

Brokk Manual



Part. No: 3136 8039 59-G GB

Translation of the original instructions

Contents

Introduction	5	Handling	35
Foreword	5	Areas of use	35
Modifications	5	The machine is intended for:	35
Manufacturer's conditions	5	The machine is NOT intended for:	35
Guarantee conditions	6	Ergonomics	36
Safety instructions	7	Regulations for environmentally unfriendly waste	37
General	7	Affecting the operational reliability of the machine	38
Warning levels	7	Regular service	38
If an accident has occurred	7	The machine's working environment	39
Supervisors and operators	8	Transporting and lifting	41
Protective equipment	9	Loading and unloading using a ramp	41
Machine risk zone	10	Transportation	42
Risk factors during operations	11	Lifting the machine	43
Lifting the machine	11	Working in hazardous operating zones	45
Transporting the machine	11	Working near edges	45
Work site	12	Working and movement on uneven and inclined surfaces	46
Electrical safety	13	When working with pipes and cables	47
Radio	13	Operating instructions	48
Diesel powered machine	14	Control unit	48
Before work	14	Safety when operating	48
While working	15	Positioning in relation to the machine	49
Operating	17	Operating the undercarriage of the machine	50
After working	19	Operating the upper section of the machine	51
Risk factors during service and maintenance	20	Starting and stopping	54
Description	23	Pre work inspection	54
Machine construction	23	Connect the electrically driven machine	54
Drive	23	Start the machine	54
Outriggers	23	Post work inspection	55
Swivel function	24	Towing	55
Arm system	24	Diesel	56
Extra equipment	24	General	56
Tools	24	Battery	56
System description	25	Fuel	57
Electric system	25	Cleaning the machine	58
Control system	25	Safety when cleaning	58
Hydraulic system	26	Cleaning methods	58
Connection to the electrical supply	27	Cleaning components	59
Power supply	27	Before washing	60
Fuses	27	After washing	60
Power supply cable	27		
Safety functions	28		
Protection of personnel	28		
Machine protection	31		
Stickers	32		
Type plate	32		
Information stickers	32		
Warning stickers	33		

Control system	61	Service	103
Control unit	61	General	103
Battery	62	Service schedule	103
Link radio transmitter – radio receiver	63	Checks	103
Approval	63	Service schedule	104
Control unit functions	64	New machine inspection	104
Switch	64	8 hours inspection	105
Menu management	67	40 hour service (service 1 in display)	106
LED indication upon startup	70	Service / 250 hours (service 2 in display)	107
Indications radio receiver	71	Service / 500 hours or at least once a year	
Starting and stopping	72	(service 3 in the display)	108
Before starting	72	Service / 1000 hours (service 4 in display)	108
Start, remedies on the machine	72	Lubrication points	109
Starting the control unit	73	Preparations for service and maintenance	111
Starting/stopping the engine	73	Hydraulic fluid and lubricants	115
Engaging the control circuit	73	Checking instructions	116
Stop	73	Lubrication	116
Reset service message	74	Cracks	118
Operating	75	Securing	119
Operating the undercarriage	75	Level check	120
Operating the caterpillar tracks and arm system	76	Wear and damage	123
Operating the upper section	78	Leakage	124
Changing reach	79	Function	125
Rotation process arm	80	Replacement	128
Operating hydraulic tools	81	Other	136
Electric cabinet's functions	83	Welding work on the machine	137
Tools	85	Before welding	137
General	85	Recommended welding wire	138
Positioning of tools	85	Advice when welding	138
Hydraulic settings	85	Components which should not be welded	138
Changing tools	86		
Fixed tool mounting Brokk 60	87		
Mechanical quick hitch	88		
Connecting tools to the hydraulic system	90		
Correct connection of tools	91		
Using tools	92		
General	92		
Selecting tools	92		
Extra equipment	95		
General	95		
Extra hydraulic function	95		
Breaker lubrication	97		
Cable drum	98		
Swivel limitation	99		
Forced air cooling	99		
Extra work lamps	99		
Water flushing	99		
Compressed air flushing	99		
Earth fault relay	100		

Introduction

Foreword

Thank you for choosing a Brokk machine. We hope that it increases your work capacity.

The Brokk manual contains descriptions and instructions for all Brokk machines. Illustrations can differ and the functions described may be different to your machine. Keep the Brokk manual for future reference. Keep the manual safe and available for the operator in the work place.

Note before starting the machine!

It is the responsibility of the owner / employer to ensure that the operator can use the machine safely. Before starting the machine, both the supervisor and operator must have read and understood the Brokk manual so that they understand:

The safety instructions which apply to the machine

What the machine is intended for and what it is not equipped to deal with

How to maintain, use and operate the Brokk machine

How to follow the instructions to prevent personal injury and damage to the machine.

Modifications

At the request of the owner, the machine can be modified during manufacture. These modifications are handled as additions to the standard documentation and can be found behind the tab divider in the folder. Always check what modifications have been made to the machine by reading the relevant additions.

Ordering spare parts

When ordering spare parts it is extremely important to know what modifications have been made to the machine. There may be sections in the standard documentation that are similar to the modified machine which may cause the wrong spare part to be ordered. Always read the modified section, which supersedes other sections, before ordering.

Manufacturer's conditions

- Brokk AB reserves the right to change the specifications and instructions of the machines without prior warning.
- The machine must not be modified without written permission from the manufacturer. The owner takes responsibility if the machine is modified after delivery from Brokk, and without written permission from the manufacturer. Modification may cause new risks to the operator, machine and surrounding area. For example these could be a reduction in rigidity or defective protection. It is the responsibility of the owner to specify the modifications to be carried out and to contact the machine supplier for approval before starting any such modification.

