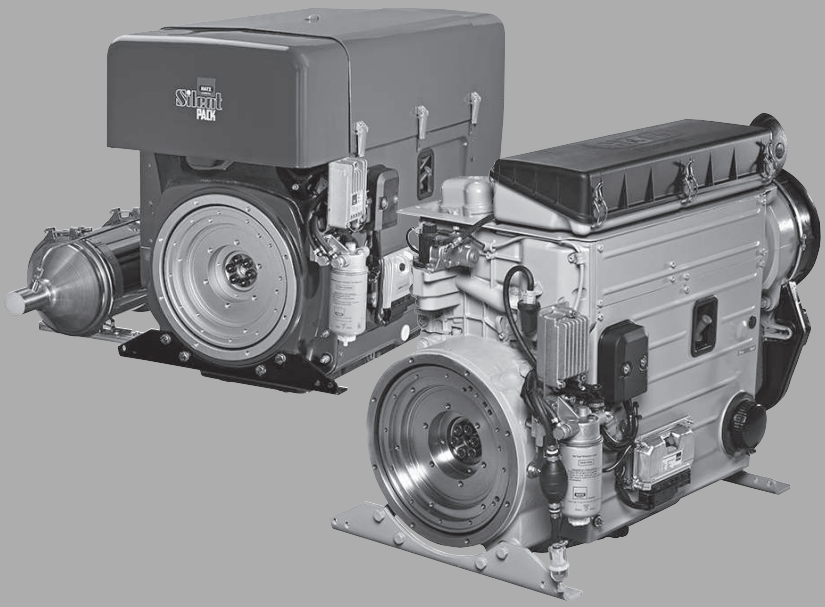
CREATING POWER SOLUTIONS.



3-4L43C | 3-4M43 | 3-4M43Z

MANUAL
for diesel engine

Hatz Diesel

1 Notices

Contact data

© 2016
Motorenfabrik HATZ
Ernst-Hatz-Straße 16
94099 Ruhstorf
Germany

Tel. +49 (0)8531 319-0

Fax +49 (0)8531 319-418

marketing@hatz-diesel.de

www.hatz-diesel.com

Copyright

Original manual

This manual has been translated into multiple languages.

The German version is the **original manual**. All other language versions are **translations** of the **original manual**.

2 General information

Information on the document

This manual was created with due care. It is exclusively intended to offer a technical description of the machine and to provide instructions on commissioning, operating and maintaining the machine. When operating the machine, the applicable standards and legal regulations as well as any in-house regulations apply.

Before commissioning, during operation and before maintenance work is begun on the machine, read this manual carefully and keep it close by for ready access.

Machine

This manual describes the following machine.

Machine name	HATZ diesel engine
Type number	3-4L43C, 3-4M43, 3-4M43Z

Customer service

Have service work performed by qualified technicians only. We recommend that you work with one of the over 500 **HATZ service stations**. Trained specialists there will repair your machine with **Hatz original spare parts** and with **HATZ tools**. The global HATZ service network is at your disposal to advise you and supply you with spare parts. For the address of the **Hatz service station** nearest you, please see the enclosed spare parts list or visit us in the Internet at: **www.hatz-diesel.com**

Installation of unsuitable spare parts can lead to problems. We cannot accept responsibility for direct damage or secondary damage that results from this.

We therefore recommend the use of **Hatz original spare parts**. These parts are manufactured according to strict Hatz specifications and achieve maximum operational reliability through their perfect fit and functionality. The order number can be found in the enclosed spare parts list or on the Internet at: **www.hatz-diesel.com**

Exclusion of liability

The manufacturer cannot be held responsible for personal injury, damage to property or damage to the machine itself caused by improper use, foreseeable misuse, or failure to follow or adequately follow the safety measures and procedures described in this manual. This also applies to changes made to the machine and the use of unsuitable spare parts.

Modifications, which serve the technical improvements, are reserved

3 Safety

3.1 General information

Introduction

This chapter contains the information you need to work safely with this machine.

To prevent accidents and damage to the machine, it is imperative that these safety instructions be followed.

Read this chapter carefully before beginning work.

3.1.1 Intended use and foreseeable misuse

Intended use

The machine described in this manual fulfills the following functions:

- Diesel engine intended for installation in a machine or for assembly with other machines to form a machine. See chapter *11 Installation declaration, page 102*.

This engine is intended exclusively for the purpose specified and tested by the manufacturer of the machine in which the engine is installed.

Any other use is not intended and therefore not permitted. Violations compromise the safety of the personnel working with the machine. Motorenfabrik HATZ does not accept any liability for damage resulting from this.

The operational safety of the machine is only guaranteed if it is used as intended.

Use according to the intended purpose also includes observance of the instructions in this Operator's Manual.

Foreseeable misuse

The following is considered to be foreseeable misuse:

- Any use that varies from or extends beyond the uses specified above.
- Failure to comply with the instructions given in this manual.
- Failure to comply with the safety instructions.
- Failure to immediately eliminate malfunctions that impact safety before continuing work with the machine (working with the machine when it is not in perfect condition, either functionally or in terms of safety).
- Failure to perform the necessary inspection and maintenance work.
- Any unauthorized modification of or removal of safety equipment.
- Use of spare parts and accessories that are unsuitable or have not been approved by HATZ.
- Operation in flammable or hazardous environments.
- Operation in closed-off or poorly ventilated rooms.

- Installation of the machine in mobile equipment (e.g. vehicles, trailers) or in closed rooms without additional measures to handle supply air, extract air, and exhaust gas.
- Improper operation at variance with DIN 6271 and DIN ISO 8528 (climate, load, safety).

Residual risks

Residual risks result during daily use and in association with maintenance work.

These residual risks will be pointed out in chapter *3.2.2 Machine-specific safety instructions for operation, page 15* and in chapter *3.2.3 Machine-specific safety instructions for maintenance work, page 16* as well as in the further contents of the manual, directly in front of the descriptions or operating instructions concerned.

3.1.2 Machine user or machine manufacturer obligations

Machine manufacturer obligations

If you have an engine that is not yet installed in a machine, it is imperative that you follow the **Assembly Instructions for HATZ Diesel Engines** before installing the engine. These assembly instructions contain important information on how to safely install the engine and are available at your nearest **HATZ service station**.

It is prohibited to start the engine before it is fully installed.

In addition, please note that it is prohibited to start up the machine before it has been determined that the machine into which this engine is installed fulfills all safety-related requirements and legal regulations.

User obligations

The operator is obliged to only operate the machine when it is in perfect condition. The operator must check the condition of the machine before use and ensure that any defects are eliminated before it is taken into service. Running the machine while identified defects exist is not permitted. The user must also ensure that all persons who work on the machine are familiar with the contents of this manual.

Obligations of the operating and maintenance personnel

Personnel assigned with operating and maintaining the machine must have read and understood this manual or must possess the qualifications necessary for working with this equipment, acquired in training/instructional courses. No one may work with the machine without the necessary qualifications, even if for just a brief period.

The operating personnel must not be under the influence of drugs, medication or alcohol.

All work performed on the machine must be in compliance with the information provided in this manual.

Storing this manual

This manual is an integral component of the machine (also when being sold). It must be stored in the direct vicinity of the machine and be accessible to personnel at all times.

3.1.3 Representation of safety notes

Overview

This machine has been designed and built according to state-of-the-art technology and the recognized safety standards. Despite these precautions, risks exist when operating the machine and during maintenance work.

These risks are identified in this manual by means of safety notes.

The safety notes precede the related description or operating step.

Structure of the safety notes

The safety notes consist of:

- Danger symbol
- signal word
- Description of danger
- Possible consequences
- Preventative measures

General danger symbol

The general danger symbol is used to identify the danger of personal injury.

Signal words

Signal words identify the magnitude of the risk and the seriousness of the possible injuries:

Danger symbol/ signal word	Meaning
DANGER	This signal word is used to indicate imminently dangerous situations which, if not avoided, will lead to serious injury or death.
WARNING	This signal word is used to indicate potentially dangerous situations which, if not avoided, may lead to serious injury or death.
CAUTION	This signal word is used to indicate potentially dangerous situations which, if not avoided, may lead to minor or moderate injury.
CAUTION	This signal word, without a danger symbol, is used to indicate the risk of property damage.
NOTICE	This signal word indicates additional useful information, such as operating tips and cross references.

3.1.4 Meaning of safety symbols

Explanation of symbols

The following table describes the meanings of the safety symbols used in this manual.

Symbol	Meaning
	Smoking, fire, and open flames are prohibited!
	Warning of personal injury!
	Warning of hot surfaces!
	Warning of flammable substances!

Symbol	Meaning
	Warning of explosive substances!
	Warning of toxic engine exhaust!
	Warning of corrosive substances!
	Warning of heavy loads!
	Warning of environmental damage!
	Comply with this manual or additional documentation from other manufacturers or the carrier.
	Additional information that is useful to the reader.

3.2 Safety notes

3.2.1 Operational safety

Introduction

This chapter contains all of the important safety instructions for personal protection and for safe and reliable operation. Additional, task-related safety instructions can be found at the beginning of each chapter.

	DANGER
	**Danger to life, danger of injury or danger of property damage due to failure to comply with this manual and the safety instructions contained therein.** ▪ As the operator of the machine, you must ensure that all people working on the machine are familiar with the content of this manual. ▪ Before working on the machine, read this manual carefully, paying special attention to the safety notes. ▪ Fulfill all required safety conditions before working on the machine. ▪ Follow all general safety instructions as well as the specific task-related safety instructions contained in the individual chapters.

Using the machine

- Only operate the machine for the purposes described in chapter *3.1.1 Intended use and foreseeable misuse, page 7*.

Compliance with other regulations

- Adhere to the applicable accident prevention regulations of the trade associations.
- Comply with the regulations concerning the minimum safety and health requirements for the use of work equipment by workers at work.
- In addition, local safety, accident prevention and environmental regulations also apply when operating the machine.

Personal protective equipment

During operation and maintenance of the machine, personal protective equipment must be available and must be used if necessary. The required personal protective equipment is specified in the descriptions of the operating steps.

Personal protective equipment	Pictogram	Function
Safety shoes		Safety shoes offer protection against: ▪ Slipping ▪ Falling objects
Hearing protection		Hearing protection offers protection against ear injuries due to excessive and constant noise.
Safety gloves		Safety gloves protect the hands against injury, e.g. from battery acid.
Safety goggles (with side protection)		Safety goggles protect the eyes from flying objects (e.g. dust particles, spraying liquids, spraying acid).
Working clothes		Wear close-fitting clothing. However, it must not restrict the wearer's freedom of movement.

Warning labels and information signs on the machine

The warning labels and information signs on the machine must be followed (see chapter "Labels" *3.3 Labels, page 20*).

The warning labels and information signs must be kept legible and must be replaced if necessary. For this purpose, contact your nearest **HATZ service station**.

Maintenance work

Maintenance work that goes beyond the scope described in this manual must only be performed by qualified technicians (see chapter *2 General information, page 6*).

Independent maintenance work and constructional changes to the machine, especially to the safety equipment, are not permitted.

Safety equipment

Safety equipment must not be modified and must not be rendered ineffective during normal operation.

General safety instructions

DANGER

Danger to life and danger of injury due to failure to follow the warnings on the machine and in this manual.

- Heed the warnings on the machine and in this manual.

WARNING

Danger of injury and danger of incorrect operation due to inadequate personnel qualifications.

- The personnel must have read and understood this manual or must possess the qualifications necessary for working with this equipment, acquired in training/instructional courses.
- Only qualified personnel is permitted to operate and maintain this machine.
- Failure to comply will cause the warranty to become void.

WARNING

Danger of injury from failure to follow the operating instructions and from performing unauthorized tasks on the machine.

- Follow all instructions.
- Do not perform activities for which no qualification is available. Contact properly trained personnel if necessary.

CAUTION

Danger of injury from overloading the body.

Lifting the machine to transport it or to move it to another location can lead to injuries (of the back, for example).

- Only lift the machine with a hoist (see chapter *6.1 Transport, page 30*).

3.2.2 Machine-specific safety instructions for operation

Introduction

The machine can pose residual risks during operation. To eliminate these risks, all persons working on the machine must follow the general and machine-specific safety instructions.

If you have an engine that is not yet installed in a machine, it is imperative that you follow the **Assembly Instructions for HATZ Diesel Engines** before installing the engine.

These assembly instructions contain important information on safe installation.

If the engine is installed in a machine or assembled with other machines to form a machine, it is prohibited to start the engine before it has been determined that the newly created machine fulfills all safety-related requirements and applicable legal regulations.

Safe operation

- Before switching on the machine, ensure that no one can be injured when the machine is started up.
- During machine operation, ensure that unauthorized persons do not have access to the area in which the machine has an impact.
- Parts of the exhaust gas system and the surface of the engine become hot during operation. Risk of injury from touching hot parts! Let the engine cool before maintenance.
- Do not refuel during operation.

Faults

- Immediately eliminate faults that compromise safety.
- Switch off the machine and do not take into service again until all faults have been eliminated.

Safety instructions for operation

⚠ DANGER	
	**Danger to life from inhaling exhaust gases.** Toxic engine exhaust gases can lead to loss of consciousness and even death in closed-off and poorly ventilated rooms. ▪ Never operate the machine in closed-off or poorly ventilated rooms. ▪ Do not breathe in the exhaust gases.

DANGER

Fire hazard from fuel.

Leaked or spilled fuel can ignite on hot engine parts and cause serious burn injuries.

- Only refuel when the engine is switched off.
- Never refuel in the vicinity of open flames or sparks that can cause ignition.
- Do not smoke.
- Do not spill fuel.

DANGER

Danger of fire from hot exhaust gas system.

The exhaust gas system and, in particular, the diesel particulate filter can become very hot. Combustible materials can ignite on the exhaust gas system, even when the engine has already been switched off.

- Keep combustible materials away from the exhaust gas system.
- Do not operate and place the engine in the direct vicinity of combustible materials.

3.2.3 Machine-specific safety instructions for maintenance work

Introduction

The machine can pose residual risks during maintenance. To eliminate these risks, all persons working on the machine must follow the general and machine-specific safety instructions.

Maintenance intervals

- Strictly adhere to the maintenance intervals.
- Check the safety equipment regularly to ensure it is in good condition and functioning properly.
- Check connections, cables and fasteners regularly to ensure they are in good condition.

Maintenance work

Maintenance work that goes beyond the scope described in this manual must only be performed by qualified technicians. We recommend that you work with one of the over 500 **HATZ service stations**.

Replacing parts

- When replacing defective components, we recommend that you use **genuine HATZ original spare parts** (see chapter *2 General information, page 6*).
- When disposing of parts that can no longer be used, do so in accordance with local environmental regulations or send them to a recycling center.

Measures following maintenance and troubleshooting

- Securely reconnect loose electrical connections; check that the electrical components and equipment are functioning properly.
- Check the entire machine for foreign bodies; remove any foreign bodies.

Safety instructions for maintenance work

DANGER

Danger of explosion from flammable cleaning agents.

Cleaning with benzene is an explosion hazard. It is highly flammable, can become electrostatically charged, and can generate an explosive gas/air mixture.

- Use halogen-free, cold cleaners with a high flashpoint for cleaning.
- Comply with manufacturer's instructions.

WARNING

Danger of injury from compressed air and dust particles.

Eye injuries may occur when cleaning with compressed air.

- Wear safety goggles.

CAUTION

Danger of injury if maintenance instructions are not followed.

- Only perform maintenance when the engine is switched off.
- For engines with an electric starter:
  Disconnect the negative battery terminal.
  Protect the starting key against unauthorized access.

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Let the engine cool before maintenance.

3.2.4 Electrical equipment

Safety notes

DANGER

Danger to life, danger of injury or danger of property damage due to incorrect use of batteries.

