



OM 501 LA - OM 502 LA engines
Operating Instructions



Mercedes-Benz



Thank you for choosing this Mercedes-Benz engine.

Please get to know your new Mercedes-Benz engine first. Make sure you read the Operating Instructions in particular before using the engine for the first time. In this way you can ensure successful and safe use. At the same time you will avoid endangering yourself and others when operating the engine.

Items of special equipment are marked with an asterisk *. The equipment in your Mercedes-Benz drive train may vary, depending on the version. Mercedes-Benz is constantly updating its engines to the state of the art. You cannot, therefore, base any claims on the data, illustrations or descriptions in these Operating Instructions.

For further information contact a Mercedes-Benz Service Centre.

The Operating Instructions and Maintenance Booklet belong with the engine. You should therefore always keep them with the engine and pass them on to the new owner if you sell it.

The technical documentation team at DaimlerChrysler AG wishes you every success.

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The aim of these Operating Instructions**▼ The aim of these Operating Instructions**

These Operating Instructions are intended to assist you in all situations with your new engine. Each section has a print register to help you find the information you require quickly:

1 At a glance

This section gives you an overview of the layout of important components in the engine.

2 Getting started

This contains the basic information you require for initial operation. If this is your first Mercedes-Benz engine, you should read this section first.

3 Safety

This section contains important aspects with regard to safety in the use of the Mercedes-Benz OM 501 LA and OM 502 LA engines.

4 Controls in detail

Here you will find all the information you will need when you are operating the engine.

5 Operation

This is where you will find more detailed information about maintenance work.

6 Practical advice

Here you will find practical help for possible problems.

7 Technical data

All the important technical data for the engine is listed here.

8 Glossary and index

The glossary of technical terms explains the most important technical terms.

The index is intended to help you find information quickly.

The engine documentation comprises the following:

- these Operating Instructions
- the Maintenance Booklet
- Specifications for Service Products

You may receive additional supplements depending on the equipment.

Symbols

You will find the following symbols used in these Operating Instructions:

- * This asterisk indicates special equipment. Since not all models have the same standard equipment, the layout of your engine may differ from certain descriptions and illustrations.

Warning



A warning draws your attention to possible risks of accident and injury to yourself and others.

You should therefore always read and observe all warning notices.

Environmental note



An environmental note gives you tips on the protection of the environment.



This note draws your attention to possible hazards to your engine.



This tip contains advice or further information you may find useful.

- ▶ This symbol means that you have to do something.
- ▶ A number of these symbols one after the other indicates a sequence of actions.
- ▷ page This symbol indicates the page on which you will find further information on the subject.
- ▷▷ This continuation symbol indicates an interrupted sequence of actions that will be continued on the next page.
- > This symbol in the glossary of technical terms means that the term following the arrow is also explained.

▼ Protection of the environment

Environmental note



DaimlerChrysler's declared policy is one of integrated environmental protection. This policy starts at the root causes and encompasses in its management decisions all the consequences for the environment which could arise from production processes or the products themselves.

The objectives are for the natural resources which form the basis of our existence on this planet to be used sparingly and in a manner which takes the requirements of both nature and humanity into account.

Operate the engine in an environmentally responsible manner, and you will help to protect the environment.

Fuel consumption and engine wear depend on the operating conditions.

Therefore you should:

- not warm up the engine in idling mode
- switch off the engine during operation-associated waiting times
- check fuel consumption
- carry out the specified maintenance work regularly

Operating safety

The operating safety of an engine firstly depends on its proper installation into the complete system (e.g. vehicle, machine, etc.). Secondly, as operator or service personnel, you also have a direct influence on the safe operation of the engine.

Some of the requirements for operating the engine safely can be achieved by adhering to the specified maintenance intervals and ensuring that the required maintenance work is carried out correctly.

However, safe engine operation also depends on correct servicing, such as checking the engine oil level at regular intervals.

Risk of accident



Improper operation of the engine, e.g. exceeding the permitted maximum engine speed in overrun mode or operating the engine with too little oil, can cause engine damage. Engine damage can lead to an increase in the risk of an accident.

Therefore, observe the notes on operating the engine in these Operating Instructions.

Risk of accident



Faulty maintenance work or failure to carry out maintenance work, e.g. not changing the oil filter or not observing the correct maintenance interval, can cause engine damage. Engine damage can lead to an increase in the risk of an accident.

Therefore, observe the notes on engine maintenance in these Operating Instructions.

Risk of accident

Work incorrectly carried out on electronic components and its software could impair the functioning of these components. Since the electronic systems are networked, this might also affect systems that have not been modified.

Always have work on or modifications to electronic components carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

Correct use

The engine is only designed for installation in accordance with the specifications determined in the contract.

The manufacturer of the end product is personally responsible for the complete system of the end product, and in particular for the correct installation and compatibility of this engine with the complete system.

The engine must not be modified.

DaimlerChrysler accepts no responsibility for damage caused as the result of modifications.

Correct use of the engine includes adhering to these Operating Instructions, adhering to the maintenance intervals and performing maintenance work correctly in accordance with these Operating Instructions.



A close-up, black and white photograph of a microphone's mesh grille. The mesh is composed of a fine grid of small, circular holes, creating a textured, honeycomb-like appearance. The lighting is soft, highlighting the depth and curvature of the mesh. The background is blurred, showing a vertical rectangular shape, possibly a handle or part of the microphone's body.

At a glance

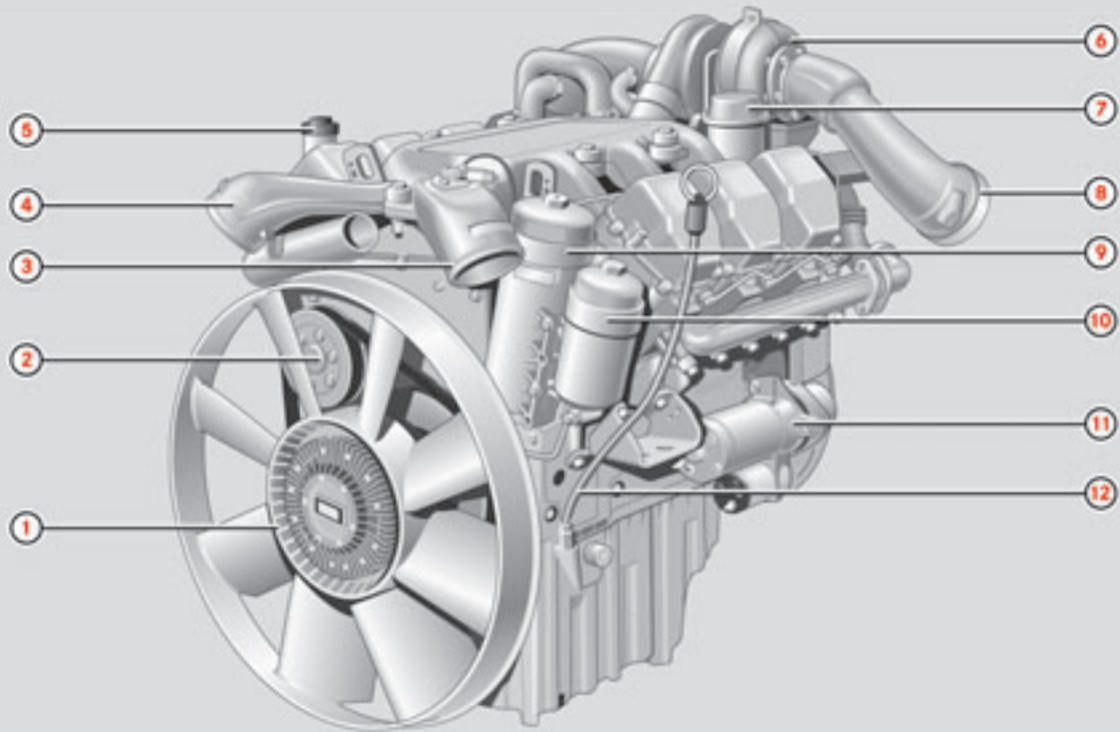
OM 501 LA overview

OM 502 LA overview

Location of sensors

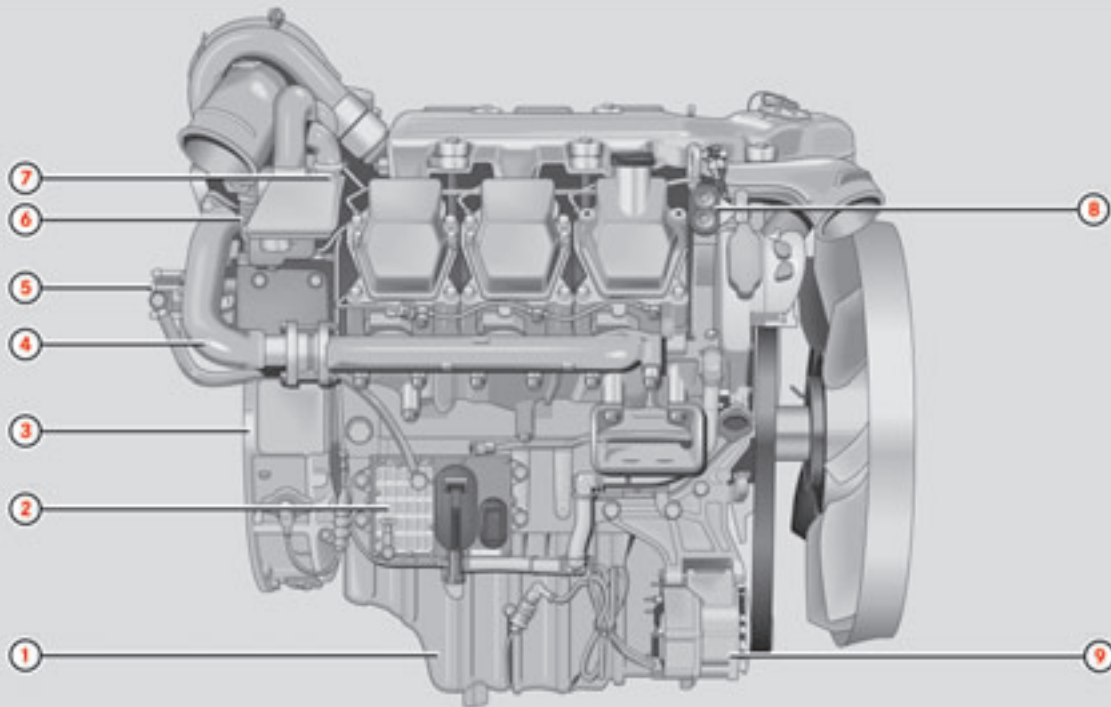
Engine plate

1



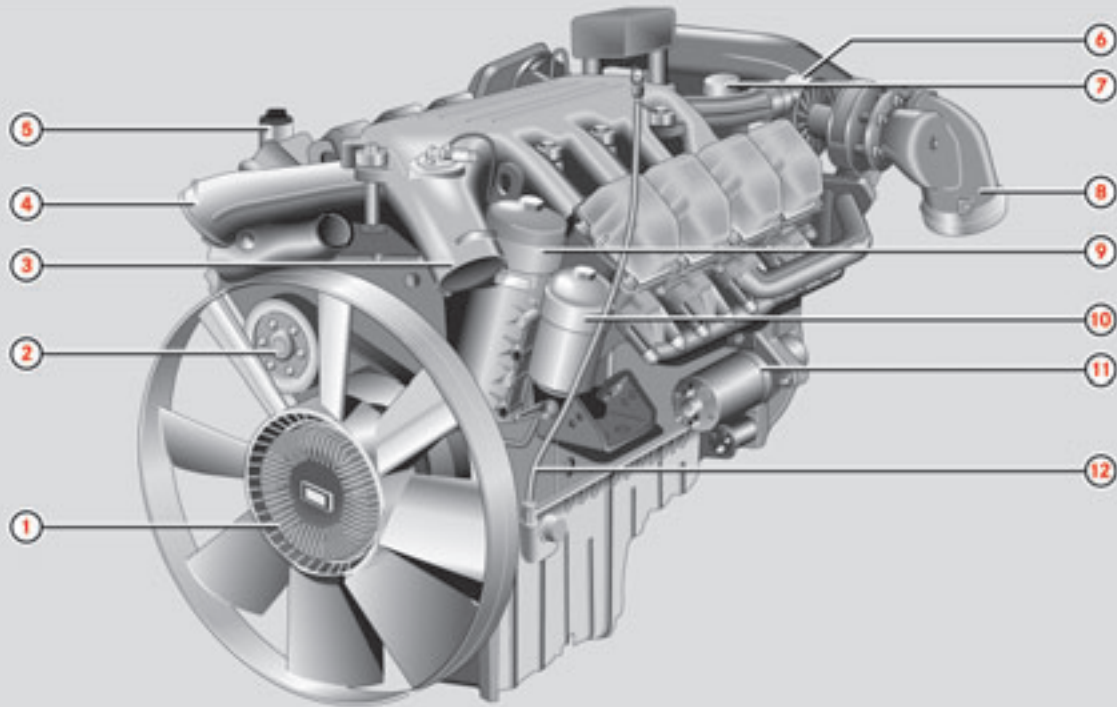
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- ① Fan
- ② Coolant pump
- ③ Charge-air pressure pipe (with flame-start system*) from charge-air cooler
- ④ Charge-air pressure pipe to charge-air cooler
- ⑤ Oil filler neck
- ⑥ Exhaust gas turbocharger
- ⑦ Crankcase ventilation system oil trap
- ⑧ Exhaust pipe (with engine brake throttle valve*)
- ⑨ Oil filter
- ⑩ Fuel filter
- ⑪ Starter motor
- ⑫ Dipstick



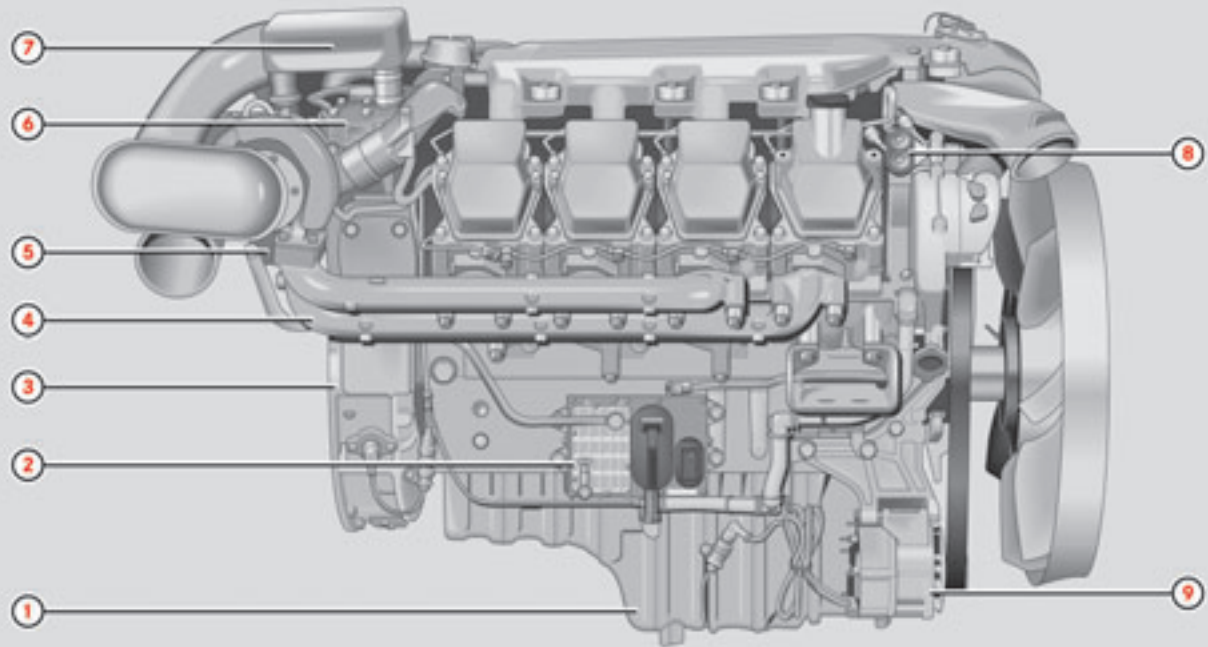
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- ① Oil sump
- ② Engine control unit
- ③ Flywheel housing
- ④ Exhaust manifold
- ⑤ Fuel pump (with flange-mounted power-steering pump*)
- ⑥ Air compressor*
- ⑦ Resonator* (only in conjunction with air compressor)
- ⑧ Start-Stop buttons
- ⑨ Alternator



