SR1046X

FOREST HARVESTER
Instruction Manual

Sampo-Rosenlew Oy
PL 50
28101 PORI

09/02
0812342
THIS BOOK

The purpose of this book is to enable the Operator to handle and maintain the forest harvester efficiently. It is
of utmost importance that the Operator becomes familiar with the structures, adjustments and maintenance
of his harvester. Compliance with the advice and instructions given in this manual guarantees the best results
at the lowest costs.

This manual provides descriptions of as well as operating and maintenance instructions for the forest
harvester. The other manuals you will find useful when using and servicing your forest harvester include the
instructions and spare part catalogue for the harvester head, the instructions for the harvesting computer, the
instructions for the crane, the instructions for the crane control system as well as the engine manual and the
spare part catalogue. Have these manuals always in the cab, in the special pocket reserved for them, for
convenient reference. If, for some reason, they are not supplied together with the harvester, send
immediately for new manuals.

Item "Technical Specifications" has a description of all the features of the forest harvester in accordance with
the delivery contract. It does, however, not include retro-fitted accessories.

The Manufacturer reserves the right to modify the structure, adjustments or accessories of the harvester as
well as the service and maintenance instructions without further notice.

SAMPO-ROSENLEW Oy
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SAFETY PRECAUTIONS

Read carefully these instructions on safety and use before starting to operate the harvester. Time spent in becoming familiar with the instructions now, will save you money or may even spare you from injury. Before accepting the delivery of the harvester, make sure it conforms to the delivery contract. Do not fit the harvester with any accessories not approved of by the Manufacturer. The Manufacturer of the forest harvester is not responsible for any damage or injury caused by such accessories either to people or property.

1. TRANSPORTATION ON A VEHICLE OR BY RAIL

Make sure you know the measurements and weights of the harvester and the transporter. Comply with any regulations concerning transportation. Use increased tyre pressure (a minimum of 3 bar) to improve stability. Fix the harvester securely to the transporter. For road transport lower the crane fully and fix it to the transporter.

2. DRIVING IN TRAFFIC

When driving on public roads, comply with the relevant statutory traffic regulations. Remember that the harvester has articulated steering. Test brake functions before driving on the road. The crane must be locked in the transport position. The headlights shall be correctly aligned. The rear lights shall be turned out in their road position. Never drive downhill with the gear in neutral. Never carry passengers on the harvester. Never use the harvester for transporting goods. Hang the "Slow Vehicle" sign at the back.

3. FOREST HARVESTING

Get familiar with the structure of the forest harvester by studying the manual before starting harvesting. Make sure the protective guards are properly attached and in good condition. Sound the signal to warn people around the harvester before starting the engine. Never use the forest harvester for anything except harvesting of trees. Manual feeding of trees into the harvester head is forbidden. Before starting and moving make sure nobody is standing too near. Fasten the seat belt. This may be important, particularly when driving across steep terrain. Test the brakes as soon as you start, and stop immediately if the brakes or steering operate defectively. Never adjust the seat or joysticks while driving. Never leave the cab while the harvester is moving.
Never leave the engine running unattended.
Beware of the crane and the moving parts in the harvester head.
In cold weather heat the oil by also rotating it through the harvester head at low revolutions and low pressure before starting work.
Drive carefully on hillsides; the harvester may overturn, particularly with the crane on the downhill side.
The forest harvester cab is a safety cab.
The harvester has two exits. The left-side door is the normal exit. The right-side window may be used as an emergency exit when the lock is opened.
When the harvester is working, the emergency exits must be closed. For safety reasons their construction must not be changed.
When driving on frozen rivers or lakes, make sure the ice is strong enough.
Note the recommended safety distances when harvesting under power lines.
Stop the engine before cleaning or servicing of the harvester.
Stop the harvester and the engine immediately if there is an alarm or any abnormal sounds or smells.
Find out the reason for them, and solve the problem before continuing with harvesting.
If hydraulic connections leak, tighten the connections and wipe off any oil from the frame and underpans.

Support or lock the crane and the harvester head before going beneath them.
Never clean the harvester without proper equipment.
When leaving the harvester, lower the crane, stop the engine, remove the ignition key, lock the door and turn the main power switch to its zero position.

SAFETY DISTANCES WHEN HARVESTING UNDER OPEN-WIRE POWER LINES

The minimum space between the harvester and power lines with voltage must be in accordance with the enclosed illustration.
Low-voltage power lines (240/400V) can be distinguished from high-voltage lines (over 1 kV) by the smaller insulators and the fact that there are usually four low-voltage lines. In case the height or voltage of the power line is difficult to estimate, the electric company shall be consulted.
In case of accident

If there is an accident despite all precautions, keep calm and consider carefully what to do. First try to reverse the harvester away from the power line. If there are other people near, ask them to check that the harvester is not stuck in the line. If the harvester is just leaning against the lines, try to drive it away from them. Follow the advice from the people nearby. Due to their own safety, they shall stay a minimum of 20 metres away from the harvester touching the power line.

If the harvester cannot be driven off, and you have to leave the machine, jump down with your feet together in order not to touch the harvester and the ground simultaneously. Do not make yourself a conductor through which electricity can pass; the real danger lies in touching the harvester and the ground simultaneously.

Get away from the harvester jumping either with your feet together, or with only one foot on the ground at a time. Otherwise the electric field on the ground may create a fatal electric current between your legs. You will be safe at a distance of 20 metres from the harvester. Beware of broken power lines lying on the ground. A harvester touching a power line may catch fire. Leave the harvester immediately if smoke starts coming from the tyres.

Make sure the harvester will be guarded at a safe distance. Do not try to get on the harvester even if the power in the power lines may seem to have gone off.

Remember that open-wire lines never have a "blown fuse", but they are always dangerous unless made dead by an electrician. Even if the power went off, it might come back on in a while due to technical reasons. This may be repeated several times.

Contact the electric company and inform them about the exact site of the accident. By doing this, any risk can be eliminated and the fault repaired.

Ask the electric company for advice and follow it.
Inform them about any contact with power lines even if there was no actual damage.

Source: Konevieti Magazine 15/87

4. REPAIR AND SERVICE

Always keep the harvester in good condition. Check the condition of fast moving parts daily. Pay special attention to the transmission mechanism and the rotating parts in the harvester head. Replace defective parts before they become dangerous.

Clean, repair and service the harvester with the transmission and engine off and the ignition key off the ignition switch.

Disconnect the negative battery cable before repairing the engine or any electrical instruments.
Do not use inappropriate tools to connect and disconnect the battery.
Do not make an open fire or smoke near the battery.
Handle the battery acids with care.
Do not add air in the tyres without a pressure gauge due to risk of explosion.
Do not add coolant with the engine running.
Do not remove the radiator cap from an overheated engine.
Do not refuel with the engine running. Do not smoke while fuelling.
Do not adjust the hydraulic working pressure without a pressure gauge due to possible injury and damage to the components.
When servicing the hydraulics, be aware of the high pressure in the system. Make sure there is no pressure in the system, in the harvester head pressure accumulator or in the pressurized oil tank before disconnecting the connectors.
Never use over-sized fuses; they involve risk of accident.
Never start the harvester with anything but the ignition key.
When refitting a wheel, tighten the fixing screws to the correct torque. If the harvester is equipped with Black Bear motors with brakes, the diesel may be started only with the rear wheel rim attached to the motor.
Do not make any such structural changes or additions to the harvester that would make it less safe.
Tow the harvester only from designated points.

This symbol in the manual refers to a special risk involved in taking a certain measure, due to which extra caution shall be practised.
**MARKING OF THE DANGER POINTS**

Although an effort has been made to build the forest harvester as safe to use as possible, there are certain risks involved in its use. These are to be kept in mind when operating the harvester. The danger points have been marked on the harvester using danger symbols. On the following page you will find the key to these symbols. The danger symbols are based on the international ISO 11 683 standard.

**DANGER SYMBOLS**

<table>
<thead>
<tr>
<th>Danger</th>
<th>How to avoid it</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject to danger due to insufficient information</td>
<td>Read the manual before starting the harvester</td>
<td><img src="image1.png" alt="Symbol" /></td>
</tr>
<tr>
<td>A raised part may fall down</td>
<td>Support raised parts before going under them</td>
<td><img src="image2.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Gap in belt drive</td>
<td>Stop the engine and remove the ignition key before removing any guards</td>
<td><img src="image3.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Getting entangled in Moving parts</td>
<td>Keep at a safe distance from jointed components</td>
<td><img src="image4.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Falling of the machine or objects handled with it</td>
<td>Keep at a safe distance from the forest harvester, the crane, the head and the wood handled</td>
<td><img src="image5.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Electric shock</td>
<td>Keep at a safe distance from power lines. See the safety distances above</td>
<td><img src="image6.png" alt="Symbol" /></td>
</tr>
</tbody>
</table>
Fire
In case of fire:
- turn off the engine
- turn off the main power
- extinguish the fire
- get help if necessary

Fire
Extinguish the fire with the fire extinguisher stored under the guard marked with this sticker

Service measure
Before starting service:
- turn off the engine
- turn off the main power switch
- when servicing the harvester head, remove pressure from the pressure accumulator as instructed

Pressurized oil spray
Before disconnecting hydraulic connections, let the pressure off the pressurized oil tank by opening the breather filter with a gloved hand while keeping your face far from the breather.

