

MANUAL **BOXER III**



Prins Maasdijk



MANUAL

BOXER III

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1. FOREWORD

Thank you for buying this Prins Boxer III fork lift truck from Prins Maasdijk. This manual contains all the important information you need for the operation and maintenance of your lift truck. We recommend that you read through this manual very carefully and let other users read it too before taking the lift truck into use. Once you have read the manual, keep it somewhere it is easy to find, so that you have access to information about maintenance, defects, etc, at any time.

If you want to order parts for your Prins lift truck, or have any questions and/or comments about it, please contact Prins Maasdijk. When you call us you will be asked for the *service number* and *serial number* of your lift truck, which can be found on the plates in the top left and top right-hand corners of the dashboard. Have these numbers to hand whenever you call us.



We wish you every success with the use of your new lift truck.

Prins Maasdijk

2. IMPORTANT

This manual contains important information about the correct and safe use of your lift truck. Always follow the instructions given in this manual.

You will find the following symbol in various places in this manual:



Warning! Important information.

Whenever you see this symbol, always read carefully what appears after the symbol before you start on the operation. This is information for your personal safety and the safety of others. Always be alert to hazardous situations.



3. GENERAL SAFETY REQUIREMENTS



When working with and carrying out maintenance on the lift truck you must always be conscious of the possible associated hazards. Pay close attention to the safety rules. Failure to do so may result in serious physical injury to yourself or others.








The manufacturer cannot anticipate every unsafe situation. As a user you must therefore oversee your own and other people's safety when using and carrying out maintenance on the lift truck. Always use the tools and products recommended by the manufacturer and use only original parts for repairs.

For your own and other people's safety:

- Never load the lift truck above the maximum permissible lifting weight.
- Pay close attention to the load diagram on the lift truck engine cowling.
- In the unlikely event that you have to take the load on one fork, remember that the maximum load will therefore be halved. Try to avoid this as far as possible.
- When travelling with a load keep your speed down (never top speed!) and keep the load as low to the ground as possible, say 10 to 20 cm.
- When lifting a load keep the speed as low as possible and pay attention to lift truck headroom.
- Always carry out the necessary preventive checks on the lift truck before starting to work with it. Never start working with the lift truck before you have checked it fully. This prevents accidents. In this regard pay particular attention to the tyres, battery, brakes, steering mechanism, fuel system and the electrical components.
- Never top up fuel while the engine is running. There must be no smoking and no flames and sparks in the immediate vicinity while refuelling or changing/topping up oil is in progress. Explosive gases are released during refuelling.
- After refuelling or changing/topping up oil always remove spilled liquid from the lift truck.
- Check the machine for spots of oil or fuel before refuelling or changing/topping up oil and check where they are coming from. If they are the result of a technical fault, repair it first before you start working with the lift truck.
- Always put the handbrake on and the gear into neutral when leaving the lift truck.
- Incorrect sitting posture can lead to accidents. Always therefore adjust the seat so that you can operate all the handles properly and have a clear view.
- Never work with a lift truck without a safety cage or roll bar (supplied as standard).
- Always wear a safety belt when you use the lift truck.

- Always drive at a speed at which you have the lift truck properly under control. Excessive speed can be dangerous. Sudden braking, acceleration or turning can also cause a hazardous situation.
- When working in places with limited headroom and when you have to drive in and out, take account of the following:
 - Always check that there is enough room next to and above the lift truck.
 - Keep all body parts inside the safety cage, hands on the wheel and feet on the pedals at all times.
 - Look carefully where you are going.
- Operate the handles smoothly. This will significantly extend the life of your lift truck and is very much safer.
- Never let anyone walk under the forks when carrying a load. This is very dangerous.
- Never let anyone ride on the lift truck with you and do not use the forks to lift anyone.
- Always let the load down slowly and do so with forks horizontal or tilting back slightly, never with forks tilting forward.
- The condition of the machine can be checked on the basis of numerous factors. Changes in sound, vibrations or responses to control handles may be an indication of defects or faults. If you suspect a fault, immediately put the lift truck to one side and stop the engine. Check the cause and take the necessary action.

Table 3.1 | Meaning of safety symbols

 <p>Follow the directions for use and safety</p>	 <p>Wear safety goggles and protective clothing</p>
 <p>No smoking or open flame</p>	 <p>Electrolyte is highly corrosive</p>
 <p>Live connectors, avoid contact</p>	 <p>Rooms where batteries are located or charged must be adequately ventilated</p>
 <p>Explosion risk, avoid short circuits</p>	

