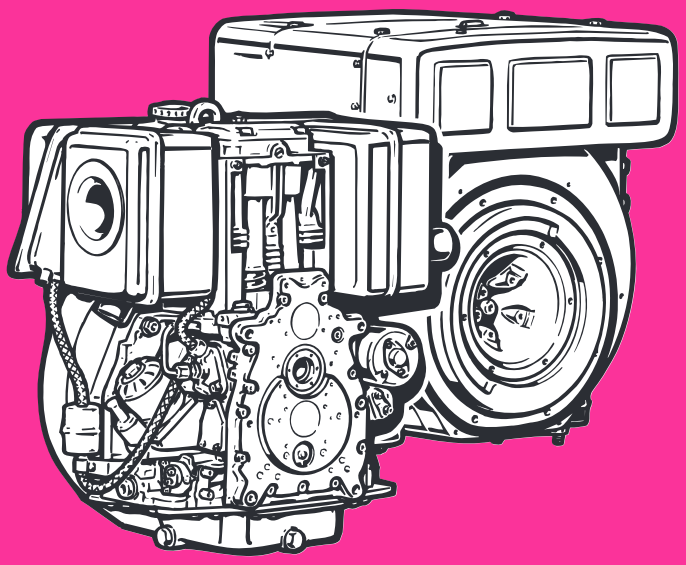
Translation of the
ORIGINAL INSTRUCTION BOOK



1D 41.
1D 42.
1D 50.

1D 81.
1D 90.

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Printed in Germany

33

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.

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

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.

In the interests of technical progress we reserve the right to introduce modifications.

MOTORENFABRIK HATZ GMBH & CO KG

Contents

This symbol draws attention to important safety precautions.
Please comply with them most carefully in order to avoid any risk of injury to persons or damage to materials.
General legal requirements or safety regulations issued by the competent authorities or industrial accident insurers are also applicable.

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; this is particularly important on engines started with a starting handle.
- Mechanical starting devices must not be used by children or persons of insufficient physical strength.
- In order to benefit from the advantages of the starting handle with kick-back damping, it must be used precisely as recommended in this Instruction Book.
- 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 handle and the 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

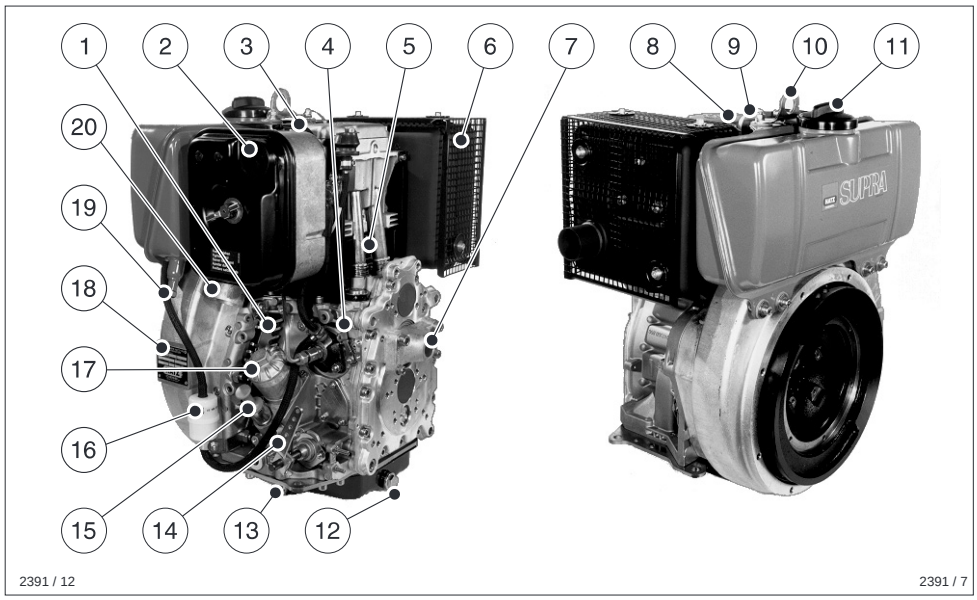
- Stop the engine before performing any maintenance, cleaning- and repair work.
- Stop the engine before refuelling.
  Never add fuel near a naked flame or a source of sparks.
  Don't smoke. Don't spill fuel.
- Keep explosive materials as well as flammable materials away from the engine because the exhaust 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 servicing in accordance with the details provided in this Instruction Book is essential to keep the engine operating reliably.

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

2. Description of engine

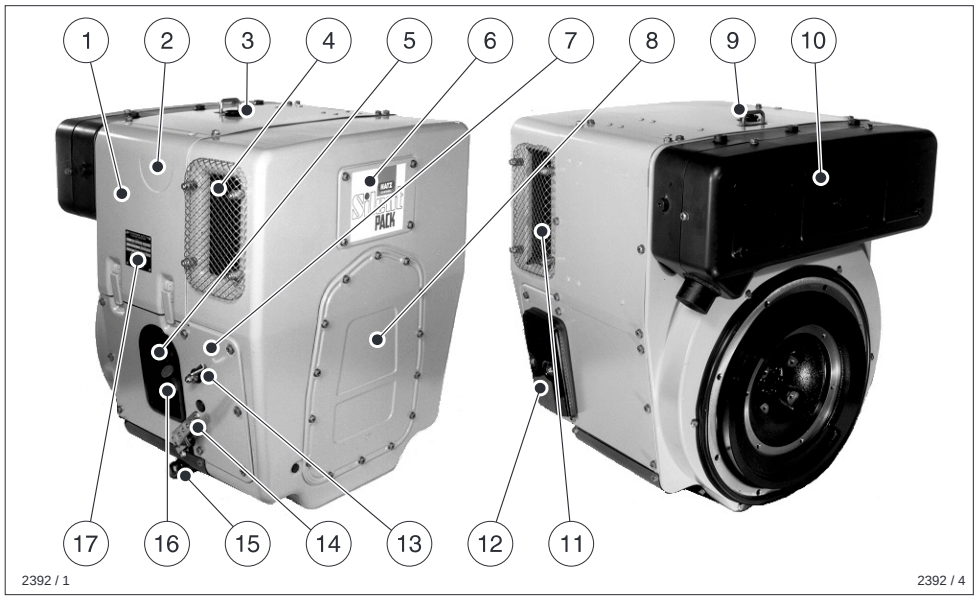
1D41 • 1D42 • 1D50 • 1D81 • 1D90 S / Z engines



1

1 Cooling air inlet
2 Dry-type air cleaner
3 Decompression lever
4 Stop lever
5 Cooling air outlet
6 Silencer (muffler)
7 Guide sleeve for starting handle
8 Cylinder head cover
9 Cold-start oil metering device
10 Suspension lug
11 Tank filler cap
12 Oil drain plug, governor housing
13 Oil drain plug, governor side
14 Speed control lever
15 Oil filler pipe and dipstick
16 Fuel filter
17 Oil filter
18 Type plate
19 Tank drain plug
20 Combustion air intake

