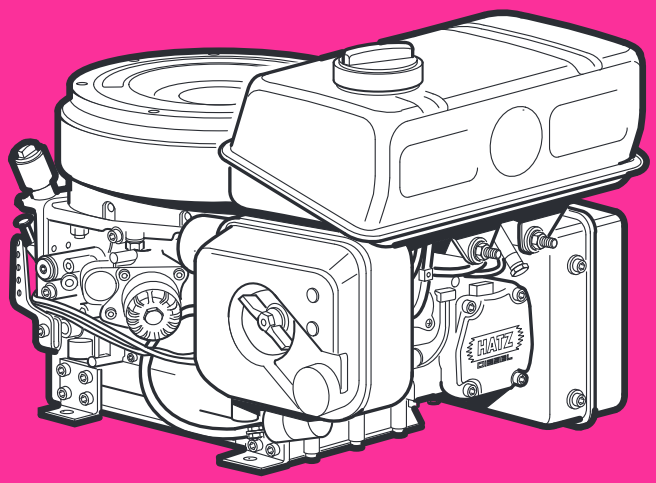
Translation of the
ORIGINAL INSTRUCTION BOOK



1D 90 V
1D 90 W

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Printed in Germany

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A new HATZ diesel engine is ready to work for you

This engine is intended only for the purpose determined and tested by the manufacturer of the equipment in which it is installed. Using it in any other manner contravenes the intended purpose. For danger and damage due to this, Motorenfabrik HATZ assumes no liability. The risk is with the user only. Use of this engine in the intended manner presupposes compliance with the maintenance and repair instructions laid down for it. Noncompliance leads to engine breakdown.
Please study this Instruction Book before you start the engine for the first time: it will help you to avoid accidents, to operate the engine correctly, to perform maintenance work and to keep the engine operating at full efficiency for a very long time.
Please pass this Instruction Manual on to the next user or to the following engine owner.

HATZ DIESEL SERVICE

Always have service work performed by qualified specialists. To this effect, we recommend that you consult one of the 500 HATZ service stations. There, your engine is repaired by staff who constantly undergo training and who use both original HATZ spare parts and HATZ tools. The world-wide HATZ service network is also available to you for consultation and spare parts supply.
For the address of your nearest HATZ service station, please refer to the attached list or the internet under: www.hatz-diesel.com

HATZ DIESEL

Original-Ersatzteile
Original-spare parts
Pièces de rechange d'origine
Repuestos originales

The installation of inappropriate spare parts may cause problems. We cannnot accept any liability for damage or consequential damage resulting therefrom.
Thus, we recommend that you use original HATZ spare parts. These parts are manufactured following the strict HATZ specifications and ensure, thanks to their perfect fit and function, maximum operating reliability. For the reference number, please consult the attached spare part list or the internet under: www.hatz-diesel.com. Please take the complete spare parts kits in Table M 00 into account.

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

MOTORENFABRIK HATZ GMBH & CO KG

Contents

This symbol identifies important safety precautions.
Please comply with these most carefully in order to avoid any risk of injury to persons or damage to materials.
General legal requirements and safety regulations issued by the competent authorities or industrial accident insurers must also be complied with.

1. Important notes on safe operation of the engine

HATZ diesel engines are economical, strongly built and long-lasting. They are therefore frequently chosen for commercially and industrially operated equipment and machinery.
Since the engine forms part of the finished equipment or machine, its manufacturer will take all the applicable safety regulations into account.
Nevertheless, we give below certain additional comments on operating safety, and would recommend you to note them carefully.
Depending on the manner in which the engine is installed and its intended application, the equipment manufacturer or operator may have to attach additional safety devices and prohibit potentially hazardous aspects of operation, for example:

- Parts of the exhaust system as well as the surface of the engine are of course hot during operation of the engine, but also when it is still cooling down after use, and must not be touched.
- Faulty wiring or incorrect operation of electrical equipment may lead to sparks forming, and must be avoided as a potential fire hazard.
- Rotating parts must be shielded against accidental contact when the engine is installed in other equipment or machinery.
  Guards are available from HATZ to protect belt drives, cooling fans and generators.
- Before attempting to start the engine it is essential to have studied the starting information in the Instruction Book.
- Mechanical starting devices must not be used by children or persons of insufficient physical strength.
- Before starting the engine, ensure that all the specified protective guards are in place.
- The engine must only be operated, serviced or repaired by persons who have received the appropriate training.
- Keep the starting key out of reach of unauthorized persons.
- Never run the engine in closed or badly ventilated rooms.
  Do not breath in emissions - danger of poisoning!
- Also fuel and lubricants could contain poisonous components. Please follow the instructions of the mineral oil producer (safety data sheets).

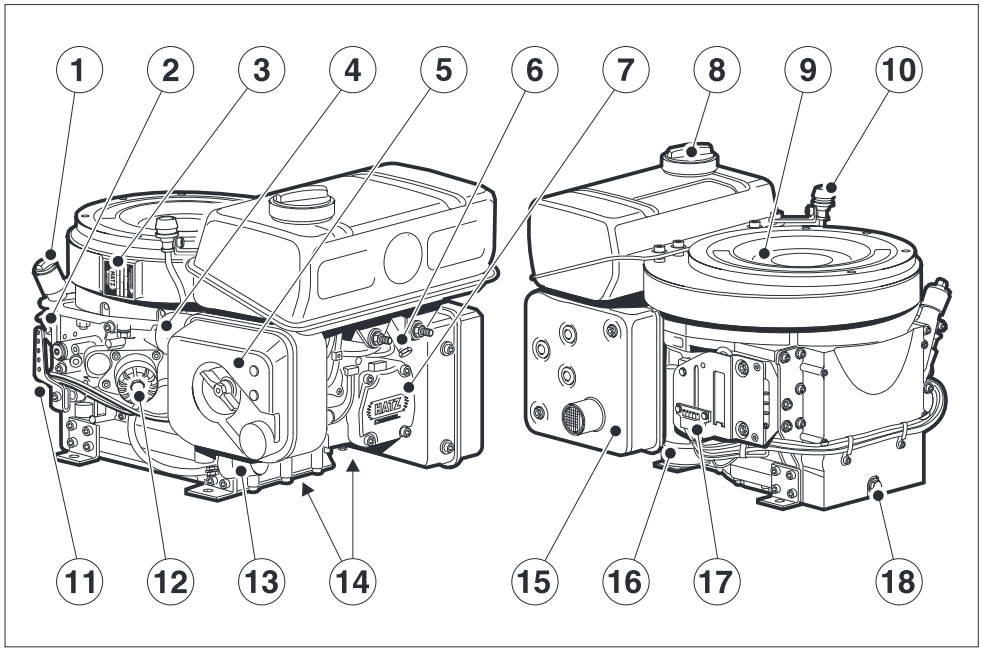
Important notes on safe operation of the engine

