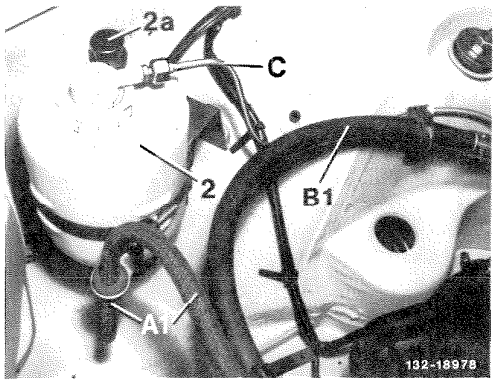


Fluid reservoir metal version
Models 107, 114, 115, 116
(oil level shown between max. and min.)

2 Fluid reservoir
2a Closing cap with oil dipstick
2b Clamping strap
2c Cover with filter element
2d Rubber sealing ring
2e Rubber sealing ring
2f Bypass valve
2g Breather cap
A Suction line fluid reservoir – pressure oil pump
C Return flow line level controller – fluid reservoir

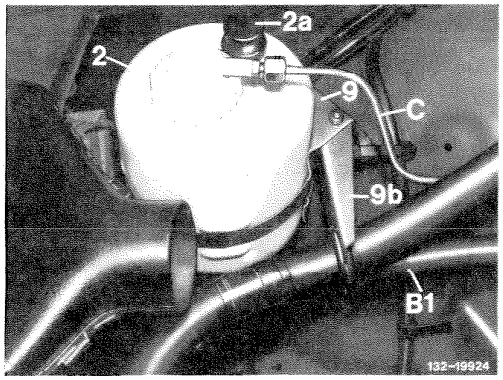
Model 116 has been supplied with a plastic fluid reservoir since the end of 1975. Concurrently, the fluid reservoir has been shifted to the left front side of the engine compartment.

On model 123, the fluid reservoir is made of plastic material and is located on the righthand side of the engine compartment.



Fluid reservoir
Model 123 Standard

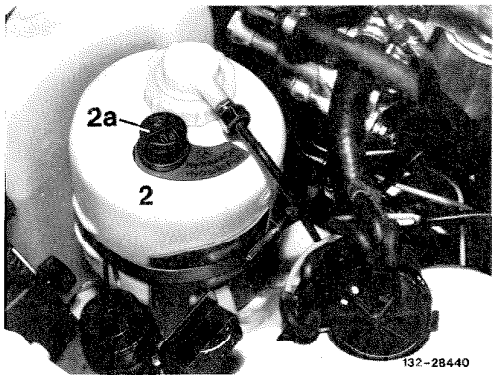
2 Fluid reservoir
2a Closing cover with oil dipstick
A1 Suction line fluid reservoir – pressure oil pump
B1 Pressure line pressure oil pump – level controller
C Return flow line level controller – fluid reservoir



Fluid reservoir
Model 123.193 (USA)
Up to model year 1985

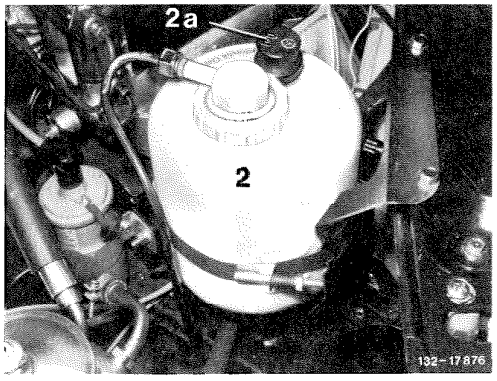
2 Fluid reservoir
2a Closing cover with oil dipstick
9 Holder for fluid reservoir
9b Holder for high-pressure expansion hose
B1 Pressure line pressure oil pump – level controller
C Return flow line level controller – fluid reservoir

On model 123.193 (USA) starting model year 1985, the fluid reservoir has been shifted from the righthand side of the engine compartment to the left.

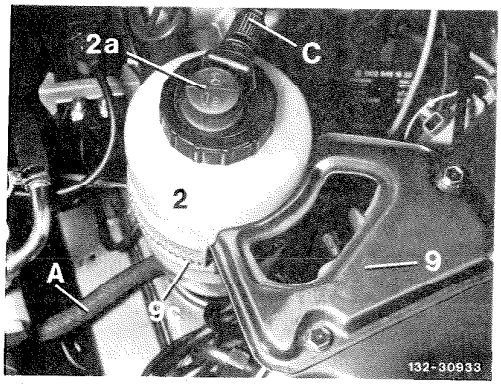


Fluid reservoir
Model 123.193 (USA)
Starting model year 1985

On model 126, the fluid reservoir is arranged on the lefthand side of the engine compartment.



