Passenger Car Types with Engine M 117

service

Introduction into service

Daimler-Benz Aktiengesellschaft
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The new Types in the Series 116

450 SE (116.032)
450 SEL (116.033)

and the Series 107

450 SL (107.044)
450 SLC (107.024)

are variants of the well-known models 350 SE (116.028), 350 SL (107.043) and 350 SLC (107.023) with engine M 116.

Main features are the engine M 117 and the further development of the diagonal swing axle with anti-squat device.

The 100 mm longer wheelbase and interior of the 450 SEL is fully to the benefit of rear seat passengers.

The body and the interiors as well as all other assemblies correspond to those of the types 350 SE/350 SL/SLC and are decribed in introductory brochures and supplements to service manuals.

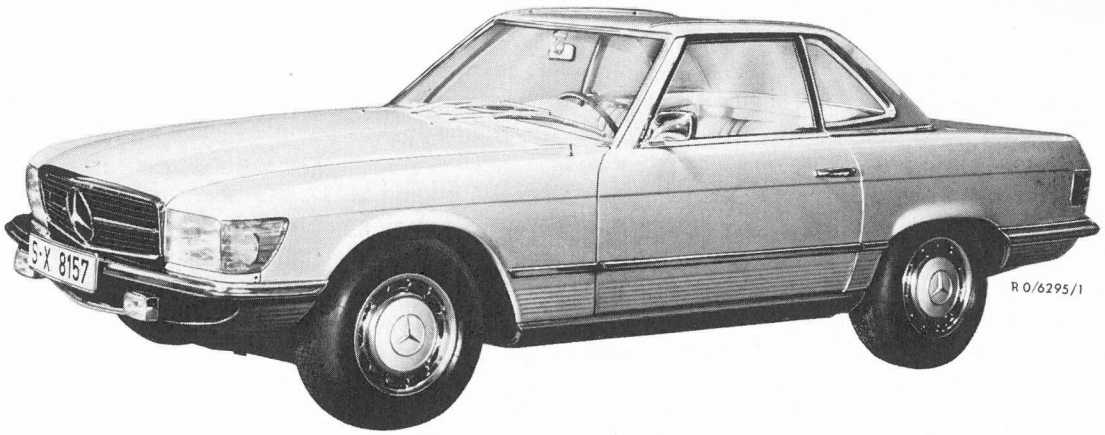
For this reason only deviations and new features are described here.

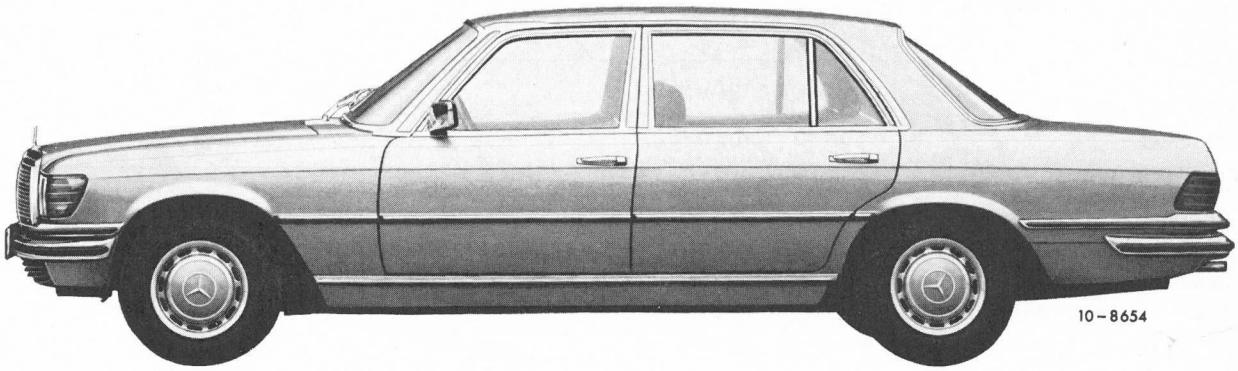
Daimler-Benz Aktiengesellschaft
Zentralkundendienst

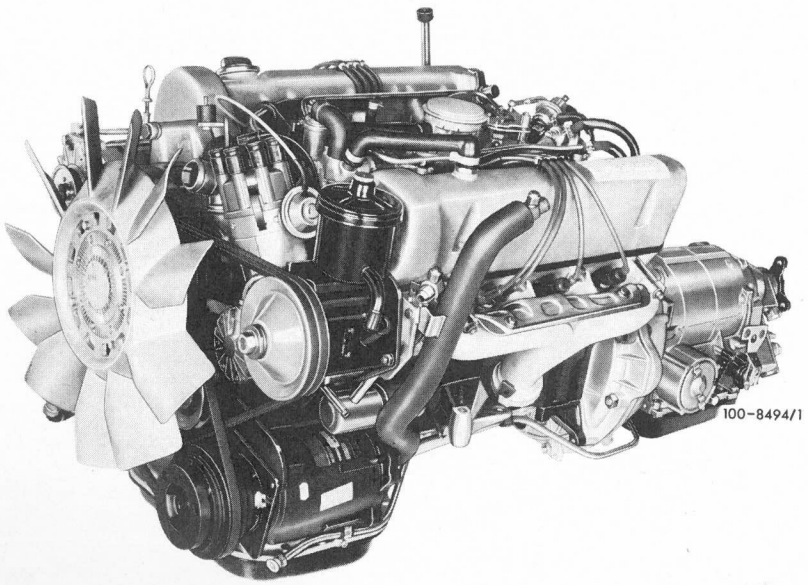
March 1973

Contens

Series 107 and 116 with Engine M 117







Above: 450 SL Roadster

Centre: 450 SEL Limousine

Below: Engine M 117

General Information on the Engine M 117

The 8-cylinder V-engine M 117 with 4.5 litres piston displacement is a variant of the engine M 116 with a stroke of 85 instead of 65.8 mm.

Both V-engines are identical in their basic construction and are equipped with electronically controlled fuel injection and transistorised ignition.

The output of this engine is 165 kW (225 h.p.) at 5000/min., the maximum torque of 378 Nm (38.5 mkp) being reached at 3000/min. The peak values for output and torque are reached at much lower engine speeds compared with the M 116.

The engine M 117 has been supplied to the USA with emission control equipment since model year 1972. In its mechanics the engine M 117 is only different from the USA version of the M 117 because of its higher compression ratio.

Engine M 117 is installed in the following models:

Sales Designation	Model	Engine Model
450 SE	116.032	117.983
450 SEL	116.033	117.983
450 SL	107.044	117.982
450 SLC	107.024	117.982

In some of its parts engine M 117 is different from engine M 116. The main differences are described in the chapters to follow. Assembly, checking and adjusting procedures correspond to those of the engine M 116 and can be found described in the engines workshop manual, volume 1. Servicing instructions are in the service manual.

As a result of the larger stroke and compression space, the following parts are different from those of the engine M 116.

Cylinder crankcase, timing gear case cover, crankshaft, connecting rods, pistons, cylinder head, timing chain tensioning rail, timing chain, **camshafts and camshaft bearings.**

Camshafts and Camshaft Bearings

Camshafts code numbered 56/57 are installed in this engine. Apart from different timings these camshafts have an oil groove in the fifth bearing pin. The camshaft bearings have been widened to **25 mm** (Fig. 1).

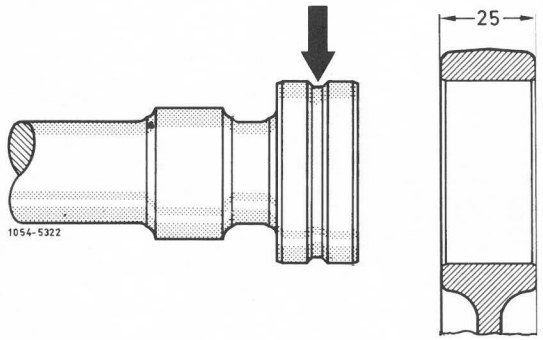


Fig. 1 Engine M 117

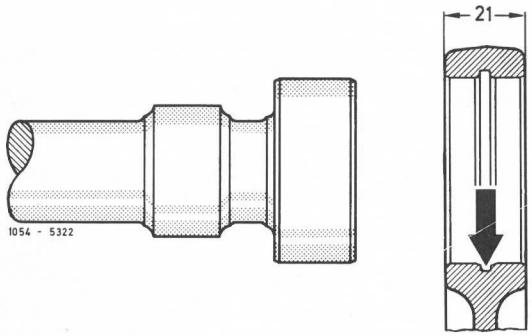


Fig. 2 Engine M 116 and M 117 USA-version

Engines M 116 and M 117 USA-version have camshafts code numbered 52/53. The oil groove is in the fifth camshaft bearing. The camshaft bearings are **21 mm** wide (Fig. 2).

Caution! The camshaft bearings must not be interchanged!

No wide (25 mm) camshaft bearings must be installed into engines M 116 and M 117 USA-version with camshafts code numbered 52/53.

Likewise no narrow camshaft bearings (21 mm) must be installed into engine M 117 with camshafts code numbered 56/57.

Interchanging the camshaft bearings leads to serious engine damage.

Water Pump Drive

The water pump drive ratio is identical to that of the engine M 117 USA-version.
M 116 = 0.9 (low)
M 117 = 1.1 (high)
Belt pulley water pump M 116 = 152 Ø
Belt pulley water pump M 117 = 126 Ø

Electronically controlled Fuel Injection System

There are the following deviations from the system of engine M 116:

- Intake pipe pressure sensor with altitude corrector cell.
- Throttle flap switch with full load contact.
- Control unit with new settings.
- Injection valves with larger ring gap.

