

Model Identification

In most sections of this manual, the individual models are identified by the chassis type instead of the model designation. The chassis type designations are the first six digits of the chassis number (see page 005/2).

For example, sales designation model 280 E is chassis type 123.033.

In some instances, only the first three digits (123) will be referred to. In this case, this section applies to all vehicles of this particular chassis type.

Location of Specific Repair Instructions

Locate main component group in Group Index. The group number is listed in the upper outside corner of each page within the group.

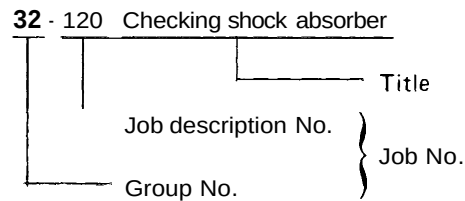
Check group contents, first page of each group, for the exact job description required. The job numbers, succeeded by page numbers within each group are listed in the lower portion of the individual pages.

Unit Version 0 in the various Groups is general information applicable to the pertinent unit.

Unit Version with a *different numeral* is specific information for the title vehicle.

Depending on the unit installed in the vehicle, the numeral for the unit version may vary in the different groups.

Example:



Data, adjusting values, processing dimensions, tightening torques and tools are listed at the beginning of each Section.

All the dimensions are in millimeters (mm), provided no other unit of measure is used.

The indicated part numbers are serving exclusively for identification and better differentiation of individual versions. When ordering spare parts, the part numbers must always be taken from the respective spare parts literature.

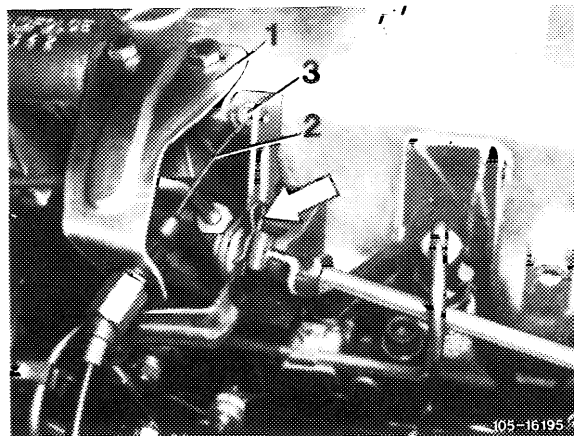
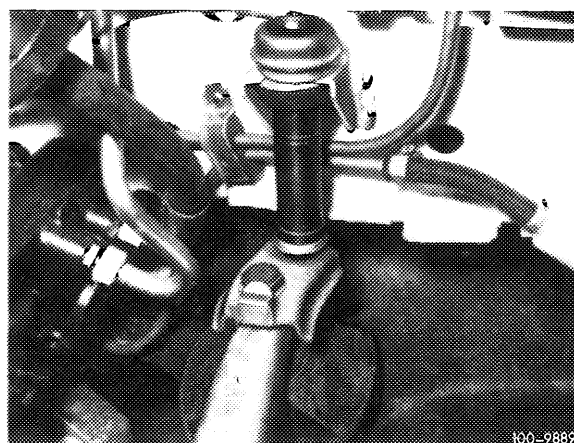
7 Draw oil out of power steering pump reservoir and disconnect hoses.

8 Unhook control linkage.

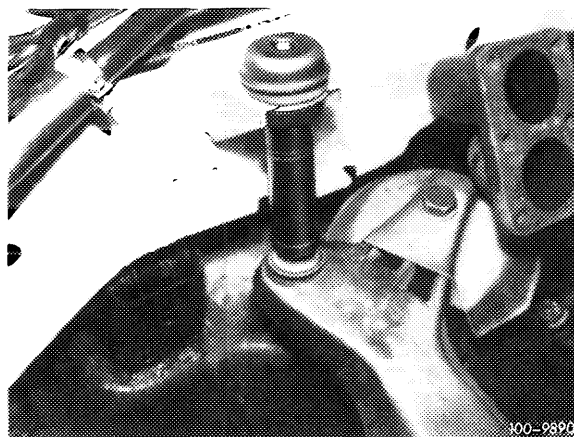
9 Disconnect all coolant, vacuum, oil, fuel and electric lines which lead to engine.

10 On uprated engines, remove longitudinal control shaft. To do so, unhook control rods, withdraw retaining ring (arrow) and force longitudinal control shaft backward.