Version up to 8/85
Fluid reservoir model 126



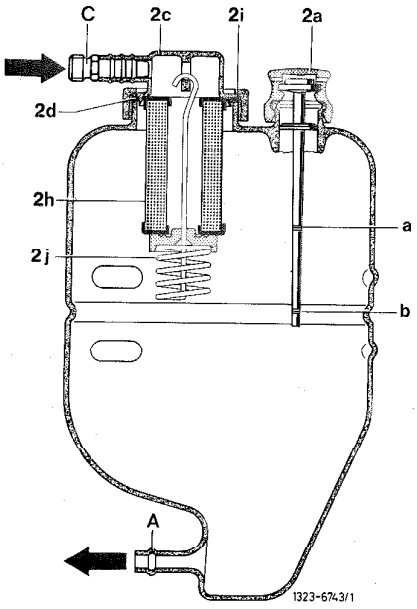
Version starting 9/85

2 Fluid reservoir
2a Closing cap with oil dipstick
9 Holder for fluid reservoir
9c Holding spring
A Suction line fluid reservoir – pressure oil pump
C Return flow line level controller – fluid reservoir

Models 116, 123
Model 126 up to 8/85

The filter element (2h) in fluid reservoir (plastic version) is exchangeable.

Attention!
For vehicles with green information label use hydraulic oil part No. 000 989 85 03.



Fluid reservoir, plastic version
Models 107, 114, 115, 116, 123
Model 126 up to 8/85

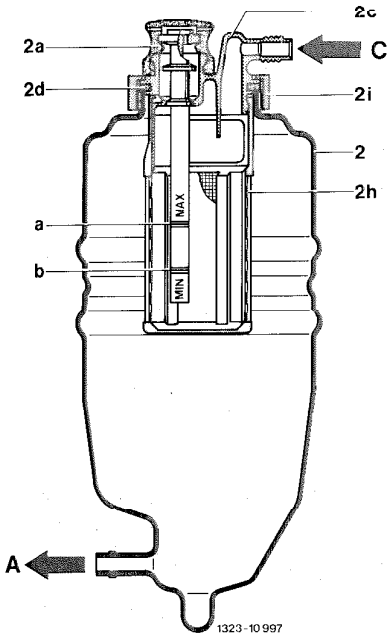
2 Fluid reservoir
2a Closing cap with oil dipstick
2c Cover with connection
2d Rubber sealing ring
2h Filter element
2i Closing nut
2j Holding spring
a Maximum – mark
b Minimum – mark
A Suction line fluid reservoir – pressure oil pump
C Return flow line level controller – fluid reservoir

Model 126 starting 9/85

The fluid reservoir has been taken from model 124. Its smaller capacity changes the filling-in quantity:

Filling-in quantities	approx. liters
Complete system	2.0
Fluid reservoir up to marks on oil dipstick	Maximum: 1.2 Minimum: 1.0

Caution!
Use hydraulic oil part No. 000 989 91 03 only.



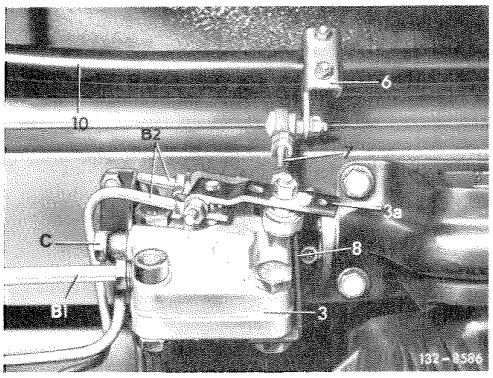
Version starting 9/85

2a Closing cap with oil dipstick
2c Cover with connection
2d Rubber seal
2h Filter element
2i Closing nut
a Maximum – mark
b Minimum – mark
A Suction line fluid reservoir – pressure oil pump
C Return flow line level controller – fluid reservoir

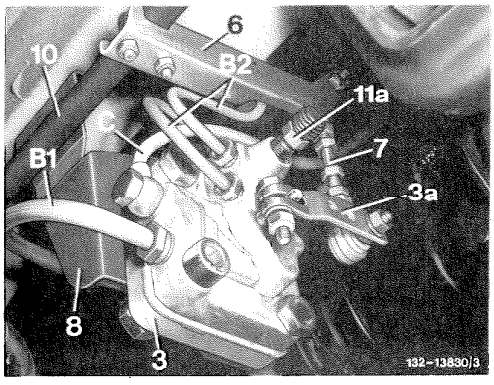
D. Control equipment

The **level controller** (3) is attached to frame floor by means of holder (8) and is connected with lever (6) on torsion bar (10) by means of connecting rod (7).