The principle and the functioning of this system are described in the engines workshop manual, volume 1, group **07.4.0.**

The control unit and the pressure sensor are not identical to the components for engine M 117 USA-version.

List of the new components:

Designation	MB Part No.	Bosch Order No.
Control unit (type 116)	000 545 55 32	0 280 002 009
Control unit (type 107)	000 545 27 32	0 280 002 003
Pressure sensor	002 542 32 17	0 280 100 112
Throttle flap switch	003 545 61 24	0 280 120 015
Injection valve	000 078 18 23	0 280 150 015

Wiring Diagram for the Control Unit of the electronic Fuel Injection

In the wiring diagram below the individual parts of the electronically controlled fuel injection system and their connection to the control unit are shown.

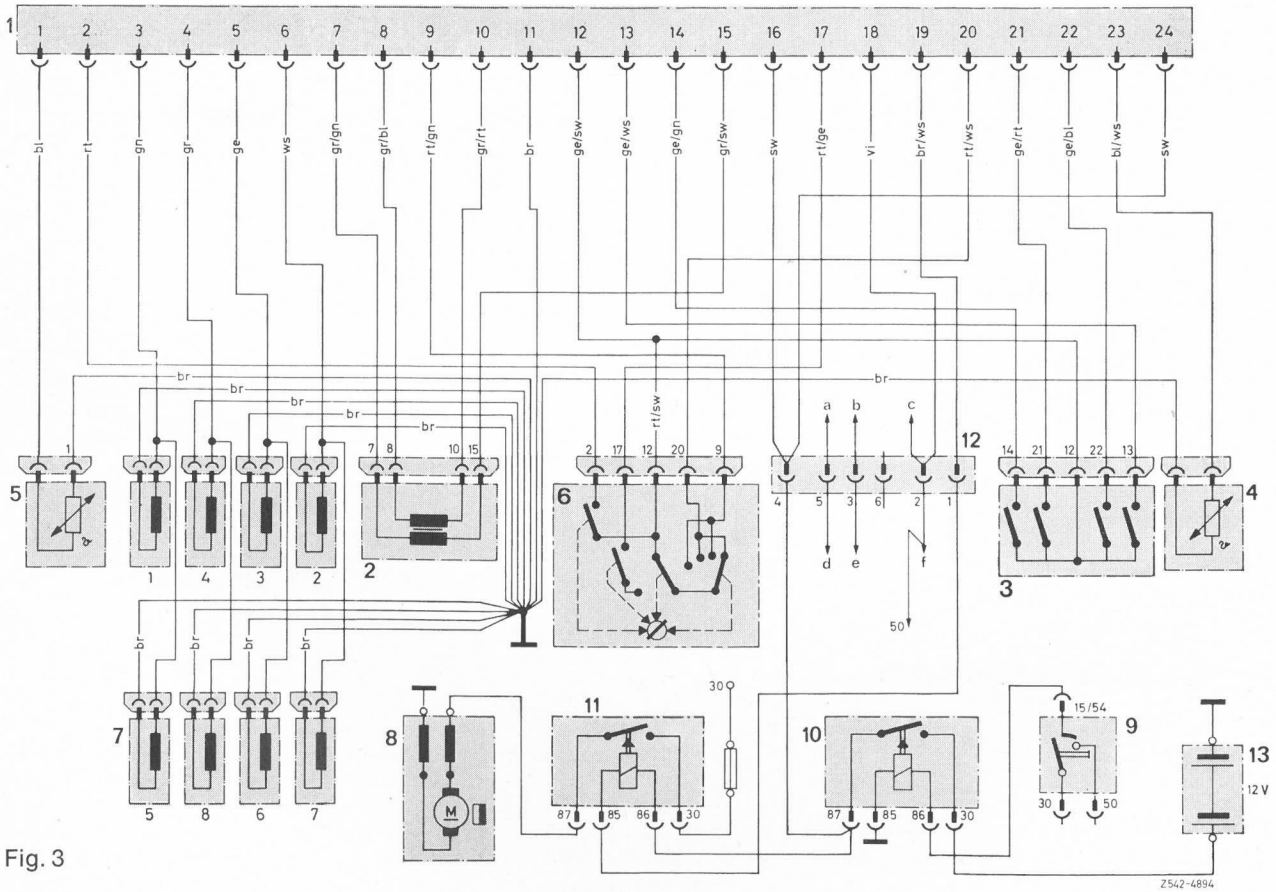


Fig. 3

1 Plug board (control unit)
2 Pressure sensor
3 Release contacts (distributor)
4 Temperature sensor (coolant)
5 Temperature sensor (air)
6 Throttle flap switch
7 Injection valves, cylinders 1–8
8 Fuel pump
9 Ignition switch
10 Main relay (current to control unit)
11 Pump relay
12 Intermediate plug (connection to vehicle wiring harness)
a Starter valve
b Thermo delay switch terminal W
c Thermo delay switch terminal G
d Relay for starter valve terminal 87
e Relay for starter valve terminal 85
f Relay for starter valve terminal 86
13 Vehicle battery

Ignition System

All vehicles with engine M 117 have a transistorised coil ignition. According to the type different switching units are installed.

TSZ Switching Units

450 SE and 450 SEL

These types have the "standard switching unit" which is already known from types 280 SE and 350 SE (116.024 and 116.028).

450 SL and 450 SLC

These types are equipped with the switching unit in the wheel arch as known on the 350 SL (107.043).

Installed in vehicle type	MB Part No.	Bosch Order No.
116.032, 116.033	000 545 39 32	0 227 051 014
107.024, 107.044	000 545 59 32	0 227 051 017

Distributor

Connection of the ignition cables on M 4 threaded bolts by means of a snap plug. 1 kΩ suppressor resistors are cast into the connections to the individual ignition cables.

As a protection against dirt the contact breaker points are provided with a protective cap which can be removed for adjustment work.

The release contacts for the electronically controlled fuel injection now also bear protective plastic caps to prevent fouling by dirt or oil.

Because of the different switching units in types 116 and 117, two versions of distributor are necessary, which are however only different in the version of the connection from the contact breaker points to the switching unit.

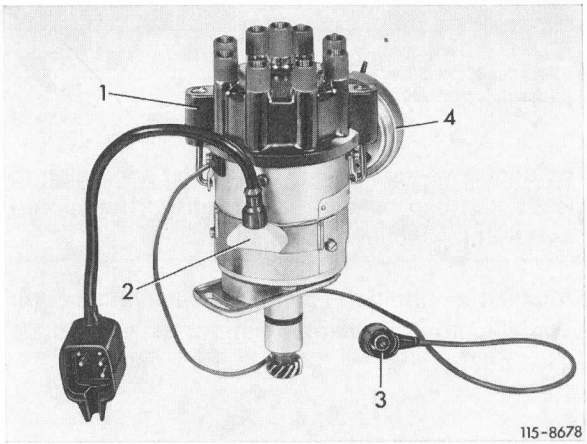


Fig. 4 Distributor for engine M 117.983

1 Metallicised distributor cap
2 Electronic insert with release contacts for the electronic fuel injection
3 Coaxial plug for connection to the TSZ-standard switching unit for transistorised coil ignition
4 Vacuum double cell

Type	Type of Connection	MB Part No.	Bosch Order No.
107.024 107.044	connector lug	001 158 95 01	0 231 403 004
116.032 116.033	coaxial plug	001 158 93 01	0 231 403 003

Engine Speed Limiter

As in the M 116 distributor, an engine speed limiter is installed in the distributor arm.

By this means the engine speed is limited to **5850 ± 150/min.** To indicate this, the number "4.5" is printed on the upper visible surface of the distributor arm.

Interference Suppression

With engine M 117 the ignition system has short-distance interference suppression. The following suppression units are standard:

Integrated ignition cables with partly shielded sparking plug connectors (5 kΩ), metal coated distributor cap with suppression resistors (1 kΩ), suppressed distributor rotor (5 kΩ).

Ignition Timing

The distributor is equipped with a double vacuum cell for advancing and retarding the ignition.

To improve the quality of the emissions during idling and on the overrun, the ignition timing is retarded (Fig. 5).

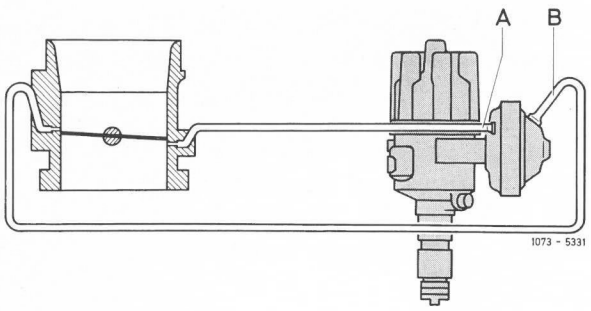


Fig. 5

A Vacuum connection "retard" (white)
B Vacuum connection "advance" (red)

The double vacuum cell is controlled according to the throttle flap position in relation to the venturi control unit vacuum exit bores.

To adjust the ignition timing, the vacuum lines for advancing (red) and retarding (white) should be pulled off.

Ignition Timing Readjustment

In vehicles with air conditioning the vacuum adjustment to retard is cancelled out when the air conditioner is switched on so as to stabilise the engine speed during idling (Fig. 6).

