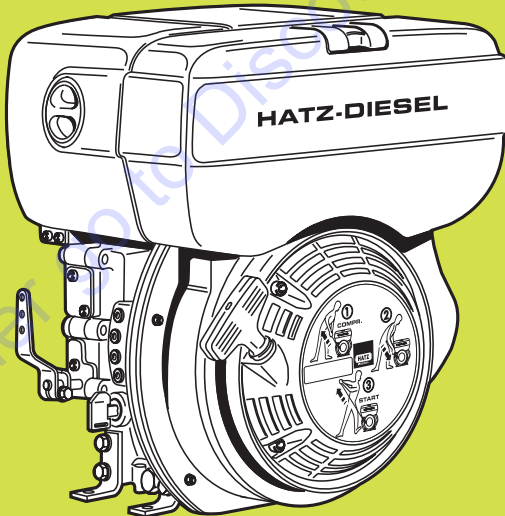


# INSTRUCTION BOOK



1B 20

1B 27

1B 30

1B 40

1B 50

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## A new HATZ Diesel engine - working 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 do not fail to read this operating manual before starting the engine. This will help you to avoid accidents, ensure that you operate the engine correctly and assist you in complying with the maintenance intervals in order to ensure long-lasting, reliable performance.

Please pass this Instruction Manual on to the next user or to the following engine owner.



### Original - Ersatzteile

Original-spare parts

Pièces de rechange d'origine

Repuestos originales

Use only original spare parts from HATZ. Only these parts guarantee a perfect dimensional stability and quality. The order numbers can be found in the enclosed spare parts list. Please note the spare part kits shown in Table M00.

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

**MOTORENFABRIK HATZ GMBH & CO KG**

# Contents

	Page		Page
<b>1. Important safety notes when operating the engine</b>	<b>3</b>	<b>5.3. Maintenance every 250 operating hours</b>	<b>21</b>
<b>2. Description of the engine</b>	<b>5</b>	5.3.1. Oilbath air cleaner maintenance	21
<b>3. General notes</b>	<b>6</b>	5.3.2. Changing engine oil	22
3.1. Technical data	6	5.3.3. Checking and adjusting valve clearances	23
3.2. Transport	7	5.3.4. Cleaning cooling air area	24
3.3. Notes on installation	7	5.3.5. Checking screw connections	24
3.4. Load on engine	7	5.3.6. Cleaning the exhaust mesh inlet	25
3.5. Type plate	7	<b>5.4. Maintenance every 500 operating hours</b>	<b>26</b>
<b>4. Operation</b>	<b>8</b>	5.4.1. Renewing fuel filter	26
4.1. Prior to first-time start-up	8	5.4.2. Air cleaner maintenance	27
4.1.1. Engine oil	8	<b>5.5. Maintenance every 1000 operating hours</b>	<b>29</b>
4.1.2. Version with oilbath air cleaner	9	5.5.1. Cleaning the oil filter	29
4.1.3. Fuel	9	<b>6. Malfunctions – causes – remedies</b>	<b>31</b>
4.2. Starting	10	<b>7. Work on the electrical system</b>	<b>35</b>
4.2.1. Preparations for starting	10	<b>8. Storage out of use</b>	<b>35</b>
4.2.2. Recoil starter	12		
4.2.3. Electric starter	13		
4.3. Stopping the engine	15		
<b>5. Maintenance</b>	<b>17</b>		
5.1. Maintenance chart	17		
<b>5.2. Maintenance every 8–15 operating hours</b>	<b>19</b>		
5.2.1. Checking engine oil level	19		
5.2.2. Check air intake area for combustion and cooling	19		
5.2.3. Check air cleaner maintenance indicator	20		
5.2.4. Checking the water trap	20		



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 safety notes when operating the engine



HATZ diesel engines are efficient, strong and durable. For this reason they are frequently installed on equipment used for commercial purposes.

The manufacturers of such equipment must observe any relevant equipment safety regulations when the engine forms part of an overall system.

A few general points concerning operating safety should none the less be noted.

Depending on the engine's operating and installation conditions, equipment manufacturers and their users may have to fit safety or protective devices in order to prevent improper use. Examples:

- Exhaust system components as well as the surface of the engine will naturally be hot and must not be touched while the engine is running or until it has cooled down after being stopped.
- Incorrect wiring or improper operation of the electrical system may cause sparking and must therefore be avoided.
- Provide protection against contact with rotating parts once the engine is connected to the driven equipment or machine.  
HATZ protective guards are available for the belt drive of the cooling fan and alternator drive systems.
- Always observe the start-up information in the operating instructions before starting the engine: **this is particularly important when starting an engine with the recoil starter.**
- Mechanical starting devices should not be operated by children or persons deficient in physical strength.
- Check that all safety devices are in place before starting the engine.
- Ensure that operation, maintenance and repair of the engine are undertaken by suitably trained personnel only.
- Protect the starter key against unauthorised use.
- Do not 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.

## Important safety notes when operating the engine

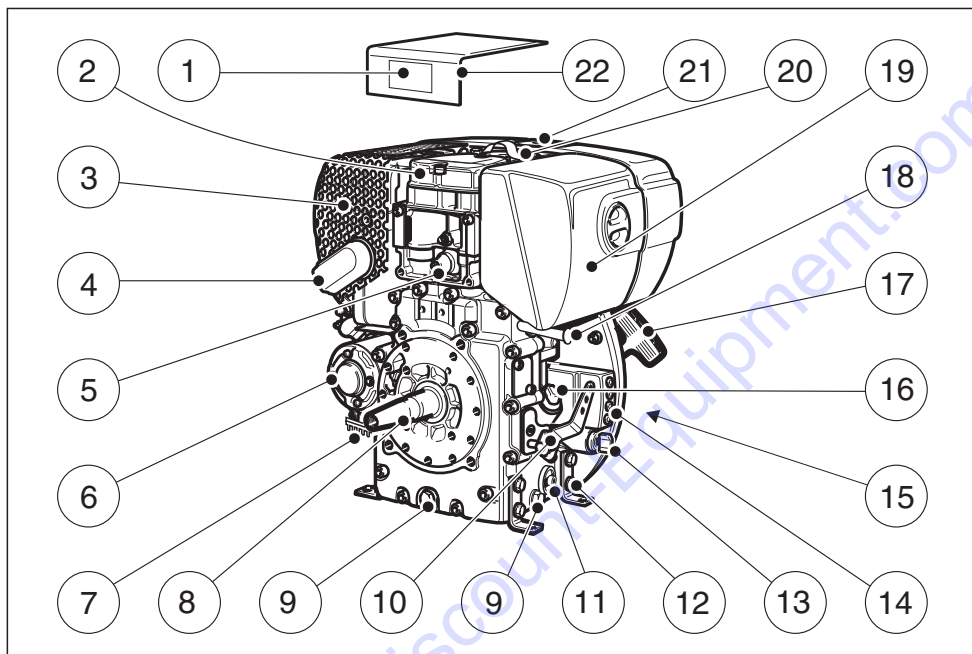


- The engine must be stopped before performing any maintenance, cleaning- or repair work.
- Stop the engine before refilling the fuel tank.  
Never refuel near a naked flame or sparks which could start a fire. Don't smoke. Don't spill fuel.
- Keep explosive materials as well as flammable materials away from the engine because the exhaust gets very hot during operation.
- Wear close-fitting clothing when working on the engine while it is running.  
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. Contact Discount-equipment, if a sticker comes off or is illegible and ask for a new one.
- We accept no liability for damage resulting from improper modifications to the engine.

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

When in doubt, consult Discount-equipment before starting the engine.

