



Fuels, Lubricants and Coolants for MAN Diesel Engines
Betriebsstoffe für MAN-Dieselmotoren
Sustancias de servicio para motores Diesel MAN
Ingrédients pour moteurs Diesel MAN
Materiali d'esercizio per motori Diesel MAN

Fuels, Lubricants and Coolants for
MAN Industrial and Marine Diesel Engines



Dear Customer,

MAN diesel engines are developed to the state of the art and built using the latest production technology.

This results in significant properties such as:

- Economical operation owing to low fuel and lubricating oil consumption
- Low weight
- Limited maintenance overhead and spare part requirements and a long service life
- Future-oriented environmental compatibility
- Quick load pickup
- Compact design

However, trouble-free operation and high performance can be achieved only if the specified maintenance intervals are observed and the fuels, lubricants and coolants approved by MAN are used.

Please observe guidelines for the protection of the environment when handling fuels, lubricants and coolants.

Yours faithfully
MAN Nutzfahrzeuge Aktiengesellschaft
Nuremberg Plant

We reserve the right to make technical modifications in the course of further development.

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Fuels, lubricants and coolants are poisonous, inflammable and also harmful to the environment if they are not used properly. Do not allow them to seep into the ground or into the sewerage system. Hand used oil over to old oil disposal companies or dispose of them as special waste.

Comply with safety regulations.

Follow the instruction sheet for handling used engine oil.

Engine oil

- Hand old oil over to old-oil-disposal companies only.
- Ensure without fail that oil does not seep into the sewerage system and / or into the ground.
Caution:
Risk of contamination of potable water.
- Dispose of used filter elements and cartridges as special waste.

Coolant

- Dispose of undiluted anticorrosion protection and / or antifreeze agents as special waste.
- When disposing of used coolant, the regulations issued by the relevant local authorities must be observed.

Diesel fuel

- Strict attention should be paid to ensuring that diesel fuel does not seep into the sewerage system and / or into the ground.
Caution:
Risk of contamination of drinking water.
- Dispose of used filter elements and cartridges as special waste.



Engine oils

Engine oils approved by MAN

Engine oils complying with factory standard are to be used for industrial and ship's diesel engines.

The choice of a suitable engine oil is based on the scheduled oil use period, the fuel quality used and the climate conditions at the place of deployment.

Always observe the oil change intervals specified in the operating manual or on-board service booklet / service booklet.

The permitted engine oils can be found on the Internet:

<http://www.man-mn.com/> → **Products & Solutions** → **E-Business**

Use of permitted engine oils

Engine model	MAN 270	MAN 271	M 3275	M 3277
D 02xx – aspirating engine	yes	yes	yes	yes
D 02xx – with turbocharger / intercooler	yes	yes	yes	yes
D 08xx – aspirating engine	yes	yes	yes	yes
D 0826 – with turbocharger / intercooler	yes	yes	yes	yes
D 0826/36 TE/LE 5..	no	no	yes	yes
D 0836 – with turbocharger / intercooler	yes	yes	yes	yes
D 0836 LE 4..	no	no	no	yes
D 28xx – aspirating engine	yes	yes	yes	yes
D 2866 TE, D 2866 LE 1..	no	no	yes	yes
D 2866 – with turbocharger / intercooler	yes	yes	yes	yes
D 2876 – with turbocharger / intercooler	yes	yes	yes	yes
D 2876 – with Common Rail	no	no	no	yes
D 2842 TE	no	no	yes	yes
D 284x – with turbocharger / intercooler	yes	yes	yes	yes
D 2842 LE 409 – two-stage turbocharging	no	no	yes	yes
D 284x – with Common Rail	no	no	no	yes

**Caution:**

Common-rail engines may only be operated with oils complying with works standard M 3277.

Single-grade engine oils

SAE 30 or 40 single-grade engine oils to works standard MAN 270 should be used only if multi-grade engine oils are not available or if the use of single-grade oils is explicitly required.

Heed the operating temperature range.

High-performance diesel engine oils

High-performance diesel engine oils to works standards M 3275 and M 3277 have a considerably higher performance level than engine oils to works standards MAN 270 and 271.

In turbocharged diesel engines in particular, high-performance diesel engine oils have major advantages in terms of piston cleanliness, wear and tear and power reserves. High-performance diesel engine oil are of course also suitable for non-turbocharged engines.

