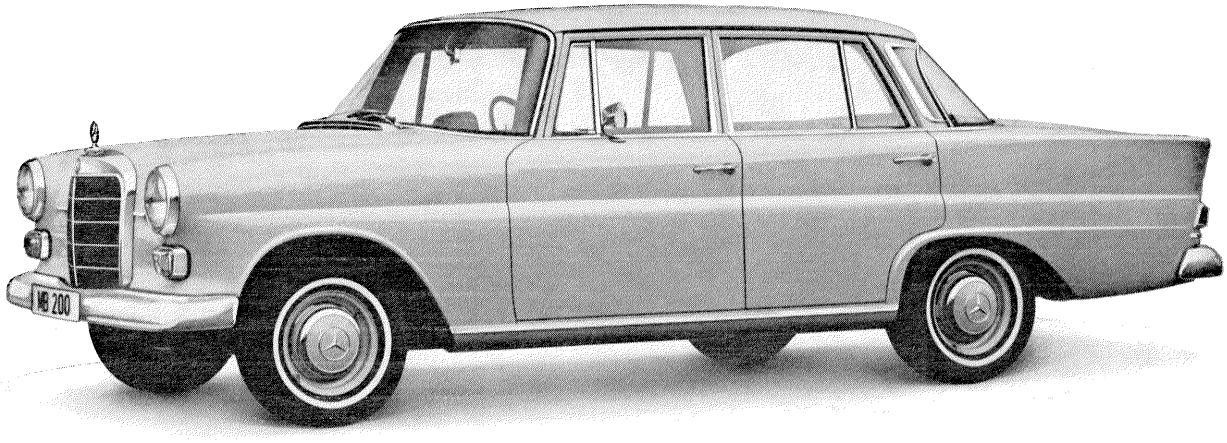
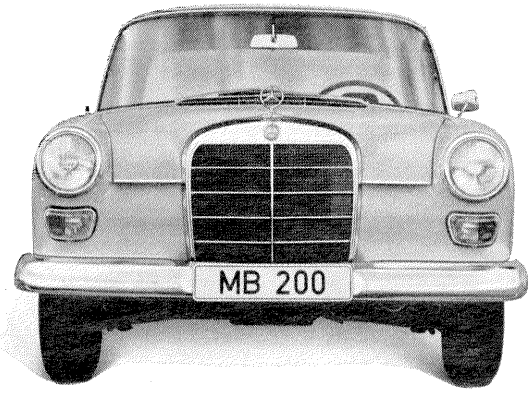
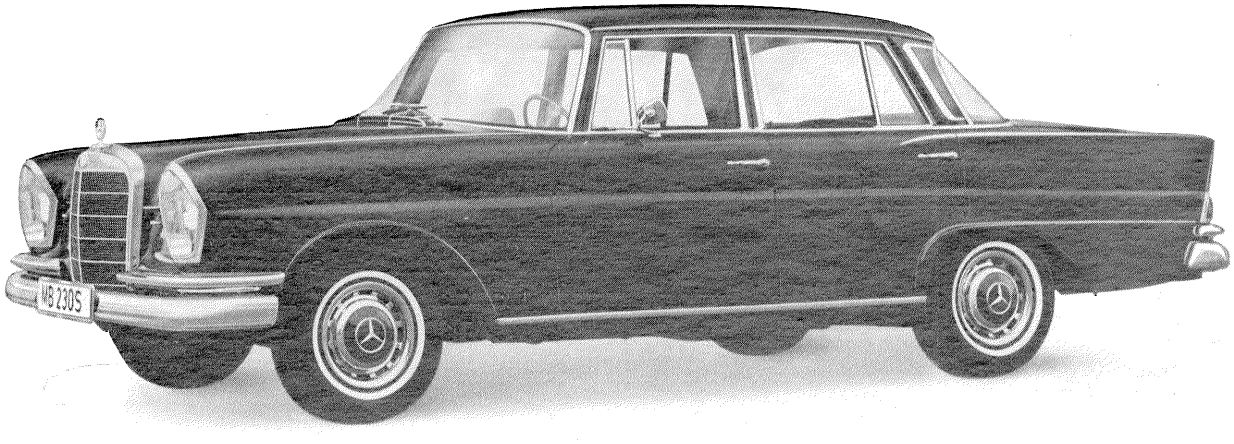
I. Description of Models 200 D, 200, 230, and 230 S





Models 200 D and 200 are improved modifications of the preceding models 190 DC and 190 C. Model 230 is a new development, providing a moderately priced vehicle with a 6-cylinder engine.



Model 230 S features the proven body of the 220 series with a 2.3 liter six-cylinder engine and was given the same improvements in details as the previously named models.

A. Engine

a) Model 200 D

The proven OM 621 diesel engine, whose main characteristic is its economy of operation, remains unchanged in output and torque at

55 HP (DIN) and 4 200 rpm
11.5 mkg (DIN) and 2 400 rpm

Component changes as compared with the engine of model 190 DC are as follows:

Crankshaft

Between cylinders 1 and 2, as well as 3 and 4, the crankshaft has been given an additional bearing, making for a total of 5. The resulting shorter distances between bearings provide more favorable vibration characteristics of the crankshaft.
Flywheel and counterweight have been fitted to the changed flywheel mass of the crankshaft.

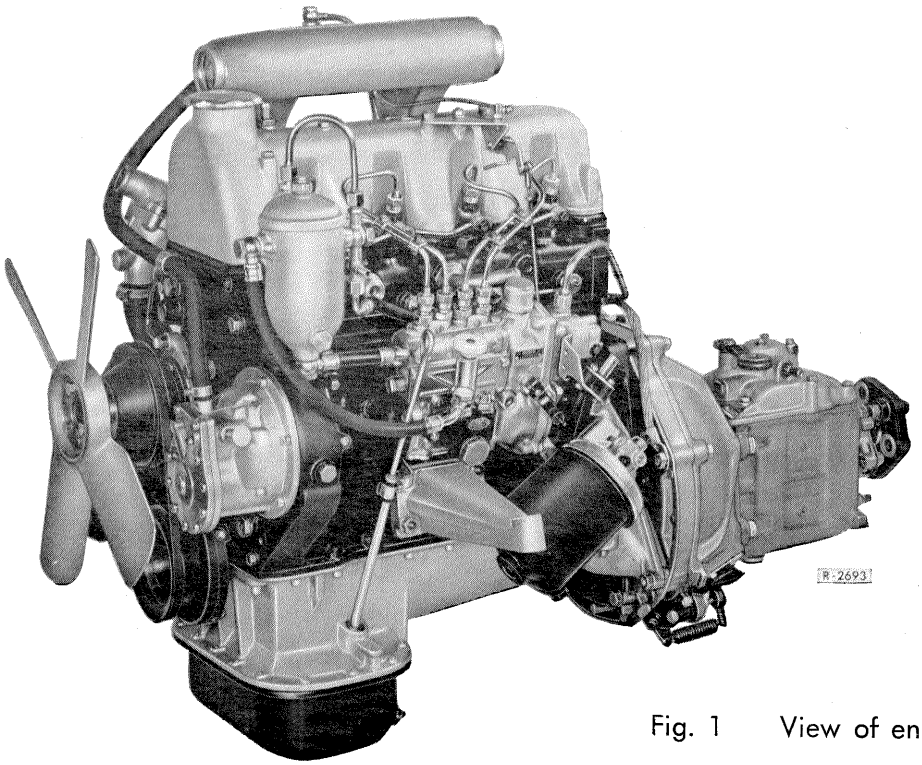


Fig. 1 View of engine of model 200 D

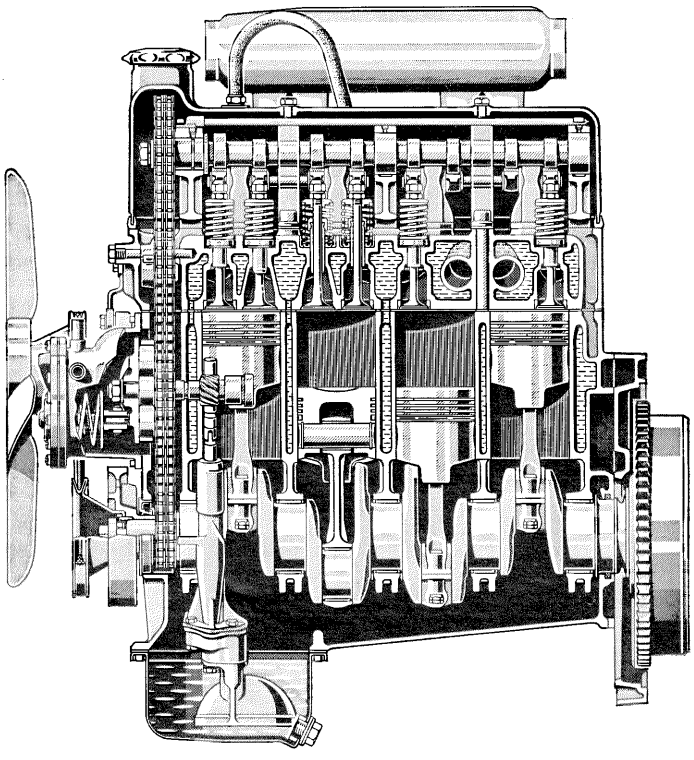
Cylinder crankcase

The cylinder crankase supports the crankshaft in 5 bearings. The center bearing is the fitted bearing.

The crankcase is vented in a closed system which prevents escaping vapors from reaching the outside air. The vent filter on the oil dipstick is no longer used. Venting now proceeds via the exhaust line of the cylinder head cover toward the clean air end of the oil bath air filter (Fig. 3).

Cylinder head

A casting change of the cylinder head at the oil return line requires a new cylinder head gasket Part No. 621 016 10 20. The new gasket can be used for the former cylinder head, **but the old cylinder head gasket Part No. 621 016 09 20 cannot be used for the new head.**



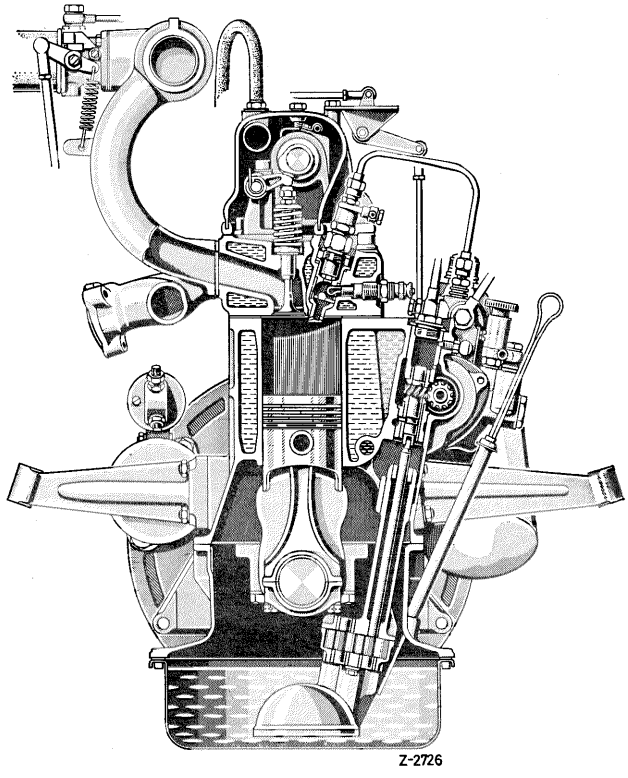


Fig. 2 Engine section Model 200 D

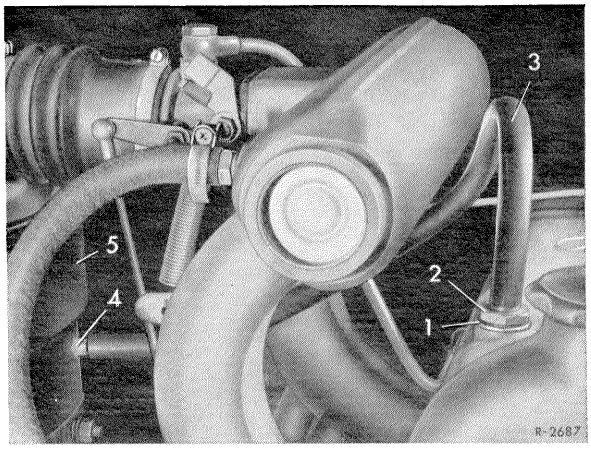


Fig. 3 Cylinder crankcase venting

1 Seal
2 Screw connection
3 Flexible hose
4 Connection pipe
5 Oil air bath filter

Oil pump

The oil pump is provided with higher gear wheels, which increases delivery. The outlet hole of the oil pump which leads to the main oil duct has been increased as a result of the displacement of the main oil duct in crankcase (oblong hole). The former oil pump cannot be used for model 200.

Combination oil filter

The combination main flow and by-pass filter has in principle remained the same. Its dimensions have been made smaller for good accessibility during servicing.

Vee-belts

As a result of the installed alternator the Vee-belt (narrow widht belt) is now longer (9.5 × 925 mm).

Alternator

Model 200 D carries the already known alternator 14 V 35 A 490 W.

b) Model 200

This engine is a modification of the model 190 C power plant. The following is an explanation of the changes made:

With an increased cylinder bore, higher compression, a newly arranged camshaft, a new design of intake pipe and exhaust manifold, and a dual carburetor system

(Solex 38 PDSI) the engine has the following output and torque values:

95 HP	(DIN) at 5200 rpm
15.7 mkg	(DIN) at 3600 rpm

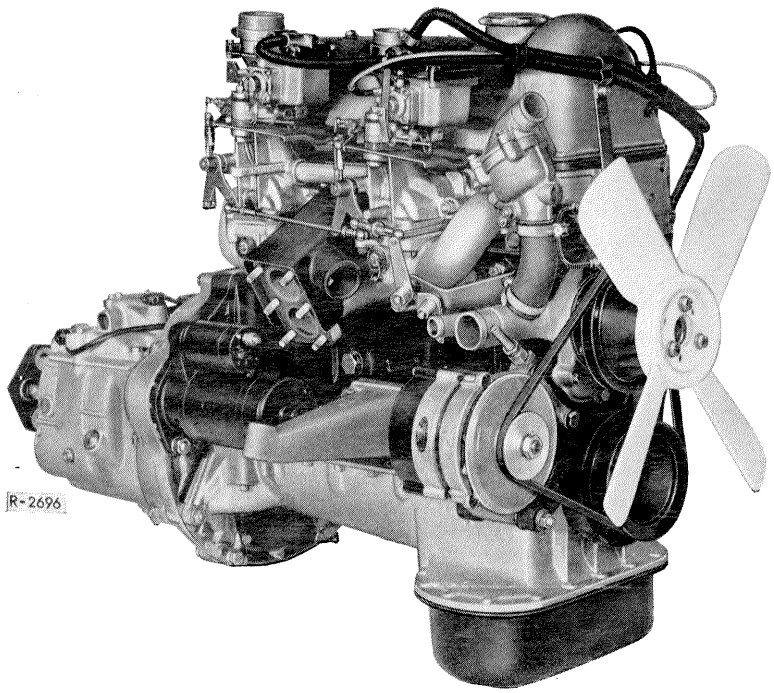


Fig. 4 View of engine of model 200

Crankshaft

The crankshaft — similar to model 200 D — is supported in 5 bearings.

Cylinder crankcase

The crankcase has been changed to accomodate the 5 bearings. (Refer to model 200 D, Fig. 2). The cylinder bore dia. has been increased from 85 to 87 mm. The crankcase is vented by way of the breather pipe of the cylinder head cover to the suction pipe of the air filter. The venting filter of the oil dipstick has also been eliminated.

Vee-belt

Refer to model 200 D.

Oil pump

The oil pump is similar in design to the 200 D model. Likewise, the former oil pump cannot be used for model 200.

Cylinder head

Smaller compression spaces provide a compression ratio of $\varepsilon = 9.0 : 1$.

All the valves are provided with rotocaps recessed in cylinder head. The valve guides are shorter than for model 190 C and have been given a different shape to match the new valve shaft sealing (Fig. 5). The larger cylinder bores also require a different cylinder gasket.

Pistons

The 3-ring pistons are provided with an oblong ring, a nose ring and a tapered ring with expanding spring.

Camshaft

The cams of the camshaft have been given another shape and have also been widened to 18 mm. The camshaft of model 200 is identified by the numeral "50" punched in at face end.

Rocker arms

The rocker arms were widened to 18 mm just like the cams and were also reinforced. The initial engines will have reinforced, but not yet widened rocker arms.

Intake and outlet valves

To obtain better seating of the cone halves the shaft ends of the valves were given a special design (Fig. 5). The exhaust valves are hard faced at their seats and are not filled with sodium.

Because of the changed timing the valve springs have been given other characteristics. When assembling the outer valve spring make sure that the identification mark, a paint strip, shows downward.

The valve spring plates are reinforced at the cone half section for better support of the cone halves.

Valve shaft sealing

The valves are provided with the improved valve shaft sealing similar to model 230 SL. It consists of the Teflon sealing ring, clamping ring and sealing band, with different diameters for intake and exhaust valves.

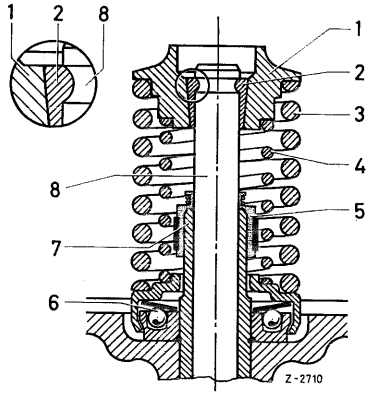


Fig. 5 Valve arrangement

1 Valve spring plate
2 Valve half
3 Outer valve spring
4 Inner valve spring
5 Teflon sealing ring with clamping ring and clamping band
6 Rotocap
7 Valve guide
8 Valve

Carburetor

Refer to page 13

Fuel pump

From now on the fuel pump has a shaped diaphragm, which is more durable. In addition, the upper and lower parts of the housing were widened at the sealing surfaces and the pump lever modified. Therefore, the former pump diaphragms and pump lever cannot be installed in the new fuel pump.

The new fuel pump can be identified by the inscription "DB 4" on the top part of the casing.

Generator

Refer to model 200 D.

Engine mounts

Model 200 uses new front and rear rubber mounts. When installing the rear rubber mount without stop, make sure that the pin (21) points in driving direction. The pin is required to keep the soft rubber mount from twisting when tightening hex bolt (22).

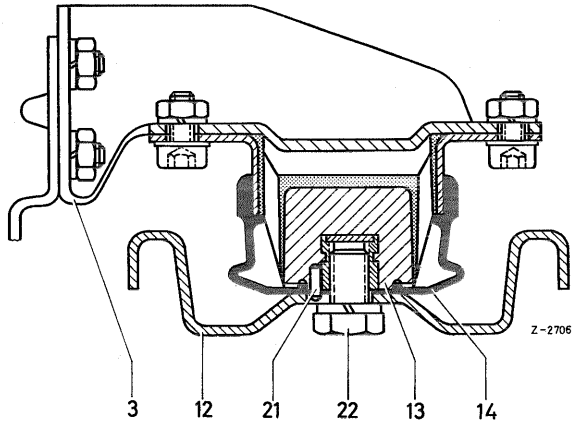


Fig. 6 Rear engine mount

3 Engine support
12 Support
13 Rubber mount
14 Bellows
21 Pin
22 Hex screw

c) Model 230

The engine of model 230 is a modification of the former 2.2 liter engine.

The enlarged bore provides 2.3 liter displacement for the engine. The changed cylinder head with its enlarged ducts, together with a new camshaft and a dual carburetor system (Solex 38 PDSI), results in the following values for output and torque:

105 HP	(DIN) at 5200 rpm
17.7 mkg	(DIN) at 3600 rpm

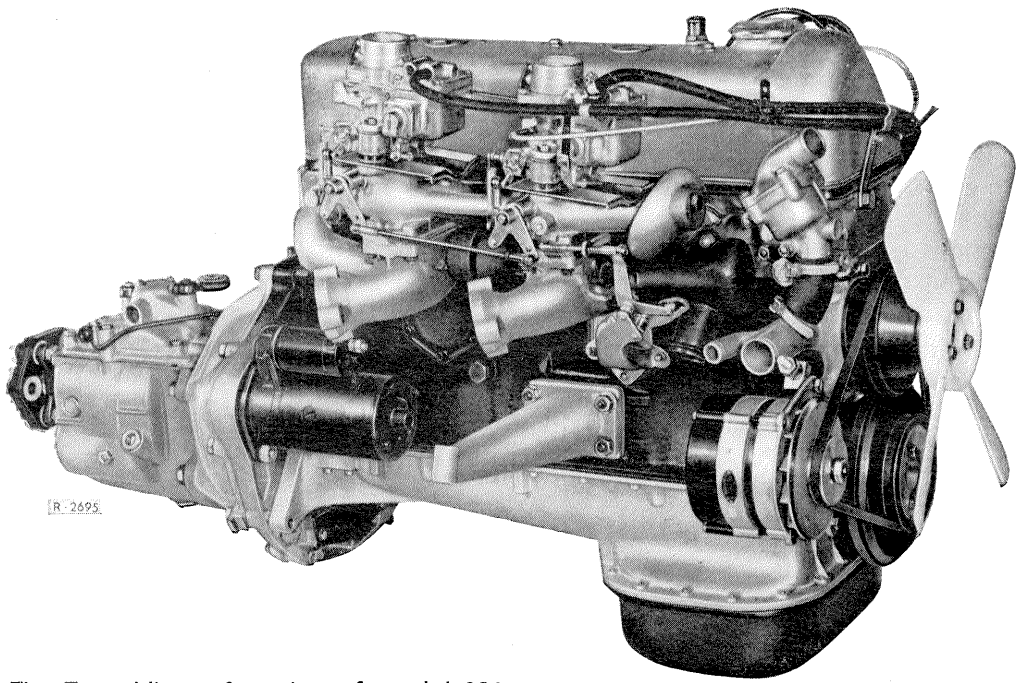


Fig. 7 View of engine of model 230

Cylinder crankcase

The cylinder bore in the crankcase has been increased by 2 mm to 82 mm. The crankcase is vented from cylinder head cover to intake pipe between air filter and carburetor. The oil dipstick has no vent filter.

Cylinder head

Smaller compression spaces provide a compression ratio of $\varepsilon = 9.0:1$. The water distributors were changed, the intake ducts and the valve seat rings are larger in dia. Intake valves have thrust rings recessed in cylinder head. Valve guides are shorter and differently shaped to match the new valve shaft seals (refer to model 200, fig. 5).

The larger cylinder bores also require a new cylinder head gasket, which is curved between the individual cylinders.

Crankshaft

The vibration damper has a larger OD and a different outer shape.

Connecting rod

The new connecting rod has been shortened to 125 mm. It is reinforced at the piston pin boss, the inner bore of the small end bushing is 25 mm. The connecting rod bolt has been reinforced from 10 to 11 mm.

Pistons

From the piston pin bore to the piston head the pistons are 10 mm higher than those of model 220 B, which compensates for the distance of the shorter connecting rod to the parting surface. The piston carries an oblong ring with inner taper, a tapered compression ring with inner taper and an oil wiper ring (tapered ring with spring). Piston pins are reinforced (25 mm OD).

Timing chain

Model 230 is equipped with a single roller chain. Consequently, the sprocket wheels are single-sprocket tooth types.

Camshaft

Cams have been given a different shape and have been made wider. The first cam is 16 mm wide, all the others 18 mm. From the outside, camshafts of model 230 are identified by the punched in numeral "86" at their face end.

Rocker arms

Refer to model 200.

Valves

The plate dia. of the intake and exhaust valves is larger. For better seating of the cone halves the valves have a special design at their shaft end (refer to model 200, fig. 5). Exhaust valves have hard-faced seats and **no** sodium filling.

In addition, the **exhaust valves** are equipped with service-free rotocaps. Instead of the rotocaps the intake valves are provided with a thrust ring under the valve springs.

Because of the changed timing periods the valve springs have been given different characteristics. When installing the outer valve spring make sure that the identification mark, a green paint mark, points downward.

The valve spring plates are reinforced at the cone half section for better support of the valves.

Valve shaft seals

Refer to model 200 (fig. 5).

Carburetor

Refer to page 17

Fuel pump

Refer to model 200

Fuel pump of model 230 can be identified by the inscription "DB 5".

Oil pump

The exit hole in the oil pump top which leads to the main oil duct has been enlarged by an oblong hole as a result of displacing the main oil duct in cylinder crankcase. The new oil pump with the oblong exit hole can be used for the former 220 models, and the former oil pump for model 230.

Generator

Refer to model 200 D.

Engine mounts

Similar to model 200, a new rubber mount is used for rear engine suspension.

In addition, an engine shock absorber is fitted to eliminate engine vibrations (see fig. 8).

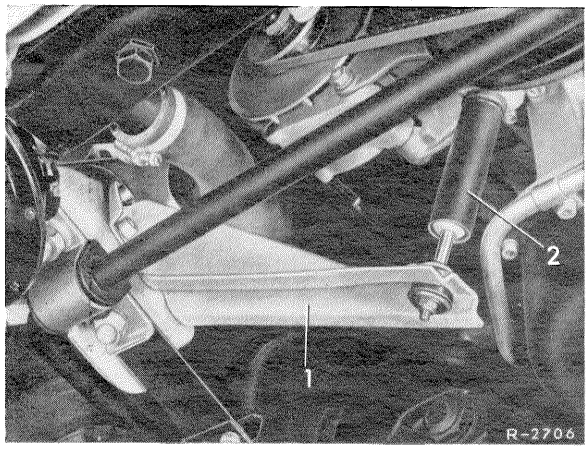


Fig. 8 Engine shock absorber

1 Bracket 2 Engine shock absorber

Engine installation instructions

Prior to dismounting the engine, remove gearbox and fan.

When installing the engine make sure that the radiator shell is properly adjusted since otherwise the engine may become overheated. The distance between fan blade and radiator shell circle should be at least 15 mm.

To remove exhaust manifold loosen hexagon screw of right-hand engine mounting and raise engine at the right.

d) Model 230 S

The engine of the new model 230 S is also a modification of the former 2.2 liter engine.

With a two-carburetor system (Zenith 35/40 INAT) the engine delivers the following output and torque:

120 HP	(DIN) at 5400 rpm
18.2 mkg	(DIN) at 4000 rpm

In its design and individual components the engine is very similar to that of model 230. Differences are as follows:

Valves

The exhaust valves have hard-faced seats and are filled **with** sodium.

Contrary to model 230 the **intake** valves are provided with service-free rotocaps. The exhaust valves have under the valve springs a thrust ring instead of the rotocaps.

Carburetor

Refer to page 17

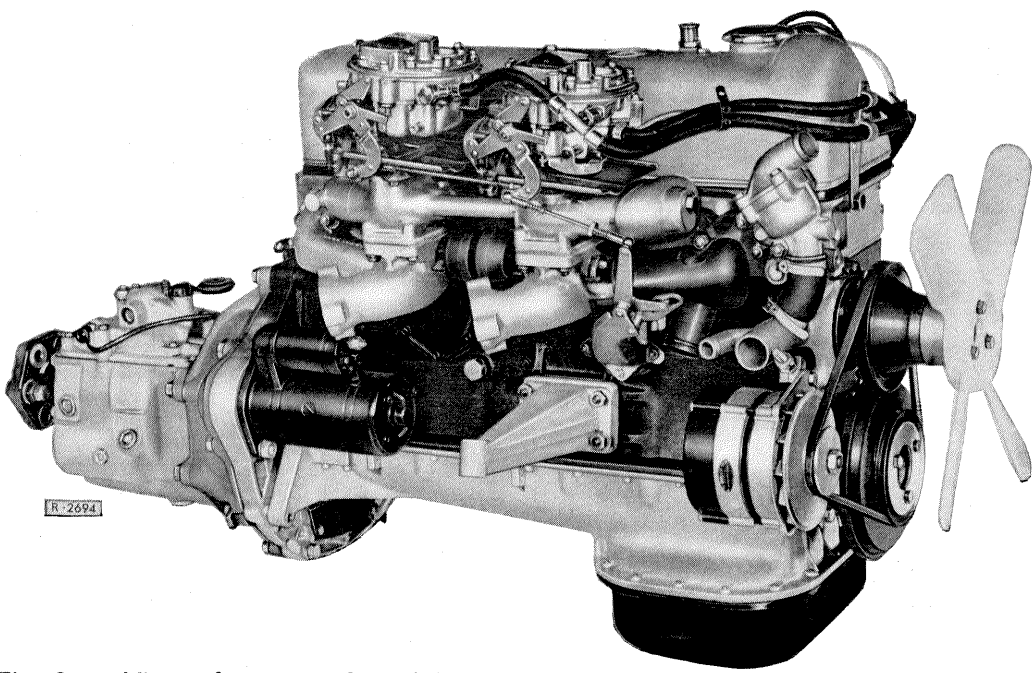


Fig. 9 View of engine of model 230 S

B. Carburetor

a) Model 200

The engine of model 200 is provided with two Solex downdraught carburetors 38 PDSI, which replace the carburetor Solex 34 PICB of model 190 C.

The new carburetor differs from the former mainly by a starting device with choke valve and a changed arrangement of the fuel outlet of the main gasification.

The function of the starting device, the main gasification, as well as the work required on the new carburetor system for repairs and service are as follows:

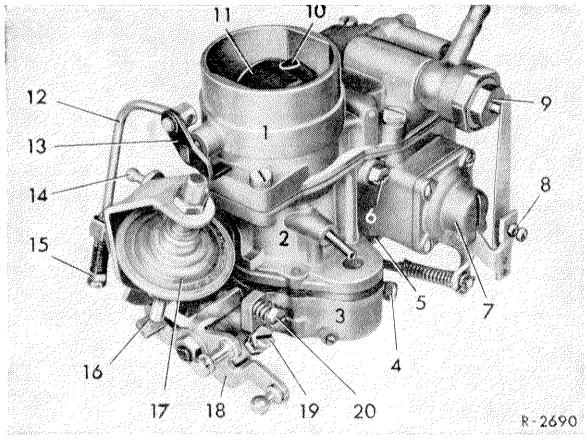


Fig. 10 Carburetor Solex 38 PDSI

1 Carburetor cap
2 Float housing
3 Throttle valve housing
4 Idling mixture regulating screw
5 Blind plug or, for model 230, enriching nozzle
6 Idling jet
7 Accelerating pump
8 Adjusting screw — fuel return valve
9 Fuel return valve
10 Vent pipe for float housing
11 Starter flap
12 Connecting rod
13 Lever
14 Starter lever
15 Flanged nut
16 Carrier lever
17 Closing damper
18 Throttle lever
19 Adjusting screw — starting device
20 Idling speed adjusting screw

Starting device

The starter flap in the air intake pipe of the carburetor is mechanically operated by the starter pull knob on the instrument panel via connecting rod (3) and the starter lever (4). Simultaneously, via starter lever (4) and carrier lever (8) the throttle flap will be slightly opened so that the vacuum created in the mixing chamber when the engine is started can become effective. (Fig. 11).

The starting flap is held closed only by compression spring (5) on connecting rod (4). When the engine is started, the vacuum can open the offcenter starter flap slightly against the spring pressure. During the starting operation the starter flap will open and close in a fast sequence (Fig. 11).

When the engine has fired open starter flap by partially sliding back the starter pull to the extent that the engine runs smoothly at increased idling speed. Upon reaching the operating temperature open starter flap completely (Push starter pull completely back).

