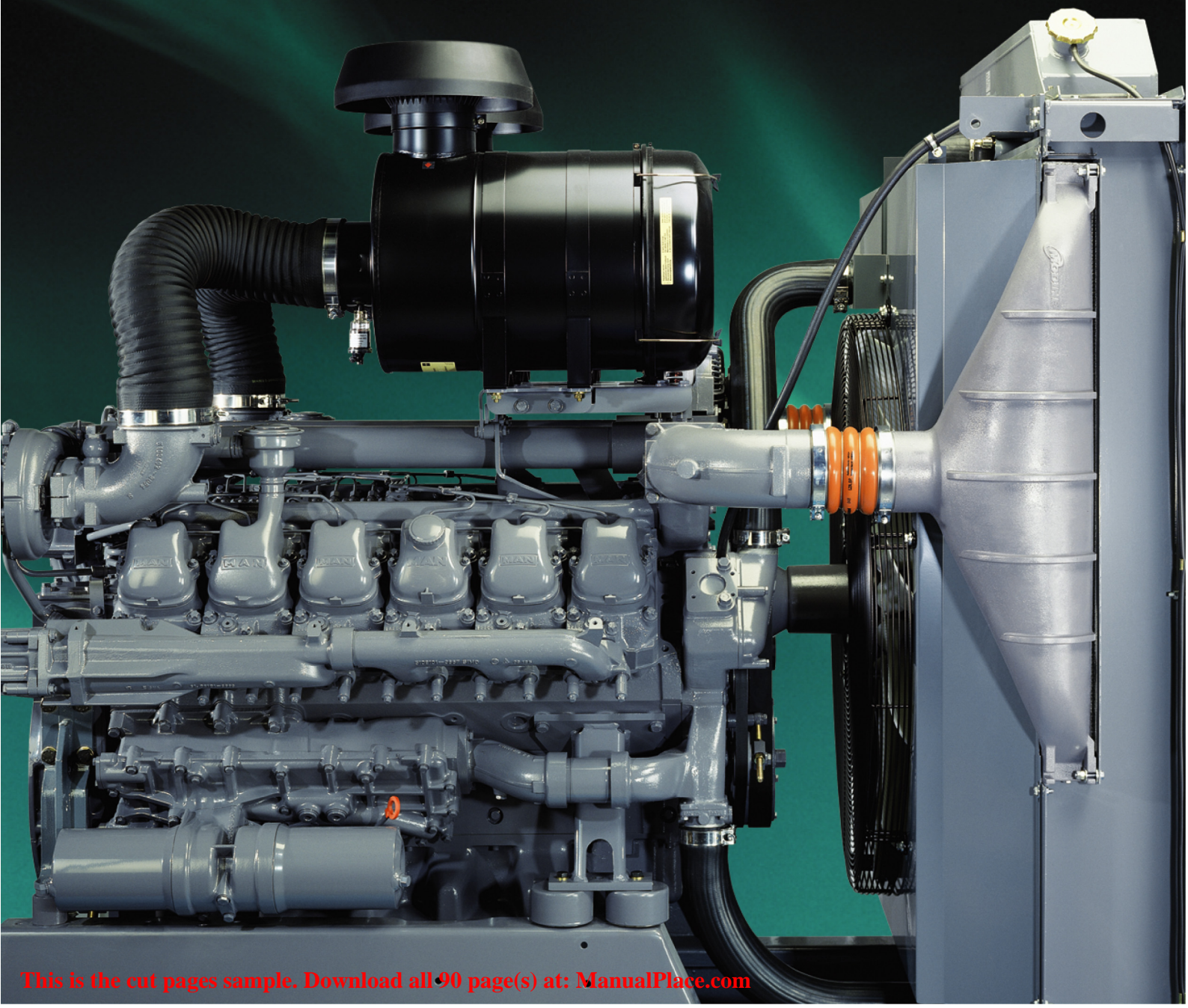


Installation Instructions



MAN industrial Diesel engines
for genset and pump drives



Dear Customer

The purpose of these installation instructions is to:

- Provide assistance and advice during the installation of stationary MAN industrial diesel engines of the model series D 0836 and D 2866 / D 2876 / D 2848 / D 2840 / D 2842
- Establish the conditions for trouble-free operation and avoid installation-related malfunctions and any consequential damage

Area of application

These installation instructions apply to the installation of stationary industrial diesel engines as drive systems for generator centrifugal pumps and power engines. They also cover the version of engines with electronic GAC regulation. Deviating regulating systems, e.g. Bosch EDC, are described in separate descriptions allocated to each engine version.

General regulations

The installation and operation of MAN diesel engines must satisfy all legislation and regulations valid at the place of use and for the type of operation.

Warranty

Warranty claims against MAN will be accepted only if these installation instructions have been complied with.

All previous installation instructions for MAN industrial diesel engines are replaced herewith.

Within the framework of development, MAN reserves the right to make changes of a technical nature.

On request and against payment, MAN will perform acceptance tests for installations. Certifications of prototypes are only valid for series installations, provided that no retroactive modifications are carried out.

