CREATING POWER SOLUTIONS.

2-4L41C | 2-4M41 | 2-4M41Z | 4L42C | 4M42

OPERATOR'S MANUAL
Diesel engine

Hatz Diesel

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ENG

1 Notices

Contact data

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Original Operator's Manual

This Operator's Manual was translated into multiple languages.

The German version is the **original Operator's Manual**. All other language versions are **translations** of the **original Operator's Manual**.

2 General information

Information on the document

This Operator's 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 the Operator's Manual carefully and keep it close by for ready access.

Machine

This Operator's Manual describes the following machine.

Machine name	HATZ diesel engine
Type number	2-4L41C 2-4M41 2-4M41Z 4M42 4L42C

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 directory included or visit the Internet at: **www.hatz-diesel.com**

Problems may occur if unsuitable spare parts are installed. We cannot accept responsibility for damage and secondary damage that result 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 included 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 Operator's Manual. This also applies to changes made to the machine and use of unsuitable spare parts.

We reserve the right to make modifications in the interest of technical improvement.

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 Operator's Manual fulfills the following functions:

- Diesel engine intended for installation in a machine or for assembly with other machines to form a machine. See the chapter *11 Installation declaration, page 103*.

This engine is intended exclusively for the purpose specified and tested by the manufacturer of the machine into 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. Responsibility is not accepted by Motorenfabrik HATZ for damage resulting from this situation.

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 in this Operator's 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 moving equipment (e.g. vehicles, trailers) or in closed rooms without additional measures to handle supply air, extract air and exhaust.
- 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 are described in the chapter *3.2.2 Machine-specific safety instructions for operation, page 14* and in the chapter *3.2.3 Machine-specific safety instructions for maintenance work, page 16*, and in other parts of the manual directly preceding the affected descriptions and instructions.

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 user is obligated to only operate the machine while it is in perfect condition. The user must check the condition of the machine before using it and ensure that any defects are eliminated before it is taken into service. Operation of the machine while identified defects exist is not permitted. The user must also ensure that the information contained in the Operator's Manual has been read and understood.

Obligations of the operating and maintenance personnel

Personnel assigned with operating and maintaining the machine must have read and understood the Operator's Manual or must be able to demonstrate the necessary qualifications 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.

All work performed on the machine must be in compliance with the information provided in the Operator's Manual.

Storing the Operator's Manual

This Operator's 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:

- Warning 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:

Warning 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.

Warning symbol/ Signal word	Meaning
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 Operator's Manual.

Symbol	Meaning
	Smoking, fire and open flames are prohibited.
	Warning of personal injury!
	Warning of hot surfaces!
	Warning of flammable substances!
	Warning of explosive substances!
	Warning of toxic engine exhaust!
	Warning of corrosive substances!

Symbol	Meaning
	Warning of heavy loads!
	Warning of environmental damage!
	Comply with the Operator's Manual or additional documentation from other manufacturers or the user.
	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 the Operator's Manual and the safety instructions contained therein.** ▪ As the user of the machine, you must ensure that all people working on the machine are familiar with the content of this Operator's Manual. ▪ Before working on the machine, read this Operator's 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 the 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.

Operating personnel

- The machine may only be operated by qualified personnel. The personnel must have read and understood this Operator's Manual or must be able to demonstrate the necessary qualifications for working with this equipment, acquired in training/instructional courses.
- The operating personnel must not be under the influence of drugs, medication or alcohol.

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, for example from battery acid.

Personal protective equipment	Pictogram	Function
Safety goggles (with side shields)		Safety goggles protect the eyes from flying objects (for example, dust particles, spraying liquids, spraying acid).
Working clothes		Wear close-fitting clothing. However, it must not restrict the wearer's freedom of movement.

Warning and notice labels on the machine

The warning and notice labels on the machine must be followed (see the chapter *3.3 Labels, page 19*).

The warning and notice labels 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 the 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 notes

 **DANGER**	
	**Danger to life and danger of injury due to failure to follow the warnings on the machine and in the Operator's Manual.** ▪ Heed the warnings on the machine and in the Operator's Manual.

WARNING

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

- The personnel must have read and understood this Operator's Manual or must be able to demonstrate the necessary qualifications 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 be void.

WARNING

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

- Follow all instructions.
- Do not perform activities that are not authorized. 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 the chapter *6.1 Transport, page 31*).

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 while 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 injury from defective crankhandle.** A damaged or broken handle bar can cause injuries. A worn cranking shaft can slip out of the starting mechanism when starting and also cause injuries. ▪ Check the crankhandle for a broken handle bar, worn cranking shaft, etc.; replace if necessary.

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 parts, we recommend the use of **HATZ original spare parts** (see the 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.

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 the maintenance instructions are not followed.

- Only perform maintenance while the engine is switched off.
- In engines with a starter:
  Disconnect the negative terminal of the battery.
  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 terminal of the battery. ▪ 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 incendive 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 the 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 pull out the starting key during operation.
- Do not disconnect the battery while the machine is running. Resulting voltage peaks could destroy the electronic components.
- When performing a manual emergency start, leave the (possibly depleted) battery connected.
- 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.

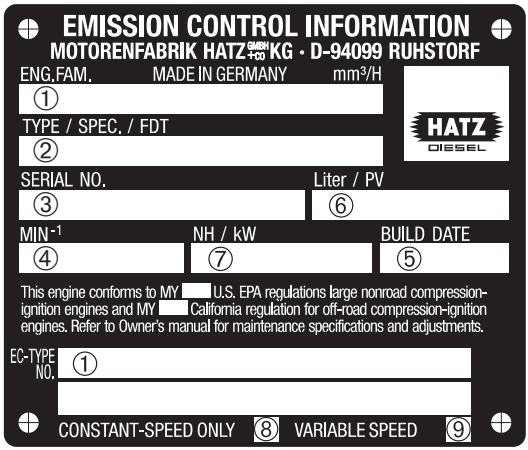
3.3 Labels

Overview

The following labels are found on the machine:

- Engine type plate
- Warning labels and information signs on the engine
- Warning labels and information signs on the crankhandle

Engine type plate



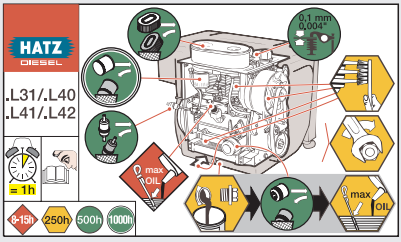
The engine type plate is located on the crankcase or sound protection hood and contains the following engine information:

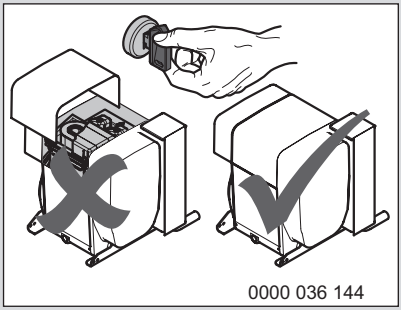
1	Number of the engine family or the EU approval (for engines with exhaust certificate only)
2	Engine type, customer specification and setting of pumping start (° crankshaft before top dead center)
3	Engine serial number
4	Max. engine speed (rpm)
5	Model year
6	Displacement (liters) and inspection requirement 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

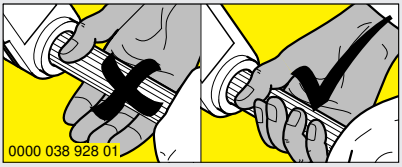
2	Engine type and customer specification
3	Engine serial number
4	Max. engine speed (rpm)

Warning labels and information signs

Label	Meaning
	Maintenance instructions (see the chapter *8.1 General maintenance instructions, page 55*)

Label	Meaning
	CAUTION! Damage from inadequate engine cooling. ▪ Only run the engine when all covers are installed.
	Refuel with diesel fuel only. For the specification, see the chapter *4.2 Fuel, page 23* Do not use bio diesel.

Warning labels and information signs on the crankhandle

Label	Meaning
	Hold the handle bar so that it cannot twist and quickly turn the crank so that continuous traction between the engine and crank is ensured, see the chapter Starting the engine with crankhandle.

4 Technical data

4.1 Engine

Type		2L41C 2M41.	3L41C 3M41.		4L41C / 4L42C 4M41. / 4M42
Type		Air-cooled four stroke diesel engine			
Combustion system		Direct injection			
Number of cylinders		2	3		4
Bore/stroke	mm	102 / 105	102 / 105		102 / 105
Displacement	cm^3	1716	2574		3432
Engine oil pressure at oil temperature of 100 ± 20°C		Min. 0.6 bar at 850 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			
Net weight	Approx. kg				
.M41		258	308		373
.M41**Z**		263	315		388
4M42					378
.L41**C**		303	363		433
4L42**C**					438
Max. perm. inclination during continuous operation in direction		**with** / **without** oil sump	**with** oil sump	**without** oil sump	only **with** oil sump
Operating side		30° [1]	30° [1]	25° [1]	25° [1]
Exhaust air side		30° [1]	30° [1]	30° [1]	30° [1]
Timing cover side		30° [1]	25° [1]	25° [1]	15° [1]
Flywheel side		30° [1]	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 [2] Ltr.	Mark on the dipstick
2L41C	With	7.5	C
2M41Z	Without	4.5	A
2M41	With	8.5	C
	Without	5.5	A
3L41C	With	10.5	D
3M41Z	Without	8.0	A
3M41	With	11.0	D
	Without	8.5	A
4L41C	With	13.0	D
4L42C	Without	–	–
4M41Z			
4M41	With	14.0	D
4M42	Without	–	–

[2] These values are approximations only. The correct level is indicated by the max. mark on the dipstick (see the chapter *7.9 Checking the oil level and adding oil if necessary, page 53*).

4.2 Fuel

Fuel type

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

- **EN 590** or
- **BS 2869 A1 / A2** or
- **ASTM D 975- 1D / 2D**

	CAUTION
	Danger of engine damage from low quality fuel. The use of fuel that does not meet the specifications can lead to engine damage. ▪ The use of fuel that does not meet specifications requires approval by Motorenfabrik HATZ (main plant).

Winter fuel

When outside temperatures drop below 0 °C, use winter fuel or mix in petroleum in advance:

Lowest ambient temperature at start [°C]	Percentage of petroleum [%] for	
	Summer fuel	Winter fuel
0 to -10	20	-
-10 to -15	30	-
-15 to -20	50	20
-20 to -30	-	50

4.3 Engine oil

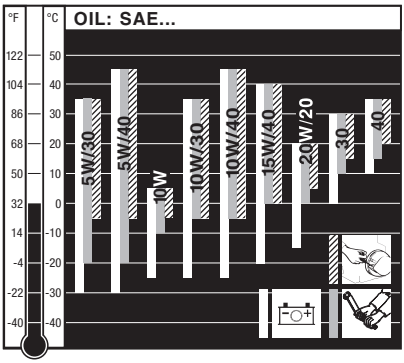
Oil quality

All oil brands that meet at least one of the following specifications are suitable:

- **ACEA – B2 / E2** or better
- **API – CD / CE / CF / CF-4 / CG-4** or better

If engine oils of a low quality standard are used, the oil change interval must be reduced from 250 to 150 or from 500 to 250 operating hours depending on the engine specification.