Fully-encapsulated version
1D41C • 1D42C • 1D81C • 1D90C engines



2

1 Capsule
2 Decompression lever
3 Cold-start oil metering device
4 Combustion and cooling air intake
5 Oil filter
6 Cleaning hatch
7 Side panels
8 Hold for starting handle
9 Suspension lug
10 Silencer (muffler), encapsul.
11 Cooling air outlet
12 Battery connection and central plug for electrical system
13 Stop lever
14 Speed control lever
15 Oil drain plug
16 Oil filler and dipstick
17 Type plate

3. General information

3.1. Technical data

Type		1D41.	1D42.	1D50.	1D81.	1D90.
Engine models		S, Z, C	S, Z, C	S, Z	S, Z, C	S, Z, C
Mode of operation		air-cooled four-stroke diesel engine				
Combustion method		Direct-fuel injection				
Number of cylinders		1	1	1	1	1
Bore / stroke	mm	90 / 65	90 / 70	97 / 70	100 / 85	104 / 85
Displacement	cm^3	413	445	517	667	722
Engine oil content without filter with filter	approx. L	1.1 [1] 1.2 [1]	1.1 [1] 1.2 [1]	1.4 [1] 1.5 [1]	1.8 [1] 1.9 [1]	1.8 [1] 1.9 [1]
Volume of oil between „max" and „min" marks	approx. L	0.4 [1]	0.4 [1]	0.5 [1]	0.9 [1]	0.9 [1]
Consumption of lubrication oil after running-in period		approx. 1 % of fuel consumption at full load				
Engine oil pressure Oil temperature 100 ± 20 °C	min.	0.6 bar at 850 rpm.				
Direction of rotation looking at the flywheel		counterclockwise				
Valve clearance at 10 - 30 °C Inlet Exhaust	mm	 0.10 0.20	 0.10 0.20	 0.10 0.20	 0.10 0.20	 0.30 0.30
Max. angle from vertical in any direction (continuous operation)	max.	30° [2]	30° [2]	30° [2]	25° [2]	25° [2]
Weight (incl. fuel tank, air-cleaner, exhaust silencer and electric starter) Engine model S Engine model Z Engine model C	 approx. kg approx. kg approx. kg	 78 81 100	 78 81 100	 83 85 –	 105 107 126	 106 108 127
Battery capacity	min / max	12 V - 45 / 88 Ah • 24 V - 36 / 55 Ah				

Model S: non-encapsulated, normal system of balancing
Z: non-encapsulated, add. system of balancing
C: SILENT PACK, add. system of balancing

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

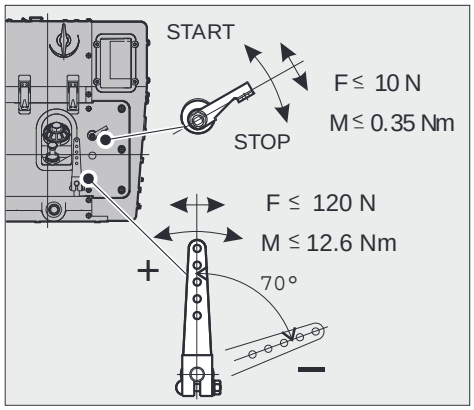
[2] Exceeding these limits causes engine breakdown.

3.2. Transport

A lug is provided on top of the engine as standard equipment, so that the engine can be lifted safely. It is not suitable for lifting complete machines or similar with the engine attached, and this is strictly prohibited. (See Chapter 2.)

3.3. Instructions for installation

The „Manual for Selection and Installation of Engines" contains all the information you need if your engine has not yet been installed on or in the equipment it is intended to drive, or set up in its correct operating position. You can obtain a copy of this manual from your nearest HATZ service station.
Moreover, we would like to point out that in this case, commissioning is prohibited until it has been verified that the machine into which this engine is to be incorporated complies with the regulations of the EC Machinery Directive. Refer also to Chapter 9 „Declaration for Incorporation".



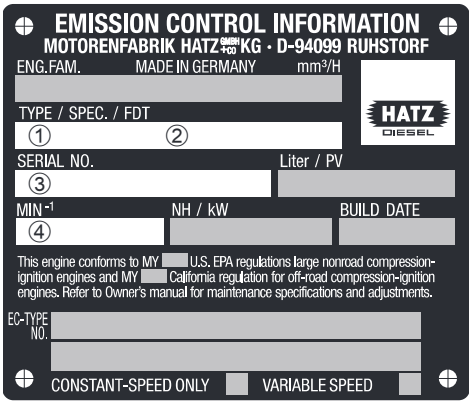
3

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.

3.4. Load on engine

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

3.5. Type plate



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The type plate is placed on the crankcase resp. on the capsule (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.

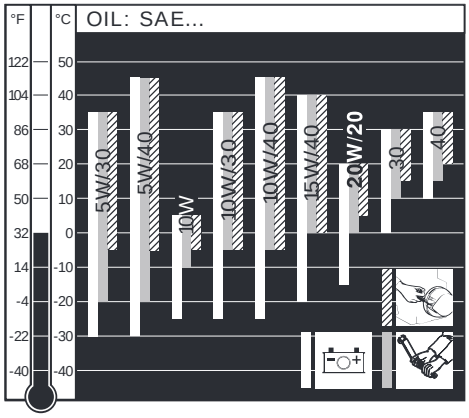
4.1.1. Engine oil

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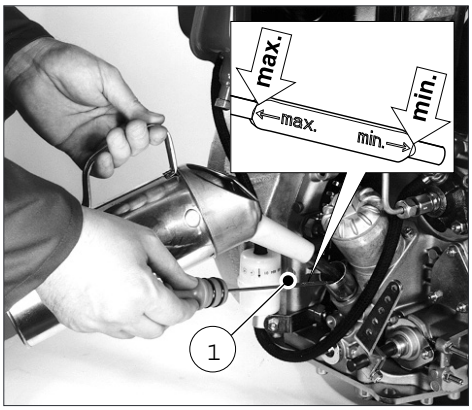
Please select the recommended viscosity depending on the ambient temperature at which the engine is operated.

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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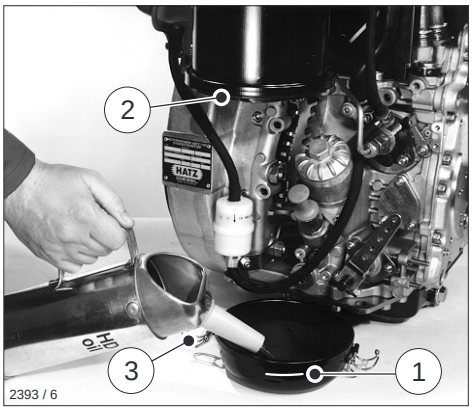
– Pull out dipstick „1" and add engine oil of the correct specification and viscosity up to the „max" mark on the dipstick; (Chapter 3.1.).

4.1.2. Oilbath air cleaner



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– Take off the oil reservoir and fill it up to the mark „1" using engine oil.

– Attach the oil reservoir, making sure that sealing ring „2" is correctly seated and catches „3" are tight.

4.1.3. 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.

