

Safety instructions

General

The following safety instructions cover those matters that are **absolutely essential** to know and follow when working with Brokk. Before starting the machine, both the supervisor and operator must have read and understood the entire Brokk manual.

Warning levels

There are two types of warning in the manual. The first type indicates first what the risk is and then the situation in which it occurs. Finally it explains how to avoid the risk. This type of warning is often supplemented by a warning symbol.

The other type are warnings are graded into four levels as shown in the example below.

	Danger! Indicates that an accident will occur if the instructions are not followed. The accident would cause serious injury, possibly death or severe damage to property.
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	Warning! Indicates that an accident might occur if the instructions are not followed. The accident would cause serious injury, possibly death or severe damage to property.
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	Caution! Indicates that an accident might occur if the instructions are not followed. The accident would lead to personal injury or damage to property
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NB!	Indicates a risk of breakdown if the instructions are not followed.
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If an accident has occurred

The employer has the responsibility of making a plan, and training all operators, to deal with an accident situation.

Do not resort to panic. React quickly and effectively to save lives and only then to prevent material damage. Learn First Aid. You could save lives!

Checklist for actions in event of an accident

- Get an overview of what has happened, if anyone is hurt and if anyone is still in the area of the accident.
- Alert the emergency services as soon as possible. Be prepared to supply detailed information.
- Give First Aid
- Appoint someone/several people with good local knowledge to meet the emergency service vehicles, unlock doors and show the way for the emergency service personnel.
- Ensure that any casualties are accompanied to hospital
- Secure the scene of the accident
- Contact supervisors
- Contact subordinates
- Establish the cause of the accident
- Take action to prevent accidents
- Always inform Brokk AB of accidents whether the machine was directly involved or not.

Supervisors and operators

Responsibility

Supervisors and operators are responsible for:

- Ensuring that National and local laws, safety regulations, precautions and other instructions are followed when the machine is used. This may include special protective equipment, values for lighting and vibrations, fencing off, driver permits etc.
- That the operator has the relevant training and experience to carry out the work safely. This can be achieved by experienced Brokk operators with good judgement, guiding, training and supervising personnel in operating and working with Brokk.
- That no one is permitted to enter the zone without the correct training and protection. There is a risk of accident and injury.
- That the machine is only used for the intended uses.
- That the machine is used in a safe manner.
- That no one is permitted to enter the risk zone or operating zone while the machine is in operation.
- That the operator is informed of the nature of the operating zone, for example the tolerances of the joists and the locations of load bearing walls, cables and pipes.
- That personnel with access to the operating zone are aware of and have access to protective equipment.

Requirements of the operator

- The operator must learn the function, characteristics and limitations of the machine under safe conditions.
- The operator must try to anticipate the risks of a task and use this information to calculate the size of the risk zone the machine will require. Use common sense to avoid incidents and accidents.
- The operator must stop using the machine in the event of a hazardous situation. Ensure that the machine cannot be used by mistake and inform the supervisors. The machine must not be used until the safety hazard has been removed.
- The operator must not be under the influence of alcohol, narcotics or anything else which may affect reaction times or judgement.
- The operator must use personal protection equipment appropriate to the work.
- The operator must ensure that the machine cannot be used by unauthorised personnel, by leaving the control unit unattended for example.

Protective equipment

Because Brokk machines can be used in a variety of environments and for different applications, the protective equipment must be suitable for the working conditions. The operator and supervisor must evaluate what protective equipment is required. The following equipment is only an example.

Personal protective equipment

The following is recommended as basic protection:

- hardhat with eye protection and ear defenders
- thick overalls
- protective gloves
- safety footwear



Attention. Danger. Use personal protective equipment

Other protective equipment

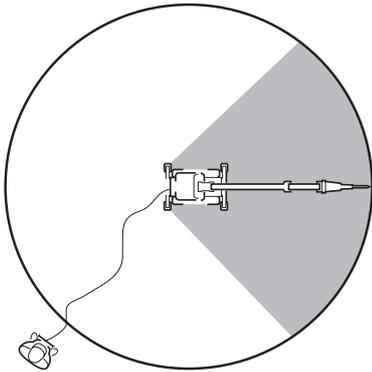
- Safety harnesses and stands for control units must be used when working at height or where there is risk of collapse. The operator and machine must be secured using separate harnesses.
- Breathing masks, gas masks or airstream helmets must be used in environments where the inhaled air is harmful to health.
- Heat shields and appropriate protective clothing must be used when working in hot environments.
- Barriers must be used to mark out the risk zone of the machine.
- Safety equipment must be used to secure machine components during repairs or service.