Safety belt not worn
Always wear a properly adjusted seat belt while working and driving on the road

Normal exit not available
Open the handle on the right-side door and exit through the open emergency door

Refrigerant
Leaking refrigerant may cause frostbite
TYPE MARKING

When ordering spare parts or service, always quote the type marking and number shown on the machine plate. When ordering engine parts, also quote the engine number.

Write down the serial numbers of the forest harvester and the engine on this page (and in the spare parts list).

![Type Marking Plate]

Fill in the serial numbers of the crane and the harvester head

**Engine Number**

Note! Left side of the forest harvester = The side of the cab with the stairs
Right side of the forest harvester = The side of the side instrument panel
The basic forest harvester with articulated steering includes: a cab, gear box, valves, and crane on the front frame, an engine, pumps and tanks on the rear frame.

### Technical Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Weight without crane and head approx. 4,500 kg</td>
</tr>
<tr>
<td></td>
<td>Maximum weight 6,000 – 7,400 kg</td>
</tr>
<tr>
<td>Main Dimensions</td>
<td>Length without crane 4.9 m</td>
</tr>
<tr>
<td></td>
<td>Width 2.1 / 2.3 m</td>
</tr>
<tr>
<td></td>
<td>Height in transport position 3.03 m</td>
</tr>
<tr>
<td></td>
<td>Ground clearance 0.6 m</td>
</tr>
<tr>
<td>Engine</td>
<td>Valmet 420 DSRE</td>
</tr>
<tr>
<td></td>
<td>- power 73.5 kW/2,200 rpm</td>
</tr>
<tr>
<td></td>
<td>- fuel tank 135 l</td>
</tr>
<tr>
<td>Transmission</td>
<td>Traction hydraulic pump 123 l / min &amp; 420 bar</td>
</tr>
<tr>
<td>Front axle drive motor in dividing gearbox</td>
<td>45 cc</td>
</tr>
<tr>
<td>Rear wheels with hub motors</td>
<td>1340 cc / 3150 cc</td>
</tr>
<tr>
<td></td>
<td>Two speed ranges forward and backward 1&lt;sup&gt;st&lt;/sup&gt; gear 0-4 km/h / 0-3 km/h</td>
</tr>
<tr>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; gear 0-15 km/h</td>
</tr>
<tr>
<td></td>
<td>Electrically controlled flow divider valve</td>
</tr>
<tr>
<td></td>
<td>At front hydraulically controlled mechanical differential lock</td>
</tr>
<tr>
<td>Tyres</td>
<td>Front 500/60-26.5, 500/65R28, 600/55-26.5, 540/65R28</td>
</tr>
<tr>
<td></td>
<td>Rear 500/60-26.5, 500/65R28, 14.9 –24, 540/65R28</td>
</tr>
<tr>
<td>Hydraulic System</td>
<td>Working hydraulic pump 220 l/min &amp; 210 bar</td>
</tr>
<tr>
<td></td>
<td>Load-sensing, programmable IQAN</td>
</tr>
<tr>
<td></td>
<td>Oil tank 110 l</td>
</tr>
<tr>
<td>Electric System</td>
<td>Voltage 12 V / 24 V in harvester head</td>
</tr>
<tr>
<td></td>
<td>Battery 180 Ah</td>
</tr>
<tr>
<td></td>
<td>Charging generators 2 x 95 A</td>
</tr>
<tr>
<td></td>
<td>Working lights 15</td>
</tr>
<tr>
<td>Crane</td>
<td>Kesla H560 / H570, Mowi 460 / 700</td>
</tr>
<tr>
<td></td>
<td>Operating range 5.4 / 6.0 / 6.5 / 7.13 m</td>
</tr>
<tr>
<td></td>
<td>Lifting capacity (gross) 46 / 52 / 59 / 52 kNm</td>
</tr>
<tr>
<td></td>
<td>Weight 750 / 1050 / 1135 / 1180 kg</td>
</tr>
<tr>
<td>Harvester Head</td>
<td>Keto 51 / Keto 51 Victor with a dual-hose hydraulic system</td>
</tr>
<tr>
<td></td>
<td>Max. deliming diameter 420 mm</td>
</tr>
<tr>
<td></td>
<td>Weight approx. 420 – 500 kg</td>
</tr>
<tr>
<td>Brakes</td>
<td>Hydraulic / mechanic drum brakes</td>
</tr>
<tr>
<td></td>
<td>Optional negative multi-disc brakes at rear</td>
</tr>
<tr>
<td>Cab</td>
<td>Quiet safety cab (FOPS, ROPS, OPS)</td>
</tr>
<tr>
<td></td>
<td>Noise level under 80 dB (A)</td>
</tr>
<tr>
<td></td>
<td>Windows: Lexan Margard polycarbonate</td>
</tr>
<tr>
<td>Harvesting Computer</td>
<td>EPEC 4W50</td>
</tr>
<tr>
<td></td>
<td>a 4-wire CAN route</td>
</tr>
</tbody>
</table>
CERTIFICATE ON CONFORMITY TO THE EU DIRECTIVES

Sampo Rosenlew Ltd
P.O. Box 50
28101 Pori
Finland

Declares that the machinery placed on the market:

Forest Harvester Type: SR 1046X
Serial Number: ...........................................

complies with the technical requirements specified in machinery directive 98/37/EEC

The machinery has been designed in conformity with the following international standards and standard proposals:

ISO 11850 Machine for Forestry – Self-propelled machinery - Safety

Pori 9 October 2001

Sampo Rosenlew Ltd
Timo Prihti
Managing Director
GUARANTEE

Sampo Rosenlew Ltd, later called the Manufacturer, grants a guarantee regarding defects in the material and workmanship.

1. The guarantee period starts as soon as the harvester has been delivered to the customer and is valid for 6 months or 1000 operating hours coming to an end when the first condition has been fulfilled.

2. The guarantee does not cover:
   • transport damages
   • damages due to carelessness, misuse or injury
   • damages due to impurities in the hydraulic oil or the use of wrong type of oil
   • damages due to non-compliance with the operating instructions
   • damages due to neglected periodical maintenance procedures
   • damages caused by spare parts not approved of by the Manufacturer
   • damages due to the natural wear of parts; parts and materials likely to show natural wear, such as:
     • rubber hoses
     • light bulbs, sensors in the harvesting computer
     • chain and guide bar
     • tyres
     • belts and chains
     • windscreen wipers
     • fuel, oil, coolant and brake fluids
     • filter cartridges
     • packings and gaskets replaceable in regular service such as gaskets on the cover of the valve system and nozzle gaskets
     • injection nozzles
     • windows and guards made of polycarbonate
   • damages due to measures taken by the purchaser affecting the quality and structure of the harvester. Increasing of the hydraulic working pressure and pressure limits may cause damage; indirect damage, such as:
     • loss of output or down time
     • compensation claims submitted by a third party
     • overtime and holiday compensations
     • damage to property caused by the equipment
     • if there is a change in the ownership of the harvester

3. When working in cold conditions, the guarantee is valid only when the outdoor temperature does not drop below -25°C.

4. Any compensation claims under guarantee shall be submitted in a complete form within two weeks of the damage to the Manufacturer.

5. The guarantee compensation is limited, and the Manufacturer shall only replace the defective component unless otherwise agreed with the customer.

6. The components replaced under guarantee are the property of the Manufacturer, and they shall be returned to the Manufacturer upon request. Otherwise they shall be scrapped.

7. The guarantee on components delivered or repaired during the guarantee period will run out at the same time as the guarantee on the harvester.
STRUCTURE AND FUNCTIONS OF THE FOREST HARVESTER

Structure

The Sampo 1046X forest harvester has been designed to meet the demands set on the first thinning of forest. It is light and easy to handle, small but with a wide operating range. It does not damage standing trees and due to its light weight, it does not cause damage to the roots.

The forest harvester has articulated steering. The crane, gears and cab are located on the front frame. The engine, hydraulic pumps and oil and fuel tanks are located on the rear frame. The harvester is steered and tilted by means of a joint. The weight of the crane, which is the outermost part of the harvester, is low down. Therefore the whole operating range of the harvester can be utilised, and it is easy to get close to the trees. The inner rims of both the front and rear tyres go along the same tracks, which means that the harvester is easy to handle even in dense forest, as you only need to keep your eye on the front. The rear will always follow the front without hitting the trees. The harvester is very flexible; it has an extremely small turning radius (4.4 m), and the machine is narrow, only slightly over 2 metres at its widest point. Although the harvester is designed for use in first thinning, it also performs efficiently when clearing larger trees off the driving tracks.