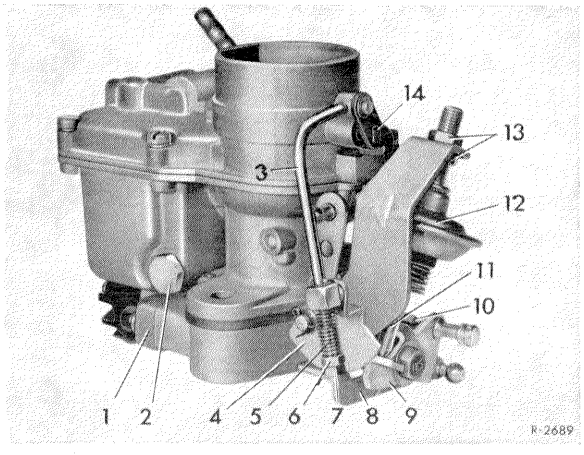


Fig. 11 Carburetor Solex 38 PDSI

1 Idling gas switch
2 Closing plug main jet
3 Connecting rod
4 Starter lever
5 Compression spring
6 Flanged nut
7 Hex nut
8 Carrier lever
9 Throttle lever
10 Adjusting screw
11 Pin
12 Closing damper
13 Hex nut
14 Starter flap shaft with lever

In the event of complaints about the starting device check the following:

1. Check starter flaps and connecting rods for easy operation.

2. Adjustment of starter connecting rod (9) Fig. 15.

Adjust connecting rod between carburetors to ensure that both starter flaps are in the same position. Adjust starter flap of rear carburetor that it barely opens. Next, adjust length of connecting rod until also the starter flap of the front carburetor barely opens.

3. Adjustment of starter pull

Fasten Bowden spiral of starter pull in a manner ensuring that it is flush with the sloping edge of Bowden cable holder (4). Next, push starter pull down, whereby a clearance of 1 mm between starter pull button and dashboard should be observed. Advance starter lever (8) as far as stop (6) on Bowden cable holder (4). In this position, fasten starter pull with setscrew (7) to the starter lever (see fig. 12).

Re-check for correct adjustment by fully drawing out starter pull and checking wheter both starter flaps are completely closed. Next, push starter pull completely down and check whether the starter flaps of both carburetors open up in a position, which should be accurately prependicular to the air intake pipe connection. Starter flap levers (1) should rest against the stop on carburetor covers (2), while connecting rods (3) should be biased to produce a toggle effect keeping linkage and starter flaps in alignment. Starter lever (8) need not necessearily rest against stop (6) o the Bowden cable holder.

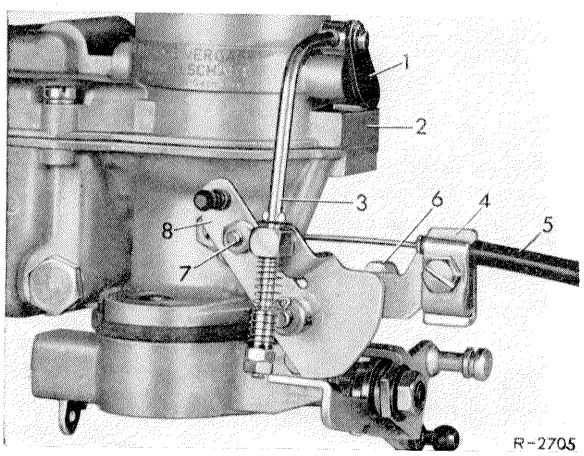


Fig. 12 Starting device

1 Starter flap
2 Stop on carburetor cover
3 Connecting rod
4 Bowden cable holder
5 Starter pull spiral
6 Stop
7 Setscrew
8 Starter lever

4. Adjustment of choke gap

Fully draw out starter pull. The starter flap should be completely closed. Push connecting rod (3) as far as stop of flanged nut (6) on starter lever (4). Measure choke valve gap between the smaller win of the starter flap, which opens upwards, and the wall of the air intake pipe connection. To measure, use round material of 9 mm dia., e. g. a twist drill. If gap is incorrect, loosen hex nut (7) and adjust flanged nut (6) correspondingly.

Turning the nut out gives a larger, and turning it in, a smaller gap (see fig. 11).

The choke valve gap of 9 mm is only an adjusting value for the compression spring. When the engine is started, the starter flap will "sniff" only slightly.

5. Adjustment of throttle valve

When after a cold start idling speed is too high or too low, check opening of throttle valve as follows:

Push starter pull completely down. Turn back idling speed adjusting screw until throttle valve is fully closed. Using a feeler gauge, measure clearance between starter lever (4)

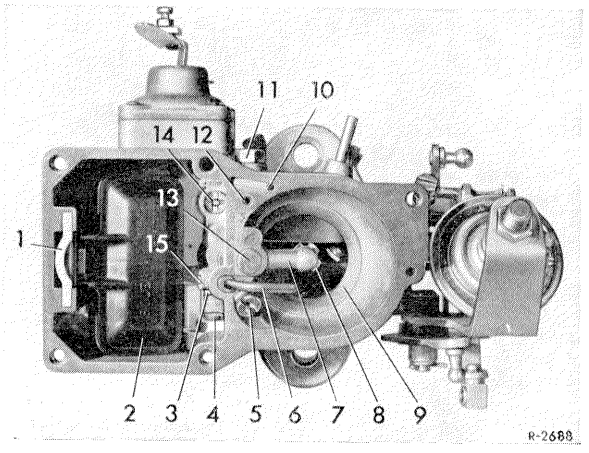


Fig. 13 Carburetor Solex 38 PDSI

1 Retainer
2 Float
3 Main nozzle
4 Screw plug
5 Air compensating nozzle
6 Injection pipe
7 Outlet arm
8 Bushing with mixture outlet hole
9 Venturi
10 Vacuum duct for full-load enrichment in type 230
11 Idling speed fuel nozzle
12 Idling speed air nozzle
13 Venting nozzle
14 Enrichment nozzle, in model 200 blind plug
15 Relief bore — model 200 only

and carrier lever (8). Clearance should be 0.1—0.2 mm. During measuring, care must be taken that throttle lever (9) is not lifted (see fig. 11).

Adjust clearance by turning adjusting screw (10). Turning the screw out gives a greater, and turning it in a smaller clearance and thus a higher engine speed (see fig. 11).

Main Gasification

The arrangement of the fuel outlet elements differs from the 190 C carburetor. The mixing pipe holder has been replaced by an outlet arm (7) cast into the carburetor housing. The fuel arrives from the float chamber through main nozzle (3) in the non-exchangeable mixing pipe located underneath venting nozzle.

Here, compensating air is added in the usual manner by air compensating nozzle (5). The venting nozzle (13) prevents any lifting suction at mixture outlet. A bushing with the mixture outlet holes (8) is pressed into outlet arm (fig. 13).

The float shaft is locked by retainer (1) made of ployamide. The retainer must be installed with the elbow pointing toward the housing wall. Wrong installation may result in overflowing of carburetor, since the float will then knock against retainer and the float needle valve will not close.

Main nozzle (3) is mounted in wall of housing without main nozzle holder. Unscrew carburetor cap to remove main nozzle. Remove closing screw (4) with a short screw driver and unscrew nozzle from outside (fig. 13).

Closing damper

Vehicles with automatic transmission have a built-in closing damper (12) which prevents the engine from stopping with a gear engaged when the vehicle comes to a sudden stop. The closing damper is adjusted with hex nuts (13) in such a manner that the pin will complete a strocke of 5—5.5 mm up to idling speed stop (fig. 11).

Fuel return valve

The function of the scavenging device for the prevention of gas bubbles at high outside temperatures is in principle the same as in the carburetor of model 190 C.

Allow engine to idle for a short time and stop. Tighten adjusting screw (12) until leaf spring (11) rests against valve bolt without tension (fig. 15).

Checking fuel level and injection volume

Fuel level is correctly adjusted by fitting a 1-mm sealing ring underneath the float needle valve. Measuring and adjustment of injection volume is the same as in the 190 C carburetor (for values, refer to table).

To measure injection volume, unscrew carburetor cover.

During the pump stroke, fuel will escape from bore (15) (see fig. 13). This relief bore in the pump duct prevents dribble of the injection pipe.

Injection should begin immediately upon opening of the throttle valve. The fuel jet should be directed parallel to the venturi axis and hit the gap at a 20° opening of the throttle valve (see fig. 14).

If the injection pipe is re-bent, care must be taken that the opened starter flap does not brush against pipe.

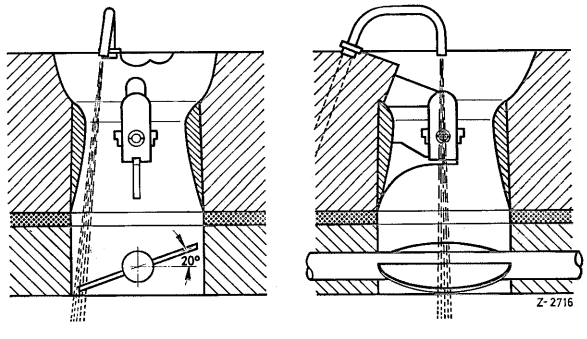


Fig. 14 Direction of fuel jet

Adjusting carburetor linkage

1. Disconnect thrust rods (1) and (15). Set connecting rod (1) to distance of the two bearing pins (3) and reconnect.

2. Disconnect thrust rods (4) on throttle lever of both carburetors. Check carburetor linkage and throttle flap shafts for easy running. Check full load stop. If throttle lever (5) rests against carburetor housing, the throttle flap must also be completely open.

3. Screw out idling speed adjusting screw (6) of both carburetors until throttle flap is completely closed. First, turn adjusting screw down until the throttle flap just begins to open. Then turn adjusting screw down half a turn.

4. Adjust thrust rods (4).

Place angle lever (2) on cast-on stop (13) against intake pipe and check whether throttle lever rests against idling speed adjusting screw. Adjust both thrust rods in such a manner that the ball sockets of the thrust rods fit into the ball rods of the throttle lever without tension.

Adjusting the idling speed

Adjustment of the idling speed is similar to model 220 B.

For synchronizing of the two carburetors use "Synchro" tester.

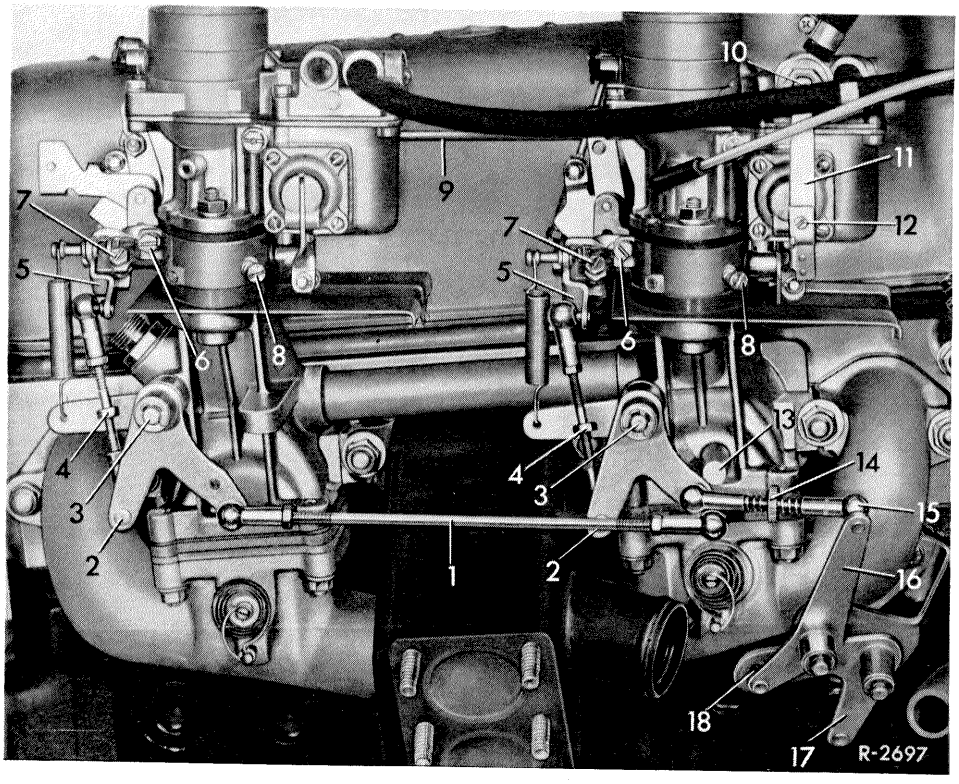


Fig. 15 Carburetor arrangement and linkage

1 Thrust rod
2 Angle lever
3 Bearing pin
4 Thrust rod
5 Throttle lever
6 Idling speed adjusting screw
7 Adjusting screw-carrier lever
8 Idling mixture control screw
9 Starter connecting rod
10 Fuel return valve
11 Leaf spring
12 Adjusting screw — fuel return valve
13 Stop — angle lever
14 Set collar
15 Thrust rod
16 Angle lever
17 Gate lever
18 Roller

Fault	Cause	Correction
Bad cold start	1. Starter flaps stick	Arrange for free movement of flaps
	2. Starter flaps do not close completely	Adjust starter pull
	3. Choke valve gap too large or too small	Adjust gap to correct width
Jerky running of engine during changeover	Fuel jet from injection pipe hits throttle valve or venturi wall	Bend injection pipe to ensure that fuel jet is parallel to venturi axis and hits gap at throttle valve opening 20°
	Incorrect injection volume	Adjust to correct volume
Idling speed too high or too low during cold start	Incorrect setting of throttle valve	Set throttle valve to correct position
Accelerator linkage sluggish, hard spot during acceleration	1. At front carburetor, the control rod of the accelerator pump runs up against the pump lever	Slightly bend control rod to correct position
	2. Idling speed gas switch sticks	Dismount switch and remedy trouble by re-filing
	3. Sluggish operation of ball sockets of control linkage	Replace ball sockets

b) Model 230

The carburetor of model 230 differs from that of model 200 by the nozzle arrangement and by the additional enrichment of the fuel-air mixture during full load.

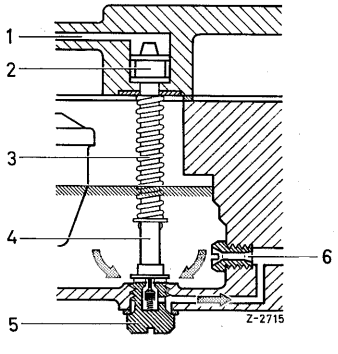


Fig. 16 Enrichment valve

1 Vacuum duct
2 Vacuum piston
3 Compression spring
4 Piston rod
5 Enrichment valve
6 Main nozzle

The intake pipe vacuum controls the full load enrichment. High underpressure raises vacuum piston (2) in carburetor cover against pressure of spring (3) and thereby closes the enrichment valve (6) in float housing.

When the underpressure drops to a certain value, spring (3) will push piston rod (4) against enrichment valve and will open valve. Fuel will then flow through a special duct behind main nozzle (5) into main gasification system.

The control linkage is adjusted similar to model 200 except for the angle lever stop. Similar to model 220 B, the intake pipe has an adjusting bolt with a head of 16 mm dia. serving as a stop for the angle lever.

c) Model 230 S

The engine of model 230 S is provided with 2 Zenith two-phase down-draught carburetors 35/40 INAT. The difference as compared

with the carburetors of model 220 SB is their nozzle equipment, the positive return of the second stage throttle flap, as well as the adjustment of idling speed and the float housing vent valve.

Adjustment of idling speed

The idling speed is no longer adjusted by means of the usual idling speed adjusting screw, but with knurled head screw (8) of plastic connecting rod (7).

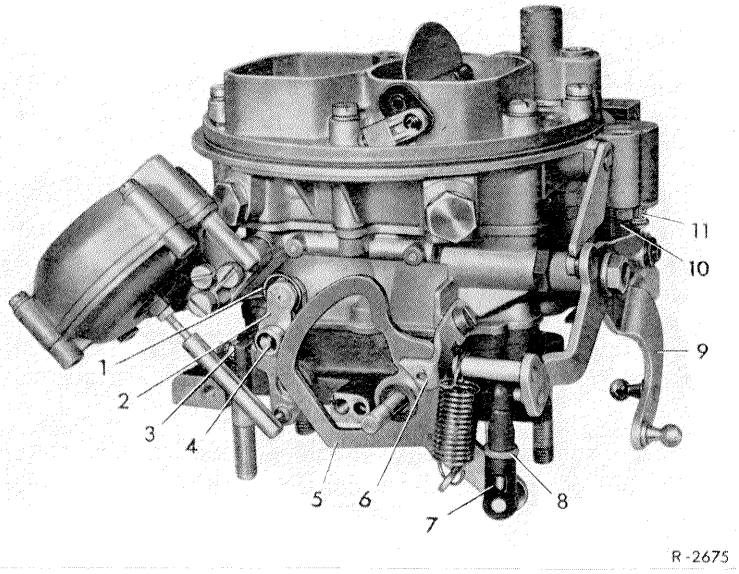


Fig. 17

Carburetor Zenith 35/40 INAT

1 Torsion spring
2 Throttle lever 2nd stage
3 Adjusting screw
4 Roller
5 Throttle lever 1st stage with cam surface
6 Holder
7 Plastic connecting rod
8 Adjusting screw (knurled type)
9 Guiding lever
10 Adjusting screw-vent valve
11 Float housing vent valve

Positive return of second stage

The throttle flap of the second stage no longer opens and closes by means of a gate, but by means of a cam surface on throttle lever (5) of the first stage. The new cam controls guarantee perfect closing of the 2nd stage throttle valve.

In addition, the carburetor is provided with a stop for the 2nd stage throttle lever, so that the closed throttle valve can no longer stick in housing. The stop has been set by the manufacturer at the adjusting screw in such a manner that there will be a small, air flow through the 2nd stage, which is uniform in all carburetors.

Never change the setting of the adjusting screw (3).

For basic adjustment of the 1st stage throttle valve turn knurled head screw (8) until guide lever (9) just begins to lift off from stop screw (10). In this position the throttle valve is completely closed. Turn knurled head screw back by half a turn. Idling speed adjustment then continues similar to model 220 SB.

Caution: If a connecting rod of model 220 SB should be installed between the carburetors, make sure that the hexagon does not get stuck against throttle lever of front carburetor.

Float housing — vent valve

The vent valve has been set by the manufacturer. The adjusting screw, locked by hexagon nut (10), is simultaneously the idling speed stop for the first stage throttle flap **and should never be readjusted.**

C. Clutch

a) Models 200 D and 200

Models 200 D and 200 are provided with the same clutch parts (clutch thrust plate, clutch drive plate, clutch throwout bearing) as models 190 DC and 190 C.

with the carburetors of model 220 SB is their nozzle equipment, the positive return of the second stage throttle flap, as well as the adjustment of idling speed and the float housing vent valve.

Adjustment of idling speed

The idling speed is no longer adjusted by means of the usual idling speed adjusting screw, but with knurled head screw (8) of plastic connecting rod (7).

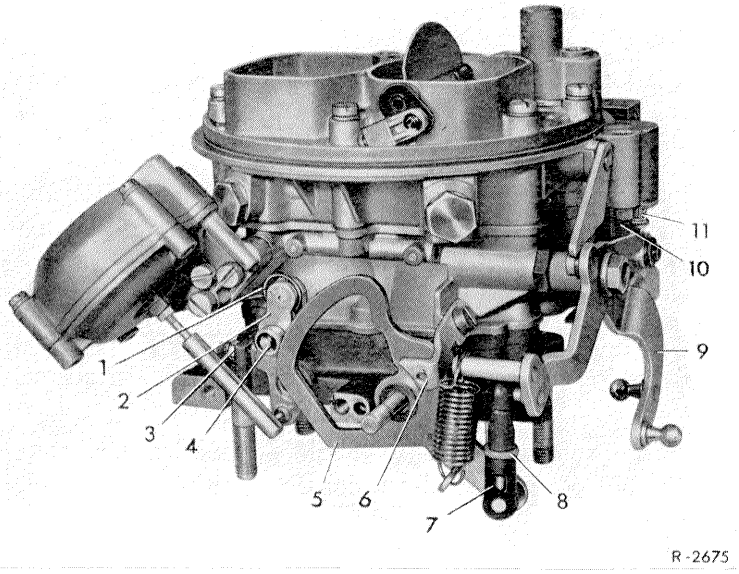


Fig. 17

Carburetor Zenith 35/40 INAT

1 Torsion spring
2 Throttle lever 2nd stage
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5 Throttle lever 1st stage with cam surface
6 Holder
7 Plastic connecting rod
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10 Adjusting screw-vent valve
11 Float housing vent valve

Positive return of second stage

The throttle flap of the second stage no longer opens and closes by means of a gate, but by means of a cam surface on throttle lever (5) of the first stage. The new cam controls guarantee perfect closing of the 2nd stage throttle valve.

In addition, the carburetor is provided with a stop for the 2nd stage throttle lever, so that the closed throttle valve can no longer stick in housing. The stop has been set by the manufacturer at the adjusting screw in such a manner that there will be a small, air flow through the 2nd stage, which is uniform in all carburetors.

Never change the setting of the adjusting screw (3).

For basic adjustment of the 1st stage throttle valve turn knurled head screw (8) until guide lever (9) just begins to lift off from stop screw (10). In this position the throttle valve is completely closed. Turn knurled head screw back by half a turn. Idling speed adjustment then continues similar to model 220 SB.

Caution: If a connecting rod of model 220 SB should be installed between the carburetors, make sure that the hexagon does not get stuck against throttle lever of front carburetor.

Float housing — vent valve

The vent valve has been set by the manufacturer. The adjusting screw, locked by hexagon nut (10), is simultaneously the idling speed stop for the first stage throttle flap **and should never be readjusted.**

C. Clutch

a) Models 200 D and 200

Models 200 D and 200 are provided with the same clutch parts (clutch thrust plate, clutch drive plate, clutch throwout bearing) as models 190 DC and 190 C.

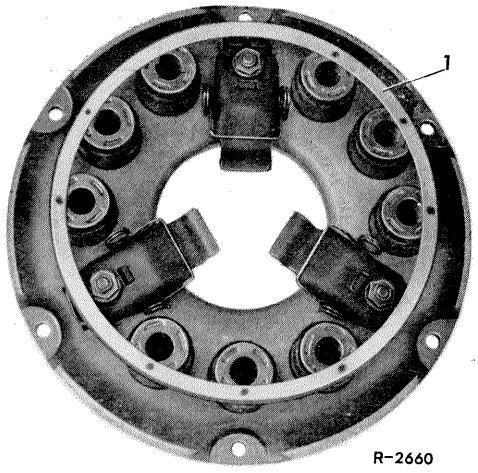

Fig. 18 Clutch thrust plate

1 Sheet metal ring

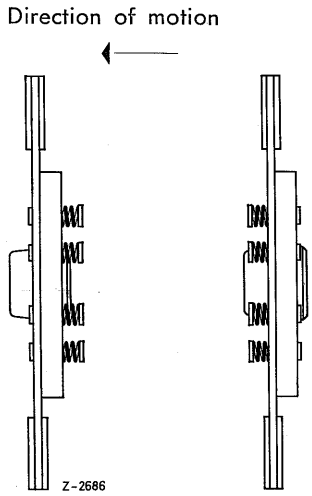

Fig. 19 Drive plate

b) Models 230 and 230 S

Models 230 and 230 S are provided with thrust plate type TK 288 KX which maintains a more uniform speed. This thrust plate has been standard equipment for model 230 SL since January 1965. It differs from the former thrust plates of type TK 288 KX sheet metal ring (1) placed on the spring sockets (refer to Fig. 18).

The drive plate is also the same for both models. The 6 compression springs of the friction damper are now on the flywheel face of the drive plate (refer to Fig. 14). Watch out during repairs!

To avoid faulty mounting the clutch side of the new drive plate is inscribed "Kupplungsseite" (clutch side).

The throwout bearing has also been taken from the 220 models without a change.

D. Gearbox (Transmission)

Mechanical gearbox

The gearboxes for models 200 D, 200, 230 and 230 S were taken from the previous models without a change.

Accordingly, models 200 D, 200 and 230 have "normal toothing", model 230 S has "high toothing".
Optionally, all models can be supplied with stickshift.

When setting the additional lever on range selector lever be sure that the adjusting mark at the upper oblong hole is aligned with the center line of the range selector lever.

The combination starter lock-reversing light switch is used not only for vehicles with stickshift, but also for righthand steering vehicles with steering column shift. The transmissions for models 200 D and 200 are similar to those of models 190 DC or 190 C, but the hydraulic clutch is now attached to the flywheel by means of six bolts and has Part No. 111 250 15 02.

Automatic DB transmission

Models 200 D, 200, 230 and 230 S are optionally available with the automatic DB transmission, either with steering column shift or stickshift. The stickshift is adjusted similar to model 230 SL.

The transmissions and the hydraulic clutches for models 230 and 230 S are similar to those of the former 220 models. Model 230 is not fitted with an oil cooler; Part No. is 110 270 20 01.

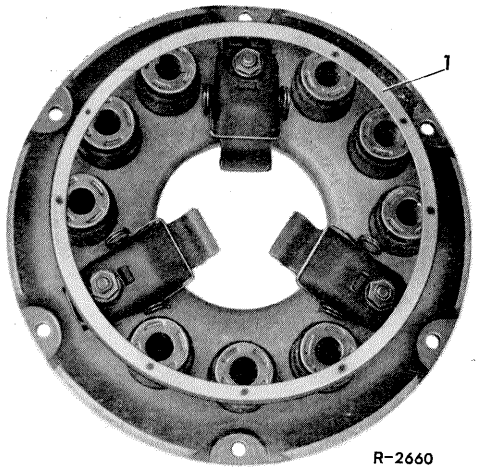

Fig. 18 Clutch thrust plate

1 Sheet metal ring

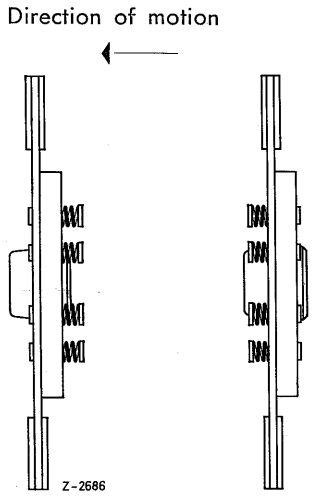

Fig. 19 Drive plate

b) Models 230 and 230 S

Models 230 and 230 S are provided with thrust plate type TK 288 KX which maintains a more uniform speed. This thrust plate has been standard equipment for model 230 SL since January 1965. It differs from the former thrust plates of type TK 288 KX sheet metal ring (1) placed on the spring sockets (refer to Fig. 18).

The drive plate is also the same for both models. The 6 compression springs of the friction damper are now on the flywheel face of the drive plate (refer to Fig. 14). Watch out during repairs!

To avoid faulty mounting the clutch side of the new drive plate is inscribed "Kupplungsseite" (clutch side).

The throwout bearing has also been taken from the 220 models without a change.

D. Gearbox (Transmission)

Mechanical gearbox

The gearboxes for models 200 D, 200, 230 and 230 S were taken from the previous models without a change.

Accordingly, models 200 D, 200 and 230 have "normal toothing", model 230 S has "high toothing".
Optionally, all models can be supplied with stickshift.

When setting the additional lever on range selector lever be sure that the adjusting mark at the upper oblong hole is aligned with the center line of the range selector lever.

The combination starter lock-reversing light switch is used not only for vehicles with stickshift, but also for righthand steering vehicles with steering column shift. The transmissions for models 200 D and 200 are similar to those of models 190 DC or 190 C, but the hydraulic clutch is now attached to the flywheel by means of six bolts and has Part No. 111 250 15 02.

Automatic DB transmission

Models 200 D, 200, 230 and 230 S are optionally available with the automatic DB transmission, either with steering column shift or stickshift. The stickshift is adjusted similar to model 230 SL.

The transmissions and the hydraulic clutches for models 230 and 230 S are similar to those of the former 220 models. Model 230 is not fitted with an oil cooler; Part No. is 110 270 20 01.

E. Pedal Linkage

Pedal linkage of models 200 D, 200, 230, and 230 S is the same as in the previous types.

Models 200 D, 200, 230, and 230 S with right hand drive are fitted with a joint equalizing tank for the braking system and the hydraulic clutch operation.

For this reason, the equalizing tank on the tandem master cylinder of the braking system is fitted with a pipe connection at its face end, through which the brake fluid is conducted to the transmitting cylinder via a connection hose and a pipe.

The pipe connection is fitted to the equalizing tank in a manner ensuring that in the event of leakage of fluid by hydraulic clutch operation, the remaining fluid level is sufficiently high to ensure acceptable functioning of the brakes. Service is simplified by the joint equalizing tank, since inspections include only one tank for control of fluid level and topping up.

In vehicles equipped with this type of tank the braking system may not be vented with the aid of a venting device while the speed transmission gear is dismounted, as this would force the piston out of the receiving cylinder of the clutch (refer also to section "Brakes").

F. Springs and Shock absorbers

The hydropneumatic compensating spring (made by Boge) which keeps the rear of the vehicle up under high loads by automatically regulating the level of the rear axle during the driving, is known. This new unit is now standard equipment on model 230 S, as well as on the station wagons and ambulance vehicles of models 200 D, 200, and 230. For models 200 D, 200, and 230 the hydropneumatic compensating spring will probably be optionally available as form the beginning of 1966.

The hydropneumatic compensating spring is particularly suited for customers who are often driving with considerable luggage or with trailers. In contrast to the supplementary compensating air spring which is attached at the rear axle parallel to the compensating spring, the hydropneumatic compensating spring takes the place of the steel compensating spring.

The hydropneumatic compensating spring will automatically return any rear end of a vehicle, which has come down by excessive rear axle loads, approximately back to its normal level while underway. The result is a substantially constant camber of the rear wheels while carrying varying loads.

Mercedes-Benz Service Information No. 25 of April 1965 contain a full description, while checking and adjusting work required is outlined in Mercedes-Benz Service Information No. 38 of June 1965. (Group 32).

Models 200 D, 200, and 230 have the steel compensating spring as standard equipment.

As shown by the Table for spring combinations below, the springs remain unchanged.

For standard suspension and for harder settings the shock absorbers have been set to higher pressures than before.

In future, only shock absorbers with the new adjustment will be supplied, including cases of free replacement. In repair work, this type can be readily interchanged individually and used in conjunction with previous types.

For station wagons and ambulance vehicles, the rear springs now have the characteristics of the suspensions used for ambulances up to now.

E. Pedal Linkage

Pedal linkage of models 200 D, 200, 230, and 230 S is the same as in the previous types.

Models 200 D, 200, 230, and 230 S with right hand drive are fitted with a joint equalizing tank for the braking system and the hydraulic clutch operation.

For this reason, the equalizing tank on the tandem master cylinder of the braking system is fitted with a pipe connection at its face end, through which the brake fluid is conducted to the transmitting cylinder via a connection hose and a pipe.

The pipe connection is fitted to the equalizing tank in a manner ensuring that in the event of leakage of fluid by hydraulic clutch operation, the remaining fluid level is sufficiently high to ensure acceptable functioning of the brakes. Service is simplified by the joint equalizing tank, since inspections include only one tank for control of fluid level and topping up.

