

Passenger Cars Series 116



service

Introduction into service

Daimler-Benz Aktiengesellschaft
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The new models of Series 116 are superseding the models of Series 108 and 109.

The new Series comprises the models
280 S (116.020) with M 110.922 engine
280 SE (116.024) with M 110.983 engine
350 SE (116.028) with M 116.983 engine

Body and front axle are new designs, the other units are structural elements employed before but slightly modified and include, for example, engines M 110, M 116, manual transmissions G 76/18 B, G 76/27 A, automatic transmission W 4 B 025, W 3 A 040 and the diagonal swing axle from model series 107, 114 and 115.

The present Introductory Publication provides a general survey of these new models.

Pertinent instructions and adjusting data for service and adjusting jobs are included.

The testing and adjusting data for the engines include only those adjusting data which are different from the data applying to the already known M 110 and M 116 engines.

Daimler-Benz Aktiengesellschaft
Zentralkundendienst

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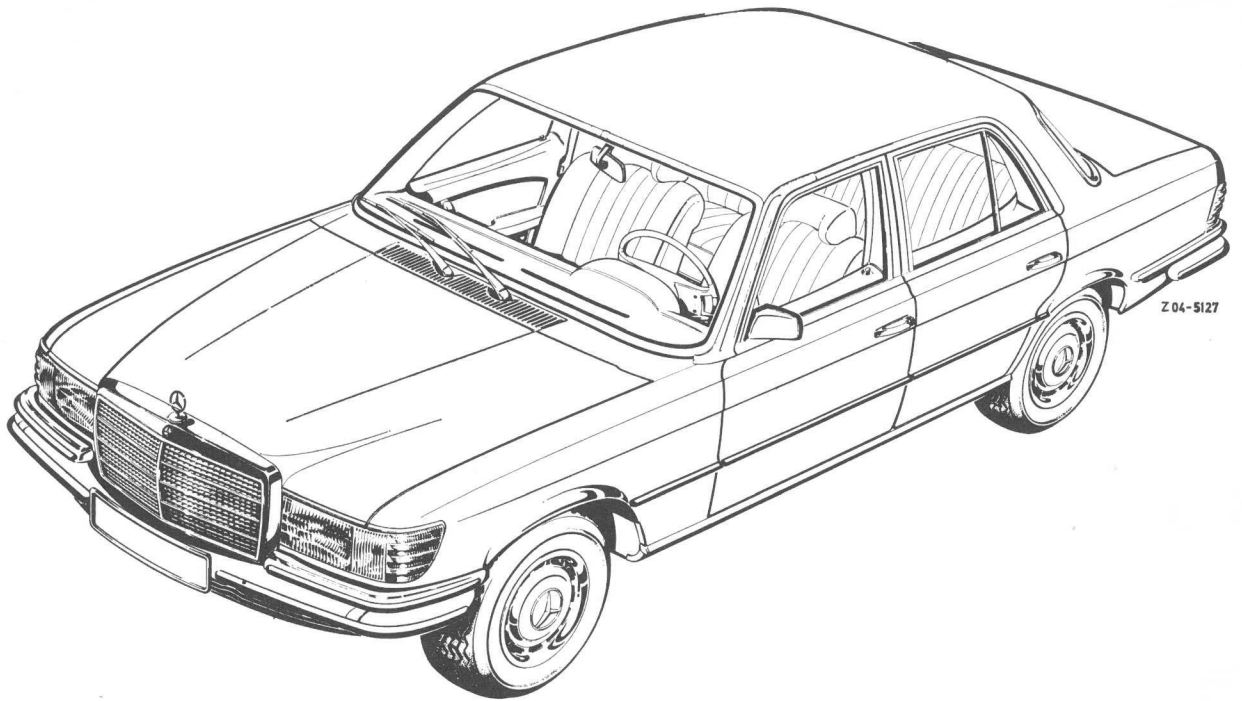
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General Description of Engine

Vehicle model 116 is optionally available with the M 116.983 8-cylinder V-injection engine or the M 110 6-cylinder in-line engine, carburetor version 110.922 or injection version 110.983.

Except for a few changes resulting from different installation conditions, these engines are similar to the versions of the already known M 116 and M 110 engines.

Instructions and technical data for testing, adjusting, service and repairs are shown in the already known workshop data.

The newly added items, testing and adjusting values, as well as new specifications for spark plugs of vehicle model 116 are shown in the section covering assembly, testing and adjusting jobs or testing and adjusting values, respectively.

Electronically Controlled Gasoline Injection System

Function and testing are already known from earlier publications covering the M 110 and M 116 engines.

The control unit is located in the righthand legroom and accessible after removing the righthand lateral cover.

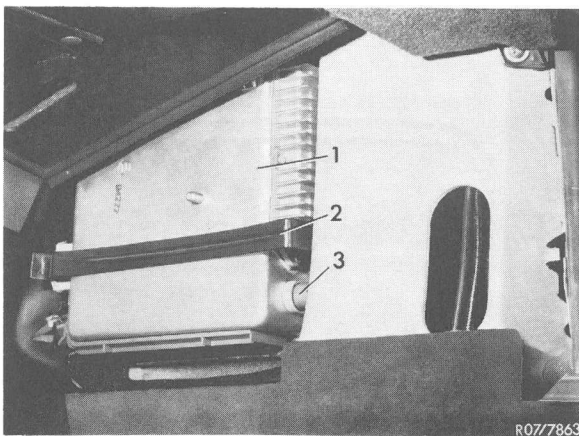


Fig. 1

- 1 Control unit
- 2 Spring clip
- 3 Idling speed adjusting screw

Ignition

Model 116.020 with carburetor engine has a standard ignition system with heavy-duty ignition coil and 1.8 Ohm series resistance.

Models 116.024 and 116.028 with injection engine have transistor ignition with standard switchgear.

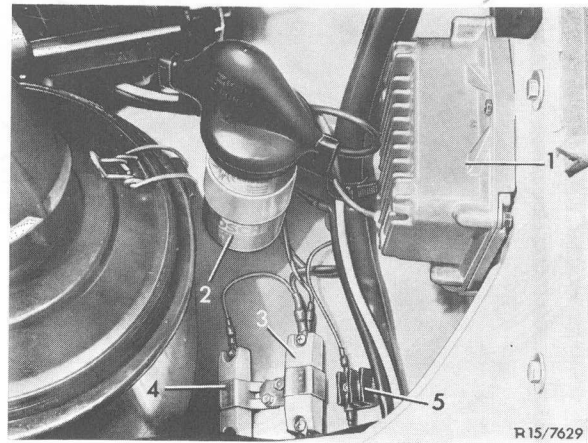


Fig. 2

- 1 Standard switchgear
- 2 Ignition coil
- 3 0.4 Ohm series resistance
- 4 0.6 Ohm series resistance
- 5 Cable connector

For circuit, electrical connections and testing refer to page 23.

General Description of Chassis

A. Clutch

Clutch in General

The clutch, as well as the clutch actuation, of series 116 vehicles conform essentially to the pertinently comparable predecessor models.

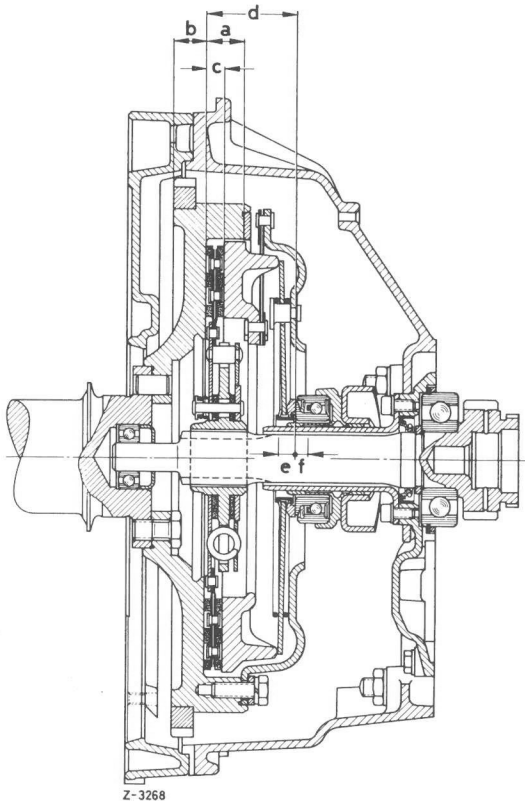


Fig. 3 Layout of diaphragm spring clutch of models 116.020 and 116.024 with 4- and 5-speed transmission

Models 116.020 and 116.024 are provided with the same type of clutch as models 108 and 109 with 6-cylinder engine and models 114 with M 110 engine.

Individual components are the clutch pressure plate M 228 Sph. with yellow color code (contact pressure 600 – 660 kp) and the driven plate 228 TPD with plate spring damper.

Model 116.028 with pressure plate MF 240 Sph. (contact pressure: 720 – 790 kp) and driven plate 240 GSD (with increased torsion damper friction coefficient) conforms essentially to the models equipped with the M 116 engine up to now.

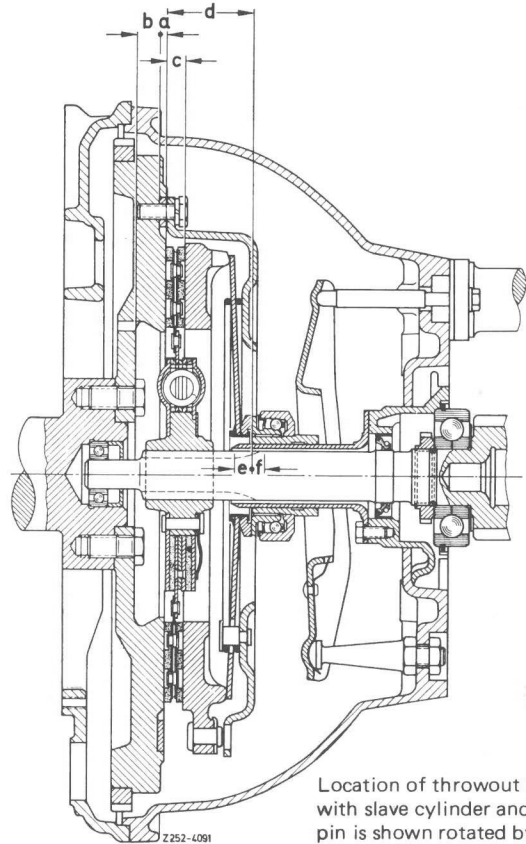


Fig. 4 Layout of diaphragm spring clutch of model 116.028

Master and Slave Cylinder

Master and slave cylinder are similar to the versions of comparative predecessor models. The master cylinder is mounted on rubber for damping vibrations and is the same on all vehicles of the 116 series.

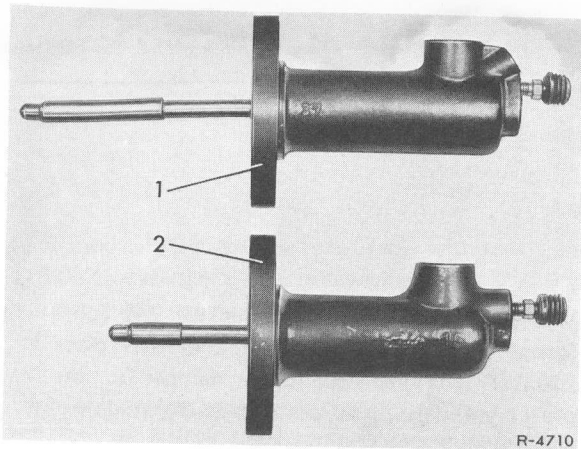


Fig. 5 Slave cylinder comparative illustration

- 1 Slave cylinder for clutch M 240 Sph. for model 116.028
- 2 Slave cylinder for clutch M 228 Sph. for models 116.020 and 116.024

B. Pedal Assembly

The pedal assembly is substantially the same as that on vehicles of series 107.

Deviations are only with regard to dead center spring. In accordance with the varying clutch contact pressure, this spring is softer for 6-cylinder models and harder for the 8-cylinder model.

Dead center springs are generally adjusted to "a" = 66 mm — each time measured across both spring retainers.

Pedal travel "c" is:

for clutch pedal 162 mm
for brake pedal max. 150 mm

Clearance "b" between piston in master cylinder and push rod is the same as for all other passenger car models.

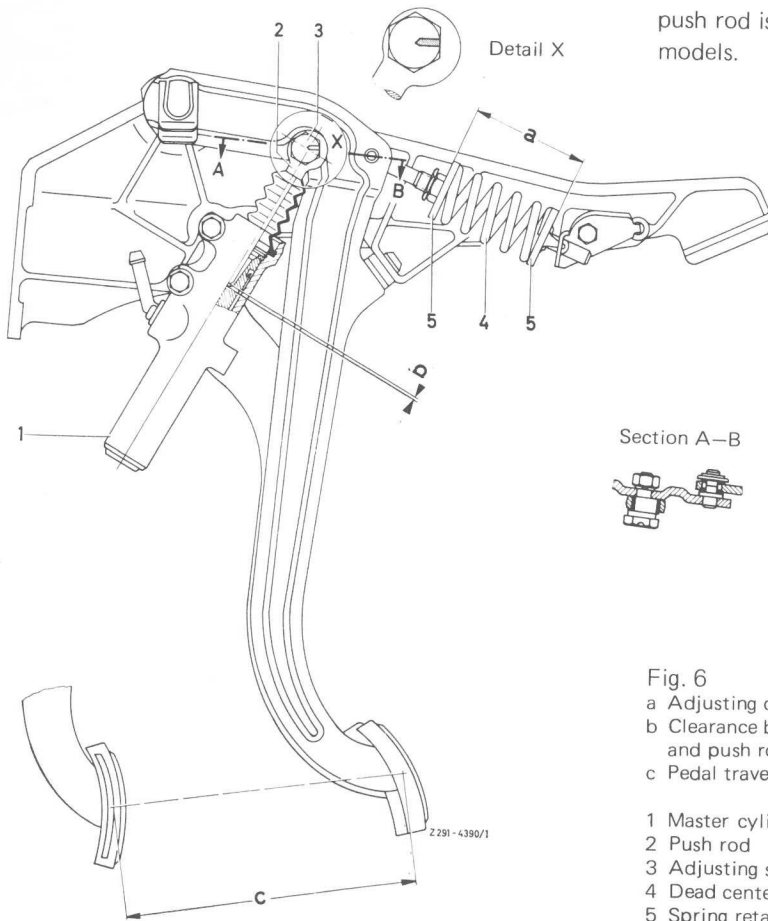


Fig. 6

- | | | |
|---|--|------------------|
| a | Adjusting dimension of dead center spring | = 66 |
| b | Clearance between piston in master cylinder and push rod | = 0.1—0.2 |
| c | Pedal travel | Clutch = 162 |
| | | Brake max. = 150 |

- 1 Master cylinder (on models 116 mounted in rubber)
- 2 Push rod
- 3 Adjusting screw
- 4 Dead center spring
- 5 Spring retainer

C. Manual Transmission

4-Speed Transmission

Vehicles 116.020 and 116.024 are provided with transmission type G 76/18 B (type designation 716.001), and vehicle 116.028 with transmission type G 76/27 A (type designation 716.100).

Both transmission types are proven units taken from the former series.