4. PARTS OVERVIEW

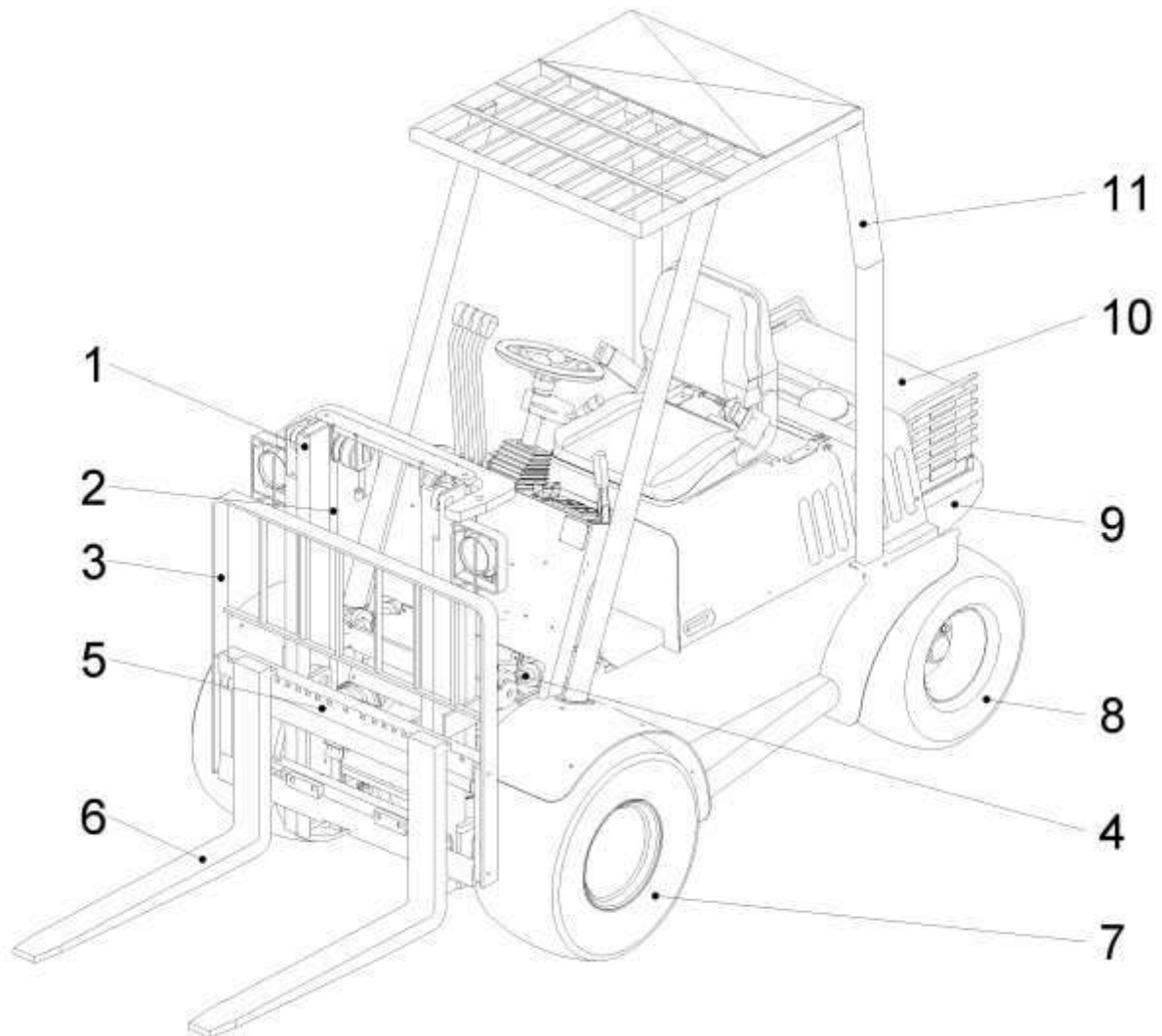


Figure 4.1 | Overview

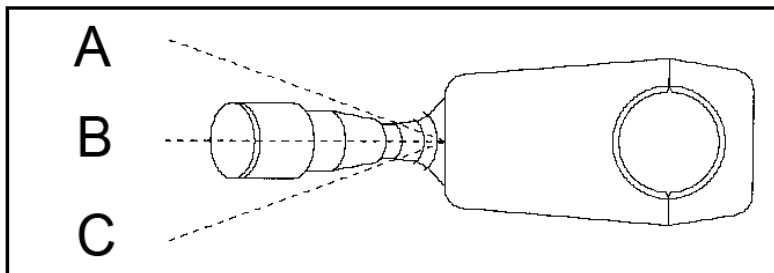
- 1 – Mast
- 2 – Lifting cylinder
- 3 – Carriage
- 4 – Tilting cylinder
- 5 – Fork skid plate
- 6 – Forks
- 7 – Front wheel
- 8 – Rear (steering) wheel
- 9 – Counterweight
- 10 – Ballast slabs
- 11 – Safety cage

5. LIFE TRUCK OPERATION

5.1 Starting and stopping the engine

1. Before starting the engine put the direction selector switch to the left of the steering wheel into neutral (see Figure 5.1).

Figure 5.1 | Gear lever



A = forward
B = neutral (free)
C = reverse

2. Turn the ignition key to the "ON" position. In normal circumstances two lamps will come on, the oil pressure lamp and the charging current lamp.

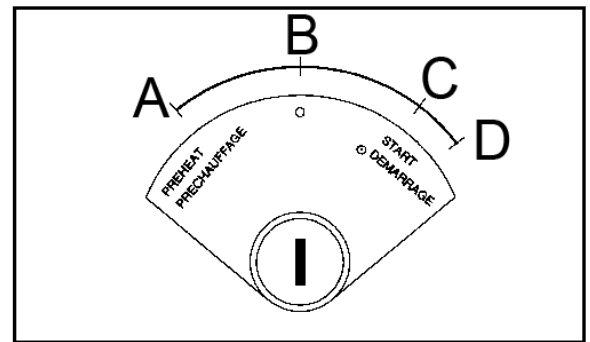


Figure 5.2 | The ignition

A = PREHEAT
B = OFF
C = ON
D = START

3. If both lamps are on, the ignition key must be turned back past "OFF" to "PREHEAT". When the preheat lamp goes out, the ignition key can be turned to "START" and the engine will start.



Warning! The preheat lamp has been set to approximately six seconds. At very low temperatures it is advisable to preheat for more than these six seconds. Table 5.1 shows how long preheating must continue after the lamp has gone out.

Table 5.1 | Preheat times

Temperature	Additional preheat time
above 10°C	Not required
between -5°C and 10°C	Approx. 5 sec
below -5°C	Approx. 10 sec
maximum interval for continuous preheating	20 sec

4. If the engine fails to start within 10 seconds, turn the ignition key back to “OFF” and wait 30 seconds before making a new attempt. Start each new attempt from step 1.



