

Operation & Maintenance Manual

WEAMPC9501



PC95-1

HYDRAULIC EXCAVATOR

SERIAL NUMBERS

5005145 and up



WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept inside the cab for reference and periodically reviewed by all personnel who will come into contact with the machine.

KOMATSU

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FOREWORD

- 1° This manual has been prepared by FKI S.p.A. to provide you with all the information you need to operate and maintain your machine in total safety. By complying with the instructions contained in this manual you will get the best out of your machine and keep it operating at maximum efficiency for many years to come.
- 2° This operator's manual, together with the spare parts catalogue, are essential items of machine equipment and must accompany the machine throughout its working life, even if the machine is sold to new owners.
- 3° Keep this manual in a convenient place on board the machine where it can be consulted quickly and easily. We recommend that you keep it in the document pocket behind the seat, together with the documents of ownership and registration.
- 4° Make sure that this manual is always readily available to all machine operators and maintenance personnel who must read it carefully and understand how to operate and maintain the machine and what hazards must be avoided.
If this manual becomes damaged or lost, request another copy from FKI or from your FKI dealer.
- 5° FKI machines are constantly being improved in terms of efficiency and reliability. This manual describes the machine as first sold.
Consult your FKI dealer for information on technical changes.
- 6° Make orderly notes immediately any work is done during maintenance checks. This is not only a demonstration of efficient servicing, but also provides a clear record of what work has been done and what still remains to be done at the next service interval. Check the hour counter and the maintenance chart regularly.
- 7° Your FKI dealer has years of experience in dealing with customers' queries. Do not hesitate to contact your dealer if you need more information. He can help you to get the best out of your machine, and can suggest the most appropriate equipment for a job. Your dealer can also provide Technical Assistance for any modifications needed to adapt your machine to comply with safety.
Your FKI dealer also stocks original FKI spare parts - the only ones which guarantee safety and interchangeability.
- 8° Write your machine's serial numbers on the form provided at the end of this section. Give these details to your dealer whenever you request Technical Assistance or spare parts.



CAUTION

- **Incorrect operation or inadequate maintenance can lead to serious damage, injury, or even death.**
- **Machine operators and maintenance personnel must read this entire manual carefully before using the machine or performing any maintenance.**
- **If someone is seriously injured while operating or maintaining this machine, it means that the procedures described in this manual have not all been followed.**

- The procedures and precautions contained in this manual apply to the machine only in the course of normal work.
The machine operator becomes directly and solely responsible for his own safety and that of other persons if he uses the machine in an improper manner.
-

CALIFORNIA **PROPOSITION 65 WARNING**

DIESEL ENGINE EXHAUST AND SOME OF ITS CONSTITUENTS ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS AND OTHER REPRODUCTIVE HARM

SAFETY INFORMATION

Most accidents are caused by lack of knowledge or by failure to observe the basic safety regulations which should always be applied during operation and maintenance.

To prevent unnecessary accidents, before you start work or perform maintenance on the machine, read, understand, and follow all the precautions and warnings contained in this manual and those provided in safety notices on the machine itself.

The following terms have been adopted in the safety notices in this manual and on the machine.



DANGER

- **This term is used throughout this manual and on machine safety notices when failure to observe the instructions given will in all probability result in serious injury or even death.**

These warnings and notices provide essential instructions which must be followed to avoid risk. Failure to do so could also lead to serious damage to the machine



CAUTION

- **This term is used throughout this manual and on machine safety notices when failure to observe the instructions given could result in slight or moderate injury.**

This term may also identify risks of damage to the machine.



IMPORTANT

- **This term is used throughout this manual and on machine safety notices to identify precautions which must be taken to avoid shortening the working life of the machine.**
-

FKI cannot possibly foresee all circumstances which might give rise to potential hazards during the operation or maintenance of the machine. The safety notices in this manual and on the machine may not therefore provide all possible safety precautions.

Nevertheless, if only permitted operations are performed, and all the warnings in this manual and on the machine are followed, both the operator and those working around the machine can be sure of working in safety and with no risk of damage to the machine. If you have any doubts whatsoever regarding what precautions must be taken for any operation, contact FKI or your local dealer.



DANGER

For greater clarity some of the illustrations in this manual show the machine without panels or guards fitted. Never use the machine without these items in place and do not start the engine while they are removed unless specifically instructed to do so in the maintenance procedures.



DANGER

It is strictly forbidden to modify the settings of the hydraulic system safety valves. FKI cannot be held responsible for damage or injury to persons, equipment, or the machine caused by interference with the standard settings of the hydraulic system.



DANGER

Only fit recommended and approved optional equipment. (See section «31. APPROVED OPTIONALS»).

INTRODUCTION

PERMITTED USES

The machines described in this manual are designed to operate mainly as «EXCAVATORS AND LOADERS».

If equipped with appropriate safety systems, or if they have the characteristics described in section «31. AUTHORISED EQUIPMENT», these machines may be used with authorised optional equipment.

MAIN FEATURES

- Simple to use.
- Hydrostatic transmission via two variable displacement hydraulic motors driving epicyclic final drives with pressure release hydraulic brakes.
- Revolving frame swing powered by axial piston hydraulic motor driving an epicyclic gearbox.
- Grease bath lubricated fifth wheel pinion gear.
- Main equipment controlled by two servo-assisted levers permitting combined, proportionally and continuously modulable movement.
- Boom rotation and machine movement controlled by two servo-assisted pedals permitting combined, proportionally and continuously modulable movement.
- Speed control pedal.
- Servo-assisted controls for boom arm and blade.
- Complete instrumentation arranged for easy viewing from driving seat.
- Lever type accelerator control.
- Maintenance arranged at convenient intervals.

RUNNING IN THE MACHINE

All FKI machines are rigorously tested and inspected before delivery.

New machines should nevertheless be used with care during the first 100 hours to allow components to run in gradually.

By subjecting a brand new machine to excessive loads, you can quickly reduce its potential efficiency.

Use your new machine with care, and pay particular attention to the following points:

- When you start the engine, leave it idle for at least 5 minutes to allow it to warm up gradually before subjecting it to working loads.
- Avoid operating at maximum load or at high speed.

- Avoid harsh starts, acceleration, deceleration, and braking, and sharp turns.
- Perform the following operations after the first 50 hours work in addition to the standard scheduled 50 hour maintenance:
 - 1 - Replace the hydraulic system filter.
 - 2 - Check the tension of the fan belt.
- Perform the following operations after the first 250 hours work in addition to the standard scheduled 250 hour maintenance:
 - 1 - Change the oil in the final drives.
 - 2 - Change the oil in the swing motor.
 - 3 - Check and adjust the engine tappet (valve) clearance.



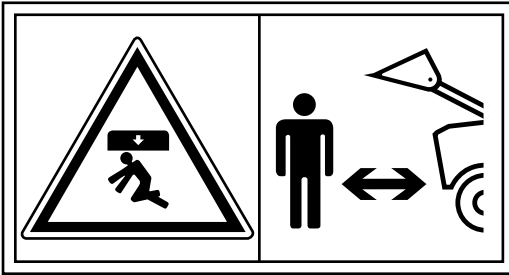
IMPORTANT

- **When changing oil filter elements, check inside them for abnormal deposits. If unusual deposits are found, check the possible causes before re-starting work.**
 - **Total working hours are shown on the hour counter.**
-

SUMMARY OF PICTOGRAMS

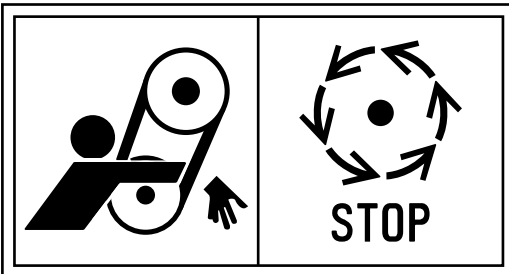
The safety and warning notices fixed to the machine are accompanied by or represented by pictograms.

Personnel responsible for operating or servicing the machines must fully understand the symbols contained in the pictograms; what they represent and their specific meanings are explained below.



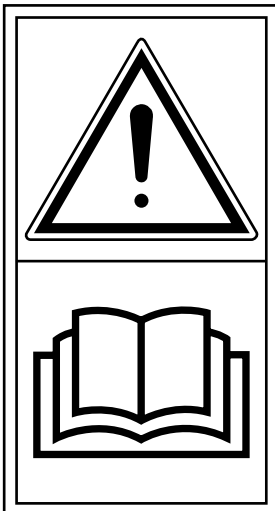
DANGER: WORKING ZONE

Do not approach or stand in the turning circle of the equipment when the boom and the bucket are raised.



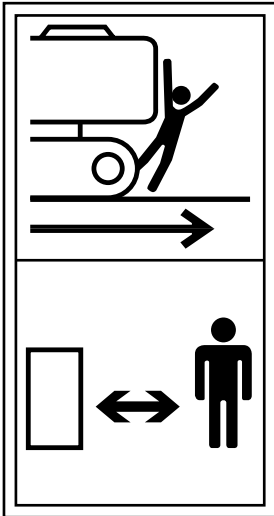
DO NOT OPEN BONNET

Do not open or remove the bonnet when the engine is running.



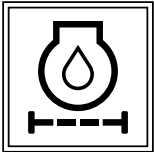
REFER TO MANUAL

Read the manual carefully before using the machine or carrying out maintenance.

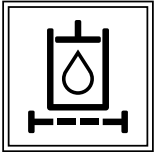


SAFETY DISTANCE

Never enter or stand within the range of operation of the machine



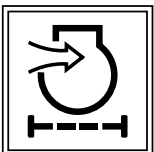
ENGINE LUBRICATING OIL FILTER



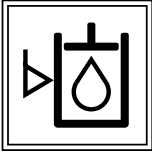
HYDRAULIC OIL FILTER



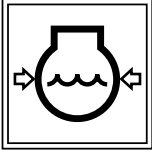
FUEL FILTER



ENGINE AIR FILTER



HYDRAULIC OIL LEVEL



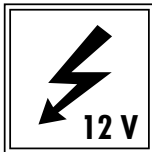
ENGINE COOLANT PRESSURE



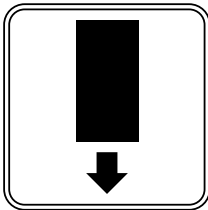
FUEL



HYDRAULIC OIL



ELECTRICAL SOCKET

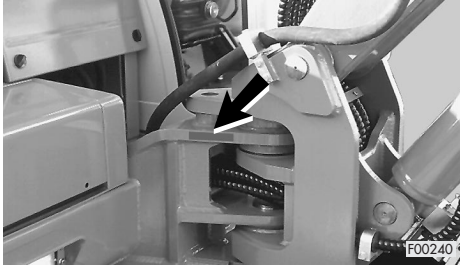


EMERGENCY EXIT

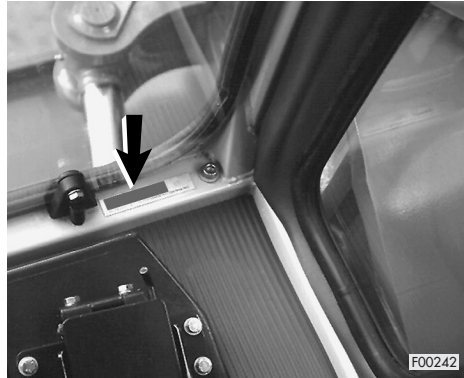


ANCHORING POINT

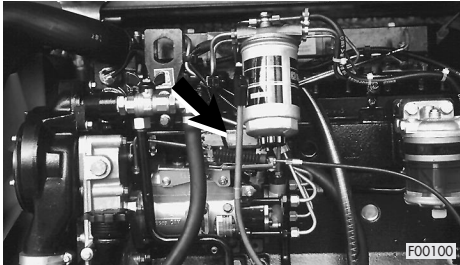
LOCATION OF MACHINE COMPONENT IDENTIFICATION PLATES



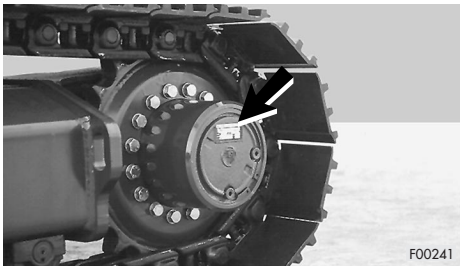
MACHINE SERIAL NUMBER



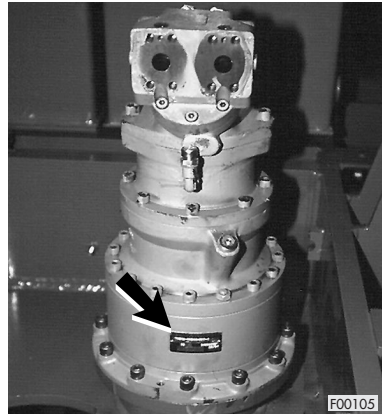
CAB SERIAL NUMBER



ENGINE SERIAL NUMBER



FINAL DRIVE SERIAL NUMBER



SWING MOTOR SERIAL NUMBER

SERIAL NUMBERS AND ADDRESS OF DEALER

Machine serial N° _____ Model _____

Engine serial N° _____

Final drive serial N° _____

Swing motor serial N° _____

Cab serial N° _____

Dealer:

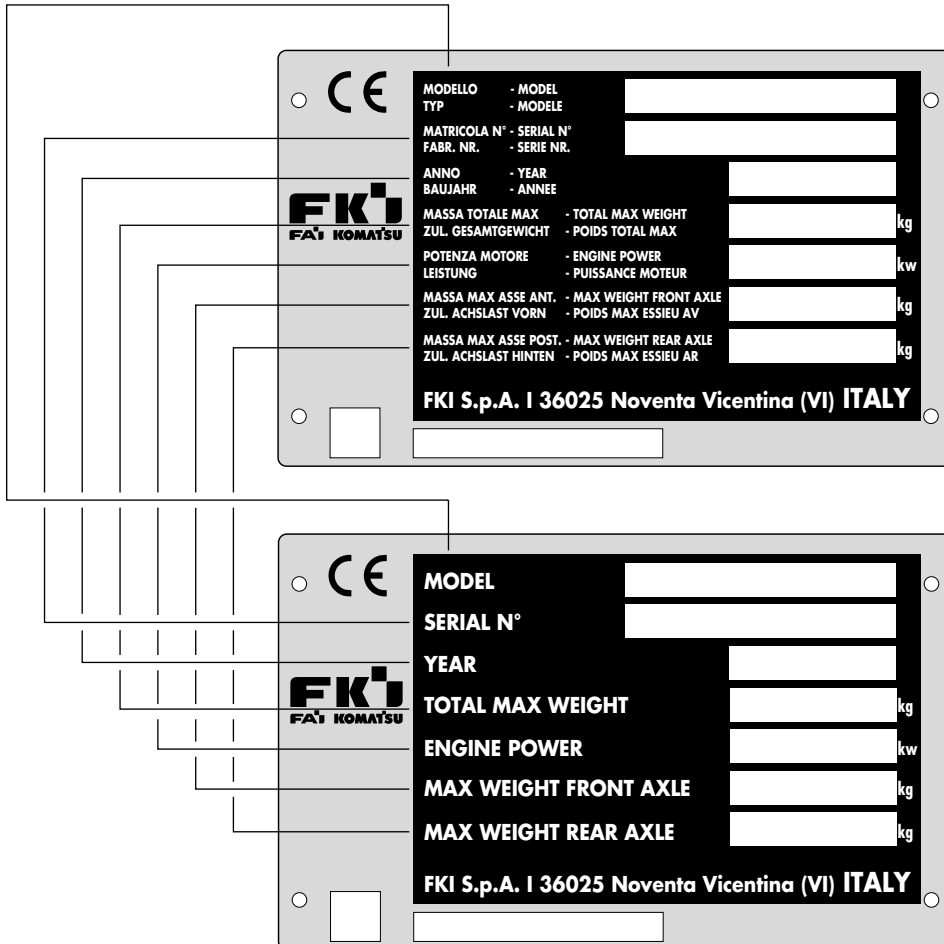
Address _____

_____ Tel. _____

Person to be contacted:

REMARKS: _____

POSITION AND CONTENTS OF «CE» PLATE



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**SAFETY AND
ACCIDENT
PREVENTION**

1. SAFETY MEASURES

1.1 GENERAL PRECAUTIONS

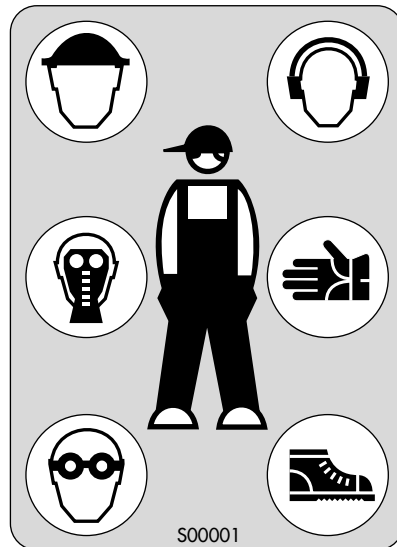
- The machine must only be used by authorised personnel who are trained in its operation. Maintenance personnel must likewise be authorised and trained for the purpose.
- When operating the machine or carrying out maintenance on it, always observe all possible safety regulations and precautions, and respect all safety notices.
- If other persons are working on or around the machine, or if the area in which you are working is entered frequently by other persons, make sure that everybody is fully conversant with a set of agreed signals and that everybody works where they can see the machine and can be seen by you as the machine operator.

1.2 SAFETY DEVICES

- Make sure that all protective panels and guards are securely installed in their correct positions. Replace or repair damaged panels or guards immediately. Never use the machine without all panels and guards in place and never remove them while the engine is running.
- Always use the appropriate safety devices to secure the machine when parked. Always wear the safety belt correctly.
- See section 11. «SAFETY DEVICES» for further information on the safety devices.
- See section 15.4 «THE SAFETY BELT» for further information on the safety belt.
- Never remove any safety devices and always keep them in good working order.

1.3 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

- Do not wear large or loose clothing, rings, or wrist-watches, and do not approach moving parts if you have long, unbounded hair, which might become entangled and cause serious injury.
Do not wear clothing which is stained with oil or fuel which might catch fire easily.
- When operating or carrying out maintenance on the machine, always wear a hard hat, safety goggles and boots, a mask, gloves, and anti-noise earmuffs.
- Always wear safety goggles, a hard hat, and thick gloves capable of protecting your hands against metal splinters and shards of material. These precautions are particularly important when fitting and hammering equipment link pins, and when blowing clean the air filter and radiator.



Also make sure that no unprotected persons are allowed to enter the vicinity during these operations.

- Anti-noise earmuffs or earplugs must be worn when working for a period of 8 hours at a noise level of over 90 dBA. This is particularly important towards the end of the work shift.

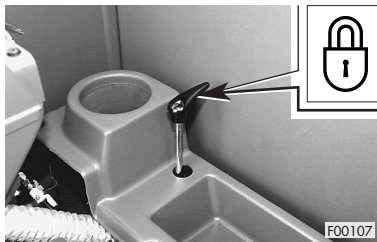
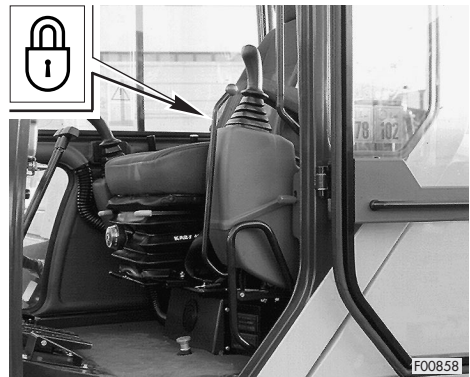
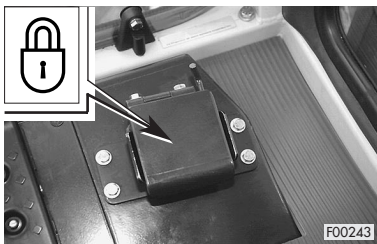
1.4 UNAUTHORISED MODIFICATIONS

- No modifications may be made to the machine without prior authorisation from FKI. Unauthorised modifications can cause serious hazards.
- Consult your FKI dealer before making any modification. FKI cannot be held responsible for injury or damage incurred as the result of unauthorised modifications.

1.5 LEAVING THE DRIVING SEAT

- When leaving the driving seat even for a moment, make sure that the machine is parked on safe ground. (See section 3.10 «PARKING THE MACHINE».)
- Before leaving the driving seat, perform the following operations in the sequence given:
 - 1 - Lower the equipment to the ground.
 - 2 - Fit the boom rotation pedal lock and engage the swing lock lever.
 - 3 - Engage the control lever safety lock to disable the equipment control levers.
 - 4 - Switch off the engine.

Take the ignition keys with you if you are going far enough to lose sight of the machine.



1.6 ENTERING AND LEAVING THE MACHINE

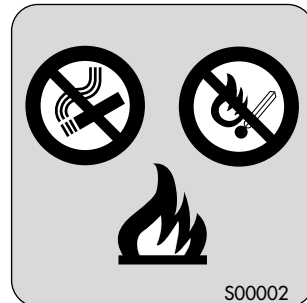
- Do not jump from or on to the machine, even if it is stationary.
- Use the hand grips, track frame, and tracks to enter and leave the machine. Enter and leave the machine calmly and with due care.
- Do not hold on to or lean on any controls to enter or leave the machine.
- When entering or leaving the machine always maintain three points of contact at a time (hand-holds or footholds) in order to avoid losing your balance and falling.
- Re-tighten immediately any hand grip securing bolts which become loose. Clean the hand grips, track frame, and tracks immediately if they become oily or greasy. Clean the cab floor thoroughly if it becomes soiled with oil, grease, mud, or debris.



1.7 PREVENTION OF FUEL AND OIL FIRES

Fuel, oil, and certain types of anti-freeze can catch fire extremely easily if they come into contact with a naked flame. Fuel is particularly inflammable and is therefore a severe fire hazard.

- Keep naked flames away from inflammable liquids.
- Switch off the engine and refrain from smoking while refuelling.
- Only refuel with the engine switched off and with the machine in a well ventilated area.
- Keep a well demarcated area aside for refuelling operations and do not allow unauthorised persons in the vicinity.

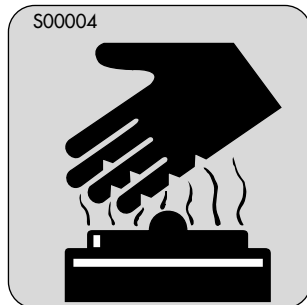


- Hold the delivery nozzle firmly when refuelling. Keep it in steady contact with the tank orifice until delivery is complete to prevent sparks from static electricity.
- Carefully fasten the filler caps of the fuel and hydraulic fluid tanks when you finish filling them.
- Do not fill the fuel tank up to the brim. Leave a space for fuel expansion.
- Mop up any spilled fuel immediately.



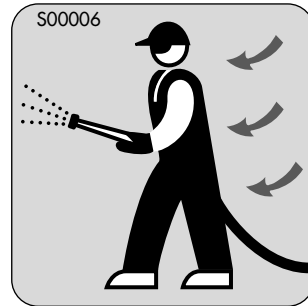
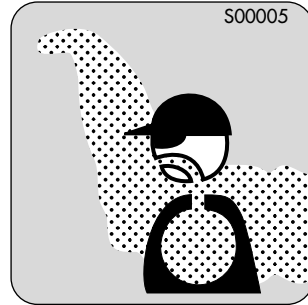
1.8 PREVENTION OF BURNS AND SCALDING

- If the engine coolant, engine oil, or hydraulic fluid are hot, use thick rags and wear thick gloves, protective clothing, and safety goggles before checking fluid levels or touching hot parts.
- Switch off the engine and wait for the coolant to cool down before checking its level. If you have to check the coolant level while the engine is hot (e.g. because the engine is overheating), unscrew the radiator cap slowly to release residual pressure before removing the cap. Hot liquid could otherwise spray out and cause severe scalding.
- Switch off the engine and wait for the engine oil and hydraulic fluid to cool down before checking their levels. Hot oil spraying out could cause serious scalding.



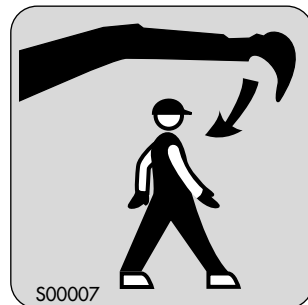
1.9 PREVENTION OF ASBESTOS DUST CONTAMINATION

- If inhaled, asbestos dust is extremely harmful to health.
- Take the following precautions when handling material which contains asbestos fibres:
 - 1 - When cleaning the machine, work in a well ventilated environment. **Do not use compressed air. Use vacuum cleaners instead.**
 - 2 - For thorough cleaning, use running water at low pressure to avoid raising dust.
 - 3 - Whenever possible operate upwind of the material (i.e. with your back to the wind) to avoid exposure to wind-borne dust.
 - 4 - Wear a suitable approved mask when working with asbestos even if the cab provides efficient protection.
 - 5 - Asbestos dust collected during cleaning operations must be damped down and placed in a sealed, duly marked container for disposal in accordance with applicable regulations.



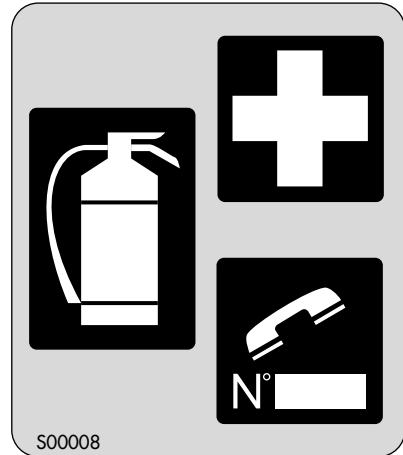
1.10 PREVENTION OF INJURY BY WORK EQUIPMENT

- Never stand within or enter the working range of equipment, even if there is an operator on board the machine and the engine is running.
- Never stand or work under raised booms, arms, or articulations without having first checked that the necessary safety devices have been applied.
- Never carry out any work on raised booms or arms without having first checked that the relevant safety devices are in place and are firmly holding the equipment in place.



1.11 FIRE EXTINGUISHERS AND FIRST AID KIT

- Make sure that you know where the fire extinguishers are.
- Regularly check that the fire extinguishers are fully charged and make sure that you know how to use them.
- Make sure that you know where the first aid kit is.
- Regularly check that the first aid kit contains all the required disinfectants, bandages, medicines, etc..
- Make sure that you know exactly what to do in case of fire or injury.
- Make sure that the telephone numbers of emergency personnel and services are always to hand at the operating site and at the place of maintenance.



1.12 PRECAUTIONS REGARDING THE CAB FRAME

- If the cab is involved in a collision during work, or if the machine turns over, the cab frame may be damaged or its strength impaired. This clearly reduces the degree of active safety which the cab can afford the operator.
Consult FKI or your FKI dealer to have the cab frame checked after any accidental knock or damage is incurred.

1.13 PRECAUTIONS REGARDING EQUIPMENT

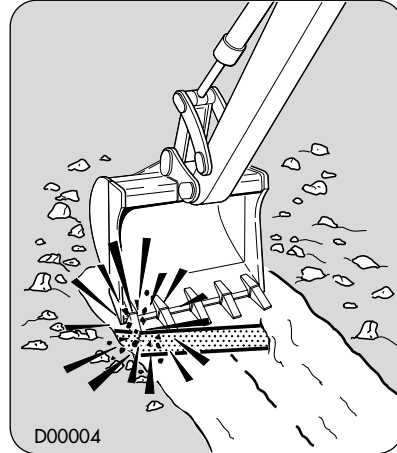
- When optional equipment is fitted to the machine, read the operating manual for the equipment thoroughly and obey the instructions given in it.
- Do not use optional or special equipment without the prior authorisation of FKI or your FKI dealer.
The installation and use of unauthorised equipment represents a serious safety hazard and can reduce the functionality and working life of the machine.
- FKI cannot be held responsible for any damage, accident, or diminished machine efficiency incurred by the use of unauthorised equipment.

PRECAUTIONS

2. PRECAUTIONS TO BE TAKEN BEFORE STARTING THE ENGINE

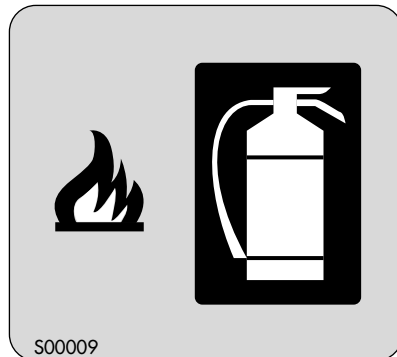
2.1 ON-SITE SAFETY

- Before starting the engine, carefully check the area you are going to work in and note any ground conditions which may prove dangerous.
- After you have examined the area, and still before starting the engine, carefully study the work plan and the proposed method of operation.
- If possible, level off the area you are going to work in before you start work.
- When working on a public road, designate someone to control both pedestrian and vehicular traffic and install perimetral fencing around the work area.
- If there are water or gas mains, telephone lines, or high voltage power lines below ground in the work area, contact the relevant authorities to ascertain their exact location or to have them cut off until work has been completed. Take the greatest care not to cut through or damage underground pipes or cables.
- If you have to work with the machine in water or on the banks of a river, check the depth of the water carefully before you enter it, and also note the strength and the direction of the current.



2.2 FIRE PREVENTION

- Carefully remove all pieces of wood, rubbish, paper, or any other inflammable material which may have collected in the engine compartment. Debris around the engine constitutes a fire hazard.
- Check the fuel lines and hydraulic circuit for leaks and make any necessary repairs immediately. Thoroughly clean up all traces of leaked fuel, oil, or any other inflammable liquid.
- Make sure that fire extinguishers are readily available in the work area.

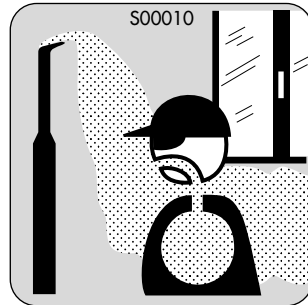


2.3 PRECAUTIONS REGARDING THE CAB

- Do not store articles or tools in the cab. They can obstruct the controls and cause serious accidents.
- Keep the floor of the cab and the controls (pedals and levers) free from oil and grease. Do not allow earth or gravel to accumulate on the floor of the cab.
- Regularly check the condition of the safety belt and replace it if damaged or worn. Replace it only with an approved model available from FKI or any FKI dealer.

2.4 VENTILATION OF ENCLOSED AREAS

- Before starting the engine in restricted or enclosed spaces, make sure that there is adequate ventilation, or connect the exhaust pipe to an outside outlet. Engine exhaust gases can be lethal.



2.5 CLEANING WINDOWS, MIRRORS AND HEADLIGHTS - CHECKING WIPER BLADES, LAMPS

- Keep the cab windows, headlights, and rear-view mirrors clean. They are essential to a clear view of the work area.
- Adjust the rear-view mirrors if they have been moved to obtain a clear view of the area behind the machine. Replace any cracked mirrors immediately.
- Make sure that all bulbs, including those of the work floodlights are functioning perfectly. Replace any burned out bulbs with new ones of the same rating.
- Check the wiper blades for wear or damage. The scraping edge must be straight, smooth, and fully attached to the body of the blade. Replace the blade if the scraping edge becomes worn or damaged.

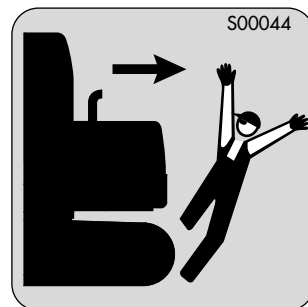
3. PRECAUTIONS TO BE TAKEN WHILE WORKING

3.1 STARTING THE ENGINE

- Before entering the machine, walk around it and take a careful note of all persons and obstacles within range.
- Do not start the engine if safety notices have been attached to the control levers.
- Before starting the engine, sound the horn for a moment to alert anyone in the vicinity.
- Sit correctly in the driving seat and fasten the safety belt before starting the engine.
- Do not allow anyone else to climb on to the machine or enter the cab.

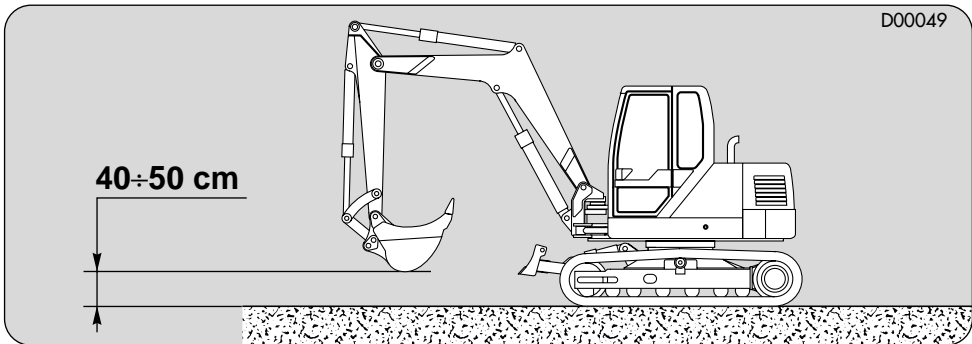
3.2 CHECKS PRIOR TO REVERSING

- When working in potentially hazardous areas, or where visibility is restricted, designate someone to control the movements of your machine and of any other vehicles in the area.
- Sound the horn to warn persons in the work area before starting to move the machine.
- Someone might be standing in a blind spot behind the machine (i.e. where he cannot be seen in the rear-view mirrors).
Make sure that there is nobody behind the machine before starting to reverse.



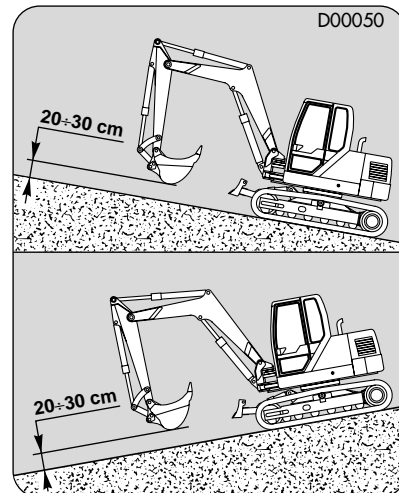
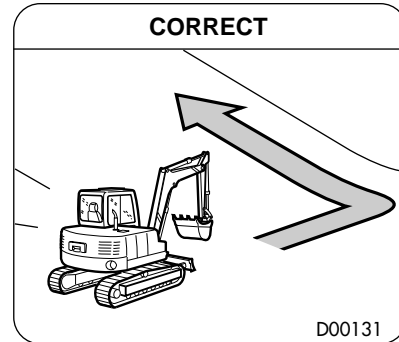
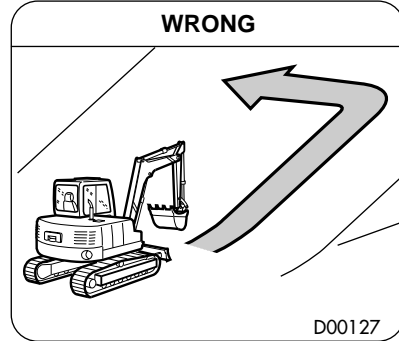
3.3 MOVING THE MACHINE

- Before moving the machine, fully raise the blade and raise the bucket 40÷50 cm above the ground. This position affords both optimum visibility and stability.
- Make sure that the revolving frame is turned so that the cab faces the blade. If it is facing the other way, the effect of the steering and controls will be reversed.
- If you have to use the equipment controls while the machine is moving, do so slowly and with care. Abrupt manoeuvres can rapidly alter the attitude of the machine and make it difficult to steer.
- When driving over rough terrain, drive slowly and avoid rapid movements of the boom and arm.
- If you have to drive over high obstacles while moving, keep the equipment as low as possible and drive slowly to avoid straining the tracks and rollers.



