Minimum pressure valve

Introduction

The minimum pressure valve is incorporated into the No. 1 hydraulic system between the levelling valve and the suspension struts (see fig. G17-1).

The purpose of the valve is to retain a predetermined hydraulic pressure in the suspension struts.

During normal system operation, the minimum pressure valve is held in the open position by hydraulic system pressure. This allows the uninterrupted flow of hydraulic system mineral oil between the levelling valve and the suspension struts.

However, if the supply of hydraulic system mineral oil to the suspension struts falls below a predetermined pressure, the minimum pressure valve will close and isolate the suspension struts from the system.

The minimum pressure valve is adjustable and it is important that the pressure is kept between the figures quoted later in this Section under the heading Minimum pressure valve – To test.

A leakage return hose is fitted between the minimum pressure valve and the levelling valve, to ensure that the designed leakage within the levelling valve is allowed to return back to the reservoir.

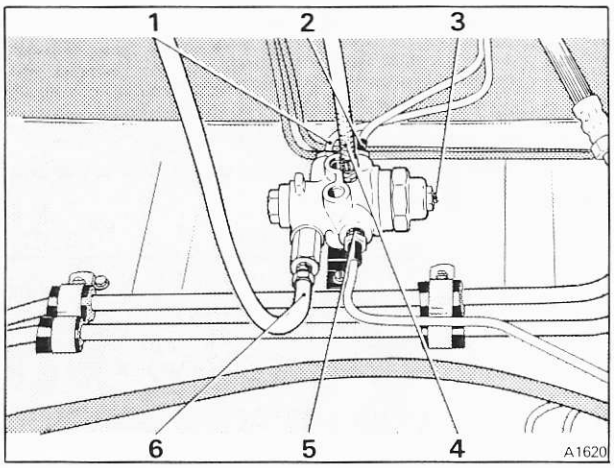

Fig. G17-1 Minimum pressure valve

1 Supply pipe to suspension struts
2 Leakage return pipe from suspension struts
3 Pressure adjuster
4 Leakage return pipe
5 Return pipe to reservoir
6 Supply pipe from levelling valve

Minimum pressure valve – To remove

1. Depressurize the hydraulic system as described in Section G3.
2. Disconnect the hydraulic pipe connections from the minimum pressure valve. Blank off all pipe ends and valve ports.
3. Remove the mounting screws. Lower the valve assembly and remove the setscrews securing it to the mounting bracket.

Minimum pressure valve – To dismantle

(see fig. G17-2)

1. Remove the adapter and sealing washer.
2. Remove the lock-nut and unscrew the adjusting socket setscrew.
3. Remove the large end cap, taking care not to lose the spring and internal components. Discard the 'O' ring.
4. Remove the small end plug and sealing washer.
5. Remove the valve stem from the valve housing. It may be necessary to use air pressure applied through the inlet port, to eject the valve.
6. Thoroughly clean all components using petroleum ether (120/160°C). Dry with dry compressed air, not with any type of cloth.

Minimum pressure valve – To assemble

(see fig. G17-2)

Assemble the minimum pressure valve by reversing the procedure given for dismantling, noting the following.

1. Ensure that the valve stem is fitted with the longer shoulder towards the small end plug.
2. Fit a new 'O' ring and sealing washers.
3. Torque tighten in accordance with the figures quoted in Section G22.

Minimum pressure valve – To fit

1. Fit the minimum pressure valve to the bracket. Secure the assembly to the underside of the car.
2. Remove the blanks and connect the hydraulic pipes.
3. Fit the leakage return hose between the minimum pressure valve and the levelling valve.
4. Bleed the hydraulic system as described in Section G5.
5. Torque tighten all bolts and pipe connections to the figures quoted in Section G22 and Chapter P.