Guarantee conditions

The following points must be met before a claim application can be requested:

- In order to be processed, a claim must be made within 14 days of the repair being completed at the latest.
- If a damaged component can cause further damage to the machine, Brokk AB must be informed immediately. If this is not done, the warranty does not cover any subsequent damage.
- Brokk AB is only liable for Brokk original components. The liability does not cover faults that have occurred due to accidental damage, modifications, misuse or incorrect usage.
- Regardless of what warranty conditions may apply locally and providing no other agreements have been made, Brokk AB's warranty period for new standard products is 12 months from delivery to end user, or a maximum of 1000 operating hours, whichever occurs first. If the start date is not reported to Brokk AB, the delivery date from Brokk AB's factory applies.
- Brokk AB's responsibility for claims regarding failures in the design, materials or manufacture is limited to replacement of the faulty component. In the event that specialist knowledge is required to replace a faulty component, Brokk AB will remove the old component and install the new one. Where specialist knowledge is not required, Brokk AB has fulfilled its responsibility when the repaired or replaced component is supplied to the purchaser.
- Brokk AB's responsibility does not cover normal wear or degradation. Brokk AB is not liable for faults or breakdowns caused by incorrect or defective maintenance, incorrect repairs, problems caused by dirt, water or particles in the hydraulic system or insufficient power supply. The equipment must be used and maintained in accordance with the instructions in the Brokk manual.
- Brokk AB's warranty for replacement parts applies for 12 months from installation or a maximum of 18 months after delivery from the factory, whichever comes first.
- Examples of components that are not normally covered by the warranty: Cylinders, hoses, chisels for hydraulic breakers, buckets, rubber feet, caterpillar tracks, bearings etc.
- Warranty conditions in accordance with ORGALIME S 2000.

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.
	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.
	Caution! Indicates that an accident might occur if the instructions are not followed. The accident would lead to personal injury or damage to property
NB!	Indicates a risk of breakdown if the instructions are not followed.

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

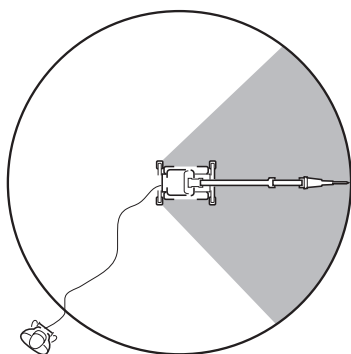
- Safety harnesses and stands for control units must be used when working at height or where there is risk of collapse. The operator and machine must be secured using separate harnesses.
- Breathing masks, gas masks or airstream helmets must be used in environments where the inhaled air is harmful to 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.



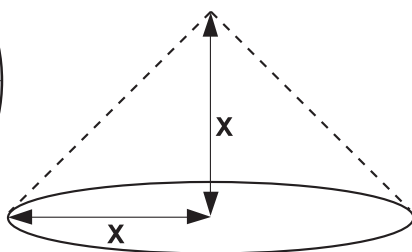
Attention. Danger. Use protective equipment appropriate to the work

Machine risk zone

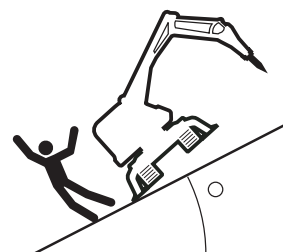
The operating zone of the machine is limited by its reach. However, the risk zone can be considerably larger. The size of the risk zone around the machine varies considerably depending on the work object, the work method, the surface underfoot, the position of the arm, the angle of the machine, the domino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



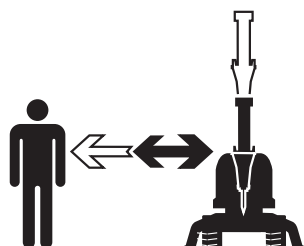
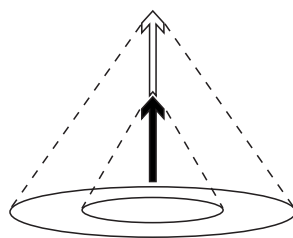
Machine operating zone



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



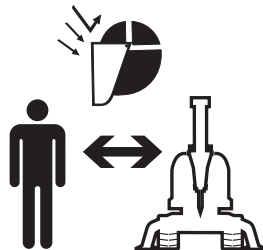
The risk zone varies depending on the incline of the surface underfoot.



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 for collapses, splinters and toppling machines. The risk of toppling machines increases the greater the incline. The risk can change during the course of operation.



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

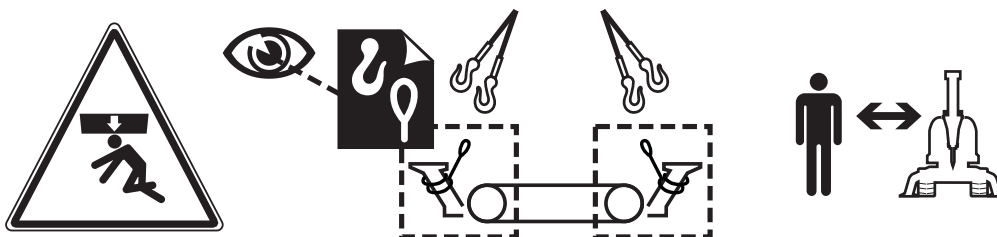
Risk factors during operations

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.

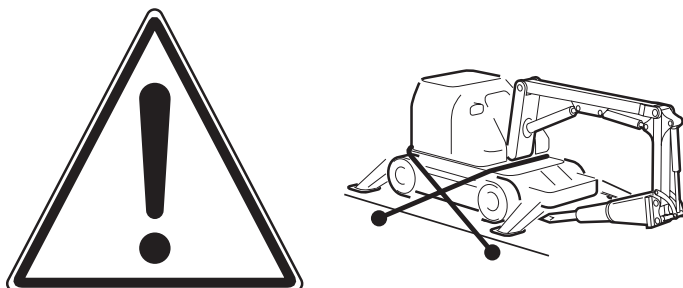


Risk of compression or crushing injury. Locate and attach the lifting equipment to all the lifting eyes. Keep your distance

- 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

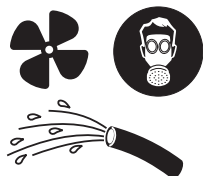
Work site

- 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.