In the interest of greater engine life expectancy we recommend using such oils for turbo-charged and non-turbocharged engines.



Caution:

In high-performance marine diesel engines, extreme operating conditions may lead to deposits in the charge-air area that reduce the engine output. For these engines, low-deposit engine oils complying with factory standard M 3277 are recommended in particular.

Conditions of approval

The approval for engine oils is valid for two years and can be extended by another two years at the request of the manufacturer / supplier provided that the quality of the oil in question has not changed.

Before purchasing a product, make sure that it is still approved by having the supplier produce the MAN letter of approval.

Engine oils without MAN approval

If in certain countries MAN-approved engine oils are not available, use only engine oils for which the manufacturer or supplier confirms in writing that their quality level complies at least with ACEA E2 (for MAN 270 / 271), ACEA E3/E5 (for M 3275) or ACEA E4 (for M 3277) or API-CF 4, CG 4 CH-4, CI-4.

If these engine oils are used, the oil change intervals specified in the operating manual or on-board service booklet / service booklet are to be reduced on agreement (consult MAN Nutzfahrzeuge AG, customer service).



Engine oils

Engine oils – US market

Engine oils approved by MAN for the US market

Permitted engine oils, complying with factory standard MAN 270		
Approval granted to	Product designation	Viscosity class SAE
ChevronTexaco Global Lubricants	Chevron Delo 400	SAE 30
	Chevron Delo 400	SAE 40
	Texaco Ursa Premium TDX	SAE 30
	Texaco Ursa Premium TDX	SAE 40
ExxonMobil	Mobil Delvac 1630	SAE 30
	Mobil Delvac 1640	SAE 40
Shell International	Shell Rimula X	SAE 30
	Shell Rimula X	SAE 40

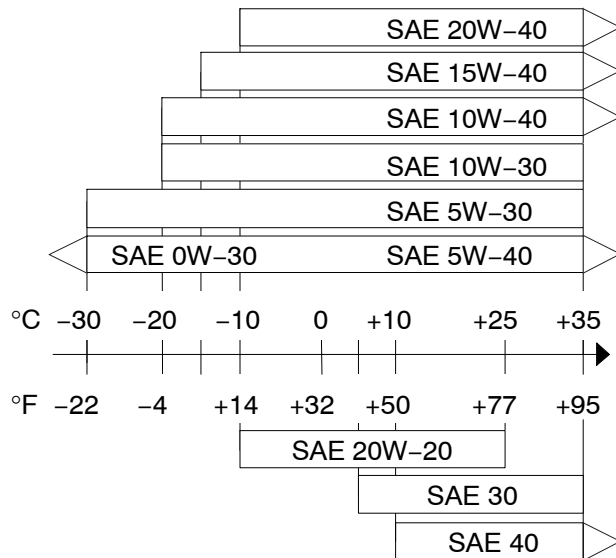
Permitted engine oils, complying with factory standard MAN 271		
Approval granted to	Product designation	Viscosity class SAE
Pennzoil-Quakerstate	Pennzoil Long-Life	SAE 15W-40
	Pennzoil Long-Life 2000	SAE 15W-40
	Pennzoil Long-Life 2000	SAE 20W-50

Permitted engine oils, complying with factory standard M 3275		
Approval granted to	Product designation	Viscosity class SAE
Caterpillar	Caterpillar Diesel Engine Oil	SAE 15W-40
ChevronTexaco Global Lubricants	Chevron Delo 400 Multigrade	SAE 15W-40
	Chevron RPM Heavy Duty Motor Oil	SAE 15W-40
	Texaco Ursa Premium TDX	SAE 15W-40
	Texaco Ursa Super Plus	SAE 15W-40
Shell International	Shell Rimula Premium	SAE 15W-40
	Shell Rimula X CH4	SAE 15W-40
	Shell Rotella T	SAE 15W-40

Permitted engine oils, complying with factory standard M 3277		
Approval granted to	Product designation	Viscosity class SAE
ExxonMobil	Mobil Delvac 1 SHC	SAE 5W-40
	Mobil Delvac XHP Extra	SAE 10W-40

SAE viscosity classes

SAE viscosity class is dependent on ambient air temperatures (see diagram).



Engine oil additives

Only engine oils which have been tested in accordance with works standards MAN 270, MAN 271, M 3275 and M 3277 and comply with these standards are approved for use in MAN diesel engines.

