

BB00.40-P-0215-00A	Use of lubricating oils		
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MODEL ALL

The following points are important for the correct use of lubricating oils:

1. Kind and quality of oil
2. Capacities

3. Oil change intervals
4. SAE grade (viscosity)

1. Brand name, viscosity class and oil quality

Details on the specified type and quality of oil are included in Sheets 221.0, 223.1/2 and 231.0 to 231.3.

The brand name clearly defines the product, the oil qualities are clearly specified. The designations on the

lubricant containers must therefore accurately match the brand names approved by us.

2. Capacities

A distinction is to be made between the following terms depending on the purpose and timing of the oil fill:

2.1 **Initial fill capacity** is the oil quantity that is required to fill the empty and dry major assembly. It is always larger than the filling capacity which is normally specified.

2.2 **Filling capacity** means the oil quantity that is required during an oil change. Because the oil change is included in

the regular maintenance operations, only the filling capacities are always specified in the Specifications for Operating Fluids.

2.3 **Top-off quantity** is the quantity that is required to supplement the oil consumed between the oil change intervals.

3. Oil change intervals

The quality of the lubricating oil is reduced in operation. The more difficult the operating conditions the faster the lubricating tasks and its other functions are only fulfilled to a sufficient degree. For economic reasons, however, it should not be replaced too soon with new oil.

The question " **which oil change interval is right** " cannot therefore be answered easily even with a precise knowledge of the operating conditions.

Reason: The quality changes of the oil due to operation can be accelerated or slowed down due to various factors with different effect.

Except for the quality and degree of alloying of the oil, the following factors are decisive for the oil change:

1	Design of engine	gasoline/diesel
		prechamber/direct injection
		Naturally-aspirated/charger/compressor
2	Exhaust aftertreatment systems	Particulate filters/catalytic converters
3	Specific capacity of engine oil circuit	
4	Oil load/temperatures	
5	Oil consumption and topping-up quantities	
6	Oil filter efficiency/maintenance	
7	Air filter efficiency/maintenance	
8	Operating conditions on	Urban traffic
		construction site
		long distance
9	Aggravating fuel characteristics	Sulfur content
		Components
		additives
1 0	Thinning by fuel	Boiling characteristics
		Final boiling point
1 1	Water/antifreeze compound	
1 2	Oil quality	
1 3	Oil viscosity/season	

As each of these factors alone and together with one or more can cause different effects, it is understandable why the question concerning the correct oil change interval cannot generally be answered.

Above all it is the operating conditions which necessitate different oil change intervals. In addition to this fuel quality plays a part. We therefore distinguish between oil change intervals for

- 3.1 Running-in period
- 3.2 Aggravated operating conditions
- 3.3 Normal operating conditions
- 3.4 Vehicle subject to low level of stress
- 3.6 Diesel fuel with increased sulfur content
- 3.9 Flexible Service System for commercial vehicles (Telligent)
- 3.10 Trucks fitted with longlife oil filter (code M 18)
- 3.12 Active Service System ASSYST

In general at each oil change the filter element should also be replaced.

3.1 During the **running-in period**, parts sliding on each other must run in and metal abrasion is therefore greater than after the break-in period. On some major assemblies therefore the oil is to be changed sooner than in subsequent operation (see Service documents).

3.2 Many motor vehicles, especially commercial vehicles, are driven under **aggravated operating conditions**.

These mainly include:

Extremely short-distance traffic, very poor road conditions, all-wheel drive operation, high incidence of dust, construction site operation; operation of municipal vehicles, firefighting vehicles, taxis and doctor's vehicles, agricultural and forestry vehicles and more of the same.

With commercial vehicles, a mileage of less than 10,000 km a year counts as aggravated operating conditions.

For cars a distinction is made between normal and aggravated operating conditions: under aggravated conditions the oil change intervals are to be reduced in accordance with the maintenance booklet.

The following applies as aggravated operating conditions on passenger cars:

More than 50% short-distance traffic (less than 8 km per journey) in conjunction with a coolant temperature below 80 °C. This applies in particular for low outside temperatures.

More than 50 % of journeys in the lower gears in combination with high engine load (hill-climbing, towing a trailer, etc.).

On trucks, buses and vans there are different subdivisions of operating conditions on which the oil change intervals depend. Depending on the vehicle type, class or generation, a distinction is made, e.g. between maintenance categories I, II, or I, II, III or between

aggravated operation, short-distance haulage and long-distance haulage.

With aggravated conditions the operating hours counter or engine maintenance counter deliver an exact measure for the engine oil change cycle given in distance driven (km). However, this type of oil change stipulation is only possible on vehicles with operating hours counter or engine maintenance counter. But operating hours counters and engine maintenance counter do not always give an exact standard for the oil change. If, for example, the vehicle is driven for longer periods with different loads and frequently in the lower gears, then only the fuel consumption (fuel throughput) is a reliable starting point for the demands made on the oil and consequently for the oil change.