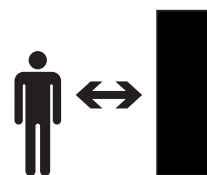
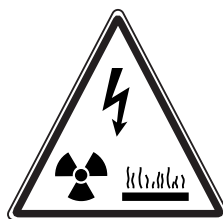


Attention. Danger. Ensure that the work lighting is satisfactory

- 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 toppling over. When working on inclined surfaces, there is a risk to people below the machine. The risk zone increases with increased angle. Define and seal off the risk zone.
- 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 air ratio 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

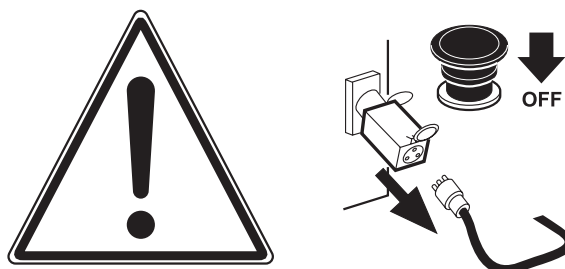


Risk of hazardous substances in solid or gas form. Keep your distance. Use protective clothing

- 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.

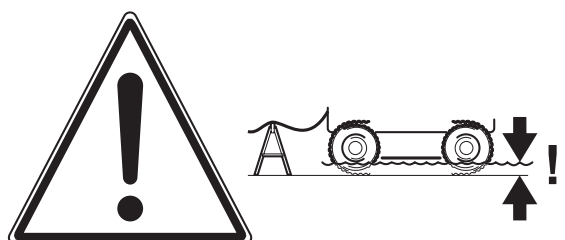
Electrical safety

- 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

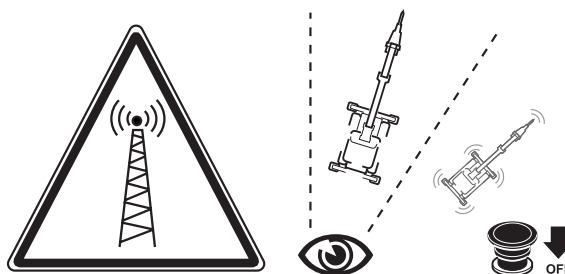
- Risk of electric shock. Never move the machine into water deep enough to reach and penetrate connections, electric motors or other electrical equipment. The machine will conduct current and electrical equipment can be damaged. Ensure that water does not reach the electrical equipment on the machine.



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. Restart the machine, open radio frequency is selected automatically.



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.

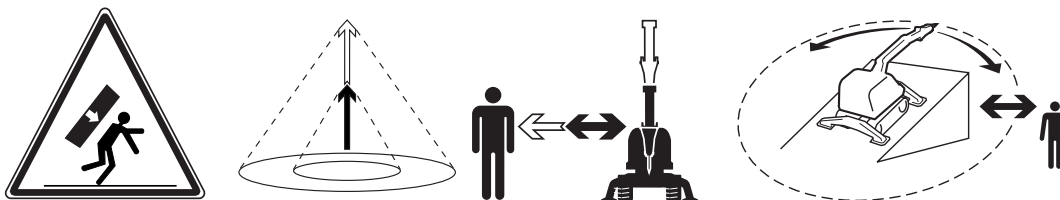
Before work

- 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

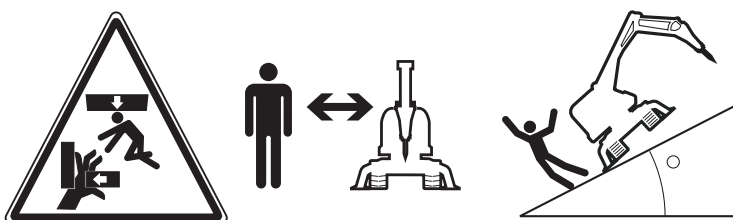
- Risk of injury to the operator or other personnel in the surrounding area because of the surface giving way or the machine moving suddenly. Do not stand on control or power cables. There is a risk of entanglement. The operator must always be independent of the control unit when there is risk of the 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. The machine can tip while operating on inclined surfaces. 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

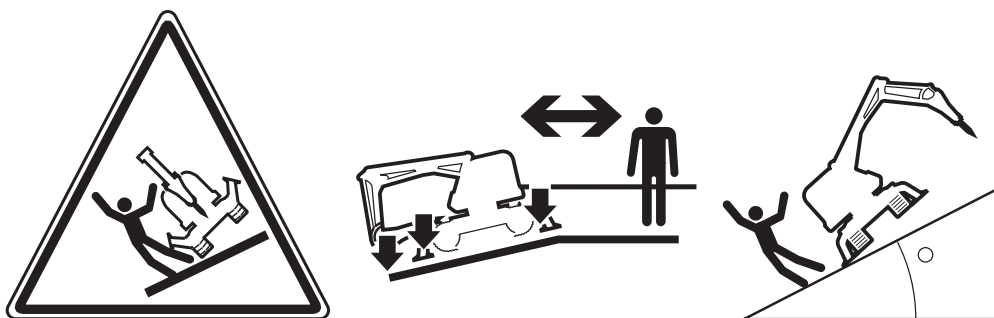
Machine stability

- 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.

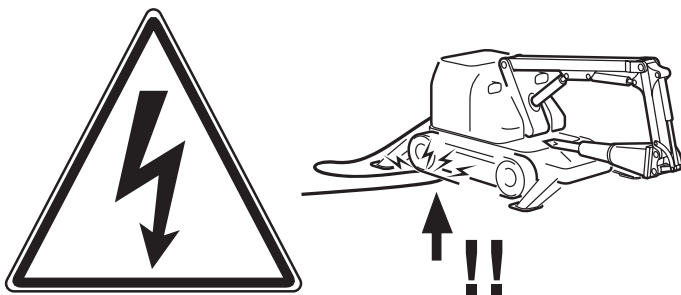


Risk of collapse and splinter injury. Use personal protective equipment. Keep your distance

- 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

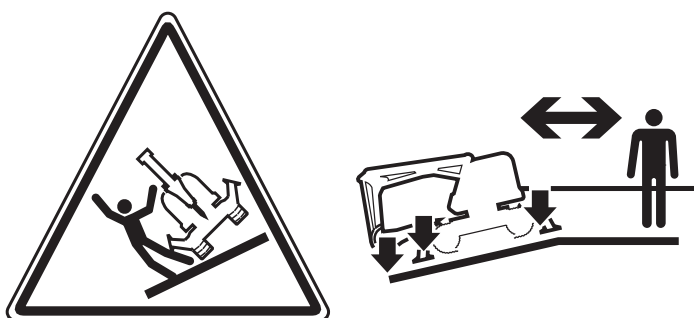
- Risk of accidental operation. Do not activate the control circuits until you are sure that the correct machine will be operated. Always concentrate on the machine when the control circuit is switched on. Always wait until the control circuit is switched off, preferably with the motor stopped, before 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