Harvester Head

The harvester head cuts and fells the tree. After that the tree is delimbed and cut into a pre-set length. When harvesting, make sure the engine revolutions are high enough to produce sufficient working pump output to enable the required work movements. However, too high revolutions are heavy on fuel.

The Keto 51 is a suitable harvester head for the Sampo forest harvester. The dual-hose system in hydraulics and the CAN route with its easily detachable connectors used in controlling of the head make the head easy to remove. The programmable Harvemeter products can be used as the harvesting computer.

For further harvesting instructions, check the user manuals for the harvesting computer and the harvester head.
1. Final drive
2. Gear box
3. Hydraulic motor
4. Traction hydraulic pump
5. Working hydraulic pump
6. Hub motor
7. Fuel tank
8. Radiator
9. Oil cooler
10. Hydraulic valve
11. Oil tank
12. Air filter
13. Engine
OPERATOR CONTROLS AND INSTRUMENTS

EQUIPMENT ON THE INSTRUMENT PANEL (Fig. 1)

A  Engine Thermometer
B  Thermometer for Hydraulic Oil
C  Harvesting Computer Display
D  Programming Wheel of the Harvesting Computer
E  Signal Lights
H  Throttle Lever
J  Ignition, Starter (and Electric Stop)
K  Emergency Stop
L  Hour Gauge
M  Fuel Gauge
N  Heater Thermostat
O  Fan Speed Regulator
R  Radio
T  Phone Outlet
V  IQAN System Display
X  A/C Regulator
Y  Engine Heater Display

SWITCHES ON THE INSTRUMENT PANEL (Fig. 2)

A  Joint Lock Switch
B  Brake Switch
C  Sound Signal
D  Headlights
E  Seat Heater
F  Flashing Emergency Light
G  Working Lights, general
H  Working Lights, additional
K  Harvesting Computer Switch
O  Windscreen Washer
P  Alarm Reset
R  Working Lights, tree tops
S  Windscreen Wiper Switch
T  Turning Signal Switch
U  Dip Switch
V  4WD Switch
X  Rear Lock Switch
Y  Front Lock Switch
Z  Working Light, engine compartment

EQUIPMENT ON THE CEILING (Fig. 3)

A  Alarm Light (yellow)
B  Fire Extinguishing System Light (red)
C  Inside Light
D  Speaker
SIGNAL LIGHTS (Fig. 4)

The harvester has signal lights that indicate:

- lowering of engine oil pressure A
- lowering of charge B and C
- turning signal on D
- overheating of hydraulic oil E
- overheating of engine F
- high beam on H
- blocked suction filter in hydraulic oil I
- blocked pressure filter in hydraulic oil J
- blocked return filter in hydraulic oil K
- hydraulic oil level L

If a signal light comes on, it indicates either use or defect

VERTICAL JOYSTICKS (Fig. 5):

LEFT-SIDE JOYSTICK FOR THE CRANE
V1 Outer boom forward
V2 Outer boom inwards
V3 Crane turn to the left
V4

RIGHT-SIDE JOYSTICK FOR THE CRANE
O1 Lifting of the crane
O2 Lowering of the crane
O3 Steering of the frame to the right/turn of the rotator
O4 Steering of the frame to the left/turn of the rotator

MINI JOYSTICKS (Fig. 6):

LEFT-SIDE JOYSTICK FOR THE CRANE
V1 Outer boom forward
V2 Outer boom inwards
V3 Crane turn to the left
V4 Crane turn to the right
V5 Crane side tilt to the left
V6 Crane side tilt to the right

RIGHT-SIDE JOYSTICK FOR THE CRANE
O1 Lifting of the crane
O2 Lowering of the crane
O3 Steering of the frame to the right/turn of the rotator
O4 Steering of the frame to the left/turn of the rotator
O5 Harvester head open/up
O6 Harvester head closed/down
SWITCHES ON THE JOYSTICKS
WITH VERTICAL JOYSTICKS (Fig. 7)

LEFT-SIDE JOYSTICK
A  Crane tilt forward/backward
B  Harvester head up/down
C  Opening of knives
D  Opening of tracks

RIGHT-SIDE JOYSTICK
E  Side tilt
F  Feed forward
G  Feed backward
H  Harvester head open/closed
I  Saw
J  Harvesting/driving switch

PRE-SET PUSH BUTTONS
K  Tree species
L  Pre-set measurements

SWITCHES ON THE PUSH BUTTON BOARDS WITH MINI JOYSTICKS (Fig. 8)

LEFT-SIDE PUSH BUTTON BOARD
A  Saw
B  Feed forward
C  Feed backward
D  Vacant
E  Colour marking and stump treatment
F  Tree species
G  Opening of tracks
H  Opening of knives
I  Opening of rear knife
J  Crane tilt forward/backward

RIGHT-SIDE PUSH BUTTON BOARD
A  Saw
B  Feed forward
C  Feed backward
D  Vacant
K  Pre-set measurements
L  Harvester head up/down
M  Harvester head open/closed
N  Harvesting/driving switch
<table>
<thead>
<tr>
<th>Signs and symbols</th>
<th>Description</th>
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<td>Glow Switch</td>
<td>Hour Gauge</td>
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<tr>
<td>Suction Filter</td>
<td>Pressure Filter</td>
</tr>
<tr>
<td>Return Filter</td>
<td>Hydraulic Oil Level</td>
</tr>
<tr>
<td>Temp. of Hydraulic Oil</td>
<td>Fuel</td>
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<td>Seat heater</td>
<td>Windscreen Washer</td>
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<td>Ignition Lock</td>
<td>Stop</td>
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<td>Oil Pressure</td>
<td>Charge</td>
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<td>Engine Revolutions</td>
<td>Gear Diagram</td>
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<td>Sound Signal</td>
<td>Turning Signal</td>
</tr>
<tr>
<td>Working Light</td>
<td>Windscreen Wiper</td>
</tr>
<tr>
<td>Phone</td>
<td>Parking Light</td>
</tr>
<tr>
<td>Fan</td>
<td>Air Conditioning</td>
</tr>
<tr>
<td>Rotating Flasher</td>
<td>Flashing Emergency Light</td>
</tr>
<tr>
<td>Heat Alarm for Coolant</td>
<td>Headlights, dipped</td>
</tr>
<tr>
<td>Headlights, full</td>
<td>Inside Light</td>
</tr>
<tr>
<td>Brake</td>
<td>Joint Lock</td>
</tr>
<tr>
<td>Differential Lock</td>
<td>Differential Lock rear</td>
</tr>
<tr>
<td>front</td>
<td>Harvesting Computer</td>
</tr>
<tr>
<td>4WD</td>
<td></td>
</tr>
<tr>
<td>Head Lights</td>
<td></td>
</tr>
</tbody>
</table>
OPERATION AND ADJUSTMENT

The harvester functions have been divided into two different functioning environments, which are harvesting in forest and longer-range driving. The difference between these operating environments is in automation. With the harvesting / driving switch (fig. 7, switch J or fig. 8, switch N) in the harvesting position, the harvester head can always be rotated using the right-side joystick with the drive pedal in its mid position. When depressing the drive pedal, the right-side joystick starts to steer the frame thus enabling a quick and efficient change from harvesting to driving towards the next tree.

With the harvesting / driving switch is in its drive position 4WD cannot be used.
Both the brakes and the frame lock can be engaged to function automatically depending on the drive pedal position. When depressing the frame lock switch (fig. 2, switch A) and the brake switch (fig. 2, switch B) to their forward positions, the brakes and the frame lock get always engaged when the drive pedal is in its mid position. Correspondingly, when depressing the drive pedal, the brakes and the frame lock get disengaged. This keeps the harvester stationary and stable during harvesting, but allows moving towards the next tree.

HARVESTING COMPUTER AND THE LEFT-HAND JOYSTICK

The harvesting computer and the left-side joystick are switched on using the same switch. This ensures speedy start of working. The right-side joystick is always on when the engine is running. Therefore the harvester can always be steered with the engine on.

With the door open both the left-side joystick and the harvesting computer get switched off.

The printer of the harvesting computer has its own on/off switch. Turn it on when you want to print. When printing, the printer must be in a horizontal position.

JOYSTICK (Fig. 9) Positions Can Be Adjusted

The positions of the crane joysticks and armrests can be adjusted at several points. To facilitate entering and leaving the cab, the joystick near the door can be turned both up/down and sideways. After adjustment it is important to lock the positions of the joystick and the armrest to prevent unwanted movements.

SEAT (Fig. 10) Has Several Adjustments

1. To adjust the fore and aft position, lift lever A and move the seat in the required direction.
2. Adjust the height using forks B at the front and back of the seat.
3. Adjust the suspension by turning lever C.
4. Adjust the backrest angle using lever D.
AIR-SUSPENDED SEAT (Fig. 11) Has More Adjustments

1. To adjust the fore and aft position, unlock lever A and move the seat in the required direction.
2. Adjust the height and fore/aft tilt by pressing levers B on the side of the seat and lifting/lowering the front or rear of the seat.
3. Adjust the seat suspension pneumatically by pressing button C.
4. Adjust the backrest angle using lever D.
5. If the seat has side tilt, it can be tilted using the regulator unit on the armrest.