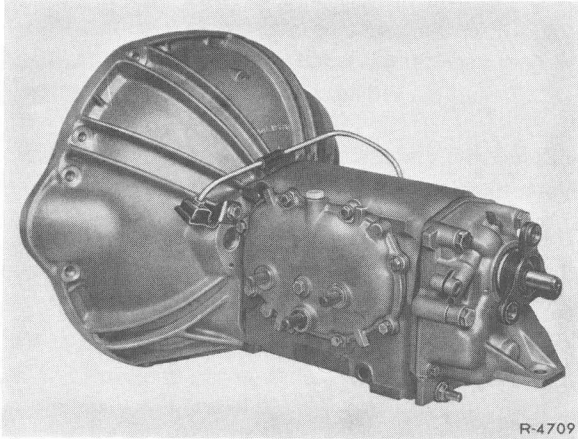


Fig. 7 Transmission G 76/27 A

D. Automatic Transmission

Vehicles with engine 116.983 are optionally provided with the automatic transmission carrying the designation W 3 A 040.

This is a 3-speed transmission with 2 planetary gear sets and torque converter.

Vehicles with the M 110 engine are optionally available with the automatic transmission carrying the designation W 4 B 025.

This is a 4-speed transmission with 3 planetary gear sets and a torque converter.

Transmission W 3 A 040

This transmission differs from the version manufactured for the USA as from model year 1972 as follows:

5-Speed Transmission

Vehicles 116.020 and 116.024 are optionally available with the MB 5-speed transmission G 76/27-5 (type designation 717.000) in combination with a different rear axle ratio.

Assembly Note

Removal and installation of transmission are the same as for the former standard types. The initial removal of the complete exhaust system cannot be avoided.

Gear Shift

Vehicles of series 116 with manual transmission are provided with floor shift only.

The floor shift for 4- and 5-speed transmissions conforms to the present series.

1. The torque converter has a smaller diameter (270 mm) and is therefore matched to the torque of the 3.5 liter engines.
2. The rear transmission housing is provided with a modified pressure absorbing piston, which will make the jolt when engaging a forward speed softer.
3. The double loop brake band B 2 is replaced by a single band, in combination with the brake band piston B 2 of 88 mm dia. The shift end of the brake band piston is additionally provided with a compression spring.

For the rest, design and operation of the transmission conform to the description provided in the Service Introduction Model Year 1972 Passenger Cars USA Version.

Transmission W 4 B 025

The transmission is substantially the same as the reinforced transmission K 4 C 025.

The front transmission cover is provided with the stator shaft required for the torque converter. The primary pump is slightly larger to obtain higher delivery. The pressure absorbing piston in the rear transmission housing has been changed for the converter transmission to provide a substantial reduction of the jolt when engaging a forward gear.

E. Suspension

Suspension is in principle the same as the steel spring suspension used up to now. At the front axle, the spring is between the lower control arm and the frame floor. The front shock absorber is located outside the front spring as before (Fig. 8 and 9).

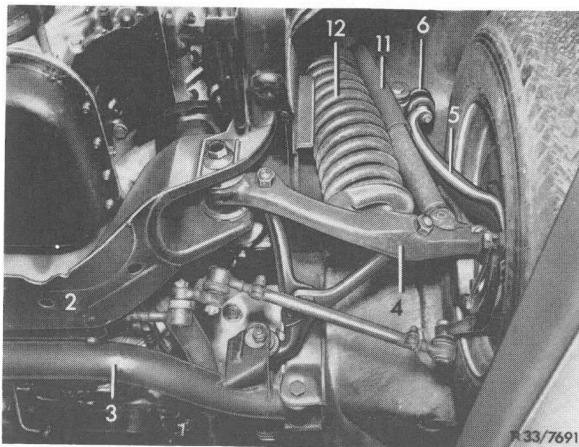


Fig. 8

- 2 Frame cross member
- 3 Cross yoke
- 4 Lower control arm
- 5 Steering knuckle
- 6 Upper control arm
- 11 Front shock absorber
- 12 Front spring

The shift sleeve housing for this transmission has been modified. In shift lever positions "D" and "S" in the range of partial to full throttle the vehicle is started in second gear. However, first gear can be engaged in these selector lever positions by starting in kickdown to obtain better acceleration.

The power flow as well as the engagement of the servo links in the individual speeds corresponds exactly to transmission type K 4 C 025.

The rear axle is provided with rear springs and shock absorbers similar to models 107, 114, and 115 located between the semi-trailing arm and the frame floor (Fig. 12).

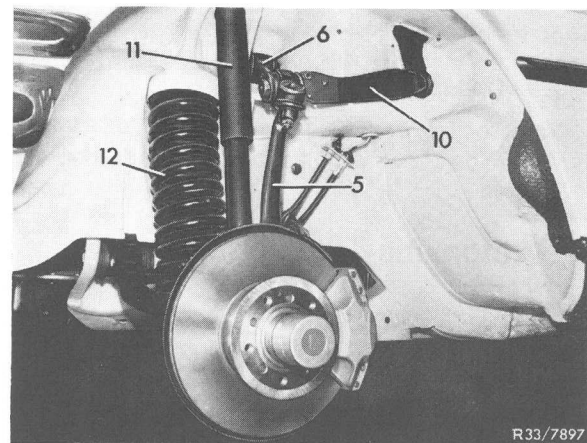


Fig. 9

- 5 Steering knuckle
- 6 Upper control arm
- 10 Torsion bar
- 11 Front shock absorber
- 12 Front spring

Level control on rear axle is available as an option. The system corresponds to models 114 and 115.

F. Front Axle

The front axle of vehicle model 116 is a double control arm axle with maintenance-free rubber mountings and ball joints. The lower control arm (4) is designed as an A-arm (wishbone); it is mounted to the frame cross member at the front and to the cross yoke (3) at the rear. The cross yoke is elastically attached to the frame floor and contributes to the excellent noise and impact insulation characteristics of the vehicle (Fig. 10).

The upper control arm is attached to the front end. The torsion bar stabilizer (10) is connected to the upper control arm and thereby serves the additional purpose of supporting the upper control arm longitudinally on this front axle assembly.

The torsion bar stabilizer is also a safety element due to its arrangement at the front wall, which will intercept the engine-transmission unit and the propeller shaft in the event of a frontal impact.

The special arrangement of the control arm pivots also serves to obtain an anti-dive effect, that is, the diving of the front end of the vehicle while braking is almost completely eliminated.

The steering knuckle is connected to the lower control arm by means of the pressed-in supporting joint (7), and to the upper control arm by means of the guide joint (8). The large supporting base of the steering knuckle and the control arms will guide the wheels accurately in spite of the soft rubber mountings which

contribute a considerable share for insulating noise and shocks. In addition, the forces initiated at the individual axle components and conducted toward the vehicle body are considerably reduced.

The steering knuckle carries a toe-in offset, that is, the kingpin is located in front of the connecting line of the two wheel joints which represent the steering axle (Fig. 11).

In combination with the large caster angle the changes in caster when turning the front wheels are much larger than before, which in turn provides an excellent stability around bends.

Additional advantages are stable straight-ahead driving characteristics and accurate response of the steering.

The angle of lock has been increased by approx. 4° as compared with the previous models and permits a turning circle smaller by 0.4 m in spite of the longer wheel base of 11.4 m.

The layout of the steering knuckle connecting points is such that the degree of tire contact equals zero.

In given driving situations this will provide a still better handling of the vehicle:

Insensibility against one-sided pulling of the brake, no veering of vehicle in the event of tire failure on one side, as well as reduced interference while steering.

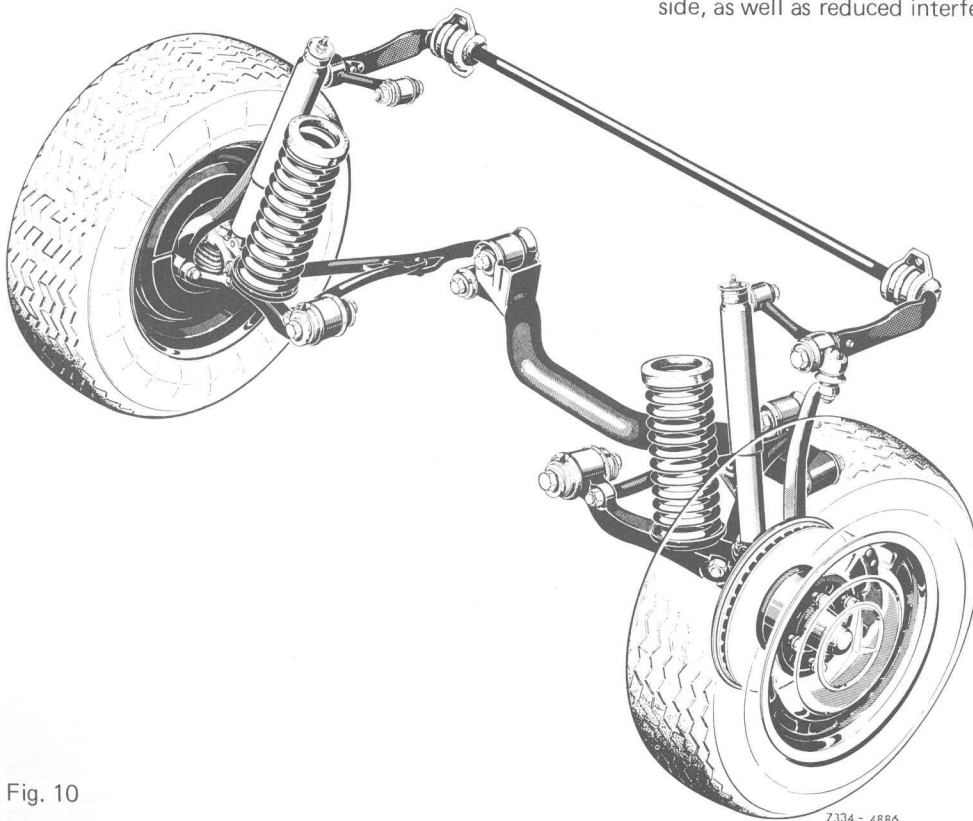


Fig. 10

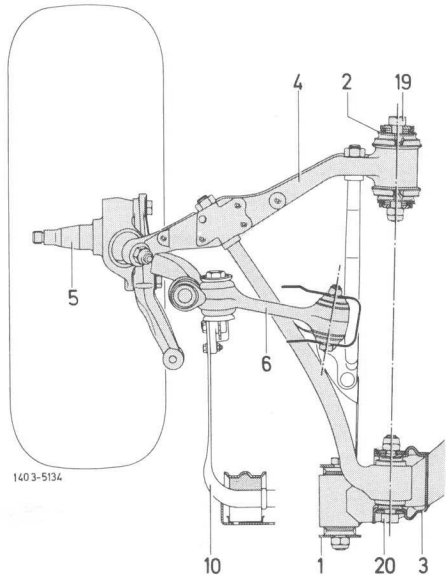
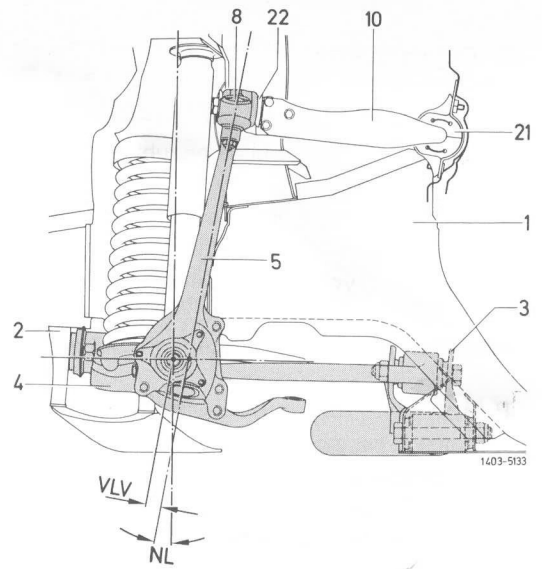
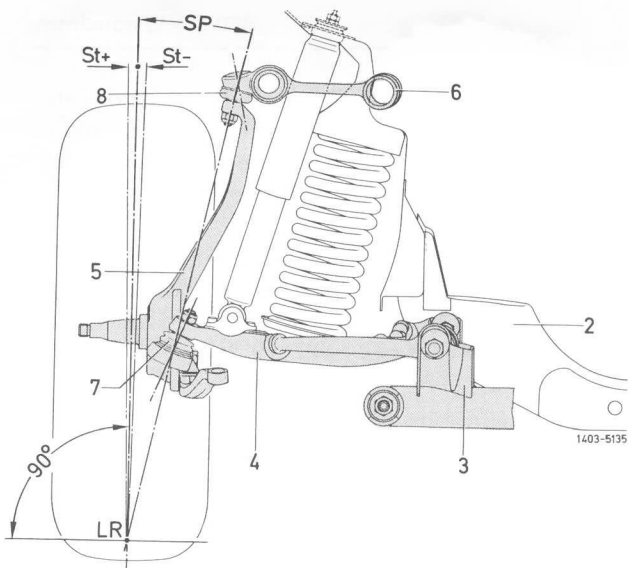


Fig. 11

- ST Camber
- NL Caster
- SP KPI
- LR Degree of tire contact
- VLV Toe-in offset
- 1 Frame side member
- 2 Frame cross member
- 3 Cross yoke
- 4 Lower control arm
- 5 Steering knuckle
- 6 Upper control arm
- 7 Supporting joint
- 8 Guide joint
- 10 Torsion bar
- 19 Eccentric bolt of front bearing (adjustment of camber)
- 20 Eccentric bolt of rear bearing (adjustment of caster)
- 21 Bearing of torsion bar at front end
- 22 Support of upper control arm on torsion bar

G. Rear Axle

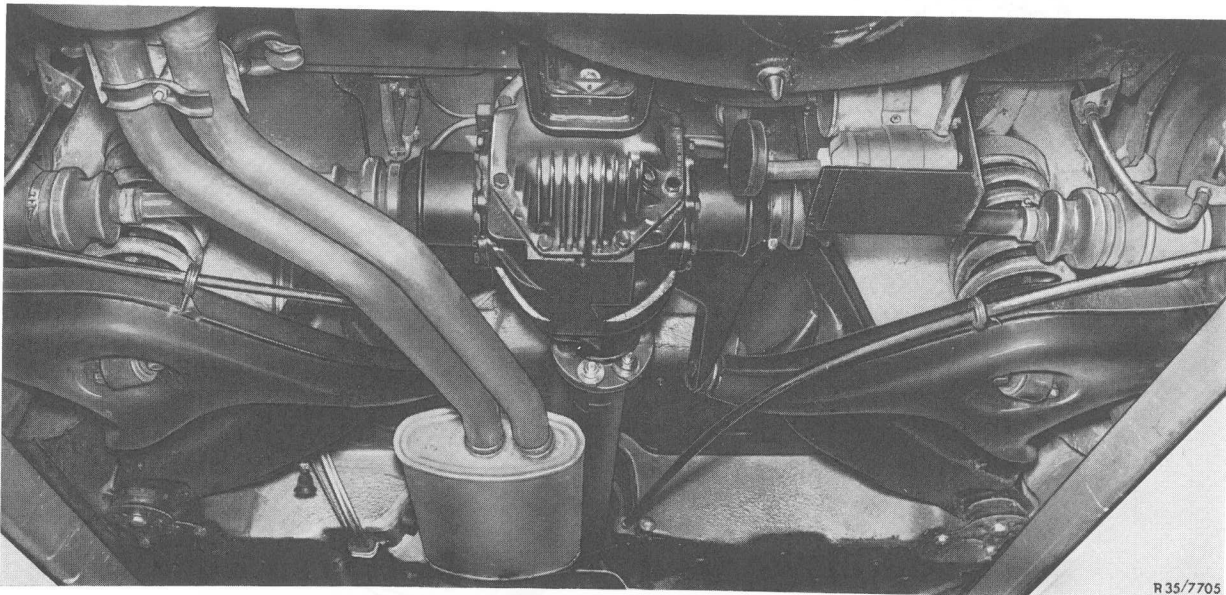
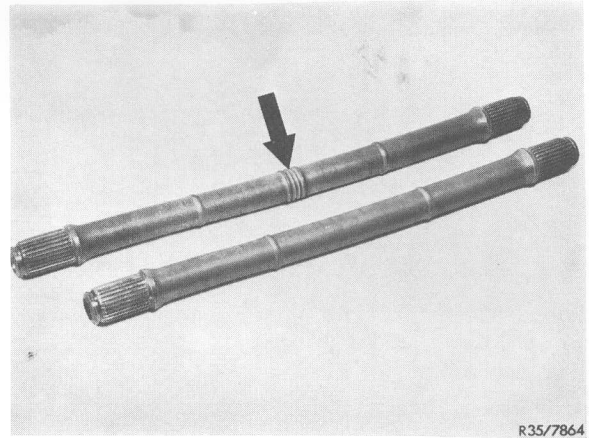


Fig. 12

The rear axle corresponds in principle to models 107, 114 and 115, but with a wider track. The rear axle carrier and the rear axle shaft are matched to the wider track.