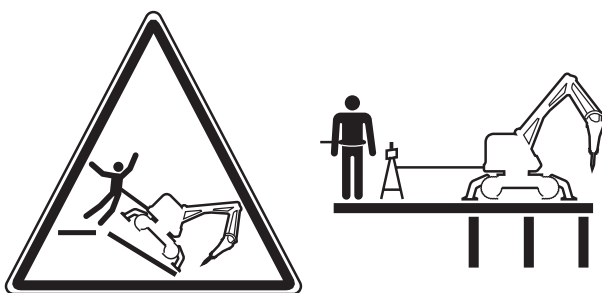
Moving the machine

- 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

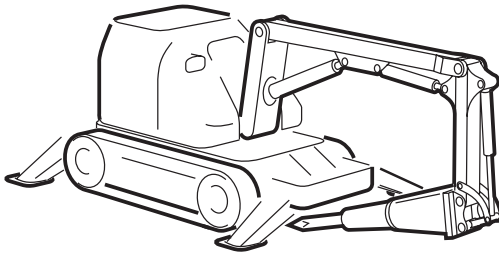
- Risk of compression injury. Always stand uphill of the machine and outside the risk zone when driving on inclined surfaces.
- Risk of the machine tipping. The arm must be in the folded position when the outriggers are not deployed. In certain circumstances, when moving the machine, the arm can be used 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.

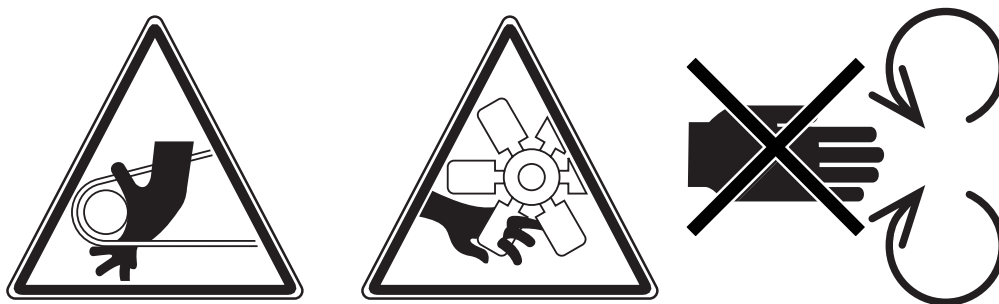


Always position the tool on the machine on the floor or ground when work is complete

Risk factors during service and maintenance

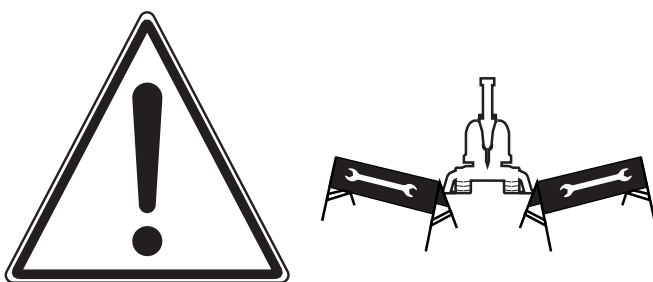
Most machine accidents occur during fault-tracing, service and maintenance because personnel must be within the risk zone to carry out the work. Personal injury can be avoided by strict awareness of the risk. Carry out "Preparations for service and maintenance".

- 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.



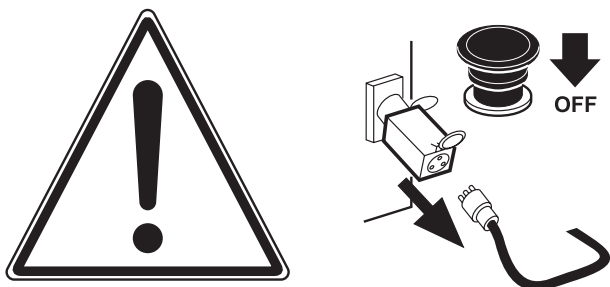
Risk of personal injury. Switch off the motor

- 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.



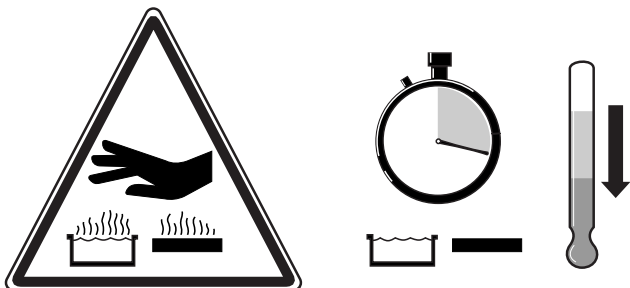
Risk of personal injury. Keep your distance. Rest the arm system against the ground. Switch off the motor. Read the manual

- 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.



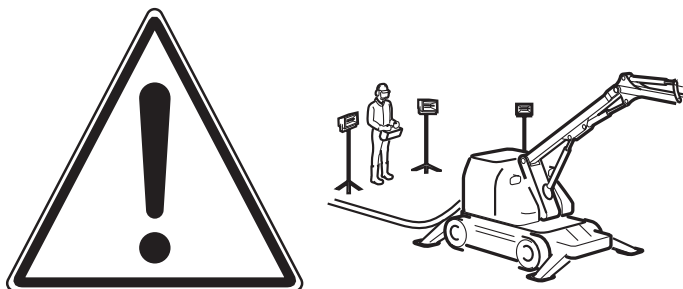
Always mechanically secure moving components before disconnecting screwed joints or hydraulic hoses

- 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.



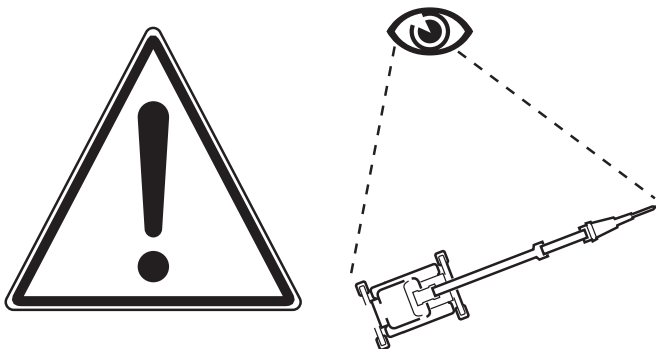
Risk of fire or burn injury. Allow the machine to cool. Do not cover the lighting

- 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.