3.4 WORKING ON SLOPES

- When working on slopes, hillsides, river banks, lakesides, or wet ground, the machine is more likely to skid or overturn.
- If you have to work on a slope, avoid swinging the revolving frame since this could cause the machine to lose balance and overturn. Swinging the revolving frame is particularly dangerous when facing downhill with a loaded bucket. If any amount of work has to be done under these conditions, build up a level platform of earth for the machine to work from.
- On slopes, hillsides, and banks, keep the bucket as low as possible (20÷30 cm from ground level) and lower it to the ground in an emergency to help the machine stop.
- Do not change direction on a slope, and if possible avoid travelling at an angle. Cross either above or below a slope.
- Do not drive over damp grass or thick layers of dead leaves on slopes since these can cause the machine to skid if it is moving at an angle.
- Always engage the working brake when working on slopes.
- If the fuel gauge enters the reserve (red) area when you are working on a slope, stop work and refuel immediately. Otherwise, air could enter the fuel lines and the engine could stop unexpectedly, placing you and others working downhill in great danger.
- If the engine stops unexpectedly, lower the bucket to the ground immediately.



3.5 PREVENTION OF ELECTROCUTION

- Digging in the vicinity of overhead power cables represents a serious hazard which could even lead to death by electrocution. When working near overhead cables, always observe the minimum safety distances specified by the authorities and all relevant accident prevention regulations.
- The minimum safety distance from underground power cables is determined by the type and thickness of the protective sheathing in which the cables are laid.
- The following are basic precautions which must be taken to avoid risk:
 - 1 - Wear footwear with thick rubber or leather soles.
 - 2 - Seek assistance from someone who can stand in a suitable position and give you directions to ensure that no part of the machine makes contact with power cables.
 - 3 - Work slowly.
 - 4 - Learn the first aid procedures to be applied in case of electrocution.
 - 5 - Keep the telephone numbers of the local electricity board and the nearest first aid post in a handy and easily visible place.
- If by any chance the machine does make contact with power cables, remain in the cab until the electricity board has been contacted and the power supply to the cables has been cut off.
- Warn all persons in the area to maintain a safe distance from the machine and all working equipment.
- Contact the electricity board before starting work to find out the voltage carried by the lines and the minimum safety distance from them.



DANGER

- **Minimum safety distances from overhead lines vary from one country to another depending on climate and humidity. The following table provides approximate distances.**

Voltage of cables	Minimum safety distance
1.0 kV (supply lines)	5 m
6.6 kV (2-3 insulators)	5.2 m
33 kV (min. 3 insulators)	5.5 m
66 kV (min. 6 insulators)	6 m
154 kV (min. 10 insulators)	8 m
275 kV (min. 19 insulators)	10 m

3.6 VISIBILITY

- Switch on the driving lights or work floodlights as soon as visibility becomes poor.
- If visibility is seriously impaired by fog, smoke, or heavy rain, stop the machine in a safe place and wait until visibility improves again.

3.7 WORKING ON FROZEN OR SNOW-COVERED GROUND

- If the ground is frozen or covered by snow, the machine may not respond precisely to movement of the control levers.
Apply the following precautions to limit risk:
 - 1 - Use the accelerator smoothly and gradually.
 - 2 - Brake gently and only after having reduced speed as much as possible by engine braking.
 - 3 - Do your utmost to avoid harsh braking and acceleration, abrupt steering manoeuvres and tight cornering.

3.8 PREVENTION OF DAMAGE BY THE EQUIPMENT

- When working in tunnels, galleries, beneath electricity cables or other ducts (e.g. air ducts or telephone cables), and whenever headroom is restricted, take the greatest care to prevent the bucket or the arm from causing damage.

3.9 WORKING ON LOOSE OR PLOUGHED SOIL

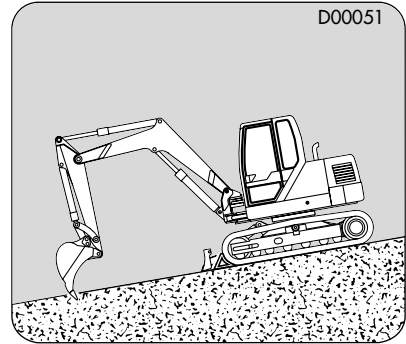
- Avoid using the machine on soft shoulders, roadsides, overhangs, or the edges of ditches.
These areas could all give way and cause the machine to fall or overturn, leading to serious injury or even death.
Remember that the danger of collapse is increased by rain and vibrations.
- Earth dredged from ditches and deposited at the sides can easily collapse under the weight of the machine or as the result of the vibrations it transmits to the ground. Take great care. Always keep the cab door closed and always wear your safety belt.

3.10 PARKING THE MACHINE

- Always park the machine on firm, level ground. If you have to park on a slope, park the machine facing downhill and take the following precautions:

- 1 - Rotate the bucket into unloading position and lower the boom and arm until the bucket's teeth dig into the ground.
- 2 - Switch off the engine.
- 3 - Place wedges or safety blocks under the tracks.

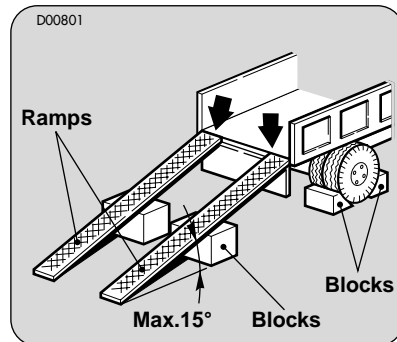
- Always lower all equipment to the ground. If for any reason you have to park with the boom and arm raised, engage the necessary locks and safety devices.
- Always disable the equipment control levers by engaging the control lock.
- Check that all the cab windows are tightly closed before leaving the machine. Remove the ignition key and lock the cab door.
- If you have to park on a public road, warn other road users of the hazard in compliance with national laws (hazard warning lights, barriers, roadwork signs, traffic priority signs, deviation signs, etc.).



4. TRANSPORTING THE MACHINE ON ANOTHER VEHICLE

4.1 LOADING AND UNLOADING

- Loading and unloading the machine onto and off another vehicle always involves some element of danger. Take the greatest care throughout these operations.
- Only perform loading and unloading operations on firm, level ground. Keep well away from the edges of ditches and roads.
- If the vehicle which is to transport the machine is not specially equipped for loading and unloading, place supporting blocks underneath the ramps to prevent them bending.
- Always block the wheels of the transporting vehicle with wedges.
- Only use ramps which are wide enough for the purpose and which are capable of withstanding the weight of the machine. Position the ramps parallel to each other and perpendicular to the edge of the loading platform. Make sure that the ramps are placed at the right distance for the machine's track.
- Make sure that the ramps are firmly attached to the loading platform. Only use ramp pairs of the same length.
- Position the ramps at a maximum angle of 15°.
- Make sure that there are no traces of oil, grease, earth, or ice on the ramps. Clean the dirt off the tracks before starting to negotiate the ramps.
- Load the machine with the bucket facing forward, i.e. in the direction of travel of the vehicle.
- Do not correct steering on the ramps. If correction is required, reverse down off the ramps and re-align the machine before trying again.
- After loading, block the machine with wedges under the tracks and tie it down with cables or chains to prevent it swaying or moving sideways.



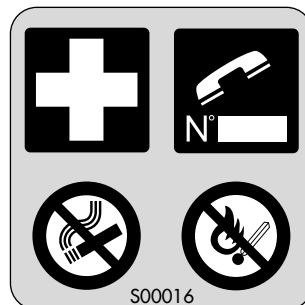
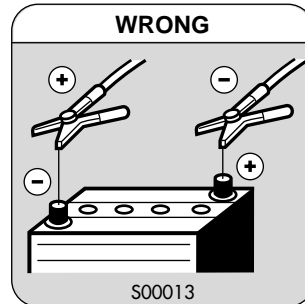
4.2 THE ROUTE

- Work out the route to be followed, taking into account the width, height, and weight of the transporting vehicle plus the machine. Make sure that the overall dimensions of the vehicle and load are compatible with the roads, tunnels, underpasses, bridges, power and telephone lines, etc. along the route.
- Obey all laws and regulations governing the width, height, weight, and speed of heavy vehicles.

5. THE BATTERY

5.1 SAFETY PRECAUTIONS FOR WORK ON BATTERIES

- Electrolytic (wet) batteries contain sulphuric acid which can cause burns. It can also corrode clothing and make holes in it. If you get splashed with battery acid, wash the affected part immediately with plenty of water.
- Battery acid can cause blindness if it comes into contact with the eyes.
If acid accidentally gets into your eyes, wash them immediately with plenty of clean, running water and consult a doctor straight away.
- If you accidentally swallow battery acid, drink plenty of water, milk, beaten egg white, vegetable oil, or any anti-acid treatment such as milk of magnesia, bicarbonate of soda, etc.. Call a doctor urgently or go to the nearest poison treatment unit.
- Always wear safety goggles when working on batteries.
- Batteries produce hydrogen which is highly explosive in the presence of sparks or naked flames.
- Switch off the engine and remove the ignition key before starting any work on batteries.
- Avoid short-circuiting the battery, even accidentally. Avoid connecting the terminals to the machine's frame or to tools. Do not invert the polarity of the terminals.
- Screw terminal clamps up tightly. Loose terminals can cause sparks which in turn can cause explosions in the battery.

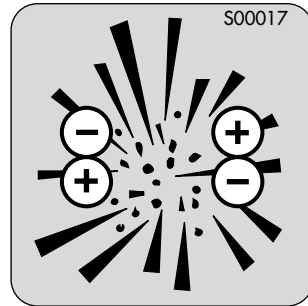


5.2 STARTING THE ENGINE WITH JUMP LEADS

- Always wear safety goggles when using jump leads to start the engine.
- When using the battery of another machine to start the engine, do not allow the two machines to come into contact with each other.

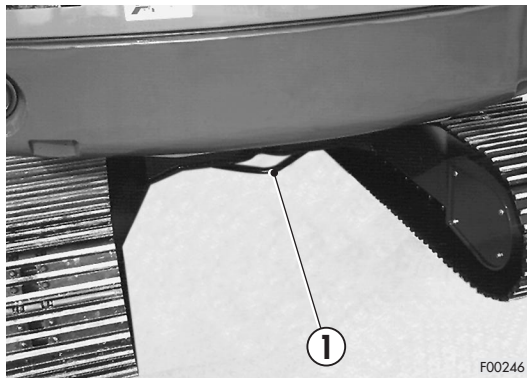
PRECAUTIONS FOR EMERGENCY RECOVERY

- When connecting jump leads, always connect the positive (+) lead first and then the negative or earth (–) lead. Once the engine has started, disconnect the negative (–) lead first and then the positive (+) lead.
- Only connect batteries in parallel: positive to positive and negative to negative.
- When connecting the negative (earth) lead to the frame of the machine to be started, make the connection as far as possible from the battery. (See section 23.2 «IF THE BATTERY IS FLAT».)



6. PRECAUTIONS FOR EMERGENCY RECOVERY

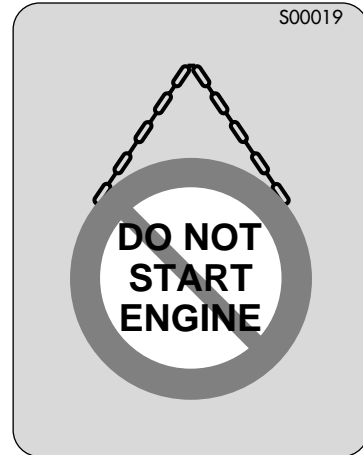
- The emergency recovery hook (1) is only to be used for emergency recovery of the machine and is not intended as a towing hook.
- Place all the controls in neutral before moving the machine.
- Remember that improperly executed manoeuvres can lead to serious damage, injury, and death.
- Only use cables which are strong enough for the purpose. Do not use cables which show signs of wear or have broken strands.
- Make sure that no-one approaches either the machine or the cable during the recovery operation.
- Do not stand astride the cable.
- Move the machine just far enough to carry out essential repairs, and no further.
- Maximum pulling force at emergency recovery hook: 6550 Kg.



7. PRECAUTIONS TO BE TAKEN DURING MAINTENANCE

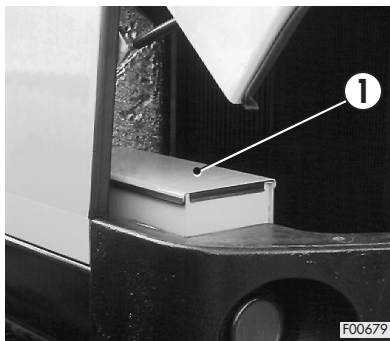
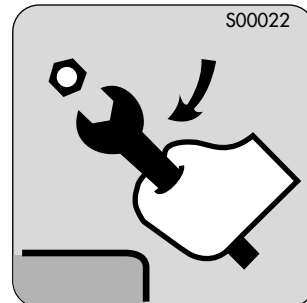
7.1 WARNING NOTICES

- Before starting any maintenance work, apply the relevant safety devices and locks on the equipment and the control levers. Only perform maintenance on firm, level ground and with the parking brake on.
- If other people start the engine or operate the control levers while you are performing maintenance, you could be seriously injured or even killed.
- To avoid the risk of this happening, before starting maintenance work, attach clear warning notices to the ignition key, and control levers. If necessary, also place notices around the machine and on the cab door handles.



7.2 TOOLS

- Only use the tools provided in the tool-kit and other high quality tools.
- Throw away any worn, damaged, poor quality, or improvised tools.
- After use, always replace tools in the tool kit (1) on the left side panel of the engine compartment.



7.3 PERSONAL PRECAUTIONS

- Maintenance must only be performed by trained and authorised personnel. Each person performing maintenance must be instructed to adopt specific personal precautions when performing grinding or welding operations and when using heavy mallets or hammers.
- When fitting equipment or cylinder link pins, use soft materials such as wood or plastic to check the alignment of the holes.
Never use your fingers. These could easily be severed by unexpected movement.

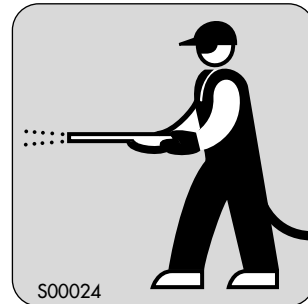
7.4 EQUIPMENT

- When not in use on the machine, special and standard equipment must be stored safely and in such a way that it cannot fall and cause injury.
- When equipment needs to be installed or dismantled ensure that cables and lifting hooks are in a good state of repair and that their size correspond to the weight they will lift.



7.5 KEEPING THE MACHINE CLEAN

- Smears of oil and grease, loose tools, and loose components can cause people to slip, stumble, and fall.
Always keep the machine and the work area clean and tidy.
- Use a jet of hot water or steam in conjunction with a proprietary detergent to clean the machine.
Do not use diesel, petrol, or solvents. Fuels leave an oily film which attracts dust. Solvents (even weak ones) can damage the paint-work and favour the formation of rust.



- If jets of water penetrate electrical components, they can not only oxidise the contacts and prevent starting, but can even cause the engine to start unexpectedly.
For this reason never use jets of water or steam on sensors or switches, or inside the cab.

7.6 RUNNING THE ENGINE DURING MAINTENANCE

- Only run the engine during maintenance work when absolutely necessary. If the engine must be run (e.g. to flush out the cooling circuit or check the alternator) ensure that an operator remains in the driving seat to switch off the engine whenever necessary.
- During maintenance work, if the engine is running, never disengage the control locks, and never move the track drive levers.
Maintenance personnel should never move control levers.
- When performing maintenance, never touch moving parts and never wear large, loose garments.

7.7 RULES FOR REFUELLING AND ADDING OIL

- Splashes of fuel or oil can cause a person to slip and are therefore hazards. Mop up spillages immediately and clean the area affected.
- Keep the filler caps of the fuel tank and hydraulic fluid tank firmly tightened down.
- Never use fuel to clean parts of the machine which are smeared with oil or dust.
- Only add fuel or hydraulic fluid in well ventilated areas, and refrain from smoking while doing so.



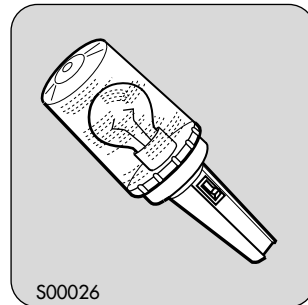
7.8 LEVEL OF COOLANT IN THE RADIATOR

- Leave the engine and radiator cool down before checking the coolant level.
- If you must remove the radiator cap while the engine is hot, wear protective gloves and clothing and loosen the cap slowly in order to release pressure gradually.



7.9 USING LAMPS

- Use only approved anti-explosion lamps to check fuel, oil, coolant, battery electrolyte, and hydraulic fluid levels. Unsuitable lamps can cause fires and explosions.



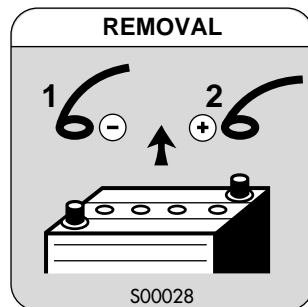
7.10 BATTERY AND ALTERNATOR PRECAUTIONS

- Disconnect the battery before starting work on the electrical system in order to interrupt the electrical circuit.

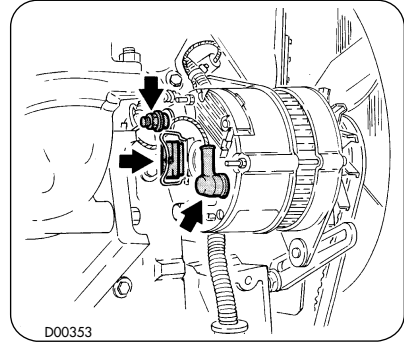


IMPORTANT

- **Disconnect the negative (-) or earth lead first, and then the positive (+) lead.**
On completion of work, reconnect the positive (+) lead first and then the negative (-) or earth lead.



- Disconnect both the battery and the alternator before performing any welding on the machine.



7.11 PRECAUTIONS REGARDING HIGH PRESSURE HOSES

- Do not bend or scratch high pressure hoses with sharp or abrasive objects. Do not use bent or cracked pipes or hoses which have been previously rejected because of leaks or other defects. Faulty hoses can burst during operation.
- Repair or replace immediately any loose or faulty fuel or hydraulic lines. Fuel or oil leaks can cause fires.

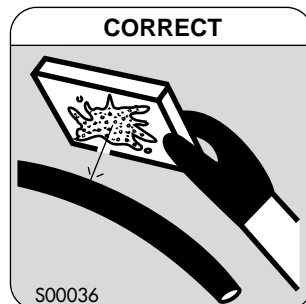
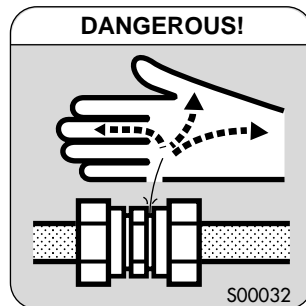
7.12 PRECAUTIONS TO BE TAKEN WHEN WORKING ON HIGH PRESSURE SYSTEMS

- Remember that working hydraulic circuits are always under pressure. If you have to add or drain hydraulic fluid, or service or inspect the hydraulic circuit, lower the equipment to the ground and release circuit pressure and residual tank pressure before starting work.

Leaks from pressurised hydraulic lines are extremely dangerous since the spray from them can penetrate the skin and enter the bloodstream, or enter the eyes.

Always wear thick gloves and protective goggles when working on the hydraulic circuit. Use a sheet of cardboard or plywood to search for leaks.

If you are struck by a jet of hydraulic fluid under pressure, or if you are injured even slightly, consult a doctor immediately for medication and appropriate treatment.



7.13 PRECAUTIONS FOR MAINTENANCE WORK INVOLVING HIGH TEMPERATURES AND PRESSURES

- When you stop the machine at the end of a job, remember that the engine coolant, oil, and all engine parts are hot and that the hydraulic circuit is still under pressure. If you attempt to drain the coolant, hydraulic fluid, or engine oil under these conditions, in order to change them or replace filters, you expose yourself to various dangers, including the risk of serious burns.
Carry out maintenance and the procedures described in this section of the manual only once the temperatures have dropped to within normal limits (40±45°C).

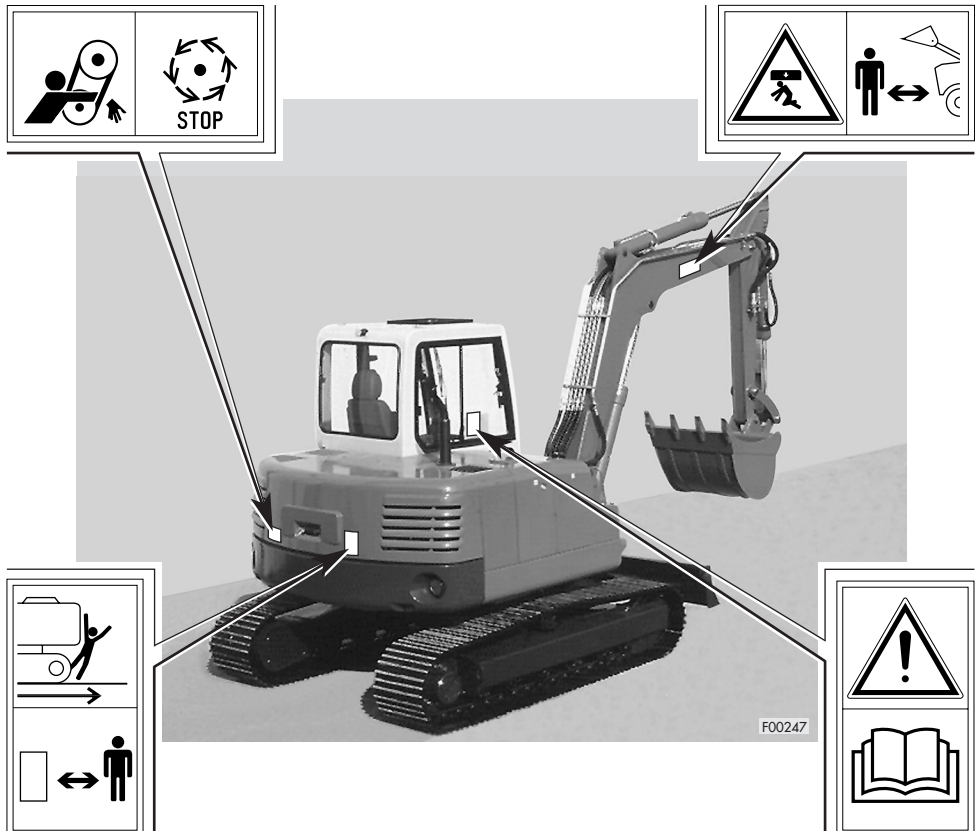
7.14 THE RADIATOR COOLING FAN AND FAN BELT

- Take particular care near rotating parts. Keep other persons well away.
- If hands, clothing, or tools become entangled in the fan blades or fan belt, amputation, severe strains, and other situations of serious danger may result. Keep well away from all rotating parts.

8. SAFETY AND NOISE ABATEMENT NOTICES

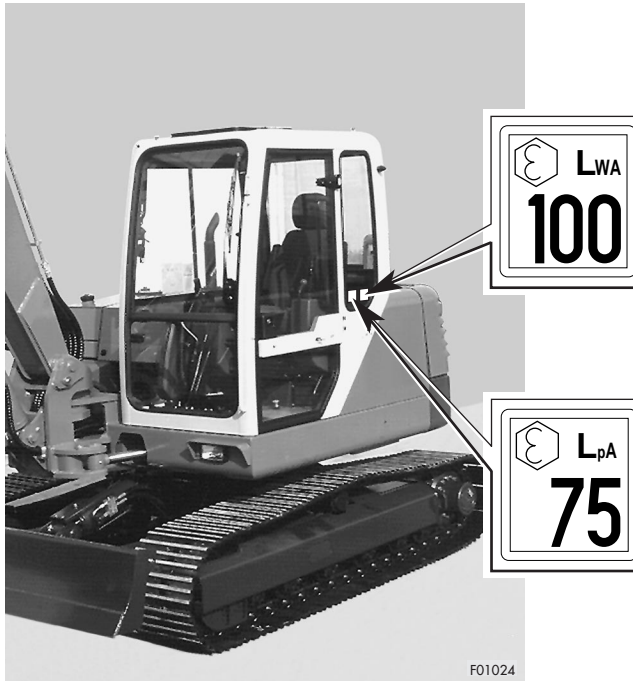
8.1 LOCATION OF SAFETY NOTICES

- Safety notices must always be whole and legible. If notices become dusty, oily, or greasy, clean them with a solution of water and detergent. Do not use diesel, petrol, or solvents.
- If safety notices become damaged, ask FKI or your FKI dealer for replacements.
- If a part carrying a safety notice is replaced, make sure that the same notice is attached to the new part.
- Other notices may be attached to the machine in addition to those shown below. Follow the instructions given on all safety notices.



8.2 LOCATION OF NOISE ABATEMENT NOTICES

- Noise abatement notices must always be whole and legible. If notices become dusty, oily, or greasy, clean them with a solution of water and detergent. Do not use diesel, petrol, or solvents.
- If safety notices become damaged, ask FKI or your FKI dealer for replacements.
- If a part carrying a noise abatement notice is replaced, make sure that the same notice is attached to the new part.



9. VIBRATIONS TO WHICH THE USER IS SUBJECTED

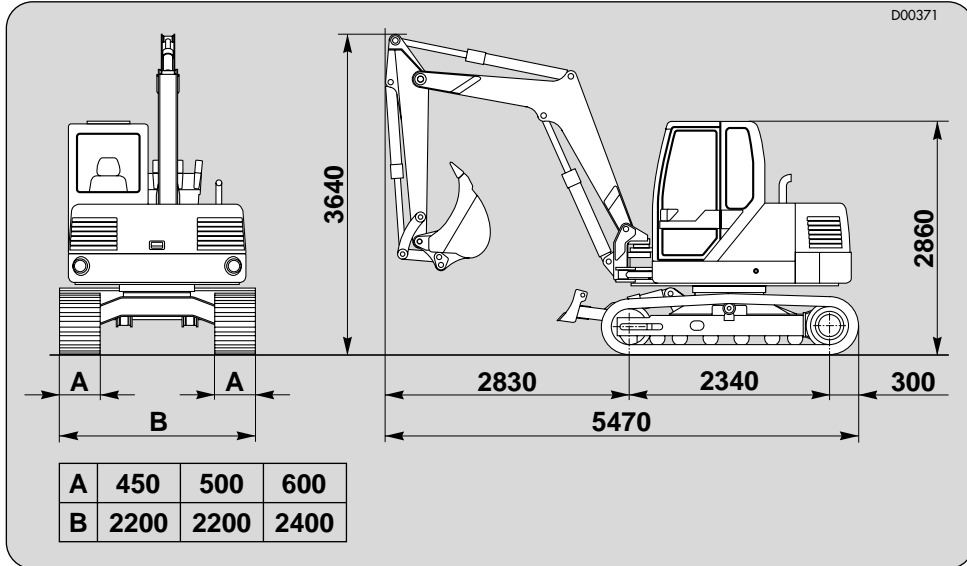
- By the trials carried out to determine the vibrations transmitted by the machine to the operator, it has been found that the value to which the arms are subjected is lower than 2.5m/sec^2 , the value to which the body (feet or posterior) is subjected is lower than 0.5m/sec^2 .

**TECHNICAL
SPECIFICATIONS**

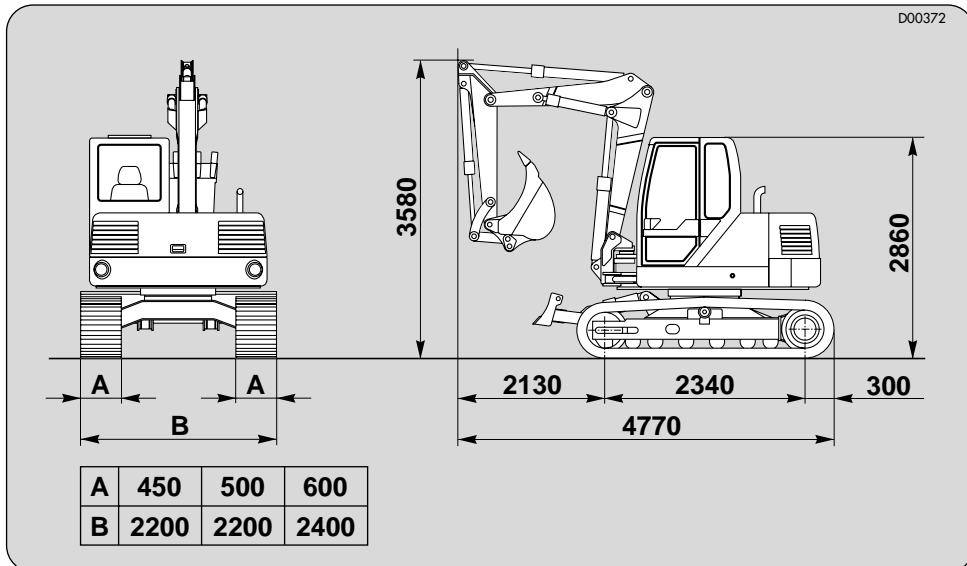
10. TECHNICAL SPECIFICATIONS

10.1 OVERALL DIMENSIONS

OVERALL DIMENSIONS WITH MONOBLOCK BOOM



OVERALL DIMENSIONS WITH ARTICULATED BOOM



10.2 TECHNICAL SPECIFICATIONS

TOTAL WEIGHT

Maximum total weight (monoblock boom)	kg	8950
Maximum total weight (articulated boom)	kg	9300

BUCKET CAPACITY

Standard bucket capacity (SAE)	m ³	0.285
--------------------------------------	----------------	-------

ENGINE

Perkins diesel, model		1004.4
Power at flywheel (2000 rpm EEC 80/1269)kW	55
Rated torque (1500 rpm EEC 80/1269)	Nm	280

ELECTRICAL SYSTEM

Alternator		12V
Power output		55 A
Earth		negative
Battery		155 Ah rated
Starter motor	kW	2.8

REVOLVING FRAME SWING

Swing speed	rpm	7.2
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SPEED

Working speed	km/h	3
Transfer speed	km/h	5.1

10.3 LIFTING CAPACITY



DANGER

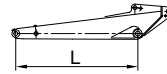
- Do not attempt to lift loads unless the machine is standing on firm, level ground.
 - Make sure that the overload alarm has been enabled before starting to lift. (See section 13.1.3, No. 21, LIFTING OVERLOAD ALARM SWITCH.)
-

10.3.1 LIFTING CAPACITY TABLE

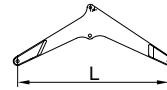
A - Length of second boom L = 1600 mm

B - Length of second boom L = 1850 mm

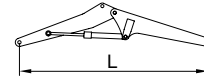
C - Length of second boom L = 2300 mm



D - Length of standard boom L = 2950 mm



D - Length of boom with transportable device L = 3675 mm

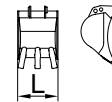


E - Standard counterweight mass 1150 kg

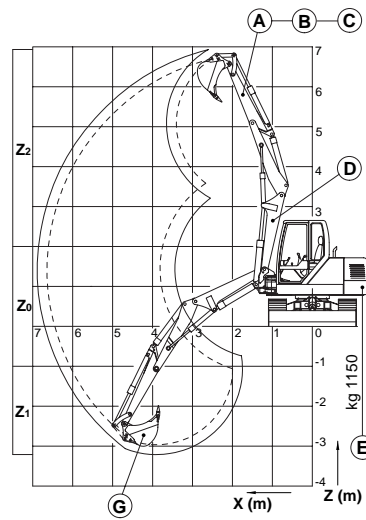
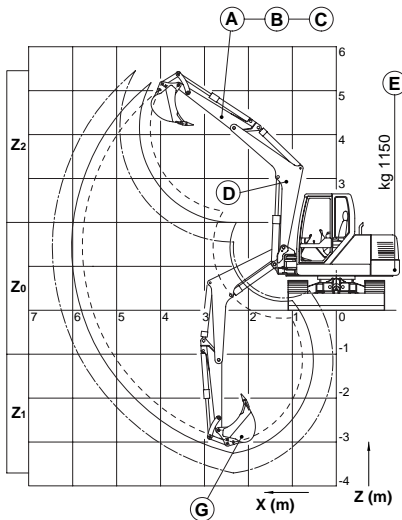
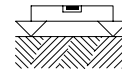
F - Hydraulic working pressure (27.5 MPa/275 bar)