Oil viscosity



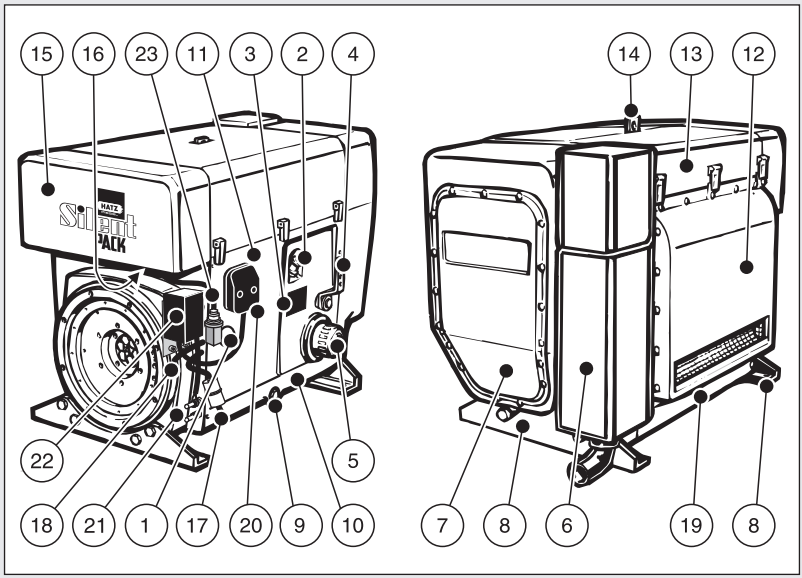
Choose the recommended viscosity based on the type of start (recoil, crank-handle or electric) and on the engine temperature at which the engine will be operated.

CAUTION	
	Engine damage from unsuitable engine oil. Using engine oil that does not meet the above specifications considerably shortens the engine service life.

5 Engine design

Engine 2-4L41C

Encapsulated model "Silent Pack"

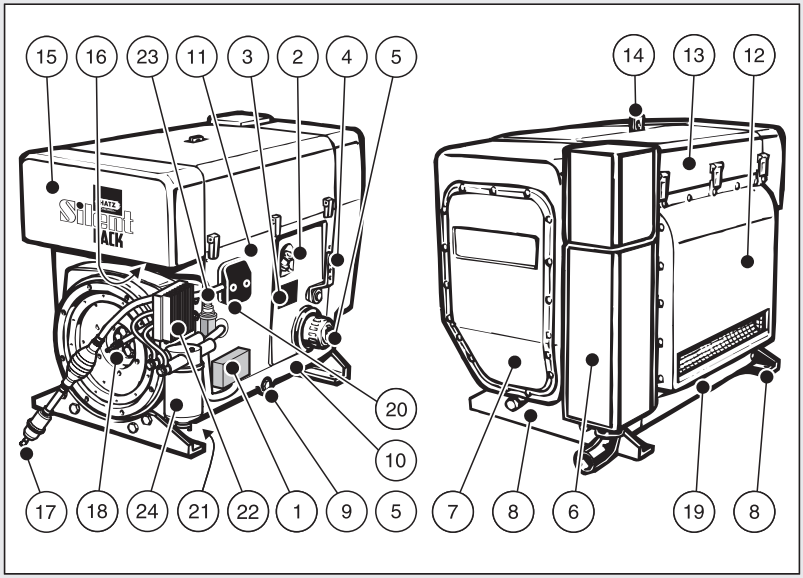


Pos.	Designation
1	Access cap for fuel feed pump
2	Oil filling opening and dipstick
3	Type plate
4	Speed control lever
5	Oil filter
6	Exhaust silencer (encapsulated)
7	Cover for air guide housing (access to cooling fan belt)
8	Engine brackets
9	Oil drain screw
10	Cover plate on operating side
11	Side wall
12	Exhaust air duct
13	Capsule hood

Pos.	Designation
14	Retractable lifting eye, max. load 5000 N
15	Capsule intake shaft
16	Intake opening for combustion air
17	Fuel feed line with fuel prefilter
18	Fuel return line
19	Cover plate on exhaust side
20	Central connector for electrical equipment
21	Battery connections
22	Powerbox
23	Electrical maintenance switch for air filter

Engine 4L42C

Encapsulated model "Silent Pack"

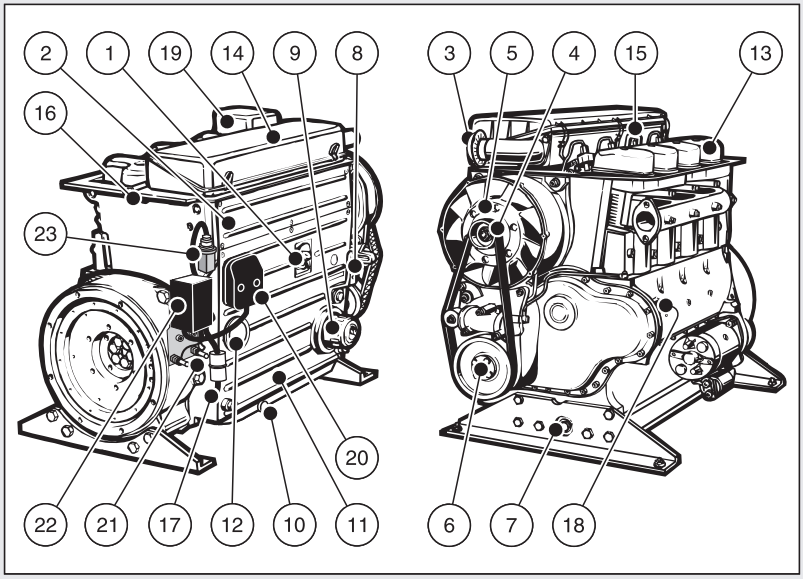


Pos.	Designation
1	Electronic control unit
2	Oil filling opening and dipstick
3	Type plate

Pos.	Designation
4	Speed control lever
5	Oil filter
6	Exhaust silencer (encapsulated)
7	Cover for air guide housing (access to cooling fan belt)
8	Engine brackets
9	Oil drain screw
10	Cover plate on operating side
11	Side wall
12	Exhaust air duct
13	Capsule hood
14	Retractable lifting eye, max. load 5000 N
15	Capsule intake shaft
16	Intake opening for combustion air
17	Fuel feed line with fuel prefilter and manual fuel pump
18	Fuel return line
19	Cover plate on exhaust side
20	Central connector for electrical equipment
21	Battery connections
22	Powerbox
23	Electrical maintenance switch for air filter
24	Fuel filter

Engine 2-4M41, 2-4M41Z

Standard model

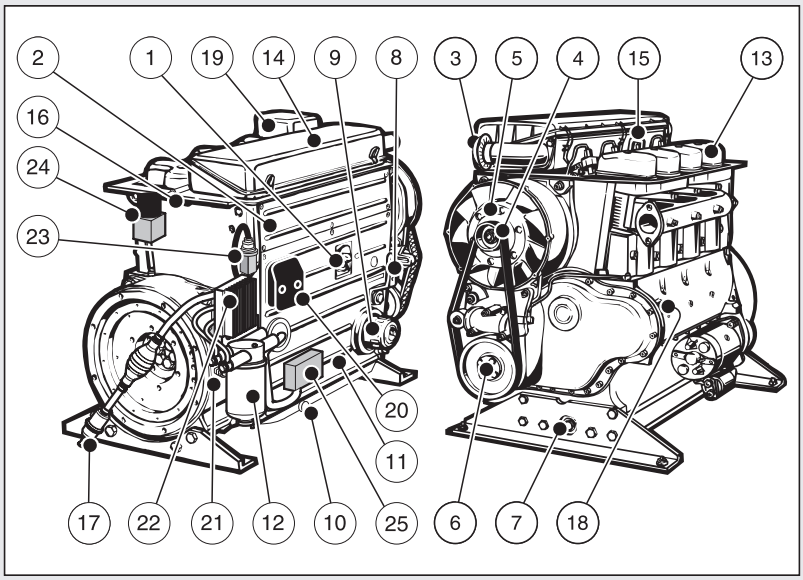


Pos.	Designation
1	Oil filling opening and dipstick
2	Side trim panel
3	Intake opening for combustion air
4	Cooling fan belt
5	Cooling fan with installed three phase alternator
6	1/2-inch square socket for turning the engine
7	Oil drain screw
8	Speed control lever
9	Oil filter
10	Oil drain screw (on oil sump)
11	Cooling air guide for oil cooler
12	Access cap for fuel feed pump
13	Cylinder head cover
14	Air filter housing cover
15	Lifting eye, max. load 5000 N

Pos.	Designation
16	Fuel return line
17	Fuel feed line with fuel prefilter
18	Type plate
19	Silencer
20	Central connector for electrical equipment
21	Battery connections
22	Powerbox
23	Electrical maintenance switch for air filter

Engine 4M42

Standard model



Pos.	Designation
1	Oil filling opening and dipstick
2	Side trim panel
3	Intake opening for combustion air
4	Cooling fan belt
5	Cooling fan with installed three phase alternator

Pos.	Designation
6	1/2-inch square socket for turning the engine
7	Oil drain screw
8	Speed control lever
9	Oil filter
10	Oil drain screw (on oil sump)
11	Cooling air guide for oil cooler
12	Fuel filter
13	Cylinder head cover
14	Air filter housing cover
15	Lifting eye, max. load 5000 N
16	Fuel return line
17	Fuel feed line with fuel prefilter and manual fuel pump
18	Type plate
19	Silencer
20	Central connector for electrical equipment
21	Battery connections
22	Powerbox
23	Electrical maintenance switch for air filter
24	Exhaust gas return valve (EGR)
25	Electronic control unit

6 Transport, assembly and commissioning

6.1 Transport

Safety notes

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.

CAUTION	
	**Only use lifting lugs for transporting the engine.** Do not use for lifting the entire equipment.

NOTICE	
	**Danger of environmental damage from leaking fluid.** If the machine is tilted, engine oil and diesel fuel can run out. ▪ Only transport the machine in an upright position.

Transport conditions

- Only lift the engine by the standard fitted lifting lugs.
- 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 the chapter *1 "Notices", page 5* or **www.hatz-diesel.com**.

6.2 Assembly instructions

Assembly notes

HATZ diesel engines are efficient, robust and long-lived. 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 notice and warning labels on the engine and keep them in a legible condition. If a label should become detached or be difficult to read, it must be replaced promptly. For this purpose, contact your nearest **HATZ service station**.
- Any improper modification of the engine results in a loss of liability coverage for resulting damage.

Only regular maintenance, as specified in this Operator's 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 the chapter *3 Safety, page 7*.

DANGER

Danger to life due to 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 the 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.

CAUTION

Danger of engine damage from low load operation.

Operating the engine at no load or at very low load for an extended period can impair the running characteristics of the engine.

- Ensure that the engine load is at least 15 %.
- Before switching off the engine following low load operation, briefly operate it at a considerably higher load.

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 the chapter *4.2 Fuel, page 23*).
4	There is a sufficient amount of engine oil in the engine housing (see the chapter *4.3 Engine oil, page 24*).
5	For hand start: ▪ Crankhandle in functional condition. ▪ Sliding area between crankhandle and guide sleeve lightly greased.
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 lever (see the chapter *7.3.1 Pumping fuel with the manual lever, page 34*) or ▪ Pump the fuel with the manual fuel pump (see the chapter *7.3.2 Pumping fuel with the manual fuel pump, page 35*)

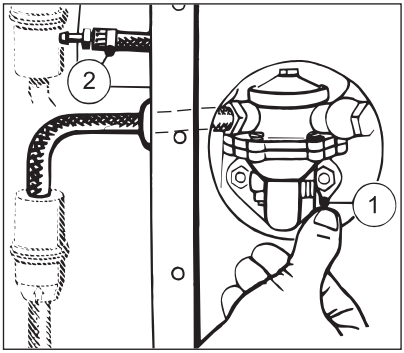
7.3.1 Pumping fuel with the manual lever

Requirements

Pre-pumping of fuel with the manual lever of the fuel feed 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	Manual lever (fuel feed pump)
2	Return line

Procedure

Step	Activity
1	If there is air in the fuel system: Fill with fuel if necessary.
2	Remove the access cap.
3	Actuate the manual lever (1) on the fuel feed pump until the fuel audibly flows back into the fuel tank through the return line (2).
4	Install the access cap again.

