Service products

MAN Industrial and Ship Diesel Engines

51.99589-8001
Version 02

“Translation of the original instructions”

Imprint

MAN Truck & Bus AG
Vogelweiherstraße 33
90441 Nuremberg
Germany

Tel.: +49 911 / 420-1745
Fax: +49 911 / 420-1932

E-mail: Engine-Documentation@man.eu
Internet: www.man-engines.com

Technical Status 11.2015

51.99589-8001

Read the instructions carefully before starting any work!
This particularly applies to the chapter “General Safety Instructions” and the respective safety instructions in the chapters.

Contents

1 Preface

1.1 Information

Dear customer,

MAN industrial and ship diesel engines are developed and manufactured using state-of-the-art technological standards and production plants.

This results in important characteristics, such as:

- Efficient operation through low fuel and lubricant consumption
- Low weight
- Low maintenance and spare parts requirements, as well as long service life
- Future-proof environmental sustainability
- Fast load pick-up
- Compact design

However, trouble-free operation and the expected high performance and service life can only be achieved if the prescribed service intervals are complied with using service products that are approved by MAN.

Please observe the general safety information and in particular the “environmental protection rules” when handling service products.

Yours sincerely,
MAN Truck & Bus AG
Nuremberg Plant

1.2 Explanation of icons

Warning notices

Warning notices are marked in this publication with symbols for service products. The information has been introduced with signal words that express the extent of risk or danger.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

DANGER

Describes an immediate dangerous situation that will lead to severe injuries or death if it is not avoided.

WARNING

Describes a potentially dangerous situation that may lead to severe injuries or death if it is not avoided.

CAUTION

Describes a potentially dangerous situation that may lead to minor or moderate injuries if it is not avoided.

NOTE

Describes a potentially dangerous situation that may lead to damage to property if it is not avoided.

Tips and Recommendations

Tip for users

Tips and recommendations as well as information for efficient and trouble-free operation.

ENVIRONMENTAL NOTE

Tips on conduct for environmental protection.

General information

- This symbol indicates a listing at the first level.
- ► This symbol indicates an action / sequence of actions.

1.3 Limitation on liability

All information and instructions in this manual have been compiled taking into consideration the applicable standards and regulations, the state-of-the-art technology as well as our knowledge and experience acquired over a period of several years.

MAN does not assume any liability for damage caused as a result of:

- Non-observance of this manual
- Use that is not in accordance with specifications
- Use of untrained personnel
- Use of prohibited service products.

1.4 Copyright protection

Tip for users

The information, text, drawings, pictures and other illustrations that it contains are protected by copyright and are subject to industrial property rights.
Any misuse is punishable by law.

1.5 Customer service

The MAN customer service is at your disposal for technical information.

Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

2 General safety instructions

Generally applicable safety instructions and those to be observed and followed are listed, which ensure optimal protection of personnel as well as safe and fault-free operation of the engine.

Specific, handling-related or situation-related safety information is placed before the relevant handling step or the relevant description in the section concerned.

Failure to observe the handling instructions and safety information provided in this publication for service products can result in considerable danger.

2.1 Notes for people

DANGER

Risk of death from highly inflammable substances
Risk of death from highly inflammable substances, liquids and gases.

Therefore:
- Smoking is prohibited in the danger zone.
- Use of open flames or ignition sources in the danger zone is prohibited.
- Keep fire extinguisher available.
- Immediately report suspicious substances, liquids or gases to the person responsible.
- In case of fire, immediately stop work and vacate the danger zone until the all-clear is given.

WARNING

Risk of death when handling service products

Therefore:
- Do not use any food or beverage containers for draining or storing service products or process materials.
- Observe the manufacturers’ safety data sheets.

WARNING

Risk of injury from service products that are harmful to health

Therefore:
- Observe the manufacturers’ safety data sheets.
- Wear personal protective equipment.
- Avoid contact with eyes and skin.
- Avoid spillage and mist formation.

CAUTION

Risk of injury when handling AdBlue®
Health risks can occur in the event of contact with skin or eyes.

Therefore:
- Use local exhaust ventilation (LEV).
- Do not eat, drink or smoke at the workplace.
- Wear personal protective equipment.
- If necessary, additionally wear ear protection, protective mask, safety goggles and chemical-resistant protective gloves.
- Wash hands thoroughly after work.
- In case of skin contact, wash skin with water and skin cleanser; seek medical assistance in case of skin irritation.
- Remove contaminated clothing immediately.
- In case of contact with eyes, rinse eyes with water or eye rinse solution for at least 15 minutes with open eyelids.
- In case of swallowing or persistent symptoms, call a doctor.
- Please observe the safety data sheets.

2.2 Environmental protection rules

ENVIRONMENTAL NOTE

Danger of environmental pollution caused by improper handling of service products
Considerable damage is caused to the environment.

Therefore:
- Observe national safety regulations.
- Collect service products using appropriate and sufficiently large containers.
- Only store service products in original containers.
- Absorb leaked or service product with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTE

Waste water must not enter into bodies of water or the ground.

Therefore:
- Only carry out engine cleaning in a washing area with an oil separator.

Engine oil

Tip for users

Observe the “Handling used engine oil leaflet”!

ENVIRONMENTAL NOTE

Risk of contaminating bodies of water and soil

Therefore:
- Collect service products using appropriate and sufficiently large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Treat undiluted antifreeze as hazardous waste.