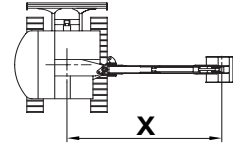


G - Standard bucket length and weight L = 800/200 kg



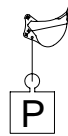
H - Machine parked on solid flat ground





I - Lateral lifting

L - Standard operating mass



P - Lifting capacity

Z - Height of lifting point from ground

X - Distance from column rotation axis to bucket lifting point

- Bucket cylinder fully extended
 - Standard shoes L = 450 mm
-

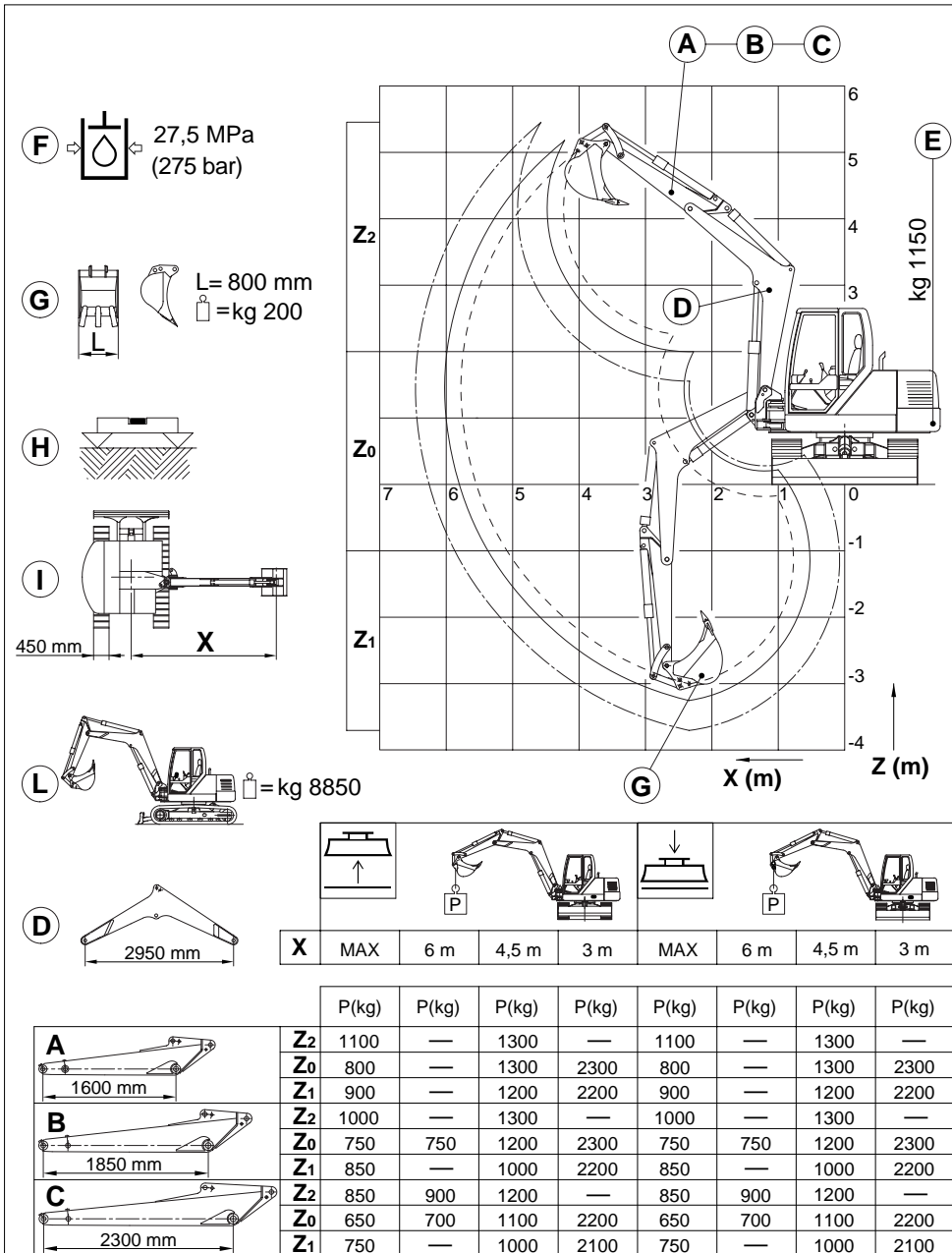
• Blade up



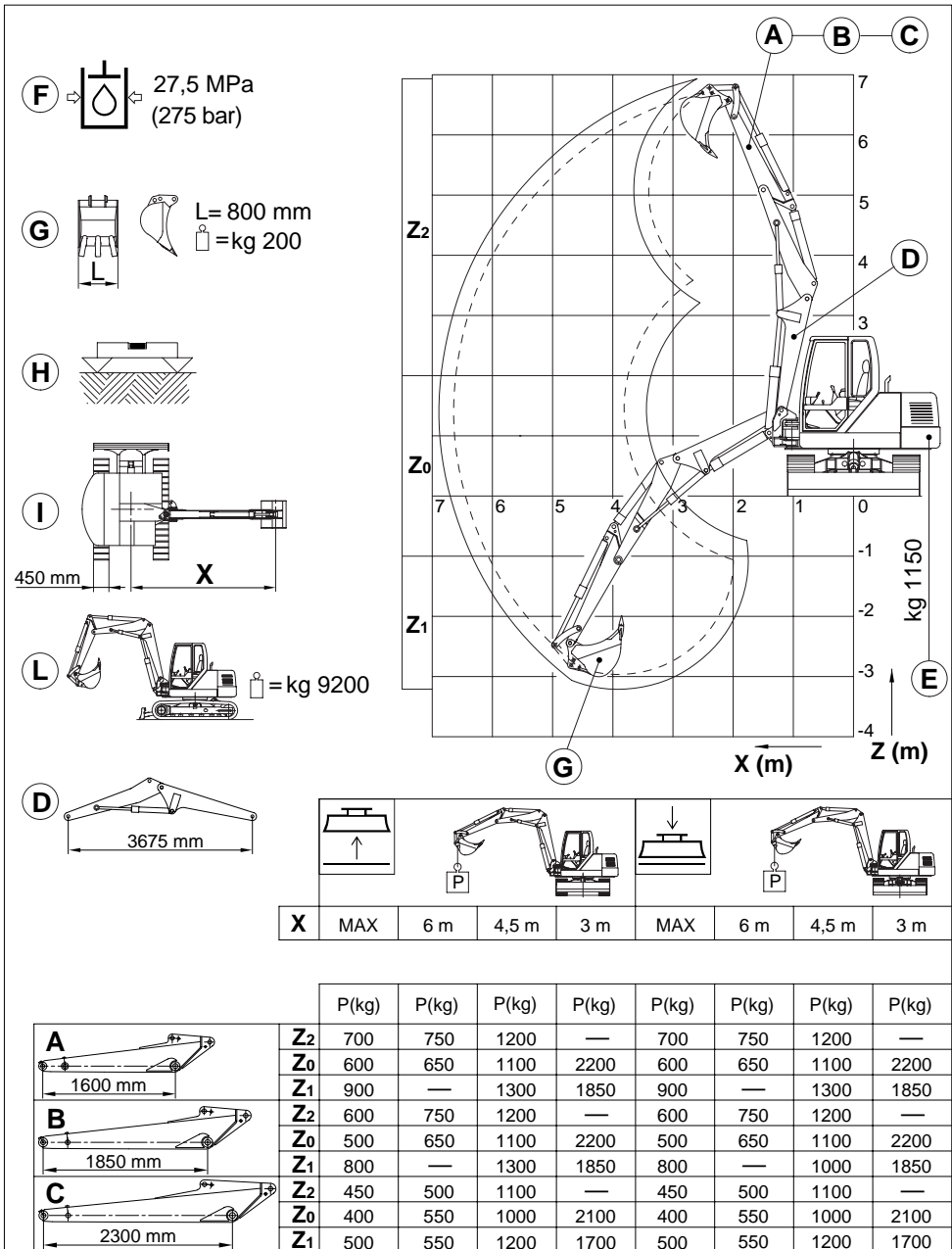
• Blade down



10.3.2 LIFTING CAPACITY WITH MONOBLOCK BOOM



10.3.3 LIFTING CAPACITY WITH ARTICULATED BOOM





**THE MACHINE AND
ITS OPERATIONS**

11. SAFETY DEVICES



DANGER

- Whenever you have to stop the machine, always lower the equipment to the ground, and always engage the equipment control lock.
 - If you ever have to stop the machine with the boom raised, it is your own responsibility to provide and install props providing adequate support and security.
 - Turn the revolving frame to face the blade and engage the revolving frame rotation lock before driving the machine from one place to another.
 - Failure to observe these precautions can lead to serious accidents.
-

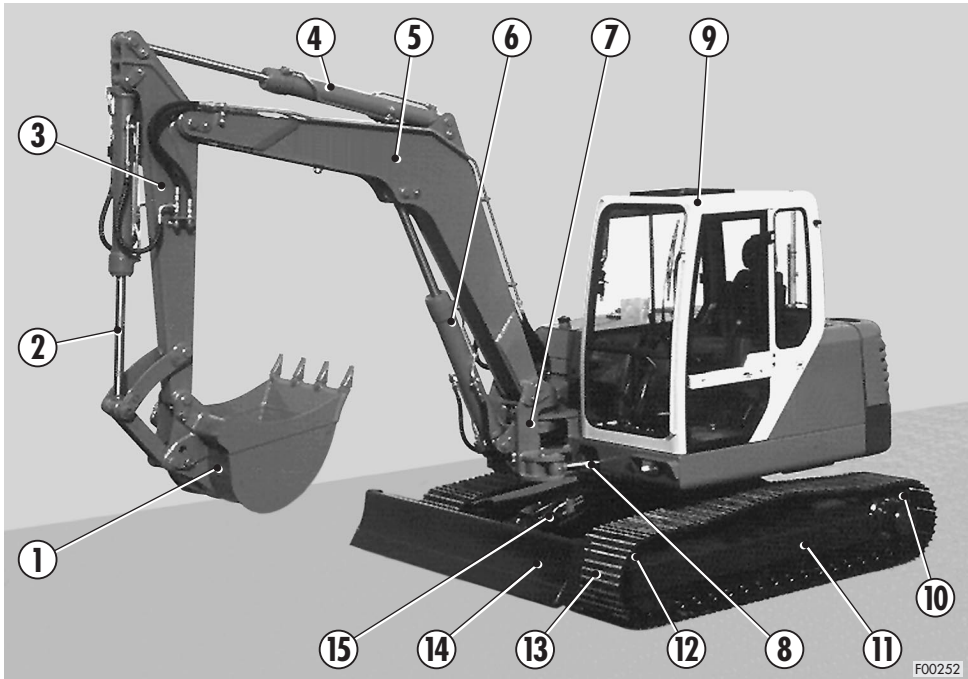
11.1 EQUIPMENT SAFETY DEVICES

- The swing lock lever (1) can be engaged from inside the cab. Always engage the swing lock lever before driving the machine on the roads and before transporting it.
- Other safety locks are provided for the following purposes:
 - a) To lock the boom rotation pedal (2).
 - b) To lock the equipment control lever (3)



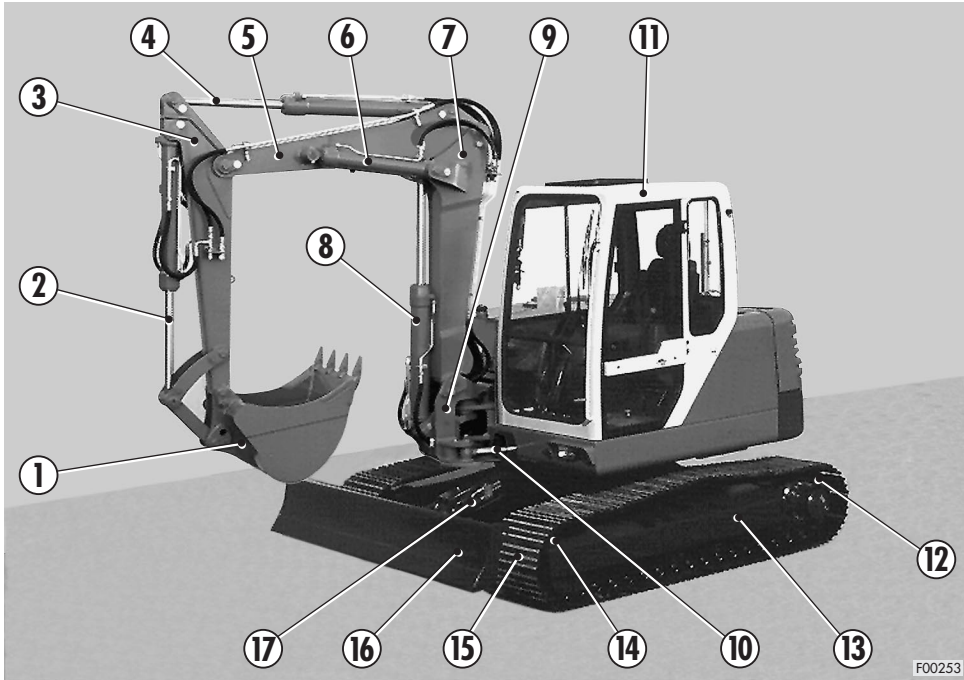
12. GENERAL VIEWS

12.1 GENERAL VIEW (MONOBLOCK BOOM)



- | | |
|----------------------------|---------------------|
| 1 - Bucket | 9 - Cab |
| 2 - Bucket cylinder | 10 - Drive sprocket |
| 3 - Arm | 11 - Track frame |
| 4 - Arm cylinder | 12 - Track idler |
| 5 - Monoblock boom | 13 - Track |
| 6 - Boom lifting cylinder | 14 - Blade |
| 7 - Boom rotation bracket | 15 - Blade cylinder |
| 8 - Boom rotation cylinder | |

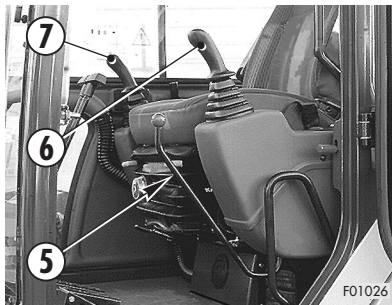
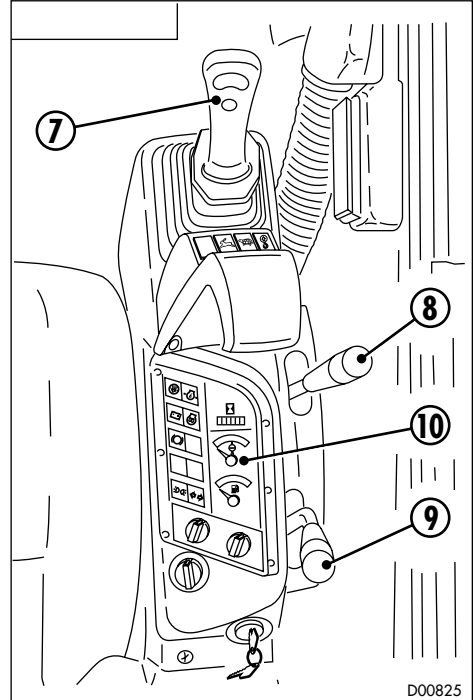
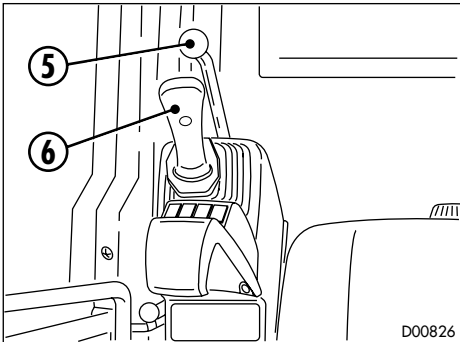
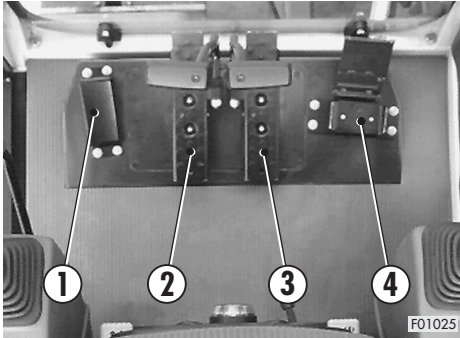
12.2 GENERAL VIEW (ARTICULATED BOOM)



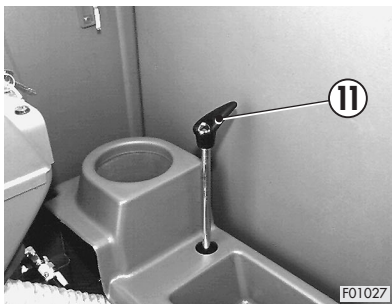
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- | | |
|------------------------------------|-----------------------------|
| 1 - Bucket | 10 - Boom rotation cylinder |
| 2 - Bucket cylinder | 11 - Cab |
| 3 - Arm | 12 - Drive sprocket |
| 4 - Arm cylinder | 13 - Track frame |
| 5 - Upper articulated boom section | 14 - Track idler |
| 6 - Boom articulation cylinder | 15 - Track |
| 7 - Lower articulated boom section | 16 - Blade |
| 8 - Boom lifting cylinder | 17 - Blade cylinder |
| 9 - Boom rotation bracket | |

12.3 GENERAL VIEW OF INSIDE OF CAB

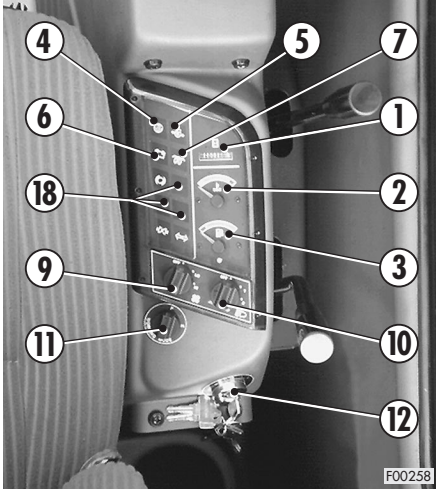


- 1 - Articulated boom control pedal
- 2 - Left track drive pedal
- 3 - Right track drive pedal
- 4 - Boom rotation pedal
- 5 - Equipment control lock lever
- 6 - Arm extension - swing control lever
- 7 - Boom lift - bucket control lever
- 8 - Blade control lever
- 9 - Accelerator lever
- 10 - Dashboard
- 11 - Swing lock lever

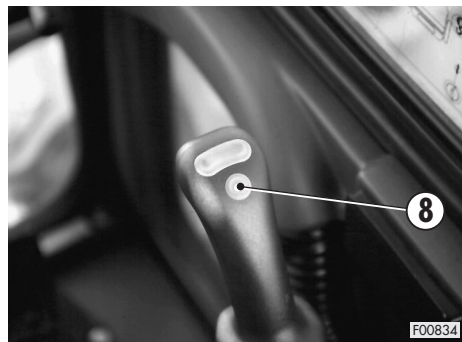
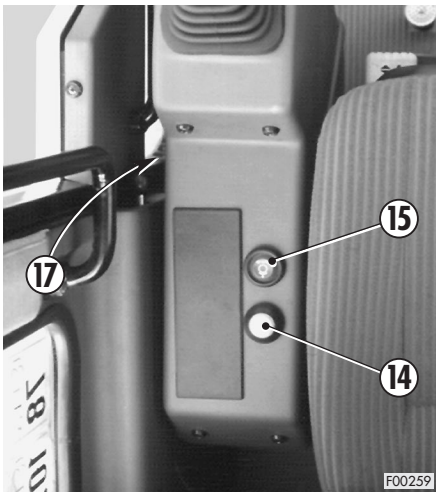


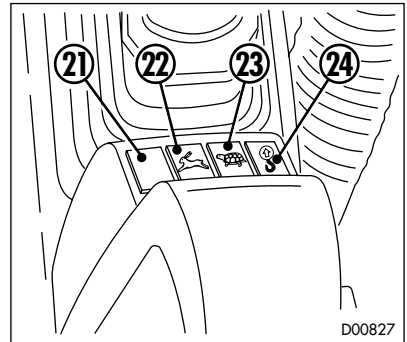
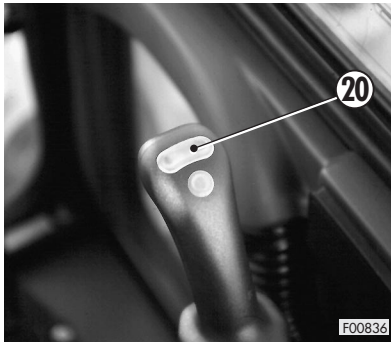
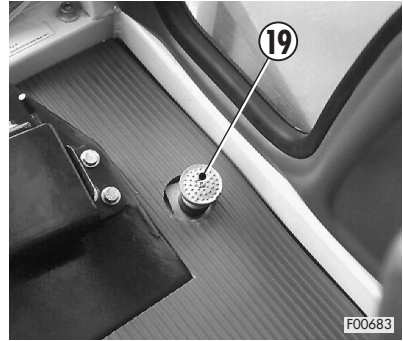
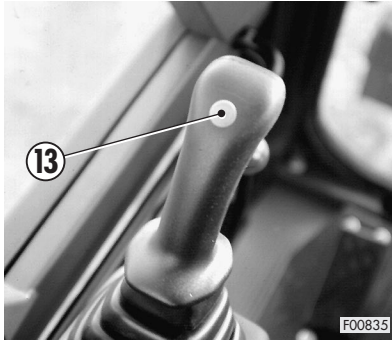
13. INSTRUMENTS AND CONTROLS

13.1 INSTRUMENTS, WARNING LIGHTS, AND PUSH-BUTTONS



- 1 - Hour counter
- 2 - Engine temperature gauge
- 3 - Fuel gauge
- 4 - Air filter warning light
- 5 - Low oil pressure warning light
- 6 - Alternator warning light
- 7 - Preheating warning light
- 8 - Horn switch
- 9 - Cab blower rotary switch
- 10 - Work floodlight and dashboard lighting rotary switch
- 11 - Working mode rotary selector
- 12 - Ignition key-switch
- 13 - Straight drive push-button
- 14 - Rotating beacon push-button
- 15 - Working brake push-button
- 16 - Screen washer-wiper rocker switch
- 17 - Engine warning buzzer
- 18 - Not used
- 19 - Demolition hammer push-button
- 20 - Clamshell bucket rotation rocker switch
- 21 - Spare switch
- 22 - Speed increase switch
- 23 - Normal speed reset switch
- 24 - Boom overload alarm switch
- 25 - Roof light
- 26 - Electrical power socket





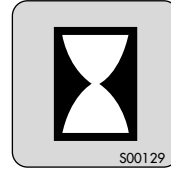
13.1.1 INSTRUMENTS

1 - Hour counter

This instrument shows the hours worked by the engine. The figure shown is the total hour count, and advances by 1 for each hour worked, irrespective of engine speed.

The hour counter advances if the engine is running even if the machine is not travelling or working.

Use the hour counter to determine when maintenance is needed.

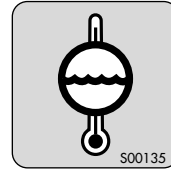


2 - Engine temperature gauge

This instrument shows the temperature of the engine coolant. Temperature should normally remain in the range 80÷85°C.

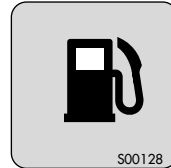
After starting the engine, wait for it to warm up before you start work.

If the engine overheats during work, leave it idle until the temperature returns to within the normal range.



3 - Fuel gauge

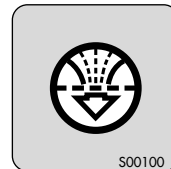
This gauge shows how much fuel is left in the fuel tank. The ignition key must be in position «I» for the gauge to work. (See item 12 below.)



13.1.2 WARNING LIGHTS AND INDICATORS

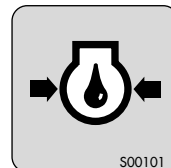
4 - Air filter warning light

This warning light comes on whenever the engine air intake filter needs cleaning.



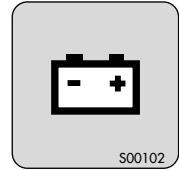
5 - Low oil pressure warning light

This warning light comes on and the engine warning buzzer sounds as soon as the ignition key is turned to position «I» before the engine starts. After starting, both the warning light and the buzzer should switch off as soon as the oil circuit pressurises. If this warning light stays on, or if it comes on during operation, stop the machine immediately and locate the cause of the fault.



6 - Alternator warning light

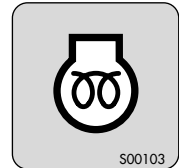
This warning light comes on when the ignition key is turned to position 1 and goes out as soon as the engine speed exceeds idling. If this warning light stays on even with the engine running above idling speed, the alternator is not working correctly and the battery is therefore not being charged correctly.

**IMPORTANT**

- If this warning light does not come on when the ignition key is turned to position «I», the alternator is faulty.

7 - Preheating warning light

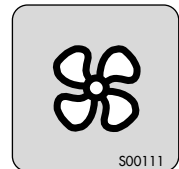
This warning light comes on when the ignition key is turned to position «I» to show that the glow-plugs are working. It should go out after approximately 13 seconds to show that the engine is ready to start.

**13.1.3 PUSH-BUTTONS AND SWITCHES****8 - Horn switch**

This button is fitted to the knob of the right hand equipment control lever. Use it to warn persons in the vicinity when working with the excavator.

**9 - Cab blower rotary switch**

This rotary switch controls the two speed cab blower fan. If the cock in the left side of the engine compartment is opened, the fan blows in hot air and acts as cab heater. (See section 15.2 «VENTILATION AND HEATING».)

**10 - Work floodlight and dashboard lighting rotary switch**

This is a three position rotary switch (OFF - 1 - 2).
 Pos. 1) Switches on dashboard lighting and dipped work floodlights
 Pos. 2) Switches on main beam work floodlights

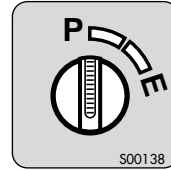


11 - Working mode rotary selector

This two position rotary selector selects the level of power delivered to the working equipment.

Pos. **P** (red sector) Normal work

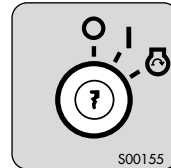
Pos. **E** (green sector) Light work.



12 - Ignition key-switch

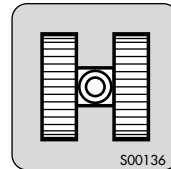
This rotary key-switch has four positions marked **O** (OFF) - **I** - **⚙** (START).

See section 16.2 «STARTING THE ENGINE» for further details.



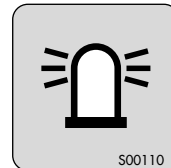
13 - Straight drive push-button

Press to maintain straight line travel (forward or reverse) while operating the equipment.



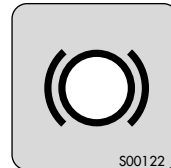
14 - Rotating beacon push-button

Press to switch the rotating beacon on and off.



15 - Working brake push-button

Press to engage the working brake when working on slopes. The incorporated indicator comes on. Press again to release the working brake.

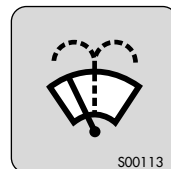


 **IMPORTANT**

- **The working brake engages automatically when the engine is switched off and the pressure in the hydraulic system drops.**

16 - Screen washer-wiper rocker switch

At the first click, this switch operates the windscreen wipers. At the second click, it operates the windscreen washer. The switch returns automatically from the second to the first click.



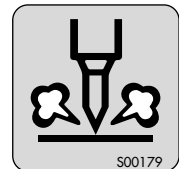
17 - Engine warning buzzer

The engine warning buzzer sounds when the ignition key is turned to position «I» and switches off automatically as soon as the engine starts. If the buzzer sounds while the engine is running, engine oil pressure could be low, coolant temperature could be high, or the alternator could be faulty or the fan belt loose or broken.

**18 - Indicators left free for customer use****19 - Demolition hammer push-button**

Press and hold to operate the demolition hammer. Release to stop the hammer.

See section 32.1 DEMOLITION HAMMER - Description and operation.

**20 - Clamshell bucket rotation rocker switch**

Press to the right to rotate the clamshell bucket clockwise.

Press to the left to rotate the clamshell bucket anti-clockwise.

Release to stop bucket movement.

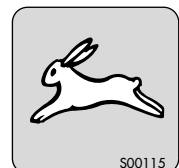
See section 33.1 CLAMSHELL BUCKET - Description and operation.

**21 - Spare switch****22 - Speed increase switch**

A single function switch for machine speed increase.

When pressed, the corresponding LED lights up to indicate speed increase.

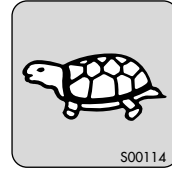
To restore normal speed, press switch pos. 23.

**IMPORTANT**

- Do not use the speed increase switch while changing direction or during a counter-rotation.
- When the engine stops, the machine always resets itself to normal speed mode.

23 - Normal speed reset switch

A single function switch used for returning to normal speed after the speed increase function has been used.
Selection of this function is indicated by a lighted LED.



24 - Boom overload alarm switch

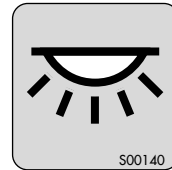
Press to enable the lifting overload alarm.
When this push-button is lit, the alarm sounds to warn that maximum capacity has been reached.
Press again to disable alarm operation.



13.1.4 ELECTRICAL ACCESSORIES

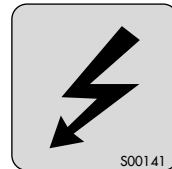
25 - Roof light

The roof light comes on when the switch is set to ON.

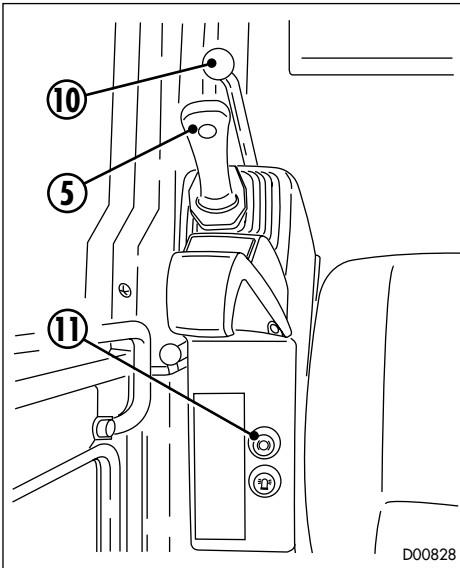
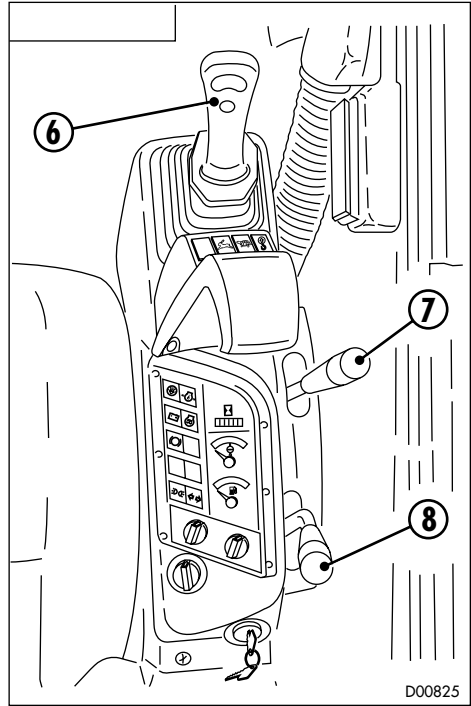
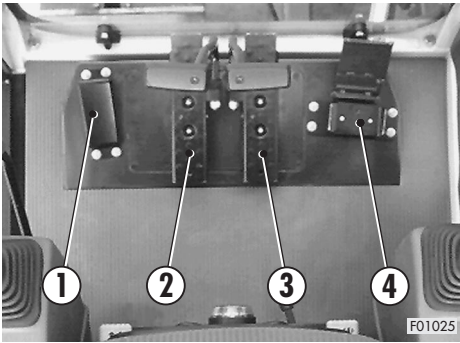


26 - Electrical power socket

A power socket is fitted at the front of the machine for connecting a servicing and maintenance lamp. It is of the 2-pin type and conforms with ISO norm 4165-1979.
Power input is 12V.



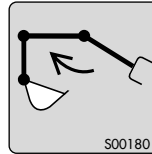
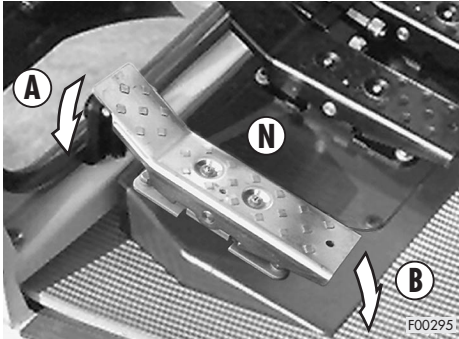
13.2 LOCATION OF MACHINE CONTROLS



13.2.1 MACHINE CONTROLS

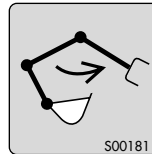
1 - ARTICULATED BOOM CONTROL PEDAL

This pedal controls the extending and retracting movement of the articulated boom as shown.



A - Extend boom

N - Neutral



B - Retract boom

All boom movements are disabled if the equipment control lock is engaged. (See pos.10.)

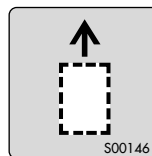
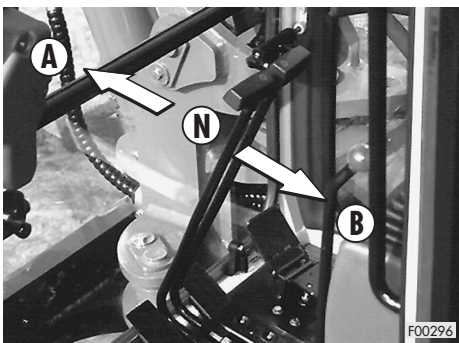
2 - 3 TRANSLATION AND STEERING LEVER



DANGER

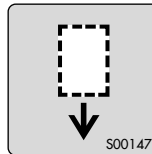
- Make sure that the revolving frame is turned to face the blade before moving off. If the revolving frame is facing the other way, the effect of the steering and controls will be reversed.
- Make sure that the working brake is off and that all safety locks are engaged before moving off.
- Failure to observe these precautions can lead to serious accidents.

The drive levers control the left and right track drive motors in forward and reverse according to the following diagram.



A - Forward drive

N - Neutral



B - Forward drive

All boom movements are disabled if the equipment control lock is engaged. (See pos.10.)

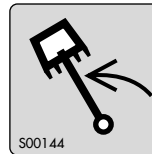
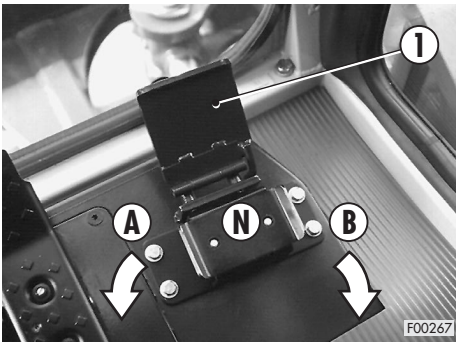
4 - BOOM ROTATION PEDAL



CAUTION

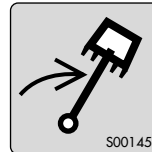
- Always engage the boom rotation lock (1) before driving from one place to another and when parking the machine.

This pivoting pedal controls left and right boom rotation as shown.



A - Rotate boom left

N - Neutral



B - Rotate boom right

All boom movements are disabled if the equipment control lock is engaged. (See pos.10.)



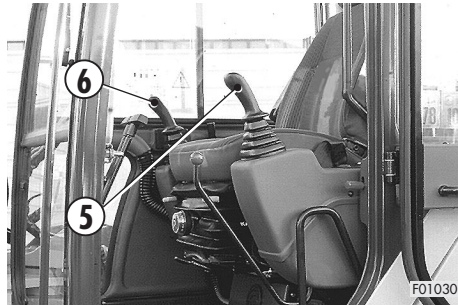
IMPORTANT

- Rotate the boom only if you need to dig trenches at an angle from the machine. Rotate the revolving frame and not the boom to unload the bucket onto waiting lorries. Once the boom is aligned with the trench, do not rotate it unnecessarily.

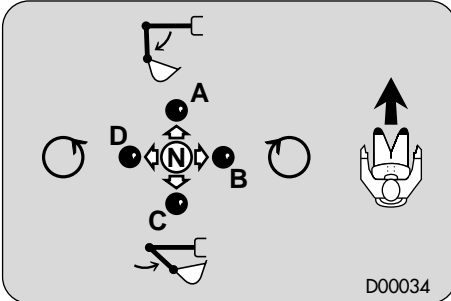
5 - 6 EQUIPMENT CONTROL LEVERS



- Before performing any manoeuvre with these levers, you must be correctly seated in the driving seat with the safety belt fastened. Before all manoeuvres, comply with the instructions given in section 22. «USING THE WORK EQUIPMENT».
- Before leaving the driving seat, lower all equipment to the ground, engage the equipment control lock, and switch off the engine.

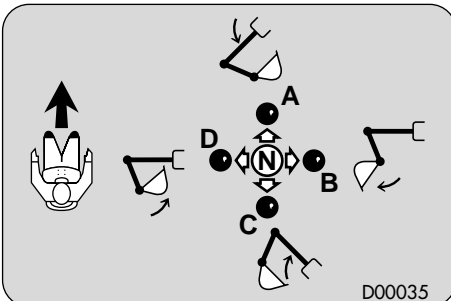


Control lever (5) to the left of the driving position controls arm extension and retraction and swing as shown.