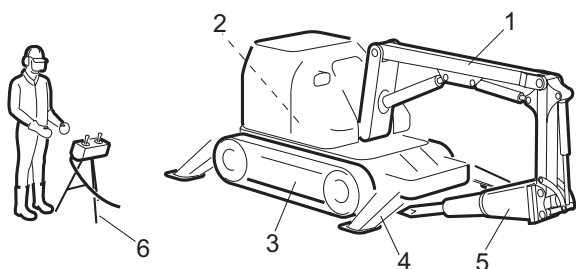
- Ensure that the service location is well ventilated when working with diesel engines. There is a risk of carbon monoxide poisoning. Use an extractor fan.
- When working with diesel engines be aware of the risk of burns caused by hot coolant or engine oil. If the engine is hot and the coolant reservoir 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.

Description

Machine construction

Brokk machines can be adapted for different tasks and environments during manufacture. This is possible because the machine is constructed from modules. By combining the different modules, Brokk machines can be adapted for very specific tasks or for more general use. The machine can be supplemented with additional equipment, tools and accessories. The Brokk manual describes the functions of the most frequently used modules.

1. Arm system
2. Swivel function
3. Drive
4. Outriggers
5. Tools
6. Stand, an example of an accessory



The Brokk machine is constructed from modules. The machine can be supplemented with tools and accessories.

Drive

The caterpillar tracks are driven individually by hydraulic motors. The machine can be turned by operating the caterpillar tracks at different speeds. If the tracks are run in opposite directions the machine can make sharp turns. The drive motors are locked by passive brakes when the drive function is not activated.

Most of the machine models can operate the caterpillar tracks and arm system at the same time. The function is useful when the machine is operated in difficult terrain. The arm system can be used to stabilise the machine or to pull the machine in the direction in which the caterpillar tracks are moving.

Outriggers

The main task of the outriggers is to give the machine stability. Therefore, the outriggers must always be used when working with the machine. On certain models the outriggers are designed for other functions than just providing stability, for example, the bulldozer blade.

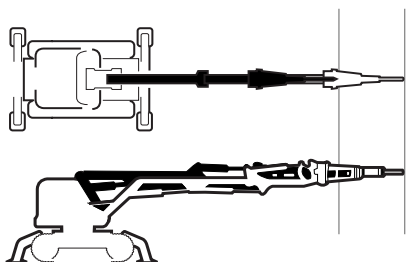
Swivel function

The upper section of the machine can be fully rotational or rotation limited. Refer to the technical data of the machine. By swivelling the upper section of the machine, work can be carried out in several directions without moving the machine.

The swivel function of the machine must not be exposed to overloading from impermissible heavy tools. The heavy weight Brokk machines are equipped with a swivel brake. When the swivel function is not activated the function is braked by a passive brake.

Arm system

The arm system consists of three sections which provide good movement characteristics, long reach and remain compact. Conical shafts minimise the risk of play. By operating cylinder 1 and cylinder 2 at the same time, the reach of the machine can be adjusted without the machine having to be moved.



Changing the reach of the machine by operating cylinder 1 and 2 together

Extra equipment

The machine can be supplemented with additional equipment. Extra equipment is fixed to the machine, such as, an extra hydraulic function or lubrication for the hydraulic breaker. Extra equipment is required if the machine is to use tools such as a side-angling device or rotator, in these cases extra hydraulic functions are used.

Tools

The Brokk machine must be equipped with the tool appropriate for the job. The weight and performance requirements of the tool are important in determining the suitability for installation on the machine. Read sections, machine data and tools and the tool suppliers instructions for more information. Contact the machine supplier if you have any doubts.

The tools are attached to the machine via a tool mounting. The shape of the tool mounting varies between machine models.

System description

All the functions of the machine are based on cooperation between the electric system, the control system and the hydraulic system.

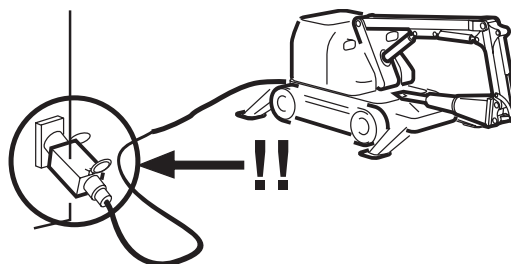
Electric system

The electric system consists of power supply via a high current circuit, a low current and a control system. Brokk machines with diesel engines do not have a high current circuit.

High current circuit

The electrically driven machine is connected to the power supply using a connector. We recommend use of a earth fault relay. For the machine to work the power supply must be sufficiently stable and powerful, even at full load. For further information see "Connection to the electrical supply".

The high current is used as a power source for both electric motors and low current circuits. A phase sequence switch in the electric cabinet or in the connector ensures that the electric motor turns in the correct direction.



Connect the machine via the earth fault relay

Low current circuit

Low current is produced when high current is reduced. It is used as a power supply for the start function, control system and functions such as work lamps and filling pumps. If the machine has a diesel engine, the generator of the engine generates the low current.

Control system

A control unit, electronic unit and pilot valves are the main components in the control system. When a control lever or switch is affected, the signals carrying information about the present position are transmitted to a transmitter card in the control unit. The signal from the transmitter card to the electronic unit is transmitted via the radio transmitter and receiver or via cable. The electronic unit transfers the signals to the relevant function on the machine.

The signal from a control lever is proportional to the movement of the lever. A small movement of the lever causes the function to move slowly. Increased movement of the lever increases the speed of the function proportionally. The pilot valve transfers the signal to the hydraulic system by converting the electric current to hydraulic pressure.

The signal from the switch indicates if the function is switched On or Off; the relevant function assumes the correct position, on or off.

Hydraulic system

The task of the hydraulic system is to provide the functions of the machine with power and motion through hydraulic pressure and flow. The system consists of a hydraulic pump, tank, filter and different types of valve. Hoses or pipes connect the components to each other.