Coolant

ENVIRONMENTAL NOTE

Do not allow any service products to enter the ground or bodies of water.

Therefore:
- Do not spill any service products while filling.

AdBlue®

ENVIRONMENTAL NOTE

Risk of environmental damage due to incorrect storage
Do not discharge AdBlue® into the groundwater or soil.

Therefore:
- Maximum storage temperature 25°C
- Absorb leaked or spilt AdBlue® with binding agent and dispose of properly.
- Store AdBlue® in original containers.

2.3 General information on service products

Tip for users

Observe all relevant standards, safety data sheets and national safety regulations prior to use.

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

2.4 Personal protective equipment

It is necessary to wear personal protective equipment in order to minimise the risks to health while working.

- Wear the personal protective equipment that is required for the respective work at all times while working.
- Obey signs that are posted in the working area regarding personal protective equipment.

Industrial protective clothing

is tight-fitting work clothing with low tear strength, with tight-fitting sleeves and without protruding parts. They are used primarily to protect against injuries, climatic influences and dirt or contamination.

Do not wear any rings, necklaces or other jewellery on the body while working.

Hard hat

for protection against parts falling down or flying about.

Safety shoes

to protect against heavy falling parts and slipping on slippery surfaces.

Safety gloves

to protect the hands from abrasion, getting pricked or deep injuries as well as from coming into contact with hot or corrosive parts or liquids.

Wearing for special work

When doing special work, special protective equipment is necessary. Special reference is made to these in the various chapters of this manual.

Safety goggles

to protect the eyes from parts flying around and liquid sprays.

Ear protection

to protect against hearing loss caused by noise.

3 Engine oils

3.1 Important information

WARNING

Risk of injury from engine oils that are harmful to health

Therefore:
- Observe the manufacturers' safety data sheets.
- Wear personal protective equipment.
- Avoid contact with eyes and skin.
- Avoid spillage and mist formation.

NOTE

Risk of engine damage from contaminated engine oil

Therefore:
- Strict rules for cleanliness must be applied when filling the engine with engine oil.
- Remove contaminants from filler openings.

ENVIRONMENTAL NOTE

Risk of contaminating bodies of water and soil

Therefore:
- Collect engine oils using appropriate and sufficiently large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.

3.2 Engine oils with MAN approval

For industrial and ship diesel engines, engine oils must be used that are approved according to the works standard.

The selection of a suitable engine oil is based on the intended oil operating time, the fuel quality used and the climatic conditions at the operation site.

The oil change intervals must basically be observed, which are specified in the Operator's Manual or the service logbook.

Tip for users

Additional information about engine oils can be found online:
https://my.man-mn.com/portal/irj/asp

3.3 Use of approved engine oils

For engines		MAN 270	MAN 271	M 3275	M 3277	M 3377	M 3477	M 3677
Euro0, Euro1		Yes	Yes	Yes	Yes	Yes	No	No
Euro2	D08 and D28	Yes	Yes	Yes	Yes	Yes	No	No
	D20 and D26 with diesel fuel of **less than** 50 ppm sulphur content	No	No	Yes	Yes	Yes	Yes	Yes
	D20 and D26 with diesel fuel **from** 50 ppm sulphur content	No	No	Yes	Yes	Yes	No	No
Euro3	with diesel fuel of **less than** 50 ppm sulphur content	No	No	No	Yes	Yes	Yes	Yes
	with diesel fuel **from** 50 ppm sulphur content	No	No	No	Yes	Yes	No	No
Euro4 EGR	with PM catalytic converter	No	No	No	No	No	Yes	Yes
Euro4 with SCR	with diesel fuel of **less than** 50 ppm sulphur content	No	No	No	Yes	Yes	Yes	Yes
	with diesel fuel **from** 50 ppm sulphur content	No	No	No	Yes	Yes	No	No
Euro5	with diesel fuel of **less than** 50 ppm sulphur content D20xxLF, D26xxLF: with exhaust gas recirculation and DOC	No	No	No	Yes	Yes	No	No
	D08: with exhaust gas recirculation and DOC D20xxLF, D26xxLF: with SCR	No	No	No	Yes	Yes	Yes	Yes
	D20xxLUH: with exhaust gas recirculation and PM catalytic converter	No	No	No	No	No	Yes	Yes
EEV	exhaust gas recirculation with PM-catalytic converter or CRT	No	No	No	No	No	Yes	Yes
	SCR	No	No	No	Yes	Yes	Yes	Yes
Euro6	EGR with SCRT	No	No	No	No	Yes*	No	Yes

* M3377: Long-life oil for special customer request in case of substantially shortened DPF standing times; not for vehicles with maintenance and full service contracts.
For vehicles with a service interval calculator, reprogramming of the vehicle parameter update (VPU) must be made by the workshop with a change to the oil specification.

Read the instructions carefully before starting any work!
This particularly applies to the chapter “General Safety Instructions” and the respective safety instructions in the chapters.

