1. Coolant

1.1 Coolant composition

1.1.1 Passenger car and commercial vehicle engines (normal case)

50 vol.-% Water
50 vol.-% Anticorrosion/antifreeze agents (see Sheet 325.0 or 325.2, 325.3) antifreeze protection down to approx. -37 °C

1.1.2 Commercial vehicle engines (without antifreeze specification)

Blend of water and coolant additive in accordance with Sheet 312.0, for prescribed mixture ratio refer to Sheet 312.0.

Scope: If constant ambient temperatures above freezing point.

1.1.3 Commercial vehicle engines (exceptional case, not for engines OM 500 and OM 900)

99 vol.-% Water
1 vol.-% Refining agent (see Sheet 311.0)

Scope: for constant ambient temperatures above freezing point, e.g. in tropical regions, in which it can be proven that no approved anticorrosion/antifreeze agents and coolant additives according to Sheet 312.0 are available.

⚠ Passenger-car engines, which are installed in a commercial vehicle, must always be filled up as for a passenger-car engine, refer to item 2.1/2.2.

i A quick-glance overview of the fields of application for the approved coolant additives and the prescribed change intervals is available in Section 5. Please note the mixing prohibition for Sheets 325.3 and 326.3!

1.2 Water

1.2.1 Fresh-water regulations/water treatment

Clean, and where possible, not too hard water should be used for processing the coolant. Drinking water frequently, although not always, complies with the given specifications.

Sea water, brackish water, brine and industrial waters are not suitable. The level of water containing dissolved substances can vary greatly depending upon its origin (ground, spring, surface water) and it is of major significance regarding the presence of corrosion.

Water that is too hard is disadvantageous because of the possibility of scaling or sludging occurring. Salt content, predominantly chloride, greatly promotes corrosion. If in doubt, analyze the water.

Information concerning the water quality of drinking water is available from the local water-plant authorities or the official water utilities on request.
If there is no available information regarding the quality of the drinking water then distilled or deionized water should be used.

If the water fails to comply with the approved analysis values, then it should be processed in a suitable manner, because even excellent anticorrosion/antifreeze agents are greatly impaired in their ability to protect against corrosion if the water quality is poor.

Should it not be possible to soften the water then the water should be brought up to an approved hardness by an admixture of soft or distilled (deionized) water.

If the chloride or total ionic content of the water is too high then the level can be reduced through the admixture of deionized, in other words, exchanged ions or distilled water.

Corresponding processing methods will need to be used (desalination and softening or the separating method) depending upon the contaminants present in the water. Hints on how to conduct water treatment are available from water plants or water utilities as well as several companies and engineering consultants who are experienced in this area.

Depending upon the composition of the coolant, the analysis values for the water should lie within the following limits:

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1.2.2 Fresh-water quality for coolant composition as under item 1.1.1 (passenger-cars and commercial-vehicle engines)

Sum of earth alkalis (water hardness):	0 to 3.6 mmol/l (0 up to 20° d)*
pH-value at 20 °C:	6.5 to 8.5
Chlorine ion content:	max. 100 mg/l
Sum of chlorides + sulfates:	max. 200 mg/l

1.2.3 Fresh-water quality for coolant composition as under item 1.1.2/1.1.3 (commercial-vehicle engines)

Sum of earth alkalis (water hardness):	0 to 2.7 mmol/l (0 up to 15° d)*
pH-value at 20 °C:	6.5 to 8.0
Chlorine ion content:	max. 80 mg/l
Sum of chlorides + sulfates:	max. 160 mg/l

If in doubt, contact DaimlerChrysler AG, department EP/MEK (operating fluids), H 120, D-70546 Stuttgart.

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* Customary designations for water hardness in various countries:
1 mmol/l=5.6° d=10° f=7.02° e=100 mg/kg Ca CO_3.
1° d (German degree =1° dGH)=1.78° (French degree)=1.25° e (English degree)=17.9 mg/kg Ca CO_3 (USA hardness).

1.3 Premixed coolant

Several providers have water with premixed coolant in their product range. Provided they are approved (see below), they can also be used; the regulations relating to application, composition, change intervals, etc. of these coolant specifications also apply. It is imperative that the correct concentration (50/50) is used in their application and, of course, further dilution is not permitted!