The bleed screw in distributor or level controller (11a) serves for reducing the pressure in system for repair and test jobs.



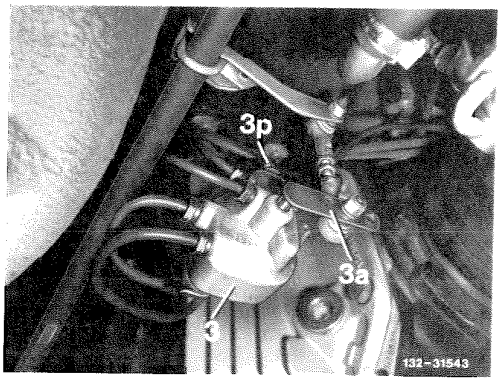
Level controller without bleed screw 1st version



Level controller with bleed screw 2nd version up to 8/85

3a Lever
11a Bleed screw
B1 Pressure line pressure oil pump – level controller
B2 Pressure line level controller – pressure reservoir
C Return flow line level controller – fluid reservoir

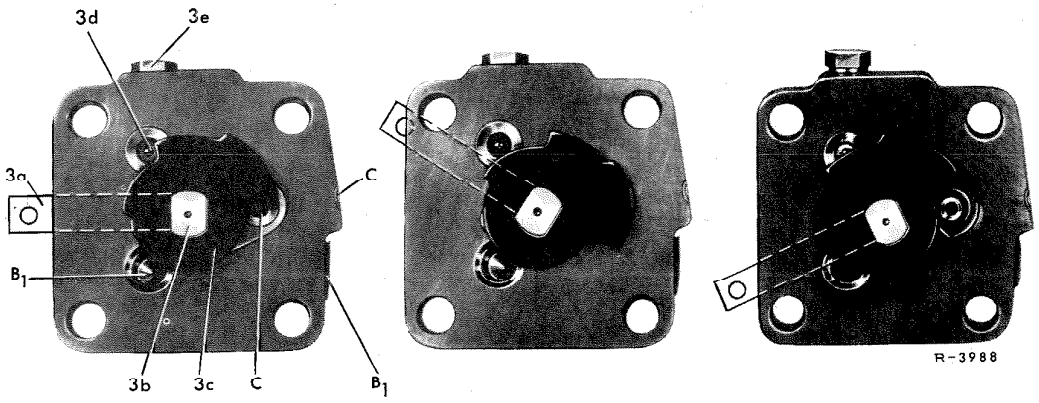
Owing to the elastic suspension of the rear axle center piece the level controller is installed from the left to the right.



Level controller version starting 9/85

3 Level controller
3a Lever on level controller
3p Vent screw

Functional positions of level controller (version up to 8/85)



Neutral
Vehicle in level position; lever in center position

Filling
Vehicle rear end lowered after loading; lever above center position

Return flow
Vehicle rear end raised after unloading; lever below center position

3 Level controller
3a Lever
3b Control shaft
3c Control disk
3d Return valve
3e Closing plug
B1 Pressure duct from pressure oil pump
C Return flow duct to fluid reservoir