- Do not place tools on the battery.
- Before performing work on the electrical equipment, always disconnect the negative battery terminal.
- Never swap the positive (+) and negative (–) battery terminals.
- When installing the battery, first connect the **positive cable** and then the **negative cable**.
- When removing the battery, first disconnect the **negative cable** and then the **positive cable**.
- It is imperative that you prevent short circuits and mass contact of current-carrying cables.
- If faults occur, check the cable connections for good contact.

DANGER

Danger of explosion from flammable substances.

There is a danger of explosion from flammable gases.

- Keep batteries away from open flames and incendiary sparks.
- Do not smoke when working with batteries.

⚠ CAUTION

Danger of chemical burns

Chemical burns can occur when using batteries for the electrical operation.

- Protect your eyes, skin, and clothing from corrosive battery acid.
- Immediately rinse areas affected by splashed acid with clear water and consult a physician if necessary.

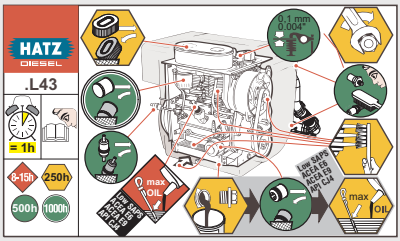
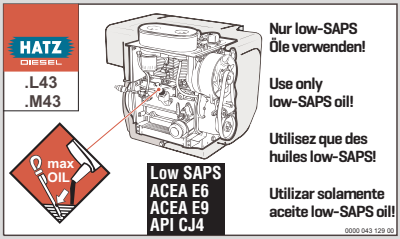
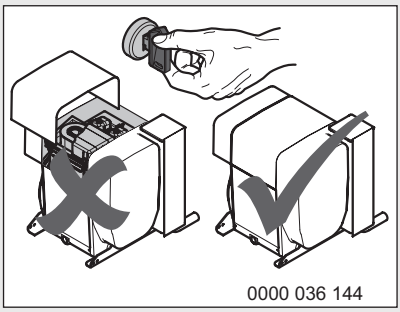
NOTICE

- The necessary wiring diagrams are included with the machine if it is equipped with electrical equipment. Additional wiring diagrams can be requested when needed.
- We cannot be held liable for electrical equipment that is not designed according to HATZ wiring diagrams.

- Promptly replace faulty indicator lamps.
- Do not disconnect the battery while the machine is running. Resulting voltage peaks could destroy the electronic components.
- When cleaning, do no spray the electrical equipment components with a water jet or high pressure cleaner.
- When performing welding work on the machine, disconnect the battery and place the ground clamp of the welding equipment as close as possible to the welding area. Disconnect the plug-in connection to the voltage regulator.

3.3 Labels

Warning labels and information signs on the engine

Label	Meaning
	Maintenance instructions (see chapter *8.1 General maintenance instructions, page 48*)
	Only use engine oil with the relevant specification (see chapter *4.3 Engine oil, page 24*).
	CAUTION! Damage from inadequate engine cooling. ▪ Only operate the engine when all covers are installed.
	Refuel with diesel fuel only. For the specification, see chapter *4.4 Fuel, page 25* Do not use bio diesel.
	The engine may only be operated with fuel that is "EXTREMELY LOW IN SULFUR OR SULFUR-FREE". The fuel label is located close to the fuel cap. If there is no fuel tank installed on the engine, the label must be applied permanently close to the fuel filler opening.

4 Technical data

4.1 Engine information and filling quantities

Type		**3L43C, 3M43, 3M43Z**		**4L43C, 4M43, 4M43Z**
Type		Air cooled four stroke diesel engine		
Combustion system		Direct injection		
Number of cylinders		3		4
Bore/stroke	mm	102 / 105		102 / 105
Displacement	cm^3	2574		3432
Engine oil pressure at oil temperature of 100 ± 20°C		Min. 0.6 bar at 950 rpm		
Engine oil consumption (after running-in period)	Max.	1% of fuel consumption, pertaining to full load		
Sense of rotation		When viewing flywheel: left		
Tappet clearance at 10 - 30 °C inlet/outlet	mm	0.10		0.10
Net weight				
.M43	approx. kg	328		393
.M43**Z**		335		408
.L43**C**		383		453
Max. perm. inclination during continuous operation in direction		**With** oil sump	**Without** oil sump	Only **with** oil sump
Operating side		30° [1]	25° [1]	25° [1]
Air outlet side		30° [1]	30° [1]	30° [1]
Timing cover side		25° [1]	25° [1]	15° [1]
Flywheel side		22° [1]	25° [1]	18° [1]
Battery capacity	Min/max	12 V – 88/143 Ah/24 V – 55/110 Ah		

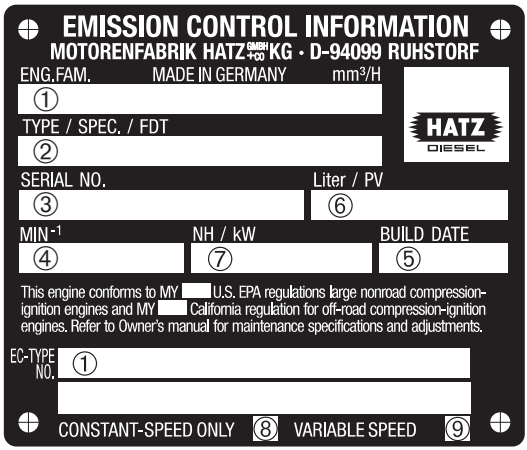
[1] Exceeding these limit values causes engine damage.

Engine oil capacities and dipstick equipment

Type	Oil sump	Engine oil capacity liters [2)]	Code letter on the dipstick
3L43C	With	10.5	D
	Without	8.0	A
3M43	With	11.0	D
	Without	8.5	A
3M43Z	With	10.5	D
	Without	8.0	A
4L43C	With	13.0	D
4M43	With	14.0	D
4M43Z	With	13.0	D

[2)] These values are approximations only. The max. mark on the dipstick is decisive in any case (see chapter *7.8 Checking the oil level and adding oil if necessary, page 43*).

4.2 Engine type plate



The engine type plate is located on the crankcase or noise reduction capsule and contains the following engine information:

1	Number of the engine family or the EU approval (for engines with exhaust certificate only)
2	Engine type, customer specification and setting of pumping start (° crankshaft before top dead center)
3	Engine serial number
4	Max. engine speed (rpm)
5	Model year
6	Displacement (liters) and inspection requirement for special settings
7	Injection pump effective stroke (mm) and engine capacity (kW)
8	"Constant speed only" (for engines with EPA/CARB exhaust certificate only)
9	"Variable speed" (for engines with EPA/CARB exhaust certificate only)

The following data must always be specified for requests and spare part orders

2	Engine type and customer specification
3	Engine serial number
4	Max. engine speed (rpm)

4.3 Engine oil

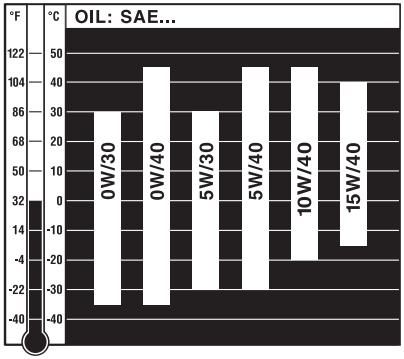
Oil quality

All brand name oils that satisfy at least the following specification are suitable:

- **ACEA E6** (recommended)
- **ACEA E9**
- **ACEA C3 / C4** (HTHS ≥ 3.5 mPas)
- **API CJ-4**

CAUTION	
	Damage to the catalytic converter and/or particulate filter from using unsuitable engine oil. Unsuitable engine oil diminishes the functionality and service life of the catalytic converter and/or particulate filter. Only use engine oils with very low quantities of sulfate ash, phosphor and sulfur – so-called "low SAPS" oils which fulfill at least one of the specifications mentioned above.

Oil viscosity



Select the recommended viscosity depending on the ambient temperature at which the engine will be operated.

CAUTION	
	Engine damage from unsuitable engine oil. Unsuitable engine oil considerably reduces engine service life. Only use engine oil that fulfills the specifications stipulated above.

4.4 Fuel

Fuel type

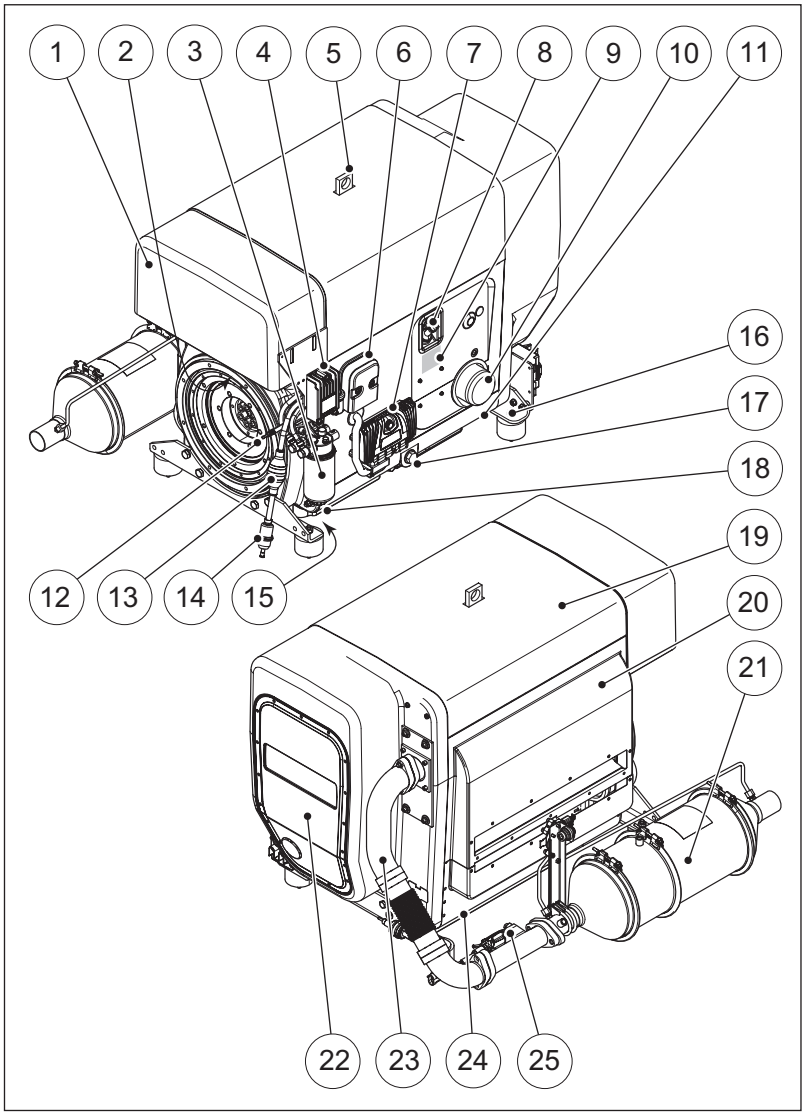
All types of diesel fuel that meet the minimum requirements of the following specifications are suitable:

- **Europe: EN 590**
- **UK: BS 2869 A1 / A2**
- **USA: ASTM D 975-09a 1-D S15** or **2-D S15**
- **Japan: JIS K 2204** (with a maximum HFRR value of 520 µm)

	CAUTION
	Danger of engine damage from low quality fuel. The use of fuel that does not meet the specifications can lead to engine damage. ▪ Only use fuel that is very low in sulfur or that contains no sulfur at all. ▪ The use of fuel that does not meet specifications requires approval by Motorenfabrik HATZ (main plant).

5 Engine design

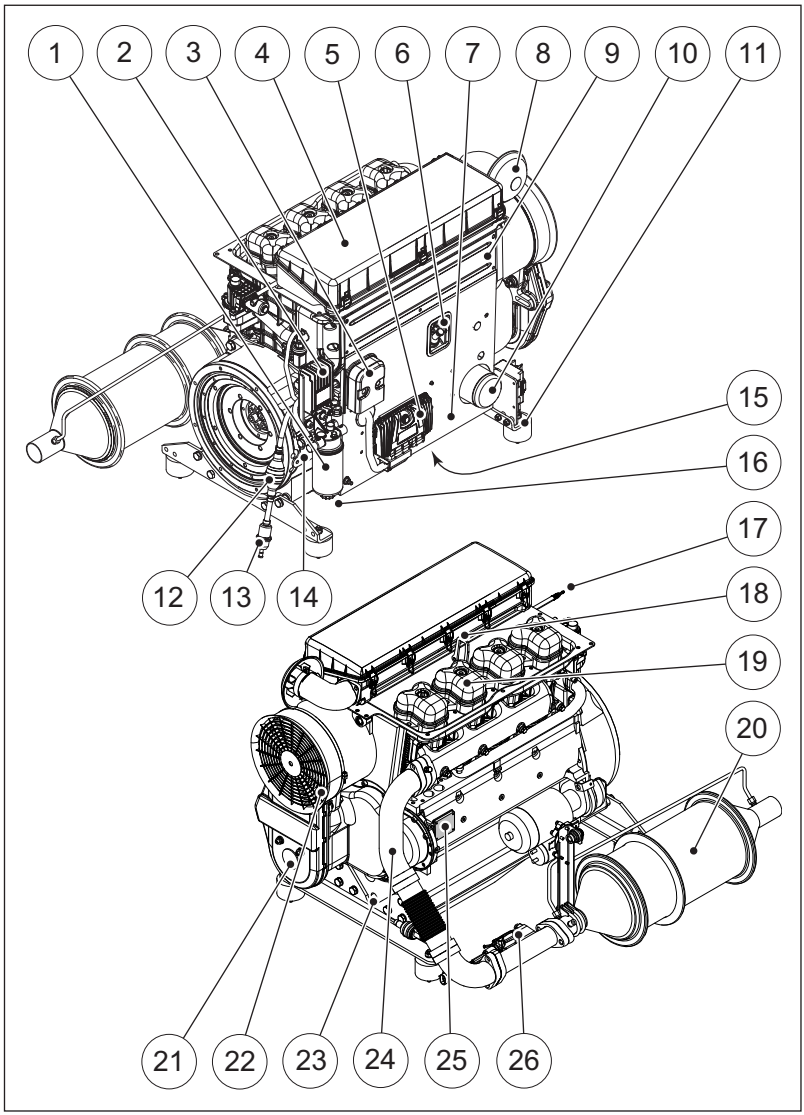
Engine 3-4L43C (sealed version - *Silent Pack*)



Pos.	Designation
1	Air intake duct for capsule
2	Intake opening for combustion air and cooling air

Pos.	Designation
3	Fuel filter
4	Powerbox
5	Retractable lifting eye, max. load 5000 N
6	Central connector for electrical equipment
7	Control unit for exhaust emission after-treatment
8	Oil filling opening and dipstick
9	Engine type plate
10	Oil filter
11	Cover plate on operating side
12	Fuel return line
13	Manual fuel pump
14	Fuel feed line with fuel prefilter
15	Battery connections
16	Engine mount
17	Oil drain screw
18	Drain screw on the water separator
19	Capsule hood
20	Air outlet duct for cooling air
21	Catalytic converter with diesel particulate filter
22	Air guide housing cover (access to the poly v belt)
23	Exhaust pipe
24	Cover plate on air outlet side
25	Fuel evaporator (vaporizer)

Engine 3-4M43, 3-4M43Z (standard version)



Pos.	Designation
1	Fuel filter
2	Powerbox
3	Central connector for electrical equipment

Pos.	Designation
4	Air filter housing cover
5	Control unit for exhaust emission after-treatment
6	Oil filling opening and dipstick
7	Cooling air guide for oil cooler
8	Intake opening for combustion air
9	Side trim panel
10	Oil filter
11	Engine mount
12	Manual fuel pump
13	Fuel feed line with fuel prefilter
14	Battery connections
15	Oil drain screw (on oil sump)
16	Drain screw on the water separator
17	Fuel return line
18	Lifting eye, max. load 5000 N
19	Cylinder head cover
20	Catalytic converter with diesel particulate filter
21	1/2-inch square socket for turning the engine
22	Belt guard (access to the poly v belt)
23	Oil drain screw
24	Exhaust pipe
25	Engine type plate
26	Fuel evaporator (vaporizer)

6 Transport, assembly and commissioning

6.1 Transport

Safety notes

WARNING

Danger of injury from improper lifting and transport.