These oils are composed in such a way that they meet the engine requirements in every case if the specified oil change intervals are complied with.

Additives of any kind that are added **later** to the engine oil alter the engine oil in an unpredictable manner.

As the performance and maintenance overhead can be negatively influenced if additives of this nature are used, claims regarding deficiencies submitted to MAN Nutzfahrzeuge AG shall be void if the damage results from using such additives.



Mixing engine oils

In order to prevent a drop in performance of the engine oil used, and thus a reduction in the oil change interval, only engine oils with at least the same performance range should be mixed.

Engine oils from various manufacturers can be mixed and are compatible if used for the same area of application.

Oil change intervals

The oil change intervals are specified in the operating manual or on-board service booklet / service booklet.

Diesel fuel complying with the following standards is suitable for the operation of MAN diesel engines:

- European norm EN 590
- DIN EN 590 (Germany)
- ASTM D 975 No. 1 D (USA)
- BS 2869 Part 1 Class A 1 (Great Britain)

Low sulphur content in diesel fuel

- Diesel fuel**
- **low-sulphur** (<50 mg/kg sulphur) **according to EN 590**
 - **sulphur-free** (<10 mg/kg sulphur) **according to DIN EN 590**

For environmental-protection reasons MAN recommends the use of low-sulphur / sulphur-free diesel fuels.

These fuels can be used if they contain additives which guarantee sufficient lubricity (request written confirmation from the supplier; for minimum requirements, see EN 590). To avoid injection nozzle coking, low-sulphur / sulphur-free fuels must in general contain detergent additives. This must be ensured by the fuel supplier to guarantee the correct harmonisation and combined effect of lubricity and detergent additives.

High sulphur content in diesel fuel

MAN diesel engines can be operated with fuels whose sulphur content is max. 0.5%.

Fuels with a sulphur content of >0.5% are not permitted as they result in increased corrosion and hence greatly reduce the service life of engines.

The oil change intervals must be halved if the sulphur content is >0.2%. At the same time, only engine oil complying with works standard M 3277 may be used.

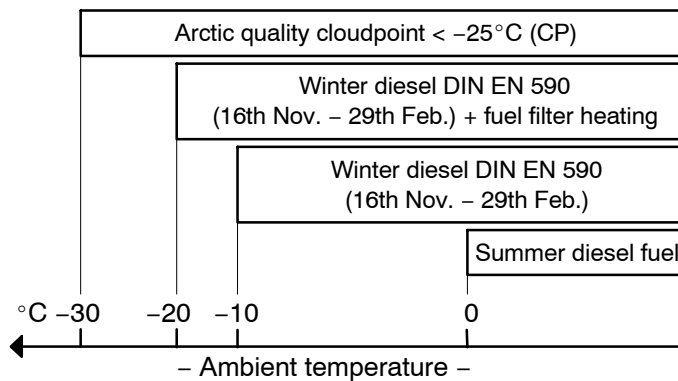
Winter operation

As ambient temperatures fall diesel fuel deposits paraffin crystals which increase the flow resistance in the fuel filter so much that an adequate fuel supply is no longer guaranteed.

Summer-grade diesel fuel to DIN EN 590 guarantees cold-flow characteristics down to 0°C, winter-grade fuel to DIN EN 590 to temperatures down to -20°C.

Winter diesel fuel is required for trouble-free operation in winter. The fuel manufacturer guarantee operating reliability for this fuel that goes beyond the DIN standard!

Alongside the “Limit value of filtering capability” usually defined in the EN 590 standard (CFPP), a cloudpoint (CP) that is as low as possible is decisive for safe operating characteristics (see diagram).



Do not add petrol:

If the cold-flow characteristics of the diesel fuel are inadequate or the outdoor temperatures are even lower, we recommend fitting fuel filter heating. Before winter, dewater the fuel pre-filter and fuel tank.

In countries where even lower ambient temperatures are reached, special diesel fuel (Alpine or Arctic quality) is usually available.

Danger classes as per German regulation for combustible fluids

Applies only in the Federal Republic of Germany. Country-specific regulations must be observed.

Diesel fuel / RME:

Danger class A III (flash point above 55°C)

Number 30

Designation no. 1202

Diesel fuel additives

No fuel additives of any kind are required for the operation of MAN diesel engines if the diesel fuel meets the requirements in the above specifications.