- Stop the engine before performing any maintenance, cleaning- and repair work.
- Stop the engine before refuelling.
  Never add fuel near a naked flame or a source of sparks.
  Don't smoke. Don't spill fuel.
- Keep explosive materials as well as flammable materials away from the engine because the exhaust gets very hot during operation.
- Wear close-fitting clothing when working on a running engine.
  Please don't wear necklaces, bracelets or any other things which you could get caught with.
- Please pay attention to all advice- and warning stickers placed on the engine and keep them in legible condition. In case a label has come off or is no longer clearly legible, it must be replaced immediately. To this effect, please contact the HATZ service station in your area.
- Note that any unauthorized modification to the engine absolves its manufacturer from liability for the consequences.

Regular maintenance in accordance with the details given in these operating instructions is essential to keep the engine in good working order.

In case of doubt, always consult your nearest HATZ service station before starting the engine.

2. Description of engine



1

1 Oil filler pipe
2 Dipstick
3 Type plate
4 Combustion air intake
5 Dry-type air cleaner
6 Tank drain plug
7 Cylinder head cover
8 Tank filler cap
9 Cooling air inlet
10 Air cleaner maintenance indicator
11 Speed control lever
12 Oil filter (optional extra)
13 Fuel filter
14 Cooling air outlet
15 Silencer (muffler)
16 Starter motor
17 Central plug for electical system
18 Oil drain plug

3. General information

3.1. Technical data

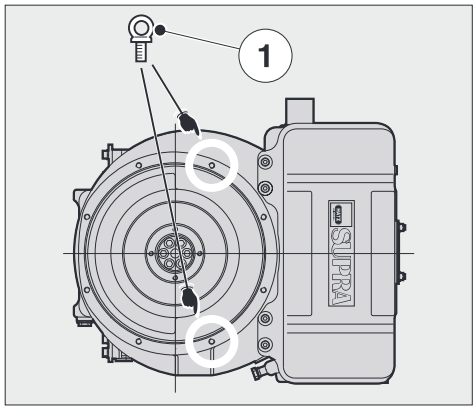
Type		1D90.
Engine models		V/W
Mode of operation		air-cooled four-stroke diesel engine
Combustion method		Direct-fuel injection
Number of cylinders		1
Bore / stroke	mm	104 / 85
Displacement	cm^3	722
Engine oil content without filter with filter	approx. L approx. L	1.5 [1] 1.6 [1]
Volume of oil between „max" and „min" marks	approx. L	0.7 [1]
Consumption of lubrication oil after running-in period		approx. 1 % of fuel consumption at full bad
Engine oil pressure Oil temperature 100 ± 20 °C		min. 0.6 bar at 850 rpm.
Direction of rotation looking at the flywheel		counterclockwise
Valve clearances at 10 - 30 °C Inlet Exhaust	 mm mm	 0.30 0.30
Max. angle from vertical in any direction (continuous operation)	max.	25° [2]
Weight (incl. fuel tank, air-cleaner, exhaust silencer and electric starter) Engine models V Engine models W	 approx. kg approx. kg	 106 108
Battery capacity	min / max	12 V - 45 / 88 Ah • 24 V - 36 / 55 Ah

Model V: normal system of balancing, counterclockwise rotation
W: add. system of balancing, counterclockwise rotation

[1] These data are approx.-values. The max. mark on oil dipstick counts, fig. 6.

[2] Exceeding these limits causes engine breakdown.

3.2. Transport



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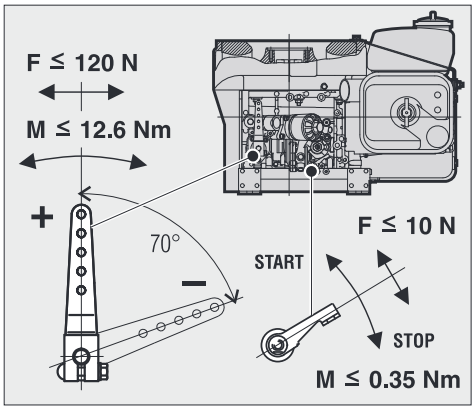

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Location for suspension lugs „1", please see picture 2.
Suspension lugs serve for save engine transport. They are not suitable and allowed for lifting complete machines.

The permitted loads and elements on the speed adjusting lever and the stop lever should be observed as an exess can lead to damage to the contacts and inner governor parts.

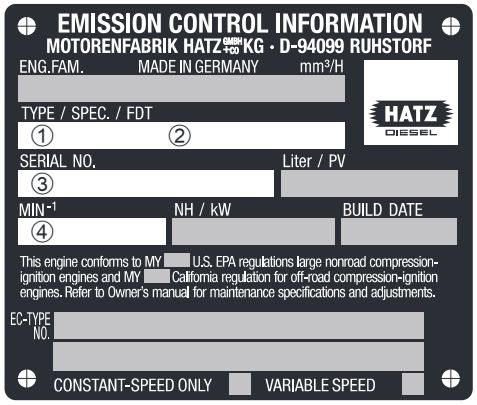
3.3. Instructions for installation

If you have an engine which is not yet installed in a machine and still has to be installed, make sure that the Assembly Instructions for HATZ Diesel Engines are complied with prior to installation. These Assembly Instructions contain important information about safe assembly of the engine and are available from your the HATZ service center in your area.
Pending complete installation, the engine must not be started!
Moreover, we would like to point out that in this case, commissioning of the machine is also prohibited until it has been verified that the machine into which this engine is to be incorporated complies with all the safety precautions and regulations provided by law.
Refer also to the Declaration for Incorporation at the end of these Operating Instructions.

3.4. Load on engine

Operating the engine for a lengthy period off-bad or at very low bads can affect its running quality.
We therefore recommend a minimum engine bad of 15 %. If operated at such low bads, it is best to operate the engine at a significantly higher bad for a short period before switching it off.

3.5. Type plate



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The type plate is placed on the crankcase (chapt. 2) and includes the following engine information:

① engine type
② code (only for special equipment)
③ engine number
④ max. engine speed

For any offer as well as spare parts orders it is necessary to mention these data (also see spare parts list, page 1).

4. Operation

4.1. Before initial start-up

Engines are normally delivered without fuel and oil.