In vehicles equipped with this type of tank the braking system may not be vented with the aid of a venting device while the speed transmission gear is dismounted, as this would force the piston out of the receiving cylinder of the clutch (refer also to section "Brakes").

F. Springs and Shock absorbers

The hydropneumatic compensating spring (made by Boge) which keeps the rear of the vehicle up under high loads by automatically regulating the level of the rear axle during the driving, is known. This new unit is now standard equipment on model 230 S, as well as on the station wagons and ambulance vehicles of models 200 D, 200, and 230. For models 200 D, 200, and 230 the hydropneumatic compensating spring will probably be optionally available as form the beginning of 1966.

The hydropneumatic compensating spring is particularly suited for customers who are often driving with considerable luggage or with trailers. In contrast to the supplementary compensating air spring which is attached at the rear axle parallel to the compensating spring, the hydropneumatic compensating spring takes the place of the steel compensating spring.

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Mercedes-Benz Service Information No. 25 of April 1965 contain a full description, while checking and adjusting work required is outlined in Mercedes-Benz Service Information No. 38 of June 1965. (Group 32).

Models 200 D, 200, and 230 have the steel compensating spring as standard equipment.

As shown by the Table for spring combinations below, the springs remain unchanged.

For standard suspension and for harder settings the shock absorbers have been set to higher pressures than before.

In future, only shock absorbers with the new adjustment will be supplied, including cases of free replacement. In repair work, this type can be readily interchanged individually and used in conjunction with previous types.

For station wagons and ambulance vehicles, the rear springs now have the characteristics of the suspensions used for ambulances up to now.

Combinations Front Springs — Rear Springs — Compensating Spring — Shock Absorber

Model	Front Spring Part No.	Pertinent Front Shock Absorber Designation Part No.	Rear Spring Part No.	Compensating Spring Part No.	Pertinent Rear Shock Absorber Designation Part No.
Standard Suspensions					
200	**110 321 08 04**	Bilstein Type B 36 **111 323 19 00**	**110 324 30 04**	**110 329 04 01** or **111 320 01 99**[1])	Bilstein Type B 46 **111 326 03 00**
200 D	**111 321 15 04**				
230					
230 S				**111 320 01 99**[1])	
Special Designs: harder springing for bad road conditions					
200	**110 321 10 04**	Bilstein Type B 36 **111 323 18 00**	**110 324 12 04**	**110 329 05 01** or **111 320 02 99**[1])	Bilstein Type B 46 **111 326 02 00**
200 D	**110 321 09 04**				
230					
230 S				**111 320 02 99**[1])	
Special Designs: harder springing for police radio cars and special purposes					
200	**110 321 10 04**	Bilstein Type B 36 **111 323 18 00**	**110 324 12 04**	**111 320 01 99**[1])	Bilstein Type B 46 **111 326 02 00**
200 D	**110 321 09 04**				
230					
230 S					
Suspensions for Station Wagons					
200	**110 321 10 04**	Bilstein Type B 36 **111 323 18 00**	**110 324 32 04**	**111 320 04 99**[1])	Bilstein Type B 46 **110 326 14 00**
200 D	**110 321 09 04**				
230					
230 S					
Suspensions for Ambulances					
200	**110 321 10 04**	Bilstein Type B 36 **111 323 18 00**	**110 324 32 04**	**111 320 04 99**[1])	Bilstein Type B 46 **110 326 14 00**
200 D	**110 321 09 04**				
230					
230 S					

[1]) Hydropneumatic Compensating Spring

Shock Absorbers

Models 200, 200 D, 230, 230 S

Test Ratings

Shock Absorbers Part. No.	Color Designation	Test Ratings at 100 mm deflection and 100 rpm of Testing Machine			
		Ratings for new Shock Absorbers		Minimum ratings for used Shock Absorbers	
		Tension kg	Compression kg	Tension kg	Compression kg
Front Shock Absorber					
111 323 19 00	1 longitudinal line, green	130 ± 10	55 ± 5	105	40
111 323 18 00	2 longitudinal lines, green	186 ± 14	55 ± 5	150	40
Rear Shock Absorber					
111 326 03 00	1 longitudinal line, green	160 ± 12	70 ± 7	130	50
111 326 02 00	2 longitudinal lines, green	212 ± 15	65 ± 6	170	45
110 326 14 00	3 longitudinal lines, red				

Checking the Oil Reserve

Shock Absorber Part. No.	Color Designation	Length (Shock-Absorber compressed)	Pison Rod Exit	
			Rating for new Shock Absorber mm	Max. Rating mm
Front Shock Absorber				
111 323 19 00	1 longitudinal line, green	340 ± 2	5 ± 2	35
111 323 18 00	2 longitudinal lines, green			
Rear Shock Absorber				
111 326 03 00	1 longitudinal line, green	335 ± 2	5 ± 2	30
111 326 02 00	2 longitudinal lines, green			
111 326 14 00	3 longitudinal lines, red	264 ± 2	0 + 2	10

Torsion bar at front axle

Model	Torsion bar Part No.	Diameter mm	Torsion bar seating Rubber mount Part. No.	Diameter of bore	Rubber hardness ° Shore
200 200 D	110 323 03 65	19.5	110 323 04 85	18—0.5	60 ± 5
230 230 S	111 323 14 65	21.5	111 323 09 85	20—0.5	
200, 200 D 230, 230 S Station wagons and ambulances	109 323 03 65	23.5	112 323 02 85	22—0.5	

Hydropneumatic compensating spring

Hydropneumatic compensating spring				Left ball joint included in equipment		
Total scope of delivery Part No.	Part No. without ball joints	Gas filling pressure atm.	Color marking	Part No.	Length [1] mm	Marking [2]
111 320 01 99	000 320 00 13	60	none	000 329 01 30	60.5	none
111 320 02 99				000 329 02 30	66.5	red dot
111 320 04 99	000 320 04 13	75	1 green longitudinal line			

[1] From mounting surface to front edge of threaded segment.
[2] On face of threaded segment.

G. Front Axle

For models 200 D and 200 the front axles were not changed as compared with models 190 DC and 190 C.

The front axle of models 230 and 230 S is the same as of models 220 B and 220 SB.

Suspension of Front Axle

The suspension of the front axles for models 200 D, 200, and 230 is the same as for the two former models 190 DC and 190 C. For model 230 S the suspension is the same as for model 220 SB.

Longitudinal Support of Front Axle

As a result of the standardization of the caster adjusting values introduced now, where a difference exists only between vehicles without and with power steering, the following components for longitudinal support of the front axle apply:

Model	Rubber Support Part No.	Eccentricity of bore, mm	Leaf Spring Part No.	Length mm
Vehicles without Power Steering				
200	110 322 1585	1.5	111 331 11 12	248 ± 0.5
200 D				
230				
230 S			112 331 00 12	243 ± 0.5
Vehicles with Power Steering				
200	112 322 03 85	4.5	111 331 11 12	248 ± 0.5
200 D				
230				
230 S			112 331 00 12	243 ± 0.5

Hydropneumatic compensating spring

Hydropneumatic compensating spring				Left ball joint included in equipment		
Total scope of delivery Part No.	Part No. without ball joints	Gas filling pressure atm.	Color marking	Part No.	Length [1] mm	Marking [2]
111 320 01 99	000 320 00 13	60	none	000 329 01 30	60.5	none
111 320 02 99				000 329 02 30	66.5	red dot
111 320 04 99	000 320 04 13	75	1 green longitudinal line			

[1] From mounting surface to front edge of threaded segment.
[2] On face of threaded segment.

G. Front Axle

For models 200 D and 200 the front axles were not changed as compared with models 190 DC and 190 C.

The front axle of models 230 and 230 S is the same as of models 220 B and 220 SB.

Suspension of Front Axle

The suspension of the front axles for models 200 D, 200, and 230 is the same as for the two former models 190 DC and 190 C. For model 230 S the suspension is the same as for model 220 SB.

Longitudinal Support of Front Axle

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Model	Rubber Support Part No.	Eccentricity of bore, mm	Leaf Spring Part No.	Length mm
Vehicles without Power Steering				
200	110 322 1585	1.5	111 331 11 12	248 ± 0.5
200 D				
230				
230 S			112 331 00 12	243 ± 0.5
Vehicles with Power Steering				
200	112 322 03 85	4.5	111 331 11 12	248 ± 0.5
200 D				
230				
230 S			112 331 00 12	243 ± 0.5

H. Rear Axle

Vehicles of models 200 D, 200, 230, and 230 S have kept the rear axles of their predecessors with the following reduction ratios:

Model	Reduction Ratio	Remarks
200	4.08	Standard
200 D	3.92	Standard
	4.08	Vehicles to the USA
		Station Wagons and Ambulances
		Vehicles with 15" Wheels
230 230 S	4.08	Standard

I. Wheels and Tires

Disk Wheels

For models 200 D, 200, 230, and 230 S disk wheels 5 J K × 13 B (Part Nr. 110 400 11 02) will be continued.

For the special models with 15" wheels for bad road conditions, as well as for station wagons and ambulance vehicles the former disk wheel 5 J × 15 B will be replaced by the wider disk wheel 5 1/2 J × 15 H.

Tires

Model 200 D is tubeless with standard tires 7.00-13, and also tubeless with sports tires 7.00 S-13 PR.

For approved standard tires: refer to Model 190 DC.
For approved sports tires: refer to Model 200.

Model 200 is given sports tires 7.00 S-13 PR, tubeless.

Tires approved up to now:

Continental	Firestone
Dunlop	(Swiss make)
Englebert	Fulda
Firestone-Phoenix	Good Year

Model 230 is given sports tires 7.00 S- 13 tubeless.

Approved tires: refer to model 200, except Good Year.

Model 230 S, just like model 220 SB, is given Nylon sports tires 7.25 S-13 PR, tubeless.

Radial tires, Michelin-X, are optional equipment.

Approved tires: refer to model 220 SB.

Note: Michelin-X tires, size 7.25-13, can be subsequently installed also on types 200 D, 200, and 230.

H. Rear Axle

Vehicles of models 200 D, 200, 230, and 230 S have kept the rear axles of their predecessors with the following reduction ratios:

Model	Reduction Ratio	Remarks
200	4.08	Standard
200 D	3.92	Standard
	4.08	Vehicles to the USA
		Station Wagons and Ambulances
		Vehicles with 15" Wheels
230 230 S	4.08	Standard

I. Wheels and Tires

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For models 200 D, 200, 230, and 230 S disk wheels 5 J K × 13 B (Part Nr. 110 400 11 02) will be continued.

For the special models with 15" wheels for bad road conditions, as well as for station wagons and ambulance vehicles the former disk wheel 5 J × 15 B will be replaced by the wider disk wheel 5 1/2 J × 15 H.

Tires

Model 200 D is tubeless with standard tires 7.00-13, and also tubeless with sports tires 7.00 S-13 PR.

For approved standard tires: refer to Model 190 DC.
For approved sports tires: refer to Model 200.

Model 200 is given sports tires 7.00 S-13 PR, tubeless.

Tires approved up to now:

Continental	Firestone
Dunlop	(Swiss make)
Englebert	Fulda
Firestone-Phoenix	Good Year

Model 230 is given sports tires 7.00 S- 13 tubeless.

Approved tires: refer to model 200, except Good Year.

Model 230 S, just like model 220 SB, is given Nylon sports tires 7.25 S-13 PR, tubeless.

Radial tires, Michelin-X, are optional equipment.

Approved tires: refer to model 220 SB.

Note: Michelin-X tires, size 7.25-13, can be subsequently installed also on types 200 D, 200, and 230.

Specified tire pressures in atm. (1 atm = 14.2 psi)

Model	Vehicle load		Standard operation (e. g. city and moderate highway driving)				Fast driving (e. g. fast highway driving or speeding on expressways)			
	Trunk space kg	Persons	cold front	cold rear	warm front	warm rear	cold front	cold rear	warm front	warm rear
Tires with standard treads										
200 D	Light, under 40	1—4 / 5—6	1.5	1.9	1.7	2.2	1.5	1.9	1.9	2.3
	Heavy, above 40	1—6	1.7	2.1	1.9	2.4	1.7	2.1	2.1	2.5
200 230	Light, under 40	1—4 / 5—6	1.5	1.8	1.7	2.1	1.7	2.0	2.1	2.4
	Heavy, above 40	1—6	1.7	2.1	1.9	2.4	1.9	2.3	2.3	2.7
230 S	Light, under 40	1—4 / 5—6	1.6	1.8	1.8	2.1	1.8	2.0	1.9	2.2
	Heavy, above 40	1—6	1.6	2.1	1.9	2.4	1.8	2.3	2.2	2.7
Winter tires										
200 D 200 230 230 S	—	—	1.7	2.2	1.9	2.4	1.7	2.2	2.0	2.5

Special vehicles

Models 200 D, 200, 230, 230 S.

For station wagons, tires Continental Super-Record-Nylon 7.00 H 15 L have been approved.

All ambulances are equipped with Michelin radial tires 185—15 X.

Tire pressures

Station wagons

Tire pressures							
cold				warm			
front	rear at a rear axle load up to approx.			front	rear at a rear axle load up to approx.		
	1,100 kg	1,200 kg	1,300 kg		1,100 kg	1,200 kg	1,300 kg
2.0	2.25	2.75	3.25	2.2	2.5	3.0	3.5

Ambulances

Tire pressures			
cold		warm[1]	
front	rear	front	rear
2.1	2.6	2.3	2.8

Winter tires

2.0	2.8	2.2	3.0

[1] Tire pressure after fast highway driving and long-distance cruising: front 2.5, rear 3.0 atm.

Minimum spare tire pressure should be equal maximum pressure of cold rear tires.

Wheel adjustment

Wheel adjustment values, as well as correct levels for individual models are quoted in the tables below.

Wheel adjustment values

(Valid for vehicle under test load, ready to move)

Model	200 200 D[1]) 230	230 S[1])
Front wheel camber Vehicle ready to move	+ 0° 30' — 20'	
under test load	+ 0° 20' — 20'	
Toe-in (vehicle rolling)	2 ± 1 mm or 0° 20' ± 10' [2])	
Angle of track difference at an inner wheel steering angle of 20°	approx — 1°	approx — 0° 30'
Caster without power steering	3° 30' ± 15'	
with power steering	4° ± 15'	
King-pin inclination	5° 30' ± 10'	
Wishbone position of front axle (difference in height "a" between inner and outer bearing bolt of lower wishbone	See table "Values relating to vehicle level"	
Permissible tolerance between left and right wishbone position	5 mm $^{+1}_{-3}$	
Ball seat (as checked with testing device No. 111 589 12 21 00)	5,0 3 + 1 — 3	
Permissible deviation in height of ball seat from steering-gear arm to intermediate steering lever	2 mm	
Permissible difference between left and right axle base front axle	5 mm	
rear axle	3 mm	
Rear wheel camber	See table "Values relating to vehicle level"	
Permissible toe-in (+) or toe-out (—) of rear wheels	± 2 mm or ± 0° 20'	
Distance between center of rotation of rear axle tubes and center of vehicle	36 mm	
Permissible deviation of rear axle from center position	2 mm	
Permissible difference between left and right wheelbase	8 mm	

[1]) Ajustment values quoted above are also valid for station wagons and ambulances.
[2]) Target value of toe-in is 0° 20'.

Vehicle levels

Front axle

Model	Wishbone position			
	standard suspension		harder suspension for bad roads, as well as station wagons and ambulances	
	ready to move	under test load[1])	ready to move	under test load[1])
200 200 D 230 230 S	93 ± 15	57 ± 15	97 ± 10	70 ± 10
Station wagons and ambulances 200 200 D 230 230 S	—	—		

[1]) Test load: vehicle ready to move plus 3 × 65 kg
Load distribution: 2 × 65 kg on front seats
1 × 65 kg on rear bench

Rear axle

Model	Wishbone position			
	standard suspension		harder suspension for bad roads, as well as station wagons and ambulances	
	ready to move	under test load[1])	ready to move	under test load[1])
Steel compensating spring				
200 200 D 230	+ 1° 30' ± 30'	— 0° 45' ± 30°	+ 2° 15' ± 30'	+ 0° 30' ± 30'
Hydro-pneumatic compensating spring				
200 200 D 230	+ 0° 30' ± 1°	+ 0° 45' ± 1°	+ 1° ± 1°	+ 0° 30' ± 1°
230 S	0° ± 1°		+ 0° 45' ± 1°	
Station Wagons and ambulances 200 200 D 230 230 S	—	—	+ 0° 30' ± 1°	

[1]) Test load = vehicle ready to move plus 3 × 65 kg
Load distribution: 2 × 65 kg on front ceats
2 × 65 kg on rear bench

K. Drive shaft

Model 200, as well as ambulance models 200 D and 230 with long wheelbase are equipped with a three-part drive shaft comprising front, intermediate and rear section, which is fitted to the floor drame by two intermediaste bearings. Both ends of the intermediate shaft carry a key section with clamping connection. By loosening the latter, overall length of the shaft can be changed to suit it to tolerances in body dimensions. When tightening the lock nuts, care must be taken that the intermediate shaft does not run up against the ends of the front and rear shafts.

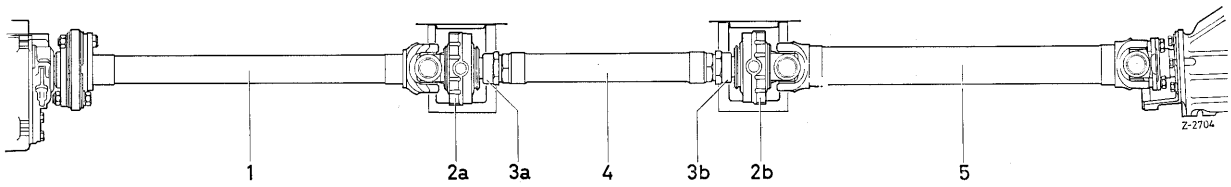


Fig. 20 Three-part drive shaft

1 Front drive shaft
2a, 2b Intermediate bearing
3a, 3b Lock nut
4 Intermediate shaft
5 Rear drive shaft

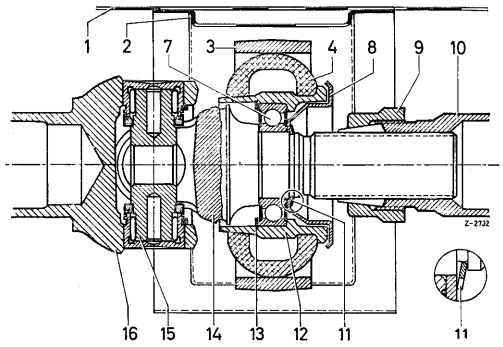


Fig. 20a Intermediate drive shaft bearing

1 Floor frame
2 Drive shaft tunnel
3 Bearing block
4 Rubber mount
7 Grooved ball bearing
8 Protective cap
9 Lock nut
10 Intermediate shaft
11 Circlip
12 Bearing casing
13 Circlip
14 Yoke
15 U-joint spider with needle bearing bushings
16 Front drive shaft

Models 200 D, 230 and 230 S are equipped with a two-part drive shaft with the intermediate bearing advanced by 230 mm. New diameter of front drive shaft is 45 mm, while diameter of the rear section has remained unchanged.

Drive shafts of individual models differ only by the length of the front section, which depends on the different wheelbases or wheter the vehicle features mechanical or automatic speed transmission. All drive shafts are fitted with maintenance-free intermediate bearings.

L. Brakes

Front wheel brakes

Except for an improved cover plate, which provides extensive cover for the inside and the perimeter of the brake disk, no modifications have been made to the front wheel brakes. Models 230 and 230 S are fitted with Girling brake calipers throughout, while models 200 D and 200 are equipped either with Teves or with Girling disk brakes.

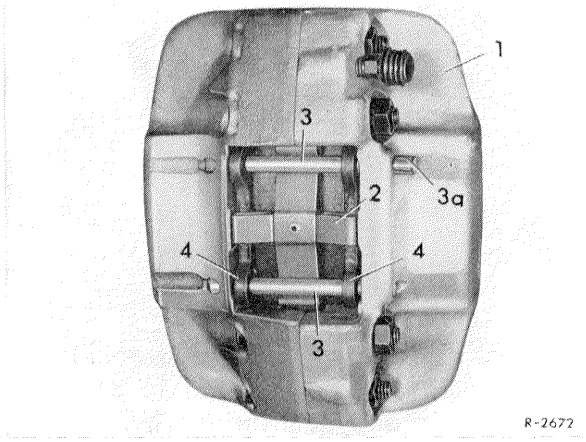


Fig. 21 Teves brake caliper

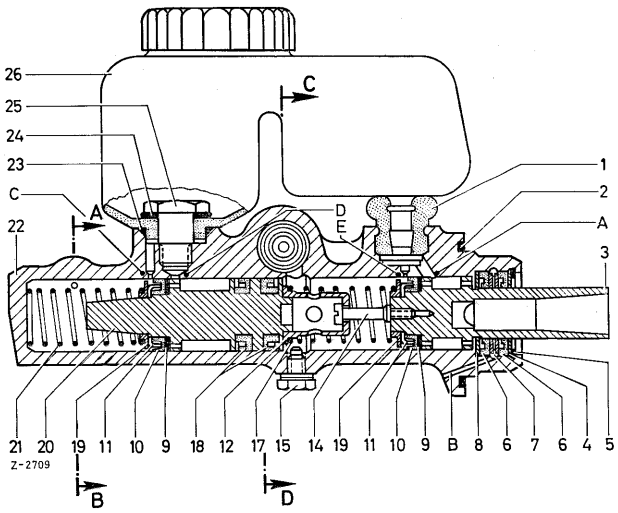
1 Brake caliper
2 Cross spring
3 Locking pin
3a Clamping sleeve
4 Brake block

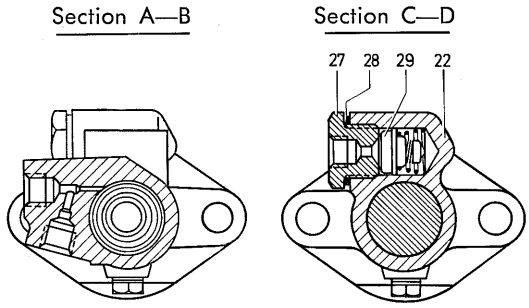
For Teves brake calipers, brake blocks with Fadil lining 77—79 N7 (green-green-white color marking) and for Girling calipers, brake blocks with Ferodo brake lining DS 31 (blue-white color marking) will continue to be used.

Standard equipment of Teves brake calipers includes shaft cover plates and modified locking pins for the brake blocks. Whereas hitherto the locking pins were arrested in the caliper by the safety eyes, new design provides for clamping sleeve (3a) fitted to locking pin (3), which secures the pin axially. Moreover, the center bridge of cross spring (2) has been widened, so that in the event of heavily worn brake blocks the back plate rapidly contacts the cross spring, which eliminates damages to the brake disk.

Rear wheel brakes

Design of rear wheel brakes has remained unchanged throughout.





For the time being, the tandem master cylinder, third design, will be fitted **only** to models 250 S, 250 SE, 300 SEB and 300 SEL.

Fig. 22 Tandem master cylinder, third design

1 Tank plug
2 O-ring
3 Piston (push-rod circuit)
4 Impact plate
5 Circlip
6 Vacuum seal
7 Intermediate ring
8 Bearing ring
9 Shim
10 Primary packing sleeve
11 Thrust ring
12 Spring support plate
14 Connection screw
15 Stop screw for intermediate piston
17 Compression spring
18 Annular packing sleeve
19 Spring washer
20 Intermediate piston (floating circuit)
21 Compression spring
22 Casing
23 O-ring
24 Spring plate
25 Hollow screw
26 Equalizing tank
27 Connection piece
27a Bottom valve with spring
28 Sealing ring
29 Bottom valve with spring
A Drip duct (push-rod circuit)
B Leakage duct
C Equalizing duct (floating circuit)
D Drip duct (floating circuit)
E Equalizing duct (push-rod circuit)

Tandem master cylinder

The tandem master cylinder has been modified. Unlike the previous design, in which the piston of the push-rod circuit was connected to the piston of the floating circuit only by a compression spring, both pistons are positively joined by a connection screw. In the new master cylinder, the compression spring fitted between both pistons is stronger than its counterpart arranged in front of the floating piston. Thus, the piston assembly remains stretched until the pressure built up, together with the spring force in the floating circuit, equals the force of the compression spring in the push-rod circuit, in which pressure now begins to build up. In the previous type, the piston of the push-rod circuit was first advanced until the pressure generated plus the force of the compression spring was equal to the force of the stronger compression spring in the floating circuit. By the new arrangement, less fluid is required for applying the brake blocks or brake shoes, so that brake pedal travel is slightly reduced.

To avoid confusion with the previous type, the face of the tandem master cylinder bears a white color marking.

In models with right hand steering and mechanical speed transmission the front compartment of the equalizing tank is connected to the transmitter cylinder of the hydraulic clutch operation. Thus, only one equalizing tank is available for the braking system and the hydraulic operation of the clutch. Te connection is fitted to the middle of the front compartment so as to ensure acceptable functioning of the braking system in the event of leakage in the hydraulic system for operating the clutch.

Braking device

Models 200 D, 200 and 230 are fitted with the single-diaphragm device T 51/100, and model 230 S with the double-diaphragm device T 51/200. Design of both devices has remained unchanged.

Gasoline separators are no longer fitted to gasoline-powered vehicles, since the separately installed vacuum nonreturn valve prevents ingress of gasoline into the braking device. In addition, vacuum hoses of plastic materials have been generally introduced.

Replacing the brake blocks
(Teves brake calipers)

1. Detach shaft cover plate.

2. Using a drift, knock locking pin (3) to the inside and dismount.

Annotation: Locking pins are now held in the brake caliper by clamping sleeve (3a).

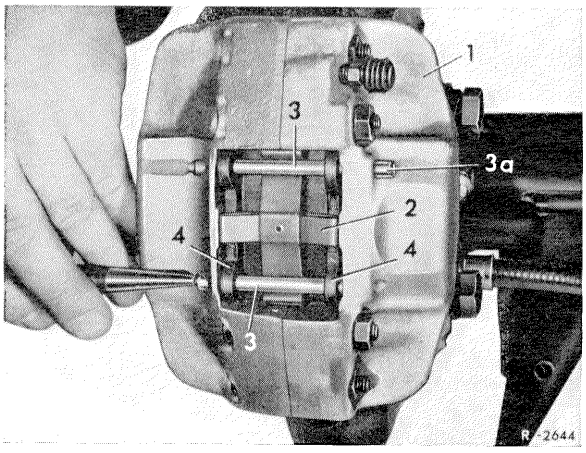


Fig. 23 Replacing the brake blocks

1 Brake caliper
2 Cross spring
3 Locking pin
3a Clamping sleeve
4 Brake block

3. Detach cross spring (2). Withdraw one brake block (4) with stripping tool from brake caliper. Then, force piston back with the return rod.

4. Thoroughly clean brake block guide in brake caliper and inspect dust cap for damages.

5. Fit brake block and dismount second block as described in sub-paras 2 and 3 above.

6. Place cross spring in position and insert both locking pins in brake caliper.

Annotation: the locking pin must fit tightly in the brake caliper. As soon as the clamping sleeve has engaged in the brake caliper, the pin should be knocked into the caliper with a hammer, until the clamping sleeve fits over its full length in the bore provided in the brake caliper. Loose fit of the locking pin necessitates widening of the clamping groove or replacement of pin.

7. Re-fit shaft cover plates.

M. Steering gear

All mechanically steered models are equipped with the known Daimler-Benz recirculating ball steering gear. To reduce manual effort, particularly when passing through narrow bends or during parking maneuvers, a steering worm with a pitch of 12 mm has been fitted in lieu of the previous type having a pitch of 13 mm, so that total reduction ratio has changed from 21.9 : 1 to 22.8 : 1. This type of steering gear has already been used in models 220 SEB/C.

Optionally, all models can be fitted with the Daimler-Benz power steering gear.

N. Fuel system

Models 200 D, 200, 230 and 230 S are equipped with a fuel tank having a capacity of 65 liters. All models are fitted with a return line. Fuel lines are no longer fastened to the middle of the vehicle, but to the left outer side member, similar to model 300 SE. Therefore, care must be taken when lifting the vehicle that the vehicle jack or the inspection pit lift is applied only to the vehicle jack supports.

For indication of fuel tank level, all models are equipped with an immersion tube transmitter (see section "Electrical Installation").

O. Exhaust system

The exhaust system of model 200 D is the same as used in its forerunner.

Models 200, 230 and 230 S are fitted with systems similar to those used in the previous 220 models, i. e. single-pipe exhaust systems with plug connection. Mounts for suspension from floor frame or speed transmission gear have remained basically the same.

P. Cooling system

Cooling system of models 200 D, 200 and 230 S is the same as that used in previous models.

Due to installation conditions, model 230 is fitted with a radiator of a reduced capacity. To ensure an adequate supply of coolant, an additional cooling water tank is arranged on the front wall, similar to model 230 SL. Moreover, maximum throughflow of cooling air is ensured by a fan frame fitted rearward of the radiator block. In view of the small clearance between fan and frame the latter must be accurately adjusted. Clearance should be 10—15 mm (see arrows shown in fig. 26.). Failure to observe this rule might cause the fan blades to come into contact with the fan frame as a result of engine motions while the vehicle is in operation.
Besides this a minimum clearance of 20 mm between fan and radiator must be observed.

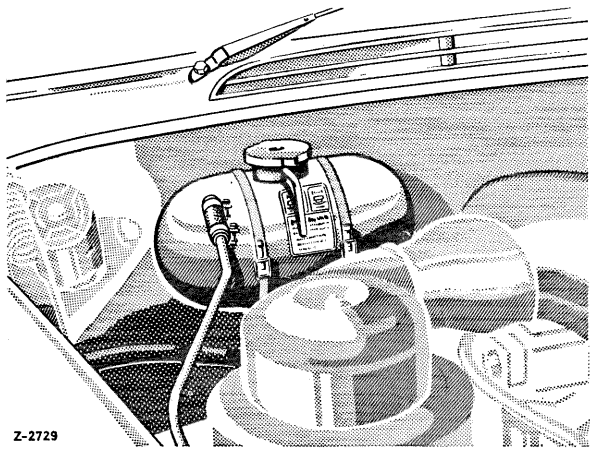


Fig. 24 Cooling water tank

In models 230, the rules for filling the cooling system, which are quoted on the plate affixed to the cooling water tank, should be strictly adhered to.

In cold engines, cooling water level should be approx. 4 cm below the bottom edge of the filler plug, and 2 cm when the engine has reached working temperature.

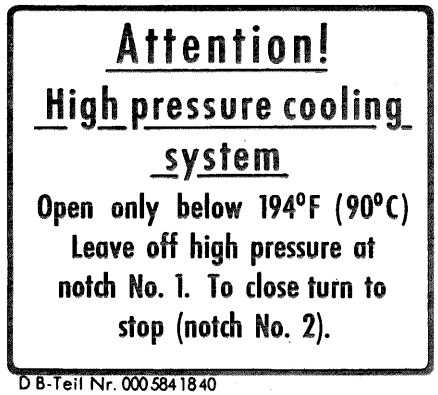


Fig. 25 Cooling water level instructions

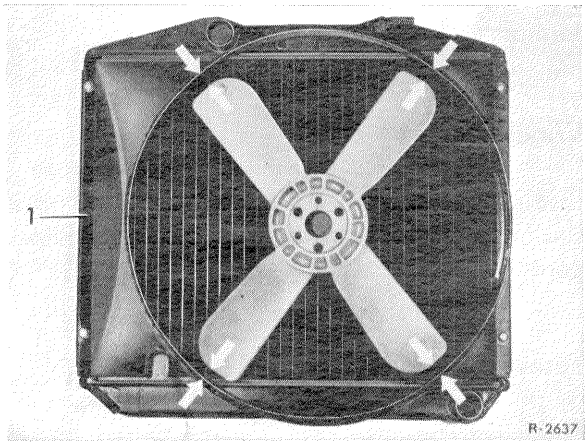


Fig. 26 Radiator core with fan frame (1)

Q. Electrical installation

As hitherto, all models operate on a voltage of 12 V.