- N - Neutral
- A - Extend arm
- B - Rotate cab right
- C - Retract arm
- D - Rotate cab left

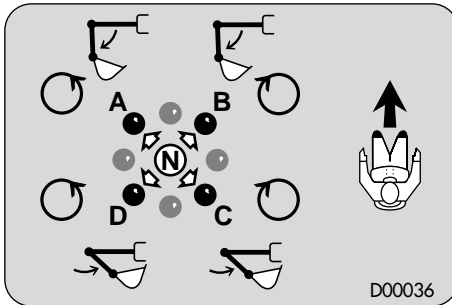
Control lever (6) to the right of the driving position raises and lowers the boom and rotates the bucket as shown.



- N - Neutral
- A - Lower boom
- B - Rotate bucket to unload
- C - Raise boom
- D - Rotate bucket to fill

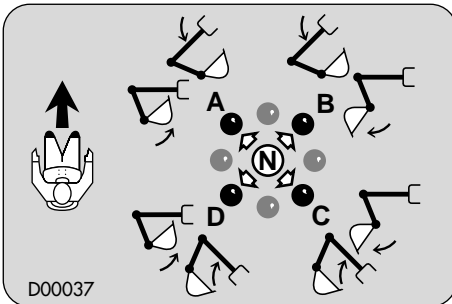
By moving the levers diagonally with respect to the axis of the machine, you can obtain two movements simultaneously. The extent of each movement depends on the angle in which the lever is moved. Combined movements are achieved by simultaneously operating the hydraulic control valves for two individual functions.

Left control lever (5):



- N - Neutral
- A - Extend arm - rotate cab left
- B - Extend arm - rotate cab right
- C - Rotate cab right - retract arm
- D - Rotate cab left - retract arm

Right control lever (6):



- N - Neutral
- A - Lower boom - rotate bucket to fill
- B - Lower boom - rotate bucket to unload
- C - Rotate bucket to unload - raise boom
- D - Rotate bucket to fill - raise boom



IMPORTANT

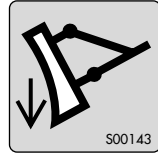
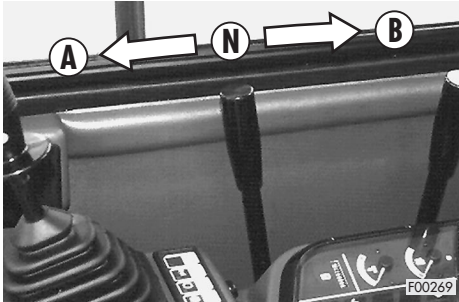
- Before rotating the revolving frame, make sure that the swing locking pin is released (lifted).
- All movements are disabled if the control lock is engaged. (See pos.10.)

7 - BLADE CONTROL LEVER



- **Make sure that the blade is fully raised before moving the machine.**

The blade control raises and lowers the blade according to the following diagram.



A - Lower blade

N - Neutral



B - Raise blade

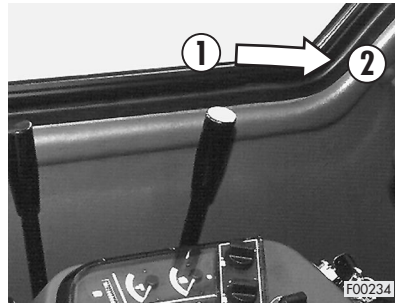
All boom movements are disabled if the equipment control lock is engaged. (See pos.10.)

8 - ACCELERATOR LEVER

This lever controls the engine speed and power output.

- **Idling position (1):**
Lever pushed fully forward.
- **Maximum power position (2):**
Lever pulled fully back.

Use the accelerator sparingly and smoothly, particularly when the machine is under strain or working in difficult conditions. By not racing the engine unnecessarily you keep down fuel consumption and prolong the working life of the engine and the machine.



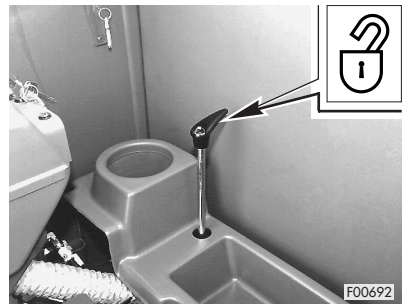
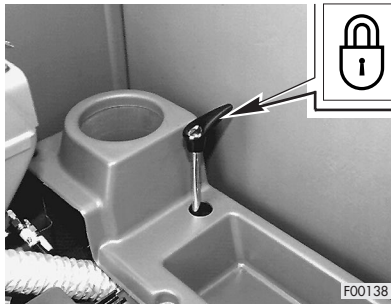
9 - SWING LOCK LEVER



DANGER

- The swing lock lever must be engaged whenever the machine is travelling or being transported. Turn the revolving frame to face the front axle before engaging the swing lock lever.
- Make sure that the revolving frame is turned to face the blade before moving off. If the revolving frame is facing the other way, the effect of the steering and controls will be reversed.

Lower the swing lock lever to locked position to lock revolving frame.
Lift the lever and return it to its rest position to free revolving frame.



IMPORTANT

- Never attempt to rotate the revolving frame while the swing lock lever is engaged.
-

10 - EQUIPMENT CONTROL LOCK

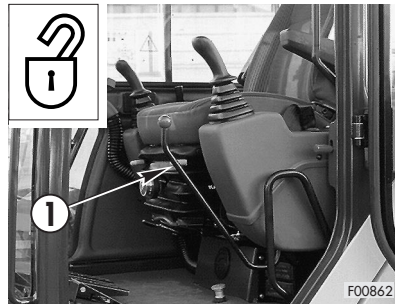
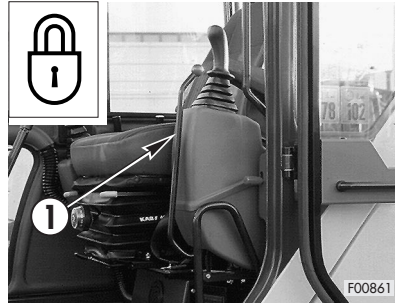
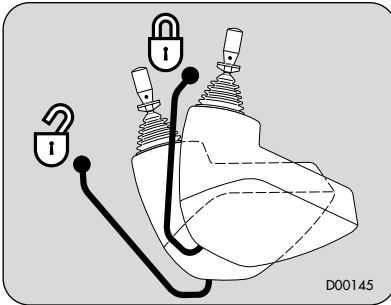


DANGER

- Before leaving the driving seat, lower the equipment to the ground and engage the control lock.

To engage the equipment control lock, lift the lever (1). The lever automatically stops in locked position.

To release the equipment control lock, push lever (1) down and engage it in its safety catch.



IMPORTANT

- All equipment movement is prevented if the equipment lock lever is engaged.

11 - WORKING BRAKE

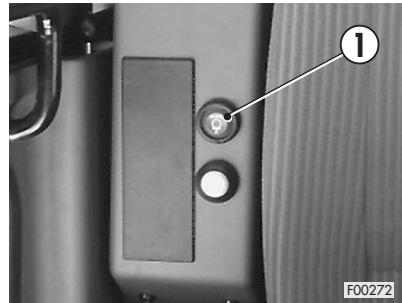
**DANGER**

- Always engage the working brake before leaving the driving seat, even briefly.
 - Always engage the working brake when working on slopes.
 - Check regularly that the parking brake is working.
-

Press the push-button (1) to engage the working brake. The incorporated indicator lights. Simply press the push-button again to release the working brake.

**IMPORTANT**


- The working brake engages automatically when the engine is switched off and the pressure in the hydraulic system drops.
-



14. FUSES AND RELAYS

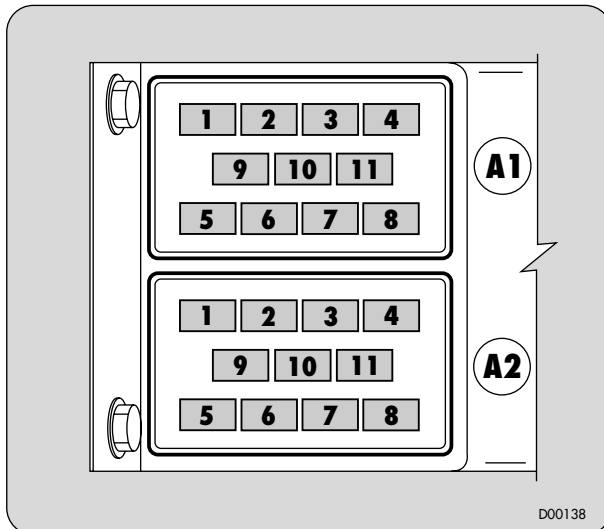
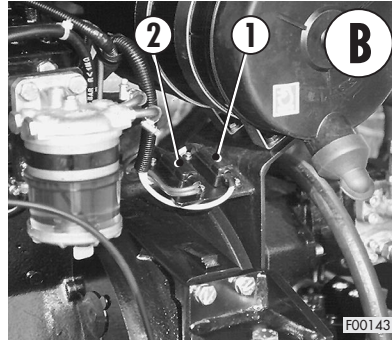
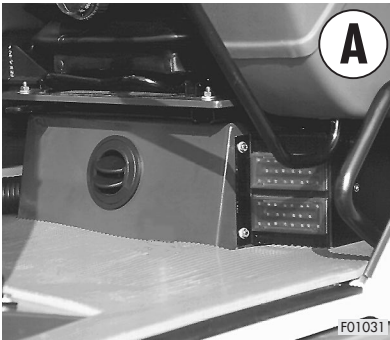


IMPORTANT

- Make sure that the ignition key is turned to position «O» before changing any fuses.
- Replace any corroded, oxidised, or loose fuses with new ones of the same rating.
- If the engine does not start when the ignition key is turned to position «» START, check the main fuse and replace it if necessary.

14.1 FUSES

Auxiliary circuit fuses (A) are housed in a fuse box located underneath the left side dashboard. The main fuses (B) are housed in a fuse box in the engine compartment.



FUSES (A)

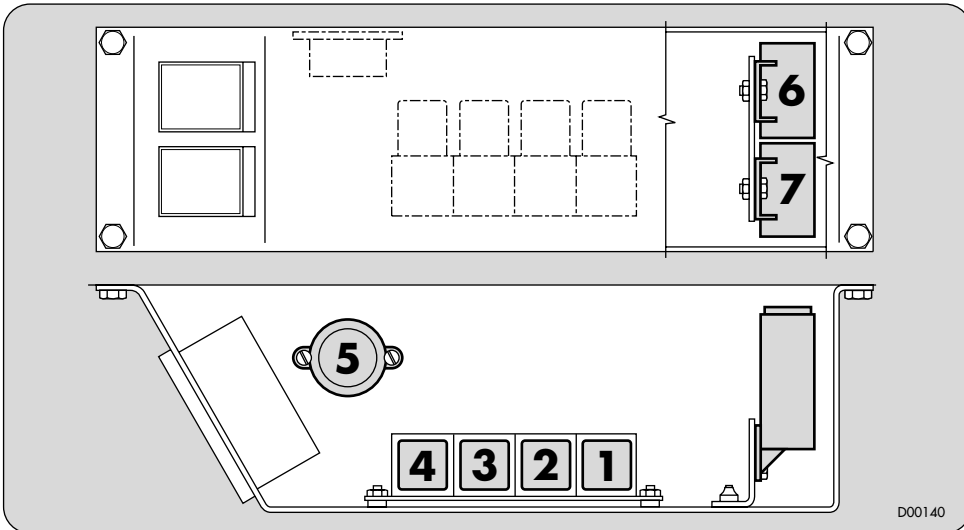
	Pos.	Colour	Capacity A	Circuit protected
FUSE BOX (A1)	1	Brown	7,5	Engine stop
	2	Brown	7,5	Servocontrols
	3	Violet	3	Alarm buzzer
	4	Red	10	Lights, instruments
	5	Orange	5	Car radio
	6	Brown	7,5	Straight drive, disabling of 2 nd speed
	7	Brown	7,5	Wiper, rooflight
	8	Violet	3	Instruments power supply
	9	Brown	7,5	Working mode
	10	Brown	7,5	Working brake
	11	Violet	3	Pre-heating box (15)
FUSE BOX (A2)	1	Red	10	Horn
	2	Brown	7,5	Speed increase electrovalve
	3	Red	10	Heater
	4	Red	10	Hammer, clamshell
	5	Brown	7,5	Cab (30)
	6	Blue	15	Glow plug
	7	Red	10	Traffic beam
	8	Blue	15	Driving beam
	9	Brown	7,5	Working lamp
	10	Blue	15	Socket
	11	Red	10	Rotary beacon

FUSES (B)

Pos.	Capacity Ah	Circuit protected
1	80	Alternator
2	50	General system

14.2 RELAYS

All relays are housed in a single box located inside the left side dashboard.



Pos.	Function
1	Working lamp relay
2	Speed increase relay
3	Traffic light relay
4	Driving light relay
5	Alarm buzzer
6	Diode panel
7	Pre-heating box

15. THE CAB AND DRIVING POSITION

15.1 THE CAB



DANGER

- If the cab is involved in any collision, or if the machine tips over, ask your FKI dealer to check the cab for strength and active safety before using the machine again.

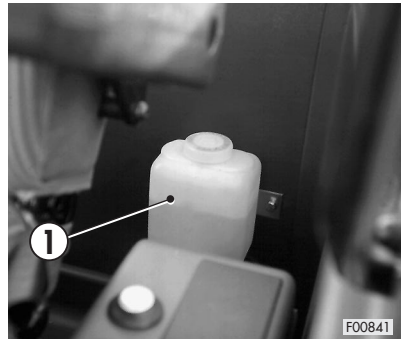
The cab door is of the fully opening type. The front screen can also open. The release for the front screen is located under the cab roof.

The bottom screen section can be removed. The sun-roof can be raised. The side windows can also be partially opened.

These functions are particularly useful in the Summer when a constant circulation of air is necessary to prevent stuffiness and fatigue.

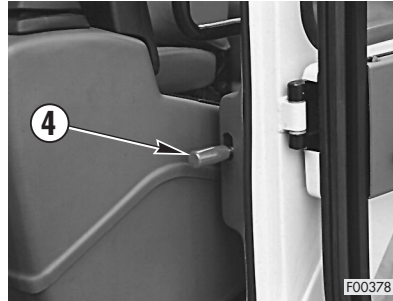
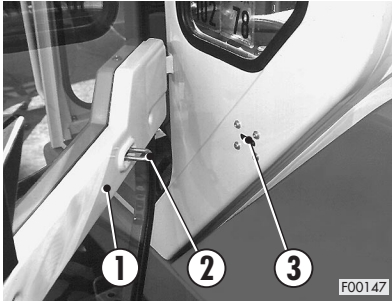


The front windscreen washer tank (1) is positioned inside the cab; it is filled with detergent.

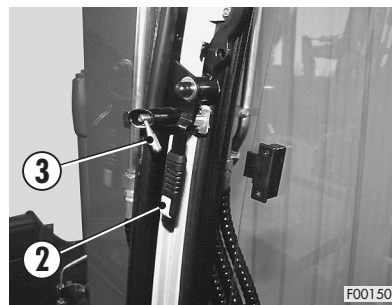
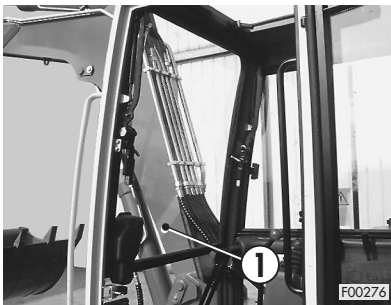


THE CAB AND DRIVING POSITION

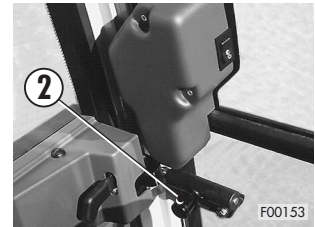
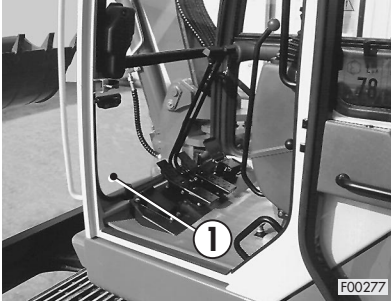
- Door (1) can be opened fully and held open by catch (2).
The catch engages automatically when the door (1) strikes stop (3).
To release the catch (2), pull up lever (4) on the left cab upright.



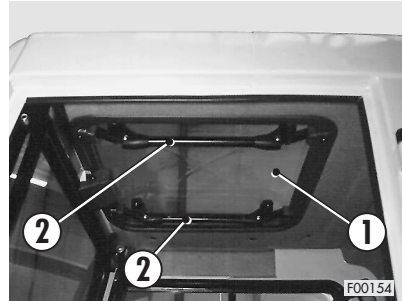
- To open the front screen (1), you must first release catches (3). With the catches released, pull the windscreen inwards and upwards.
Press the buttons on the catches to release them. Use handles (2) to pull the windscreen open.
Lift the windscreen all the way up. With the catch buttons released, the windscreen will automatically engage the top locks.
Simply reverse the procedure to close the windscreen.



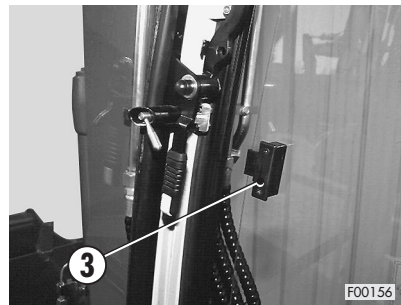
- Once the front screen is open, you can also remove the bottom screen (1). To do so, simply release catches (2). Store the bottom screen behind the driving seat. Use the catches to secure it to the locks provided (3).



- The sun-roof (1) can be raised partly or fully. Push the handle (2) upwards to raise the sun-roof to the position you require.



- Side windows (1) and (2) on the right of the cab can be slid open. Simply press handle (3) and slide the windows to the position required.

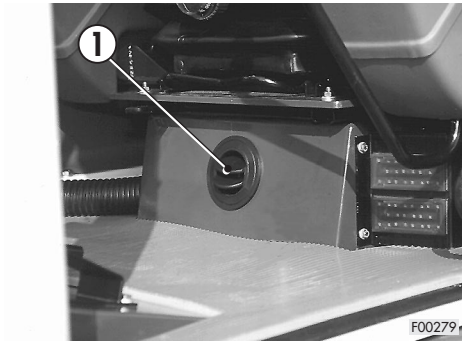


15.2 VENTILATION AND HEATING

The cab ventilation and heating system ensures comfort and alleviates fatigue in warm and cold weather alike. The system also prevents condensation from forming on the front screen and thus maintains good visibility during work and road travel.

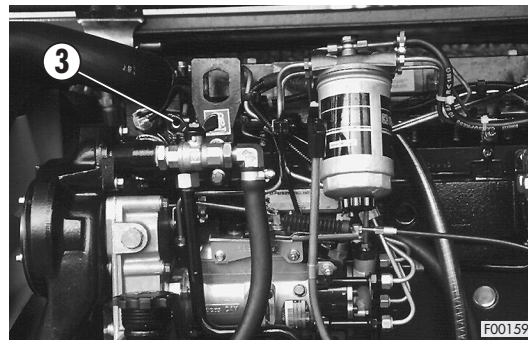
Ventilation and air circulation is achieved by a two speed fan installed inside the cab under the base of the driving seat.

Air is distributed inside the cab by a swivelling, adjustable delivery vent (1). The de-icer, de-mister vent (2) is fixed in direction but allows delivery to be adjusted.



A heater is installed in series with the fan. The heater can be used to heat the air entering the cab in cold weather. The heater takes heat directly from the engine cooling circuit.

Water flow to the heater is opened, shut off, and regulated by a cock (3) located on the left side of the engine compartment.



15.3 THE DRIVING SEAT

The driving seat is extremely comfortable thanks to five different regulations.

- a - forward/back position;
- b - backrest angle;
- c - damping (to absorb vibrations and jerks);
- d - seat angle;
- e - headrest adjustment.

The driving seat is mounted on sliding rails and can slide forwards and back together with the control levers, dashboard, and switchboards. Adjust the seat to the most comfortable position for your own stature.



To adjust the forward/back position of the driving seat, simply lift lever (1) and slide the seat along its rails.

When the seat reaches the required position, release lever (1) and jog gently in both directions to make sure that the locking pin has engaged a positioning hole.

To adjust the position of the backrest, lift lever (2) and move your back to the position you require. The backrest is sprung to follow your movements. To adjust the degree of damping, turn knob (3) while watching the scale on the knob.

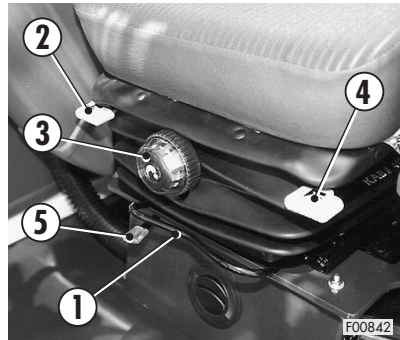
The ideal setting is achieved when the weight displayed on the scale corresponds to your own weight.

You can set damping as you wish to suit your own preferences. Turn the knob (3) clockwise (⊕) to obtain a harder action, or anti-clockwise for a softer action.

To adjust seat angle, lift lever (4) and move the front of the seat to the position you require. There are four possible settings.

The headrest can also be adjusted in height and angle to suit the individual operator.

The driving seat is fixed to the guide rails of the operating controls. Both the seat and the controls can therefore slide together.



There are 6 fixed positions in a range of 80 mm.

To adjust the forward/back position of the seat/control group, lift lever (5) and slide the group along its rails.

When the group reaches the required position, release lever (5) and jog gently in both directions to make sure that the locking pin has engaged a positioning hole.

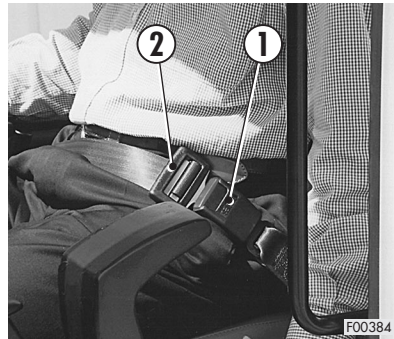
15.4 THE SAFETY BELT



DANGER

- **Fasten the safety belt before starting the engine.**
 - **Replace the safety belt immediately if it becomes damaged or worn.**
-

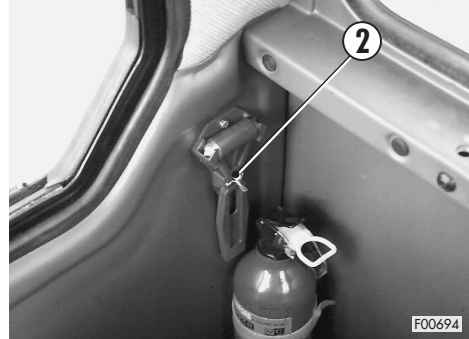
The safety belt (1) has two anchorage points. It incorporates an adjuster (2) for length. The safety belt must be worn tightly around the hips, leaving the abdomen free.



15.5 EMERGENCY EXIT

In an emergency, if the normal exits are blocked, the rear window (1) can be used as an emergency exit.

Use emergency hammer (2) to break the glass if necessary.



IMPORTANT

- Make sure that the emergency hammer is always kept in place inside the cab.

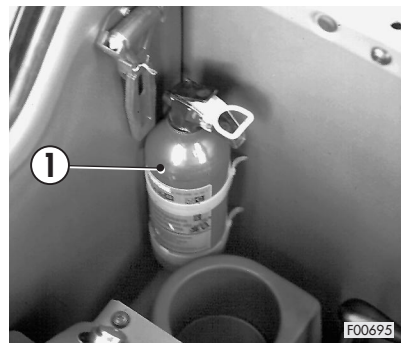
15.6 FIRE EXTINGUISHERS



CAUTION

- Always make sure that fire extinguishers are conveniently located around the work site.
- At regular intervals, make sure that the fire extinguishers are charged and ready for use in an emergency.
- Make sure that you yourself know the procedure to follow in case of fire.

If local or site regulations require a fire extinguisher to be kept on board the machine, one can be fitted to the right rear upright of the cab (1).



15.7 FIRST AID KIT



CAUTION

- At regular intervals, make sure that the first aid kit contains all the necessary disinfectants, bandages, and medicines, and also make sure that the kit contents have not passed their expiry date.

If local or site regulations require a first aid kit to be kept on board the machine, one can be kept in the rear storage compartment.



15.8 TECHNICAL DOCUMENTATION



CAUTION

- This operator's manual, together with the spare parts catalogue, are essential items of machine equipment and must accompany the machine throughout its working life, even if the machine is sold to new owners.

Keep this manual in a convenient place on board the machine where it can be consulted quickly and easily. We recommend that you keep it in the document pocket behind the seat, together with the documents of ownership and registration.



16. OPERATING THE MACHINE

16.1 CHECKS PRIOR TO STARTING THE ENGINE

16.1.1 VISUAL CHECKS



DANGER

- **Dirt, oil, or fuel spilled near hot areas in the engine compartment can lead to fires and seriously damage to the machine. Check frequently and repair leaks immediately. If leaks recur, contact your FKI dealer.**
-

Carefully examine the machine, including the underside, before starting the engine, to make sure that:

- 1 - There are no loose screws or nuts.
- 2 - There are no oil, fuel, or coolant leaks.
- 3 - The equipment is not worn or damaged.
- 4 - All electrical connections are tight.
- 5 - The exhaust pipe and manifold are firmly connected.
- 6 - The tracks are correctly tensioned, and the track shoes and drive sprockets are secure
- 7 - All safety notices are clean and legible.
- 8 - The cab access hand grips are clean and secure.

Repair any leaks or faults immediately, and clean up all traces of oil or grease.

Also visually check:

- 9 - The condition of the safety belt.
- 10 - The condition of the instruments and dashboard.
- 11 - The cab windows are clean and unbroken, and the work floodlights are working properly.

16.1.2 DAILY CHECKS



DANGER

- **Do not smoke when refilling with fuel, oil, or hydraulic fluid. Do not use naked flames or unapproved lamps to check fluid levels, since these can cause fires.**
 - **If fuel, hydraulic fluid, or oil is spilled during filling operations, clean up the spillage immediately.**
-

Check the levels of the engine coolant, engine oil, and hydraulic fluid before you start work. Refuel as soon as you finish work in order to prevent condensation forming in the fuel tank, and check the level on the dashboard fuel gauge.



IMPORTANT

- **Never fill the fuel tank completely. Leave some space for the fuel to expand.**
 - **On completion of refuelling, replace the tank cap and check that the breather hole is unobstructed.**
 - **Check the level of the engine oil with the machine on level ground. Check the level of the hydraulic fluid with the arm and bucket cylinders retracted and the teeth of the bucket resting on the ground.**
-

16.1.3 OPERATING CHECKS



DANGER

- **You must be sitting correctly in the driving seat with the safety belt fastened to perform the following checks.**
 - **Safety devices may have been removed or disengaged if the machine has been idle or maintained. As you enter the cab, check immediately that the equipment control lock is engaged, and that the equipment cannot move unexpectedly and create a hazard.**
-

Check:

- 1 - That the equipment control lock is engaged.
- 2 - That the accelerator lever is in idling position.
- 3 - That the controls are in neutral.

For the next set of checks, turn the ignition key to position «I» to energise the dashboard. Check that the engine warning buzzer, fuel gauge, low oil pressure warning light, alternator warning light, and preheating warning light.



16.2 STARTING THE ENGINE

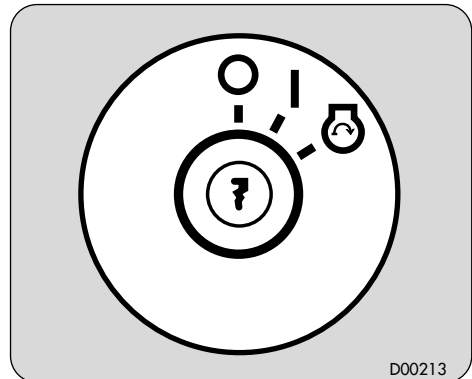
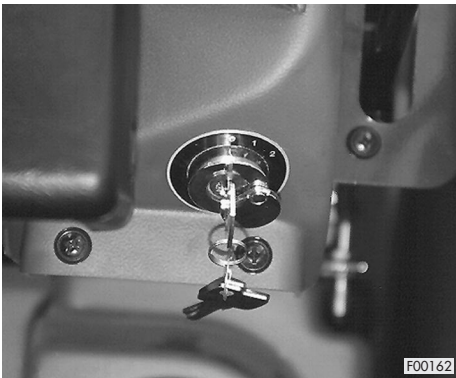


DANGER


- Before starting the engine, study the safety instructions in this manual and make sure that you are familiar with all the controls.
From the moment you start the engine, you become directly responsible for all damage or injury caused by improper manoeuvres or failure to comply with safety.
 - Check that there is nobody in the range of action of the machine before starting the engine. Sound the horn to warn of your intention to start up.
-

16.2.1 STARTING A WARM ENGINE AND STARTING IN WARM WEATHER

- 1 - Move the accelerator lever to about mid-way and turn the ignition key directly to the START «» position.
- 2 - As soon as the engine fires, release the ignition key to allow it to return to position «» and return the accelerator lever to idling position.



IMPORTANT

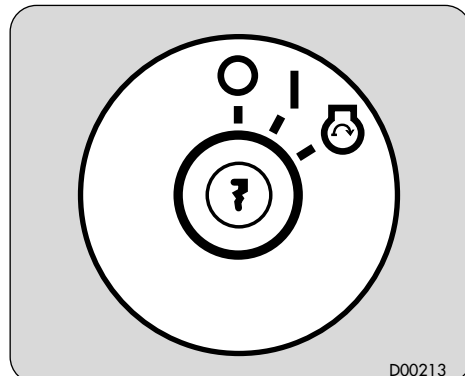
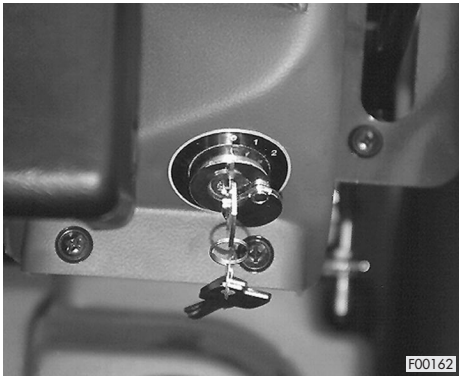
- If the engine does not fire within 15 seconds, release the key which will return to position «», and wait a further 15 seconds before trying again.
-

16.2.2 STARTING A COLD ENGINE AND STARTING IN COLD WEATHER



- Do not use easy start sprays or other cold start products which are ether based, since these can lead to explosions.

- 1 - Move the accelerator lever to fully accelerated position and turn the ignition key to position «I». Make sure that the preheating warning light comes on. Preheating takes about 13 seconds. The warning light goes out when preheating is complete.
- 2 - Turn the ignition key to position «II» and hold until the engine starts. Do not hold for more than 15 seconds.
- 3 - As soon as the engine fires, release the ignition key, which will return to position «I», and return the accelerator to idling position.



- If the engine fails to start, repeat steps 1 and 2 as necessary, but wait at least 30 seconds between attempts to avoid straining the battery.

16.3 WARMING UP THE ENGINE

- 1 - Once the engine has started, allow it to warm up before you start work.
- 2 - Establish a fast idle with the accelerator lever until the engine is warm.

**IMPORTANT**

- **Do not operate the accelerator lever abruptly or to fully accelerated position until the engine temperature has reached at least 60°C as shown on the dashboard temperature gauge.**
-

- 3 - If you need to warm up the engine more quickly, accelerate occasionally.
- 4 - Keep an eye on the colour of the exhaust fumes during warm-up, and also check for unusual noises and vibrations. If you notice anything unusual, investigate immediately and perform any necessary repairs.

16.4 WARMING UP THE HYDRAULIC FLUID

While the engine is warming up, particularly in cold weather, it is a good idea to warm up the hydraulic circuit as well.

When engine temperature reaches 60°C:

- 1 - Disengage the equipment control lock. (See section 11. «SAFETY DEVICES».)
- 2 - Perform a number of complete and slow extension and retraction manoeuvres of the arm and bucket.
- 3 - Rest the bucket on the ground and re-engage the control lock

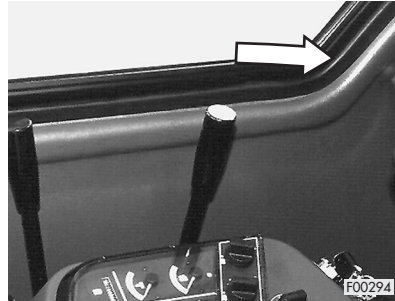
16.5 MOVING THE MACHINE**DANGER**

- **Before moving the machine, make sure that you are perfectly familiar with the functions of all the controls, as well as with the safety precautions associated with them.**
 - **Check that the revolving frame is turned to face the blade, and that the revolving frame rotation lock is engaged.**
 - **Make sure that you are correctly seated in the driving seat, with your safety belt fastened.**
 - **Before moving the machine, check that nobody else is working within the machine's operating range, and that the work area is free from obstacles.**
 - **Exercise particular care before engaging reverse gears. Always check for persons, other vehicles, and obstacles behind you.**
 - **Do not start to drive the tracks or steer with the engine fully accelerated. The resulting movement could be very jerky.**
-

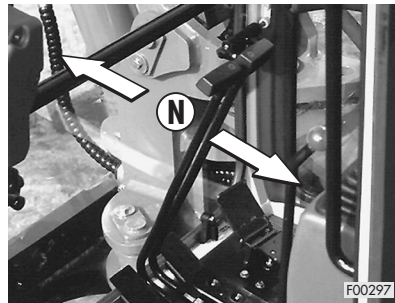
OPERATING THE MACHINE



Once you have checked the instruments and warmed up the engine and hydraulic fluid, before you move the machine check that the revolving frame rotation lock is engaged. Release the equipment lock and fully raise the blade. Raise the equipment at least 40÷50 cm above ground level. Finally, make sure that all control levers are in neutral position.

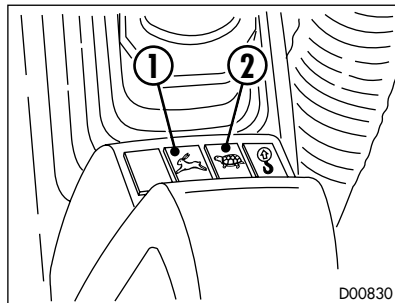
1 - Set a fast idle with the accelerator lever.



2 - Move both track levers (left and right) forward or back to move the machine in the required direction.



3 - Pressing switch (1)  increases traversing speed while pressing switch (2)  resets normal speed.



16.5.1 STEERING AND DIRECTION CHANGING



- Make sure that the revolving frame is turned so that the cab faces the blade before operating the drive levers.
If it is facing the other way, the effect of the steering and controls will be reversed.

- Avoid abrupt direction changes as much as possible. Stop the machine before turning around.
- Because of the very high friction created during direction change, do not use the speed increase function.

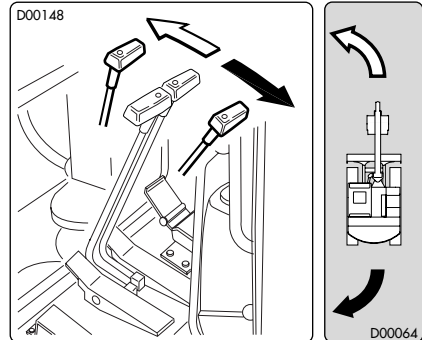
STEERING WHEN STATIONARY

To turn left forwards, push the RIGHT track drive lever forwards. To turn left backwards, pull the RIGHT track drive lever back.



IMPORTANT

- Use the LEFT track drive lever in the same way to turn right.



