

# Measures for Winter Operation

Job No.
0-7

## Lubricating Oil of Engine:

At the beginning of the cold season a motor oil with the specified SAE viscosity class has to be filled into the engine in due time (see Job No. 0-4). The injection pump, the governor of the injection pump, the blower, and the oil bath air filter have to be treated in a similar way.

## Cooling Water:

At temperatures near and below the freezing point of water one of the following anti-freezes or a foreign product of the same quality has to be added to the cooling water.

## Anti-freeze:

Trade Name	Firm
* BP Anti-Frost . . . . .	BP Benzin- und Petroleum AG, Hamburg
* Fuchs Anti-freeze . . . . .	R. Fuchs, Mineraloelwerk, Mannheim
Genantin . . . . .	Farbwerke Hoechst, Werk Gendorf/Obb.
Glystantin . . . . .	Chem. Fabrik Holten, Oberhausen
Hyperol Anti-freeze . . . . .	Montan-Union GmbH, Hamburg
* Prestone, Anti-freeze . . . . .	National Carbon Company, Toronto
* Shell Antifrost . . . . .	Shell Austria, Vienna
* Sinclair Anti-freeze . . . . .	Sinclair Refining Company, New York

\* Available in Germany and in foreign countries or in the latter only.

Protection at outside temperatures as low as °C	-10	-15	-20	-25	-30	-40
Anti-freeze in %	20	27	34	40	44	51
Specific weight of mixture at 20° C water temperature	1.027	1.037	1.047	1.055	1.060	1.068

The specific weight, which can be determined with an areometer at each Mercedes-Benz service station, is a means to check the correct concentration.

**The cooling water should also be refined according to our instructions if an anti-freeze is used.**

During the cold period this check has to be conducted several times and if necessary more anti-freeze should be added.

If anti-freeze has been added to the cooling water a label with the legend "Anti-freeze filling, do not drain cooling water" should be attached to the drain cock. To prevent the freezing of the heated cooling water being filled in the cold engine, only cooling water with anti-freeze should be used. If no or not enough anti-freeze has been filled into the cooling system and the engine is taken out of operation for a longer period while the outside temperature is below 0° C, but also if there is only danger of frost, drain the cooling water by opening the cocks at the lowest point of the cooling system and the radiator. (Watch outflow, cocks can freeze up.) Remove cap screw at filler hole to speed up draining of cooling system.

## Fuel:

Before the beginning of the cold season the sediment in the fuel tank must be removed by draining. The pre-filter must be cleaned thoroughly to remove the accumulated water before it can cause failures of the fuel system due to freezing in the fuel lines. As soon as the outside temperatures drop below the clouding point of the diesel fuel and/or start to influence the filterability, the flowing properties of the fuel can become insufficient due to clouding. The result is feeding difficulties caused by clogging of the filter or obstruction of the pipes. In the winter months winter diesel fuels with a lower clouding point are on the market in order to help to eliminate these failures.

However, since winter diesel fuels with adequate flowing properties are not available in time at all filling stations, it is advisable, in order to be able to maintain a satisfactory operation, to add to the summer diesel fuel a certain quantity of non-premium gasoline, kerosene and/or tractor fuel depending on the outside temperature. This advice is in any case also valid for winter diesel fuel at outside temperatures below  $-15^{\circ}\text{C}$ .

If kerosene, tractor fuel, and non-premium gasoline are available, the first mentioned should be preferred, because by using non-premium gasoline other operational difficulties can be expected due to a possible formation of gas bubbles giving rise to vapor lock. Gasoline-benzol mixtures must not be used, because they considerably reduce the ignition quality of the diesel fuel.

At lower temperatures such a mixture has better flowing properties than the standard diesel fuel. Important is in these cases that the fuel added to obtain the mixture is filled into the tank so early, that all fuel lines are filled with the mixture before the outside temperature reaches the critical point. When preparing the mixture pour the additive in a mixing can, then the diesel fuel, stir well, and pour the mixture into the tank.

The mixing ratio between the different fuel additives and summer and/or winter diesel fuel at different outside temperatures is listed in the following table.

### Mixing Table for Diesel Fuel with Additives

such as non-premium gasoline, kerosene, and tractor fuel

Outside temperature	Summer diesel fuel	Additive	Winter diesel fuel	Additive
$^{\circ}\text{C}$	%	%	%	%
$\pm 0$ to $-10$	80	20	100	—
$-10$ to $-15$	70	30	100	—
$-15$ to $-20$	50	50	80	20
$-20$ to $-25$	—	—	70	30
below $-25$	—	—	50	50

### Starting of Engine at outside Temperatures below $-8^{\circ}\text{C}$ :

In the winter special care has to be given to the battery and it must be aimed for a full loading capacity before starting by careful maintenance and low power consumption.

The capacity of the battery depends on the temperature and is reduced considerably if exposed to cold; at  $-10^{\circ}$  C the actual capacity is only 20 % of the rated capacity. Especially in the cold season this negative reaction of the battery has to be fully taken into consideration during starting. Therefore, at very low outside temperatures it is advisable after stopping the engine to remove the battery and store it in a heated room. When connecting the battery make sure that the terminals are clean and free of oxides.

In order to start the engine 3 consecutive trial starts can be carried out as described below:

**Trial Start 1:**

2 minutes of preliminary heating by holding starting switch in position 1,  
10 seconds of cranking by holding starting switch in position 2.

For starting, set adjusting lever (injection pumps with centrifugal governor) or control lever (injection pumps with pneumatic governor) to 'full throttle' position, and return to idling immediately after the engine has started.

**Trial Start 2:**

1 minute of preliminary heating by holding starting switch in position 1,  
10 seconds of cranking by keeping starting switch in position 2.

For starting, set adjusting lever (injection pumps with centrifugal governor) or control lever (injection pumps with pneumatic governor) to 'full throttle' position, and return to idling immediately after the engine has started.

If the cranking speed decreases wait 1 minute, if not, turn to

**Trial Start 3:**

1 minute of preliminary heating by holding starting switch in position 1,  
10 seconds of cranking by keeping starting switch in position 2.

For starting, set adjusting lever (injection pumps with centrifugal governor) or control lever (injection pumps with pneumatic governor) to 'full throttle' position, and return to idling immediately after the engine has started.

After 3 negative trial starts give the battery 2 minutes of rest before starting again.