Generator

Points of consumption and battery are supplied with current by a three-phase generator. The advantages incorporated in this type became manifest when some time ago it was introduced in model 230 SL.

Reduction ratio crankshaft/generator is such that the generator begins to supply current already at an engine speed of 700—800 rpm.

Starter

As in previous models, a Bendix-type starter is used, which is operated by an ignition and starting switch combined with the steering wheel lock. This switch is also equipped with a safety lock to prevent inadvertent repeated operation. Type 200 D is equipper with a combined glow-starter-switch.

Ignition system

The protection tube for the ignition cables so far in use has been abandoned and replaced by plastic ignition cable holders fitted to the cylinder head cover. By the new wiring of the cables, TV and radio shielding has been improved.

Distributor cap and top part of ignition coil are made of polyester, which is less sensitive to moisture, fouling and burns.

Windshield washer

In all models, the windshield washer pump is designed as foot pump with electrical wiper contact.

Fuses

The electrical installation is protected by 11 fuses 8 amps and 1 fuse 25 amps.

Instruments

Design and arrangement of instruments has remained the same. In models 200, 230 and 230 S speed measuring range has been increased as compared with previous models.

Fuel gauge

The lever transmitter hitherto used in all models has been supplanted by an immersion tube transmitter with mechanical delay of reserve fuel level indication. By the immersion tube transmitter, steady, accurate indication of fuel level is ensured at all times, even if tank contents are agitated by driving in hilly terrain, violent braking and acceleration, passing through extreme bends etc.

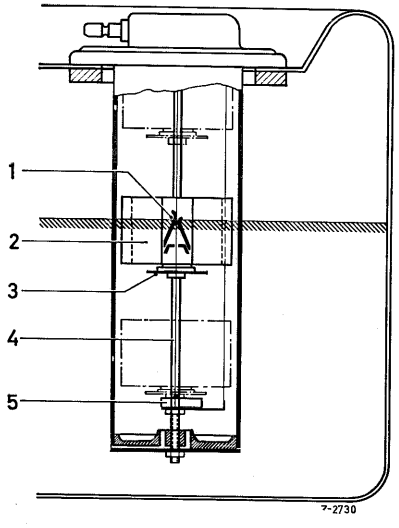


Fig. 27 Immersion tube transmitter

1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Warning contact for fuel reserve

Lighting

In models 200 D, 200 and 230, a combined flasher, parking and fog lamp unit is fitted underneath the main headlights. The flashers mounted laterally on the fenders have been abandoned. Model 230 S is equipped with a lighting unit identical to that used in the 220 series.

Apart from the modified exterior, the rear lights are, with regard to their equipment and function, the same as those used in previous models.

In all models, trunk compartment lighting is standard. The light is switched on automatically when the lid is opened. The switch is built into the lighting unit.

Trunk compartment lighting is wired to terminal 58 (rear light).

The foot dimmer switch has been abandoned in all models. Instead, the left side of the steering column tube is fitted with a combined switch for the following 5 functions:

1. Lift lever: headlight flasher
2. Lever in center position: low beam
3. Lever pressed forward: high beam
4. Swing lever to right: right headlight flasher
5. Swing lever to left: left headlight flasher

Miscellaneous

A radio-shielded type of wiper and blower motor is fitted.

R. Bodywork

a) Models 200 D and 200

Bodywork of models 200 D and 200 is basically the same used in previous types, except for certain modifications to front and rear fenders to suit them to the new lighting units and trimstrips.

The horizontal line is accentuated by a new type of rear light together with two trimstrips — one above and one underneath the lighting units — which extend across the full vehicle width.

The chrome-plated trim on the side marker edges has been discontinued.

Range of interior equipment is extended and partly improved. Backrests have been given a more pronounced profile and thus provide better lateral support. The interior mirror is of the same size as those used in all other models of our car program.

Door paneling is designed for tropical service. In addition, pre-formed door pockets are provided.

As opposed to the previous material, the new door paneling must not be bent during installation, as this would invite the risk of breakage.

Interior door closing facilities are recess-mounted.

To improve sound and heat insulation, the rubber mats, whose color matches with the interior equipment, have been given a plastic foam backing.

Backrest adjustment by handwheel is now included in standard equipment.

In addition, the rear pillars of the new 4-cylinder models are fitted with the same venting facilities incorporated in the previous 220 series.

b) Model 230

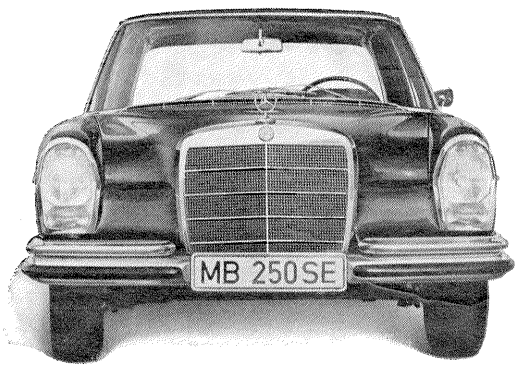
Bodywork and equipment of model 230 are identical with that of models 200 D and 200. In addition, a hinged center armrest has been fitted in the passengers' compartment.

c) Model 230 S

Although the bodywork is similar to that used in the previous model 220 SB, it differs in model 230 S by various design detail and corresponds with the improved and amplified range of equipment of models 200 D, 200 and 230. Moreover, model 230 S is equipped with glove box lighting, while the entrance is fitted with trim made of rustproof material.

II. Description of models 250 S, 250 SE, 300 SEB, and 300 SEL

These models hold advanced and top rank in the car program and allow only a limited comparison with previous models. The new bodywork, with which all models are equipped, imparts to the vehicles a low, sweeping outline. The new bodywork, as well es a range of new and improved assemblies, have been successfully combined to form models 250 S, 250 SE, 300 SEB, and 300 SEL.



A. Engine

a) Models 250 S and 250 SE

The engines of models 250 S and 250 SE were developed from the previous 2.2-liter types.

Bore has been increased from 80 to 82 mm and stroke from 72.8 to 78.8 mm, which gives a swept volume of 2.5 liters. The cylinder head is equipped with enlarged inlet manifold, exhaust manifold and valves; also a new type of camshaft is fitted.

With a slightly modified dual carburetor system (Zenith 35/40 INAT), the engine of model 250 S develops the following performance and torque:

130 h.p. (DIN)	at 5,400 rpm
19.8 mkg (DIN)	at 4,000 rpm

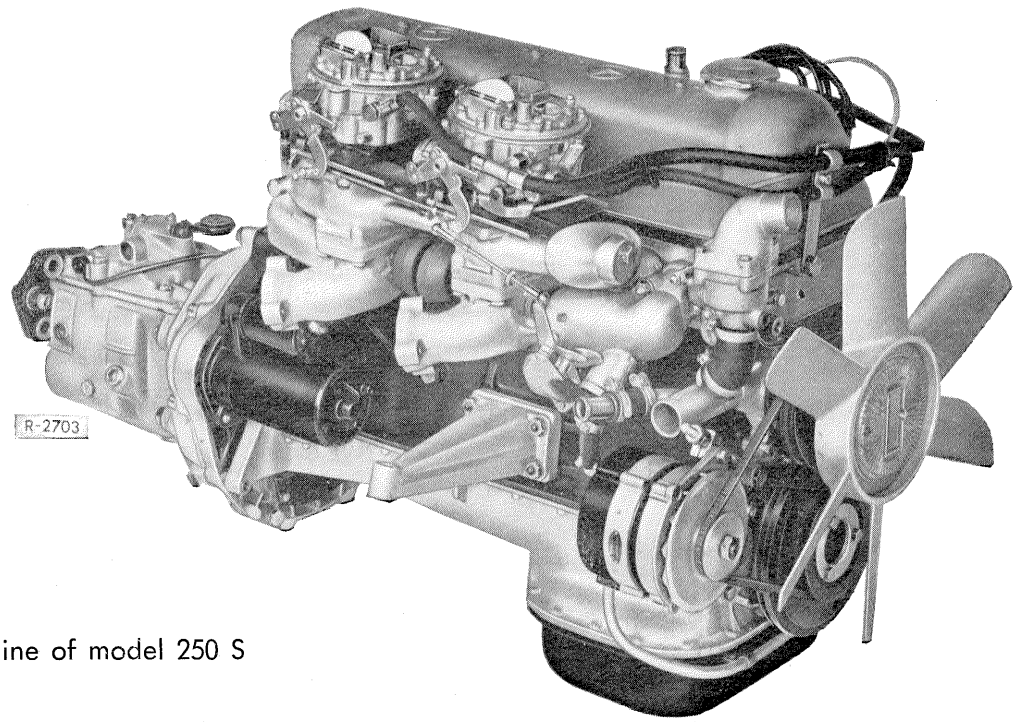


Fig. 28 Engine of model 250 S

The engine of model 250 SE is fitted with the six-plunger injection pump known from model 230 SL, and the corresponding injection nozzles. It develops the following performance and torque:

150 h.p. (DIN)	(DIN) at 5,500 rpm
22 mkg (DIN)	(DIN) at 4,200 rpm

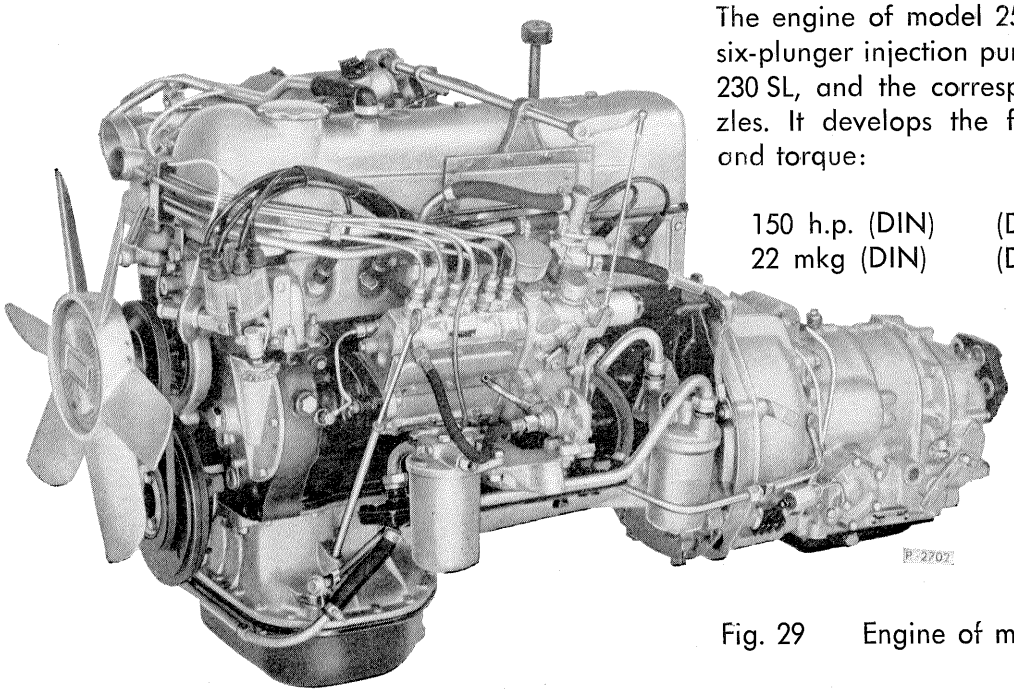


Fig. 29 Engine of model 250 SE

All other modified parts have been described in the following.

Crankshaft

The crankshaft is seated in seven bearings. This design feature greatly adds to stiffness of torsion and thus improves vibration and noise level, and also extends useful life of bearings. The vibration damper has been given a different shape and an enlarged diameter. The counterweight is fastened to the crankshaft by a necked-down bolt and three cup springs.

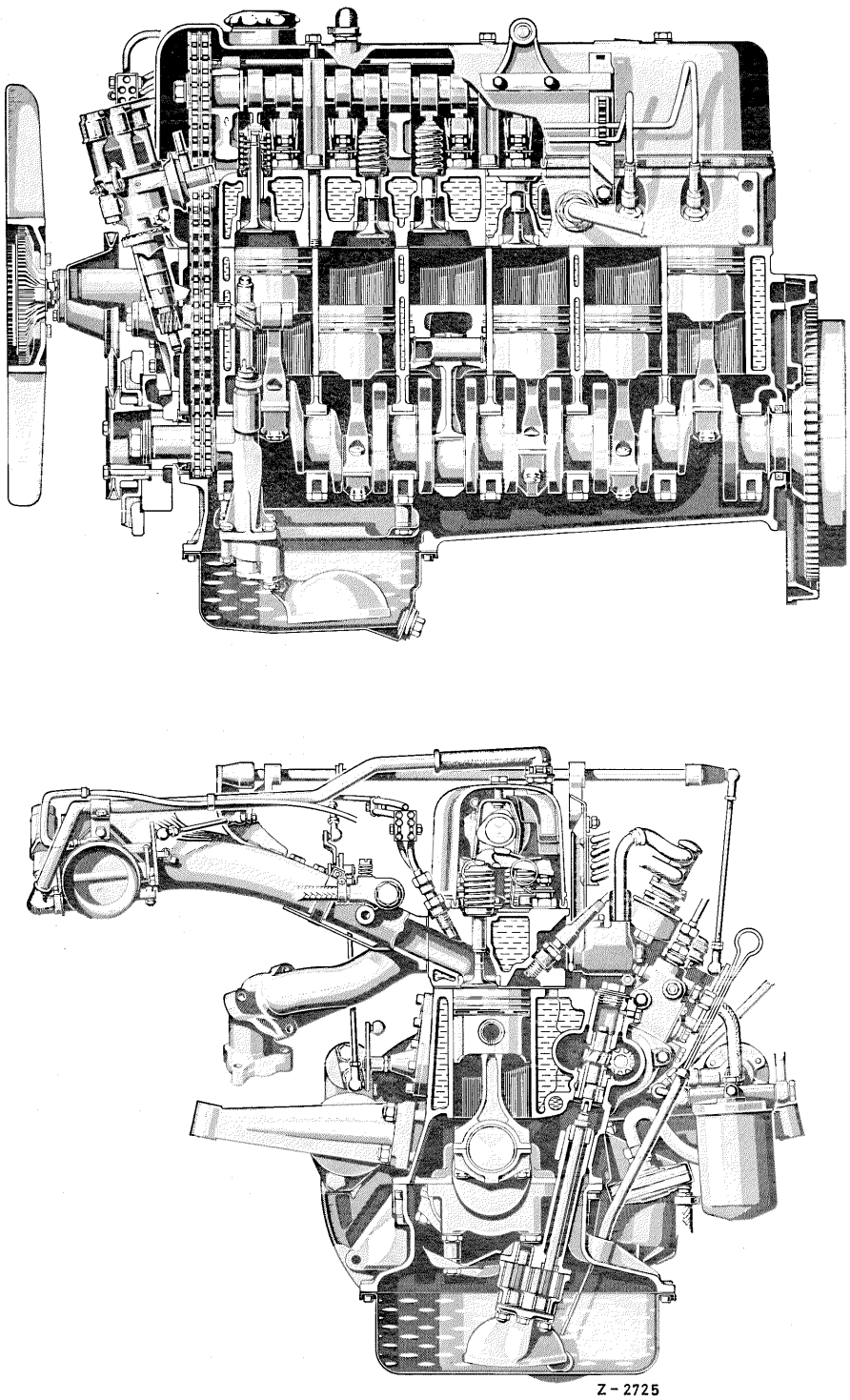


Fig. 30 Sectional view of engine of model 250 SE

Cylinder crankcase

Design of the cylinder crankcase is adapted to the seven crankshaft bearings (see fig. 30). Crankshaft bearing No. 3 is designed as lapped bearing. Bearings 1, 5, and 7 are 24 mm, and 2, 4, and 6 21 mm wide. Top and bottom bearing shells are of different design.

The cylinder crankcase is vented in a closed system which prevents escape of vapors to the open air. The vent filter on the oil dipstick has been abandoned. Venting now proceeds via the exhaust line of the cylinder head cover to the suction scoop in model 250 S, and to the valve connection in model 250 SE.

Cylinder head

Cylinder heads of models 250 S and 250 SE differ by their compression ratio, which is as follows:

9.0 : 1 in model 250 S, and
9.3 : 1 in model 250 SE

Moreover, different injection nozzles are fitted to the cylinder head of model 250 SE.

All valves are provided with rotocaps recessed in the cylinder head.

Apart from the above exceptions, design detail is the same as in model 230.

Pistons

Piston diameter has been increased to 82 mm. Design was modified as in model 230.

Also piston ring equipment differs; models 250 S and 250 SE are fitted with a double Acme ring, a nose ring and a tapered oil scraper ring with expanding spring.

Connecting rods and camshaft

Refer to model 230.

Rocker arms, valve shaft sealing

Refer to model 200.

Valves

Refer to model 230, however with the following exception:

Both the inlet and exhaust valves are fitted with maintenance-free rotocaps.

Carburetor in model 250 S

The Zenith two-phase downdraught carburetor 35/40 INAT differs from that installed in model 230 S by the nozzle equipment, reinforced fastening of vacuum box of second phase by a third screw, as well as provision of additional bracket (6) for the starter casing (refer to fig. 17).

Injection unit in model 250 SE

Model 250 SE is equipped with a gasoline injection unit with six-plunger injection pump; injection nozzles are built into the suction duct of the cylinder head. The unit is already known from model 230 SL.

The injection pump (Bosch Code No. PES 6 KL 70/120 R 18) differs from type R 11 used in model 230 SL by the space cam, which had to be adapted to the 2.5-liter engine, the pump casing, which for reasons of production is somewhat longer, as well as the fuel connections arranged at the front of the suction chamber of the pump.

The warming-up device switches off when cooling water temperature has risen to 65-70° C.

The vacuum connection for the ignition distribution is now situated in the valve connection behind the throttle valve (see distributor).

The timing switch in the starting device has been abandoned.

The quantity of fuel available at starting position of the control rod of the injection pump has been reduced, and the quantity fed to the starting valve at the suction pipe increased.

Method of operation is as follows:

Independent of cooling water temperature, the solenoid switch at the injection pump is operated by relay I throughout starting procedure.

At cooling water temperatures below 35° C, the thermoswitch is closed, so that also the electrical starting valve at the suction pipe is energized by way of relay II.

Period of operation of the valve increases as temperature decreases and reaches approx. 12 seconds at -20° C.

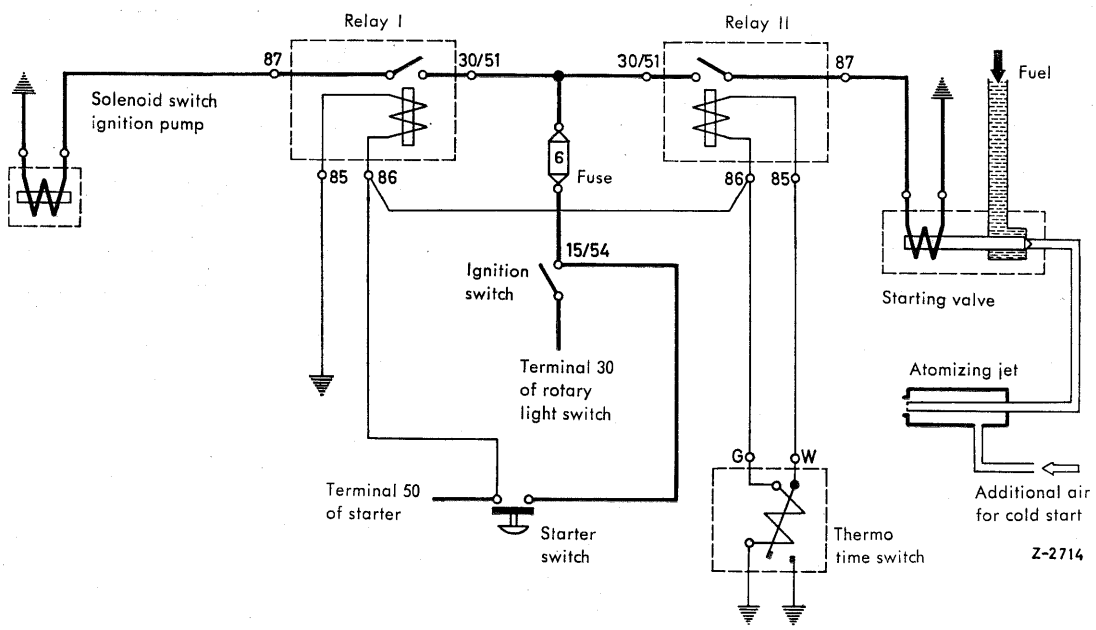


Fig. 31

Wiring diagram of starting device

Fuel pump in model 250 S

Refer to model 230

Ignition distributor in model 250 S

To eliminate jerky operation, vacuum settings of the ignition distributor have been changed. Ignition is retarded as vacuum increases, and not advanced as in earlier types. Vacuum adjustment is only effective when the throttle valve is closed, since the bore for the vacuum connection is situated at the valve connection directly behind the throttle valve.

Oil-water heat exchanger

In view of the enhanced engine performance, the lube oil is heated up to a higher temperature and thus also subjected to higher loads. For this reason, an oil-water heat exchanger has been included in standard equipment, which is fitted to the left engine support and connected to the engine by hoses. When draining the cooling system, care must be taken that also the drain plug of the heat exchanger is opened (refer to fig. 32).

Oil-pump

Delivery rate of oil pump has been increased by the use of higher gear wheels (28 mm).

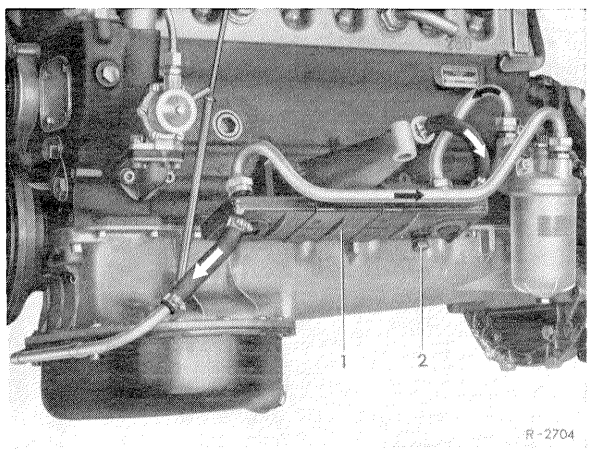


Fig. 32 Oil-water heat exchanger

1 Oil-water heat exchanger
2 Drain plug

Due to the arrangement of the oil duct in the cylinder crankcase, the exit bore in the top part of the oil pump casing has been modified to form a slot. The new oil pump may not be installed in previous models of the 220 series, unless, also the new intermediate gear shaft and helical wheel are fitted.

The increase in delivery rate called for modification of the pump drive mechanism. Helical wheel or intermediate gear shaft may not be used in conjunction with previous types.

Water pump

Form of the water pump has been shortened; it is filled with a special oil grade and operates maintenance-free. The water pump cannot be repaired, but only replaced as unit.

Viscosity fan coupling

Models 250 S and 250 SE incorporate the new viscosity fan coupling (make Behr).

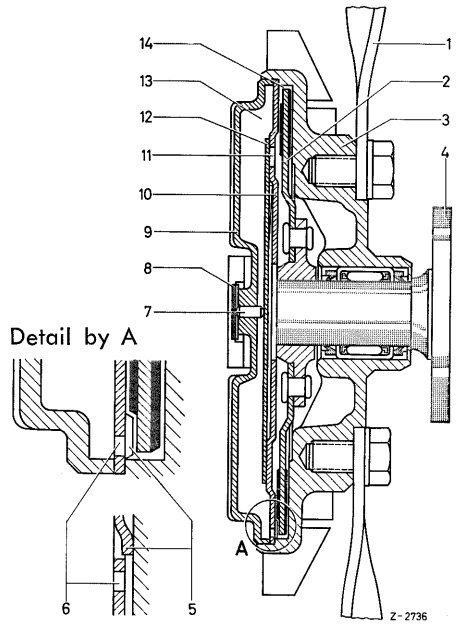


Fig. 33 Viscosity fan coupling

1 Fan
2 Drive disk (primary section)
3 Coupling body (secondary section)
4 Drive shaft with flange
5 Oil scraper nose
6 Return bore
7 Thrust pin
8 Bimetallic strip
9 Cover (secondary section)
10 Intermediate disk
11 Feed bore
12 Valve lever
13 Reservoir
14 Working space

The viscosity fan coupling incorporates the same advantage as the electro-magnetic and hydraulic types, in that no drive power is required when the fan is uncoupled. Thus, increased engine power is nearly always available to the vehicle, since the fan operates only in extreme situations, e. g. when crossing mountain passes, or driving in columns, during the hot season. As additional advantages, fan noise is reduced and rapid, efficient heating up of the engine ensured.

The viscosity fan coupling operates maintenance-free. It is designed as a closed unit and cannot be dismantled. Design provides for a primary and a secondary section. The latter includes coupling body (3), to which the fan is bolted by 4 screws. The primary section comprises drive disk (2) which is positively connected to drive shaft (4). The drive disk rotates in the secondary section, i. e. the working space formed by coupling body (3) and cover (9). At both sides of the drive disk, a narrow air slot is provided. When the fan or the coupling engages, the working space is filled with silicone oil, which is used as the torque-transmitting medium. Since silicone oil is insensitive to temperature fluctuations, its viscosity is near-constant. As no mechanical connection exists between primary and secondary section, torque is transmitted solely by the viscous silicone oil. Obviously, the oil cannot establish a rigid contact between the driving and the driven section of the clutch in the present arrangement. For this reason, fan speed will be invariably below initial speed, even if the entire oil filling is in the working space.

The temperature-dependent control of the coupling is fitted to cover (9). Control equipment comprises intermediate disk (10) with feed bore (11) and valve lever (12), as well as oil scraper nose (5), thrust pin (7) and bimetallic strip (8).

The oil reservoir (13) is formed by cover (9) with intermediate disk (10) and valve lever (12). The reservoir connects to the working space by two bores. One of these, which is arranged in the intermediate disk, ensures feed of oil from reservoir to working space, while return bore (6), in the intermediate disk in front of oil scraping nose (5) is provided for return flow of oil from working space to reservoir. Fan speed is controlled by corresponding batching of silicone oil.

Since batching of oil is temperature-dependent, the bimetallic strip is used as temperature senser. Control of the bimetallic strip is based on the temperature of the cooling air rearward of the radiator core, which is dependent on the engine temperature.

Bending rate of the bimetallic strip acts directly on the valve lever via the thrust pin. As long as the bimetallic strip is cold, it is also straight and the valve remains closed. It bends as temperature rises and thus opens the valve.

By oil scraper nose (5), arranged beside return bore (6) in the intermediate disk, backpressure is created with the aid of the speed difference between primary and secondary

section. By action of the pressure, the oil is collected and forced into the reservoir. It circulates from working space via oil scraper nose and return bore to the reservoir and thence by action of the valve lever and via feed bore back to the working space. Circulation continues as long as the drive disk rotates. The oil collects forcibly in the reservoir when the valve lever is closed by the cold bimetallic strip. If the slot provided at either side of the drive disk is largely free from silicone oil, the coupling will rotate without being engaged. Hereby, the fan maintains a minimum speed, which amounts to 25 per cent of the initial coupling speed and is still sufficient to supply a stream of cooling air to exhaust manifold, injection pump, fuel pump, generator etc. When the bimetallic relay has been sufficiently heated by the cooling air emerging from the circulation, the thrust pin and the valve lever open the feed bore and the working space is filled with silicone oil. With the valve fully open, the fan performs maximum revolutions. Depending on actual air temperatures, any intermediate fan speed can be attained. If speed of the primary section rises above 3,000 rpm and the fan is fully engaged, control of the coupling is exercised by the torque, so that the speed of the fan remains constant within a wide range of the engine speed.

Testing the viscosity fan coupling in the vehicle:

Cold starting of the engine will result in a higher fan speed for approximately 1—3 minutes until the oil has been fed back from the working space to the reservoir. Thereafter, the fan coupling will disengage and cause fan speed to drop to 25—30 per cent of drive speed.

Allow engine to run for a short period and switch off when it is still cold; next, check whether the fan can be turned by hand with a relatively small effort. Now, the coupling is fully disengaged. The coupling is fully engaged when the temperature of the cooling air discharged from the radiator amounts to at least 62° C.

Couplings cannot be repaired. Defective units must be replaced.

Transport and storage:

Viscosity fan couplings must be transported and stored in vertical position. If they are stored in any other manner, it may occur that small quantities of oil are discharged from the bearing or the thrust pin underneath the bimetallic strip as a result of fluctuating atmospheric pressure and varying temperatures. With the unit in operation and the fan axle in horizontal position, the oil filling occupies only part of the lower half of the coupling without reaching the bearing seals or the thrust pin.

Hints for installation:

Dismounting

Uniformly loosen collar screws SW 10 (3) for fastening to water pump and detach coupling with fan and hub ring (5). Unscrew fan from coupling.