Minimum pressure valve – To test

1. Place the car on a ramp. Engage park position and chock the front wheels. Remove fuse A6 from fuse panel F2 on the main fuseboard. Release the parking brake.
2. Depressurize the hydraulic system as described in Section G3.
3. Fit a pipe to the suspension struts bleed screw and slowly depressurize the struts by allowing the

mineral oil to flow into a clean container. Remove the bleed screw and fit the pressure gauge RH 9727 GMF.
4. Start the engine and allow the hydraulic systems to fully pressurize (approximately four minutes).
5. Bleed the suspension struts and pressure gauge.
6. Position an open ended spanner [maximum length not exceeding 152 mm (6.0 in)] onto the levelling valve operating lever. Then, push the lever towards the valve. Hold in this position until a pressure of approximately 34,5 bar (500 lbf/in²) is indicated on the pressure gauge.
7. Pull the lever away from the valve. The pressure will start to descend slowly.

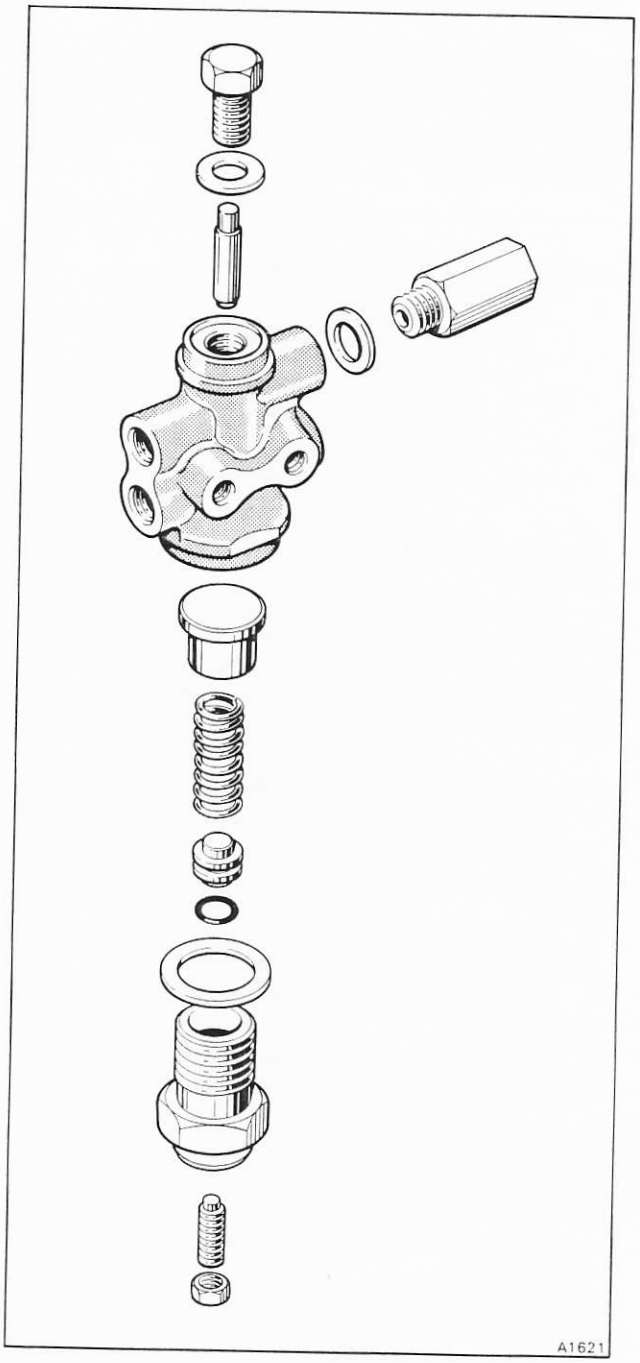

Fig. G17-2 Minimum pressure valve with adjuster

8. Note the pressure on the gauge when it stops falling. It is normal for the gauge needle to 'flick' and then settle. This final settled reading is the minimum pressure valve setting and should be between 24,1 bar and 26,2 bar (350 lbf/in² and 380 lbf/in²).
9. If the pressure is outside these limits, the minimum pressure valve should be adjusted as follows.
10. Slacken the lock-nut on the side of the minimum pressure valve. Then, turn the Allen socket screw clockwise to raise the setting, or anti-clockwise to reduce it. Torque tighten the lock-nut to the figures quoted in Chapter P.
11. Repeat Operations 4, 6, 7, and 8.
12. When the minimum pressure valve setting is correct, switch off the engine.
13. Depressurize the hydraulic systems and suspension struts.
14. Remove the pressure gauge.
15. Bleed the hydraulic systems as described in Section G5.
16. Top-up the reservoirs as described in Section G7.