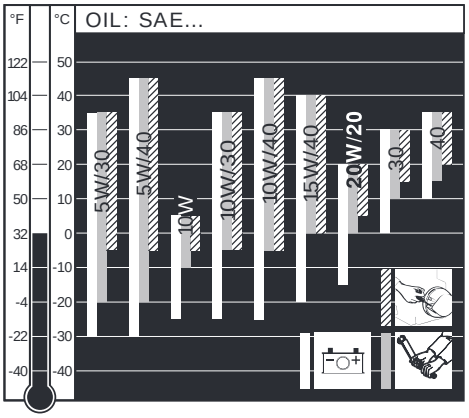
4.1.1. Engine oil

Oil quality
Qualified are all trademark oils which fulfil at least one of the following specifications:

ACEA – B2 /E2 or more significant
API – CD /CE /CF /CF-4 /CG-4 or more significant.

If engine oil of a poorer quality is used, reduce oil change intervals to 150 hours of operation.

Oil viscosity:



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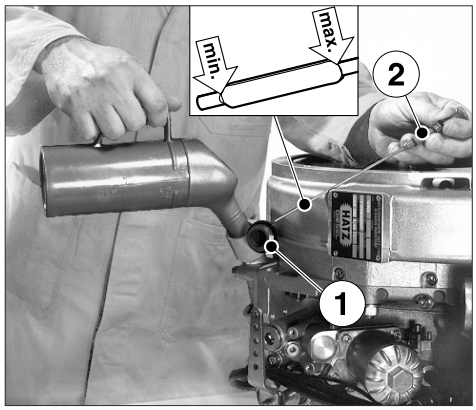
Please select the recommended viscosity depending on the ambient temperature at which the engine is operated.

Inappropriate engine oil may shorten the engine's service life significantly.

The engine must be in a horizontal position before adding oil or checking the oil level.



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– Remove oil fill screw „1" and dipstick „2".

– Add engine oil up to the max. mark on the dipstick.
  Lubricating oil capacity: see Chapter 3.1.

– Tighten oil fill screw by hand.

Attention!
If the engine is operated while the oil level is below the min. mark or above the max. mark, it can cause damage to the engine.

4.1.2. Fuel

⚠ Only refuel when engine is stopped. Never refuel close to open flames or flammable sparks, don't smoke. Use only pure fuel and clean replenishing cups. Don't spill the fuel.

All diesel fuels sold as fuel and complying with the following minimum specification can be used:

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

Important!
The use of fuels of different specifications requires the prior written consent of the HATZ headquarters.

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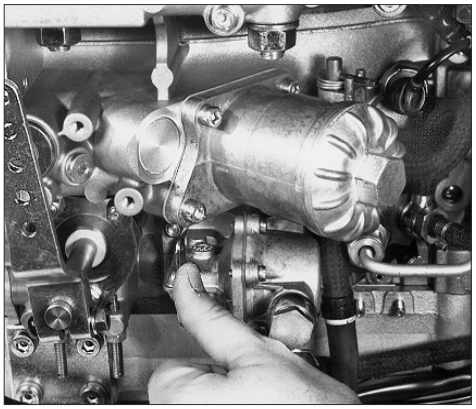
– Add diesel fuel to the fuel tank until it is at least half full.
  The fuel system is bled automatically if the fuel tank is attached to the engine or located higher than the injection pump.



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– If the fuel tank is not mounted on top of the engine, or is at a lower level, operate the lever on the fuel feed pump until fuel is heard to flow back to the tank through the return line.

At temperatures below 0 °C, winter-grade fuel should be used or paraffin added to the fuel well in advance.

Lowest ambient temperature when starting, in °C	Paraffin content for:	
	Summer fuel	Winter fuel
0 up to –10	20 %	–
–10 up to –15	30 %	–
–15 up to –20	50 %	20 %
–20 up to –30	–	50 %

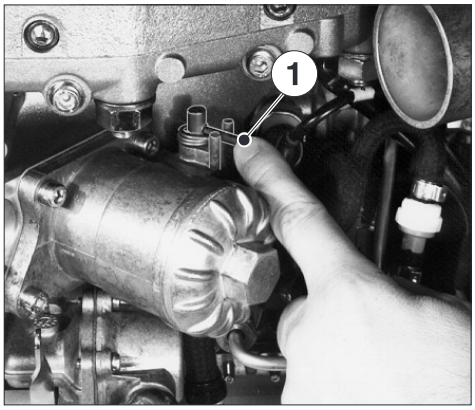
4.1.3. Mechanical oil pressure monitor (optional extra)

The mechanical oil pressure monitor should be activated:

- when first filling, or after running the fuel tank dry.
- if engine shut down automatically because lubricating oil supply was inadequate.

– Add fuel, chap. 4.1.2.

– Check engine oil level, chap. 5.2.1.



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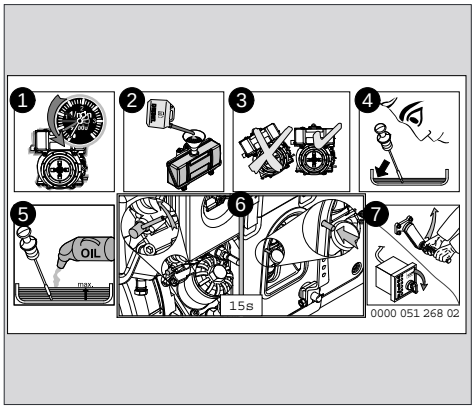
– To activate the monitor, press lever „1" for approx. 15 seconds.

– If the engine has a fuel feed pump, operate its lever for several strokes at the same time (Fig. 8).



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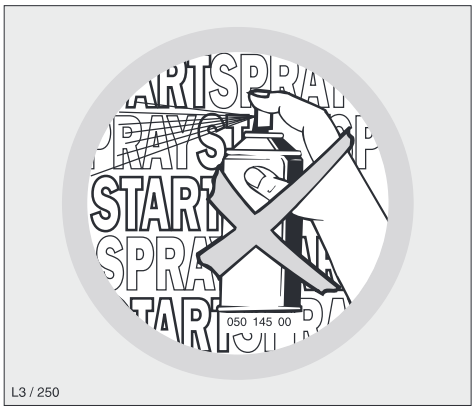
Instructions to activate the mechanical oil pressure control are mentioned on the sticker placed on the engine.

IMPORTANT !
Even with mechanical oil pressure monitoring the oil level must be checked every 8 – 15 operating hours.