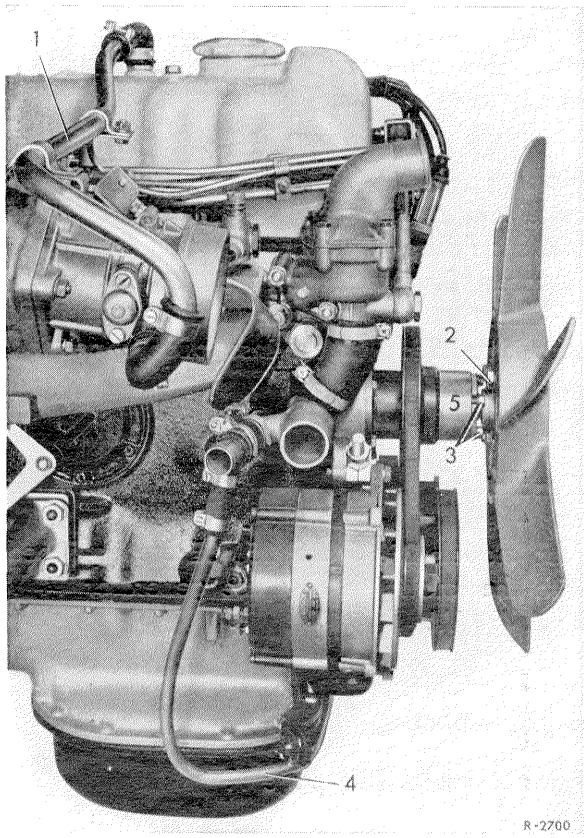


Fig. 34 Engine of model 250 SE

1 Cylinder crankcase vent from cylinder head to valve connection
2 Hex screw of fan
3 Collar screw SW 10 for fastening viscosity fan coupling to water pump
4 Coolant line from oil-water heat exchanger
5 Hub ring

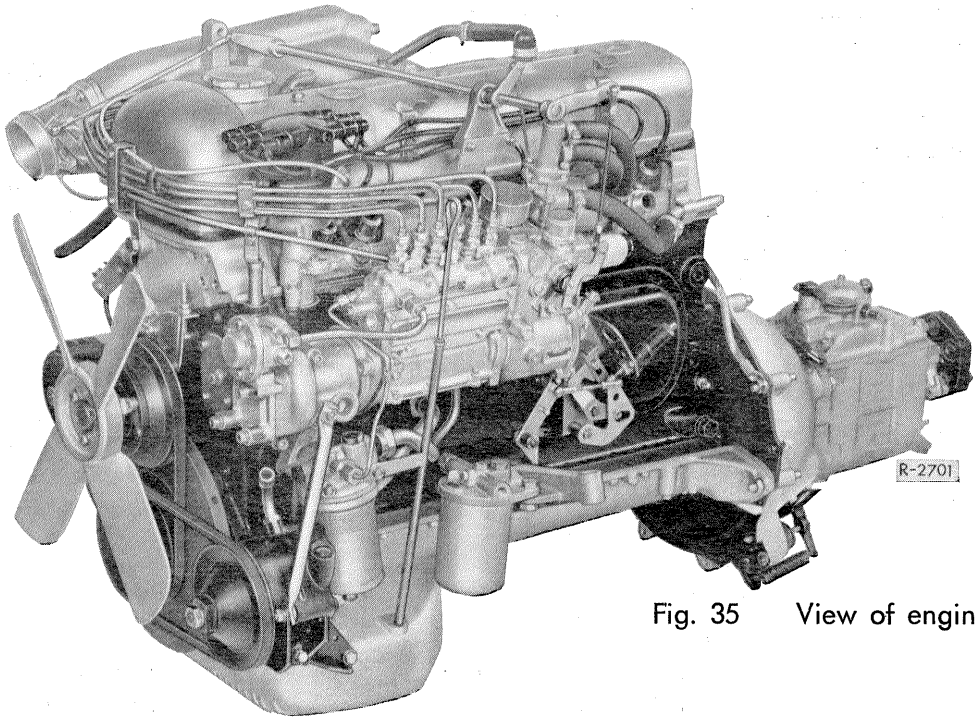


Fig. 35 View of engine of model 300 SEB

Installation

Screw fan to coupling. Introduce 4 collar screws (3) into the slots of the hub, fit hub ring (5) to the collar screws, screw the latter uniformly to the water pump and tighten.

Bimetallic strip (8) fitted to the front side is extremely sensitive to mechanical damages and should be dismounted only in exceptional cases. Care must be taken that thrust pin (7) does not fall out and that the bimetallic strip is re-fitted with the inscription uppermost (see fig. 33).

Generator

Also models 250 S and 250 SE are equipped with the known three-phase generator 14 V 35 A 490 W.

Engine mounting

Refer to model 230, page 11

b) Models 300 SEB and 300 SEL

Apart from various minor modifications, the 6-cylinder engines with a piston displacement of 3 liters are the same as those used in the previous model 300 SE. For both engines, rating and torque is as follows:

170 h. p.	(DIN) at 5,400 rpm
25.4 mkg	(DIN) at 4,000 rpm

Since model 300 SEB is not equipped with air suspension, a compressor is not fitted with the engine.

Oilpan

To accommodate the engine, which is mounted on a lower level, a flat, wide oilpan has been provided, which is made of cast iron and designed in unit construction unlike previous types comprising a cast iron top and a sheet metal bottom part.

Oil pump

The oil pumps of previous models 300 SE and models 300 SEB and SEL differ by the shortened suction pipe with strainer, as well as the bracket. Changes in design are due to the flatter oilpan used. The pressure oil line from oil filter to fuel injection pump has been modified and is fastened to the latter by a holder.

Cylinder crankcase

Venting is effected in the same manner as in model 250 SE. Instead of the holder for the compressor (not fitted), a cover plate has been mounted, to which the damping container for fuel return is fastened.

Fuel injection unit

The injection unit differs in the following respects from that used in previous model 300 SE:
For technical reasons, the casing of the injection pump with the Bosch designation PES 6 KL 70/120 R 19 is slightly lengthened.
The fuel return line connection is fitted at the front (suction chamber) of the pump. The starting device is arranged as in model 250 SE; for this reason, the injection pump of previous model 300 SE cannot be used in this car.

Water pump

Design of the pump casing has been modified at the water inlet. In addition, a connection to the oil cooler is fitted underneath the cooling water line to the fuel injection pump. The water pump is packed with special grease and operates maintenance-free. This water pump, giving enhanced performance, has been in use already since December 1964 in model 300 SE. It cannot be repaired and must be replaced as unit.

Bracket for high-pressure oil pump
(model 300 SEB only)

In model 300 SEB, the high-pressure oil pump is mounted at the left bottom side of the cylinder crankcase with the aid of a bracket; it is driven by a V-belt dimensioned 900 x 12.5 mm. The tightening screw is fitted to the bracket.

Engine mounting

Refer to model 230 (page 11)

Hint for installation

When dismounting or re-fitting the engine of model 300 SEB, the high-pressure oil pump for the power-steering gear must be screwed off.

c) Testing and adjustment of engine
Checking arrangement of valve socket and fuel injection pump in models 250 SE, 300 SEB, 300 SEL

For this check, the previous adjusting device with graduated disks should be used. However to enable fitting of the graduated disk to the regulating lever of the fuel injection pump, an additional lever as shown in fig. 36 should be manufactured. First, fit additional lever (3) to the graduated disk and fasten both to the regulating lever. Adjustment values are the same as hitherto.
Note. To mount graduated disk (1) on the regulating lever in model 250 SE, fuel feed line (6) must be screwed off (see fig. 37).

Do not forget to re-connect fuel feed line

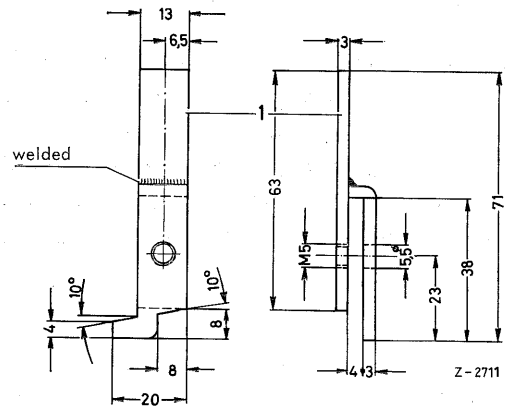


Fig. 36 Additional lever (3) for graduated disk

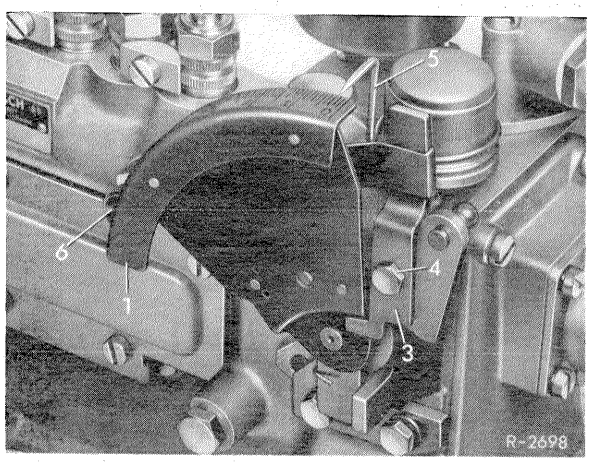


Fig. 37 Graduated disk on fuel injection pump

1 Graduated disk
3 Additional lever
4 Hex screw
5 Indicator
6 Fuel feed line connection

Adjustment of idling speed in model 250 SE

Adjustment of idling speed is the same as in model 230 SL. Cars with mechanical speed transmission gear are fitted with a closing damper to prevent jerky running of the vehicle caused by sudden deceleration. Dampers should be adjusted individually for each vehicle during a road test depending on jerkiness.

If vehicles run smoothly, the damper need not be adjusted.

After adjustment of closing damper check whether control linkage returns smoothly to idling position.

Instead of the damper, a lifting magnet is installed in all models equipped with automatic speed transmission gear.

To increase revolutions, models with Daimler-Benz power steering gear are fitted with pressure cylinder (5), which should be adjusted with adjusting nut (8) to ensure an idling speed of approximately 800 rpm, when the wheels are turned to extreme steering angle lock.

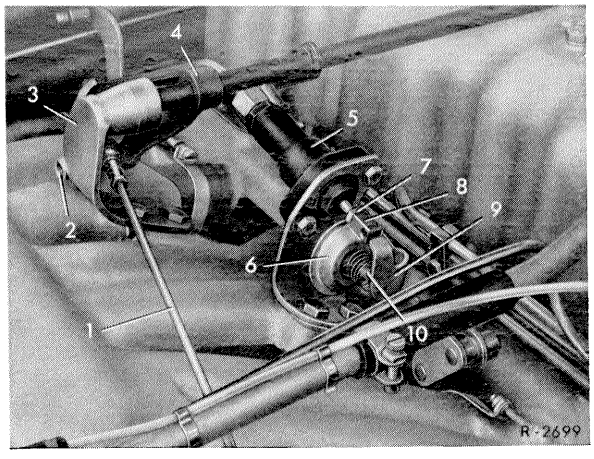


Fig. 38 Closing damper

1 Regulating rod
2 Control bore
3 Regulating lever support
4 Regulating lever
5 Pressure cylinder
6 Closing damper
7 Hex nut
8 Adjusting nut
9 Regulating lever
10 Pin

B. Clutch

a) Models 250 S and 250 SE

Refer to models 230 and 230 S

b) Models 300 SEB and 300 SEL

The clutch in models 300 SEB and 300 SEL is the same as that used in model 300 SE. It remains also unchanged if a ZF 5-speed transmission gear is fitted as optional extra.

C. Speed transmission gear

a) Mechanical Daimler-Benz 4-speed transmission gear

Design of the mechanical speed transmission gears in models 250 S and 250 SE on the one hand, and models 300 SEB and 300 SEL on the other hand is identical with that of the previous types fitted to the 220 and 300 SE; however reduction ratio has been changed. Optionally, model 300 SEL can be equipped with the mechanical Daimler-Benz 4-speed transmission gear. All four models can be supplied with shiftstick. The opposite table shows the new reduction ratios as compared with those of the previous designs used in the 220 series and model 300 SE.

b) Mechanical ZF- 5-speed transmission gear

Optionally, models 300 SEB and 300 SEL can be fitted with an ZF 5-speed transmission, however only with stickshift.

Gear		250 S 250 SE 300 SEB 300 SEL	220 B 220 SB 220 SEB 300 SE
Constant	Reduction Number of teeth Toothing	1.72 25/43 high	1.875 24/45
First	Reduction Number of teeth Toothing	4.05 14/33 standard	13/28
Second	Reduction Number of teeth Toothing	2.23 27/35 high	2.28 28/34
Third	Reduction Number of teeth Toothing	1.40 38/31 high	1.53
Top	Reduction	1	
Reverse	Reduction Number of teeth	3.58 12/17/25	3.92

Reduction ratios of the 5-speed transmission gear are shown in the table below:

Reduction ratios in 5-speed transmission[1])

Constant	First	Second	Third	Fourth	Top	Reverse
1.27	3.92	2.215	1.418	1	0.848	3.49

[1]) All gears, including reverse, are lock-synchronized

c) Daimler-Benz automatic speed transmission gear

In model 300 SEL, the Daimler-Benz automatic speed transmission gear is standard.

Optionally, models 250 S, 250 SE, and 300 SEB can be fitted with the Daimler-Benz automatic speed transmission gear, and all types with steering column or central shift. (For adjustment of central shift, refer to models 200 and 230).

Transmission gear in model 250 S is the same as in the previous 220 series, while for model 250 SE the type installed in model 230 SL was selected. All models of the 250 series are fitted with the modified hydraulic clutch 111 250 16 02.

Speed transmission gear and hydraulic clutch of models 300 SEB and 300 SEL are the same as the previous types in model 300 SE.

D. Pedal linkage

Pedal linkage in models 250 S, 250 SE, 300 SEB and 300 SEL corresponds with the types used in the 220 series and model 300 SE, respectively.

Models 300 SEB and 300 SEL with left and right drive, as well as models 250 S and 250 SE with right drive are fitted with a common equalizing tank for the braking system and operation of the hydraulic clutch.

For description and hints for installation, refer to models 200 D, 200, 230 and 230 S, and also section "Brakes".

E. Suspension and shock absorbers

Models 250 S, 250 SE and 300 SEB are fitted with steel springs and the known hydro-pneumatic compensating spring at the rear axle (see page 47). Springs and shock absorbers have been adapted to the models, as can be seen from the tables published below.

Basically, the air suspension in model 300 SEL is the same as that in previous model 300 SE. As a new design feature, level regulating valves have been added, with which the level of the car can be increased similar as in model 600.

For changeover from "standard" to "higher" level the stalk-type switch used in previous model 300 SE has been replaced by a lever switch, which, besides level regulation, includes a third position for wheel changing.

Functions of the lever switch are as follows:

N = standard vehicle level
R = wheel changing
H = higher vehicle level

Spring and shock absorber combinations

Vehicles with steel springs

Model	Front spring Part No.	Relevant front shock absorber Designation Part No.	Rear spring Part No.	Compensating spring Part No.	Relevant rear shock absorber Designation Part No.
Standard suspension					
250 S 250 SE	**108 321 0304**	Bilstein Type B 36 **111 323 1800**	**108 324 0104**	**111 320 0399** [1]	Bilstein Type B 46 **111 326 0200**
300 SEB	**108 321 0104**				
Special design: harder suspension for bad roads					
250 S 250 SE	**108 321 0404**	standard	**110 324 1204**	**111 320 0499** [1]	standard
300 SEB	**108 321 0204**				

[1] Hydro-pneumatic compensating spring

Vehicles with air suspension

Model	Front spring bellow Designation Part. No.	Relevant front shock absorber Designation Part. No.	Rear spring bellow Designation Part. No.	Relevant rear shock absorber Designation Part. No.
300 SEL	Phoenix-Harburg Type 1 A 04 Z **112 320 00 17**	Bilstein Type B 36 [2]	Phoenix-Harburg Type 1 A 05 Z **112 320 00 21**	Bilstein Type B 46 [2]

[1] Part No. not yet published

Torsion bar at front axle

Model	Torsion bar Part No.	Diameter mm	Torsion bar mounting Rubber mount Part No.	Diameter of bore	Rubber hardness ° Shore
250 S 250 SE	111 323 14 65	21.5	111 323 09 85	20 - 0.5	60±5
300 SEB 300 SEL	109 323 03 65	23.5	112 323 02 85	20 - 0.5	

Hydro-pneumatic compensating spring

Hydro-pneumatic compensating spring				Pertinent left ball joint		
Total delivery Part No.	Part No. without ball joints	Filling pressure (atm.)	Color marking	Part No.	Length[1] mm	Marking[2]
111 320 03 99	000 320 04 13	75	Green longitudinal line	000 329 01 30	60.5	Nil
111 320 04 99				000 329 02 30	66.5	Red paint dot

[1]) From contact surface to front edge of screw union
[2]) At the face of screw union

Shock absorbers Models 250 S, 250 SE and 300 SEB

Test ratings

Front shock absorbers		Test ratings at 100 mm deflection and 100 rpm of testing machine			
		Ratings for new shock absorbers		Minimum ratings for used shock absorbers	
Part No.	Color marking	Tension kg	Compression kg	Tension kg	Compression kg
111 323 18 00	2 green longitudinal lines	186 ± 14	55 ± 5	150	40
Rear shock absorbers					
111 326 02 00	2 green longitudinal lines	212 ± 15	65 ± 6	170	45

Checking the oil reserve

Front shock absorbers		Length	Piston rod outlet	
Part No.	Color marking	(shock absorber compressed)	Rating for new shock absorber mm	Maximum rating mm
111 323 18 00	2 green longitudinal lines	340 ± 2	5 ± 2	35
Rear shock absorbers				
111 326 03 00	1 green longitudinal line	335 ± 2	5 ± 2	30

F. Front axle

Except for the following modification, the front axles in models 250 S, 250 SE, 300 SEB and 300 SEL are the same as those for models 220 SB, 220 SEB, or 300 SE, respectively.

In view of the enlarged brake disks, the points for fastening the brake calipers to the stub axle have been placed farther outwards.

Hydro-pneumatic compensating spring

Hydro-pneumatic compensating spring				Pertinent left ball joint		
Total delivery Part No.	Part No. without ball joints	Filling pressure (atm.)	Color marking	Part No.	Length[1] mm	Marking[2]
111 320 03 99	000 320 04 13	75	Green longitudinal line	000 329 01 30	60.5	Nil
111 320 04 99				000 329 02 30	66.5	Red paint dot

[1]) From contact surface to front edge of screw union
[2]) At the face of screw union

Shock absorbers Models 250 S, 250 SE and 300 SEB

Test ratings

Front shock absorbers		Test ratings at 100 mm deflection and 100 rpm of testing machine			
		Ratings for new shock absorbers		Minimum ratings for used shock absorbers	
Part No.	Color marking	Tension kg	Compression kg	Tension kg	Compression kg
111 323 18 00	2 green longitudinal lines	186 ± 14	55 ± 5	150	40
Rear shock absorbers					
111 326 02 00	2 green longitudinal lines	212 ± 15	65 ± 6	170	45

Checking the oil reserve

Front shock absorbers		Length	Piston rod outlet	
Part No.	Color marking	(shock absorber compressed)	Rating for new shock absorber mm	Maximum rating mm
111 323 18 00	2 green longitudinal lines	340 ± 2	5 ± 2	35
Rear shock absorbers				
111 326 03 00	1 green longitudinal line	335 ± 2	5 ± 2	30

F. Front axle

Except for the following modification, the front axles in models 250 S, 250 SE, 300 SEB and 300 SEL are the same as those for models 220 SB, 220 SEB, or 300 SE, respectively.

In view of the enlarged brake disks, the points for fastening the brake calipers to the stub axle have been placed farther outwards.

Mounting of front axle

Mounting of front axle in models 250 S, 250 SE, 300 SEB, and 300 SEL is the same as in previous models 220 SB, 220 SEB, and 300 SE.

Longitudinal support of front axle

Due to the recent introduction of standardized caster adjustment values, which differ only in vehicles with and without power steering gear, the following component parts for longitudinal front axle support in the individual models have been provided:

Model	Rubber mount Part No.	Eccentricity ob bore mm	Leaf spring Part No.	Length
Vehicles without power steering gear				
250 S 250 SE	110 322 15 85	1.5	112 331 00 12	243 ± 0.5
Vehicles with power steering gear				
250 S 250 SE 300 SEB 300 SEL	112 322 03 85	4.5	112 331 00 12	243 ± 0.5

G. Rear axle

Similar to previous designs, the rear axle is of the single-joint oscillating type with low pivot point. Longitudinally, it is held by rubber-mounted members and transversely by a rubber-mounted crosstie. To withstand the higher loads, nearly all component parts of the axle are reinforced. Equalizer disk (2) on the bevel gear for the adjustment of the gear train is now located between rear axle housing and rear outer bearing ring. Spacer tube (31) has been shortened; it is supported by the bevel gear and the front inner bearing ring. However method of adjustment of taper roller bearings has remained in principle the same.

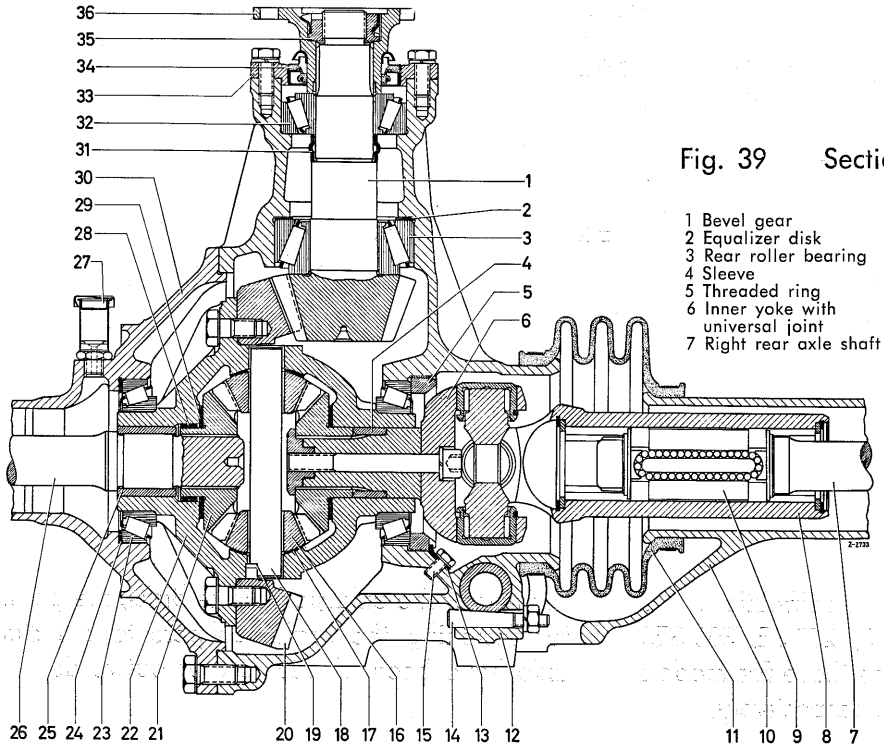


Fig. 39 Sectional view of rear axle

1 Bevel gear
2 Equalizer disk
3 Rear roller bearing
4 Sleeve
5 Threaded ring
6 Inner yoke with universal joint
7 Right rear axle shaft
8 Outer yoke
9 Sliding sleeve
10 Right axle tube
11 Rubber packing
12 Rear axle housing
13 Security mechanism
14 Wedge-type screw
15 Hex screw
16 Differential spider pinion
17 Ball-type disk
18 Equalizer bolt
19 Leaf spring
20 Crown wheel
21 Right differential gear
22 Differential gear casing
23 Taper roller bearing
24 Equalizer disk
25 Bearing bush
26 Left rear axle shaft
27 Venting device
28 Bearing ring
29 Check plate
30 Bearing flange with left axle tube
31 Spacer tube
32 Front taper roller bearing
33 Cover
34 Sealing ring
35 Grooved nut with lock washer
36 Joint flange

Equalizer bolt (18) in the differential gear is held in position by leaf spring (19). The previous securing pin is no longer used.

An additional seat has been provided for the left rear axle shaft by bush (25) pressed into the differential gear casing.

The rear axle shafts in models 250 S, 250 SE and 300 SEB run in the axle tube on both sides in grooved ball bearings, while model 300 SEL is equipped with selfaligning bearings on both sides.

Since model 300 SEL is fitted with air suspension, its rear axle incorporates a brake support of known design, which ensures that the forces created at the rear axle during braking are transmitted to the bodywork and thus prevent rising of the rear end of the vehicle.

Models 300 SEB and 300 SEL can be optionally fitted with a rear axle including a differential gear with lock.

Model	Reduction ratio	Remarks
250 S 250 SE	3.92	standard
	4.08	Vehicles for USA Vehicles with 15" wheels
300 SEB 300 SEL	3.92	standard
	4.08	Vehicles with mechanical 5-speed transmission gear Vehicles for USA Vehicles with 15" wheels[1])
	3.69	optional

[1]) Applicable to model 300 SEB only

H. Road wheels and tires

Disk wheels

Models 250 S, 250 SE, 300 SEB and 300 SEL are equipped with 14" disk wheels 6 J x 14 H (Part No. 108 400 00 02). The new 14" disk wheel differs from type 6 J x 14 H (Part No. 113 400 01 06) used as second design in model 230 SL by its modified wheel dish.

Prescribed tire pressures in atm. (1 atm. = 14.2 psig)

Model	Vehicle load		Standard operation e. g. city and moderate highway driving				Fast driving e. g. fast highway driving or speeding on expressways			
	Trunk space kg	Persons	cold front	cold rear	warm front	warm rear	cold front	cold rear	warm front	warm rear
Tires with standard treads										
250 S	Light under 40	1—4	1.6	1.8	1.8	2.1	1.8	2.0	1.9	2.2
		5—6	1.6	2.1	1.9	2.4	1.8	2.3	2.2	2.7
	Heavy above 40	1—6								
250 SE	Light under 40	1—4	1.6	1.9	1.5	2.2	1.8	2.1	2.1	2.4
		5—6	1.8	2.3	2.1	2.6	2.0	2.5	2.3	2.8
	Heavy above 40	1—6								
300 SEB 300 SEL	Light under 40	1—4	1.7	1.9	2.0	2.2	1.9	2.1	2.2	2.4
		5—6	1.9	2.3	2.2	2.6	2.1	2.5	2.4	2.8
	Heavy above 40	1—6								
Winter tires										
250 S	—	—	1.7	2.2	1.9	2.4	1.7	2.2	2.0	2.5
250 SE 300 SEB 300 SEL	—	—	1.9	2.4	2.1	2.6	1.9	2.4	2.2	2.7

Important note. In the event of replacement or when changing over to winter tires, the previous 13" or 14" disk wheels may NOT be used because of the larger brake disks fitted to the new models.

In the special design "15" wheels for bad road conditions" (only applicable to cars with steel springs), disk wheel 5½ J x 15 H is used. Similar to the 14" wheel, this new type is equipped on both sides of the rim with "hump" shoulders.

Tires

Models 250 S, 250 SE and 300 SEB are fitted with Super Sport tires size 7.35 H 14/185 H 14. Model 300 SEL features Super Sport tires size 7.75 H 14/195 H 14. Both above sizes belong to the type known as "Super tires with flat section".

The following tires have been hitherto approved:

7.35 H 14/185 H 14 Continental, Dunlop
7.75 H 14/195 H 14 Continental

Wheel adjustment values (valid for vehicles ready to move under test load)

Model	250 S 250 SE	300 SEB	300 SEL
Front wheel camber Vehicle ready to move under test load	+ 0° 30' — 20' + 0° 20' — 20'		+ 0° 20' — 20'
Toe-in (vehicle rolling)	2 ± 1 mm or 0° 20' ± 10' [1]		
Angle of track difference at an inner wheel steering angle of 20°		ca. —0° 30'	
Caster without power steering	3° 30' ± 15'	—	—
with power steering		4° ± 15'	
King pin inclination		5° 30' ± 10'	
Wishbone position of front axle (difference in height "a" between inner and outer bearing bolt of lower wishbone).	See table "Values relating to vehicle level"		
Permissible tolerance between left and right wishbone position		5 mm	
Ball seat (as checked with testing device No. 111 589 12 21 00)		4.0 $^{+1}_{-3}$ mm	
Permissible deviation in height of ball seat from steering gear arm to intermediate steering lever		2 mm	
Permissible difference between left and right axle base — front axle		5 mm	
Permissible difference between left and right axle base — rear axle		3 mm	
Rear wheel camber	See table "Values relating to vehicle level"		
Permissible toe-in (+) or toe-out (—) of rear wheels		± 2 mm or ± 0° 20	
Distance between center of rotation of rear axle tubes and center of vehicle		36 mm	
Permissible deviation of rear axle from center position		2 mm	
Permissible difference between left and right wheelbase		8 mm	

[1]) Target value of toe-in is 0° 20'

Vehicle levels

Vehicles with hydro-pneumatic compensating spring

Model	Front axle wishbone position (mm)				Rear axle rear wheel camber			
	standard suspension		harder suspension for bad road conditions		standard suspension		harder suspension for bad road conditions	
	ready to move	under test load [1]	ready to move	under test load [1]	ready to move	under test load [1]	ready to move	under test load [1]
250 S 250 SE 300 SEB	93 ± 15	57 ± 15	97 ± 10	70 ± 10	— 0° 45' ± 1°		+ 0° 30' ± 1°	

[1]) Ready to move plus a load of 3 × 165 kg

Vehicles with air suspension

Model 300 SEL	Standard level [1])		Higher level [4])
	adjustment values [2])	test ratings [3])	test ratings
Wishbone position of front axle [5])	57 ± 2 mm	57 ± 10 mm	107 ± 10 mm
Rear wheel camber	— 0° 45 ± 15'	— 0° 45' ± 1°	+ 3° 15' ± 1°

[1]) Standard vehicle level is obtained as follows: with the vehicle ready for motion, correspondingly adjust connecting bars at the level regulating valves (one each at right and left side of front axle, and at center of rear axle).
[2]) Operate level regulating valves by hand until required level is obtained.
[3]) The tolerance differential between adjustment values and test ratings results from the lost motion of the level regulating valves. The adjustment values obtained by manual operation of the level regulating valves hold only good whilst the vehicle is in motion.
[4]) Values relating to higher level are quoted for testing only, and not for adjustment.
[5]) Difference in height of inner and outer bearing bolt on lower wishbone.

I. Drive shaft

Similar to previous types, the drive shaft of models 250 S, 250 SE and 300 SEB is bipartite and fastened to the floor frame by an intermediate bearing. The rear shaft is no longer fitted with a sliding joint. To equalize body-work tolerances, the front drive shaft is fitted with a key section and a clamping connection. Model 300 SEL will be equipped with a tripartite drive shaft. For detailed description see Driveshaft Model 200, Page 27.

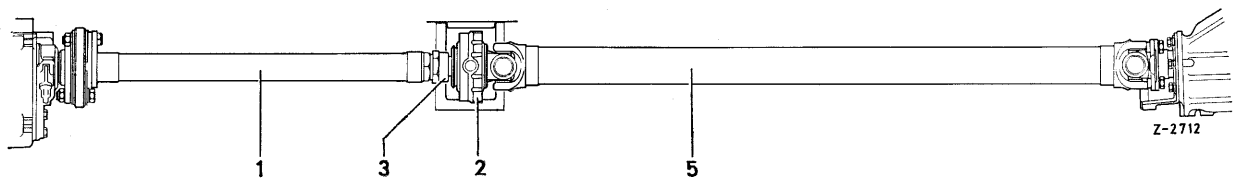


Fig. 40 Bipartite drive shaft

1 Front drive shaft
2 Intermediate bearing
3 Clamping nut
4 Rear drive shaft

Drive shafts of individual models differ only by the length of the front section, which depends on the different wheelbases or whether the vehicle is equipped with mechanical or automatic speed transmission gear.

All drive shafts run maintenance-free, except for the centering star on the front drive shaft.

K. Brakes

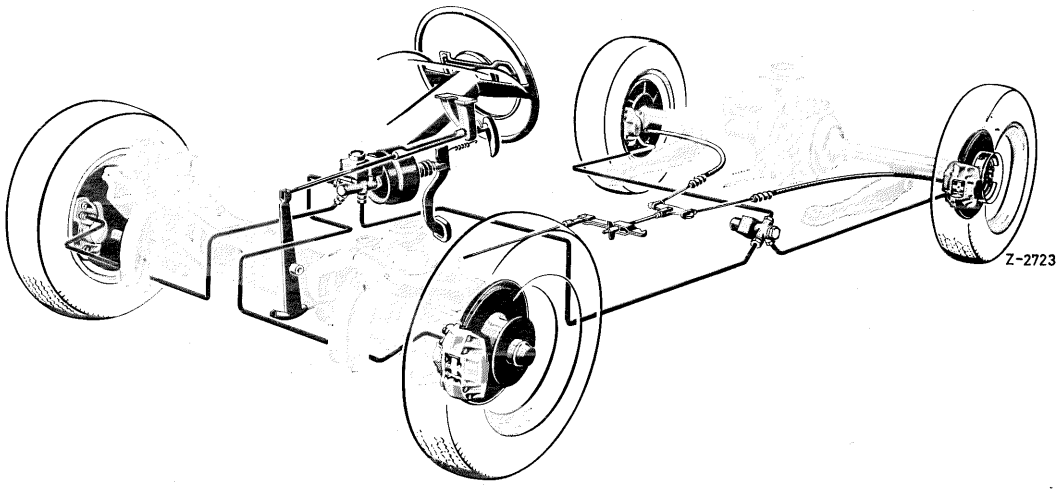


Fig. 41 Braking system

Front wheel brakes

Diameter of brake disks of the front wheel brakes has been increased by 20 mm to 273 mm. All types are fitted with Teves brake calipers. To avoid confusion with previous types the inner pressure cylinder of the new brake caliper is marked "14". To suit calipers to the larger diameter of brake disks, their opening has been increased.