3.3 Alternating city, country road and freeway journeys are understood to be **normal operating conditions**. In this mode relatively long oil change intervals can be stipulated. The oil change interval for normal operating conditions is mostly specified in accordance with distances covered in kilometers (km). The normal operating conditions for commercial vehicles are mileages between 10,000 and 100,000 km in **maintenance category II** and more than 100,000 km in **maintenance category III**.

3.4 On vehicles which only travel **short distances** in the course of a year, the oil change interval is not determined by distance traveled, operating hours, engine maintenance counter or fuel throughput, but rather by time. Depending on the vehicle model and type of use, the usual time periods for an oil change are twice a year, once a year or once every two years. The specifications in the respective maintenance booklet are decisive.

3.5 Maintenance categories for industrial engines

With industrial engines the three maintenance categories are determined on the one hand by operating time per year, on the other hand by the assignment to "aggravated operation", "normal operation" and "continuous operation".

3.6 Diesel fuel with increased sulfur content

If the sulfur content of the diesel fuel is higher than 500 ppm (=0.0500 % by weight), then the oil change intervals must be halved, unless aggravated operating conditions exist anyway. If the sulfur content of the diesel fuel is higher than 1000 ppm (=0.1000 % by weight), then the oil change on all commercial vehicle and industrial engines must be carried out in accordance with maintenance category I as for aggravated operation, i.e. one-fourth of the oil change intervals.

For Euro 4/5 or EU4/5 vehicles: In order to comply with the current and forthcoming emissions standards, additional exhaust aftertreatment systems, such as diesel particulate filters (DPF), NOx storage catalytic converters, Selective Catalytic Reduction (SCR) catalytic converters, etc. will be needed in diesel commercial and passenger vehicles.

These exhaust aftertreatment systems must fulfill their function reliably and extremely efficiently over a very long application period specified by the legislator and must not

be impaired or even destroyed by components of the fuel or the engine oil.

It is therefore important to use sulfur-free fuels (sulfur <10 ppm) or low-sulfur fuels (sulfur <50 ppm) in combination with so-called low SPash engine oils (MB sheets 229.31, 229.51, 228.31 or 228.51) that have no negative influence or only a small negative influence on the exhaust aftertreatment systems and enable a long idle time for these systems! If sulfur-free diesel fuel is not used, the oil change intervals must be shortened.

3.7 Used oil analyses for stipulating oil change intervals

Oil change intervals do not take place in accordance with a rigid system. They take place in accordance with distance traveled, operating hours or fuel flow rates as well as depending on operating conditions, fuel and oil quality. In addition we offer our Flexible Service System (Telligent). Certain engine and vehicle data such as the number of cold starts, the oil temperatures and engine rpms are also used to calculate the optimal use period for the engine oil.

To determine the specific intervals, field, test stand and laboratory studies as well as years of experience are required. If our specifications are followed correctly, an oil change is not necessary prior to the stated period. For technical warranty reasons, it is not possible to extend the oil change intervals.

It is absolutely essential to adhere to the max. oil change intervals - even if used oil analyses are carried out.

3.7.1 Used oil analyses for early damage recognition by determining abrasion elements

Attempts for early damage recognition are based on determining metallic abrasion elements such as iron, copper, chromium, etc. The appraisal of this type of analysis encounters difficulties at the service companies. Limits to be used are not only dependent on the analysis method used (often differs from laboratory to laboratory), but also on the type of engine used (knowledge of components necessary), on the oil change interval driven, on the type of oil, on the fuel and not least also on the operating conditions.

Such evaluation problems often lead to uncertainty or to improper responses.

It is also very important to take a proper sample. It has to be taken from the oil circuit when the engine is running. A sample taken from the oil sump often results in incorrect analyses as a result of the residues which are present in the sump. Unfortunately for cost and capacity reasons it is not possible for us to take counter-samples. We also cannot issue any certificate of non-objection for investigation results not determined by us.

3.7.2 Used oil analyses as an aid to workshop practice

Used oil analyses may be sensible if they are needed to identify undesired components in the oil, such as fuel,

water, glycol or sand/silicon. It is possible to react at short notice and possible damage can also be avoided or rectified.

3.7.3 General recommendation

There is no good reason for regular used oil analyses (cost/benefit relationship). Due to oil analyses it is possible to shorten the oil change interval but not to extend it under any circumstances. Observing our maintenance and care instructions as well as our Specifications for Operating Fluids can prevent damage from occurring and guarantees the long service life expected.