## 2. Description of the engine



1

- |                               |  |
|-------------------------------|--|
| 1 Type plate                  | 13 Ignition key                                  |
| 2 Cylinder head cover         | 14 LED display                                   |
| 3 Exhaust silencer            | 15 Intake opening for cooling and combustion air |
| 4 Exhaust mesh insert         | 16 Oil filler pipe and dipstick                  |
| 5 Oil pressure switch         | 17 Recoil starter                                |
| 6 Starter motor               | 18 Engine shutdown pin                           |
| 7 Voltage regulator           | 19 Dry-type air cleaner                          |
| 8 Crankshaft - power take-off | 20 Lifting lug (see also Fig 41, Pos. 1)         |
| 9 Oil drain plug              | 21 Fuel tank cap                                 |
| 10 Speed adjustment lever     | 22 Noise insulating hood                         |
| 11 Oil filter                 |  |
| 12 Engine mountings           |  |

### 3. General notes

#### 3.1. Technical data

Type		1B20	1B27	1B30	1B40	1B50
Design		Air-cooled four-stroke diesel engine				
Combustion system		Direct injection				
Number of cylinders		1	1	1	1	1
Bore / stroke	mm	69 / 62	74 / 62	80 / 69	88 / 76	93 / 76
Displacement	cm <sup>3</sup>	232	267	347	462	517
Lubricating oil capacity without oil sump	l, approx.	0.9 <sup>1)</sup>	0.9 <sup>1)</sup>	1.1 <sup>1)</sup>	1.5 <sup>1)</sup>	1.5 <sup>1)</sup>
with oil sump	l, approx.	2.6 <sup>1)</sup>	–	2.8 <sup>1)</sup>	3.2 <sup>1)</sup>	–
Difference between “max” and “min” levels without oil sump	l, approx.	0.5 <sup>1)</sup>	0.5 <sup>1)</sup>	0.5 <sup>1)</sup>	0.8 <sup>1)</sup>	0.8 <sup>1)</sup>
with oil sump	l, approx.	1.6 <sup>1)</sup>	–	1.8 <sup>1)</sup>	2.2 <sup>1)</sup>	–
Lubricating oil consumption (after running in)	max.	1 % of fuel consumption at full load				
Lubricating oil pressure (oil temperature 100 °C)	approx.	2.5 bars at 3000 r.p.m.				
Direction of rotation, power take-off end		anti-clockwise				
Valve clearance 10 - 30 °C Inlet and exhaust valve	mm	0.20	0.10	0.10	0.10	0.10
		or automatically <sup>2)</sup>				
Max. tilt angle in operation, in direction		Flywheel 25° down <sup>3)</sup> all other directions 35° <sup>3)</sup>				
Weight (incl. fuel tank, air-cleaner, exhaust silencer, recoil starter and electric starter)	kg, approx.	33	34	40	55	56
Battery capacity	Amp/h	max. 12 V / 60 Amp/h				

<sup>1)</sup> These values are intended as an approximate guide. The **max.** marking on the dipstick is the determining factor, Fig. 7.

<sup>2)</sup> Depending on model (see maintenance charts, chapter 5.1).


<sup>3)</sup> Exceeding these limits causes engine breakdown.

#### Tightening torques

Item	Nm
Oil drain plug	50

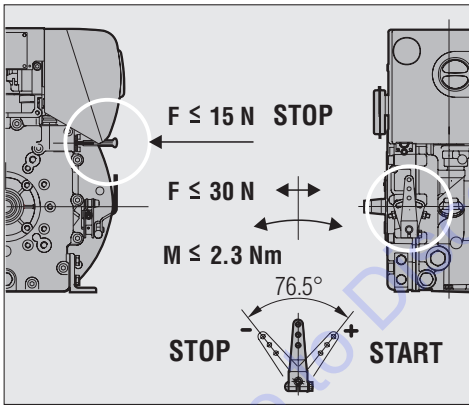


### 3.2. Transport


 Standard lifting lug „20“ is to allow the engine and its auxiliaries to be transported safely, chap. 2. It is not suitable or approved for lifting the complete equipment to which the engine is attached.

### 3.3. Notes on installation

The „Guide to selecting and installing an engine“ contains all the necessary information on engine applications if you have an engine which has not yet been installed in equipment and still has to be fitted or set up. This guide is available from Discount-equipment.



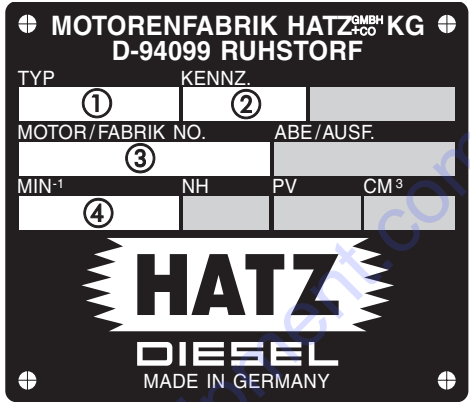
2

 Do not exceed the forces and torques indicated on the speed adjustment lever and the stop pin, otherwise you may damage the stops and internal governor components.

### 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

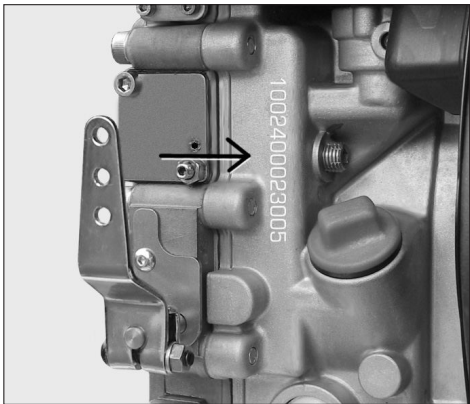


3

The type plate is placed on the noise insulating hood (Fig. 1, pos. 1) and includes the following engine information:

- ① engine type
- ② code (only for special equipment)
- ③ engine number (also stamped on crankcase, Fig. 4)
- 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

Engine serial number on crankcase

## 4. Operation

### 4.1. Before starting up for the first time

Engines are normally supplied dry, i.e. not containing fuel or oil.

#### 4.1.1. Engine oil

##### Oil quality

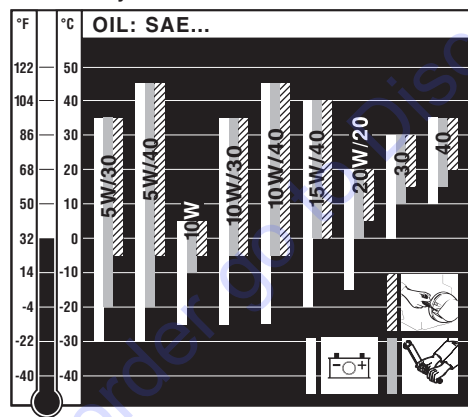
Qualified are all trademark oils which fulfil at least one of the following specifications:

**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.

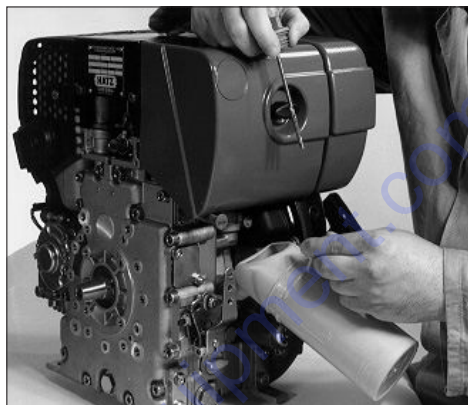
##### Oil viscosity



5

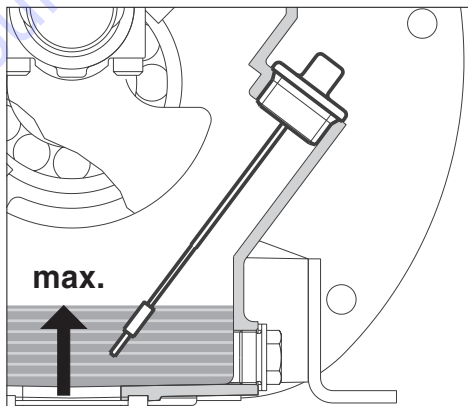
Select the viscosity class according to the ambient temperature for cold starts.

When adding oil or checking the oil level, the engine must be horizontal.



6

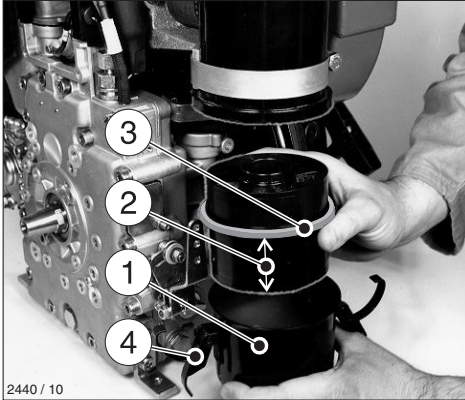
- Remove oil filler screw and add engine oil. Lubricating oil capacity: see Chapter 3.1.



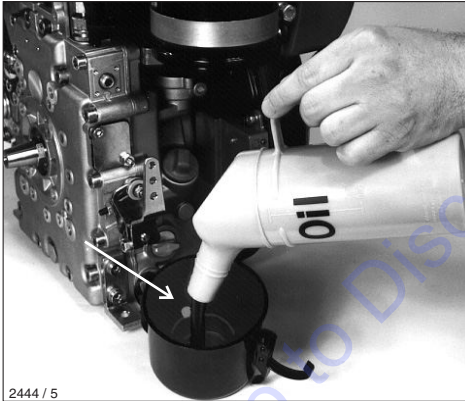
7

- To check the oil level, remove the dipstick, clean it - then screw it back in and finally remove it again. Check the oil level on the dipstick and, if necessary, top up to the **max.** level.