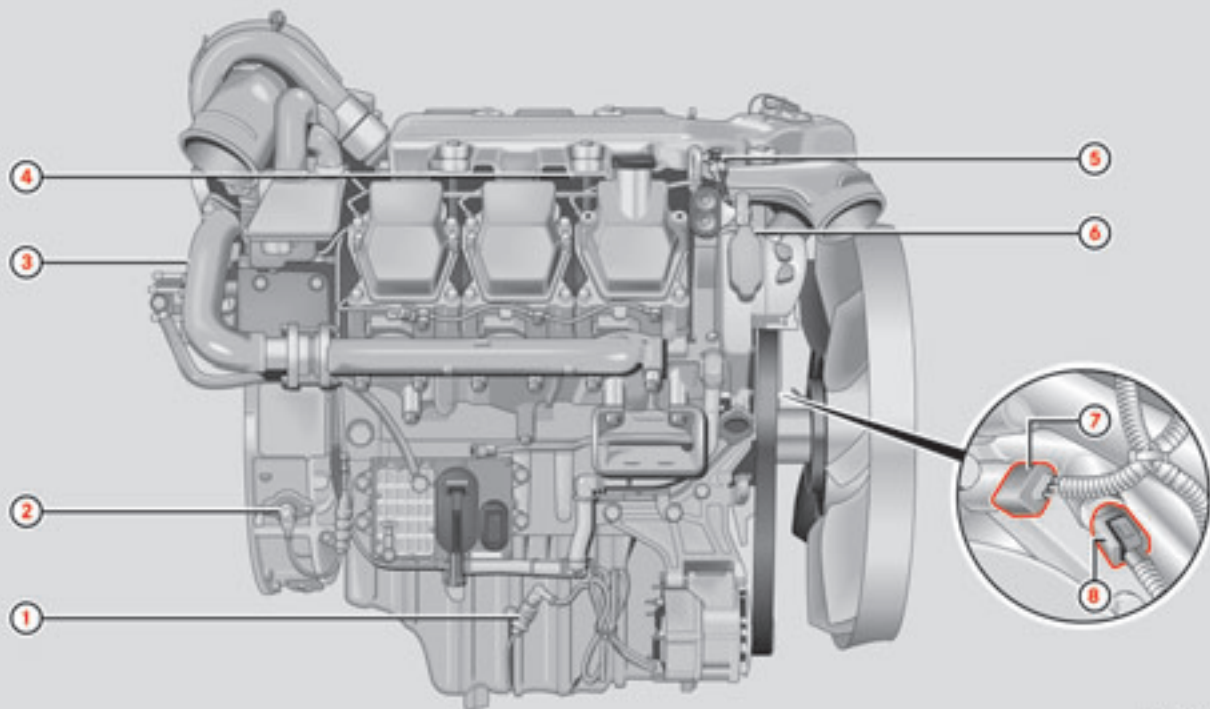
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001.00-3149-31

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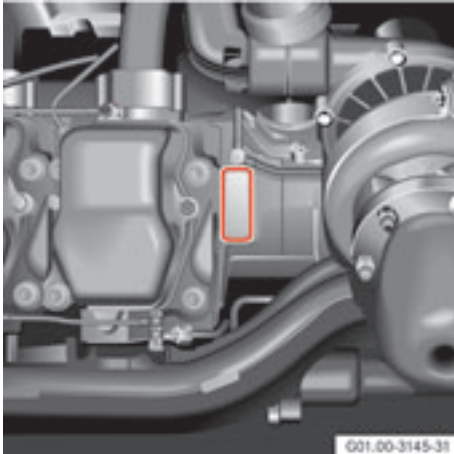
- ① Oil level sensor
- ② Crankshaft position sensor (on the flywheel)
- ③ Cylinder 1 TDC sensor (on the camshaft sprocket)
- ④ Fuel temperature sensor
- ⑤ Combined charge-air pressure and temperature sensor
- ⑥ Coolant temperature sensor
- ⑦ Oil pressure sensor
- ⑧ Oil temperature sensor

Engine plate

Location

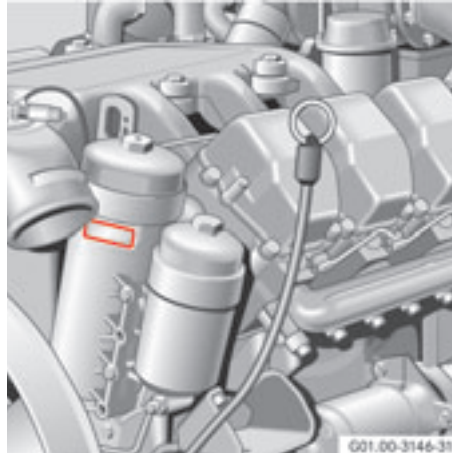
The engine plate is located on the left-hand side of the engine, on the engine block after the last cylinder.

1



Engine plate, left-hand side of engine, fly-wheel end

A second engine plate is mounted on the front of the oil filter casing.

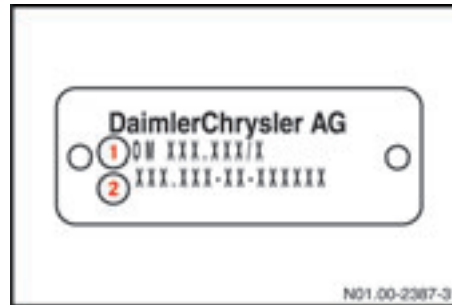


Engine plate, left-hand side of engine, fan end

Information on the engine plate

On motor vehicles, the engine plate shows the engine model designation ① and the full engine number ② along with the manufacturer's name.

In addition to this, engines for mobile machines and equipment carry the engine series designation and approval number.



Engine plate

- ① Engine model designation
- ② Engine number





Before commissioning

General remarks

Transport/installation

2

General remarks

Type designation

OM 501 L A

OM Oil engine (diesel engine)
501 Engine model¹
L Charge-air cooling
A Exhaust gas turbo-charger

¹ Engine model 501: 6-cylinder,
engine model 502: 8-cylinder

Engine data card

The engine data card (DIN A4 sheet) forms an integral part of the documents belonging to the engine and should always be kept with the Maintenance Booklet. It contains details about the engine's construction, including special equipment features.

The engine data card must be produced for the procurement of genuine parts.



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Engine data card



The engine data card describes the scope of delivery from the supplying factory; later changes to the scope of delivery are not included on the data card.

Always keep the engine data card with the Maintenance Booklet.

Description of the engine

The OM 501 LA and OM 502 LA engines are water-cooled 4-stroke direct injection diesel engines.

The 6 or 8 cylinders are arranged in a 90° V and have separate fuel-injection pumps (unit pumps) with a short high-pressure fuel injection line to the multihole injection nozzle located centrally in relation to the combustion chamber. The unit pumps are mounted directly on the crankcase and is driven by the camshaft. Each cylinder has two inlet valves and two exhaust valves.

The OM 501 LA and OM 502 LA engines are equipped with an exhaust gas turbocharger and a charge-air cooler as standard. The engine can be optionally equipped with an engine brake* (throttle valve and constantly-open throttle valves) and a flame-start system.

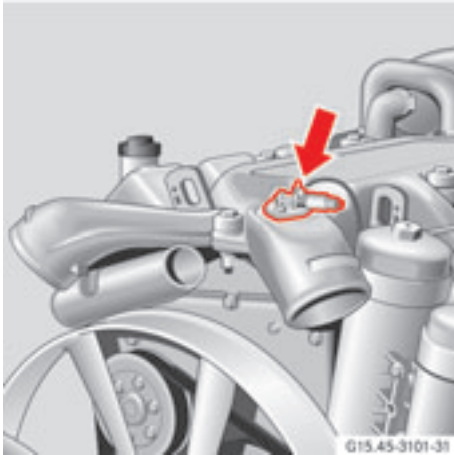
Thanks to their fully electronic control system for controlling the injection quantity and injection timing via solenoid valves, these are particularly low-emission engines.

The control system comprises an engine-resident control unit, an engine control (MR) with integrated heat exchanger for cooling by means of the forward fuel flow and an application-related control unit, a vehicle control (FR) or an adaptation module (ADM), all interconnected via the Controller Area Network (CAN).

General remarks

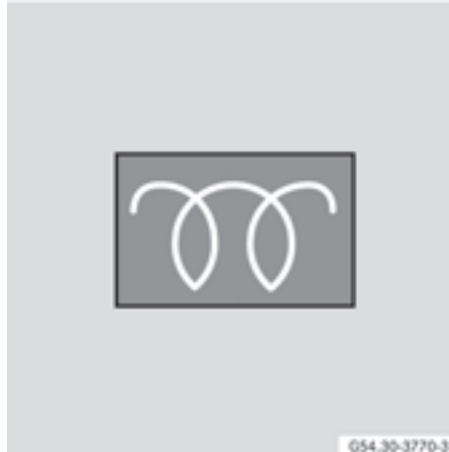
Flame-start system*

The flame-start system is a cold-start aid for starting at low outside temperatures. It reduces the white smoke emission after the engine is started. In addition, it reduces the strain on the starter motor and batteries by shortening the startup time.



Flame-start system

Fuel can be ignited by a flame heater plug mounted in the charge-air duct intake. The fuel is supplied to the flame heater plug via a solenoid valve with a dosing jet.



Flame-start system indicator lamp (example)

The flame-start system is primed after a preglow time (maximum 20 seconds) which is dependent on the outside temperature. After this time the flame-start system indicator lamp goes out.

Once the engine has started, the flame-start system is supplied with fuel by the engine's fuel delivery pump.

The flame-start system is only operational if the engine is started within 30 seconds of the flame-start system indicator lamp going out.



If the flame-start system indicator lamp does not go out after more than 20 seconds, there is a malfunction in the flame-start system.



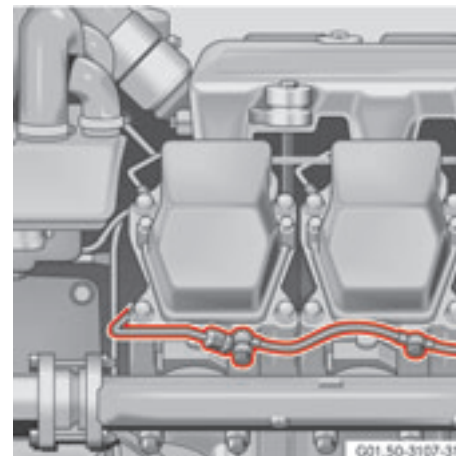
Also observe the "Diesel fuels" (▷ page 62) and "Coolant" (▷ page 65) sections when operating the engine at low outside temperatures.

Engine exhaust brake / constantly-open throttle valves*

To increase braking power, the engines can be equipped with an engine brake valve on the exhaust gas turbocharger in conjunction with constantly-open throttle valves on the cylinders.

While the exhaust gas back pressure from the engine brake valve can be used to increase the braking power, the constantly-open throttle valves cause a pressure reduction in the working cycle (3rd stroke), while compression (2nd stroke) is practically unaffected.

The constantly-open throttle valves are small valves which are integrated in the cylinder head and located on the side opposite the exhaust valve. When open, they form a connection from the combustion chamber to the exhaust port.



Control of the constantly-open throttle valves

General remarks

When the engine brake is applied*, the constantly-open throttle valves are pressurised with compressed air which opens the valves. At the same time, the engine brake valve on the exhaust gas turbocharger is closed.

2 The engine brake* is controlled by the drive control unit (▷ page 33) or the ADM.

The engine brake* is always inactive below 900 rpm to prevent the engine from stalling. The engine brake* is also automatically deactivated if the position sensor is triggered (e.g. if the accelerator pedal is depressed).



In emergency running mode (constant engine speed), the engine brake* can only be activated in overrun mode at a higher engine speed. The engine brake* is automatically deactivated again once the constant engine speed has been reached.

Telligent® engine system

The engines have a fully electronic control system, which, in addition to the engine and related sensors, also comprises:

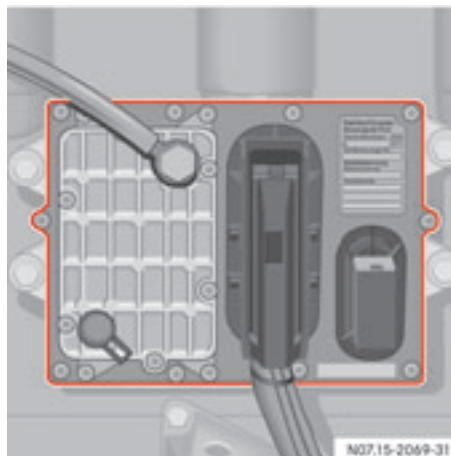
- an engine control unit, and
- a drive control unit and/or other vehicle-specific control units or ADM.

Both are interconnected via a CAN (Controller Area Network) line which exchanges all the necessary data / information.

The engine control monitors itself as well as the engine. A safety and emergency-running program is selected automatically depending on the malfunctions / failures which occur (▷ page 4 1).

Engine control unit (engine-resident)

The engine control unit is located on the right-hand side of the engine.



Engine control unit

The engine control unit processes data coming from the drive control unit or the ADM, such as the position of the sensor (accelerator pedal position sensor), the engine brake* or engine start / stop, etc.

General remarks

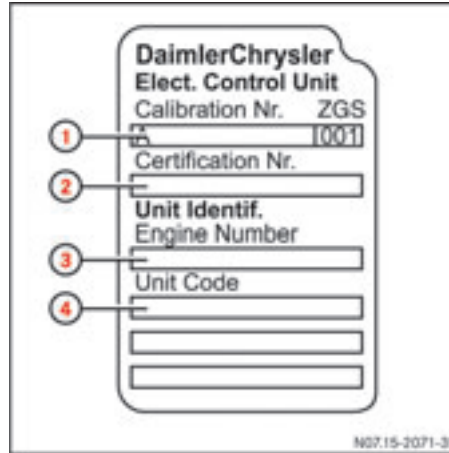
This data is evaluated along with data from the sensors on the engine, such as those for

- charge-air pressure and temperature
- coolant temperature
- fuel temperature
- oil pressure

2

These parameters are compared with the characteristic diagrams and curves stored in the engine control unit.