3.8 Vehicles with certain exhaust aftertreatment systems

For vehicles with exhaust aftertreatment systems such as DPF, CRT, SCR, NSC, TWC, special oil recommendations and oil change intervals apply in some cases. For vehicles with particulate filters (DPF, CRT), special engine oils, so-called low SPAsh oils (e.g. sheets 228.31, 228.51, 229.31, 229.51) and corresponding oil change intervals are required. There are currently no special recommendations for the various catalytic converter concepts.

3.9 Commercial vehicles that are equipped with the **Flexible Service System** (Telligent) are not maintained in accordance with fixed maintenance intervals. The system determines the correct time for the service depending on the stress and for each major assembly separately. In particular it is **not** necessary to classify the vehicle in a particular "maintenance category" depending on the operating conditions. Maintenance operations due are automatically announced on a display in the instrument panel; the vehicle owner decides which operations are to be completed combined with other operations. Alternatively the system can also provide a summary itself. For the control unit of the Flexible Service System to operate correctly, the default setting of the oil quality (in accordance with sheet no. of this Specifications for Operating Fluids), the oil viscosity and fuel sulfur content in percentage by weight is required. For more detailed information on this, refer to operator's manual, service booklet and workshop literature.

3.10 Engine oil change interval in combination with MB longlife oil filters (code M18)

Via code M18, for the MK and SK including industrial engines, a long-life oil filter has been available for a long time for particular model designations/code combinations. This is an additional engine oil filter which is attached to the frame. The oil is additionally filtered in the bypass flow. After the positive conclusion of detailed long-term trials, it is possible to redefine the interval for engine oil and filter change for vehicles fitted with a longlife oil filter: double interval in comparison to vehicles not fitted with this special equipment. Account is also taken, as before, of the operating conditions (long-haul working, short-haul working, aggravated operation), the oil quality and the

sulfur content of the fuel. The filter element of the long-life oil filter is not longer changed at the inspection. However, the engine oil in the filter bowl must be replaced at the inspection.



After changing the engine oil, run the engine at idle speed for about 10 minutes.

The stipulation also applies retroactively to vehicles which were equipped with code M18 at an earlier point in time. It goes without saying that it only applies to long-life oil filters approved and tested by us. The maintenance booklets and maintenance sheets have been revised accordingly. Vehicles with the Flexible Service System (FSS/code Y88) can of course be equipped with the long-life oil filter. As a result, they likewise achieve double the engine oil change intervals which are certainly determined depending on load here.

3.11 Installation of other make bypass oil filters

Various companies have advertised intensely in recent times with the retrofitting of bypass oil filters and have stated that this makes it possible to dispense with changing the oil. We should like to take this occasion to inform you on the possibilities and limitations of bypass flow oil filtering.

3.11.1 Approved MB longlife oil filter (code M 18) for medium/heavy-duty vehicles

Primarily the interval extension is attributable to the significant increase in oil quantity with this special equipment. Above all the additional filter serves to increase the filter capacity.

3.11.2 The chemical/physical changes to the engine oil as well as their consequences

A modern engine oil consists of a highly-complex mixture of base oil and additives. Additives are oil-soluble agents for protection against scuffing and wear, for neutralization of acid combustion products and for the prevention of sludge and deposits to name but a few examples. The additives reduce in continuous operation. Base oil also suffers under the engine's influences. This limits the service life of the engine oil. The performance limits are reflected in the specified oil change intervals.

General statements according to which oil change intervals can be extended beyond certain overall travel distances or even dispensed with when using external bypass oil filters, are not justifiable from a technical standpoint. As the bypass oil filter can only filter dirt and abrasion out of the oil, the exhausted oil is not refreshed. The replenishment quantities due to oil consumption and filter change are not sufficient for refreshing the oil. The most important negative effects when installing external bypass oil filters, linked with exceeding of the oil change intervals specified by us:

Effect	Consequence
Additives not refreshed	Engine oil exhausted
Reduction in dirt conveying capacity, increase in oil oxidation	Sludging, deposits, wear
Increase in content of iron and solid foreign bodies	Increased wear, increase in oil viscosity
Increase in oil viscosity and friction resistance	Increased fuel consumption, poorer cold starting performance
Reduction in neutralization capacity, formation of acids	Corrosion, wear, deposits

There are not any oil filters through which the oil quality in operation is improved.

3.11.3 Other make bypass oil filters and environmental protection

Manufacturers outside of MB frequently advertise their bypass oil filters with environmental protection. You should also know: Used engine oil is not waste, but rather a high-quality raw material. The used oil disposal in workshops and gas stations is organized and safeguarded so that the used engine oil can be added to recycling. The bypass filter manufacturers on the free market specify changing the filter inserts frequently (as a rule every 10,000 km). Used oil filters are special waste and must be burnt under particular safety precautions and with comparatively high costs in a manner which has neutral effect on the environment. As a consequence of exhausted engine oil and engine wear, there is a deterioration in exhaust emissions, an increase in fuel consumption, a worse CO₂ balance and a reduced service life of the engine.