Vehicles with 6-cylinder engine are provided with small rear axle center piece, vehicles with 8-cylinder engine with a large rear axle center piece. On rear axles with large center piece a differential with limited slip can be provided as option.

The joints of the rear axle shafts are filled with special oil. The only external identification characteristics in relation to the present series are two wide and two narrow beads at rear axle shaft (Fig. 13).



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Fig. 13

Transmission Ratio

Sales Designation	Model	Ratio	Remark
280 S	116.020	1:3.69	Standard version (small center piece)
280 SE	116.024	1:3.92	Vehicles with manual 5-speed transmission
350 SE	116.028	1:3.46	Standard version (large center piece)

H. Brakes

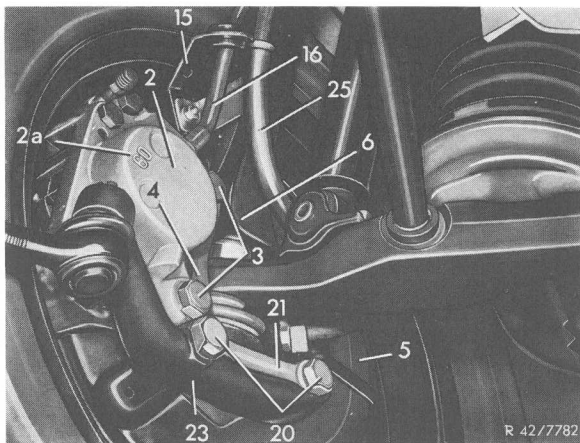


Fig. 14

- | | |
|--------------------------|-------------------------|
| 2 Caliper | 16 Brake hose |
| 3 Hex. head fitted screw | 20 Hex. head screw |
| 4 Lock washer | 21 Lock washer |
| 5 Cover plate | 23 Steering knuckle arm |
| 6 Steering knuckle | |
| 15 Brake hose holder | |

Similar to model 107 the front wheel brake is provided with vented brake discs 22 mm wide. The brake discs are asymmetric, that is, they are 8 mm thick at the outside and 6 mm at the inside. The brake calipers have

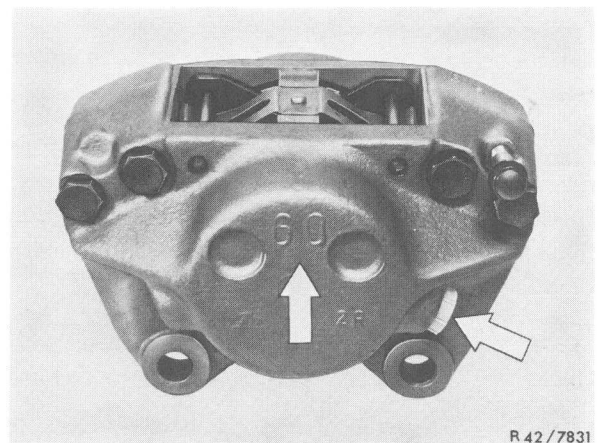


Fig. 15

a piston diameter of 60 mm, the brake linings are 90 mm wide.

These brake calipers carry the code number "60", they are provided with a brake hose connection installed at an upward angle and are located behind the wheel center (Fig. 14 and 15).

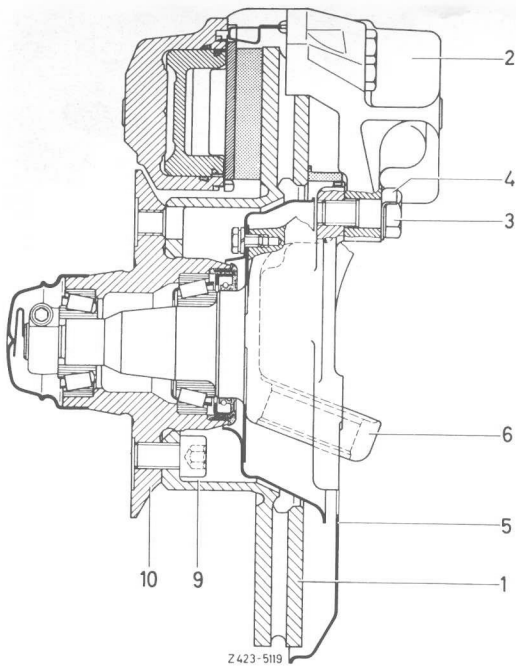


Fig. 16

- | | |
|--------------------------|---------------------|
| 1 Brake disc | 5 Cover plate |
| 2 Brake caliper | 6 Steering knuckle |
| 3 Hex. head fitted screw | 9 Hex. socket screw |
| 4 Lock washer | 10 Front wheel hub |

This arrangement of the brake calipers places the elevation on the brake caliper piston (marked in

illustration) at another position to eliminate the tendency to squeal (Fig. 17).

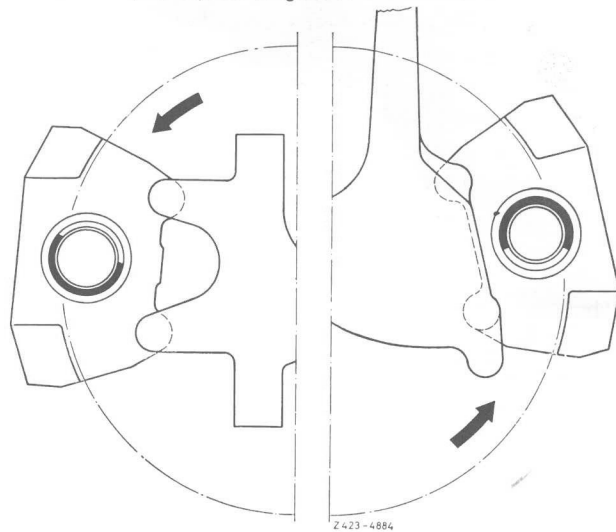


Fig. 17

Version on model
107, 114, 115

Version on model
116

The rear wheel brake is the same as that of the present models 107, 114 and 115. The piston dia. of the brake calipers is 38 mm.

The pedal parking brake corresponds to the version of models 114 and 115.

I. Steering

All the vehicles of series 116 are provided with power steering LS 90 as standard equipment.

To keep the steering forces low, above all when parking, all the vehicles with a V-8 engine are provided with a modified high-pressure oil pump to compensate for the high front axle load. The pressure relief valve of the modified pump will start opening at 90 atü.

The high-pressure oil pump is identified by means of the number 90 punched in above the type rating plate (refer to arrow in Fig. 18).

To reduce the oil temperature on model 116 with V-8 engine, the return oil coming from the power steering is additionally guided through the oil cooling pipe (1) attached to the frame side member (Fig. 19).

The steering lock is no longer restricted by the steering knuckle or control arm as before, but by a newly designed stop of the pitman arm or intermediate steering lever at the frame cross member of the front axle (Fig. 20).

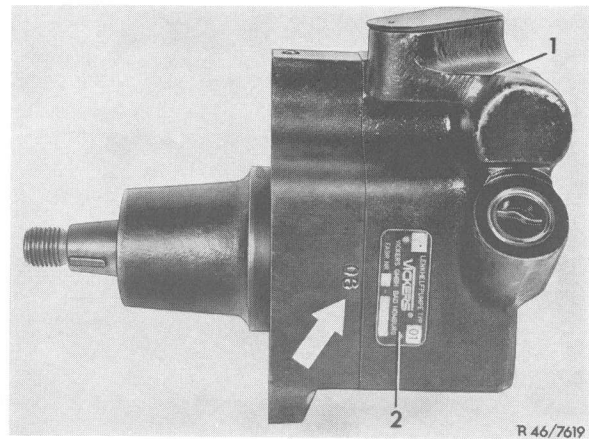


Fig. 18

- | |
|--------------------------|
| 1 High-pressure oil pump |
| 2 Type rating plate |

To prevent any damage to rubber sleeves of ball joints at track rod and drag link when removing the pitman arm or the intermediate steering arm, joints may be pushed off only with special tools 116 589 153 300 or 116 589 163 300.

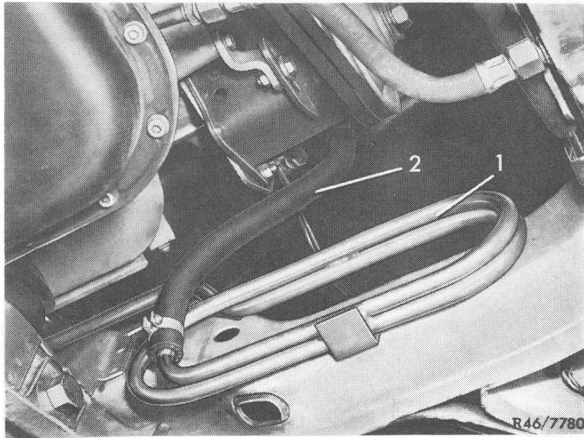


Fig. 19
 1 Oil cooling pipe
 2 Connecting hose

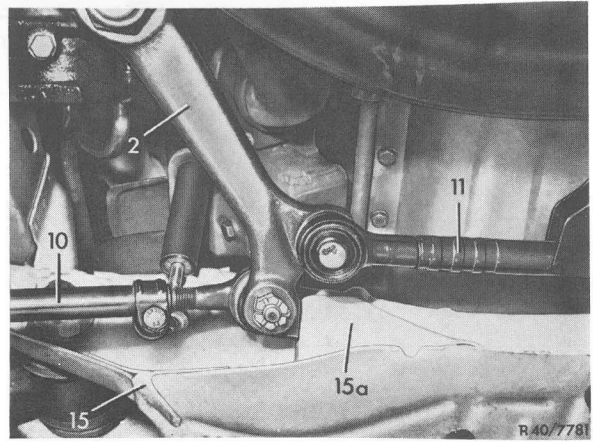


Fig. 20
 2 Pitman arm
 10 Track rod
 11 Drag link
 15 Frame cross member of front axle
 15a Stop on frame cross member

The four-spoke safety steering wheel is polyurethane foamed similar to model 107. The entire padded plate is designed to serve as a horn button.

K. Electrical System and Instruments

Starter Motor and Alternator

Similar to the versions of the individual engine types already known.

Lights

The horizontally arranged front light units provide the following functions: High beam and low beam (dimmer), fog lamp, side marker or parking light and flasher.

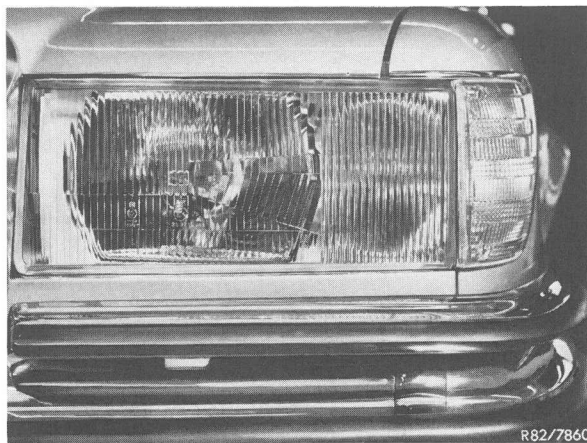


Fig. 21

The bulbs can now be replaced without removing light unit.

The bulb sockets are accessible after removing a cover from engine compartment end.

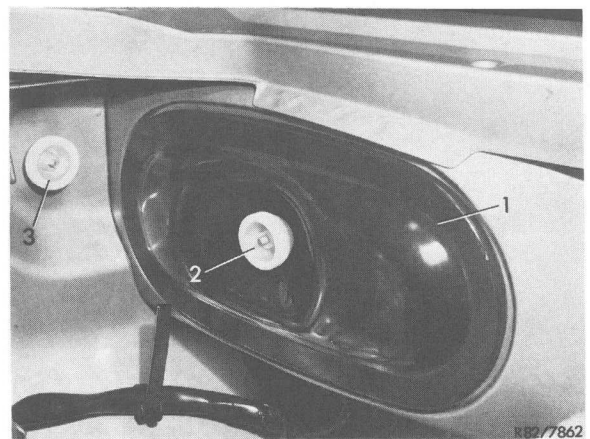


Fig. 22
 1 Cover
 2, 3 Knurled nuts

The following Table provides a survey of the light unit version for the individual vehicle models.

Model	High beam and low beam	Fog lamp	Flasher	Side marker or parking light
116.020 LHD 116.024 LHD	Two-filament headlamp bulb 45/40 W	Bulb 35 W	Bulb 21 W	Bulb 4 W
116.020 RHD 116.024 RHD 116.028	Halogen bulb Type H4 60/55 W	Halogen bulb Type H 3 55 W	Bulb 21 W	Bulb 4 W

Models 116.020 and 116.024 for lefthand steering can be provided with halogen light units as special equipment.

The rear lamps carry the flasher, the brake light, the tail or parking light and the backup light in one unit.

The lefthand light unit is additionally provided with a standard fog tail light.

The profiling of the rear lights makes them less prone to dirt than before.

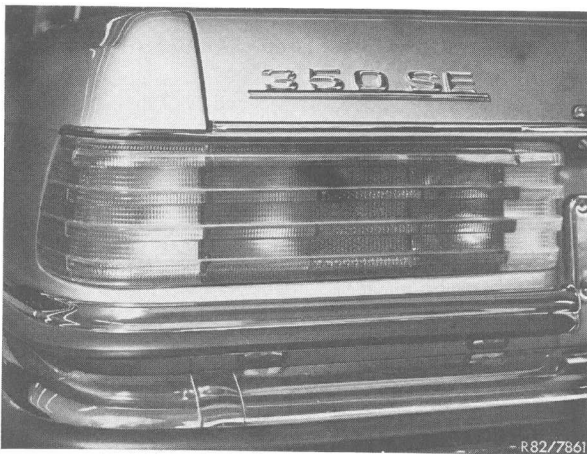


Fig. 23

Combination Instrument

The combination instrument is substantially the same as that on model 107 and contains 3 round instruments.