The valves are used to control the hydraulic system pressure, volume flow and direction. The pressure controlled valves limit or reduce the pressure to a desired value. The volume controlled valves affect the flow of hydraulic fluid and therefore the speed of the functions. The directionally controlled valves direct the hydraulic fluid to the different functions.

Connection to the electrical supply

One of the most common causes of malfunction in a Brokk machine is a defective connection to the electrical supply. For safety reasons, the machine must be connected via an earth fault relay and have a functioning protective earth. For further information see "Safety functions":

Power supply

In order for the electric motor to start and continue to run effectively, the electrical supply must be sufficiently powerful and stable. There must be no variation caused by a voltage drop.

Insufficient voltage causes the current consumption of the electric motor, and therefore temperature, to increase until the overload relay is tripped.

Fuses

The fuses in the central electrical unit protect the electrical equipment in the event of an overload or a fault in the connected machine. The electrical sockets used must be correctly fused. Check the electric motor. Check the length of the power supply cable and the cross section of the conductor in the power supply cable.

The fuse required for the electric motor can be read off from the table "Guidelines for connection to the electrical supply" in the "Troubleshooting" section.

Slow blow fuses must be used for direct started and Y/D started machines. Circuit breakers must be equipped for motor operation, type K or in certain cases, type D. Other types are often too quick to blow and can therefore cause problems. Machines equipped with soft start can be started using the more common fuse types.

If a fuse blows, first establish the cause, then replace the blown fuse with a new one of the same voltage rating (A). Use slow blow fuses.

If the new fuse also blows, there is a fault in the electrical equipment or in the connected machine. The cause of the fault must be established before a fuse is replaced.

Power supply cable

The machine is connected to the electrical supply using an extension cable. It is important that the extension cable used has the correct dimensions. The cross section must be correct in relation to the length of the conductors. If a long cable with a small cross section is used, resistance causes a voltage drop in the cable and the overload relay or fuses will blow. Guidelines for the dimensions of the cable can be found in the "Guidelines for connection to the electrical supply" table in the "Troubleshooting" section.

Safety functions

The safety functions of the machine can be divided into two groups. Safety functions for protection of personnel and safety functions for component protection. Several of the safety functions provide protection to both personnel and to the machine.

Protection of personnel

Zero position indication

When the control unit is started and the control circuit is engaged the zero position indicator checks that none of the control levers are activated. If any function passes the zero position, the function is inhibited. The function is locked until the control lever returns to the neutral position.

Zero position indication prevents the machine from making an unexpected movement if a control lever is activated when the control unit is started, in the event of a fault in the potentiometer or if a cable break occurred before the control unit was started.

During operation the function is only protected against a cable break, if there is a fault in the potentiometer there is a risk of incorrect activation.

Signal voltage limitation

The voltage level of the control signals is limited to within a max and min value. If the voltage level is outside these values, this is interpreted as false activation of a function and the machine stops.

Signal voltage limitation prevents the machine from making an unexpected movement in the event of a cable break or a short-circuit.

Lever gate

The lever gate opens and closes the operating voltage to the control circuit. The levers must be in the neutral position to open the operating voltage to the control levers. If the control levers are in the neutral position for 3 seconds the control circuit is broken automatically. If the lever gate is open for operating voltage, the switches must be released before the lever gate can be reactivated, therefore it is not possible to secure the switch in the active position.

The safety function prevents the machine from being activated by mistake, which might happen if the control unit could be left with the control circuit engaged.

Radio limitation

If no function is activated for 120 seconds, the electronic unit for radio signals is blocked. The machine cannot be started until the power supply voltage to the electronic unit in the electric cabinet is broken and restored.

The safety function ensures that the operator knows which machine is being started, and that the correct control unit is used, on sites with a number of Brokk machines.

Radio channels

If several radio controlled Brokk machines, construction cranes or other radio controlled machines are close to each other there is a risk of frequency collision. Machines transmitting radio signals on the same frequency will interfere with each other. The operator will experience frequency collision as interference or interruptions in operation. The control system has an automatic function to find an open frequency to minimise the chances of frequency collision.

Identity code

Each control unit has a unique ID code which is programmed into the electronic unit. During radio control only the machine with the same ID code programmed into the electronic unit can be controlled by the control unit. The safety functions make it possible for several machines to work in the same area without faulty movements in the machines.

During cable control the ID code is suppressed and the same control unit can be used for different machines if they have the same type of control system.

Control system stop circuit

When the mushroom switch on the control unit is pressed the power supply voltage to the control unit is mechanically broken. The machine motor stops because the transfer of signals to the machine's electronic unit stops. The safety function switches off the energy source of the machine and the machine freezes in position.

Protective earth

The machine and components are connected to the earth lead in the power supply cable. In the event of a fault, the dangerous current is led off via the earth lead through the connector to the earth protected wall socket. There is a short-circuit, the main circuit fuse breaks and the current is broken.

The wall socket to which the Brokk machine is connected must be earth protected. If the earth leads are missing, incorrectly connected, have disconnected or are loose in a connection the current is not broken and touching the machine could be lethal.

If there is reason to believe that the protective earth has been damaged the machine must be shut off and the power supply cable removed until the protective earth has been restored. The earth lead is green and yellow striped. If the connector is pulled off, the earth lead must always be disconnected last so the earth pin is always the longest.

Earth fault relay

The machine must always be connected via an earth fault relay which is complementary protection to the protective earth. The earth fault relay must break at a current leakage of max 30 mA to protect personnel.

Connect the earth fault relay as close to the electrical supply as possible. This will additionally protect the cables to the machine.

The earth fault relay has the task of preventing personal injury or fire caused by electrical faults.

Hydraulic brake

Hydraulic motors are used for moving the machine and the swivel mechanism on a number of machine models. All the hydraulic drive motors and some of the swivel motors are equipped with brakes. These hydraulic motors contain a load retaining valve which prevents an uncontrolled flow of hydraulic fluid through the motor, for example when manoeuvring down an inclined surface or when the machine is parked. The load retaining valve closes a port to the tank when the drive motors are not being operated.

Mechanical brake

Brokk machines are equipped with mechanical parking brakes. The machine is braked until the drive function is activated, when the sprung brake is released by hydraulic pressure.