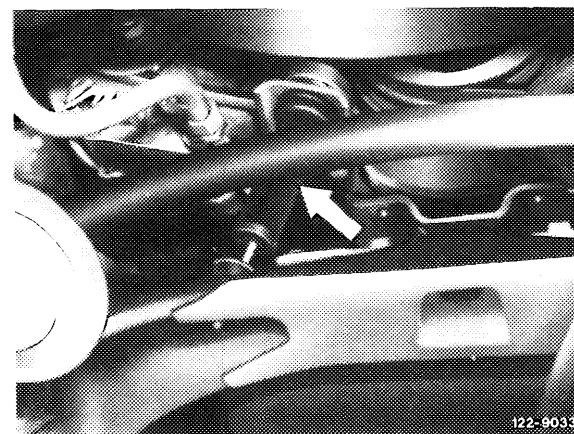
11 On types 115.117, 123.105/130/150 and 123.102/103/120/123/126/183 featuring automatic transmission, unscrew engine shock absorbers. On type 115.114, release engine shock absorbers from body-work and force out toward engine.



Type 115.114
Engine shock absorber left (straight-ahead)



Type 115.114
Engine shock absorber right (straight-ahead)



Type 115.117

Recording charts for engines with oil removal connection (oil dipstick with red handle)

German/English, publication No. 800 99 402 00

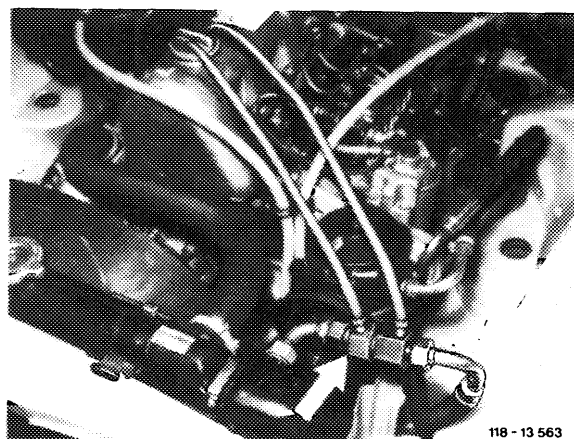
French/Spanish, publication No. 800 99 402 01

The recording charts that go with each particular type of oil dipstick can be identified by the engine designations at the top of the recording chart.

For engine models 616, 617 in type 115.1 and model 617 in type 123.1, it is necessary to fit the check valve between the air-cooled oil cooler and upper oil hose so that the oil will not run back out of the oil cooler during the measurement.

Should the check valve not fit for lack of space, it is to be inserted with the aid of a pipe bend and connecting pipe.

View showing engine 617



Prior to measuring consumption, remember to vent air-cooled oil cooler.

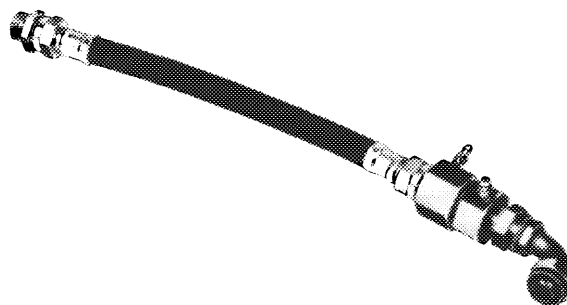
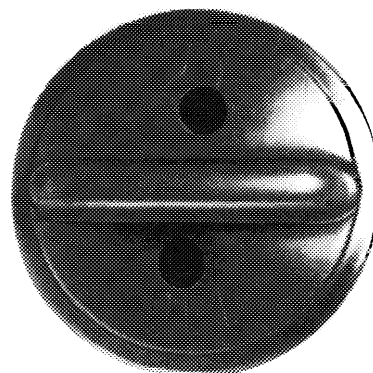
To do so, clip two transparent plastic hoses onto the vent plugs attached to the check valve. Remove filler cap from valve cover and push both hoses into the filler hole.

Caution:

To avoid oil ejection you are recommended to use a filler cap having two holes (outside diameter of hoses).

The procedure needed for the consumption measurement is described on the front of the recording chart.

In order to avoid incorrect readings, check engine oil for fuel dilution prior to commencing.



- 2 Run engine to 75–85 °C oil temperature.
- 3 Slowly accelerate with accelerator pedal and read revolution counter. Specified engine speed should be attained.

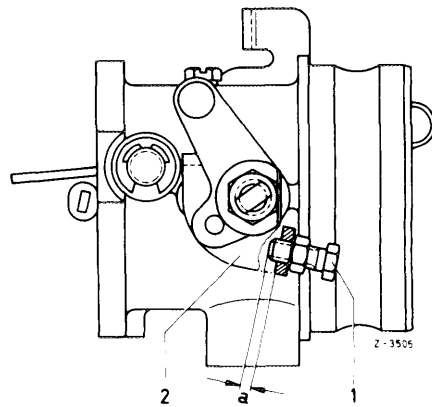
Adjustment (M-injection pump with pneumatic governor)

- 4 Adjust speed by means of full load stop screw (1) on throttle unit.