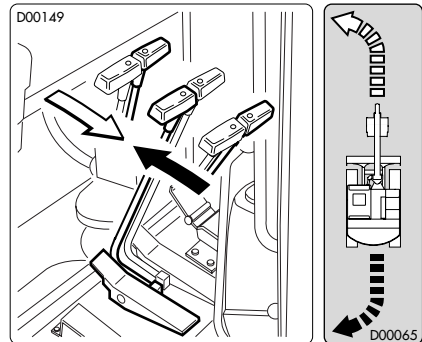
STEERING WHILE MOVING (with both track drive levers pushed forwards)

To turn left, return the LEFT track drive lever to neutral position.



IMPORTANT

- Use the RIGHT track drive lever in the same way to turn right.



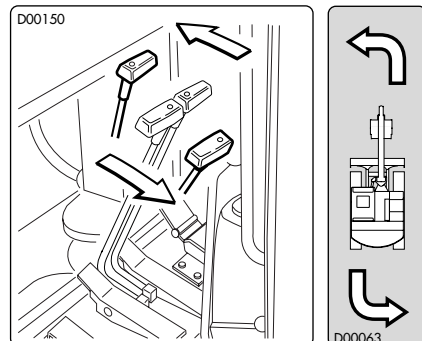
TURNING AROUND (when stationary)

To turn around to the left, pull the LEFT track drive lever back while pushing the RIGHT track drive lever forwards.



IMPORTANT

- To turn around to the right, pull the RIGHT track drive lever back while pushing the LEFT track drive lever forwards.



16.5.2 NEGOTIATING SLOPES

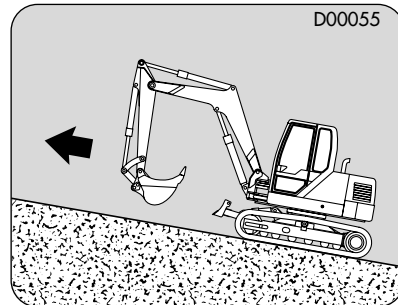
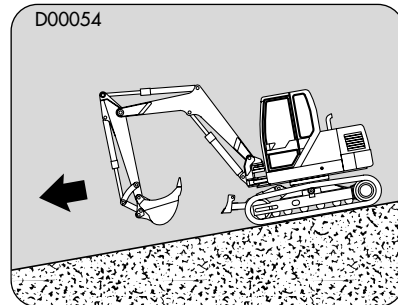


DANGER

- Check the efficiency of the working brake before starting work on a slope.
 - Avoid using the speed control pedal when working on slopes.
-

Work on slopes requires special precautions to avoid danger to yourself and to other persons in the vicinity. Proceed as follows when working on slopes.

- 1 - Examine the work area and take note of any snow, mounds, gravel or loose earth which might affect working conditions or machine stability.
- 2 - When driving down a slope, keep the bucket downhill from the machine as shown in the figure.
- 3 - When driving up a slope, keep the bucket uphill from the machine.
- 4 - Keep the bucket as low as practically possible when moving the machine around the work site.
- 5 - Cross slopes at the top or at the bottom. If this is not possible, make a number of small diagonal movements across the slope, keeping the machine as parallel as possible with the direction of the slope.
Never drive across slopes at sharp angles, or worse still straight across them.



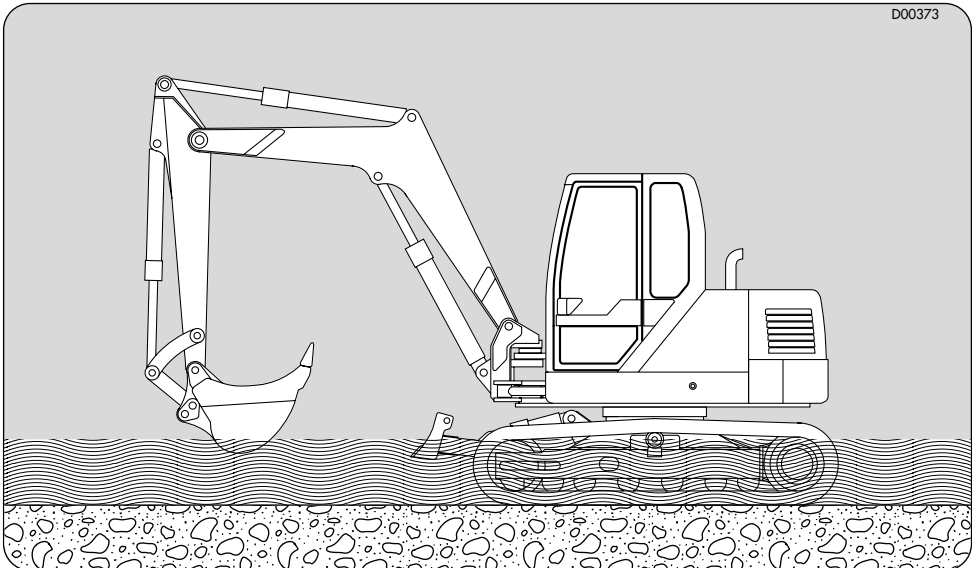
16.5.3 MAXIMUM DEPTH OF WATER



DANGER

- If you have to perform work in water, on the banks of a river, or on the sea shore, check the depth of the water and the direction and strength of the current before entering the water.
- Check that the bed on which the machine will be standing is firm before driving into the water.

Check the depth of water before entering. Water must never submerge the middle of the top roller.



CAUTION

- When working in water or on muddy ground, lubricate all articulations more frequently than stated in the normal maintenance intervals.
 - On completion of work, remove all mud and dirt, and lubricate all articulations.
-

17. PARKING THE MACHINE

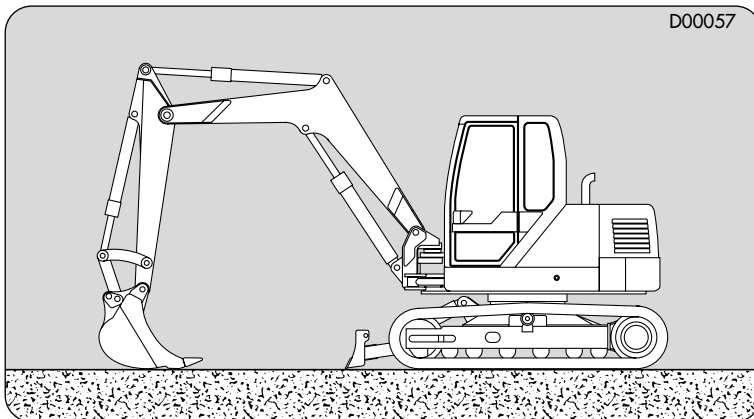
17.1 PARKING ON LEVEL GROUND



DANGER

- Park the machine on firm, level ground where there is enough space for daily checks, refuelling, and lubrication operations.
- Lower the blade, and equipment to the ground before you leave the machine.
- Engage all safety devices to prevent accidental movement of the machine when you are not in the driving seat.
- Remove the ignition key when you leave the machine. Use the access steps and hand grips to climb down from the cab. Lock the door when you leave.

-
- 1 - Park the machine on firm, level ground which affords adequate space.
 - 2 - Lower the blade and the bucket to the ground. If the space available does not permit this, fold the equipment into travel position and secure it with the relevant safety devices.
 - 3 - Engage the boom rotation pedal lock, the swing lock lever, and the equipment control lock.
 - 4 - Switch off the engine as instructed in section 18. «STOPPING THE ENGINE».
 - 5 - Always use the grips, tracks, and track frame to climb down from the cab.
 - 6 - Refuel the machine, taking all the prescribed precautions.
 - 7 - Remove the ignition key and lock the cab securely.



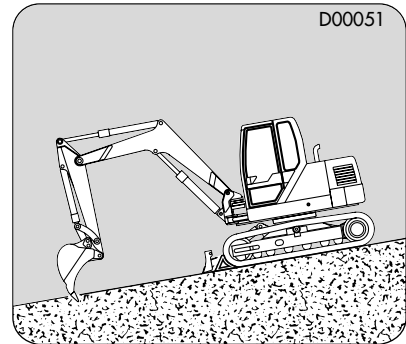
17.2 PARKING ON A SLOPE



DANGER

- **Accidental movement of the machine without an operator on board can lead to serious, even fatal accidents. Apply the procedures listed below to prevent accidental movement.**
 - **Only park on a slope when absolutely unavoidable.**
 - **Always park with the bucket downhill from the machine.**
-

- 1 - Park the machine with the bucket downhill, lodged against a solid obstacle.
If no suitable obstacles are available, rotate the bucket into unloading position and lodge its teeth firmly into the ground.
- 2 - Lower the blade to the ground.
- 3 - Engage the boom rotation pedal lock, swing lock lever, and equipment control lock.
- 4 - Switch off the engine as instructed in section 18. «STOPPING THE ENGINE».
- 5 - Always use the grips, tracks, and track frame to climb down from the cab.
- 6 - Place safety wedges under the wheels.
- 7 - Refuel the machine, taking all the prescribed precautions.
- 8 - Remove the ignition key and lock the cab securely.



18. STOPPING THE ENGINE

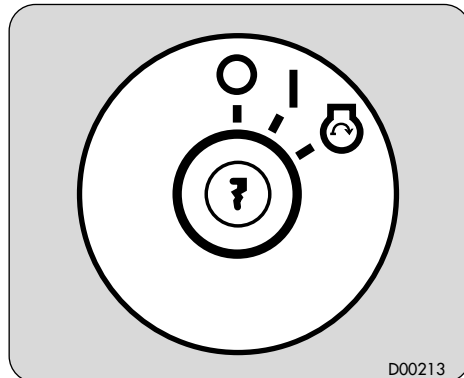
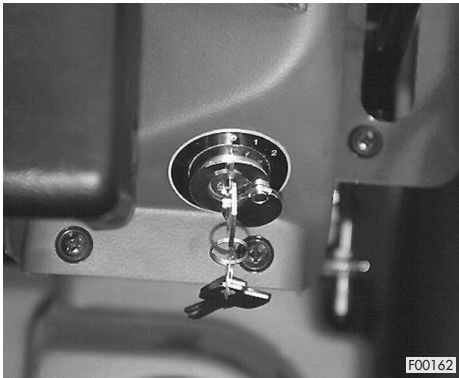


IMPORTANT

- Do not switch the engine off while it is under load, other than in an emergency. Switching off under load shortens the working life of the engine.
- It is equally inadvisable to switch off the engine immediately if it has been under load for an extended period of time and is very hot. Leave the engine turn over without load for about 5 minutes to allow it to cool down before switching it off.

Before stopping the engine:

- 1 - Move all levers to neutral position, and engage all the safety locks.
- 2 - Return the accelerator lever to idling position.
- 3 - Turn the ignition key to «O» (OFF) position.



19. TRANSPORTING THE MACHINE ON ANOTHER VEHICLE

19.1 LOADING AND UNLOADING

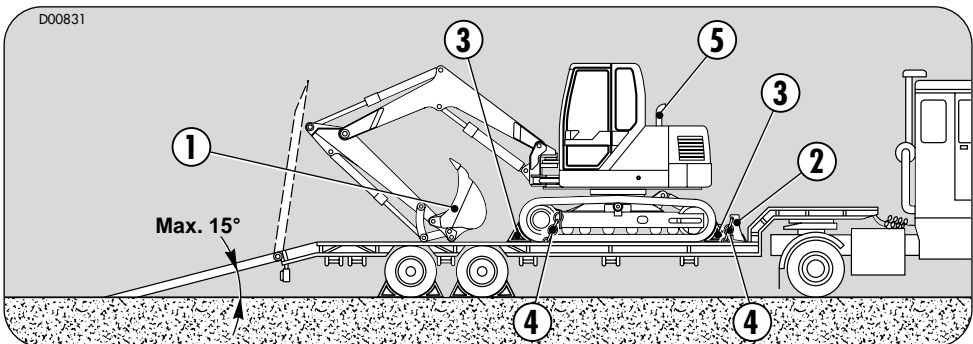
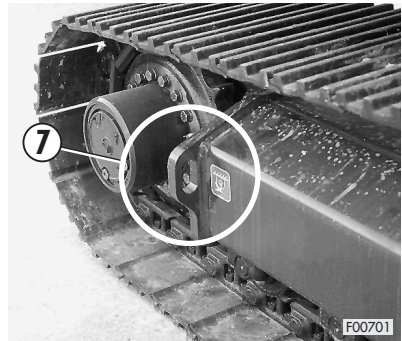
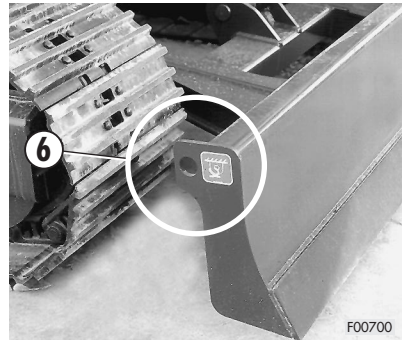


DANGER

- Only perform loading and unloading operations on firm, level ground. Keep well away from the edges of ditches and roads.
- Block the transporting vehicle with wedges in front of and behind its wheels.
- Make sure that the loading ramps are strong enough. If necessary, place supporting blocks underneath the ramps to prevent them bending.

- Make sure that the ramp pairs are of the same length, firmly attached to the transporting vehicle, parallel to each other, and perpendicular to the rear edge of the loading platform. Make sure that the ramps are positioned at the right distance for the width of the machine's track.
- Position the ramps at a maximum angle of 15°.
- Remove all traces of oil, grease, or ice from the ramps and the loading platform.
- Do not correct steering on the ramps. If correction is required, reverse down off the ramps and re-align the machine before trying again.

- 1 - Load the machine onto the vehicle with the bucket (1) facing forward, i.e. in the direction of travel of the vehicle, and at a suitable height from the ground.
- 2 - On completion of loading, rotate the revolving frame through 180° to avoid the truck's cab, and engage the revolving frame rotation lock. Lower the blade (2) and the equipment into contact with the loading platform. Engage the equipment control lock.
- 3 - Switch off the engine and remove the ignition key.
- 4 - Block the machine with (3) wedges in front of and behind the tracks.
- 5 - Tie the machine down with cables or chains (4) using the anchoring points provided (6 and 7).
- 6 - Protect the end of the exhaust pipe (5).



19.2 THE ROUTE

- 1 - Check the overall height, width, and weight of the vehicle and machine. Make sure that these dimensions are compatible with the roads, tunnels, underpasses, bridges, power and telephone lines etc. along the route.
- 2 - Observe all laws and regulations concerning heavy load notices and speed limits. Comply with all road traffic regulations. Obtain transport permits etc. where necessary.

20. COLD WEATHER PRECAUTIONS

During cold weather, or in regions where temperatures, especially at night, drop significantly, take the precautions listed below to prevent damage from frost and freezing.

20.1 FUEL AND LUBRICANTS

- 1 - Change the fuel to winter diesel type ASTM D975 N° 1.
- 2 - Change the engine oil for an oil of suitable viscosity.
See section 26. «FUEL, COOLANT, AND LUBRICANTS» for the necessary specifications.

20.2 COOLANT



DANGER

- **Coolants which contain anti-freeze are inflammable. Do not smoke or use naked flames while carrying out checks or mixing new coolant.**
- **Do not use methanol, ethanol, or propanol based anti-freezes.**

- 1 - If no permanent anti-freeze is available, use an ethylene glycol based product with anti-corrosion and anti-foam additives.
Only use this type of anti-freeze during the Winter months. When changing the coolant (in the autumn and spring) wash out the coolant circuit. (See section 29.10 «OCCASIONAL MAINTENANCE».)
- 2 - When calculating the required ratio of anti-freeze to water, base your calculations on the coldest temperature recorded in the past and allow for a 10°C safety margin. (See section 25.1.2. «ENGINE COOLING WATER».)
- 3 - Do not use leak sealing additives either on their own or in conjunction with anti-freeze.
- 4 - Do not mix different brands of anti-freeze.
- 5 - If the circuit is filled with a permanent anti-freeze, this need not be changed, and the circuit does not therefore require washing out.
- 6 - Permanent anti-freeze must comply with SAE-J1034 and FEDERAL STANDARD O-A-548D standards.
Ask the manufacturer for further information if you are in doubt about whether any particular anti-freeze complies with these standards.

20.3 THE BATTERY



DANGER

- **Do not cause sparks or use naked flames near the battery, as this could cause explosions.**
 - **The electrolyte contained in acid batteries is dangerous. If electrolyte splashes into your eyes or on to your skin, wash the affected part immediately with plenty of clean running water and consult a doctor.**
-

- 1 - When the ambient temperature drops, the capacity of the battery and the electrolyte diminishes. If the battery charge is already low, the electrolyte may even freeze. Keep the battery fully charged and lag it to protect it against the cold to ensure that the machine is always easy to start.
- 2 - Measure the specific weight of the electrolyte and check the percentage charge of the battery using the following table.

PERCENTAGE CHARGE	ELECTROLYTE TEMPERATURE			
	20°C	0°C	-10°C	-20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

- 3 - If the level of electrolyte in the battery is low, top it up with distilled water at the start of the day and not at the end. Otherwise, the electrolyte may freeze at night.

20.4 OTHER PRECAUTIONS

- 1 - Before using the machine at a normal working pace, move slowly backwards and forwards a few times, and extend and retract all the hydraulic cylinders. This warms up the oil in the final drives and the hydraulic fluid.

20.5 PRECAUTIONS AT THE END OF A WORKING DAY

- 1 - Remove all mud and standing water from the machine. Park the machine on firm, level ground. If you have to park near river banks or ditches, park on wooden planks to distribute the weight of the machine over as large an area as possible.

- 2 - Carefully remove all drops of water from the hydraulic rams. If these are allowed to freeze on the rams, they can damage the hydraulic seals if the cylinder is operated.
Coat the cylinder rams with protective oil to prevent moisture from settling and freezing on them.
- 3 - Drain off any condensation which may have formed in the fuel tank and fuel line water trap to prevent it from freezing during the night.
- 4 - Since battery capacity can fall considerably at low temperatures, at the end of the working day, either cover the battery or remove it and store it in a warmer place.

21. WARM WEATHER PRECAUTIONS

- 1 - When the weather changes from cold to warm, change the oils, coolant (unless permanent), and the fuel.



IMPORTANT

- **There is no need to change permanent coolant.**
See section 26. «FUEL, COOLANT, AND LUBRICANTS» for all necessary specifications.
-

- 2 - Check the condition of the fan belt.
- 3 - Check that the cooling fins of the radiator and hydraulic fluid heat exchanger group are clean and not blocked.
- 4 - Check the condition of the radiator cap seal and spring. Replace the cap if you have any doubts regarding its efficiency.

22. USING THE WORK EQUIPMENT



DANGER

- Always fasten the safety belt before performing any manoeuvre.
 - Operate the horn button on the right hand control lever to warn other people in the vicinity that you are about to start work.
 - In case of failure, if the machine stops with the work equipment lifted turn the starting key to position «I», unlock the safety device, lower the bucket to the ground and release all residual pressure.
-



IMPORTANT

- The following illustrations are designed only to provide a basic idea of how to use the machine properly. It is up to you to familiarise yourself with the machine and its correct operation. Make a habit of organising your work in an obstacle free area. Always sit correctly in the driving seat.
-

22.1 ORGANISATION OF THE WORK AREA

If your preliminary inspection of the work area shows that the ground is uneven, cluttered with large obstacles, or sloping, flatten it out as much as possible before starting work. This saves unnecessary strain on the machine and on any lorries to be loaded. Preliminary levelling reduces the total time required for a job. It also saves operator fatigue and strain on the machine, as well as saving digging time and lorry manoeuvring time.

22.2 POSITIONING THE BUCKET ACCORDING TO THE JOB



DANGER

- Take special care when installing the link pins which connect the bucket to the arm and bucket cylinder ram. Metal splinters can easily cause injury.
- Always wear protective goggles, thick gloves, and a hard hat.

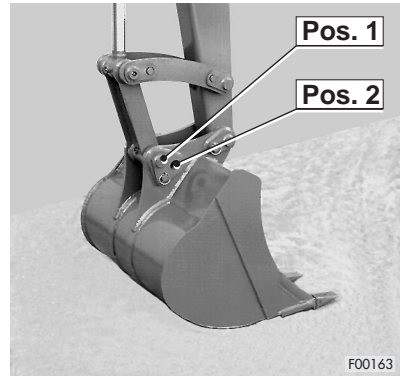
- **Never use your fingers to check on the alignment of holes. Unexpected movements can easily shear fingers.**
-

BUCKET POSITIONS

The bucket can be fitted in either of two positions:

Pos. 1: for normal digging operations; affords maximum force at the bucket.

Pos. 2: for working on vertical walls; affords maximum rotation and working height, but reduced tearing force at the bucket.



22.3 POSITIONING THE MACHINE FOR DIGGING



DANGER

- Before moving the equipment, make sure that there is no-one in the work area.
 - When working on a slope, make sure that the working brake is engaged before moving the equipment.
 - Try out all possible machine movements to check that the control levers are working correctly.
 - If visibility is poor, or there are pipes or cables in the area, work at a reduced pace and engage the assistance of a second person.
-

1 - Position the machine in line with the trench to be dug.



IMPORTANT

- If this is not possible because of the presence of walls or banks, rotate the boom to the side and line the machine up alongside the proposed trench.
-

USING THE WORK EQUIPMENT

- 2 - Remove the boom rotation lock and disengage the revolving frame rotation lock.
- 3 - Fasten your safety belt. Accelerate the engine to about half speed.
- 4 - Release the control lock (1) and commence work.



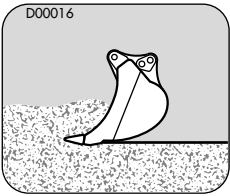
22.4 DIGGING METHOD



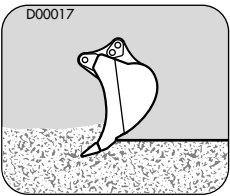
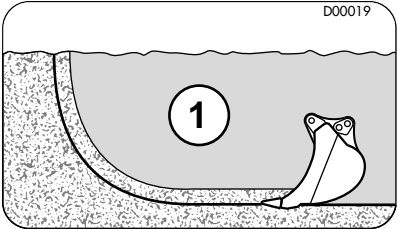
- **The boom, arm, and bucket are articulated in such a way that it is theoretically possible to dig under the tracks, thus undermining the ground on which the machine is standing.**
 - **Never dig further in than the end of the boom to avoid the risk of the ground giving way and the machine turning over.**
-

- 1 - Hold the bucket at the correct angle of attack to penetrate the soil.
- 2 - Once the desired digging depth has been reached, rotate the bucket so that its teeth are parallel with the bottom of the trench, and move it forward to start filling it.
- 3 - While filling the bucket, manipulate the bucket, the boom, and the arm together. Combined movements fill the bucket faster and increase productivity.
- 4 - Keep the bucket at an appropriate depth for optimum earth removal. The best working depth varies according to the type of soil. Avoid digging too deep as this may prevent bucket movement and overload the engine and the hydraulic pump as well as slowing down work.

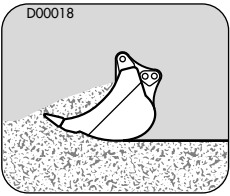
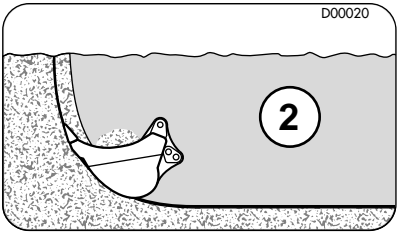
5 - Unload the bucket as it approaches the unloading point. In this way the momentum of the soil compacts the heap and avoids the need for you to compress it with the bucket, thus reducing wear on the pins and bushings.



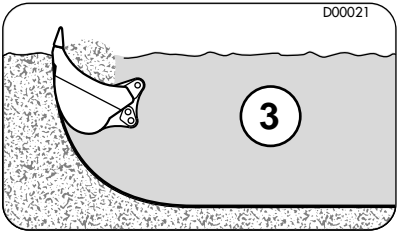
CORRECT
(The bucket works with its teeth parallel to the ground.)



INCORRECT
(The bucket is forced downwards and work is slowed down.)



INCORRECT
(The bucket is forced upwards and does not fill efficiently.)



DIGGING METHOD

CORRECT DIGGING METHOD
(Sequence 1 - 2 - 3)

22.5 CHANGING THE WORK EQUIPMENT



DANGER

- Metal splinters may form when link pins are being fitted or removed. Always wear gloves, goggles, and a hard hat when performing these operations.
 - The assistance of a second person is required in order to change equipment. Make sure that both of you agree on the words, phrases, and signals to be used.
 - Never use your fingers to check on the alignment of holes. Unexpected movement can easily sever fingers.
-

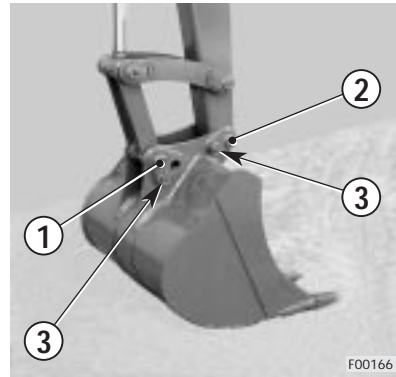
22.5.1 CHANGING THE BUCKET

- 1 - Lower the bucket so that the flat back rests on flat ground.
- 2 - Remove, in this order, the bucket cylinder ram link pin (1) and then the arm link pin (2).
- 3 - Replace the bucket. Clean the link pins and the bushings, and lightly grease the link pins before fitting.



IMPORTANT

- Fit the arm link pin first, making sure that the sealing washers are in good condition.
-
- 4 - Replace the link pin safety clips (3) and lubricate the link pins through the grease nipples.



23. FAULT FINDING

23.1 RUNNING OUT OF FUEL

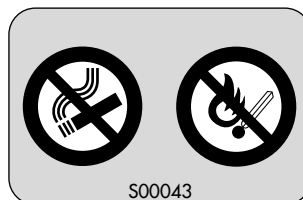
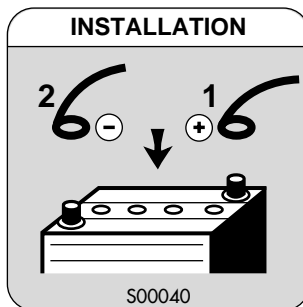
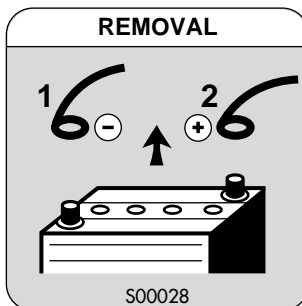
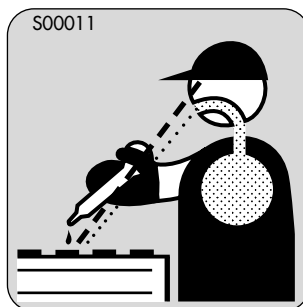
If you run out of fuel, you must bleed all the air out of the fuel system before you can re-start the engine. See section 29.7 «EVERY 500 HOURS».

23.2 IF THE BATTERY IS FLAT



DANGER

- When checking or working on the battery, switch off the engine and make sure that the ignition key is in position «O».
- Acid batteries generate hydrogen gas which can cause explosions. Do not smoke or use naked flames near the battery. Take care not to cause sparks.
- The battery electrolyte contains diluted sulphuric acid which can corrode clothing and skin. If you get battery electrolyte on you, wash the affected part immediately with plenty of clean running water. If you get acid in your eyes, wash them immediately with plenty of clean running water and consult a doctor straight away.
- Always wear safety goggles and gloves when working on the battery.
- When removing the battery, disconnect the negative (-) cable first, and then the positive (+) cable. When replacing the battery, connect the positive (+) cable first and then the negative (-) cable.
- Do not allow any tools to touch the positive terminal of the battery while in contact with the machine frame. This could cause sparks with a consequent risk of explosions.
- Tighten the battery terminals securely. Loose terminals can cause sparks and consequently explosions.



23.2.1 USING JUMP LEADS TO START THE ENGINE



DANGER

- When starting the engine from the battery of another machine, connect the two batteries in parallel.
- Avoid contact between the positive (+) and negative (-) leads when making connections.
- Always wear safety goggles when starting the engine from the battery of another machine.
- Make sure that the two machines do not come into contact with each other. Accidental contact could lead to sparks and consequently explosions of the hydrogen produced by the batteries. Battery explosions can cause serious damage and injury.
- Make sure that you do not get the two jump leads mixed up. Connect the negative (-) lead last, and as far as possible away from the battery.
- Take great care when removing jump leads. Make sure that they do not come into contact with any part of the machine when disconnected from the battery. Accidental contact can lead to sparks and hydrogen explosions.

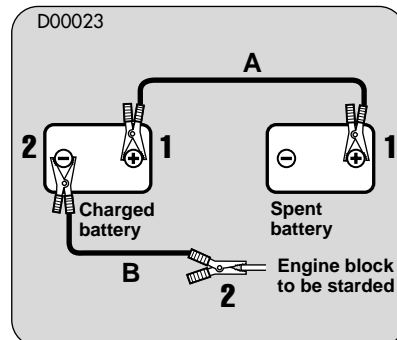


IMPORTANT

- Jump lead thickness and clamp size should be proportional to the current to be carried.
- The battery used for starting should be of equal or higher capacity than the flat battery.
- Make sure that the jump leads and clamps are not corroded.
- Check that the clamps grip the terminals securely.

CONNECTING THE JUMP LEADS AND STARTING THE ENGINE

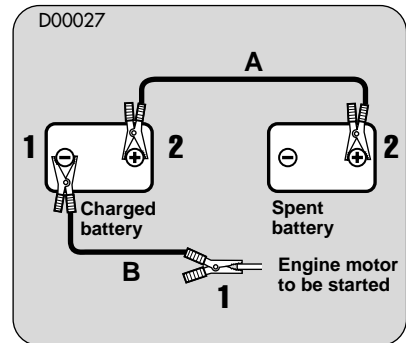
- 1 - Make sure that the ignition key is in position «O».
- 2 - Connect the positive (+) terminals of the two batteries together (A).
- 3 - Connect the negative (-) terminal of the charged battery to the frame of the machine to be started (B).
- 4 - Start the engine of the machine with the charged battery and accelerate it to a high speed.
- 5 - Start the engine of the machine with a flat battery. (See section 16.2 «STARTING THE ENGINE».)



REMOVING THE JUMP LEADS

Once the engine is running, remove the jump leads in reverse order.

- 1 - Disconnect the negative (-) lead from the frame of the machine with a flat battery and then from the charged battery (B).
- 2 - Disconnect the positive (+) lead first from the charged battery and then from the flat battery (A).



23.3 OTHER FAULTS

(●): Contact your FKI dealer when these operations have to be performed.

- : If the fault or the cause is not listed, contact your FKI dealer to arrange the necessary repairs.

23.3.1 ELECTRICAL SYSTEM

PROBLEM	PROBABLE CAUSE	REMEDY
The headlights do not give enough light even when the engine is at high revs:	<ul style="list-style-type: none"> ● Faulty wiring. ● Incorrect fan belt tension. 	<ul style="list-style-type: none"> (●) Check and repair loose terminals and connectors. ● Adjust fan belt tension (see «EVERY 250 HOURS»).
The headlights flicker even when the engine is running:		
The alternator warning light stays on even when the engine is started and accelerated:	<ul style="list-style-type: none"> ● Faulty alternator. ● Faulty wiring. 	<ul style="list-style-type: none"> (●) Replace. (●) Check and repair.
The alternator makes a strange noise:	<ul style="list-style-type: none"> ● Faulty alternator. 	<ul style="list-style-type: none"> (●) Replace.
The starter motor does not turn when the ignition key is turned to start position:	<ul style="list-style-type: none"> ● Faulty wiring. ● Battery flat. ● Faulty main fuse 	<ul style="list-style-type: none"> (●) Check and repair. ● Charge battery. ● Replace
The starter motor engages and then kicks out:	<ul style="list-style-type: none"> ● Low battery charge. 	<ul style="list-style-type: none"> ● Charge the battery.
The starter motor only turns the engine slowly:	<ul style="list-style-type: none"> ● Low battery charge. ● Faulty starter motor. 	<ul style="list-style-type: none"> ● Charge the battery. (●) Replace.
The starter motor disengages before the engine starts:	<ul style="list-style-type: none"> ● Faulty wiring. ● Low battery charge. 	<ul style="list-style-type: none"> (●) Check and repair. ● Charge the battery.
The low oil pressure warning light fails to come on when the engine is switched off (ignition key in position «I»):	<ul style="list-style-type: none"> ● Faulty lamp. ● Faulty pressure sensor. 	<ul style="list-style-type: none"> (●) Replace. (●) Replace.
The alternator warning light fails to come on when the engine is switched off (ignition key in position «I»):	<ul style="list-style-type: none"> ● Faulty lamp. ● Faulty wiring. 	<ul style="list-style-type: none"> (●) Replace. (●) Check and repair.

23.3.2 ENGINE

PROBLEM	PROBABLE CAUSE	REMEDY
The low oil pressure warning light stays on even when the engine is at high revs:	<ul style="list-style-type: none"> • Engine oil level low. • Oil filter blocked. • Oil not suitable for the season. 	<ul style="list-style-type: none"> • Top up to correct level. • Replace filter. • Change oil.
Steam coming out of radiator breather tube:	<ul style="list-style-type: none"> • Coolant level low. Leaks in system. • Fan belt slack. • Sludge or limescale build-ups in coolant system. • Radiator cooling fins damaged or clogged. • Faulty thermostat. • Radiator cap loose or faulty; or machine is working at altitude. 	<ul style="list-style-type: none"> • Top up as necessary: repair. • Check and adjust belt tension. • Flush out system and change coolant. • Repair or clean. (•) Replace. • Tighten or replace cap.
Temperature gauge pointer always at full scale:	<ul style="list-style-type: none"> • Faulty temperature gauge. 	<ul style="list-style-type: none"> (•) Replace.
Temperature gauge pointer always at start of scale:	<ul style="list-style-type: none"> • Faulty thermostat. • Faulty temperature gauge. 	<ul style="list-style-type: none"> (•) Replace. (•) Replace.
The engine does not fire when the starter motor turns:	<ul style="list-style-type: none"> • No fuel. • Air in fuel system. • Compression fault (incorrect valve clearance). 	<ul style="list-style-type: none"> • Refuel. • Bleed the system. (•) Adjust valve clearance
Exhaust fumes are white or blue:	<ul style="list-style-type: none"> • Too much oil in sump. • Wrong type of fuel 	<ul style="list-style-type: none"> • Restore correct level. • Replace with fuel which conforms to specifications.
Exhaust fumes are occasionally black:	<ul style="list-style-type: none"> • Air filter clogged. • Injectors worn. • Poor compression. 	<ul style="list-style-type: none"> • Clean or replace. (•) Replace. (•) Adjust valve clearance.
Occasional whistling from engine:	<ul style="list-style-type: none"> • Faulty injectors. 	<ul style="list-style-type: none"> (•) Replace.
Unusual mechanical or popping noises:	<ul style="list-style-type: none"> • Low cetanic rating fuel. • Engine overheated. • Silencer damaged internally. • Excessive valve clearance. 	<ul style="list-style-type: none"> • Change to fuel which complies with specifications. • See temperature gauge problems. (•) Replace. (•) Adjust valve clearance.