If you intend to modify an engine subassembly which has been acceptance-tested by MAN, you must notify MAN in writing as renewed acceptance testing may be required.

Kind regards
MAN Nutzfahrzeuge Aktiengesellschaft
Nuremberg

Subject to technical alterations due to continuing development.

© 2005 MAN Nutzfahrzeuge Aktiengesellschaft
Reprinting, copying or translation, even of extracts, are not allowed without written permission from MAN. All rights under copyright laws are strictly reserved by MAN.



Contents

	Page
Foreword	1
Safety regulations	3
Engine vicinity	6
Definition of engine output of engines for gensets	7
Calculation of engine output of engines for gensets	9
Measuring the engine output of engines for gensets	11
Load application and control conditions for genset engines	12
Engine output of engines to drive pumps	15
Access to the engine	16
Engine room ventilation	18
Engine mountings	21
Power take-off	26
Transmission of power by propshafts	29
Air intake system	32
Exhaust system	34
Cooling system	45
Intercooling	56
Electrical preheating of coolant	59
Fuel system	61
Flame starting system	66
Electronic speed control on D 08 engines	67
Electronic speed control on D 28 engines	69
Electrical system	73
Appendix	75
Coolant hoses	78
Recommended values for assignment: Starter, battery size and starter cable	82
Wiring diagram	83
Index	85

General

Important safety regulations are summarised in this quick-reference overview and arranged by topic to effectively convey the knowledge necessary to avoid accidents causing injury, damage or environmental hazards. Additional information can be found in the Operator's Manual for the engine.

Important:

Should an accident occur despite all precautionary measures, particularly one involving contact with corrosive acid, penetration of fuel into the skin, scalding by hot oil, antifreeze splashing into the eyes etc. **you must seek medical assistance immediately.**

1. Regulations designed to prevent accidents with injury to persons

Checks, setting jobs and repair work must be carried out by authorised skilled personnel only.

- When carrying out maintenance and repair work, ensure that the engine cannot be accidentally started by unauthorised persons.
- The engine may only be started and operated by authorised personnel.
- When the engine is running, do not get too close to the rotating parts. Wear closely-fitting working clothes.

- Do not touch hot engine with bare hands: Risk of burns.

- Keep area surrounding engine, ladders and stairways free of oil and grease. Accidents caused by slipping can have serious consequences.
- Only work with tools which are in good condition. Worn spanners / wrenches slip: Danger of injury.
- Persons must not stand under an engine suspended on a crane hook. Keep lifting gear in good order.

- Open the coolant circuit only when the engine has cooled down. If opening the coolant circuit while the engine is hot is unavoidable, observe the instructions in the chapter "Maintenance and care" in the Operating Instructions.
- Do not tighten or undo pipes and hoses under pressure (lubricating oil circuit, coolant circuit and any downstream hydraulic oil circuits). The fluids which escape can cause injury.

- When checking the injection nozzles, do not hold your hands in the fuel jet. Do not inhale fuel vapour.



- When working on the electrical system, first disconnect the earth cable of the battery and reconnect this last to prevent short circuits.
- Follow the manufacturer's instructions for handling batteries.
Caution:
Battery acid is toxic and caustic. Battery gases are explosive.
- When performing welding work, observe the "Notes for welders".



2. Regulations designed to prevent damage to engine and premature wear

- ***The engine must be cleaned thoroughly prior to repair. Ensure that dirt, sand or foreign matter cannot get into the engine during repair work.***
- If engine operation is disrupted, immediately determine the cause and have it remedied to prevent additional damage.
- Only ever use genuine MAN parts. Installation of "equally good parts" from other suppliers may cause severe damage for which the workshop carrying out the work is liable.
- Never allow the engine to run dry, i.e. without lubricant or coolant.
Appropriate notices must be attached to engines that are not in an operable condition.
- Use only MAN-approved service products (fuel, engine oil, antifreeze and anti-corrosion agent). Maintain a high standard of cleanliness. Diesel fuel must be free of water.
- ***Do not fill engine oil beyond the max. notch on the dipstick. Do not exceed the maximum permissible engine inclination.***
The engine may be seriously damaged if these instructions are not adhered to.
- Control and monitoring devices (charge control, oil pressure, coolant temperature) must be in perfect working order.
- Observe the instructions for operating the alternator; see chapter "Maintenance and care" in the Operating Instructions.

3. Regulations designed to prevent pollution

Engine oil and filter cartridges and elements, fuel / fuel filters

- Old oil must be passed on for recycling.
- Take strict precautions to ensure that no oil or diesel fuel gets into the drains or the ground.

Caution:

The drinking water supply could be contaminated.

- Filter elements are classed as dangerous waste and must be treated as such.

Coolant

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

4. Notes on safety in handling used engine oil*

Prolonged or repeated contact of any kind of engine oil with the skin causes the skin to degrease, which may result in dryness, irritation or inflammation. Old engine oil also contains hazardous substances that may cause skin cancer. Handling old engine oil does not pose any health hazard if the basic safety and hygiene-related regulations are observed.