Danger of crushing from falling or tipping of the engine.

- Only use the lifting eye already mounted on the machine for lifting.
- Only use a suitable hoist with a sufficient carrying capacity.
- Do not remain under suspended loads.

CAUTION

Only use the lifting eye for transporting the engine.

Do not use for lifting the entire machine.

CAUTION

Danger of injury from overloading the body.

Lifting the machine to transport it or to move it to another location can lead to injuries (of the back, for example).

- Only lift the machine with a hoist.

NOTICE

Danger of environmental damage from leaking fluid.

If the machine is tilted, engine oil and fuel can run out.

- Only transport the machine in an upright position.

Transport conditions

- When transporting the machine, follow the safety instructions.
- When transporting, follow the applicable safety and accident prevention regulations of the trade associations.
- After delivery, check the machine for completeness and transport damage.
- Only transport the machine when it is switched off and has cooled down.
- If you have questions on transporting the machine, please contact your nearest **HATZ service station**. For contact data, see chapter *1 Impressum, page 5* or **www.hatz-diesel.com**.

6.2 Installation notes

HATZ diesel engines are efficient, robust, and have a long service life. Therefore, they are usually installed in machines that are used for commercial purposes.

The machine manufacturer must follow the applicable regulations regarding machine safety – the engine is a part of a machine.

Depending on the use and installation of the engine, it may be necessary for the machine manufacturer and machine user to install safety equipment to prevent inappropriate use. Note the following:

- Parts of the exhaust gas system and the engine surface become hot during operation and may not be touched until they cool down after the engine is switched off.
- Incorrect cable connections and incorrect operation of the electrical equipment can lead to sparking and must be avoided.
- After the engine is installed in the machine, rotating parts must be protected against contact.
  HATZ safety equipment is available for the belt drive of the cooling fan and alternator.
- Comply with all notices and warning labels on the engine and keep them in a legible condition. If a label should become detached or difficult to read, it must be replaced promptly. For this purpose, contact your nearest **HATZ service station**.
- Any improper modification of the engine will result in a loss of liability coverage for resulting damage.

Only regular maintenance, as specified in this manual, will maintain the operating readiness of the engine.

The **assembly instructions** contain important information on how to safely assemble the engine. They are available from any **Hatz service station**.

If you have any questions, please contact your nearest **HATZ service station** before commissioning the engine.

6.3 Preparations for commissioning

- Check the delivered parts for completeness, damage, and other noticeable issues.
- Ensure that the setup location is adequately ventilated.

	DANGER
	**Danger to life from inhaling exhaust gases.** Toxic engine exhaust gases can lead to loss of consciousness and even death in closed-off and poorly ventilated rooms. ▪ Never operate the machine in closed-off or poorly ventilated rooms. ▪ Do not breathe in the exhaust gases.

7 Operation and use

7.1 Safety notes

NOTICE
 **Comply with the safety chapter!** Follow the basic safety instructions in chapter *3 Safety, page 7*.

⚠ WARNING
 **Danger of injury from damage and defects on the machine.** ▪ Do not take the machine into service if damage has been localized and identified. ▪ Replace faulty components.

⚠ WARNING
 **Danger of injury from failure to follow the operating instructions and from performing unauthorized tasks on the machine.** ▪ Define the responsibilities of the personnel taking the machine into service. ▪ Replace faulty machine parts immediately. ▪ Check the installation conditions when the machine is first taken into service and after the machine has been inactive for a lengthy period.

7.2 Performing tests

Before starting

Before starting the engine, several tests need to be performed to ensure the machine is working properly.

Procedure

Step	Test
1	The machine is standing securely and on a level surface.
2	The installation location is adequately ventilated.
3	There is a sufficient amount of fuel in the fuel tank (see chapter *4.4 Fuel, page 25*).
4	There is a sufficient amount of engine oil in the engine housing (see chapter *4.3 Engine oil, page 24*).

Step	Test
6	No persons are located in the danger zone of the engine or machine.
7	All safety equipment is in place.

7.3 Start preparation

Procedure

Step	Activity
1	Before the first start and with an empty fuel system: ▪ Pump the fuel with the manual fuel pump (see chapter *7.3.1 Pumping fuel with the manual fuel pump, page 34*)

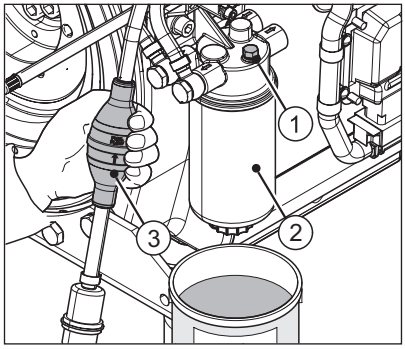
7.3.1 Pumping fuel with the manual fuel pump

Requirements

Pre-pumping of fuel with the manual fuel pump is necessary in the following situations:

- Engine shuts down due to empty fuel tank
- at first filling of the fuel tank
- after changing the fuel filter

Overview



Pos.	Designation
1	Bleed screw
2	Filter
3	Rubber ball

Procedure

Step	Activity
1	Fill with fuel if necessary.
2	Place a suitable container under the filter (2) to collect emerging fuel.
3	Open the bleed screw (1) by approx. one turn.
4	Squeeze and release the rubber ball (3) repeatedly until fuel emerges from the bleed screw (1).
5	Close the bleed screw (1) and then activate the rubber ball **two more times**.

7.4 Starting the engine

The standard equipment of the engine is an electric start mechanism.

If possible, separate the engine from the machine being driven by uncoupling it. Always switch the machine into idle mode.

Safety notes

DANGER

Danger to life from inhaling exhaust gases.

Toxic engine exhaust gases can lead to loss of consciousness and even death in closed-off and poorly ventilated rooms.

- Never operate the machine in closed-off or poorly ventilated rooms.
- Do not breathe in the exhaust gases.

CAUTION

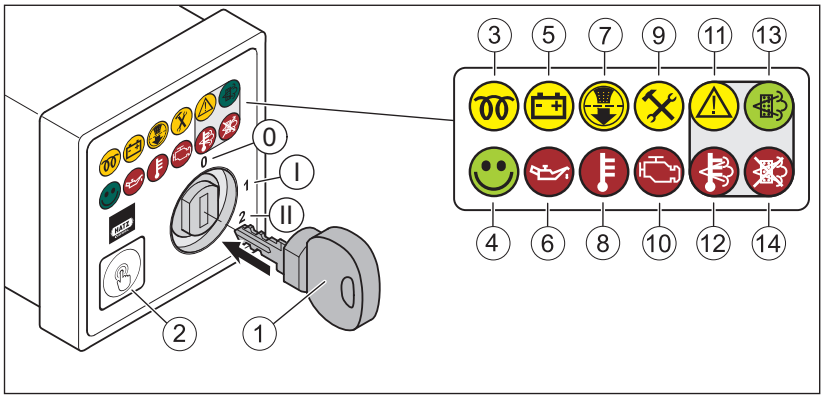
Danger of engine damage from the use of starting fluid.

- Engine damage from the use of starting fluid can lead to uncontrolled ignition.
- Engine damage from uncontrolled ignition.
- Never use starting fluid.

NOTICE

See also starting instructions in the documentation for the complete machine.

Overview — HATZ instrument boxes



1	Starting key
2	Pushbutton
3	Pre glow display
4	Operating display
5	Charge control
6	Oil pressure display
7	Air filter maintenance indicator (not activated)
8	Engine temperature display
9	Maintenance interval indicator
10	Engine fault
11	Fault in the area of the exhaust emission after-treatment system
12	Regeneration of the diesel particulate filter not possible
13	Regeneration of the diesel particulate filter is activated
14	Regeneration of the diesel particulate filter was suppressed
Ignition lock	
0	Off
I	Operation
II	Start

Indicators

The function of all indicators is checked when the starting key is turned. They flash or light up for different times. If there is a fault, the applicable indicator does not go out after the engine start or it lights up again during operation.

Explanation of symbols

Symbol	Meaning
	**Pre glow display** Lights at temperatures below 0°C. Start the engine when the display has gone out. *NOTE:* After the start or during operation it is possible that the pre glow display lights up for a short time. This is normal and no cause for concern.
	**Operating display** Lights up during operation when there is no engine fault.
	**Charge control** Fault in the alternator or alternator charging circuit. The battery is no longer charged. Eliminate the fault immediately.
	**Oil pressure display** Switch off the engine immediately! Danger of engine damage. Check the oil level (see chapter *7.8 Checking the oil level and adding oil if necessary, page 43*). Contact **Hatz service** if the oil level is correct.
	**Air filter maintenance indicator** (not activated) *NOTE:* A dirty air filter unit can be identified by the corresponding flashing signal in the indicator for "Fault in the area of the exhaust emission after-treatment system".
	**Engine temperature display** Switch off the engine immediately! Danger of engine damage. Engine temperature is impermissibly high. For details of troubleshooting, see chapter *9.1 Trouble shooting, page 88*.
	**Maintenance interval indicator** This indicator flashes when maintenance work is necessary (see chapter *9.4 Flash code table for maintenance intervals, page 98*). After completion of maintenance work reset the maintenance interval indicator (see chapter *8.2.19 Resetting the maintenance interval indicator, page 86*).
	**Engine fault** This indicator flashes when there are engine faults (see chapter *9.2 Flash code table for engine faults, page 92*). Switch off the engine immediately.

Symbol	Meaning
	**Fault in the area of the exhaust emission after-treatment system** A flashing signal indicates the type of fault (see chapter *9.3 Flash code table for faults on the exhaust emission after-treatment system, page 94*).
	**Regeneration of the diesel particulate filter not possible** Exhaust gas temperature too low (see chapter *7.9 Regenerating the diesel particulate filter, page 45*).
	**Regeneration of the diesel particulate filter is activated** Lights up during regeneration. The regeneration process is automatically started and takes approx. 15 minutes (see chapter *7.9 Regenerating the diesel particulate filter, page 45*).
	**Regeneration of the diesel particulate filter was suppressed** (see chapter *7.9 Regenerating the diesel particulate filter, page 45*).
	**Pushbutton** The pushbutton fulfills the following functions: ▪ **Suppress regeneration of the diesel particulate filter.** When this button is pressed (maximum 2 seconds), a regeneration that was activated when the engine was running is suppressed. Pressing the button again reactivates the regeneration (see chapter *7.9 Regenerating the diesel particulate filter, page 45*). ▪ **Reset the maintenance interval indicator.** (see chapter *8.2.19 Resetting the maintenance interval indicator, page 86*).

Procedure

NOTICE	
	▪ Start for max. 30 seconds. If the engine is still not running after that, turn the starting key back to position "0" and eliminate the cause (see chapter *9.1 Trouble shooting, page 88*). ▪ Turn the starting key to position "0" every time you want to start the engine. ▪ The anti repeat device in the ignition lock makes it impossible for the starter to engage while the engine is running and become damaged.

Step	Activity
1	Insert the starting key all the way and turn to position "I".

Step	Activity
2	When the pre glow display (3) lights up, wait until it goes out then continue with step 3
3	Turn the starting key to position "II".
4	As soon as the engine is running, release the starting key. ▪ The starting key springs back to position "I" and remains in this position during operation. ▪ The charge control (5) and oil pressure display (6) go out. ▪ The operating display (4) lights up.

NOTICE

- In case of irregularities, switch off the engine immediately.
- Identify the fault and eliminate it.
- For details of troubleshooting, see chapter *9.1 Trouble shooting, page 88*.

NOTICE

- If the engine stops again immediately after starting, or stops independently during operation, this is an indication that a monitoring element of the automatic shutoff has been activated.
- Remedy the fault before making further starting attempts (see chapter *9.1 Trouble shooting, page 88*).
- Despite the automatic switch-off, check the oil level every 8–15 operating hours (see chapter *7.8 Checking the oil level and adding oil if necessary, page 43*).

7.5 Switching off the engine

Safety note

CAUTION

Danger of injury from unauthorized access.

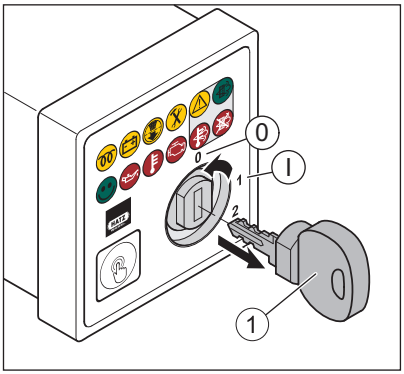
There is a danger of injury if unauthorized persons handle the machine.

- Protect the starting key against unauthorized access during breaks in operation or after completing work.

NOTICE

See also instructions in the documentation for the complete machine.

Overview — HATZ instrument boxes



Pos.	Designation
1	Starting key
Ignition lock	
0	Off
I	Operation

Procedure

Step	Activity
1	Turn the starting key (1) to position "0". The engine switches off. All indicator lamps go out.
2	Remove the starting key.

NOTICE

Danger of exhaustive battery discharge.

- When the machine is switched off, always turn the starting key to position "0" or else the battery may become fully discharged.

7.6 Refueling

This diesel engine is intended for installation in a machine or for assembly with other machines to form a machine and does not have its own fuel tank. Follow the instructions from the manufacturer and comply with the following safety information.

Safety notes

DANGER

Fire hazard from fuel.

Leaked or spilled fuel can ignite on hot engine parts and cause serious burn injuries.

- Only refuel when the engine is switched off.
- Never refuel in the vicinity of open flames or sparks that can cause ignition.
- Do not smoke.
- Do not spill fuel.

CAUTION

Danger of environmental damage from spilled fuel.

Do not overfill the fuel tank and do not spill fuel.

- Collect any leaking fuel and dispose of it according to local environmental regulations.

CAUTION

Engine damage from using low quality fuel.

The use of fuel that does not meet the specifications can lead to engine damage.

- Only use the fuel specified in chapter *4.4 Fuel, page 25*.
- The use of fuel that does not meet specifications requires approval by Motorenfabrik HATZ (main plant).

7.7 Checking the water separator

Safety notes

CAUTION

Danger of environmental damage from spilled fuel.

When water is drained from the water separator, a small amount of fuel is drained as well.

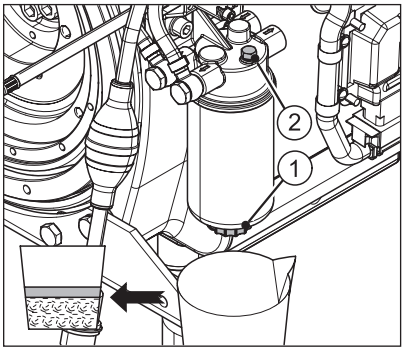
- Collect any escaped water/fuel mixture and dispose of it according to local environmental regulations.

NOTICE

The interval for checking the water separator depends entirely on the proportion of water in the fuel and on the care exercised during refueling; the water separator should be checked at least once a week.

Overview

Water in the fuel collects at the lowest point of the fuel filter in the water separator.



Pos.	Designation
1	Drain plug
2	Bleed screw

Procedure

Step	Activity
1	Place a suitable container under the drain plug (1). *NOTE:* In inaccessible locations, an extension hose can be mounted on the drain screw (1).
2	Open the drain screw (1) and drain the water into the container.
3	If not enough liquid escapes, undo additional screw (2).
4	As soon as fuel escapes, close the drain plug (1) and screw (2). *NOTE:* First water escapes then fuel. This can be seen by a clear separator.
5	Dispose of the water/fuel mixture in accordance with the local environmental regulations.

NOTICE

Note - If starting difficulties occur:

Bleed the injection system with the aid of the manual fuel pump with the aid of the injection system (see chapter *7.3.1 Pumping fuel with the manual fuel pump, page 34*).

7.8 Checking the oil level and adding oil if necessary

Safety notes

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Wear safety gloves.