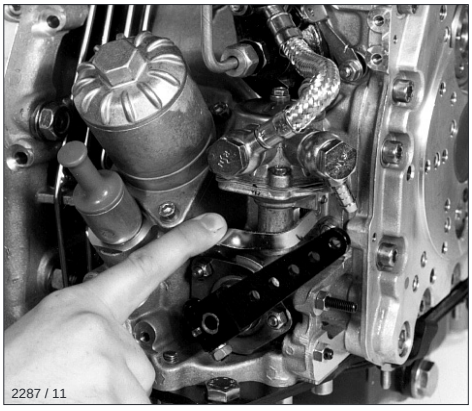
All diesel fuels sold as fuel and complying with the following minimum specification can be used:

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.

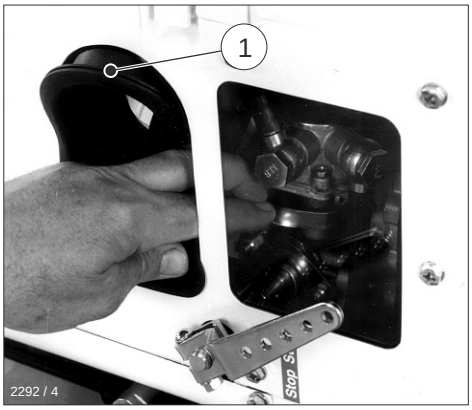
8

– Before the first start or if the fuel tank has been run dry, completely fill the fuel tank with diesel.
The fuel system is bled automatically if the fuel tank is attached to the engine or located higher than the injection pump.



9

– 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.



10

– On fully encapsulated engines, move sleeve „1" to one side to gain access to the feed pump.
After operating the feed pump, make sure that the sleeve is replaced correctly and makes a good seal.

At temperatures below 0 °C, winter-grade fuel should be used or parafin 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 %

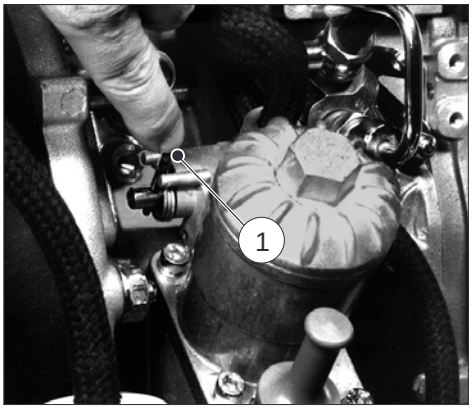
4.1.4. Mechanical oil pressure monitor (optional extra)

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.
- after freeing it by turning at low temperatures (Chapter 4.2.4.)
- after replacing the fuel filter, Chapter 5.4.1.

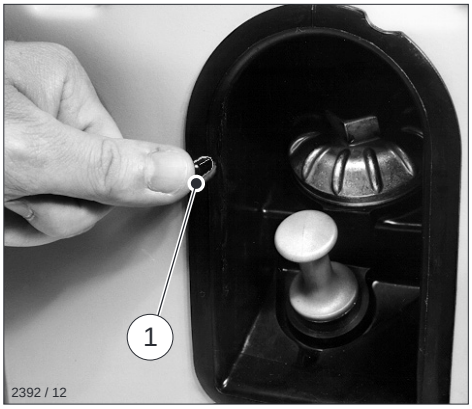
– Add fuel, chap. 4.1.3.

– Check engine oil level, chap. 5.2.1.



11

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

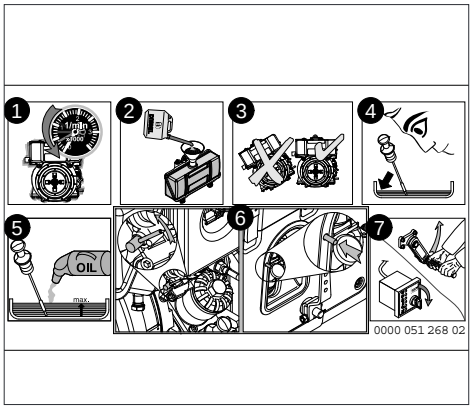


12

– If the engine has a full capsule, press pin „1" for app. 15 seconds.

– If the engine has a fuel feed pump, operate its lever for several strokes at the same time (Figs. 9 and 10).

– Re-assemble all parts repositioned or removed. Check that capsule elements make a good seal.



13

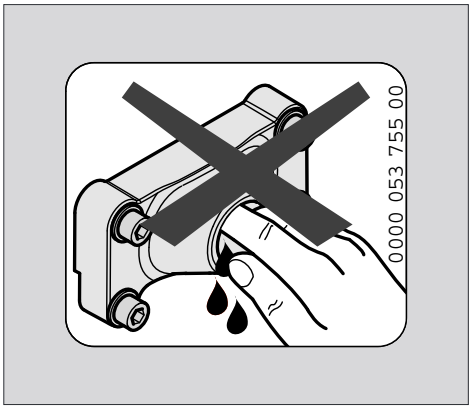
Instructions to activate the mechanical oil pressure control are mentioned on the sticker placed on the engine.

IMPORTANT !
Even with mechanical oil pressure monitoring the oil level must be checked every 8 – 15 operating hours (Chapter 5.2.1.).

4.2. Starting the engine

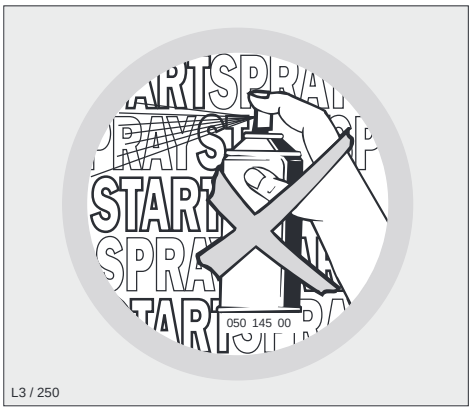
⚠ Do not run the engine in closed or badly ventilated rooms – danger of poisoning ! Before the engine is started, always make sure that nobody is in the danger area (moving parts on engine or machinery) and that all safety guards are in place.

Check that the starting handle is in good condition: renew tubular grip if broken, worn drive pin etc.
Lightly grease the sliding-contact area between the starting handle and the guide sleeve.



14

⚠ Do not enter the guide sleeve of the starting device whilst engine is running - risk of injury !

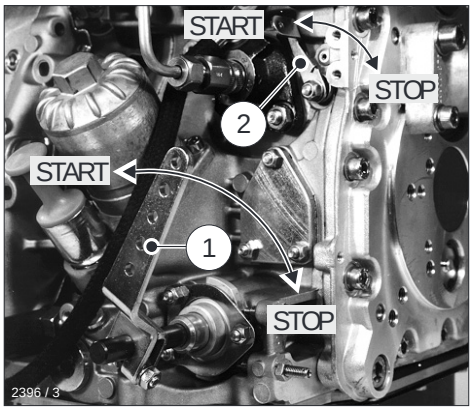


15

⚠ Never use any spray starting aids.

4.2.1. Preparations for starting

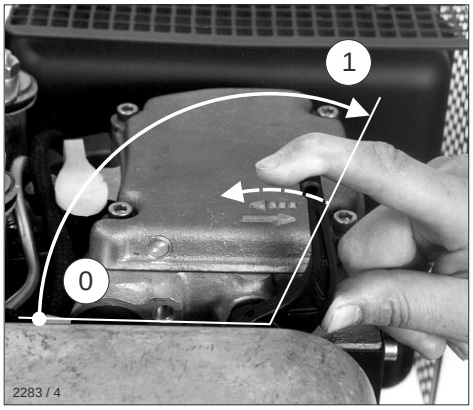
– If possible, disengage the engine from any driven equipment. The auxiliary equipment should always be placed in neutral.