As the use of additives of this nature negatively influences the performance characteristics, exhaust clouding, pollutant emissions as well as the maintenance overhead and service life of the engines, the MAN Nutzfahrzeuge Aktiengesellschaft warranty is voided in this case.

Use of biodiesel (FAME) according to DIN EN 14214:

(FAME = Fatty Acid Methyl Ester) e.g. rapeseed oil methyl ester (RME)

As a general principle, MAN engines can be operated with FAME if this fuel meets the standard **DIN EN 14214** and has been made of rapeseed oil.

There is currently no approval for FAME made of other substances.



Common Rail:

Engines with CR fuel injection are not approved for operation with FAME!

A number of special features are important:

In comparison with diesel fuel, **FAME** has less favourable vaporisation characteristics. This leads to **fuel dilution of the engine oil, a reduction in viscosity** and – all things considered – to increased engine wear. For this reason, the **engine oil change intervals (including engine oil filter and fuel filter changes) must be halved:**

These specifications apply equally to alternating operation of diesel fuel and FAME as well as for mixtures of diesel fuel with FAME that are not covered by DIN EN 590.

FAME gels at low temperatures, so we recommend using winter diesel in the cold season.



Caution:

It is not permitted to use pure vegetable oils or mixtures thereof!
The same applies to any type of so-called “alternative fuels” that do not comply with the DIN EN 590 or DIN EN 14214 standards mentioned.

Micro-organisms in fuel systems running on diesel fuel and biodiesel

In favourable conditions micro-organisms (bacteria, fungi, yeast) contained in diesel fuel and biodiesel (RME) are likely to multiply. For their growth, water, which is found in the form of condensation in any fuel or storage tank, as well as vital elements (e.g. sulphur, phosphorus, nitrogen, oxygen and trace elements) in chemically bound form are needed. Fuel additives too may be conducive to their growth.

Depending on the temperature, they multiply fast or slowly, which leads to the formation of fibrous fungal meshwork, sludge and microbial corrosion.

The consequences are: rusting of tanks, clogging-up of fuel pre-filters with rust and fibres (fibrous fungal meshwork) and, as a result of this, frequent filter changes. This leads to reductions in output and, in extreme cases, to complete engine failure.

Remedial measures in the event of an attack by micro-organisms

In the event of an attack by micro-organisms we recommend you combat them by using the following disinfectants:

Product: **MAR 71**

Manufacturer: Schülke & Mayr

D-22840 Norderstedt

Tel.: 040 / 521 00-0

Fax.: 0 40 / 521 00-108

or:

Product: **BAKZID**

Manufacturer: Bodechemie Hamburg

Melanchthonstr. 27

D-22525 Hamburg

Tel.: 0 40 / 540 06-0

Fax.: 0 40 / 540 06-200

Both products are soluble in diesel fuel, biodiesel (RME) and water. They form no corrosive products after combustion. Owing to their alkalinity, acids formed as a result of microbial growth are neutralised.

Application:

Fuel tank:

In filling operations, add 50 ml (0.05 %) of disinfectant to every 100 litres of diesel fuel or biodiesel. This operation is repeated a total of three times.

In doing so, check the fuel pre-filter.

Storage tank:

If the tank sump shows no heavy water or sludge contamination, it is not necessary to flush the tank. In this case, it is sufficient to add 1 litre disinfectant per m³ tank content.



Caution:

Before using the disinfectants mentioned, be sure to observe the EU data sheets on safety (latest version).

If necessary, contact the manufacturer (e.g. for information on supply sources abroad).

General recommendations

The cooling system functions properly only if it works at a positive pressure. It is therefore absolutely necessary that it is kept clean and tight, that the radiator closing and working valves function correctly and the required coolant level is maintained.

Antifreeze agents tested and approved by us guarantee sufficient protection against frost, corrosion and cavitation. They do not attack seals and hoses and do not foam.

The cooling systems of the engine must be filled for the whole year with a mixture of 60% water and 40% antifreeze providing frost protection down to -27°C .

Coolant

Coolants which contain unsuitable antifreeze agents or which are prepared insufficiently or incorrectly, are liable to cause failure of machinery and components in the cooling circuit due to cavitation or corrosion damage. Besides, heat insulating deposits may occur on heat transferring components, so that in the end the engine is overheated and fails.