Warning!: Never operate the starter motor continuously for more than 20 seconds.

5. Once the engine has started, check that the oil pressure and charging lamps have gone out. If they have **not**, turn the engine off immediately and investigate the following possible causes

Oil pressure lamp stays on:

- Is the oil level correct?
- Is there any dust or are there any other impurities in the sump oil?
- Is there a short circuit and are there any other defects in the wiring?

Charging lamp stays on:

- Is the battery charged?
- Is the battery acid level correct?
- Is there a short circuit and are there any other defects in the wiring?

If you have made all these checks and not found any defects, contact your dealer.

6. When the engine is cold, it will not run altogether smoothly. As it warms up, it will start running more smoothly. Bring the engine up to temperature by running it at half throttle without a load.
7. When you want to stop the engine, ensure the direction selector switch to the left of the steering wheel is in neutral. Also ensure that the lift truck forks are resting on the ground (this will avoid unnecessary loading of the lifting cylinders and prevent accidents). Turn the ignition key to “OFF”.



Warning!: Before dismounting from the lift truck the gear lever must be in neutral and the handbrake engaged. Then it is safe to dismount.

5.2 Moving and stopping the lift truck

The Prins Boxer III is fitted with a hydrostatic drive for fully automatic travel. The direction of travel can be chosen with a direction selector switch on the steering column.



Figure 5.3 | Direction selector switch

1. Home
2. Forward
3. Reverse

Lift the direction selector switch slightly and move it forwards or backwards to select the forward or reverse direction of travel respectively. By operating the accelerator pedal the machine will move in the desired direction. If you have to change direction, you must first stop the machine and then move the switch to the desired direction.

To choose between extra speed and extra tractive power the machine is fitted with two gears. The choice between the two gears can be made using a pull switch on the dashboard (Figure 5.5). There is no need to pull away in first gear. It is worthwhile deciding which gear you want and selecting it before pulling away. First gear can always be selected as standard. The maximum tractive power is then available. This results in the best travel properties and the most constant speed of travel.

If long distances have to be covered and the load will not be the maximum, second gear can be selected. The speed of travel will be higher. Be sure that the conditions, such as the condition of the ground, permit this higher speed.

It is possible to choose between the two gears during slow travel. Always release the accelerator pedal when changing gear. When changing gear there may be a jerk in the drive. This does not do the machine any harm, but remember that it may have an impact on the load.

Figure 5.4 | Pedals



- 1 = BRAKE pedal
- 2 = ACCELERATOR pedal

To bring the lift truck to a stop you must release the accelerator pedal and carefully depress the brake pedal until the lift truck has come to a complete standstill, at which point put the gear lever into neutral.

The machine is fitted with an electrically operated parking brake, which is switched on and off using the switch on the dashboard. The switch will light up if it has been switched on and the ignition is on. If the ignition is off, the machine is always on the handbrake.

When leaving the lift truck the forks must always be fully lowered and the parking brake engaged. The machine cannot move with the parking brake engaged.

Figure 5.5 | Dashboard

- 1. Work lamps front
- 2. Work lamps rear
- 3. Battery
- 4. Gear selector switch
- 5. Ignition lock
- 6. Parking brake switch



5.3 Optional

As an option the machine can be fitted with a battery, which is switched on using the switch shown in Figure 5.5.

The battery serves as a shock absorber for the load carried by the lift truck. For correct operation the battery must be adjusted to the weight of the load being carried. Consult the Prins Maasdijk technical department or your dealer.

If overloaded the battery can suffer irreparable damage. If you travel without a load or carry loads that are substantially heavier (more than 25%) than the load to which the battery has been adjusted, always switch the battery off. The battery must also be switched off for the accurate positioning of the load.

In incidental cases the position of the battery switch may be occupied by that of another (optional) function. Be sure to familiarise yourself with the machine's optional equipment before operating and using it.

5.4 Settings

Before starting the machine first assume the correct sitting position.

5.4.1 Steering column adjustment



Figure 5.6 | Steering column operation

Undo (A) the handle as shown in Figure 5.6 and set the steering column to a comfortable position. Then secure (B) the handle again by moving it upwards.

5.4.2 Seat adjustment

In the case of the standard seat the lengthways adjustment can be made by adjusting the angle of the back. The possible adjustments are shown in Figure 5.7. Adjust the seat until you have a comfortable and safe sitting position.



Figure 5.7 | Seat adjustment

As an option a different seat may be fitted. Find out about the correct possible adjustments of this seat or if necessary contact Prins Maasdijk.

5.5 Operation of mast and forks

The lift truck is equipped as standard with two hydraulic functions, the first to lift the load and the second to tilt the mast. In most cases the machine will also be equipped with a function to move the load sideways (side shift). A fourth or even fifth hydraulic function can also be fitted. The various functions are all operated by means of a valve block located on the driver's right.

Figure 5.8 | Hydraulic functions



1. Lifting and lowering
2. Setting angle of tilt
3. Side shift
4. Optional function



Warning! Always ensure that the load is properly stacked and balanced. A falling load can lead to injury to yourself or others.

5.6 Loading and unloading goods

1. Put the lift truck directly in front of the goods to be unloaded. Ensure that the load is evenly distributed across the forks.
2. Ensure that the mast does not tilt back or forward and then bring the forks to the right height.
3. Move forward slowly until the load makes contact with the carriage. Then lift the load 5 to 10 cm. It may be that the load is not entirely on the edge of the trailer or warehouse rack, in which case insert the forks as far as possible and then tilt them a little.