Machine protection

Phase sequence relay

The phase sequence relay is an active connected electrical component. It must be active and functioning for the motor to start. The phase sequence relay prevents the electric motor from starting in the wrong direction of rotation, which could damage the machine.

Overload relay

The overload relay is an active connected electrical component. It must be functioning for the motor to start. The overload relay prevents machines with electric motors from overloading, preventing the consequent risks of damage to the machine and fire. Resetting is manual or automatic

Fuses

Fuses are used to protect components and to avoid fire in the event of faults or when overloading electrical components.

Pressure limiting valve

The hydraulic systems of Brokk machines are equipped with pressure limiting valves. These protect the hydraulic system against high pressure and mechanical components against overload.

Pump regulator

Machines with variable pumps are protected against overload by integrated pressure cut-offs in the pump regulator.

Dump valve

The dump valve drains the hydraulic pressure to the tank when the safety stop is pressed or if the lever gate for operating voltage to the control circuit is closed. When the dump valve drains the flow to the tank, the pressure in the hydraulic system is released and the risk of unexpected movements is prevented. The dump valve is not available on all Brokk machines.

Control system protection

Outputs are software protected against temporary overload in the control system.

Stickers

Brokk machines are equipped with type plates, warning stickers and information stickers. Before using the machine the operator must have read and understood the instructions regarding the plates and stickers on the machine. Any stickers which are missing or illegible must be replaced. The location and part number of a sticker is given in the spare part list.

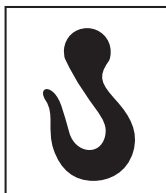
Type plate

The type plate is located beside the mounting for arm one and inside the electric cabinet. It contains the following information:

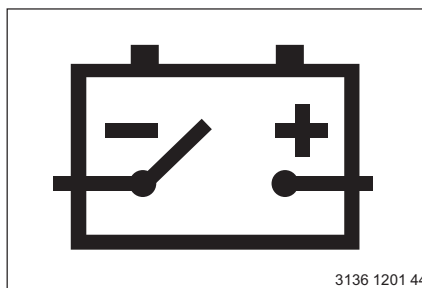
- CE mark
- Manufacturer
- Year of manufacture
- Type designation, revision
- Serial number
- Motor data
- Machine weight

Information stickers

The sticker can indicate direction of movement, lifting points or what hydraulic fluid was in the hydraulic system of the machine on delivery.



The sticker indicates the position of the lifting points. The number of lifting points varies depending on the machine model.



Main circuit breaker, disconnects the battery



Tank for fuel, diesel

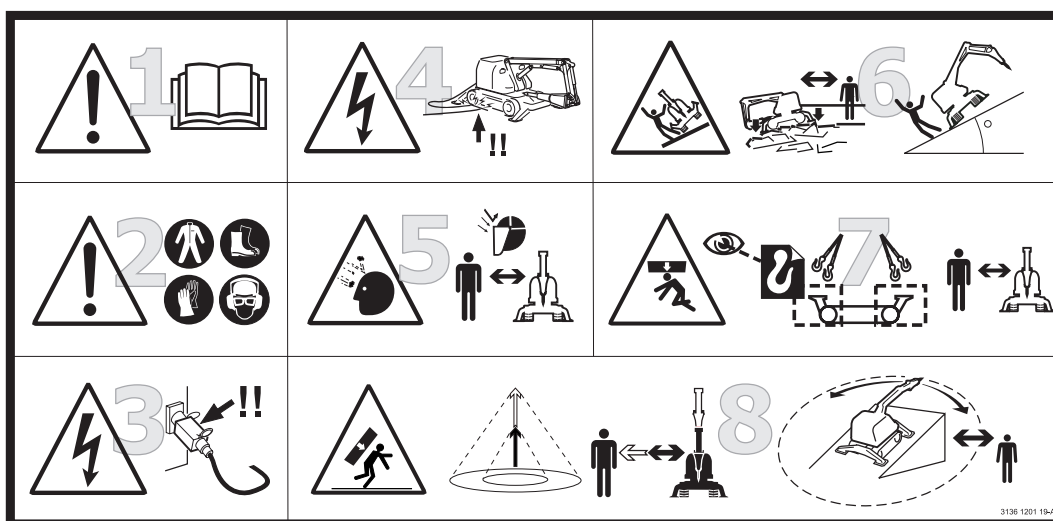
Warning stickers

Warning stickers have a red border. They provide important information about risks which can cause serious personal injury, therefore it is important that the operator has understood the meaning of the sticker. The machine is equipped with a general warning sticker as well as specific warning stickers which are associated to a relevant risk. The number of specific warning stickers varies depending on the machine model.

General warning sticker

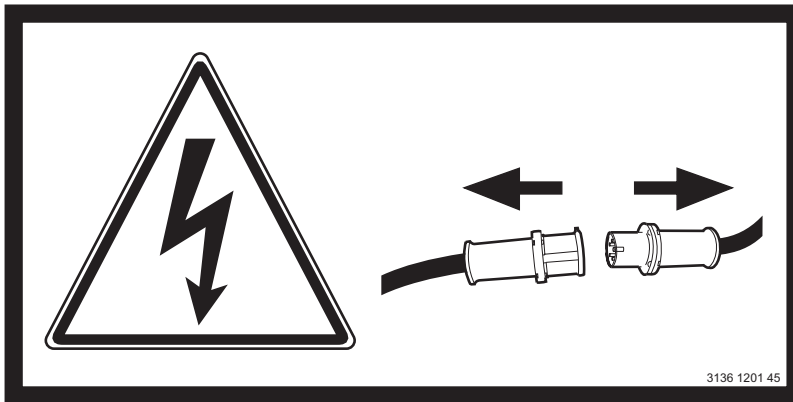
The warning symbols on the general warning sticker have the following meanings:

- 1. Danger – Read and understand the Brokk manual
- 2. Danger – Use personal protective equipment
- 3. Warning high current – Connect the machine via an earth fault relay
- 4. Warning high current – Monitor the power supply cable of the machine
- 5. Risk of splinter, falling debris - Keep your distance. Use personal protective equipment
- 6. Risk of the machine tipping/sliding - Anchor the machine. Keep your distance. Stand uphill of the machine
- 7. Risk of crushing – locate the lifting points, attach approved lifting equipment to all the lifting points, keep outriggers and arm system retracted, keep your distance
- 8. Risk of crushing – the risk zone varies. Keep your distance



General warning sticker

Specific warning stickers



Warning of high current. The sticker is located on the electric cabinet of the machine.