The lefthand instrument contains the indicators for fuel tank contents, cooling water temperature and engine oil pressure. The cooling water temperature is measured electrically.

The instrument in the center contains the speedometer with mileage/km and daily mileage/km counter. The

daily mileage/km counter can be set to zero by pushing a button.

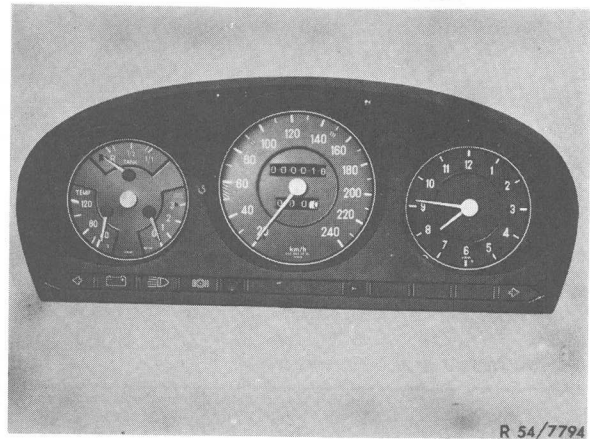


Fig. 24

Instead of the time clock at the right an electrical revolution counter combined with a smaller time clock is optionally available.

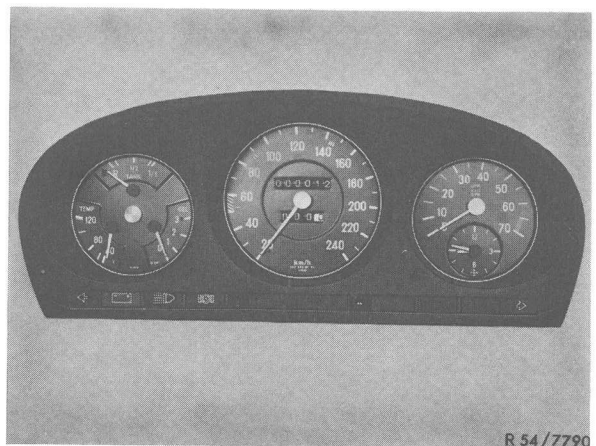


Fig. 25

Underneath the instruments are the warning lights and the potentiometer for adjusting the brightness of the instrument lights.

Rotary Light Switch

The rotary light switch is installed in the instrument panel at the left of the jacket tube.

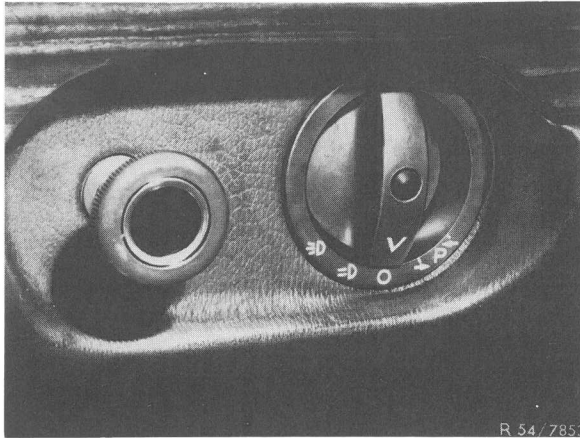


Fig. 26

The fog tail light is switched on with the second pulling stage. The pertinent warning light is installed in the switch handle.

Combination Switch

The combination switch is provided with an additional tipping contact for flashing. For short flashing signals when passing or changing lanes the switch need merely be tipped. Upon release, the switch will return immediately to its center position. Locking the flasher position requires depression beyond a pressure point.

Windshield Wipers

The wiper blades are running in parallel and are parked at the right. This arrangement provides favorable flow conditions in relation to windshield pane and prevents any lifting off of wiper blades at high driving speeds.

The wiper motor can be switched to **interval wiping** by setting lever of combination switch to position III.

The **interval relay** is installed separately from wiper motor under the instrument panel at the left of the jacket tube. It is connected to the general circuit by means of a plug connection.

The relay has two functions:

1. Interval wiping (in stage III of wiper switch).
2. Finish-wiping when actuating the electrical windshield washer.

Windshield Washer

The windshield washer and its electrical pump are actuated with the left foot by means of a foot switch. The pump will deliver water and the wiper motor will run as long as the switch is kept depressed. Upon release of the foot switch the wiper motor will complete up to four additional wiping movements under the control of the interval relay.

Fuses and Relays

Fuses and relays are installed in a special splash water proof plastic box in the engine compartment at the left of the splash wall.

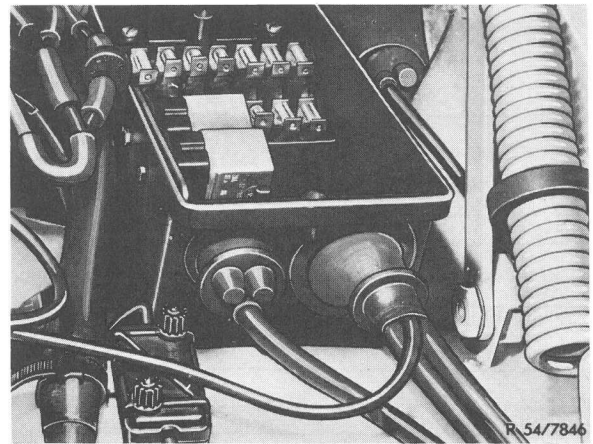


Fig. 27

They are accessible after removing the box cover. Information concerning the use of the individual fuses is provided by the following table "Arrangement of Fuses".

Arrangement of Fuses Type 116.020

Fuse No.	Fuse Insert Amps.	Circuit No.	Consumer	Remarks
1	8	30	Time clock, trunk and glovebox light, ceiling and reading light, warning flasher system, automatic antenna *	Continuously energized
2	16	15/54	Windshield wiper, windshield washer, horns, fanfares *, solenoid clutch refrigerant compressor *	Energized at ignition lock position II
3	16	15/54	Heater blower, cigar lighter	
4	8	15/54	Flasher system, brake light, backup light, combination instrument, idling speed shutoff valve, automatic starting device, automatic transmission *	
5	8	58	Side marker light, tail light, parking light right, license plate and instrument panel lights, gear shift lights *	Controlled by means of rotary light switch
6	—	15/54	Unused	—
7	8	58	Side marker light, tail light, parking light left	Controlled by means of rotary light switch
8	16	15/54	Electrically operated sliding top *, supplementary fan *	Energized at ignition lock position II
9	8	58	Fog light, fog tail light	Controlled by means of rotary light switch
10	16	15/54	Heatable rear window *	
11	8	56 a	High beam left	Controlled by means of rotary light switch
12	8	56 a	High beam right, high beam warning light	
13	8	56 b	Low beam (dimmer) left	
14	8	56 b	Low beam (dimmer) right	
15	16	30/15	2 window openers *, front right and rear left	
16	16	30/15	2 window openers *, front left and rear right	

* Special equipment

The ignition is not fused. The radio (special equipment) is fused by a single supplementary fuse (2 A-glass fuse) in fuse and relay box.

Arrangement of Fuses Type 116.024/028

Fuse No.	Fuse Insert Amps.	Circuit No.	Consumer	Remarks
1	8	30	Time clock, trunk and glovebox light, ceiling and reading light, warning flasher system, automatic antenna	Continuously energized
2	16	15/54	Windshield wiper, windshield washer, horns, fanfares *, solenoid clutch refrigerant compressor *	Energized at ignition lock position II
3	16	15/54	Heater blower, cigar lighter	
4	8	15/54	Flasher system, brake light, backup light, combination instrument, automatic transmission *	
5	8	58	Side marker light, tail light, parking light right, license plate and instrument panel lights, gear shift lights *	Controlled by means of rotary light switch
6	8	15/54	Electronics, main relay terminal 86, fuel pump relay terminal 30	Energized at ignition lock position II
7	8	58	Side marker light, tail light, parking light left	Controlled by means of rotary light switch
8	16	15/54	Electrically operated sliding top *, supplementary fan *	Energized at ignition lock position II
9	8	58	Fog light, fog tail light	Controlled by means of rotary light switch
10	16	15/54	Heatable rear window *	
11	8	56 a	High beam left	Controlled by means of rotary light switch
12	8	56 a	High beam right, high beam warning light	
13	8	56 b	Low beam (dimmer) left	
14	8	56 b	Low beam (dimmer) right	
15	16	30/15	2 window openers *, front right and rear left	
16	16	30/15	2 window openers *, front left and rear right	

* Special equipment

The ignition is not fused, the radio (special equipment) is fused by a single supplementary fuse (2 A-glass fuse) in fuse and relay box.

General Description of Body and Interior Equipment

With regard to their external dimensions the vehicles of series 116 are approx. 60 mm longer, approx. 50 mm wider and approx. 50 mm lower than the vehicles of series 108 and 109.

The completely newly developed body has been designed in accordance with the proven knowledge gained about internal safety. Particularly striking are the voluminous front wall, center and rear pillars. Together with the extremely sturdy roof frame, a passenger compartment of extremely high strength has been obtained.

The windshield and the rear window are not glued in as on model 107, but are conventionally installed with fitted rubber frames.

The windshield is provided on both sides with ornamental trim which serves to guide the dirty water away from the windshield to restrain any contamination of the side windows. Pivot windows provide no longer any advantages due to the excellent ventilation of the vehicle as such and are no longer installed.

The external rear view mirror on side window next to the driver is provided with the standard internal adjustment similar to model 107. The already proven door handles are also the same as for model 107. The closing system with master and secondary key is known from previous models.

All the vehicles of series 116 are provided with central interlocking as standard equipment.

Contrary to the standard version, the thickly foamed door lining of the special version is not attached by means of clips but is inserted into the inside door panel from the top down by means of four bows. The door lining should never be removed in the conventional manner since the fastening hooks would break off and make the door lining unfit for use (refer to Fig. 28 and 29).

Door linings of the standard version are removed and installed as usual.

The head lining is no longer glued on, but attached to roof frame by means of plastic clips.

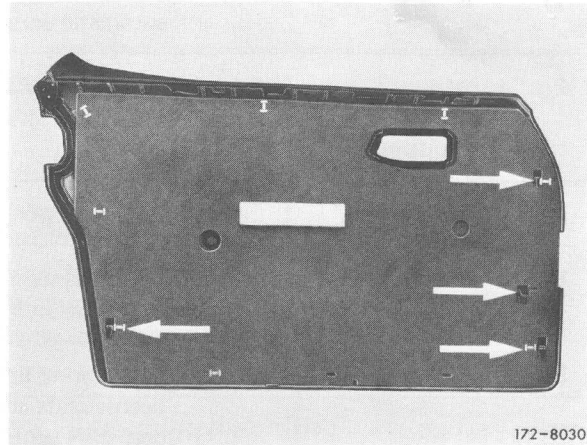


Fig. 28

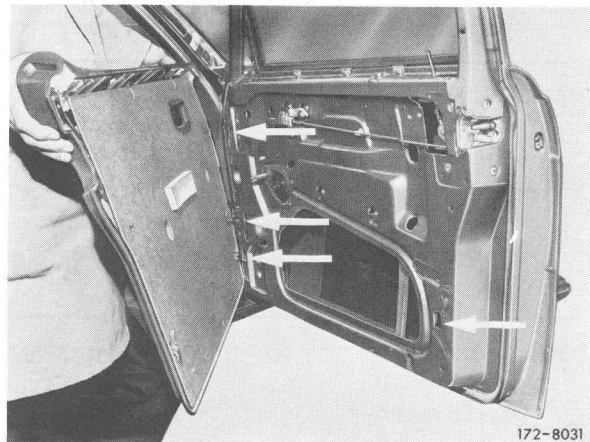


Fig. 29

To increase internal safety, the roof frame is covered with a foamed lining which is simultaneously framing the headlining.

Seats

The dimensions of the seats have been changed, the styling has been modified. The driver's seat is provided with height adjustment as standard equipment (optional also for front passenger seat).

The reclining seat fittings are no longer screwed on but riveted to backrest frame. This system has the advantage that the fittings are no longer exposed and that the hand wheel for backrest adjustment can also be comfortably operated when the seat is backed up, due to the slimmer design.

For repairs, the rivets must be drilled out and replaced by screws M 8.

The rear seat of series 116 vehicles is also secured by two locks.

Safety Belts

Anchor points for inertia-reel safety belts (three-point belts for front and rear seats) are installed as standard equipment. The three-point inertia-reel safety belts optionally installed ex factory are known from model 107.

Headrests are optionally available.

Instrument Panel

The entire instrument panel — sheet steel with PVC foam and PVC sheet lining — has a smooth surface and its yield matches the load resistance of the human

body — as on model 107, the panel can be removed as a complete unit.

A center console with a tray between the seats similar to model 107 contains an ashtray with cigar lighter and the controls for heating and venting; in addition there is room for installing a radio (optional).

A cross member under the instrument panel is within range of the jacket tube but ends at center console.

For removal and installation of the heater or air-conditioning box the instrument panel can remain in place.

Heating and Venting

Heating and venting is widely independent of dynamic pressure. The system is in principle the same as on model 107.

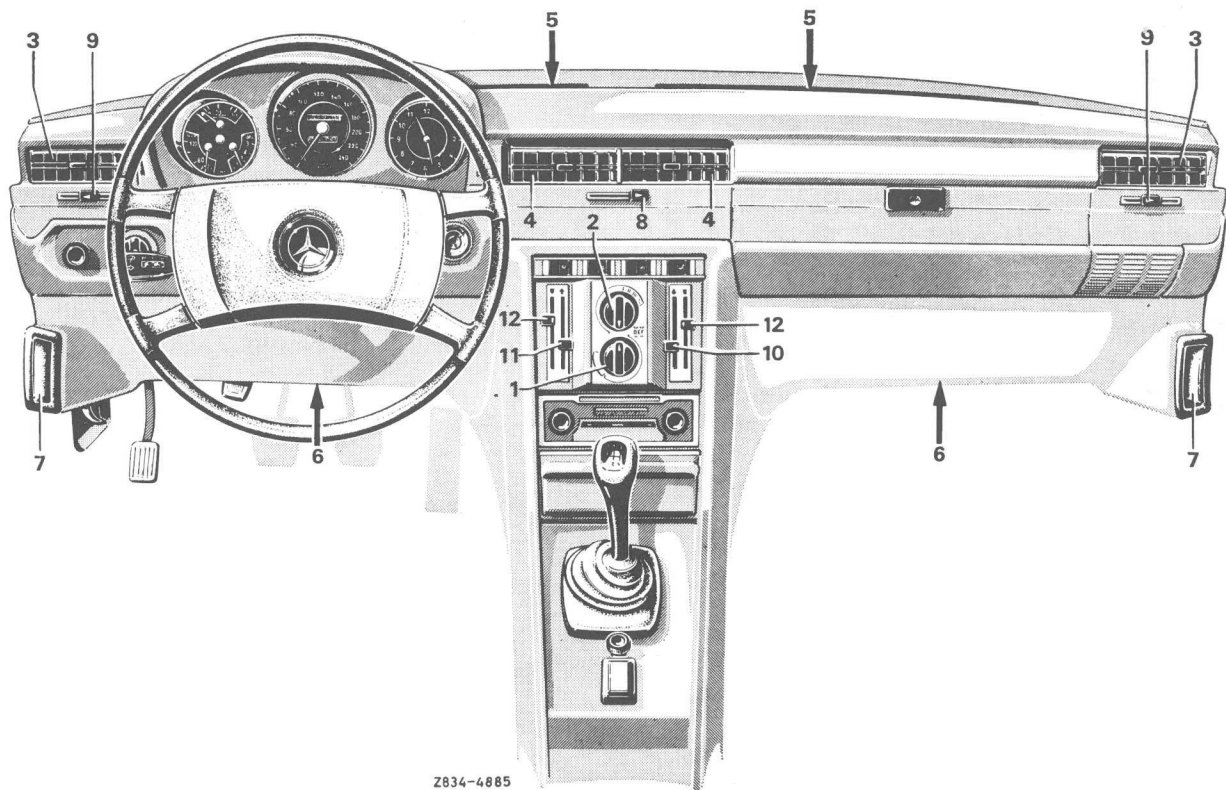


Fig. 30

- 1 Temperature vacuum switch for air-conditioning system
- 2 Switch for air volume control and blower
- 3 Movable inserts for lateral venting
- 4 Movable inserts for fresh air
- 5 Air outlet from defroster nozzle on windshield
- 6 Air outlet in legroom

- 7 Air outlet in doors
- 8 Control lever for fresh air
- 9 Control lever for lateral venting (on 350 SE only)
- 10 Control lever for ventilation of legroom and rear passenger compartment
- 11 Control lever for air outlet at windshield
- 12 Control lever for heating system

The doors are connected to the heating and venting system. The heat is controlled by air-mixing flaps which are independently adjustable by the driver and the front passenger.