7.3.2 Pumping fuel with the manual fuel pump

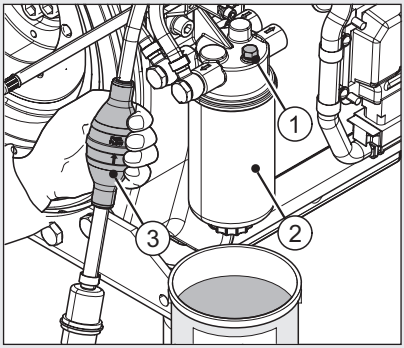
Requirements

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

Model with manual fuel pump

Only for 4L42C and 4M42



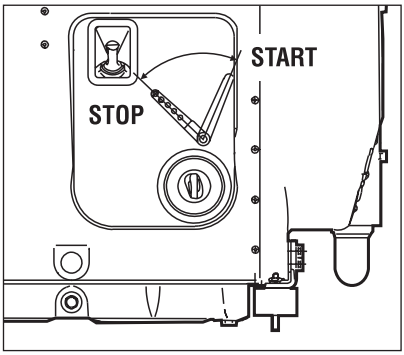
Pos.	Designation
1	Bleed screw
2	Filter
3	Rubber ball

Procedure

Step	Activity
1	If there is air in the fuel system: 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 Setting the speed control

Overview



Procedure

Step	Activity
1	Depending on the possibility or requirement, place the speed control lever in either the "1/2" or "Start" position.

NOTICE	
	A lower speed setting will cause less exhaust smoke when starting.

7.5 Starting the engine

Starting options

The standard equipment of the engine is an electric start mechanism. A hand starter can be installed as an option.

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 injury from defective crankhandle.** A damaged or broken handle bar can cause injuries. A worn cranking shaft can slip out of the starting mechanism when starting and also cause injuries. ▪ Check the crankhandle for a broken handle bar, worn cranking shaft, etc.; replace if necessary.

CAUTION	
	**Danger of injury and danger of engine damage from the use of starting fluid.** ▪ Danger of injury during hand starting because the use of starting fluid can result in uncontrolled ignitions. ▪ Engine damage from uncontrolled ignitions. ▪ Never use starting fluid.

7.5.1 Starting the engine with crankhandle

This chapter contains the following sections:

- **Preparations for cranking the engine:**
  Adjust the continuous decompression.
- **Crank the engine:**
  Crank the engine without compression (approx. 10-20 crank turns).
  This lowers the resistance to rotation.
- **Preparations for starting the engine:**
  Adjust the automatic decompression.
- **Start the engine:**
  Cranking starts the cylinders one after the other and the decompression is automatically canceled.

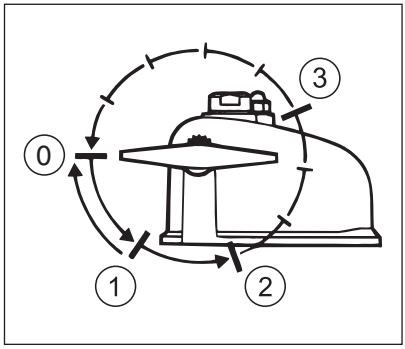
Turning over the engine:

Safety note

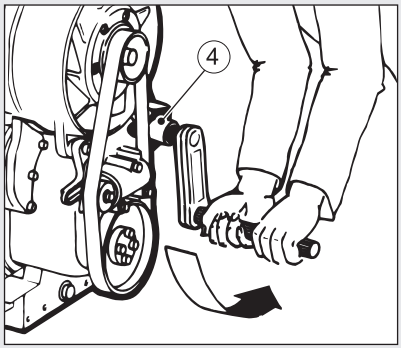
	CAUTION
	Danger of engine damage from decompression while the engine is running. ▪ Do not operate the decompression lever while the engine is running.

Overview

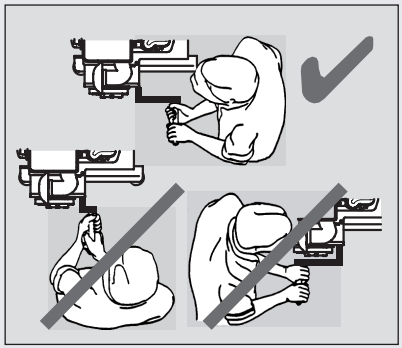
Decompression lever



Attach the crankhandle



Position of operator



Pos.	Designation
0 - 3	Positions of the decompression lever
4	Guide sleeve

Preparation

Step	Activity
1	Carry out start preparations (see the chapter *7.3 Start preparation, page 34*).
2	Move the speed control lever into position "Start" (see the chapter *7.4 Setting the speed control, page 37*).
3	Move all decompression levers to position "1". ▪ 1 lever for two cylinder engine ▪ 3 levers for three cylinder engine ▪ 4 levers for four cylinder engine

	NOTICE
	Only operate the decompression lever while the engine is at a standstill and observe the sense of rotation ▪ Only turn the decompression lever in the direction of the arrow. ▪ Exception: The lever can be turned directly back from position "1" to "0". ▪ Position "1" is the continuous decompression setting.

Procedure

Step	Activity
1	Insert the crankhandle into the guide sleeve (4).
2	Assume the correct position.
3	Grasp the handle bar with both hands.
4	Crank the engine until the crank resistance becomes markedly less.

Starting the engine

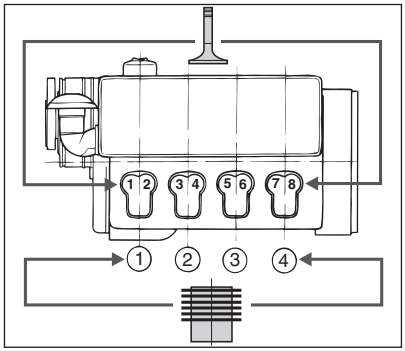
Safety note

CAUTION
Danger of injury from recoiling of the engine. ▪ Use a crankhandle with a recoil damper. ▪ Hold the handle bar so that it cannot twist and quickly turn the crank so that continuous traction between the engine and crank is ensured. ▪ If recoil occurs due to cautious turning where the engine starts in the opposite sense of rotation under certain circumstances (smoke from the air filter), release the crankhandle immediately and stop the engine. ▪ To repeat the starting process, wait until the engine has stopped; only then recommence start preparations.

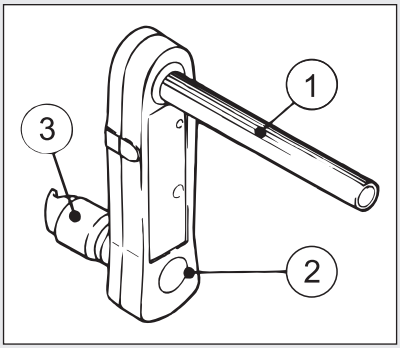
CAUTION
Danger of injury if the crankhandle recoils or turns with the engine. ▪ The use of crankhandles without recoil damping is not permissible within the European Union.

Overview

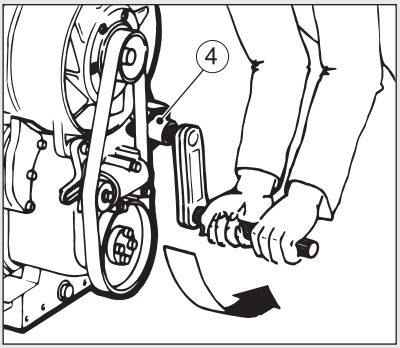
Numbering of the valves and cylinders from the fan side



Crankhandle



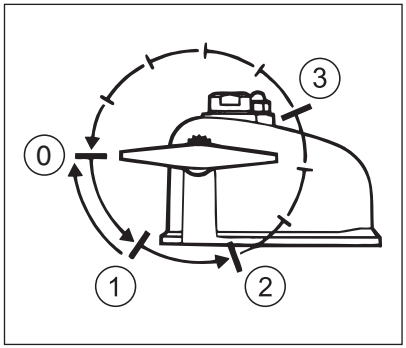
Attach the crankhandle



Pos.	Designation
1	Handle bar
2	Crank arm
3	Drive dog
4	Guide sleeve

Preparation

The decompression lever must be set depending on the number of cylinders of the engines **2-4M41.**.



Step	Activity
1	Setting the decompression lever: ▪ **Two cylinder engine 2M41.** Turn the lever to position "2". ▪ **Three cylinder engine 3M41.** Turn the levers of the 1st and 3rd cylinders to position "2". Turn the lever of the 2nd cylinder to position "3". ▪ **Four cylinder engine 4M41.** Turn the levers of the 1st, 3rd and 4th cylinders to position "2". Turn the lever of the 2nd cylinder to position "3".

Starting the engine with a recoil-dampened crankhandle

Step	Activity
1	Assume the correct position.
2	Grasp the handle bar with both hands.
3	First turn the crankhandle slowly until the drive dog and the engagement mechanism of the crankhandle engage.
4	Turn the crankhandle forcefully with increasing speed. When the decompression lever engages in the "0" position (compression), the highest possible speed must be reached.
5	As soon as the engine starts, pull the crankhandle out of the guide sleeve.

	NOTICE
	If recoil occurs during the starting process, the crank arm/drive dog linkage releases via the handle bar due to the short reverse rotation.

Starting with a crankhandle without recoil damping

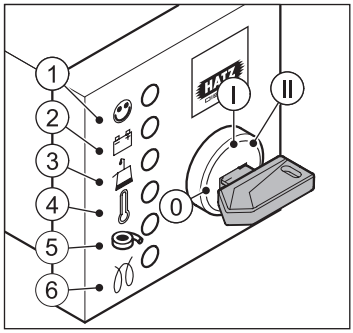
Only applies to engines **2-4M41.**

Step	Activity
1	Assume the correct position.
2	Grasp the handle bar (1) with both hands.
3	Slowly turn the crankhandle until the drive dog (3) engages.

Step	Activity
4	Turn the crankhandle forcefully with increasing speed. When the decompression lever engages in the "0" position (compression), the highest possible speed must be reached.
5	As soon as the engine starts, pull the crankhandle out of the guide sleeve (4).

7.5.2 Starting the engine with an electric starter

Standard model



Pos.	Designation
1	Operating display
2	Charge control
3	Oil pressure display
4	Engine temperature display (option)
5	Air filter maintenance display
6	Pre glow display (option)
Ignition lock	
0	Off
I	Operation
II	Starting

Procedure

NOTICE	
	▪ Start for max. 30 seconds. If the engine still is not running after that, turn the starting key back to position "0" and eliminate the cause (see the chapter *9 Faults, page 93*). ▪ 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.

NOTICE	
	The starter protection module prevents the starter from engaging while the engine is running and becoming damaged. ▪ The starter protection module is required when the user cannot detect at the ignition lock if the engine is still running or is already at a standstill. ▪ In models equipped with a starter protection module, the starting key must be kept in the 0 position for at least 8 seconds before another start is possible after the engine is switched off.