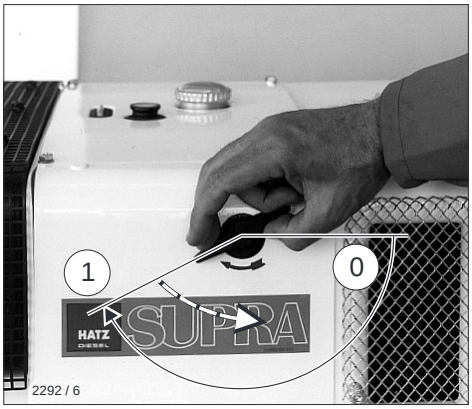
16

– 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.



17



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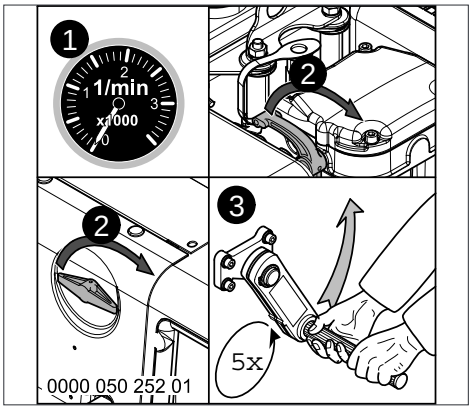
– Turn the decompression lever until stop „1" is reached. In this position the automatic decompression system is heard to engage and the engine can then be started; Figs. 17 and 18.

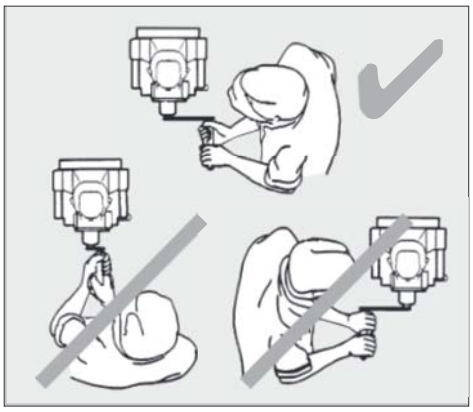


19

After the automatic decompression device has engaged at its limit stop, five turns of the crank handle are needed for the engine to build up compression and fire again.

4.2.2. Starting with the handle

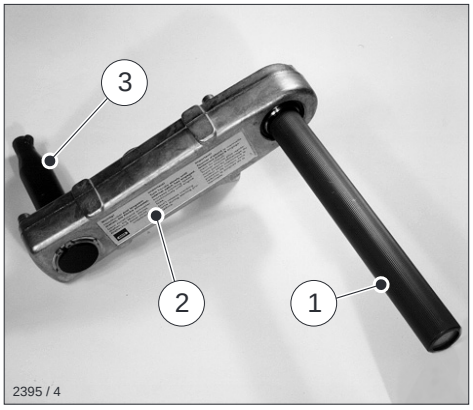
For preparations to start the engine, see Chapter 4.2.1.



20

For correct position to adopt when starting the engine, see Fig. 20.

Starting with the handle with kick-back damping (retrofit)



21

– Always hold tubular grip „1" with both hands.

– Turn the handle slowly until the paw lengages in the ratchet, then increase turning force to build up speed. The highest speed must have been reached when the decompression lever returns to the „0" position (compression). As soon as the engine has started, pull the starting handle out of the guide sleeve.

⚠ You must hold the tubular grip firmly to maintain contact all the time between the starting handle and the engine. Maintain turning force during the entire hand starting operation.

If backfiring occurs when starting the engine because the crank handle was not turned firmly enough, the brief reverse rotation at the handle tube separates the link between crank lug „2" and driving dog „3" (Fig. 21).

– If the engine begins to run backwards after backfiring (smoke emerges from air cleaner), release the crank handle immediately and stop the engine (Chapter 4.3.).

– To restart the engine, wait until it has come to a standstill, then repeat the starting preparations.

Starting by means of the standard starting crank

⚠ In the countries of the European Union, starting cranks without kick-back damping must not be used.

For preparations to start the engine, see Chapter 4.2.1.

– For correct position to adopt when starting the engine, see Fig. 20.

– Take hold of the starting handle with both hands and turn it at increasing speed. The maximum speed of rotation must have been reached by the time the decompression lever has returned to the „0" position (compression). As soon as the engine has started, pull the starting handle out of the guide sleeve.

– If the engine backfires because the crank handle was not turned firmly enough (the engine may even start to run backwards), release the crank handle immediately and stop the engine (Chapter 4.3.).

⚠ There is a risk of injury from the rotating crank handle.

– To restart the engine, wait until it has come to a standstill, then repeat the starting preparations.

Safety precaution
For greater protection against accidental injury when starting with the handle, a handle with kick-back damping can be used.

4.2.3. Starting in cold weather

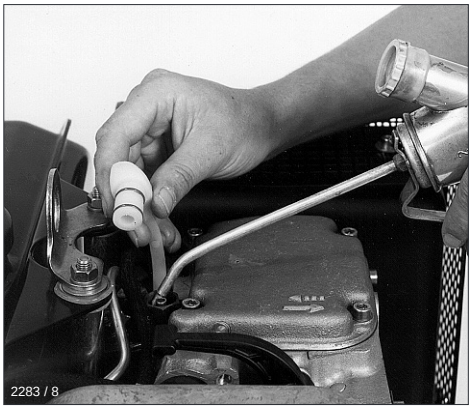
At temperatures below app. –5 °C, always turn the engine over to ensure that it rotates freely.

– Move the speed control lever to the START position; Fig. 16.

– Place decompression lever in central position between „0" and „1" (Fig. 17 and 18).

– Turn the engine over with the starting handle until it is felt to rotate more freely (10 – 20 turns of the starting handle).

– If mechanical oil pressure monitoring is fitted, press lever „1" or pin „1" in for about 15 seconds (Figs. 11 and 12).



22

23

– Remove dirt from the cover of the metering device and the surrounding area. Pull off the cover; Figs. 22 and 23.

– Add a free-flowing lubricating oil to the housing until the level reaches the upper rim. Replace the cover and press it in firmly. Two filling operations in succession are needed.

– Turn the decompression lever until limit stop „1" (fig. 17 and 18).

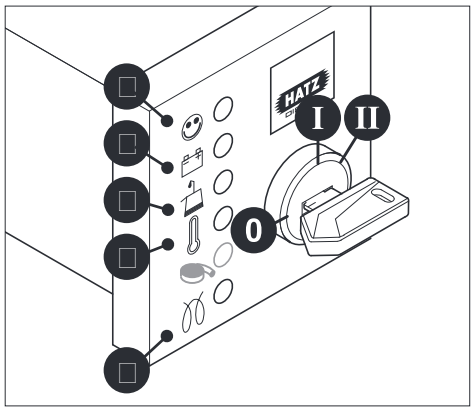
– After this, start the engine immediately. Chap. 4.2.1./4.2.2.