Screwing in = speed decrease

Screwing out = speed increase

- 1 Full load stop screw
- 2 Regulating lever
- a = Adjustment max 2 mm



Adjustment ("a") of throttle valve should not exceed max 2 mm.

If the full load stop screw is screwed in still further, the air feed will be throttled and driving performance will drop.

If the throttle unit can no longer be adjusted, tension or slacken governor spring by means of compensating washers (07.1–130).

- 5 If the respective speed is not attained on MW and **M/RSF-injection** pumps, check for presence of vacuum at vacuum box on injection pump. For this purpose, pull off hose on vacuum box. If the speed is still not attained, remove injection pump and adjust maximum speed free of load on a Bosch injection pump test bench.

A. Engine 615,616 M-injection pump with pneumatic governor

Standard version

Injection pump with governor and delivery pump for operating at altitudes up to 2000 m above sea level

Model	Engine	Injection pump Bosch designation (abbreviation)	Governor Bosch designation	Delivery pump Bosch designation	Control rod path including compensating path ¹⁾ mm	Test values ²⁾ MB-sheet Date or edition
115.1	615.912	PES 4 M 55 C 320 RS 47 (M)	EP/MN 60 M 23 DR	FP/K 22 M 13	14.8–15.0 ⁴⁾	2,2 a 5. 1972
	615.913	PES 4 M 50 C 320 RS 14 (M)	EP/MN 60 M 25 DR		14.9–15.0	2,0 a 4th edition
123.1	615.940	PES 4 M 50 C 320 RS 59 (M)	EP/MN 60 M 45 DR	FP/K 22 M 14	14.4–14.5	2,0 d 4th edition
	615.941	PES 4 M 55 C 320 RS 60 (M)	EPIMN 60 M 44 DR		14.3–14.4	2,2 f 3rd edition
115.1	616.916 ³⁾	PES 4 M 55 C 320 RS 47 (M)	EP/MN 60 M 38 DR EP/MN 60 M 39 DR ⁴⁾	FP/K 22 M 13	15.2–15.3	2,4 a 3rd edition
123.1	616.912	PES 4 M 55 C 320 RS 60 (M)	EP/MN 60 M 46 DR	FP/K 22 M 14	14.8–14.9	2,4 d 4th edition

Engine 615 for operating at altitudes above 2000 m above sea level

115.1	615.912	PES 4 M 55 C 320 RS 47 ^z (M)	EPIMN 60 M 23 DR	FPIK 22 M 13	13.9–14.1 ⁵⁾	2,2 a 5. 1972
	615.913	PES 4 M 50 C 320 RS 14 ^z (M)	EP/MN 60 M 25 DR		14.2–14.3	2,0 a 4th edition

¹⁾ Data concerning control rod path represent the path of the control rod from full load stop to outermost stop position. By means of these data for the control rod and compensating path, the injection pump can be regulated occasionally and in an emergency without a test bench.

²⁾ **Accurate regulation and adjustment of injection pump is possible on an injection pump test bench only.** For workshops which own such a test bench, the required data sheets for the various pumps are available.

³⁾ In the event of replacements, (USA) version vehicles are supplied with injection pumps model year 1975/76 only.

⁴⁾ Replaced by M 38 DR when stocks were used up.

⁵⁾ On engines with injection nozzles DN 0 SD 1510, as a result of the shorter compensating path, the control rod path amounts to 14.5–14.7 mm and on injection pumps for altitudes above 2000 m it is 13.6–13.8 mm.



Identification: Full load stop screw and governor housing lead-sealed.

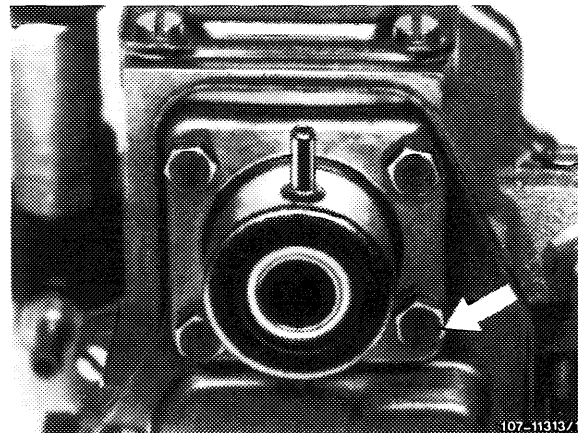
Model year 1975/76

115.1	615.912	PES 4 M 55 C 320 RS 47 (M)	EP/MN 60 M 27 DR	FP/K 22 M 13	14.2–14.4	2,2 c 1st edition
	615.913	PES 4 M 50 C 320 RS 14 (M)	EP/MN 60 M 28 DR		14.2–14.3	
	616.916	PES 4 M 55 C 320 RS 47 (M)	EP/MN 60 M 40 DR		14.5–14.6	2,4 a 3rd edition

