



BB00.40-P-0231-00A	General gear oils		Sheet 231.0
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General information

The gear oils approved for assemblies installed in MB vehicles are classified according to their application into:

Hypoid gear oils	Sheet 235.0/.6/.7/.8/.9/.20
Gear oils	Sheet 235.1/.4/.5/.10/.11/.12/.13/ .15/.27/.61
Automatic transmission fluids (ATF)	Sheet 236.1/.2/.3/.6/.7/.8/.81/ .9/.91/.10/.11/.14/.20

Frequently the "gear oils" fulfill multifunctional requirements, which is why they are used in a wide variety of transmission designs and hydraulic systems. However, where very specific technological properties of the transmission oil are required, special transmission oils had to be formulated for these major assemblies and these are listed on separate sheets of the Specifications for Operating Fluids and explain the large number of sheets for transmission oils.

The Mercedes-Benz standard for the corresponding lubricant quality and the area of application for assemblies installed in MB vehicles are documented in the various sheets.

The overviews on Sheets 231.1/.2/.3 provide the allocation of the operating fluid sheets (lubricant quality) to their use in the respective assemblies.

Requests

Gear oils are, like all lubricants, design-specific materials which only fulfill their task best if they are perfectly matched to the materials in tribological contact with them.

These specific material requirements can be subdivided into structural, technological and material requirements and are the primary properties that vehicle gear oils have to fulfill.

The general requirements, which are not any less important, are classified into shelf life, environmental compatibility, worldwide availability, economy and the constant quality of the guaranteed lubricant properties, which must meet the Mercedes-Benz standards worldwide.

Disposal

All approved gear oils, either fresh oil or used oil, are valuable substances which can be reused using the appropriate recycling method for the material. The detailed disposal methods can be found in the waste guidelines for the countries.

1. Hypoid gear oils

Hypoid gear oils contain a high level of EP/AW additives (Extreme Pressure/Antiwear) and a highly viscous base oil to prevent seizure when the hypoid gears mesh (mixed and boundary friction conditions) and to ensure a high degree of protection against wear. The compatibility with radial shaft seals is regarded as critical with such high concentrations of additives because the P/S additive systems become thermally unstable at temperatures from 130 °C to 140 °C and this may lead to sludging of the hypoid oil. The resultant deposits on the radial shaft seals then generally lead to thermal overload and this in turn leads to leakage in this component.

1.7 Viscosity requirements

The cold flow behavior is only specified for SAE , ... oils. Here, the limits apply according to SAE J 306 c, according to which the dynamic viscosity may be max. 150,000 mPas at -40 °C for oils and at -12 °C for oils. As a result of the tendency to form deposits in the transmission, the polymer content is limited to max.

1 percent by weight for pour point reducers. Polymers as VI improvers for thickening low-viscosity base oils are not permitted. The kinematic viscosity at 100 °C must be at least 16.5 mm²/s.

The tooth engagement conditions of the hypoid gears result in a high proportion of sliding and a low hydrodynamic proportion of tooth engagement between the pinion and ring gear. Due to the high tribological load compared to adhesive wear (seizure) and pitting, the performance of hypoid gear oils must be particularly high with respect to these types of wear. The formula of the oils is therefore determined by a high concentration of EP/AW additives and a highly viscous base oil. Alternative oils, e.g. engine oils, cannot be used for these drive types. Proof of performance that an oil fulfills the requirements of Daimler AG is provided by internal tests. However, the hypoid gear oils must at least correspond to the US military specification MIL-L-2105 B/C/D and must be classed GL-5 in the quality grade according to API (American Institute of Petroleum).

2. Transmission oils, **sheet 235.1**

The additive and viscosity properties of the transmission oils are adjusted so that they meet all the requirements placed on manual transmissions with steel/molybdenum synchronization, spur gear axles, MB and ZF transfer cases and reversing gears. Among other things, this results in the fact that the oils ensure a defined friction coefficient of the synchronizer elements, even after a high number of shift operations, without crunching noises. With gear drives and roller bearings, the adhesive wear (seizure) and pitting in particular should be minimized as far as possible.

2.1 Viscosity requirements

The cold flow behavior is only specified for SAE , 80W, ...oils. Here, the limits according to SAE J 306 c apply, according to which the dynamic viscosity may be max. 150,000 mPas at -40 °C for oils, at -26 °C for oils and at -12 °C for oils. Due to the formation of deposits in the transmission, the polymer content is limited to max. 1 percent by weight for pour point reducers. Polymers as VI improvers for thickening low-viscosity base oils are not permitted. The kinematic viscosity at 100 °C must be at least 9.5 mm²/s. In hot zones, gear oils of SAE grade 90 are also permitted.