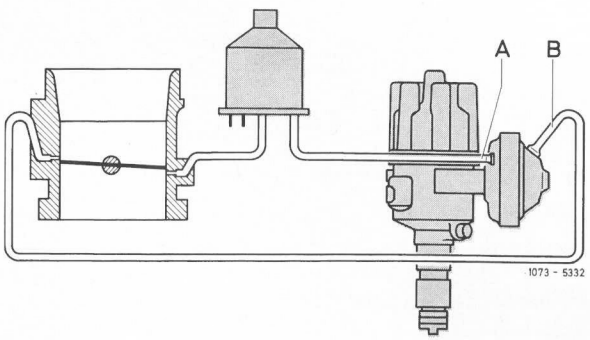


Fig. 6

A Vacuum connection "retard" (white)
B Vacuum connection "advance" (red)

For this purpose a two-way valve is installed in the vacuum line between the venturi control unit and the distributor. When the air conditioning is switched on, the two-way valve is energised. By this means the vacuum cell on the distributor receives atmospheric pressure.

The ignition timing is advanced by about 10° by the spring in the vacuum cell. The engine speed increases by about 100/min. at the same time.

Checking the Ignition Timing Readjustment

Connect a stroboscope and a rev counter. Read off the ignition timing mark at idling speed (nominal value TDC ±2°). Switch on air conditioner.

The ignition should advance by about 10°.

If the ignition retardation is not cancelled in this test, the two-way valve must be renewed (Figs. 7 and 8).

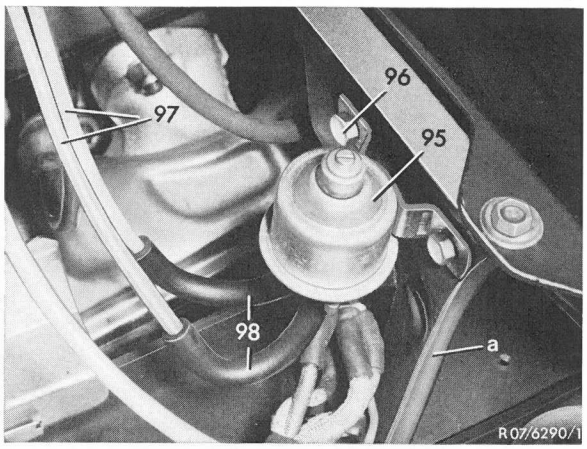


Fig. 7 Model 107

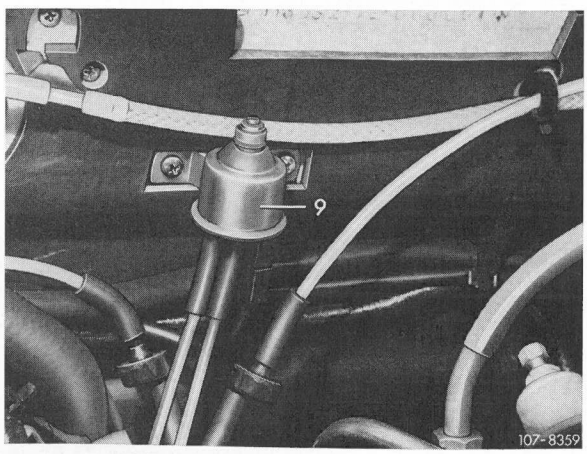


Fig. 8 Model 116

Checking and Adjusting Data

Ignition Timing for Test Measurements with 2 mm Valve Lift

Camshaft Code Number [1]		Intake Valve		Exhaust Valve	
Left	Right	Opens after TDC	Closes after BDC	Opens before BDC	Closes before TDC
56	57	With new engine or newly installed timing chain [2]			
		5/3	21/19	25/27	5/7
		Engines having run for 20 000 km			
		5	21	25	5

[1] The code number is always stamped into the rear face of the camshaft.
[2] The values given first apply to the left camshaft.

Valve Clearance

Intake	0.08 mm (0.12 with constant ambient temperatures under −20° C)
Exhaust	0.20 mm

Dwell Angle

Transistorised Ignition Feature: Blue Ignition Coil Two Series Resistors and Transistor Switching Unit	Checking and **Adjusting Value** during Idling [1]	Change between Idling and 3000/min.
	30–34°	max. ±3°

[1] When installing new and adjusting old contact breaker points adjust the dwell angle according to the value in heavy type ± 1.

Ignition Timing

Engines with normal and low Compression

Distributor Bosch Order No.	**Adjusting value** of ignition timing **without** vacuum 3000/min.	**Test value** ignition timing **with/without** vacuum			Vacuum adjustment to		**Installation value** of distributor at starting engine speed **without** vacuum
		idling **with**	1500/min. **without**	3000/min. **without**	"retard" during idling	"advance" at 3000/min. (total)	
0231 403 003 0231 403 004	30°	TDC ±2° [1]	15–19°	30°	8–12°	8–12° (38–42°)	10° before TDC

[1] Switch off air conditioner.

Sparking Plugs

Engines with		Normal compression		Low compression	
		Designation	MB Part No.	Designation	MB Part No.
Version	Bosch	W 200 T 30	001 159 85 03	W 175 T 30	001 159 81 03
	Beru	D 200/14/3 A	001 159 86 03	D 175/14/3 A	001 159 82 03
	Champion	N 8 Y	001 159 94 03	N 9 Y	001 159 95 03
Electrode gap	mm	0.6		0.6	

Idling Engine Speed and Idling Emissions Quality

Idling speed 1/min	Idling emissions value % CO
700–750	1.5–2.5

Check Fuel Pressure

Measuring specification		During idling with at least 12 V at the fuel feed pump
Delivery pressure in distributing line	measuring spot	In front of the start valve in the distributing line
	bar (atm)	2.0 + 0.1
Capacity [1])	measuring spot	Behind the pressure regulator in the return line
	1 litre	In max. 30 seconds

[1]) To measure the capacity, the fuel tank must be at least half full.

Automatic Transmission

General

Vehicles with engine M 117, unlike USA-version vehicles, are equipped with a standard automatic transmission named W 3 B 050. A torque convertor of 310 mm diameter is connected to the transmission.

Transmission W 3 B 050 is a reinforced version of transmission W 3 A 040 and is identical to this in construction and function.

Clutches K 1 and K 2 and the freewheeling unit were reinforced.

Each clutch features 5 internally toothed discs, the freewheeling unit was widened from 13 mm to 19 mm. The externally toothed disc carrier of K 2 was lengthened to accommodate the 5 internally toothed discs and the reinforced freewheeling unit, which in turn necessitated a lengthening of the transmission case by 10 mm compared with other transmission types.

Shifting Points

Accelerator pedal position	Shifting	▲ km/h	▼ km/h
Selector lever position "D"			
Idling	1–2–1	30	19
	2–3–2	45	35
Full throttle	1–2–1	68	19
	2–3–2	138	60
Kick-down	1–2–1	68	51
	2–3–2	138	123
Selector lever position "S"			
Idling	1–2–1	34	23
Full throttle	1–2–1	77	27
Kick-down	1–2–1	77	62

Explanation of Symbols: ▲ = shifting up
▼ = shifting down

All speeds given are approximate values.

Nominal Pressure Values

Hydraulic pressures in bar

Modulated pressure	in position "D"	3.1 [1]) 4.6 [2])
Working pressure	in position "L"	7.7 ± 0.4 [1])
	in position "S"	5.5 ± 0.2 [1])
	in position "D"	11.3 ± 0.4 [2])
	reverse gear	18.0 and over
Governor pressure	20 km/h 40 km/h 60 km/h 90 km/h 120 km/h	0.5 + 0.1 1.2 + 0.1 2.0 ± 0.1 2.6 ± 0.1 3.4 ± 0.1 [3])

[1]) Measured at 65 km/h at full throttle with vacuum line connected.
[2]) Measured at standstill with vacuum line disconnected and at full throttle (stalling speed).
[3]) Can only be measured at full throttle.

Caution! Because of the strong generation of heat, stalling speed must only be maintained for a maximum of 5 seconds and the vehicle must be well braked using the parking and the service brakes.

Checking of the modulating pressure and of the working pressure must take place at 65 km/h since only this pressure value can be accurately measured. The pressure values given for standstill are only approximate.

General

The front axle and the suspension are identical to those on the already familiar types 107 and 116.

The front spring rubber mounts are adapted to the higher axle loads.

The torsion bar on the rear axle has the additional task of supporting the wheel carrier at the frame (Fig. 9).

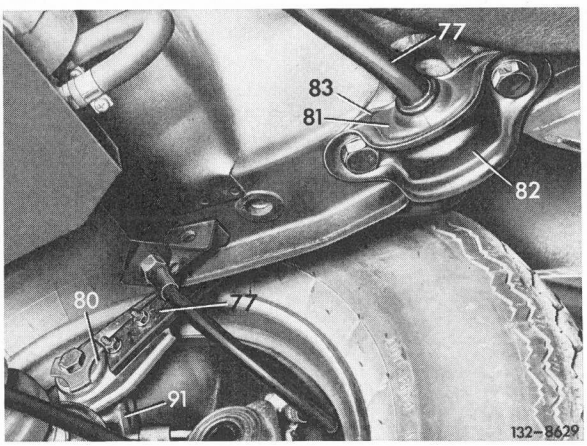


Fig. 9

77 Torsion bar
80 Support for the wheel carrier at the torsion bar
81 Rubber mount for the torsion bar at the frame floor
82 Lower holding bracket
83 Upper holding bracket
91 Wheel carrier

On vehicles with automatic levelling control device on the rear axle, levelling control devices with a new lever are installed. The new lever is longer and has two boreholes to accommodate the connecting rod (Figs. 10 and 11).