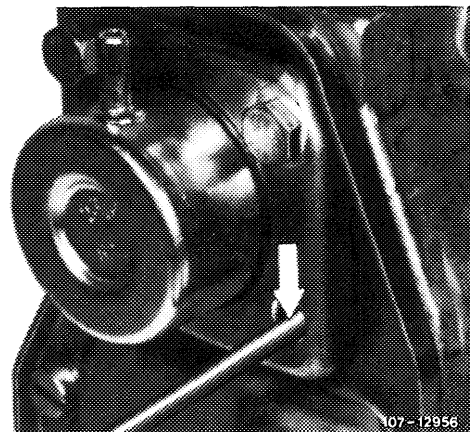
b) Check control rod for easy operation (except injection pumps with altitude adjusting box):

MW-injection pump

Unscrew lower righthand fastening screw (arrow) on shutoff box.



Insert a plug gauge through bore up to stop. Push plug gauge slightly against control rod. Move regulating lever on injection pump from idle speed to full load stop. Plug gauge should closely follow control rod.



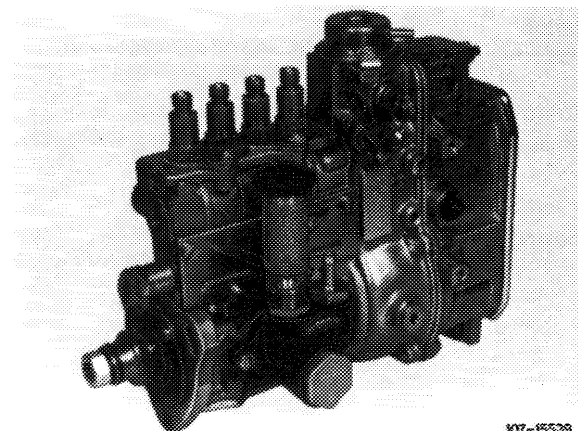
If control rod is hard to move under the influence of resinification, add clean gasoline into fuel feed connection to act on elements for a short period.

Push control rod back and forth until it is freely moving.

M/RSF-injection pump

Remove closing cap of control rod.

Move regulating lever on injection pump from idle speed to full load stop. Control rod should return automatically.



- 5 To make sure, subsequently check control rod position once again as described in item 2. The mark on plug gauge should again be in alignment.

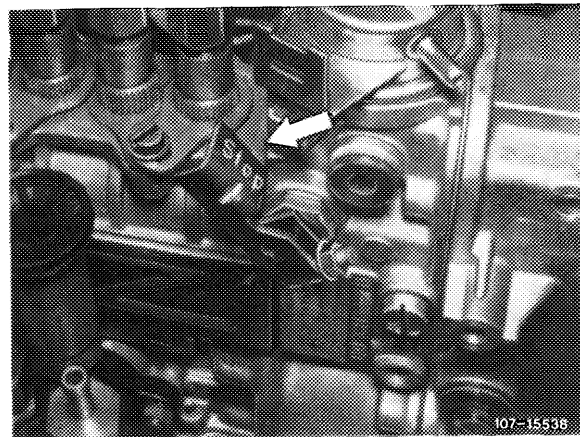
C. M/RSF-injection pump in model 123.1

Removal

- 1 Unscrew both fastening screws.
- 2 Slightly raise vacuum box, tilt toward the rear in direction of engine and remove.

Installation

- 3 Check O-ring for damage and replace, if required.
- 4 Push emergency stop lever (arrow) to stop and engage connecting rod of vacuum box in rocker of emergency stop lever.
- 5 Mount fastening screws while paying attention to correct seat of fastening plates.



A. General

On a diesel engine, combustion is effected by **self-ignition** of the fuel sprayed into the highly compressed and thereby highly heated combustion air.

In a cold engine, the self-ignition temperature is not attained by compression alone. A preglow system is therefore required, which serves the purpose of increasing the temperature of the compressed air to facilitate starting of the cold engine by the inflammation of fuel particles on filament of glow plug.

The duration of preglowing (preheating) depends on temperature of engine and on ambient temperature.