Explanations of abbreviations	
EGR	exhaust gas recirculation
CRT	continuously regenerating trap, oxidation catalyst and particle filter
DOC	diesel oxidation catalytic converter, diesel-oxidations catalytic converter
DPF	diesel particle filter
PM-KAT	particle filter with catalytic converter
SCR	selective catalytic reduction, exhaust gas aftertreatment with AdBlue®
EEV	Enhanced Environmentally friendly Vehicle
SCRT	combination of SCR and CRT

For special engine types	MAN 270	MAN 271	M 3275	M 3277	M 3377	M 3477	M 3677
D 02xx - naturally aspirated engine	Yes	Yes	Yes	Yes	Yes	No	No
D 02xx - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 08xx - naturally aspirated engine	Yes	Yes	Yes	Yes	Yes	No	No
D 0826 - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 0826/36 TE/LE 5..	No	No	Yes	Yes	Yes	No	No
D 0836 - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 0836 LE 4..	No	No	No	Yes	Yes	No	No
D 28xx - naturally aspirated engine	Yes	Yes	Yes	Yes	Yes	No	No
D 2866 TE, D 2866 LE 1..	No	No	Yes	Yes	Yes	No	No
D 2866 - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 2876 - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 2876 - with Common Rail	No	No	No	Yes	Yes	No	No
D 2842 TE	No	No	Yes	Yes	Yes	No	No
D 284x - with turbo charger / intercooler	Yes	Yes	Yes	Yes	Yes	No	No
D 2842 LE 409 - Two-stage charging	No	No	Yes	Yes	Yes	No	No
D 284x - with Common Rail	No	No	No	Yes	Yes	No	No
D 2868 LE 4xx	No	No	No	Yes	Yes	No	No
D 2862 LE 4xx	No	No	No	Yes	Yes	No	No

3.4 Single-grade engine oils

Only use single-grade engine oils SAE 30 or 40 according to works standard MAN 270 if no multi-grade engine oils are available or single-grade engine oils are prescribed.

► Please observe the operational temperature range!

3.5 High-performance diesel engine oils

High-performance diesel engine oils according to works standard M 3275, M 3277 and M 3477 have a significantly higher performance level than engine oils according to works standards MAN 270 and 271. Particularly in turbocharged diesel engines, high-performance diesel-engine oils offer significant advantages in terms of piston cleanliness, wear and a larger performance reserve. High-performance diesel engine oils are, of course, also suitable for non-turbocharged engines.
In the interest of a longer expected service life, we therefore recommend the use of such engine oils for turbocharged, as well as non-turbocharged engines.

NOTE

Risk of component damage from residues in the charge air area
Reduction of the engine performance under extreme operating conditions

Therefore:
- For high-performance ship diesel engines, use low-residue engine oils according to works standard M3277.

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

3.6 Approval requirements

The approval for engine oils is valid for **two years** and can be extended for another two years upon application by the manufacturer / supplier, provided that the quality has not changed.

Prior to every purchase, find out from your supplier whether the approval still exists by requesting submission of the MAN approval letter.

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

3.7 Engine oils without MAN approval

If no engine oils that are approved by MAN are available in certain countries, engine oils should be used, for which the manufacturer or supplier confirms in writing that their quality level at least fulfils 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.

When using these engine oils, the oil change intervals, which are specified in the Operator's Manual or the service logbook must be reduced by arrangement (consultation with MAN Truck & Bus AG, Customer Service).

The MAN customer service is at your disposal for technical information.

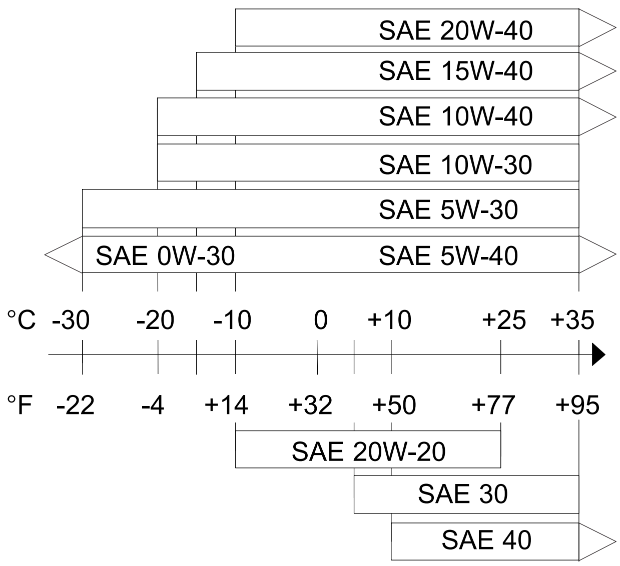
Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

3.8 SAE viscosity grades

The SAE viscosity grades must be selected according to the expected ambient temperatures (see figure).



3.9 Engine oil additives

For MAN industrial and ship diesel engines, engine oils are only approved, which have been inspected according to the works standards MAN 270, MAN 271, M 3275, M 3277 and M 3477 and fulfil these. These oils are formulated to cope with engine requirements where the specified oil change intervals are observed.

NOTE

Risk of engine damage due to subsequently added additives to engine oil
The characteristics of the engine oil change in an incalculable manner.

Therefore:
- Do not subsequently add additives to the engine oil.
- Lapse of liability for defects.

The MAN customer service is at your disposal for technical information.

Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

3.10 Mixing engine oils

Do not mix different engine oils together unless the performance capabilities of the oils are at least equivalent. This is to prevent deterioration in the performance of the added engine oil, which would result in a shortening of the oil change interval.