2.2 Alternative transmission lubricants for commercial vehicle synchromesh transmissions which are operated with transmission oils as per sheets 235.1, 235.5.

If there are no gear oils according to Sheet 235.1 and 235.5 available, the following engine oils can also be used as alternatives:

In a moderate climate, engine oils of SAE-grade 30 as per sheet 235.12

In tropical climate, engine oils of SAE-grade 40 as per Sheet 235.12

2.3 Fully synthetic transmission oil, sheet 235.4

Completely synthetic gear oils are **imperative** for the Unimog manual transmission UG 3/40, UG 3/65 and the PTO transmission - as of the vehicle end No. ...179909 -. Older vehicles can have their oils changed from gear oils according to Sheet 235.1 to gear oils according to Sheet 235.4 when an oil change is due.

The gear oils correspond to the ZF lubricant specifications TE-ML01 and TE-ML02 and are consequently alternatives to the gear oils according to Sheet 235.1 in all synchronized ZF manual transmissions installed in MB vehicles, with and without interaxles. Furthermore, the approval extends to the MB transfer case VG 2400 without oil cooler.

Due to the favorable viscosity/temperature characteristics, a good cold-shifting response and, due to the composition of the transmission oil, a good thermal/oxidative stability of the oil at high transmission oil temperatures can be expected.

2.4 Transmission oil, Sheet 235.5

The gear oils are approved for MB and ZF manual transmissions with steel/molybdenum synchronization, MB and ZF transfer cases and corner gears.

The transmission oils have a low chlorine content as well as a potential for lower oil temperatures under certain operating conditions.

2.5 Transmission oils, **sheet 235.10**

The partly synthetic gear oils are approved for the commercial vehicle manual transmission Model G16/G28, for the passenger vehicle front-wheel-drive manual transmission SG 150/180 (A class) as well as for all passenger vehicle in-line transmissions of the model series 717.4 as of transmission serial number 7 340 241.

Due to the favorable viscosity/temperature characteristics, a very good cold-shifting response and, due to the composition of the transmission oil, a good thermal/oxidative stability of the oil at high transmission oil temperatures can be expected.

With regard to the use in passenger vehicle front-wheel drive manual transmissions/in-line transmissions, which are also installed in cross-country vehicles, the approved gear oil is usually only used in the event of repairs or for service fills.

2.6 Transmission oils, **sheet 235.11**

The fully synthetic gear oils are approved for all MB commercial vehicle manual transmissions installed in MB vehicles with steel/molybdenum synchronization with and without oil coolers, in MB transfer cases with and without oil coolers as well as in ZF manual transmissions with steel/molybdenum synchronization.

Due to the favorable viscosity/temperature characteristics, a good cold-shifting response and, due to the composition of the transmission oil, a good thermal/oxidative stability of the oil at high transmission oil temperatures as well as a fuel savings potential depending on the operating conditions can be expected.

2.7 Engine oils, **sheet 235.12**

The engine oils must be used with a common oil system for transmissions used in tropical countries, and for manual transmissions with a torque converter and clutch unit. These engine oils display the very high seizure resistance required for use in transmissions. The oils need not comply with the engine oil pour point specifications in these Specifications for Operating Fluids.

2.8 Engine oils, sheet 235.27

Commercial vehicle retarder oils: the products listed in the tables apply to commercial vehicle transmissions: see MB Specifications for Operating Fluids 231.2. The engine oils are suitable for retarder use. The oils need not comply with the engine oil pour point specifications in these Specifications for Operating Fluids.

3. Automatic transmission fluids (ATF), Sheet 236.1/.2/.3/.6/.7/.8/.81/.9/.91/.10/.11/.12/.13/.20

ATFs are comparatively low-viscosity gear oils which, due to their universal use potential as a gear oil or a hydraulic fluid, can cover a wide spectrum of applications. The ATFs in the individual sheets differ essentially due to their inherent friction coefficients in tribological contact. This property predestines these oils as function fluids for automatic transmissions whose ease of shifting, among other things, is considerably affected by the friction coefficient of the ATF. Therefore, to achieve optimum performance of the vehicles, only the ATF quality (sheet no.) assigned to the major assembly is to be used. The individual ATF qualities will be described in greater detail below.

3.1 Automatic transmission fluids (ATF), **sheet 236.1**

The approved ATF correspond to the currently no longer valid GM specification Dexron II-D or the currently valid GM specification Dexron III.

The field of application of these ATF includes MB automatic transmissions without controlled torque converter lockup clutch in passenger cars, ZF Ecomat transmissions, Allison automatic transmissions, Voith-Diwa transmissions and MB automatic transmissions in commercial vehicles and buses except W4B035.