Warning! Ensure that you lift the load so that it does not topple forward, that is always ensure that the forks are inserted at least 2/3 – 3/4 of the way into the load (depending on the weight of the load).

4. Then move back slightly until the load is positioned so that it can be taken fully on the forks. Put the load down again and then insert the forks all the way into the load until it comes into contact with the carriage and lift the load 5 to 10 cm.
5. Lower the forks with load to just above the ground (10 to 20 cm).
6. Tilt the mast back as far as you can and reverse carefully.
7. Move the load to the desired destination.



Warning! With a load on the forks brake and steer extremely carefully. Sudden changes of speed and direction may cause the load to fall.

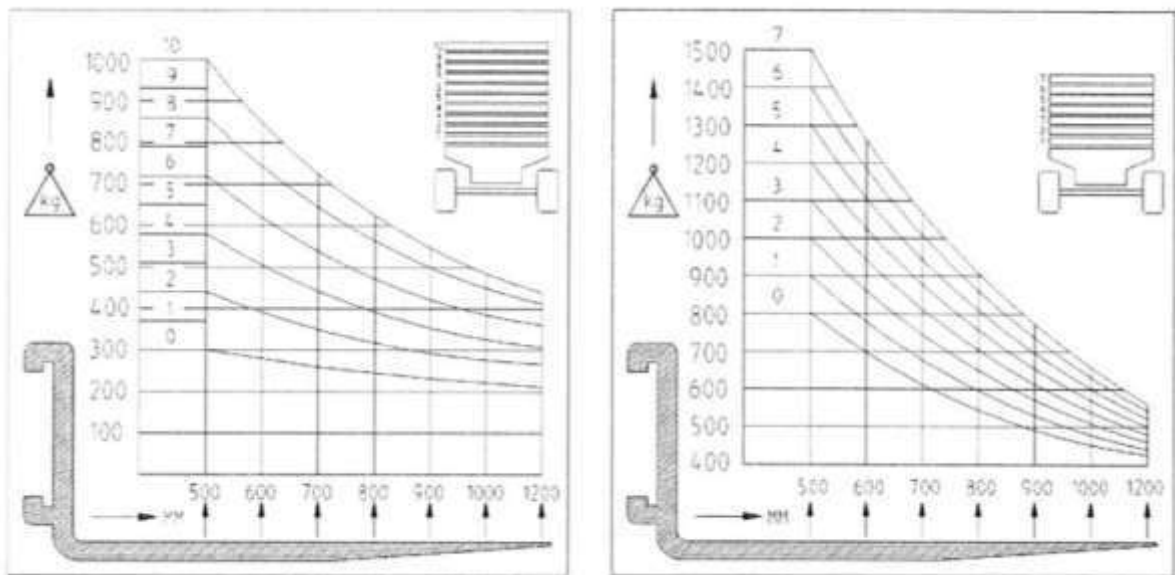
8. On arrival at the destination, again ensure that the forks are in a vertical position so that the load is parallel to the unloading platform.
9. Lower the load to approx. 5 cm above the unloading platform. Move forward slowly and put the load down 10 to 20 cm in front of its final position.

10. Then reverse the same 10 to 20 cm, lift the load approx. 5 cm again and finally put it down in the right place (if the forks are protruding from the load at the front, this is to prevent the ends of the forks from causing damage to obstacles in front of the lift truck that the lift truck driver cannot see because of the presence of the load on the forks).
11. The Prins forklift truck is provided with removable counterweight slabs. If the lift truck is carrying small loads, various slabs can be removed according to the size of the load to reduce the weight of the machine. This may deliver benefits with regard to all-terrain manoeuvrability or surface rutting. If this is not important, always ensure that the maximum number of counterweight slabs is in place.

Procedure:

1. Determine the load to be carried.
2. Consult the load table in Figure 5.9 for the minimum number of counterweight slabs that must be in place.
3. Place this number of slabs. The addition or removal of slabs always requires two people.
4. Once the right number of slabs is in place, refit the locking device.

Figure 5.9 | Load tables



6. LIFT TRUCK MAINTENANCE

It is very important to maintain your lift truck properly. A well-maintained lift truck will last significantly longer. Prins Maasdijk therefore strongly recommends that you do everything covered in this manual meticulously and with care.

This manual gives indications as to when these operations are to be carried out. The prescribed times, shown in hours, are the working hours of the lift truck, which are displayed on the hour counter on the dashboard. The indications given are the times of use in normal circumstances. In difficult or extreme conditions it may be necessary to perform certain activities more frequently.



Warning! Only carry out the operations described in this manual if you are familiar with the relevant work procedure. And if you are familiar with the safety regulations and the hazards that can arise if you ignore them. If you are unfamiliar or insufficiently familiar with the regulations, let your dealer or the Prins Maasdijk technical department carry out the operations.

6.1 The drive, hydraulic system

The Prins Boxer III is fitted with a so-called hydrostatic drive, which means that the drive is effected by means of hydraulic oil, using a pump and an engine. For good operation and long life it is extremely important to keep the oil in top condition. So follow the instructions below carefully. Failure to do so correctly or contamination of the system can lead to serious shortening of the service life or expensive repairs.

It is expressly recommended that work on the hydraulic system be done only by Prins Maasdijk or its dealer.

During running-in period (first 50 hours):

1. After every 10 hours of operation use the oil dipstick (see no. 1 in Figure 6.1) to check the hydraulic system oil level. Top up the oil if necessary (see no. 2 in Figure 6.1). Ensure that the lifting cylinder is in its lowest position.

Figure 6.1 | Hydraulic oil



1. Oil dipstick
2. Oil filler opening
3. Oil filter

Figure 6.2 | Hydraulic oil (from below)





Warning! Do the check when the engine is idling and the oil is at operating temperature.