To guarantee reliable operation of MAN diesel engines, the coolant must generally consist of 60% water and 40% antifreeze over the whole year. This guarantees adequate corrosion protection. In special cases, corrosion inhibitors (chemicals) according to MAN 248 may be used.

As a matter of fundamental principle, emulsive anticorrosion protection oils are not permitted.

Specified ingredients of the coolant

Water

Potable tap water with the following restricted analytical data may be used:

Appearance: colourless, transparent, free of mechanical contaminants

Hardness: max 20° German total hardness
 $\doteq 35,6^{\circ}$ French hardness
 $\doteq 25^{\circ}$ British hardness
 $\doteq 358$ ppm USA hardness

Chlorides: max. 100 ppm

Sulphates: max. 150 ppm

pH-value at 20°C : 6,5 to 8,5

Enquires on potable water analyses are to be addressed to the competent authorities.

Where no such tap water is available, mix distilled water or distillate or condensate until the analytic values are reached.

Antifreeze with corrosion inhibitor

Permitted antifreeze agents complying with factory standard MAN 324

MAN fuels, lubricants and coolants (approved products) can be found on the Internet at:
<http://www.man-mn.com/> → **Products & Solutions** → **E-Business**

**Caution:**

Coolants to MAN 324 Type SNF must not be used in conjunction with silicon coolant hoses to MAN 334 Type 3 (blue).

Distinguishing feature of silicon coolant hoses: blue colour, the figure 3 in the item number, e.g. 04.27405–9150, 50–~~3~~x1000.

- Use only such antifreeze agents which have been approved according to MAN 324. A minimum concentration must always be maintained at 40% b.v. as corrosion protection is inadequate below that level.
- The cooling system is designed such that in Central Europe a coolant charge with max 40% b.v. antifreeze (frost protection down to -27°C) can be left in the system during the summer months as well, providing the cooling system is in good working order.
- At the beginning of the cold weather months the antifreeze content of the coolant may have to be increased for the outside temperatures to be expected (see mixing table).

Mixing table:

Outside temperature down to $^{\circ}\text{C}$	Water %	Antifreeze %
-27	60	40
-31	55	45
-37	50	50

**Prohibited mixture:**

Coolants according to MAN 324 type SNF must not be mixed with coolants type N or type NF.

Ready-made antifreeze-water mixtures with at least 40% b.v. of an approved antifreeze agent in deionised water are permitted.

Coolant check and replacement

- Always supplement incorrect coolant amounts with a mixture of water and a minimum of 40–50% b.v. (-37°C) antifreeze agent to that there is a reserve if only water needs to be topped up
- The concentration should be checked once every three months by means of a hydrometer or refractometer
- Never allow antifreeze concentration to drop below 40% by volume
- A concentration of more than 50% b.v. is to be avoided



Caution:

An increased proportion of antifreeze agent leads to a temperature increase in the coolant

- **Renew complete coolant after 4 years at the latest**
- Independent of these intervals, the coolant must be replaced if it turns brown or becomes cloudy

Corrosion inhibitor

For certain applications, where the use of antifreeze agents is not mandatory (e.g. tropical climate), corrosion inhibitors according to MAN 248 must be used.

Permitted anticorrosive agents for engine cooling systems complying with factory standard MAN 248

MAN fuels, lubricants and coolants (approved products) can be found on the Internet at: <http://www.man-mn.com/> → **Products & Solutions** → **E-Business**

The product-specific application concentration can be found in the service products database on the Internet.

Anticorrosive agent check and replacement

- Change all the coolant after one year or after 1500 operating hours, whichever period ends earlier
- Independent of these intervals, the coolant must be replaced if it turns brown or becomes cloudy
- The product-specific application concentration can be found in the service products database on the Internet

**Prohibited mixture:**

Anticorrosive agents according to MAN 248 must not be mixed with antifreeze agents or coolants according to MAN 324!

When antifreeze agent according to MAN 324 is to be replaced with anticorrosive agent according to MAN 248 or vice versa, the entire coolant is to be drained off. It is not necessary to flush the system.

Disposal of antifreeze and corrosion inhibitors

Undiluted antifreeze and corrosion inhibitors are to be treated as special waste. Regarding the disposal of used-up coolants (mixture of antifreeze or anticorrosive agent with water), the regulations of the local authorities responsible have to be observed.



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