Start, duration and amount of injection are calculated from the curves and the unit pumps are controlled accordingly via the solenoid valves.



Control unit type plate

- ① Data record
- ② Certification no.
- ③ Engine number
- ④ Equipment code

i

All the information on the control unit type plate is required to obtain a replacement engine control unit.

FR (drive control) unit or ADM (appliance-resident)

The engine can be adapted to meet the various application-specific requirements by means of the FR (drive control) unit or adaptation module (ADM).



Drive control unit

The FR (drive control) unit or the ADM unit stores data for specific applications, such as idling speed, maximum working speed and speed limitation.

The FR (drive control) unit and the ADM receive data from the

- operator (position of setpoint value sensor, engine start / stop)
- engine brake switch*
- other systems (e.g. acceleration skid control)
- engine control unit (e.g. oil pressure and coolant temperature)

From this data, the instructions for the MR (engine control) unit are computed and transmitted to it via the CAN line.

The drive control unit and the ADM control various displays, e.g. the electronics warning lamp, the engine brake* and the constantly-open chokes*.

General remarks

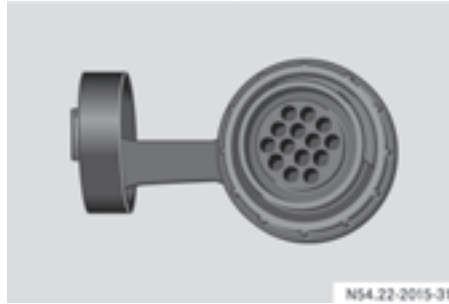
If the Telligent[®] engine system detects a fault, this is stored as a fault code in the control units and can be read using the appropriate diagnostic testers (STAR DIAGNOSIS or Mini diag 2). In addition, the electronics warning lamp is switched on.

2



You can connect the diagnostic testers to the appliance-resident, 14-pin diagnostic socket. You can read both the malfunction memory and the stored engine data with these testers.

Information about the diagnostic testers is available at any Mercedes-Benz Service Centre.



Diagnostic socket

Organisational measures

Risk of accident and injury



Before operating the engine, please read these Operating Instructions and other authoritative documentation, such as the Operating Instructions for the vehicle or the machine the engine is installed in.

You could otherwise fail to recognise dangers and could injure yourself or others.

The Operating Instructions and Maintenance Booklet must be given to the personnel responsible for operating the engine or carrying out work on the engine, and should be kept where the engine is used in an easily accessible place.

Personnel must be instructed in how to work on the engine using these Operating Instructions. In particular, the safety notes must be explained. This is especially important for personnel who only work on the engine occasionally.

In addition to these Operating Instructions, the country-specific legal and all other binding regulations for accident prevention and protection of the environment must be observed.

▼ Transport/installation

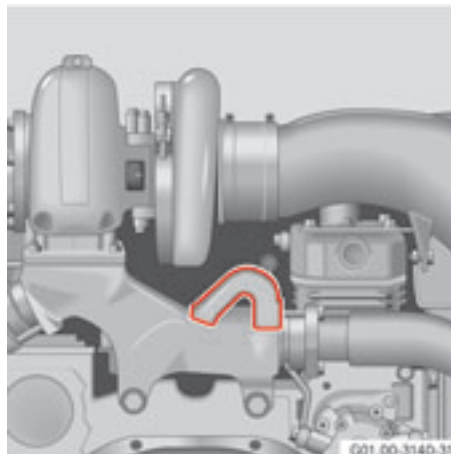
Transport

Risk of accident and injury



The engine can tear loose and cause injury to persons by overturning or falling.

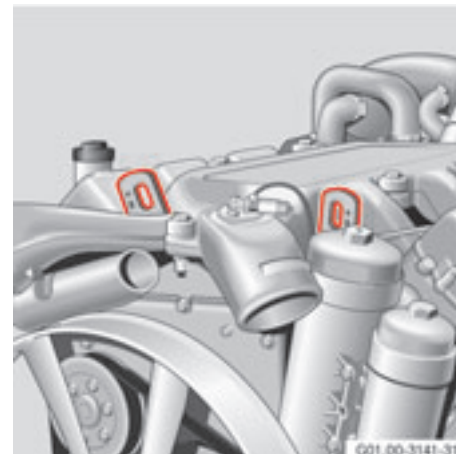
- Only lift the engine by the appropriate lifting points on the engine.
- Only use transport equipment which has been approved for use by DaimlerChrysler.
- Only lift and transport the engine in its installation position: Note that the engine must not be tilted more than 30° when it is being hoisted in or out of equipment or vehicles.



Suspension fixture, flywheel end (illustrated: OM 501 LA)



The flywheel end suspension fixture on the OM 502 LA is located behind the turbocharger intake pipe.



Suspension fixture, belt side

Transport/installation

Installation

The engine is only designed for installation in accordance with the specifications determined in the contract.

2 The manufacturer of the end product is personally responsible for the complete system of the end product, and in particular for the correct installation and compatibility of this engine with the system as a whole.

Observe the "Correct use" (▷ page 9) and "Conversion parts and modifications to the engine" (▷ page 40) sections.

These Operating Instructions contain installation data in the "Technical data" section.

Should you have any questions, please contact a Mercedes-Benz Service Centre.



The engine is filled with engine oil at the factory.

Safety precautions

Personnel requirements

Commissioning parts and modifications

Safety/emergency running programs

Replacement parts

Safety precautions

Make sure that the following safety precautions are observed to prevent damage to the engine, components and cable harness and any personal injury that may occur as a consequence.



- Only start the engine with securely connected batteries.
- Do not disconnect the batteries with the engine running.
- Only start the engine with the rotational speed sensor connected.
- Do not use a rapid charger to start the engine.
- Only perform jump-starting with separate batteries.
- Please note that the battery terminals must be removed for rapid battery charging. Observe the rapid charger operating instructions.



- Note that for electric welding work, the batteries must be disconnected and both connector leads ("+" and "-") securely connected to each other.
- The control unit connectors must only be removed or inserted when the electrical system has been switched off.
- Incorrect polarity of the control unit supply voltage (e.g. through incorrect battery polarity) can cause irreparable damage to the control units.
- Tighten the connections on the fuel-injection system to the specified tightening torque.
- The control units must be removed if temperatures over 80 °C (e.g. in the drying oven) are expected.



- Only use suitable test leads (e.g. DaimlerChrysler connection set) for measuring connectors.
- Mobile phones and two-way radios which are not connected to an exterior aerial can cause malfunctions to the vehicle's electronics and could therefore endanger the engine's operating safety.

▼ Personnel requirements

Risk of accident and injury



Maintenance and repair work to the engine incorrectly performed can cause engine damage and may lead to personal injury as a consequence.

Maintenance and repair work on the engine may only be carried out by personnel who have undergone the appropriate training.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

Engines may only be operated, maintained and repaired by trained personnel instructed and authorised by the operator.

Responsibility for operation, maintenance and repairs must be determined by the operator.

The legal minimum age for carrying out the work listed above must be observed.

Commissioning parts and modifications

Risk of accident and injury



Tampering with the engine with the intention to produce modifications to it can impair both its correct operation and its safety, leading to personal injury as a consequence.

Always have work on or modifications to the engine carried out at a qualified technical workshop which has the necessary specialist knowledge and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

The warranty does not cover damage arising from tampering with the engine.

3



Tampering with the fuel-injection system and engine electronics can affect the engine's performance and emissions. Compliance with the factory settings and legal environmental protection conditions can then no longer be guaranteed.

▼ Safety/emergency running programs

The engine is equipped with an electronic control system which monitors both the engine and itself (self-diagnostic system).

As soon as a malfunction is detected and has been assessed, one of the following measures is automatically implemented:

- When the engine is in operation, the electronic system warning lamp lights up, indicating a malfunction.
- In conjunction with the Telligent® engine system (vehicle diagnostic system), the fault codes can be shown on a display.
- The engine switches to the appropriate back-up function for continued (but restricted) operation (e.g. constant emergency running speed).

Risk of accident



Incorrectly performed maintenance and repair work to the engine can impair both its correct operation and safety, leading to accidents and personal injury as a consequence.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.



The fault codes can be read from the DaimlerChrysler diagnostic testers (STAR DIAGNOSIS or Minidiag 2 tester), which are connected to the 14-pin diagnostic socket (appliance-resident).



Electronic system warning lamp

Replacement parts

Make sure that the replacement parts are suitable for your vehicle. Parts which lead to a vehicle modification, e.g.:

- a change in the type of vehicle approved in the General Operating Permit
- which could pose a threat to road users, or
- cause a deterioration in exhaust gas emission levels or noise levels,

3

will result in the invalidation of the General Operating Permit (in many countries). The use of non-approved parts can impair safety.

Additional information about recommended conversion parts and accessories and permissible technical modifications is available from any Mercedes-Benz Service Centre. Always quote the engine number and type designation when ordering genuine parts. You will find the numbers on the engine plate (▷ page 22) and on the engine data card (▷ page 26).

Environmental note



To combine cost-effective repairs with recycling, Mercedes-Benz also offers reconditioned engines and parts. These are of the same quality and have the same warranty as new parts.

Operation

Commissioning

Monitoring engine operation

Stopping the engine

Winter operation

Cleaning/protective treatment

Service products

4

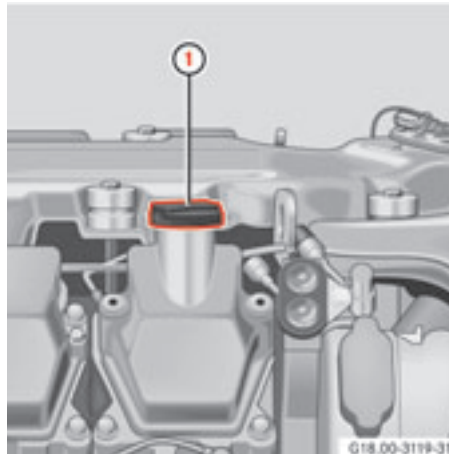
Preparation

When it leaves the factory, the engine is always filled with engine oil in accordance with Sheet 228.5 of the Mercedes-Benz Service Product Guidelines.

These high-quality engine oils assist the running-in process, enabling the first oil change to take place at the usual oil change intervals for normal operation. This eliminates the need for initial operation oils and additional oil changes.

4

The extended maintenance intervals can be observed if engine oils in accordance with Sheet 228.5 of the Mercedes-Benz Specifications for Service Products are used.



① Oil filler neck

- ▶ Check the oil level and add engine oil if necessary via filler neck ① up to the maximum mark on the dipstick (▷ see page 72).

Topping up with coolant

- Coolant composition (▷ see page 65).
- Filling the cooling system (▷ see page 93).

Refuelling

Use summer or winter fuel depending on the season. See also "Diesel fuels" (▷ page 62).



Make sure that utmost cleanliness is observed while refuelling and that no water is allowed to enter the tank.

Bleeding the fuel system

The fuel system is bled when the engine is started after refuelling if the fuel system was previously allowed to run dry. Continuous bleeding takes place automatically in the filter.

- ▶ Bleed the engine fuel system, i.e. the fuel filter and fuel pre-filter with heated water separator*, by operating the hand pump on the fuel pre-filter.



The battery must have enough charge when starting the engine to ensure the fuel system can be bled.

Checking the batteries

Risk of burning



The acid contained in batteries burns skin and eyes on contact.

- Do not allow acid to come into contact with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety glasses should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

Risk of explosion



Gases escaping from batteries can explode and injure people.

Therefore, do not allow fire, naked flames, smoking or the creation of sparks in the vicinity of batteries.

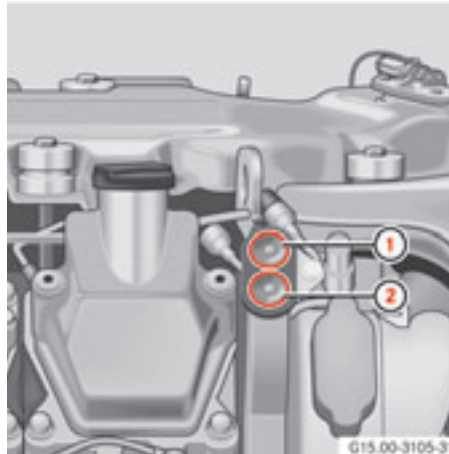
Only use batteries which are completely filled and have been perfectly maintained. Grease the battery terminals with acid-proof grease (terminal grease).

Commissioning

Initial commissioning

Carry out the work listed under "Preparation for commissioning" (▷ page 44) before operating the engine for the first time.

- ▶ Switch on the operating current.
- ▶ Start the engine and run at idling speed (idling position of the setpoint value sensor, e.g. accelerator pedal), for instance by operating the starter switch on the equipment or Start button ① on the engine (▷ see page 49).



Start-Stop buttons

- ① Start button
- ② Stop button

i

As a safety feature, the Telligent® engine system is equipped with a function that only allows the engine to be started with the transmission in neutral.

Risk of burns



The engine becomes very hot while it is running and remains so for some time after it has stopped. It will cause burns if you touch it.

Before starting any work on the engine, allow all engine parts to cool down or else wear suitable gloves and items of clothing to protect yourself against hot engine components.

Risk of injury

There is a danger of limbs being caught, entrapped, crushed or torn off by rotating engine parts. Therefore you should:

- Keep a safe distance between yourself and rotating engine parts, including when the engine is being started.
- Wait until all engine parts have come to a standstill before carrying out any work on the engine.
- Wear work clothing which is fastened and close-fitting. Wear a hair net if necessary. Remove jewellery such as watches and necklaces.

Risk of scalding

The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

Risk of poisoning

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into container normally used for beverages.
- Store coolant out of the reach of children.

► To check the coolant level:

Leave the engine running at medium speeds for approximately 5 minutes.

- If the coolant temperature is below 50 °C, check the coolant level again and add coolant if necessary.



Commissioning



If a heating system is connected to the cooling system, you must open all heating system valves while the cooling system is being topped up.

Otherwise there might be too little coolant in the cooling system after filling.

Only close the heating system valves once the engine has been running for a brief period and topped up where necessary.

4

- ▶ Check the engine for leaks.
- ▶ Check the hose fittings, hose clamps and pipe connections on the engine as well as the oil feed and return lines on the exhaust gas turbocharger for leaks and firm seating, and retighten if necessary.

- ▶ Check the engine oil level approximately 5 minutes after stopping the engine and add oil up to the maximum mark on the dipstick if necessary.
- ▶ Check for firm seating of mountings on the engine.
- ▶ Check the securing screws on the exhaust manifold, engine mountings, coolant pump, starter motor and air compressor for firm seating.

Starting the engine

Risk of injury



If not properly secured, a vehicle might accidentally be set in motion when the engine is started, knocking people down or trapping them. Before starting the engine:

- Prevent the vehicle from rolling away by applying the parking brake and, if necessary, by placing chocks under the wheels.
- Shift the transmission into neutral.