Approval status:

Coolant for all vehicles and engines	(Basis 325.0) Sheet 326.0
Coolant for commercial vehicle and industrial engines	(Basis 325.2) Sheet 326.2
Coolant for commercial vehicle and industrial engines	(Basis 325.3) Sheet 326.3

The regulations for each respective Sheet 325.x are to be transferred correspondingly to Sheet 326.x.

At the time of compiling these regulations it is possible that not all the sheets 326.x are represented with approved products.

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2. Coolant additives (General information)

Normally, coolant consists of water and anticorrosion/antifreeze agents. The anticorrosion/antifreeze agents (ethylene glycol with corrosions inhibitors) in the cooling system have to fulfill, among other things, the following functions:

- to provide sufficient corrosion and cavitation protection for all cooling system components
- freezing point depression (antifreeze)
- increasing boiling point

For corrosion protection purposes the coolant approx. 50 vol.-% Anticorrosion/antifreeze agents are added if the expected ambient temperatures do not require an even higher concentration. This concentration (50 vol %) offers frost protection up to approx. -37 °C. A higher concentration is only necessary if the ambient temperatures are even lower.

Even with extremely low ambient temperatures, not more than 55 vol.-% anticorrosion/antifreeze agent should be used, because at this level the maximum antifreeze protection is reached and a greater concentration reduces the antifreeze protection again and decreases the heat dissipation (55 vol.-% corresponds to antifreeze protection down to approx. -45 °C).

Should these coolant regulations fail to be observed then corrosion and damage to the cooling system are inevitable.

The admixture of anticorrosion/antifreeze agent serves to increase the boiling point. By raising the pressure the boiling temperature can be increased yet further. Both physical relationships are put to use in modern cooling systems, the maximum coolant temperature is raised, without increasing the danger of boiling. In keeping with the higher temperature level the cooling performance is also greater. Only approved products (Sheet 325.0 and 326.0, or 325.2 and 326.2, 325.3 and 326.3, as well as 312.0 or 311.0) provide reliable protection of the cooling system. In special cases (commercial-vehicle engines, no antifreeze specification) coolant additives can be used that are primarily corrosion protection additives. In this case item 2.3 is valid.

As an exception, if neither anticorrosion/antifreeze agent conforming to Sheet 325.0 nor coolant additives without addition of antifreeze conforming to Sheet 312.0 are available, proceed according to point 2.4 (exception: OM 500 and OM 900). The systems described under items 2.2/2.3/2.4 are not compatible with each other. It is recommended to mix the entire coolant quantity outside the engine.

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2.1 Anticorrosion/antifreeze agent for passenger-car engines

Alongside the correct constitution of the cooling water (item 1.2.2) care must be taken to ensure that only anticorrosion/antifreeze agents as approved for all engines in accordance with **Sheet 325.0** are used. These products serve to guarantee that, in particular, an effective protection against corrosion is provided for all light-alloy parts in the cooling system and they are also specified for all passenger-car engines.

In order to ensure that the protection against corrosion is effective, the anticorrosion/antifreeze agent must remain in the cooling system throughout the year - including w

As a result of the optimizations we have made to the system of engine/coolant/cooling system, in the majority of our newer passenger vehicles, a change of the coolant is not necessary until reaching 15 operating years or 250,000 km (whichever comes first). This may not apply to some models; in these cases the maintenance booklet will stipulate another regulation.

2.2 Anticorrosion/antifreeze agent for commercial-vehicle engines (normal case) (not: OM 601, OM 602, OM 603, M 102)

The coolant in commercial-vehicle engines is made up of both water and anticorrosion/antifreeze agent (refer to item 1.1.1) and as such offers ideal protection against corrosion and cavitation.

All the approved products on the Sheets 325.2, 325.3 or 325.0 which are part of the Specifications for Operating Fluids can be used to select an anticorrosion/antifreeze agent. However, it should be noted that passenger vehicle engines built into commercial vehicles must be filled like passenger vehicles (e.g. OM 601 in T1), i.e. a product conforming to Sheet 325/6.0 must be used.