#### 4.1.2. Version with oilbath air cleaner



8



9

- Take off oil reservoir „1“ and fill with engine oil as far as the mark, Figs. 8 and 9.
- Insert the filter element into the oil reservoir with the long end „2“ leading, Fig. 8.
- Attach the oil reservoir, making sure that sealing ring „3“ is correctly seated and fasteners „4“ are tight.

#### 4.1.3. Fuel



**Stop the engine before refilling the fuel tank. Never refuel near a naked flame or sparks which could start a fire. Don't smoke. Use only pure fuel and clean filling equipment. Take care not to spill fuel.**

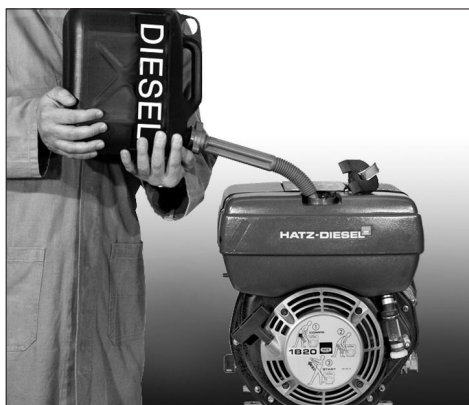
All diesel fuels which satisfy the following specifications are suitable:

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



10

- Remove fuel tank cap.



11

- Before the first start or if the fuel tank has been run dry, completely fill the fuel tank with diesel. The bleeding of the fuel system is automatically.

#### Note:

If a **double fuel filter system** is provided (Chapter 5.4.1), wait for a short time after replenishing fuel (approx. 1 to 2 minutes) for automatic bleeding to be completed.



12

- Close and fix fuel tank cap.

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 %

## 4.2. Starting



**Do not run the engine in closed or badly ventilated rooms – danger of poisoning! Before starting the engine, ensure that no-one is in the danger area close to the engine or equipment, and that all protective guards are fitted.**

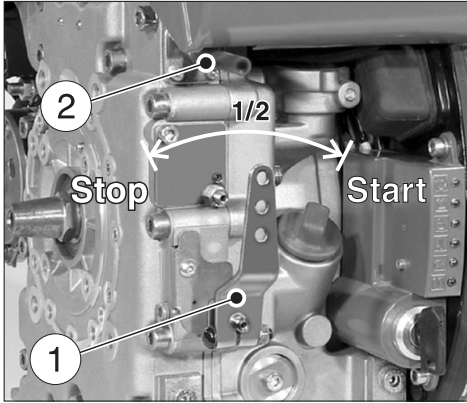
### 4.2.1. Preparations for starting

If possible, disengage the engine from any driven equipment.

The auxiliary equipment should always be placed in neutral.

- First of all set the speed adjuster to the STOP position, Figures 13 and 14, then move it to the starting position.

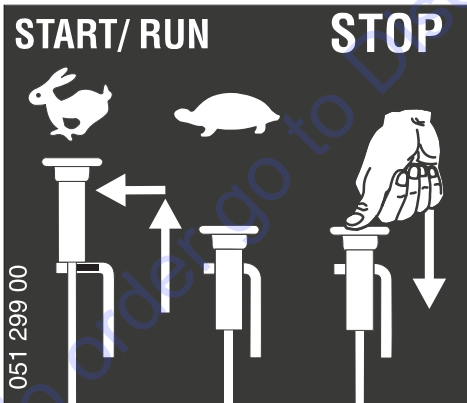
### Speed adjuster, standard version



13

- Set speed adjustment lever „1“ either to 1/2 START or max. START position, as desired or necessary.  
Starting at a lower speed will help to prevent exhaust smoke.

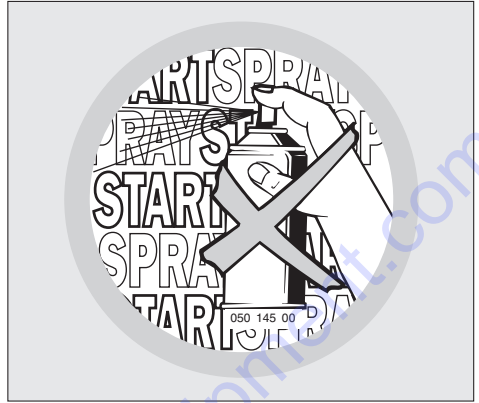
### Speed adjuster with pull rod



14

- Move speed adjuster to the „START/RUN“ position.

Now, the engine is ready for starting.



15



**Never use starting sprays !**

### Important !

After long-time standstill (approx. 6 months or even longer) or first operation, operate engine with low adjusted speed and without load for approx. 20 sec. after start. This measure assures a lubrication of all bearings before increasing speed and load.

It also prevents an insufficient lubrication.

## 4.2.2. Recoil starter (down to $-6^{\circ}\text{C}$ )

– For starting preparations, see Chapter 4.2.1.

### Starting procedure



16

- Pull the starting cable out by the handle until you feel a slight resistance.
- Let the cable run back; in this way the entire length of the starting cable can be used to start the engine.
- Devices which are not securely fastened should be restrained with the foot.



17

- Grip the handle with both hands.



18

- Commence pulling the starting cable vigorously and at an increasing speed (do not jerk it violently) until the engine starts

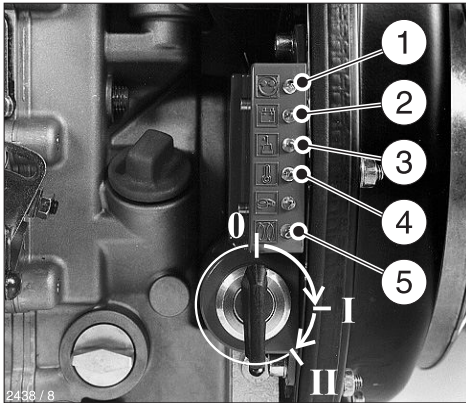
### Note:

If after several attempts of starting the exhaust begins to emit white smoke, move the speed adjustment lever to the STOP position and pull the starting cable out slowly 5 times. Repeat the starting procedure, Chapter 4.2.1.

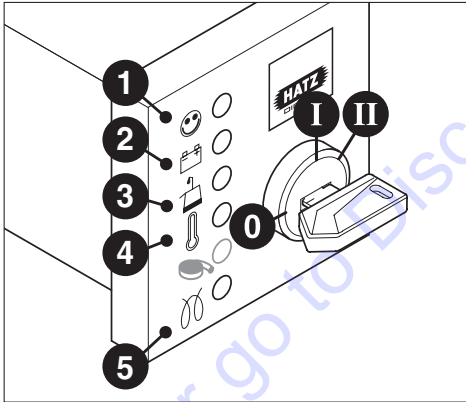


### 4.2.3. Electric starter

– For starting preparations, see Chapter 4.2.1.



19



20

– Insert the key **to its stop** and turn it to **position I**, Fig. 19 and Fig. 20.

Depending upon the model, the battery charge telltale „2“ and the oil pressure warning light „3“ will come on.

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**, see chapter 6.

– Turn the key to **position II**.

– Release the key as soon as the engine runs. The starting key must spring back to **position I** and remain there during engine operation.

– The battery charge and oil pressure lights should extinguish directly after the engine starts. The display lamp „1“ lights up to show that the engine is running.

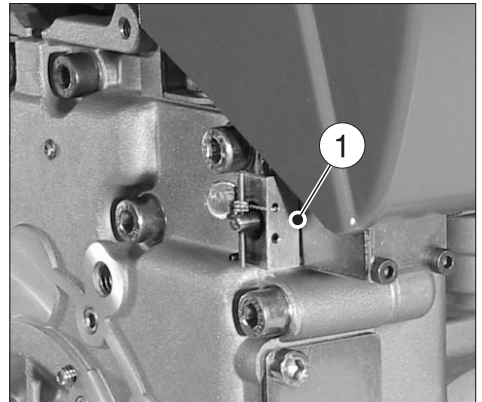
– Prior to starting up again, the key has to be returned to **position 0**. When the engine is running the starter repeat lock in the ignition switch will prevent the starter from engaging and suffering damage.

### Preheater system (optional extra)

When starting a **cold** engine, the preheat indicator „5“ will light, Fig. 19 and Fig. 20.

– Start the engine immediately after the light goes out.

### Fuel shut-off valve, stop solenoid (additional equipment)



21

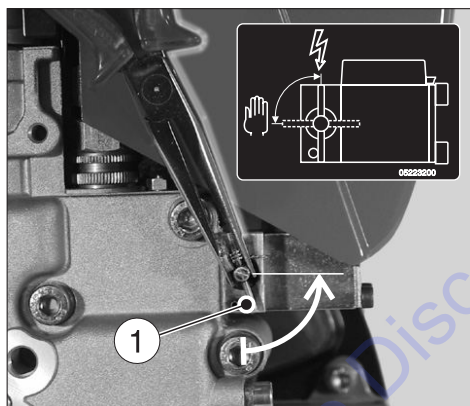
As soon as the starting key is at **Position I**, **fuel shut-off valve „1“ is electrically released**. The fuel feed to the injection pump is then open and the engine is ready to start.