4.2.4. Electric starter

For preparations to start, see Chapter 4.2.1.

– The decompression lever remains in pos. „0".

Starting procedure



24

– Insert the key to its stop and turn it to position I.

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

– Turn start key to position II (fig. 24).

– 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, chap. 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.

⚠ 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 start protection module is installed, the start key has to be returned to position 0 for at least 8 seconds if the engine has failed to start before a further attempt to start the engine can be made.

Preheating device with automatic heating timer (additional equipment)

The preheating light „5" lights up additionally at temperatures below 0° Celsius (Fig. 24).

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

Automatic electrical shutdown system (additional equipment)

This is characterized by a brief flashing of all pilot lamps once the starter key has been turned to position I (Fig. 24).

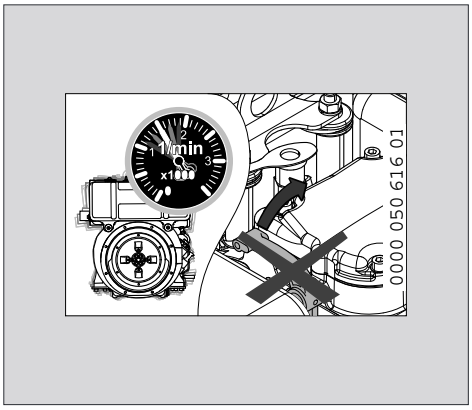
Important!
If the engine cuts out immediately after starting or switches off by itself during operation, a monitoring element in the automatic shutdown system has tripped. The corresponding indicator light (Fig. 24, positions 2 - 4) will come on.
After the engine has stopped, the display continues to 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.).

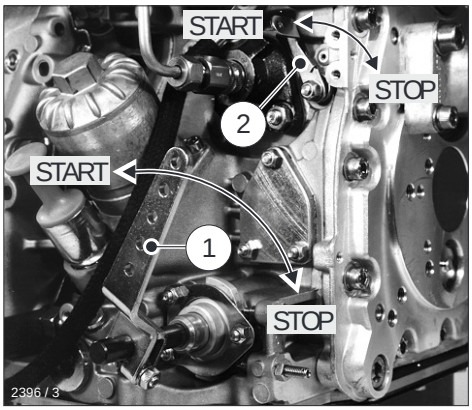
4.3. Stopping the engine

⚠ Never stop the engine by moving the decompression lever. During breaks in work or at the conclusion of the working period, keep the starting handle and starting key in a safe place, out of reach of unauthorized persons.



25

⚠ Never stop the engine by actuating the decompression lever!
Risk of damage to the engine.



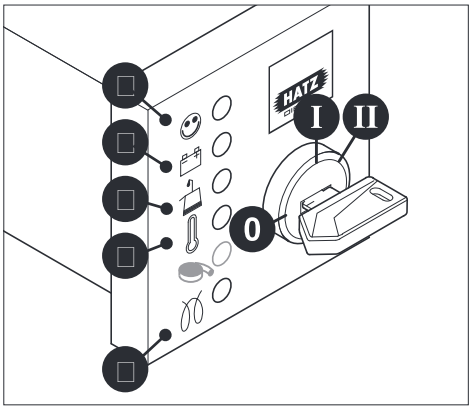
26

– 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" 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.

Electrical system



27

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.

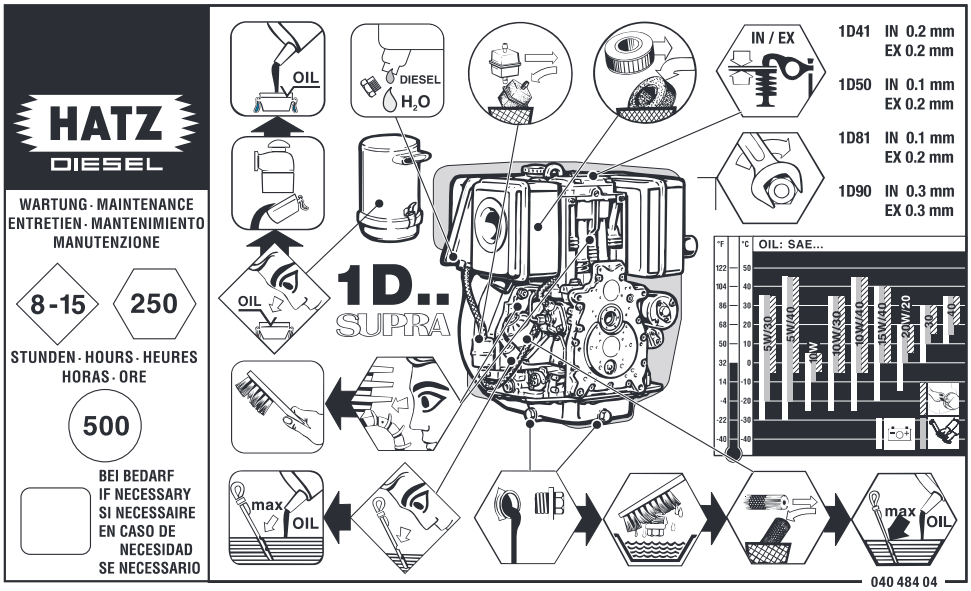
Note:
Engines with an automatic electrical shutdown system (Chapter. 4.2.4.) can also be switched off by turning the start key back to position 0.

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 and starting handle out of reach of unauthorized persons.
To immobilize engines with an electric starter, 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.
		Check the lower part of the oilbath air cleaner for correct oil level and freedom from dirt; renew oil if sludge has formed.	4.1.2. 5.3.1.
250	Every 250 operating hours	Maintenance of oilbath air filter.	5.3.1.
		Replace engine oil and oil filter.	5.3.2.
		Check and adjust tappet clearance.	5.3.3.
		Clean cooling air system .	5.3.4.
		Examine screw connections.	5.3.5.
		Cleaning mesh insert in exhaust silencer	5.3.6.
500	Every 500 operating-hours	Replace fuel filter.	5.4.1.
		Maintenance of dry-air filter.	5.4.2



28

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. 5.3.2.
- Check tappet clearance, and adjust if necessary, chap. 5.3.3.
- Examine screw connections, chap. 5.3.5. Do not tighten the cylinder head fastening.

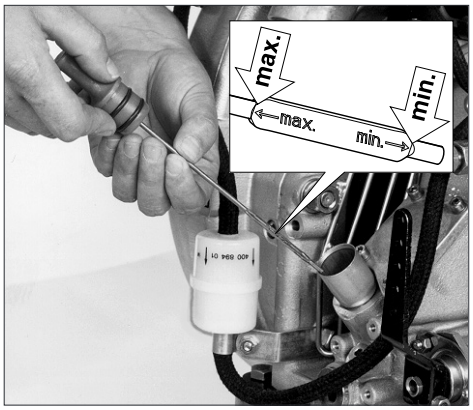
For short operating periods: replace engine oil and oil filter after 12 months at the latest, regardless of the number of operating hours.

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.