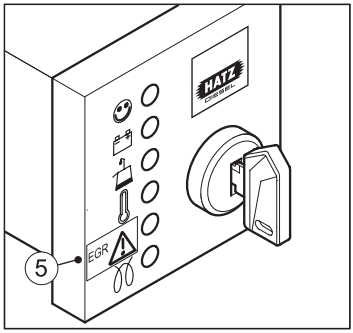
Step	Activity
1	Check the speed control (see the chapter *7.4 Setting the speed control, page 37*).
2	Insert the starting key all the way and turn to position "I". Depending on the model, the following indicators light up: ▪ Charge control (2) ▪ Oil pressure display (3) ▪ Pre glow display (6) at temperatures below 0°C *NOTES:* ▪ If the optional engine temperature display (4) lights up, the cylinder head temperature is impermissibly high. Do not start the engine; eliminate the cause. ▪ The air filter maintenance indicator (5) only lights up during operation if the air filter needs to be cleaned or changed. ▪ When the optional pre glow display (6) goes out, continue with step 3.
3	Turn the starting key to position "II".

Step	Activity
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 (2) and oil pressure display (3) go out. ▪ The operating display (1) lights up.

	NOTICE
	▪ In case of irregularities, switch off the engine immediately. ▪ Identify the fault and eliminate it. ▪ For details of troubleshooting, see the chapter *9 Faults, page 93*.

Model with exhaust gas return valve

The engines **4L42C** and **4M42** are equipped with an exhaust gas return valve (EGR). The indicators change as follows:



Pos.	Designation
5	Indicator EGR

Blink codes

The indicator (5) only flashes during operation if a problem arises in connection with the exhaust gas return system. This includes a dirty air filter. This can be identified by the following flash code of the indicator (5):

- 7 times short flash (approx. 0.5 seconds) and 1 long flash (approx. 1.5 seconds).
- The flash code indicates that the air filter must be cleaned or changed (see the chapter *8.2.11 Checking and cleaning the air filter cartridge, page 76*).
- If a different flash code appears, please contact the nearest **Hatz service**.

NOTICE
If the electronics indicate a problem continuously for more than 15 minutes without interruption (flash code - display lamp (5)), the engine switches off automatically. ▪ If the problem persists, the engine can be started but only for another 15 minutes. ▪ If necessary, contact your nearest **HATZ service station**.

Electrical automatic shutoff (additional equipment)

The distinguishing feature of the electrical automatic shutoff is brief flashing of all indicators after turning the starting key to position "I".

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 malfunction before further starting attempts (see the chapter *9.1 Troubleshooting, page 93*). ▪ Despite the automatic shutoff, check the oil level every 8-15 operating hours (see the chapter *7.9 Checking the oil level and adding oil if necessary, page 53*). ▪ If the engine switches off due to an electrical fault signal or due to insufficient oil pressure with the aid of the automatic switch-off, an emergency start can be attempted by the user. The user must bear responsibility for any resulting damage (see the chapter *9.2 Emergency start, page 99*).

7.6 Switching off the engine

Methods of switching off the engine

⚠ CAUTION
Danger of injury from unauthorized access. There is a danger of injury if unauthorized persons handle the machine. ▪ Protect the crankhandle and starting key against unauthorized access upon breaks in operation or after completing work.

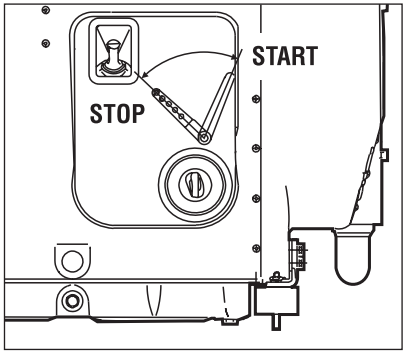
	CAUTION
	Danger of engine damage. ▪ Never stop the engine on the decompression lever.

The engine can be switched off in different ways depending on how it is equipped:

- Speed control lever (mechanical)
- Starting key (electrical)

7.6.1 Switching off the engine (mechanical)

Overview



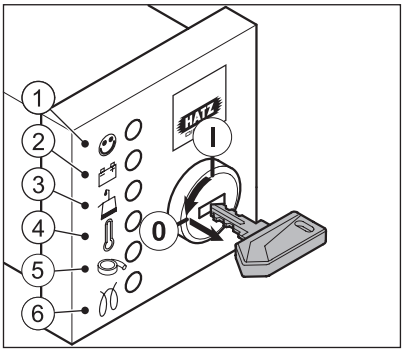
Procedure

Step	Activity
1	Move the speed controller lever to the "STOP" position. The engine switches off.
2	Additional step for engines with a starter: ▪ Turn the starting key to position "0". All indicator lamps go out.

	NOTICE
	Engines with an automatic switch-off can also be switched off by turning the starting key back to position "0".

7.6.2 Switching off the engine (electrical)

Overview



Pos.	Designation
0	Off
I	Operation

Procedure

	NOTICE
	Danger of full battery discharge. ▪ When the machine is switched off, always turn the starting key to position "0" or else the battery may become fully discharged.

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

Automatic electrical switch-off with fault storage

This is identified by brief flashing of all indicators after the starting key is turned to position "I".

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.

Procedure

Step	Activity
1	Check the indicators (2-4). After the engine comes to a standstill, the fault will continue to be displayed by the indicator for approx. another 2 minutes.
2	Then the electrical equipment switches off automatically.
3	Set the starting key to position "0".
4	Turn the starting key back to position "I". The fault display lights up again. Remedy the fault before further starting attempts (see the chapter *9 Faults, page 93*). The indicator goes out at the next start.

7.7 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 while 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 emerging fuel and dispose of it in an environmentally compatible manner.

	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 the chapter *4.2 Fuel, page 23*. ▪ The use of fuel that does not meet specifications requires approval by Motorenfabrik HATZ (main plant).

7.8 Checking the water separator

Only for engines **4L42C** and **4M42**

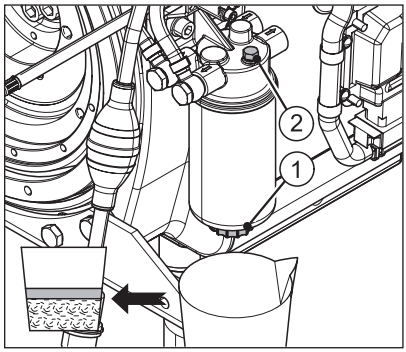
Safety notes

	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. ▪ Catch the emerging water-fuel mixture and dispose of it in an environmentally compatible manner.

	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 an environmentally compatible manner.

	NOTICE
	Note - If starting difficulties occur: Bleed the injection system with the aid of the manual fuel pump (see the chapter *7.3.2 Pumping fuel with the manual fuel pump, page 35*).

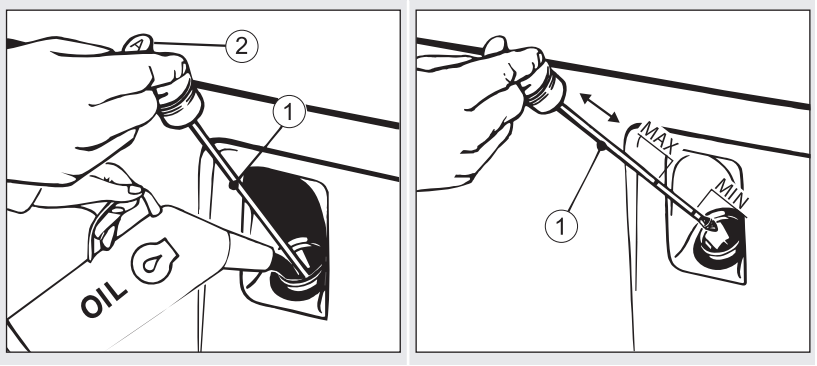
7.9 Checking the oil level and adding oil if necessary

Safety notes

	CAUTION
	**Danger of burns.** There is a danger of burns when working on a hot engine. ▪ Wear safety gloves.

	CAUTION
	Danger of 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 machine must be horizontal and the engine must be switched off.

Overview



Pos.	Designation
1	Dipstick
2	Mark on the dipstick

Procedure

Step	Activity
1	Switch off the engine and wait several minutes for the engine oil to collect in the crank housing. The machine must be horizontal.
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.
7	Reinsert the dipstick.

8 Maintenance

8.1 General maintenance instructions

Safety notes

⚠ WARNING	
	**Danger of injury from the failure to follow the operating instructions and from performing unauthorized tasks on the machine.** ▪ Follow all instructions. ▪ Do not perform activities that are not authorized. Contact properly trained personnel if necessary.

NOTICE	
	**Comply with the safety chapter!** Follow the basic safety instructions in the 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 use personal protective equipment.
- Only use fully functional tools.
- Problems may occur if unsuitable spare parts are installed. We cannot accept responsibility for damage and secondary damage that result from this. We therefore recommend the use of **Hatz original spare parts**.
- Closely adhere to the maintenance conditions prescribed in this Operator's Manual.
- Only make changes on the machine in agreement with the manufacturer.
- Only perform maintenance while the engine is switched off.
- Adhere to legal regulations when handling and disposing of used oil, filters and cleaning agents.
- Protect the starting key against unauthorized access.
- For engines with a electric starter: disconnect the negative battery terminal.
- 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.

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

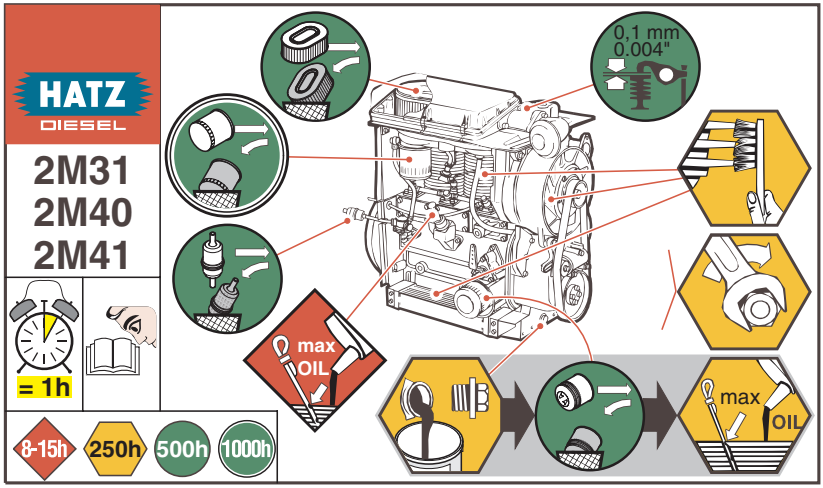
Safety note

	CAUTION
	**Danger of injury if the maintenance instructions are not followed.** ▪ Only perform maintenance while the engine is switched off. ▪ Protect the starting key against unauthorized access. ▪ For engines with a starter: disconnect the negative battery terminal. ▪ After the maintenance work is completed, ensure that all tools have been removed from the machine.

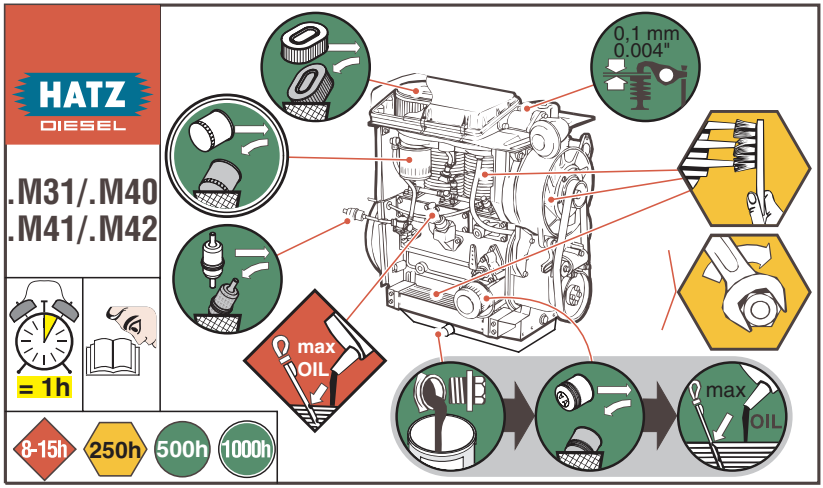
8.2.1 Maintenance notice label

	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 the chapter *8.2.2 Maintenance plan, page 58*).