Engine oils from different manufacturers can be mixed together and are compatible with each other provided that they are intended for the same area of application.

3.11 Diesel engines with PM catalytic converter

Exclusively use engine oils according to works standard M 3477. In addition to this, only low-sulphur diesel fuel (< 50 mg/kg sulphur) according to DIN EN 590 is permitted to be used.

3.12 Sulphur content in diesel fuel (non-EU countries)

Depending on the sulphur content in the diesel fuel, the oil and filter change intervals are multiplied by a correction factor according to the following table. The oil and filter change intervals can be found in the Operator's Manual or the service logbook / service log. The correction factors do not depend on the engine oil specification used.

Sulphur content S in diesel fuel	Correction factor oil change interval
S < 50 ppm	1
50 < S < 1,000 ppm	0.5
S > 1,000 ppm	0.3

3.13 Oil change intervals

The oil change intervals are specified in the Operator's Manual or the service logbook / service log.

4 Fuel

Diesel fuel according to the following standards is suitable for the operation of MAN industrial and ship diesel engines:

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

4.1 Important information

WARNING

Risk of injury from fuels that are harmful to health

Therefore:
- Observe the manufacturers' safety data sheets.
- Wear personal protective equipment.
- Avoid contact with eyes and skin.
- Avoid spillage and mist formation.

DANGER

Risk of death from highly inflammable substances
Risk of death from highly inflammable substances, liquids and gases.

Therefore:
- Smoking is prohibited in the danger zone.
- Use of open flames or ignition sources in the danger zone is prohibited.
- Keep fire extinguisher available.
- Immediately report suspicious substances, liquids or gases to the person responsible.
- In case of fire, immediately stop work and vacate the danger zone until the all-clear is given.

ENVIRONMENTAL NOTE

Risk of contaminating bodies of water and soil

Therefore:
- Collect service products using appropriate and sufficiently large containers.
- Observe local legal regulations for disposal.

4.2 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**

ENVIRONMENTAL NOTE

For environmental protection reasons, MAN recommends using low-sulphur / sulphur-free diesel fuels.

These fuels can be used if they contain additives, which guarantee sufficient lubrication capability (lubricity) (request written confirmation from the supplier, minimum requirements, see EN 590). To avoid the carbonisation of the injection nozzle, such low-sulphur/sulphur-free fuels generally need to be supplemented with detergent additives (cleaning additives). These must be ensured by the fuel supplier, in order to guarantee the correct coordination and interaction of lubricity and cleaning additives.

4.3 High sulphur content in diesel fuel

MAN industrial and ship diesel engines can be operated with fuels that have a maximum sulphur content of 0.5%.

Fuels with a sulphur content > 0.5% are not permitted to be used due to high corrosion and a significantly shortened service life of the engines.

With sulphur content > 0.2%, the oil change intervals should be halved. At the same, time, engine oil according to works standard M 3277 is exclusively permitted to be used.

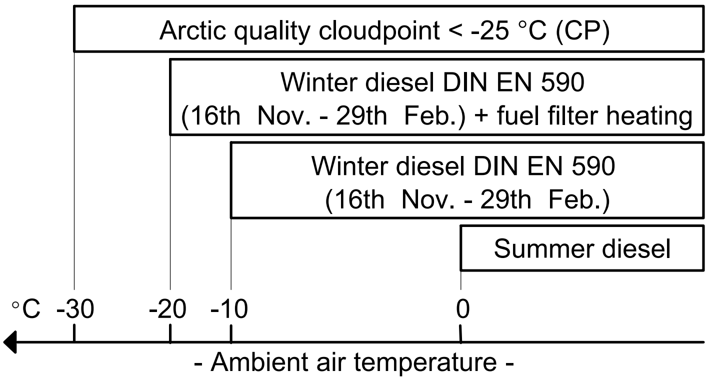
4.4 Winter operation

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.

In a temperate climate, a cold flow behaviour of up to 0 °C with summer diesel fuel and up to -20 °C with winter diesel fuel according to standard EN 590 is guaranteed.

To ensure trouble-free operation in the winter, you must use winter diesel fuel for which the fuel manufacturer guarantees operational reliability in addition to compliance with the DIN standard.

In addition to the usually specified “limit value of filterability” (CFPP - cold filter plugging point) in standard EN 590, for safe operating behaviour, the lowest possible cloudpoint (CP) is crucial (see diagram).



NOTE

Risk of engine damage from admixture of benzene

Therefore:
- Do not add any benzene.
- Only use diesel fuel according to standard DIN EN 590.
- With insufficient cold flow behaviour of the diesel fuel or even lower ambient temperatures, install fuel filter heating.
- Drain before the winter fuel pre-filter and fuel tank.
- In case of low ambient temperature, use specialist diesel fuel (alpine/Arctic quality).

4.5 Hazard classes according to VbF

(Regulation on flammable liquids)

Only applicable to Germany. Observe the regulations valid in the country concerned.

Diesel fuel / RME (Rapeseed Methyl Ester):
Hazard class A III (flash point above 55°C)
Hazard number 30
Substance number 1202

4.6 Diesel fuel - additives

For the operation of MAN industrial and ship diesel engines, fuel additives are not necessary, regardless of the type, if the diesel fuel fulfils the requirements according to the foregoing specifications.