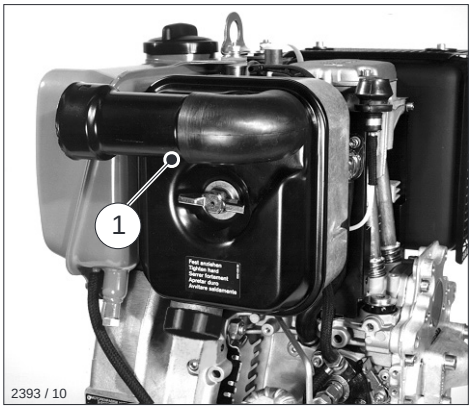
29

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

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).

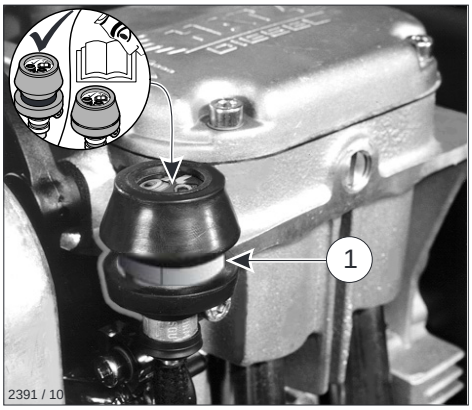


30

– Check that dust outlet „1" on the centrifugal dust trap (depending on version) is not blocked, and clean if necessary.

5.2.3. Air cleaner blockage indicator (optional extra)

– Run the engine at full speed shortly.



31

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.

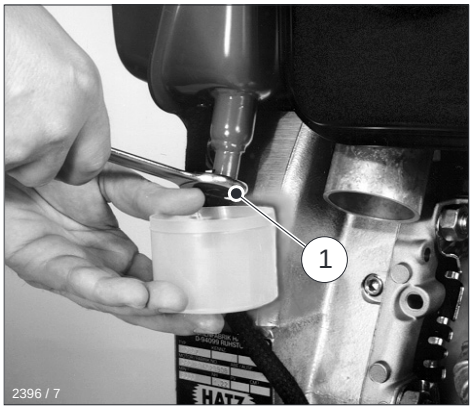
5.2.4. Checking cooling air zone

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 5.3.4.).
- If a temperature warning light „4" is provided, it will come on if the engine overheats, fig. 27. In this case, stop the engine immediately (Chapter 4.3. and 5.3.4.).

5.2.5. Checking the water trap

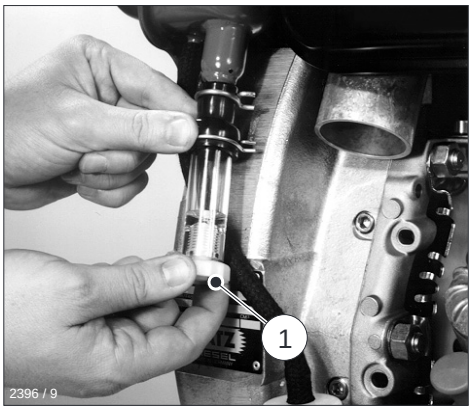
The intervals at which you should check the water trap depend entirely on the amount of water in the fuel and the care taken when refuelling. The normal interval is once a week.



32

- 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.



33

- 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.

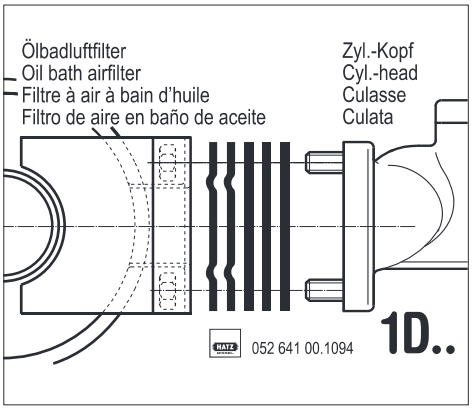
5.3. Maintenance every 250 hours of operation

5.3.1. Oilbath aircleaner maintenance

34

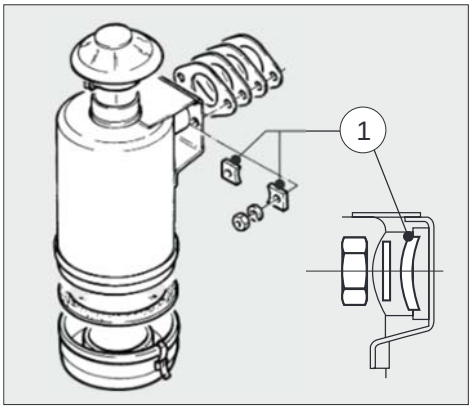
Catch waste oil and dispase acc. to environmental regulations.

- Take off the oil reservoir „1" and clean it.
- Remove contaminated oil and sludge from the oil tank, and clean it out.
- Take off rain cap „2" and clean it.
- Clean the entire length of intake pipe „3".
- Check the inserted seal and renew if in poor condition.
- Fill the oil reservoir up to the mark with engine oil and re-assemble the oilbath aircleaner, Chap. 4.1.2.
- If the filter pack is very dirty, also clean the upper part of the aircleaner as follows: Remove the upper part of the aircleaner from the engine and rinse it in diesel oil.
- Before re-assembling the aircleaner, allow the diesel fuel to drip off thoroughly, or wipe it off.
- Never attempt any repairs (welding, brazing etc.) to the oilbath aircleaner, or it may be rendered useless and the engine may also be damaged.
- If the sealing face is uneven, the aircleaner body cracked and/or the filter wool content is incomplete, install a new aircleaner.
- Attach the upper part of the aircleaner with a new flange gasket.



35

- Sealing package acc. picture 35 is mounted at engines 1D41, 1D42 and 1D50.



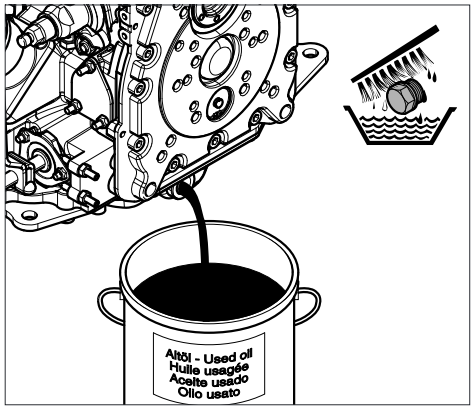
36

- Shim washers „1" should be installed with the convex side (outward curve) towards the nut.
- Re-assemble the complete aircleaner and fill it with oil to make it ready for further operation.

5.3.2. 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.
For oil drain plug, see Chapter 2.

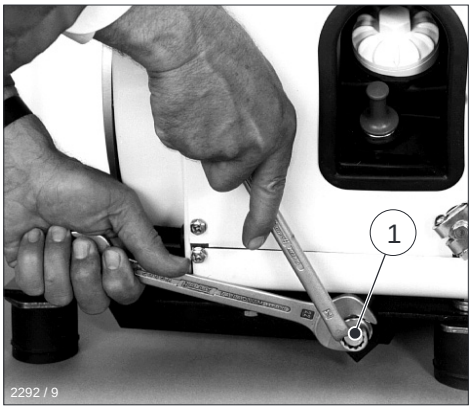
⚠ Risk of scalding from hot oil.
Catch waste oil and dispase acc. to environmental regulations.