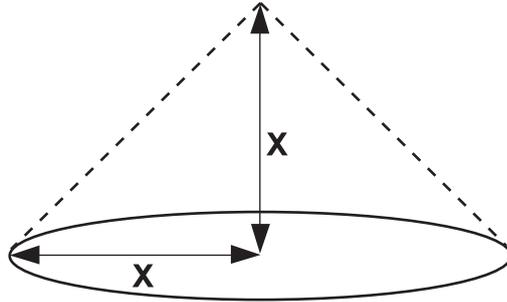
Attention. Danger. Use protective equipment appropriate to the work

Machine risk zone

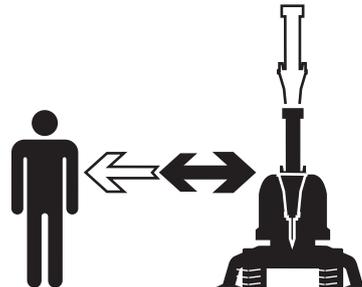
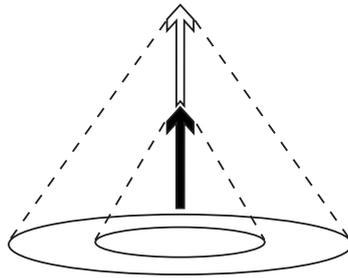
The operating zone of the machine is limited by its reach. However, the risk zone can be considerably larger. The size of the risk zone around the machine varies considerably depending on the work object, the work method, the surface underfoot, the position of the arm, the domino effect and the driving style of the operator.



Machine operating zone



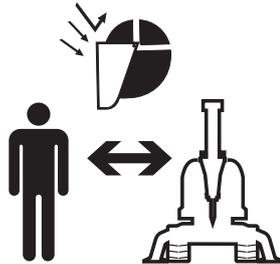
The risk zone varies depending on the height of the work object



Attention. Danger. Keep your distance from the machine depending on the size of the risk zone. The size of the risk zone varies

To avoid near misses and accidents the operator must continuously define the risk zone. Before starting a task the operator must select the method of work, analyse any possible risks and take the relevant safety precautions by, for example, extending the sealed off area and the distance from the barriers to the machine and work object. If the working conditions are variable the risk zone must be continually redefined.

No one may enter the operating zone while the machine is in operation! Remain outside the risk zone. The risk can change during the course of operation.



Risk of collapse and splinter injury. Use personal protective equipment. Keep your distance

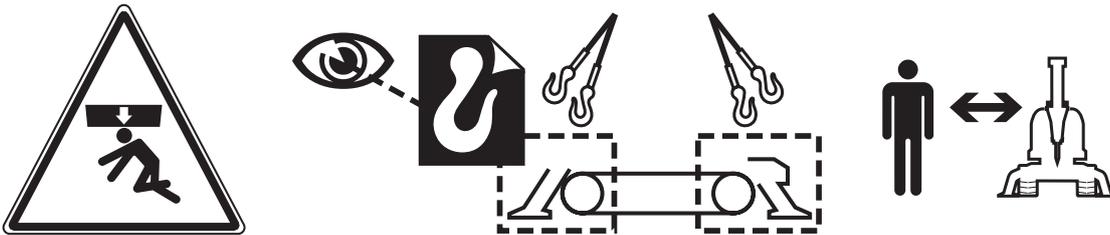
Risk factors during operations

The identification and prevention of any risks and of defining the relevant risk zone, before and during operations, is the responsibility of the operational supervisors and the operator. Experience of working with the machine, caution and safety precautions are important for ensuring that work is carried out without exposing personnel or equipment to risk.

Because the machines are used in many different environments and for different types of work it is difficult to provide general guidelines or to advise of all the possible risks. The following is a summary of possible risk factors. The aim is to introduce the supervisors and operators to a way of thinking which anticipates risk factors so that they can identify possible risks and take any precautions necessary to prevent injury or damage. Use the summary as a guide when analysing the site and working method.

Lifting the machine

- Risk of dropping the machine because of incorrect lifting method or incorrect lift. Read and follow the instructions for lifting the machine. Check that the lifting equipment and lifts used for lifting are fault free and approved for the weight of the machine.