2. The transmission must be checked regularly for oil leaks.

After running-in period (after 50 hours):

- Replace oil filter (see no. 3 in Figure 6.1).

Periodically:

Every 200 hours:

- Check the transmission oil level and top up if necessary.

Every 500 hours:

- Replace oil filter.

Every 1,000 hours of operating time:

- Change the oil in the transmission.



Warning! If the operating time is less than 1,000 hours a year, the oil change must take place every two years.



Warning! Keep all dirt out of the tank or oil when working on the hydraulic system or checking the oil level. The tiniest particle of dirt can cause damage.

Oil change data

Capacity

Tank : 70 litres

Hydraulic oil

ESSO H46 or

OLNA H 46

Venting the hydraulic system

If driving or lifting are accompanied by jolting, it will sometimes be necessary to vent the hydraulic system.

The venting process is as follows:

1. Undo the hydraulic hose above the pump one or two turns.
2. Start the engine.
3. Wait until oil runs out of the opening.
4. Tighten the hose again.

6.2 Engine

The engine of your new Prins lift truck also needs a running-in period. It lasts approx. 50 hours. Below are the operations necessary to keep your lift truck engine in optimum condition and to prevent problems. Tables 7.1 and 7.2 show all the operations associated with the maintenance on the lift truck.

During running-in period:

1. Use the oil dipstick to check the oil level in the sump of the engine regularly. Top up if necessary (also after the running-in period).



Warning! Carry out the check before starting the engine or at least five minutes after switching off the engine.

2. The engine must be checked regularly for oil leaks.

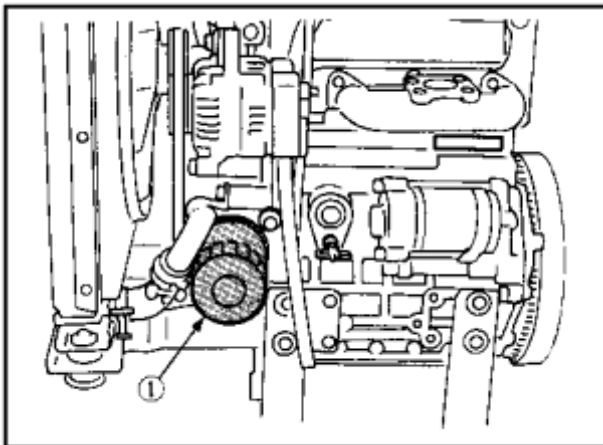
After running-in period:

1. Replace the oil filter

Replacing the oil filter:

- Use a filter wrench to remove the old filter
- Apply a film of oil to the gasket of the new filter
- Tighten the filter by hand
- Once the filter has been fitted, the oil level generally falls a little. First check if the filter is leaking and then check the oil level and top up if necessary

Figure 6.3 | Oil filter



1. Oil filter

2. Change the oil. First let the old oil out of the sump through the drain plug under the engine.

Periodically:

Every 200 hours of operating time:

1. Replace the oil filter
2. Change the oil.

Oil change data

Capacity

Sump: 5 litres

Oil

ELF Multiperformance 3C 15W40 or
Equivalent with specifications MIL-L-2104C or
API classification, CD level or higher

6.2.1 Cooling water system

It is important that the coolant level is correct, otherwise the engine will overheat, which will lead to damage. Therefore check the coolant level every day.

The procedure for this is as follows.



Warning! Always wait until the engine has cooled down before opening the coolant reservoir.

1. Carefully open the valve a little and first allow air to escape against any overpressure.
2. Then remove the valve entirely and check that the coolant comes up to the edge.
3. Top up coolant if necessary.
4. Tighten the valve fully after topping up coolant.

Coolant

ELF COOLELF

6.2.2 Fuel filter

The fuel filter must be replaced at least once every six months.

Venting the fuel system

To prevent damage to the engine or its parts, it is sometimes necessary to vent the fuel system.



Warning! Never vent the fuel system while the engine is still warm. This may cause explosion or fire risk. Evaporating fuel can also release toxic fumes.

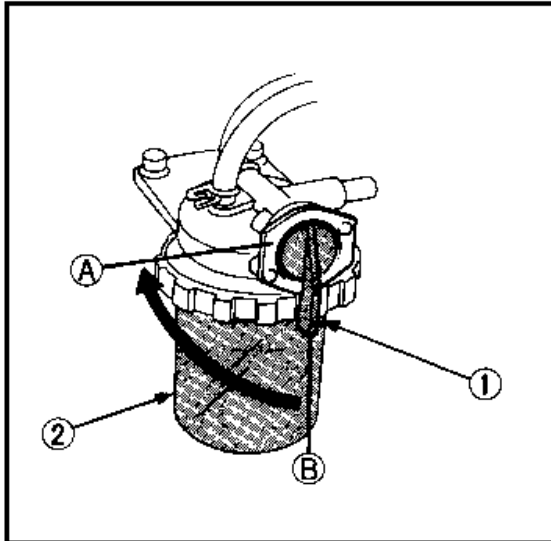
When is venting necessary?