CAUTION

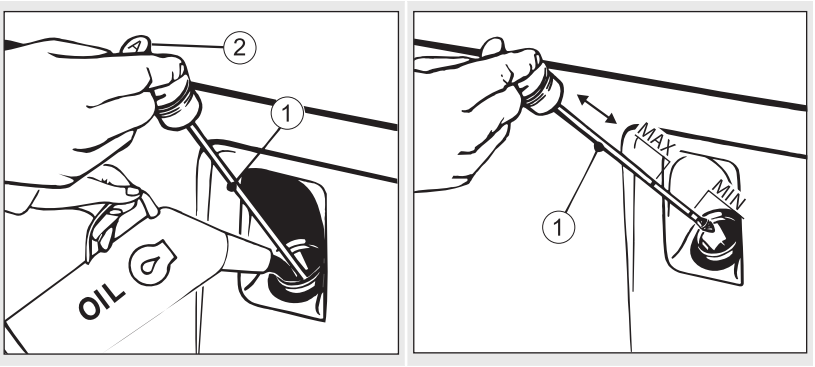
Danger of injury

Prolonged contact with engine oil can lead to irritation of the skin.

- Wear safety gloves.
- If there is contact with the skin, thoroughly wash the affected areas of the skin with soap and water.

	CAUTION
	Danger of later engine damage. ▪ Operating the engine with an oil level below the **min.** mark or above the **max.** mark can lead to engine damage. ▪ When checking the oil level, the engine must be horizontal and have been switched off for a few minutes.

Overview — Checking oil level/adding oil



Pos.	Designation
1	Dipstick
2	Code letter on the dipstick

Procedure — Checking oil level/adding oil

Step	Activity
1	Switch off the engine and wait several minutes for the engine oil to collect in the crankcase. Engine must be level.
2	Remove contamination on the engine in the area of the dipstick (1).
3	Pull out the dipstick and clean it.
4	Reinsert the dipstick.
5	Pull out the dipstick and check the oil level.
6	If the oil level is close to the **min.** mark, add engine oil to the **max.** mark. For the specification and viscosity, see chapter *4.3 Engine oil, page 24*.
7	Reinsert the dipstick.

7.9 Regenerating the diesel particulate filter

The engine has an automatic regeneration process for cleaning the diesel particulate filter (DPF).

The diesel particulate filter filters soot particles out of the exhaust gas. During regular regeneration the accumulated soot particles are burnt off at high temperatures.

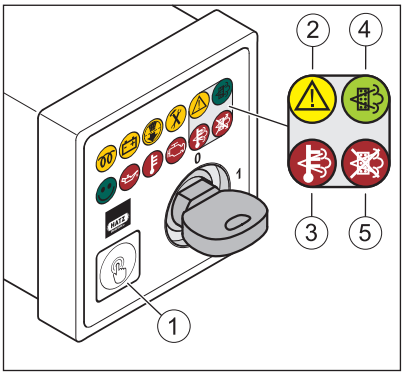
The regeneration process starts automatically and takes approx. 15 minutes. In special situations, it can be suppressed using a pushbutton on the instrument box.

Safety notes

	DANGER
	**Danger of fire from hot exhaust gas system.** The exhaust gas system and, in particular, the diesel particulate filter can become very hot. Combustible materials can ignite on the exhaust gas system, even when the engine has already been switched off. ▪ Keep combustible materials away from the exhaust gas system. ▪ Do not operate and place the engine in the direct vicinity of combustible materials.

	CAUTION
	Danger of damaging the diesel particulate filter. If the regeneration of the diesel particulate filter is suppressed over a longer period, a large amount of particles collects in the filter. This can damage or destroy the diesel particulate filter. ▪ Only suppress regeneration when needed, and reactivate it again as soon as possible.

Overview — HATZ instrument boxes



Pos.	Designation
1	Pushbutton
2	Indicator "Fault in the area of the exhaust emission after-treatment system". For more information, see chapter *9.3 Flash code table for faults on the exhaust emission after-treatment system, page 94*)
3	Indicator "Regeneration of the diesel particulate filter not possible"
4	Indicator "Regeneration of the diesel particulate filter is activated"
5	Indicator "Regeneration of the diesel particulate filter was suppressed"

Procedure

NOTICE

- The full regeneration process of the diesel particulate filter takes approx. 15 minutes.
- If the regeneration process is interrupted, (e.g. by pressing the pushbutton or switching off the engine), it is automatically resumed the next time the engine is started and continues until regeneration is fully completed.

Step	Activity
Regeneration of the diesel particulate filter is activated	
1	The regeneration process starts automatically and continues unnoticed while the engine is running. The indicator (4) lights up.
Regeneration of the diesel particulate filter not possible	
1	When the indicator (3) lights up the exhaust gas temperature is too low. The regeneration process can not be started. Remedy: Increase the engine load. *NOTE*: The way the engine load is increased depends on the respective use of the engine. If possible, do not reduce the engine load during the regeneration process.
Suppressing regeneration of the diesel particulate filter	
1	If the regeneration process is to be suppressed for a the short time, press the pushbutton (1) (maximum 2 seconds). The indicator (5) lights up. Pressing the button again reactivates the regeneration. *NOTE:* Switch back to the regular regeneration process as soon as possible.

8 Maintenance

8.1 General maintenance instructions

Safety notes

WARNING

Danger of injury from failure to follow the operating instructions and from performing unauthorized tasks on the machine.

- Follow all instructions.
- Do not perform activities for which no qualification is available. Contact properly trained personnel if necessary.

NOTICE

Comply with the safety chapter!

Follow the basic safety instructions in chapter *3 Safety, page 7*.

- Maintenance tasks may only be performed by trained personnel.
- Accident prevention measures must be in accordance with the local accident prevention regulations.
- Perform setting and maintenance work at the specified intervals.
- Replace faulty machine parts as soon as possible.
- Always wear personal protection equipment.
- Only use fully functional tools.
- Installation of unsuitable spare parts can lead to problems. We cannot accept responsibility for direct damage or secondary damage that results from this. We therefore recommend the use of **Hatz original spare parts**.
- Closely adhere to the maintenance conditions prescribed in this manual.
- Only make changes on the machine in agreement with the manufacturer.
- Only perform maintenance when the engine is switched off.
- Protect start-up devices (crank handle, recoil start or starting key) from unauthorized access.
- After completing maintenance work, check that all tools, bolts, aids, and other objects are removed from the machine, and that all safety equipment has been replaced.
- Before starting, ensure that no persons are located in the danger zone of the engine or machine.
- Adhere to legal regulations when handling and disposing of used oil, filters, and cleaning agents.

- For engines with an electric starter: Disconnect the negative battery terminal before carrying out maintenance work.

Performance of maintenance work

The entire machine is designed to be maintenance friendly. Parts that require maintenance are easily accessible.

- Perform maintenance work faithfully at the specified intervals to prevent premature wear of the machine.
- Follow the notice and warning labels on the machine.
- Always retighten screw connections loosened during maintenance work.
- After the necessary maintenance and repair work is completed, perform a function test (test run).
- For maintenance work that is not listed and described in the maintenance documentation, please contact your nearest **HATZ service station**.

8.2 Maintenance work

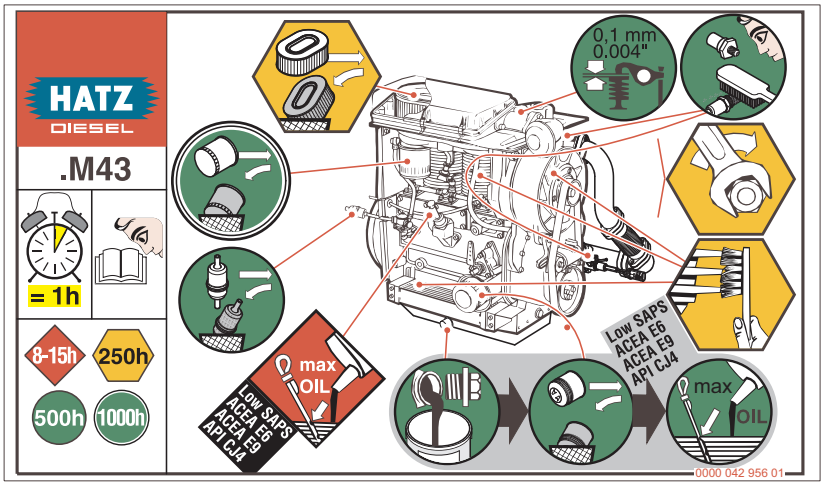
Safety note

⚠ CAUTION	
	**Danger of injury if maintenance instructions are not followed.** ▪ Only perform maintenance when the engine is switched off. ▪ Protect start-up devices (crank handle, recoil start or starting key) from unauthorized access. ▪ For engines with a starter: Disconnect the negative battery terminal. ▪ When the maintenance work has been completed, ensure that all tools are removed from the machine.

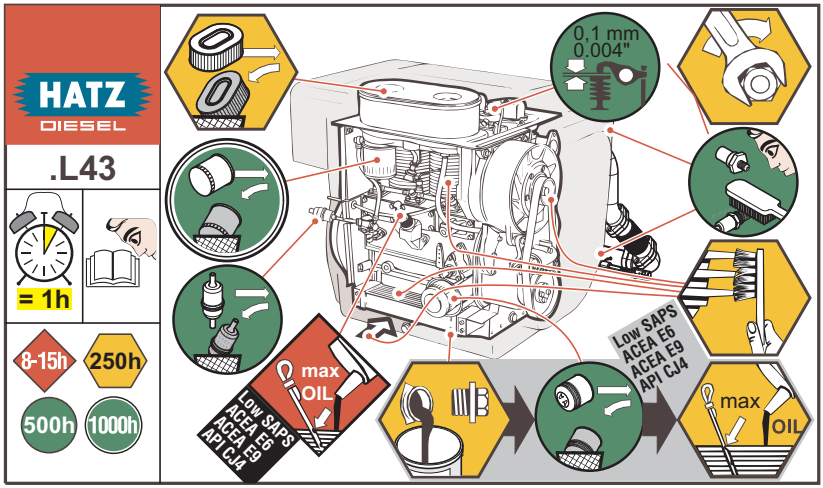
8.2.1 Maintenance notice label

NOTICE	
	Depending on the engine type, one of the maintenance plans shown below is supplied with the engine. ▪ It should be mounted on the engine or machine in a clearly visible location. ▪ The maintenance intervals specified on the maintenance plan must be adhered to (see chapter *8.2.2 Maintenance plan, page 51*)

3-4M43, 3-4M43Z



3-4L43C



8.2.2 Maintenance plan

In new and generally overhauled engines, after **25 operating hours**:

- Change the engine oil
- Check the tappet clearance and adjust if necessary
- Check the screw connections (do not retighten the screws for attaching the cylinder head)

In case of a low number of operating hours, change the engine oil no later than every 12 months, regardless of the actual number of operating hours.

The degree of contamination of the fuel, the care with which refueling is performed and the soiling on the inside of the fuel tank are decisive in determining the change interval of the fuel **pre**filter and the fuel filter.

Symbol	Maintenance interval	Maintenance activity/Check	Chapter
	Every 8–15 operating hours or every day before starting	Check the oil level.	*7.8 Checking the oil level and adding oil if necessary, page 43*
		Check the intake area of the combustion air.	*8.2.3 Checking the intake area of the combustion air, page 53*
		Check the cooling air area.	*8.2.4 Checking the cooling air area, page 54*
	Weekly	Check the water separator.	*7.7 Checking the water separator, page 42*
	Every 250 operating hours	Change the engine oil (3-4L43C).	*8.2.5 Change the engine oil., page 55*
		Check the poly v belt.	*8.2.6 Checking the poly v belt, page 57*
		Clean the cooling fan, cooling fins and oil cooler.	*8.2.7 Cleaning the cooling fan, cooling fins and oil cooler, page 58*
		Check the screw connections.	*8.2.8 Checking the screw connections, page 62*
		Check the fuel **pre**filter for contamination and change if necessary.	*8.2.9 Changing the fuel prefilter, page 63*
		Reset the maintenance interval indicator.	*8.2.19 Resetting the maintenance interval indicator, page 86*

Symbol	Maintenance interval	Maintenance activity/Check	Chapter
	Every 500 operating hours	Change the fuel **pre**filter.	*8.2.9 Changing the fuel prefilter, page 63*
		Maintain the dry air filter. Change the filter cartridge.	*8.2.10 Maintaining the dry air filter, page 65*
		Check and set the tappet clearance.	*8.2.12 Checking and setting the tappet clearance, page 69*
		Change the engine oil (3-4M43 and 3-4M43Z).	*8.2.5 Change the engine oil., page 55*
		Change the oil filter.	*8.2.13 Changing the oil filter, page 72*
		Check the fuel evaporator (vaporizer).	*8.2.17 Check the fuel evaporator (vaporizer) and clean if necessary., page 81*
		Check the exhaust gas back pressure sensor.	*8.2.18 Checking the exhaust gas back pressure sensor, page 85*
		Reset the maintenance interval indicator.	*8.2.19 Resetting the maintenance interval indicator, page 86*
	Every 1000 operating hours	Change the main fuel filter	*8.2.14 Change the main fuel filter, page 73*
		Reset the maintenance interval indicator.	*8.2.19 Resetting the maintenance interval indicator, page 86*
---	Every 2000 operating hours	Renew the gaskets in the belt tensioner or the complete belt tensioner. (To be carried out by a trained specialist).	
		Renew the poly v belt.	*8.2.15 Renewing the poly v belt and checking the function of the switch-off unit, page 76*
---	Every 3000 operating hours	Clean the EGR valve, EGR housing, and intake area. (To be carried out by a trained specialist).	---

8.2.3 Checking the intake area of the combustion air

Safety notes

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

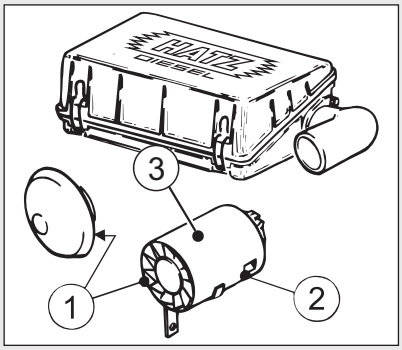
- Let the engine cool.
- Wear safety gloves.

NOTICE

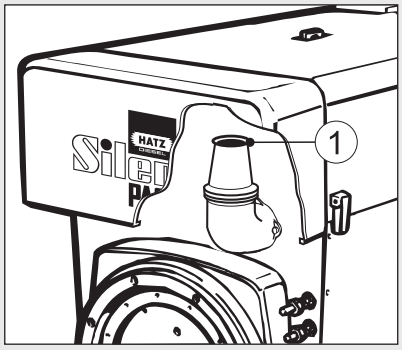
In case of heavy contamination, shorten the maintenance intervals accordingly (see chapter *8.2.2 Maintenance plan, page 51*).

Overview

3-4M43 and 3-4M43Z



3-4L43C



Pos.	Designation
1	Intake opening for combustion air
2	Dust outlet opening
3	Cyclone (option)

Procedure

Step	Activity
1	Check the intake opening (1) for coarse contamination such as leaves, heavy dust deposits, etc., and clean if necessary.
2	Check that the dust outlet opening (2) at the bottom of the cyclone precleaner is clear.
3	If the dirt contamination is oily, remover the cyclone (3) and clean it.

8.2.4 Checking the cooling air area

Safety notes

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Let the engine cool before maintenance.

CAUTION

Danger of injury.

When working with compressed air, foreign bodies may fly into your eyes.

- Wear safety goggles.
- Never direct the compressed air jet toward people or toward yourself.

CAUTION

Danger of engine damage from overheating.

The engine temperature display (option) lights up as soon as the engine becomes impermissibly hot.

- Switch off the engine immediately and eliminate the cause.

NOTICE

In case of heavy contamination, shorten the maintenance intervals accordingly (see chapter *8.2.2 Maintenance plan, page 51*).