BRAKES (Fig. 12) While Driving and Harvesting

The harvester has negative hydraulic brakes. Braking power is generated by springs, and the brakes are released using hydraulics. Mechanical outer shoe brakes operate on the front wheels through the drive shafts. With the gear engaged the hydrostatic drive transmission always brakes itself when the drive pedal goes toward its mid position.

The brakes are mainly controlled from the cab using a triple-position switch (fig. 2, switch B). Using the triple-position brake switch, the brakes can be engaged, disengaged and put in their automatic position hydraulically. In their mid position the brakes are always engaged, and when depressed all the way back they are always disengaged. In their forward position, that is the automatic position, the brakes operate depending on the position of the drive pedal. When harvesting or driving on hilly roads, the brake switch should be in its automatic position.

In the cab there is also brake pedal A, which can be depressed to generate braking power on the brake shoes comparable to pedal power. Depressing the brake pedal does not generate as much braking power as hydraulic spring brakes. The brake pedal is mainly intended for use on the road if the braking power in hydrostatic transmission is not enough.

PARKING BRAKE

The parking brake gets engaged automatically when the engine is switched off.

FRAME LOCK

The frame lock operates similarly to the brakes. Depending on the position of the frame lock switch, the dual-function cylinder either locks the frames together, allows them to turn independent of each other or operates in the automatic position at the same time with the brakes. With the frame lock switch (fig. 2, switch A) in its mid position the frame lock is always engaged and when depressed backward the frame lock is disengaged. Normally when harvesting, the frame lock switch should be in its automatic position.
TRACTION TRANSMISSION

Engine power is transmitted to the consecutive work and drive pumps by means of a flexi switch. From the pump to the hydraulic motor of the gear box the power is transmitted by means of liquid. The pump output is adjusted steplessly using the drive pedal between positions 0 and +/- maximum.

There are three gear speed ranges, which are selected using lever A, fig. 13. The ranges are intended for harvesting (range 1 with the gear lever down pulled backward), driving in the forest (range 2 with the gear lever up pushed forward), and driving on the road (range 3 with the gear lever down pushed forward). Gears should be shifted on level ground with drive pedals B in their mid position. From the gearbox power is transmitted to the front wheels by means of the drive shafts and the final drives.

The speed of the harvester is controlled by drive pedals B. With the pedals in their mid position the harvester is stationary if the gear is engaged and the engine running.

The harvester goes forward when the left-side drive pedal is depressed. The further the pedal is depressed, the higher the speed. To reverse the harvester, depress the right-side drive pedal. When driving in traffic, the harvester head should be kept close to the harvester and tied. The harvesting computer should be switched off in case of unintended crane movements.

A forest harvester equipped with hydrostatic transmission must never be parked using only the gear, but the parking brake must always be engaged. The hydraulic motor cannot keep the harvester stationary for a long period.

FOUR-WHEEL DRIVE

Rear-wheel drive is switched on electrically using switch V on the right-side instrument panel, fig. 2. The coupling shall be done with the harvester stationary. Four-wheel drive can only be switched on when using the slower gearbox speed ranges or with the gear in neutral.

When towing the harvester, four-wheel drive must be off and the engine running to allow the wheel motors to be disengaged. Short-distance towing at a low speed is permitted if the engine and the drive pump cannot be kept running.

DIFFERENTIAL AND REAR-WHEEL DRIVE LOCK

There are often situations when both the wheels on the front or rear axle do not have sufficient grip in respect to the required traction power. In this case one of the wheels stops gripping, which will further decrease the traction power. This can be avoided by engaging either the front lock using switch Y (fig. 2) and/or the 4WD lock using switch V, (fig. 2). The engagement of the 4WD lock generates anti-skid between the front and the rear. This also engages the hydraulic lock between the rear wheels. The 4WD lock does not hold 100%.

Thus it allows different wheels to turn at a different speed. On solid ground the 4WD lock makes turning difficult, so it should be switched off.

The mechanical differential lock at the front should also be disengaged before sharp turns.
STOPPING OF THE ENGINE

Before stopping of the engine, move the throttle into the idling position. The engine is stopped using the electric stopper by turning the ignition key to position 0.

MAIN POWER SWITCH (Fig. 15) Controls Electricity for the Whole Forest Harvester

There is a main power switch to control the electrical instruments of the harvester. It is located on the left-hand side, behind the rear wheel inside a closed box. The current is switched on in position 2. When the switch is turned to position 1, the current is switched off and the key can be removed. Make it a habit to switch off the main power when leaving the harvester.

EMERGENCY STOP

When the emergency stop switch (fig. 1, switch K) is depressed all the way, the diesel engine gets switched off, but there is still current in the electrical system. This engages the brakes. When the engine is switched off, the harvester cannot be steered.

CAB FRESH-AIR FAN Provides Good Ventilation.

The 3-speed fan is started using switch A (fig. 16). To change the airflow direction, turn the nozzles on the panels. The fan air is filtered in from the left-hand bottom corner of the cab. The outer-most filter is of a coarse mesh type, and the inner one is the actual fresh air filter. To keep up the fan capacity and secure the purity of the air, the filters shall be cleaned or replaced often enough to prevent impurities and fungi from clogging the filters. In dusty conditions it is necessary to clean the coarse mesh filter several times a day.
HEATER Provides Additional Heat from the Engine

The air in the cab is heated by a heating element in which the engine coolant circulates. Push lever B forward to increase the amount of coolant circulating in the element. This will increase the temperature in the cab.

AIR CONDITIONER Cools the Air in the Cab (Fig. 17)

The cab can be equipped with an optional air conditioning system.

Turn switch X, fig. 1 to the right to switch on and regulate the air conditioner.

Note! A difference of over 8°C between indoor and outdoor temperature is harmful to your health. Keep the cab door closed when the air-conditioning is on. Keep the heater regulator lever in its cold position, i.e. the heater water circulation off.

The alarm light on the ceiling flashes and there is a sound on the instrument panel if the temperature in the engine or the hydraulic oil increases too much. It also flashes if the oil pressure decreases, or the hydraulic oil filter becomes clogged. The flashing light can be reset, but a small signal light will stay on. The light will also flash when the current is switched on to check the signal light function. When the alarm light starts flashing, find out the reason for it immediately and carry out any necessary repairs.

TOWING (Fig. 18) Allowed from Towing Points Only

The harvester may be towed from designated points only. When towing backward, the towline is put around the pin as shown in fig. 18. When towing forward, there are holes as shown in fig. 18 near the reduction gear. With the harvester on tow, the operator must be in the cab and the engine running to enable steering. Four-wheel drive must be off.

Unless the engine can be started, the harvester must be towed with great care; as steering is not working. When towing on the road, statutory traffic regulations must be followed.
ENGINE, Source of Power

The engine is a water-cooled, four-stroke, direct-injection diesel. For a more detailed description of the engine, see the engine manual. The power is transmitted from the rear of the engine to the working hydraulics and traction transmission pump. The front of the engine houses belt drives for the fan and the alternator generators and the optional A/C compressor.

Suction Air Filter (Fig. 19)

The engine suction air is cleaned by two-part paper filter B. See cleaning instructions in "Maintenance".

Fuel Tank (Fig. 20) To Be Filled with Pure Fuel Only

The volume of the fuel tank is 135 litres. Use high-quality diesel oil as fuel. Check the fuel requirements in the engine manual. The fuel must be free from any impurities and water. Before refuelling, remove all impurities from around filler A. Never drain a spare tank into the fuel tank, as impurities and water tend to settle on the bottom. If fuel is added from a spare tank, a funnel with a sieve should be used.

There are air bleeds on the outer rim of the filler through which air gets into the tank. Make sure these bleeds stay unblocked. Never use a filler without air bleeds.

Daily Checks of the Engine (Fig. 21)

Lubrication System

⚠️

It is of utmost importance to use correct lubricating oil, in accordance with the load placed on the engine. See Lubrication Table under "Maintenance". Check the oil level daily before starting; it shall be between the minimum and maximum marks on dipstick A, preferably near the maximum, fig. 20. Oil is refilled through filler B. A warning light on the instrument panel indicates low oil pressure. Should the oil pressure warning light come on with the engine running, stop the engine immediately and find the cause for the trouble.
Cooling System

The engine cooling system is filled with coolant that has 40-50 % ethylene glycol in it. Do not use plain water as coolant as it damages the engine. Before refill, the engine must cool off. When refilling, remember the coolant expands considerably when it gets warm, so do not fill up the system. The coolant level is correct when the cells are clearly covered by the coolant, and the coolant level can be seen at the bottom of the level indicator hose of the expansion tank. Check the coolant level daily before starting.