3.11.4 Costs when using an other make bypass oil filter

No cost advantage due to installation costs and due to frequent filter change (procurement and disposal of the filter). Increased fuel costs due to increased viscosity and friction. Shorter service life of the engine due to higher wear. No warranty in the event of engine damage due to an external bypass oil filter. Alone the costs for the filter change, the installation and fuel consumption are higher than the savings which are possible with the engine oil.

3.11.5 Additional technical risks and warranty provisions

Bypass oil filters are not usually attached to the engine but to the chassis or body. Particular attention is to be paid to the connection between the engine and filter in the design layout, testing and assembly to avoid leaks (chafing, slipping, breakage, etc.). Defects can result in expensive engine damage due to oil loss, but also be a danger to traffic and pollute the environment due to the oil which runs out. We must point out that damage which has a causal relationship with the installation of parts not approved by us as well as the resultant consequential damage and irregularities do not fall within our area of responsibility. Our company also does not take over any warranty for parts which do not originate from MB and which are retrofitted to our vehicles.

3.11.6 Advantages of Mercedes-Benz long-life oil filter

Doubling of oil change intervals. Filter change only in combination with oil change. Service and warranty as a package. Can be ordered from the plant, no idle times for retrofit, easy to retrofit and tested. Special equipment and retrofitting are competitive.

3.12 Active Service System ASSYST

With a production breakpoint of February 1997, the previous maintenance system for passenger cars with rigid intervals was superseded by an **A**ctive **S**ervice **S**ystem known as "ASSYST".

Beginning with the W 210 4-Matic in 02/97 and phased in on the remaining model series as of 06/97 (except G 463, 09/97), the introduction followed.



see also:

- Introduction into service manual passenger cars model series 210 Innovations February/March 1997
- Video "Model series 210 Innovations model year 1997"
- WIS (microfiche) overall system description, GF00.20-P-0999AZ

With "ASSYST", for the first time at Mercedes-Benz service intervals up to 40,000 km or 2 years (min. 15,000 km or 1 year) are made possible. The system takes into account individually the driving style of the customer by evaluating engine speed, engine temperature, engine load and time. The timing of the service required is calculated and the due date is displayed to the customer in the instrument cluster.

3.13 Diesel particulate filter for passenger car diesel engines

The following information can also be found in the SI14.40-P-0001A dated 15. 9. 2003. As of October 2003, 4-cylinder diesel engines in combination with engine version EURO 4 standard will be offered for the first time with an optional diesel particulate filter, CODE474. The Mercedes-Benz diesel particulate filter, also called a soot filter in the press, allows particulate emissions, which result from the combustion of diesel fuel, to be eliminated almost completely. The Mercedes-Benz filter operates without any extra additives and in combination with in-engine measures it complies with the Euro4 emissions standard. The design of the filters consists of a ceramic honeycomb filter element (silicon carbide) coated with a rare metal (platinum) with channels which are opened and closed alternately at the front and rear. Flowing diesel emissions can then flow into the opening when the filter is open, but no longer flow out

at the end of the filter. The exhaust is filtered by the porous ceramic material and exits through the channels in the filter open at the rear. This ensures that the diesel particles are retained in the filter element. Upstream from the filter is an oxidation-type catalytic converter for absorption of the hydrocarbons (HCs) and carbon monoxides (CO). Through automatic periodic increases in exhaust gas temperature by means of the engine control function

(diesel fuel injection, intake air throttling, exhaust gas recirculation and boost pressure control), filter regeneration takes place, i.e. the particulates stored in the filter are then burned off. The diesel particulate filter remains effective over a very long operational period (depending on how the vehicle is driven and therefore does not have a fixed replacement interval). A significant platinum content makes this filter a high-quality Mercedes-Benz original

replacement part. In most cases, the filter can be recycled after being replaced and therefore reused. It is a genuine reconditioned part and is processed using the existing replacement process for Mercedes-Benz original replacement parts.

Specifications for engine oil used as per sheet 229.31, 229.51, 228.31 or 228.51 ("low SPAsh"): For Euro4 or EU4-version engines with diesel particulate filter, a special engine oil has been developed which generates less combustion residue during operation and thus ensures the filter's long service life. When performing an engine oil change, the use of the above-mentioned engine oils is mandatory for vehicles with filter (CODE 474). Oil refillings performed by the customer using approved oils specified in sheet 229.3 and 229.5 are possible.

4. SAE grade (viscosity)

The SAE-grades refer to the viscosity of the lubricating oils. The SAE-grade indicates the viscosity at low and high temperatures. Viscosity is of importance at low temperatures for cold-starting and at high temperatures for

adequate lubricating properties at full load or at high speeds. It is therefore important to pay attention to the SAE-grades specified on sheets 224.1/224.2 and 231.1/.2/.3.