Gas springs and Suspension struts

Introduction

The rear suspension struts situated beneath each rear wheel arch are mounted between the rear suspension trailing arms and the car body. A gas spring is attached to the top of each strut.

With the exception of Corniche/Continental cars, the gas springs and top mountings of the suspension struts are situated in the luggage compartment.

On Corniche/Continental cars the gas springs and top mountings are situated in the hood stowage well.

The gas spring and suspension strut combine to perform the functions of car levelling and suspension damper. The suspension strut is similar in design to a conventional damper, but is supplied with pressurized mineral oil from the No. 1 hydraulic system accumulator. The gas spring consists of a sphere, similar to that fitted to the hydraulic accumulator, divided into two chambers by a rubber diaphragm.

Nitrogen gas, under pressure, is retained on one side of the diaphragm. Hydraulic system mineral oil fills the other half of the sphere and suspension strut.

When a rear road wheel contacts a protrusion, the piston of the suspension strut is forced upwards. This action forces mineral oil into the gas spring sphere, compressing the gas behind the diaphragm. Conversely, when the rear road wheel travels over a hollow, the piston is forced downwards by the expansion of the gas.

Holes machined into the suspension strut piston, allow a restricted flow of mineral oil from one side of the piston to the other, thus acting as a shock damper.

Rear levelling control is achieved by increasing or decreasing the amount of mineral oil in the suspension strut and gas spring assembly. If extra load is applied to the car the levelling valve will actuate and allow extra mineral oil to flow into the suspension strut. This increase in the volume of mineral oil within the suspension strut, effectively raises the body height of the car to the correct levelled height position. When load is removed from the car, the levelling valve is actuated in the opposite direction, allowing the excess mineral oil to exhaust from the suspension strut back to the reservoir, thus lowering the height of the car body.

Gas spring spheres and suspension struts are both non-serviceable items. Therefore, in the event of a failure, a new component must be fitted.

No attempt should be made to charge a gas spring sphere. All spheres are charged to the correct pressure prior to despatch from the manufacturer.

Note Pressure gauge RH 9727 GMF is quoted for the testing of the gas spring spheres and suspension struts in this Section. The gauge gives a reading of between zero bar and 345 bar (zero lbf/in² and 5000 lbf/in²). However, it is essential that the gauge gives a correct reading in the 7 bar to 28 bar (100 lbf/in² to 400 lbf/in²) range.

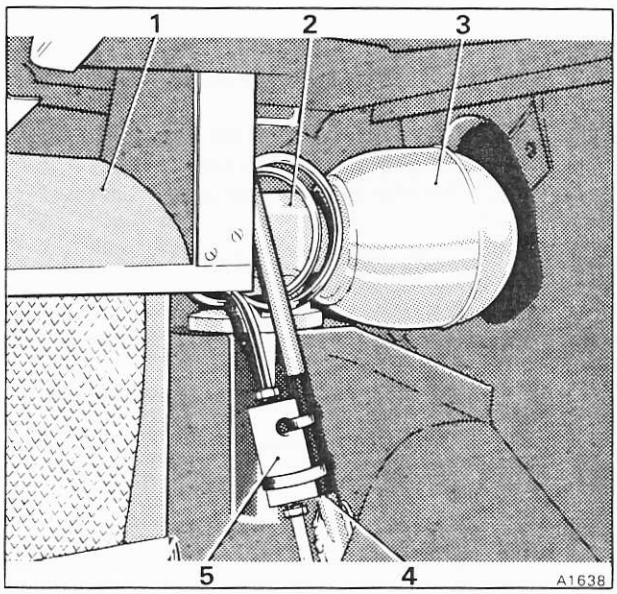

Fig. G18-1 Gas spring sphere

1 Fuel tank
2 Adapter
3 Sphere
4 Parcel shelf tie-bar
5 Connector block

Gas spring sphere – To remove (see fig. G18-1)

1. Depressurize the hydraulic system as described in Section G3.
2. Disconnect the battery.
3. Remove the Posidriv screws from the carpet covered sealing panel in the luggage compartment.
4. Remove the battery master switch knob and special ring nut from the right-hand side of the panel (if fitted).
5. On all cars except Corniche/Continental, release the press stud fastening straps adjacent to each luggage compartment hinge. Withdraw the panel to expose the fuel tank and gas spring spheres.
6. Remove the setscrews securing the battery master switch mounting bracket, to enable removal of the gas spring.