In the case of vehicle engines, secure the vehicle to prevent it from rolling away accidentally:

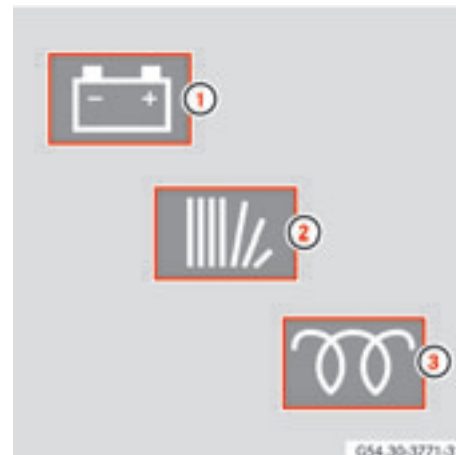
- ▶ Apply the parking brake.
- ▶ Shift the transmission into neutral.
- ▶ Insert the key into the ignition and turn it to the driving position.
The following indicator and warning lamps light up:

Starting procedure

1

Starting the engine for the first time (▷ see page 46).

Carry out special measures before starting the engine when it has been stopped for a long period, see the "Cleaning, protective treatment" section (▷ page 57).

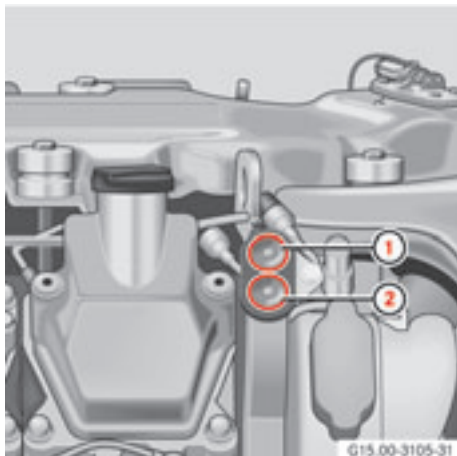


- ① Charge current indicator lamp
- ② Electronic system warning lamp
- ③ Flame-start system*



Commissioning

▷▷



4

Start-Stop buttons

- ① Start button
- ② Stop button

- ▶ Once flame-start system indicator lamp ③* has gone out, start the engine within 30 seconds:
 - ▶ using the starter switch on the equipment

or

- ▶ by pressing Start button ① on the engine.
- ▶ Monitor the oil pressure gauge immediately after starting the engine.



Keep the engine running at idling speed until an oil pressure reading is displayed (not rev up the engine). If no oil pressure is displayed after approximately 10 seconds, switch off the engine. Determine the cause (▷ page 52).



If necessary, break off the starting procedure after a maximum of 20 seconds, and then repeat after approximately 1 minute.

The charge current indicator lamp and electronic system warning lamp must go out after the engine has started. If they remain on, there are malfunctions; (▷ see page 51) and (▷ page 52).



Depending on the outside temperature, the flame-start system* indicator lamp lights up:

- for approximately 2 seconds (function check, flame-start system not operating)
- up to about 20 seconds (maximum preglow time)

If the flame-start system indicator lamp does not go out after 20 seconds, there is a fault.

At extremely cold temperatures, do not place the cold engine under a full load immediately after starting.

▼ Monitoring engine operation

Charge current

The charge current indicator lamp must go out after the engine has been started.



Charge current indicator lamp

If the indicator lamp does not go out or lights up when the engine is running, stop the engine and check the poly-V-belt.



The poly-V-belt contact surfaces must not be damaged (e.g. torn), oily or glazed, as otherwise the poly-V-belt may slip.

Do not run the engine without a poly-V-belt. The alternator and coolant pump will not be driven which will result in engine damage.

Monitoring engine operation

Telligent® engine system

The electronic system warning lamp must go out after the engine has been started.



Electronic system warning lamp

If the warning lamp does not go out or lights up while the engine is running, there is a fault in the Telligent® engine system.

Each fault is stored in the system with a special fault code. Even temporary faults are stored.

The fault codes can be shown on a display which is part of the Telligent® engine system (vehicle diagnostic system).

If the electronic system warning lamp lights up while the engine is running, read or determine the fault code.

Fault codes can be sorted using DaimlerChrysler diagnostic testers (STAR DIAGNOSIS or Minidiag 2-Tester). If the electronic system warning lamp lights up while the engine is running, read or determine the fault code.

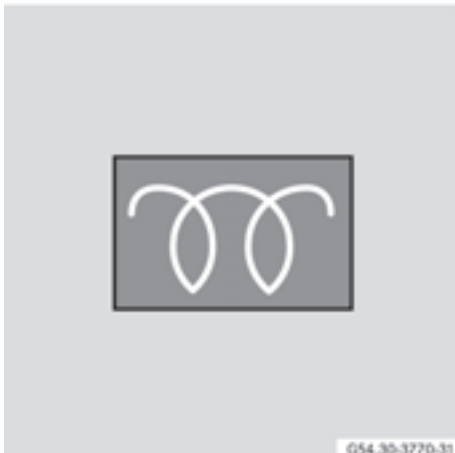
Oil pressure



Once the operating temperature has been reached, the engine oil pressure must not fall below:

- 2.5 bar at rated speed
- 0.5 bar at idling speed

If pressure falls below these values, stop the engine and determine the cause.

Flame-start system***Flame-start system indicator lamp (example)**

There is a fault in the flame-start system if:

- the flame-start system indicator lamp lights up when the engine is running
- the indicator lamp does not go out after 20 seconds when the engine is started

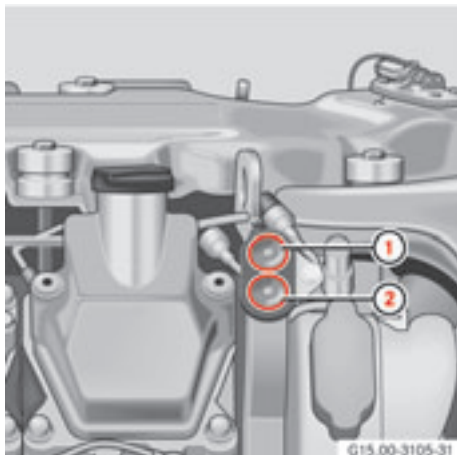
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The flame-start system switches off automatically if:

- the engine is not started within 30 seconds of the flame-start system indicator lamp going out
- the engine is started while the flame-start system indicator lamp is still lit
- the charge current indicator lamp does not go out when the engine is running
- the engine reaches a temperature at which the flame-start system is no longer needed

Stopping the engine

- ▶ After running at full power output or at a high coolant temperature, allow the engine to idle without load for one or two minutes.



Start-Stop buttons

- ① Start button
- ② Stop button

- ▶ Press Stop button ② on the engine or on the equipment-resident stopping facility.



Stop the engine immediately if you observe any of the following signs:

- oil pressure dropping or fluctuating significantly
- power and speed dropping while the position sensor (accelerator pedal position sensor) stays in the same position
- large amounts of exhaust smoke being emitted from the exhaust
- coolant and oil temperature rising very rapidly
- unusual noises suddenly occurring in the engine or exhaust gas turbocharger

▼ Winter operation

The following notes should be observed at the start of the cold season:

Fuel

Risk of fire



There is an increased risk of fire when handling fuels as they are highly flammable.

Avoid fire, naked flames, and sparks and refrain from smoking when handling fuels.

Use cold-resistant diesel fuel (▷ see page 62).

Engine oil

When changing the engine oil, select an engine oil that is compatible with the SAE class and the ambient temperatures expected during the period of use (▷ see page 64).

Coolant

Risk of scalding



The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

Risk of poisoning



There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into container normally used for beverages.
- Store coolant out of the reach of children.

Check the coolant's antifreeze protection in good time and increase the antifreeze/corrosion inhibitor concentration if necessary (▷ see page 65).

Winter operation

Batteries

Have the batteries serviced and recharged more frequently during the cold months of the year.

Risk of burning



The acid contained in batteries burns skin and eyes on contact.

- Do not allow acid to come into contact with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety glasses should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

Risk of explosion



Gases escaping from batteries can explode and injure people.

Therefore, do not allow fire, naked flames, smoking or the creation of sparks in the vicinity of batteries.

Careful maintenance and low power consumption will help maintain the full battery charge. Starting capacity is greatly reduced in cold weather; for example, at $-10\text{ }^{\circ}\text{C}$ it is only about 60% of normal capacity. If the engine is not used for a long period of time, store the batteries in a heated place if possible. Ensure good ventilation when recharging.

▼ Cleaning / protective treatment

Cleaning the engine

Risk of poisoning

Care and cleaning agents can be poisonous and lead to severe poisoning if swallowed.

- Always keep care and cleaning agent containers closed and out of the reach of children.
- Never store care or cleaning products in foodstuff containers such as bottles so as to avoid confusion with foodstuffs.
- Observe the instructions for using care and cleaning products.

Risk of fire and injury

Fuels are highly flammable and can injure your health. If they are used as cleaning agents, they can cause fires or skin irritation and poisoning.

Never use fuels for cleaning.

Environmental note

Observe the regulations for environmental protection.

Only clean the engine in a washing area designed for this purpose. Dispose of empty packaging and used cleaning materials in an environmentally responsible manner.



Make sure that water does not enter the intake, ventilation or bleed ducts.

Protect the engine after cleaning. Be careful to protect the belt drive against preservative agents.



Information about suitable cleaning and preservative agents is available from any Mercedes-Benz Service Centre.

Cleaning/ protective treatment

High-pressure cleaners

Observe the manufacturer's operating instructions.



Maintain the minimum distance between the high-pressure cleaner nozzle and the object to be cleaned:

- approximately 70 cm for round-spray jets
- approximately 30 cm for 25° flat-spray jets and concentrated-power jets

Keep the water jet constantly moving while cleaning. To avoid damage, do not aim the water jet directly at:

- electrical components,
- couplings
- seals or
- hoses

Information about suitable cleaning and preservative agents is available from any Mercedes-Benz Service Centre.

Cleaning the cooling system

Environmental note



Collect used coolant, cleaning solutions and detergents and dispose of them in accordance with current local regulations and in an environmentally responsible manner.

- ▶ Blow out any foreign objects (dust, insects, etc.) from the radiator fins using compressed air or remove by spraying water on the rear side of the radiator (against the direction of the cooling air flow).



Only apply moderate pressure when cleaning since the radiator fins could otherwise be damaged.

Risk of scalding



The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

Risk of poisoning

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
 - Never put coolant into container normally used for beverages.
 - Store coolant out of the reach of children.
- ▶ Drain the coolant when the engine is cold (coolant temperature below 50 °C) (▷ page 93).
- ▶ If a heater is attached to the cooling system, open the regulating valves fully.

Degreasing

- ▶ Fill the cooling system with a 5% solution of water and a mild alkaline cleaner, e.g. "P3 Croni" (50 g cleaning agent per litre of water).
- ▶ Warm up the engine at moderate engine speed up to approximately 80 °C (coolant thermostat starts to open) and allow to run for approximately 5 minutes longer.
- ▶ Switch off the engine and allow to cool down to approximately 50 °C.
- ▶ Drain off the cleaning solution completely.
- ▶ Immediately afterwards, fill the cooling system with clean water, warm up the engine, and drain off the water after 5 more minutes. Then repeat the procedure a second time.
- ▶ Fill the cooling system with fresh coolant (▷ page 94), following the instructions in the "Coolant" section (▷ page 65).

Cleaning/ protective treatment

Protective treatment

The special protection required will depend on the length of time the engine is to be out of use as well as the climate of the place where the engine is to be located or stored.

After cleaning the engine, store it in a dry, well-ventilated place as far as possible. If this is not possible, the intervals for carrying out regular protective measures must be shortened by half.

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It is essential that the engine be protected from direct contact with water (rain / spray water).

If the engine is to be out of use for **less than 12 months** and the above conditions are met, no corrosion-protection measures need be taken.

If the engine is to be out of use for **more than 12 months and there are exceptional storage and transport conditions**, special protective treatment measures are required.



Information is available from any Mercedes-Benz Service Centre. We strongly recommend asking for information.

▼ Service products

Risk of poisoning and injury

Service products can cause injury or poisoning if they come into contact with skin or are swallowed.

Observe the prevailing regulations when handling service products and storing and disposing of them. Service products could otherwise endanger people and the environment.

- Always wear appropriate protective clothing and a breathing mask when handling service products. If possible, avoid inhaling vapours.
- Do not allow service products to come into contact with your skin, eyes or clothing. Clean affected areas of skin with soap and water.

- If service products do come into contact with your eyes, rinse off thoroughly with clean water and consult a doctor if necessary.
- Consult a doctor immediately if a service product is swallowed.
- Keep service products out of the reach of children.

Risk of fire

There is an increased risk of fire when handling fuels and lubricants as they are highly flammable.

Avoid fire, naked flames, and sparks and refrain from smoking when handling service products.

Greases and lubricants must be compatible with engine components. For this reason, only brands that have been tested and approved by DaimlerChrysler should be used. These are listed in the Mercedes-Benz Specifications for Service Products.

Special lubricant additives are not necessary. The warranty entitlement may be restricted if special lubricant additives are used.



Information is available from any Mercedes-Benz Service Centre.

Environmental note

Dispose of service products as well as parts which come into contact with service products, e.g. the filter, in an environmentally responsible manner.

Observe the legal requirements.

Service products

Diesel fuels

Only use commercially available vehicle diesel fuels (EN 590). Grades such as marine diesel fuel, heating oils, etc. are not permitted.

Fuel additives are not necessary. The warranty entitlement may be restricted if fuel additives are used.

If diesel fuels with a sulphur content above 0.3% by weight are used, carry out an oil change at shorter intervals. Observe the information provided in the Maintenance Booklet.

Filling the vehicle's fuel tank from drums or canisters may introduce impurities into the fuel system. This can lead to fuel system malfunctions. Therefore, filter the fuel when filling the tank.

Never allow water to mix with the diesel fuel.

The OM 501 LA and OM 502 LA engines are suitable for use with FAME fuels in accordance with DINE 51606. Consult a Mercedes-Benz Service Centre to have the exact conditions of use (e.g. maintenance intervals) explained before you start using such fuels.

Diesel fuels in extremely cold weather

At low outside temperatures, paraffin separation may affect the flow characteristics of diesel fuel.

To prevent operating problems (e.g. as a result of blocked filters), diesel fuel with improved cold flow properties is available on the market in the winter months. Deviations may be possible in the transition between the cold and the warm seasons, and in other countries. In Germany, special cold-resistant winter-grade diesel fuels are sold. They ensure reliable operation down to approximately -20°C .

Winter-grade diesel fuel can normally be used without risk of malfunctioning at the outside temperatures expected in the country of sale.

If summer diesel fuel or winter diesel fuel with less resistance to low temperatures is used, only add a specific quantity of flow improver or kerosene, depending on the outside temperatures.

Risk of fire and explosion



Adding petrol reduces the flash point for the diesel fuel and increases the risk of fire and explosion.