4.2. Starting the engine

⚠ Do not run the engine in closed or badly ventilated rooms – danger of poisoning ! Before the engine is started, always make sure that nobody is in the danger area (moving parts on engine or machinery) and that all safety guards are in place.



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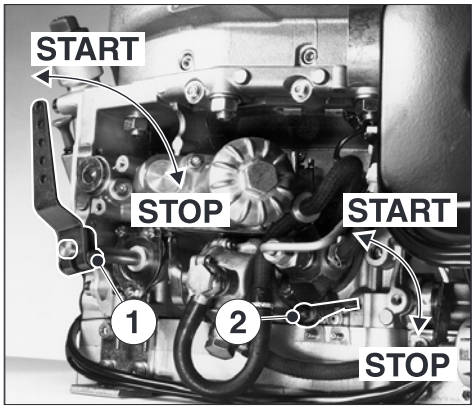
Never use any spray starting aids.

4.2.1. Preparations for starting

– If possible, disengage the engine from any driven equipment.
The auxiliary equipment should always be placed in neutral.



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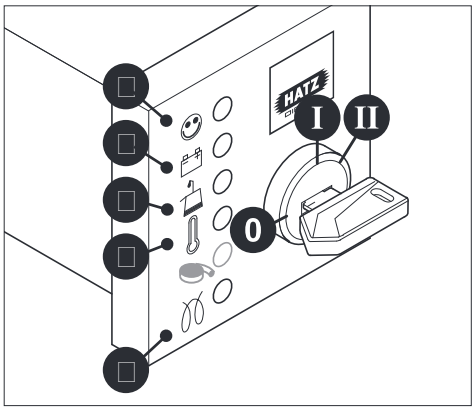
– Set speed control lever „1" to a position between 1/2 START and max. START, according to requirements.
Selecting a lower engine speed will reduce smoke when starting.

– Make sure that stop lever „2" - if fitted - is in the operating „START" position.

4.2.2. Electric starter

For preparations to start, see Chapter 4.2.1.

Starting procedure



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– Insert start key and turn to position I (Fig. 13)

– Battery charge telltale „2" and oil pressure warning „3" must light up.

– Turn start key to position II (Fig. 13).

– As soon as the engine runs, release the start key. It must return to position I by itself and remain in this position during operation.
The battery charge telltale and oil pressure warning must go out immediately after starting. Indicator light „1" is on when the engine is in operation.

– If anything seems to be incorrect, stop the engine immediately and trace and rectify the fault (chapt. 6).

– The engine temperature display „4" (additional equipment) lights up if the temperature at the cylinder head becomes too high.
Switch off the engine and trace and eliminate the cause of the problem, chapter 6.

– Always turn the start key back to position 0 before re-starting the engine. The repeat lock in the ignition lock prevents the starter motor from engaging and possibly being damaged while the engine is still running.

Note:
Start for max. 30 seconds. If the engine does not run after this time, turn starter key back to position 0 and eliminate the cause, Chapter 6.

⚠ Never operate the electric starter when the engine is running or coasting to a standstill. There is a risk of broken starter pinion or ring gear teeth.

Important!
If a starter protection module is installed, the start key has to be returned to position 0 for at least 8 seconds after the engine has failed to start or after switching it off before a further attempt can be made to start the engine.

Preheating device with automatic heating timer (additional equipment)

The preheating light „5" lights up additionally at temperatures below 0° Celsius (Fig. 13).

– After the light has gone out, start the engine without delay.

Automatic shut-down function (additional equipment)

This is characterized by a brief flashing of all pilot lamps once the starter key has been turned to position I (Fig. 13).

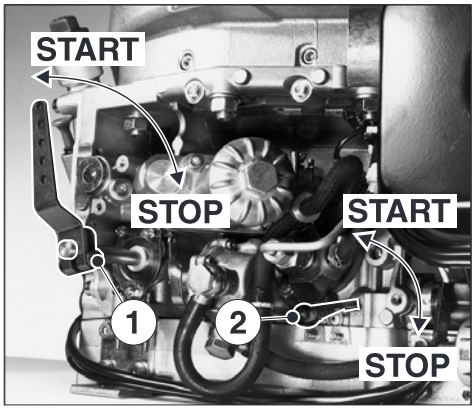
Important!
If the engine cuts out immediately after starting or switches off by itself during operation, a monitoring element in the automatic shutdown system has tripped. The corresponding indicator light (Fig. 13, positions 2 - 4) will come on. After the engine has stopped, the display continues to glow for about 2 minutes.
The electrical device then switches itself off automatically.
The display lights up again after the start key has been turned back to position 0 and then to position I again.
Trace and eliminate the cause of the operating fault before trying to restart the engine (see chapter 6).

The display light goes out when the engine is next started.

Even with automatic shutdown monitoring the oil level must be checked every 8 – 15 operating hours (chapter 5.2.1.).

4.3. Stopping the engine

⚠ During breaks in work or at the conclusion of the working period, keep the starting key in a safe place, out of reach of unauthorized persons.



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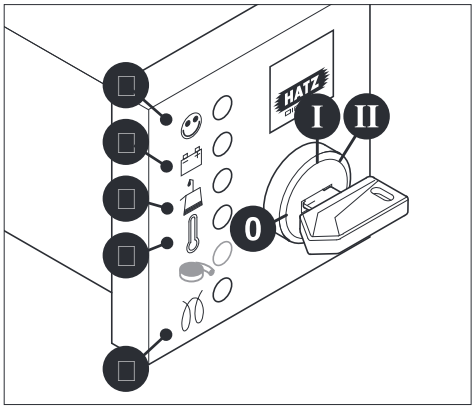
– Move speed control lever „1" back to the STOP position.

– On engines with the lower engine speeds not accessible, move speed control lever „1" back, then move stop lever „2" (optional extra) in the STOP direction. Hold it there until the engine has stopped.

– Once the engine is not running any longer, release the stop lever. The stop lever is returned automatically to its operating position START via a spring.



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The charge „2" and oil pressure telltales „3" come on.

– Turn the key to the 0 position and pull it out. The telltale lights must then go out.