The coolant temperature can be seen in the gauge on the instrument panel. It shall be between 75-95°C. A warning light on the instrument panel indicates engine overheating when the temperature reaches 95°C. If the temperature starts to rise, check that the outside of the radiator is not clogged. The best way to clear blockage is to direct compressed air from the side of the fan through the radiator, or use a brush for cleaning. Always be careful not to damage the lamellas. Behind the cooler course mesh filter there is a small-holed screen. To clean it, first turn the rear cog to its down position and then lift up the screen.

FIRE EXTINGUISHERS

The harvester is supplied with two portable 6-kg fire extinguishers. They are located above the rear wheel inside a side guard that opens backwards. The extinguishers shall be checked every six months by an authorised service outlet.

The harvester may also be equipped with a semi-automatic fire extinguishing system, which shall be operated in compliance with the Manufacturer’s instructions.

OPENING OF THE GUARDS

The movable guards of the forest harvester are equipped with quick-release locks. The guards can be locked placing an ordinary padlock in the hole for the quick-release lock.
HYDRAULICS

Hydraulics is divided in traction and working hydraulics. They have a joint oil tank on the rear frame of the harvester.

**Traction hydraulics** (fig. 23) includes a suction filter, drive pump, distributor valve, five directional valves, a hydraulic motor at the front and hub motors at the rear. The drive pump produces pressure corresponding to the drive resistance and a volume flow corresponding to the drive pedal position. When using four-wheel drive forward, the oil flows into the distributor valve. The distributor valve distributes the volume flow between the front and the rear. From the distributor valve, the oil flows to the hydraulic motor at the front and from there onwards to the pump. The oil flows from the distributor valve to the rear hub motors through the directional valves. The flow from the rear motors goes though the joint return directional valve back to the drive pump.

When using front-wheel drive, the directional valves close off the connection to the distributor valve and the drive pump. At the same time they engage the rear hub motors in neutral.

A  Drive pump
B  Front hydraulic motor
C  Hub motors
D  Distributor valve
E  Directional valves

**Working hydraulics in the basic harvester** (fig. 24) includes a work pump, pressure filter, load sensing directional valve and return filter. Crane movements are controlled by a load-sensing valve. The work pump produces the right pressure and output in relation to the load weight and speed. This enables fast and precise movements in every circumstance.

A  Work pump
B  Pressure filter
C  Directional valve
D  Return filter

It is forbidden to change the pressure in working and traction hydraulics without permission from the Manufacturer, as it may damage the harvester and cause risk of injury to the mechanic and the harvester operator.

The operations of the **brakes and the front differential lock** (fig. 25) are controlled by directional valves. The cylinder in the differential lock is dual-functioning and when disengaged, the pressure is on the side of the cylinder rod. When engaged the is directed to the side of the cylinder piston. Brake cylinders disengage brakes when pressure is directed to the rod side of the cylinder. The piston sides are connected to the tank line. The brakes and the front lock derive their driving force either from the drive
pump feed pressure or from the pump in working hydraulics by means of a pressure reducing valve.
A  directional valves
B  cylinders

The frame lock is equipped with a dual-function cylinder. The cylinder derives its load from the return flow. When the frame lock is engaged, the directional valve closes the flow routes and the cylinder becomes locked in its place.

The basic harvester is equipped with a separate cooler for the hydraulic oil. The cooler includes a pump and condenser. Oil is sucked directly from the tank and pumped through the condenser and the return filter back to the tank.

When dealing with hydraulics, uncompromising cleanliness is of utmost importance. The oils used shall comply with the Manufacturer’s instructions. Refill shall always be done through the return filter.
SERVICE AND MAINTENANCE

SAFETY

Safety regulations and instructions given by the Ministry of Labour.

Installations and adjustments may be carried out only by a person with the required skills and qualifications and the necessary knowledge of the machine in question.

Installations and adjustments as well as repairs must generally be feasible to undertake with the energy feed switched off and the moving parts in balance and stopped and, when necessary, locked. If this is technically not feasible, great care shall be taken to guarantee the performance of the work without any hazards.

When installing, adjusting, servicing or repairing a technical device,
- without unhampered visibility to all its parts, or
- on which several people are working, or
- which is started from a control centre, or
- which is started from such a place that the whole device can not be seen,
it must be ascertained that the device may not be started unintentionally or defectively. This can be guaranteed by locking the starting device in the stop position.

When installing, adjusting, servicing or repairing a technical device with energy reserves, no measures are to be taken before it has been ascertained that no hazardous machine movements may occur.

When starting a technical device, the operator must ascertain that nobody will be injured.

The service and periodical checks of a technical device must be carried out in compliance with the Manufacturer’s instructions and operating conditions so that no malfunctions may occur which could cause any risk or hazard.

Proper maintenance and service guarantee the harvester a long working life and the validity of the warranty.
SERVICE MEASURES DAILY OR EVERY 8 HOURS

1. CHECKING OF THE ENGINE OIL LEVEL
Stop the engine on level ground and wait for a few minutes. The oil level shall be between the marks on the dipstick. Fig. 26.

Fig. 26
A Oil Measuring Dipstick
B Oil Filler
C Coolant Check
D Coolant Check / Refill

2. CHECKING OF THE COOLANT LEVEL
NOTE! Open the over-pressurised radiator cap with great care when the engine is hot.
Never use plain water as coolant!
Do not pour cold coolant into a hot engine.
The coolant level shall be approx. half way up the expansion tank.
Coolant is added through the expansion tank.
Make sure there is anti-freeze in the radiator in the cold season.

3. CHECKING OF THE HYDRAULIC OIL LEVEL
Check the hydraulic oil level in the measuring glass in the tank with the lift cylinders in their inner position.

NOTE! The oil level shall always be visible in the measuring glass.

Oil shall always be refilled through filler A in the return filter capped with a hexagonal screw. Fig. 27. This will leave all the impurities in the filter.

4. DAILY LUBRICATION
Lubricate the daily lubrication points in compliance with the lubrication table. See Lubrication Table.

5. CLEANING OF RADIATOR GRILLES
Depending on the operating environment, the radiator grilles shall be cleaned often enough to prevent the engine from overheating. Clean the rear cog screen and the removable grille using compressed air or a brush (fig. 28). When necessary, clean the oil and engine condensers.
NOTE! The rear cog and the grilles must not be covered when the engine is running.
6. CHECKING OF TYRE AIR PRESSURE
Check the tyre air pressure and external condition visually. Check the air pressure if necessary. The correct air pressure for the 500/60-26.5 tyres is 3.3 bar, the 600/55-26.5 tyres 2.7 bar, the 500/65R28 tyres 3.2 bar, and the 14.9-24 tyres 3.0 bar.

7. CHECKING FOR LEAKAGE
Check for any liquid, fluid and oil leakage.

8. CHECKING OF CONNECTIONS
Check the screw and pipe connections visually.

NOTE! During the first operating month the tightness of the screw connections in the crane, shafts and joint shall be checked daily.

It is important to tighten the screw connections to the correct torque. The required spanner sizes and torques:

<table>
<thead>
<tr>
<th>Screw size</th>
<th>Spanner Size mm</th>
<th>Torque for 8.8 screws Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 6</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>M 8</td>
<td>13</td>
<td>25</td>
</tr>
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<td>M 10</td>
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<td>120</td>
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<tr>
<td>M 16</td>
<td>24</td>
<td>180</td>
</tr>
<tr>
<td>M 20</td>
<td>30</td>
<td>335</td>
</tr>
</tbody>
</table>

NOTE! Torque for the wheel fixing screws:

- Front wheels: 600 Nm
- Rear wheels: 540 Nm

SERVICE MEASURES WEEKLY OR EVERY 50 HOURS

1. CHANGE OF ENGINE OIL AND FILTER AFTER THE FIRST 50 HOURS
Engine oil and the fuel pre-filter are changed after the first 50 operating hours. See for more detailed instructions in the engine manual.

2. ALL DAILY SERVICE MEASURES
The service measures to be taken every 50 hours include all the measures listed in SERVICE MEASURES DAILY OR EVERY 8 HOURS.

3. LUBRICATION IN COMPLIANCE WITH LUBRICATION TABLE
Lubricate in compliance with the lubrication table paying attention to any special instructions. See Lubrication Table.

4. CHECKING OF THE FUNCTIONS OF HYDRAULIC SIGNAL LIGHTS
Earth the sensor cables of the suction, pressure and return filters. The signal lights on the instrument panel should come on.

5. CLEANING OF ENGINE AIR FILTER
The engine suction air filter is of a dual-element type. The filter housing is located in the engine compartment. Both filter cartridges are attached by means of the filter cover, which can be opened by the locking latches.

The outer filter cartridge shall be cleaned every 50 hours. Pull the cartridge out of the housing and blow dry compressed air inside the filter (not exceeding 5 bar) (fig. 29). If compressed air is not available, knock the filter head lightly against your palm and turn it. Great care shall be taken not to damage the filter cartridge.
After cleaning, the condition of the filter is checked. Direct a strong light to the inside of the filter (fig. 30). The filter cartridge may be cleaned 5-10 times. When refitting the filter, make sure the gaskets are undamaged, mating surfaces clean, and that the filter refits properly.