Operations 7 to 9 inclusive are applicable only to Corniche/Continental cars.

7. Carefully remove the rear seat cushion.
8. Remove the rear seat squab.
9. Release and remove the hood well trim to gain access to the rear suspension strut spheres.
10. Disconnect the coiled feed pipe from the gas spring adapter. Ensure protection is given to the carpet, trim, etc., in the luggage compartment.

RROC (A) Editor's Note

Gas Spring Sphere Removal.

The gas spring spheres may best be removed WITHOUT removing the accumulator assembly from the vehicle as prescribed in this manual. This preserves the seal between the accumulator body and the suspension strut, and saves considerable time.

Once the sphere is accessed, simply use a suitable strap wrench such as a sturdy oil filter removal tool, or a chain wrench for very tight spheres. In some cases, in order to use a chain wrench it may be necessary to bend the body seam adjacent to the sphere slightly. This is a very minor procedure and the bend cannot be seen.

Suitable Tools for Gas Spring Sphere Removal

11. Remove the three Allen screws from the adapter.
12. Carefully lift the adapter and sphere off the top of the suspension strut. Discard the sealing rings.
13. Secure the sphere adapter in a soft jawed vice. Using a suitable strap spanner, unscrew the sphere from the adapter. Discard the sealing ring.

Gas spring sphere – To fit (see fig. G18-2)
Fit the sphere by reversing the procedure given for removal, noting the following.
1. Ensure that all components are free from burrs, and then thoroughly clean them with petroleum ether (120/160°C). Dry with dry compressed air, not with any type of cloth.
2. Lubricate the new sealing rings with clean hydraulic system mineral oil.
3. If a replacement sphere is to be fitted, remove the blanking cover and allow any hydraulic system mineral oil to drain from the sphere.
4. When fitting the battery master switch, ensure sufficient clearance exists between the cable connections on the rear of the switch and the gas spring. **Never** allow a foul condition to exist in this area.
5. Torque tighten all setscrews and pipe connections in accordance with the figures quoted in Section G22 and Chapter P.
6. Bleed the hydraulic system as described in Section G5. Check all disturbed joints and pipe connections for leaks.