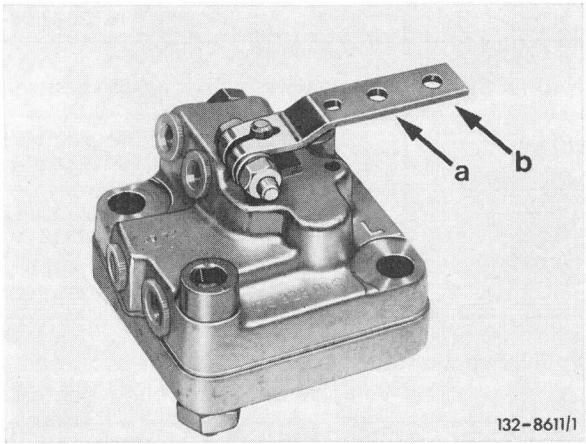


Fig. 10

a Borehole for the connecting rod on the normal diagonal swing axle
b Borehole for the connecting rod on the diagonal swing axle with anti-squat device

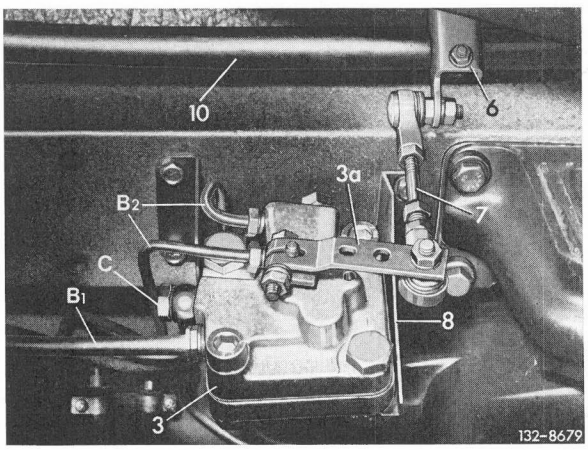


Fig. 11

3 Levelling control device
3a Lever
6 Lever on the torsion bar
7 Connecting rod
8 Bracket
10 Torsion bar
B1 Pressure line, oil pressure pump – levelling control device
B2 Pressure line, levelling control device – gas-filled pressure reservoir
C Return flow line, levelling control device – oil reservoir

Permissible Combination of Springs – Shock Absorbers

Type	Front spring Part No.	Front shock absorber Designation Part No.	Rear spring Part No.	Front shock absorber or hydropneumatic strut Designation Part No.
Normal Suspension (vehicles **without** levelling control device on the rear axle)				
107.024 107.044	114 321 06 04	Bilstein type B 36 107 321 01 00	115 324 22 04	Bilstein type B 46 116 326 02 00 F & S type E 45 116 326 04 00
116.032 116.033	116 321 33 04 116 321 32 04 [1])	Bilstein type B 36 116 323 19 00 F & S type E 36 116 323 17 00	116 324 08 04	
Normal Suspension (vehicles **with** levelling control device on the rear axle)				
107.024	114 321 06 04	Bilstein type B 36 107 323 01 00	115 324 21 04	116 320 30 13
116.032 116.033	116 321 33 04 116 321 32 04 [1])	Bilstein type B 36 116 323 19 00 F & S type E 36 116 323 17 00	116 324 10 04	
Special Version: Harder suspension for poor road conditions (greater vehicle level) Vehicles **without** levelling control device on the rear axle.				
116.032 116.033	116 321 33 04 116 321 32 04 [1])	Bilstein type B 36 116 323 21 00 F & S type E 36 116 323 20 00	116 324 09 04	Bilstein type B 46 116 326 03 00 F & S type E 45 116 326 05 00
Special Version: Harder suspension for poor road conditions (greater vehicle level) Vehicles **with** levelling control device on the rear axle.				
116.032 116.033	116 321 33 04 116 321 32 04 [1])	Bilstein type B 36 116 323 21 00 F & S type E 36 116 323 20 00	116 324 11 04	116 320 29 13

Refer to table "Adjustment of the Springs" when installing suspension.

[1]) Valid for vehicles with several optional extras.

Adjustment of the Front Springs (Matching of Front Spring Rubber Mounts)

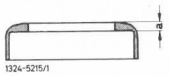
Type	Front spring Part No.	Height of the spring rubber mounts according to vehicle equipment [1] and spring colour code									
		No extras		**One** extra		**Two** extras		**Three** extras or air conditioner		**One to three** extras and air conditioner	
		Spring colour code		Spring colour code		Spring colour code		Spring colour code		Spring colour code	
		blue	red	blue	red	blue	red	blue	red	blue	red
Normal Suspension											
107.024	114 321 06 04	8	13	13	18	–	–	13	18	18	23
107.044	114 321 06 04	8	13	–	–	–	–	13	18	–	–
116.032	116 321 33 04	18	23	–	–	–	–	–	–	–	–
	116 321 32 04	–	–	8	13	–	–	13	18	13	18
116.033	116 321 33 04	18	23	–	–	–	–	–	–	–	–
	116 321 32 04	–	–	8	13	–	–	13	18	18	23
Special Version: Harder suspension for poor road conditions (greater vehicle level)											
116.032	116 321 32 04	13	18	13	18	–	–	23	–	23	–
116.033	116 321 32 04	13	18	18	23	–	–	23	–	23	–

[1]) e. g. Sliding roof

Rubber Mounts for Front Springs

Height "a" mm	Part No. [1])
8	115 321 48 84 (115 321 32 84)
13	115 321 49 84 (115 321 33 84)
18	115 321 50 84 (115 321 34 84)
23	115 321 51 84 (115 321 35 84)

1st version



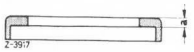
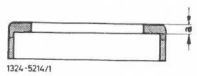
2nd version

[1]) The part numbers given in brackets refer to the rubber mounts of the 1st version. On the mounts of the 2nd version the total height of the shaft has been standardised.

Adjusting the Rear Springs (Matching of Rear Spring Rubber Mounts)

Type	Vehicles **without** levelling control device			Vehicles **with** levelling control device		
	Rear spring Part No.	Height of spring rubber mounts according to colour code of spring		Rear spring Part No.	Height of spring rubber mounts according to colour code of spring	
		blue	red		blue	red
Normal Suspension						
107.024	115 324 22 04	9.5	14	115 324 27 04	9.5	14
107.044				–	–	–
116.03	116 324 08 04	9.5	14	116 324 10 04	9.5	14
Special Version: Harder suspension for poor road conditions (greater vehicle level)						
116.03	116 324 09 04	9.5	14	116 324 11 04	9.5	14

Rubber Mounts for Rear Springs

Height "a" mm	Part No. [1])	
9.5	115 325 22 44 (115 325 15 44)	 1st version
14	115 325 23 44 (115 325 16 44)	 2nd version
19	115 325 24 44 (115 325 19 44)	

[1]) The part numbers given in brackets refer to the rubber mounts of the 1st version. On the mounts of the 2nd version the total height of the shaft has been standardised.

Torsion Bar on the Rear Axle

Type	Torsion Bar		Rubber torsion bar mount	
	Part No.	Diameter	Part No.	Bore-ϕ
107.024 107.044	107 326 26 65	18 ± 0.3	116 326 07 81	16.5
116.03	116 326 23 65			

Diagonal swing axle with anti-squat device

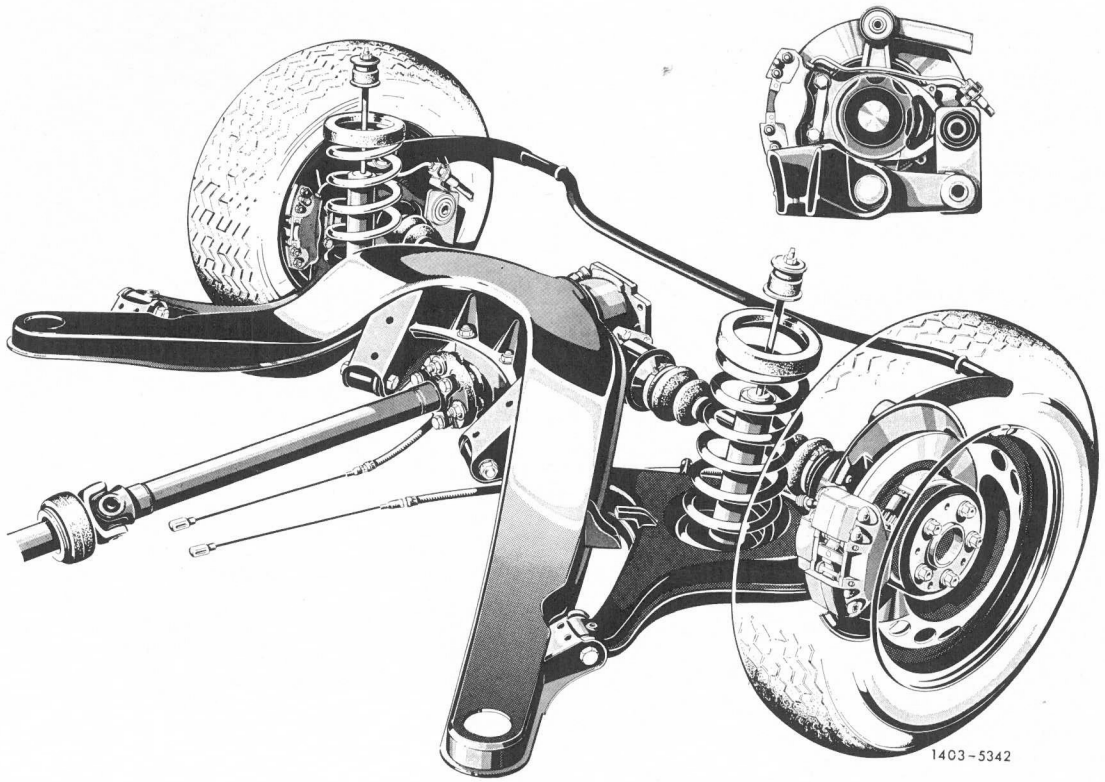


Fig. 12

The familiar axle from the type 350 SE (116.028) with a different rear axle ratio is installed, i = 3.07. The track is identical to that of the 350 SE. Drive shafts with large joints on the inside and medium joints on the outside are used. On request a limited slip differential can be installed.