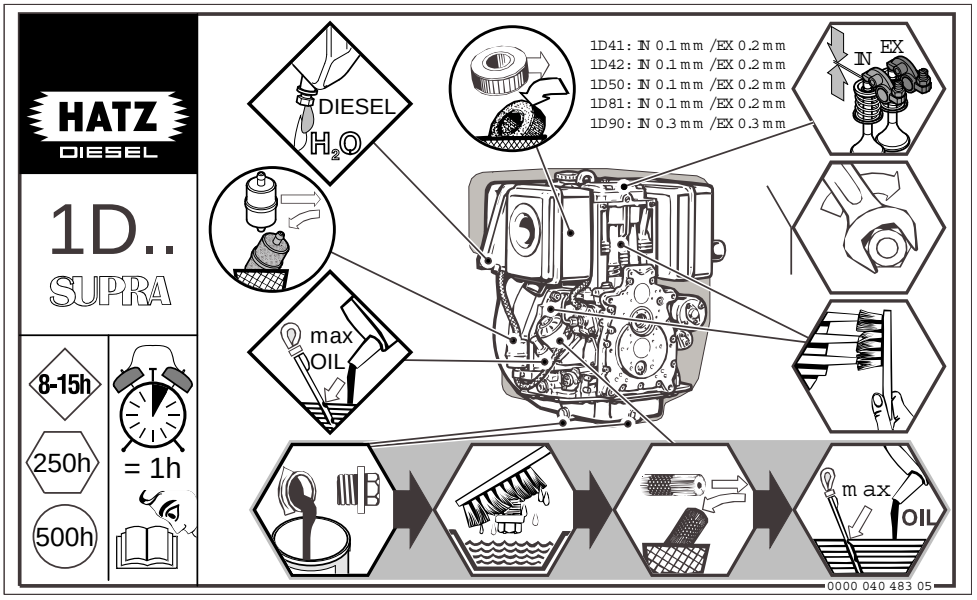
Note:
Engines with an automatic shut-down function (chapter 4.2.2.), can also be switched off by turning the start key back to position 0.

5. Maintenance

⚠ The engine must be stopped before any maintenance work is attempted.
Comply with legal requirements when handling and disposing of old oil, filters and cleaning materials.
Keep the engine's starting key out of reach of unauthorized persons.
Disconnect the negative battery terminal.
At the end of the maintenance work, check that all tools have been removed from the engine and all safety guards, covers etc. replaced in their correct positions.
Before starting the engine, make sure that nobody is in the danger area (engine or driven machinery).

5.1. Maintenance summary

	Maintenace intervals	Maintenance work required	Chap.
8-15	Every 8 – 15 operating hours or before daily starting.	Check oil level.	5.2.1.
		Check area round combustion air input.	5.2.2.
		Check the air cleaner maintenance indicator.	5.2.3.
		Check the cooling air zone.	5.2.4.
		Check the water trap.	5.2.5.
250	Every 250 operating hours	Replace engine oil and oil filter.	5.3.1.
		Check and adjust tappet clearance.	5.3.2.
		Clean cooling air system .	5.3.3.
		Examine screw connections.	5.3.4.
500	Every 500 operating hours	Replace fuel filter.	5.4.1.
		Maintenance of dry-air filter.	5.4.2.



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The above maintenance chart is supplied with every engine. This label should be affixed to the engine or equipment in an easily visible position. The maintenance chart governs the maintenance intervals.

For new or reconditioned engines, the following must always be carried out after first 25 operating hours:

- Replace engine oil and oil filter, chap. 5.3.1.
- Check tappet clearance, and adjust if necessary, chap. 5.3.2.
- Examine screw connections, chap. 5.3.4. Do not tighten the cylinder head fastening.

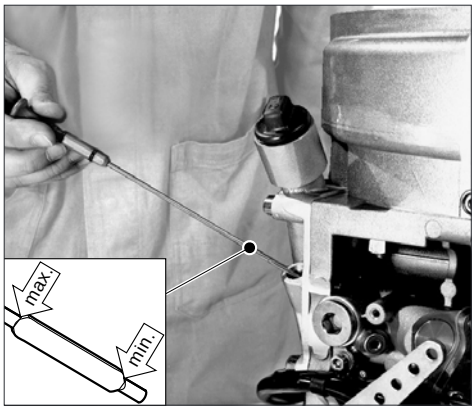
For short operating periods: replace engine oil and oil filter after 12 months at the latest, regardless of the number of operating hours.

5.2. Maintenance every 8 – 15 hours of operation

5.2.1. Check engine oil level

When checking the oil level, the engine should be standing level, and must not be running.

– Remove any dirt in the dipstick area.



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– For oil level inspection, remove the dipstick and wipe it dry using a lint-free, clean piece of cloth; then insert it to its stop and pull it out again.

– Check oil level at the dipstick; top up if necessary as far as the „max" mark (see Chapter 4.1.1.).

Attention!
If the engine is operated while the oil level is below the min. mark or above the max. mark, it can cause damage to the engine.

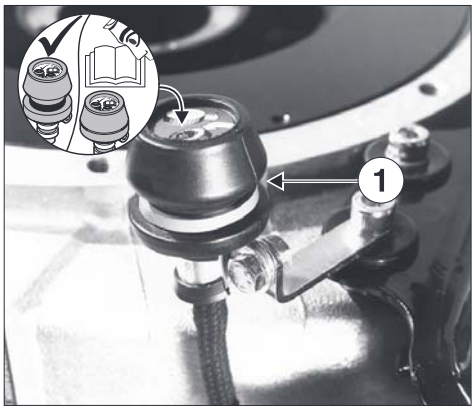
5.2.2. Check air intake point

Severe contamination is a sign that there are large amounts of dust in the atmosphere and the air cleaner maintenance intervals should be reduced.

– Depending on the air intake pattern, check for severe blockage; clean if necessary (see Chapter 2).

5.2.3. Air cleaner blockage indicator (optional extra)

– Run the engine at full speed shortly.



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If the rubber bellows is pulled in and obscures the green zone „1", maintenance work is due on the air cleaner, Chapt. 5.4.2.
In dusty operating conditions, check the rubber bellows several times a day.

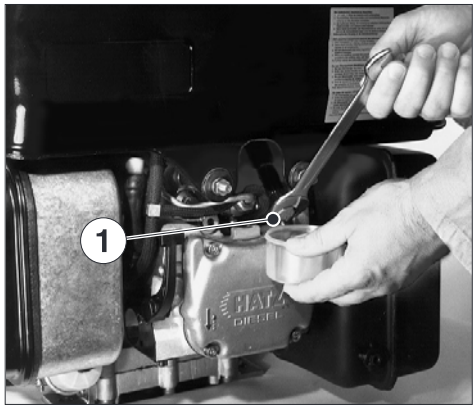
5.2.4. Checking cooling air zone

Severe contamination is a sign that there are large amounts of dust in the atmosphere and that maintenance intervals should be reduced.