An air-conditioning system can be optionally installed and is substantially similar to the air-conditioning system of model 107.

Model 116 is also provided with rear vent.

Windshield Wiper

The wiper motor and the wiper linkage are one unit and can be easily removed from outside after taking off the air intake grille. Only the plug for the electrical connections under from instrument panel must be disconnected first.

The wiper linkage is no longer adjustable and therefore requires no adjustment with special gauge.

Fuel Tank

The fuel tank has a capacity of 96 liters (13 liters in reserve) and is mounted above the rear axle well-protected for safety reasons; the passenger compartment and the trunk are protected by bulkheads.

In contrast to the former version, the immersion tube indicator is mounted to the fuel tank by means of an O-ring and a hex. head closing plug.

Note: For model 107, this version will soon be available as standard equipment.

For assembling the immersion tube indicator, the plastic tray with the first aid kit must be taken out of hat rack.

The tank filler neck is underneath a flap at righthand vehicle end.

Spare Wheel

Similar to model 107 the spare wheel is placed horizontally in trunk and covered by a flap.

Corrosion Protection

The vehicles of series 116 are provided with cavity preservation as standard equipment, which should be refreshed within the first year to provide maximum protection against corrosion damage in cavities of the vehicle.

Trailer Device

A trailer device up to max. 1,900 kg can be ordered ex Sindelfingen plant as an option. The permissible trailer load is 1,200 kg.

An increase of the permissible trailer load is possible only under certain conditions and subject to our written permission. Address inquiries to department ZKD-T3.

A trailing device for 1,900 kg with removable ball neck can be installed subsequently only.

Assembly, Inspection and Adjusting Jobs

Engine

Removal and Installation of Engine

When removing engine, observe the following:
Remove battery frame. Unscrew bolts attaching engine carrier to engine mounts from below (refer to arrow in Fig. 31).

Do not loosen the bolts inserted from above.

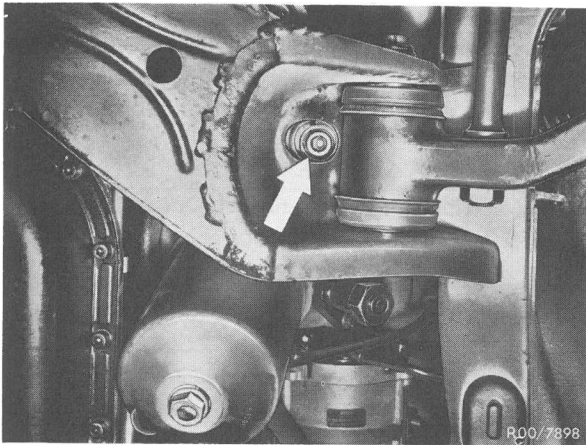


Fig. 31

Adjusting Idling Speed

When adjusting the idling speed, engines with electronically controlled gasoline injection are subject to the following considerations:

For adjusting the idling speed on vehicles with air-conditioning system, the air-conditioning system must be disconnected to permit stabilization of idling speed.

The control unit is mounted in the legroom at the front right.

Remove ornamental trim for adjusting idling speed CO content (Fig. 32).

Set exhaust gas value with idling speed adjusting screw on control unit (refer to arrow in Fig. 33).

Turning counterclockwise (down) = leaner
Turning clockwise (up) = richer

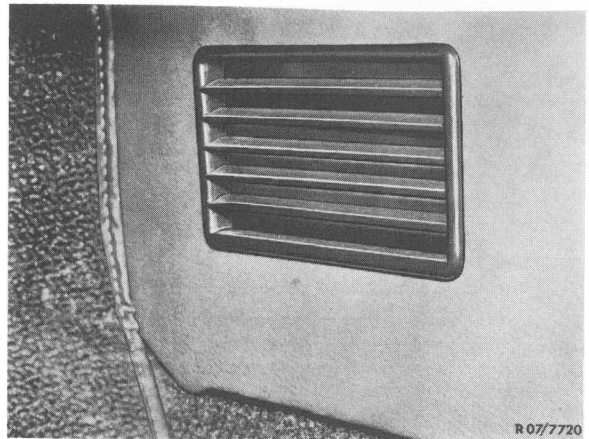


Fig. 32 Ornamental trim

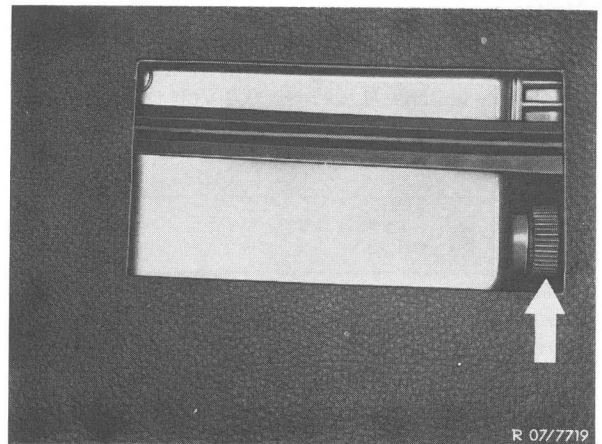


Fig. 33 Idling speed adjusting screw

Testing the Transistorized Ignition System (Standard Control Unit)

Control Unit Test

The test is made with the engine stopped and the ignition switched on.

For connection of tester refer to Fig. 34.

Voltage data with contact breaker point closed:

on ignition coil

terminal 15	3.6 – 4.6 Volt
terminal 1	0.7 – 1.5 Volt

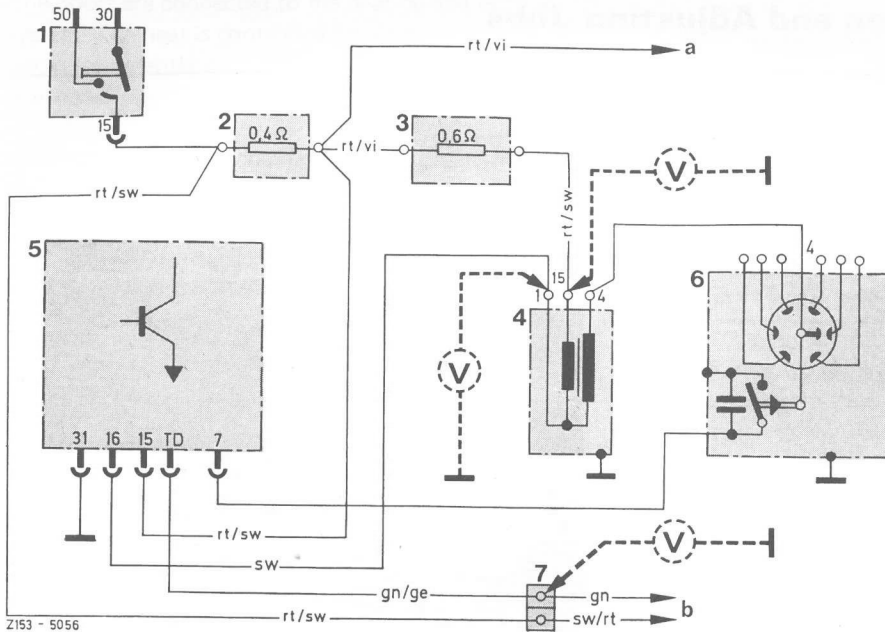


Fig. 34 Wiring diagram for SI transistorized ignition with standard switchgear

- 1 Ignition starting switch
- 2 Series resistance 0.4 Ohm
- 3 Series resistance 0.6 Ohm
- 4 Ignition coil
- 5 SI standard switchgear
- 6 Ignition distributor
- 7 Cable connector with test terminal TD
- a to terminal 16 starter
- b to central plug connection
- V Voltmeter

- Line Colors**
- rt = red
 - sw = black
 - gn = green
 - ge = yellow
 - vi = violet

on cable connector
 terminal TD max. 0.3 Volt
 (max. voltage loss on contact breaker point).

Voltage data with contact breaker point open:

All the terminals of the ignition system are connected to battery voltage. (Less max. 0.4 Volt voltage loss between battery and ignition system.)

Ignition Coil Test

Disconnect all connections on ignition coil. The primary resistance between terminal 1 and 15 is

0.38 – 0.43 Ohm at 20°C.

Connections 1 and 15 should have no ground connection.

Measure with conventional resistance measuring bridge. The ohm ranges in a normal multiple-measuring instrument are generally too inaccurate for this type of measurement.

At an ignition coil temperature of approx. 80°C the resistance value measured will be approx. 25 % higher.

Series Resistance Test

Disconnect connecting lines.

Test connection terminals for ground connection. Measure resistance with a measuring bridge.

1. Nominal value 0.4 ± 0.05 Ohm at 20°C (resistance 0.4 Ohm).
2. Nominal value 0.6 ± 0.05 Ohm at 20°C (resistance 0.6 Ohm).

Tester Connections

SUN Testers without Changeover for TSZ

	Red clip to	Black clip to
Speed timing angle tester TDT 5, 6, 12, 216	Ignition coil terminal 1	Ground
Exhaust gas speed timing angle tester CVT 260	Ignition coil terminal 1	Tester to battery as usual
Engine tester QDT 83, EET 745, 820, EDET 1020	Ignition coil terminal 1	Ground
	High-voltage triggering on cylinder 1 (speed impulse pickup at secondary end)	

SUN Testers with Changeover for TSZ

Speed timing angle tester TDT 12 DB	Ignition coil terminal 15	Ignition coil terminal 1
Engine tester QDT 83, SMT 89, EET 745, 820, 1130, EDET 1020	High-voltage triggering on cylinder 1 (speed impulse pickup at secondary end)	

Bosch Testers

Mini-Tester EFAW 226	Ignition coil terminal 15	Ignition coil terminal 1
Speed timing angle tester EFAW 166 C	Black clip to ground	Green clip to ignition coil terminal 1

Testing of Alternator with Transistor Regulator

Vehicles with M 110 engines are equipped with an alternator and attached transistor regulator. This regulator is tested in vehicle as described below:

Connect voltmeter to terminal B+ (6 mm screw of triple cable connector) and to ground.

Start engine and keep speed constant to at least 2,500/min.

Switch on consumer with a capacity of approx. 100 W (high beam or low beam).

Read voltage on voltmeter.

Nominal value: 13.7 – 14.5 V

If the indicated voltage deviates from nominal value, replace regulator and repeat test.

No corrections can be made on transistor regulator.

Chassis

Suspension, Front Axle and Chassis Measurements

Due to their considerable extent descriptions for assembly jobs and wheel adjustments are not included in this introductory publication.

The respective supplement will be published soon in the workshop manual "Axles".

Immersion Tube Pickup

Tightening Torque

Hex. head closing screw

Nm

20–30

(kpm)

(2–3)

Commercial Tools

Socket wrench insert SW 46, 73 mm long

for example Hazet 1000

Adapter 3/4" to 1/2"

for example Hazet 1058 R-2

Removal and Installation

- 1 Remove first aid kit from plastic shell.
- 2 Loosen fastening screws for plastic shell and remove plastic shell.
- 3 Remove cable plug connection on immersion tube pickup.
- 4 Loosen hex. head closing screw (27) of immersion tube pickup (26) and remove pickup (Fig. 35).

5 For installation proceed vice versa, using a new O-ring (25) (Fig. 35).

6 Tighten hexagon closing screw.

Removal and Installation of Seats

For removing the seat bench, push the two detents (provided with red PVC coating) toward the rear against stop. Only then raise seat bench in upward direction (Fig. 36).

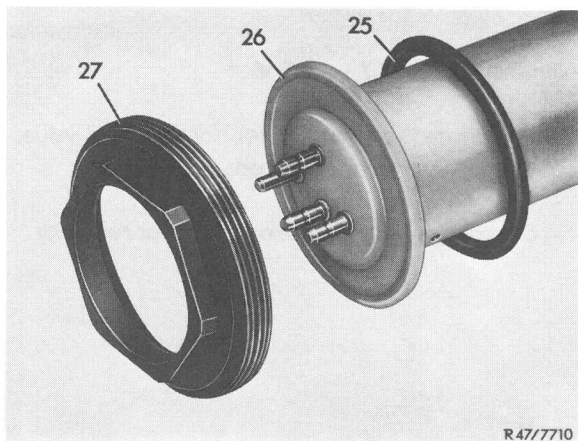


Fig. 35

25 O-ring

26 Immersion tube pickup

27 Hex. head closing screw

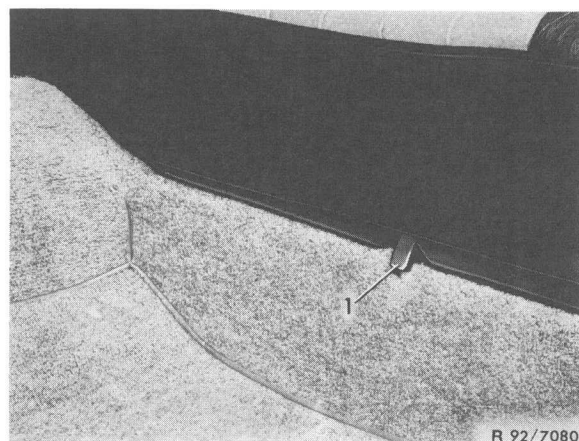


Fig. 36

1 Detent

Testing and Adjusting Data

Engine

Engine M 110, M 116.983

Spark Plugs

		Designation	MB Part No.
Version	Bosch	W 200 T 30	001 159 85 03
	Beru	D 200/14/3 A	001 159 86 03
	Champion	N 8 Y	001 159 94 03
Electrode gap	mm	0.6	

Engine M 110.922

Carburetor Complement and Adjusting Data

Carburetor designation	Solex double two-stage carburetor 4 A 1	
Carburetor stage	1st Stage	2nd Stage
Nozzle needle	—	A 2
Main nozzle "G"	x 95	—
Idling speed air nozzle	110	—
Adjustment of choke gap	mm	1.5
Cold starting speed	1/min	2,400–2,600
Starter cover	Preload	to mark
	Code No.	67

Chassis

Automatic Transmission

Hydraulic Overpressures in bar (atü) ¹⁾

Model		116.020	116.024	116.028
Modulating pressure	Position "D"	3,8 ²⁾		3.1 ²⁾
		6.3 ± 0.2 ³⁾		4.7 ³⁾
Working pressure	Position "L"	6.5 ± 0.4 ²⁾	6.3 ± 0.4 ²⁾	7.4 ± 0.4 ²⁾
	Position "S"	6.3 ± 0.2 ²⁾	6.4 ± 0.2 ²⁾	5.2 ± 0.2 ²⁾
	Position "D"	10.6 ± 0.4 ³⁾	10.7 ± 0.4 ³⁾	11.5 ± 0.4 ³⁾
	Position "R"	18 and above		
Governor pressure	20 km/h	0.6 + 0.1		0.6 + 0.1
	40 km/h	1.4 + 0.1		1.6 + 0.1
	60 km/h	2.2 ± 0.1		1.9 ± 0.1
	90 km/h	3.1 ± 0.2 ⁴⁾		2.6 ± 0.2 ⁴⁾
	120 km/h	4.3 ± 0.2 ⁴⁾		3.4 ± 0.2 ⁴⁾

1) Overpressure values in "bar" conform to former pressure data in kp/cm² or atü.