The use of special kinematics is a new feature, which above all prevents the vehicle from squatting when moving off. The design principle and the considerations connected with it are further explained below.

Because of the high torque of the engine M 117, the familiar diagonal swing axle was developed further and provided with an anti-squat device.

This prevents rear-end squatting during acceleration, especially when moving off from rest. Thus the camber of the rear wheels and the full spring travel are retained, which is important for driving safety and comfort.

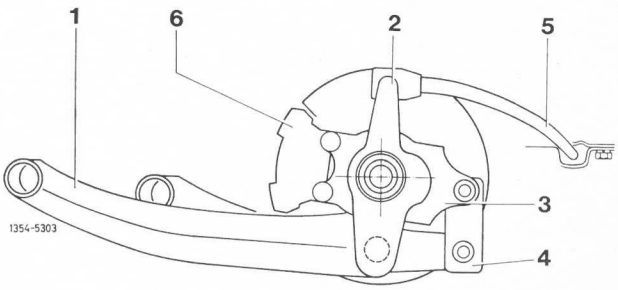


Fig. 13

1 Trailing control arm
2 Wheel carrier
3 Brake caliper carrier
4 Connecting plate
5 Torsion bar
6 Brake caliper

The anti-squat device is only necessary for engines having very high torque and is therefore only installed in vehicles with engine M 117 – not however in vehicles for the American market (derated output, derated torque).

With the diagonal swing axle with anti-squat device each rear wheel is attached to a Watts linkage.

The lower, forward-pointing control arm is a light metal trailing control arm having the same pivotal point on the axle carrier as the normal diagonal swing axle (item 1 in Fig. 13).

The lever arm of the torsion bar stabilisor mounted behind the axle serves as an upper control arm, pointing backwards (item 5 in Fig. 13).

Both control arms are linked by the wheel carrier which houses the wheel bearings (item 2 in Fig. 13).

The type of guidance and the kinematics of the axle itself are however identical to the normal diagonal swing axle.

The disc brake caliper is attached to a separate brake anchor which pivots on the wheel carriers concentrically with the rear wheel bearings (item 3 in Fig. 13).

The principle of this brake carrier positioning is already familiar from the MB-passenger cars with air suspension and an anti-dive device.

The braking torque is taken up via a connecting plate (item 4 in Fig. 13), which connects the brake carrier with an extension of the trailing control arm.

According to the unit construction principle the diagonal swing axle with anti-squat device uses the main components of the normal diagonal swing axle.

By means of a certain arrangement of the trailing control arm and the torsion bar with respect to each other, spring deflection during acceleration in inhibited (Fig. 14a).

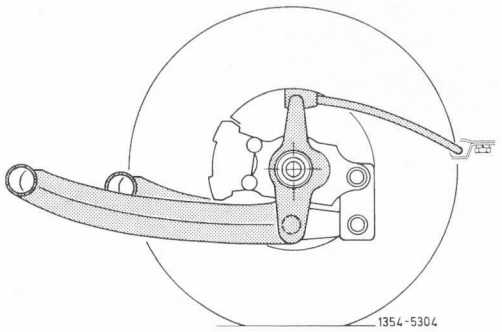


Fig. 14a Anti-squat device

Likewise lifting of the vehicle rear end is prevented during braking by the brake caliper carrier and by the relative arrangement of the trailing control arm and the torsion bar (Fig. 14b).

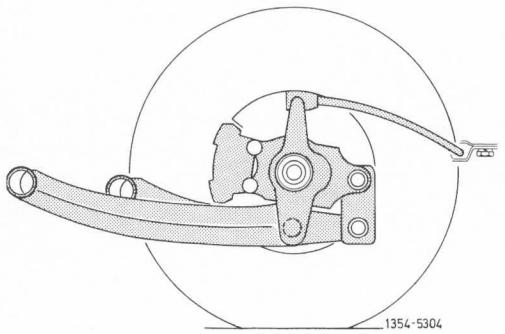


Fig. 14b Anti-dive device

The control arm wheel carrier and the torsion bar stabilisor are so arranged that with a medium load in the vehicles (3 persons) no movement of the vehicle rear end occurs whatsoever during acceleration, and during braking the rear end is slightly pulled down.

Note
For overhauling the rear axle and for normal repair work there is soon to appear a supplement to the workshop manual "Axles".

Wheels and Running Gear Measurement

Table for Disc Wheels and Tires

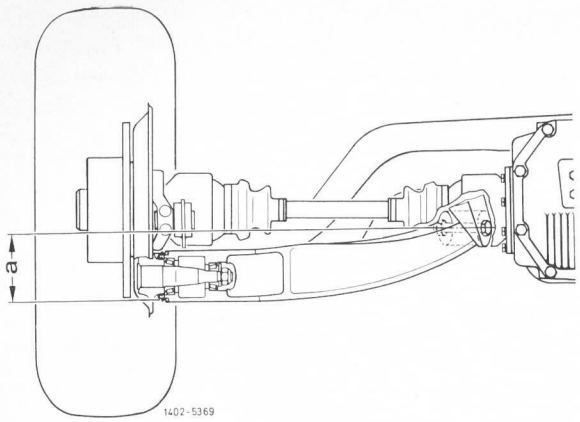
Type	Disc wheel	Summer tire Radial	Winter tire Radial
107.024 107.044 116.032 116.033	6½ J × 14 H 2	205/70 VR 14 tubeless and tube type	205/70 SR 14 tubeless

Disc Wheels

Type	Designation	Manufacturer	MB Part No.	Remarks
Sheet Steel Disc Wheels (standard version)				
107.024 107.044 116.032 116.033	6½ J × 14 H 2	Kronprinz Lemmerz	108 400 08 02	with inner ventilation ring
Light Alloy Disc Wheels (special version)				
107.024 107.044 116.032 116.033	6½ J × 14 H 2	Fuchs	108 400 10 02	Range of delivery 108 400 16 02 (with wheel embellisher and spherical collar bolts)

Approved Tire Brands

Summer tires	Continental TS 773 tube type [1] [4] Dunlop Sp 57 tube type [2] Michelin XWX tubeless [3] [5] Phoenix P 110 Ti-V tube type Pirelli CN 36 tube type	[1] Not for model 107. [2] Not for model 116. [3] Further development of tire 205/70 VR 14 tube type. [4] When fitting note marking "Aussenseite" (Outside). [5] Fit tires with tube for light alloy disc wheels.
Winter tires	Veith 444 tubeless	



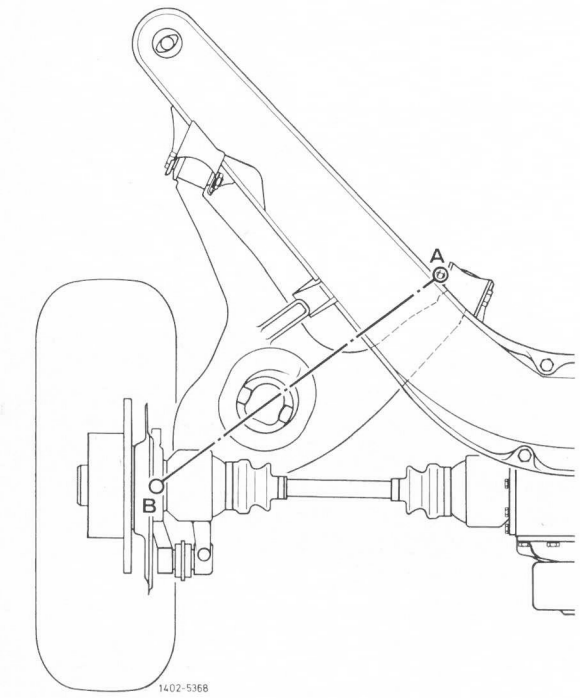


Fig. 15

"a" = height difference inner control arm bearing (A) – lower edge protective ring of wheel carrier bearing on trailing control arm (B).