Procedure

Step	Activity
1	Check the supply and exhaust air areas for coarse contamination such as leaves, heavy dust deposits, etc., and clean if necessary (see chapter *8.2.7 Cleaning the cooling fan, cooling fins and oil cooler, page 58*).

8.2.5 Change the engine oil.

Safety notes

CAUTION

Danger of burns.

When working on the engine there is a danger of burns from hot oil.

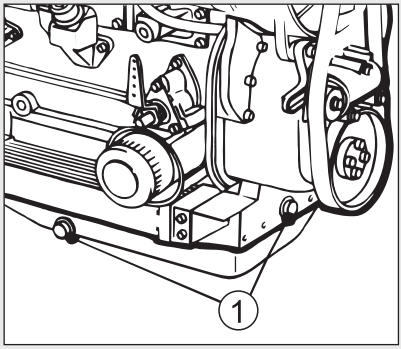
- Wear personal protective equipment (gloves).
- Collect the used oil and dispose of it according to local environmental regulations.

NOTICE

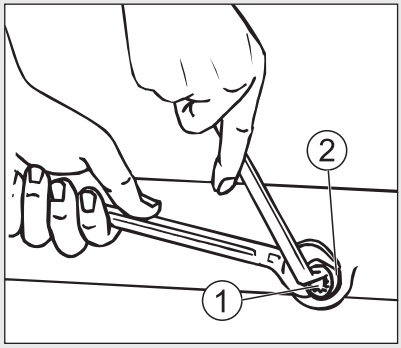
- The engine must be level.
- The engine must be switched off.
- Only drain engine oil while it is warm.

Overview — Draining the oil

3-4M43, 3-4M43Z
(standard version)



3-4L43C
(sealed version)

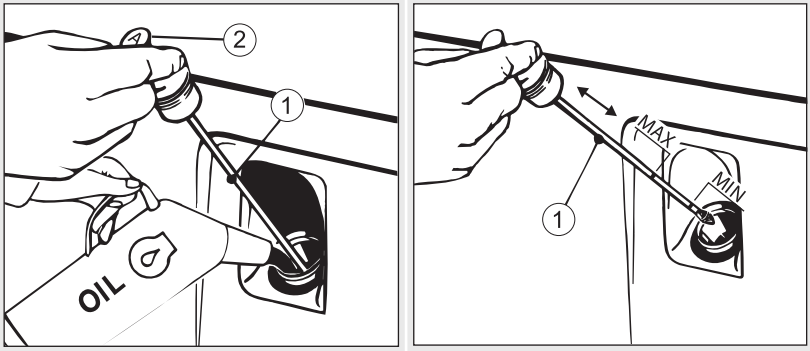


Pos.	Designation
1	Oil drain screw
2	Drain pipe

Procedure — Draining the oil

Step	Activity
1	Unscrew the oil drain screw (1) and drain the oil entirely. In case of sealed engines, when unscrewing the oil drain screw (1) ensure that the drain pipe (2) is not loosened. Hold it with an open-end wrench.
2	Screw in the cleaned oil drain screw (1) with the new gasket and tighten.

Overview — Checking oil level/adding oil



Pos.	Designation
1	Dipstick
2	Code letter on the dipstick

Procedure — Adding oil

Step	Activity
1	Add engine oil to the **max.** mark on the dipstick (1). ▪ For the specification and viscosity, see chapter *4.3 Engine oil, page 24*. ▪ The code letter on the dipstick (2) indicates whether the engine is equipped **with** an oil sump or **not** (see chapter *4 Technical data, page 21*).
2	Reinsert the dipstick (1).

Step	Activity
3	After a short test run, check the oil level and correct it if necessary (see the chapter *7.8 Checking the oil level and adding oil if necessary, page 43*).

8.2.6 Checking the poly v belt

Safety notes

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Let the engine cool before maintenance.

CAUTION

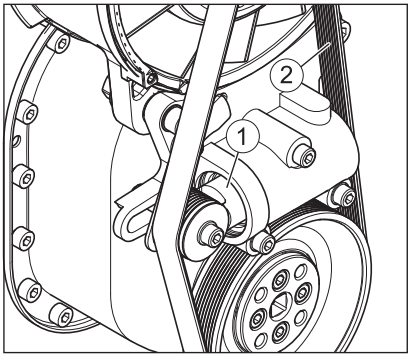
Damage from inadequate engine cooling.

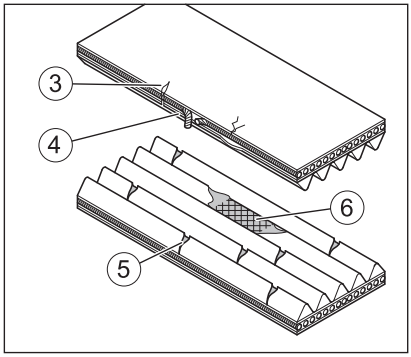
Only operate the engine when all covers are installed.

Preparation

Step	Activity
1	On **encapsulated engines**, unscrew the cover of the air guide housing (see chapter *5 Engine design, page 26*).
1	On **engines without a capsule**, unscrew the belt guard (see chapter *5 Engine design, page 26*).

Overview





1	Belt tensioner

2	Poly v belt
Damage on the poly v belt	
3	Transverse cracks on the rear
4	Fraying on the edges
5	Transverse cracks in multiple ribs
6	Broken ribs

Procedure

Step	Activity
1	Check the belt tensioner (1) for leaks. If the belt tensioner is oily, contact **HATZ service**.
2	Check the poly v belt (2) for the following damage: ▪ Transverse cracks on the rear of the belt. ▪ Fraying on the side. ▪ Accumulation of dirt between the ribs. ▪ Oily dirt contamination. ▪ Transverse cracks in multiple ribs. ▪ Broken ribs. If one or more of these instances of damage are present, replace the poly v belt (see chapter *8.2.15 Renewing the poly v belt and checking the function of the switch-off unit, page 76*).
3	Refit the air guide housing cover and belt guard.

8.2.7 Cleaning the cooling fan, cooling fins and oil cooler

Safety notes

	DANGER
	**Danger of explosion from flammable cleaning agents.** Cleaning with benzene is an explosion hazard. It is highly flammable, can become electrostatically charged, and can generate an explosive gas/air mixture. ▪ Use halogen-free, cold cleaners with a high flashpoint for cleaning. ▪ Comply with manufacturer's instructions.

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Let the engine cool before maintenance.

CAUTION

Danger of injury.

When working with compressed air, foreign bodies may fly into your eyes.

- Wear safety goggles.
- Never direct the compressed air jet toward people or toward yourself.

CAUTION

Danger of engine damage from overheating.

The engine temperature display (option) lights up as soon as the engine becomes impermissibly hot.

- Switch off the engine immediately and eliminate the cause.

CAUTION

Danger of damage to the machine from incorrect engine cleaning.

- Let the engine fully cool down before cleaning.
- Do not spray components of the electrical equipment with a water jet or high pressure jet during cleaning.
- Do not use gasoline or acid-based cleaning agents.

CAUTION

Damage from inadequate engine cooling.

Only operate the engine when all covers are installed.

NOTICE

In case of heavy contamination, shorten the maintenance intervals accordingly (see chapter *8.2.2 Maintenance plan, page 51*).

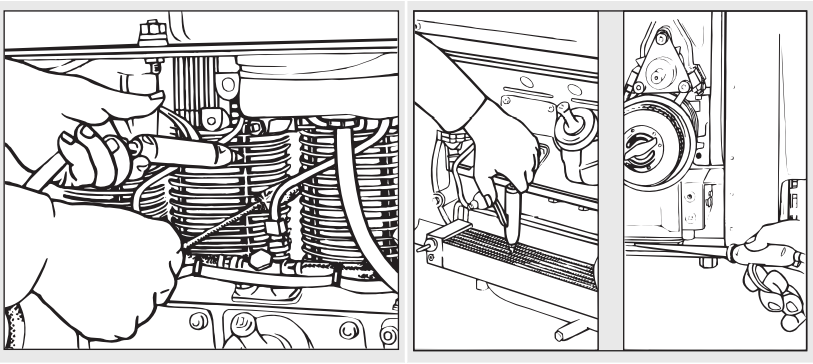
Overview — Preparatory activities

Pos.	Designation
1	Baffle plate

Preparation — Cleaning

Step	Activity
1	**On encapsulated engines unscrew the following:** (see chapter *5 Engine design, page 26*) ▪ Hood ▪ Side panel ▪ Cover plate on operating side ▪ Air outlet duct for cooling air ▪ Cover plate on air outlet side
1	**Remove the following on engines without a capsule:** ▪ Side trim panel ▪ Cooling air guide for lubrication oil cooler
2	Unscrew the baffle plate (1)

Overview — Cleaning



Procedure — Cleaning

Step	Activity
Cleaning in case of dry dirt contamination	
1	Clean the cooling fan, cylinder head and cylinder with a suitable brush.
2	Blow out the entire cooling air area with compressed air.
3	Blow out the oil cooler with compressed air only. *NOTE:* ▪ Do not place the compressed air gun against the sensitive radiator fins.
4	On encapsulated engines, also clean the area between the floor plate and crankcase.
5	Mount the capsule and air guide parts again.
Cleaning of wet or oily dirt contamination	
1	Disconnect the negative battery terminal.
2	Manually clean the alternator and regulator.
3	Cover the alternator with the installed regulator and do not spray directly.
4	Spray the entire area with a suitable cleaning solution according to manufacturer instructions and then clean off with a jet of water. Do not spray components of the electrical equipment with a water jet or high pressure jet during cleaning.
5	Blow dry the engine with compressed air.

Step	Activity
6	Determine the cause of the oil contamination and have leaks corrected by the **HATZ service station**.
7	Mount the capsule and air guide parts again.
8	Let the engine run warm to prevent rust formation.

8.2.8 Checking the screw connections

Safety note

NOTICE	
	▪ Do not retighten the screws for attaching the cylinder head. ▪ The adjustment screws on the speed governor and the injection system are secured with locking varnish and are not permitted to be tightened or adjusted. ▪ Only retighten loose screw connections. Screw connections can be secured with thread locking adhesive or tightened to a defined torque. Retightening tight screw connections can cause damage.

Procedure

Step	Activity
1	Check the condition of all screw connections and ensure that they are tight (for exceptions, see note).
2	Tighten any lose screw connections.

8.2.9 Changing the fuel prefilter

Safety notes

DANGER

Fire hazard from fuel.

Leaked or spilled fuel can ignite on hot engine parts and cause serious burn injuries.

- Never refuel in the vicinity of open flames or sparks that can cause ignition.
- Do not smoke.
- Do not spill fuel.

CAUTION

Danger of injury

Repeated contact with diesel fuel can cause chapped and cracked skin.

- Wear safety gloves.

CAUTION

Danger of environmental damage from spilled fuel.

When the filter is removed, a small amount of fuel is drained as well.

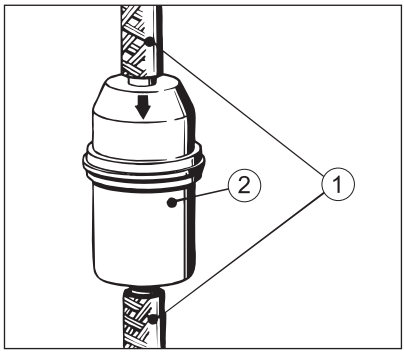
- Collect any escaping fuel and dispose of it according to local environmental regulations.

CAUTION

Dirt particles can damage the injection system.

- Maintain clean conditions to ensure dirt does not enter the fuel line.

Overview



Pos.	Designation
1	Fuel lines
2	Fuel prefilter

Procedure

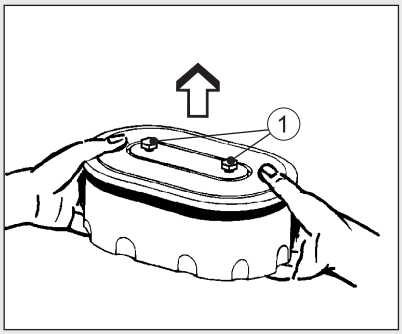
Step	Activity
1	Place a suitable container under the filter to collect emerging fuel.
2	Close the fuel feed line.
3	Pull the fuel lines (1) off of the fuel prefilter (2) on both sides.
4	Dispose of the old filter in accordance with local environmental regulations.
5	Insert a new fuel prefilter. Note the following: ▪ Direction of arrow for the flow-through direction depends on position of the fuel tank: HIGH or LOW ▪ Installation position/flow-through direction should be as vertical as possible
6	Open the fuel feed line.
7	Perform a test run. While doing this, check the filter and lines for leak-tightness.
8	If you have difficulties starting the engine, bleed the injection system with the aid of the manual fuel pump (see chapter *7.3.1 Pumping fuel with the manual fuel pump, page 34*).

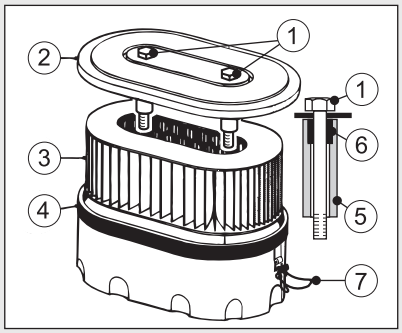
8.2.10 Maintaining the dry air filter

NOTICE

- Clean the filter cartridge immediately if, at maximum speed, the combined indicator on the instrument box flashes 14 times.
- The air filter cartridge either needs to be replaced, or cleaned or checked depending on the degree of contamination.
- Renew the filter cartridge after a use period of 500 operating hours.
- Four cylinder engines have two filter cartridges.

Overview — Removing the air filter cartridge (engines 3-4L43C)





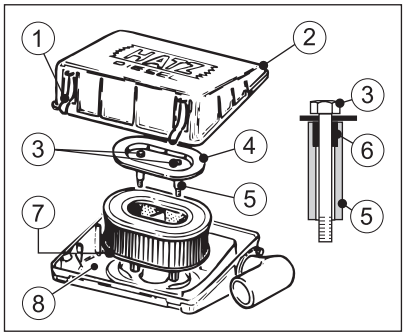
Pos.	Designation
1	Screw
2	Cover
3	Filter cartridge
4	Air filter housing
5	Spacer
6	Bushing
7	Clamp

Procedure — Removing the air filter cartridge (engines 3-4L43C)

Step	Activity
1	Remove the capsule hood.
2	Remove adherent dirt in the area of the air filter housing (4).

Step	Activity
3	Only loosen the screws (1) to the point where you can lift off the complete air filter housing (4).
4	Cover the opening in the intake pipe to prevent ingress of dirt and other foreign bodies.
5	On three cylinder engines, open the clamp (7). ▪ On three cylinder engines, the cover (2) is additionally held by a clamp (7).
6	Open the air filter housing (4).
7	Take out the filter cartridge (3).
8	Clean the air filter housing (4) and cover (2).
9	Renew the bushing (6) if the spacer (5) is loose. ▪ The spacer (5) is connected with the screw (1) by the elastic bushing (6) to ensure that it cannot fall into the intake pipe during disassembly and assembly.

Overview — Removing the air filter cartridge (engines 3-4M43 and 3-4M43Z)



Pos.	Designation
1	Clamp
2	Air filter housing cover
3	Screw
4	Filter cover
5	Spacer
6	Bushing
7	Filter cartridge
8	Air filter housing

Procedure — Removing the air filter cartridge (engines 3-4M43 and 3-4M43Z)

Step	Activity
1	Release the clamps (1) and remove the cover of the air filter housing (2).
2	Remove adherent dirt in the air filter area.
3	Only loosen the screws (3) to the point where the filter cover (4) can be removed with the filter cartridge (7).
4	Cover the opening in the intake pipe to prevent ingress of dirt and other foreign bodies.
5	Clean the air filter housing cover (2), filter cover (4) and air filter housing (8).
6	Renew the bushing (6) if the spacer (5) is loose. ▪ The spacer (5) is connected with the screw (3) by the elastic bushing (6) to ensure that it cannot fall into the intake pipe during disassembly and assembly.