- If one or more fuel system pipes has been disconnected
- If the fuel tank has been completely empty
- If the engine has not been in operation for a long time

The venting process is as follows:

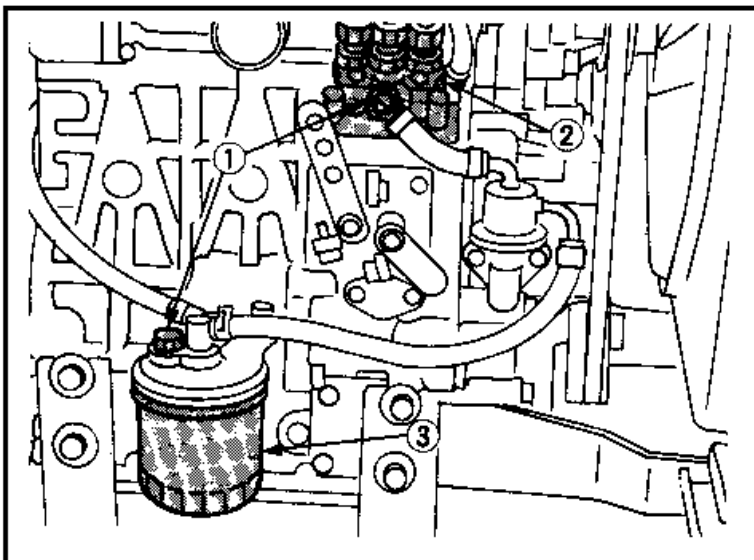
1. Fill the fuel tank with fuel
2. Open the fuel valve fixed to the fuel filter
3. Undo the two venting bolts on top of the fuel filter
4. Wait until fuel seeps through the vent openings and tighten the venting bolts again

Figure 6.4 | Fuel filter



1. Fuel valve
2. Viewing glass
- A. Valve "closed"
- B. Valve "open"

Figure 6.5 | Fuel filter in engine block



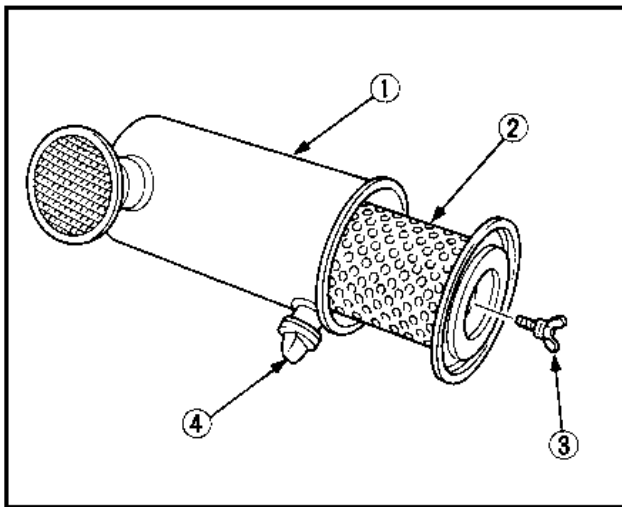
1. Venting bolt
2. Injection pump
3. Fuel filter

6.2.3 Air filter

The air filter is used to filter the air drawn in for the engine. It is a dry filter that is not suitable for use with oil. The filter must be replaced every 600 hours or more frequently if work is done in dirty conditions. Blowing the filter clean is permitted, if necessary. However, blowing must always be from inside to out with a maximum air pressure of 7 bar.

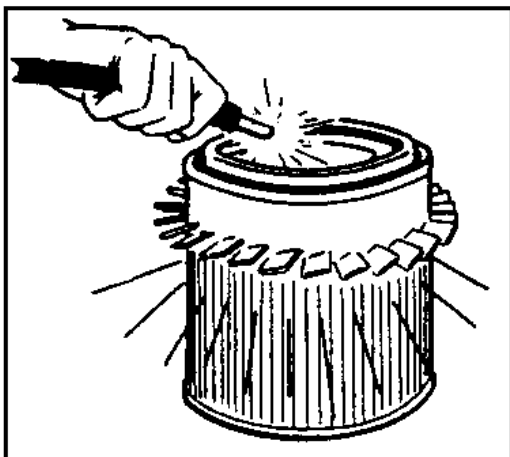
When putting the filter element back into the filter housing it is extremely important that the filter element is properly secured. If it vibrates loose while the engine is running, dust will find its way into the engine, which will lead to engine damage (see Figure 6.6 and Figure 6.7).

Figure 6.6 | Air filter



1. Air filter housing
2. Air filter element
3. Fixing nut
4. Discharge valve for dirt

Figure 6.7 | Blowing air filter element clean



6.2.4 Battery

Electrical energy is needed for the lift truck starter motor, for instance. It is supplied by the battery, which in its turn is charged by the dynamo that is driven by the outgoing shaft of the engine. The battery may not work well for a variety of reasons, one of which may be that the connection of the wiring to the battery is not good. This may be the result of corrosion, for example. Therefore always grease the terminals with Vaseline for example to prevent corrosion.

Another cause can be that the battery acid level is too low. To rectify this, you must top up the battery with distilled water. The procedure for this is as follows.

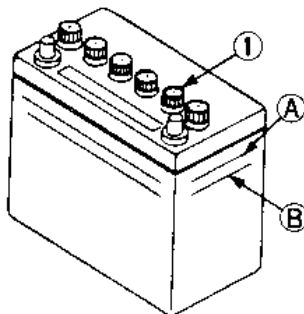
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Warning! Do not touch the battery electrolyte! The dilute sulphuric acid solution will burn your skin and make holes in your clothing. In the event of accidents, rinse immediately with running water.