– Check the air inlet and outlet zones for blockage by coarse material such as leaves, large amounts of dust etc., and clean if necessary (see chapters 2 and 5.3.3.).
If a temperature warning light „4" is provided, it will come on if the engine overheats (Fig. 15).
In this case, stop the engine immediately (Chapters 4.3. and 5.3.3.).

5.2.5. Checking the water trap

The intervals at which you should check the water trap depend entirely on the amount of water in the fuel and the care taken when refuelling. The normal interval is once a week.



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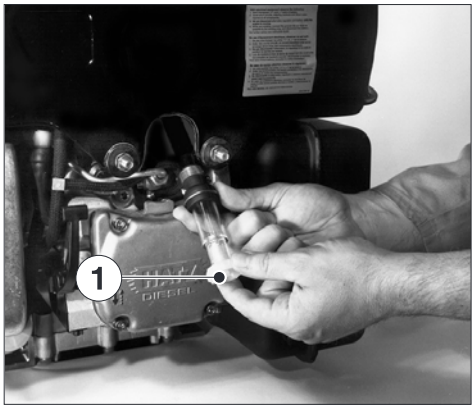
– Loosen hexagon screw „1" with approx. 2-3 rotations.

– Trap the drops which emerge in a transparent vessel. Since water has a greater specific gravity than diesel fuel, the water emerges before the diesel fuel. The two substances separate at a clearly visible line.

– As soon as diesel only emerges at screw „1", this can be tightened again.

If an external water trap is attached, check its water content every day, when the engine oil level is checked.
The water which has collected is separated at a clearly visible line from the diesel fuel above it.



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– Open drain plug „1" and drain the water out into a suitable vessel.

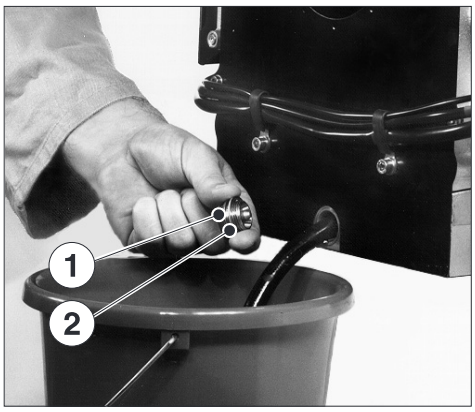
If the drain plug is difficult to reach, an extension hose can be attached to it.

5.3. Maintenance every 250 hours of operation

5.3.1. Changing engine oil, renewing oil filter

The engine must be stopped, and should stand on a flat, level surface.
Drain the engine oil only when it is warm.

⚠ Danger of scalding from hot oil. Trap the old oil and dispose of it in accordance with local legislation.



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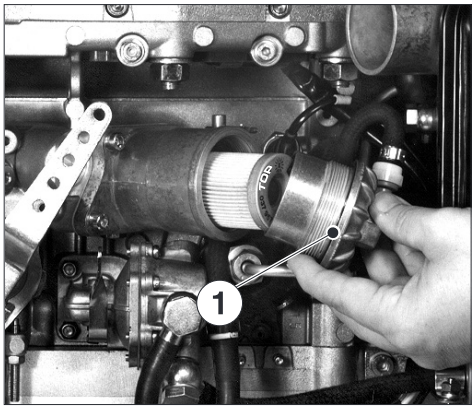
– Unscrew the oil drain plug „1" and allow all the oil to drain out.

– Clean the oil drain plug and attach a new seal „2". Insert and tighten the plug.



22

– Renew the replaceable lubricating oil filter-element (optional extra). Catch leaking oil!

Important!
Note the „TOP" mark on the oil filter.

23

– Clean sieve bottom carefully in order not to bend the netting. Wipe out cap screw or blow it out with compressed air.

⚠ Persons handling compressed air must wear protective goggles. Never direct the jet to animals, persons or yourself!

– Check condition of O-ring „1" and renew it if necessary (Fig. 22).

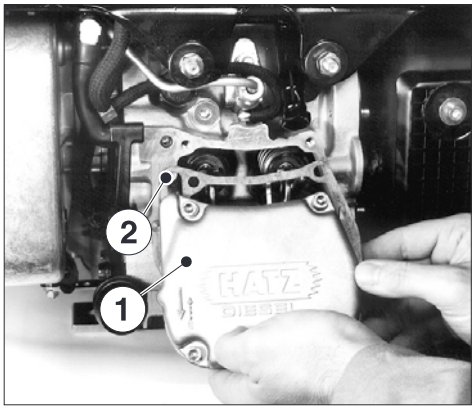
– Wet the thread and the O-ring of the drain plug with lubricant „K" (see spare parts list).

– Add engine oil up to the „max" mark on the dipstick (see Chapter 4.1.1.).

– Run the engine for a short period, then check the oil level again and top up if necessary.

– Check that there is no leakage past screw plug on the oil filter housing.

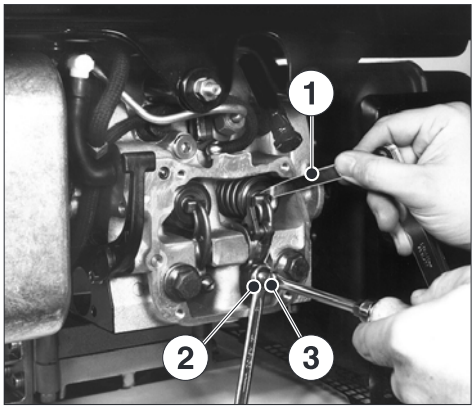
5.3.2. Checking and adjusting valve clearances



24

– Unscrew cover „1" and take off together with gasket „2". Never re-use this gasket.

– Turn the engine over in the normal direction of rotation until compression is felt.



25

– Check valve clearances between rocker and valve stem, using feeler gauge „1"; (see Chapter 3.1.).

– If valve clearance is incorrect, slacken off hex. nut „2".

– Turn adjusting screw „3" with a screwdriver until feeler gauge „1" can just be pulled through between the rocker and the valve stem with slight resistance to its movement after nut „2" has been retightened.

– Attach the cover at the cylinder head again and tighten down uniformly.

– Run the engine briefly and check that the cover is not leaking.

5.3.3. Clean the cooling air system

Before cleaning, the engine must be stopped and allowed to cool down.

– Remove parts of air duct.

Dry contamination
– Clean all air guide elements and the complete cooling air zones on the cylinder head, cylinder and flywheel blades without making them wet. Blow them dry with compressed air.

Persons handling compressed air must wear protective goggles. Never direct the jet to animals, persons or yourself!