23.3.3 HYDRAULIC SYSTEM

PROBLEM	PROBABLE CAUSE	REMEDY
The pump makes a strange noise:	<ul style="list-style-type: none"> • Low oil level in tank. • Faulty pump. • Hydraulic fluid not suitable for temperature. 	<ul style="list-style-type: none"> • Top up to correct level. (•) Repair or replace. • Change fluid.
The equipment only moves slowly:	<ul style="list-style-type: none"> • Faulty pump. • Pressure relief valves badly regulated, or jammed open by dirt. • Outlet filter dirty. 	<ul style="list-style-type: none"> (•) Repair or replace. (•) Reset or replace. • Fit new filter.

MAINTENANCE

24. MAINTENANCE GUIDE

- Engage all the locks and safety devices and switch off the engine before opening the engine compartment.
- Before checking the level of the hydraulic fluid, retract the bucket and arm cylinders, extend the articulated boom cylinders and lower the teeth of the bucket to the ground.
- Only carry out maintenance on firm, level ground.
- Choose the right lubricants for the ambient temperatures encountered.
- Use only clean oils and greases. Make sure that all lubricant containers are clean, and that no dirt has got into them.
- Keep the machine perfectly clean. This makes it far easier to see broken or faulty parts. Keep all grease nipples, breathers, and the fluid level inspection areas clean to prevent dirt from entering the systems.
- It is dangerous to drain coolant or oil when the engine is still hot. Wait for the engine to cool to a safe temperature of 40÷45°C.
- When changing oil and filters, check for metal particles. If these are present in any quantity, consult your FKI dealer.
- Only check and change the hydraulic fluid with the machine parked in a clean area, to prevent dirt from entering the hydraulic system.
- Before starting maintenance work, attach warning notices to the ignition switch, control levers, and cab door to avoid the engine being started while you are working.
- Observe the precautions given on the various safety notices on the machine while performing maintenance.
- Instructions for arc welding:
 - Turn the ignition key to «**O**» position.
 - Disconnect the battery (negative terminal first, and then positive terminal).
 - Disconnect the alternator.
 - Never apply a current of over 200 V continuous.
 - Connect the welder's negative (earth) cable to a point on the machine frame no further than 1 metre from the point to be welded.
 - Do not attach the negative cable in such a way that bearings or seals lie between it and the welding point.
- Never use inflammable liquids to clean parts. Avoid naked flames. Refrain from smoking.
- When removing seals and O-rings, thoroughly clean the seats and always fit new seals and O-rings. Make sure that seals and O-rings are properly seated when re-assembling parts.

- Do not place parts or tools in your pockets. They can drop into the machine when you bend over.
- Do not direct high pressure jets of water at the radiator and hydraulic fluid heat exchanger group when washing the machine.
- When washing the machine, protect all electrical connectors and avoid wetting the ignition switch.
- Grease all articulations before starting work on muddy ground, in the rain, on river banks or on the sea shore.
On completion of work in these areas, wash the machine immediately to prevent rust from setting in. Grease articulations more frequently in these work environments.
- When working in a dusty environment:
 - Check and clean the air filter frequently to ensure that it does not become clogged.
 - Clean the radiator and hydraulic fluid heat exchanger group frequently to prevent the cooling fins from becoming clogged.
 - Change the diesel fuel filter more frequently.
 - Regularly clean the dust from all electrical components, particularly the alternator and starter motor.
- Do not mix different brands of oil.
If the oil which is available differs from that in the engine, do not top up; change the oil completely.

**DANGER**

- **Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.**
 - **Combustible material from certain components can become extremely dangerous if burned. Never allow burned material to contact your skin or eyes, and avoid breathing fumes from fires.**
-

25. MAINTENANCE NOTES

- Use only original FKI spare parts.
- Do not mix different types of oil.
- Unless otherwise specified, the oils and coolants used by FKI for initial filling prior to delivery are:

PRODUCT	SPECIFICATIONS
• Engine oil	SAE 15W-30 Spec. API CD-SF
• Hydraulic fluid	SAE 10W Spec. API CD-SG
• Final drive oil	SAE 80W/90 Spec. API GL5
• Swing motor oil	SAE 80W/90 Spec. API GL5
• Fuel	From April to September: Diesel ASTM D975 N° 2 From October to March: Diesel ASTM D975 N° 1
• Radiator	Permanent ethylene glycol based anti-freeze with rust inhibitor for protection down -26° C.

25.1 ENGINE MAINTENANCE NOTES

25.1.1 ENGINE OIL

- Good, clean engine oil is essential to the efficiency of the engine, which is the heart of the machine. Engine oil must therefore be chosen with care. The principal maintenance operations regarding engine oil are:
 - 1 - Daily checks on the oil level;
 - 2 - Checks for oil contamination;
 - 3 - Scheduled oil changes.

25.1.2 COOLING WATER

- The water in the cooling system prevents the engine from overheating and keeps it at an optimum operating temperature. Check the water level in the expansion chamber every day and top up if necessary.
- Anti-freeze is inflammable. Do not use naked flames or smoke when checking or refilling the radiator.
- The proportion of anti-freeze to be added to the water in the cooling system depends on the minimum ambient temperatures against which the system has to be protected. Add anti-freeze according to the following table:

QUANTITY OF ANTI-FREEZE TO BE MIXED WITH COOLING WATER

Minimum ambient temperature (°C)	-5	-10	-15	-20	-25	-30
Quantity of anti-freeze (ℓ)	5.8	7.2	8.6	10	11	12
Quantity of water (ℓ)	18.2	16.8	15.4	14	13	12

- Only use soft, drinkable water in the cooling system (i.e. not hard water).
- Do not use rust inhibitors containing soluble oils, since these can damage the rubber hoses.
- If in any doubt, consult your FKI dealer.

25.1.3 FUEL

- Only use fuel which is suitable for the engine. Fuels with incorrect specifications will not produce the same power and can even damage the engine.
- Always refuel at the end of a day's work.
- When refuelling, check that there is no water standing on the top of the fuel drum, and avoid drawing condensate from the bottom of the drum.
- Air must be bled from the system if you run out of fuel and when you change the fuel filter.

25.2 HYDRAULIC SYSTEM MAINTENANCE NOTES

- Take great care when working on the hydraulic circuit. Remember that after a day's work the hydraulic fluid is very hot.
High pressures are also present in the circuit not only while the machine is working, but even after completion of work.
- The hydraulic system requires the following maintenance:
 - 1 - Daily checks of fluid level in the tank;
 - 2 - Scheduled changes of the hydraulic system filter;
 - 3 - Scheduled changes of hydraulic fluid.
- After the filter or hydraulic fluid has been changed, all air must be led out of the system.
- When any part of the hydraulic circuit is removed, check the seals and O-rings, and fit new ones if they are damaged.
- If a cylinder or any other component of the hydraulic system is removed, air must be bled from the system after re-assembly. To do so, proceed as follows:
 - 1 - Start the engine and allow it to run at low revs.
 - 2 - Perform 4÷5 manoeuvres with all the cylinders up to about 100 mm from the end of stroke.
 - 3 - Perform 3÷4 slow manoeuvres with all the cylinders up to the complete end of stroke.

25.3 ELECTRICAL SYSTEM MAINTENANCE NOTES

- If electrical cables are damp or their insulation damaged, current can leak from the electrical system and cause malfunctions.
- The electrical system requires the following maintenance:
 - 1 - Check fan belt tension;
 - 2 - Check the fan belt for damage or breakage;
 - 3 - Check for electrolyte level in the battery.
- Do not remove any standard component of the electrical system, and do not install any new component unless approved by FKI.
- Avoid wetting the electrical system when washing the machine, and keep rain off it.
- If you have to work for any extended period on the banks of rivers or lakes or on the sea shore, protect all electrical connectors with a suitable anti-corrosion product.
- Do not connect any optional equipment to the fuses, ignition switch, battery, or relays, etc.. Consult your FKI dealer for the best way to install optional.
- Disconnect the battery and the alternator before performing any welding.

25.4 NOTES ON LUBRICATION

- Correct lubrication ensures smooth operation, prevents wear, and eliminates noise at articulations and joints.
Lubrication involves the application of either oil or grease.
- Lubrication maintenance includes:
 - 1 - Checking lubricant levels;
 - 2 - Changing oil;
 - 3 - Greasing articulations via the greasing nipples.
- Only use recommended lubricants, and choose those most suitable for the ambient temperature.
- Always clean the greasing nipples before pumping in fresh grease. Pump in fresh grease until it starts to exude from the articulation or joint, and then clean up all the old grease which has been expelled. This is particularly important on rotating parts.
- Keep lubricants topped up to the correct levels. Too low or too high levels can lead to damage.

25.5 PARTS SUBJECT TO RAPID WEAR AND REQUIRING REGULAR REPLACEMENT

- Consumable parts such as filters, bucket teeth, etc, must be replaced during scheduled maintenance or whenever they wear out.
Replacement of these components during scheduled maintenance enables a more economical use of the machine.
Only use original FKI spare parts, which guarantee quality and interchangeability.

GROUP	CODE	PART	Q.ty	FREQUENCY OF REPLACEMENT
Hydraulic fluid filter	21D-60-11130	Filter element	1	EVERY 250 HOURS
Servocontrol filter	21D-60-11220	Filter element	1	EVERY 250 HOURS
Engine oil filter	6810-51-5130	Filter element	1	EVERY 250 HOURS
Fuel filter	6810-71-6110	Filter element	1	EVERY 500 HOURS
Air filter	21D-02-11160	Main filter element	1	EVERY 500 HOURS
	21D-02-11170	Backup filter element	1	EVERY 1000 HOURS
Bucket	21D-926-1180	Teeth	AR	—
	21D-926-1190	Spring pin	AR	—
	21D-926-1210	Spring pin	AR	—

26. FUEL, COOLANT, AND LUBRICANTS

SELECTION ACCORDING TO AMBIENT TEMPERATURE

GROUP/SYSTEM	TYPE OF FLUID	AMBIENT TEMPERATURE					CAPACITY(ℓ)			
		-20	-10	0	10	20	30°C	1st Filling	Change	
Engine sump	OIL • API CD-SG • MIL-L-2104 E • CCMC D4-G4			SAE 10W				11,5	11,5	
Engine oil filter				SAE 20W-20				1	1	
					SAE 30					
						SAE 40				
Hydraulic system				SAE 10W				145	82	
Final drive (each)	OIL • API GL5 • MIL-L-2105 D							1	1	
Swing motor				SAE 80W/90				4	4	
Fuel tank	DIESEL		*					140	—	
				ASTM D975 N. 2						
Engine cooling system	WATER + ANTI-FREEZE							24	—	
	WATER							24	—	
	PERMANENT COOLANT							24	—	

* ASTM D975 N. 1

GREASING

GREASING POINTS	CONSISTENCY	TYPE
Articulations	NLGI 2	GREASE (Lithium based)
Fifth wheel, fifth wheel pinion gear	NLGI 2	GREASE (Calcium based)


IMPORTANT

- If the diesel fuel has a sulphide content of below 0.5%, change the engine oil at the intervals specified. If the sulphide content is above this figure, change the oil at the intervals stated in the table below.

Sulphide content	Engine oil change interval
from 0.5 to 1.0%	1/2 of normal interval
over 1.0%	1/4 of normal interval

- If the engine is started at an ambient temperature of less than 0°C, use SAE 10W, 20W-20 engine oil even if the daytime temperature rises by 10°C.
- Use engine oil with a CD classification. If you have to use CC class oil, change the oil at half the standard interval.
- Only use products which are specially designed for use with your engine, hydraulic system, and final drives.

1st filling capacity: This is the total quantity of product required to fill the entire system, including oil lines and actuators.

Change capacity: This is the quantity of product needed to refill the system following scheduled maintenance operations.

ASTM: American Society of Testing and Materials

SAE: Society of Automotive Engineers

API: American Petroleum Institute

MIL: U.S. Military Specifications

CCMC: Common Market Manufacturers Committee

27. NUT AND BOLT TIGHTENING TORQUES

27.1 STANDARD TIGHTENING TORQUES

★ Nm (Newton metre): 1 Nm = 0.102 kgm

Thread diameter (mm)	Pitch (mm)	Spanner size (mm)	8.8		10.9	
			kgm	Nm	kgm	Nm
6	1	10	0.96 ± 0.1	9.5 ± 1	1.3 ± 0.15	13.5 ± 1.5
8	1,25	13	2.3 ± 0.2	23 ± 2	3.2 ± 0.3	32.2 ± 3.5
10	1,5	17	4.6 ± 0.5	45 ± 4.9	6.5 ± 0.6	63 ± 6.5
12	1,75	19	7.8 ± 0.8	77 ± 8	11 ± 1	108 ± 11
14	2	22	12.5 ± 1	122 ± 13	17.5 ± 2	172 ± 18
16	2	24	19.5 ± 2	191 ± 21	27 ± 3	268 ± 29
18	2,5	27	27 ± 3	262 ± 28	37 ± 4	366 ± 36
20	2,5	30	38 ± 4	372 ± 40	53 ± 6	524 ± 57
22	2,5	32	52 ± 6	511 ± 57	73 ± 8	719 ± 80
24	3	36	66 ± 7	644 ± 70	92 ± 10	905 ± 98
27	3	41	96 ± 10	945 ± 100	135 ± 15	1329 ± 140
30	3,5	46	131 ± 14	1287 ± 140	184 ± 20	1810 ± 190



IMPORTANT

This table does not apply to nuts and bolts which have to secure components in nylon or other plastic material, nor to those fitted with washers, nor to those which tighten on to non-ferrous metals.

27.2 SPECIAL TIGHTENING TORQUES

GROUP	DESCRIPTION	kgm	Nm
Cab platform	Front mounting bolts	16 ± 1	157 ± 9.8
	Rear mounting bolts		
Tracks	Shoe fixing bolts	16 ± 1	157 ± 9,8
Engine	Main front mounting bolt	16 ± 1	157 ± 9.8
	Main rear mounting bolt		
Fifth wheel	Revolving frame nuts	32 ± 1	314 ± 9,8
	Chassis bolts		

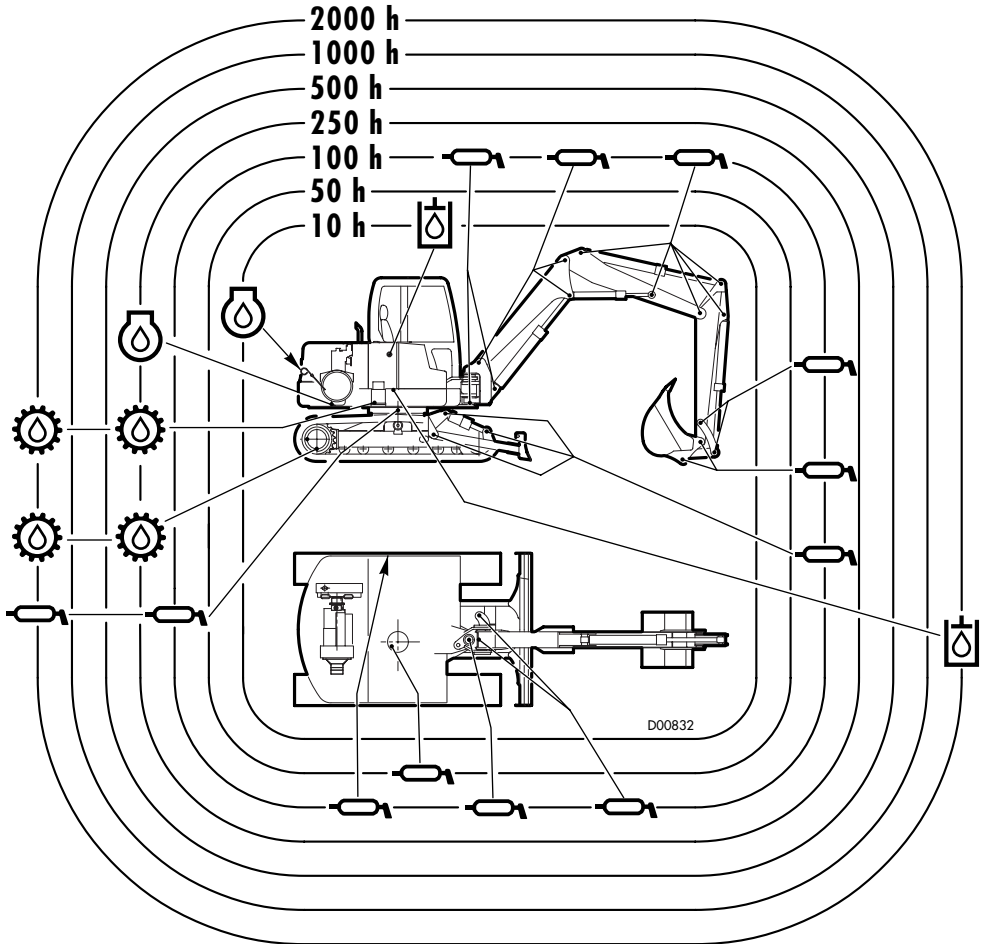
28. LUBRICATION

28.1 LUBRICATION CHART



CAUTION

- The type of oil to be used is shown in the Lubrication Chart (See «26. FUEL, COOLANT AND LUBRICANTS»).



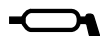
Engine oil



Hydraulic fluid



Gearbox oil



Grease

29. SCHEDULED MAINTENANCE

29.1 PRE-STARTING CHECKS

N.	ITEM	OPERATION	PAGE
a	Various checks	—	111
b	Coolant level	Check and top up	111
c	Fuel tank	Check and top up	112
d	Engine oil level	Check and top up	112
e	Hydraulic fluid level	Check and top up	113
f	Electrical system	Check	114
g	Fuel line water trap	Drain	114

29.2 AFTER THE FIRST 50 HOURS

N.	ITEM	OPERATION	PAGE
a	Hydraulic fluid return line filter	Change	115
b	Fan belt	Check tension	115

29.3 EVERY 50 HOURS

N.	ITEM	OPERATION	PAGE
a	Swivel joint	Lubricate (1 point)	115
b	Engine air filter	Clean air filter dust trap	115

29.4 EVERY 100 HOURS

N.	ITEM	OPERATION	PAGE
a	Articulations	Lubricate (25 points)	116
b	Air filter	Clean main element	119
c	Fifth wheel	Lubricate (4 points)	120
d	Overload device cam	Lubricate (1 point)	120

29.5 AFTER THE FIRST 250 HOURS

N.	ITEM	OPERATION	PAGE
a	Final drive case	Change oil	120
b	Swing motor	Change oil	120
c	Engine valves	Check valve clearance	120

29.6 EVERY 250 HOURS

N.	ITEM	OPERATION	PAGE
a	Fan belt	Check condition and tension	121
b	Battery	Check electrolyte level	121
c	Final drive case	Check oil level (2)	122
d	Swing motor	Check oil level (1)	123
e	Hydraulic fluid return line filter	Change	123
f	Servocontrol filter	Change	124
g	Engine oil	Change	125
h	Engine oil filter	Change	126

29.7 EVERY 500 HOURS

N.	ITEM	OPERATION	PAGE
a	Air filter	Change main element	127
b	Fuel tank	Drain condensate	127
c	Radiator/heat exchanger group	Clean externally	128
d	Fuel filter and fuel pump gauze filter	Change element and clean gauze	128
e	Fifth wheel pinion gear	Check grease level and top up	130

29.8 EVERY 1000 HOURS

N.	ITEM	OPERATION	PAGE
a	Air filter	Change backup filter element	131

29.9 EVERY 2000 HOURS

N.	ITEM	OPERATION	PAGE
a	Hydraulic fluid tank	Change hydraulic fluid	132
b	Final drive case	Change oil	134
c	Swing motor	Change oil	134
d	Fifth wheel pinion gear	Change grease	136
e	Coolant	Change	137
f	Engine valves	Check valve clearance	138
g	Alternator and starter motor	Check	138

29.10 OCCASIONAL MAINTENANCE

N.	ITEM	OPERATION	PAGE
a	Coolant circuit	Wash out	139
b	Track chains	Check and adjust tension	140
c	Tracks	Check shoe mountings	142

29.1 PRE-STARTING CHECKS

29.1.a VARIOUS CHECKS



DANGER

- **Dirt, oil, and fuel spillages near hot areas in the engine compartment can lead to engine fires and seriously damage the machine.**
Check for leaks on a regular basis and repair immediately. Consult your FKI dealer if leaks recur frequently.
-

Before starting the engine, check:

1. That there are no loose nuts or bolts.
2. That there are no oil, fuel, or coolant leaks.
3. The wear on the working equipment.
4. Track tension and wear.
5. The correct functioning of all dashboard warning lights and indicators, working flood-lights, windscreen wipers and horn.

Also perform the following safety checks:

6. Condition and functioning of the safety belt.
7. Completeness and legibility of all safety notices.
8. Cleanliness of access hand grips and cab floor.

29.1.b CHECKING THE COOLANT LEVEL

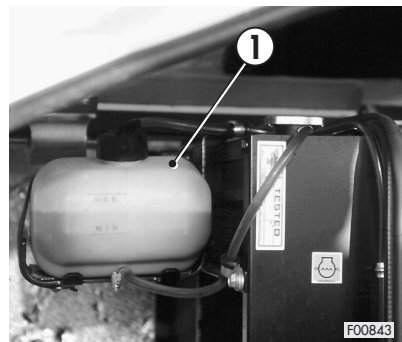


DANGER

- **Never remove the radiator cap to check the coolant level. Wait for the engine to cool and check the coolant level in the expansion chamber.**
-

Open the engine bonnet to gain access to the expansion chamber (1). The coolant level should be between the minimum and maximum level marks.

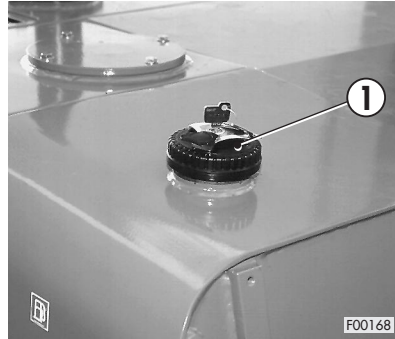
If necessary, top up with clean water or coolant. If the coolant level drops significantly every day, check the radiator and engine seals and gaskets.



29.1.c CHECKING THE FUEL LEVEL



- Avoid spillages when refuelling. Spilled fuel represents a fire hazard. If fuel does get spilled, clean it up immediately.
- Fuel is highly inflammable. Do not use naked flames and do not smoke while refuelling.
- Hold the fuel delivery gun firmly against the tank filler.



Use the fuel gauge on the dashboard to check fuel level. Avoid overfilling the tank: leave enough room for the fuel to expand.



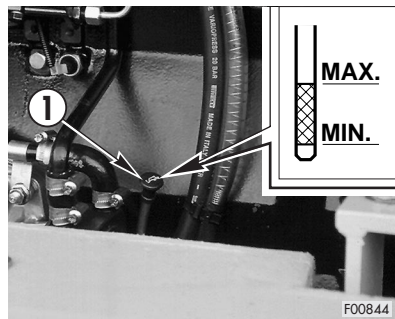
- Refuel at the end of every working day to prevent condensation from forming in the tank.
- On completion of refuelling, replace and lock the fuel cap (1).

29.1.d CHECKING THE ENGINE OIL LEVEL



- The engine can still be very hot when it is switched off, and can therefore cause burns. Wait for the engine to cool down before checking the oil level.

Open the bonnet to gain access to the dip-stick. Check the oil level when the engine is cold and with the machine parked on firm, level ground. Oil must come to between the MIN and MAX marks on the dipstick (1). If the oil level drops to near the MIN mark, top up with the same oil, which must be suitable for the ambient temperature in which the machine is operating. (See section «26. FUEL, COOLANT, AND LUBRICANTS».)

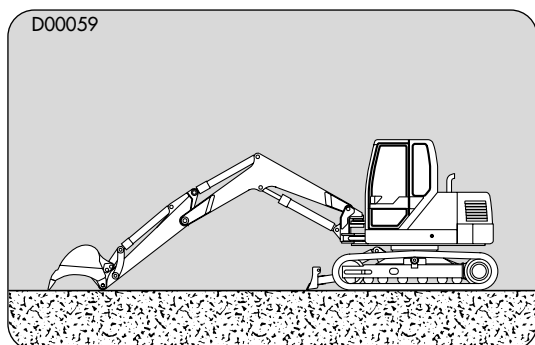
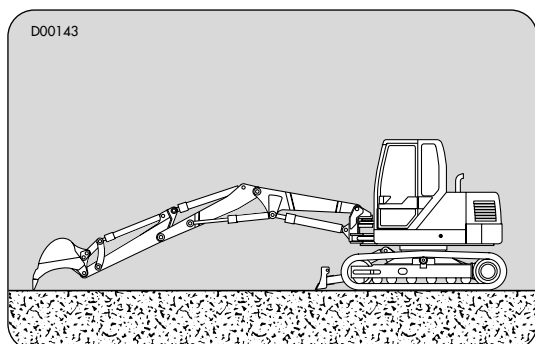


- If you have to check the oil level during work or immediately afterwards, wait at least 15 minutes for the oil to settle.

29.1.e CHECKING THE LEVEL OF THE HYDRAULIC FLUID

**DANGER**

- The hydraulic fluid must be cold and the machine must be parked on firm, level ground with the bucket and arm cylinders retracted, the articulated boom cylinders extend and the bucket resting on the ground. Hydraulic fluid must be visible in the inspection window in the hydraulic tank.
Use only the recommended hydraulic fluid to top up.
(See section «26. FUEL, COOLANT, AND LUBRICANTS».)
 - If the hydraulic fluid level drops continuously, check the seals of the entire circuit, including those of the rams and pump.
-



29.1.f CHECKING THE ELECTRICAL SYSTEM



- **Replace any fuses which are corroded, oxidised, or loose with new fuses of the same rating. Make sure that the ignition key is in position «O» before changing fuses.**
 - **If the wiring shows any signs of short-circuiting, trace the cause and make the necessary repairs. Contact your FKI dealer to have the fault located.**
-

Check that no cables are loose or short-circuited.

Check that all cables are held firmly in their cable clamps. Secure any loose cables.

Check:

1. Battery
2. Starter motor
3. Alternator.

29.1.g DRAINING THE FUEL LINE WATER TRAP

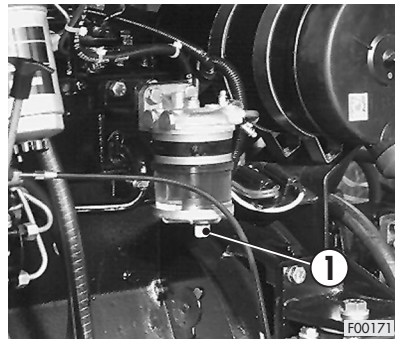


- **Fuel is highly inflammable. Do not use naked flames and refrain from smoking when performing this operation.**
 - **Clean up any spilled fuel immediately.**
-

This operation drains off any water from condensation build-ups in the fuel line. It must be performed with the fuel tank full to prevent air from entering the fuel delivery line.

Drain off condensation from the water trap at the end of a day's work, before the engine has fully cooled down. This ensures that the water does not freeze inside the trap in low temperatures.

Open cock (1) and drain off all condensation until clean diesel fuel starts to drain out.



29.2 AFTER THE FIRST 50 HOURS

★ The following operations must be performed after the machine's first 50 hours work in addition to the operations scheduled for every 50 hours.

- CHANGE THE HYDRAULIC FLUID RETURN LINE FILTER.
- CHECK FAN BELT TENSION.

See the section «EVERY 250 HOURS» for details on these jobs.

29.3 EVERY 50 HOURS

29.3.a GREASING THE SWIVEL JOINT

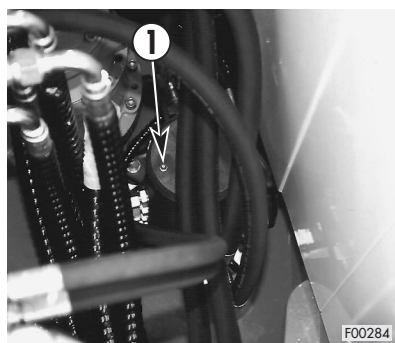


IMPORTANT

- Clean greasing nipples (1) before applying the grease gun.
- Clean up the old grease forced out from the union when you finish.

Grease the swivel joint with the recommended grease.

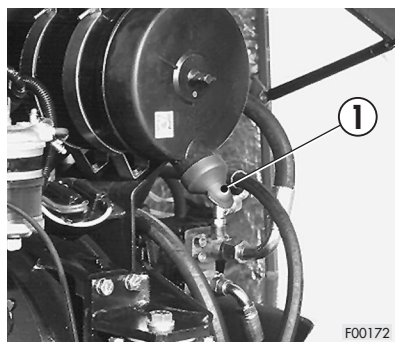
(See section «26. FUEL, COOLANT, AND LUBRICANTS».)



29.3.b CLEANING THE ENGINE AIR FILTER DUST TRAP

Open the bonnet to gain access to the dust trap. Press the dust trap (1) down with two fingers to open it and expell the dust which inevitably accumulates every day.

When releasing the trap, make sure that the rubber surfaces close efficiently, and are not soiled with sticky oil or grease.



IMPORTANT

- Perform this operation more frequently when working in dusty environments.

29.4 EVERY 100 HOURS

- ★ Every 100 hours, perform the following operations in addition to those scheduled for every 50 hours.

29.4.a GREASING THE ARTICULATIONS



IMPORTANT

- Clean the greasing nipples before applying the grease gun.
- Clean up any old grease forced out of the articulations when you finish.
- Perform these operations more frequently if the machine is working in harsh conditions.

The equipment must be extended and resting on the ground in order to perform these operations.

Use only the recommended greases.

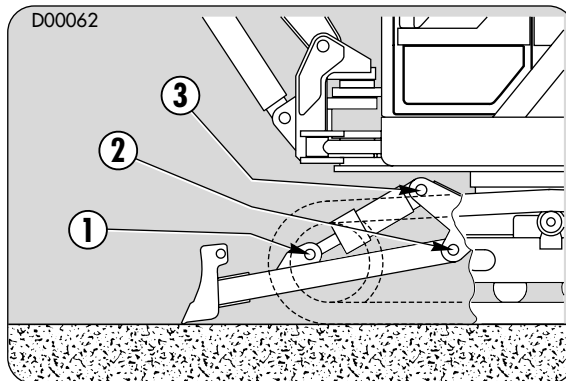
(See section «26. FUEL, COOLANT, AND LUBRICANTS».)



IMPORTANT

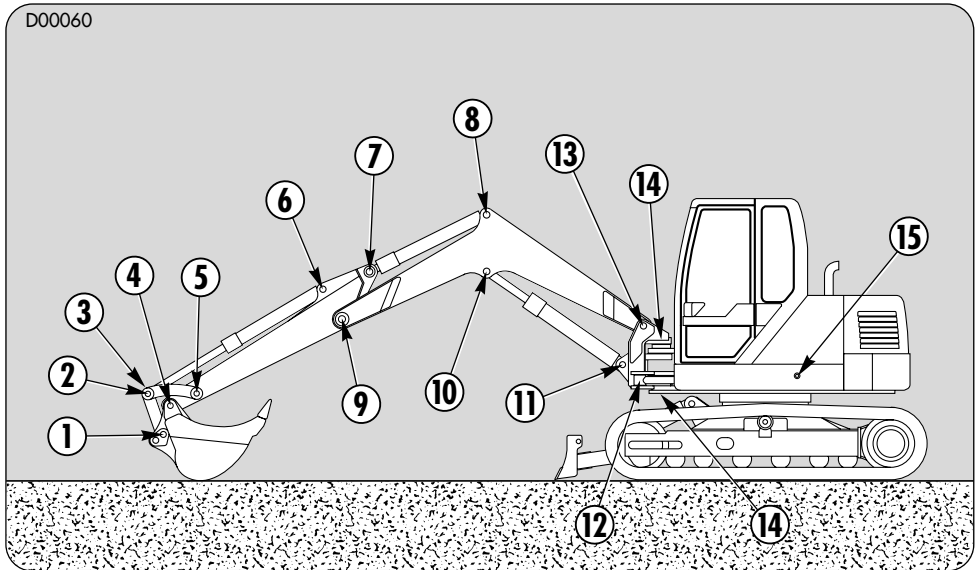
- As a general rule, each hydraulic cylinder has two greasing points, one at each end, and each link or fulcrum pin has at least one greasing point.

BLADE



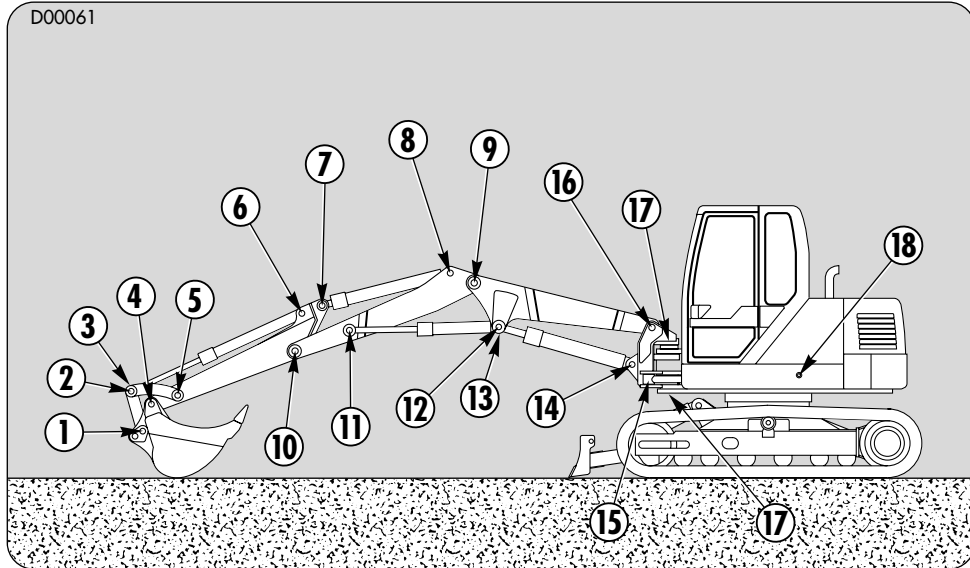
- | | |
|-----------------------------|------------|
| 1 - Blade cylinder rod end | (1 point) |
| 3 - Blade arm fulcrum pin | (2 points) |
| 4 - Blade cylinder foot pin | (1 point) |

MONOBLOCK BOOM



- | | |
|--------------------------------------|------------|
| 1 - Tie rod - bucket link pin | (1 point) |
| 2 - Tie rod - lever link pin | (1 point) |
| 3 - Bucket cylinder rod end | (1 point) |
| 4 - Bucket fulcrum pin | (1 point) |
| 5 - Lever fulcrum pin | (1 point) |
| 6 - Bucket cylinder foot pin | (1 point) |
| 7 - Arm cylinder rod end | (1 point) |
| 8 - Arm cylinder foot pin | (1 point) |
| 9 - Arm fulcrum pin | (1 point) |
| 10 - Boom cylinder rod end | (1 point) |
| 11 - Boom cylinder foot pin | (1 point) |
| 12 - Boom rotation cylinder rod end | (1 point) |
| 13 - Boom fulcrum pin | (1 point) |
| 14 - Boom rotation fulcrum pin | (2 points) |
| 15 - Boom rotation cylinder foot pin | (1 point) |

ARTICULATED BOOM



- | | |
|---|------------|
| 1 - Tie-rod - bucket link pin | (1 point) |
| 2 - Tie rod - lever link pin | (1 point) |
| 3 - Bucket cylinder rod end | (1 point) |
| 4 - Bucket fulcrum pin | (1 point) |
| 5 - Lever fulcrum pin | (1 point) |
| 6 - Bucket cylinder foot pin | (1 point) |
| 7 - Arm cylinder rod end | (1 point) |
| 8 - Arm cylinder foot pin | (1 point) |
| 9 - Articulated boom fulcrum pin | (1 point) |
| 10 - Arm fulcrum pin | (1 point) |
| 11 - Articulated boom cylinder rod end | (2 points) |
| 12 - Articulated boom cylinder foot pin | (2 points) |
| 13 - Boom cylinder rod end | (1 point) |
| 14 - Boom cylinder foot pin | (1 point) |
| 15 - Boom rotation cylinder rod end | (1 point) |
| 16 - Boom fulcrum pin | (1 point) |
| 17 - Boom rotation fulcrum pin | (2 points) |
| 18 - Boom rotation cylinder foot pin | (1 point) |

29.4.b CLEANING THE MAIN AIR FILTER ELEMENT



DANGER

- Switch off the engine before removing the air filter. Never run the engine without the air filter.
- Wear safety goggles when blowing the air filter clean.