In case the outer filter cartridge is broken, it shall be replaced. The inner filter shall also be replaced as it has become dirty.

Do not loosen the inner cartridge unless it needs replacing. The filter protects the suction channel against impurities during service.

Check the condition of the suction channels. Perform any necessary repairs.

Note! Do not run the engine without filters.

6. CHECKING OF BATTERY FLUID LEVEL

Clean the battery housing carefully. Check that the battery fluid level is 5-10 mm above the cells. Make sure the cable lugs are properly tightened. Remove any oxidisation with hot water. Coat the cable lugs with copper or aluminium paste.

7. CLEANING OF BREATHER ON THE HYDRAULIC TANK

Clean the filter and the surrounding area carefully (fig. 31).

8. CHECKING OF THE CONDITION OF THE TRACTION TRANSMISSION EQUIPMENT

Check the condition and connections of the final drives, drive shafts and gearbox for cracks. Check the attachment of the transmission hydraulic pump and the motors. Check for leaks in hose connections.

9. CLEANING OF CAB AIR FILTER

Remove the cab fresh air filter with its housing and clean it carefully with compressed air. Replace a soiled or broken filter. The paper filter shall be replaced at least once a year. Check also the condition of the air intake suction channel.
10. CHECKING OF OIL LEVEL IN THE GEAR BOX
Clean the dipstick and breather area. The oil level shall be between the bottom of and the mark on the dipstick with the dipstick screwed on. Refill in compliance with the oil table (fig. 32).

11. CHECKING OF LIGHT OPERATIONS
Make sure the headlights, working lights, turning signals and signal lights function properly. When replacing the bulbs, comply with the Manufacturer's recommendations.

12. CHECKING OF OIL LEVEL IN THE FINAL DRIVES
Clean around the control opening and breather. The oil level should come up to the control opening. When necessary, refill oil through the breather until oil runs out of the control opening. Refit the breather and control plug and wipe off excessive oil (fig. 33).
   A  Control opening
   B  Breather

13. DRAINING OF WATER OUT OF WATER SEPARATOR
For further instructions, check the engine manual.

14. CHECKING OF BRAKE FUNCTIONS
The brakes shall be adjusted regularly due to the wear of brake bands. The free travel of the brake pedal shall be 20-50 mm. Make sure the harvester cannot move, start the engine and disengage the brakes. Make sure the clearance in the lower brake shoe is approx. 1 mm.
Adjustments can be made by turning limiter B. Adjust the clearance in the upper brake shoe using adjusting screw A. The clearance between the brake shoe and drum shall be the same on both sides of the harvester to achieve even braking.
Fig. 34
A  Adjusting screw
B  Limiter

15. CHANGE OF HYDRAULIC OIL FILTER AFTER THE FIRST 100 OPERATING HOURS
The harvester leaves the factory equipped with a denser filter to guarantee the perfect purity and operability of the hydraulic system. After the first 100 operating hours the filters are replaced with 10-micron filters. See further instructions on changing of filters in Item Service Measures every 600 Hours.
16. CHECKING OF BELT TENSION
Check the tension of belts in the water pump, generator and optional air conditioner. The tension is correct when there is a deflection of 15-20 mm when pressing with your thumb. Replace worn and damaged belts (fig. 35).

17. CLEANING OF POLYCARBONATE WINDOWS
Remove any particles that may damage the window surface. Avoid using any sharp objects.

SERVICE MEASURES EVERY 300 HOURS

1. ALL DAILY AND WEEKLY SERVICE MEASURES.
The service measures to be taken every 300 hours include all the measures listed in item SERVICE MEASURES DAILY OR EVERY 8 HOURS as well as measures listed in item SERVICE MEASURES WEEKLY OR EVERY 50 HOURS.

2. CHANGING OF ENGINE OIL AND FILTER
Keep the engine running until it warms up. Open the drain plugs in the underpan and the engine sump. Drain the oil into a pan. When all the oil has been drained, close the drain plug with a new gasket (fig. 36). The oil filter is replaced every time the oil is changed. Clean around the oil filter. Remove the old filter using a filter key. Coat the gasket of the new filter lightly with new oil (fig. 37), and make sure the gasket surfaces are clean. Attach the filter manually. Wipe off any excessive oil. Pour new oil through the filler to the top mark on the dipstick. Pay attention to the amount of oil poured into the filter. Acceptable oil brands and amounts are given in the Lubrication Table and the engine manual. For further instructions, see the engine manual.

NOTE! ONLY USE OIL RECOMMENDED BY THE MANUFACTURER!
Check the engine breather pipe every time the oil is changed. The pipe shall be clean inside and it must not be dented.

3. CHECKING OF THE OPERATIONS OF THE DRIVE PEDAL
Check the operation and position of the drive pedal. The pedal shall move to its mid position as the foot is
removed off the pedal. Lubricate the drive chain and centralising device when necessary. The frame lock and the brakes shall be disengaged slightly before the harvester starts moving.

The disengagement is controlled by an inductive switch located on the drive pump. Turn off the engine and secure the drive pedal in its forward drive position. The distance of the inductive switch from the lever arc shall be 0.5-1.5 mm. Release the drive pedal and adjust the switch in the middle of the lever notch. The rotation of the brake and frame lock operations to the start-up of the harvester can be adjusted by changing the distance of the inductive switch from the lever arc. The distance shall, however, remain within the recommended limits. See fig. 38.

4. USE OF ADDITIONAL HEATER OUTSIDE THE HEATING SEASON
The heater shall be used approx. once a month outside the heating season, too. This is done to prevent the fan motor and water pump from getting stuck.

SERVICE MEASURES EVERY 600 HOURS

1. ALL SERVICE MEASURES TO BE PERFORMED DAILY, WEEKLY AND EVERY 300 HOURS
The service to be performed every 600 hours includes all the service measures listed in items SERVICE MEASURES DAILY OR EVERY 8 HOURS, SERVICE MEASURES WEEKLY OR EVERY 50 HOURS AND SERVICE MEASURES EVERY 300 HOURS.

2. CHANGING OF FUEL FILTER
See instructions in the engine manual, fig. 39.

3. DRAINING OF CONDENSED WATER OUT OF THE FUEL TANK
Run a little fuel from the filler at the front of the fuel tank into a pan.
4. CHANGING OF OIL IN THE CRANE TURNING MOTOR
The oil in the turning motor is changed every 600 hours. However, first time oil is changed after 300 hours. The breather shall be cleaned (fig. 40) when oil is changed. Refill in accordance with the oil table.
A Breather
B Control opening
C Drain opening

5. CHANGING OF HYDRAULIC OIL FILTER
Change the filters in working and traction hydraulics (fig. 41).
The hydraulic oil does not need to be drained when changing the filters. When changing the suction filter in the traction hydraulics, you need a pan to collect about 1.5 litres of oil that is drained.
See further instructions in Item SERVICE MEASURES EVERY 1200 HOURS

SERVICE MEASURES EVERY 1200 HOURS

1. ALL SERVICE MEASURES TO BE PERFORMED DAILY, WEEKLY, EVERY 300 AND 600 HOURS
The service to be performed every 1200 hours includes all the service measures listed in items SERVICE MEASURES DAILY OR EVERY 8 HOURS, SERVICE MEASURES WEEKLY OR EVERY 50 HOURS AND SERVICE MEASURES EVERY 300 AND 600 HOURS.

2. CHANGING OF OIL IN THE FINAL DRIVES
Clean around control opening A, breather B and oil drain C. Remove the protective plugs and drain the oil into a pan. Remove and clean magnetic plug D. Refit the magnetic plug and oil drain plug and pour the oil through the breather. The oil level should come up to control opening A. Refit the cleaned breather and control plug. Used oil is problem waste, which shall be disposed of in an appropriate manner.
Use an oil type in accordance with the oil table. The right-side final drive holds approx. 5.2 litres and the left-side one approx. 5 litres of oil. See fig. 42.
A Control Opening
B Breather
C Oil Drain Plug
D Magnetic Plug

3. CHANGING OF OIL IN THE GEARBOX
The oil is drained by unplugging oil drain A. New oil is poured into filler B. The gearbox holds approx. 4 litres of oil. The oil level shall be between the lower end of the filler dipstick and the mark with the cap screwed on. Used oil is problem waste, which shall be disposed of in an appropriate manner.
Use an oil type in accordance with the oil table.
Check and clean, if necessary, breather C on the cover (fig. 43).

4. CHANGING OF ENGINE COOLANT

The coolant shall be changed at least every other year to maintain its anti-corrosion properties.

The cooling system is drained by opening the draining taps at the bottom of the radiator and on the left-side of the engine at the rear and by unscrewing the radiator cap. In order to drain the coolant from the radiator cell, turn the thermostat to its maximum position. Used coolant is problem waste, which shall be disposed of in an appropriate manner. Therefore the draining taps are equipped with connectors to which a hose can be attached to drain the liquid (fig. 44).

NOTE! See further instructions in the engine manual.