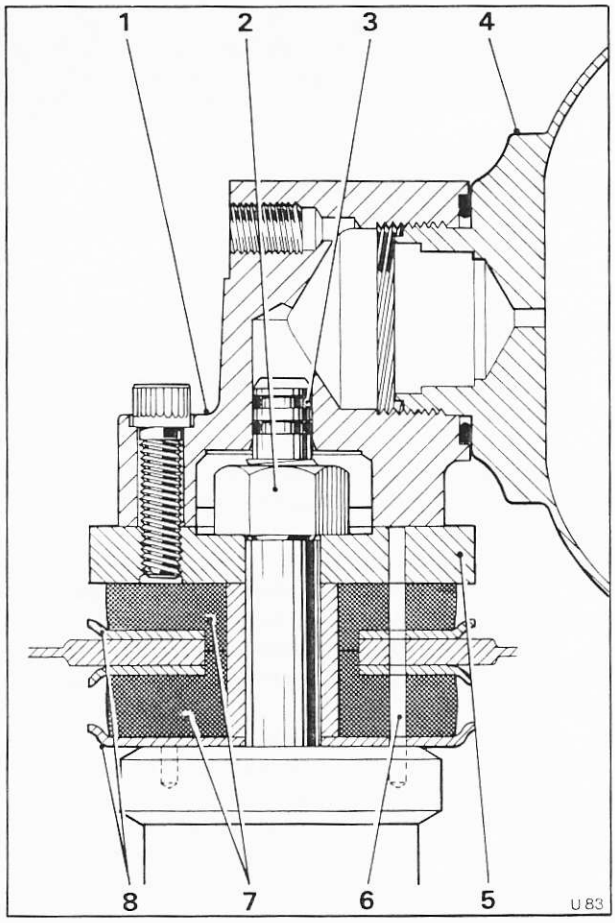

Fig. G18-2 Gas spring to suspension strut mounting
1 Adapter
2 Strut retaining nut
3 Sealing rings
4 Gas spring sphere
5 Gas spring mounting plate
6 Location peg holes
7 Rubber mounts
8 Cup-washer

Suspension strut – To remove
(see figs. G18-2 and G18-3)
1. Place the car on a ramp and securely chock the front wheels.
2. Depressurize the hydraulic system as described in Section G3.
3. Raise the rear of the car and place sill blocks under the rear end of the body sills. Support the trailing arms in the raised position, do not allow the suspension rebound struts to support the full suspension load.
4. Remove the relevant road wheel.
5. Remove the gas spring sphere as described under Gas spring sphere – To remove. Fit a protective blank to the top of the strut.
6. Disconnect the leakage return pipe from the lower end of the suspension strut. Hold the elbow of the pipe connection when unscrewing the nut, to ensure the pipe is not unscrewed from the strut. Blank off the pipe connections.
7. Remove the self-locking nut from the lower end of the suspension strut situated at the rear of the suspension trailing arm. Collect the rubber mounting bush, sleeve, and cup-washer.

Note In order to prevent rotation of the strut during removal of the retaining nut the location pin should be inserted through the mount. For details refer to Suspension strut – To fit.

8. Remove the retaining nut from the upper suspension strut mount. Collect the rubber mounting bush, gas spring mount, and cup-washers.
9. Support the suspension strut and lower the trailing arm. Lower the suspension strut from beneath the car, taking care not to damage the gas spring connection stem.

Suspension strut – To fit (see fig. G18-4)
In order to correctly locate the suspension strut, location holes are situated in the top face of the suspension strut and mount components. These location holes can be aligned by using a 76,20 mm (3.0 in) length of 4,75 mm (0.187 in) diameter bar.

The location peg can be fitted to either of two diametrically opposed holes in the strut, dependent on which side of the car the suspension strut is to be fitted. When positioned correctly the leakage drain pipe should point rearwards on both sides of the car. Fit the suspension strut by reversing the procedure given for removal, noting the following.
1. Fit the upper strut mount, distance piece, cup-washers, and location peg into position on the strut stem.

2. Pass the strut stem through the hole in the body strut tower, using a peg to locate its angular position i.e. drain pipe to the rear of the car.
3. Fit the cup-washer, rubber mount, and gas spring mount onto the strut stem and location pin. Fit and torque tighten the stem nut to the figures quoted in Section G22.
4. Remove the location pin.
5. Connect the strut piston rod to the trailing arm using a self-locking nut. Torque tighten the nut to the figures quoted in Section G22.
6. Remove the protective cap from the strut stem. Lubricate the two stem sealing rings with clean hydraulic system mineral oil and fit them onto the strut stem.
7. Fit the gas spring sphere assembly onto the strut stem mount, taking care not to damage the stem or sealing rings (see Gas spring sphere – To fit).
8. All nuts, capscrews, and pipe connections should be torque tightened in accordance with the figures quoted in Section G22 and Chapter P. Ensure the elbow of the leakage drain pipe is pushed fully onto the drain pipe of the suspension strut. Hold the elbow in position when tightening the pipe nut.
9. On completion, bleed the hydraulic system as described in Section G5.

Gas spring sphere and Suspension strut operating pressures – To check

If a malfunction of the levelling system or ride deterioration is difficult to diagnose, the gas spring gas pressure and the suspension strut operating pressure should be checked as follows.
1. Place the car on a ramp and chock the front wheels.
2. Depressurize the hydraulic system as described in Section G3.
3. Fit the pressure gauge RH 9727 GMF into the suspension struts bleed screw port.