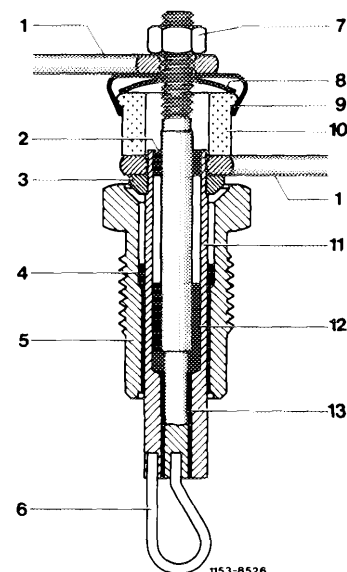
B. Glow plug design

a) Filament-type glow plugs

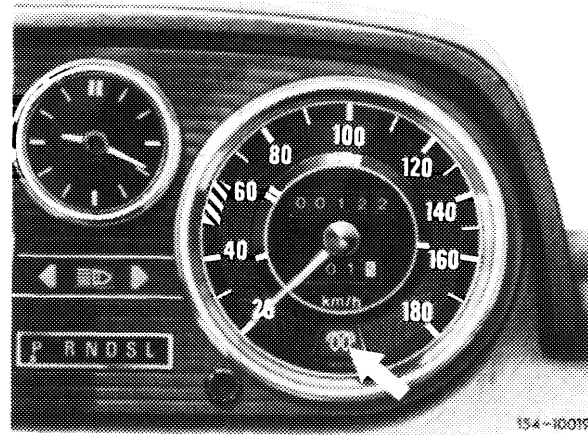
The filament-type glow plugs are essentially comprising the plug body (5) with threads M 18 x 1.5, one center electrode with filament wire and the outer electrode. The current is carried by conductor (1) or a connecting cable, depending on location of plug, to center electrode (13) or to ring element (3) of outer electrode (11). The center electrode (13) and the outer electrode (11) are connected to each other by means of the glow filament (6). The two electrodes are insulated in relation to each other by the insulating compound (12) and in relation to the plug body (5) by the insulation compound (4).

In addition, a plastic insulator (2) is installed at upper end of glow plug between outer and center electrode. The connection insulator (10) insulates the two current connections. The domed washer (8) installed in insulator serves as a lock for nut (7).

- | | |
|-------------------------------------|---|
| 1 Conductor | 8 Domed washer |
| 2 Plastic insulator | 9 Sheet-metal cap on connection insulator |
| 3 Ring element (on outer electrode) | 10 Connection insulator |
| 4 Insulation compound | 11 Outer electrode |
| 5 Plug body | 12 Insulating compound |
| 6 Glow filament | 13 Center electrode |
| 7 Nut | |



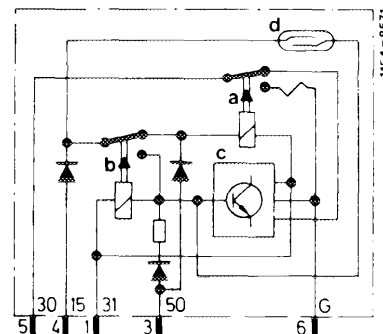
The preglow time is indicated by the preglow indicator lamp.



In dependence of the coolant temperature and the preglow current flowing across the thermo time switch, the preglow indicator lamp is contacted with minus by the closed contact in thermo time switch. In parallel with the glow plugs, the control lamp is connected to plus by a line connected to the glow plug of the 5th cylinder. When the optimal preglow time is obtained, the contact in thermo time switch will interrupt minus and the preglow indicator lamp is extinguished. The engine is now ready for starting.

In starting position the preglow time relay is contacted by terminal 50 of the steering lock starter switch via terminal 3. Control relay (b) is energized. The contacts are closing (interrupting the rest position) and remain closed via terminal 4 in a self-holding circuit.

The power relay (a) is not switching off, since during the starting operation the power relay is directly contacted via terminal 3. The preglow system remains switched on (refer to wiring diagram).



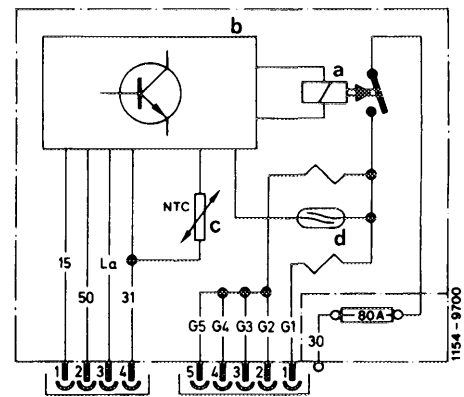
At end of starting operation the key moves back into position "2" (preglowing, drive).

The power relay switches off, since there is no voltage neither via terminal 3, nor via the interrupted rest contact of the control relay which remains switched on via terminal 4.

The preglow system is now in disconnected condition.

Note: If tolerances of pencil **element** glow plugs or of Reed relay (**d**) are unfavorable, response of fault indicator only if two pencil element glow plugs are defective is acceptable.

Faults are indicated (pencil element glow plug resistance control) by comparing the current of pencil element glow plug **G1** with current of remaining pencil element glow plugs **G2–G5** (or **G2–G4**) connected in parallel.