Products that are not listed in Sheets 325.0 and 326.0, or 325.2 and 326.2, or 325.3 and 326.3 are not approved and are therefore not to be used under any circumstances.

Anticorrosion/antifreeze agents or coolants conforming to Sheet 325/6.3 may be used for longer than other products due to their composition. The change interval is set at 5 years (refer to Overview Section 5). However, it should always be remembered that anticorrosion/antifreeze agents or coolants conforming to Sheet 325.3 and 326.3 must not be mixed with those conforming to Sheet 325.0 and 326.0 or 325.2 and 326.2.

2.3 Coolant additives for commercial-vehicle engines without antifreeze specifications (refer to item 1.1.2) (not: OM 601, OM 602, OM 603, M 102)

In those application cases where no antifreeze is necessary, coolant for commercial-vehicle engines as under item 1.1.2 can be mixed to suit. It is impossible to cite gene

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2.4 Coolant regulations for commercial-vehicle engines (exceptional case, not engines OM 500 and OM 900)

In the event that neither an approved anticorrosion/antifreeze agent is available, nor a coolant additive in accordance with sheet 312.0 and if temperatures do not drop below freezing then it is possible in this exceptional case to use a coolant refining agent to 1 vol % if it is approved in sheet 311.0 (soluble corrosion protection oil). This will not raise the boiling point. The starting-off water itself underlies the more stringent regulations as under item 1.2.3.

The period of usage for this coolant, which may only be used in exceptional circumstances, is shorter than usual (refer to position 3).

⚠ Water that is too hard may impair the emulsion resistance, with the result that the emulsion breaks down (oil separation) and the engine's water jackets are contaminated.

2.4.1 Applying water refining mixture

When carrying out a new filling (initial filling or filling after a cleansing operation) an emulsion of 1.0-1.5 percent by volume should be used. When refilling, an emulsion of 0.5-1.0 vol % should be used. Concentrations that are too high (>1.5 vol %) do not improve the corrosion protection capability and may exert a negative influence on seals and hoses.

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3. Monitoring coolant operation

It is very important to monitor the coolant constantly if the engine is to run trouble free.

The concentration level should be checked every six months.

The inspection should be conducted with suitable apparatus. If, when monitoring the concentration of the coolant, it is determined that the concentration of anticorrosion/antifreeze agent has reached **40 vol.-%** or less or an antifreeze protection of **-28 °C** is no longer guaranteed, the concentration must be increased to the regulation filling of **50 vol.-% (-37 °C)**. When topping up (after coolant loss), an anticorrosion/antifreeze agent content in the coolant of at least 50 vol.-% (antifreeze protection down to -37 °C) must be ensured, or the concentration regulations according to point 2.3 / 2.4.1 must be observed. In closing an example is given in Overview Section 5.

The corrosion inhibitors diminish during operation and lose their protective capability. Coolant that is too old, and has lost its important inhibitors and anti-aging additives, becomes strongly corrosive. The coolant additives as under Sheets 311.0 and 312.0 will also age. This causes a deterioration in the level of protection capability, and with regard to coolant refining agents this will also cause the emulsion to break down.

For this reason it is important to replace the coolant, in order to ensure that its corrosion protection capability is retained. If necessary the cooling system should be thoroughly cleansed before refilling with the new coolant. A sufficient level of heat dissipation will only be given if the cooler surfaces are clean.

The maximum permissible period of usage for coolant is cited in Overview Section 5.

⚠ **Non observance of these regulations or the use of non-approved products will result in serious damage.**

⚠ **The use of approved operating fluids, which naturally include the anticorrosion/antifreeze agents, is a well-known constituent of the warranty conditions.**

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4. Disposal of coolants

The coolants are biologically-degradable material.

All statutory regulations or waste water regulations in each individual country with regard to the disposal of used coolant must be observed.

It is recommended to have the possibilities available for disposing of materials explained by the local responsible water authorities.

Currently in Germany methods are being compiled for the purification of used coolant. The separate collection of all used operating fluids is highly recommended.