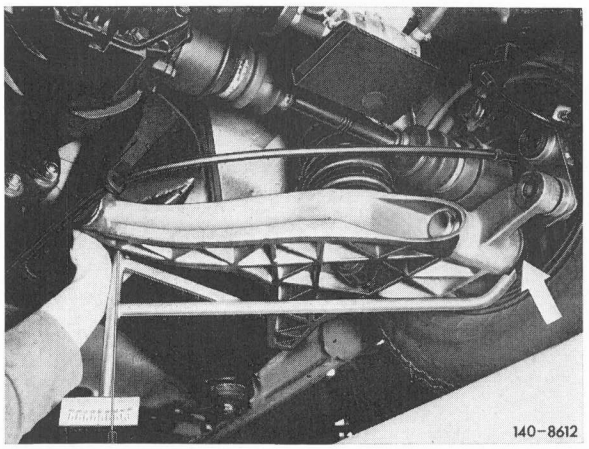


Fig. 16 Measuring device for trailing control arm position 116 589 16 21 00

Wheel Alignment on the Front Axle

The values for wheel alignment on the front axle correspond to those for models 116.02 or 107.02 and 107.04 in curb condition.

Measuring the Vehicle Level at the Rear Axle

As with the normal diagonal swing axle, the vehicle level at the rear axle is measured by the trailing control arm position "a".

The departure point for measuring the control arm position is the inner bearing of the control arm at the rear axle carrier.

Whereas on the normal diagonal swing axle, measuring point (B) is the lower edge of the outer universal joint of the rear axle shaft, measuring point (B) on the diagonal swing axle with anti-squat device is the lower edge of the protective ring on the bearing of the wheel carrier on the trailing control arm (Figs. 15 and 16).

Values for Wheel Alignment at the Rear Axle in Curb Condition

Camber of the rear wheels		See comparative table trailing control arm position – rear wheel camber
Toe-in of the rear wheels	with trailing control arm position 80 to 135 mm	1.0^{+2}_{-1} mm or $0^{\circ}\ 10'\ ^{+20'}_{-10'}$
	with trailing control arm position 135 to 150 mm	1.5^{+2}_{-1} mm or $0^{\circ}\ 15'\ ^{+20'}_{-10'}$
	with trailing control arm position 150 to 160 mm	2.0^{+2}_{-1} mm or $0^{\circ}\ 20'\ ^{+20'}_{-10'}$

Comparison: Trailing Control Arm Position on Rear Axle – Rear Wheel Camber

Trailing Control Arm Position mm	Corresponds to Rear Wheel Camber	Trailing Control Arm Position mm	Corresponds to Rear Wheel Camber
150	$+1^{\circ}\ 10' \pm 30'$	110	$-0^{\circ}\ 45' \pm 30'$
145	$+0^{\circ}\ 55' \pm 30'$	105	$-1^{\circ} \pm 30'$
140	$+0^{\circ}\ 40' \pm 30'$	100	$-1^{\circ}\ 15' \pm 30'$
135	$+0^{\circ}\ 25' \pm 30'$	95	$-1^{\circ}\ 30' \pm 30'$
130	$+0^{\circ}\ 10' \pm 30'$	90	$-1^{\circ}\ 45' \pm 30'$
125	$-0^{\circ}\ 05' \pm 30'$	85	$-2^{\circ} \pm 30'$
120	$-0^{\circ}\ 20' \pm 30'$	80	$-2^{\circ}\ 15' \pm 30'$
115	$-0^{\circ}\ 30' \pm 30'$	75	$-2^{\circ}\ 30' \pm 30'$

Vehicle Level in Curb Condition

Type	Front Axle			Rear Axle		
	Axle load [1] curb condition Approx. kg	Control arm position mm: Normal vehicle level (normal suspension)	Control arm position mm: Greater vehicle level (harder suspension for poor road conditions)	Axle load [1] curb condition Approx. kg	Trailing control arm position mm: Normal vehicle level (normal suspension)	Trailing control arm position mm: Greater vehicle level (harder suspension for poor road conditions)
Vehicles without Levelling Control Device on the Rear Axle						
107.024	885	47 ± 15	–	770	125 ± 10	–
107.044	870	64 ± 15		735	111 ± 10	
116.032	935	44 ± 12	56 ± 12	825	133 ± 10	145 ± 10
116.033	940			835		

For continuation see over

Vehicle Level in Curb Condition (continued)

Type	Front Axle			Rear Axle		
	Axle load [1] curb condition Approx. kg	Control arm position mm Normal vehicle level (normal suspension)	Control arm position mm Greater vehicle level (harder suspension for poor road conditions)	Axle load [1] curb condition Approx. kg	Trailing control arm position mm Normal vehicle level (normal suspension)	Trailing control arm position mm Greater vehicle level (harder suspension for poor road conditions)
Vehicles with Levelling Control Device on the Rear Axle [2]						
107.024	890	47 ± 15	–	780	125 ± 10	–
116.032	940	44 ± 12	56 ± 12	835	133 ± 10	145 ± 10
116.033	945			845		

[1] The indicated axle loads refer to the normal standard version without any extras.
Additional loads on the front axle:
Sliding roof approx. 10 kg, automatic transmission approx. 15 kg, radio approx. 5 kg, air conditioner approx. 30 kg, partition approx. 30 kg.
Additional loads on the rear axle:
Sliding roof approx. 10 kg, trailer coupling approx. 20 kg, partition approx. 30 kg.

[2] For vehicles with levelling control device on the rear axle take note of the table "Checking the Vehicle Level under Load".

Checking the Levelling Control Unit under Load

Type	Vehicle Load [1]	Vehicle Level at Rear Axle Trailing Control Arm Position mm	
		Normal vehicle level (normal suspension)	Greater vehicle level (harder suspension)
107.024	approx. 150 kg in the trunk or approx. 120 kg trailer load [2]	108 ± 10	–
116.032 116.033		105 ± 10	119 ± 10

[1] Before loading the vehicle must be in curb condition.

[2] Connect the trailing load to the rear bumper brackets.

[3] In vehicles with levelling control device, the tolerances of the trailing control arm position refer only to checking. When adjusting, the nominal values should be adhered to. A value between the nominal value and the upper tolerance limit should be aimed for. Tolerances are caused by free play of the levelling control device.

On vehicles with a diagonal swing axle with anti-squat device the brake caliper is located in front of the wheel centre (Fig. 17).

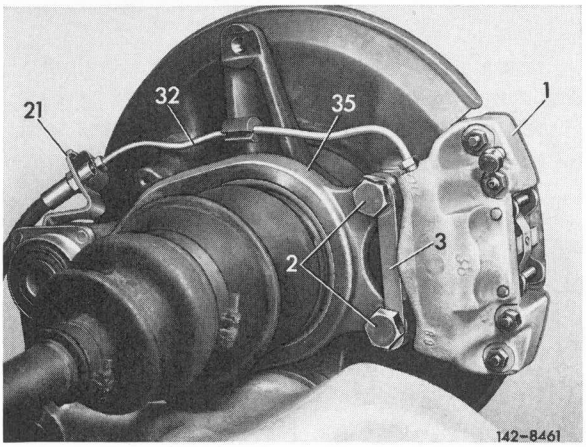


Fig. 17

1 Brake caliper
2 Hexagon headed bolt
3 Locking plate
21 Brake hose holder
32 Brake line
35 Brake caliper carrier

By means of this arrangement of the brake caliper, the raised portion of the brake caliper piston (shown in the picture) is given a different position so as to avoid squeaking (Fig. 18).

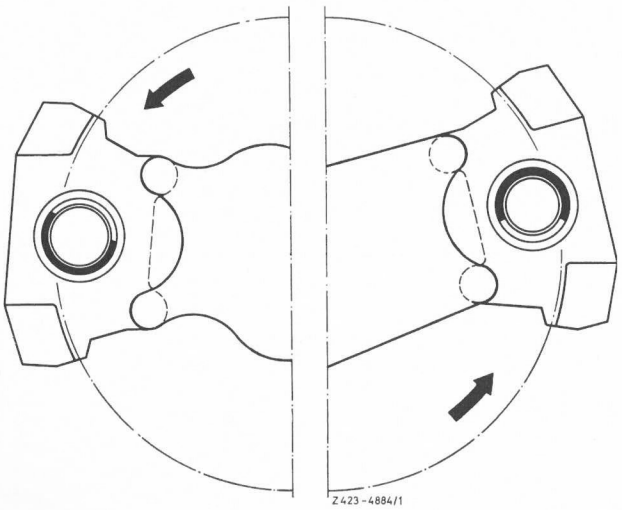


Fig. 18

Arrangement on vehicles with:

Diagonal swing axle with anti-squat device

Diagonal swing axle

To adjust the parking brake on vehicles with a diagonal swing axle with anti-squat device, the rear wheels should be turned until the screw hole points towards the front, seen in driving direction (Fig. 19).

The turning direction of the screwdriver to tighten the brake shoes is:

left side: from rear to front
right side: from front to rear

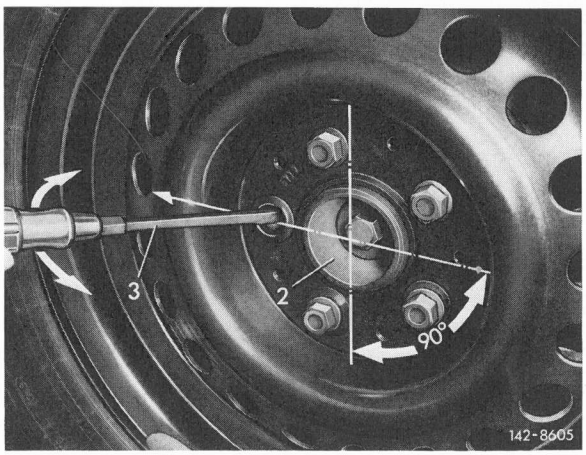


Fig. 19

2 Rear axle shaft flange
3 Screwdriver

The starter and the alternator are the same as those already known from engine M 116.