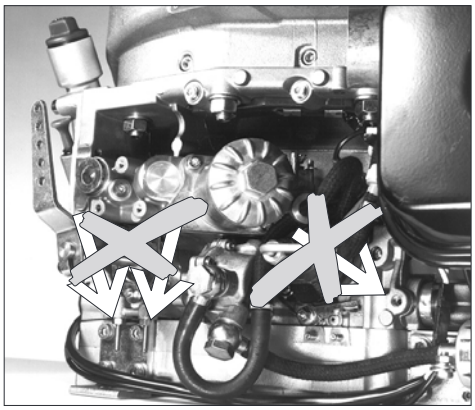
Moist or oily contamination
– Disconnect the battery. Clean the complete area with a solvent, cold cleaner etc. according to its manufacturer's instructions, then spray down with a powerful water jet.
Do not splash electrical device with water jet or pressure jet during engine cleaning.
– Trace the cause of any contamination with oil and have the leak eliminated by a HATZ service station.
– Install the air guide elements previously removed.

The engine must never be run without the air guide elements in position.

Immediately after re-assembly, run the engine until warm to prevent residual moisture from causing rust.

5.3.4. Checking threaded connections

Check the condition and tightness of all threaded connections, wiring, hose clips and other components attached to the engine and its mountings, provided that these can be reached during maintenance work.
Do not tighten the cylinder head bolts.



26

Adjustment screws on speed governor and injection system are painted with safty lacquer. Do not tighten or adjust them.

5.4. Maintenance every 500 hours of operation

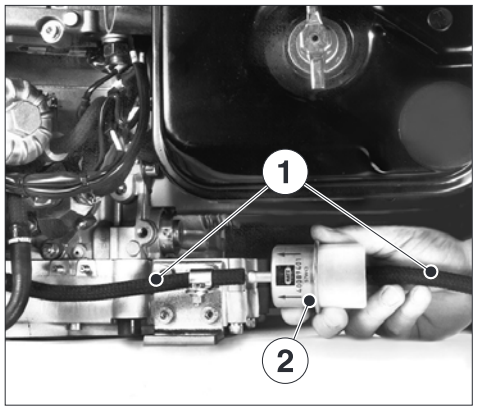
5.4.1. Renewing fuel filter

Fuel filter maintenance intervals depend on the purity of the fuel used; reduce them to 250 hours of operation if necessary.

⚠ Do not smoke or bring a naked flame near the fuel system when working on it.

– Place a suitable vessel under the filter to trap escaping fuel.

– Close the fuel supply line.



27

– Pull fuel supply line „1" off fuel filter „2" at both sides, and insert the new filter.

Important!
Keep the entire area clean so that no dirt reaches the fuel. Fuel particles may damage the injection system.

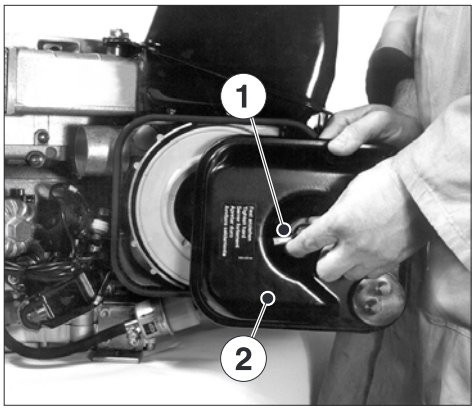
– Always renew the fuel filter. Note the arrows indicating the correct direction of fuel flow.

– Open the fuel supply line or prime the pump until the fuel flows (see Chapter 4.1.2.).

– Run the engine briefly to check the fuel filter and lines for leaks.

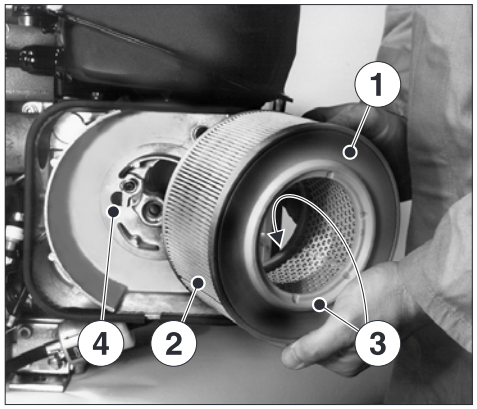
5.4.2. Dry-type air cleaner maintenance

It is best to clean the filter cartridge only when the maintenance indicator displays the appropriate signal.
Apart from this, the cartridge should be renewed after 500 hours of operation.



28

– Slacken off wing bolt „1" and remove it with cover „2".



29

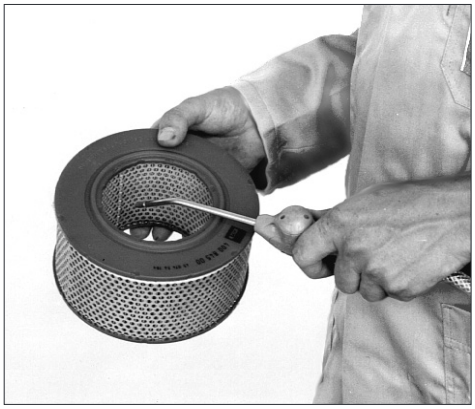
– Carefully pull out filter cartridge „1".

– On the version with air cleaner maintenance indicator, check that valve plate „4" is clean and in good condition.

– Clean filter housing and cover.
Make sure that dirt or other foreign matter cannot enter the engine air intake port.

Cleaning the filter cartridge

Dry contamination



30

– Blow through the filter cartridge from the inside, moving the jet of dry compressed air up and down until no further dust is expelled.
Warning: air pressure must not exceed 5 bar.

⚠ Persons handling compressed air must wear protective goggles. Never direct the jet to animals, persons or yourself!

– Tilt the filter element and hold it against the light (or shine a light through it) to trace any cracks or other damage.

Important!
If there is even the slightest damage to paper filter element „2" or sealing lips „3", the filter element should not be re-used. (Fig. 29)

Wet or oily contamination
– Renew the filter cartridge.

– Re-assemble in the reverse order of work.