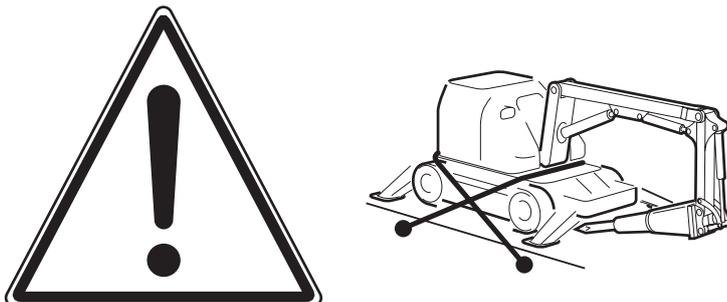


Risk of compression or crushing injury. Locate and attach the lifting equipment to all the lifting eyes. Keep your distance

- Risk of injury to personnel or damage to equipment while lifting. Define the risk zone. Check that no one is within the risk zone when lifting.

Transporting the machine

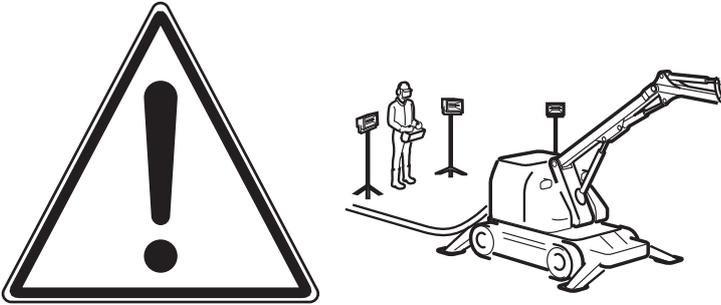
- Risk that the machine, or parts of the machine, may move during transportation. Always secure the machine when transporting on a vehicle. Read and follow the instructions for transporting a Brokk machine. Follow any local regulations.



Attention. Danger. Secure the load in transit

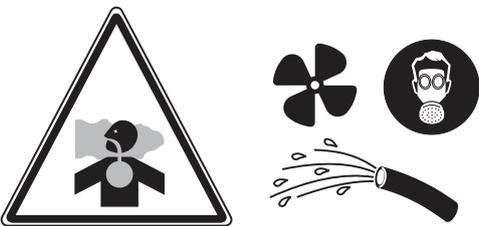
Work site

- Risk that the operator or nearby personnel may not anticipate dangers because of inadequate lighting. Work lighting must be satisfactory and correctly positioned. Supplement the machine lighting with free standing work lights if necessary.

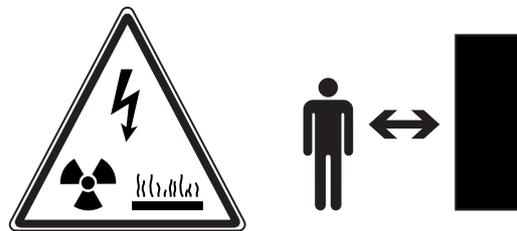


Attention. Danger. Ensure that the work lighting is satisfactory

- Risk of stumbling or slipping because of unevenness, loose materials, oil, ice or something else on the ground. Keep the operator's workplace clean.
- Risk of collapse. Materials, the machine and personnel risk danger from collapse depending on the conditions of the site. Inspect each site critically for ground conditions, load bearing constructions, domino effect etc. Do not start any work until all the risks have been defined and precautions have been taken.
- Risk of crushing. When working at heights, on roofs or platforms for example, there is a risk to personnel at ground level. The risk zone increases with increased height. Secure the machine. Define and seal off the risk zone at ground level.
- Risk of injury to the operator, or other personnel in the surrounding area, by hazardous substances. Electrical, gas and liquid pipelines may be concealed. Air in confined spaces or in a pocket can quickly become harmful by pollution from gases or dust. Ensure that the airflow is good. Check what the risks are at each work object. Consider how the risk can be avoided. Follow local regulations for handling the relevant materials.



Risk of asphyxiation. Ensure good ventilation. Use a gas mask and water flushing

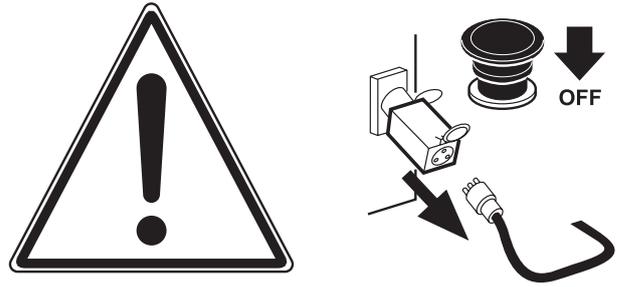


Risk of hazardous substances in solid or gas form. Keep your distance. Use protective clothing

- Risks during solo operation. Minimise the risk and increase safety by ensuring that the alarm can be raised via a mobile telephone or other equipment.