Starter:
Bosch type GF 12 V 1.4 h.p.

Alternator:
Bosch type K 1 – 14 V 55 A 20
with suppressed regulator.

Also the vehicle lighting system, the instruments, the windshield wiping and washing system and the arrangement of the fuses and relays are identical to those of the vehicles with engine M 116.

Central Locking System

The proven central locking system is also installed into types 450 SE, 450 SEL, 450 SL and 450 SLC. Type 450 SEL is supplied with this system as standard. With types 450 SE, 450 SL and 450 SLC it is available as an optional extra.

In the main, the system is identical in its construction and function to the central locking system hitherto. Marked differences to the familiar systems are firstly in all limousines of the 116 series the arrangement of double elements in the doors and the installation of the reservoir in the trunk above the fuel tank (Fig. 20).

The double elements in the doors ensure reliable functioning even with low ambient temperatures.

In types 450 SL/SLC the system is identical to that of types 350 SL/SLC.

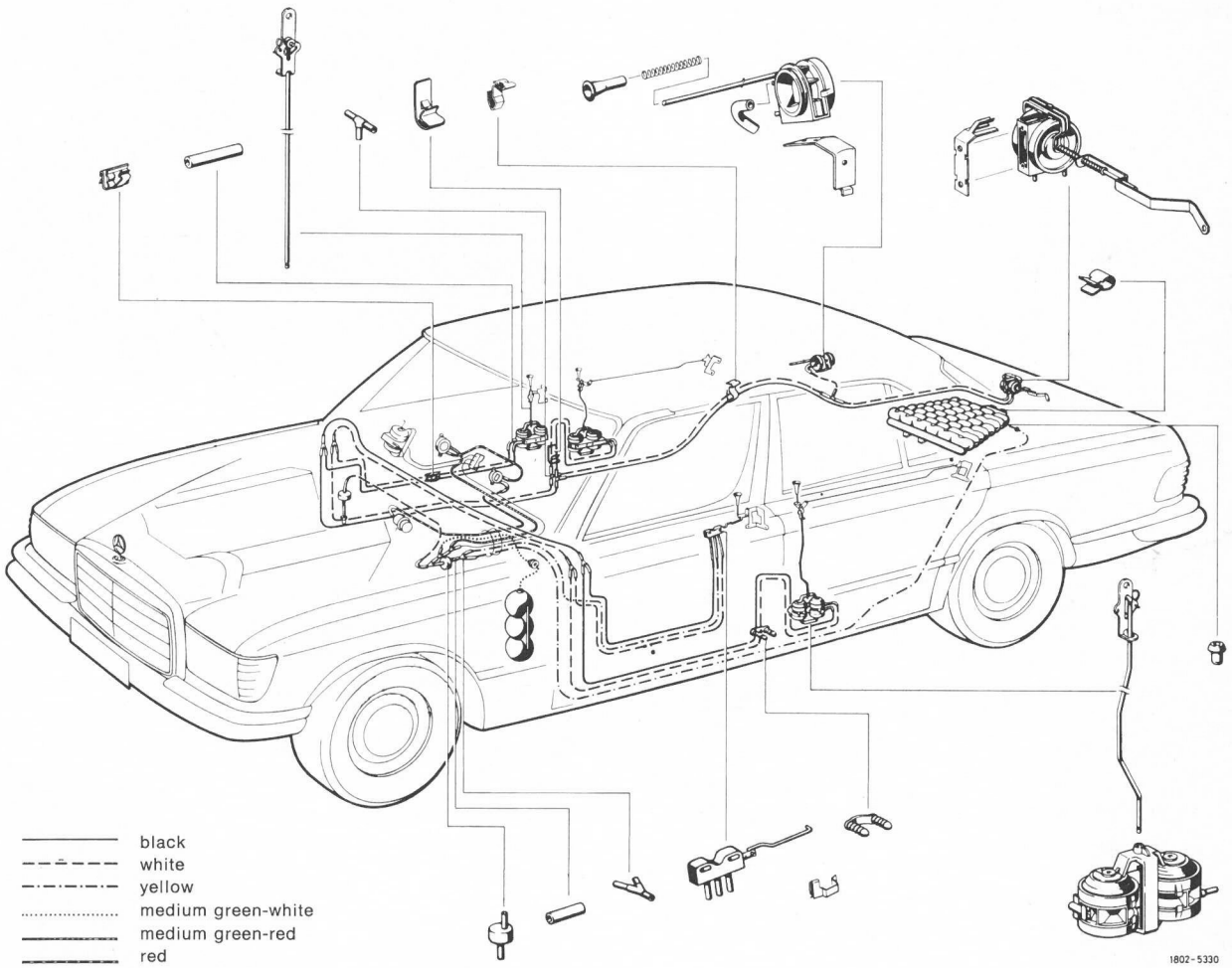


Fig. 20 Arrangement of the central locking system type 116

Jacking up the Vehicle

The vehicle should be lifted at the front by the frame cross member for the front axle (model 116) or at the front axle support (model 107) at the rear by the centre section of the rear axle using a workshop trolley jack or a pit hoist.

On model 116 a hardwood block should be placed between the jack and the frame cross member, so that the block is fixed into the two holes on the underside of the cross member. By this means, indents in the cross members are avoided (Fig. 21).

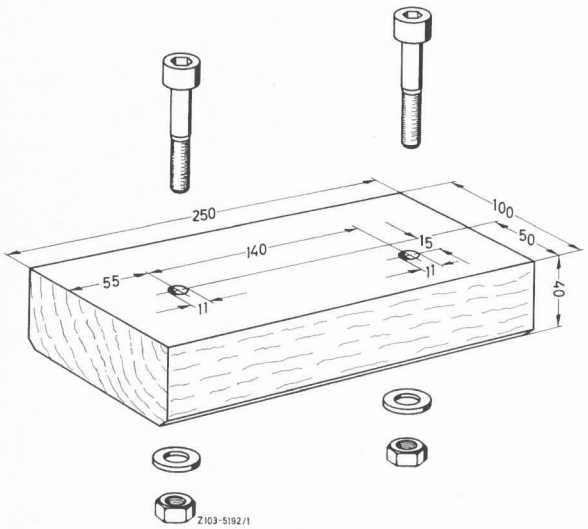


Fig. 21 Hardwood block with two hexagonal socket screws M 10×50 for fixing to the frame cross member (own manufacture)

On no account must a lifting device be attached to the trailing control arm when jacking! Indents or localised damage to the underside of the cross member must be avoided!

If the vehicle is to be put on blocks, use blocks 107 589 00 63 00.

When lifting the vehicle by means of a lifting platform, use only the prescribed attachment points (at the front the inner frame cross members, at the rear the front mounting of the rear axle carrier at the frame floor).

Removal and Installation of the Rear Axle

The work procedure is the same as for the normal diagonal swing axle. Only the method of mounting the support for the wheel carrier on the torsion bar is different from the previous method, since the arm of the torsion bar must be fixed in a definite position relative to the wheel carrier. For this purpose both parts are faced accordingly (Fig. 22).

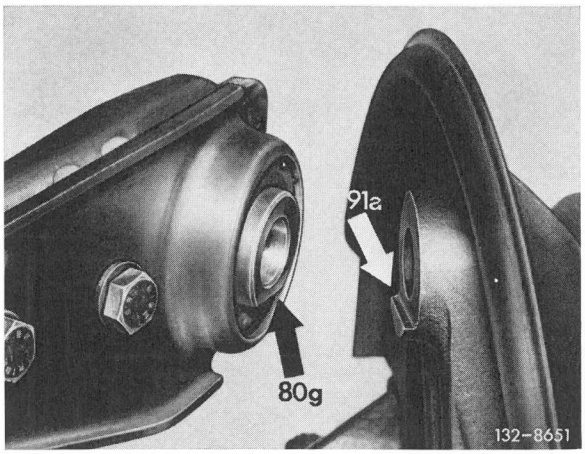


Fig. 22

80g Surface on the inner bush of the rubber mount
91a Surface on the wheel carrier

To instal the wheel carrier support, mount both rear wheels and lower the rear end of the vehicle, if necessary by loading the trunk, until the surface of the inner bush of the rubber mount coincides with the surface on the wheel carrier.

Then insert the necked-down bolt and tighten to approx. 70 Nm (7 kpm) (Fig. 23).

Caution! In case of repair only use new necked-down bolts.