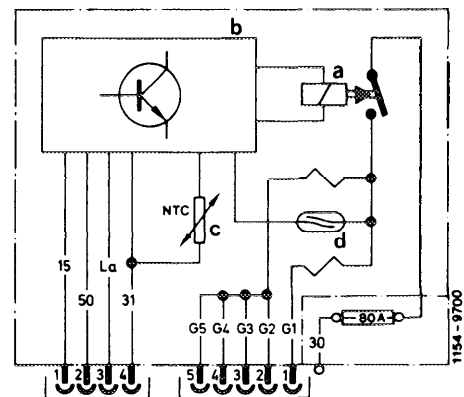


The currents of the two lines to the pencil element glow plugs **G1** and **G2** up to **G5** (or **G2–G4**) are rooted through two Reed relay coils with different numbers of windings connected opposite to each other.

If the current flow in both coils is the same, the magnetic fields will cancel each other and the Reed contact will not respond.

If the balance of the magnetic field is interrupted by the **loss** of one or several pencil element glow plugs, the Reed contact will close and the electronic system (**b**) will be activated.

The preglow indicator lamp switches off immediately and will therefore not light up when the preglowing begins.

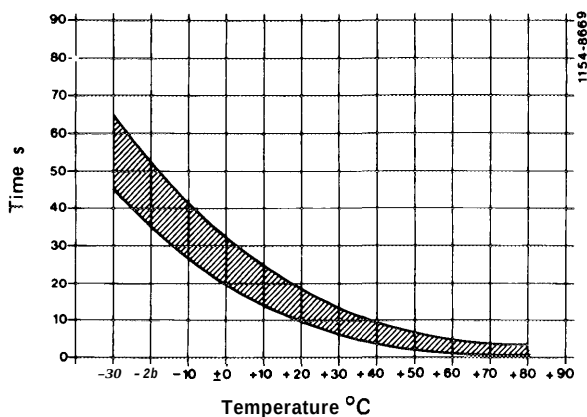


b) Preglowing system glowing too slowly or too fast

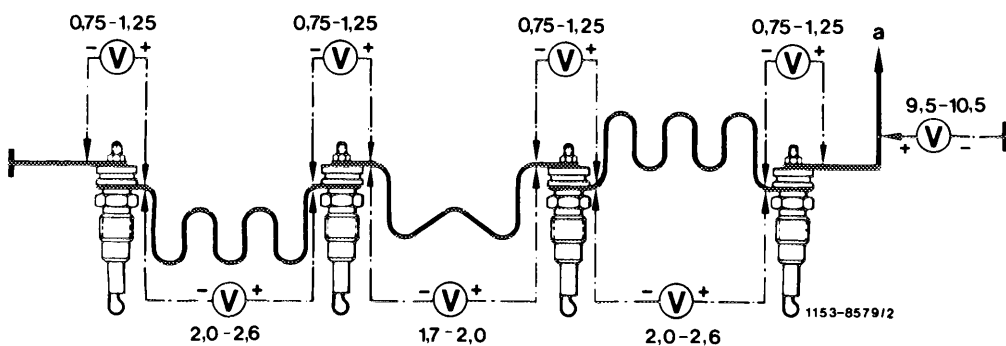
Nominal time at: + 20 °C/68 °F approx. 12 seconds
 – 5 °C/23 °F approx. 30 seconds

Preglowing system preglows too slowly because not enough current can flow through transition resistances in glow plugs or on connections.

Preglowing system preglows too fast because too much current flows through one or several glow plugs due to ground short.

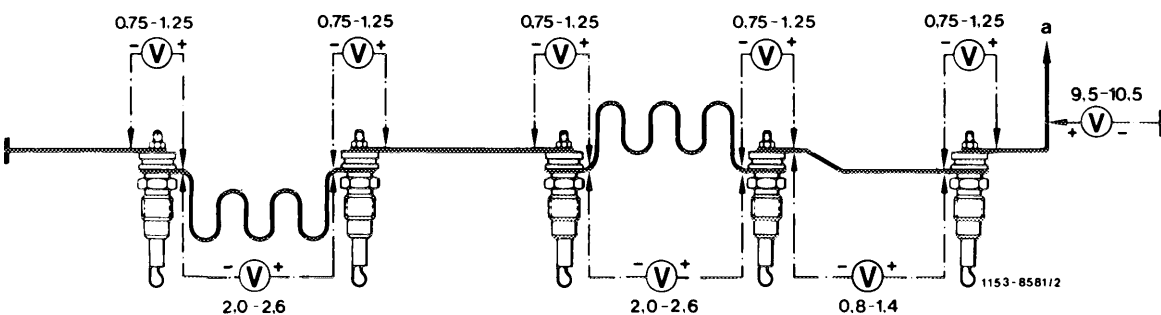


These faults can be found by measuring voltage drop of each glow plug. Measure voltage on glow plugs at current input and output with test points of voltmeter (measuring range 0–3 volts).