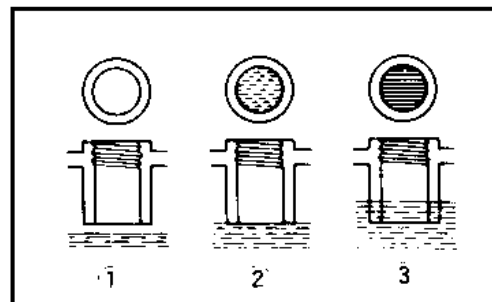
1. Remove the battery guard
2. Then first disconnect the negative terminal
3. Then disconnect the positive terminal
4. Open the filler opening, check the liquid level and, if necessary, top it up (see Figures 6.8 and 6.9)
5. When reconnecting the battery secure the positive terminal first and then the negative terminal

Figure 6.8 | The battery



1. filler cap
- A. Maximum level
- B. Minimum level

Figure 6.9 | The battery acid level



1. Level too low
2. Level okay
3. Level too high

6.2.5 Fan belt

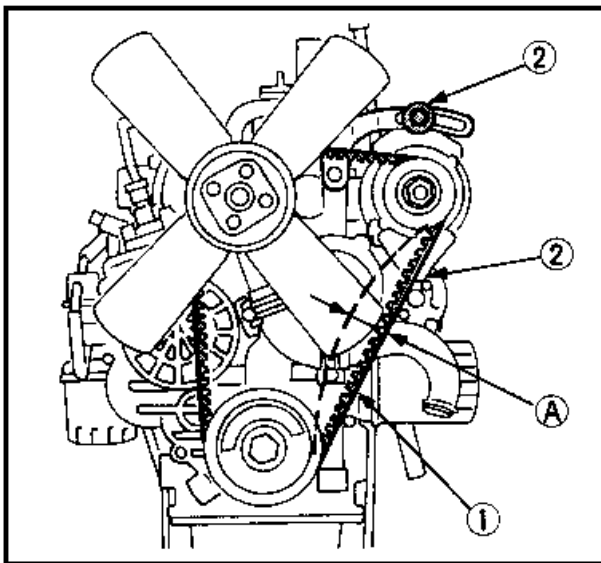
The fan belt or V-belt provides the drive for the fan and the dynamo. If it is not tensioned sufficiently, it will start to slip, with the result that the fan, which provides engine block cooling, cannot function properly. As a result the engine will overheat. The same applies to the dynamo, which cannot function properly either and therefore the battery will not be charged sufficiently. This can cause problems when starting, for example. So always ensure that the V-belt is properly tensioned. This is fairly easy to check.



Warning!: Always ensure that the engine is off when checking the V-belt.

1. Take the section of V-belt between the dynamo and the engine shaft and push down on the middle of the belt with your finger. The deviation of the V-belt from its rest position may be not less than 7 mm nor more than 9 mm.
2. If this is the case, undo the two dynamo fixing bolts.
3. Position the dynamo so that the V-belt has the right tension and tighten the bolts again.

Figure 6.10 | Tensioning V-belt



1. Fan belt (V-belt)
2. Adjusting bolts
3. Play 7 – 9 mm

6.3 Other maintenance

Lubrication

The following parts must be lubricated at least once a month:

- Side shift cylinder (sliding blocks)
- Steering cylinder (lubricating nipples)
- Shaft tilting piece (lubricating nipples)
- Tilt cylinders (lubricating nipples)
- Mast (section on inside)

Tyres

The tyre pressures must be checked every week. The pressure in the tyres must be:

- Driven (front) wheels : 3.0 bar
- Steering (rear) wheels : 2.5 bar

The valves are located on the edge of the wheel rim. If the machine is fitted with the optional double pneumatic tyres, then the innermost wheel rim valve is located at the rear (the chassis side) on the edge of the wheel rim. Raise the mast to maximum height and look from the front to see whether the valve is accessible. If necessary, move the machine a short distance forward or back to gain better access to this valve.

Figure 6.11 | Outside wheel rim valve



Warning! Always top up the outer wheel of double pneumatic tyres with at least 0.5 bar less compared with the inner wheel.

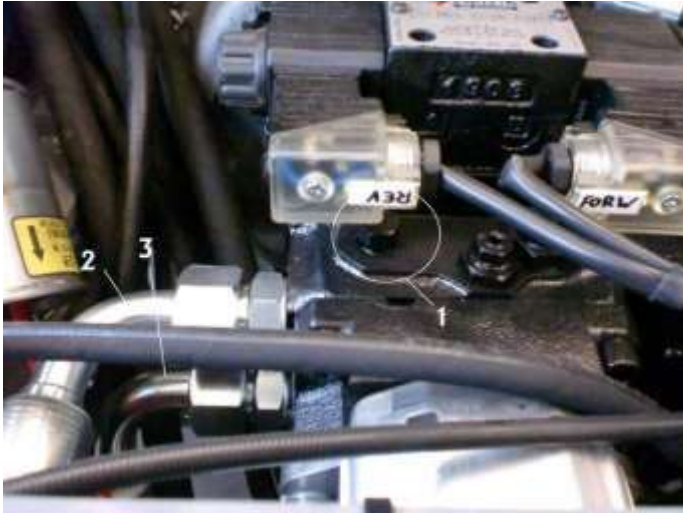
Figure 6.12 | Inside wheel rim valve



6.3.1 Towing position

If you want to use the towing position function, undo the bolt on top of the hydraulic pump a few turns so that pipes 2 and 3 are connected to each other and the wheels are free. You must perform this operation with the engine running.

Figure 6.13 | Towing position bolt



1. Towing position function bolt
2. Pipe
3. Pipe

7. OVERVIEW OF MAINTENANCE INTERVALS

Tables 7.1 and 7.2 below contain an overview of the maintenance operations to be carried out on your forklift truck.

Table 7.1 | The hydraulic drive

Operation	Running-in period First 50 hours	Every 500 hours	Every 1,000 hours	Every year	Every two years
Change oil			X		X
Replace filters	X	X		X	

Check oil levels and system for leaks daily.