8.2.11 Checking and cleaning the air filter cartridge

Safety notes

⚠ CAUTION

Danger of injury.

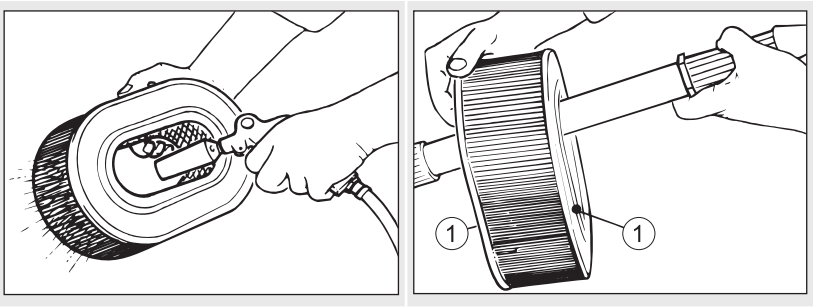
When working with compressed air, foreign bodies may fly into your eyes.

- Wear safety goggles.
- Never direct the compressed air jet toward people or toward yourself.

NOTICE

- The pressure must not exceed 5 bar.
- A distance of approx. 150 mm must be maintained between the filter cartridge and the compressed air gun.
- The filter cartridge may not be washed out or beaten out.
- Even minor damage in the areas of the sealing surface, filter paper or filter cartridge makes it impossible to reuse the filter cartridge.

Overview — Checking/cleaning the air filter cartridge



Pos.	Designation
1	Sealing surface

Step	Activity
Dry contamination	
1	Blow out the filter cartridge with dry compressed air from the inside to the outside until dust no longer emerges.
2	Check the sealing surfaces (2) of the filter cartridge for damage.
3	Check the filter cartridge for cracks in the filter paper and other damage by holding it against the light at a slant or letting light from a lamp shine through it.
4	Replace the filter cartridge if necessary (see note).
Moist or oily contamination	
1	Renew the filter cartridge.

Procedure — Mounting the air filter cartridge

Step	Activity
1	When assembling, mount the parts individually one after the other to make sure they are correctly seated and to ensure leak tightness.

8.2.12 Checking and setting the tappet clearance

Safety notes

CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine. Only perform the settings while the engine is cold (10-30°C).

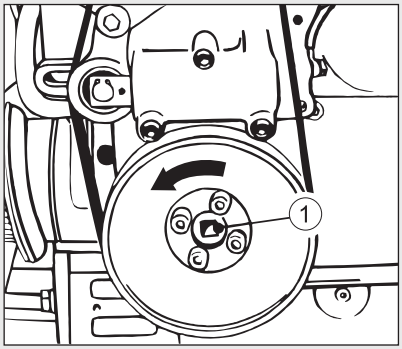
- Let the engine cool.

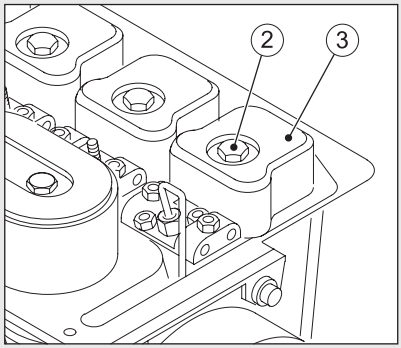
CAUTION

Damage from inadequate engine cooling.

Only operate the engine when all covers are installed.

Overview — Preparatory activities





Pos.	Designation
1	Square opening
2	Hex nut
3	Cylinder head cover

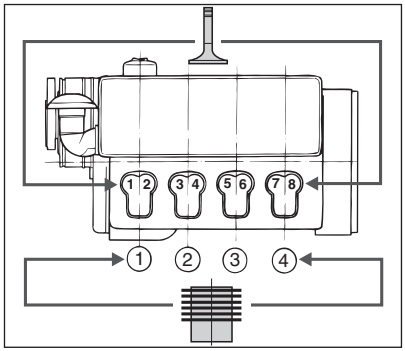
Preparation — Adjusting the tappet clearance

Step	Activity
1	On encapsulated engines, remove the hood of the capsule (see chapter *5 Engine design, page 26*).
2	Remove the hex nut (2) and remove the cylinder head cover (3).

Step	Activity
3	Remove the air guide housing cover (see chapter *5 Engine design, page 26*) and belt guard.
4	Insert the ratchet or T-piece 1/2" with the required extension (1) into the square opening.

	NOTICE
	**Turn the engine in the sense of rotation.** Anti-clockwise in both cases - flywheel side or timing cover side.

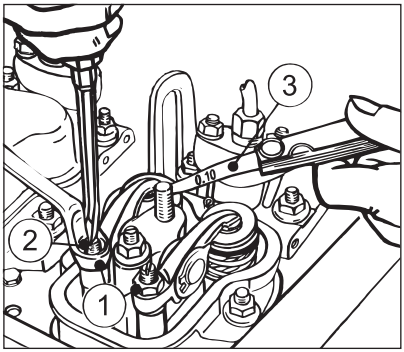
Numbering of the valves and cylinders from the fan side



Setting method for three and four cylinder engines

Type	Valve no. ... fully opened	Check the valves of the ... cylinder
3-cylinder	1	3rd cylinder
	5	2nd cylinder
	3	1st cylinder
4-cylinder	1	3rd cylinder
	5	4th cylinder
	7	2nd cylinder
	3	1st cylinder

Overview — Adjusting the tappet clearance



Pos.	Designation
1	Hex nut
2	Adjusting screw
3	Feeler gauge

Procedure — Adjusting the tappet clearance

Step	Activity
1	Check the tappet clearance with the feeler gauge (3). For the setting, see the chapter *4 Technical data, page 21*
2	If the tappet clearance needs to be corrected: ▪ Release the hex nut (1). ▪ Turn the adjustment screw (2) so the feeler gauge (3) can be pulled through with a barely perceptible resistance after the hex nut (1) is tightened again.
3	Repeat the above procedure for the entire valve area, taking special care to use the described adjustment method.
4	Mount the cylinder head cover again: ▪ Always renew the gaskets. ▪ Use the fixing nuts for the cylinder head cover no more than twice before renewing them. ▪ Tightening torque: **10 Nm**.
5	Mount all covers. *NOTE:* ▪ Under no circumstances is the engine permitted to be operated if not all covers are mounted.

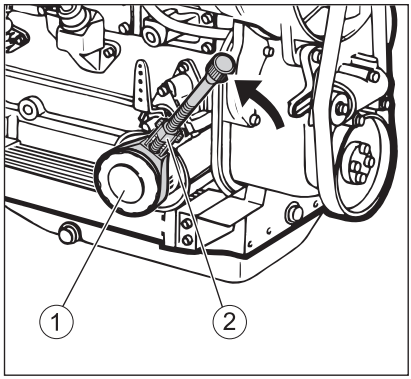
Step	Activity
6	After a brief trial run, check the cylinder head cover for tightness.

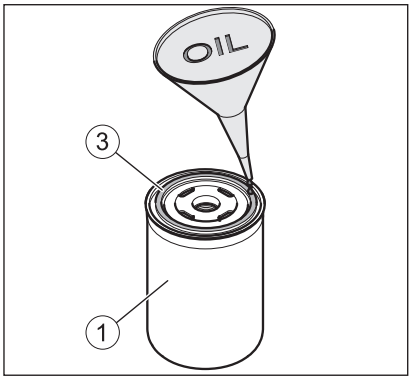
8.2.13 Changing the oil filter

Safety note

CAUTION
 **Danger of burns.** When working on the engine there is a danger of burns from hot oil. ▪ Wear personal protective equipment (gloves). ▪ Collect the used oil and dispose of it according to local environmental regulations.

Overview





1	Oil filter
2	Strap wrench
3	Gasket

Procedure

Step	Activity
1	Release the oil filter (1) with a strap wrench (2) and quickly unscrew it or pull it out. ▪ HATZ order no. for strap wrench: 620 307 01.
2	Dispose of the old filter in accordance with local environmental regulations.

Step	Activity
3	Wipe spilled engine oil out of the oil baffle.
4	Lightly oil the gasket (3) of the new oil filter.
5	Screw in the oil filter and tighten it by hand.
6	Add engine oil to the **max.** mark on the dipstick. ▪ For the specification and viscosity, see chapter *4.3 Engine oil, page 24*. ▪ The mark on the dipstick indicates whether the engine is equipped **with** an oil sump or **not** (see chapter *4.1 Engine information and filling quantities, page 22*).
7	Reinsert the dipstick.
8	Check the oil level after a short test run and correct if necessary.
9	Check the oil filter for tightness and retighten by hand if necessary.

8.2.14 Change the main fuel filter

Safety notes

DANGER

Fire hazard from fuel

Leaked or spilled fuel can ignite on hot engine parts and cause serious burn injuries.

- Do not spill fuel.
- No open flames when working on the fuel system.
- Do not smoke.

CAUTION

Danger of injury

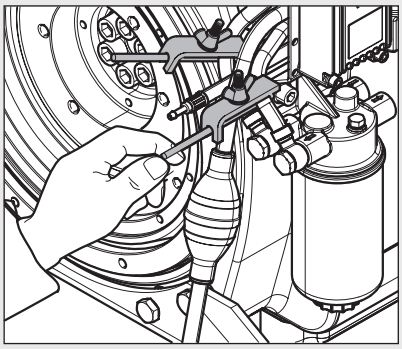
Repeated contact with diesel fuel can cause chapped and cracked skin.

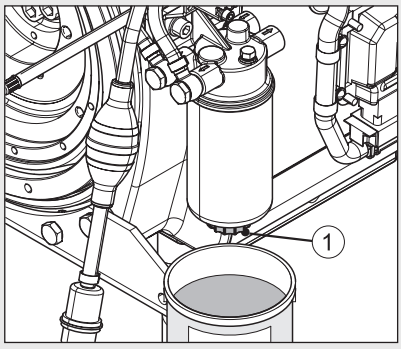
- Wear safety gloves.

	CAUTION
	**Danger of environmental damage from spilled fuel.** When the filter is removed, a small amount of fuel is drained as well. ▪ Collect any escaping fuel and dispose of it according to local environmental regulations.

	CAUTION
	Dirt particles can damage the injection system. ▪ Maintain clean conditions to ensure dirt does not enter the fuel line. ▪ Only install fuel filters dry and do not prefill in order to avoid contamination.

Overview — Preparatory activities



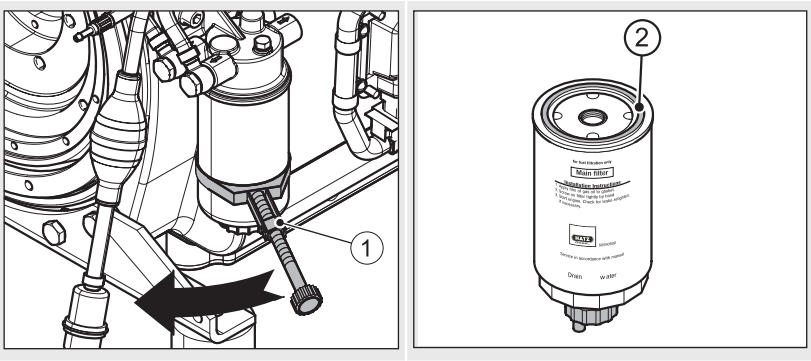


Pos.	Designation
1	Drain plug

Preparation — Changing the fuel filter

Step	Activity
1	Close the fuel lines on the filter housing.
2	Place a suitable container under the filter to collect emerging fuel.
3	Release the drain screw (1) and drain the fuel.

Overview — Changing the fuel filter



Pos.	Designation
1	Strap wrench (HATZ order no.: 620 307 01)
2	Gasket

Procedure — Changing the fuel filter

Step	Activity
1	Slide on the strap wrench (1) and unscrew the fuel filter counter-clockwise.
2	Dispose of the old filter in accordance with local environmental regulations.
3	Lightly oil the gasket (2) of the new fuel filter.
4	Mount the fuel filter and tighten it **by hand**.
5	Open the fuel feed line.
6	Bleed the injection system with the aid of the manual fuel pump with the aid of the injection system (see chapter *7.3.1 Pumping fuel with the manual fuel pump, page 34*).
7	After a brief trial run, check the fuel filter for leak tightness and retighten by hand.

8.2.15 Renewing the poly v belt and checking the function of the switch-off unit

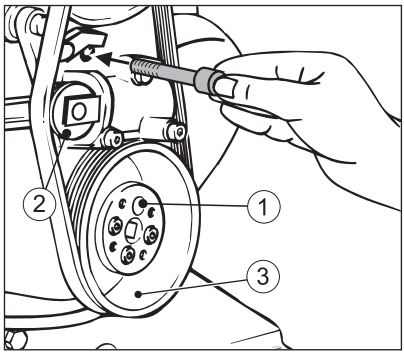
Safety note

NOTICE

When changing the belt:

- Always check the function of the switch-off unit. The switch-off pin must emerge by spring force, or else the machine will not switch off automatically if the belt tears.
- If the grooves are broken off or bent, renew the damaged pulley.

Overview — Removing the poly v belt

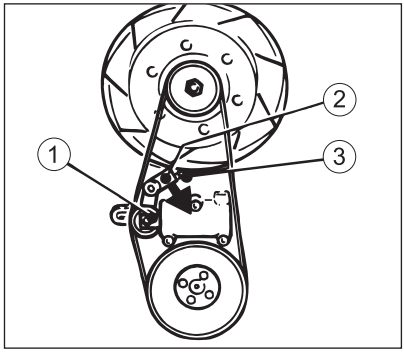


Pos.	Designation
1	Cylinder screw
2	Tension pulley
3	Pulley

Procedure — Removing the poly v belt

Step	Activity
1	Unscrew one cylinder screw (1) from the pulley (3).
2	Push back the tension pulley (2) and lock it using the cylinder screw (1).
3	Unscrew the pulley (3).
4	Check the pulley (3) for broken or bent grooves.
5	Remove the poly v belt.

Overview — Checking the function of the switch-off unit of the belt monitoring system

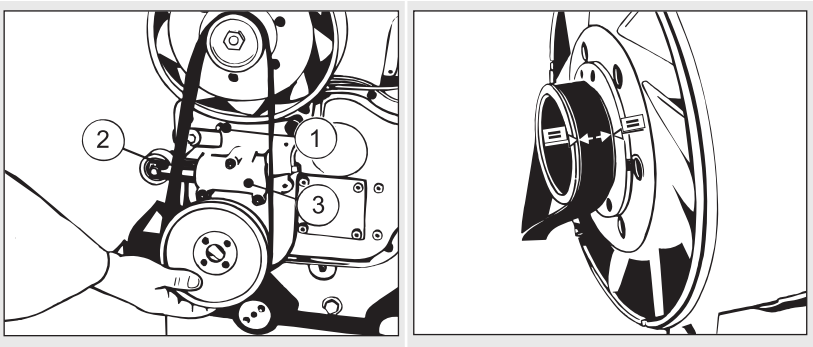


Pos.	Designation
1	Tension pulley
2	Angle lever
3	Switch-off pin

Procedure — Checking the function of the switch-off unit of the belt monitoring system

Step	Activity
1	Release the piston with the tension pulley (1) by removing the cylinder screw. ▪ The piston with the tension pulley is pushed out of the housing by spring pressure. ▪ The angle lever (2) turns downward and releases the switch-off pin (3). ▪ The switch-off pin (3) must emerge by spring force, or else the machine will not switch off automatically if the belt tears.
2	If there is no reaction, please contact the nearest **HATZ service station**.