3.2 Automatic transmission fluids (ATF), **sheet 236.2**, for MB passenger car and commercial vehicle transmissions with non-ferrous metal synchronization except front-wheel drive manual transmissions of the A-Class (see Section 2.5, Sheet 235.10), Allison transmission, commercial vehicle power steering, hydraulic fan drive.

The ATF must meet all the requirements of the transmissions with nonferrous metal synchronization. These include, in particular, wear protection against pitting and seizure as well as a defined friction coefficient of the synchronizer components that is as constant as possible over the entire service life. As a hydraulic fluid, the ATF is used for hydraulic power transmission and for protecting the hydraulic assemblies from wear. The seal compatibility must be ensured with all elastomer materials used.

If the approved ATF are not available, engine oils according to sheet 227.0, SAE 10W or, depending on the outside temperature, 20W-20 can be used in the above-mentioned synchronized manual transmissions as a makeshift measure (queries should be directed to the Abt. Betriebsstoffe EP/QWB (EP/QWB Operating Fluids Dept.).

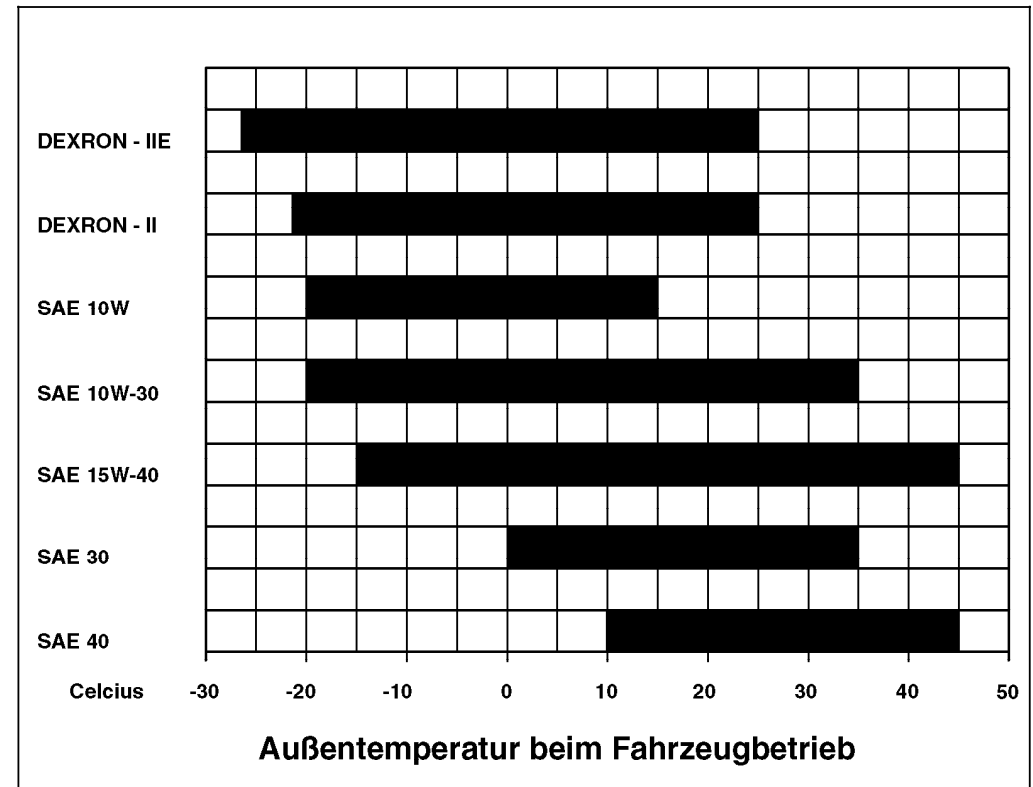
The approved ATF according to Sheet 236.2 correspond to the currently no longer valid GM specification Type A Suffix A. The kinematic fresh oil viscosity at 100 °C must be at least 7.0 mm²/s, after shearing (as per CEC- TLPG 7) at least 6.0 mm²/s.

3.3 Steering gear oil, **sheet 236.3**, for all commercial vehicle steering systems, except vans T0 and T1N, power steering systems for passenger cars, except S-Class W220, power pack of the A-Class, and cross-country vehicles, manual steering L 075 Z for passenger cars and manual steering in cross-country vehicle.

In the S class W220, in the Power-Pack of the A class as well as in the Transporters T0 and T1N as of/below outside temperatures of 25 °C the hydraulic fluids according to sheet 345.0 must be used.

3.4 Allison automatic transmissions in makes AT500, MT600, S1000, S2000, World Transmission in series 3000 and 4000 must only be filled with the oils specified in Sheet 236.9 or TES 295.

i If prior to starting the vehicle the gear oil temperature is below the critical temperature for the oil used, then either the gear oil should be prewarmed or the transmission should be warmed up while in neutral.