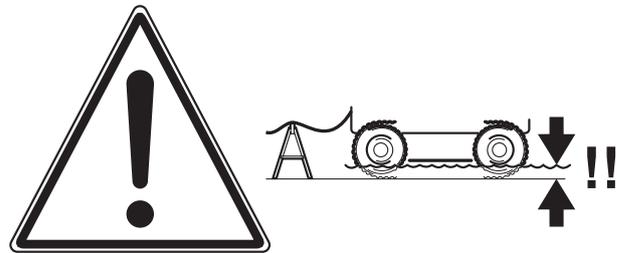
Electrical safety

- Risk of electric shock or burn injury from high currents. Damaged electrical cables can cause malfunctions in the machine and the machine components can become conductors. The electrical cabinet must not be opened when the machine is connected to the electrical network. Certain components in the electrical cabinet always carry current. Check that the power cable and connector are undamaged before connection. Always connect the machine via an earth fault relay which cuts out at 30 mA.



Risk of electric shock. Connect the machine via an earth fault relay

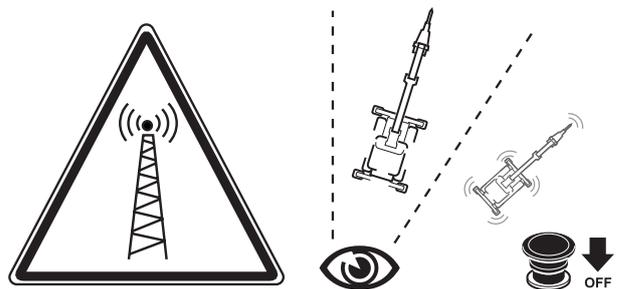
- Risk of electric shock. Never move the machine into water deep enough to reach and penetrate connections, electric motors or other electrical equipment. The machine will conduct current and electrical equipment can be damaged. Ensure that water does not reach the electrical equipment on the machine.



Risk of electric shock. Ensure that water does not reach the electrical equipment on the machine.

Radio

- Risk of stoppage. If several radio controlled machines are close to each other and are transmitting radio signals on the same frequency, they will interfere with each other. The machine with the weaker signal will stop. Change the radio frequencies.



Risk of stoppage. Note the risk in sites with several radio controlled machines

Diesel powered machine

Read and understand the safety precautions of the engine manufacturer before using the machine.

- Risk of poisoning by the machine exhaust gases. Air in confined spaces or in a pocket can quickly become harmful. Ensure that there is sufficient ventilation before starting the engine. If the machine is started indoors the exhaust pipe must be attached to an extraction fan system to prevent exhaust gases from remaining in the room.
- Risk of fire caused by the heat of the exhaust gases. Ensure that the exhaust pipe is free from flammable materials when the engine is running.
- Risk of fire. The fuel for the machine is a fire hazard. Ensure that there are no naked flames or sparks in the vicinity.
- Diesel is harmful to the environment and to health. Avoid inhalation. In the event of skin contact wash and rinse with water. Use containers and other equipment to prevent leakage.

Battery

- Risk of corrosive damage. Batteries contain sulphuric acid which is poisonous and corrosive. Always use eye protection. Avoid contact with sulphuric acid on the skin, clothing or the machine. If you have come into contact with sulphuric acid, remove the contaminated clothing and flush the skin generously with water for at least 15 minutes. If sulphuric acid has come in contact with your eyes, flush with water immediately for at least 15 minutes and then seek medical attention.
- Risk of explosion. An explosive gas is created in the battery, keep well away from sparks or naked flames.