Overview — Mounting the poly v belt

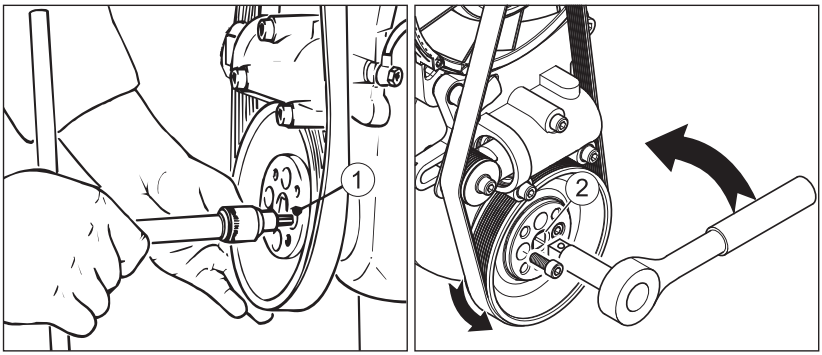


Pos.	Designation
1	Switch-off pin
2	Tension pulley
3	Housing

Procedure — Mounting the poly v belt

Step	Activity
1	Slide in the switch-off pin (1).
2	Slide the piston with the tension pulley (2) into the housing (3) and lock it using the cylinder screw.
3	Position the poly v belt centrally on the pulley of the fan wheel, the tension pulley (2) and the pulley at the bottom.

Overview — Centering the pulley



Pos.	Designation
1	Cylinder screw

Pos.	Designation
2	Square opening

Procedure — Centering the pulley

Step	Activity
1	Lightly secure the pulley with a cylinder screw (1) without placing the pulley fully on the centering.
2	Insert the ratchet or T-piece 1/2" with the required extension into the square opening (2).
3	Turn the pulley until a further cylinder screw can be fitted.
4	Insert the remaining cylinder screws and tighten all screws.

8.2.16 Replacing the diesel particulate filter

Safety notes

⚠ CAUTION

Danger of burns.

During the regeneration process, the diesel particulate filter and the exhaust system become very hot. There is a danger of burns when working on a hot exhaust system.

- Let the diesel particulate filter and exhaust system cool down.
- Wear safety gloves.

CAUTION

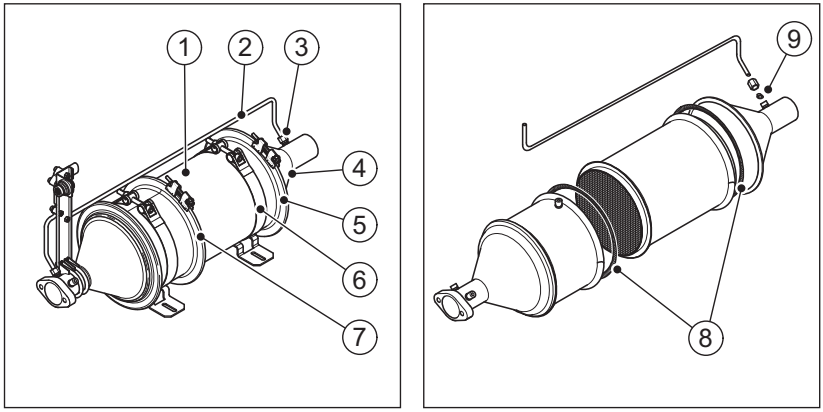
Damage of the diesel particulate filter from improper cleaning.

- Do not spray the filter fabric of the diesel particulate filter with a water jet or high pressure jet.
- Do not use gasoline or chemical cleaning agents.
- Do not burn the filter fabric of the diesel particulate filter free of soot.

NOTICE

- The diesel particulate filter must be conditioned/replaced when the indicator lamp for "Fault in the area of the exhaust emission after-treatment system" flashes 2 times for a long time (see *Explanation of symbols*, chapter *7.4 Starting the engine, page 35*).
- The conditioning of the diesel particulate filter must be carried out by a specialized company. In order to ensure shutdown periods as short as possible, the "Hatz EasyClean" exchange program is recommended.

Overview



Pos.	Designation
1	Diesel particulate filter
2	Differential pressure line
3	Cap nut
4	Discharge funnel
5	V-band clamp (discharge funnel)
6	Retaining foot clamp
7	V-band clamp (diesel particulate filter)
8	Cord packing
9	Sealing dome

Procedure

Step	Activity
1	Undo the cap nut (3) of the differential pressure line. Carefully pull off the differential pressure line, take care with the sealing dome (9).
2	Loosen the V-band clamp (5) of the discharge funnel, remove the discharge funnel (4) from the diesel particulate filter.
3	Loosen the V-band clamp (7) of the diesel particulate filter.
4	Loosen the retaining foot clamp (6) and remove the diesel particulate filter (1).
5	Remove the cord packings (8) from the diesel particulate filter.
6	Fit new cord packings on the new/conditioned diesel particulate filter.
7	Reinstall the diesel particulate filter, discharge funnel and differential pressure line in reverse order. *NOTE:* The installation direction of the diesel particulate filter is determined by the design. Only tighten the retaining foot clamp fully at the end.

8.2.17 Check the fuel evaporator (vaporizer) and clean if necessary.

Safety notes

DANGER

Danger of explosion due to fuel mist.

There is a danger of explosion from the fuel-air mixture.

- Do not clean the fuel evaporator in the vicinity of open flames and hot surfaces.
- Do not smoke when cleaning the fuel evaporator.

CAUTION

Danger of burns.

During the regeneration process, the diesel particulate filter and the exhaust system become very hot. There is a danger of burns when working on a hot exhaust system.

- Let the diesel particulate filter and exhaust system cool down.
- Wear safety gloves.

CAUTION

Danger of injury.

When working with compressed air, foreign bodies may fly into your eyes.

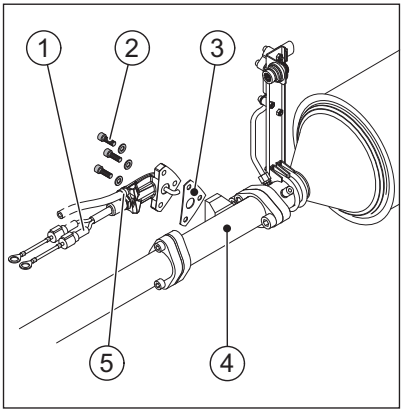
- Wear safety goggles.
- Never direct the compressed air jet toward people or toward yourself.

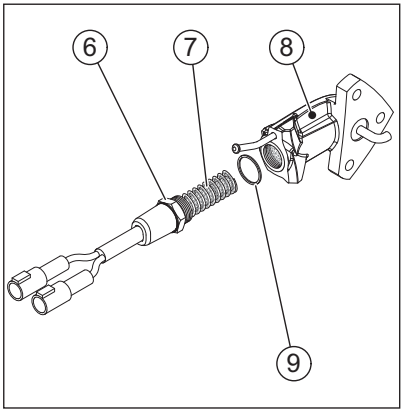
CAUTION

Damage to the coiled filament from wire brush.

- Clean the coiled filament only with a soft copper or brass wire brush.
- Do not use a hard steel wire brush.

Overview — Removing the fuel evaporator (vaporizer)





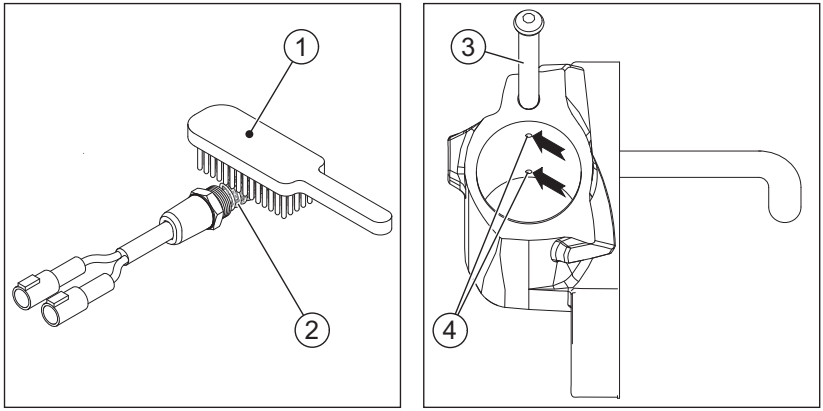
Pos.	Designation
1	Electrical connection cable
2	Evaporator unit fixing screws
3	Gasket
4	Exhaust pipe
5	Fuel hose
6	Hex nut
7	Coiled filament
8	Evaporator housing

Pos.	Designation
9	Copper ring

Procedure — Removing the fuel evaporator

Step	Activity
1	Disconnect the electrical connection cable (1) by loosening the connector fasteners.
2	Loosen the fuel hose clamp (5) and pull off the fuel hose.
3	Loosen the evaporator unit mounting bolts (2).
4	Carefully slacken the evaporator unit, the gasket (3) should not be damaged. The gasket can be reused if it remains undamaged.
5	Remove the complete evaporator unit from the exhaust pipe (6).
6	Screw the coiled filament (7) out of the evaporator housing (8) by using the hex net (6), remove the copper ring (9).

Overview — Checking and cleaning the fuel evaporator (vaporizer)



Pos.	Designation
1	Copper or brass wire brush
2	Coiled filament
3	Fuel line connection
4	Fuel holes

Procedure — Checking the fuel evaporator (vaporizer)

Step	Activity
1	Check the coiled filament for soot deposits and clean if necessary (see section "Cleaning the fuel evaporator (vaporizer)").
2	Visually check the coiled filament for damage. If damage is visible, replace the coiled filament.
3	Blow out the fuel line connection (3) with compressed air. Cover the fuel holes (4) in the evaporator housing with a cloth when doing this to collect deposits and fuel splashes. If the fuel holes are clogged, clean the evaporator housing (see section "Cleaning the fuel evaporator (vaporizer)").

Procedure — Cleaning the fuel evaporator

Step	Activity
1	Brush off soot deposits from the coiled filament (2) with a copper or brass wire brush (1).
2	Use a wire to carefully remove hard soot and carbon deposits from the fuel holes (4). Then blow out the fuel line connection again.

Procedure — Installing the fuel evaporator (vaporizer)

Step	Activity
1	Replace the copper ring (9), screw the coiled filament back into the evaporator housing, tightening torque 55 Nm.
2	Screw the evaporator unit tightly onto the exhaust pipe. Undamaged gaskets may still be used, replace the gasket if damage is visible.
3	Connect the fuel hose and secure with the clamp.
4	Reconnect the electrical connection cable.

8.2.18 Checking the exhaust gas back pressure sensor

Safety notes

CAUTION

Danger of burns.

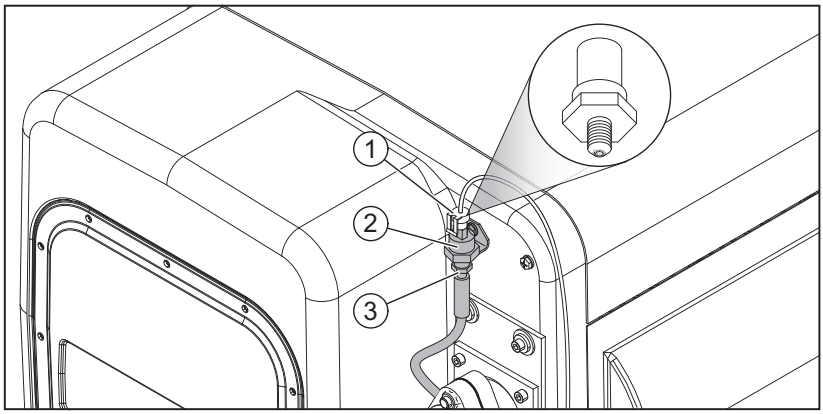
There is a danger of burns when working on a hot engine.

- Let the engine cool.
- Wear safety gloves.

CAUTION

Damage to the exhaust gas back pressure sensor by cleaning.

The exhaust gas back pressure sensor is destroyed by cleaning in the majority of cases. The correct operation of the sensor can not be easily checked. The exhaust gas back pressure sensor must therefore always be replaced when it is sooted up.



Overview

Pos.	Designation
1	Signal line with connector
2	Exhaust gas back pressure sensor
3	Line connection

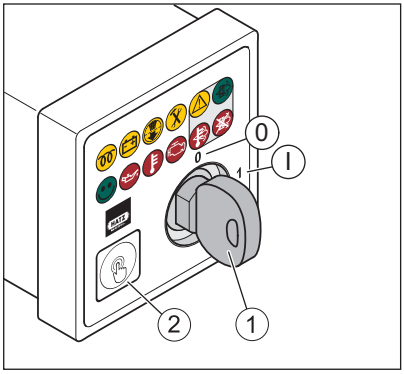
Procedure

Step	Activity
1	Disconnect the signal line (1) from the exhaust gas back pressure sensor (2) by loosening the connector fastener.
2	Unscrew the line connection (3) and remove the exhaust gas back pressure sensor.
3	Check the bore hole for the exhaust gas back pressure sensor. When the bore hole is blocked with soot, the exhaust gas back pressure sensor must be replaced.
4	Refit the exhaust gas back pressure sensor and reconnect the signal line.

8.2.19 Resetting the maintenance interval indicator

After completion of maintenance work reset the maintenance interval indicator. The counter starts again at zero and indicates when the next service is due.

Overview — HATZ instrument boxes



1	Starting key
2	Pushbutton
Ignition lock	
0	Off
I	Operation

Procedure

Step	Activity
1	The starting key is at position "0". ▪ Press and hold down the button (2).
2	Turn the starting key from position "0" to position "I".
3	Release the button (2) after a wait time of at least 5 seconds but no longer than 10 seconds. The maintenance interval indicator is now reset.

	NOTICE
	**If a HATZ instrument box is not used:** Comply with the instructions in the documentation for the **complete machine**.

9 Faults

9.1 Trouble shooting

General troubleshooting notes

If the cases listed below have been worked through but the fault continues to persist, please contact your nearest **Hatz service station**.

The engine does not start or does not start immediately, but it can be turned with the starter.

Possible causes	Remedy	Chapter
No fuel at the injection pump.	Refuel.	*7.6 Refueling, page 41*
	Operate the manual fuel pump.	*7.3.1 Pumping fuel with the manual fuel pump, page 34*
	Systematically check the entire fuel supply. If this does not yield results:	
	▪ Check the feed line to the engine.	
	▪ Check the fuel prefilter.	*8.2.9 Changing the fuel prefilter, page 63*
	▪ Check the main fuel filter.	*8.2.14 Change the main fuel filter, page 73*
	▪ Check the function of the feed pump.	
Injection nozzle is not functional.	Contact Hatz service.	
Poly v belt torn.	Renew the poly v-belt.	*8.2.6 Checking the poly v belt, page 57*
Insufficient compression:		
▪ Wrong tappet clearance.	Check the tappet clearance and adjust if necessary.	*8.2.12 Checking and setting the tappet clearance, page 69*
▪ Cylinder and/or piston ring wear.	Contact Hatz service.	

For low temperatures (engine does not start)

Possible causes	Remedy	Chapter
Faulty pre glow system.	Contact Hatz service.	
Fuel gelled due to insufficient cold resistance.	Check whether the fuel that emerges from the fuel feed line is clear and not cloudy. If the fuel has gelled, either warm the engine or drain the entire fuel supply system. Fill with a temperature-resistant fuel mixture.	*4.4 Fuel, page 25* *8.2.9 Changing the fuel prefilter, page 63* *8.2.14 Change the main fuel filter, page 73*
Oil is too viscous and causes a too low starter speed.	Change the engine oil and oil filter. Add engine oil with a suitable viscosity class.	*8.2.5 Change the engine oil., page 55*
Insufficiently charged battery.	Check the battery and contact the service center if necessary.	*3.2.4 Electrical equipment, page 18*
Machine is not uncoupled.	If possible, separate the engine from the machine by uncoupling it.	

The starter does not switch on and the engine does not turn.

Possible causes	Remedy	Chapter
Irregularities in the electrical equipment:		
Battery and/or other cable connections are incorrectly connected.	Check the electrical equipment and its components or contact Hatz service.	*3.2.4 Electrical equipment, page 18*
Cable connections are loose and/or oxidized.		
Battery is faulty and/or not loaded.		
Faulty starter.		
Faulty relay, monitoring elements, etc.		