6. Malfunctions – Causes – Remedies

Malfunction	Possible causes	Remedial action	Chap.
Engine will not start or start is delayed, although it can be turned over with the starter.	Speed control lever is in stop or idle position.	Set lever to „START"-position	4.2.
	Stop lever in stop position.		
	No fuel reaching injection pump.	Add. fuel.	4.1.2.
			4.1.3.
		Check entire fuel supply system carefully.	
		If no fault is found:	
		- supply line to engine	
		- fuel filter	5.4.1.
		- Function of delivery pump must be checked.	4.1.2.
	Compression too low:		
	- Valve clearances incorrect	Check valve clearances, adjust if necessary.	5.3.2.
	- Valves worn	See workshop manual.	
	- Cylinder bore and/or piston ring wear	See workshop manual.	
	Injector not operating correctly.	See workshop manual.	
Also applicable for engines with mechanical oil pressure monitoring.	Oil pressure lost.	Check engine oil level.	5.2.1.
		Activate mechanical oil pressure monitor.	4.1.3.
At low temperatures.	Lower starting temperature limit exceeded.	Operate preheat system (optional extra).	4.2.2.
	Machinery not uncoupled.	Disengage engine from machinery or equipment if possible.	
	Defective preheat system (optional extra).	See workshop manual.	

Malfunction	Possible causes	Remedial action	Chap.
At low temperatures.	Fuel separates has inadequate resistance to low temperatures.	Check whether clear (not turbid) fuel emerges at the fuel line detached from the injection pump. If turbid or separated - either warm up the engine or drain the complete fuel supply system. Refuel with winter-grade fuel to which paraffin has been added.	4.1.2.
	Starting speed too low:		
	- Engine oil is too thick	Refill with a different grade of engine oil.	5.3.1.
	- Battery charge is insufficient.	Check the battery; consult a specialist workshop if necessary	7.
Starter does not run or engine is not turned over.	Fault in electrical system:		
	- Battery and/or other wiring is wrongly connected.	Check electrical system incl. indiv. components or contact a HATZ-service station.	7.
	- Wiring connections loose and/or corroded.		
	- Battery defective and/or flat.		
	- Defective starter motor		
	- Defective relays, monitoring elements etc.		
Engine fires but stops again as soon as starter is switched off.	Drive still engaged.	Uncouple engine from driven machinery if possible.	
	Fuel filter blocked.	Renew the fuel filter.	5.4.1.
	Fuel supply interrupted.	Check through the entire fuel supply systematically.	
	Stop signal from monitoring element for automatic shutdown system (optional extra):		
	- oil pressure lost	Check oil level.	5.2.1.
	- cylinder head temperature too high.	Clean cooling air system.	5.3.3.
	- alternator has failed.	See workshop manual.	

Malfunction	Possible causes	Remedial action	Chap.
Engine stops by itself during regular operation.	Fuel supply is interrupted:		
	- Tank run dry	Add fuel.	4.1.2. 4.1.3.
	- Fuel filter blocked	Renew fuel filter.	5.4.1.
	- Defective feed pump.	Check through entire fuel supply system.	
	Mechanical oil pressure monitor stops the engine due to low oil pressure.	Check engine oil level. Activate mechanical oil pressure monitor.	5.2.1. 4.1.3.
	Mechanical defects.	Contact a HATZ-service station.	
In addition, if automatic electrical engine shutdown is installed.	Stop signal from monitoring element because of:	Check engine for:	
	- oil pressure too low.	Engine oil level	5.2.1.
	- cylinder head temperature too high.	Cooling air passages blocked or cooling system otherwise affected.	5.3.3.
	- alternator has failed.	See workshop manual.	
	Malfunction signal from over-voltage and polarity reversal protection in voltage regulator:		
	- Battery and/or other cable connections incorrectly connected.	Check electrical equipment and the components thereof.	
	- Cable connections loose.		
Low engine power, output and speed.	Fuel supply is obstructed:		
	- Tank run dry.	Add fuel.	4.1.2. 4.1.3.
	- Fuel filter blocked.	Renew fuel filter.	5.4.1.
	- Tank venting is inadequate	Ensure that tank is adequately vented.	
	- Leaks at pipe unions.	Check threaded pipe unions for leaks.	
	- Speed control lever does not remain in selected position.	Prevent speed control from moving.	

Malfunction	Possible causes	Remedial action	Chap.
Low engine power, output and speed, black exhaust smoke.	Air cleaner blocked.	Remove dirt from air cleaner.	5.4.2.
	Incorrect valve clearances.	Adjust valve clearances.	5.3.2.
	Malfunction at injector.	See workshop manual.	
Engine runs very hot. Cylinder head overheat, telltale lamp (optional extra) comes on.	Too much oil in engine.	Drain off engine oil down to upper mark on dipstick.	5.3.1.
	Inadequate cooling:		
	- Entire cooling air system contaminated.	Clean cooling air system.	5.3.3.
	- Inadequate sealing at air guide plates.	Check that air guide plates and enclosure elements are all present and make a tight seal.	

7. Work on the electrical system

⚠ Batteries generate explosive gases. Keep them away from naked flame and sparks which could cause them to ignite. Do not smoke. Protect the eyes, skin and clothing against battery acid. Pour clear water over acid splashes immediately. In case of emergency call doctor.
Do not place any tools on top of the battery.

Always disconnect the negative (–) pole of the battery before working on the electric device.

- The positive (+) and negative (–) battery terminals must not be accidentally interchanged.
- When installing the battery, connect the positive lead first, followed by the negative lead. Negative pole to earth (ground) on engine block.
- When removing the battery, disconnect the negative lead first, followed by the positive lead.
- In all circumstances, avoid short circuits and shorts to earth (ground) at live cables.
- If electrical faults occur, first check for good contact at the cable connections.
- Replace a failed indicator light without delay.
- Do not take the key out while the engine is running.
- Never disconnect the battery while the engine is running. Electric voltage peaks can cause damage to electrical components.
- Do not splash electrical device with water jet or pressure jet during engine cleaning.
- When carrying out welding work on the engine or attached equipment, attach the earth (ground) clip as near as possible to the welding point, and disconnect the battery.
  If an alternator is fitted, separate the plug connector leading to the voltage regulator.

The relevant circuit diagrams are supplied with engines which have an electrical system. Additional copies of circuit diagrams can be obtained on request.

HATZ assumes no liability for electrical systems which was not carried out acc. HATZ circuit diagrams.

8. Protective treatment

A new engine can normally be stored for up to 12 months in a dry place.
If atmospheric humidity is high (or if exposed to sea air), protection is sufficient for about 6 months' storage.
If the engine is to be stored for a longer period, or laid up out of use, please consult the nearest HATZ service point.

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:
1D41=09421; 1D42=13310; 1D50=10916; 1D81=07325; 1D90=10818; 1D90V=11315

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., 1.2.4.3., 1.3.1., 1.3.2., 1.3.3., 1.3.4., 1.3.7., 1.3.9., 1.4.1., 1.4.2.1., 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 **)

29/09/2009	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.

Technical Library

http://engine.od.ua