37

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

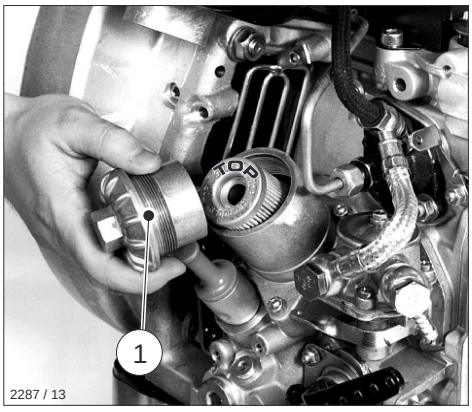
Fully encapsulated engines:



38

When unscrewing oil drain plug „1", make sure that the drain tube is not loosened. Prevent it from turning if necessary with an open-ended wrench of the correct size.

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



39

– Renew the replaceable lubricating oil filter element.

40

– 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 at animals, persons or yourself!

Important!
Note the „TOP" mark on the oil filter. Fig. 39

– Check condition of O-ring „1" and renew it if necessary (Fig. 39).

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

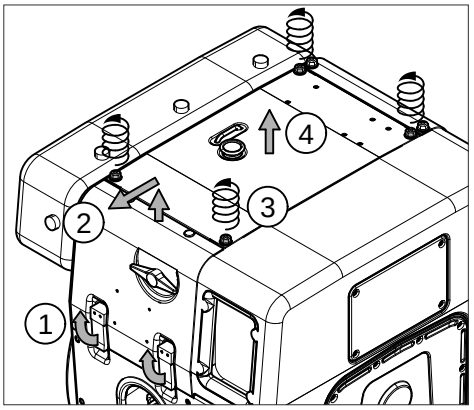
– Add engine oil up to the „MAX" mark on the dipstick (see Chapter 4.1.1.)

– 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.

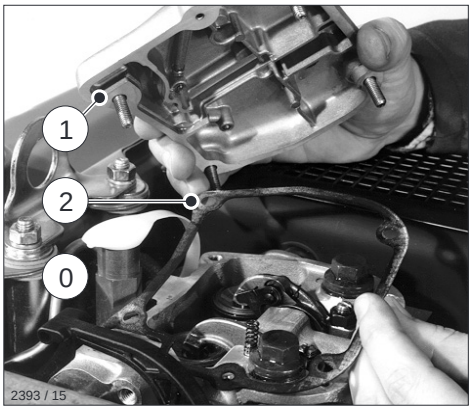
5.3.3. Checking and adjusting valve clearances

– Move the decompression lever to position „0"; Fig. 17 and 18.



41

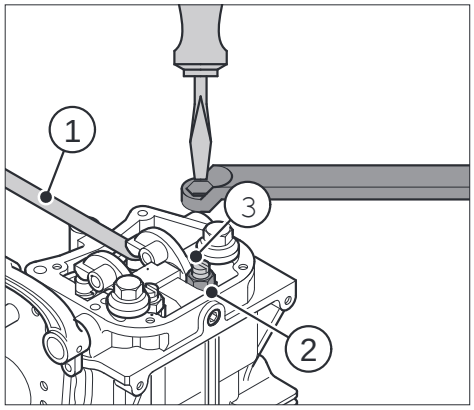
– In case of the enclosed design, please remove the parts of the enclosure in the order 1..4. The decompression lever is also taken off when the cover is removed.



42

– 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.



43

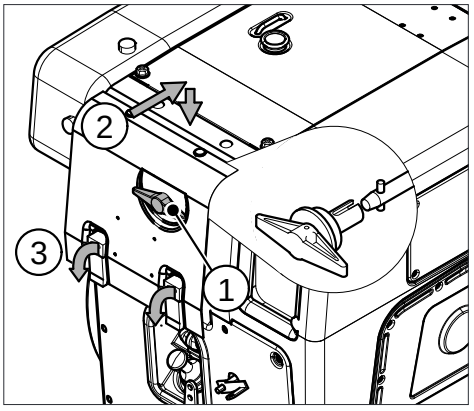
– Check valve clearances between rocker and valve stem , using feeler gauge „1". For the setting, refer to Chapter 3.1.

– 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.

– Depending on version mount parts of air duct.



44

– In case of the enclosed design, place the lever for decompression „1" in horizontal position. Then, mount the cover of the enclosure in the order 2...3.

– After a short test run, check the cylinder head cover for leakage.

5.3.4. 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.
  Important!
  When cleaning the engine, do not direct a jet of water or a high-pressure jet at the components of the electrical equipment.

- Trace the cause of any contamination with oil and have the leak eliminated by a HATZ service station.

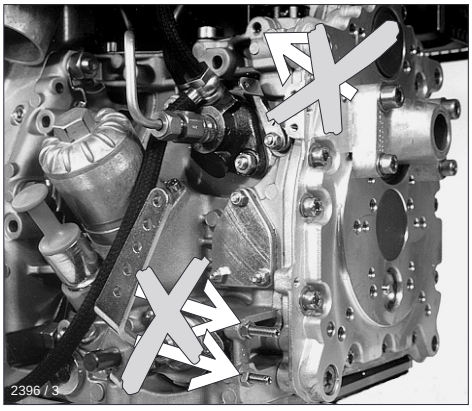
- Install the air guide elements previously removed.

⚠ 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.

5.3.5. Checking threaded connections

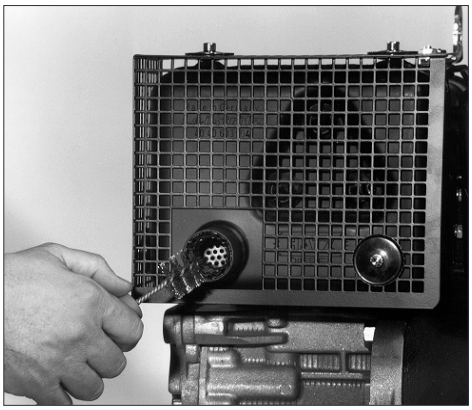
Check the condition and tightness of all threaded connections, wiring, hose clips and other components attached to the engine and its mountings, provided that these can be reached during maintenance work.
Do not tighten the cylinder head bolts.



45

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

5.3.6. Cleaning mesh insert in exhaust silencer (additional equipment)



46

- Remove deposits from the mesh insert with a suitable wire brush.

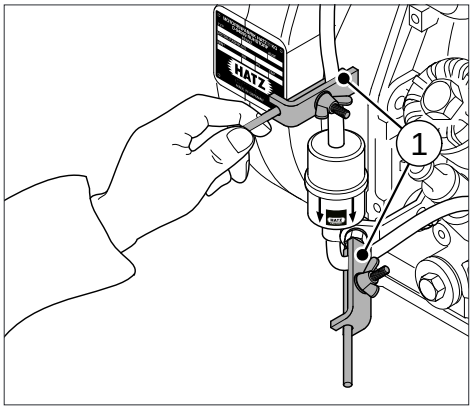
5.4. Maintenance every 500 hours of operation

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.