- Therefore, never add petrol to diesel fuel.
- For this reason, you must avoid fire, naked flames and sparks and refrain from smoking when handling these service products.
- Observe the relevant safety regulations.



If petrol is added, there is a risk of serious engine damage.

Therefore, never add petrol to diesel fuel.

Add the flow-improver additive to the diesel fuel in good time, before paraffin separation affects the diesel's flow properties. Malfunctions caused by paraffin separation can only be remedied by warming up the entire fuel system.

Do not add additives to especially cold-resistant winter diesel fuels, as the fuel's cold flow properties could deteriorate.

Flow improvers

The effectiveness of flow improvers cannot be guaranteed with all fuels. Observe the manufacturer's recommendations.

Information about recommended flow improvers is available from any Mercedes-Benz Service Centre.

Kerosene

Add as little as possible, depending on outside temperatures. The addition of 5% by volume of kerosene improves the cold-resistance of diesel fuel by approximately 1 °C. Do not exceed the maximum mixing ratio of 50% kerosene.

Service products

For safety reasons, only mix kerosene with diesel fuel in the fuel tank. Add the kerosene first, then the diesel fuel. Run the engine for a while to ensure that the additive reaches all parts of the fuel system.

Risk of fire and explosion

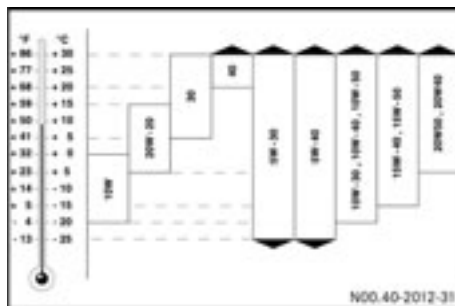


Adding kerosene reduces the flash point of the diesel fuel and increases the risk of fire and explosion.

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- For this reason, you must avoid fire, naked flames and sparks and refrain from smoking when handling these service products.
- Observe the relevant safety regulations.

Engine oils



Engine oil SAE classes

Engine oils are specially tested for suitability in Mercedes-Benz engines. Therefore, only use engine oil brands approved by Mercedes-Benz. These are listed in the Mercedes-Benz Specifications for Service Products. Observe the information provided in the Maintenance Booklet.



The use of non-approved engine oil brands can restrict the warranty entitlement.

If engine oils of a different grade are used, the oil change intervals will alter. Information is available from any Mercedes-Benz Service Centre. Select the SAE class of engine oil in accordance with the outside temperatures.

After maintenance work, the engine oil change is entered in the Maintenance Booklet along with the engine oil brand, grade and SAE class.

Only use engine oils of the same grade and SAE class when topping up.



If engine oil of a lower grade is used to top up, the properties of the engine oil are impaired and the engine oil and filter changes must therefore be carried out at shorter intervals.

Coolant

Coolant is a mixture of water and anti-freeze/corrosion inhibitor. Coolant must remain in the cooling system all year round to ensure anti-corrosion protection and to increase the boiling point.

Risk of poisoning



There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into container normally used for beverages.
- Store coolant out of the reach of children.



Renew coolant every three years, since the level of corrosion protection decreases over time.

Water

Water without additives is not permitted as coolant, even if antifreeze properties are not necessary.

Coolant water must satisfy certain requirements which are not always fulfilled by drinking water.

If the water used is not of sufficient quality, it must be treated.



Information is available from any Mercedes-Benz Service Centre.

Service products

Antifreeze/corrosion inhibitor

To prevent damage to the cooling system:

- Only use approved antifreeze / corrosion inhibitor. Information is available from any Mercedes-Benz Service Centre.
- When topping up (after coolant loss), make sure that the antifreeze / corrosion inhibitor concentration is 50% by volume (this ensures antifreeze protection down to -37 °C).

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If the concentration is too low there is a risk of engine damage as a result of corrosion/cavitation.

- Do not increase the concentration of antifreeze / corrosion inhibitor beyond 55% by volume (= maximum antifreeze protection). Above this concentration, antifreeze protection deteriorates and heat dissipation is less effective.

Coolant mixing ratio:

Antifreeze protection down to	-37 °C	approximately -45 °C
Water % by vol.	50	45
Antifreeze / corrosion inhibitor % by vol.	50	maximum 55

In exceptional cases, when no antifreeze / corrosion inhibitor is available and / or no antifreeze protection is required (in tropical regions), use an approved coolant additive without antifreeze properties in accordance with Sheet 312.0 of the Mercedes-Benz Specifications for Service Products (e.g. MB corrosion inhibitor A 000 989 13 25 10 by DaimlerChrysler AG or an approved additive from another manufacturer).



In this case, the coolant must be renewed every year.

Disposal

Environmental note



The coolants mentioned are biodegradable substances. When disposing of used coolants, observe the legal requirements and waste water regulations in the country concerned.

DaimlerChrysler recommends that you ask the relevant water authority for advice on the disposal of coolant.

Due to the complex tasks which a modern coolant must perform, improper "recycling" consisting simply of a mechanical pre-cleaning must be emphatically rejected.

Maintenance instructions

This section describes all maintenance work which concerns the engine.

Risk of accident



Before any maintenance work or repairs are carried out, please make sure that you read the relevant sections of the technical documentation concerned with servicing and repairs, for example:

- Operating Instructions and workshop information

You should also familiarise yourself first with the legal requirements, for example:

- work safety and accident prevention regulations

You could otherwise fail to recognise dangers and could injure yourself or others.

Risk of accident



Incorrect maintenance work or failure to carry out maintenance work, e.g. not changing the oil filter or not observing the correct maintenance interval, can cause engine damage. Engine damage can lead to an increase in the risk of an accident.

For that reason, please observe the instructions on servicing the engine given in these Operating Instructions.



All maintenance intervals and maintenance work refer to genuine Mercedes-Benz parts and accessories specifically approved for the engine by DaimlerChrysler.

The scope of maintenance and frequency of maintenance work depend on the different operating conditions and are listed in the Maintenance Booklet.

The work carried out must be confirmed in the Maintenance Booklet. This proof of regular maintenance is always required for any warranty claims.

Please also observe the maintenance regulations for special accessories.



Change the engine oil filled at the factory in accordance with Sheet 228.5 of the Mercedes-Benz Specifications for Service Products if more than 12 months elapse before engine is operated for the first time.

▼ Overview of work plans

Maintenance service

Engine:

Oil change and filter replacement



Change the engine oil and replace the oil filter at least once a year.

Poly-V-belt: Check condition

Checking for leaks and general condition

Check for points of abrasion and incorrect positioning:

Engine:

Lines and hoses on the engine

Intake pipe between air cleaner and engine

Cooling and heating system

Checking and correcting fluid level

If more fluid is lost than can be accounted for by normal consumption, trace the cause and rectify.

Engine cooling system:

Check and correct fluid level and antifreeze / corrosion inhibitor concentration

Additional work

Valve clearance: check and adjust



Adjust the valve clearance during the first maintenance service and then during the 3rd, 5th, 7th maintenance services and so on.

Additional work during every 3rd maintenance service

Fuel filter: replace filter

Fuel prefilter with water separator: replace filter element

Engine brake*: check condition and setting

Coolant: renew



Renewal interval depends on the coolant additive used (see Mercedes-Benz Specifications for Service Products).

Work plans

Engine: Checking for leaks and general condition

- ▶ Visual inspection of the engine for signs of leakage.

Sealing points which are slightly damp are harmless.



Remedy more significant leaks involving constant oil loss immediately.

Lines and hoses on the engine: Checking for leaks and general condition

- ▶ Make a visual inspection of lines and hoses for leaks. At the same time, make sure that all lines and hoses are undamaged, that they are correctly routed in such a way that no chafing is caused and that they are correctly secured.

Risk of burns



The engine is very hot when it is running and also for some time after it has been switched off. It may cause burns if you touch it.

- Before starting any work on the engine, allow all engine parts to cool down or else wear suitable gloves and items of clothing to protect yourself against hot engine components.

Risk of injury



There is a danger of limbs being caught, entrapped, crushed or torn off by rotating engine parts. Therefore you should:

- Keep a safe distance between yourself and rotating engine parts, including when the engine is being started.
- Wait until all engine parts have come to a standstill before carrying out any work on the engine.
- Wear work clothing which is fastened and close-fitting. Wear a hair net if necessary. Remove jewellery such as watches and necklaces.

Engine: Oil change and filter replacement

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Only change engine oil when the engine is at normal operating temperature.

Risk of scalding

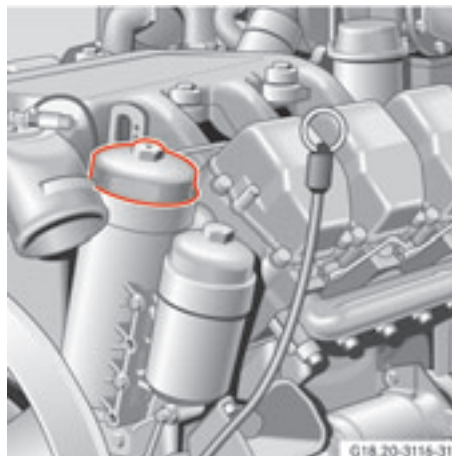


Hot engine oil spraying out can scald your skin and eyes.

Wear suitable protective gloves, protective clothing and eye protection.

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Make sure that no foreign objects enter the filter housing. Never wipe the filter housing out, as this could allow fluff or dirt to get into the oil circuit.



Oil filter on the engine

- ▶ Remove the oil filter cap using the socket spanner insert (WAF 36). Allow oil to drain from the filter housing.
- ▶ Unscrew cap ① and oil filter element ③ and remove oil filter element ③ from the cap by pressing the lower edge on the sides.



Oil filter

- ① Cap
- ② Sealing ring
- ③ Oil filter element



Work plans

- ▶ Replace sealing ring ② on cap ①. Grease the sealing ring lightly.
- ▶ Insert new filter element ③ in cap ① and clip it into place by pressing on it.
- ▶ Screw on cap ① and oil filter element and tighten; tightening torque 40 Nm.

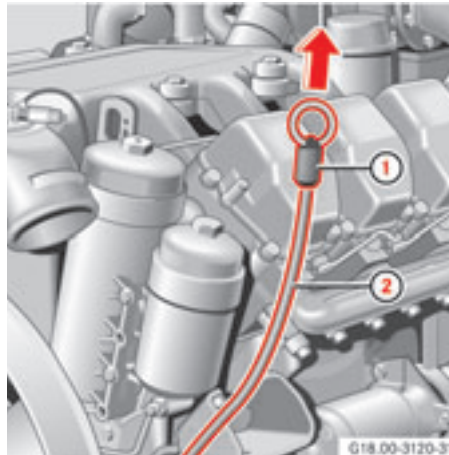
Pumping out/draining engine oil

Pumping out:



Observe the operating instructions for the engine oil scavenging tool.

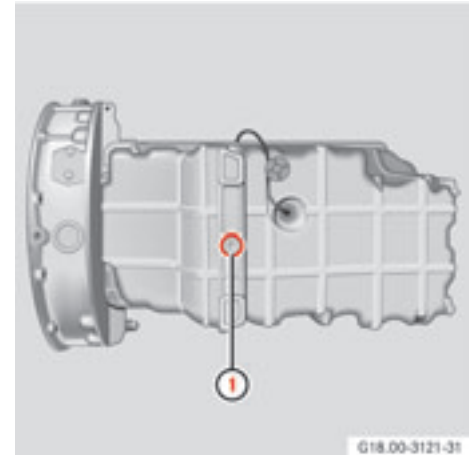
- ▶ Siphon off the engine oil through the dipstick guide pipe ②.
- ▶ To do this, pull out dipstick ① and insert the scavenging device sealed with an O-ring into dipstick guide pipe ②.



- ① Dipstick
- ② Dipstick guide pipe

Draining:

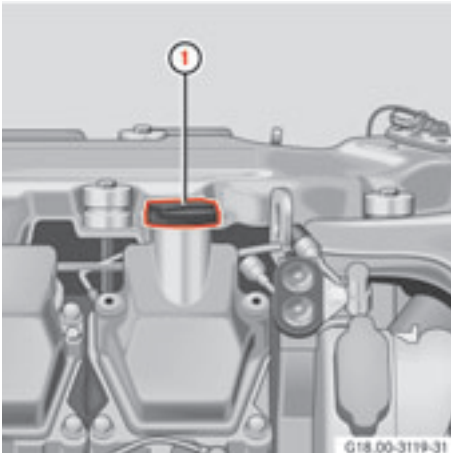
- ▶ Place a suitable collecting receptacle under drain plug ① on the underside of the oil sump.
- ▶ Unscrew drain plug ① carefully and allow the oil to drain out.



- ① Oil drain plug

Environmental note

Dispose of engine oil and filters in accordance with the legal regulations in force at the place of use of the engine.



① Oil filler neck

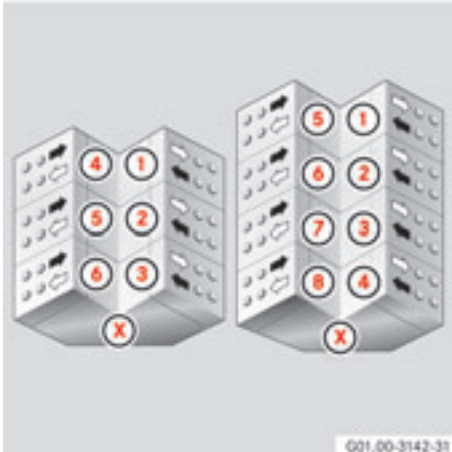
- ▶ Screw drain plug back in with a new sealing ring and tighten; tightening torque 60 Nm.
- ▶ Add new engine oil into the engine via the oil filler neck ① up to the maximum mark on the dipstick.
- ▶ Start the engine and run at idle (with the setpoint value sensor in the idling position). Monitor the oil pressure gauge.



Keep the engine running at idling speed until an oil pressure reading is displayed. If no oil pressure is displayed after approximately 10 seconds, switch off the engine. Determine the cause.

- ▶ Check the filter and drain plug for leaks.
- ▶ Stop the engine. Check the oil level after approximately 5 minutes. Top up oil to the maximum mark on the dipstick if necessary.

Adjusting the valve clearance



5

Layout of cylinders and valves

- ← = inlet valve
→ = exhaust valve
X = flywheel end

Special tools

Turning tool 904 589 04 63 00

Valve adjustment tool 422 589 00 11 00

Valve clearance:

Inlet valves = 0.40 mm

Exhaust valve = 0.60 mm



Adjust the valve clearance when the engine is cold (at least 30 minutes after the engine was stopped, even if it was only operated for a brief period).

Clean very dirty cylinder head covers before removing.

Risk of injury



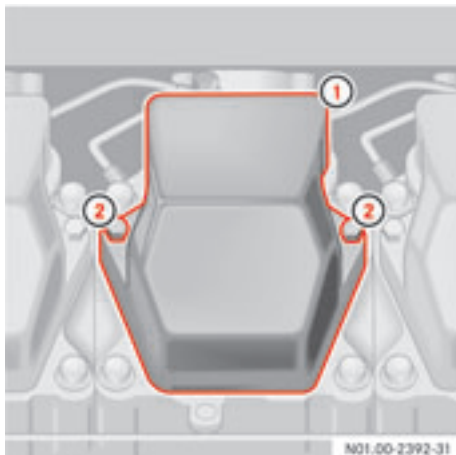
If not properly secured, a vehicle might accidentally be set in motion, knocking people down or trapping them and otherwise causing an accident and injuring you or others.