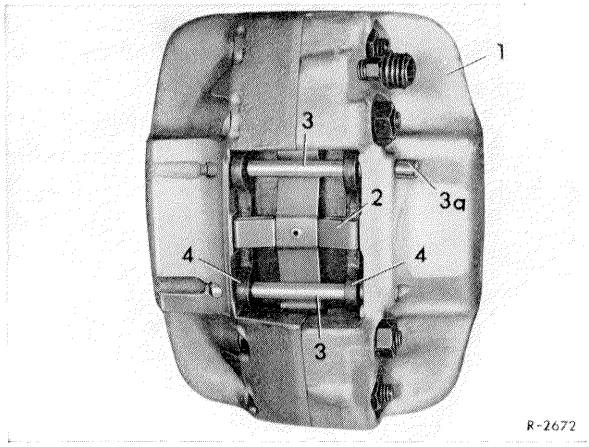


Fig. 42 Teves brake caliper

1 Brake caliper
2 Cross spring
3 Locking pin
3a Clamping sleeve
4 Brake block

The Teves brake calipers are fitted with Fadil lining 77-79 N 7 (green-green-white color marking), Part No. 000 586 06 42.

Standard equipment of brake calipers includes shaft cover plates. In addition, locking pins (3) are held in position in the brake calipers (1) by clamping sleeves (3a). In the event of heavy wear on the brake lining, the widely dimensioned bridge of cross spring (2) prevents the back plate from running up against the brake disk.

Rear wheel brakes

Also the rear axles of the new 2.5 and 3-liter models are fitted with disk brakes. Piston diameter of the built-in Teves brake calipers amounts to 42 mm, which is larger than that used in previous model 300 SE, since the built-in braking pressure regulator reduces the effect of the rear brakes when a certain pressure prevails in the pipework.

The brake calipers are equipped with automatic adjustment, as well as a wobble equalizer for the brake disk. Piston faces incorporate projection of 0.3 mm extending over 240° of the circumference, which ensures one-sided application of the brake block during braking operations with resultant reduction in

brake squeal. Also the brake calipers of the rear wheel brakes feature brake blocks with Fadil lining 77—79 N 7 (green-green-white color marking), Part No. 000 586 14 42.

The arresting brake is of the dual Servo type and accommodated in the cup of the brake disk. Designed as a shoe brake with outstanding self-energizing properties, excellent braking effect is warranted in both directions of rotation.

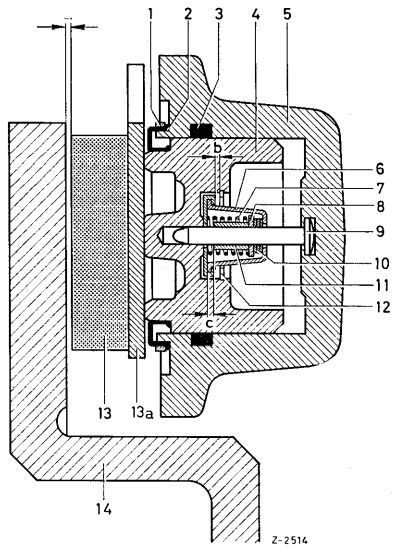


Fig. 43 Brake disk wobble equalizer

1 Clamping ring
2 Dust cap
3 Piston seal
4 Piston
5 Pressure cylinder of brake caliper
6 Stop
7 Compression spring
8 Spacer disk
9 Guide pin
10 Clamping rings
11 Spacer tube
12 Retaining ring
13 Brake block
13a Back plate
14 Brake disk
a Play between brake block and brake disk
b Play between stop and retaining ring
c Play in brake disk wobble equalizer

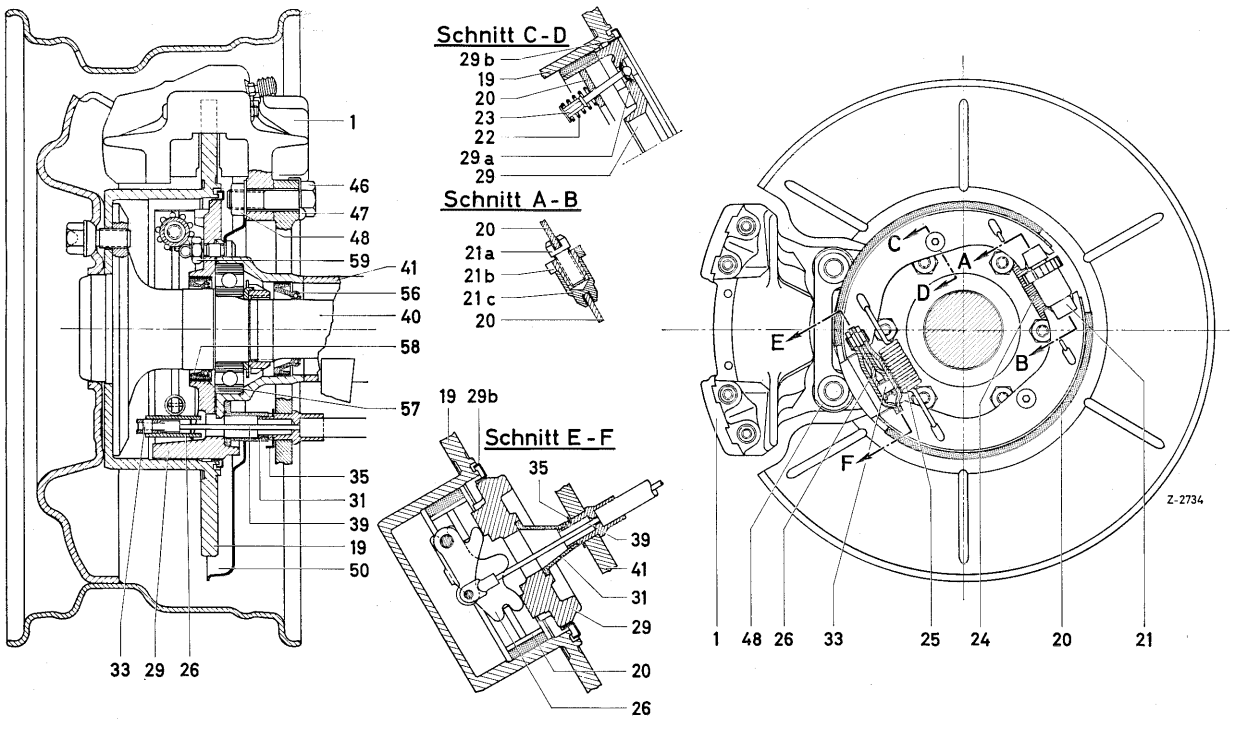


Fig. 44 Dual Servo brake

1 Brake caliper
19 Brake disk
20 Brake shoe
21 Adjusting device
21a Pressure plate
21b Adjusting wheel
21c Pressure sleeve
22 Compression spring
23 Tensioning pin
24 Upper return spring
25 Lower return spring
26 Expanding lock
29 Brake bracket
29a Spring plate
29b Guard plate
31 Rubber sleeve
33 Brake cable pin
35 Brake cable safety mechanism
39 Brake cable
40 Rear axle shaft
41 Axle tube
46 Reamed hex bolt
47 Lock washer
48 Bracket with nut
50 Cover plate
56 Sealing ring
57 Grooved ball bearing
58 Sealing ring
59 Reamed bolt with lock washer and hex nut

Tandem master cylinder

Design features are the same as in models 200 D, 200, 230 and 230 S and are described on page 33.

In models 250 S and 250 SE with right hand drive, as well as models 300 SEB and 300 SEL with left and right hand drive, the front compartment of the equalizing tank connects to the transmitter cylinder of the hydraulic clutch control. Thus, only one equalizing tank is available for the braking system and the hydraulic clutch operation. The connection is fitted to the middle of the front compartment so as to ensure acceptable functioning of the braking system in the event of leakage in the hydraulic system for operating the clutch.

Braking force regulator

As an innovation, the circuit of the rear wheel brakes includes a built-in braking force regulator. Whereas hitherto distribution of braking force from front to rear axle remained constant throughout then braking operation, it can now be changed during braking with the aid of the new device. Thus, road holding properties of the vehicle are materially improved during the braking process, since side-slipping of the rear end of the vehicle due to premature locking of the rear wheels is eliminated. It is a known fact that lateral guide force of wheels is greatly reduced by locking; besides, optimum braking effect cannot be achieved and the vehicle tends to side skidding, which is difficult, if not impossible, to control.

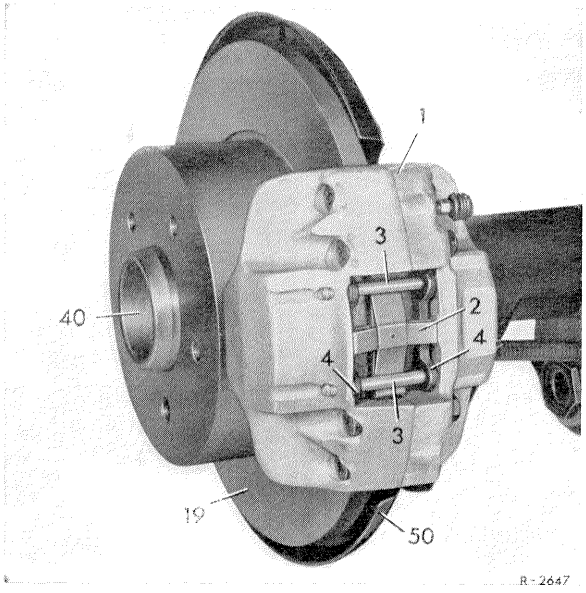


Fig. 45

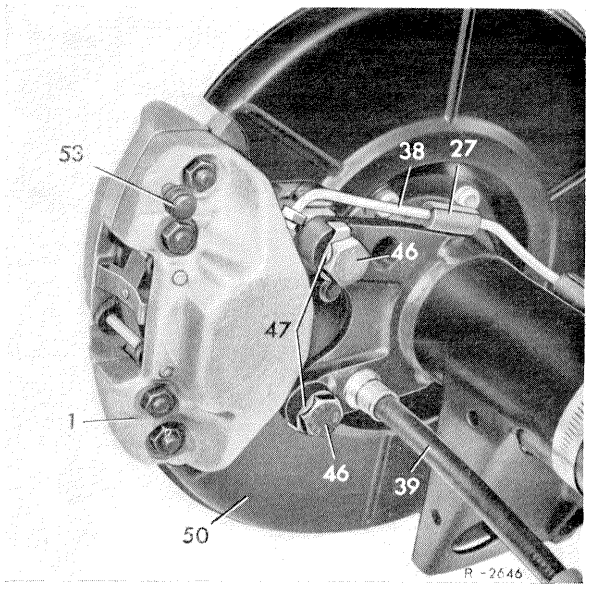


Fig. 46

Arrangement of brake caliper in models 250 S, 250 SE and 300 SEB

1 Brake caliper
2 Cross spring
3 Locking pin
4 Brake block
19 Brake disk
40 Rear axle shaft
50 Cover plate

1 Brake caliper
27 Rubber ring
38 Brake line
39 Brake cable
46 Reamed hex bolt
47 Tab washer
50 Cover plate
53 Vent screw with rubber cap

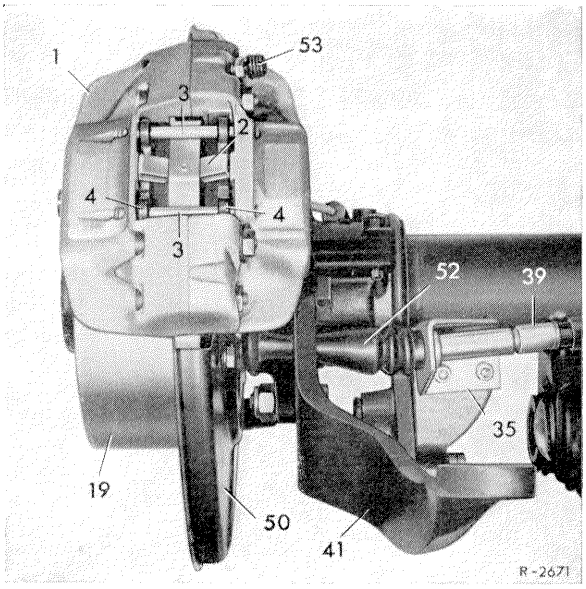


Fig. 47

Arrangement of brake caliper in model 300 SEL

1 Brake caliper
2 Cross spring
3 Locking pin
4 Brake shoe
19 Brake disk
35 Brake cable holder
39 Brake cable
41 Brake support lever
50 Cover plate
52 Rubber sleeve
53 Vent screw with rubber cap

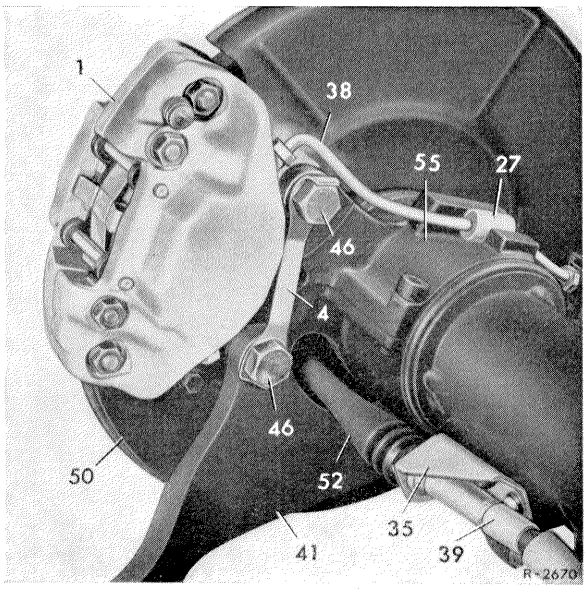


Fig. 48

1 Brake caliper
4 Tab washer
27 Rubber ring
35 Brake cable holder
38 Brake line
39 Brake cable
41 Brake support lever
46 Reamed hex bolt
50 Cover plate
52 Rubber sleeve
55 Bearing box

Operation of the brake force regulator is pressure-dependent; the pressure transmitted to the front and rear wheel brakes increases uniformly until a pressure in the system of approx. 40 atm. is reached. Thereafter, the pressure transmitted to the rear wheel brakes drops below the pressure introduced into the system (refer to graph below).

At the same time, the line pressure transmitted to the front wheel brakes remains unaffected.

The brake force regulator is fitted to the frame floor in front of the rear axle. In the event of defects or faults, the complete unit must be replaced; it may not be opened nor may any attempts be made to repair it.

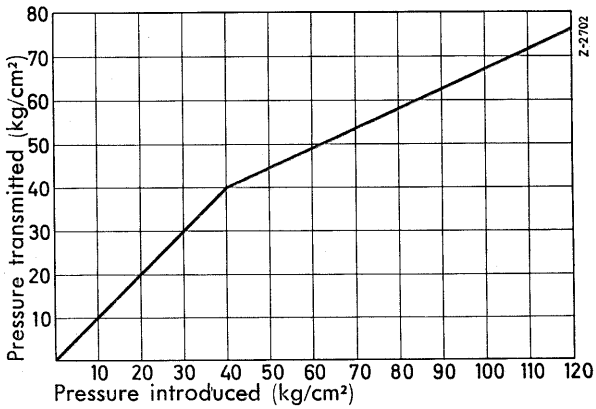


Fig. 49

Brake pressure diagram of rear wheel brakes and brake force regulator

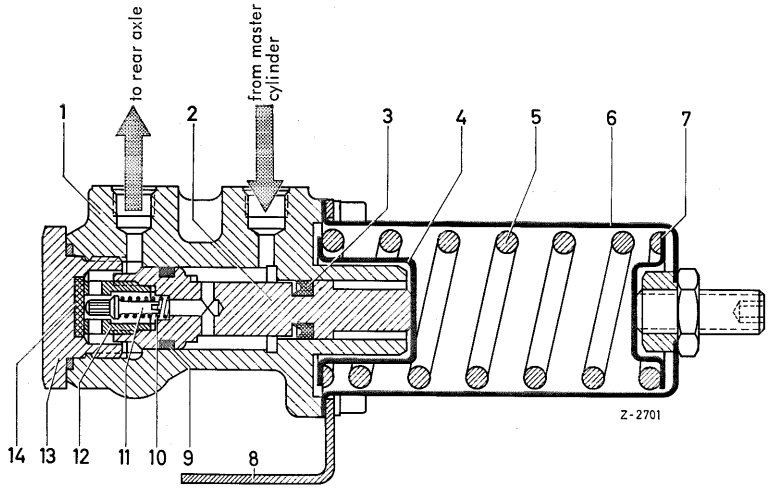


Fig. 50 Brake force regulator

1 Casing of regulator
2 Piston
3 Grooved sleeve
4 Spring cage
5 Compression spring
6 Spring casing
7 Spring plate
8 Bracket
9 Sealing ring
10 Valve spring
11 Valve
12 Valve carrier
13 Screw plug with sealing ring
14 Rubber pad

Design of brake force regulator

Casing (1) accommodates piston (2) with grooved sleeve (3), sealing ring (9), valve (11) with spring (10) and valve carrier (12). By compression spring (5), the piston is forced via spring cage (4) against rubber pad (14).

Method of operation of brake force regulator

Before reaching the pre-determined changeover point at 40–2 atm., piston (2) rests against rubber pad (14) by action of biased spring (5). Valve (11) is opened by the valve stem, which is also in contact with rubber pad (14). Thus, the brake fluid from the master cylinder is freely fed to the rear wheel brakes via the bore provided in the piston and the open valve. The pressure introduced by braking acts simultaneously on the large left piston area and on the smaller annular surface at the right side of the piston and tends to move the latter to the right against the force of compression spring (5). The piston performs this motion as soon as pressure has built up to an extent that the force at the left of the piston exceeds the initial stress in compression spring (5) together with the pressure acting on the annular surface of the piston. Upon commencement of piston stroke, the valve is closed by spring (11). Changeover point has now been reached and throughflow of brake fluid to the rear wheel brakes is temporarily disrupted. When pressure increases, the piston responds by moving to the left, in that the pressure acting on the annular piston surface is higher than that acting on the opposite side, so that the connection to the rear wheel brakes is restored. The valve opens and closes continuously as pressure increases. In view of the short valve lift, opening and closing intervals are very short, as a result of which silent, vibration-free operation is ensured. In the pressure graph, pressure build-up in the rear wheel brakes appears as a rather steeply rising straight line, which flattens at the changeover point (40 atm.) and continues at a lower rate in comparison with the pressure build-up in the front wheel brakes (see diagram).

Further rise of the characteristic pressure curve is determined by the piston diameter, while changeover depends on the spring bias.

Setting of the compression spring (hex socket screw with counter nut on spring casing) may not be changed.

When the hydraulic pressure drops upon release of the brake pedal, the piston is forced to the left against the rubber pad, whereby the valve is opened, so that the brake fluid can return to the equalizing tank.

Braking device

All models are fitted with the doublediaphragm device type T 51/200 in known design.

Adjusting the handbrake (dual servo type)

Note: If the ratchet lever can be drawn out by more than 10 notches (out of a total of 16) with moderate physical effort, the handbrake should be readjusted.

1. Unscrew one rear wheel stud at both sides.

2. Jack up vehicle; turn one wheel to ensure that the screw hole, from which the stud was detached, points upwards to the rear at an angle of approx. 45°. Check with inspection lamp whether the adjusting wheel is visible; if necessary, correct position by turning the road wheel correspondingly.

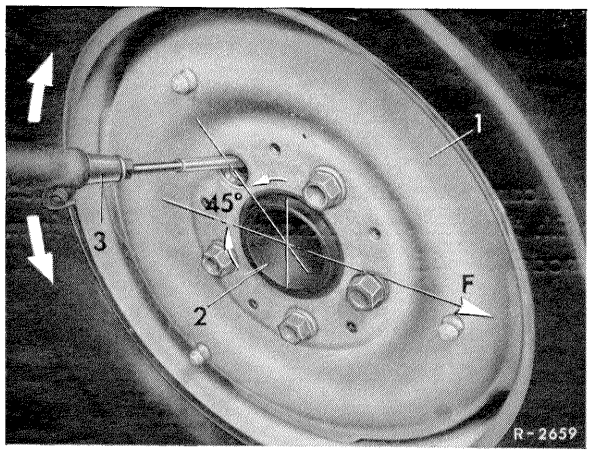


Fig. 51 Adjusting the handbrake

1 Disk wheel
2 Rear axle shaft
3 Screwdriver
F Direction of motion

3. Introduce screwdriver (3) (Size 4.5 mm) through the bores in disk wheel (1), brake disk (4) and rear axle shaft (2) until it engages with the adjusting wheel of adjusting device (21). Next, turn adjusting wheel until road wheel is just locked. Subsequently, turn adjusting wheel by 2 or 3 notches, so that the road wheel can rotate freely.

Note. To eliminate the risk of damages to the thread in the rear axle shaft during adjustment, it is recommended to slip a plastic hose over the shank of the screwdriver.

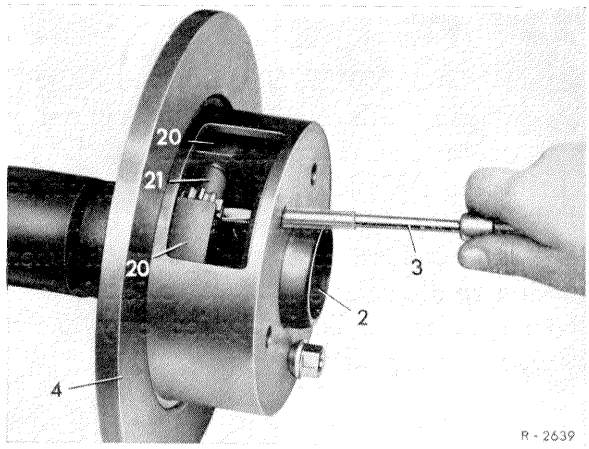


Fig. 52 Adjusting the handbrake

2 Rear axle shaft
3 Screwdriver
4 Brake disk
20 Brake shoes
21 Adjusting device

Important note. At the left side, adjustment should be made with the screwdriver moving upwards, and vice versa at the right side.

4. Upon completion of adjustment, carry out the following check:

Draw out ratchet lever by one notch; in this position, the rear wheels should rotate freely.

Note. The wing nut at the intermediate lever has been provided solely for the purpose of equalizing cable pull lengths and should not be tampered with during adjustment of hand-brake.

Replacement of brake blockes (Teves brake calipers)

Refer to models 200 D and 200 (page 30).

Note. When replacing brake linings, the same type and quality of lining should be used for front and rear wheel brakes.

L. Steering gear

Models 250 S and 250 SE are fitted with the Daimler-Benz recirculating ball steering gear. Optionally, the Daimler-Benz power steering gear can be installed.

The Daimler-Benz power steering gear is standard in models 300 SEB and 300 SEL.

M. Fuel system

Models 250 S, 250 SE, 300 SEB, and 300 SEL are equipped with an 82-liter fuel tank and a fuel return line. Fuel lines are no longer fastened to the middle of the vehicle, but to the left outer side member, similar to model 300 SE. Therefore, care must be taken when jacking up the vehicle that the vehicle jack or the inspection pit lift is applied only to the vehicle jack supports.

For indication of fuel tank level, all models are equipped with an immersion tube transmitter (see section "Electrical installation" on page 32).

In Models 250 SE, 300 SEB, and 300 SEL, the fuel pipes between engine and chassis are fitted at both sides with screw unions.

N. Exhaust system

Model 250 S incorporates a single-pipe exhaust system with plug connection. The system is similar to that used in the previous 200 series.

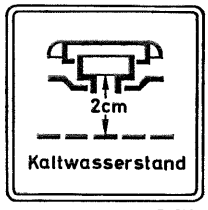
All cars with fuel injection engines are fitted with the dual-pipe exhaust system know from model 300 SE.

O. Cooling system

The cooling system of models 250 S and 250 SE is basically the same as that used in previous models.

For models 300 SEB and 300 SEL, an additional cooling water tank with overpressure and underpressure valve has been provided, which is fitted to the face wall. However the filler plug has remained in its previous position, i. e. on the top water tank of the radiator.

In cold engines, cooling water level should be approximately 2 cm below the bottom edge of the filler plug, and 1 cm when engine has reached working temperature.



Cold water level

Fig. 53

Sign indicating prescribed cooling water level in models 300 SEB and 300 SEL.

P. Electrical installation

All models operate on a voltage of 12 V.

Generator

In models 250 S and 250 SE, points of consumption and battery are supplied with current by a three-phase generator. As hitherto, models 300 SEB and 300 SEL are equipped with a d. c. generator.

Windshield washer

All models are fitted with a windshield washer foot pump with electrical contact.

Instruments

All models 250 S, 250 SE, 300 SEB and 300 SEL, are equipped with the same instruments of the new circular type; design is as follows:

The left instrument comprises fuel gauge, fuel reserve warning light, remote cooling water temperature indicator, oil pressure gauge, handbrake warning light and, in model 300 SEL, also air suspension warning light.

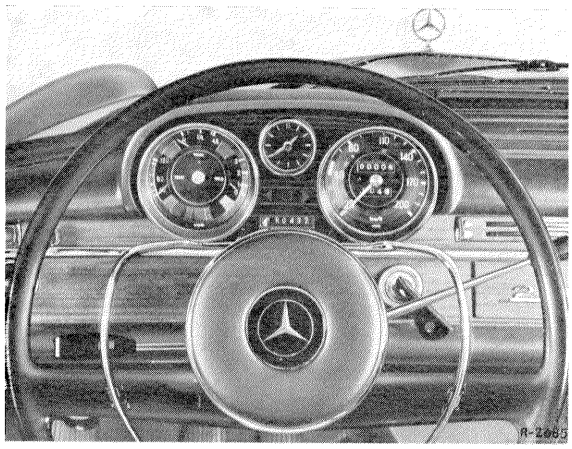


Fig. 54 Instruments

The right instrument consists of the speedometer with mileage and daily mileage counter. Between these instruments, an electric clock is arranged, and warning light for right and left flasher, as well as high beam, underneath.

Underneath the warning lights, the selector lever indicator is arranged in all vehicles equipped with automatic speed transmission gear. The cutout is provided with a cover in all models fitted with mechanical speed transmission gear.

Lighting

Apart from a minor modification, design and function of lighting units and rear lights are the same as in the previous models. Also trunk lighting is the same as in models 200 D, 200, 230, and 230 S (see page 33).

The foot dimmer switch has been abandoned in all models. All models are equipped with a glove box light, which at the same time can be used as map reading lamp.

Combined switch

A new combined switch has been fitted to the left side of the steering column tube, which discharges the following seven functions:

1. Lift lever: headlight flasher
2. Lever in center position: low beam
3. Lever pressed forward: high beam
4. Swing lever to right: right headlight flasher
5. Swing lever to left: left headlight flasher
6. Press lever against steering column tube: wiper stage I
7. Operate switch built into lever: wiper stage II

Heating and ventilation

Models 250 S, 250 SE, 300 SEB, and 300 SEL are equipped with a radial-flow blower for mixture of heating air. The unit operates in three stages in conjunction with the fresh air valve. By opening the fresh air valve approx. half way to the left, the blower remains inoperative; when advancing the valve to three quarters its travel, first stage is switched on. The second stage is operated when the notch or pressure-point is reached, and third stage when the valve is advanced to the left end stop.

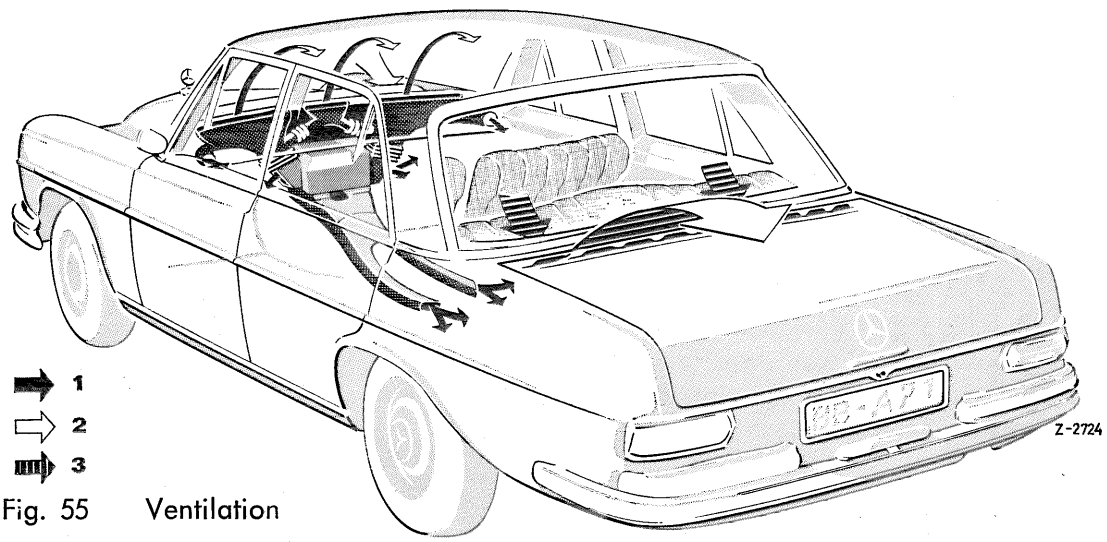


Fig. 55 Ventilation

1 Air distribution 2 Fresh air intake 3 Air exit

Window lift

Standard equipment of model 300 SEL includes electrical window lifts, which can also be fitted to models 250 S, 250 SE, and 300 SEB as optional extra. The four side windows can be operated by a switch provided on each door. Besides, they can be centrally controlled from the driver's door.
The switch group on the driver's door includes a safety switch as fifth unit, which permits the following operations:

Center: with the ignition switched **on,** operation of window lift is only possible from the driver's door.

Bottom: with the ignition switched **on,** windows can be operated individually or from the driver's door.

Top: with the ignition switched **off,** windows can be operated only from the driver's door.

Miscellaneous

Fuel pump, wiper motor and blower motor are fitted in radio-shielded design.

For starter, ignition system and fuel level indication refer to models 200 D, 200, 230, and 230 S (page 32).

Q. Bodywork

Development of the new bodies for models 250 S, 250 SE, 300 SEB, and 300 SEL was governed by the latest concepts of internal and external safety.

Overall dimensions have remained approximately the same as hitherto.

Side windows are slightly curved, so that interior width in shoulder height is increased by 90 mm in the front, and by 70 mm in the passengers compartment.

The low waistline and the flat rear end, as well as the flat roof combine to form a low, sweeping outline of the car.