When the engine is running, turning the starting key to **position 0** closes the **cut-off valve** and interrupts the fuel supply to the injection pump, so that the **engine stops**; Chapter 4.3. This shut-off valve is also used for the automatic electrical shutdown system.

## Emergency start

If the **shut-off valve** is blocking the fuel supply as a result of an **electrical fault** and the **engine therefore cannot be started**, an emergency start can be attempted.

Proceed as follows for this:



22

- For emergency starting, turn the lever at fuel shut-off solenoid „1“ anti-clockwise by at least 90° using suitable pliers. The lead seal wire will break off.
- As soon as the emergency start lever is in the starting position, the electric starter or recoil starter can be used; Chapter 4.2.2. The oil level must always be checked before an emergency start, as insufficient oil pressure can lead to complete damage of the engine within a very short time.



After this, the engine can only be stopped with the starting key in the emergency operating mode if the emergency starting lever is first turned back **clockwise** to the stop position.

Immediately after a period of emergency running, ascertain the cause of the fault and have it rectified; Chapter 6.

When the automatic electrical shutdown system is used, the emergency start described above means that liability for risks must be accepted by the operator (**Motorenfabrik HATZ assumes no liability**).

In case of difficulty contact Discount-equipment.

## Automatic electrical shutdown system (additional equipment)

### Model with error memory

This is characterized by a brief flashing of all pilot lamps once the starter key has been turned to **position I** (Fig. 19 and 20).

### 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. 20, positions 2 - 4) will come on. After the engine has stopped, the display continues to glow for about 12 seconds.

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 6.2).

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



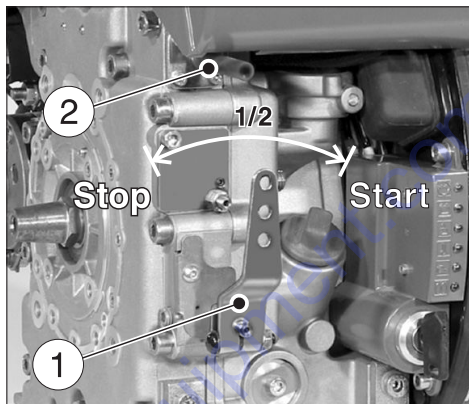
### Model without error memory

This model has no specific characteristic which appears externally. If the engine stops immediately after starting, this indicates a reaction of a monitoring element of the automatic shut-off feature. Before performing further starting attempts, locate and eliminate the malfunction (Chapter 6.2).

**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

### Speed adjuster, standard version



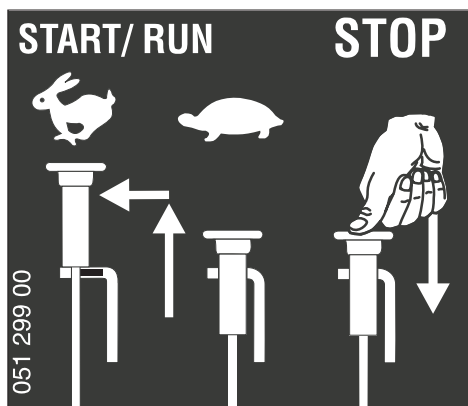
23

- Move the speed adjustment lever „1“ back to the STOP position. The engine cuts out.

#### Note:

Engines with a **fixed lower idling speed** cannot be switched off using the speed adjustment lever. See the paragraph entitled „Other ways of switching off the engine“.

### Speed adjuster with pull rod (optional extra)

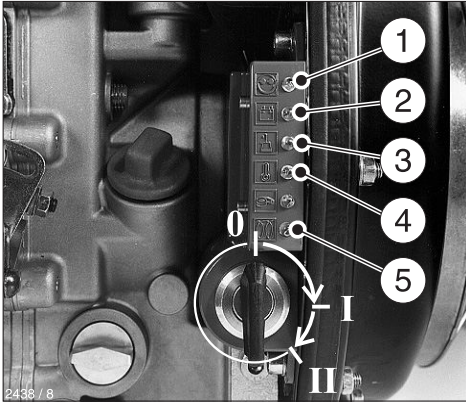


24

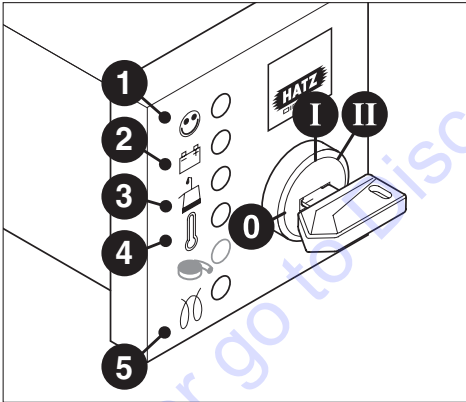
- Move the speed adjuster to the „STOP“ position and press it until the engine cuts out.

## Other ways of switching off the engine

### 1. Fuel shut-off valve, stop solenoid (optional extra)



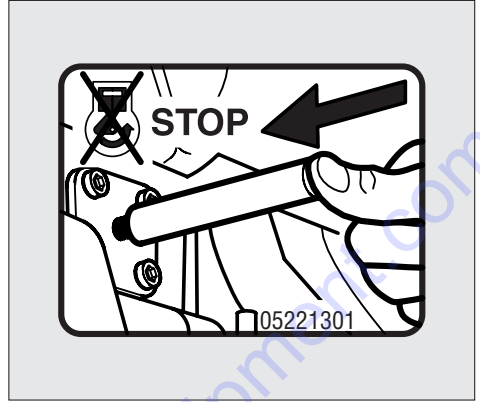
25



26

- Turn ignition key to the **0 position**. The engine cuts out, Fig 25 and Fig. 26.

### 2. Stop pin (optional extra)



27

- Press the stop pin until the engine cuts out, also see Fig. 23, position 2.
- Once the engine has cut out, release the pin „2“ and ensure that it returns to its initial position.

Depending upon the model, the battery charge indicator „2“ and oil pressure warning indicator „3“ will come on again after the engine comes to a stop, Fig. 25 and Fig. 26.

- Turn the key to **position 0** and remove it. All the indicator lights must go out, Fig. 25 and Fig. 26.

#### Note:

Failure to return the starter key to **position 0** may result in the battery being totally discharged.



**If operation of the engine is interrupted for any reason, or at the end of the working day, the starter key should be kept out of reach of unauthorised persons.**

## 5. Maintenance



Only carry out maintenance work with the engine switched off.

Observe all relevant laws and regulations governing the handling and disposal of used oil, filters and cleaning agents.






Protect the starting key against unauthorised use.

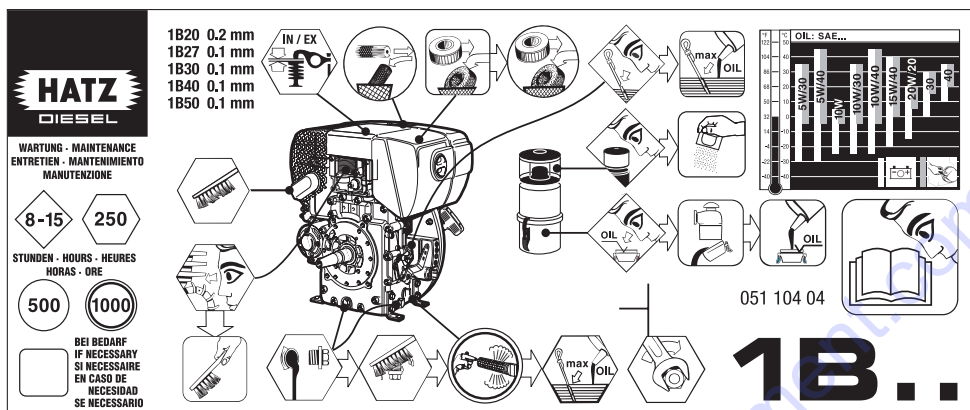
On engines with an electric starter, disconnect the battery's negative terminal.

When maintenance work has been completed, check that all tools have been removed from the engine and all protective guards fitted again.