- Always secure the vehicle against rolling away by applying the parking brake and, if necessary, by placing chocks under the wheels.
- Shift the transmission into neutral.
- Only turn the engine over with the rotation device provided for the purpose.

Removing/fitting cylinder head covers

- ▶ Slacken hexagon bolts ② on cylinder ①.
- ▶ Remove cylinder head cover ①.

Fit in the reverse order.



Cylinder head cover securing bolts



Flywheel inspection hole

- ▶ Remove the cover of the flywheel housing inspection hole.
- ▶ Assemble turning tool 904 589 04 63 00 on the flywheel housing inspection hole.

Concluding work

After adjusting the valve clearance:

- ▶ Refit the cylinder head cover (▷ see page 75).
- ▶ Remove the turning tool from the flywheel housing inspection hole.
- ▶ Close the inspection hole with the cap. Tightening torque: 25 Nm.

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- Adjusting the valve clearance on the OM 50 1 LA: ▷ page 76.
- Adjusting the valve clearance on the OM 50 2 LA: ▷ page 77.

Work plans

Adjusting the valve clearance on the OM 501 LA

Engine	Crankshaft position	Cylinder/ valves to be adjusted					
		1	2	3	4	5	6
OM 501 LA	5th cylinder valve overlap	I / E	E	I	E	-	I
6-cylinder	1st cylinder valve overlap	-	I	E	I	I / E	E

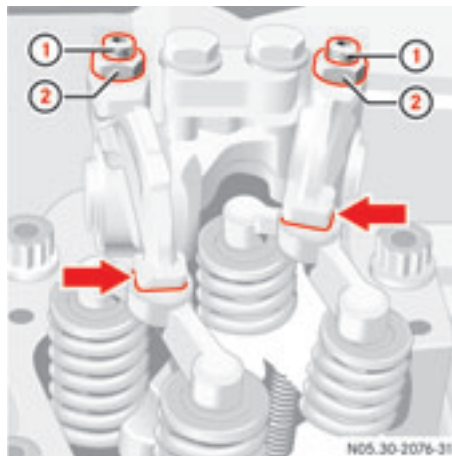
I – inlet valve

E – exhaust valve

Adjust all valves in 2 crankshaft positions.

- 5 ▶ Use the rotation device to turn the crankshaft until No. 5 cylinder is at overlap TDC (No. 1 cylinder at ignition TDC). Then turn No. 1 cylinder to overlap TDC (No. 5 cylinder at ignition TDC).
- ▶ Check the valves in accordance with the above table and adjust.

Checking/adjusting valve clearance



① Adjustment screw

② Counternut

- ▶ Measure the valve clearance between the rocker arm and valve bridge with a feeler gauge (arrow). It must be possible to pull the feeler gauge through with only light resistance.
- ▶ Slacken counternut ② to adjust the valve clearance. Adjust the valve clearance by turning adjustment screw ①.
- ▶ Retighten counternut; tightening torque 50 Nm.
- ▶ Check the valve clearance again and readjust if necessary.

Adjusting the valve clearance on the OM 502 LA

Engine	Crankshaft position	Cylinder /valves to be adjusted							
		1	2	3	4	5	6	7	8
OM 502 LA	6th cylinder valve overlap	I/E	E	I	I	E	-	E	I
8-cylinder	1st cylinder valve overlap	-	I	E	E	I	I/E	I	E

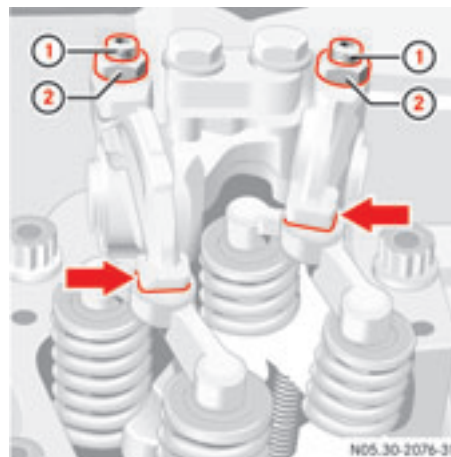
I – inlet valve

E – exhaust valve

Adjust all valves in 2 crankshaft positions.

- ▶ Use the rotation device to turn the crankshaft until No. 6 cylinder is at overlap TDC (No. 1 cylinder at ignition TDC). Then turn No. 1 cylinder to overlap TDC (No. 6 cylinder at ignition TDC).
- ▶ Check the valves in accordance with the above table and adjust.

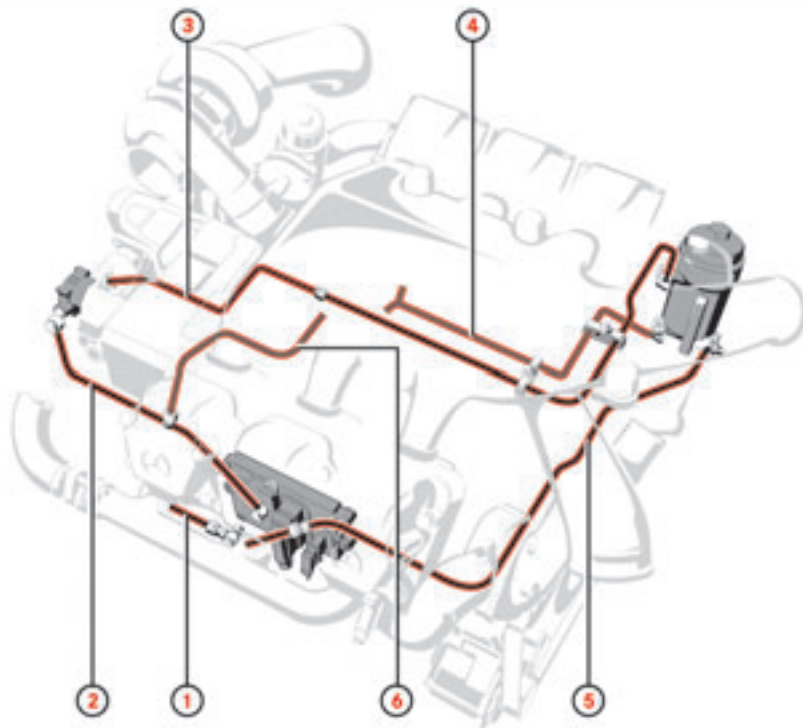
Checking / adjusting valve clearance



- ① Adjustment screw
- ② Counternut

- ▶ Measure the valve clearance between the rocker arm and valve bridge with a feeler gauge (arrow). It must be possible to pull the feeler gauge through with only light resistance.
- ▶ Slacken counternut ② to adjust the valve clearance. Adjust the valve clearance by turning adjustment screw ①.
- ▶ Retighten counternut; tightening torque 50 Nm.
- ▶ Check the valve clearance again and readjust if necessary.

Fuel connections



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Low pressure fuel circuit

- ① From the fuel tank
- ② To the fuel pump
- ③ To the fuel filter
- ④ To the unit pumps
- ⑤ Return line to tank
- ⑥ Return line from the unit pumps

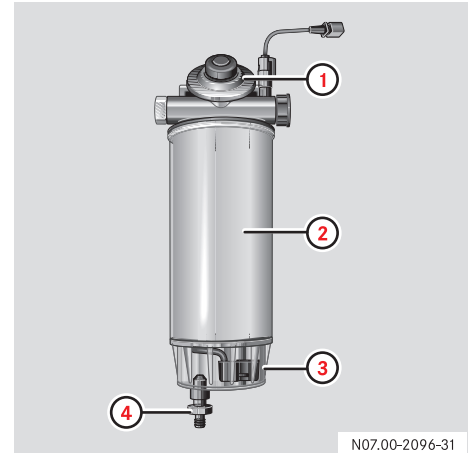
Fuel prefilter with heated water separator*: Replacing the filter element**Risk of fire**

There is an increased risk of fire when handling fuels as they are highly flammable.

Avoid fire, naked flames and sparks and refrain from smoking when handling fuels.

Environmental note

Dispose of used filter elements, seals and fuel residue in accordance with applicable local regulations.

**Fuel prefilter with heated water separator***

- ① Hand pump
- ② Filter housing
- ③ Water separator (heated)
- ④ Water drain valve



Work plans

- ▷▷ ▶ Open drain valve ④ and loosen the vent screw. Collect the fuel/water mixture from the filter element in a suitable receptacle.
- ▶ Unscrew filter housing ②.
- ▶ Unscrew water separator ③ from filter housing ② and clean or replace as necessary.
- ▶ Refit in the reverse order. Use new sealing rings.



Screw filter element ② onto the filter head tightly by hand.

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- ▶ Close the drain valve and fill the pre-filter using fuel hand pump ①. Then close the vent screw.
- ▶ Start the engine and bleed the fuel system.



Leave the engine running for approximately 1 minute. The fuel system bleeds automatically. If the engine does not start, you will have to bleed the fuel system manually.

- ▶ Start the engine, check the prefilter for leaks.

Replacing the fuel filter element

Risk of fire



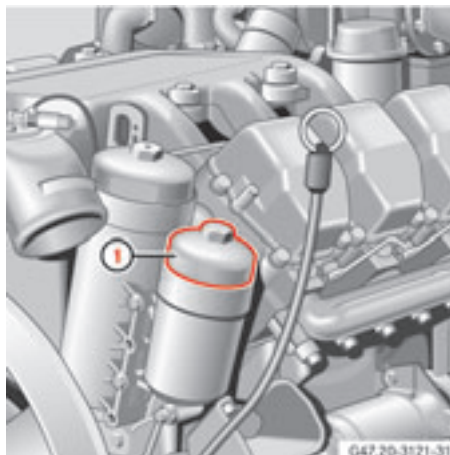
There is an increased risk of fire when handling fuels as they are highly flammable.

Avoid fire, naked flames and sparks and refrain from smoking when handling fuels.

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The fuel prefilter is fitted on the equipment or vehicle.

Therefore, observe the notes on operating and maintenance regarding the fuel prefilter in the operating instructions for the equipment or vehicle.



To replace the fuel filter element

① Cap

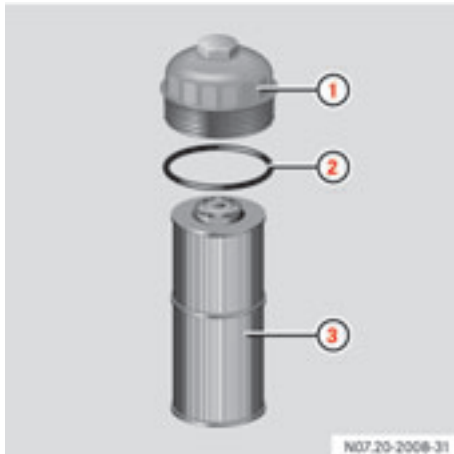
- ▶ Open the tank cap to prevent excess pressure in the fuel tank.
- ▶ Unscrew fuel filter cap ① with the socket spanner (WAF 36).

- ▶ Pull cap ① and filter element ③ slightly out of the filter housing. Allow fuel to flow out.
- ▶ Remove the cap and filter element. Unclip the filter element by pressing the lower edge of the filter element on the sides.

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- Make sure that no foreign objects enter the filter housing.
- Never wipe the filter housing out.
- Make sure that no water enters the filter housing.

Work plans



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Fuel filter element

- ① Cap
- ② Sealing ring
- ③ Filter element

- ▶ Replace sealing ring ② (grease lightly).
- ▶ Clip new filter element ③ into cap ①.

- ▶ Screw on cap ① and filter element ③ and tighten: tightening torque 25 Nm.
- ▶ Bleed the fuel system (▷ page 45).
- ▶ Start the engine and bleed the fuel system.



Leave the engine running for approximately 1 minute. The fuel system bleeds automatically. If the engine does not start, you will have to bleed the fuel system manually.



To allow manual bleeding, a hand pump must be provided on the equipment or the vehicle, e.g. on a fuel prefilter.

- ▶ Start the engine and check the fuel filter for leaks.

Environmental note



If the level of the diesel fuel in the tank is higher than the level of the engine, you will have to close the feed line when replacing the filter. Diesel fuel could otherwise flow out.

Intake pipe between air cleaner and engine: Checking for leaks and general condition

- ▶ Check the rubber sleeves, intake pipe and connection hoses for damage and leaks.
- ▶ Check the hose clamps, flanged joints and intake manifold for firm seating.

Poly-V-belt: Checking the condition

Risk of injury



Faulty poly-V-belts may tear and parts or all of the belt may be thrown off, thereby causing injury to persons.

- Always adhere to the specified maintenance intervals for poly-V-belts.
- If damage is detected, replace the poly-V-belt concerned immediately.

Special tools

Turning tool: 904 589 04 63 00

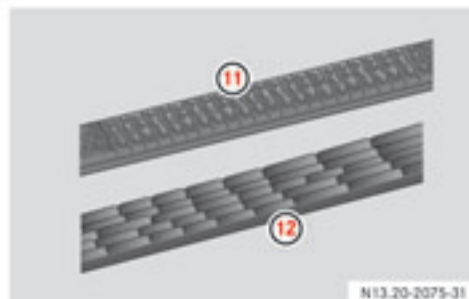
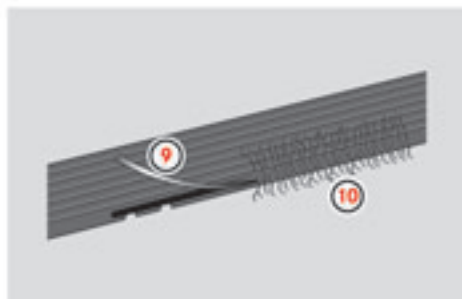
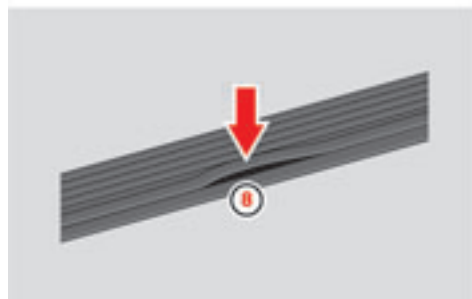
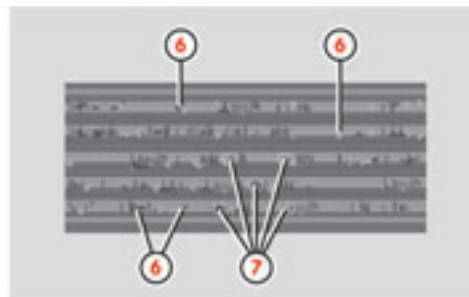
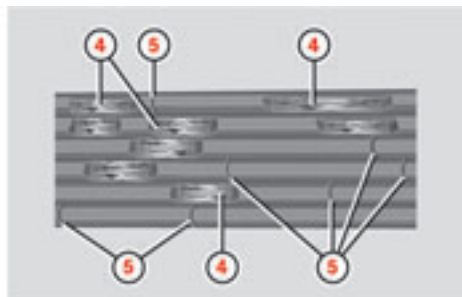
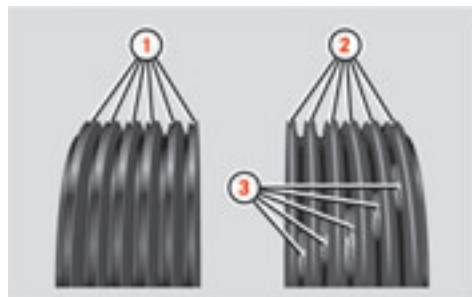
- ▶ Fit the rotation device to the flywheel housing inspection hole.
- ▶ Make a chalk mark on the poly-V-belt.