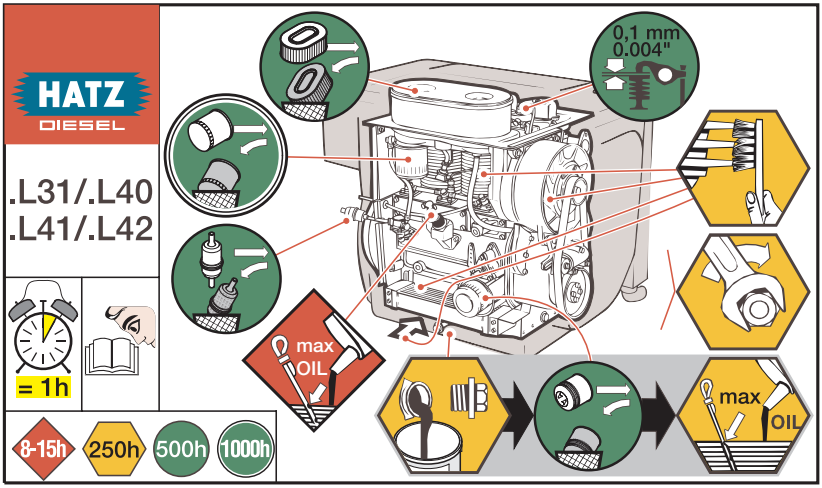
2M41. Without oil sump



2M41. With oil sump; 3-4M41. and 4M42 in general



2-4L41C; 4L42C



8.2.2 Maintenance plan

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
8-15h	Every 8-15 operating hours or every day before starting	Check the oil level.	*7.9 Checking the oil level and adding oil if necessary, page 53*
		Check the intake area of the combustion air.	*8.2.3 Checking the intake area of the combustion air, page 60*
		Check the cooling air area.	*8.2.4 Checking the cooling air area, page 63*
		Visual check of the condition of the crankhandle (handle bar, crank arm, drive dog) If necessary, lightly grease gliding area between crankhandle and guide sleeve.	–

Symbol	Maintenance interval	Maintenance activity/check	Chapter
250h	Every 250 operating hours	Change the engine oil (2M41. **without** oil sump, 2-4L41C and 4L42C in general).	*8.2.5 Change the engine oil, page 64*
		Clean the cooling fan, cooling fins and oil cooler.	*8.2.6 Cleaning the cooling fan, cooling fins and oil cooler, page 66*
		Check the screw connections.	*8.2.7 Check the screw connections, page 70*
		Clean the screen insert in the exhaust pipe.	*8.2.8 Cleaning the screen insert in the exhaust pipe (additional equipment), page 70*
		Check the water separator.	*7.8 Checking the water separator, page 51*
		Check the fuel **pre**filter for contamination and change it if necessary.	*8.2.9 Changing the fuel prefilter, page 72*
		Check the air filter maintenance indicator.	*8.2.15 Checking that the air filter maintenance indicator is working properly, page 87*
500h	Every 500 operating hours	Change the fuel **pre**filter.	*8.2.9 Changing the fuel prefilter, page 72*
		Maintain the dry air filter. Change the filter cartridge.	*8.2.10 Maintaining the dry air filter, page 74*
		Check and set the tappet clearance.	*8.2.12 Check and set the tappet clearance, page 78*

Symbol	Maintenance interval	Maintenance activity/check	Chapter
		Change the engine oil (2M41. **with** oil sump, 3-4M41. and 4M42 in general).	*8.2.5 Change the engine oil, page 64*
		Changing the oil filter.	*8.2.13 Changing the oil filter, page 81*
	Every 1000 operating hours	Changing the fuel filter.	*8.2.14 Change the fuel filter, page 83*

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.

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.

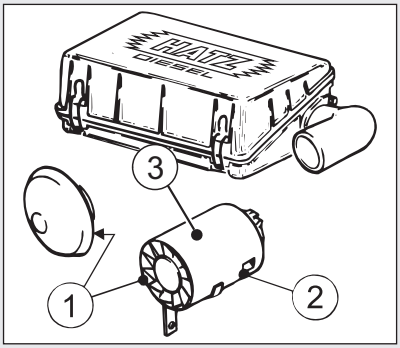
- Let the engine cool.
- Wear safety gloves.

NOTICE

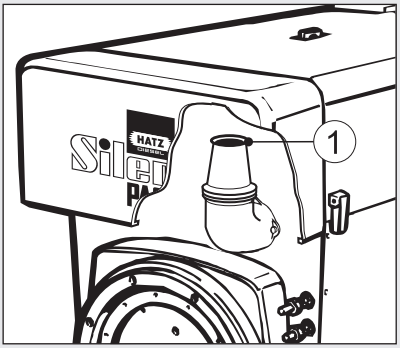
In case of heavy contamination, shorten the maintenance intervals accordingly (see the chapter *8.2.2 Maintenance plan, page 58*).

Overview

2-4M41 and 4M42



2-4L41C and 4L42C



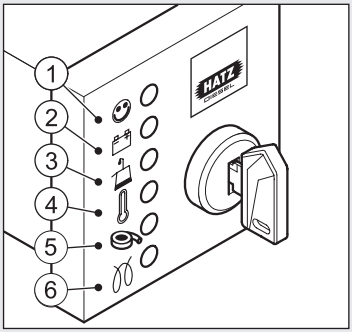
Pos.	Designation
1	Intake opening for combustion air
2	Dust outlet opening
3	Cyclone (option)

Procedure

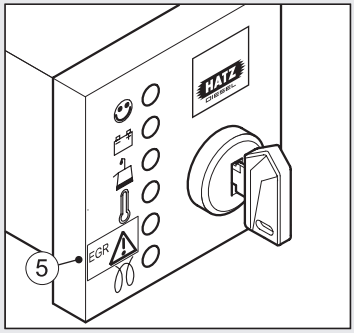
Step	Activity
1	Check the intake opening (1) for coarse contamination such as leaves, heavy dust deposits, etc., and clean if necessary.
2	Check that the dust outlet opening (2) at the bottom of the cyclone precleaner is clear.
3	If the dirt contamination is oily, remover the cyclone (3) and clean it.

Electrical air filter maintenance display

2-4L41C and 2-4M41

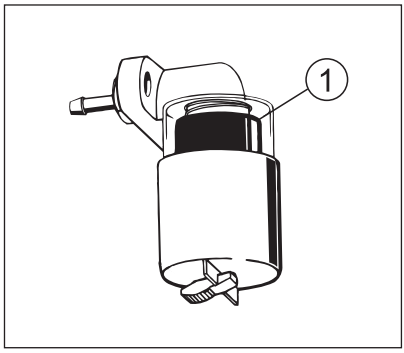


4L42C and 4M42



Pos.	Designation
5	Air filter maintenance display

Mechanical air filter maintenance display



Pos.	Designation
1	Red field

Procedure

Step	Activity
For the electrical air filter maintenance display:	

Step	Activity
1	Briefly let the engine run at maximum speed and watch for the indicator (5) to light up for a short period – depending on the version. In the engines **4L42C and 4M42**, the following flash code indicates that maintenance work is required on the air filter ▪ 7 short flashes (approx. 0.5 seconds) and ▪ 1 long flash (approx. 1.5 seconds) (see the chapter *8.2.10 Maintaining the dry air filter, page 74*).
With mechanical air filter maintenance display:	
1	Briefly let the engine run at maximum speed and watch for the visible red field (1) in the mechanical air filter maintenance display. The visible red field (1) indicates that maintenance work is required on the air filter (see the chapter *8.2.10 Maintaining the dry air filter, page 74*).

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 the chapter *8.2.2 Maintenance plan, page 58*).

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 the chapter *8.2.6 Cleaning the cooling fan, cooling fins and oil cooler, page 66*).

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.

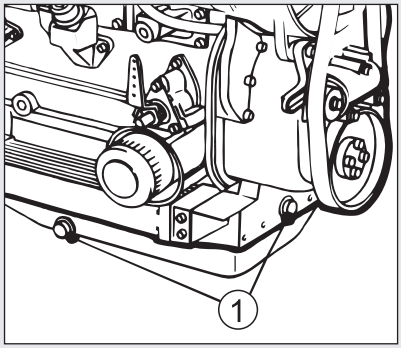
- Wear personal protective equipment (gloves).
- Collect the used oil and dispose of it according to local environmental regulations.

NOTICE

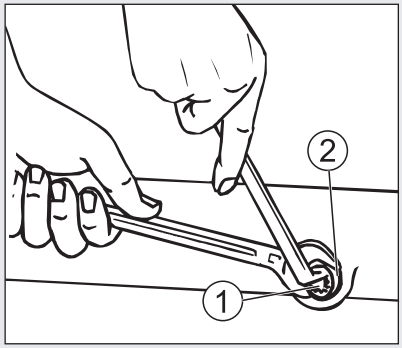
- The engine must be level.
- The engine must be switched off.
- Only drain engine oil while it is warm.
- The engine oil should be changed when the oil filter is changed.

Overview

M41



L41

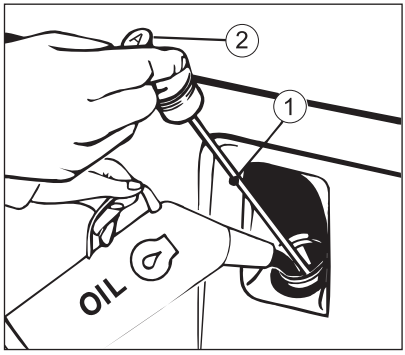


Pos.	Designation
1	Oil drain screw
2	Drain pipe

Draining the oil

Step	Activity
1	Unscrew the oil drain screw (1) and drain the oil entirely. When unscrewing the oil drain screw (1) on engines of type **2-4L41C** and **4L42C**, 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



Pos.	Designation
1	Dipstick
2	Mark on the dipstick

Adding oil

Step	Activity
1	Add engine oil to the **max.** mark on the dipstick (1). ▪ For the specification and viscosity, see the chapter *4.3 Engine oil, page 24*. ▪ The mark of the dipstick (2) indicates whether the engine is equipped **with** an oil sump or **not** (see the chapter *4.1 Engine, page 22*).
2	Reinsert the dipstick (1).
3	Check the oil level after a short test run and correct if necessary.

8.2.6 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.

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.

- 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 run the engine when all covers are installed.

NOTICE

In case of heavy contamination, shorten the maintenance intervals accordingly (see the chapter *8.2.2 Maintenance plan, page 58*).