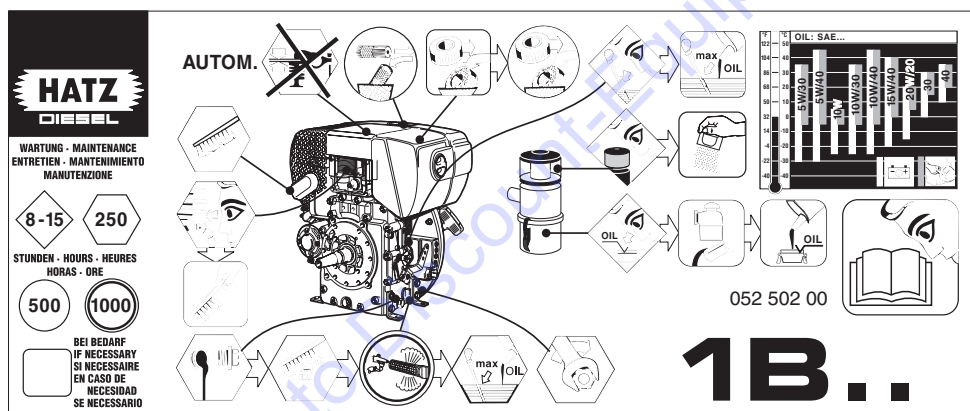
Before starting the engine, ensure that there are no persons in the danger area close to the engine or equipment.

### 5.1. Maintenance chart

	Maintenance interval	Maintenance work required	Chap.
	Every 8 – 15 operating hours, or before each daily start-up	Check oil level.	5.2.1.
		Examine the lower section of the oilbath air cleaner to ensure correct oil level and freedom from contamination; change the oil if it contains sludge.	4.1.2.
		On version with cyclone-type dust trap, empty the dust collector.	5.3.1.
		Check combustion and cooling air intake zone.	5.3.1.
		Check air-cleaner maintenance indicator.	5.2.2.
		Check the water trap.	5.2.3.
			5.2.4.
	Every 250 operating hours	Oilbath air cleaner maintenance.	5.3.1.
		Change engine oil.	5.3.2.
		Check and adjust valve clearances.	
		(Not applicable with automatic self adjusting valve clearance models, see next page)	5.3.3.
		Clean cooling air area.	5.3.4.
		Check screw connections.	5.3.5.
	Every 500 operating hours	Clean mesh insert for exhaust.	5.3.6.
	Every 1000 operating hours	Change fuel filter element.	5.4.1.
		Dry-type air cleaner maintenance.	5.4.2.
	Every 1000 operating hours	Clean the oil filter.	5.5.1.



Model **without** automatic valve clearance adjustment.



Model **with** automatic valve clearance adjustment.

Depending whether the engine is equipped with or without automatic valve clearance adjustment one of the illustrated maintenance plans is included. This label should be affixed to the engine or equipment in an easily visible position. The maintenance chart governs the maintenance intervals.

On **new or reconditioned engines**, after the **first 25 operating hours**, always

- Change engine oil, Chapter 5.3.2.
- Check valve clearances and adjust if necessary, Chapter 5.3.3.
- Examine screw connections, chapter 5.3.5.  
**Do not tighten the cylinder head fastening.**

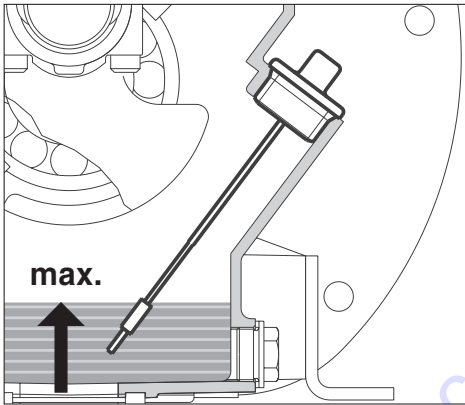
**If the engine is not used frequently**, change the engine oil after **12 months at the latest**, regardless of the actual number of hours it has been in operation.

## 5.2. Maintenance every 8–15 operating hours

### 5.2.1. Checking engine oil level

To check the oil level, the engine must be standing level and be switched off.

- Remove any dirt from the oil dipstick area.
- Remove dipstick and clean it.



28

- To check the oil, screw the dipstick back in and then remove it again.
- Check the dipstick oil level and, if necessary, add oil to the **max.** mark, Chapter 4.1.1.

### 5.2.2 Check air intake area for combustion and cooling

Heavy contamination is an indication that increased dust accumulation necessitates a correspondingly shorter maintenance interval, Chapter 5.3.1., 5.3.4. and 5.4.2.



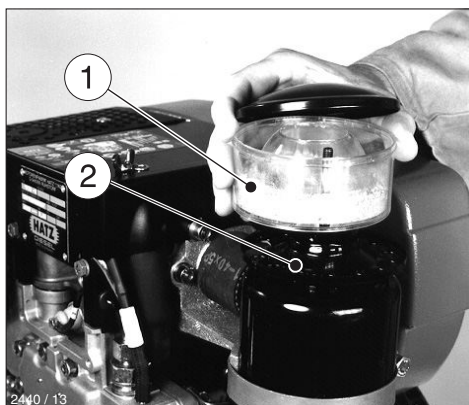
29

- Check air intake points for severe blockage due to leaves, heavy dust accumulation etc., and if necessary clean them.



30

- For models fitted with cyclone, additionally check if inlet point „1“ is clear. Make sure that dust outlet „2“ is not blocked and clean if necessary.

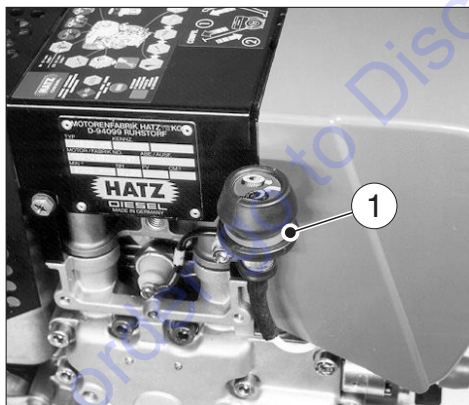


31

- On version with oilbath air cleaner, also check air intake area „2“.

### 5.2.3. Check air cleaner maintenance indicator (optional extra)

#### Mechanical service indicator



32

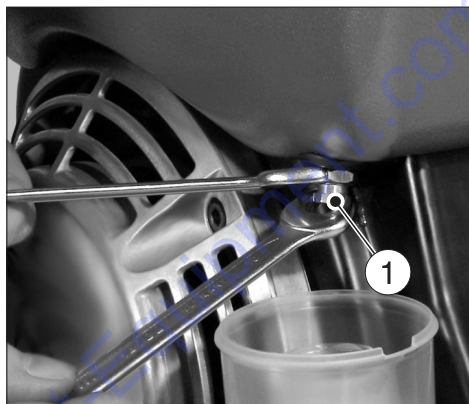
- Increase the speed of the engine briefly to the maximum.

If the **rubber bellows shrinks** and covers the green area „1“, the air cleaner system should be serviced, Chapter 5.4.2.

Under dusty conditions, check the rubber bellows several times per day.

### 5.2.4. Checking the water trap

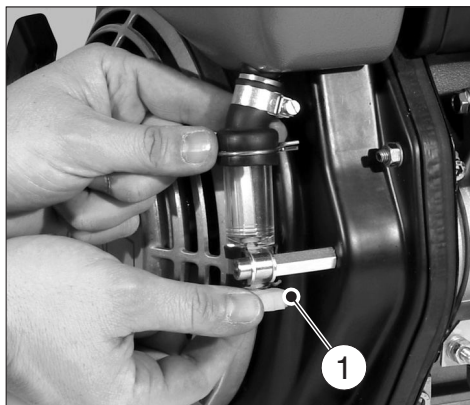
The intervals at which you should check the water trap depend entirely on the amount of water in the fuel and the care taken when re-fuelling. The normal interval is once a week.



33

- Loosen hexagon screw „1“ with approx. 3-4 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.



34

- 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 operating hours

### 5.3.1. Oilbath air cleaner maintenance



35



**Trap the old oil and dispose of it in accordance with local legislation.**

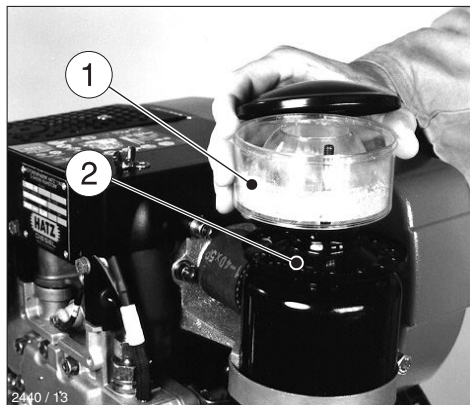
- Take off the oil tank „1“.
- Remove contaminated oil and sludge from the oil tank, and clean it out.
- Rinse out filter element „2“ in diesel oil; allow it to drip thoroughly and wipe it down before re-assembling the air cleaner.
- If severely contaminated, clean filter housing „3“.

Never attempt to repair the oilbath air cleaner by welding, brazing etc., as this could damage the filter beyond repair and cause engine damage.

- Re-attach parts previously removed from the air cleaner and add oil so that it is ready for use, Chapter 4.1.2.