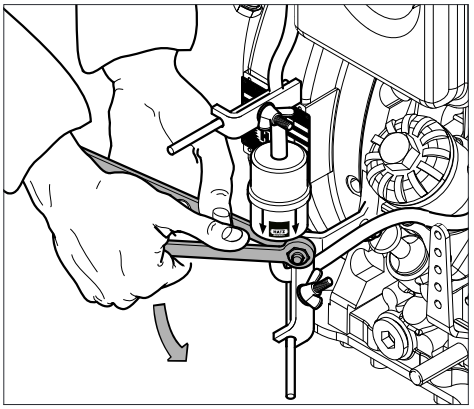
⚠ Do not smoke or bring a naked flame near the fuel system when working on it.

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



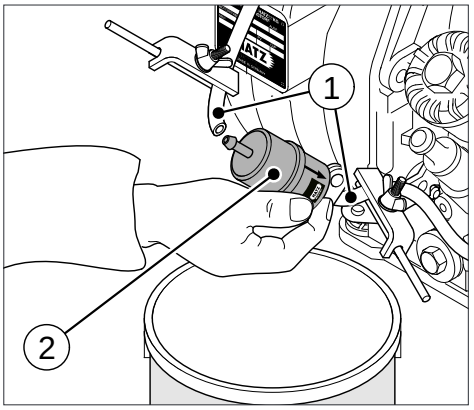
47

– Shut off the fuel supply line upstream and downstream of the fuel filter according to item 1.



48

– Unscrew the fuel filter from its mount.



49

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

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

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

– Secure the filter to its mount.

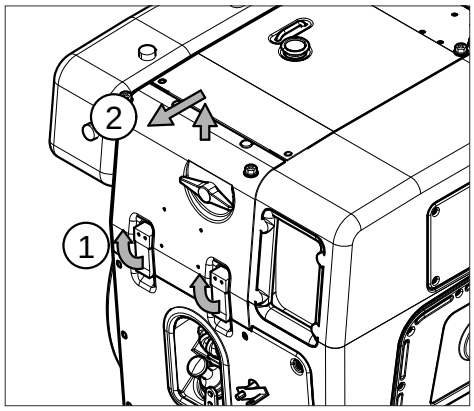
– Open the fuel supply line or prime the pump until the fuel flows (see Chapter 4.1.3.).

– Activate mechanical oil pressure monitor (optional extra), chap. 4.1.4.

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

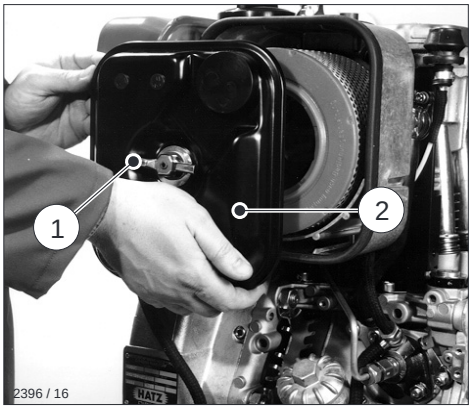
5.4.2. Dry-type air cleaner maintenance

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.



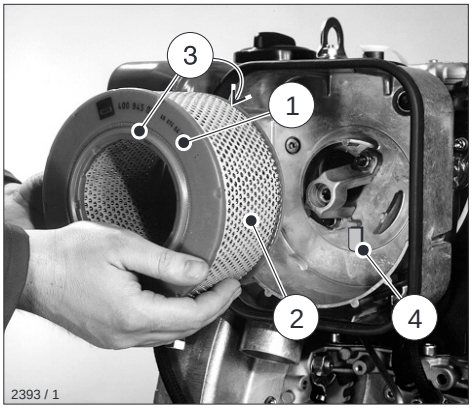
50

– In case of the enclosed design, please remove the cover of the enclosure in the order 1..2. The decompression lever is also taken off when the cover is removed.



51

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



52

– 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

53

– 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!

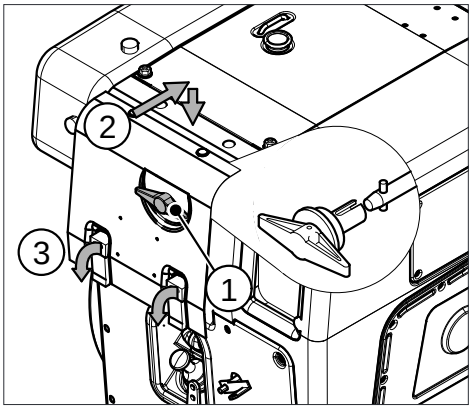
– Tilt the filter element and hold it against the light (or shine a light through it) to trace any cracks or other damage.

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. 52)

Wet or oily contamination

– Renew the filter cartridge.

– Re-assemble in the reverse order of work.



54

– In case of the enclosed design, place the lever for decompression „1" in horizontal position. Then, mount the cover of the enclosure in the order 2...3.

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.		
	Stop lever in stop position.	Set lever to „START"-position	4.2.
	No fuel reaching injection pump.	Add. fuel.	4.1.3.
			4.1.4.
		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.	4.1.3.
	Compression too low:		
	- Valve clearances incorrect	Check valve clearances, adjust if necessary.	5.3.3.
	- 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.	4.1.4
At low temperatures.	Lower starting temperature limit exceeded.	Comply with cold starting instructions.	4.2.3.
		Operate preheat system (optional extra).	4.2.4.
	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.	4.1.3.
	Starting speed too low:		
	- Engine oil is too thick	Refill with a different grade of engine oil.	5.3.2.
	- 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.	5.3.4.
	- 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.	4.1.3. 4.1.4.
	- Fuel filter blocked	Renew fuel filter.	5.4.1.
	- Defective feed pump.	Check through entire fuel supply system.	
	- Air in the fuel system.	Check fuel system for penetration of air. Check air vent valve.	
	Mechanical oil pressure monitor stops the engine due to low oil pressure.	Check engine oil level. Activate mechanical oil pressure monitor.	5.2.1. 4.1.4.
	Mechanical defects.	Contact a HATZ-service station.	
In addition, if automatic engine shutdown is installed.	Stop signal from monitoring element because of:	Check engine for:	
	- oil pressure too low.	Engine oil level.	
	- cylinder head temperature too high.	Cooling air passages blocked or cooling system otherwise affected.	
	- 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	
	- Cable connections loose.	the components thereof.	

Malfunction	Possible causes	Remedial action	Chap.
Low engine power, output and speed.	Fuel supply is obstructed:		
	- Tank run dry.	Add fuel.	4.1.3. 4.1.4.
	- 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.	
	- Air in the fuel system.	Check fuel system for penetration of air. Check air vent valve.	
	- Speed control lever does not remain in selected position.	Prevent speed control from moving.	
Low engine power, output and speed, black exhaust smoke.	Air cleaner blocked.	Remove dirt from air cleaner.	5.3.1. 5.4.2.
	Incorrect valve clearances.	Adjust valve clearances.	5.3.3.
	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.	5.3.2.
	Inadequate cooling:		
	- Entire cooling air system contaminated.	Clean cooling air system.	5.3.4.
	- Inadequate sealing at air guide plates or capsule elements.	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.
- In case of an emergency start in manual mode, leave the battery (which might be discharged) connected to the engine.
- For emergency operation without battery, make sure that the plug-and-socket connector to the instrument box is disconnected additionally before the engine is started.
- 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**)

Assembly and operating instructions have been prepared and have been enclosed to the incomplete machine.

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