Seats are equipped with fluted upholstery. Both front seats are of the reclining type. Driver's seat permits adjustment of the backrest inclination, in addition to horizontal and vertical adjustment. These facilities ensure correct seating of the driver.

Deflector panes are operated by a short lever, which enables rapid opening and closing.

Also these models incorporate open door pockets; besides, door armrest and door grip handle are combined. Similar to other models, door paneling is designed for tropical service. (see page 33).

Interior door-closing facilities are recess-mounted.

To protect vehicles against scratches, which are frequently caused by opening the doors when the car is alongside other parked vehicles, the trimstrip on the side wall is fitted with a plastic cover strip. Front and rear bumpers include an interchangeable protective strip made of rubber.
Similar to model 230 SL, heating and ventilation are equipped with air mixing control facilities, which readily adjust to any desired air exit temperature.
By utilizing the back-pressure, fresh air is fed through substantially enlarged intake ports arranged underneath the windshield.
For air mixing control, a fresh and a hot air duct has been provided. Both air streams can thus be mixed from „cold" to „warm". Separate control facilities are provided for left and right leg space; thus, both air streams can be regulated independently.
The blower switch is coupled with the fresh air valve control. Depending on valve position, the blower can be made to run at high or moderate speed, or it is switched off altogether (refer to section „Electrical installation" on page 59). Interior venting facilities are now arranged underneath the rear window, which is thus less exposed to the risk of dimming. The air is discharged through a slot between body and trunk lid.
The glove box is of wider design and equipped with lighting facilities.

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The glove box is of wider design and equipped with lighting facilities.

To improve sound and heat insulation, the floor of the passengers compartment is covered with rubber matting, which has been given a plastic foam backing. For the tunnel, as well as for the leg space in the passengers' compartment, carpets have been provided.

Fastening points for fitting floor frame to leveler have remained unchanged. Steering position now corresponds with that in coupés.

Model 300 SEL differs from the other models in the following points:

Length of passengers' compartment has been increased by 100 mm. Also a new type of door handle has been introduced, which accommodates a safety lock system KESO; the latter affords better protection against burglary than the type so far in use.

The key bit is of rhomboidal shape and is equipped with conical bores (see fig. 56).

Tunnel and passengers' compartment are covered with velour. Besides, a vacuum-operated central locking system and electrically controlled window lifts are standard. Also the sunshine roof, which can be fitted as optional extra, is electrically operated.

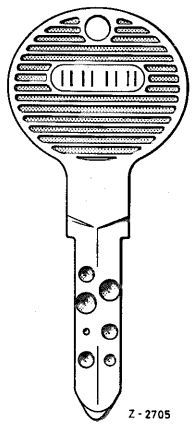


Fig. 56
Key for KESO locking system

III. Description of models 250 SE/C

Models 250 SE Coupé and Convertible have retained the exterior styling of models 220 SEB/C, however they are fitted with the assemblies of model 250 SE saloon.

In the following, only the points are enumerated, which differ from model 250 SE saloon:

The torsion bar at the front axle is the same as used in model 300 SEB.

Tires of model 250 SE Convertible correspond with those of model 300 SEL. Tire pressures are equal to those prescribed for model 250 SE saloon.

Vehicle level values for models 250 SE/C are quoted in the table below:

Vehicle levels for models 250 SE/C

Front axle wishbone position (mm)				Rear axle rear wheel camber			
standard suspension		harder suspension for bad road conditions		standard suspension		harder suspension for bad road conditions	
ready to move	under test load [1]	ready to move	under test load [1]	ready to move	under test load [1]	ready to move	under test load [1]
89 ± 15	53 ± 15	92 ± 10	65 ± 10	—0° 45' ± 1°		+ 0° 30' ± 1°	

[1] Ready to move plus a load of 3 × 165 kg

The drive shaft with clamping connection as described for model 250 SE saloon is also fitted to model 250 SE Coupé. Drive shaft of model 250 SE Convertible remains unchanged.

The mechanical revolution counter fitted to previous models 220 SEB/C has been replaced in models 250 SE/C by a transistorized type.

IV. Description of Models 300 SE/C

Models 300 SE Coupé and Convertible are continued with a few changes.

Below, only those items are named which differ from model 300 SEL:

Reduction Ratio

For the rear axle of models 300 SE/C the following reductions apply:

Model	Reduction ratio	Remarks
300 SE/C	3.69	Production model
	4.08	Vehicles with mechanical 5-speed box Vehicles for USA
	3.92	optional

For model 300 SE Coupé the tire pressure ratings of model 300 SEL apply, while for model 300 SE Convertible they are as follows:

Specified tire pressure in atm (1 atm = 14.2 psi)

Model 300 SE Convertible

Vehicle load		Normal operation (for ex. city driving and moderate highway driving)				Fast driving (for ex. fast highway and expressway driving)			
		cold		warm		cold		warm	
Trunk load kg	Pass.	front	rear	front	rear	front	rear	front	rear
low, under approx. 40	1—4	1.7	1.9	2.0	2.2	1.9	2.1	2.2	2.4
	5—6	1.9	2.4	2.2	2.7	2.1	2.6	2.4	2.9
high, above 40	1—6								

For winter tires refer to model 300 SEL

The universal shaft with clamp connection described for model 300 SEL is also used for model 300 SE Coupé. The universal shaft of model 300 SE Convertible remains unchanged.

Instead of the former mechanical revolution counter models 300 SE/C now have a transistor counter.

V. Description of Model 230 SL

Apart from a few slight changes model 230 SL is continued as before.

The engine suspension has been slightly changed. The front stop limits for the engine rubber mounts are provided with a rubber buffer similar to the one installed in models 200 D and 200.

From now on, model 230 SL can be optionally provided with the mechanical ZF 5-speed gear box (refer to models 300 SEB and 300 SEL, page 44).

VI. Technical Data

A. Models 200 D, 200, 230, 230 S

Vehicle model	200 D	200	230	230 S
Vehicle type	110.110	110.010	110.011	111.010
Engine model	OM 621.VIII	M 121 B.XI	M 180.VI	M 180.VIII
Engine type	621.918	121.940	180.945	180.947

Engine

Operation	4-cycle diesel DB prechamber system	4-cycle carburetor		
Number of cyl.	4		6	
Bore/stroke (mm)	87/83.6		82/72.8	
Total eff. displacement (cc)	1988		2306	
Compression ratio	21 : 1	9.0 : 1	9.0 : 1	
Firing order	1—3—4—2	1—3—4—2	1-5-3-6-2-4	
Max. speed (rpm)	4320	6000	6000	6250
Engine performance in hp at rpm acc. to DIN[1]	55/4200	95/5200	105/5200	120/5400
Engine performance in gr. hp at rpm acc. to SAE	60/4200	105/5400	118/5400	135/5600
Max. torque in mkg at rpm acc. to DIN	11.5/2400	15.7/3600	17.7/3600	18.2/4000
Max. torque in mkg at rpm acc. to SAE	12.0/2400	16.9/3800	19.0/3800	20.0/4200
Crankshaft	5 bearings		4 bearings	
Crankshaft and Conrod bearings	Multi-component plain bearings with steel-backed shells			
Valve arrangement	Overhead, vertical			
Camshaft location	Top			
Cooling system	Water circulation through pump, finned tube radiator, thermostat with by-pass line and fan			
Lubrication	Force-feed lubrication by means of gear pump			
Oil filter	Combination main and by-pass filter	Main flow filter		
Air filter	Oil bath damper filter	Damper filter with paper element		

[1]) The DIN horsepower specified is effectively available at the clutch since all auxiliary power consumers have already been deducted.

Model			200 D	200	230	230 S

Electrical Equipment

Battery	Voltage (V)		12	12	
	Capacity (Ah)		66	44	
Ignition timer		Bosch	—	0231 115 052 JFU R 4	0231 116 048 JFU R 6
Ignition coil		Bosch	—	0221 102 001 TK 12 A 3	0221 102 006 TK 12 A 10
Spark or glow plugs		Bosch	0250 001 008 KE/GH 1/21	0241 225 001 W 225 T 28 [1]	
		Beru	381 GK	D 225/14/3 [1]	
Starter		Bosch	0001 354 064 EJD 1,8/12 R 104	0001 208 003 EF (R) 12 V 0,8 PS	
AC generator		Bosch	0120 400 526 14 V 35 A 490 W		

[1]) Shielded: Bosch W 225 RT 28, Beru ED 225/14/3

Dimensions

Track (mm)	front	1482		
	rear	1485		
Wheel lock	outer	32° 30'		
	inner	39°		
Min. turning circle (m)		11.4		11.5
Wheel base (mm)		2700		2750
Length of vehicle (mm)		4730		4875
Width of vehicle (mm)		1795		1795
Height of vehicle, ready for driving (mm)		1495		1500
Ground clearance, under full load (mm)		approx. 130		approx. 145

Weights

Vehicle dry weight without fuel, spare wheel and tools (kg)		ca. 1250	ca. 1200	ca. 1235	ca. 1280
Unladen weight of vehicle, ready for driving, with full fuel tank, spare wheel and tools (kg)		1325	1275	1305	1350
Permissible total weight (kg)		1825	1775	1805	1850
Permissible axle load (kg)	front	845	795	825	860
	rear	980	980	980	990

Capacities

Cooling system with heater (liter)		Water	10.1		14	11.4
Fuel tank/Fuel reserve (liter)		Fuel	65/7—8		65/7—8	
Crankcase (liter) max./min.		Engine oil	4/2.5		5.5/3.5	
Oil Filter (liter)		Engine oil	1.0	0.5	0.5	
Water pump (cc)	Hypoid oil SAE 90		10	10	10	

Model	200 D	200	230	230 S

Capacities (ctd)

Mechanical gearbox (liter)	Automatic transmission fluid	1.4		1.4
DB automatic transmission (liter)	ATF special oil	4.5 [1]		4.75 [1]
Rear axle (liter)	Hypoid oil SAE 90	2.5		2.5
Steering (liter)	Hypoid oil SAE 90	0.3		0.3
DB power steering (liter)	Aut. Transm. Fluid	1.4		1.4
Braking system (liter)	ATE blue brake fluid	0.5		0.5
Wheel hub front (gr)	Anti-friction bearing grease	65—80		65—80

[1]) For initial filling only; refills during oil change approx. 1 Liter less.

Speeds, Consumption Figures and Operating Conditions

At rear axle ratio of		3.92		4.08					
Max. speeds in individual gears (km/h)		mech. gearbox	Aut. DB transm.	mech. gearbox	Aut. DB transm.	mech. gearbox	Aut. DB transm.	mech. gearbox	Aut. DB transm.
timed	1st gear	32	32	40	42	40	42	40	42
	2nd gear	55	55	75	67	75	67	75	67
	3rd gear	86	86	125	108	125	108	125	108
	4th gear	approx. 130	approx. 127	approx. 160	approx. 155	approx. 170	approx. 165	approx. 175	approx. 170
Climbing ability (%)	1st gear	38	36	46.5	46.5	45.5	45.5	45	45
	2nd gear	20	21	29	32	31	35	31	35
	3rd gear	10.5	12	16	18	17	20	17	20
	4th gear	6.5	6.5	10	10	11	11	11	11
Acceleration time in 4th gear without cons. shifting from 0—100 km/h [1]) (secs)		37.6	—	24.4	—	22.9	—	23.1	—
Acceleration time with cons. shifting from 0—100 km/h [1]) (secs)		—	30.2	—	15.1	—	13.8	—	13.0
Engine speed at 100 km/h in 4th gear (rpm)		3320	3420	3470	3610	3470	3625	3415	3580
Fuel consumption Consumption for average highway travel (liter/100/h)		7.0—9.0		9.0—14.0		9.0—15.0		9.0—15.0	
Fuel consumption acc. to DIN 70 030 (liter/100 km/h)		8.1 [2])		10,9 [3])		11.2 [3])		11.2 [3])	
Engine oil consumption (liter 100 km)		0.15—0.2		0.15—0.2					
Oil pressure (controlled, warm, atü)		5.0		5.5					
Min. oil pressure while idling with engine warm (atü)		0.6							
Op. temperature of cooling water (°C)		70—95							
Fuel		Diesel fuel to DIN 51 601		Super (Premium) or Gasoline/Benzole mix					
Anti-knock rating for max.[4]) efficiency (ROZ)		—		98					
at max. retardation of ignition and consequent drop in performance		—		90					

[1]) With 2 persons in vehicle [2]) Measured at 97.5 km/h [3]) Measured at 110 km/h

[4]) Gasoline engines are set to maxy. efficiency at the factory using commercially available fuels. If, as an exception fuels must be temporarily used, having an octane rating below the max. efficiency rating stated above, be sure to retard the firing point in each case accordingly to match the octane rating of the fuel used. Proceed as follows: for each research method number (ROZ number) retard the firing point by approx. 1° crankshaft angle. Adjustment by one scale line on ignition timer bearing changes the firing point by 2° crankshaft angle. Do not retard firing point by more than max. 8°. As soon as fuel with the specified octane rating (98 ROZ) or more is again available, full advanced ignition must be resumed.

B. Models 250 S, 250 SE, 300 SEB, 300 SEL

Vehicle model	250 S	250 SE	300 SEB	300 SEL
Chassis type	108.012	108.014	108.015	109.015
Engine model	M 108. I	M 129. I	M 189. VIII	M 189. VII
Engine type	108.920	129.980	189.989	189.988

Engine

Operation	4-cycle carburetor	4-cycle gasoline injection	
Number of cylinders	6		6
Bote/Stroke (mm)	82/78.8		85/88
Total eff. displacement (cc)	2496		2996
Compression ratio	9 : 1	9.3 : 1	8.8 : 1
Firing order	1—5—3—6—2—4		
Max. speed (rpm)	6300	6300	6000
Engine performance in hp at rpm acc. to DIN[1]	130/5400	150/5500	170/5400
Engine performance in gr. hp at rpm acc. to SAE	146/5600	170/5600	195/5500
Max. torque in mkg at rpm acc. to DIN	19.8/4000	22/4200	25.4/4000
Max. torque in mkg at rpm acc. to SAE	21.75/4200	24/4500	28.1/4100
Crankshaft	7 bearings		
Crankshaft and Conrod bearings	Multi-component plain bearings with steel-backed shells		
Valve arrangement	Overhead, vertical		Overhead, 20° inclined
Camshaft location	Top		
Oil cooling	Oil-water heat exchanger		
Cooling system	Water circulation through pump, fined tube radiator, thermostat with by-pass line and fan		
Lubrication	Force-feed lubrication by means of gear pump		
Oil filter	Main flow filter		
Air filter	Damper filter with paper element		

[1]) The DIN horsepower specified is effectively available at the clutch since all auxiliary power consumers have already been deducted.

Model			250 S	250 SE	300 SEB	300 SEL

Electrical Equipment

Battery	Voltage (V) Capacity (Ah)		12 44	12 55		12 66
Ignition timer		Bosch	0231 116 037 JFU R 6	0231 116 047 JFU R 6		0231 141 002 PFU R 6
Ignition Coil		Bosch	0221 102 006 TK 12 A 10	0221 102 004 TK 12 A 9		0221 102 006 TK 12 A 10
Spark plugs		Bosch	0241 225 001 W 225 T 28 [1]	0241 235 001 W 235 P 21		0241 250 001 W 250 P 21
		Beru	D 225/14/3 [1]	D235/14/3 P		D 250/14/3 P
Starter		Bosch	0001 208 001 EEF 0,8/12 R 2			0001 307 019 EGE 1,3/12 AR 27
AC generator		Bosch	0120 400 526 14 V 35 A 490 W			—
DC generator		Bosch	—			0101 402 076 LJ/GK 300/12/1450 AR 53

[1] Shielded: Bosch W 225 RT 28, Beru ED 225/14/3.

Dimensions

Track (mm)		front rear	1482 1485			1482 1490
Wheel lock		outer inner	32° 30′ 39°		32° 39°	32° 39°
Min. turning circle (m)			11.5		11.7	12.0
Wheel base (mm)			2750			2850
Length of vehicle (mm)			4900			5000
Width of vehicle (mm)			1810			1810
Height of vehicle, ready for driving (mm)			1440			1415 [1]
Ground clearance, full load (mm)			145	152		162 [1]

[1] Plus approx. 50 mm at position "higher level"

Weights

Vehicle dry weight, without fuel, spare wheel and tools (kg)		1370	1395	1470	1556
Unladen weight of vehicle ready for driving, with full fuel tank, spare wheel and tools (kg)		1440	1480	1560	1640
Permissible total weight (kg)		1940	1980	2060	2140
Permissible axle load (kg)	front rear	885 1055	910 1070	990 1070	1030 1110

Capacities

Cooling System with heater (liter)	Water	11.4		16.8
Fuel tank/Fuel reserve (liter)	Fuel	82/7		82/7
Crankcase (liter) max./min.	Engine oil	5.5/3.5		6/4
Oil filter (liter)	Engine oil	0.5		0.5

Capacities (ctd)

Model		250 S	250 SE	300 SEB	300 SEL
Mechanical gearbox (liter)	Automatic transmission fluid	1.4		1.4	
DB automatic transmission (liter) [1]	ATF special oil	4.75 [3]		5.75 [3]	
Rear axle (liter)	Hypoid oil SAE 90	2.5		2.5	
Steering (liter)	Hypoid oil SAE 90	0.3		—	
DB power steering (liter) [2]	Automatic transmission fluid	1.4		1.5	
Braking system (liter)	ATE blue brake fluid	0.5		0.5	
Wheel hub front (gr)	Anti-friction bearing grease	65—80		65—80	

[1] Optional for models 250 S, 250 SE and 300 SEB
[2] Optional for models 250 S and 250 SE
[3] For initial filling only; refills during oil change approx. 1 liter less.

Speeds, Consumption Figures and Operating Conditions

At rear axle ratio of		3.92		3.92		3.92 [1]		3.92 [1]	
Max. speeds in individual gears (km/h)		mech. gearbox	aut. DB transm.	mech. gearbox	aut. DB transm.	mech. gearbox	aut. DB transm.	mech. gearbox	aut. DB transm.
timed	1st gear	46	46	46	46	44	44	45	46
	2nd gear	84	74	84	74	81	70	83	72
	3rd gear	138	120	138	120	132	114	136	117
	4th gear	180	ca.175	190	ca.185	190	ca.185	ca.190	ca.185
Climbing ability (%)	1st gear	47	47	46.5	46.5	44.5	44.5	44	44
	2nd gear	31	35	32	37	37	43	34	40
	3rd gear	17	20	17.5	20.5	20	23	18.5	21.5
	4th gear	11	11	11.2	11.2	12.2	12.2	11	11
Acceleration in 4th gear without cons. shifting from 20—100 km/h [2] (secs)		23.4	—	22.3	—	20.5	—	22.4	—
Acceleration time with cons. shifting from 0—100 km [2] secs)		—	11.7	—	10.8	—	10.6	—	11.0
Engine speed at 100 km/h in 4th gear (rpm)		3300	3480	3300	3495	3300	3440	3195	3335
Fuel consumption Consumption for average highway travel (liter/100 km)		10.0—16.0		10.0—16.0		11.0—18.0		11.0—18.0	
Fuel consumption acc. to DIN 70 030 [3] (liter/100 km/h)		11.7		11.7		12.5		12.5	13.7
Engine oil consumption (liter/100 km)		0.15—0.25		0.15—0.25		0.15—0.30		0.20—0.30	
Oil pressure, (controlled, warm, atü)		5.5							
Min. oil pressure while idling with engine warm (atü)		0.6							
Operating temperature of cooling water (° C)		70—95							
Fuel		Super (Premium) or gasoline/Benzole mix							
Anti-knock rating for max. efficiency [4]		98		96					
(ROZ)	at max. retardation of ignition and consequent drop in performance	90		90					

[1] 3.69 optional [2] With 2 persons in vehicle [3] Measured at 110 km/h
[4] Gasoline engines are set to max. efficiency at the factory using commercially available fuels. If, as an exception, fuels must be temporarily used, having an octane rating below the max. efficiency rating stated above, be sure to retard the firing point in each case accordingly to match the octane rating of the fuel used. Proceed as follows: for each research method number (ROZ number) retard the firing point by approx. 1° crankshaft angle. Adjustment by one scale line on ignition timer bearing changes the firing point by 2° crankshaft angle. Do not retard firing point by more than max. 8°.
As soon as fuel with the specified octane rating (98 ROZ) or more is again available, full advanced ignition must be resumed.

C. Models 250 SE Coupé and Cabriolet, 300 SE Coupé and Cabriolet, 230 SL

Type

Vehicle model	250 SE/C	300 SE/C	230 SL
Chassis type	Cp 111.021 Ca 111.023	Cp 112.021 Ca 112.023	113.042
Engine model	M 129.II	M 189.VI	M 127.II
Engine type	129.981	189.987	127.981

Engine

Operation	4-cycle gasoline injection		
Number of cylinders	6		
Bore/Stroke (mm)	82/78.8	85/88	82/72.8
Total eff. displacement (cc)	2496	2996	2306
Compression ratio	9.3 : 1	8.8 : 1	9.3 : 1
Firing order	1 — 5 — 3 — 6 — 2 — 4		
Max. speed (rpm)	6300	6000	6500
Engine performance			
in hp at rpm acc. to DIN[1]	150/5500	170/5400	150/5500
in gr. hp at acc. to SAE	170/5600	195/5500	170/5600
Max. torque in mkg at rpm acc. to DIN	22.0/4200	25.4/4000	20/4200
Max. torque in mkg at rpm acc. to SAE	24.0/4500	28.1/4100	22/4500
Crankshaft	7 bearings		4 bearings
Crankshaft and conrod bearings	Multi-component plain bearings with steel-backed shells		
Valve arrangement	overhead vertical	overhead 20° inclined	overhead vertical
Camshaft location	Top		
Oil cooling	Oil-water heat exchanger		
Cooling system	Water circulation through pump. finned tube radiator, thermostat with by-pass line and fan		
Lubrication	Force-feed lubrication by means of gear pump		
Oil filter	Main flow filter		
Air filter	Damper filter with paper element		

[1]) The DIN horsepower specified is effectively available at the clutch since all auxiliary power consumers have already been deducted.

Model			250 SE/C	300 SE/C	230 SL
Electrical Equipment					
Battery	Voltage (V)		12	12	12
	Capacity (Ah)		55	66	55
Ignition timer		Bosch	0231 116 047 JFU R 6	0231 141 002 PFU R 6	0231 116 042 JFU R 6
Ignition coil		Bosch	0221 102 004 TK 12 A 9	0221 102 006 TK 12 A 10	0221 102 004 TK 12 A 9
Spark plugs		Bosch	0241 235 001 W 235 P 21	0241 250 001 W 250 P 21	
		Beru	D 235/14/3 P	D 250/14/3 P	
Starter		Bosch	0001 208 001 EEF 0,8/12 R 2	0001 307 019 EGE 1,3/12 AR 27	0001 208 001 EEF 0,8/12 R 2
AC generator		Bosch	0120 400 526 14 V 35 A 490 W	—	0120 400 526 14 V 35 A 490 W
DC generator		Bosch	—	0101 402 076 LI/GK 300/12/1450 AR/53	—
Dimensions					
Track (mm)		front	1482	1482	1486
		rear	1485	1490	1487
Wheel lock		outer	32° 30′	32°	34° 20′
		inner	39°	39°	39°
Min. turning circle (m)			11.5	11.7	10
Wheel base (mm)			2750		2400
Length of vehicle (mm)			4880		4285
Width of vehicle (mm)			1845		1760
Height of vehicle, ready for driving (mm)			Cp 1420 Ca 1435	Cp 1395 [1] Ca 1400 [1]	Roadster 1320 Coupé 1305
Ground cleatance, full load (mm)			152	195 [1]	approx. 125

[1]) Plus approx, 50 mm at position "higher level".

Weights							
Vehicle dry weight, without fuel, spare wheel and tools (kg)			Cp 1400 Ca 1490		Cp 1555 Ca 1620		1210
Unladen weight of vehicle ready for driving, with full fuel tank, spare wheel and tools (kg)			Cp 1490 Ca 1575		Cp 1650 Ca 1715		1295
Permissible total weight (kg)			Cp 1960 Ca 2045		Cp 2120 Ca 2185		1650
Permissible axle load (kg)		front	Cp 890	Ca 935	Cp 1010	Ca 1035	800
		rear	1070	1110	1110	1150	850
Capacities							
Cooling system with heater (liter)		Water	11.4		16.8		10.8
Fuel tank / Fuel reserve (liter)		Fuel	82/7		82/7		65/7—8
Crankcase (liter) max./min.		Engine oil	5.5/3.5		6/4		5.5/3.5
Oil filter (liter)		Engine oil	0.5				0.5
Water pump (cc)	Hypoid oil SAE 90		self-lubricating				10

Model		250 SE/C	300 SE/C	230 SL
Capacities (ctd)				
Mechanical gearbox (liter)	Automatic transmission fluid	1.4		
DB automatic transmission (liter) [1]		4.75 [2]	5.75 [2]	4.75 [2]
Rear axle (liter)	Hypoid oil SAE 90	2.5	2.5	2.5
Steering (liter)	Hypoid oil SAE 90	0.3	—	0.3
DB power steering (liter) [1]	Automatic transmission fluid	1.4	1.5	1.4
Braking system (liter)	ATE blue brake fluid	0.5		
Wheel hub front (gr)	Anti-friction bearing grease	65-80		

[1] Optional for models 250 SE /C and 230 SL.
[2] For initial filling only; refills during oil change approx. 1 liter less.

Speeds, Consumption Figures and Operating Conditions

At rear axle ratio of		3.92				3.69				3.75	
Max. speeds in individual gears (km/h)		mech. gearbox Cp	mech. gearbox Ca	aut. DB transm. Cp	aut. DB transm. Ca	mech. gearbox Cp	mech. gearbox Ca	aut. DB transm. Cp	aut. DB transm. Ca	mech. gearbox	aut. DB transm.
timed	1st gear	46	48	46	48	48	48	48	48	45	45
	2nd gear	84	87	74	76	89	89	77	77	90	80
	3rd gear	138	143	120	124	145	145	125	125	135	130
	4th gear	approx. 190	approx. 190	approx. 185	approx. 185	approx. 200	approx. 200	approx. 195	approx. 195	ca. 200	ca. 195
Climbing ability (%)	1st gear	46.5	47	46.5	47	44.5	45	44.5	45	43,5	43.5
	2nd gear	32	29	37	33	31.5	30	35	34	33	37
	3rd gear	18	16	21	19	17	16	20	19	19	19.5
time	4th gear	11	10	11	10	10.2	10	10.2	10	10	10.2
Acceleration in 4th gear without cons. shifting from 20—100 km/h [1] (secs)		22.3	25.0	—	—	24.6	25.6	—	—	21	—
Acceleration time with cons. shifting from 0—100 km/h [1] (secs)		—	—	10.8	11.5	—	—	11.3	11.7	—	11.5
Engine speed at 100 km/h in 4th gear (rpm)		3300	3195	3495	3395	3005	3005	3145	3145	3190	3380
Fuel consumption Consumption for average highway driving (liter 100 km)		10—16				11—18				10—16	
Fuel consumption acc. to DIN 70 030 [2] (liter 100 km/h)		11.7				11.8	13			10.2	
Engine oil consumption (liter 100 km)		0.15—0.25				0.15—0.30				0.2—0.25	
Oil pressure (controlled, warm, atü)		5.5									
Min. oil pressure while idling with engine warm (atü)		0.6									
Operating temperature of cooling water (°C)		70—95									
Fuel		Super (Premium) or gasoline/benzole mix									
Anti-knock rating for max. efficiency (ROZ)		96									
at max. retardation of ignition and consequent drop in performance		90									

[1] With 2 persons in vehicle [2] Measured at 110 km/h
[3] Gasoline engines are set to max. efficiency at the factory, using commercially available fuels. If, as an exception fuels must be temporarily used which have an octane rating below the max. efficiency rating stated above, be sure to retard the firing point in each case accordingly to match the octane rating of the fuel used. Proceed as follows: for each research method number (ROZ number) retard the firing point by approx. 1° crankshaft angle. Adjustment by one scale line on ignition timer bearing changes the firing point by 2° crankshaft angle. Do not retard firing point by more than max. 8°. As soon as fuel with the specified octane rating (98 ROZ) or more is again available, full advanced ignition must be resumed.

VII. Engine Tuning-up Instructions

A. Models 200 D, 200, 230, 230 S

Valve Clearance

Model		200 D [1]	200, 230, 230 S [2]
Valve clearance with engine cold	Inlet	0.15	0.08
	Exhaust	0.35	0.18

[1] On model 200 D the valve clearance is measured between the rocker arm and the hat nut. It may also be adjusted when engine is warm (cooling water temperature 60–80° C). Inlet 0.20 Exhaust 0.35.
[2] On models 200, 230, 230 S the valve clearance is measured between the slide surface of the rocker arm and the cam base circle of the camshaft.

Timing Periods for Test Measurements at 0.4 mm Test Valve Clearance

Model	Camshaft Code No. [1]	Inlet Valve opens before TDC	Inlet Valve closes after BDC	Exhaust Valve opens before BDC	Exhaust Valve closes after TDC	Min. distance between inlet valve and piston at crankshaft setting of 5° after TDC mm
200 D	12	12½°	41½°	45°	9°	1.0[2]
200	50	11°	53°	47°	21°	0.8
230, 230 S	86					

Note: Timing periods for test measurements apply at 0.4 mm test valve clearance, that is, the stated ratings have been computed at an assumed valve clearance of 0.4 mm. When measuring, the normal operating valve clearance should be nullified by means of a feeler gauge or the like, since the absence of play will provide more accurate values.
[1] The code number is punched on the rear face to identify individual camshafts.
[2] On model 200 D also measure minimum distance between exhaust valve and piston at a crankshaft position of 5° before TDC. Minimum distance = 1.2 mm.

Compression Pressure

Model		200 D	200		230, 230 S	
Compression ratio		21 : 1	9.0 : 1	7.0 : 1	9.0 : 1	7.2 : 1
Compression pressure in atü [1]	normal	22-24	10-11	7.5-8.5	10-11	7.8-8.8
	minimum	ca. 17	ca. 8.5	ca. 6	ca. 8.5	ca. 6.5

[1] Measure compression pressure at normal operating temperature (cooling water temperature 70—80° C), with throttle or control valve open.
Crank engine with starter for at least 8 cycles. **The differences among the individual cylinders should not be more than max. 1.5 atm.** and on model 200 D not more than max. 5 atm.

Electrode Gap of Spark Plugs

Models 200, 230, 230 S

non-shielded	0.7—0.8
shielded	0.9—1.0

Distributor Contact Gaps and Angles of Closure

Model	200	230, 230 S
Distributor contact gap	0.4—0.5	0.3—0.4
Angle of closure with new contacts	50° ± 2°	$38° \pm \frac{3°}{1°}$

Note: When installing new contacts set angle of closure to max. tolerance limit, if possible.
Don't change angle of closure of used contacts, replace by pairs, if more than —5° from nominal value are measured.

Position of Crankshaft when installing Injection Pump

Model 200 D

Position of crankshaft when installing injection pump at begin of delivery position of injection pump — 26° before TDC of compression stroke

The removed injection pump is in begin of delivery position when the mark on the camshaft of the injection pump is in alignment with the mark on the flange of the injection pump.

Begin of delivery is checked following the installation of the injection pump acc. to the oberflow method and is set to 26° before TDC of compression stroke.