„Neutral" position

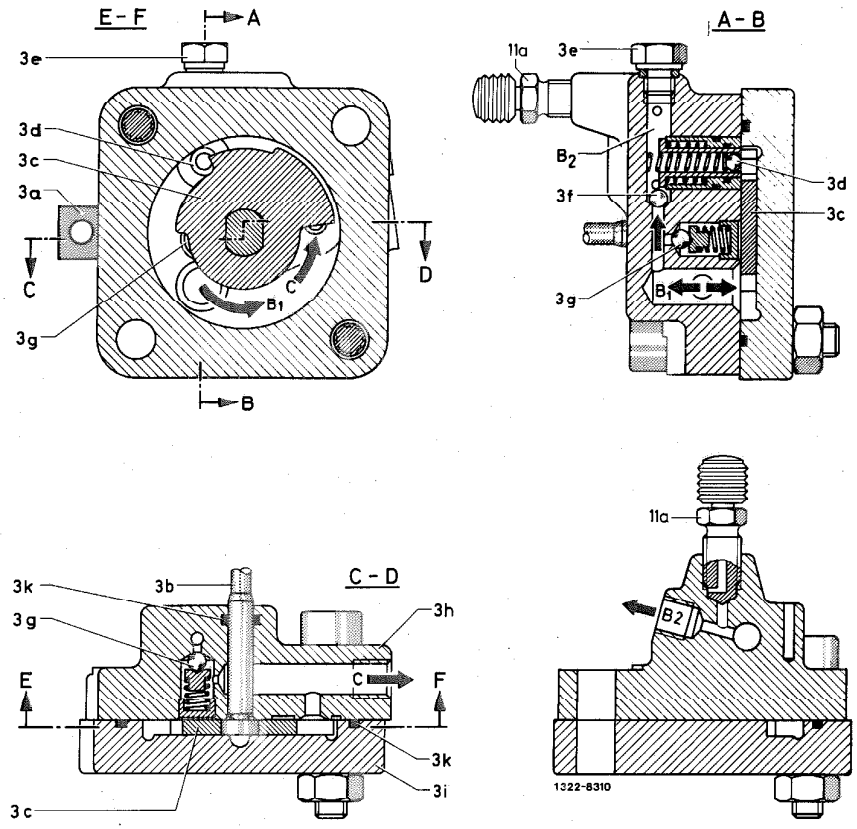
Oil entering via feed duct (B1) is returned without pressure to fluid reservoir via return flow duct and return flow line (C). Return flow valve (3d) remains closed.

„Filling" position

Control disk (3c) has closed return flow duct (C). Under influence of respective pressure, the oil is guided to the suspension elements via pressureless ball check valve (3f) and duct (B2). Raising of vehicle rear end into level position will once again attain „neutral". The system is protected against overload by the pressure relief valve (3g) which opens when the max. permissible pressure is attained.

„Return flow" position

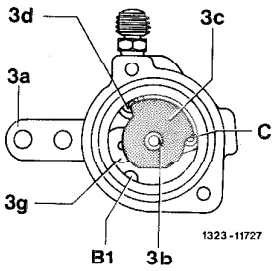
Control disk has opened return flow valve (3d). This will lower the pressure prevailing in suspension elements. The oil flows through the opened return flow valve and via the fully opened return flow duct (C) back to fluid reservoir together with the oil delivered by pump. When the level position of the vehicle has once been attained, the control disk will close return flow valve (3d). Provision of the basic pressure required for function of spring struts as shock absorbers is attained independent of position of controller by the outer compression spring of the return flow valve (3d) pushing the return flow valve out of range of control disk when pressure in suspension element drops below a given value, so that the pressure cannot drop any further.



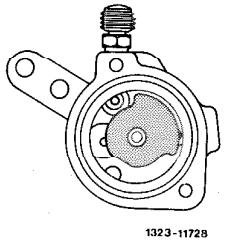
3 Level controller
3a Lever
3b Control shaft
3c Control disk
3d Return flow valve
3e Closing plugs with sealing rings
3f Check valve
3g Pressure relief valve
3h Housing
3i Cover
3k O-ring
11a Bleed screw

B1 Pressure duct from pump
B2 Pressure duct to suspension elements
C Return flow valve to fluid reservoir

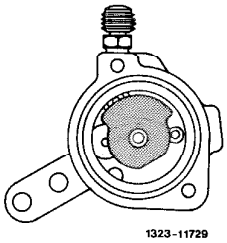
Functional positions of level controller (version starting 9/85)



Neutral
Vehicle in level position; lever in center position



Filling
Vehicle rear end lowered after loading; lever above center position



Return flow
Vehicle rear end raised after unloading; lever below center position

3a Lever
3b Control shaft
3c Control disk
3d Return flow valve
3g Pressure relief valve