- ▶ Check the poly-V-belt for damage in sections; rotate the engine and poly-V-belt a little at a time using the rotation device until the chalk mark is reached again.



Replace the poly-V-belt if one of the damage patterns shown on the next page is detected. For information on installing and removing the poly-V-belt (▷ see page 86).

- ▶ Remove the turning tool from the flywheel housing inspection hole.
- ▶ Close the inspection hole with the cap. Tightening torque: 25 Nm.

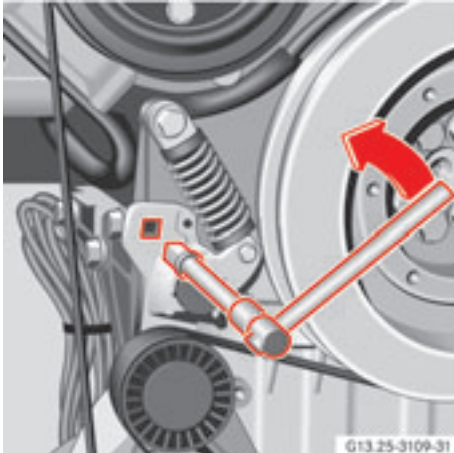


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Damage patterns

- ① Condition as new: trapezoidal ribs
- ② One-sided wear: wedge-shaped ribs
- ③ Cord visible in the base of the ribs
- ④ Ribs split
- ⑤ Transverse cracks in several ribs
- ⑥ Rubber lumps in the base of the belt
- ⑦ Deposits of dirt/stones
- ⑧ Rib detached from the base of the belt
- ⑨ Cord torn out to the side
- ⑩ Outer cords frayed
- ⑪ Transverse cracks on the back of the belt
- ⑫ Transverse cracks in several ribs

Removing and installing the poly-V-belt



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Spanner with extension in tensioner

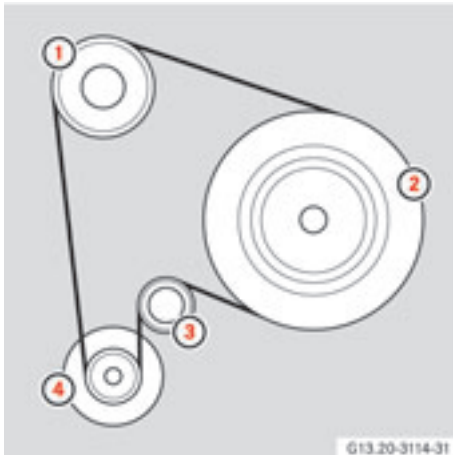
Risk of injury



The tensioner is spring-tensioned. When it is loosened or tightened, there is a risk of injury from hands or fingers being crushed or trapped in pretensioned parts.

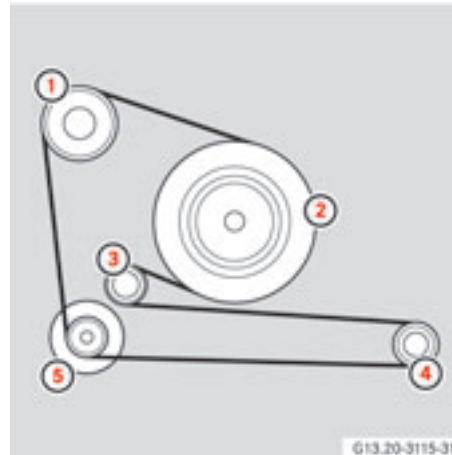
- Make sure that the tool is guided / handled correctly.
 - Keep your fingers out of the area between the belt pulley and the poly-V-belt when fitting or dismantling the poly-V-belt.
 - Wear work gloves when working on the tensioner.
- ▶ Insert the spanner with the 1/2" extension into the tensioner.
- ▶ Swing the tensioning pulley upwards and remove the poly-V-belt.
- ▶ Swing back the tensioner.

- ▶ Check that the tensioner and belt pulley are in perfect condition (e.g. check for worn bearings on tensioner, tensioning pulley and deflection pulleys as well as wear on belt pulleys); replace parts if necessary.
- ▶ Lay the poly-V-belt (new) on all pulleys, except for the tensioning pulley (see illustrations for poly-V-belt routing ▷ page 87).
- ▶ Swing the tensioning pulley upwards using the lever, place the poly-V-belt onto the tensioning pulley and swing back the tensioning pulley.
- ▶ Remove the spanner and check for correct seating of the poly-V-belt on the belt pulley.



Poly-V-belt routing without refrigerant compressor OM 501 LA/OM 502 LA

- ① Coolant pump pulley
- ② Crankshaft pulley
- ③ Idler pulley (tensioning device)
- ④ Alternator



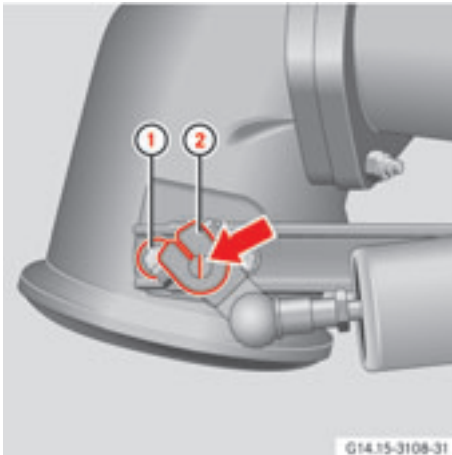
Poly-V-belt routing with refrigerant compressor OM 501 LA/OM 502 LA

- ① Coolant pump pulley
- ② Crankshaft pulley
- ③ Idler pulley (tensioning device)
- ④ Pulley on the refrigerant compressor
- ⑤ Alternator

Work plans

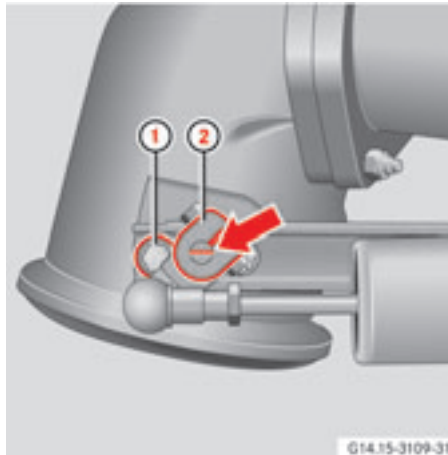
Engine brake*: Checking the condition and adjustment

Checking the condition



Throttle valve lever in rest position

- ① Retainer
- ② Throttle valve lever



Throttle valve lever in working position

- ① Retainer
- ② Throttle valve lever

- ▶ Remove the wire circlip from the ball cup on the engine brake cylinder.
- ▶ Force the ball cup off the ball neck of throttle valve lever ②.

- ▶ Check the engine brake cylinder, ball neck coupling and ball cup, and the throttle valve shaft for wear.
- ▶ Check the firm seating of throttle valve lever ② on the throttle valve shaft, tighten screws if necessary.
- ▶ Grease the ball cup with the grease specified.
- ▶ Push the ball cup back onto the ball neck coupling, fit the wire circlip.

Checking adjustment

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Throttle valve lever ② must contact bracket ① in operating position (cylinder extended) when the engine brake is operated.

When the engine brake cylinder is in rest position (with the cylinder retracted), the throttle valve lever must also contact the bracket; the pre-tension of the engine brake cylinder return spring is then sufficient.

Check the position of the throttle valve shaft: the notch must be vertical when the exhaust brake is in rest position (▷ page 88). In working position, the notch must be horizontal (▷ page 88).

Work plans

Engine cooling system: Checking and correcting the fluid level and the antifreeze / corrosion inhibitor

Risk of scalding



The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

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Risk of poisoning



There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into containers normally used for beverages.
- Store coolant out of the reach of children.



Only use service products approved by DaimlerChrysler (see Specifications for Service Products).



Only check the coolant level when the coolant temperature is below 50 °C. Check the antifreeze / corrosion inhibitor before correcting the coolant level. Only use prepared coolant with 50% by volume antifreeze / corrosion inhibitor for topping up.

- ▶ Open the engine cooling system radiator cap slowly. Relieve excess pressure.
- ▶ Check the antifreeze / corrosion inhibitor using testing device.

The concentration of 50% by volume antifreeze / corrosion inhibitor in the coolant is correct when antifreeze protection is ensured down to -37 °C. If less antifreeze protection is displayed, correct the mixing ratio. >>



If the concentration is too low, there is a risk of engine damage as a result of corrosion/cavitation in the cooling system.



Avoid concentrations of more than 55% by volume antifreeze /corrosion inhibitor, otherwise maximum antifreeze protection down to $-45\text{ }^{\circ}\text{C}$ will not be achieved. If the concentration is higher, heat dissipation and antifreeze protection deteriorate.

- ▶ Check the coolant level.
The cooling system is correctly filled if the coolant reaches the mark in the filler neck.

Cooling and heating system: Checking for leaks and general condition



The "Engine cooling system: Checking and correcting the fluid level and antifreeze /corrosion inhibitor" work item must have already been carried out.

- ▶ Carry out a visual inspection of the radiator for leaks and undamaged condition.



If damage /faults are found, repair the radiator or replace it.

- ▶ Check the radiator for external dirt. The fins must not be dirty.
- ▶ Check all radiators, the coolant pump, engine oil radiator and engine caps (core plugs) for leaks.

- ▶ Check that all lines and hoses are undamaged, that they are routed to avoid chafing and that they are secured in accordance with the regulations.

Risk of scalding



The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below $90\text{ }^{\circ}\text{C}$.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

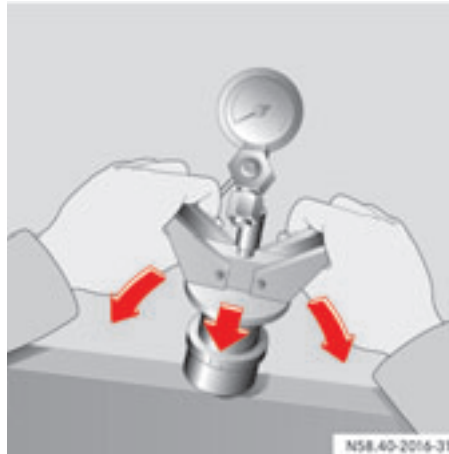
Risk of poisoning



There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into containers normally used for beverages.
- Store coolant out of the reach of children.

5



Pressure tester special tool



Special tool:

Pressure tester 001 589 83 2 1 00

- ▶ On heating systems: Open the regulating valves and shutoff valves.
- ▶ Remove the coolant expansion tank cap.

- ▶ Fit the testing equipment.
- ▶ Connect the compressed-air hose with the tyre inflator connection to the valve and build up a test pressure equal to the cooling system opening pressure.



The cooling system opening pressure can be seen on the code on the cap or pressure relief valve.

Example: Code 70 = 0.7 bar pressure.

A pressure relief valve is integrated in the testing equipment so that a pressure of 1.2 bar cannot be exceeded.

Renewing coolant

Risk of scalding



The cooling system is pressurised. Hot coolant can spray out when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the sealing cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

Risk of poisoning



There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never put coolant into containers normally used for beverages.
- Store coolant out of the reach of children.

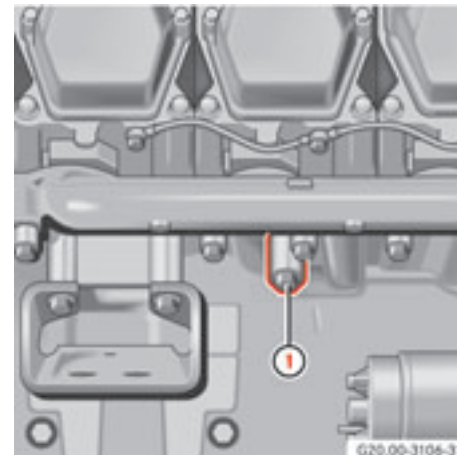


Only use antifreeze / corrosion inhibitor approved by Mercedes-Benz (see Specifications for Service Products).



Before renewing the coolant, check the cooling and heating system for leaks and condition. Have the coolant renewal confirmed in the Maintenance Booklet.

Draining coolant



① Coolant drain plug

- ▶ Open the engine cooling system radiator cap slowly. Let off excess pressure and remove the radiator cap.
- ▶ On heating systems: Open the heating temperature selector (regulating valve).



Work plans



Risk of scalding



Hot coolant will scald your skin and eyes.

- Only carry out work on the cooling system at coolant temperatures below 50 °C.
- Wear suitable protective gloves, protective clothing and safety glasses when handling coolant.

▶ Place the drain hose on the radiator coolant drain neck and drain off the coolant.

- 5** ▶ Remove coolant drain plug ① from the engine block and collect the coolant in a suitable container.



First cover the lines, etc. under the drain plugs and place a suitable receptacle underneath, large enough to collect the amount of coolant in the engine.

Environmental note



Dispose of used coolant in accordance with prevailing local regulations (▶ see page 66).

- ▶ Clear blocked drain openings from deposits.
- ▶ Retighten the coolant drain plug on the engine and use a new seal.
- ▶ Place new drain plug (without hose connections) with new seals and screw tight.

Adding coolant

- ▶ Start the engine and allow it to run at different speeds for approximately 1 minute.
- ▶ Add coolant in the specified ratio until it reaches the lower edge of the filler neck.
- ▶ Switch off the engine and close the cooling system again.



Observe any additional information in the equipment / vehicle manufacturer's operating instructions.

Malfunctions, causes and solutions

Besides careful operation and maintenance of the engine, it is important that malfunctions are remedied in good time. Further information on the measures listed under "Solution" can be found in the "Maintenance" or "Tests and other work for remedying problems" section.

You can rectify certain faults yourself (▷ page 97).

Always have faults that you cannot remedy yourself rectified at a qualified specialist workshop.

DaimlerChrysler recommends that you visit a Mercedes-Benz Service Centre for this purpose as it has the necessary specialist knowledge and tools to carry out the work required. In particular, work relevant to safety or on safety-related systems must be carried out at a qualified specialist workshop.

Risk of accident and injury



Incorrect maintenance and repair work to the engine can cause engine damage. Engine damage can lead to an increase in the risk of accident.

Maintenance and repair work on the engine may only be carried out by personnel who have undergone the appropriate training.