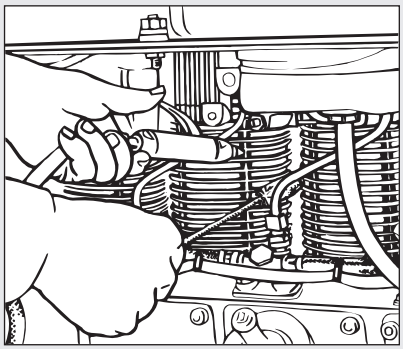
Overview

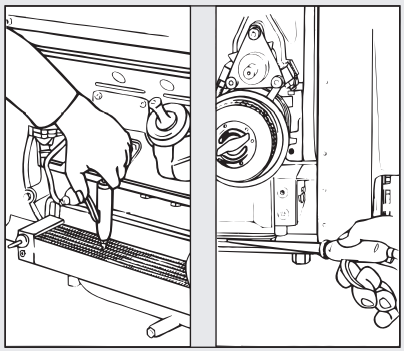
Pos.	Designation
1	Baffle plate

Preparation

Step	Activity
1	**Unscrew the following on encapsulated engines:** ▪ Hood ▪ Side wall with speed control lever ▪ Cover plate on operating side ▪ Exhaust air duct ▪ Cover plate on exhaust side (see the chapter *5 Engine design, page 25*).
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





Procedure

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 terminal of the battery.
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 strong 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.

8.2.7 Check the screw connections

NOTICE

- Do not retighten the screws for attaching the cylinder head.
- The adjustment screws on the speed regulator and the injection system are secured with locking varnish and are not permitted to be tightened or adjusted.

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.

8.2.8 Cleaning the screen insert in the exhaust pipe (additional equipment)

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

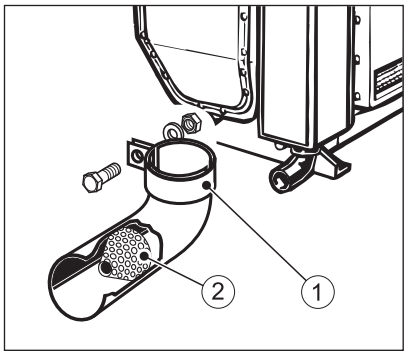
Danger of injury

There is a danger of injury when performing cleaning work at the exhaust screen.

- Wear safety gloves.

NOTICE	
	Operation of the engine for a lengthy period without a load or with only a small load can result in premature deposits on the screen insert. Shorten the maintenance interval accordingly.

Overview



Pos.	Designation
1	Pipe clamp
2	Screen insert

Procedure

Step	Activity
1	Release the pipe clamp (1) and remove it with the exhaust pipe.
2	Remove deposits on the screen insert (2).
3	Check the screen insert for cracks or breakage, and replace if necessary.

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.

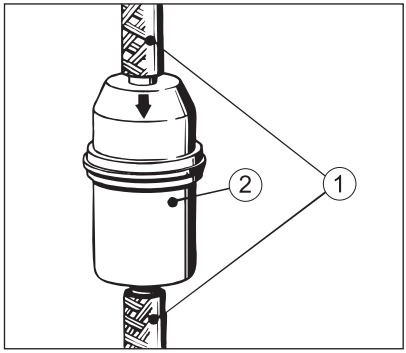
- Collect emerging fuel and dispose of it in an environmentally compatible manner.

CAUTION

Dirt particles can damage the injection system.

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

Overview



Pos.	Designation
1	Fuel lines
2	Fuel prefilter

Procedure

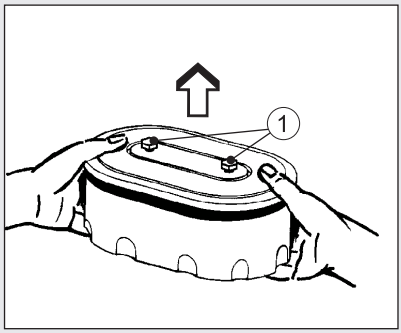
Step	Activity
1	Place a suitable container under the filter to collect emerging fuel.
2	Close the fuel feed line.
3	Pull the fuel lines (1) off of the fuel prefilter (2) on both sides.
4	Dispose of the old filter in accordance with local environmental regulations.
5	Insert a new fuel prefilter. Note the following: ▪ Arrow for flow direction ▪ 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.
2-4L41C and 2-4M41	
7	To simplify the starting procedure, it is recommended that you pre-pump the fuel using the manual lever at the fuel feed pump until you hear fuel flow back through the return line into the fuel tank (see the chapter *7.3.1 Pumping fuel with the manual lever, page 34*).
8	Perform a leak tightness test by activating the manual lever.

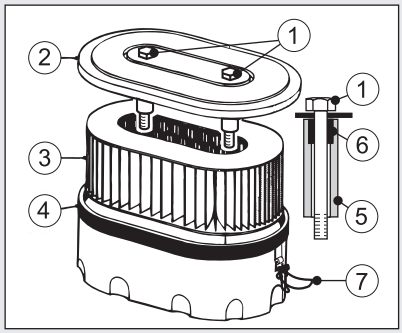
Step	Activity
9	After completion, insert the access cover to the fuel feed pump back in the side wall.
4L42C and 4M42	
7	If you have difficulties starting the engine, bleed the injection system with the aid of the manual fuel pump (see the chapter *7.3.2 Pumping fuel with the manual fuel pump, page 35*).

8.2.10 Maintaining the dry air filter

NOTICE	
	▪ Immediately clean the filter cartridge if the maintenance display appears at maximum speed. ▪ 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 of engines 2-4 L41C and 4L42C





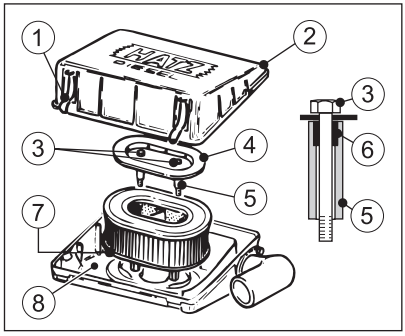
Pos.	Designation
1	Screw
2	Cover
3	Filter cartridge
4	Air filter housing
5	Spacer
6	Bushing

Pos.	Designation
7	Clamp

Removing the air filter cartridge - engines 2-4L41C and 4L42C

Step	Activity
1	Remove the capsule hood.
2	Remove adherent dirt in the area of the air filter housing (4).
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 of the engines 2-4M41. and 4M42



Pos.	Designation
1	Clamp
2	Air filter housing cover
3	Screw

Pos.	Designation
4	Filter cover
5	Spacer
6	Bushing
7	Filter cartridge
8	Air filter housing

Removing the air filter cartridge - engines 2-4M41. and 4M42

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.

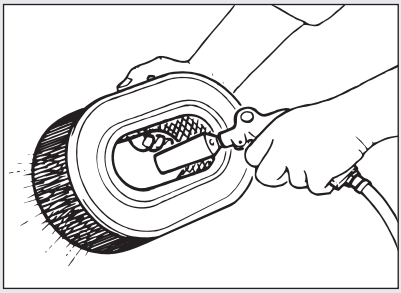
- Wear safety goggles.
- Never direct the compressed air jet toward people or toward yourself.

NOTICE

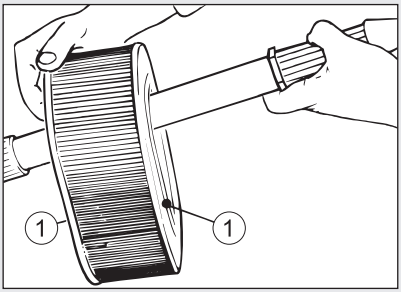
- The pressure must not exceed 5 bar.
- A distance of approx. 150 mm must be maintained between the filter cartridge and the compressed air gun.
- Even minor damage in the areas of the sealing surface, filter paper or filter cartridge makes it impossible to reuse the filter cartridge.

Overview

Clean the filter cartridge



Check the air filter cartridge

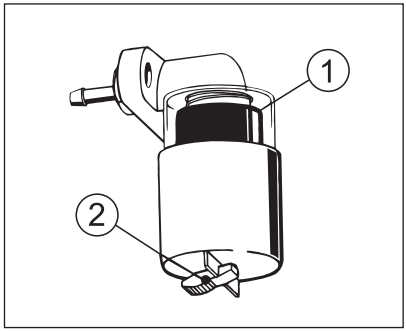


Pos.	Designation
1	Sealing surface

Procedure

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 (1) 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.

Mechanical air filter maintenance display



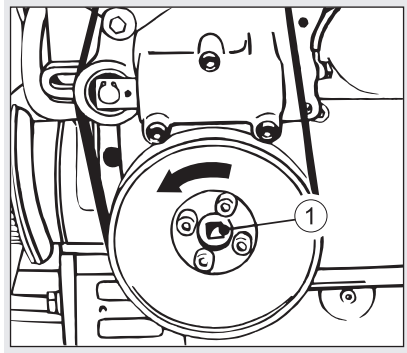
Pos.	Designation
1	Red field
2	Reset button

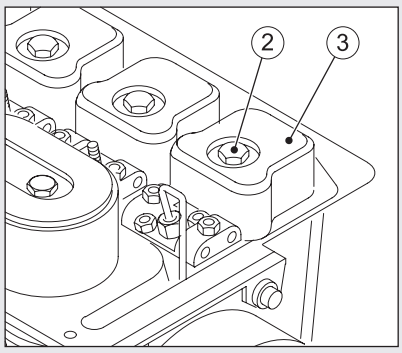
Mounting the air filter cartridge

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.
2	After the filter is mounted, unlock the visible red field (1) in the maintenance display by pressing the reset button (2).

8.2.12 Check and set the tappet clearance

Overview





Pos.	Designation
1	Square opening

Pos.	Designation
2	Hex nut
3	Cylinder head cover

Preparation

Step	Activity
1	On encapsulated engines, remove the hood of the capsule (see the chapter *5 Engine design, page 25*).
2	Remove the hex nut (2) and remove the cylinder head cover (3).
3	Remove the air guide housing cover (see the chapter *5 Engine design, page 25*) or the belt guard.
4	Insert the ratchet or T-piece 1/2" with the required extension (1) into the square opening.

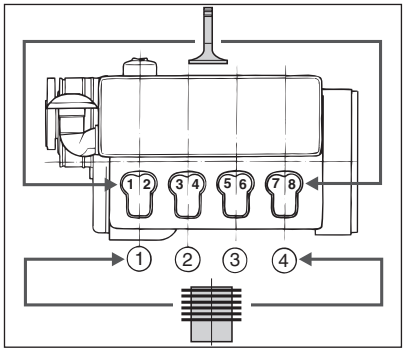
	NOTICE
	**Turn the engine in the sense of rotation.** Clockwise in both cases - flywheel side or timing cover side.

Setting method for two cylinder engine

Step	Activity
1	Set the valve of the 1st cylinder – fan side – to overlap (outlet valve not yet closed, intake valve begins to open).
2	Turn the crankshaft by 180° in the sense of rotation and check the valves of the 2nd cylinder.
3	Continue turning the crankshaft by 180° in the sense of rotation and check the valves of the first cylinder.

Setting method for three and four cylinder engines

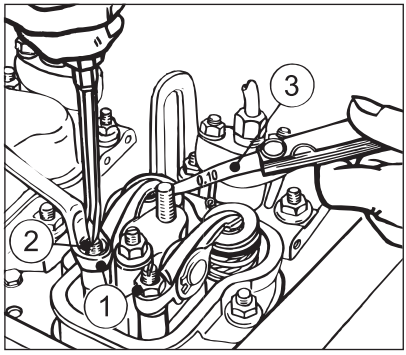
Numbering of the valves and cylinders from the fan side



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



Pos.	Designation
1	Hex nut

Pos.	Designation
2	Adjusting screw
3	Feeler gauge

Procedure

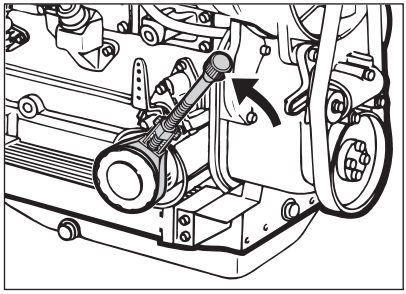
Step	Activity
1	Check the tappet clearance with the feeler gauge (3). For the setting, see the chapter *4.1 Engine, page 22*
2	If the tappet clearance needs to be corrected: ▪ Release the hex nut (1). ▪ Turn the adjustment screw (2) so the feeler gauge (3) can be pulled through with a barely perceptible 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.
6	After a brief trial run, check the cylinder head cover for tightness.