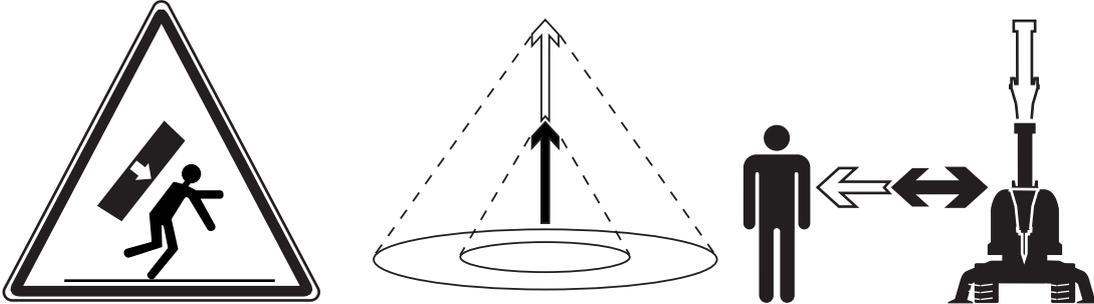
Before work

- Risk of damage caused by insufficient maintenance. The condition of the machine must be checked regularly. Daily checks and regular service must be carried out according to the Brokk instructions. Any faults must be remedied. The machine must be maintained in a condition which does not expose the operator or other personnel to danger or accidental damage. The machine must be kept clean. The signs and stickers must be visible and legible. Remedy any faults or damage immediately. Avoid using the machine until the fault has been remedied.
- Risk of personal injury because personnel are within the machine's risk zone. Define the risk zone. Seal off the risk zone. Check that no one is within the risk zone.
- Risk of crushing when replacing tools. Follow the instructions for the machine and tool carefully when replacing tools.
- Risk of allergic reaction. Repeated skin contact with chemicals such as degreaser, grease, fuels, glycol and hydraulic fluid can cause allergic reaction. Avoid skin contact. Use protective equipment.

While working

Operator's position

- Risk of injury to the operator or other personnel in the surrounding area because of incorrect operation or a fault in the machine. Define the risk zone of the machine. No one may enter the risk zone.



Attention. Danger. Keep your distance from the machine depending on the size of the risk zone. The size of the risk zone varies

- Risk of injury to the operator or other personnel in the surrounding area because of the surface giving way or the machine moving suddenly. Do not stand on control or power cables. There is a risk of entanglement. The operator must always be independent of the control unit when there is risk of the machine shifting suddenly. A stand must be used if the control unit is connected to the machine by a cable.



Risk of personal injury, the operator must be independent of the machine

Risk of personal injury. Do not stand on control or power cables. Keep your distance

- Risk of personal injury to the operator from falling objects. Incorrect operation or an unexpected incident can cause collapse. Never stand beneath a work object.
- Risk of crushing or damage by the machine. The machine can change position very quickly because of external circumstances, breakdown or incorrect operation. Never stand under a raised arm even if the machine is unpowered. Never stand where there is a risk of being crushed by the machine, between the machine and a wall or pillar for example. Define the risk zone of the machine. No one may enter the risk zone.



Risk of compression or crushing injury. Keep your distance from the machine

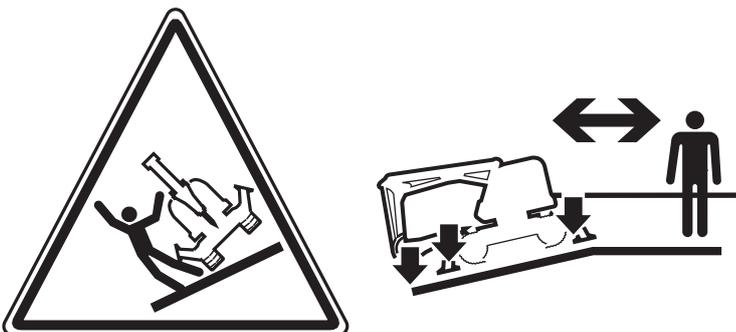
Machine stability

- The machine can tip while operating. The stability of the machine is affected by the ground surface, by the tool in use and the distance of the tool from the machine. Stability is also affected by the ability of the operator to control the machine in a safe manner. The machine must always be positioned as level as possible and the outriggers must be fully deployed. No one may enter the risk zone while the machine is operating.



Risk of compression or crushing injury. Outriggers must be deployed when working. Anchor the machine. Keep your distance