The dual-functioning thermostat must not be removed to reduce the temperature, as this would make most of the coolant circulate through the side circulation pipe, which reduces the cooling capacity.

On models equipped with additional heaters, air shall be bled from the heater when more coolant is added. See the heater instructions!

5. CHANGING OF HYDRAULIC OIL AND FILTERS

Traction and working hydraulics have a joint oil tank. Oil should be changed at least once a year. Before changing the oil, run the system until it is warm and adjust all the cylinders in their shortest positions.

Oil is drained from the system by unplugging the plug at the end of the drain hose. Have a sufficiently large pan handy, as there is approx. 100 litres of oil. Clean around the filters carefully before removing them.

NOTE! The oil does not need to be drained when the filters are changed.

When changing the suction filter, turn the filter cover counter clockwise. Quickly turn the filter cartridge out to make the flap valve inside the filter close, which prevents more than the filter volume of oil from leaking from the tank. Turn the plastic plug at the bottom of the filter off and replace the filter cartridge, fig. 45.
The pressure filter is replaced by turning the bottom of the filter off, after which the filter can be replaced by hand, fig. 46.

To change the return filter unscrew the three fixing screws on the filter cover. The cover is spring loaded, which means the screws shall be unscrewed evenly. Remove the fixing nut at the bottom of the filter element and change the filter cartridge, fig. 47.

Use only genuine filters and oil types in compliance with the oil table to guarantee perfect functioning. Make sure there are no impurities in the oil or the funnel.

After the oil change let the engine idle for approx. 30 minutes, during which time hydraulics must not be used. During this period the oil circulates through the filter several times and any impurities in the oil are filtered off. Monitor the oil level and check for any leakage in the filter.

There is a glass gauge on the side of the oil tank to monitor the oil level. The oil level shall be visible in the gauge window. Add oil, when necessary.

**REFILL ALWAYS THROUGH THE RETURN FILTER PLUG!**

At the base of the oil filter there is an alarm switch to indicate pressure loss through the filter. In case the alarm light is on in the cab and the oil is in its operating temperature, the filter cartridge is clogged and shall be replaced.

**If hydraulic oil becomes over-heated**
The temperature of the hydraulic oil should not exceed 70 degrees C. A temperature increase of 10 degrees cuts the oil lifetime in half. When the signal light comes on, the temperature of the hydraulic oil is 90 degrees. In this case you should wait long enough to let the temperature decrease. The engine can be kept running, but unloaded. Find out the reason for the excessive oil temperature. The most common reason is blockage in the radiator and its protective screens.

6. **ADJUSTMENT OF ENGINE VALVES**
See the instructions in the engine manual.

7. **SERVICING OF FIRE EXTINGUISHING SYSTEM**
The portable extinguishers shall be checked, serviced and registered by an authorised dealer. The extinguishers shall be checked every 6 months or in compliance with the fire insurance terms.
   If the harvester is equipped with an automatic extinguishing system, it shall be serviced as instructed by the Manufacturer. See servicing of the fire extinguishing system in the operator manual.
LUBRICATION

Do not lubricate while the engine is running. Remove the ignition key before starting lubricating. The table below gives recommended lubricants to be used in temperatures not exceeding 35°C. The table also gives different types of air conditioning liquids, although they do not normally have to be changed.

<table>
<thead>
<tr>
<th>Recommended lubricant</th>
<th>Oil Grade API</th>
<th>Grade SAE</th>
<th>Filling quantity litres</th>
<th>Change interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine - turbo charged</td>
<td>CD</td>
<td>10W30</td>
<td>depending of no of cylinders 4 syl. 14 l</td>
<td>300h</td>
</tr>
<tr>
<td>Gear box</td>
<td>GL-4</td>
<td>80W90</td>
<td>hydr. 3,5</td>
<td>1200h</td>
</tr>
<tr>
<td>Final drives</td>
<td>GL-4</td>
<td>80W90</td>
<td>right 5,3, left 5,0</td>
<td>1200h</td>
</tr>
<tr>
<td>Hydraulics ¹⁻</td>
<td>Shell Esso</td>
<td>Tellus Arctic 32 J-35</td>
<td>100</td>
<td>600h</td>
</tr>
<tr>
<td></td>
<td>Shell</td>
<td>Tellus Oil TX46 Tellus Oil TX32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication with oil</td>
<td>CB/CC</td>
<td>10W30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication with grease</td>
<td>Lithium</td>
<td>NLG 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil in the A/C</td>
<td>PAG</td>
<td>500 SUS</td>
<td>1,8 dl initial fill</td>
<td></td>
</tr>
<tr>
<td>Agent in the A/C</td>
<td>FC R134a</td>
<td></td>
<td>1,05 kg</td>
<td></td>
</tr>
<tr>
<td>Crane turning motor</td>
<td>GL-5</td>
<td>80W90</td>
<td></td>
<td>600h</td>
</tr>
<tr>
<td>Chain oil</td>
<td>See the manual for harvester head</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹⁻ If biodegradable hydraulic oil is to be used in the harvester, the Manufacturer shall be consulted about the type of oil.

Initial oil fills

- Engine: Shell Rimula TX 10W-30
- Gearbox: Shell Spirax HD 80W-90
- Hydraulics: Shell Tellus Arctic 32
- Lubricating grease: SHELL Rhodina Grease EP2

THE GUARANTEE IS VALID ONLY WHEN COMPLYING WITH THE INITIAL FILL LUBRICANTS!

Correct lubrication is of major importance to the perfect functioning and long working life of the forest harvester, due to which the lubrication recommendations shall be followed carefully while simultaneously monitoring if any place requires more lubrication.

All the lubricants shall be pure. Even the slightest impurities may cause damage. Oil fillers and nipples shall be wiped clean. The nipples are lubricated with grease in accordance with the lubrication table. Apply machine or engine oil to places to be oiled.
LUBRICATION DIAGRAMS

<table>
<thead>
<tr>
<th>Component</th>
<th>Interval / h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvester head</td>
<td>daily</td>
</tr>
<tr>
<td>Crane</td>
<td>50</td>
</tr>
<tr>
<td>Drive axle</td>
<td>50</td>
</tr>
<tr>
<td>Differential lock</td>
<td>50</td>
</tr>
<tr>
<td>End gears</td>
<td>1200</td>
</tr>
<tr>
<td>Gear box</td>
<td>600</td>
</tr>
<tr>
<td>Brakes</td>
<td>50</td>
</tr>
<tr>
<td>Steering cylinders</td>
<td>50</td>
</tr>
<tr>
<td>Middle joint</td>
<td>50</td>
</tr>
<tr>
<td>Hydraulic oil</td>
<td>600</td>
</tr>
<tr>
<td>Frame lock</td>
<td>50</td>
</tr>
<tr>
<td>Engine oil</td>
<td>300</td>
</tr>
<tr>
<td>Air conditioning</td>
<td></td>
</tr>
</tbody>
</table>

LUBRICATION OF CRANE AND CHANGING OF OIL IN THE TURNING MOTOR
The crane is lubricated every 50 hours. The lubrication points are shown in fig. 113.

NOTE! USE OF GRAPHITIFEROUS GREASE IS PROHIBITED.

The oil change interval in the turning motor is 600 hours. The air plug is also cleaned then.

Hypoid oil type SAE 80-90 is used in the turning motor. See further instructions in the crane manual.
**SUMMARY OF PERIODICAL MAINTENANCE PROCEDURES**

**DAILY OR EVERY 8 HOURS:**
1. Check the engine oil level.
2. Check the radiator coolant level.
3. Check the hydraulic oil level.
4. Lubricate the points to be lubricated daily.
5. Clean the radiator grilles.
6. Check the function of signal lights.
7. Check the tyre air pressure visually.
8. Check for any leakage.
9. Check the connections.

**WEEKLY OR EVERY 50 HOURS:**
1. Change the engine oil after the first 50 operating hours.
2. Lubricate all the points specified in the table.
3. Clean the engine air filter.
4. Check the battery fluid level.
5. Clean the breather on the oil tank.
6. Check the condition of the power transmission equipment.
7. Clean the cab air filter.
8. Check the oil level in the gearbox.
9. Check the light functions.
10. Check the oil level in the final drives.
11. Drain water out of the water separator.
12. Check the brake functions.
13. Replace the hydraulic oil filters after the first 300 operating hours.
14. Check the belt tension.
15. Clean the windows.

**EVERY 300 HOURS:**
1. Change the engine oil and filter.
2. Check the drive pedal function.
3. Run the additional heater outside the heating season.
4. Replace the hydraulic oil filters after the first 300 operating hours.

**EVERY 600 HOURS:**
1. Change the fuel filter.
2. Drain condensed water out of the fuel tank.
3. Change the oil in the crane turning motor.
4. Change the hydraulic filters.

**EVERY 1200 HOURS:**
1. Change the oil in the final drives.
2. Change the oil in the gearbox.
STORAGE WHEN NOT IN USE

To guarantee the operating reliability of the harvester, proper service and storage are of great importance. The pre-storage service can be divided into three parts, in order of performance: cleaning, checking and protection.