8.2.13 Changing the oil filter

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.

Overview



Procedure

Step	Activity
1	Release the oil filter with a strap wrench and quickly unscrew and remove it. ▪ HATZ order no. for strap wrench: 620 307 01.
2	Dispose of the old filter in accordance with local environmental regulations.
3	Wipe spilled engine oil out of the oil baffle.
4	Lightly oil the sealing lip 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 the chapter *4.3 Engine oil, page 24*. ▪ The mark of the dipstick indicates whether the engine is equipped **with** an oil sump or **not** (see the chapter *4.1 Engine, 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 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.

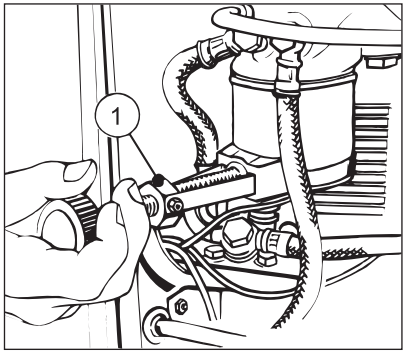
- Collect emerging fuel and dispose of it in an environmentally compatible manner.

CAUTION

Dirt particles can damage the injection system.

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

Overview 2-4L41C and 2-4M41.



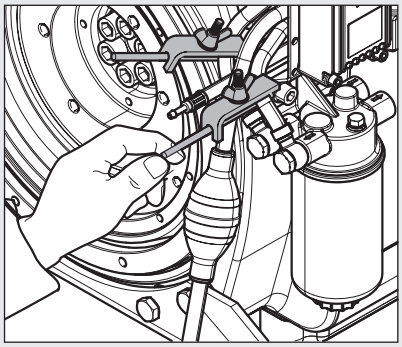
Pos.	Designation
1	Strap wrench (HATZ order no.: 620 307 01)

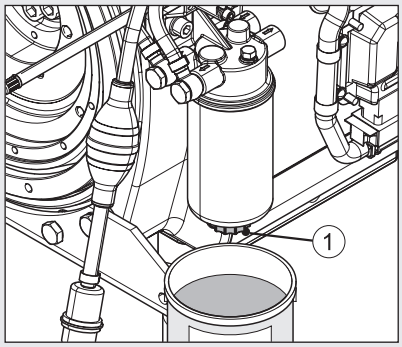
Procedure 2-4L41C and 2-4M41

Step	Activity
1	**On encapsulated engines:** ▪ Lift off the capsule hood (see the chapter *5 Engine design, page 25*).
	On engines without a capsule: ▪ Remove the side trim panel (see the chapter *5 Engine design, page 25*).
2	Place a suitable container under the filter to collect emerging fuel.
3	Close the fuel feed line.
4	Slide on the strap wrench (1) and unscrew the fuel filter counter-clockwise.
5	Dispose of the old filter in accordance with local environmental regulations.
6	Lightly oil the gasket of the new fuel filter.
7	Mount the fuel filter and tighten it **by hand**.
8	Open the fuel feed line.
9	To ease the starting procedure, it is recommended that you pre-pump the fuel using the manual lever at the fuel feed pump until you hear fuel flow back through the return line into the fuel tank (see the chapter *7.3.1 Pumping fuel with the manual lever, page 34*).

Step	Activity
10	Perform a leak tightness test by activating the manual lever.
11	After completion, insert the access cover to the fuel feed pump back in the side wall.
12	Mount the capsule and air guide parts again.

Overview 4L42C and 4M42



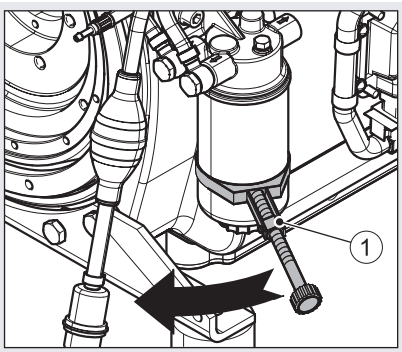


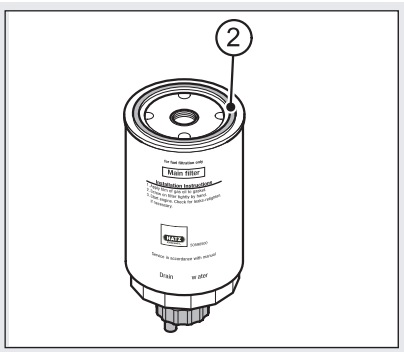
Pos.	Designation
1	Drain plug

Preparation 4L42C and 4M42

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 4L42C and 4M42





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

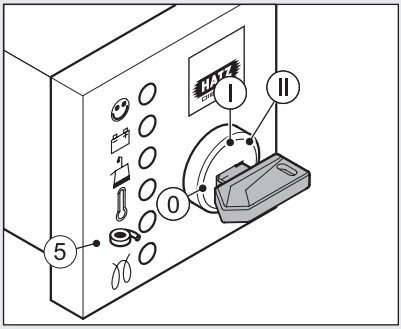
Procedure 4L42 C and 4M42

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 (see the chapter *7.3.2 Pumping fuel with the manual fuel pump, page 35*).
7	After a brief trial run, check the fuel filter for leak tightness and retighten by hand.

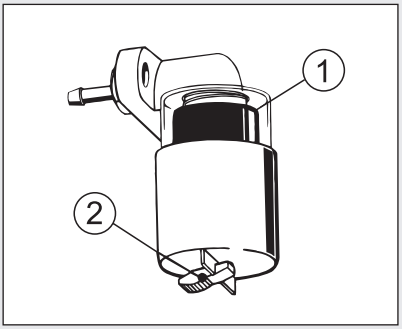
8.2.15 Checking that the air filter maintenance indicator is working properly

Overview

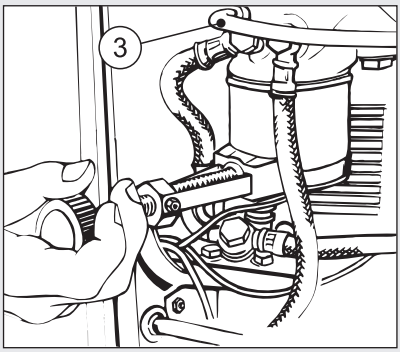
Electrical
air filter maintenance display



Mechanical
air filter maintenance display



Hose of air intake pipe



Pos.	Designation
1	Red field
2	Reset button
3	Hose
5	Air filter maintenance display
Ignition lock	
0	Off
I	Operation
II	Start

Procedure

Step	Activity
1	Remove the capsule hood and the side panel trim (see the chapter *5 Engine design, page 25*).
2	Turn the starting key to position I.
3	Pull the hose (3) off of the exhaust manifold.
Electrical air filter maintenance display	
	NOTE: On engine types **4L42** and **4M42**, this function test cannot be performed.
4	Generate a vacuum by sucking forcefully at the hose end. The indicator (5) lights up.
5	If there is no reaction, check the following: ▪ Electrical part; cable connections, etc. ▪ Indicator ▪ Function of the maintenance switch.
Mechanical air filter maintenance display	
4	Generate a vacuum by sucking forcefully at the hose end. The red field (1) engages.
5	After the function test, unlock the red field (1) by pressing the reset button (2).
After the function test	
6	Replace the faulty parts.
7	Reattach the hose (3) of the exhaust manifold.
8	Mount the capsule and air guide parts again.

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

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. ▪ To be absolutely sure that you order the right poly v belt – in terms of the length – it is recommended that you measure the diameter of the fan-side pulley and use this as the basis for your selection.

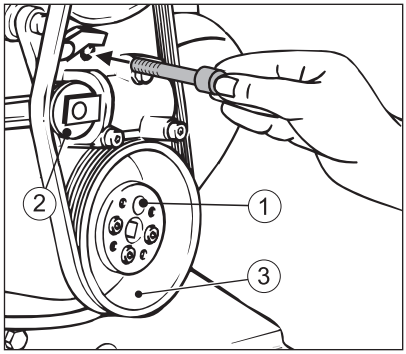
Belt types

Because of the different diameters of the fan-side pulleys, in combination with different engine types and versions, various lengths of poly v belts are used.

Type and engine version	ID number	Belt length mm	Fan pulley Ø mm
2L41C	502 031 00	920	72
All remaining types and versions	501 415 00	910	64

Removing the poly v belt

Overview



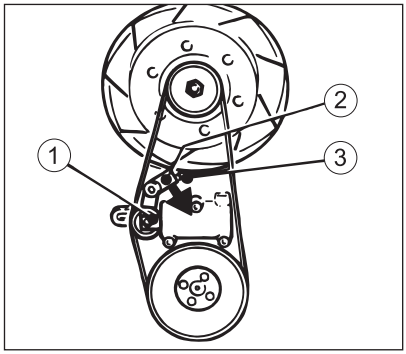
Pos.	Designation
1	Cylinder screw
2	Tension pulley
3	Pulley

Procedure

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.

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

Overview



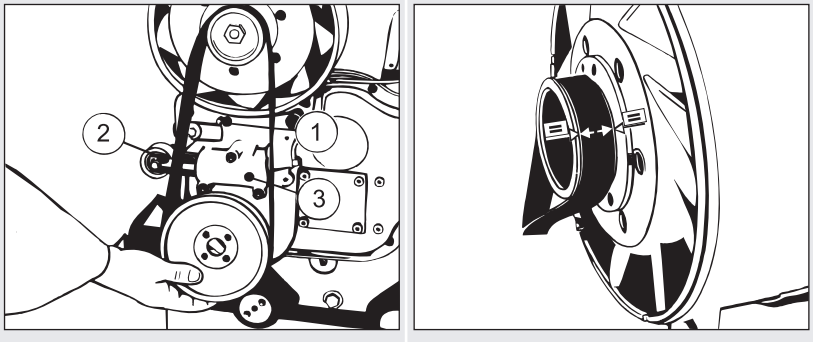
Pos.	Designation
1	Tension pulley
2	Angle lever
3	Switch-off pin

Procedure

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**.

Mounting the poly v belt

Overview



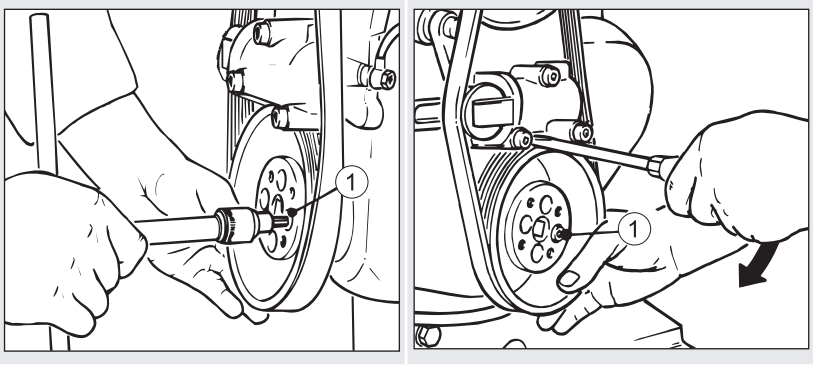
Pos.	Designation
1	Switch-off pin
2	Tension pulley
3	Housing

Procedure

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.