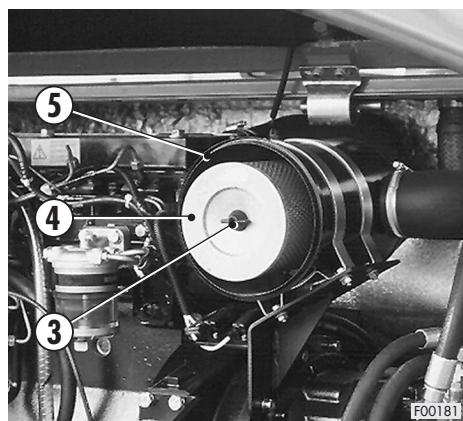
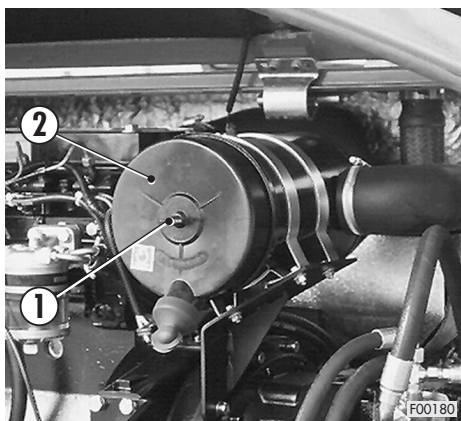
IMPORTANT

- Clean the air filter more frequently when working in dusty environments.
- Clean the air filter immediately if the air filter warning light comes on.

Open the bonnet to gain access to the air filter.

Proceed as follows to clean the air filter:

- Unscrew knob (1) and lift off cover (2).
- Remove butterfly nut (3) and pull out the main filter element (4).
- Tap the element against the palm of your hand to shake off loose dust and then blow clean with a jet of compressed air. Direct the jet onto the inside of the filter element from a distance of about 15 cm. Do not exceed an air pressure of 4÷5 bar.
- Thoroughly clean out the filter body (5), taking great care not to allow any dirt or foreign bodies to drop into the inlet manifold. Reassemble the air filter, making sure that the dust trap is located at the bottom, in vertical position.



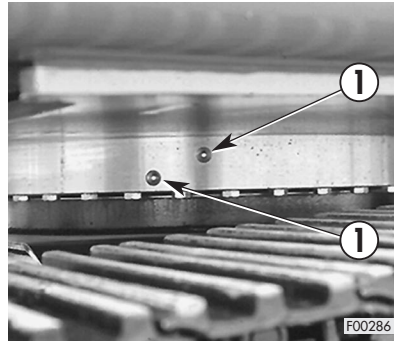
IMPORTANT

- If the air filter warning light comes on even after you have cleaned the filter element, the element must be replaced.

29.4.c GREASING THE FIFTH WHEEL

Thoroughly clean the greasing nipples (1) before applying the grease gun. Use only the recommended grease. (See section «26. FUEL, COOLANT, AND LUBRICANTS».)

When you finish, check that you have greased all the points needing it, and clean off any old grease forced out of the fifth wheel.



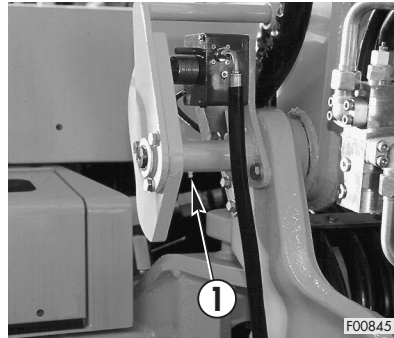
IMPORTANT

- Grease all four grease nipples (arranged at 180° one to the other) to make sure that fresh grease is evenly distributed.

29.4.d LUBRICATION OF THE OVERLOAD DEVICE CAM

Thoroughly clean the greasing nipple (1) before applying the grease gun. Use only the recommended grease. (See section «26. FUEL, COOLANT, AND LUBRICANTS».)

When you finish, check that you have greased all the point needing it, and clean off any old grease forced out.



29.5 AFTER THE FIRST 250 HOURS

- ★ Perform the following operations at the end of the first 250 hours operation in addition to those scheduled for every 250 hours.
 - CHANGE THE FINAL DRIVES OIL.
 - CHANGE THE SWING MOTOR OIL.
 - CHECK AND ADJUST THE VALVE CLEARANCE.

See the sections «EVERY 2000 HOURS» for details on these jobs.

Consult your FKI dealer to have the valve clearance checked and adjusted.

29.6 EVERY 250 HOURS

★ The following operations must be performed every 250 hours in addition to those scheduled for every 50 hours.

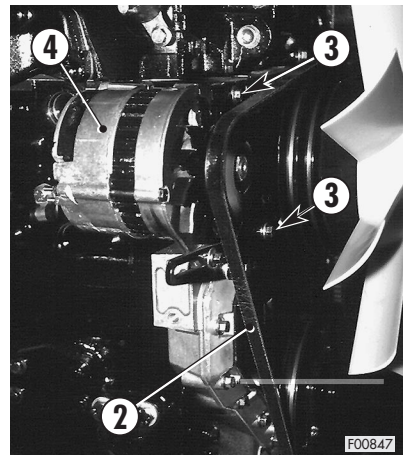
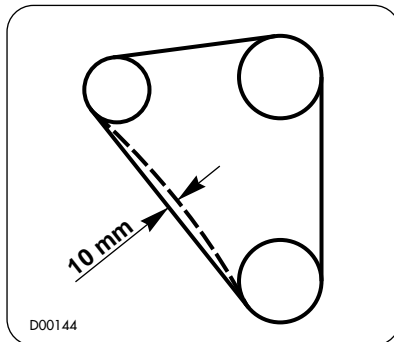
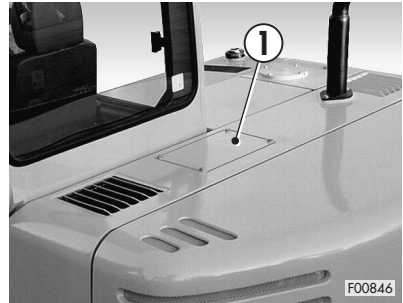
29.6.a ADJUSTING FAN BELT TENSION

The fan belt is reached through the upper structure after removing cover (1).

Push down on the longest side of the fan belt (2) with your thumb, applying a force of about 44 N (4.5 kg). The belt should give about 10 mm.

If the belt is too slack, slacken bolts (3) securing the alternator (4), place a lever between the alternator body and the engine block and lever the alternator outwards.

Re-tighten bolts (3) and re-check fan belt tension. Use the 10 and 13 mm wrench.



IMPORTANT

- If the fan belt is worn, replace it immediately. Check tension after a few hours when a new belt is fitted.

29.6.b CHECKING THE ELECTROLYTE LEVEL IN THE BATTERY



DANGER

- Switch off the engine before performing this check. If the battery has to be topped up, do so at the beginning of the day's work.

- **Always wear safety goggles and waterproof gloves when checking the battery.**
 - **Do not use naked flames, do not smoke, and do not cause sparks by short-circuiting. The hydrogen gas generated by acid batteries is highly explosive.**
 - **Battery electrolyte is a dangerous liquid. If you get it in your eyes or on your skin, wash the affected part thoroughly with clean running water and consult a doctor.**
-

To gain access to the battery (1), open the front right hand access panel on the revolving frame. The electrolyte level must reach about 6 mm above the plates in each cell. If necessary, top up with distilled water.

If electrolyte is spilled from the battery, diluted sulphuric acid must be added to maintain the concentration to suit the ambient temperatures. (See section «20.3 THE BATTERY»).



IMPORTANT

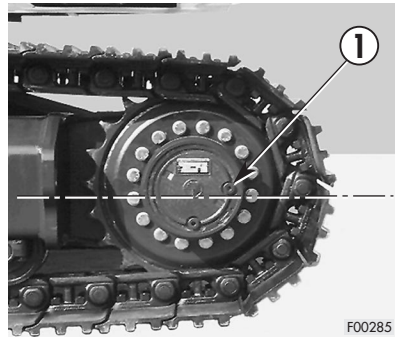
- **Only add distilled water at the start of a day's work. Weak electrolyte can freeze overnight.**
 - **Check that the breather holes in the battery cell caps are not blocked when replacing the caps.**
 - **Check that the battery terminals are not oxidised. If necessary, clean them and smear them with an anti-oxidant grease.**
-

29.6.c CHECKING THE OIL LEVEL IN THE FINAL DRIVES

This check must be repeated on both sides of the machine. The level hole must be positioned to the side of the hub to check the level.

If necessary, make small movements with the machine until the level hole is aligned perfectly along the horizontal line passing through the centre of the hub. This is essential for an accurate level check.

The oil level must reach hole (1). If necessary, top up with the recommended lubricant. (See section «26. FUEL, COOLANT, AND LUBRICANTS»). Use the 8 mm wrench.

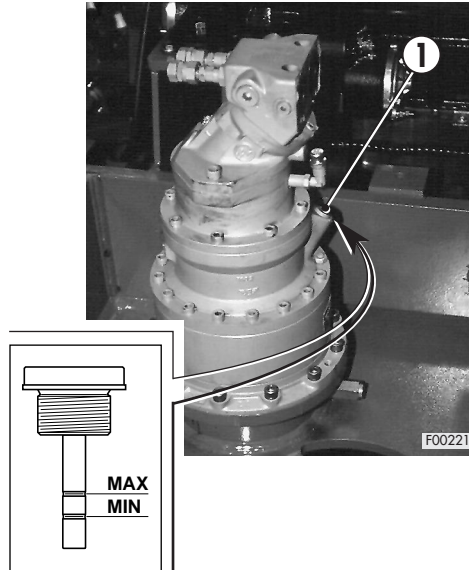


29.6.d CHECKING THE OIL LEVEL IN THE SWING MOTOR

Check the oil level on the dipstick under filler cap (1). The level must be between the MIN and MAX marks. If necessary, top up with the recommended oil.

(See section «26. FUEL, COOLANT, AND LUBRICANTS»).

Use the 8 mm wrench.



29.6.e CHANGING THE HYDRAULIC SYSTEM FILTER ELEMENT



DANGER

- The hydraulic fluid is extremely hot when the engine has just been switched off. Wait for the engine to cool to about 40÷45°C before changing the filter.
- The hydraulic system is also under pressure. Unscrew the tank filler cap slowly to release residual pressure gradually.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

The filter is fitted to the hydraulic system return line. The filter removes all the metallic particles which inevitably enter the circuit as the result of component wear.

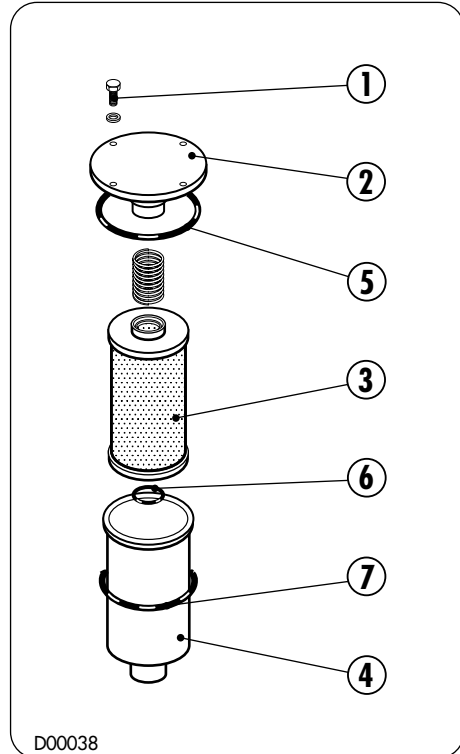
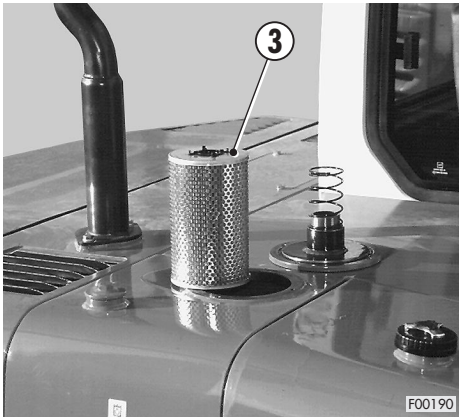
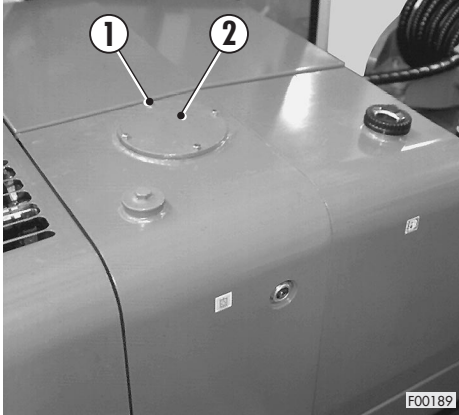
To gain access to the filter, remove the tank inspection panel. Proceed as follows to replace the filter.

- 1 - Remove bolts (1) securing the filter cover (2), and lift away the filter element (3) complete with filter body (4). Use the 13 mm wrench.
- 2 - Thoroughly clean out filter body (4) and check that the filter seal (6) and filter body seal (7) are in good condition.

SCHEDULED MAINTENANCE

3 - Fit a new filter element (3).

4 - Reassemble in the reverse order, checking that cover seal (5) is in good condition and correctly seated.



29.6.f CHANGING THE SERVOCONTROL FILTER ELEMENT



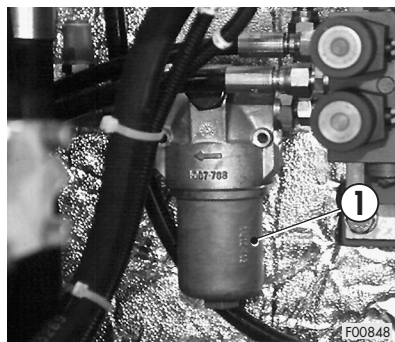
DANGER

- Hydraulic fluid is extremely hot when the engine has just been switched off. Wait for it to cool to 40÷45°C before changing the filter.
- The hydraulic system is also under pressure. Switch the engine off and move all the controls a number of times in all directions to discharge all residual pressure from the circuit.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

Replace this filter every time you replace the hydraulic system return line filter.

Open the bonnet to gain access to the servocontrol filter, and proceed as follows:

- 1 - Unscrew the filter body (1) and remove the old filter element. Use the 22 mm wrench.
- 2 - Clean all the filter parts, including the inside of the filter body (1) and fit a new filter and seal. Reassemble in the reverse order.



IMPORTANT

- Start the engine and leave it idle for 2÷3 minutes after the new filter is fitted.

29.6.g CHANGING THE ENGINE OIL

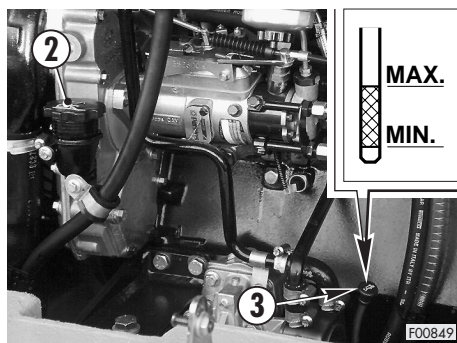
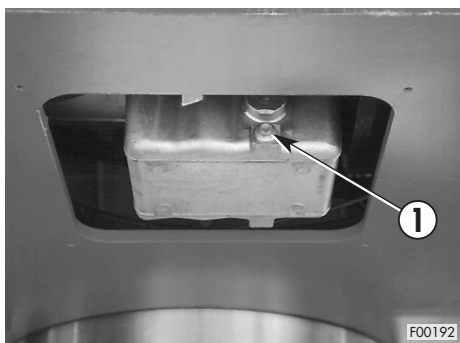


DANGER

- The engine oil is extremely hot when the engine has just been switched off. Leave it cool to 40÷45°C before draining it off.
- Oil spilled during oil changes can cause people to slip. Wear anti-slip shoes, and clean up spilled oil immediately.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

To drain off the old oil, remove drain plug (1) from the sump. Also remove filler cap (2) to enable the oil to flow out more easily. When all the old oil has drained out, replace drain plug (1) and fill the engine with the specified quantity of new oil. Check that the level comes up to the MAX mark on the dipstick (3). Use the 16 mm wrench.

Replace the filler cap. Run the engine for 5 minutes; switch off again and check the oil level. Top up if necessary. Use oil suitable to the ambient temperatures. (See section «26. FUEL, COOLANT, AND LUBRICANTS»).



29.6.h CHANGING THE ENGINE OIL FILTER



DANGER

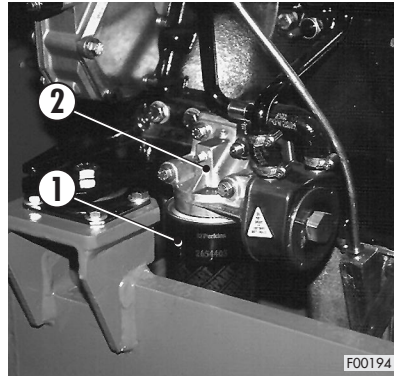
- The engine oil is extremely hot when the engine has just been switched off, and can cause burns. Wait for it to cool to 40÷45°C before draining the oil.
- Oil spilled during oil changes can cause people to slip. Wear anti-slip shoes and clean up spilled oil immediately.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

Change the oil filter every time you change the engine oil.

Proceed as follows:

- 1 - Remove the old oil filter (1) using the filter wrench provided and dispose of it correctly.
- 2 - Clean the filter seat (2).
- 3 - Fill the new filter with engine oil. Oil the seal and screw the filter into place until the seal grips firmly.
- 4 - Hand-tighten one extra half turn.

Start the engine and check that there are no leaks. Also check that the oil pressure warning light goes out.



IMPORTANT

- Do not use the filter wrench to tighten the filter into place. This can damage the filter or seal and cause leaks.
-

29.7 EVERY 500 HOURS

- ★ Every 500 hours, perform the following maintenance operations in addition to those scheduled for every 50, 100, and 250 hours.

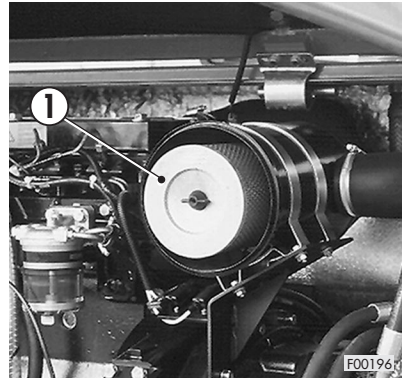
29.7.a CHANGING THE MAIN AIR FILTER ELEMENT



DANGER

- Switch the engine off before removing the filter (1). Never run the engine without the air filter in place.

Remove the air filter element as instructed in point 29.4.b for 100 hour maintenance, but fit a new element in its place.



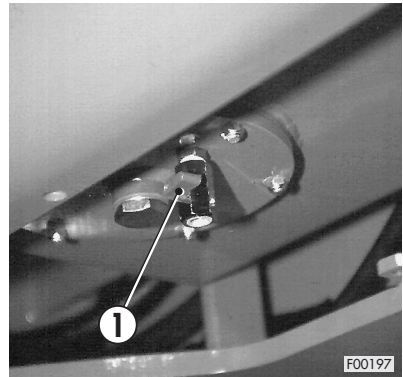
29.7.b DRAINING THE FUEL TANK



DANGER

- Take great care to avoid spillages when draining the fuel tank. Spilled diesel fuel is a fire hazard.
- Clean up any spillages immediately to prevent fires and accidents.

The fuel must be periodically drained to remove the dirt and condensation when inevitably accumulates inside the tank. Remove the access panel and open cock (1) at the bottom of the tank. Wait for clean fuel to flow out before re-closing the cock. Use the 17 mm wrench.



IMPORTANT

- At ambient temperatures above 0°C, drain the fuel before starting the engine. At ambient temperatures below 0°C, drain the fuel at the end of the day's work, or in any case when the machine is warm, so that any water in the tank will not be frozen.
 - Perform this operation before refuelling.
-

29.7.c CLEANING THE OUTSIDE OF THE RADIATOR



- **Jets of compressed air, steam or water can cause injuries. Always wear protective goggles and safety shoes.**
-

Blow the radiator and hydraulic system heat exchanger group clean with a jet of compressed air. If necessary, use a low pressure jet of steam or water. There are a number of proprietary products for cleaning radiators. If using these products, always follow the manufacturer's instructions. Dry all wet parts on completion of washing.



- **Do not use products containing oils, even in small quantities, since these cause dust and dirt to stick the radiator, thus reducing its efficiency.**
 - **Wash the radiator and hydraulic system heat exchanger-group immediately if it becomes fouled with oil, diesel fuel, or other oily or greasy substances.**
-

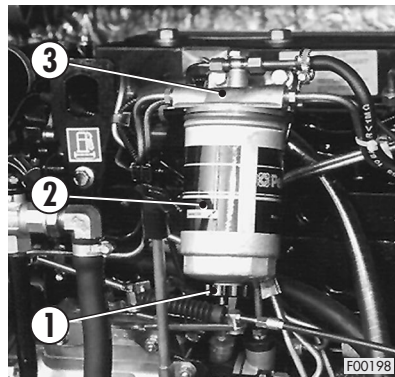
29.7.d CHANGING THE FUEL FILTER AND CLEANING THE FUEL PUMP'S GAUZE FILTER



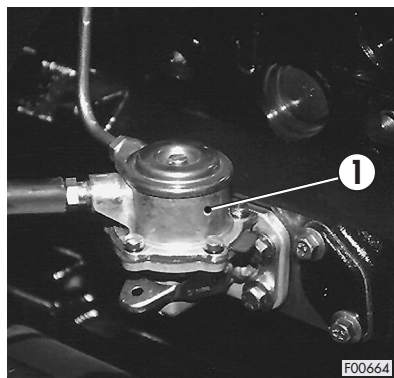
- **Wait for the engine to cool to 40÷45°C before changing the fuel filter.**
 - **Fuel may be spilled during this operation. Clean up all spillages immediately to prevent fires and accidents.**
 - **Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.**
-

THE FUEL FILTER

- 1 - Clean the outside of the filter and then open cock (1) to drain off the fuel from inside filter body (2).

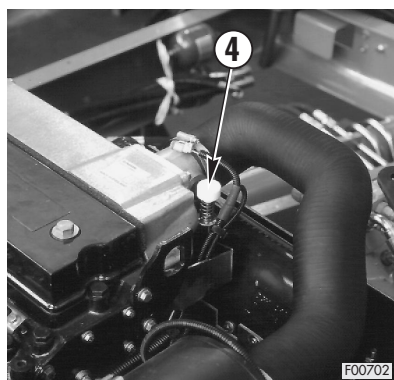


- 2 - Use the filter wrench provided to remove the filter. Dispose of the old filter correctly.
- 3 - Clean the inside of the filter seat (3), and check that the filter alignment dowel is secure in its seat.
- 4 - Smear the seals of the new filter element with clean diesel fuel and screw the element in to the filter seat until the seal grips.
- 5 - Tighten a further half turn by hand.
- 6 - Bleed the air from the fuel circuit.



FUEL PUMP GAUZE FILTER

- 1 - Remove the cover and seal (2) from fuel pump (1), and remove the gauze filter (3).
- 2 - Thoroughly clean inside the pump (1) and also clean the gauze filter (3) and cover and seal (2).
- 3 - Reassemble, checking that the seal is in perfect condition and correctly seated.
- 4 - Bleed the air from the fuel circuit.



BLEEDING AIR FROM THE FUEL CIRCUIT

- 1 - Turn the ignition key to position «I».
- 2 - Press and hold down the fuel pump push-button (4) for about 2 minutes.



IMPORTANT

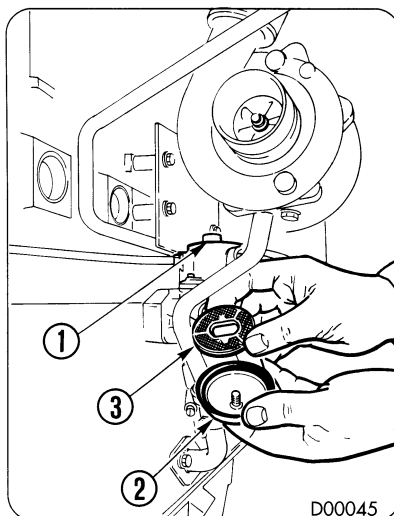
- If the fuel pump push-button (4) does not move, crank the engine through one complete revolution.

-
- 3 - Start the engine.



IMPORTANT

- If the engine starts normally but then runs roughly or stops, check for air in the fuel circuit. If air is found, check the seal of the fuel filter and fuel pump.
-



29.7.e CHECKING THE GREASE LEVEL IN THE FIFTH WHEEL PINION GEAR



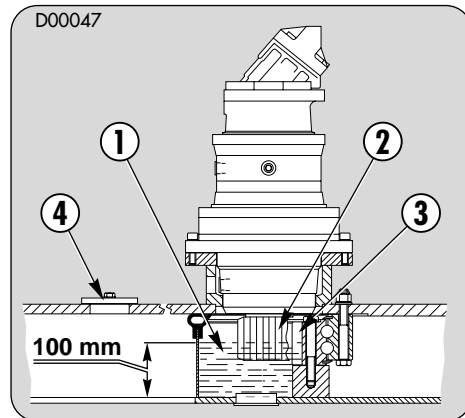
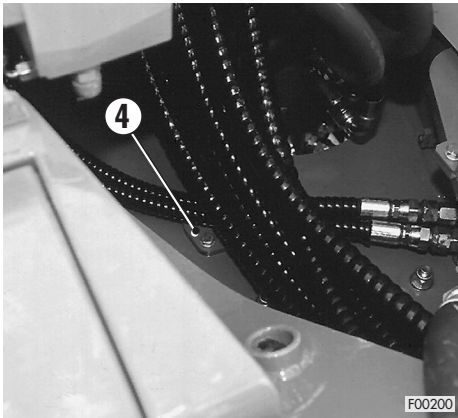
IMPORTANT

- Perform this check while the machine is still hot after a day's work, i.e. when hot.

Check the level of the grease in tank (1) in which the pinion gear (2) and fifth wheel (3) are housed.

Remove access panel (4) and check the depth of the grease with a graduated rule. The grease must cover the gear teeth to half their depth, i.e. a depth of about 100 mm. Use the 17 mm wrench.

Also check that the grease is not dirty. If necessary change the grease. (See section «29.9.d CHANGING THE GREASE IN THE FIFTH WHEEL PINION GEAR»).



29.8 EVERY 1000 HOURS

- ★ Perform the following operations every 1000 hours in addition to those scheduled for every 50, 100, 250, and 500 hours.

29.8.a CHANGING THE AIR FILTER BACKUP ELEMENT

**DANGER**

- **Switch the engine off before removing the air filter. Never run the engine without the air filter in place.**
-

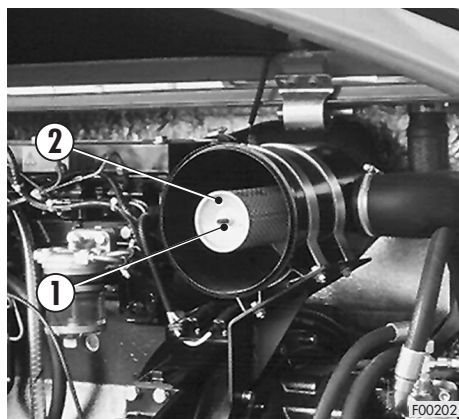
Remove the air filter as instructed in section 29.4.b for 100 hour maintenance. Remove the main air filter element and then proceed as follows:

- 1 - Remove the securing nut (1), washer, and seal. Use the 13 mm wrench.
- 2 - Remove the old backup element (2) and fit a new one.
- 3 - Secure the element with the seal, washer, and securing nut (1).

**IMPORTANT**

- **Replace the seal if it shows any signs of wear.**
-

- 4 - Reassemble the air filter.



29.9 EVERY 2000 HOURS

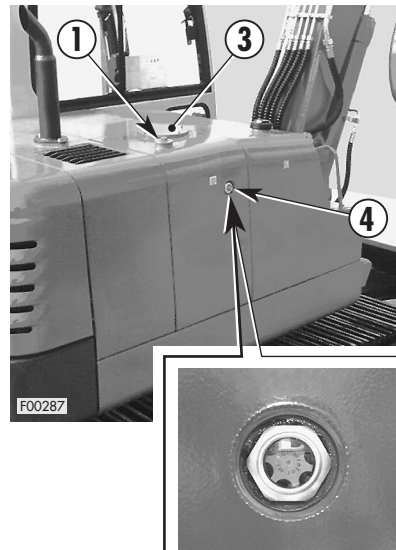
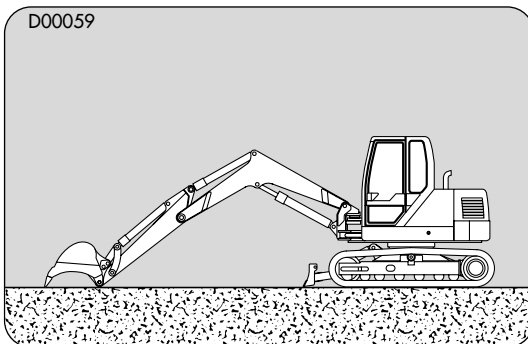
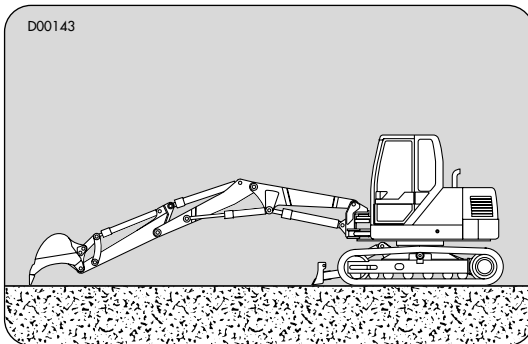
★ Perform the following operations every 2000 hours in addition to those scheduled for every 50, 100, 250, 500, and 1000 hours.

29.9.a CHANGING THE HYDRAULIC FLUID

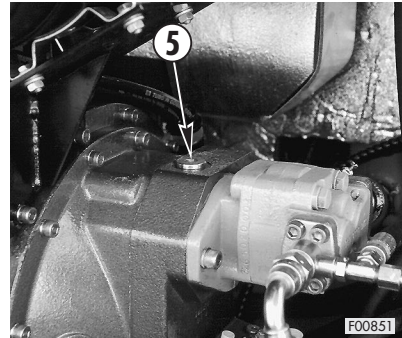
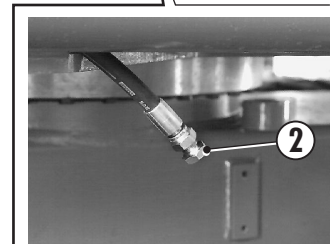


DANGER

- Fully retract the bucket and arm cylinders, extend the articulated boom cylinders and rest the bucket teeth on the ground. Switch off the engine and eliminate all residual pressure by moving the controls a number of times and slowly unscrewing the tank cap.
- Wait for the hydraulic fluid to cool to 40-45°C before draining it off.
- Clean up any spillages immediately.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.



- 1 - Remove filler cap (1). Use the 24 mm wrench.
- 2 - Remove the bottom cover under the fuel tank, remove drain plug (2) and drain all the old fluid out into a suitable container.
Use the 17 and 27 mm wrench.
- 3 - Remove the hydraulic tank inspection panel (3) and fit a new filter (See section «29.6.e CHANGING THE HYDRAULIC SYSTEM FILTER»). Use the 13 mm wrench.
- 4 - Replace the drain plug (2) and tank inspection panel (3), checking that the panel seal is in good condition and correctly seated.
- 5 - Fill the system with new fluid of the type recommended, up to level inspection window (4).
- 6 - Open the engine bonnet, loosen the pump bleed screw (5), expel any remaining air from the oil.
Use the 12 mm wrench.
Tighten screw (5).
- 7 - Replace filler cap (1) and start the engine. Operate every hydraulic cylinder a number of times to remove air from the system. Check the level again and top up if necessary.
Use only the recommended fluid for filling the system. (See section «26. FUEL, COOLANT, AND LUBRICANTS»).
- 8 - Replace the bottom cover under the fuel tank.



IMPORTANT

- **Never start the engine while the hydraulic tank is empty, since this would cause certain damage to the pump.**

29.9.b CHANGING THE FINAL DRIVES OIL

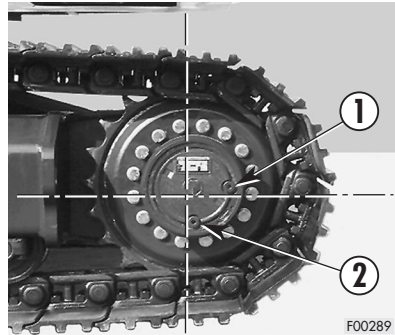


DANGER

- **Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.**

Park the machine on firm, level ground. The machine should be hot after a day's work so that the oil flows out readily, carrying with it all solid particles in suspension.

- 1 - Slowly move the machine until the drain plug (2) is located at the bottom of the hub and the level hole (1) is aligned along the horizontal line passing through the centre of the hub.
- 2 - Remove drain plug (2) and drain out all the old oil. Also remove filler plug (1) to help the oil flow out more easily. Use the 8 mm wrench.
- 3 - When all the old oil has drained out, replace drain plug (2) and fill the axle with the recommended oil through filler hole (1) until oil starts to flow out of the filler hole.
- 4 - Replace filler plug (1).



Drive the machine for a while, then stop and check the level again.

Use only the recommended oil. (See section «26. FUEL, COOLANT, AND LUBRICANTS»).

29.9.c CHANGING THE SWING MOTOR OIL



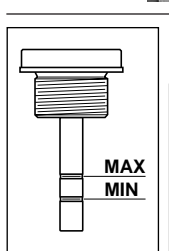
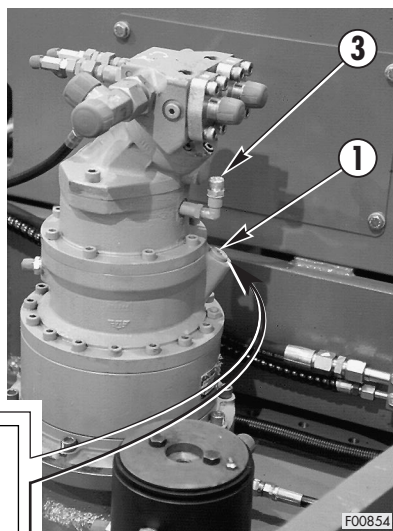
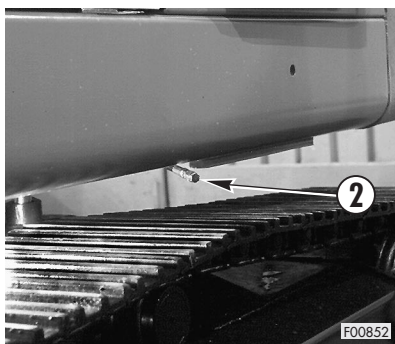
DANGER

- **Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.**

This operation must be performed at the end of a day's work when the machine is still hot, so that the oil drains easily, taking with it any solid particles in suspension. The machine must be parked on firm, level ground.