Table 7.2 | The engine

Operation	Running-in period First 50 hours	Before each use	Every 100 hours	Every 200 hours	Every 1,000 hours	Every six months
Change oil	After 50 hours		X			
Replace oil filter	After 50 hours			X		
Replace air filter					X	
Check fan belt pressure		X				
Replace fan belt				X		
Check battery acid level			X			
Check coolant level		X				
Replace fuel filter					X	

8. TROUBLESHOOTING GUIDE

8.1 Vehicle

	Possible cause	Solution
Front/rear lamps not working	<ul style="list-style-type: none"> · Fuse blown 	Check fuse, see diagram
Lift truck does not move after depressing inching pedal	<ul style="list-style-type: none"> · Direction selector switch not engaged. · Cable sticking 	<p>Check whether the direction of travel selector switch is engaged.</p> <p>Check whether the inching pedal cable returns properly.</p>
Lift truck does not get up to speed properly	<ul style="list-style-type: none"> · Hydraulic oil not up to level 	Check whether the hydraulic oil is at the right level.

8.2 Engine

	Possible cause	Solution
The engine will not start	<ul style="list-style-type: none"> · No fuel · Air in the fuel system · Water in the fuel system · Fuel pipe blocked · Fuel filter blocked · Fuel or engine oil viscosity too high at low temperature · Fuel with too low cetane content · Fuel leak because of loose injection pipes · Incorrect injection timing · Fuel camshaft worn · Injector blocked · Injection pump not working properly · Compression leak in the cylinder · Incorrect valve timing · Piston rings and bush worn · Too much valve play 	<p>Replenish the fuel tank Vent Replace fuel and repair or replace the fuel system Clean fuel pipe Clean or replace filter</p> <p>Use prescribed fuel or engine oil</p> <p>Use prescribed fuel</p> <p>Tighten nut</p> <p>Adjust Replace Clean injector Repair or replace injection pump Replace cylinder head gasket, tighten cylinder head bolt, heater plug and injector holder Improve or replace timing gear Replace Adjust</p>
Starter does not work	<ul style="list-style-type: none"> · Battery empty · Starter not functioning · Switch not working · Wiring not connected properly 	<p>Charge the battery Repair or replace Repair or replace Connect wiring</p>
Engine does not run smoothly	<ul style="list-style-type: none"> · Fuel filter blocked or dirty · Air filter blocked · Fuel leak because of loose injection pipes 	<p>Clean or replace Clean or replace Tighten nut</p>

	<ul style="list-style-type: none"> · Injection pump not functioning properly · Incorrect injector opening pressure · Injector faulty or blocked · Regulator not working properly 	<p>Repair or replace</p> <p>Adjust</p> <p>Repair or replace</p> <p>Repair</p>
White or blue exhaust gases	<ul style="list-style-type: none"> · Excess of engine oil · Piston springs and bush worn or faulty · Incorrect injection timing 	<p>Reduce to prescribed level</p> <p>Repair or replace</p> <p>Adjust</p>
Grey or black exhaust gases	<ul style="list-style-type: none"> · Too much load · Fuel level too low · Fuel filter blocked · Air filter blocked 	<p>Reduce the load</p> <p>Top up to the prescribed level</p> <p>Clean or replace</p> <p>Clean or replace</p>
Output power too low	<ul style="list-style-type: none"> · Incorrect injection timing · Uneven fuel injection · Injector pressure too low · Compression leak 	<p>Adjust</p> <p>Repair or replace the injection pump</p> <p>Repair or replace the injector</p> <p>Replace cylinder head gasket, tighten cylinder head bolt, heater plug or injector holder</p>
Excessive lubricating oil consumption	<ul style="list-style-type: none"> · Piston spring openings on the same side · Oil circuit worn or faulty · Piston ring groove worn · Valve shank and valve guide worn 	<p>Change the direction</p> <p>Replace</p> <p>Replace the piston</p> <p>Replace</p>
Fuel mixed with lubricating oil	<ul style="list-style-type: none"> · Injection pump piston worn · Injection pump faulty 	<p>Replace the pump element or the whole pump</p> <p>Replace</p>
Water mixed with lubricating oil	<ul style="list-style-type: none"> · Cylinder head gasket faulty · Cylinder block or cylinder head broken 	<p>Replace</p> <p>Replace</p>
Low oil pressure	<ul style="list-style-type: none"> · Too little engine oil · Blocked oil filter · Too much crankshaft bearing play · Too much connecting rod bearing play · Too much tumble shaft bearing play · Oil passage blocked · Incorrect type of oil · Oil pump faulty 	<p>Top up</p> <p>Clean filter</p> <p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Clean</p> <p>Use prescribed oil</p> <p>Repair or replace</p>
High oil pressure	<ul style="list-style-type: none"> · Incorrect type of oil 	<p>Use prescribed oil</p>
Engine overheats	<ul style="list-style-type: none"> · Too little engine oil · V-belt broken or incorrectly 	<p>Top up engine oil</p> <p>Replace or tension properly</p>

	<p>tensioned</p> <ul style="list-style-type: none"> · Too little cooling water · Protective grille of radiator and radiator rib blocked · Radiator corroded from inside · Cooling water supply corroded · Radiator cap faulty · Too much load · Cylinder head gasket faulty · Incorrect injection timing · Unsuitable fuel used (mixed with petrol) 	<p>Top up cooling water Clean</p> <p>Clean or replace</p> <p>Clean or replace</p> <p>Replace Reduce load Replace Adjust Use prescribed fuel</p>
Rapid battery discharge	<ul style="list-style-type: none"> · Too little battery acid · Slipping V-belt · Wiring not properly connected · Pressure regulator faulty · Dynamo faulty · Battery faulty 	<p>Top up distilled water and charge battery Tension or replace V-belt Connect wiring</p> <p>Replace Replace Replace</p>