Setting of Firing Point

a) Basic setting or assembly setting when installing ignition timer

Model	Compression ratio	Distributor Bosch design.	Basic setting [1] Checkup with test lamp for make and break ± 1°	Checkup with stroboscope at starting speed with spark plugs screwed in
200	9.0 : 1	JFUR 4 (0 231 115 052)	2° before TDC [2]	3° before TDC[2]
	7.0 : 1	JFUR 4 (0 231 115 053)		
230, 230 S	9.0 : 1 / 7.2 : 1	JFUR 6 (0 231 116 048)	1° before TDC[2]	

[1] The checkup with the test lamp applies only as assembly setting for installing the distributor and should be made on cylinders 1 and 4 of 4-cylinder engines, and cylinders 1 and 6 of 6-cylinder engines for the purpose of comparison and to eliminate measuring errors. Both values should not deviate from each other for more than 1.5°.
When checking with the stroboscope at starting speed the basic settings are approx. 1—2° earlier than when checking with the test lamp for make and break.

[2] **For measuring the firing point the setting at a speed of 4500 rpm without vacuum adjustment will apply only** (refer to Table on next page with stroboscope values).
When measuring, also make sure that the stroboscope values are within the limits stated also at speeds of 800 and 1500 rpm.

b) Stroboscope values

Model	Compression ratio ε	Stroboscope values at engine speed in rpm without load					Begin of vacuum control of distributor without load at engine speed rpm
		800	1500	3000	4500	4500	
		with or without vacuum control					
		with and without	without	without	without	with [1]	
200	9.0 : 1	6—12°	20—26°	26—32°	**39° +2**	+15° ±3	1000—1200
	7.0 : 1	3—7°	16—22°	35—41°	**48° +2**	+11° ±3	
230	9.0 : 1	5—15°	20—27°	25—31°	**35° +2**	+10° ±3	1400—1600
	7.2 : 1						
230 S	9.0 : 1						1800—2000
	7.2 : 1						

[1]) The range of adjustment of the total vacuum scale can be increased by screwing the pushrod, which connects the diaphragm in the vacuum capsule with the make and break plate, in outward direction, and can be reduced by screwing pushrod down.

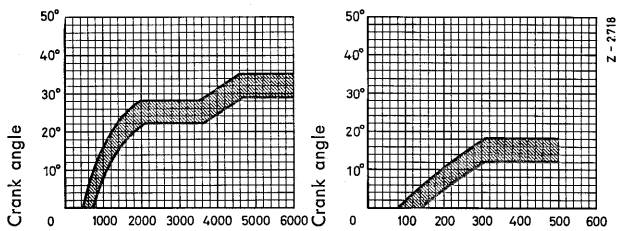
Note: If the use of a fuel with an octane rating lower than 98 ROZ results in knocking in the speed range between 1500—2500 rpm the firing point should be retarded to match the octane number of the fuel used. Proceed as follows: for each research method number (ROZ number) retard the firing point by approx. 1° crankshaft angle. Adjustment by one scale line on ignition timer bearing changes the firing point by 2° crankshaft angle. Do not retard firing point by more than max. 8°. As soon as fuel with the specified octane rating of 98 ROZ or more is again avaliable, full advanced ignition must be resumed.

Distributor Graphs

Model 200

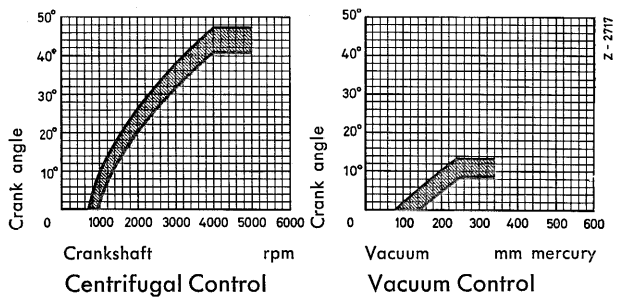
Distributor JFUR 4 (0231 115 052)

Compression ε = 9.0:1



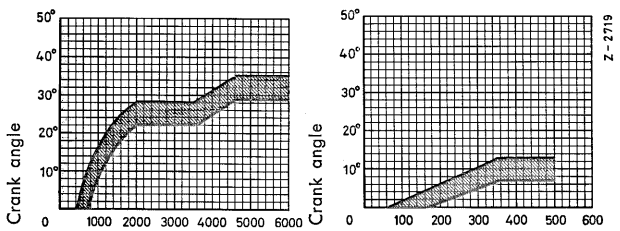
Distributor JFUR 4 (0231 115 053)

Compression ε = 7.0:1



Model 230, 230 S

Distributor JFUR 6 (0231 116 048)



Speed Ranges

Model	Idling speed rpm at. gearbox	Idling speed rpm aut. transmission	Speed in rpm at max. output hp (DIN)	Perm. max. speed in gears rpm
200	750—850	800—900	5200/95	6000
230	750—800	800—850	5200/105	
230 S		750—800	5400/120	6250

Model	Idling speed rpm [1]	Max. full load speed or begin of downshift rpm	Max. speed unloaded or end of downshift rpm
200 D	700—800	4320	5000—5200

[1] For adjustment of idling speed refer to Shop Manual OM Diesel Engines of Untertürkheim plant, pages 00-11/1 and 00-11/2.

Venting the Engine

Model	ID of screw connection in cylinder head cover	Remarks
200 D	10	Vent line runs to air filter
200	11	Vent line runs to intake scoop
230/230 S	11	

Note: To prevent the gases inside crankcase from escaping to the outside, the installed dipstick has no venting filter, and the blow-by gases are guided into the intake line in front of the throttle flap; at this point, increasing speeds will increase the vacuum which will then suck the blow-by gases out of the crankcase. The vacuum is highest at max. speed and fully opened throttle flap. To eliminate any unwelcome rise in pressure in the event of an eventual increase of blow-by by increasing the size of the bore in the screw connection of the cylinder head cover, the intake line itself is larger than the bore in the screw connection.

Ejection Pressure of Injection Nozzles

Model	Bosch designation of inj. nozzles	Ejection or opening pressure in atm. of new injection nozzles	Ejection or opening pressure in atm. of used injection nozzes
200 D	DNO SD 151	110—120 [1]	100—120

Note: When inspecting or repairing injection system components made by Bosch the respective pertinent Bosch agency or dealer should be engaged as much as possible.

[1] The difference in ejection pressure of the nozzles should not exceed 5 atü in the respective engine.

Carburetor Data and Adjusting Values

Model	200	230	230 S	
Carburetor designation	2 × Solex 38 PDSI		2 × Zenith 35/40 INAT	
Carburetor stage	—	—	Stage I	II
Air horn "K"	28	26	24	28
Main jet "Gg"	x137.5	x135	x115	x120
Air correction jet "a"	80	180	90	130
Mixing tube "s"	not exchangeable		4 S	4 N
Enrichment jet	—	100	—	—
Idle fuel jet "g"	55	50	45	60
Idle air bore (mm dia)	1.0	1.6	1.5	1.0
Accelerating pump	(neutral)		—	
Injection amount (cm^3/stroke) at idling position	0.7—1.0	1.0—1.3	0.7—1.0	—
Injection tube	high (0.5-graded)	high (0.4-graded)	high 0.5-graded)	—
Injection begin when throttle flap opens	immediately		5°	—
Injection direction of injection tube	parallel to air horn axis, with throttle flap open 20° into gap		against wall of air horn	
Pump diaphragm — bolt length (mm)	14.5		—	
Pump diaphragm — Plate dia. (mm)	22		—	
Float needle valve	2.0			
Float weight (nylon float) (gr)	8.5		7.85	
Fuel level or float adjustment (mm)	—[1]		21—23	
Adjustment of stepped pulley of aut. starting device	—		3.5—4	
Return valve adjustment (mm)	leaf spring, in flat alignment		0.3—0.5	
Adjustment of float housing venting valve (control dim. (mm)	—		mech. gearbox 1.8—0.3 aut. transm. 2.8—0.3	
Choke gap adjustment (mm)	9		2.4	—
Distance between starter lever and carrier lever of starting device (mm)	0.1—0.2		—	

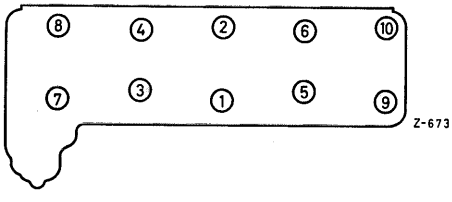
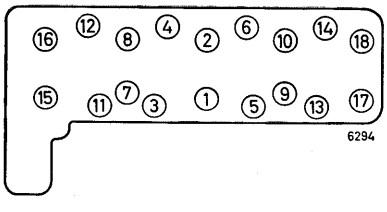
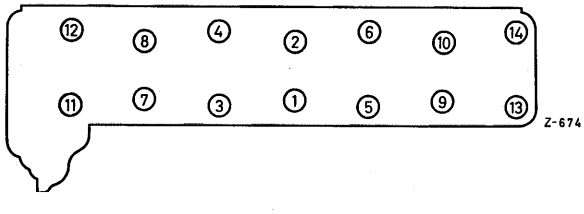
[1]) The fuel level will be right, if a 1.0 mm sealing ring has been installed under float needle valve.

Fuel Feed Pump

Model		200, 230, 230 S	200 D
Designation of pump		DVG- Diaphragm pump	Bosch FP/K 22 M 2/8
Feed pressure	Measuring point	after pump outlet	
	Feed pressure at starting speed (atü)	0.12—0.16	—
	Feed pressure at idling speed (atü)	0.15—0.20	0.8—1.5
Vacuum	Measuring point	before pump inlet	
	Vacuum at atm.	0.3—0.4	
	Starring speed mm mercury	230—320	
Suction height (m)		0.9	
Clearance between operating cams and pump plunger (mm)		0.4—0.5	—

Opening Pressure of Fuel Overflow Valve For model 200 D = 1—1.5 atm

Sequence Diagram and Chart for step-by-step Tightening of Cylinder Head Bolts M 12

Model	Sequence diagramm for tightening cylinder head bolts	Step-by-step tightening			
		step 1 mkg	step 2 mkg	step 3 mkg	check[2])
200		4	6	8	9
200 D		4	6	9	9
230 230 S		4	6	8	9

Note: All other bolts with M 8 threads are tightened with hand wrench. For loosening cylinder head bolts proceed vice-versa, that is, begin at end.

Tightening Torques in mkg

Model		200 D	200	230, 230 S
Cyl. head bolts	engine cold [1]	9	8	
	engine warm [2]	9	9	
Threaded bolt in cylinder head for rocker arm bearing		—	10	
Adjusting torque of ball bolt top for rocker arm bearing		—	1.5 min.	
Rocker arm bearing bracket bolts [3]		3.75	---	
Spark plugs		—	3—3.5	
Glow plugs		5	—	
Prechamber in cyl. head		15—18	—	
Nozzle in nozzle holder		7—8	---	
Nozzle holder in cyl. head		7—8	---	
Nut for throughpiece on nozzle holder		7	---	
Hex. nut for fastening injection timer to drive shaft of E-pump		7	---	
Pipe connection for thrust valve on E-pump [4]		4.5+0.5	---	
Coupling nuts of injection lines		2.5	—	
Conrod bearing bolts [5]		3.75		6.0
Crankshaft bearing bolts [6]		9		8
Collar bolt or clamp nut on crankshaft front		18		21 + 1
Nuts or bolts for flywheel or drive plate on crankshaft		5.5 + 0.5 w. mech. gearbox 4.5 + 0.5 w. aut. transm.		6.5 + 0.5 w. mech. gearbox / w. aut. transm.
Bolts for oil pan plate bottom		1.0		
Bolts of engine supports on crankcase		5 +0.5		
Oil pressure relief valve in cyl. crankcase		4.0		
Collar bolt for fastening clamp bolt of generator to cyl. crankcase		6.5		
Nut for pulley/generator		3.5 +0.5		

Note: Select torque wrenches in such a manner that 50—75 % of their resp. capacity will be used (for example, for a tightening torque of 3.75 mkg use a wrench of 0—6 mkg capacity).

[1] Prior to attaching cylinder head bolts coat their threads, the bearing surfaces of the heads and the washers with graphited oil (Auto-Kollag).
Be sure to observe instructions on tightening sequence and step-by-step procedure accurately (Refer to diagram for tightening sequence of bolts).

[2] Following assembly of cylinder head run engine warm under slight load to 80° C cooling water temperature. After running about 5 minutes at this temperature retighten cylinder head bolts as stated on chart with the engine "warm".
Check tightening torques as usual after the test drive; but at least check again after driving for 12 miles, applying the same torque as after running the engine warm.
The instructions about the tightening sequence and the step-by-step tightening of the bolts should also be accurately followed (refer to diagram for tightening sequence of cyl. head bolts).

[3] When tightening the rocker arm bracket bolts the rocker arms should not be unter load through camshaft.

[4] To guarantee proper seating of sealing rings on pipe connections, tighten pipe connections to 4.5 mkg, loosen, tighten again to 4.5 mkg, loosen once more and finally tighten to 4.5 + 0.5 mkg.

[5] Tighten conrod bolts without locks to the specified tightening torque, making sure that the threads are previously well coated with graphited oil, applied both to bolts and nuts.

[6] Tighten crankshaft bearing bolts without locks.

B. Model 250 S, 250 SE, 300 SEB, 300 SEL

Since with regard to inspection and adjusting jobs there are no differences between the engines of the models 250 SE Sedan, Coupe and Cabriolet, and models 300 SEB, 300 SEL and 300 SE Coupe and Cabriolet, they are not separately listed.

Valve Clearance

Model		250 S, 250 SE [1]	300 SEB, 300 SEL [2]
Valve clearance with engine cold	Inlet	0.08	0.10
	Exhaust	0.18	0.25

[1] On models 250 S, 250 SE the valve clearance is measured between the slide surface of the rocker arm and the cam base circle of the camshaft.
[2] On models 300 SEB and 300 SEL the valve clearance is measured between the valve shaft end and the adjusting screw or ball socket resp.

Timing Periods for Test Measurements at 0.4 mm Test Valve Clearance

Model	Camshaft Code No.[1]	Inlet valve opens bef. TDC	Inlet valve closes after BDC	Exhaust valve opens bef. BDC	Exhaust valve closes after TDC	Min. distance between inlet valve and piston at crankshaft position 5° after TDC (mm)
250 S, 250 SE	86	11°	53°	47°	21°	0.8
300 SEB, 300 SEL	42	7°	47°	49.5°	11.5°	

Note: Timing periods for test measurements apply at 0.4 mm test valve clearance, that is, the stated ratings have been computed at an assumed valve clearance of 0.4 mm. When measuring, the normal operating valve clearance should be nullified by means of a feeler gauge or the like, since the absence of play will provide more accurate values.
[1] The code number is punched on the rear face to identify individual camshafts.

Compression Pressure

Model		250 S		250 SE		300 SEB, 300 SEL
Compression ratio ε		9.0 : 1	7.7 : 1	9.3 : 1	7.7 : 1	8.8 : 1
Compression pressure in atü [1]	normal	10—11	8.5—9.5	11—12	8.5—9.5	10—11
	minimum	approx. 8.5	approx. 7.0	approx. 9.0	approx. 7.0	approx. 8.5

[1] Measure compression pressure at normal operating temperature (cooling water temperature 70—80° C), with throttle or control valve open. Crank engine with starter for at least 8 cycles. **The differences among the individual cylinders should not be more than max. 1.5 atü.**

Electrode Gap of Spark Plugs

Model	250 S	250 SE, 300 SEB, 300 SEL
Non-shielded	0.5—0.6	0.35
Shielded	0.9—1.0	—

Distributor Contact Gaps and Angles of Closure

Model		250 S, 250 SE	300 SEB, 300 SEL
Distributor contact gap		0.3—0.4	0.35—0.45
Angle of closure	with new contacts	$38^\circ \begin{smallmatrix}+3^\circ \\ -1^\circ\end{smallmatrix}$	$49^\circ \pm 2^\circ$

Note: When installing new contacts set angle of closure to max. tolerance limit, if possible.
Don't change angle of closure of used contacts and replace by pairs, if more than —0.5° from nominal value are measured.

Setting of Firing Point

a) Basic setting or assembly setting when installing distributor

Model	Compression ratio	Distributor Bosch design.	Basic setting [1] Checkup with test lamp for make and break ± 1°	Basic setting [1] Checkup with stroboscope at starting speed with spark plugs screwed in
250 S	9.0 : 1	JFUR 6 (0231 116 037)	1° after TDC	1° before TDC
	7.7 : 1		3° after TDC	1° after TDC
250 SE	9.3 : 1	JFUR 6 (0231 116 047)	1° before TDC	3° before TDC without vacuum control
	7.7 : 1			
300 SEB, 300 SE	8.8 : 1	PFUR 6 (0231 141 002)	1° before TDC	3° before TDC

[1] The checkup with the test lamp applies only as assembly setting for installing the distributor and should be made on cylinders 1 and 6 for comparison and to elininate measuring errors. Both values should not deviate from each other for more than 1.5°.
When checking with the stroboscope at starting speed the basic settings are approx. 1—2° earlier than when checking with the test lamp for make and break.

Note: For measuring the firing point the setting at a speed of 4500 rpm without vacuum adjustment will apply only (refer to Table below with stroboscope values).
When measuring, also make sure that the stroboscope values are within the limits stated also at speeds of 800, 1500 and 3000 rpm.

b) Stroboscope Values

Model	Compression ratio	Stroboscope values at engine speed in rpm without load [2] 800 with and without	1500 with or without vacuum control	3000 without	4500 without	4500 with [3]	Begin of vacuum control of distributor without load at engine speed rpm
250 S	9.0 : 1	3—13°	18—25°	23—29°	**35°**+2	+10° ±3 [3] [5]	1800—2000
	7.7 : 1	1—11°	16—23°	21—27°	**33°**+2		
250 SE	9.3 : 1	— [4] [5]	13—20°	30°	**30°**	— [4] [5]	—
	7.7 : 1						
300 SEB 300 SEL	8.8 : 1	7—16°	20—27°	28°	**28°**	+11° ±2 [3] [5]	800—1000

[2] The firing point is set at 4500 rpm without vacuum control and without load. Then check graph of centrifugal control at 3000, 1500 and 800 rpm for models 250 S, 300 SEB and 300 SEL, also without vacuum control and without load. For model 250 SE only at 3000 and 1500 rpm.

[3] Then measure total degree adjustment of vacuum control without load, for models 250 S, 300 SEB and 300 SEL, at 4500 rpm. Simultaneously, advance firing point by + 10° ± 3, or + 11° ± 2, in addition.

[4] For model 250 SE, on the other hand, the vacuum adjustment without load is measured with throttle flap completely closed (that is, while idling and with control rod from control shaft to guide lever on suction pipe disconnected). Simultaneously, the firing point is **retarded,** that is, the firing point should be 3° ± 2 **after** TDC. If the firing point is before TDC the vacuum adjustment should be checked.

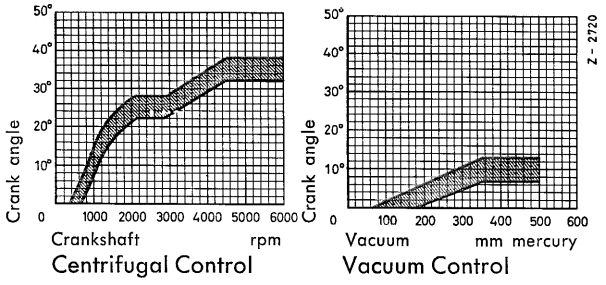
[5] The range of adjustment of the total vacuum scale can be increased by screwing the pushrod, which connects the diaphragm in the vacuum capsule with the make and break plate, in outward direction, and can be reduced by screwing pushrod down.

Note: If the use of a fuel with an octane rating lower than 96 ROZ for injection engines, or 98 ROZ for carburetor engines, results in knocking in the speed range between 1500 and 2500 rpm, the firing point should be retarded to match the octane number of the fuel used. Proceed as follows: for each research method number (ROZ number) retard the firing point by approx. 1° crankshaft angle. Adjustment by one scale line on ignition timer (distributor) bearing changes the firing point by 2° crankshaft angle. Do not retard firing point by more than max. 8°. As soon as fuel with the specified octane rating or more is again available, full advanced ignition must be resumed.

Distributor Graphs

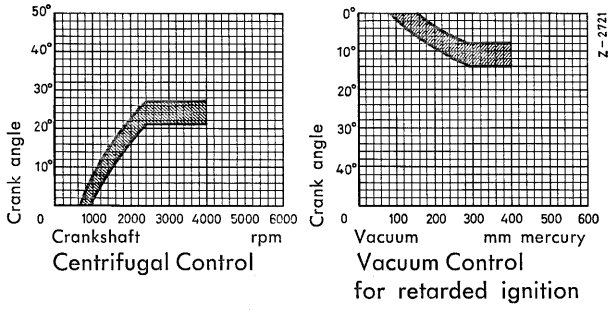
Model 250 S

Distributor JFUR 6 (0231 116 037)



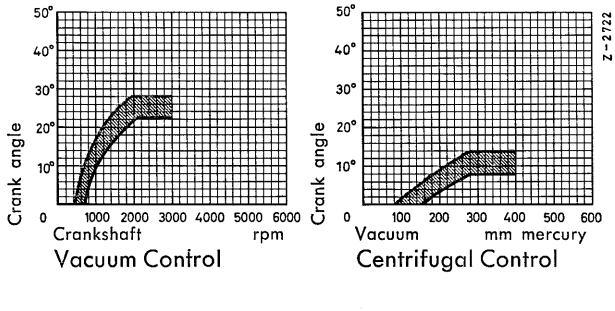
Model 250 SE

Distributor JFUR 6 (0231 116 047)



Model 300 SEB, 300 SEL

Distributor PFUR 6 (0231 141 002)



Speed Ranges

Model	Idling speed rpm at Gearbox	Idling speed rpm at Aut. transmission w. selector lever engaged	Speed in rpm at max. hp (DIN)	Permissible max. speed in gears rpm
250 S	750—800		5400/130	6300
250 SE	750—800 [1]	700—750 [3]	5500/150	
300 SEB 300 SEL	650—700 [2]	680—720 [4]	5400/170	6000

[1] 800 rpm for vehicles with additional, fully locked and held power steering.
[2] 700 rpm for vehicles with additional, fully locked and held power steering.
[3] Not below 800 rpm with additional, fully locked and held power steering.
[4] Not below 600 rpm with additional, fully locked and held power steering.

Venting the Engine

Model	ID of screw connection in cyl. head cover	Remarks
250 S	11	Vent line runs to inlet scoop
250 SE 300 SEB 300 SEL		Vent line runs to valve conn.

Note: To prevent the gases inside crankcase from escaping to the outside the installed dipstick has no venting filter, and the blow-by gases are guided into the intake line in front of the throttle flap; at this point, increasing speeds will increase the vacuum which will then suck the blow-by gases out of the crankcase. The vacuum is highest at max. speed and fully opened throttle flap. To eliminate any unwelcome rise in pressure in the event of an eventual increase of blow-by by increasing the size of the bore in the screw connection of the cylinder head cover, the intake line itself is larger than the bore in the screw connection.

Position of crankshaft when installing Injection Pump

Model	Position of crankshaft when installing injection pump at end of feed position of injection pump[1])
250 SE	20° after TDC in suction stroke [2])
300 SEB, 300 SEL	60° after TDC in suction stroke [2])

[1]) The removed injection pump is in end of feed position when the mark on the camshaft of the injection pump is in alignment with the mark on the flange of the injection pump.

[2]) The injection lines are arranged similar to the lines of the injection engine of model 230 SL, that is, the injection line from pump element 1 of the injection pump leads to injection valve 6 of the engine, from pump element 2 to injection valve 5, etc.

Caution! Therefore, set the piston of the **6th cylinder** of the engine to **20° after TDC** for model 250 SE, and to **60° after TDC of the suction stroke** for models 300 SEB and 300 SEL. (1st cylinder 20° or 60°, respectively, after ignition TDC).

Ejection Pressure of Injection Nozzles and Injection Valves

Model	Bosch designation of inj. valves	Ejection or opening pressure in atm.	
		with new inj. valves	with used inj. valves
250 SE	DC 8 C 45 R 1	17.5—18.5 [3])	15.0—18.5 [3])
300 SEB, 300 SEL	EP/DEC 100 R 2		

[3]) The difference in ejection pressure of the injection valves should not exceed. 3.0 atm. in one particular engine. To obtain the required measuring accuracy, the testing fixtures should use a pressure gauge with a **measuring range of 0—25 kg/cm².**

Note: For all inspections and repairs of injection equipment made by Bosch the pertinent Bosch dealers or representatives should always be consulted.

Throttle Valve — Injection Pump Proportions

Model 250 SE, 300 SEB, 300 SEL

Throttle valve angle	Governor angle
0°	0°
2.5	4—4.5
5	8—8.5
7.5	11.5—12.5
10	15.5—16.5
15	22.5—23.5
20	29—30
30	40.5—42
40	50.5—51.5
50	59—60
60	67—68
70	73.5—75
80—82	79—82

Carburetor Data and Adjusting Values

Model	250 S	
Carburetor designation	2 x Zenith 35/40 INAT	
Carburetor stage	Stage I	II
Air horn "K"	24	28
Main jet "Gg"	x 120	x 120
Air correction jet "a"	110	120
Mixing tube "s"	4 S	4 N
Idle fuel jet "g"	45	60
Idle air bore (mm dia.)	1.3	1.0
Injection volume (cm³/stroke)	0.7—1.0	—
Injection tube	0.5 graded	—
Injection begin when throttle flap opens	5°	—
Float needle valve	2.0	
Float weight (nylon float) (gr)	7.85	
Float adjustment (mm)	21—23	
Adjustment of float housing venting valve Control dim. (mm)	mech. gearbox 1.8—0.3 aut. transm. 2.8—0.3	
Return valve adjustment (mm)	0.3—0.5	
Choke gap adjustment (mm)	2.4	
Adjustment of stepped pulley for aut. starting (mm)	3.5—4	

Fuel Feed Pump

Model		250 S	250 SE, 300 SEB, 300 SEL
Designation of pump		DVG diaphragm pump	Electr. Bosch Feed Pump FP/ESB 5 RC 25/12 A 1
Feed pressure	Measuring point	after pump outlet	behind fuel filter
	Feed pressure at starting speed atm.	0.12—0.16	Feed pressure with engine stopped 0.7—0.95 atm.
	Feed pressure at idling speed atm.	0.15—0.20	
Vacuum pressure	Measuring point	before pump inlet	Feed end pressure with engine stopped 1.3 atm. min [1]
	Vacuum pressure at atm.	0.3—0.4	
	Starting speed mm mercury	230—320	
Suction height		0.9	
Clearance between operating cams and pump plunger mm		0.4—0.5	

[1]) Pressures at a battery voltage of min. 11 volt.

Tightening Torques in mkg

Model		250 S	250 SE	300 SEB, 300 SEL
Cyl. head bolts	engine cold [1]	8		10 [3]
	engine warm [2]	9		11 [3]
Hex. socket bolts M 10 for camshaft bearing		—		4
Threaded bolts in cyl. head for rocker arm bearing		10		—
Adjusting torque of ball bolt top for rocker arm bearing		1.5 min.		—
Rocker arm bearing bracket bolts [4]		—		3.75 [4]
Spark plugs		3—3.5		
Injection nozzle in cyl. head		—	3—3.5	—
Bolt for fastening flange of injection nozzle		—	—	0.8 + 0.2
Pipe conn. for thrust valve on E-pump [5]		—	4.5 + 0.5 [5]	
Coupling nuts of injection lines		—	2.5	
Conrod bearing bolts [6]		6.0		3.75
Crankshaft bearing bolts [7]		8		5 ± 0.2
Collar bolt or clamp nut on crankshaft front		21 + 1		20
Fastening bolts for pulley on vibration damper		2.5 + 0.5		
Nuts or bolts for flywheel or drive plate on crankshaft		9.0 + 1 with mech. and aut. transm.		4.5 + 0.5 with mech. and aut. transm.
Bolts for oil pan plate bottom		1.0		
Bolts of engine supports on crankcase		5.5 + 0.5		4.5 + 0.5
Oil pressure relief valve in crankcase		4.0		
Collar bolt for fastening clamp bolt of generator to cyl. crankcase		6.5		—
Nut for pulley/generator		3.5 + 0.5		

Note: Select torque wrenches in such a manner that 50—75 % of their resp. capacity will be used (for example, for a tightening torque of 3.75 mkg use a wrench of 0—6 mkg capacity).

[1] Prior to attaching cylinder head bolts coat their threads, the bearing surfaces of the heads and the washers with graphited oil (Auto-Kollag).
Be sure to observe instructions on tightening sequence and step-by-step procedure accurately (Refer to diagram for tightening sequence of bolts).

[2] Following assembly of cylinder head run engine warm under slight load to 80° C cooling water temperature. After running about 5 minutes at this temperature retighten cylinder head bolts as stated on chart with the engine "warm".
Check tightening torques as usual after the test drive; but at least check again after driving for 12 miles, applying the same torque as after running the engine warm.
The instructions about the tightening sequence and the step-by-step tightening of the bolts should also be accurately followed (refer to diagram for tightening sequence of cyl. head bolts).

[3] Cyl. head bolts M 10 (No. 15—20) are tightened at 5 mkg when the engine is cold, and at 6 mkg, when the engine is warm.

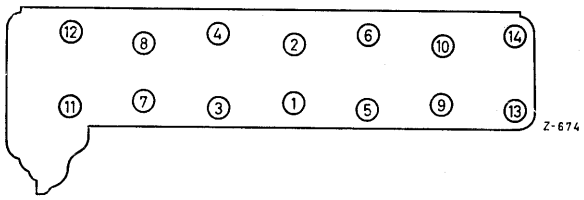
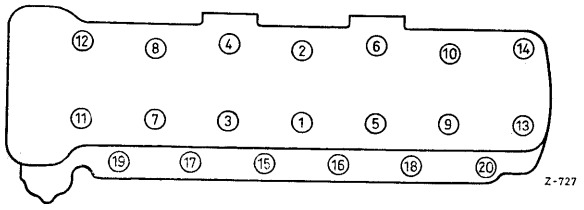
[4] When tightening the rocker arm bracket bolts the rocker arms should not be unter load through camshaft.

[5] To guarantee proper seating of sealing rings on pipe connections, tighten pipe connections to 4.5 mkg, loosen, tighten again to 4.5 mkg, loosen once more and finally tighten to 4.5 + 0.5 mkg.

[6] Tighten conrod bolts without locks to the specified tightening torque, making sure that the threads are previously well coated with graphited oil, applied both to bolts and nuts.

[7] Tighten crankshaft bearing bolts without locks. On models 300 SEB and 300 SEL with light metal cylinder crankcase the collar stud for attaching the crankshaft bearing cap must be tightened to 5 mkg, if screwing down is required.

Sequence Diagram and Chart for step-by-step Tightening of Cylinder Head Bolts M 12

Model	Sequence diagramm for tightening cylinder head bolts	step-by-step tightening			
		step 1 mkg	step 2 mkg	step 3 mkg	check [2]
250 S 250 SE		4	6	8	9
300 SEB 300 SEL		M 12 bolts 1—14			
		4	7	10	11
		M 10 bolts 15—20			
		2	4	5	6

Note: All other bolts with M 8 threads are tightened with hand wrench.
For loosening cyl. head bolts proceed vice-versa, that is, begin at end.