To check the right-hand side gas spring sphere

4. Disconnect the hydraulic pipe section from the 3-way connector to the left-hand side suspension strut.
5. Blank off the 3-way connector to withstand hydraulic system pressure. Blank off the hydraulic pipe removed.
6. Start the engine and allow the system to pressurize.
7. Bleed the right-hand strut and pressure gauge.
8. Position an open ended spanner [maximum length not exceeding 152 mm (6.0 in)] onto the levelling valve operating lever. Then, push the lever towards the valve. Hold in this position until a pressure of approximately 34,5 bar (500 lbf/in²) is indicated on the pressure gauge.

   Switch off the engine.
9. Slowly open the bleed screw on the pressure gauge. The gauge needle will commence to descend slowly. Note the actual reading on the gauge when the needle drops sharply. This figure indicates the actual gas pressure within the sphere. The pressure must be between 10,35 bar and 18,62 bar (150 lbf/in² and 270 lbf/in²).
10. Depressurize the system as described in Section G3.
11. Remove the blanks from both the 3-way connector and the hydraulic pipe. Connect the hydraulic pipe to the connector. Ensure that the restrictor is fitted. Torque tighten the pipe connections to between 7 Nm and 9 Nm (0,7 kgf m and 0,9 kgf m; 5 lbf ft and 7 lbf ft).

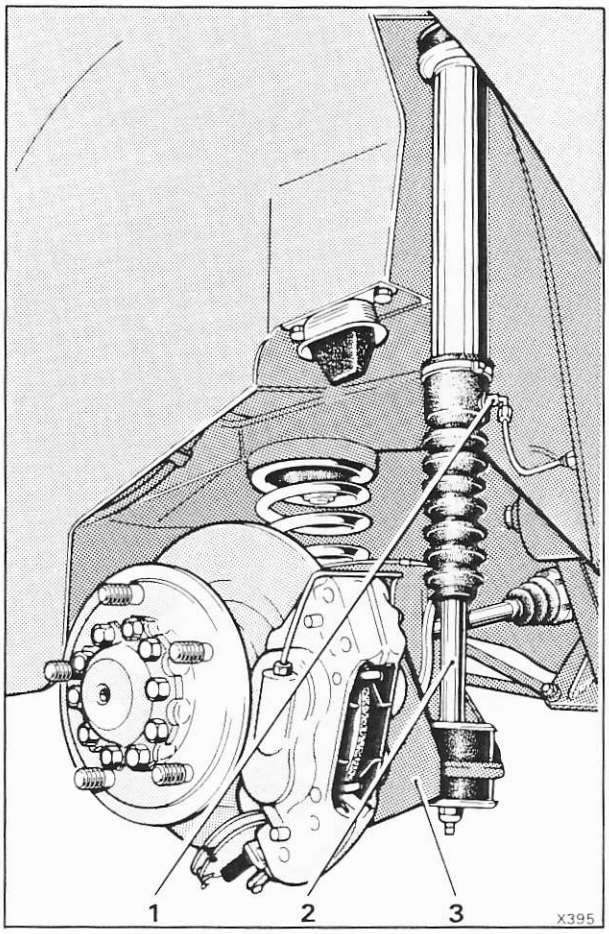

Fig. G18-3 Rear suspension strut
1 Leakage return pipe
2 Suspension strut
3 Trailing arm

To check the left-hand side gas spring sphere

12. Disconnect the hydraulic pipe section from the 3-way connector to the right-hand suspension strut.
13. Blank off the 3-way connector to withstand hydraulic system pressure. Blank off the hydraulic pipe removed.
14. Remove the pressure gauge RH 9727 GMF from the suspension struts bleed screw port. Then, replace and tighten the bleed screw.
15. Disconnect the hydraulic pipe section from the 3-way connector to the left-hand side suspension strut. Screw the pipe removed, and pressure gauge RH 9727 GMF into an **extra** 3-way connector.