NOTE

Risk of engine damage due to fuel additives subsequently added to diesel engines
The characteristic of the diesel fuel changes in an incalculable manner.

Therefore:
- Do not use fuel additives subsequently.
- Lapse of liability for defects.

The MAN customer service is at your disposal for technical information.

Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

4.7 Diesel fuel quality requirements

Requirements for the quality of the diesel fuel (worldwide) for exhaust levels Euro 2 to Euro 4

			Sulphur content maximum ppm	**Lubricity maximum** HFRR µm
Euro 2	Engine/injection equipment	VE pump	n.l.	460
		VP 44	n.l.	460
		CR	n.l.	460
Euro 3	Engine/injection equipment	VP 44 CR	n.l.	460
	EGR	No	–	–
	AGN	No	–	–
	Engine/injection equipment	CR/fuel lubricated	n.l.	460
	EGR	Yes	500	–
	AGN	No	–	–
	Engine/injection equipment	CR/oil lubricated	n.l.	n.l.
	EGR	Yes	500	–
	AGN	No	–	–
Euro 4	Engine/injection equipment	CR/fuel lubricated	n.l.	460
	EGR	Yes	50	–
		No	–	–
	AGN	No	–	–
		PM catalytic converter	50	n.l.
		SCR	n.l.	n.l.
Euro 5	Engine/injection equipment	CR/fuel lubricated	n.l.	460
	EGR	Yes	50	–
		No	–	–
	AGN	PM catalytic converter	50	–
		CRT	10	–
		DOC	n.l.	–
		SCR	n.l.	–
	Engine/injection equipment	CR/oil lubricated	n.l.	n.l.
	EGR	No	–	–
	AGN	SCR	n.l.	–

			Sulphur content maximum ppm	**Lubricity maximum** HFRR µm
EEV	Engine/injection equipment	CR/fuel lubricated	n.l.	460
	EGR	Yes	50	–
		No	–	–
	AGN	PM catalytic converter	50	–
		CRT	10	–
		SCR	n.l.	–
	Engine/injection equipment	CR/oil lubricated	n.l.	n.l.
	AGN	No	–	–
	AGN	SCR	n.l.	–
Euro 6	Engine/injection system/exhaust gas aftertreatment	CR/fuel lubricated	10	460

Meaning of Abbreviations	
AGN	exhaust gas aftertreatment
EGR	exhaust gas recirculation
CR	common rail
CRT	continuously regenerating trap, oxidation and particle filter
DOC	diesel oxidising catalytic converter, diesel-oxidation catalytic converter
n.l	not limited
PM-CAT	particle filter with catalytic converter
SCR	selective catalytic reduction, exhaust gas aftertreatment with AdBlue®
VE	distributor injection pump
VP 44	distributor injection pump 44

Further diesel fuel quality requirements

The permitted water content in the fuel must be at most 200 ppm.
If this limit is exceeded, a water trap must be installed.
The permitted total contamination in the fuel must be at most 24 mg/kg.
If FAME is used, observe SI 180911.

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

(FAME = Fatty **A**cid **M**ethyl **E**ster → fatty oil methyl ester**)** e.g. rapeseed methyl ester (RME)

MAN engines can basically be operated with FAME, if this fuel fulfils the standard **DIN EN 14214** and has been produced from rapeseed oil.
No clearance is presently available for FAME made of other starting materials.
Vehicles that are to be operated with FAME must be ordered with the “operated with biodiesel” equipment. In addition to this, a purchase guarantee must be acquired for the engine.

4.8.1 Engines that are not approved

Engines that are not approved for biodiesel (FAME):

- All vehicles with CRT filters
- All installed common-rail engines
- All D2868LFxx (V8 Euro 5) engines
- All Euro 6 engines (SCRT)

Tip for users

With Arctic climatic conditions, do not use any additives to improve the oxidation stability with FAME

Special features must be noted:

NOTE

Risk of engine damage due to FAME
The unfavourable evaporation characteristics of FAME lead to fuel dilution of the engine oil, loss of viscosity and increased engine wear.

Therefore:
- Do not use FAME for engines that are not approved.
- Halve engine oil change periods with FAME.
- Halve the engine oil filter and fuel filter change periods with FAME.
- Observe the maintenance instructions and service intervals.

These specifications apply in the same way for alternating operation of diesel fuel and FAME and well as for mixtures of diesel fuel with FAME, which are not covered by DIN EN 590.

► As FAME is emptied at low temperatures, we recommend using winter diesel during the cold season.

NOTE

Risk of component damage from alternative fuels
Pure vegetable oils or their admixture cause damage to components.

Therefore:
- Use fuels according to standards DIN EN 590 or DIN EN 14214.

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

4.9 Micro-organisms in the fuel system with diesel fuel and biodiesel

NOTE

Risk of engine damage from water and dirt in fuel
Engine damage and reduced engine performance due to contaminated fuel.

Therefore:
- Depending on the water occurrence, service the fuel filter on a regular basis according to the manufacturer's instructions.

NOTE

Risk of engine damage from micro-organisms in the diesel fuel or biodiesel (RME)
Micro-organisms lead to rusting of the tank and blockage of the fuel pre-filter.

Therefore:
- Combat micro-organisms with disinfectants.
- Clean fuel pre-filter according to the maintenance schedule.