2) Measured at 65 km/h with vacuum line connected under full throttle.

3) Measured with vehicle stopped with vacuum line disconnected under full throttle (stalling speed).

4) Can be measured only at full throttle.

Correlation Transmission – Shift Sleeve Housing – Centrifugal Governor (Part Numbers)

Model	Transmission	Shift Sleeve Housing	Centrifugal Governor
116.020	116 270 00 01	116 270 10 07	116 270 03 74
116.024	107 270 00 01	116 270 07 07	116 270 03 74
116.028	116 270 01 01	116 270 12 07	109 270 01 74

Shift Points

Model		116.020 116.024		116.028	
		▲ km/h	▼ km/h	▲ km/h	▼ km/h
Accelerator pedal position	Gear shift				
Selector lever position	"D"				
Idle throttle	1 – 2 – 1	–	–	27	17
	2 – 3 – 2	28	20	46	32
	3 – 4 – 3	47	35	–	–
Full throttle	1 – 2 – 1	–	–	73	17
	2 – 3 – 2	63	20	139	67
	3 – 4 – 3	131	57	–	–
Kickdown	1 – 2 – 1	35	22	73	60
	2 – 3 – 2	63	47	139	126
	3 – 4 – 3	131	114	–	–

Shift Points (ctd.)

Model		116.020 116.024		116.028	
		▲ km/h	▼ km/h	▲ km/h	▼ km/h
Accelerator pedal position	Gear shift				
Selector lever position	"S"				
Idle throttle	1 - 2 - 1	-	-	31	20
	2 - 3 - 2	33	26	-	-
Full throttle	1 - 2 - 1	-	-	82	24
	2 - 3 - 2	78	32	-	-
Kickdown	1 - 2 - 1	35	22	82	68
	2 - 3 - 2	78	65	-	-
Selector lever position	"L"				
Idle throttle	1 - 2 - 1	41	8	-	-
Full throttle	1 - 2 - 1	41	22	-	-
Kickdown	1 - 2 - 1	41	35	-	-
Explanation of Symbols	▲ Shifting up ▼ Shifting down	All speed data are approx. values.			

Measuring of Wheels and Chassis

Table for Disc Wheels and Tires

Model	Disc Wheel	Summer Tires Belt/Radial	Winter Tires Belt/Radial
116.020 116.024	6 J x 14 H 2	185 HR 14 tubeless	185 SR 14 ²⁾ tubeless
116.028	6 1/2 J x 14 H 2	205/70 HR 14 tubeless ¹⁾	205/70 SR 14 tubeless

1) Assembly of tires 205/70 VR 14 tube type is possible when tires 205/70 HR 14 tubeless are not available.

2) Winter tires 185 SR 14 tube type may be used when tires 185 SR 14 tubeless are not available.

Approved Tire Makes for Start of Series (Summer Tires)



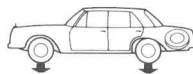


185 HR 14 tubeless	Continental Radial TT 714 Michelin XVS-P Phoenix P 110 TI
205/70 HR 14 tubeless or 205/70 VR 14 tube type	Phoenix P 110 TI Pirelli CN 36

Disc Wheels

Model	Designation	Make	MB Part No.	Remarks
Steel sheet disc wheels (standard version)				
116.020 116.024	6 J x 14 H 2	Kronprinz Lemmerz Südrad	108 400 14 02	without internal venting ring
116.028	6 1/2 J x 14 H 2		108 400 08 02	with internal venting ring
Light metal alloy disc wheels (special version)				
116.020 116.024	6 J x 14 H 2	Fuchs	108 400 09 02	Scope of delivery (with ornamental wheel cap and spherical collar screws) 108 400 15 02
116.028	6 1/2 J x 14 H 2		108 400 10 02	Scope of delivery (with ornamental wheel cap and spherical collar screws) 108 400 16 02

Tire Pressure

Cold Tires Overpressure in bar (atü) ¹⁾

Model	Vehicle load	Summer tires Belt/radial		Winter tires Belt/radial
		Predominating speed medium ²⁾	maximum ³⁾	
				
116.02	up to 	2.1 2.3	2.4 2.6	2.2 2.5
		2.3 2.5	2.6 2.8	

Warm Tires

Overpressure in bar (atü) ¹⁾

Spare Wheel

After driving in city	+ 0.2	At least max. pressure of rear wheel tires
After driving on highway	+ 0.5	

1) Overpressure values in bar correspond to former pressure indication of kp/cm² or atü.

2) For speeds up to 180 km/h.

3) Tire pressures for max. speed are also suitable for medium speeds and in fact of advantage both for driving and tire wear, even though wheel roll will be harder.

Tire Pressure Plate

Model	Tire pressure plate Part No.	Color background/letters
116.02	116 584 02 39	green/silver

Values for Wheel Adjustment with Vehicle Ready for Driving

Model	116.02
-------	--------

Front Axle

Camber of front wheels	-0° 10' ± 10'
Caster	Measured in straight ahead position 1) 10° ± 30'
	Measured with wheels against lock 9° ± 45' <i>SPECIAL GAUGE 9 3/4 ± 30'</i>
Toe-in (rolled)	3 ± 1 mm or 0° 25' ± 10' 2)
Track difference angle at 20° Lock of inside wheel	-0° 50' ± 40' 3)
Max. steering lock	43° to 44° 20' 4)
Reference dimension "a" for max. steering lock = distance between ball pin of track rod on pitman arm or intermediate steering arm and stop bracket (center position control screw of steering inserted)	126.5 to 128.5 mm 4)
Ball point position (measuring point) = difference in height "a" between axis of bearing bolt for lower control arm and bottom edge of pitman arm and intermediate steering lever (pitman arm or intermediate steering arm swivelled into measuring position)	111 + 4.5 mm - 2.5 (108.5 to 115.5 mm)
Perm. difference in height of ball point location between pitman arm and intermediate steering lever	4 mm

- 1) Effective caster value.
- 2) Try for nominal value when making adjustments.
- 3) Deduct toe-in value contained in measurements from track difference angle measured.
- 4) For corrections refer to table "Compensating plates for correcting steering lock".

Rear Axle

Camber of rear wheels	Refer to comparison table "Semi-trailing arm position – Rear wheel camber"
Toe-in of rear wheels	at semi-trailing arm position 0 to + 35 mm
	1 + 2 mm or 0° 10' + 20' - 1 - 10'
	at semi-trailing arm position + 35 to + 50 mm
	1.5 + 2 mm or 0° 15' + 20' - 1 - 10'
	at semi-trailing arm position + 50 to + 60 mm
	2 + 2 mm or 0° 20' + 20' - 1 - 10'

Vehicle Level with Vehicle Ready for Driving

Model	Front axle Axle load ¹⁾ ready for driving approx. kg	Control arm position mm		Rear axle Axle load ¹⁾ ready for driving approx. kg	Semi-trailing arm position mm	
		Normal vehicle level Normal suspension	Higher vehicle level Harder suspension for bad road conditions		Normal vehicle level Normal suspension	Higher vehicle level Harder suspension for bad road conditions

Sedans without Level Control

Model	Front axle Axle load (kg)	Control arm position (mm)	Rear axle Axle load (kg)	Semi-trailing arm position (mm)
116.020	850	44 ± 12	780	+ 38 ± 10
116.024	850		785	
116.028	890		805	

Sedans with Level Control on Rear Axle ²⁾

Model	Front axle Axle load (kg)	Control arm position (mm)	Rear axle Axle load (kg)	Semi-trailing arm position (mm)
116.020	855	44 ± 12	790	+ 38 ± 10
116.024	855		795	
116.028	895		815	

1) The indicated axle loads refer to the respective standard version without any accessories.

Additional loads on front axle: Slide roof approx. 10 kg, automatic transmission approx. 15 kg, radio approx. 5 kg, air-conditioning approx. 30 kg.

Additional loads on rear axle: Slide roof approx. 10 kg, trailing device approx. 20 kg.

2) On vehicles with level control on rear axle refer to table "Checking of level control under load".

Checking of Level Control Under Load

Model	Vehicle Load ¹⁾	Semi-trailer Position ³⁾	
		Normal suspension (normal level)	Harder suspension (higher level)
116.02	approx. 150 kg in trunk or approx. 120 kg trailer load at rear ²⁾	+ 12 ± 10 mm	+ 26 ± 10 mm

1) Vehicle must be in condition ready for driving prior to loading.

2) Attach trailer load to holding bracket for rear bumper.

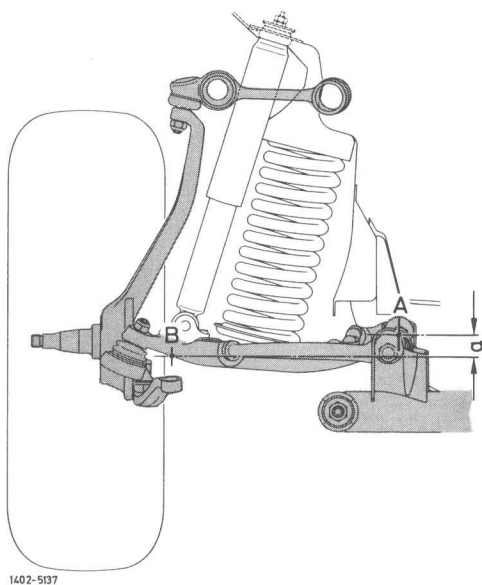
3) The tolerances of the indicated values refer only to the test. Try for nominal values when making adjustments.
Tolerances are caused by the idle travel of the level controllers.

Comparison: Semi-Trailer Position of Rear Axle in Relation to Rear Wheel Camber

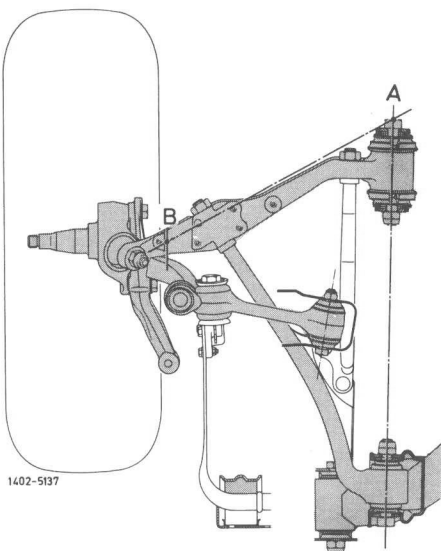
Semi-trailer position mm	corresponds to rear wheel camber
+65	+1° 45' ± 30'
+60	+1° 30' ± 30'
+55	+1° 15' ± 30'
+50	+1° ± 30'
+45	+0° 45' ± 30'
+40	+0° 30' ± 30'
+35	+0° 15' ± 30'
+30	0° ± 30'
+25	-0° 15' ± 30'

Semi-trailer position mm	corresponds to rear wheel camber
+20	-0° 30' ± 30'
+15	-0° 45' ± 30'
+10	-1° ± 30'
+5	-1° 15' ± 30'
0	-1° 30' ± 30'
-5	-1° 45' ± 30'
-10	-2° ± 30'
-15	-2° 15' ± 30'
-20	-2° 30' ± 30'

Vehicle Level



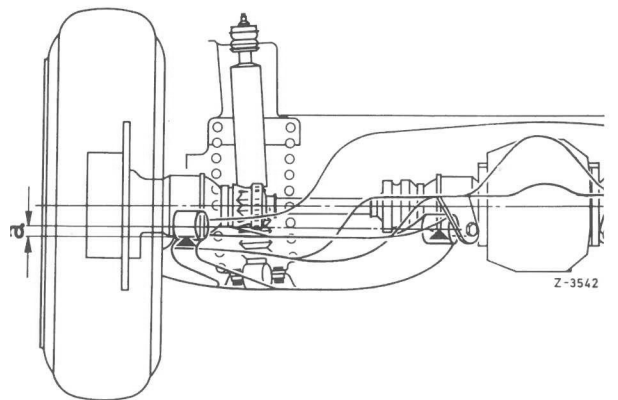
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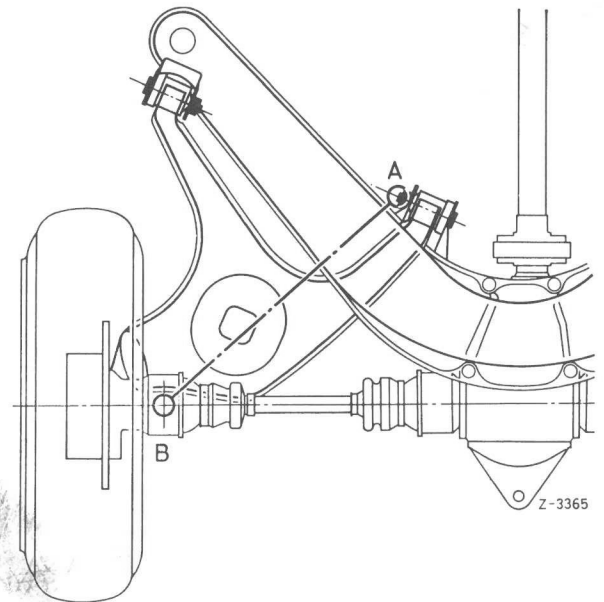
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Fig. 38 Front Axle

a = Control arm position (level difference axle front control arm bearing (A) – measuring point (B) bottom edge of control arm).



Z-3542



Z-3365

Fig. 39 Rear Axle

a = Semi-trailer position (level difference axle rear semi-trailer bearing (A) – bottom edge of cup for outer synchronizing joint (B)).

Maintenance Instructions

The maintenance jobs are already known from the units used up to now.

Series 116 has been assembled on a new work sheet and has also been included into maintenance manual.