## Version with cyclone-type dust trap



36

- Take off dust collector „1“, empty it and wipe clean (dust collector must remain dry).
- Clean intake aperture „2“ (also keeping it dry).

### Important:

Do not add any oil to the dust collector.

- Attach the cyclone-type dust trap and secure with the wing nut.

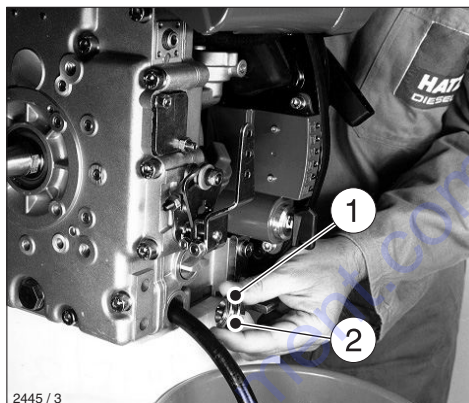
## 5.3.2. Changing engine oil

The engine must be standing level and be switched off.

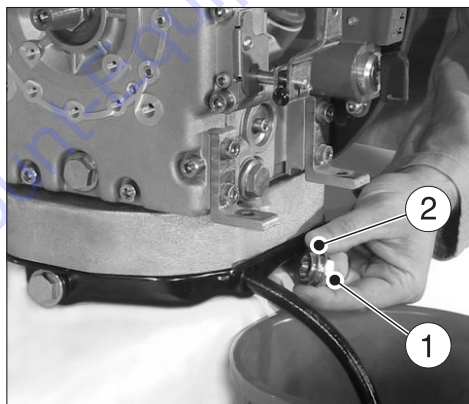
Only change the oil when the engine is warm.



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



37



38

- Take out oil drain plug „1“ and allow the oil to drain out, Fig. 37 without oil sump, Fig. 38 with oil sump.
- Clean the oil drain plug „1“, fit a **new** washer „2“, insert and tighten.

**Tightening torque: 50 Nm.**

- Add engine oil, Chapter 4.1.1.



### 5.3.3. Checking and adjusting valve clearances

#### Remark:

Following steps are inapplicable in case equipment is with automatic tappet clearance compensation.  
Identification characteristic is maintenance plan, chapter 5.1.

Only carry out adjustments when the engine is cold (10 - 30 °C).



2443 / 12

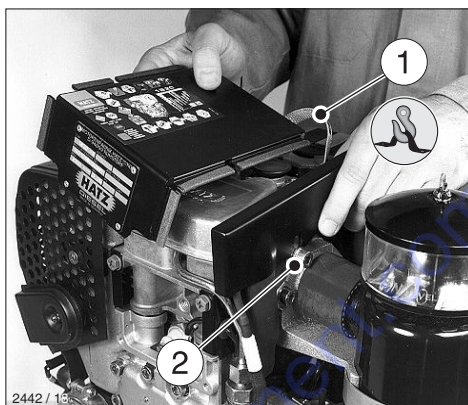
39

– Remove cover to air filter.



40

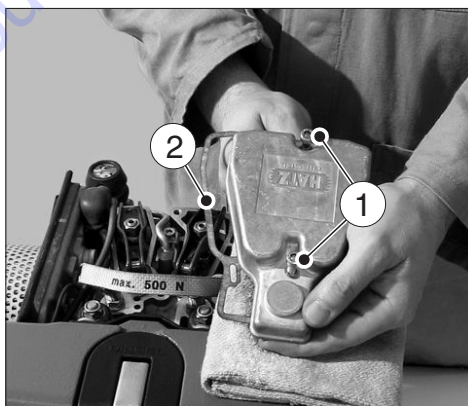
– Remove noise insulating hood.



2442 / 15

41

- On version with oilbath air cleaner, remove screw „2“ and take off cover plate with noise-insulating hood.
- Remove any contamination adhering to the cover for the cylinder head.



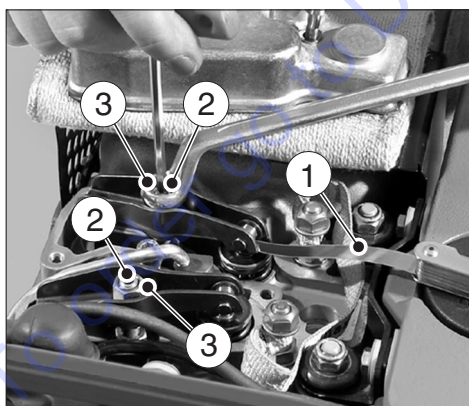
42

- Remove screws „1“ and take off the cylinder head cover with gasket „2“.



43

- Remove rubber cap from the inspection hole cover.
- Turn the engine over in the normal direction of rotation until the valves are in the overlap position (exhaust valve not yet closed, inlet valve starts to open).
- Turn the crankshaft through 360° in the normal direction of rotation and align exactly to the **OT**-marking.



44

- Check valve clearances with feeler gauge „1“ (0.10 mm).

- If valve clearances require adjusting, slacken off screw „2“ and turn hex nut „3“ until feeler gauge „1“ can be pulled through with just slight resistance when screw „2“ is retightened.
- Fit cover for cylinder head and tighten evenly, always using a new gasket.
- Re-attach parts previously removed from engine.  
**Do not forget:** replace the rubber cap at the inspection hole cover.
- Carry out a brief test run, then check the cover for leaks.

### 5.3.4. Cleaning cooling air area



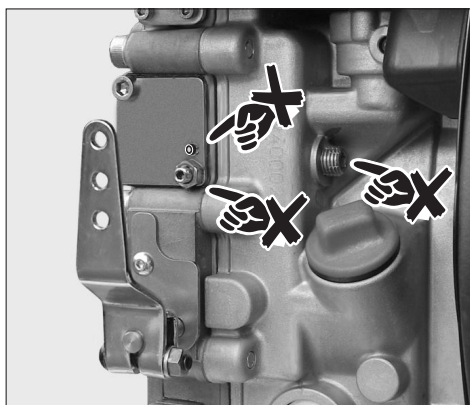
**The engine must be switched off and cooled down before cleaning!**

- If severely contaminated, clean the cooling fins on the cylinder and cylinder head, and also the fan blades in the flywheel. If necessary, contact Discount-equipment.

### 5.3.5. Checking screw connections

- Check the tightness of all threaded connections and take up slack if necessary, provided that these can be reached during maintenance work.

**Do not tighten the cylinder head bolts.**

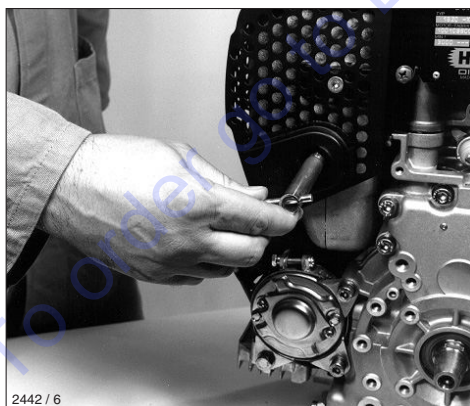


45

**!** The adjusting screws at the engine governor and on the injection system are sealed with lacquer and are not to be tightened or adjusted.

### 5.3.6. Cleaning the exhaust mesh inlet

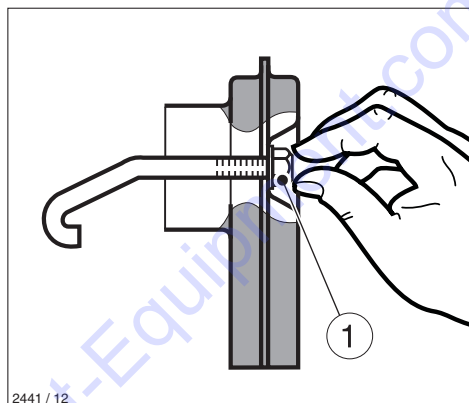
**!** Exhaust system components will naturally be hot and must not be touched while the engine is running or until it has cooled down after being stopped.



46

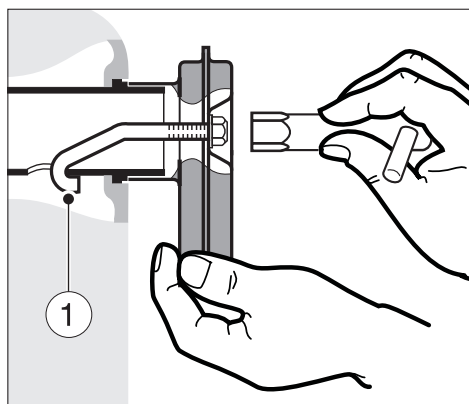
– Unscrew hex nut and remove the exhaust mesh insert.

- Remove any deposits in the mesh insert by means of a wire brush.
- Check the exhaust mesh insert for cracks or damage and, if necessary replace with a new one.