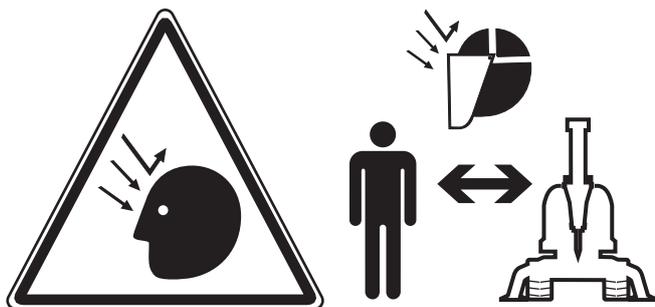
- The machine can tip while being moved. The narrow track gauge of the machine means that a small irregularity in the ground surface can cause such a large degree of lean that the machine tips. On certain models the track gauge can be narrowed even further for use in confined spaces. The stability of the machine is impaired with the tracks in the inner position. In these circumstances the arm must not be swung out beyond the outriggers/tracks. Ensure that the arm is fully folded. Drive carefully around corners and over uneven surfaces. Move the outriggers to just above ground level. Keep your distance.
- The machine can tip in situations where the outriggers cannot be deployed. This can apply in confined spaces, when moving or when working close to an obstacle. Note that the stability of the machine is greatly impaired without the outriggers deployed. The operating zone is reduced which means work must be adapted accordingly. The risk of the machine tipping increases when the arm is swung out to the side. No one may enter the risk zone while the machine is operating.
- Risk of compression or crushing injury. The machine may start moving unexpectedly because of an inclined surface. Anchor the machine. Stand uphill of the machine. Keep your distance.



Risk of compression or crushing injury. Outriggers must be deployed when working. Anchor the machine. Keep your distance

Falling objects

- Risk of splinters and falling objects. When working, the materials will splinter and debris will be scattered indiscriminately. When chipping upwards the demolished material spreads within a radius approximately equal to the distance to the area being chipped. Keep your distance. Use personal protective equipment.

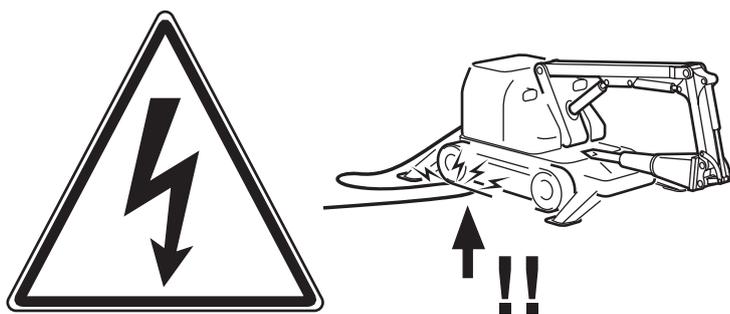


Risk of collapse and splinter injury. Use personal protective equipment. Keep your distance

- Risk of collapse. When demolishing tile linings in kilns the machine operation directly affects the risk of collapse. The tile lining above and to the sides of the operator can be shaken loose some distance from the area where the chipping occurs. Keep your distance. Use personal protective equipment.
- Risk of collapse. The operator is responsible for checking that the vibrations from the hydraulic breaker do not cause cracking in the wrong part of the object or that stones or other material do not loosen and cause personal injury or damage to property.

Operating

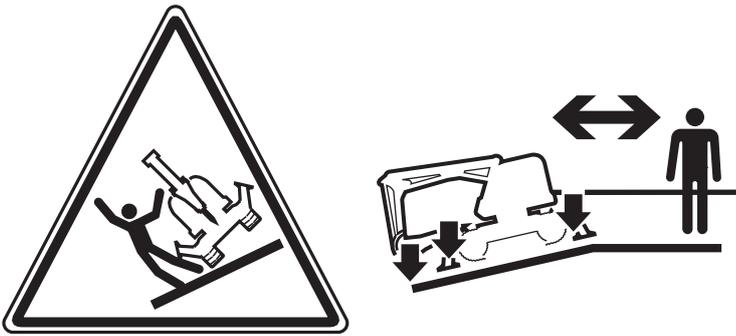
- Risk of accidental operation. Do not activate the control circuits until you are sure that the correct machine will be operated. Always concentrate on the machine when the control circuit is switched on. Always wait until the control circuit is switched off, preferably with the motor stopped, before entering the risk zone of the machine.
- Risk of electric shock. Do not drive over the control or power cables when working with, or moving the machine.



Risk of electric shock. Do not drive over the control or power cables when working with, or moving the machine

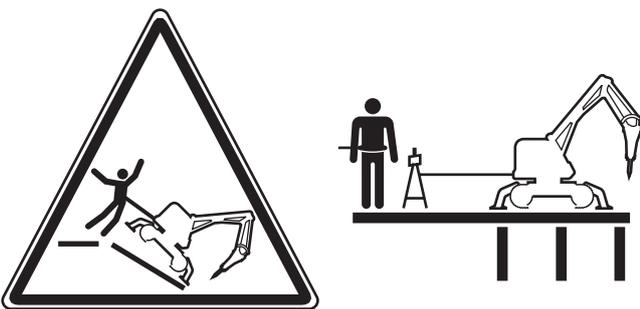
Moving the machine

- Risk of the machine tipping or sliding when driven on inclined surfaces. Driving up or down ramps and steps carries the risk of the machine tipping or sliding. Anchor the machine. Check that the ramp/steps can bear the weight of the machine. Use the arm as additional support when moving on inclined surfaces.