Technical Data

A. Model 280 S, 280 SE

Type Designation

Sales designation	280 S	280 SE
Vehicle model	116.020	116.024
Engine type	M 110	
Engine type designation	110.922	110.983

Design Characteristics

Standard	Dual circuit brake system with vacuum booster, disc brakes front and rear, power steering, diagonal swing axle, manual four-speed transmission (floor shift only), windshield pane made of safety compound glass, interval wiper switch
Optional	Automatic transmission, with steering column or floor shift, manual 5-speed transmission (floor shift only), level control, headlamp cleaning system

Engine

Engine type designation	110.922	110.983
Operation	Four-cycle carburetor	Four-cycle gasoline injection electronically controlled
Number of cylinders	6	
Arrangement of cylinders	upright, in line	
Bore/stroke	mm	86/78,8
Total eff. piston displacement	cc	2,746
Compression ratio	ε	9 : 1
Firing order	1-5-3-6-2-4	
Maximum speed	1/min	6,500
Engine output DIN ¹⁾	kW at 1/min (HP at rpm)	118/5,500 (160/5,500)
Torque max. DIN	Nm at 1/min (mkp at rpm)	226/4,000 (23/4,000)
Crankshaft bearing	7 Compound slide bearings with steel-backed shells	
Connecting rod bearings	Compound slide bearings with steel-backed shells	
Valve arrangement	Overhead, V-shaped	
Camshaft location	2 Overhead camshafts	
Oil cooling	Air-cooled oil cooler	
Cooling system	Water circulation through pump, thermostat with bypass line, fan with fluid coupling, gilled-tube radiator	
Lubrication	Forced-feed lubrication by means of gear type oil pump	
Oil filter	Full flow filter with paper element	
Air cleaner	Air filter with paper element	

1) The stated output in kW (HP) is fully available at the flywheel of the vehicle since the power used by the auxiliary units has already been deducted.

Vehicle Model	116.020	116.024
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Dimensions

Length of vehicle	mm	4,960	
Width of vehicle	mm	1,865	
Height of vehicle, in kerb condition	mm	1,425	
Wheel base	mm	2,865	
Track width	front	mm	1,525
	rear	mm	1,505
Wheel lock	inner	degree	43
	outer	degree	34
Minimum turning circle dia.	m	11.44	
Ground clearance, vehicle in design position ¹⁾	mm	148	

1) The design position is attained when the vehicle in kerb condition is loaded with 65 kg each on front seats and 1 x 65 kg on rear seat (in center).

Weights

Weight of vehicle unloaded, in kerb condition acc. to DIN 70020, with full fuel tank, spare wheel and tools	kg	1,610	1,615	
Perm. total weight	kg	2,130	2,135	
Perm. axle load	front/rear	kg	1,020/1,110	1,020/1,115

Electrical System

Battery	Voltage Capacity	12 V 55 Ah
Starting motor	Bosch	GV 12 V 1.4 HP
Alternator	Bosch K1-14 V 55 A 20	max. output 770 W

Capacities

Fuel tank/reserve	Fuel	approx. lits.	96/13
Total oil capacity	Engine oil	max/min lits.	7.5/6.0
Crankcase (without oil filter and air-cooled oil cooler)	Engine oil	max/min lits.	6.0/4.5
Oil filter	Engine oil	approx. lits.	0.75
Air-cooled oil cooler	Engine oil	approx. lits.	0.75
Cooling system with heater	Water	approx. lits.	11
Water pump			maintenance-free
Hydraulic clutch actuation	Brake fluid	approx. lits.	0.1 ²⁾

2) The supply of brake fluid for the brake system and actuation of clutch is in a common compensating tank.

Vehicle Model	116.020	116.024
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Capacities (ctd.)

Automatic transmission			6.9 (initial filling) 5.9 (at oil change)
Manual 4-speed transmission G 76/18 B	Automatic transmission fluid	lits.	1.6
Manual 5-speed transmission G 76/27-5			2.5
Rear axle	Hypoid transmission fluid SAE 90	lits.	1
Power steering	Automatic transmission fluid	lits.	1.4
Front wheel hub	Anti-friction bearing grease each hub	approx. grams	60
Brake system	Brake fluid	approx. lits.	0.5

Speeds, Consumption Figures and Operating Conditions

With a rear axle ratio of			i =		3.69		3.92		3.69		3.92	
Max. speeds in the individual gears	Type of transmission		Manual 4-speed	Autom.	Manual 5-speed	Manual 4-speed	Autom.	Manual 5-speed				
		km/h										
	1st gear	km/h	52	40	50	52	40	50				
	2nd gear	km/h		88	82		88	82				
	3rd gear	km/h		145	135		145	135				
	4th gear	approx. km/h	190	185	190	200	195	195				
	5th gear	approx. km/h	—	—	190	—	—	200				
Climbing ability	1st gear slip limit				45							
	2nd gear	%	33	45	36	35	45	38				
	3rd gear	%	18	29	20	19	32	21				
	4th gear	%	11	17	12	11.5	19	12.5				
	5th gear	%	—	—	9.5	—	—	10				
Acceleration through the gears 0–100 km/h load: 2 persons			sec. $\pm 7\%$ 1)		11.5	—	—	10.5	—			
Engine speed at 100 km/h in 4th gear			1/min		3140	3355	3340	3140	3375	3340		
Fuel consumption on average long-distance trips			lits/100 km 2)		10.5–17.5							
Fuel consumption acc. to DIN 70030 3)			lits/100 km		12.5							
Engine oil consumption			lits/100 km		0.15–0.25							
Cooling water	Operating temperature		75°–95°C									
	Maximum temperature		115°C									
Fuel			Premium grade									
Anti-knock rating	min. RON		98									
	min. MON		88									

1) The " $\pm 7\%$ " range comprises not only variations due to the permissible engine performance tolerance, but also permissible variations which may possibly be caused by the tires.

2) The fuel consumption of cars with automatic transmission is slightly higher.

3) Measured at 3/4 of maximum speed, max. 110 km/h adding 10 % to consumption obtained.

B. Model 350 SE

Type Designation

Sales designation	350 SE
Vehicle model	116.028
Engine type	M 116
Engine type designation	116.983

Design Characteristics

Standard	Dual circuit brake system with vacuum booster, disc brakes front and rear, power steering, diagonal swing axle, manual four-speed transmission (floor shift only), windshield pane made of safety compound glass, interval wiper switch
Optional	Automatic transmission, with steering column or floor shift, level control, headlamp cleaning system, positive traction with limited slip

Engine

Engine type designation	116.983	
Operation	Four-cycle gasoline injection, electronically controlled	
Number of cylinders	8	
Arrangement of cylinders	V-type 90°	
Bore/stroke	mm	92/65.8
Total eff. piston displacement	cc	3,499
Compression ratio	ε	9.5:1
Firing order	1-5-4-8-6-3-7-2	
Maximum speed	1/min	6,300
Engine output DIN ¹⁾	kW at 1/min (HP at rpm)	147/5,800 (200/5,800)
Torque max. DIN	Nm at 1/min (mkp at rpm)	286/4,000 (29.2/4,000)
Crankshaft bearing	5 Compound slide bearings with steel-backed shells	
Connecting rod bearings	Compound slide bearings with steel-backed shells	
Valve arrangement	Overhead	
Camshaft location	1 Overhead camshaft per cylinder bank	
Oil cooling	Air-cooled oil cooler	
Cooling system	Water circulation through pump, thermostat with bypass line, fan with fluid coupling, gilled-tube radiator	
Lubrication	Forced-feed lubrication by means of gear type oil pump	
Oil filter	Full flow filter with paper element	
Air cleaner	Air filter with paper element	

1) The stated output in kW (HP) is fully available at the flywheel of the vehicle since the power used by the auxiliary units has already been deducted.

Vehicle Model	116.028
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Dimensions

Length of vehicle	mm	4,960	
Width of vehicle	mm	1,865	
Height of vehicle, in kerb condition	mm	1,425	
Wheel base	mm	2,865	
Track width	front	mm	1,525
	rear	mm	1,505
Wheel lock	inner	degree	43
	outer	degree	34
Minimum turning circle dia.	m	11.44	
Ground clearance, vehicle in design position 1)	mm	148	

1) The design position is attained when the vehicle in kerb condition is loaded with 65 kg each on front seats and 1 x 65 kg on rear seat (in center).

Weights

Weight of vehicle unloaded, in kerb condition acc. to DIN 70020, with full fuel tank, spare wheel and tools	kg	1,675	
Perm. total weight	kg	2,195	
Perm. axle load	front/rear	kg	1,060/1,135

Electrical System

Battery	Voltage	V	12
	Capacity	Ah	66

Capacities

Fuel tank/reserve	Fuel	approx. lits.	96/13
Total oil capacity	Engine oil	max/min lits.	8.5/6.5
Crankcase (without oil filter and air-cooled oil cooler)	Engine oil	max/min lits.	7.5/5.5
Oil filter	Engine oil	approx. lits.	0.75
Air-cooled oil cooler	Engine oil	approx. lits.	0.4
Cooling system with heater	Water	approx. lits.	13.5
Water pump			maintenance-free
Hydraulic clutch actuation	Brake fluid	approx. lits.	0.1 2)

2) The supply of brake fluid for the brake system and actuation of clutch is in a common compensating tank.

Vehicle Model	116.028
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Capacities (ctd.)

Automatic transmission	Automatic transmission fluid	lits.	7.9 (initial filling) 6.9 (at oil change)
Manual 4speed transmission G 76/27 A			1.8
Rear axle	Hypoid transmission fluid SAE 90	lits.	1.3
Power steering	Automatic transmission fluid	lits.	1.4
Front wheel hub	Anti-friction bearing grease each hub	approx. grams	60
Brake system	Brake fluid	approx. lits.	0.5

Speeds, Consumption Figures and Operating Conditions

With a rear axle ratio of	i =	3.46		
Max. speeds in the individual gears	Type of transmission		Manual 4-speed	Automatic (converter)
	1st gear	km/h	54	90
	2nd gear	km/h	90	150
	3rd gear	km/h	150	200
	4th gear approx.	km/h	205	—
	5th gear approx.	km/h	—	—
Climbing ability	1st gear slip limit	%	45	
	2nd gear	%	38	40
	3rd gear	%	20	23
	4th gear	%	12,5	—
	5th gear	%	—	—
Acceleration through the gears (0–100 km/h)	sec. ± 7 % 1)	9,5	—	
Load: 2 persons				
Engine speed at 100 km/h in direct gear	1/min	2945	3295	
Fuel consumption on average long-distance trips	lits/100 km ²⁾	11.5–18.5		
Fuel consumption acc. to DIN 70030	lits/100 km	13.0	13.5	
Engine oil consumption	lits/100 km	0.15–0.25		
Cooling water	Operating temperature	70°–95°C		
	Maximum temperature	115°C		
Fuel		Premium grade		
Anti-knock rating	min. RON	98		
	min. MON	88		

- 1) The "±7%" range comprises not only variations due to the permissible engine performance tolerance, but also permissible variations which may possibly be caused by the tires.
- 2) The fuel consumption of cars with automatic transmission is slightly higher.
- 3) Measured at 3/4 of maximum speed, max. 110 km/h adding 10 % to consumption obtained.

Tools, Equipment

Special Tools for Service Jobs (immediately available)

Tester for wheel bearing end play	116 589 12 21 00
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Special Tools for Reconditioning Jobs (availability expected in 4th quarter of 1972)

Spring tensioner for front spring	116 589 01 31 00
Special wrench for spring tensioner	116 589 01 09 00
Puller for drag link from pitman arm and intermediate steering lever	116 589 15 33 00
Puller for track rod from pitman arm or intermediate steering lever and steering knuckle arm	116 589 16 33 00
Puller for guide joint	116 589 18 33 00
Puller for supporting joint	116 589 09 33 00
Fixture for pressing outer bearing races and radial sealing ring into front wheel hub	116 589 11 43 00
Puller for outer bearing race of inner tapered roller bearing (front wheel hub)	116 589 14 33 00
Installation bushing for flat wire tensioning ring on sleeve of supporting joint	116 589 03 14 00
Assembly bushing for flat wire tensioning ring on sleeve of guide joint	116 589 02 14 00
Puller for front wheel hub, to the extent still available (136 589 15 33 00)	116 589 17 33 00
Puller for tapered roller bearing inner race from steering knuckle	
Basic unit (top, spindle and clamping bushing)	001 589 36 33 00
Pliers	000 589 00 34 00
Measuring device for control arm position and ball point location on front axle	116 589 13 21 00
Holding plate for removal and installation of torque converter of 270 mm dia.	116 589 05 62 00

In preparation

(date to be published in Service Information):

Measuring instrument for testing front axle bearing on frame floor

Inspection device for steering knuckle

Inspection device for lower control arm and cross yoke

Removal and installation tool for rubber mountings of upper control arm, lower control arm and cross yoke

Commercial Tools

Socket wrench insert SW 46 73 mm long for removal and installation of immersion tube pickup including adapter 3/4" to 1/2"	for example Hazet 1000 for example Hazet 1058-R2
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Equipment

Straightening angle set for Celette table	ENS 184.300
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Electrical Wiring Diagrams

Model 280 S (116.020)

- | | | |
|---|---|--|
| <p>1 Lighting unit left
a = High beam
b = Low beam
c = Side marker light/
parking light
d = Flasher
e = Fog light</p> <p>2 Conductors for radio *</p> <p>3 Conductors for automatic antenna *</p> <p>4 Combination instrument
a = Flasher indicator left
b = Indicator for brake fluid level
and parking brake
c = Fuel reserve warning light
d = Fuel gauge
e = Temperature indicator
f = Instrument light
g = Instrument light rheostat
h = Alternator charging indicator
i = High beam indicator
j = Flasher indicator right
k = Electric clock</p> <p>5 Switch for glovebox light</p> <p>6 Light unit right
a = High beam
b = Low beam
c = Side marker light/
parking light
d = Flasher
e = Fog light</p> <p>7 Carburetor heater</p> <p>8 Glovebox light</p> <p>9 Idling speed shutoff valve</p> <p>10 Transmitter temperature
indicator</p> <p>11 Brake light switch</p> <p>12 Cigar lighter</p> <p>13 Door contact switch right</p> <p>14 Reading lamp front</p> <p>15 Two-tone horn</p> <p>16 Switch for parking brake indicator</p> <p>17 Control switch for brake fluid</p> <p>18 Warning flasher switch</p> <p>19 Direction indicator and warning
flasher relay</p> <p>20 Horn contact</p> <p>21 Door contact switch left</p> <p>22 Fusebox</p> <p>22a Fuse for radio</p> <p>23 Temperature switch 100°C *</p> <p>24 Temperature switch drier *</p> <p>25 Two-way valve speed increase *</p> <p>26 Relay I for window opener *</p> <p>27 Relay II for window opener *</p> | <p>28 Door contact switch II left</p> <p>29 Rotary light switch</p> <p>30 Ignition starter switch</p> <p>31 Interval wiper electronics</p> <p>32 Combination switch
a = Flasher switch
b = Headlight flasher switch
c = Hand dimmer switch
d = Wiper switch
e = Switch for wiper speed
I = Slow wiping
II = Fast wiping
III = Intermittent wiping</p> <p>33 Washer switch</p> <p>34 Electric water pump</p> <p>35 Wiper motor</p> <p>36 Ignition distributor</p> <p>37 Spark plugs</p> <p>38 Ignition coil</p> <p>39 Relay electric fan *</p> <p>40 Solenoid valve automatic
transmission *</p> <p>41 Kickdown switch *</p> <p>42 Starter locking and backup
light switch *</p> <p>43 Changeover relay air-
conditioning system *</p> <p>44 Electric fan *</p> <p>45 Blower switch</p> <p>46 Window opener motor rear
window left *</p> <p>47 Switch rear window left *</p> <p>48 Switch group window opener *
a = Switch rear window left
b = Safety switch
c = Switch front window left
d = Switch front window right
e = Switch rear window right</p> <p>49 Window opener motor front
window left *</p> <p>50 Series resistance 0.4 Ohm</p> <p>51 Series resistances for blower
motor</p> <p>52 Blower motor</p> <p>53 Temperature control air-
conditioning system *</p> <p>54 Solenoid clutch refrigerant
compressor air-conditioning
system *</p> <p>55 Push button switch for heatable
rear window *</p> <p>56 Delaying relay for heatable rear
window *</p> <p>57 Lights for heater control</p> | <p>58 Window opener motor front
window right *</p> <p>59 Socket for diagnosis</p> <p>60 Switch rear window right *</p> <p>61 Window opener motor rear
window right *</p> <p>62 Transmitter TDC</p> <p>63 Trigger impulse transmitter</p> <p>64 Plug connection for tail light
cable assembly</p> <p>65 Alternator with electronic
governor</p> <p>66 Starter</p> <p>67 Battery</p> <p>68 Door contact rear right *</p> <p>69 Ceiling light rear</p> <p>70 Switch ceiling light rear</p> <p>71 Door contact rear left *</p> <p>72 Tail light right
a = Flasher
b = Tail and parking light
c = Backup light
d = Stop light</p> <p>73 Heatable rear window *</p> <p>74 Transmitter fuel gauge</p> <p>75 Trunk light</p> <p>76 License plate light</p> <p>77 Tail light left
a = Flasher
b = Tail and parking light
c = Backup light
d = Stop light
e = Fog tail light</p> |
|---|---|--|