- 1 - Remove the cab lower cover, remove drain plug (2) and drain out all the old oil. Use the 16, 17 and 19 mm wrench.
Also remove level plug (1) and breather plug (3) which also serves as filler.
Use the 8 and 19 mm wrench.

- 2 - When all the old oil has drained out, replace drain plug (2) and fill the gearbox with the recommended oil through filler hole (3), until the level reaches the MAX mark on the dipstick of level plug (1).
- 3 - Replace plugs (1) and (3). Rotate the revolving frame a few times and check the oil level again with the machine stationary.
Use only the recommended oil. (See section «26. FUEL, COOLANT, AND LUBRICANTS»).
- 4 - Replace the cab lower cover.



29.9.d CHANGING THE GREASE IN THE FIFTH WHEEL PINION GEAR



DANGER

- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.
-

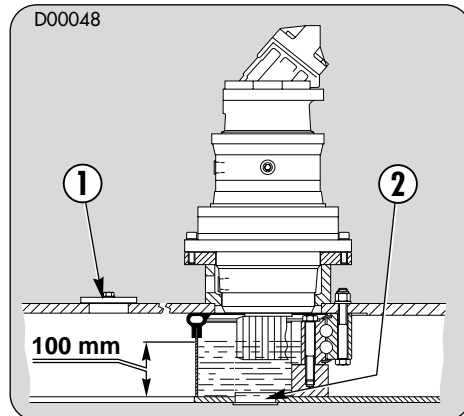
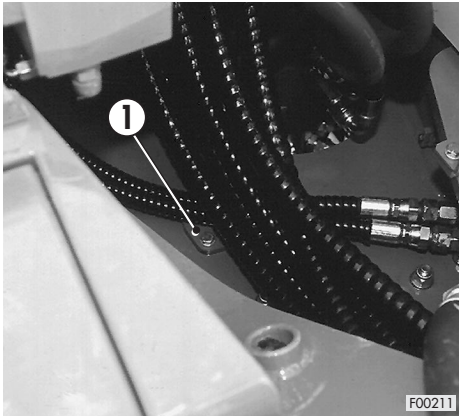


IMPORTANT

- This operation must be performed with the machine parked on firm, level ground, while still hot after a day's work.
-

Proceed as follows:

- 1 - Place a suitable container under drain plug (2). Remove the filler and inspection panel (1) and the drain plug (2) to drain off the old grease. Use the 17 mm wrench.
- 2 - Use the suction pump provided in the tool-kit to suck out all remaining grease.
- 3 - Replace drain plug (2).
- 4 - Inject new grease of the recommended type (see section «26. FUEL, COOLANT, AND LUBRICANTS») until the grease level reaches half way up the fifth wheel teeth, i.e. a depth of about 100 mm.
- 5 - Replace the filler and inspection panel (1). Check the level of the grease again after about two hours work.



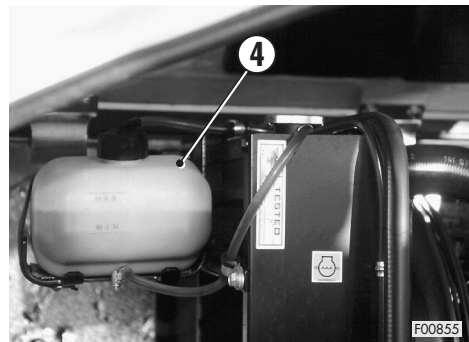
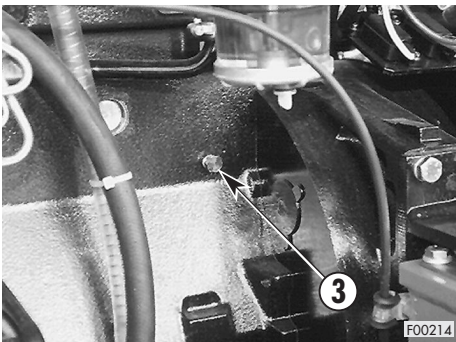
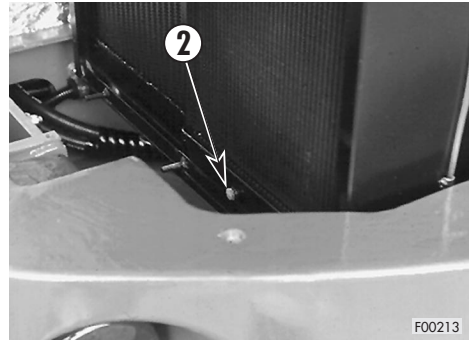
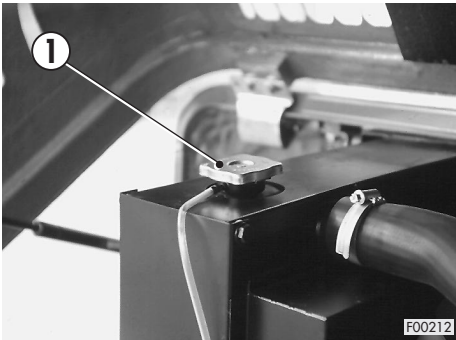
29.9.e CHANGING THE COOLANT



- When the machine has just been stopped, the engine coolant is very hot and still under pressure, and can cause serious burns. Wait for the engine to cool to about 40÷45°C before draining the coolant.
- Slacken off the radiator cap slowly to release residual pressure from the tank.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

The following operations refer to changing permanent coolant. If your cooling system is filled with water or a water and anti-freeze mix, wash out the cooling circuit to prevent it furring up. (See section «29.10.a WASHING OUT THE COOLING SYSTEM»).

- 1 - Unscrew the radiator cap (1) slowly and remove it.
- 2 - Remove the radiator drain plug (2), unscrew the drain plug (3) on the engine block and drain off all the old coolant. Use the 13 and 14 mm wrench. While the coolant is draining out, empty the coolant tank (4).



SCHEDULED MAINTENANCE

- 3 - Replace the drain plug (2) and replace the cylinder block drain plug (3). Refill the system with new coolant. (See section «26. FUEL, COOLANT, AND LUBRICANTS»).
- 4 - Start the engine and leave it idle for a few minutes. Check the coolant level again and top up as necessary. Replace the filler cap (1).
- 5 - Refill the expansion chamber (4) to the maximum level mark.

29.9.f CHECKING ENGINE VALVE CLEARANCE

Consult your FKI dealer to have this check performed.

29.9.g CHECKING THE ALTERNATOR AND STARTER MOTOR

Consult your FKI dealer to have this check performed.

29.10 OCCASIONAL MAINTENANCE

29.10.a WASHING OUT THE COOLING SYSTEM



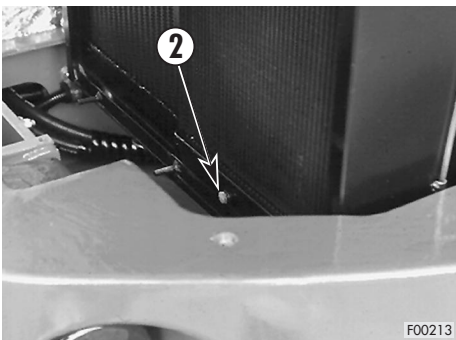
DANGER

- Take special care when performing this operation, since the engine must be left running. Have an operator stay in the driving seat and agree on all possible instructions in advance.
- When the machine has just been stopped, the engine coolant is very hot and still under pressure, and can cause serious burns. Wait for the engine to cool to about 40÷45°C before draining the coolant.
- Slacken off the radiator cap slowly to release residual pressure from the tank.
- Make sure that all equipment safety locks are engaged, and that the working brake is engaged.
- Lubricants, filters, coolants, and batteries are special waste products and must be disposed of in compliance with local waste disposal laws.

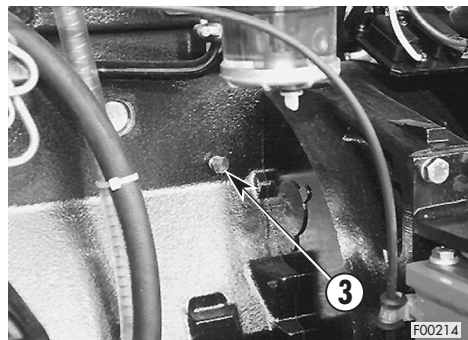
Every time you switch from water to a water and anti-freeze mix or vice-versa, the cooling system must be washed out to prevent encrustations from building up.

Proceed as follows:

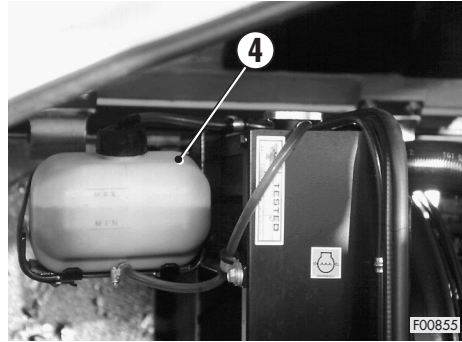
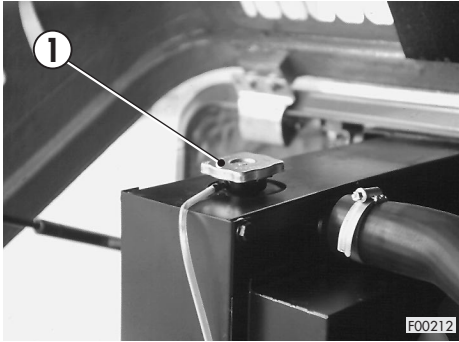
- 1 - While the coolant is still warm, remove the radiator drain plug (2), the engine block drain plug (3), and the radiator filler cap (1). Use the 13 and 14 mm wrench.
- 2 - Drain out all the old coolant, and replace the engine block drain plug (3) and radiator drain plug (2).
- 3 - Add a good quality flushing product to the radiator, following the manufacturer's instructions, and top up with water. The cooling system has a total capacity of 24 litres.



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- 4 - Start the engine and run it at high revs for about 15 minutes.
- 5 - Decelerate the engine to a fast idle and drain off the flushing mixture from the radiator drain plug (2) while refilling with clean running water for at least 40 minutes;
- 6 - Switch off the engine and drain off all the water from the cooling system. Replace and tighten the radiator drain plug (2) and fill the system with water or permanent coolant.
- 7 - Start the engine and check the level of coolant in the radiator after a few minutes. Top up if necessary. Replace filler cap (1).
- 8 - Wash out the expansion chamber (4) and top up with water or permanent coolant to a level between the minimum and maximum level marks.



IMPORTANT

- If the water used to fill the cooling system is a hard water, wash the system out more frequently.
-

29.10.b ADJUSTING TRACK TENSION

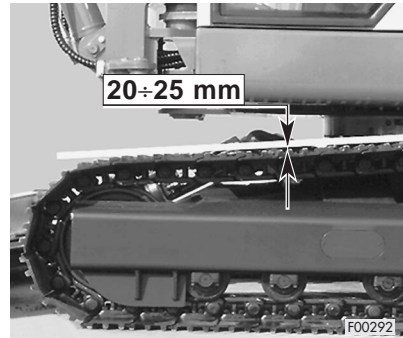


DANGER

- The grease in the tensioning cylinder is under pressure. Do not unscrew the greasing nipple (1) for more than one turn. If the greasing nipple is unscrewed fully, grease may be blown out under pressure, causing serious injury. Also, be careful not too loose any part other than the greasing nipple (1).
 - If it proves very difficult to pump grease into the greasing nipple, drive the track in question briefly in forward and reverse and try again.
-

CHECKING TRACK TENSION

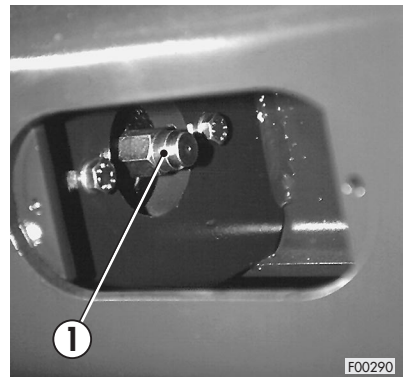
Park the machine on firm, level ground and lower the equipment. Place a straight bar on top of the track with one end resting on the track idler and the other on the middle carrier roller. Measure the gap between the shoe and the bar at the point of greatest sag. The gap should be between 20 and 25 mm. If the gap is outside these tolerances, adjust track tension as necessary.



ADJUSTING TRACK TENSION

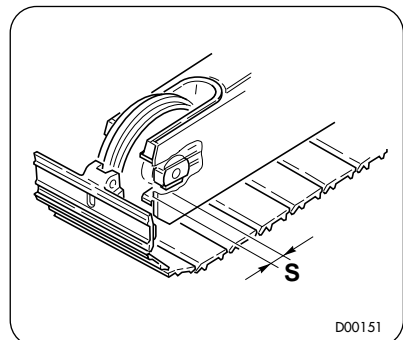
Increasing tension

- 1 - Remove the track tensioner cover bolts and lift off the track tensioner cover. Use the 5 mm wrench.
- 2 - Pump grease into the greasing nipple (1) until the correct tension is obtained.
- 3 - If the head of the track tensioner reaches position «S» at 25 mm, and the track is still not tight enough, the bushings and pins of the track chain are worn and must be turned around or replaced. Contact your FKI dealer whenever tracks require repair or replacement.



Decreasing tension

- 1 - Remove the track tensioner cover and slowly unscrew the greasing nipple (1) to leave some grease out. Do not unscrew the greasing nipple more than one turn. Use the 5 and 27 mm wrench.
- 2 - If the grease does not come out easily, drive the track in question briefly in forward and reverse.
- 3 - Retighten the greasing nipple and clean off excess grease from around it.
- 4 - Drive the machine a short distance in forward and reverse, then stop and check track tension again.





IMPORTANT

- The rate at which the track pins and bushings wear depends on the operating conditions and the type of ground. Check and adjust track tension regularly to maintain efficiency.
 - When working on stony ground, increase track tension slightly to prevent stones from getting between the track chains and the drive sprockets. On soft or muddy ground on the other hand, reduce track tension slightly since mud and earth inevitably penetrates between the rollers, sprockets, and chains and tends to increase tension.
-

29.10.c CHECKING THE SECURITY OF THE TRACK SHOES

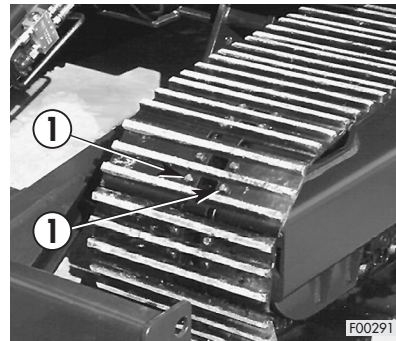


IMPORTANT

- Check the tightness of shoe fixing bolts (1) after the first 30 hours work. Perform the next check after 100 hours, and again after 200 hours if loose bolts are detected.
 - Operating with slack shoe fixing bolts shortens the working life of the tracks.
-

Check the tightness of the shoe fixing bolts with the machine parked on firm, level ground. Use a suitable torque wrench. (See section «27.2 SPECIAL TIGHTENING TORQUES»).

Use the 19 mm wrench.



30. EXTENDED PERIODS OF DISUSE

30.1 PREPARING TO LAY UP THE MACHINE

If the machine is not going to be used for an extended period of time, park it in a secure shelter and take the following precautions to keep it and all its components in good working order.

- 1 - Thoroughly wash the machine, and touch up any damaged paint-work to stop rust setting in.
- 2 - Drain off and replace the hydraulic fluid and all lubricant oils (engine, final drives) as instructed in the relevant maintenance sections.
- 3 - Replace all filters (air filter, engine oil filter, hydraulic circuit filters, fuel filter).
- 4 - Drain off the old coolant and refill the cooling system with a permanent coolant containing a rust-inhibiting agent.
- 5 - Drain the fuel tank, and add about 10 litres of special flushing fuel.
Run the engine for about 10 minutes to use up all the normal fuel in the filters, pump, and fuel lines. This prevents the pump and injectors from seizing up during the idle period.
Switch off the engine and refill the tank with normal diesel fuel.
- 6 - Remove the battery, and check the electrolyte and charge levels.
Store the battery in a warm area and re-charge it periodically.
- 7 - Smear protective grease over all the hydraulic cylinder rods. Grease all equipment joints and articulations.
- 8 - Seal the opening of the exhaust pipe and the fuel tank filler.
- 9 - Attach clear warning notices to the machine controls.
- 10 - Lock the cab door, fuel cap, and bonnet.

30.2 PREPARING THE MACHINE FOR USE

- 1 - Unblock the exhaust pipe and fuel filler cap.
- 2 - Check all fluid levels (engine oil, coolant, fuel, hydraulic fluid).
- 3 - Make sure that the battery is fully charged, replace and re-connect it.
- 4 - Disconnect the engine stop solenoid.
- 5 - Turn the ignition key directly to START position and hold until the low oil pressure warning light goes out. This operation ensures that oil is circulated to all moving parts of the engine before the engine starts.
- 6 - Re-connect the engine stop solenoid.
Start the engine and run at a fast idle for about 15 minutes.
- 7 - As the engine is warming up, clean the hydraulic rams.
- 8 - Check that the instruments, warning lights, function indicators, and working floodlights are all working correctly.
- 9 - As soon as possible, move all the hydraulic cylinders a few times to warm up the hydraulic system.
- 10 - Drive the machine slowly and test the brakes a few times.

**AUTHORISED
OPTIONAL
EQUIPMENT**

31. AUTHORISED OPTIONAL EQUIPMENT



CAUTION

- As well as the standard working equipment, FKI machines can be fitted with optional equipment. If optional equipment is installed and used, read the relative operating manual carefully, and rigorously follow the instructions it provides.
- Use only optional equipments which are recommended and approved by FKI and whose characteristics are indicated on the table herebelow.
- FKI cannot be held responsible for any damage, accident, or reduction in the machine's efficiency deriving from the fitting and use of non-authorized equipment.

31.1 OPTIONAL EQUIPMENT CHARACTERISTICS (Material density = 1.8 ton/m³)

EQUIPMENT	MAX WEIGHT (kg)	DIMENSION MAX		MAX CAPACITY SAE (m ³)	WORKING PRESSURE (bar)	MAX OIL FLOW (ℓ/min.)
		Width (mm)	Height (mm)			
General purpose bucket	200	900	—	0.30	—	—
Ditch cleaning bucket	180	1500	—	0.20	—	—
Ditching bucket	250	1650	850	0.25	—	—
Swivelling bucket	300	1500	1000	0,20	200	20
Clamshell bucket	■ 300	400	1000	0.20	200	30
Hydraulic hammer	380	—	1400	—	200	84

■ Inclusive of hydraulic rotation motor

32. DEMOLITION HAMMER



DANGER

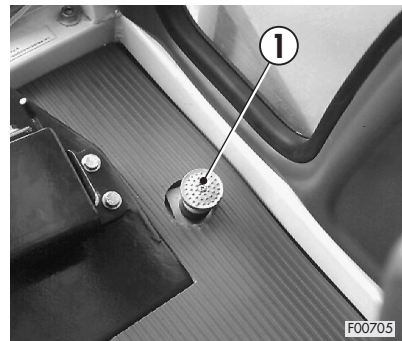
- See section 31.1 OPTIONAL EQUIPMENT SPECIFICATIONS for the technical specifications of the demolition hammer.
- All demolition hammers inevitably make a lot of noise. Wear hearing protection when working with demolition hammers.

32.1 DESCRIPTION AND OPERATION

A demolition hammer can be fitted to the end of the arm in place of the standard bucket.

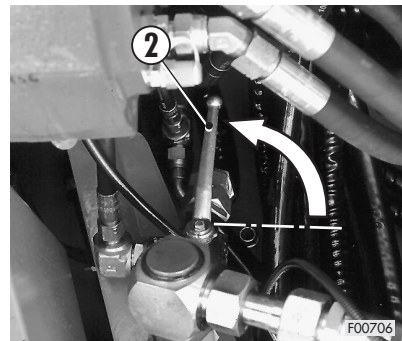
The hammer is controlled by push-button (1) on the floor of the cab alongside the boom swing pedal.

Press and hold down push-button (1) with your foot to operate the demolition hammer. Simply release the button to stop the hammer.



CAUTION

- Before you start work with the demolition hammer, make sure that the selector lever (2) is turned anti-clockwise as far as it will go.



32.2 FITTING AND REMOVING THE DEMOLITION HAMMER

32.2.1 FITTING THE DEMOLITION HAMMER



DANGER

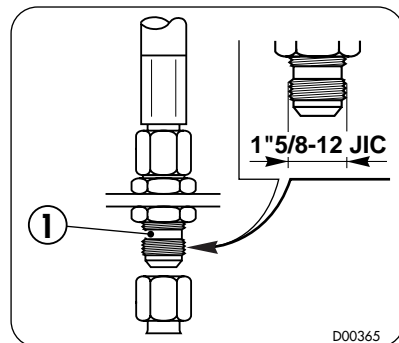
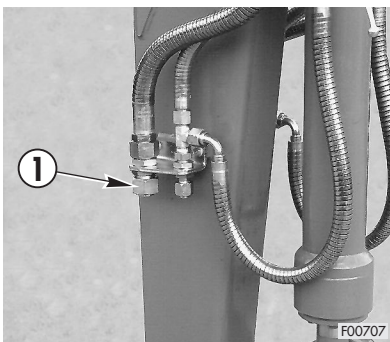
- Park the machine on firm, level ground and lower the equipment to the ground before starting to fit the demolition hammer.

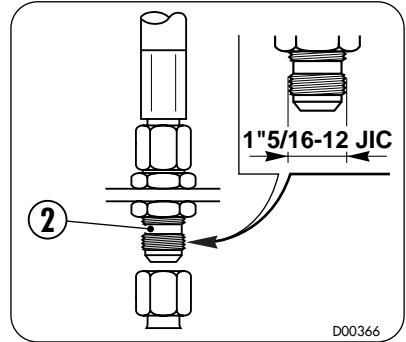
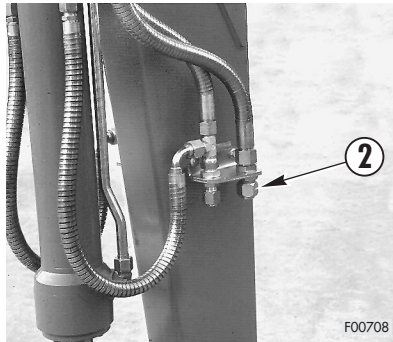
- Lay the demolition hammer flat on the ground, with the tip facing the machine.
- Wear thick gloves, safety goggles and a hard hat when fitting the demolition hammer. Splinters of metal can form when the coupling pins are fitted and removed.
- Two people are required to fit and remove the demolition hammer. Agree on instructions and signals before you start work.
- Never use your fingers to check on the alignment of holes. Fingers can easily be sheared by unexpected movement.
- Move all the controls a few times and remove the hydraulic tank filler cap to eliminate all residual pressure from the hydraulic system before starting to fit the demolition hammer.
- Clean up any oil or fluid spillages immediately.

Couple the demolition hammer to the arm as instructed in section 22.5.1 UNCOUPLING BUCKETS.

After the hammer has been mechanically fitted, connect up the hydraulic lines as follows:

- 1 - Stop the engine and move all the controls a few times to release all residual pressure from the hydraulic system.
- 2 - Turn the ignition key to position «I» and press down on the hammer control push-button to release all residual pressure from the hammer circuit.
- 3 - Return the ignition key to position «O» and remove the key.
- 4 - Using 41 and 50 mm spanners, remove the plugs from the hydraulic hoses of the hammer circuit on the machine and on the hammer itself.
- 5 - Make sure that the sizes of the unions correspond and connect the right hand hose to union (1) and the left hand hose to union (2).

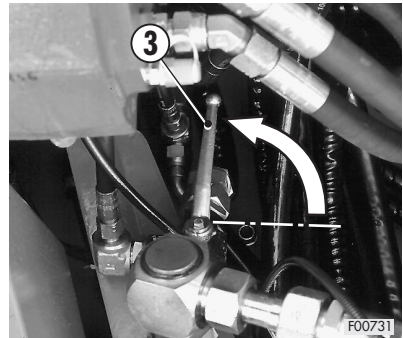




CAUTION

- Take great care to prevent dirt from entering the hydraulic hoses when making the connections.

6 - Turn the selector lever (3) anti-clockwise as far as it will go.



- 7 - Start the engine and lift the demolition hammer into a vertical position.
- 8 - Switch off the engine again. Grease the joints connecting the hammer to the arm (see section 29.4 GREASING THE ARTICULATIONS). Also grease all points on the hammer requiring lubrication (see the hammer's own technical documentation for details).
- 9 - Check all hydraulic seals for tightness before starting work.



DANGER

- Wear thick gloves and safety goggles when searching for leaks in the hydraulic system.
- Use a piece of cardboard or wood to search for hydraulic leaks, NOT your hands.

32.2.2 REMOVING THE DEMOLITION HAMMER

Proceed as follows to remove the demolition hammer.

- 1 - Park the machine on firm, level ground and deposit the demolition hammer flat on the ground where it can rest securely when removed.
- 2 - Switch off the engine and move all the controls a few times to release any residual pressure from the hydraulic system.
- 3 - Turn the ignition key to position «I» and press down on the demolition hammer control push-button to release pressure from the hammer circuit.
- 4 - Return the ignition key to position «O» and remove it.
- 5 - Use 41 and 50 mm spanners to disconnect the delivery and return hoses from the hammer.
- 6 - Seal the ends of the hoses with sealing plugs.



DANGER

- **Make sure that the sealing plugs are tight. If the hammer circuit is accidentally pressurised, jets of hydraulic fluid can escape from loose plugs and can cause serious injury if they come into contact with the skin or eyes.**
 - **Wear thick gloves and safety goggles when searching for leaks in the hydraulic system.**
 - **Use a piece of cardboard or wood to search for hydraulic leaks, NOT your hands.**
-

- 7 - Remove the coupling pins to remove the hammer. See section 22.5.1 UNCOUPLING BUCKETS.

33. CLAMSHELL BUCKET



- See section 31.1 **OPTIONAL EQUIPMENT SPECIFICATIONS** for the technical specifications of the clamshell bucket.
- The clamshell bucket can swivel at the end of the arm. Allow more space when working to allow for this movement.

33.1 DESCRIPTION AND OPERATION

A clamshell bucket can be fitted to the arm in place of the standard bucket.

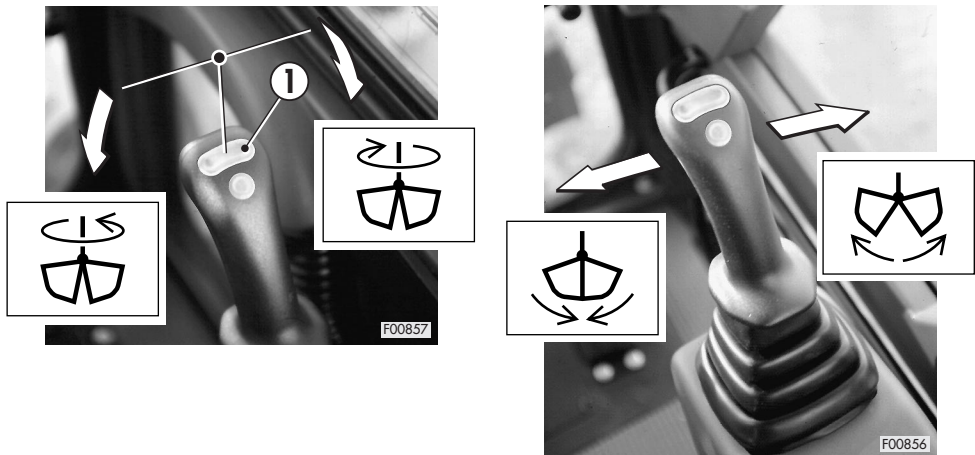
Bucket rotation is powered by an independent circuit. The bucket's opening and closing action is powered by the standard bucket tilting circuit, with the control cylinder excluded. See section 33.2 **FITTING THE CLAMSHELL BUCKET**.

The fitting of the clamshell bucket does not affect any other excavator controls (arm, boom, and revolving frame swing). See section 13.2.1 **MACHINE CONTROLS**.

The clamshell bucket is rotated by the rocker switch (1) on the right hand equipment control lever.

This switch functions as follows:

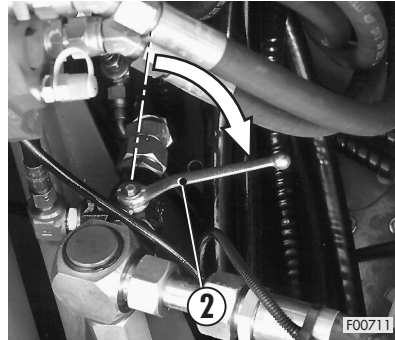
- 1 - Press to the right to rotate the clamshell bucket clockwise.
- 2 - Press to the left to rotate the clamshell bucket anti-clockwise.





CAUTION

- Before starting work with the clamshell bucket, make sure that the selector lever (2) is turned clockwise as far as it will go.
-



33.2 FITTING THE CLAMSHELL BUCKET



DANGER

- Park the machine on firm, level ground and lower the equipment to the ground before starting to fit the clamshell bucket.
 - Wear thick gloves, safety goggles and a hard hat when fitting the clamshell bucket. Splinters of metal can form when the coupling pins are fitted and removed.
 - Two people are required to fit and remove the demolition hammer. Agree on instructions and signals before you start work.
 - Never use your fingers to check on the alignment of holes. Fingers can easily be sheared by unexpected movement.
 - Move all the controls a few times and remove the hydraulic tank filler cap to eliminate all residual pressure from the hydraulic system before starting work.
 - Clean up any oil or fluid spillages immediately.
-

Proceed as follows to fit the clamshell bucket:

- 1 - Remove the standard bucket as instructed in section 22.5.1 UNCOUPLING BUCKETS.
- 2 - Fully retract the bucket control cylinder.
- 3 - Couple the clamshell bucket to the end of the arm.
- 4 - Stop the engine and move all the controls a few times to release all residual pressure from the hydraulic system.
- 5 - Turn the ignition key to position «I» and operate the clamshell bucket rotation switch to release all residual pressure from the rotation circuit.
- 6 - Return the ignition key to position «O» and remove the key.
- 7 - Lock the standard bucket thrust lever in place with the piston at the end of its stroke.

8 - Turn cock (1) clockwise as far as it will go.

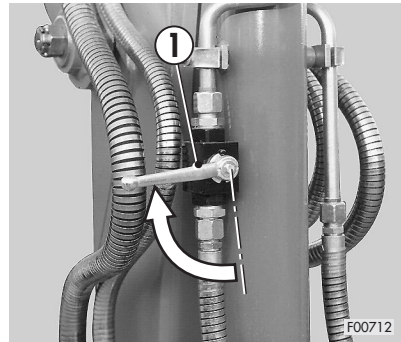


CAUTION

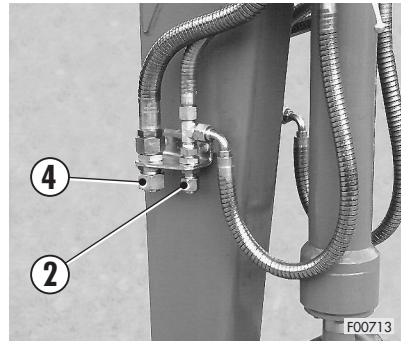
- Take great care to prevent dirt from entering the hydraulic hoses when making the connections.

9 - Using 32, 41 and 50 mm spanners, remove the plugs from the hydraulic hoses of the clamshell bucket circuit on the machine and on the bucket itself.

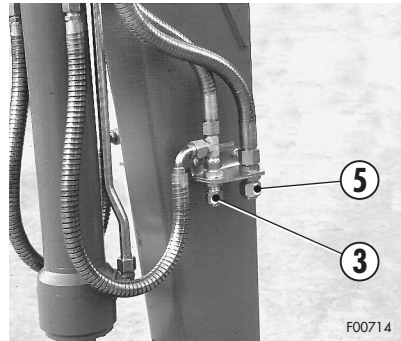
10 - Make sure that the sizes of the unions correspond and connect up the opening/closing unions (2) and (3), and those for bucket rotation (4) and (5).



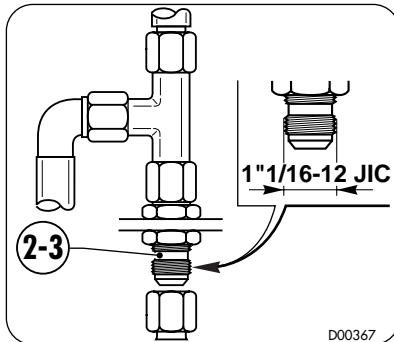
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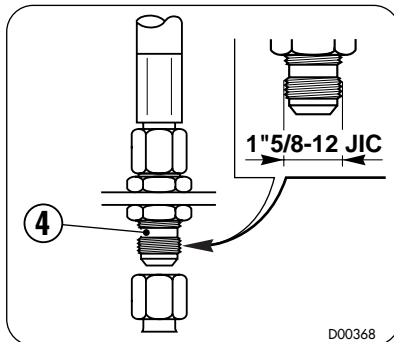
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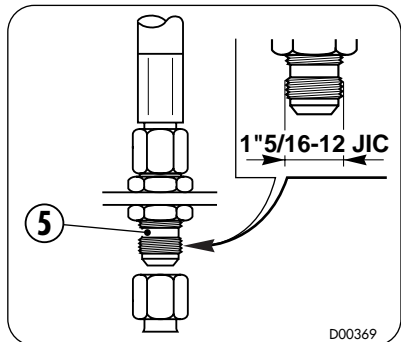
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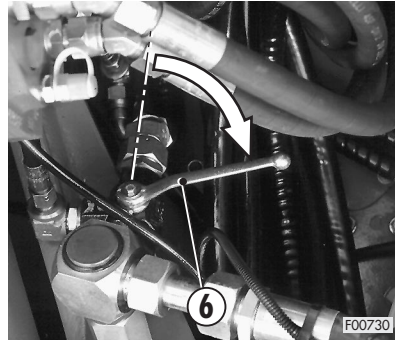
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AUTHORISED OPTIONAL EQUIPMENT

- 11 - Turn the selector lever (6) clockwise as far as it will go.
- 12 - Grease the joints connecting the clamshell bucket to the arm (see section 29.4.a GREASING THE ARTICULATIONS). Also grease all points on the clamshell bucket requiring lubrication (see the bucket's own technical documentation for details).
- 13 - Start the engine and lift the clamshell bucket just off the ground.
- 14 - Slowly open, close, and rotate the bucket a few times and check all hydraulic seals for tightness.



DANGER

- **Wear thick gloves and safety goggles when searching for leaks in the hydraulic system.**
 - **Use a piece of cardboard or wood to search for hydraulic leaks, NOT your hands.**
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