Always have work on or modifications to the engine carried out at a qualified technical workshop which has the necessary specialist knowledge and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

General troubleshooting

Malfunction	Cause	Solution
Starter pinion does not turn or turns too slowly	Battery is not sufficiently charged	▶ Charge the battery
	Connecting cable to the starter motor is loose	▶ Tighten the cable on the terminal. If necessary, solder on a new terminal.
	Starter motor solenoid switch malfunction	▶ Have it checked by specialists
Engine does not start or stops again immediately	Fuel tank empty	▶ Refuel
	Fuel filter blocked	▶ Replace the filter element (▷ page 81)
	Fuel line, pre-cleaner or screen in the fuel tank blocked	▶ Clean
	Fuel system or filter leaking	▶ Seal
	Fuel not resistant to cold	▶ Clean the pre-filter (▷ page 79) ▶ Replace fuel filter ▶ Use winter fuel (▷ page 62)

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Engine does not start or stops again immediately	Outside temperature too low	▶ Observe measures for winter operation (▷ page 55)
Engine starts badly	Fuel temperature too high or sensor malfunction	▶ Replace fuel temperature sensor; consult a qualified specialist workshop
	Engine control unit malfunction	▶ Read engine control unit malfunction memory, consult a qualified specialist workshop
	Leakages or pressure too low in the low-pressure fuel circuit	▶ Test for leaks (visual inspection); have pressure tested at a qualified specialist workshop
Engine stops unexpectedly	Engine control unit malfunction (total failure)	▶ Consult a qualified specialist workshop
	Electrical system interrupted; short circuit in cabling or in Stop button; engine control unit malfunction	▶ Consult a qualified specialist workshop
	Leakages or pressure too low in the low-pressure fuel circuit or fuel delivery pump drive defective	▶ Test for leaks (visual inspection); have pressure tested at a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Engine in emergency running mode: 1) Constant speed 1,250 rpm 2) Automatic speed 900 rpm	Engine control unit or drive control unit malfunction	▶ Read malfunction memory in control units; consult a qualified specialist workshop
Engine surges, vibrates or runs irregularly	Crankshaft position sensor or TDC sensor (camshaft angle sensor) polarity reversed	▶ Remove each sensor; sensor polarity is reversed if engine runs better (emergency running engine speed) – reverse polarity; consult a qualified specialist workshop
Poor engine output (lack of power)	Charge-air pressure sensor malfunction	▶ Check with DaimlerChrysler diagnostic tester; replace if necessary; consult a qualified specialist workshop
	Charge-air temperature too high or temperature sensor malfunction	▶ Check temperature sensor; replace if necessary; consult a qualified specialist workshop
	Fuel temperature too low	▶ Check temperature sensor; replace if necessary, check fan speed cut-in time; consult a qualified specialist workshop
	Coolant temperature too high	▶ Check temperature sensor; replace if necessary; check fan speed cut-in time; consult a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Poor engine output (lack of power)	Engine brake valve* defective	▶ Carry out function or visual inspection
	Fault in the fuel system (blocked, leaking)	▶ Carry out visual inspection for leaks; consult a qualified specialist workshop
	Engine control or drive control module malfunction	▶ Read control unit malfunction memory; consult a qualified specialist workshop
Traction force interruption	Loose contacts in the electrical supply	▶ Check battery terminal clamps and connector on engine control unit for firm seating and corrosion
	Leakages or pressure too low in the low-pressure fuel circuit	▶ Test for leaks (visual inspection); have pressure tested at a qualified specialist workshop
Poor engine braking power	Drive control unit malfunction	▶ Read drive control unit malfunction memory; consult a qualified specialist workshop
	Constantly-open throttle valve* defective	▶ Check control; consult a qualified specialist workshop
	Engine brake valve* defective	▶ Carry out a function /visual inspection; consult a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Fuel consumption too high	Fuel temperature too high or sensor malfunction	▶ Replace fuel temperature sensor; consult a qualified specialist workshop
	Connection points (unit pump – line and injectors) defective or leaking	▶ Set pumps using STAR DIAGNOSIS or Minidiag 2; consult a qualified specialist workshop
Engine cut-off too early (maximum revs cannot be reached)	Drive control unit or ADM control unit defective or incorrectly programmed	▶ Consult a qualified specialist workshop
Engine gets too hot (according to coolant temperature gauge)	Coolant temperature sensor malfunction	▶ Replace sensor
	Insufficient coolant or cooling system not fully bled	▶ Top up, bleed (▷ page 94)
	Poly-V-belt damaged	▶ see Replacing the poly-V-belt (▷ page 86)
	Fan does not switch on correctly	▶ Consult a qualified specialist workshop
	Radiator dirty on inside or choked with lime scale; radiator very dirty on outside	▶ Clean or remove lime scale
	Thermostat malfunction	▶ Check, replace if necessary; consult a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Charge current indicator lamp does not light up while the vehicle is stationary	Bulb malfunction or supply line interrupted	▶ Replace bulb or remedy interruption
Charge current indicator lamp lights up when the engine is running	Poly-V-belt too slack	▶ Check belt tension; replace tensioning pulley if necessary
	Poly-V-belt torn	▶ Replace the poly-V-belt (▷ page 86)
	Alternator or regulator malfunction	▶ Check; consult a qualified specialist workshop
Engine emits black smoke	Charge-air sensor, coolant sensor or fuel temperature sensor defective	▶ Check with DaimlerChrysler diagnostic tester; consult a qualified specialist workshop
	Injector defective	▶ Consult a qualified specialist workshop
	Exhaust gas turbocharger or charge-air pipe defective, air cleaner dirty	▶ Carry out visual inspection; consult a qualified specialist workshop
	Constantly-open throttle valve defective	▶ Consult a qualified specialist workshop
Exhaust fumes are blue	Oil level in the engine too high; engine oil entering combustion chamber	▶ Correct oil level; have it checked at a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Exhaust fumes are white	Cylinder head or cylinder head gasket leaking; coolant entering the combustion chamber	▶ Locate damaged cylinder using pressure loss test; consult a qualified specialist workshop
Engine "knocks"	Combustion malfunction	▶ Consult a qualified specialist workshop
Knocking noise from the bearings	Damage to bearings	▶ Consult a qualified specialist workshop
Abnormal noises	Leakage in intake pipe and exhaust pipe causes whistling noise	▶ Remedy leakage; replace seals if necessary
	Turbine or compressor wheel scrapes on the housing; foreign object in the compressor or turbine; seized bearing in rotating parts	▶ Have the exhaust gas turbocharger replaced at a qualified specialist workshop

Jump-starting

If the battery is discharged, the engine can be started using jump leads and a donor battery.

Risk of burning



The acid contained in batteries burns skin and eyes on contact.

- Avoid contact of acid with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety glasses should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

6

Risk of explosion



Gases escaping from batteries can explode and injure people.

Therefore, avoid fire, naked flames and sparks and refrain from smoking in the vicinity of batteries.



Make sure that the batteries have the same nominal voltage. Otherwise a battery could be irreparably damaged.

Do not place any metal parts on the batteries. There is a risk of short circuit.

Only use insulated jump leads (cable cross section approximately 70 mm²) and insulated terminal clamps. There is a risk of short circuit.

A discharged battery can freeze at about -10 °C; it must have thawed out before jump-starting.



When jump-starting the engine, the maximum on-board voltage of 28 V must not be exceeded (as this would cause electronic damage to the control part).

- ▶ Connect the positive terminals first and then the negative battery terminals.
- ▶ Start the engine (▷ see page 49) and allow to run for a short while.
- ▶ Remove the jump leads in the reverse order.

A close-up, black and white photograph of a metal mesh filter. The mesh is composed of small, interconnected circular or hexagonal cells, creating a fine, grid-like texture. A central rod or support structure is visible, extending from the bottom towards the center of the mesh. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the three-dimensional quality of the mesh.

Technical data

Engine data

Test values and adjustment values

Tightening torques

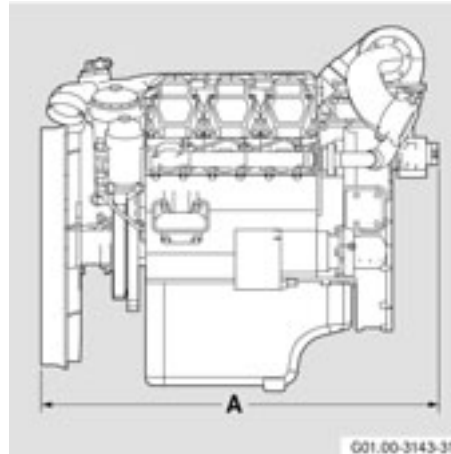
Engine data

Dimensions

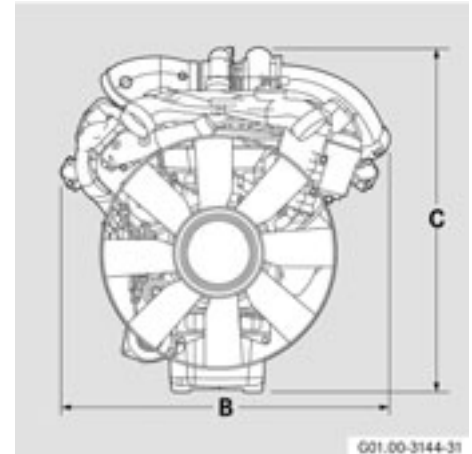
(Standard version, other versions on request)

	OM 501 LA
A = Engine length	1,190 mm
B = Engine width	1,020 mm
C = Engine height	1,130 mm

	OM 502 LA
A = Engine length	1,530 mm
B = Engine width	1,195 mm
C = Engine height	1,080 mm



Illustrated: OM 501 LA



Illustrated: OM 501 LA

Weights

	OM 501 LA	OM 502 LA
Engine, dry	885 kg	1,125 kg
Engine, wet	935 kg	1,180 kg

General data

	OM 501 LA	OM 502 LA
Type	V-engine with exhaust gas turbocharger and charge-air cooling	
Type of cooling system	Forced circulation cooling	
Combustion principle	4-stroke diesel direct injection	
Number of cylinders	6	8
Cylinder bore	130 mm	
Piston stroke	150 mm	
Total displacement	11,946 cm ³	15,927 cm ³
Direction of rotation of engine viewed from flywheel	Anti-clockwise	
Type of starting	Electric	
Coolant capacity of engine without intercooler	16.5 l	20 l
Engine oil capacity including oil filter	min. 28 l; max. 34 l	min. 30 l; max. 38 l

Engine data**Data: Starter motor, battery and alternator (standard)**

Starting the engine for the first time	
Voltage	12/24 V
Output	6.2 kW
Battery (not in scope of supply)	
Voltage	12/24 V
Cold test current in accordance with DIN 723 11	max. 700 A
Cold start ability without jump-starting and 75% battery charge down to	max. -20 °C
Alternator	
Voltage	28 V
Current rating	35/80 A

Engine oil pressure (min)

at idling speed	≥ 0.5 bar
-----------------	----------------

at rated speed	≥ 2.5 bar
----------------	----------------

Valve clearance

Inlet valve	0.4 mm
-------------	--------

Exhaust valve	0.6 mm
---------------	--------

Tightening torques



All threads on mechanical parts and related contact surfaces must be clean and smooth and lubricated with engine oil; other lubricants require significantly different tightening torques.

All tightening torques are specified in Nm and apply for both the OM 501 LA and the OM 502 LA.

Engine block	Nm
Cylinder head cover to cylinder head bolt	20
Light alloy oil sump bolt to cylinder crankcase	55
Alternator / poly-V-belt tensioning device bracket bolt to cylinder crankcase	160
Poly-V-belt tensioning device bolt to bracket	
M 10 thread	50
M 18 thread	105

Fuel/injection system	Nm
Injection line on pressure pipe connection or unit pump	35
Banjo bolts for fuel lines	
M 16 x 1.5 thread	50
M 8 x 1 thread	15
Cap on fuel filter housing	25
Starter motor /alternator	Nm
Starter motor on timing case	80
Alternator support on cylinder crankcase	160

Tightening torques

Oil circuit	Nm
Oil drain plug on light alloy oil sump	
M 20 x 1.5 thread	60
M 26 x 1.5 thread	80
Oil filter /oil radiator on cylinder crankcase	50
Oil filter cap on oil filter housing	40
Radiator cap screw on oil trap	6
Cooling circuit	Nm
Coolant line with thermostat valve on coolant pump	25
Coolant pump on cylinder crankcase	30
Belt pulley on coolant pump hub	25
Valve adjustment	Nm
Counternut on rocker arm adjustment screw	50

ADM

Control module as interface between the engine and the vehicle electronics.

Belt drive

Drive connection from the engine to the engine assemblies, such as the alternator, coolant pump or refrigerant compressor.

CAN (Controller Area Network)

Serial data transfer system which networks the vehicle's electronic systems and allows an organised mutual data exchange. At the same time the number of components required is lower. This reduction of potential malfunction sources improves reliability and maintenance friendliness.

Constantly-open throttle valve

Valve fitted in the cylinder head in conjunction with throttle valve brake or Turbobrake. When the engine brake is operated, the constantly-open throttle valve causes a reduction of the cylinder pressure during the working stroke.

Control unit

Part of the electronic system which controls the engine or transmission functions, for example.

Drive train

Collective term for all parts of the vehicle providing the drive such as engine, clutch, transmission, propeller shafts, transfer case and drive axles.

Emergency running program

Special program in the Telligent® engine system which allows limited engine operation if electronic components have failed.

Engine number

Number specified by the manufacturer and marked on the cylinder head to clearly identify each engine.

Engine oil viscosity

Measurement of the inner friction (viscosity) of the oil at a defined temperature. The viscosity is better the higher the temperature the oil can withstand without becoming too thin, or the lower the temperature the oil can withstand without becoming too thick.

Exhaust brake

Also throttle valve brake. Works by closing the exhaust pipe.

FAME fuels

(Fatty Acid Methyl Ester) FAME fuels are bio-diesel fuels based on fatty acid methyl esters.

FR

(Drive control) control unit. The drive control is a monitored electronic system and is connected to the engine control via the CAN bus. The FR is permanently installed in the driver's cab. It controls vehicle-relevant functions and switches on the engine control via CAN bus commands, e.g. engine torque request via accelerator pedal position.

Minidiag 2

DaimlerChrysler AG electronic diagnostic tool for reading faults and parameters on commercial vehicles.

MR

(Engine control) control unit. Engine control is a monitored electronic system which forms part of the Telligent® engine system. It controls the engine functions, such as the engine idling speed and exchanges data with the drive control.

OM

Engine name, abbreviation for oil engine = diesel engine.

Sensor

Electronic component which converts certain parameters (e.g. oil temperature, engine speed and others) into electrical values for use in the engine control unit.

STAR DIAGNOSIS

DaimlerChrysler AG electronic diagnostic system

TDC

Top dead centre; term for the upper position of the piston in the cylinder.

Telligent® engine system

Mercedes-Benz electronic engine control. Controls fuel injection period and quantity depending on the current operating conditions and driver's preferences.

Tightening torque (Nm)

Product of force and lever arm lengths with which bolt connections, e.g. cylinder head screws, are tightened. (Nm = Newton metres)

Turbobrake

Special engine braking system on Mercedes-Benz commercial vehicles. The Turbobrake uses the engine exhaust gas turbocharger to achieve greater braking efficiency in overrun mode.

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www.mercedes-benz.com

www.daimlerchrysler.com

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