Engine 615, 616

a To fuse



Engine 617

a To fuse

Tightening torque

Nm

Glow plugs

50

Special tools

Box wrench



617 589 00 03 00

Reamer



617 589005300

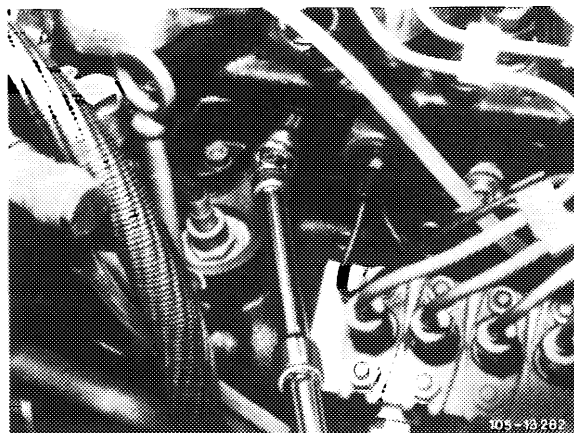
Removal

- 1 Unscrew all nuts, remove connecting line, connection insulators and conductors.
- 2 Unscrew glow plugs with box wrench.

Installation

3 Prior to installing glow plugs, clean glow plug channels and bores in prechambers with reamer. For this purpose, fill flutes of reamer with grease and ream glow plug channels.

Note: In the course of time, oil carbon will settle in glow plug channels. This may result in a ground connection of glow plugs.



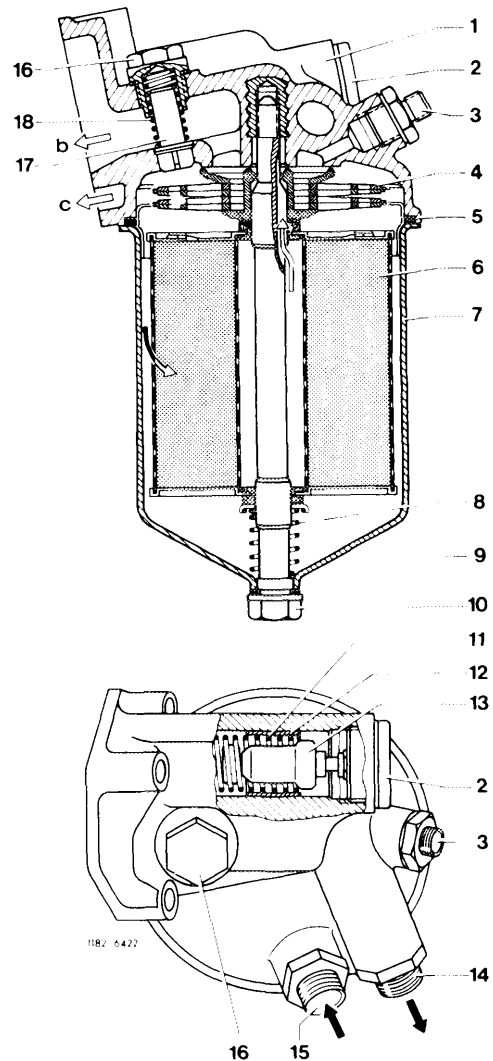
- 4 After reaming glow plug channels, crank engine several times with starter motor, so that the residue is blown out of combustion chamber.
- 5 Install glow plugs, connect to conductors, connect connection cable and attach with nuts.
- 7 Check glow plugs for function.

This quantity of oil is enough to guarantee lubrication of engine at low outside temperatures when the through-flow in oil cooler is extensively prevented by the viscosity of the oil.

The major portion of the oil flows to air oil cooler and is cooled there, it will then flow back to oil filter housing and through main and bypass filter element to bearing points or oil pan.

Engine 617

- 1 Filter top
- 2 Closing plug with sealing ring
- 3 Connection for oil pressure gauge
- 4 Main flow filter element
- 5 Sealing ring
- 6 Bypass filter element
- 7 Filter bottom
- 8 Compression spring with spring retainer
- 9 Sealing ring
- 10 Hex. screw
- 11 Compression spring
- 12 Control valve
- 13 Thermostat
- 14 Screw connection with sealing ring (uncleaned oil to oil cooler)
- 15 Screw connection with sealing ring (uncleaned oil from oil cooler)
- 16 Closing plug with sealing ring
- 17 Star valve (overflow valve – filter element)
- 18 Compression spring
- b Cleaned oil to lube points
- c Cleaned oil from bypass filter element into oil pan