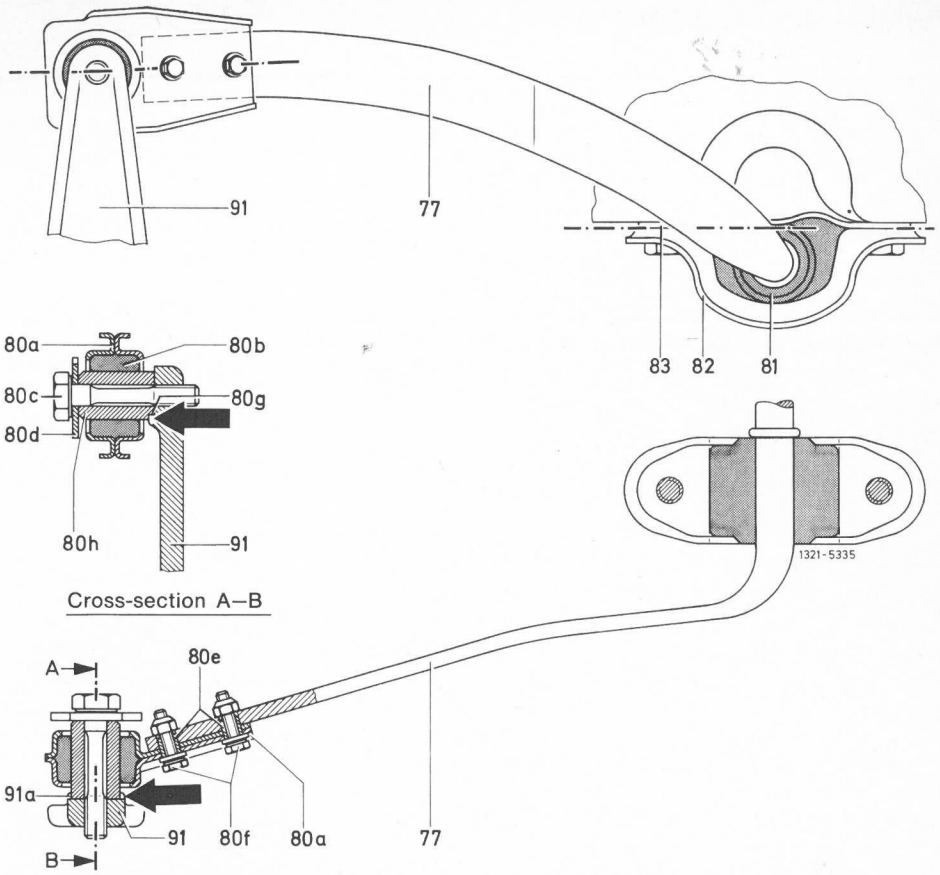


Fig. 23

77 Torsion bar
80a Connecting plate
80b Rubber mount
80c Necked-down bolt
80d Washer
80e Tension sleeves
80f Hex. head bolts with washers and self-locking nuts
80g Surface on inner bush of rubber mount
80h Inner bush of rubber mount
81 Rubber mount for torsion bar on frame floor
82 Lower holding bracket
83 Upper holding bracket
91 Wheel carrier
91a Surface of the wheel carrier

Tools and Equipment

Special Tools for Service Jobs

(Diagonal swing axle with anti-squat device)

Measuring device for trailing control arm position	116 589 16 21 00

Special Tools for Repair Work

(Diagonal swing axle with anti-squat device)

Installing arbor for bearing on wheel carrier trunnion	116 589 02 15 00
Installing arbor for protective ring on wheel carrier	116 589 03 15 00
Removing arbor for tapered roller bearing outer race from trailing control arm	116 589 04 15 00
Installing arbor for tapered roller bearing inner race on trunnion	116 589 06 15 00
Installing arbor for wheel carrier bearing cover	116 589 07 15 00
Installing arbor for tapered roller bearing inner race on rear axle shaft flange	116 589 09 15 00
Removing and installing tool for grooved ball bearing of brake caliper carrier	116 589 10 43 00
Tensioning device for trailing control arm	116 589 03 31 00
Pulling device for bearing outer race	116 589 05 33 00
Pulling device for wheel carrier bearing cover	116 589 06 33 00
Removing and installing tool for connecting plate with rubber mount and trailing control arm pin	116 589 15 43 00
Installing tool for brake caliper carrier on wheel carrier	116 589 05 35 00
Pulling device for tapered roller bearing inner race from rear axle shaft flange Basic device (upper part with spindle and tensioning sleeve)	001 589 36 33 00
Pliers (for 001 589 36 33 00)	000 589 02 34 00
Thrust piece (for 001 589 36 33 00)	000 589 03 34 00

Available from: ET Esslingen-Mettingen

Equipment

Straightening angle set for Celette Bench (also for model 116.033)	ENS 184.300

Supplier:

Federal Republic of Germany: Firma Philipp Gather, 4020 Düsseldorf-Mettmann, Postfach

Export countries: Firma G. Celette, Rue Denfert Rochereau, 34 Vienne (France)

Technical Data

Models

Sales designation	450 SE	450 SEL	450 SL	450 SLC
Vehicle model	116.032	116.033	107.044	107.024
Engine Type	M 117			
Engine model	117.983		117.982	

Design Characteristics

Standard	Twin-circuit braking system with vacuum assistance Disc brakes front and rear Power steering Diagonal swing axle with anti-squat device Automatic transmission (3-gear with torque convertor), in types 450 SE/SEL optionally with steering column or floor selector, in types 450 SL/SLC only with floor selector. Headrests and automatic safety belts for front seats Halogen headlights Radial-ply tires
Optional Extras	Electrically operated sliding roof on types 450 SE, SEL and SLC Central locking system (standard on type 450 SEL) Air conditioner Automatic levelling control device (on types 450 SE, SEL and SLC) Limited slip differential Partition (type 450 SEL)

Engine

Engine model		117.982, 117.983
Method of operation		4-stroke, electronically controlled fuel injection
No. of cylinders		8
Cylinder arrangement		V-arrangement 90°
Bore/stroke	mm	92/85
Total effective piston displacement	cm^3	4520
Compression ratio	ε	8,8 : 1
Firing order		1–5–4–8–6–3–7–2
Max. engine speed	1/min	5800
Engine output according to DIN [1])	kW at 1/min (PS at U/min)	165/5000 (225/5000)
Max. torque according to DIN	Nm at 1/min (mkp at U/min)	378/3000 (38,5/3000)
Crankshaft bearings		5 steel backed multi-layer friction bearings

[1]) The output indicated in Kw (hp) is effectively available at the clutch, since all other power requirements have been deducted.

Vehicle model	116.032	116.033	107.044	107.024

Engine (continued)

Connecting rod bearings	Steel backed multi-layer friction bearings
Valve arrangement	Overhead
Camshaft arrangement	1 overhead camshaft per cylinder bank
Oil cooling	Air/oil cooler
Cooling	Water circulation by pump, thermostat with by-pass line, fan with viscose coupling, ribbed tubular radiator
Lubrication	Oil pressure forced feed lubrication by gear pump
Oil filter	Full-flow filter with paper cartridge
Air filter	Air filter with paper cartridge

Dimensions

Vehicle length		mm	4960	5060	4380	4740
Vehicle width		mm	1870		1790	
Vehicle height, curb condition		mm	1425	1430	1300 Ro. 1290 Cp.	1330
Wheelbase		mm	2860	2960	2455	2815
Track	front	mm	1525		1452	
	rear	mm	1505		1440	
Wheel turning angle	inner	degrees	43		40	
	outer	degrees	34			
Turning circle diameter min.		m	11.44	11.78	10.34	11.55
Ground clearance in specified position [1]		mm	148		136	

Weights

Vehicle weight according to DIN, curb condition with full fuel tank, spare wheel and tools [2]		kg	1740	1755	1585	1635
Permissible gross vehicle weight		kg	2260	2275	2015	2095
Permissible axle load	front/rear	kg	1105/1115	1110/1165	1000/1015	1010/1085

Electrical System

Battery	voltage	V	12
	capacity	Ah	66

Filling Capacities

Fuel tank/reserve	Fuel	approx. ltrs.	96/13	90/13
Total oil filling capacity	engine oil	max/min ltrs.	8.5/6.5	

[1]) The specified position is achieved when the vehicle in curb condition is loaded with 65 kgs on each front seat and 65 kgs on the middle of the rear seat.

[2]) Vehicle curb weight according to DIN for vehicles in basic version. Optional extras increase this figure, which lessens the load to be added.

Vehicle model	116.032	116.033	107.044	107.024

Filling Capacities (continued)

Crankcase (without oil filter and air/oil cooler)	engine oil max/min ltrs.	7.5/5.5		
Oil filter	engine oil approx. ltrs.	0.75		
Air/oil cooler	engine oil approx. ltrs.	0.4		
Cooling system with heater	water approx. ltrs.	15		
Water pump		maintenance-free		
Automatic transmission	automatic transmission fluid ATF ltrs.	8.9 (first filling) 7.9 (for oil changes)		
Rear axle hypoid transmission oil	SAE 90 ltrs.	1.3		
Power steering	ATF ltrs.	1.4		
Front wheel hub	anti-friction bearing grease per hub approx. gr.	60	65–80	
Braking system	brake fluid approx. ltrs.	0.5		

Driving Performance, Consumption Data and Operating Conditions

With rear axle ratio		3.07		
Max. speed in the individual gears	type of transmission	automatic transmission (torque convertor)		
	1st gear km/h	95		
	2nd gear km/h	155		
	3rd gear km/h	210	215	
Climbing ability	1st gear slip limit %	45	43	
	2nd gear %	43	43	
	3rd gear %	28	31	
Acceleration with full use of gears 0–100 km/h Load: two persons	secs. ±7% [1]	9.3	8.8	
Engine speed at 100 km/h in direct gear	1/min	2865		
Fuel consumption on average overland trips	ltrs./100 km	14–22		
Fuel consumption according to DIN 70030 [2]	ltrs./100 km	14.5		
Engine oil consumption	ltrs./100 km	0.15–0.25		
Coolant	operating temperature	70–95° C		
	max. temperature	115° C		
Fuel		Premium		
Anti-knock quality	min. RON	98		
	min. MON	88		

[1] The range ± 7% not only includes the deviations caused by the permissible engine output tolerance but also the possible deviations caused by the tires.

[2] Measured at 3/4 maximum speed, max. 110 km/h with 10% added.