47

- Screw on hexagon nut „1“ by approx. 1 turn.



48

- Insert exhaust screen with hook „1“ into hole, then pull outwards again so that the hook is retained.
- Tighten the hexagon nut fully.

## 5.4. Maintenance every 500 operating hours

### 5.4.1. Renewing fuel filter

The maintenance intervals for the fuel filter are dependent upon the purity of the diesel oil being used and, if necessary, may have to be reduced to 250 hours.

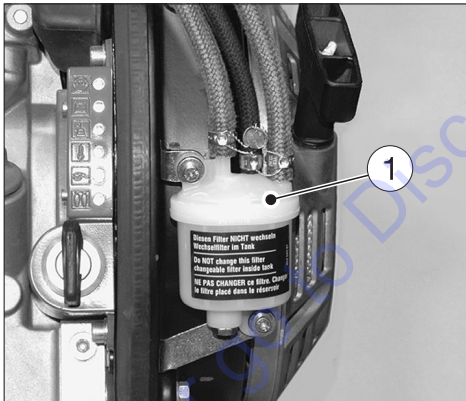


**When working on the fuel system, do not expose it to naked flames; do not smoke.**

#### Important!

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

#### Model with double fuel filter system



49

This system consists of a maintenance-free external filter „1“ (Fig. 49) and a replaceable-cartridge filter which is installed in the tank (Fig. 50). The advantage of this system consists in retaining dirt particles which might get into the fuel system on filter replacement, upstream of the following external filter, so that they cannot endanger the injection system.

#### Important!

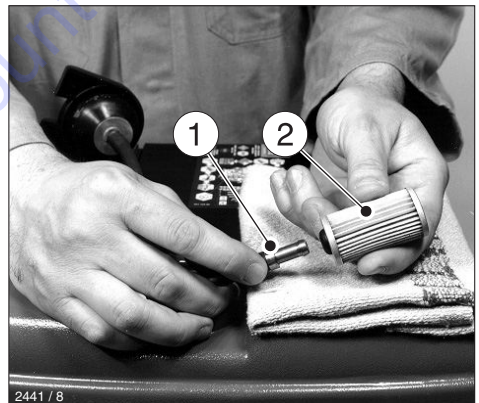
**This external filter must not be replaced. Only replace the fuel filter installed in the tank!**

#### Model with fuel filter in fuel tank



50

- Open the tank cover and pull the fuel filter out of the tank by its cord.

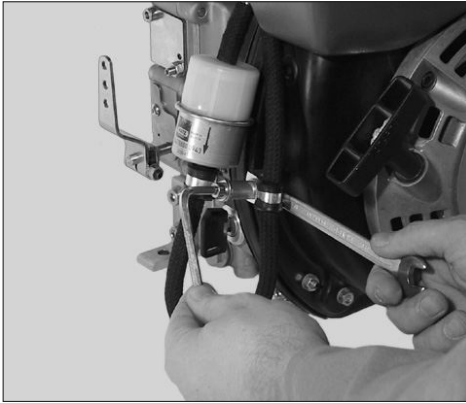


51

- Pull fuel supply line „1“ off fuel filter „2“ and insert a new filter.
- Fit the fuel filter again and close the tank cap. Bleeding of the fuel injection system takes place automatically.

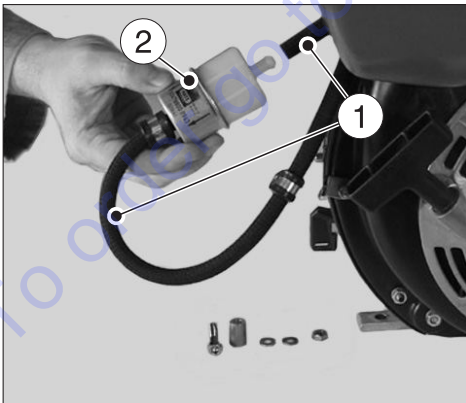
**Model with external fuel filter**  
(no fuel filter in the tank)

- Empty the fuel tank by taking out screw „1“, Fig. 33 or Fig. 34 and allow the fuel to drain into a clean vessel. This fuel can be re-used later.



52

- Unscrew the fuel filter from its mount.
- Place a suitable vessel under the filter to trap the residual fuel.



53

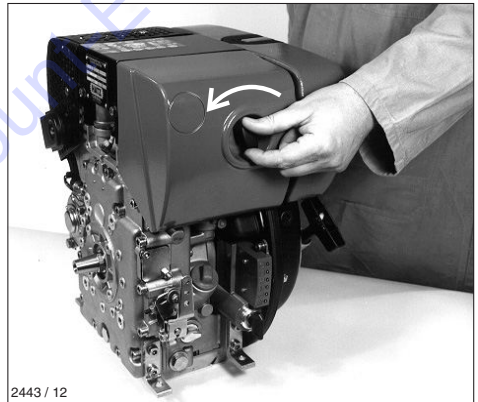
- Pull off fuel supply line „1“ at both ends of fuel filter „2“ and insert the new filter.

- Always renew the fuel filter. Note the arrows indicating the correct direction of flow.
- Secure the filter to its mount.
- Fill the fuel tank with diesel oil; Chapter 4.1.3. Air is vented from the fuel system automatically.
- Check the fuel filter and lines for leaks after a short test run.

### 5.4.2. Air cleaner maintenance

The filter cartridge should only be cleaned when the maintenance lamp lights at maximum speed, Chap. 5.2.3.

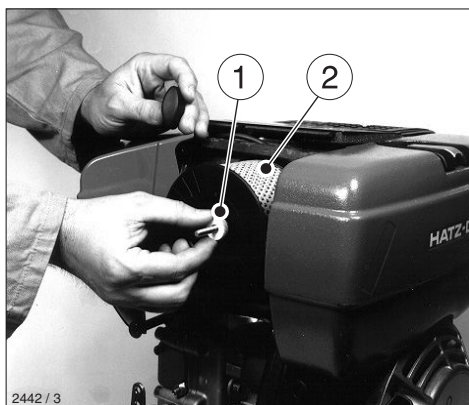
However, the filter cartridge should always be replaced after 500 operating hours at the latest.



54

- Remove the air cleaner cover.





55

- Unscrew and remove knurled nut „1“ and take off air cleaner element „2“.
- Clean the filter compartment and the cover. Dirt and other foreign bodies must not be allowed to enter the engine's air inlet points.

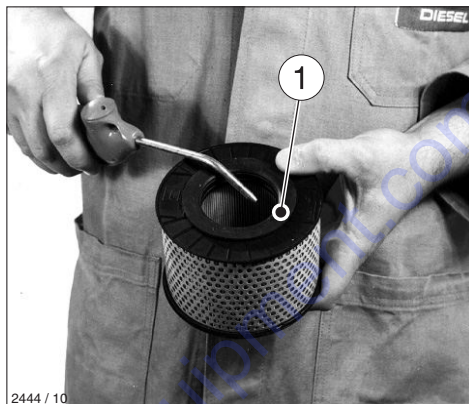


56

- On versions with a mechanical air cleaner service indicator, check the condition and cleanliness of valve plate „1“.
- The filter cartridge should either be renewed or, depending upon the degree of contamination, cleaned, or checked, as follows:

## Cleaning the filter cartridge

### Dry contamination



57

Use compressed air to blow through the filter cartridge from the inside outwards, until no further dirt emerges.

### Important!

The pressure must not exceed 5 bar.



Persons handling compressed air must wear protective goggles.

### Moist or oily contamination

Renew the filter cartridge.

## Checking the filter cartridge

- Check filter cartridge's gasket surface „1“ for damage, Fig. 57.
- Check the filter cartridge for cracks or any other type of damage to the paper filter by holding it inclined towards the light or by shining a light source through it.

### Important!

The slightest damage to the paper filter rules out it being used any longer.

- Re-assemble the filter cartridge in the reverse order of work.

## 5.5. Maintenance every 1000 operating hours

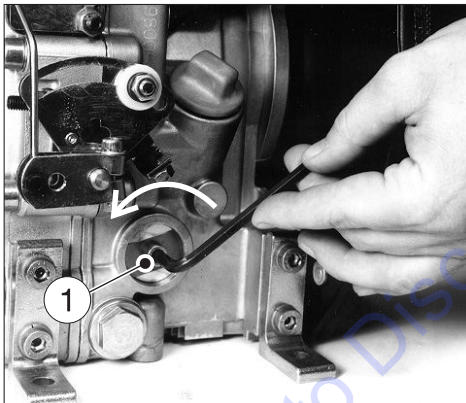
### 5.5.1. Cleaning the oil filter

The oil filter should be cleaned at the same time as the engine oil is changed, since oil escapes when the filter is removed.

The engine must be standing horizontally and switched off.