Risk of compression or crushing injury. Outriggers must be slightly deployed when moving. Anchor the machine. Keep your distance

- Risk of compression injury. Always stand uphill of the machine and outside the risk zone when driving on inclined surfaces.
- Risk of the machine tipping. The arm must be in the folded position when the outriggers are not deployed. In certain circumstances, when moving the machine, the arm can be used to lift the drive wheels over irregularities. Because of the risk of tipping, the arm must never be swung or raised high. Move the outriggers to just above ground level when moving the machine over an uneven surface.
- Risk of the machine shifting. When moving, when there is a risk of the machine shifting suddenly, the operator should always be independent of the control unit.



Risk of the machine shifting. When moving, the operator must always be independent of the control unit

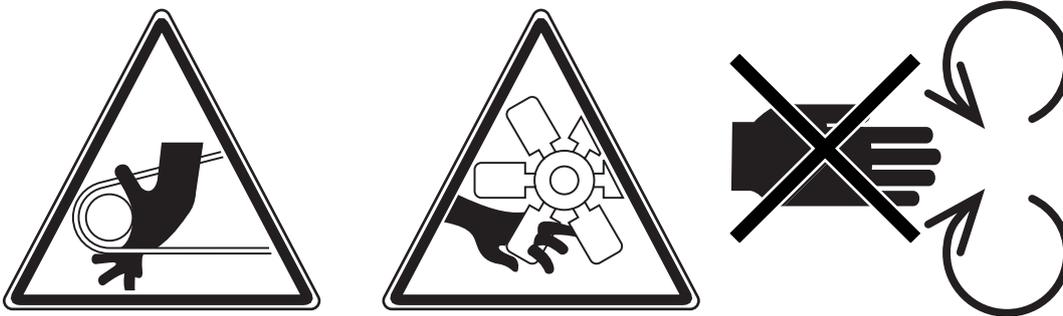
After working

- Risk of compression injury. If a hose to a cylinder on the arm system fails, the arm system can sink rapidly. Never stand under a raised arm. Always position the tool on the machine on the floor or ground when work is complete.
- Risk of accidental operation. Press the safety stop button before removing the control unit or leaving the machine.

Risk factors during service and maintenance

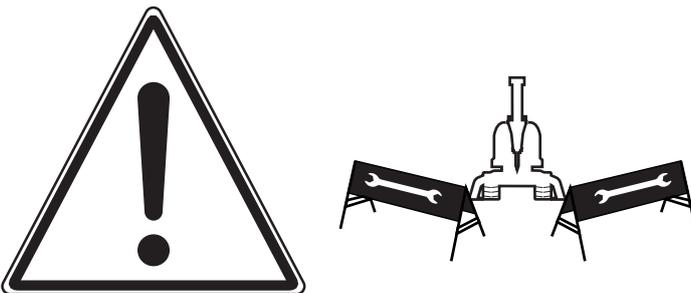
Most machine accidents occur during fault-tracing, service and maintenance because personnel must be within the risk zone to carry out the work. Personal injury can be avoided by strict awareness of the risk. Carry out "Preparations for service and maintenance".

- Risk of personal injury. Never carry out repairs on the machine without the necessary training. Only trained service personnel may carry out work on the electrical and hydraulic systems. Personal protective equipment and the appropriate safety equipment to mechanically secure machine components must be used during maintenance or service. Take great care when working with the motor running. Always switch off the motor if possible. Do not wear loose clothing when working near rotating components.



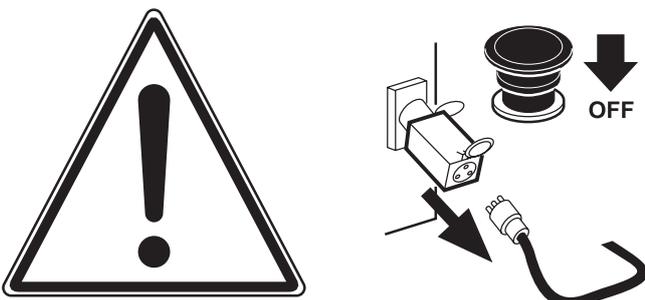
Risk of personal injury. Switch off the motor

- Risk of the machine starting by mistake. Position clear signs so that anyone nearby understands that maintenance or service is in progress. When service work does not require the machine to be started the power supply cable must be disconnected and placed so that it cannot be connected by mistake.