Centering the pulley

Overview



Pos.	Designation
1	Cylinder screw

Procedure

Step	Activity
1	Lightly secure the pulley with a cylinder screw (1) without placing the pulley fully on the centering.
2	Insert a large screwdriver between the hydraulic belt tensioner and pulley and push down until it slides fully into the centering.
3	Insert the remaining cylinder screws (1) and tighten.

9 Faults

9.1 Troubleshooting

Troubleshooting notes

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

Type of fault	Possible causes	Remedy	Chapter
The engine does not start or does not start immediately, but it can be turned with the starter.	Move the speed controller lever to the "STOP" position.	Depending on the possibility or requirement, place the lever in either the 1/2 start or max. START position. The lever must be fixed in this position.	*7.4 Setting the speed control, page 37* *7.5 Starting the engine, page 37*
	No fuel at the injection pump.	Refuel.	*7.7 Refueling, page 50*
		Activate the feed pump until the fuel can be heard to flow back through the return line into the fuel tank.	*7.3 Start preparation, 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. ▪ Check the fuel filter. ▪ Check the function of the feed pump.	*8.2.9 Changing the fuel prefilter, page 72* *8.2.14 Change the fuel filter, page 83*

Type of fault	Possible causes	Remedy	Chapter
	After every extended period of disuse, if you experience difficulties starting the engine that can be eliminated by activating the feed pump for a lengthy period, check that the fuel system is correctly sized.		*6.2 Assembly instructions, page 31*
	Insufficient compression: ▪ Wrong tappet clearance.	Check the tappet clearance and adjust if necessary.	*8.2.12 Check and set the tappet clearance, page 78*
	▪ Cylinder and/or piston ring wear.	Contact the Hatz service station.	
	▪ Faulty automatic decompression.	Contact the Hatz service station.	
	Injection nozzle is not functional.	Contact the Hatz service station.	
	Torn cooling fan belt.	Renew the poly v belt.	*8.2.16 Renewing the poly v belt and checking the function of the switch-off unit, page 89*
At low temperatures	Pre glow system is faulty (additional equipment).	Contact the Hatz service station.	
	Fuel gelled due to insufficient cold resistance.	Check whether the fuel that emerges from the detached fuel feed line directly at the injection pump 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-resistance fuel mixture.	*4.2 Fuel, page 23* *7.7 Refueling, page 50* *8.2.9 Changing the fuel prefilter, page 72* *8.2.14 Change the fuel filter, page 83*

Type of fault	Possible causes	Remedy	Chapter
	Starter speed is too low: ▪ Oil is too viscous.	Change the engine oil and add oil of the right viscosity class.	*4.3 Engine oil, page 24* *8.2.5 Change the engine oil, page 64*
	▪ 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.	Irregularities in the electrical equipment: ▪ Battery and/or other cable connections are incorrectly connected. ▪ Cable connections are loose and/or oxidized. ▪ Battery is faulty and/or not loaded. ▪ Faulty starter. ▪ Faulty relay, monitoring elements, etc.	Check the electrical equipment and their components. Contact the Hatz service station.	*3.2.4 Electrical equipment, page 18*
The engine starts, but does not continue running after the starter is switched off.	The speed control lever is not sufficiently set to the Start direction.	Set the lever to the Start position.	*7.5 Starting the engine, page 37*
	Machine is not uncoupled.	If possible, separate the engine from the machine by uncoupling it.	

Type of fault	Possible causes	Remedy	Chapter
	Fuel prefilter is clogged.	Change the fuel prefilter.	*8.2.9 Changing the fuel prefilter, page 72*
	Fuel filter is clogged.	Change the fuel filter.	*8.2.14 Change the fuel filter, page 83*
	Fuel supply is interrupted.	Systematically check the entire fuel supply.	
	Stop signal from monitoring elements that are associated with the automatic switch-off (additional equipment): ▪ No oil pressure. ▪ Dirty air filter unit. ▪ Faulty three phase alternator.	▪ Check the oil level. ▪ Check the degree of dirt contamination of the air filter, and clean or renew it if necessary. ▪ Contact the Hatz service station.	*7.9 Checking the oil level and adding oil if necessary, page 53* *8.2.10 Maintaining the dry air filter, page 74*
Engine switches off spontaneously during operation.	The tank ran out of fuel during operation	Fill with fuel.	*7.7 Refueling, page 50*
	Fuel prefilter or fuel filter is clogged.	Change the filter.	*8.2.9 Changing the fuel prefilter, page 72* *8.2.14 Change the fuel filter, page 83*

Type of fault	Possible causes	Remedy	Chapter
	Torn cooling fan belt.	Renew the poly v belt.	*8.2.16 Renewing the poly v belt and checking the function of the switch-off unit, page 89*
	Mechanical faults.	Contact the Hatz service station.	
With automatic electrical switch-off mechanism (additional equipment)	Stop signal of monitoring elements for: ▪ Oil pressure too low. ▪ Cylinder head temperature too high.	Check the engine for: ▪ Engine oil filling level ▪ Contamination of the cooling air guides or another impairment of the cooling system.	*7.9 Checking the oil level and adding oil if necessary, page 53* *8.2.6 Cleaning the cooling fan, cooling fins and oil cooler, page 66*
	Irregularities in the electrical equipment, such as: ▪ Loose contacts on cable connections. ▪ Faulty three phase alternator. ▪ Faulty relay.	Check the electrical equipment and its components, contacting the service center if necessary.	*3.2.4 Electrical equipment, page 18*
The indicator for the exhaust gas return system (EGR) flashes (only on 4L42 and 4M42).	Air filter is dirty.	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 74*
	Problems with the exhaust gas return system.	Contact the Hatz service station.	

Type of fault	Possible causes	Remedy	Chapter
The engine loses power and speed.	The fuel supply is impaired ▪ The tank ran out of fuel during operation. ▪ Fuel prefilter or fuel filter is clogged. ▪ Inadequate tank venting. ▪ Line connections are not leak tight.	Add fuel. Change the filter. Ensure that the tank is sufficiently vented. Check the line screw connections for leak tightness.	*7.7 Refueling, page 50* *8.2.9 Changing the fuel prefilter, page 72* *8.2.14 Change the fuel filter, page 83*
	▪ The speed adjustment lever does not stay in the desired position.	Block the speed adjustment.	
The engine loses power and speed, and black smoke emerges from the exhaust.	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 74*
	Tappet clearance not OK.	Adjust the tappet clearance.	*8.2.12 Check and set the tappet clearance, page 78*
	Injection nozzle is not functional.	Contact the Hatz service station.	
Engine becomes very hot. Indicator lamp for the cylinder head temperature (additional equipment) lights up.	Too much engine oil in the engine.	Drain the engine oil to the upper mark of the dipstick.	*7.9 Checking the oil level and adding oil if necessary, page 53*

Type of fault	Possible causes	Remedy	Chapter
	Inadequate cooling: ▪ Contamination in the entire area of the cooling air guides.	Clean the cooling air area.	*8.2.6 Cleaning the cooling fan, cooling fins and oil cooler, page 66*
	▪ Incompletely closed air guide parts or capsule parts.	Check the air guide parts and shafts for completeness and good sealing properties.	

9.2 Emergency start

Electrical automatic shutoff (additional equipment)

The distinguishing feature of the electrical automatic shutoff is brief flashing of all indicators after turning the starting key to position "I".

	NOTICE
	Note - 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 (see the chapter *9.1 Troubleshooting, page 93*.

If the engine switches off due to an electrical fault signal or due to insufficient oil pressure with the aid of the automatic switch-off, an emergency start can be attempted by the user. The user must bear responsibility for any resulting damage.

This may be necessary if the vehicle stops at a critical location (railroad crossing or intersection).

When a monitoring element of the automatic switch-off is activated, the corresponding indicator lights up. After shutting down the engine, the indicator remains lit for approx. 2 minutes. The electrical equipment then switches off automatically.

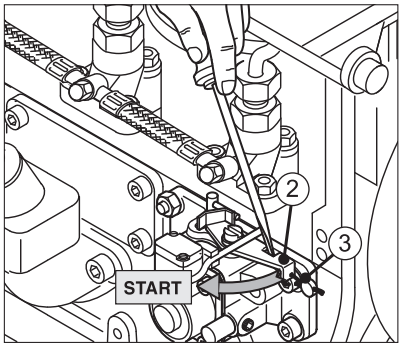
Safety notes

	⚠ CAUTION
	**Danger when switching off the engine from the emergency operation mode.** During the emergency operation mode, the engine can only be switched off with the starting key if the emergency start lever is first returned to its home position.

	CAUTION
	Danger of later engine damage. The monitoring components (oil pressure, charge control and engine temperature) are deactivated in emergency operation. ▪ The oil level must be checked before the emergency operation phase.

	NOTICE
	If the emergency operation mode is used, the risk transfers to the operator (**the Motorenfabrik HATZ does not accept liability in this case**). ▪ Immediately after the emergency operation phase, determine the cause of the fault. ▪ Have the **Hatz service station** supply the emergency start lever with a new lead seal.

Overview



Pos.	Designation
2	Emergency start lever
3	Seal wire

Procedure

Step	Activity
1	Check the oil level (see the chapter *7.9 Checking the oil level and adding oil if necessary, page 53*).
2	Remove the capsule hood and the side panel trim (see the chapter *5 Engine design, page 25*).

Step	Activity
3	Place a suitable tool, such as a screwdriver, behind the emergency start lever (2) and tear the seal wire (3) between the emergency start lever and the housing screw with a forceful jerk.
4	Turn the emergency start lever to the start position.
5	Start the engine (see the chapter *7.5 Starting the engine, page 37*).
6	Eliminate the emergency situation within a few seconds.
7	Switch off the engine.
8	Immediately after the emergency operation phase: ▪ Determine the cause of the fault and eliminate it (see the chapter *9.1 Troubleshooting, page 93*). ▪ If necessary, contact your nearest **HATZ service station**.

10 Storage and disposal

10.1 Storing the machine

General information

NOTICE	
	**Comply with the safety chapter!** Follow the basic safety instructions in the 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:

Step	Activity
1	After the machine has cooled down, cover it to protect it against dust and store it in a dry and clean place.

The new engine can normally be stored for up to 1 year.

The protection lasts up to approx. 6 months at very high humidity and with sea air.

If the storage time is longer, 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 manufacturer's declaration / Declaration of Incorporation EC Machinery Directive 98/37/EC or 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:
2L41=10214; 3L41=10314; 4L41=10414; 4L42=14010;
2M41=10514; 3M41=10614; 4M41=10714; 4M42=14310

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., 1.5.3., 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 operating manual
☒ 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 **).

Conformity with the provisions of the following, other EC Directives, i.e.
- **2004/108/EG Electromagnetic Compatibility** (EMC), dated 15.12.2004

The following standards have been used (completely or partially):
- EN 1679-1: 051998
- EN ISO 12100-1: 042004
- EN ISO 13857: 062008
- EN ISO 14121-1: 122007
- EN ISO 12100-2: 042004
- EN ISO 11102: 111997

I will submit the above-mentioned specific technical documents electronically to the competent government authority, if applicable**)

The Operating Manual 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 **)

02/12/2009	Krautloher / Directives official	Krautloher
Date	Signature and information on the undersigned	Signature

*) The machine satisfies the substantial requirements of both directives 98/37/EC shall apply until 28.12.2009; 2006/42/EC shall apply as of 29.12.2009
**) applies only to the Directive 2006/42/EC

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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