Micro-organisms that are present in diesel fuel and biodiesel (RME) (bacteria, mould, yeast) can multiply under favourable conditions. In order to grow, water, which appears as condensation in every fuel or storage tank and vital elements in chemically bonded form are required, such as sulphur, phosphorous, nitrogen, oxygen and trace elements. Fuel additives can also promote the growth of micro-organisms.
The rate of multiplication is temperature-dependent and in turn leads to the formation of fibrous mycelium, sludge and microbial corrosion.
The consequences are: Rusting of the tank, blockage of the fuel pre-filter with rust and fibres (mycelium) and resulting frequent filter change. This leads to loss of performance and in an extreme case, to complete breakdown of the engine.

Remedies for infestation with micro-organisms

Tip for users

Observe safety data sheets and national safety regulations prior to use.

If the fuel system/storage tanks are already infested with micro-organisms, we recommend the use of the disinfectants listed below.
The tanks must be drained prior to using disinfectants, as the disinfectants bind water.
Water bound in the fuel can damage the injection system.

Product	Manufacturer
Grotamar 71	Schülke & Mayr Robert-Koch Str. 2 D-22851 Norderstedt Tel.: +49 / 40 / 521 00-0 Fax.: +49 / 40 / 521 00-318 Internet: www. Schuelke.com
grotamar 82	MFT Mitkrofiltertechnik GmbH Marzahner Straße 14 D-21502 Geesthacht Tel.: +49 / 4152 / 8877 - 0 Fax.: +49 / 4152 / 8877 - 66 Internet: mirkofiltertechnik.de
BAKZID	Internet: ispcorp.com

These products are soluble in diesel fuel, biodiesel (RME) and in water. They do not produce any corrosive combustion products. Their alkaline characteristics neutralise the acids formed by microbial growth.

4.9.1 Application

Fuel tank:
During fuelling, 50 ml (0.05%) of disinfectant is added to 100 litres of diesel fuel or biodiesel. This process is repeated a total of three times.
In doing so, the fuel pre-filter must be checked.

Storage tank:
If the inspection of the tank sump does not show signs of significant water or sludge contamination, no tank flushing is required. In this case, a dosage of 1 litre of disinfectant per m^3 of tank capacity is sufficient.

NOTE

Risk of component damage from alternative fuels
Pure vegetable oils or their admixture causes damage to components.

Therefore:
- Use fuels according to standards DIN EN 590 or DIN EN 14214.

If necessary, contact the manufacturers (e.g. regarding suppliers abroad).

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

The MAN customer service is at your disposal for technical information.

Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

5 AdBlue®

5.1 Important information

⚠ WARNING

Danger to health from ammonia vapours
If AdBlue® comes into contact with hot surfaces or temperatures that are too high (> 25°C) in the tank as a result of leaks, a leaking SCR system, ammonia fumes form.

Therefore:
- Make sure that there is sufficient ventilation.
- Immediately stop machines with a leaky SCR system.
- Rinse equipment that has come into contact with the gas or the surrounding area of the leak with plenty of water.
- Observe maximum storage temperature of 25°C.
- Avoid direct sunlight.
- Wear personal protective equipment.
- Additionally wear a protective mask and safety goggles.

⚠ CAUTION

Risk of injury when handling AdBlue®
Health risks can occur in the event of contact with skin or eyes.

Therefore:
- Use local exhaust ventilation (LEV).
- Do not eat, drink or smoke at the workplace.
- Wear personal protective equipment.
- If necessary, additionally wear ear protection, protective mask, safety goggles and chemical-resistant protective gloves.
- Wash hands thoroughly after work.
- In case of skin contact, wash skin with water and skin cleanser; seek medical assistance in case of skin irritation.
- Remove contaminated clothing immediately.
- In case of contact with eyes, rinse eyes with water or eye rinse solution for at least 15 minutes with open eyelids.
- In case of swallowing or persistent symptoms, call a doctor.
- Please observe the safety data sheets.

NOTE

Risk of component damage from crystallised AdBlue®

Therefore:
- Immediately rinse all components that come into contact with AdBlue® with warm water immediately after removal and blow out with compressed air.

NOTE

Risk of engine damage from contaminated AdBlue® system
Malfunction of components in the exhaust system (e.g. catalytic converter damage).

Therefore:
- Ensure extreme cleanliness when handling AdBlue®.
- Remove contaminants from filler openings.
- Strict rules of cleanliness must be applied for a filter change of AdBlue® systems.

5.2 AdBlue®

AdBlue® is a high-purity, water-clear, synthetically manufactured 32.5% urea-water solution. The high-quality solution reduces the toxic nitrogen oxides in the exhaust into water vapour and elementary nitrogen (a natural component of the air) with SCR technology.
The system reduces nitrogen oxide by up to 85% and particles by up to 40%. The high purity and consistent quality are only guaranteed by using AdBlue® according to DIN 70070.

The AdBlue® reducing agent is a non-flammable, colourless and odourless fluid that is soluble in water (trade name AdBlue®). The freezing point is at -11°C.
On non-stainless steels and coloured metals, AdBlue® has a highly corrosive effect (rust-triggering). Therefore, if reducing agent comes into contact with metallic surfaces (sheet steel or aluminium, also painted), wash off with plenty of clear, warm water.
Reducing agent crystallises when it dries. Therefore close the opened interior surfaces of the supply module as quickly as possible again during a filter change.