Attention. Danger. Risk of the machine starting by mistake. Inform personnel that service is in progress

- Risk of electric shock. Ensure that the machine is not supplied with voltage before the cable or other components with electrical voltage are disconnected or opened. Work with high currents must only be carried out by authorised personnel. Disconnect the battery if the machine is equipped with a diesel engine.



Risk of electric shock. Ensure that the machine is not supplied with voltage

- Risk of damage caused by pressurised or leaking hydraulic systems. Pipe and hose couplings can remain pressurised despite the motor being switched off and the power cable disconnected. It must always be assumed that a hydraulic hose is pressurised and must therefore be disconnected with great care. Rest the arm system against the ground. Switch off the electric motor. Use protective equipment. Never use your hand to try to stop hydraulic fluid leaking from a hose. High pressure streams of hydraulic fluid can penetrate the skin and cause serious injury.



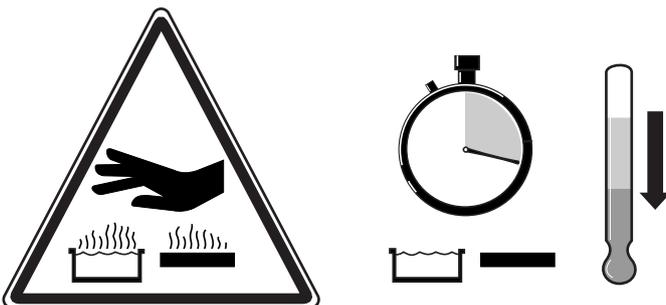
Risk of personal injury. Keep your distance. Rest the arm system against the ground. Switch off the motor. Read the manual

- Risk of compression or crushing injury. When removing components of the machine there is a risk that heavy components will be set in motion or will fall. Always mechanically secure moving components before disconnecting screwed joints or hydraulic hoses. Use lifting equipment approved for at least 500 kg loads to secure and lift heavy machine components.



Always mechanically secure moving components before disconnecting screwed joints or hydraulic hoses

- Risk of fire or burn injuries. A number of the machine components become very hot during operation, for example the lighting and hydraulic fluid. Therefore, many hydraulic components heat up. Do not start any maintenance or service work until the machine has cooled down.



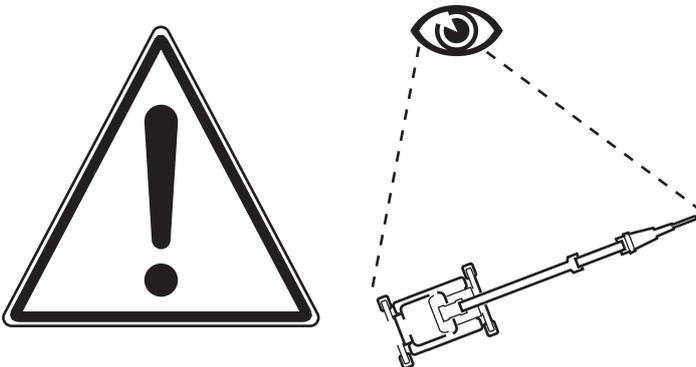
Risk of fire or burn injury. Allow the machine to cool. Do not cover the lighting

- Risk that the operator or nearby personnel may not anticipate dangers because of inadequate lighting. Work lighting must be satisfactory and correctly positioned. Supplement the machine lighting with free standing work lights if necessary.



Attention. Danger. Ensure that the work lighting is satisfactory

- Risk of unexpected incidents. If any of the connectors or hoses are incorrectly installed the movements of the machine can be incorrect. Ensure that the functions operate correctly. Take care when test driving. Be prepared to switch off the machine immediately in the event of a fault.



Attention. Danger. Take care when test driving.

- Ensure that the service location is well ventilated when working with diesel engines. There is a risk of carbon monoxide poisoning. Use an extractor fan.
- When working with diesel engines be aware of the risk of burns caused by hot coolant or engine oil. If the engine is hot and the coolant reservoir is opened there is a risk that hot coolant may spray out. When replacing the oil and the oil filter there is a risk of burns from the temperature of the oil. Always stop the engine and allow the engine to cool down before starting work on the engine. Use thick gloves, protective clothing and eye protection.