Health and safety regulations:

- Avoid prolonged, repeated contact of old engine oil with the skin.
- Use a suitable skin protection agent or wear protective gloves.
- Clean the skin that has been in contact with engine oil.
 - Wash yourself thoroughly with soap and water. A nailbrush is an effective aid.
 - Special hand cleaning agents facilitate cleaning soiled hands.
 - Do not use petrol, diesel fuel, gas oil, fluxes or solvents as cleaning agents.
- After washing, apply moisturising hand cream to your skin.
- Change oil-soaked clothes and shoes.
- Do not put any oil-soaked cloths into pockets.

**Pay meticulous attention to the proper disposal of old engine oil.
– Old oil is a water hazard –**

For this reason, do not pour any old oil into the ground, the drains or the sewerage system. Any violation of this rule is punishable.

Collect and dispose of old engine oil properly. For information concerning collection points, contact seller, supplier or the local authorities.

* Based on the "Notes on how to handle old engine oil".

The engine vicinity is gaining increasing importance for assessing the installation situations for modern diesel engines.

The following reasons are decisive for this development:

- The engines used nowadays are almost without exception turbocharged engines with intercoolers of high power density, as these achieve low fuel consumption and low exhaust emissions.

In these engines, the slightest installation errors may lead to operating faults or damage, particularly if the engines are used continually in heavy-duty operation.

Along with the power density, the necessary mass flows for combustion air, coolant, cooling air and exhaust gases to be supplied to and conducted away from the engine have also increased.

- Emission-curbing regulations which cannot be met using internal engine measures necessitate the use of soot filters and catalytic converters.

Incorrect design or faults in exhaust-gas cleaning devices cause operating faults or damage to the engine.

- For stationary engines for driving generators, authorities are increasingly granting permits for the operation with subsidised fuel only if the primary energy used is being exploited to a high degree.

This stipulation leads to the utilisation of thermal energy in coolant and exhaust gases. Using heat exchangers entails additional risks for the engine's operational reliability if improper design causes faulty cooling and combustion.

Therefore, when analysing operating faults, check the influence of all components in the vicinity of the engine to see whether they have any bearing on the engine's operating conditions.

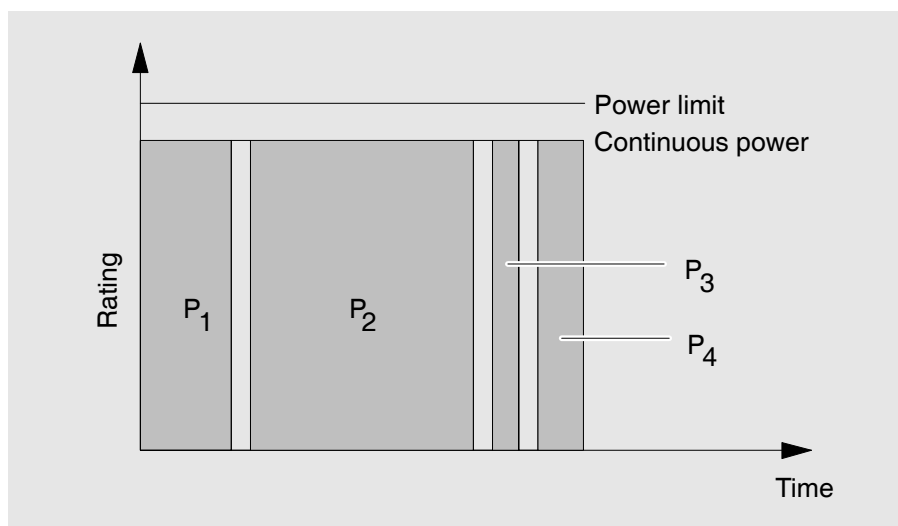


Definitions of rated output for genset engines

The performance definitions for genset engines are laid down in the ISO 8528 standard. There, the following definitions can be found (excerpt from ISO 8528):

Genset continuous power (COP = Continuous power)

Genset continuous power is defined as the power which a genset can generate during an unlimited operating period per year assuming compliance with set maintenance intervals and given environmental conditions, maintenance work having to be carried out in accordance with the manufacturer's regulations. The collective load is 100%.



Variable prime power (PRP)

Variable prime power is defined as the maximum power available during a variable power sequence during an unlimited operating period per year.

Maintenance work is to be carried out in accordance with the manufacturer's regulations.

The permissible mean power output P_{pp} during 24 h must not exceed a certain percentage of variable genset prime power specified by the manufacturer of the reciprocating internal combustion engine.

For calculations of the actual mean power output P_{pa} , outputs of less than 30% of variable genset prime power are to be included in the respective calculation as 30% outputs.

Downtimes are not to be included in the calculation.

The actual mean output is calculated as follows:

$$P_{pa} = \frac{P_1 \times t_1 + P_2 \times t_2 + P_3 \times t_3 + \dots + P_n \times t_n}{t_1 + t_2 + t_3 + \dots + t_n}$$

$P_1, P_2, P_3 \dots$ stand for power per period of time is $t_1, t_2, t_3 \dots$

In practice, this mostly results in use of 70% of continuous power on average (empirical value). It is important that the power output be intermittent.