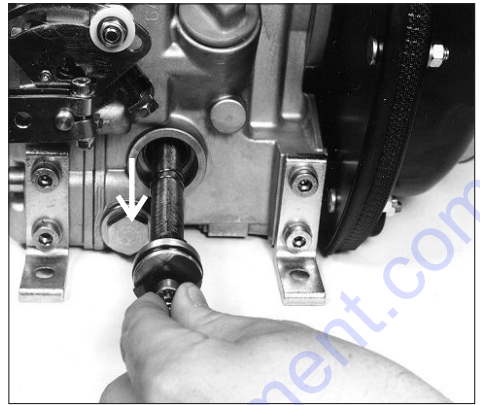


**Danger of scalding from hot oil !**  
**Trap the old oil and dispose of it in accordance with local legislation.**



58

– Loosen screw „1“ with approx. 5 rotations.



59

– Remove oil filter from housing.

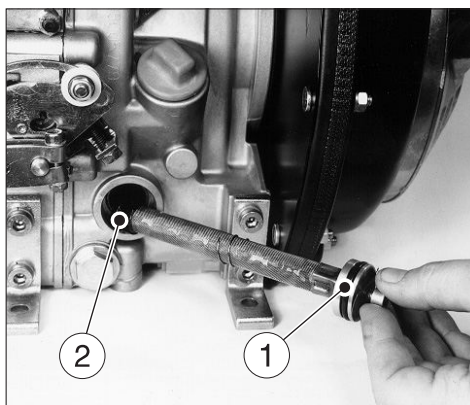


60

– Use an air line to blow out oil filter dirt from the inside outwards.

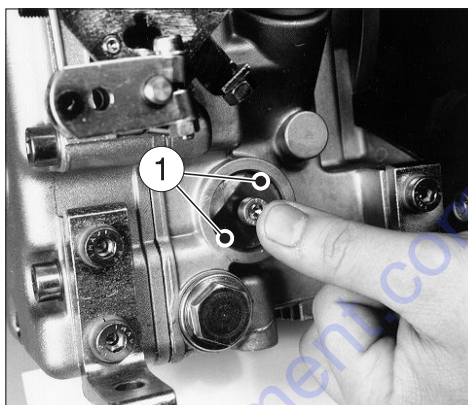


**Persons handling compressed air must wear protective goggles.**



61

- Check joint washer „1“ whether it is damage; replacement if necessary.
- Check joint washer „2“ whether it is damage and correctly fitted, replace oil filter if necessary.
- Lubricate joint washer before fitting.



62

- Put in oil filter and press until limit stop.
- Check whether tension springs sit close to oil filter with both ends „1“, before tightening screw.
- Check the oil level and restore to the **max.** level if required, Chapter 4.1.1.



## 6. Malfunctions – causes and remedies

Malfunctions	Possible causes	Remedy	Chap.
6.1. Engine does not start, or not immediately, but can be turned over easily as usual.	Speed control lever in stop or idle position.	Move lever to START position.	4.2.1.
	Engine shutdown pin in STOP position.	Move to operating position by pulling the pin gently.	4.3.
	No fuel in the injection pump.	Add fuel. Systematically check the entire fuel supply system: If still no fault found, - check engine feed line - check fuel filter	4.1.3. 5.4.1.
	Insufficient compression: - Incorrect valve clearance.	Check valve clearances, adjust if necessary.	5.3.3.
	- Cylinders and/or piston rings worn.	See workshop manual.	
	Injector not functioning.	See workshop manual.	
At low temperatures.	Below starting threshold temperature.	Operate preheater (optional extra).	4.2.3.
	Equipment not disengaged.	Disengage engine from equipment, if possible.	
	Preheating system faulty (optional extra).	See workshop manual.	
	Fuel 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. Refill with winter-grade fuel to which paraffin has been added.	4.1.3.

<b>Malfunctions</b>	<b>Possible causes</b>	<b>Remedy</b>	<b>Chap.</b>
At low temperatures:	Starting speed below 400 min <sup>-1</sup> - Viscosity of oil too high.	Change lubricating oil and add oil of the correct viscosity class.	5.3.2. 4.1.1.
	- Battery charge too low.	Check the battery, if necessary contact Discount-equipment.	7.
If equipped with a stop solenoid or automatic electrical shutdown system (additional equipment)	Solenoid faulty and/or fault in the electrical system.	See workshop manual.	
6.2. Engine fires but does not run.	Speed control lever not moved far enough towards „START“.	Move lever to „START“ position.	4.2.1.
	Equipment not disengaged.	Disengage engine from equipment if possible.	
	Fuel filter blocked.	Renew fuel filter.	5.4.1.
Automatic electrical shut-off device (optional extra)	One of the automatic shutdown's monitoring elements has initiated a stop signal. (See also Chapter 6.4.)	Localise the monitoring element responsible and clear the fault, or contact Discount-equipment.	
6.3. Starter motor does not operate or engine does not turn over.	Fault in the electrical system: - Battery and/or other cables incorrectly connected up. - Cable connections loose and/or oxidised. - Battery faulty and/or flat. - Starter motor faulty. - Faulty relays, monitoring element.	Check electrical system and its component. See also the workshop manual.	7.

<b>Malfunctions</b>	<b>Possible causes</b>	<b>Remedy</b>	<b>Chap.</b>
6.4. Engine cuts out of its own accord during operation.	Fuel supply interrupted - Tank has run empty. - Fuel filter blocked. - Tank venting inadequate. - Air in the fuel system.	Add fuel. Change fuel filter. Ensure adequate tank venting. Check fuel system for penetration of air. Check air vent valve.	4.1.3. 5.4.1.
	Mechanical faults.	Contact Discount-equipment.	
Automatic electrical shut-off device (optional extra)	One of the automatic shutdown's monitoring elements has initiated a stop signal.  Monitoring element for: - oil pressure too low - engine temperature too high  - defective alternator.	Localise the monitoring element responsible and clear the fault, or contact Discount-equipment.   Check oil lubrication. Check air cooling zone for contamination. See workshop manual.	5.2.1. 5.3.4.
6.5. Engine output and speed both drop.	Fuel supply interrupted: - Tank has run empty. - Fuel filter blocked. - Tank breathing inadequate. - Air in the fuel system.  - Speed control lever does not remain in desired position.	Add fuel. Change fuel filter. Provide adequate tank breathing. Check fuel system for penetration of air. Check air vent valve.  Lock the lever into position.	4.1.3. 5.4.1.
6.6. Engine output and speed fall, black smoke from exhaust.	Air cleaner contaminated.  Valve clearances incorrect.  Injector not functioning.	Clean or renew the air cleaner.  Adjust valve clearances.  See workshop manual.	5.3.1. 5.4.2. 5.3.3.

<b>Malfunctions</b>	<b>Possible causes</b>	<b>Remedy</b>	<b>Chap.</b>
6.7. Engine becomes very hot. Indicator lamp for cylinder temperature (optional extra) comes on.	Too much lubricating oil in engine.	Drain off lubricating oil as far as upper mark on dipstick.	5.3.2.
	Inadequate cooling: - Contamination of entire cooling air zone.	Clean cooling air zone.	5.3.4.
	- Air duct panels not properly sealed.	Check cooling air deflector plates and shafts for completeness and airtight seal.	
6.8. Moisture condensate emerging from exhaust.	Operation off load for a prolonged period.	Operate the machine at about 70 % load until moisture no longer emerges from the exhaust.	

## 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 eyes, skin and cloth against the corrosive 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.**

- Do not confuse the **positive (+)** and **negative (–)** terminals of the battery.
- When **fitting** the battery, first connect up the **positive lead**, then the **negative lead**.  
**Negative terminal to earth = engine block.**
- When **removing**, first disconnect the **negative lead**, then the **positive lead**.
- Always take care to **avoid short-circuits** and earth (ground) contact of live cables.
- If malfunctions occur, first of all **check** that **cable connections** make good contact.
- Replace a failed indicator light without delay.
- **Do not remove the ignition key** while the engine is running.
- **Do not 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.

- Before starting **emergency operation without battery**, proceed as follows before starting:
  - disconnect plug-connection to voltage regulator for engine models with **mounted instrument box (picture 25)**. Turn key to **off-position (0)** and remove.

- disconnect plug-connection to instrument box for engine models with **external instrument box (picture 26)**.

- Do not splash electrical device with water jet or pressure jet during engine cleaning.

- When carrying out **welding work** on the engine or equipment, fit the earth clip of the welding equipment as close to the welding point as possible and **disconnect the battery**. The connecting plug for the voltage regulator must be removed.

The relevant circuit diagrams are enclosed with the engine if it is equipped with an electrical system. Additional circuit diagrams can be supplied to order.

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

## 8. Storage out of use

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

In very humid climates or coastal regions, the protective treatment is sufficient for up to about 6 months.

For longer periods of storage, please contact Discount-equipment.

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