Cleaning:
Dirt is efficiently removed from a dry harvester by compressed air. A high-pressure washer may be used with caution. To reduce drying time, use warm water.
Do not direct water jets at the bearings, as the packings do not hold against a strong spray of water.
Apply suitable solvent on heavily greasy spots before washing.
Start cleaning from the top. Clean the radiator cells by blowing air from the direction of the wings.

Checking:
Take a pen and paper and write down all the shortcomings and required service measures in the following order:
- Condition of the harvester head.
- Bearing clearances and fastenings.
- Wear, corrosion and dents.

It is important to have the recorded defects repaired before storage to ensure the efficient functioning of the harvester.

Protection:
Use pure engine oil or special protective oil in a sprayer.

Places to be protected:
- Worn paint (paint).
- Electrical connections (special protective spray).

Cab Ventilator:
Clean the filters. Clean the air channels and the blower unit with its cells. This may be done with a vacuum cleaner.

Air Conditioner:
Clean the air conditioner condenser and evaporator cells preferably with compressed air.

Engine:
Clean the engine externally.
Replace the fuel filter.
Change the engine oil.
Replace the engine oil filter.
Check the anti-freezing quality of the coolant.
Clean or replace the air filter.
Clean the cable lugs and apply grease to them.

Electrical instruments:
Clean the battery surfaces, check the fluid level and charge the battery full. Charge the battery every three months.
RECOMMENDED TOOLS AND ACCESSORIES

Recommended tools
For self-made maintenance it is necessary to replenish the tools supplied with the harvester with the special tools mentioned under Maintenance as well as with the fork, ring and socket wrench kits.

Recommended Accessories
- Pulse sensors
- Inductive sensors
- Light bulbs
- Connection relays
- Packings

For the Saw
- Chains
- Spare guide bar

General Parts
- Hexagonal screws M6-M12, the most common lengths of 16-4 mm, strength class min. 8.8.
- Hexagonal nuts M6-M12, strength class 8.
- A few lock nuts.
- Washers and spring washers, 6.5-13 mm.
- Spring cotters, 3-8 mm, lengths 20-50 mm.
- Grease nipples 6 mm and 1/8", straight and angled.
- Fuses 7.5; 10, 15; 25; 30A
ELECTRICAL INSTRUMENTS

The engine is equipped with an alternator generator.
NOTE: With the engine running the main power switch must not be turned off and the ignition key must not be turned to the 0 position if there is a separate stop lever in the harvester.

Fuses
There are three fuse boxes on the forest harvester instrument panel.

Fuse box 1:
1. (1F1) Turning signal left 7.5 A
2. (1F2) Turning signal right 7.5 A
3. (1F3) Parking lights 7.5 A
4. (1F4) Gauge lights 7.5 A
5. (1F5) Headlight left, dipped 7.5 A
6. (1F6) Headlight right, dipped 7.5 A
7. (1F7) Headlight left, full 7.5 A
8. (1F8) Headlight right, full 7.5 A

Fuse box 2:
1. (2F1) Radio, inside light 7.5 A
2. (2F2) Working light relays 7.5 A
3. (2F3) Phone, emergency flasher 10 A
4. (2F4) Rotating Flasher 10 A
5. (2F5) Turning signal, radio 7.5 A
6. (2F6) Windscreen wiper 15 A
7. (2F7) Traction hydraulics 15 A
8. (2F8) Traction hydraulics 15 A

Fuse box 3:
1. (3F1) Fan, air compressor, ceiling fan 25 A
2. (3F2) Sound signal 10 A
3. (3F3) Seat heater 10 A
4. (3F4) Main relays 7.5 A
5. (3F5) Gauges, alarm lights 7.5 A
6. (3F6) Compressor, colour marking 15 A
7. (3F7) Crane tilt 7.5 A
8. (3F8) Vacant

Additionally, there are three separate fuses for the IQAN system:
1. (7F1) IQAN XP 10 A
2. (8F1) IQAN XP 10 A
3. (9F1) IQAN XP 5 A

On the rear frame of the forest harvester there are three fuse boxes:

Fuse box 4:
1. (4F1) Working lights, crane 25 A
2. (4F2) Working lights, light module 25 A
3. (4F3) Working lights, cab top 25 A
4. (4F4) Working lights, cab top 25 A
5. (4F5) Working lights, front, mid 25 A
6. (4F6) Working lights, cab side 25 A
7. (4F7) Working lights, tree tops 25 A
8. (4F8) Working lights, tree tops 25 A
Fuse box 5:
1. (5F1) Main current, ventilation 40 A
2. (5F2) Main current 25 A
3. (5F3) Main current 25 A
4. (5F4) Main current 40 A
5. (5F5) Ventilation 25 A
6. (5F6) Harvesting computer 15 A
7. (5F7) Drive lever, left 7.5 A
8. (5F8) Drive lever, right 7.5 A

Fuse box 6:
1. (6F1) Hydraulic oil filler pump 15 A
2. (6F2) IQAN MDM 3 A
3. (6F3) Heater 25 A
4. (6F4) Heater 25 A
5. (6F5) Heater 5 A
6. (6F6) Fire extinguisher 10 A
7. (6F7) Fire extinguisher 10 A
8. (6F8) Vacuum pump 10 A

Do not fit an oversized fuse as it may damage the respective electrical instrument. If a fuse blows on the same location repeatedly, find out the reason for it.

**BATTERY**

The gas generated by the battery is very explosive. Avoid open fire and sparks in the vicinity of the battery.

When servicing an electrical instrument, disconnect the negative cable of the battery.

**CHECKING OF THE CHARGE STATE OF THE BATTERY**

During harvesting the engine recharging equipment keeps the battery charged. At other times, check the state of the battery at regular intervals and recharge if necessary. An acid gauge may be used for checking. In the table below you can see the charge state of the battery compared with the acid specific weight.

<table>
<thead>
<tr>
<th>Specific weight reading</th>
<th>Charge state</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 280</td>
<td>Fully charged</td>
</tr>
<tr>
<td>1 240</td>
<td>75 % &quot;</td>
</tr>
<tr>
<td>1 200</td>
<td>50 % &quot;</td>
</tr>
<tr>
<td>1 160</td>
<td>25 % &quot;</td>
</tr>
<tr>
<td>1 120</td>
<td>No charge</td>
</tr>
</tbody>
</table>

Do not leave a flat battery unused for a long time. A low-charged battery freezes easily and exposure to frost will cause extensive damage. If a recharging device is available, recharging can also be done at home.

Before starting to recharge:
- Disconnect the battery cables.
- Unplug the cells.
- Make sure the fluid level is high enough.
- Use 5-10 % of the Ah of the battery for charging current. For example: A 100 Ah battery may be recharged using 5-10 ampere current. Recommended recharging interval is 6-10 weeks.

**CLEANING OF BATTERY AND OTHER MAINTENANCE**

Clean the battery cover regularly.
- Remove any oxidisation off the battery poles and cable lugs.
- Make sure the cable lugs are properly tightened.
Coat the outer faces of the poles and lugs with Vaseline. Check that the battery is properly fastened and the poles protected. Make sure the rubber rug on the battery is properly adjusted. Check the fluid level before the harvesting season and before storage. Add distilled water, if necessary, up to the upper fluid level. NOTE! Wrong connection of either the battery or the generator will damage the generator. Before electrical welding, disconnect the battery and generator cables. Check the condition of the cable insulation and the protective cables on a regular bases and perform any necessary repairs.

USING OF AUXILIARY BATTERY

If an auxiliary battery is needed for starting, proceed as follows:
Check that the voltage of the auxiliary battery is 12 V. Make sure the harvester battery has not frozen; a flat battery freezes in -10°C.

Follow carefully the connecting sequence given below:
1. With the auxiliary starting cables connect the positive poles of the batteries (marked with red paint, a P or a + symbol).
2. Connect the end of one auxiliary starting cable to the negative pole of the auxiliary battery (marked with blue paint, an N or a - symbol) and the last free end to the negative pole of the discharged battery.

Do not lean over the batteries while making the connections. Start the engine. Disconnect the cables in exactly the opposite order.

INSTALLATION OF ADDITIONAL ELECTRICAL INSTRUMENTS

When installing additional electrical instruments to the harvester, make sure the size of the charge generator is 2x95 A. The total consumption of a basic forest harvester in the dark is 120-150 A consisting mainly of the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headlights</td>
<td>11.7</td>
</tr>
<tr>
<td>Working lights</td>
<td>82.5</td>
</tr>
<tr>
<td>Gauge lights</td>
<td>2.0</td>
</tr>
<tr>
<td>Three-speed cab fan</td>
<td>13.5</td>
</tr>
<tr>
<td>Harvesting computer</td>
<td>3-15</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>2-16</td>
</tr>
<tr>
<td>Joystick functions</td>
<td>5</td>
</tr>
</tbody>
</table>