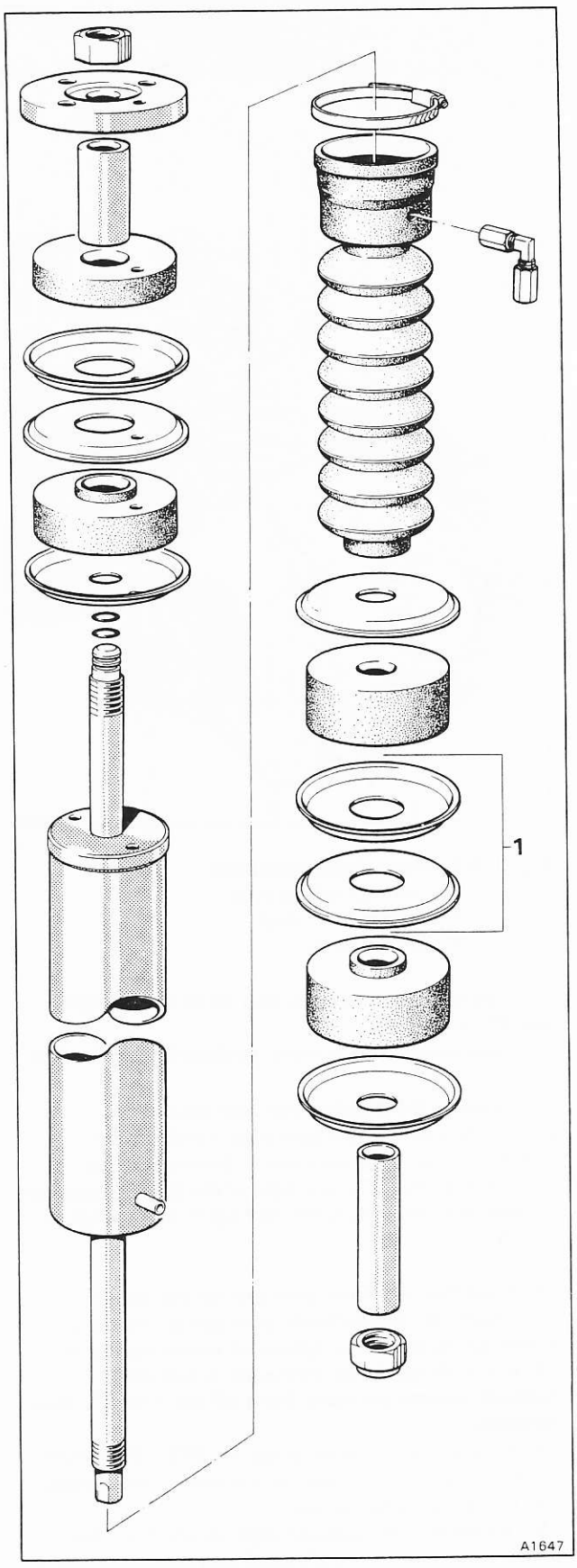

Fig. G18-4 Rear suspension strut mounts
1 Cup-washers (welded to the trailing arm)

16. Join the two 3-way connectors together with a flexible hose, capable of withstanding hydraulic pressure.
17. Start the engine and allow the system to pressurize.
18. Bleed the left-hand strut and pressure gauge.
19. Position an open ended spanner [maximum length not exceeding 152 mm (6.0 in)] onto the levelling valve operating lever. Then, push the lever towards the valve. Hold in this position until a pressure of approximately 34,5 bar (500 lbf/in²) is indicated on the pressure gauge.

    Switch off the engine.
20. Slowly open the bleed screw on the pressure gauge. The gauge needle will commence to descend slowly. Note the actual reading on the gauge when the needle drops sharply. This figure indicates the actual gas pressure within the sphere. The pressure must be between 10,35 bar and 18,62 bar (150 lbf/in² and 270 lbf/in²).
21. Depressurize the system as described in Section G3.
22. Remove the blanks from both the 3-way connector and the hydraulic pipe.
23. Remove the pressure gauge and extra 3-way connector etc. Connect the hydraulic pipes to the connector. Torque tighten the pipe connections to between 7 Nm and 9Nm (0,7 kgf m and 0,9 kgf m; 5 lbf ft and 7 lbf ft).
24. Bleed the system as described in Section G5.
25. Top-up the reservoirs as described in Section G7.