AdBlue® is not an additive, but is carried along separately in the envisaged additional tank in vehicles with SCR technology.

5.2.1 Temperature ranges (AdBlue®)

AdBlue® freezes if it is cooled down to below -11°C.
When heated, the frozen AdBlue® becomes liquid again and can be used unchanged without any loss of quality.
As AdBlue® freezes below -11°C and breaks down in an accelerated manner above 25°C, this temperature range should be observed as much as possible.

5.2.2 Storage of AdBlue®

To prevent losses of quality due to contaminants and to avoid significant inspection effort, AdBlue® is only permitted to be handled in storage and filling systems that are exclusively envisaged for AdBlue®.

AdBlue® breaks down during storage and then no longer fulfils the requirements of standard DIN 70070.
If the recommended storage temperature of max. 25°C is observed, AdBlue® fulfils the requirements of standard DIN 70070 for a minimum of 12 months after its production. If the storage temperature is exceeded, this period will be shorter.

ENVIRONMENTAL NOTE

Risk of environmental damage due to incorrect storage
Do not discharge AdBlue® into the groundwater or soil.

Therefore:
- Maximum storage temperature 25°C
- Absorb leaked or spilt AdBlue® with binding agent and dispose of properly.
- Store AdBlue® in original containers.

5.3 Ammonia

The urea-water mixture (AdBlue®) creates ammonia due to a hydrolysis reaction. This reacts at the respective temperature in the MAN AdBlue® catalytic converter with the nitrogen oxide in the exhaust. Through the selective catalytic reaction, soot particles and nitrogen oxide are removed from the exhaust.

WARNING

Danger to health from ammonia vapours
If AdBlue® comes into contact with hot surfaces or temperatures that are too high (> 25°C) in the tank as a result of leaks, a leaking SCR system, ammonia fumes form.

Therefore:
- Make sure that there is sufficient ventilation.
- Immediately stop machines with a leaky SCR system.
- Rinse equipment that has come into contact with the gas or the surrounding area of the leak with plenty of water.
- Observe maximum storage temperature of 25°C.
- Avoid direct sunlight.
- Wear personal protective equipment.
- Additionally wear a protective mask and safety goggles.

Tip for users

Ammonia is a colourless gas with a pungent odour.

6 Coolant

6.1 Important information

WARNING

Risk of injury from coolants that are harmful to health

Therefore:
- Observe the manufacturers' safety data sheets.
- Wear personal protective equipment.
- Avoid contact with eyes and skin.
- Avoid spillage and mist formation.

NOTE

Risk of engine damage due to unsuitable antifreeze
Malfunction of units and components in the cooling circuit.

Therefore:
- Use suitable antifreeze.

ENVIRONMENTAL NOTE

Danger of environmental pollution caused by improper handling of service products
Considerable damage is caused to the environment.

Therefore:
- Do not spill any coolant while filling it.
- Collect overflowing coolant in a suitable container.
- Treat undiluted antifreeze as hazardous waste.

6.2 General recommendations

NOTE

Risk of material damage when the primary pressure in the cooling system is too low

Therefore:
- Keep the cooling system sealed and clean.
- Inspect the radiator cover valves and working valves.
- Observe the required coolant level.

NOTE

Risk of engine damage due to contaminants

Therefore:
- Ensure extreme cleanliness when handling service products.
- Remove contaminants from filler openings.

Antifreezes that have been inspected and approved by us guarantee sufficient antifreeze, corrosion protection and cavitation protection, do not attack seals and hoses and do not foam.

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

The cooling systems of the engines should be filled over the entire year with a mixture of 60% water and 40% antifreeze, which guarantees cold protection up to -27 °C.

6.3 Coolant

NOTE

Risk of engine damage due to unsuitable antifreeze
Malfunction of units and components in the cooling circuit.

Therefore:
- Use suitable antifreeze.

For continuously trouble-free operation of MAN diesel engines, the coolant should basically be comprised of 60% water and 40% antifreeze all year round. This will guarantee sufficient corrosion protection.
In special cases, the use of corrosion-inhibiting agents (chemicals) according to works standard MAN 248 is possible by arrangement.
Emulsifiable corrosion protection oils are basically not permitted.

The MAN customer service is at your disposal for technical information.

Tip for users

For all notifications and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. For the address, please see page 2.

6.3.1 Prescribed components of the coolant

Water
Fresh mains water is suitable with the following restricted analysis values:

Appearance:	Colourless, clear, free from mechanical contamination
Hardness:	max 20° German total hardness
	≙ 35.6° French hardness
	≙ 25° British hardness
	≙ 358 ppm USA hardness
Chlorides:	max. 100 ppm
Sulphates:	max. 150 ppm

pH value at 20°C: 6.5 to 8.5

You should obtain analysis values for drinking water from the relevant local authorities.
Where such mains water is not available, existing water must be mixed with fully desalinated water, or distilled water or condensation, until the foregoing analysis values are reached.

6.3.2 Checking and replacement of the coolant

NOTE

Risk of material damage due to temperature increase in the coolant
Increased antifreeze content leads to temperature increase in the coolant.

Therefore:
- Check the concentration on a quarterly basis with a density spindle or refractometer.
- Never allow the antifreeze concentration to fall below 40 Vol.-%.
- A concentration of more than 50 Vol.-% must be avoided.
- Always supplement coolant shortfalls with a mixture of water and min. 40–50 Vol.-% (-37 °C) antifreeze.
- Observer service intervals in the maintenance schedule.