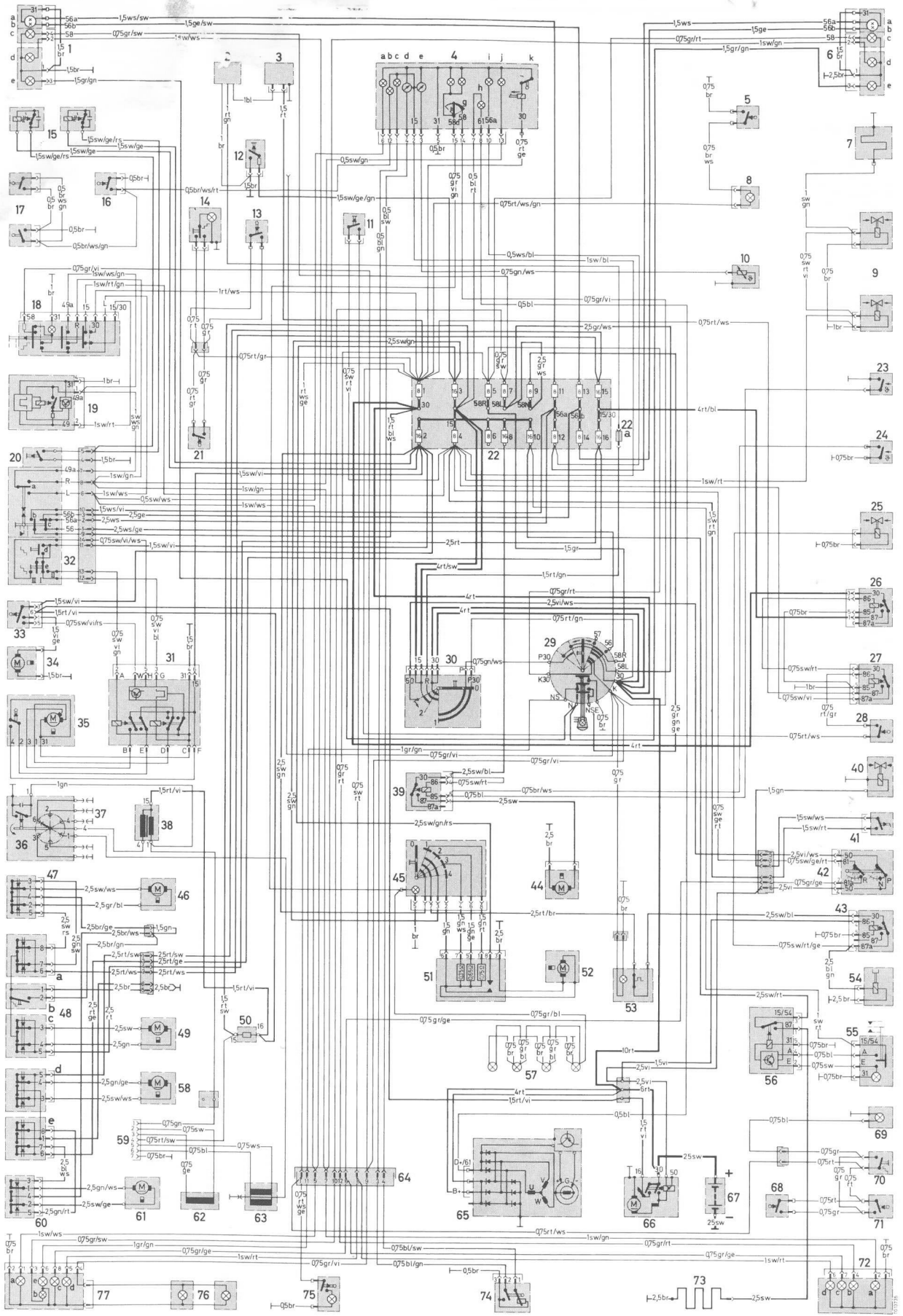
* Special equipment

Color of Conductors

ws = white	bl = blue
br = brown	rt = red
gn = green	sw = black
ge = yellow	el = ivory
gr = grey	nf = natural
rs = rose	vi = violet

Example:

Conductor designation 1.5 gr/rt
Basic color gr = grey
Code color rt = red
Conductor cross
section 1.5 = 1.5 mm²



Model 280 SE (116.024)

- 1 Lighting unit left
 - a = High beam
 - b = Low beam
 - c = Side marker light/parker light
 - d = Flasher
 - e = Fog light
- 2 Conductors radio *
- 3 Conductors automatic antenna *
- 4 Combination instrument
 - a = Flasher indicator left
 - b = Indicator for brake fluid level and parking brake
 - c = Fuel reserve warning light
 - d = Fuel gauge
 - e = Temperature indicator
 - f = Instrument light
 - g = Instrument light rheostat
 - h = Alternator charging indicator
 - i = High beam indicator
 - j = Flasher indicator right
 - k = Electric clock
- 5 Transmitter temperature indicator
- 6 Temperature sensor water
- 7 Temperature sensor air
- 8 Lighting unit right
 - a = High beam
 - b = Low beam
 - c = Side marker light/parking light
 - d = Flasher
 - e = Fog light
- 9 Electronic control unit plug strip
- 10 Fuel injection valves with pertinent cylinder designation
- 11 Pressure sensor
- 12 Throttle valve indicator
- 13 Switch for glovebox light
- 14 Glovebox light
- 15 Brake light switch
- 16 Cigar lighter
- 17 Door contact switch right
- 18 Reading light front
- 19 Switch for parking brake indicator
- 20 Two-tone horn
- 21 Control switch for brake fluid
- 22 Warning flasher switch
- 23 Direction indicator and warning flasher relay
- 24 Horn contact
- 25 Door contact switch left
- 26 Fusebox
- 26a Fuse for radio
- 27 Temperature switch drier *
- 28 Temperature switch 100°C *
- 29 Impulse trigger contact breaker
- 30 Starting valve
- 31 Thermo switch 35°C
- 32 Main relay electronic injection
- 33 Relay for fuel pump
- 34 Relay for starting valve
- 35 Relay II for window opener *
- 36 Door contact switch II left
- 37 Solenoid valve automatic transmission *
- 38 Relay I for window opener *
- 39 Rotary light switch
- 40 Ignition starter switch
- 41 Interval wiping electronics
- 42 Combination switch
 - a = Flasher switch
 - b = Headlight flasher switch
 - c = Manual dimmer switch
 - d = Wiper switch
 - e = Switch for wiping speed
 - I = Slow wiping
 - II = Fast wiping
 - III = Intermittent wiping
- 43 Washer switch
- 44 Electric washer pump
- 45 Wiper motor
- 46 Ignition distributor
- 47 Spark plugs
- 48 Ignition coil
- 49 Series resistance 0.5 Ohm
- 50 Relay electric fan *
- 51 Blower switch
- 52 Series resistances for blower motor
- 53 Blower motor
- 54 Temperature control air-conditioning system *
- 55 Electric fan *
- 56 Kickdown switch *
- 57 Starter locking and backup light switch *
- 58 Changeover relay air-conditioning system *
- 59 Two-way valve speed increase *
- 60 Solenoid clutch refrigerant compressor air-conditioning system *
- 61 Push button switch for heatable rear window *
- 62 Delaying relay for heatable rear window *
- 63 Lights for heater control
- 64 Control unit transistor ignition
- 65 Series resistance 0.4 Ohm
- 66 Window opener motor rear window left *
- 67 Switch rear window left *
- 68 Switch group window opener *
 - a = Switch rear window left
 - b = Safety switch
 - c = Switch front window left
 - d = Switch front window right
 - e = Switch rear window right
- 69 Window opener motor front window left *
- 70 Window opener motor front window right *
- 71 Socket for diagnosis
- 72 Switch rear window right *
- 73 Window opener motor rear window right *
- 74 Transmitter TDC
- 75 Trigger impulse transmitter
- 76 Plug connection for tail lamp cable assembly
- 77 Alternator with electronic governor
- 78 Starter
- 79 Battery
- 80 Door contact rear right *
- 81 Ceiling light rear
- 82 Switch ceiling light rear
- 83 Door contact rear left *
- 84 Tail light right
 - a = Flasher
 - b = Tail and parking light
 - c = Backup light
 - d = Stop light
- 85 Heatable rear window *
- 86 Fuel pump
- 87 Transmitter fuel gauge
- 88 Trunk light
- 89 License plate light
- 90 Tail light left
 - a = Flasher
 - b = Tail and parking light
 - c = Backup light
 - d = Brake light
 - e = Fog tail light

* Special equipment

Color of Conductors

- | | |
|-------------|--------------|
| ws = white | bl = blue |
| br = brown | rt = red |
| gn = green | sw = black |
| ge = yellow | el = ivory |
| gr = grey | nf = natural |
| rs = rose | vi = violet |

Example:

Conductor designation 1.5 gr/rt
Basic color gr = grey
Code color rt = red
Conductor cross section
1.5 = 1.5 mm²

Model 350 SE (116.028)

- 1 Lighting unit left
 - a = High beam
 - b = Low beam
 - c = Side marker light/parking light
 - d = Flasher
 - e = Fog light
- 2 Conductors radio *
- 3 Conductors automatic antenna *
- 4 Combination instrument
 - a = Flasher indicator left
 - b = Indicator for brake fluid level and parking brake
 - c = Fuel reserve warning light
 - d = Fuel gauge
 - e = Temperature indicator
 - f = Instrument light
 - g = Instrument light rheostat
 - h = Alternator charging indicator
 - i = High beam indicator
 - j = Flasher indicator right
 - k = Electric clock
- 5 Transmitter temperature indicator
- 6 Temperature sensor water
- 7 Temperature sensor air
- 8 Lighting unit right
 - a = High beam
 - b = Low beam
 - c = Side marker light/parking light
 - d = Flasher
 - e = Fog light
- 9 Electronic control unit plug strip
- 10 Fuel injection valves with pertinent cylinder designation
- 11 Pressure sensor
- 12 Throttle valve indicator
- 13 Switch for glovebox light
- 14 Glovebox light
- 15 Brake light switch
- 16 Cigar lighter
- 17 Door contact switch right
- 18 Reading light front
- 19 Switch for parking brake indicator
- 20 Two-tone horn
- 21 Control switch for brake fluid
- 22 Warning flasher switch
- 23 Direction indicator and warning flasher relay
- 24 Horn contact
- 25 Door contact switch left
- 26 Fusebox
- 26a Fuse for radio
- 27 Temperature switch drier *
- 28 Temperature switch 100°C *
- 29 Impulse trigger in ignition distributor
- 30 Starting valve
- 31 Thermo switch
- 32 Main relay electronic injection
- 33 Relay for fuel pump
- 34 Relay for starting valve
- 35 Relay II for window opener *
- 36 Door contact switch II left
- 37 Solenoid valve automatic transmission *
- 38 Relay I for window opener *
- 39 Rotary light switch
- 40 Ignition starter switch
- 41 Interval wiping electronics
- 42 Combination switch
 - a = Flasher switch
 - b = Headlight flasher switch
 - c = Manual dimmer switch
 - d = Wiper switch
 - e = Switch for wiping speed
 - I = Slow wiping
 - II = Fast wiping
 - III = Intermittent wiping
- 43 Washer switch
- 44 Electric washer pump
- 45 Wiper motor
- 46 Ignition distributor
- 47 Spark plugs
- 48 Ignition coil
- 49 Series resistance 0.6 Ohm
- 50 Relay electric fan *
- 51 Blower switch
- 52 Series resistances for blower motor
- 53 Blower motor
- 54 Temperature control air-conditioning system *
- 55 Electric fan *
- 56 Kickdown switch *
- 57 Starter locking and backup light switch *
- 58 Changeover relay air-conditioning system *
- 59 Two-way valve speed increase *
- 60 Solenoid clutch refrigerant compressor air-conditioning system *
- 61 Push button switch for heatable rear window *
- 62 Delaying relay for heatable rear window *
- 63 Lights for heater control
- 64 Control unit transistor ignition
- 65 Series resistance 0.4 Ohm
- 66 Window opener motor rear window right *
- 67 Switch rear window right *
- 68 Switch group window opener *
 - a = Switch rear window right
 - b = Safety switch for window interlock
 - c = Switch front window left
 - d = Switch front window right
 - e = Switch rear window left
- 69 Window opener motor front window left *
- 70 Window opener motor front window right *
- 71 Socket for diagnosis
- 72 Switch rear window left *
- 73 Window opener motor rear window left *
- 74 TDC transmitter
- 75 Trigger impulse transmitter
- 76 Plug connection for tail lamp cable assembly
- 77 Alternator
- 78 Voltage regulator
- 79 Starter
- 80 Battery
- 81 Door contact rear right *
- 82 Ceiling light rear
- 83 Switch ceiling light rear
- 84 Door contact rear left *
- 85 Tail light right
 - a = Flasher
 - b = Tail and parking light
 - c = Backup light
 - d = Stop light
- 86 Heatable rear window *
- 87 Fuel pump
- 88 Transmitter fuel gauge
- 89 Trunk light
- 90 License plate light
- 91 Tail light left
 - a = Flasher
 - b = Tail and parking light
 - c = Backup light
 - d = Stoplight
 - e = Fog tail light

* Special equipment

Color of Conductors

- ws = white
- br = brown
- gn = green
- ge = yellow
- gr = grey
- rs = rose
- bl = blue
- rt = red
- sw = black
- el = ivory
- nf = natural
- vi = violet

Example:

Conductor designation 1.5 gr/rt
 Basic color gr = grey
 Code color rt = red
 Conductor cross section
 1.5 = 1.5 mm²