The engine starts, but does not continue running after the starter is switched off.

Possible causes	Remedy	Chapter
Machine is not uncoupled.	If possible, separate the engine from the machine by uncoupling it.	
Fuel prefilter is clogged.	Change the fuel prefilter.	*8.2.9 Changing the fuel prefilter, page 63*
Main fuel filter is clogged.	Change the main fuel filter	*8.2.14 Change the main fuel filter, page 73*
Fuel supply is interrupted.	Systematically check the entire fuel supply.	
Stop signal from monitoring elements that are associated with the automatic switch-off (optional):		
▪ No oil pressure.	Check the oil level.	*7.8 Checking the oil level and adding oil if necessary, page 43*
▪ Faulty three phase alternator.	Contact Hatz service.	

Engine switches off spontaneously during operation.

Possible causes	Remedy	Chapter
The tank ran out of fuel during operation.	Fill with fuel.	*7.6 Refueling, page 41*
Fuel prefilter or main fuel filter is clogged.	Change the fuel filter.	*8.2.9 Changing the fuel prefilter, page 63* *8.2.14 Change the main fuel filter, page 73*
Poly v belt torn.	Renew the poly v belt.	*8.2.15 Renewing the poly v belt and checking the function of the switch-off unit, page 76*
Mechanical faults.	Contact Hatz service.	

With automatic electrical switch-off mechanism (option)

Possible causes	Remedy	Chapter
Stop signal of monitoring elements for:		
▪ Oil pressure too low.	Check the oil level.	*7.8 Checking the oil level and adding oil if necessary, page 43*
▪ Engine temperature too high.	Check the cooling air guides for contamination or other impairments.	*8.2.7 Cleaning the cooling fan, cooling fins and oil cooler, page 58*
Irregularities in the electrical equipment:		
▪ Loose contacts on cable connections.	Check the electrical equipment and its components, contacting the service center if necessary.	*3.2.4 Electrical equipment, page 18*
▪ Faulty three phase alternator.		
▪ Faulty relay.		

The engine loses power and speed.

Possible causes	Remedy	Chapter
Dirty air filter unit.	Check the degree of dirt contamination of the air filter, and clean or renew it if necessary.	*8.2.10 Maintaining the dry air filter, page 65*
Tappet clearance not OK.	Adjust the tappet clearance.	*8.2.12 Checking and setting the tappet clearance, page 69*
Injection nozzle not OK.	Contact Hatz service.	
Fault in the area of the exhaust emission aftertreatment system.	Note the flashing signal and eliminate the fault as shown in the flash code table.	*9.3 Flash code table for faults on the exhaust emission aftertreatment system, page 94*
The fuel supply is impaired:		
▪ The tank ran out of fuel during operation.	Add fuel.	*7.6 Refueling, page 41*

Possible causes	Remedy	Chapter
▪ Fuel prefilter or main fuel filter is clogged.	Change the fuel filter.	*8.2.9 Changing the fuel prefilter, page 63* *8.2.14 Change the main fuel filter, page 73*
▪ Inadequate tank venting.	Ensure that the tank is sufficiently vented.	
▪ Line connections are not leak tight.	Check the line screw connections for leak tightness.	

Engine becomes very hot. Indicator lamp for engine temperature (option) lights up.

Possible causes	Remedy	Chapter
Too much engine oil in the engine.	Drain the engine oil to the upper mark of the dipstick.	*7.8 Checking the oil level and adding oil if necessary, page 43*
Inadequate cooling:		
▪ Contamination in the entire area of the cooling air guides.	Clean the cooling air area.	*8.2.7 Cleaning the cooling fan, cooling fins and oil cooler, page 58*
▪ Incompletely closed air guide parts or capsule parts.	Check the air guide parts and shafts for completeness and good sealing properties.	

9.2 Flash code table for engine faults

When engine faults occur, a flashing signal is shown on the indicator lamp for "Engine fault" (see *Explanation of symbols*, chapter *7.4 Starting the engine, page 35*). The table below shows possible flashing signals, their meaning, as well as measures for remedies.
If the listed fault cases have been worked through but the fault continues to persist, please contact your nearest **HATZ service**.

Flashing signal Flashing – Pause	Possible causes	Remedy	Chapter
1 – 1 *Area affected:* **Engine oil pressure**	Engine oil level too low.	Check the oil level.	*7.8 Checking the oil level and adding oil if necessary, page 43*
2 – 1 *Area affected:* **Engine temperature**	Too much engine oil in the engine.	Drain the engine oil to the max mark on the dipstick.	
	Inadequate cooling:		
	Contamination of the cooling air guides or another impairment of the cooling system.	Clean the cooling air area.	*8.2.7 Cleaning the cooling fan, cooling fins and oil cooler, page 58*
	Incompletely closed air guide parts or capsule parts.	Check the air guide parts and shafts for completeness and good sealing properties.	
3 – 1 *Area affected:* **Charge control**	Faulty charging circuit cabling.	Check the cabling.	
	Loose contacts on cable connections.	Check the cabling.	
	Faulty three phase alternator.	Contact Hatz service.	
4 – 1 or **6 – 1** *Area affected:* **Powered machine**	Fault signal from the powered machine.	See the documentation for the complete machine.	
8 – 1 *Area affected:* **Engine speed**	Engine speed too high: ▪ Faulty electronic speed governor.	Contact Hatz service.	

9.3 Flash code table for faults on the exhaust emission after-treatment system

When there are faults on the diesel particulate filter or exhaust gas return system, a flashing signal is shown on the indicator lamp for "Fault in the area of the exhaust emission after-treatment system" (see *Explanation of symbols*, chapter *7.4 Starting the engine, page 35*). A dirty air filter unit is also indicated by a flashing signal. The table below shows possible flashing signals, their meaning, as well as action for remedies.
If the listed fault cases have been worked through but the fault continues to persist, please contact your nearest **HATZ service**.

Flashing signal Flashing – Pause	Possible causes	Remedy	Chapter
1 – 1 *Area affected:* **Exhaust gas recirculation (EGR)**	Faulty cabling to the EGR sensor.	Check the cabling.	
	Malfunction in the EGR valve.	Contact Hatz service.	
3 – 1 *Area affected:* **Pressure ratios in the diesel particulate filter (DPF)**	DPF not leak tight.	Check the DPF for leaks	
	Faulty differential pressure sensor.	Contact Hatz service.	
	Leak or clogging in the differential pressure line.	Check the differential pressure line.	
4 – 1 *Area affected:* **High current relay (HCR)**	Cabling loose or faulty.	Check the cabling.	
	Faulty high current relay.	Contact Hatz service.	
	Faulty coiled filament in the fuel evaporator.	Replace the coiled filament.	*8.2.17 Check the fuel evaporator (vaporizer) and clean if necessary., page 81*
	Faulty fuse.	Renew the fuse.	

Flashing signal Flashing – Pause	Possible causes	Remedy	Chapter
5 – 1 *Area affected:* **Fuel pump to the fuel evaporator**	Cabling loose or faulty.	Check the cabling.	
	Faulty fuel pump.	Contact Hatz service.	
6 – 1 *Area affected:* **Sensors for the diesel particulate filter (DPF)**	Cabling loose or faulty	Check the cabling.	
	One or multiple sensors faulty: ▪ Exhaust gas back pressure sensor. ▪ Differential pressure sensor. ▪ Temperature sensors on the diesel oxidation catalytic converter (DOC).	Contact Hatz service.	
7 – 1 *Area affected:* **Electronic speed control**	Faulty speed sensor.	Contact Hatz service.	
	Faulty electronic speed governor.	Contact Hatz service.	
8 – 1 *Area affected:* **Sensors for intake air**	Cabling loose or faulty.	Check the cabling.	
	Faulty intake temperature sensor or intake vacuum sensor.	Contact Hatz service.	
9 – 1 *Area affected:* **Oil temperature sensor**	Cabling loose or faulty.	Check the cabling.	
	Faulty oil temperature sensor.	Contact Hatz service.	

Flashing signal Flashing – Pause	Possible causes	Remedy	Chapter
10 – 1 *Area affected:* **Control unit for diesel particulate filter (DPF)**	Power supply to the unit outside the permissible range.	Possible faults on: ▪ Cabling ▪ Battery ▪ Three phase alternator	
	Faulty control unit.	Contact Hatz service.	
12 – 1 *Area affected:* **Control unit communication**	Faulty communication to different control units.	Check the cabling, contact Contact Hatz service.	
14 – 1 *Area affected:* **Air filter-maintenance display**	Dirty air filter unit.	Service the air filter.	*8.2.10 Maintaining the dry air filter, page 65*
15 – 1 *Area affected:* **Coding plug**	Coding plug is missing or faulty.	Install or replace the coding plug.	
	Coding plug is not suitable for the data set of the control unit for the diesel particulate filter.	Install a correct coding plug, contact HATZ service if required.	
16 – 1 *Area affected:* **Engine emergency running program**	Engine is in the emergency running program.	Contact Hatz service.	

Flashing signal Flashing – Pause	Possible causes	Remedy	Chapter
1 long – 1 *Area affected:* **Regeneration of the diesel particulate filter** (first warning level)	Diesel particulate filter is strongly loaded with soot particles.		
	▪ Regeneration process has been suppressed for a long time.	Activate the regeneration process (see Explanation of symbols).	*7.4 Starting the engine, page 35*
	▪ Regeneration process has been interrupted several times by engine stops.	If permitted by the working environment, do not switch off the engine during the regeneration process.	
	▪ Operation of the fuel evaporator impaired.	Check the fuel evaporator (vaporizer).	*8.2.17 Check the fuel evaporator (vaporizer) and clean if necessary., page 81*
2 long - 1 *Area affected:* **Regeneration of the diesel particulate filter** (second warning level)	The diesel particulate filter is blocked and must be conditioned.	Have the diesel particulate filter exchanged and professionally conditioned as part of the Hatz Easy-Clean program.	*8.2.16 Replacing the diesel particulate filter, page 79*

9.4 Flash code table for maintenance intervals

When a maintenance interval is reached, the maintenance interval indicator flashes on the instrument box (see *Explanation of symbols*, chapter *7.4 Starting the engine, page 35*).
The table below shows possible flashing signals and their meaning. The corresponding maintenance activities are described in chapter *8.2.2 Maintenance plan, page 51*.

Flashing signal Flashing – Pause	Maintenance interval / Operating hours (h)		
	250	500	1000
1 – 1	●		
2 – 1		●	
3 – 1	●	●	
4 – 1			●
5 – 1	●		●
6 – 1		●	●
7 – 1	●	●	●

10 Storage and disposal

10.1 Storing the machine

Safety notes

DANGER

Danger to life from inhaling exhaust gases.

Toxic engine exhaust gases can lead to loss of consciousness and even death in closed-off and poorly ventilated rooms.

- Never operate the machine in closed-off or poorly ventilated rooms.
- Do not breathe in the exhaust gases.

DANGER

Fire hazard from fuel.

Leaked or spilled fuel can ignite on hot engine parts and cause serious burn injuries.

- Only refuel when the engine is switched off.
- Never refuel in the vicinity of open flames or sparks that can cause ignition.
- Do not smoke.
- Do not spill fuel.

CAUTION

Danger of environmental damage from spilled fuel.

Do not overfill the fuel tank and do not spill fuel.

- Collect any leaking fuel and dispose of it according to local environmental regulations.

NOTICE

Comply with the safety chapter!

Follow the basic safety instructions in chapter *3 Safety, page 7*.

Storing the machine for a lengthy period

Take the following measures if you intend to take the machine out of service for a lengthy period (3-12 months):

Step	Activity
1	Drain the fuel tank until it is nearly empty and fill with FAME*-free fuel. Operate the engine for a few minutes so that only FAME-free fuel is still in the fuel system.
2	Change the engine oil and oil filter (see chapters *8.2.5 Change the engine oil., page 55*and *8.2.13 Changing the oil filter, page 72*).
3	Change the fuel filter (see chapter *8.2.14 Change the main fuel filter, page 73*).
4	Let the machine cool down.
5	Remove the battery in accordance with the machine operators manual and store at ambient temperature. Comply with the local regulations as well as the regulations of the battery manufacturer for the storage of batteries.
6	Close and seal all engine openings (air intake openings, air outlet openings and the exhaust gas opening) so that no foreign bodies can enter, but a small amount of air can still be exchanged. This avoids condensation.
7	After the machine has cooled down, cover it to protect it against dust and store it in a dry and clean place.

*FAME = Fatty Acid Methyl Ester

Ambient conditions during storage

- Max. permissible storage temperature: -25 °C to +60 °C
- Max. permissible humidity: 70%
- Protect the engine from direct sunlight

Recommissioning

Step	Activity
1	Remove all covers.
2	Check the cables, hoses and lines for cracks and leak tightness.
3	Check the engine oil level.
4	Install the battery in accordance with the Operator's Manual for the machine.

The brand new engine can normally be stored for up to 12 months. The protection lasts up to approx. 6 months at very high humidity and with sea air.

For storage periods of more than 12 months, please contact the nearest **Hatz service**.

10.2 Disposing of the machine

Disposal information

Dispose of the machine (including machine parts, engine oil and fuel) according to the local disposal regulations and the environmental laws in the country of use.

Because of the danger of possible environmental damage, only permit an approved specialist company to dispose of the machine.

	NOTICE
	When the machine has reached the end of its lifecycle, ensure that it is disposed of safely and properly, especially parts and substances that can be dangerous to the environment. These also include fuel, lubricants, plastics, and batteries (if present). ▪ Do not dispose of the battery with the household trash. ▪ Dispose of the battery at a collection point for possible recycling.

11 Installation declaration

Extended Declaration of Incorporation
EC Machinery Directive 2006/42/EC

The manufacturer: **Motorenfabrik Hatz GmbH & Co.KG**
Ernst-Hatz-Straße 16
D-94099 Ruhstorf a. d. Rott

hereby declares that the incomplete machine: product description: **Hatz diesel engine**
Type designation and as of serial number:
3L43C=14910; 4L43C=15010; 3M43=15110; 4M43=15210

satisfies the following basic safety and health protection requirements in acc. with Annex I to the above-mentioned Directive.

- Annex I, General principles no. 1
- Nr. 1.1.2., 1.1.3., 1.1.5., 1.2.1., 1.2.2., 1.2.3., 1.2.4.1., 1.2.4.2., 1.3.1., 1.3.2., 1.3.3., 1.3.4., 1.3.7., 1.3.9., 1.4.1., 1.5.1., 1.5.2., 1.5.8., 1.5.9., 1.6.1., 1.6.2., 1.6.4., 1.7.

All relevant basic safety and health protection requirements down to the interfaces described
☒ in the manual for diesel engine
☒ in the enclosed data sheets
☒ in the enclosed technical documents
have been complied with.

The special technical documents in acc. with Annex VII B of the Directive 2006/42/EC have been prepared.

The following standards have been used (completely or partially):
- EN 1679-1: 092011
- EN ISO 12100: 032011
- EN ISO 13857: 062008
- EN 60204-1: 062007
- EN ISO 13849-1: 122008

The manual for diesel engine has been enclosed to the incomplete machine and the Assembly Instructions have been provided to the customer electronically together with the order confirmation.

Commissioning has been prohibited until it has been established, if applicable, that the machine into which the above-mentioned incomplete machine is to be incorporated, satisfies the provisions of the Machinery Directive.

Wolfgang Krautloher / see "Manufacturer"
Name / address of EC documentation officer

12/10/2016	Krautloher / Directives official	Krautloher
Date	Signature and information on the undersigned	Signature

Motorenfabrik Hatz GmbH & Co. KG
Ernst-Hatz-Str. 16
94099 Ruhstorf a. d. Rott
Deutschland
Tel. +49 8531 319-0
Fax. +49 8531 319-418
marketing@hatz-diesel.de
www.hatz-diesel.com

0000 436 003 03 - 10.2016 - 0.1
Printed in Germany
EN

CREATING POWER SOLUTIONS.