However, as a consequence of the complex tasks asked of a modern coolant, it is on no account advisable to use an improperly "recycled" coolant, which has only undergone a mechanical pre-purification process.

5. Overview

Which coolant additive, what change interval for which engines?

Passenger cars engines

Sheet No.	**Engine series**		**Change interval years/km**
	M100/M200	OM 600	
325.0/326.0	-	-	15/250.000 ℹ Whichever occurs first must be observed; Exception: in the vehicle's maintenance booklet shorter change intervals are stipulated

Commercial vehicles engines

Sheet No.	**Engine series**				**Change interval Years**
	OM 300	OM 400	OM 500	OM 900	
311.0	-	-			0.5
312.0	-	-	-	-	1
325.0/326.0	-	-	-	-	3
325.2/326.2	-	-	-	-	3
325.3/326.3	-	-	-	-	5

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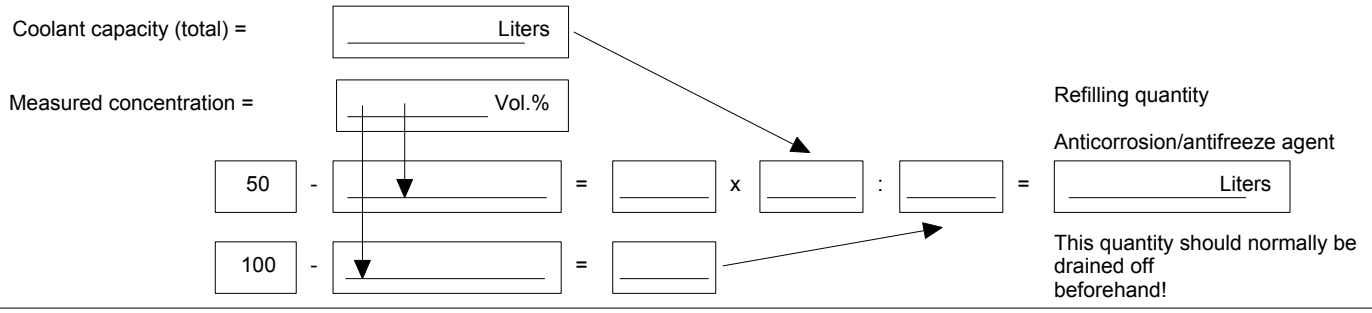
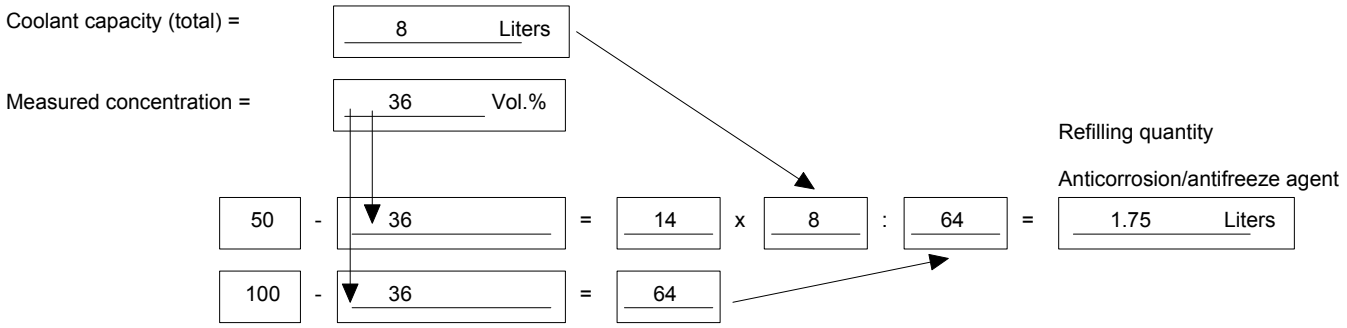
Calculation of the antifreeze quantity to be refilled with a concentration that is too low (specified: 50 vol.%)



Example of calculation:



Frost protection/concentration (approx.)

°C	-10	-14	-15	-18	-20	-23	-25	-27	-30	-33	-35	-40
vol %	20	25	26	30	32	35	37	40	42	45	47	50

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