► Replace the entire coolant after **4 years**

► Notwithstanding these intervals, the coolant must be replaced if it discolours and becomes brown or cloudy.

6.4 Antifreeze and anti-corrosion agent

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

6.4.1 Approved antifreeze according to works standard MAN 324

- The approval of a product lapses automatically **3 years** after the approval is granted.
- A change to the formulation of a product automatically ends its approval.

Tip for users

Detailed instructions for use and additional information about anti-corrosion agents and antifreezes according to standard MAN 324 can be found on the Internet at:
https://my.man-mn.com/portal/irj/asp

- Anti-freeze and anti-corrosion agents may only be used, which are approved according to works standard MAN 324. It is recommended to fill the cooling system with an anti-freeze and anti-corrosion agent according to MAN 324 Type NF.
- A minimum concentration of 40 Vol.-% must be observed.
- The cooling system is designed such that in Central Europe, coolant filling with max. 40 Vol.-% antifreeze (cold protection to -27 °C) can also remain in the summer, as long as the cooling system is functional.
- At the beginning of the cold season, the antifreeze content of the coolant should be increased in accordance with the expected ambient temperatures (see mixing table).

Coolants according to (Euro 324 type SNF):

- Not permitted to be mixed with coolants type N or type NF!
- Not permitted to be used with the use of silicone coolant hoses (blue colour)!
- Must be combined with EPDM coolant hoses.
- Not permitted to be used with D08 engines, engines with low-temperature cooling systems and vehicles with MAN Voith PriTarder.

Coolants according to MAN 324, type NF:

- Not permitted to be mixed with coolants type SNF.
- Antifreeze and anti-corrosion agent according to MAN 324 can be used in all cases with all coolant hoses.
- Vehicles with D08 engines Euro 5, engines with low-temperature cooling systems and vehicles with MAN Voith PriTarders must exclusively be filled with an antifreeze and anti-corrosion agent according to MAN 324 type NF. The mixing ratio of antifreeze and anti-corrosion agent with fresh water is 50:50 Vol.-%

Coolants according to MAN 324 type Si-OAT:

- Only permitted to be mixed with coolants type NF.
- Antifreeze and anti-corrosion agent according to MAN 324 type Si-OAT can be used in all cases with all coolant hoses.
- Only permitted to be used in a mixing ratio of antifreeze and fresh mains water 50:50 Vol.-%.

Mixture table:

Ambient temperature up to °C	Water %	Antifreeze %
-27 -31 -37	60 55 50	40 45 50

6.4.2 No mixing

Tip for users

Detailed instructions for use and additional information about anti-corrosion agents and antifreezes according to standard MAN 324 can be found on the Internet at:
https://my.man-mn.com/portal/irj/asp

Finished antifreeze-water mixtures with a minimum of 40 Vol.-% of an approved antifreeze in de-ionised water are permitted.

- Anti-corrosion agents according to MAN 248 are not permitted to be mixed with antifreeze and anti-corrosion agents/coolants according to MAN 324.
- Antifreeze and anti-corrosion agents according to MAN 324 type NF (nitrite-free) are not permitted to be mixed with antifreeze and anti-corrosion agents according to MAN 324 type SNF (silicate-free and nitrite-free).
- Antifreeze and anti-corrosion agents according to MAN 324 type Si-OAT are not permitted to be mixed with antifreeze and anti-corrosion agents according to MAN 324 type SNF (silicate-free and nitrite-free).

6.4.3 Anti-corrosion agent

For specific applications, where the use of antifreeze is not mandatory (e.g. in the tropics), anti-corrosion agents according to MAN 248 must be used.

6.4.4 Approved anti-corrosion agent for engine cooling systems according to works standard MAN 248

Tip for users

Only use service products in accordance with MAN regulations, otherwise, the liability for defects will lapse!
You can find approved products on the Internet at:
https://my.man-mn.com/portal/irj/asp

6.4.5 No mixing

► When switching from antifreeze according to MAN 324 to anti-corrosion agent according to MAN 248 or vice versa, the entire coolant should be drained out. Rinsing is not necessary.

6.4.6 Checking and replacement of the anti-corrosion agent

► Change the entire coolant after **one year** or after **15,000 operating hours**, if this is reached prior to the end of one year.

► Notwithstanding these intervals, the coolant must be replaced if it discolours and becomes brown or cloudy.

► The product-specific application concentration is shown on the Internet under the Approved Service Products.

6.4.7 Disposal of antifreeze and anti-corrosion agents

ENVIRONMENTAL NOTE

Danger of environmental pollution caused by improper handling of service products
Considerable damage is caused to the environment.

Therefore:
- Observe national safety regulations.
- Collect service products using appropriate and sufficiently large containers.
- Only store service products in original containers.
- Absorb leaked or service product with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTE

Risk of contaminating bodies of water and soil

Therefore:
- Collect service products using appropriate and sufficiently large containers.
- Observe local legal regulations for disposal.
- Treat undiluted antifreeze as hazardous waste.

MAN Truck & Bus AG
Vogelweiherstrasse 33
90441 Nuremberg
Germany

A MAN Group company

Printed in Germany 51.99589-8001