3.5 Automatic transmission fluid (ATF), **Sheet 236.6 and 236.7**, for MB automatic transmissions without regulated torque converter lockup clutch in passenger cars and commercial vehicles and buses (W4B035 only as of major assembly end no. 005733), ZF Ecomat transmissions, Voith-Diwa transmissions, commercial vehicle and cross-country vehicle power steering systems.

If the approved automatic transmission fluids as per Sheet 236.2 are not available, automatic transmission fluids as per Sheet 236.6 can be used in synchronized manual transmissions for passenger cars as a makeshift measure, except GL 76/30-5 and GL 275E (automatic transmission fluid as per Sheet 236.2 is mandatory for the two sport transmissions).

The approved ATF according to Sheet 236.6 and 236.7 correspond to the currently no longer valid GM specification Dexron II-D. The kinematic fresh oil viscosity at 100 °C must be at least 7.0 mm²/s, after shearing (as per CEC- TLPG 7) at least 6.0 mm²/s.

3.6 Automatic transmission fluid (ATF), **Sheet 236.8**, for ZF Ecomat transmissions, Voith-Diwa transmissions, MB automatic transmissions in commercial vehicles and buses except W4B035 and MB automatic transmissions without regulated torque converter lockup clutch in passenger cars (only in arctic climates).

The approved ATF correspond to the no longer valid GM specification Dexron II-E, Allison C4, Voith lubricant lists G 607 and G 1363 as well as ZF lubricant specifications TE-ML 14.

3.7 Automatic transmission fluid (ATF), **sheet 236.81**, for MB automatic transmissions without controlled torque converter lockup clutch in passenger cars, MB automatic transmissions in commercial vehicles and buses except W4B 035 as well as ZF Ecomat transmission, Voith-Diwa transmission.

The approved ATF corresponds to the ZF lubricant specifications TE-ML 09, TE-ML 14 and the Voith lubricant lists G 607 and G 1363.

3.8 Automatic transmission fluid (ATF), **Sheet 236.9**, for MB automatic transmissions without regulated torque converter lockup clutch in passenger cars, ZF Ecomat transmissions, Voith-Diwa transmissions, Allison transmissions.

The ATF correspond to the valid GM specification Dexron III, Voith lubricant lists G 607 and ZF lubricant specification TE-ML 14.

3.9 Automatic transmission fluid (ATF), **Sheet 236.10**, for MB automatic transmissions with and without regulated torque converter lockup clutch (GKÜB) in passenger vehicles. This ATF is provided ex works as lifetime oil in all MB automatic transmissions with regulated torque converter lockup clutch - model series 722.6 - in passenger cars. For repair work, only the ATF quality specified in sheet 236.10 may be used for refilling in this new generation of automatic transmissions, and this can be obtained in a 1 liter container under the part no. 001 989 2103.

All MB automatic transmissions without regulated torque converter lockup clutch in passenger cars can either be filled with the ATF as per Sheet 236.10 or the ATF as per Sheets 236.1/.6/.7/.81/.9.

3.10 Automatic transmission fluids (ATF), **sheet 236.11**, for ZF automatic transmission "IF 4 HP 20" and the automatic transmission oil circuit of the VW automatic transmission "AG4"

The approved ATF are usually only used in the event of repair or for refilling.

3.11 Automatic transmission fluids (ATF), **sheet 236.12**, for 7-gear automatic transmission oils (ATF), is also downwards-compatible for all 5-gear automatic transmissions.

3.12 **Sheet 236.13**, repair solution for MB automatic transmissions without regulated torque converter lockup clutch in passenger cars with the complaint of "double harsh engagement after engaging drive mode D", the MB automatic transmission fluid - part no.:

A 001 989 2303 11 - and/or the ATF "ATF MB 274" from Exxon Mobil Corporation, Fairfax, Virginia, USA, must be used.

The ATF "Shell ATF MB" and/or the MB automatic transmission fluid with the part no.: A 001 989 0703" previously approved for the above-mentioned application must no longer be used, but can be used up as an ATF for oil changes necessary as a result of maintenance.

3.13 Automatic transmission fluids (ATF), **sheet 236.20**, for CVT transmissions that are used in Mercedes-Benz A-class and B-Class vehicles with CVT transmission, model 169, 245 with transmission 722.8

3.14 Automatic transmission fluids (ATF), **Sheet 236.91** or TES 295 for Allison automatic transmission. This oil permits much longer oil change intervals, in particular for Allison transmissions.

Note on Allison transmission (extended maintenance intervals):

Allison offers a new fully synthetic transmission oil "TranSynd" as per Allison specification TES 295, which must be ordered directly through Allison or Castrol.

This oil permits much longer oil change intervals in combination with "High-performance filters". Further information on this can be found at the Mercedes-Benz/Allison dealers or in the particular operator's manual.