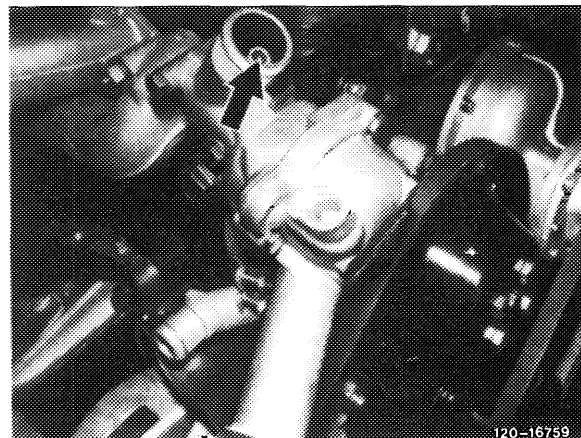


When the filter element is badly contaminated and the differential pressure between the dirty and the clean side of the filter exceeds 3.5 bar gauge pressure, the bypass valve (17) will open. The oil will then flow to engine in uncleaned condition.

Note

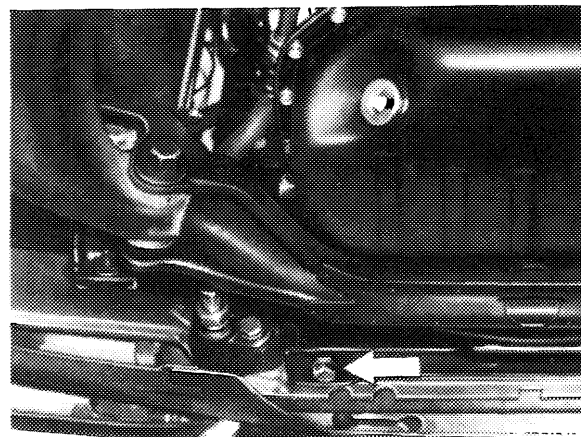
A thermostat housing with automatic vent is installed on model 123.1 starting February 1979 (2nd version).

When filling up on vehicles with automatic climate control, proceed as described in section „B“.

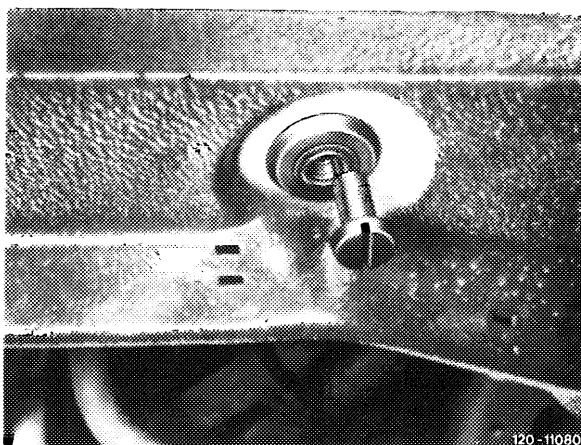


Draining

- 1 Open radiator cap in steps (only below 90°C).
- 2 Unscrew drain plug on radiator.

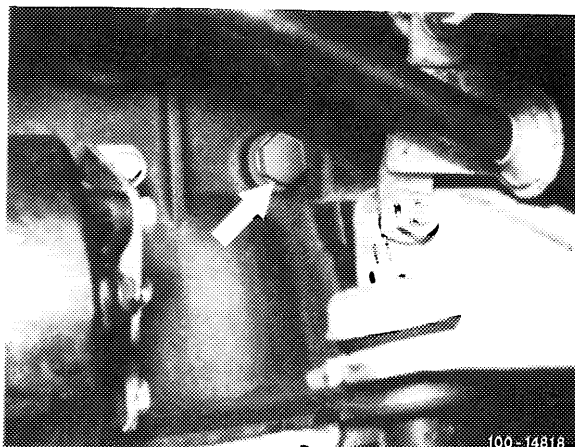


Model 115.1



Model 123.1

- 3 Unscrew drain plug on cylinder crankcase.

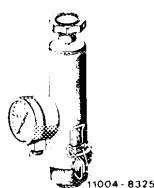


Tightening torques		Nm	(kpm)
Radiator drain plug	type 115.1	6–10	(0.6–1)
	type 123.1	1.5–2 ¹⁾	(0.15–0.2)
Water pump to water pump housing		9	(0.9)
Fan to water pump		25	(2.5)

¹⁾ This torque can be set by means of a washer or a coin.

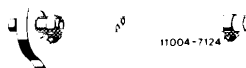
Special tools

Tester for cooling system



001 589 48 21 00

Radiator cap with hose for leak test



605 589 00 25 00

Socket 27 mm, 1/2" square for rotating engine



001 589 65 09 00

Removal

- 1 Completely drain coolant (20–010).
- 2 Remove radiator (20–420).
- 3 Unscrew fan.
- 4 Slacken V-belt and remove.

Drain plug on cylinder crankcase