B1 Pressure duct from pressure oil pump
C Return flow valve to fluid reservoir

„Neutral" position

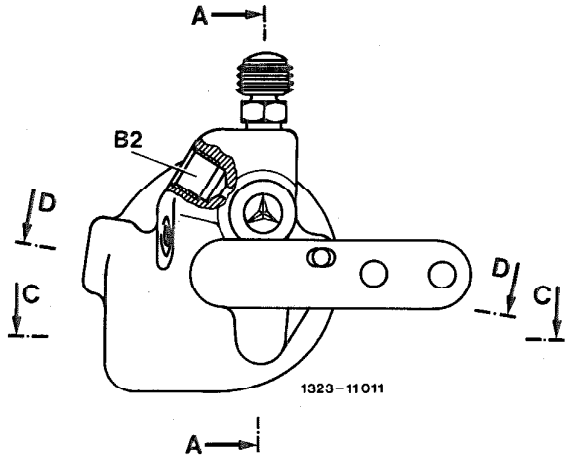
Oil entering via feed duct (B1) is returned without pressure to fluid reservoir via return flow duct and return flow line (C). Return flow valve (3d) remains closed.

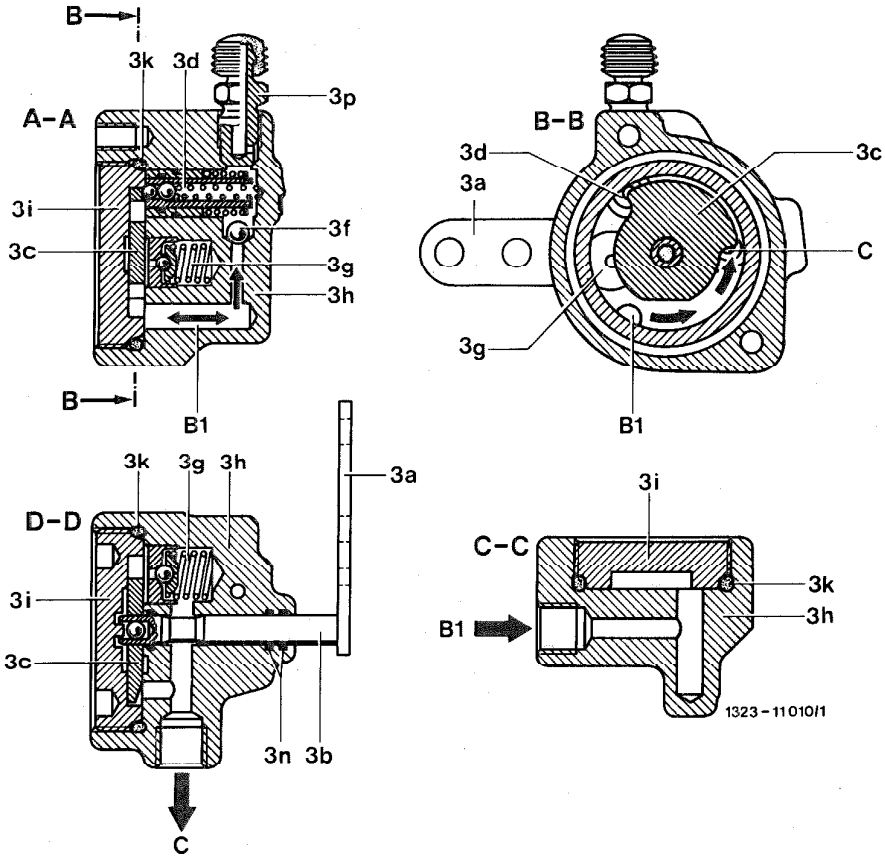
„Filling" position

Control disk (3c) has closed return flow duct (C). Under influence of respective pressure, the oil is guided to the suspension elements via pressureless ball check valve (3f) and duct (B2). Raising of vehicle rear end into level position will once again attain „neutral". The system is protected against overload by the pressure relief valve (3g) which opens when the max. permissible pressure is attained.

„Return flow" position

Control disk has opened return flow valve (3d). This will lower the pressure prevailing in suspension elements. The oil flows through the opened return flow valve and via the fully opened return flow duct (C) back to fluid reservoir together with the oil delivered by pump. When the level position of the vehicle has once again been attained, the control disk will close return flow valve (3d). Provision of the basic pressure required for function of spring struts as shock absorbers is attained independent of position of controller by the outer compression spring of the return flow valve (3d) pushing the return flow valve out of range of control disk when pressure in suspension element drops below a given value, so that the pressure cannot drop any further.





3 Level controller
3a Lever
3b Control shaft
3c Control disk
3d Return flow valve
3f Check valve
3g Pressure relief valve
3h Housing
3i Cover
3k O-ring cover
3n O-ring control shaft
3p Oil drain plug

B1 Pressure duct from pump
B3 Pressure duct to suspension elements
C Return flow duct to fluid reservoir