Warning of hot surfaces, can cause serious burns if touched

Warning of entanglement, never touch rotating parts

Handling

The most important condition for your own safety, your colleagues' safety, and the operational safety of the machine is that the information from this manual and common sense are used.

Areas of use

The machine is intended for:

- Demolition, digging, making openings, materials handling
- Working in hazardous environments. The machine is remote controlled so that the operator can control the machine without being within the risk zone
- Working with hydraulic and mechanical tools
- Work which requires safe positioning with good repetition
- Working indoors and outdoors. Indoor work using machines equipped with diesel engines requires good ventilation
- Work in dangerous environments, where the machine is exposed to risk of collapse, dangerous substances or extreme heat for example
- Work in environments classed as "fire hazards" on the condition that the connection to the electrical network is the correct size and not damaged

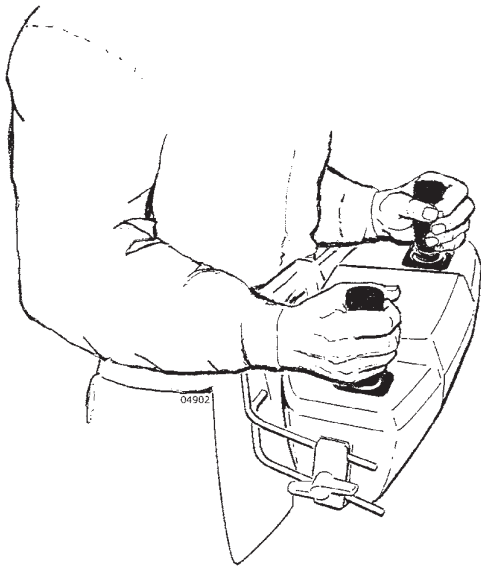
The machine is NOT intended for:

- Work in areas that are classed as "explosive hazards"
- Work in water where the water level threatens damage to the electrical equipment of the machine
- Passenger transport
- Use on the public highway
- Use as a towing vehicle or lift
- Work which endangers the lives or health of the operator or nearby personnel. Remove the risks before starting work or use another method

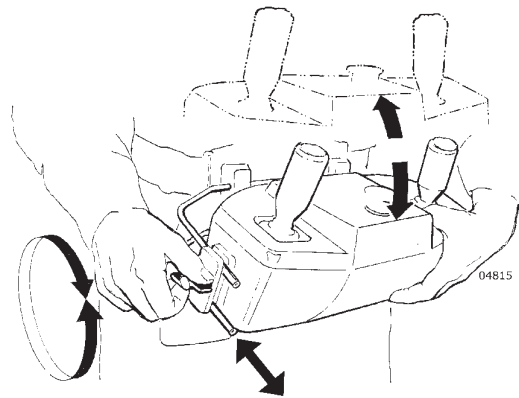
Ergonomics

Be aware that there is a risk from static loading. Vary your working position and take regular breaks to stretch your body. Vary the work between using the control unit fastened around your waist and using the control unit on a stand. Operate the machine using steady relaxed movements. Using force on the levers does not increase the power of the machine, but does increase the risk of static loading.

Adjust the control unit for the optimum working position.



Relax the shoulders by resting your hand on the control unit cover



Vary the working position by adjusting the control unit mounting

The control levers allow various grips. Hold the levers in different ways to reduce the static loads. Relax the shoulders by resting your hand on the control unit cover. A harness to distribute the weight of the control unit between the hips and shoulders is available as an option.

Regulations for environmentally unfriendly waste

Machine waste, such as used hydraulic fluid, filters, hoses etc., and deposited materials from demolitions are considered environmentally unfriendly waste. Environmentally unfriendly waste must be disposed of according to local authority regulations. Check these regulations before starting work.

The following machine components must be disposed of:

- Hydraulic hoses
- Batteries
- Rubbers and plastics
- Filters

Do not release fluids such as hydraulic fluid, oil, grease and condensation from the tanks into the environment. Collect any fluids in a container and handle according to local authority regulations.

Affecting the operational reliability of the

machine

As an operator you have a great influence on the operational reliability and service life of the machine. Three important factors are:

1. That the daily inspection and regular maintenance are carried out.
2. That the working environment of the machine is taken into account. It can affect the maintenance of the machine and the operational conditions so much that action must be taken.
3. That overloading is avoided by using an operational style based on knowledge of critical situations and machine limitations, using the methods and tools intended for the machine and meeting our recommendations.

This manual contains the results of many years experience of using Brokk machines compiled to provide instructions and advice on how to use the machine. Read, understand and follow these instructions!

Regular service

The best method of preventing unplanned stoppages and breakdowns and to retain the value of the machine is by carrying out daily inspections and regular service. Keeping the machine clean, especially before service, reduces the risks of the hydraulic system or the fuel system becoming contaminated. Even very small dirt particles can cause damage resulting in stoppages.

Extra equipment and tools must also be checked and regularly maintained. Certain tools require repeated lubrication during an operating shift. Read and follow the instructions of the tool supplier.

The machine manual contains a service schedule based on the operating hours of the machine. Because the working conditions can vary, it may be necessary to adapt the service interval to the relevant working conditions and environment. In general the following working conditions require shorter service intervals:

Dusty environments

Extreme ambient heat

Work resulting in high operating temperatures

Certain components must be replaced when damaged or worn out to preserve operational reliability. These include components such as cylinder covers, abrasion protection and outrigger pads. Rubber outrigger pads have a shock absorbent effect which protects the machine from vibrations.

The machine's working environment

The operational reliability of the machine is affected by the working environment. In harsh environments it is important to have knowledge both of what affects the machine and in what way. The operational reliability of the machine is increased by preventative action and maintenance appropriate to the environment.

Temperature

The ambient temperature, both hot and cold, affects the operational reliability of the machine. Temperature variations have an effect because of the increased risk of condensation in the tanks of the machine.

Heat

In hot environments the driver must ensure that the machine does not overheat. Both the electrical and hydraulic systems of the machine can be damaged by overheating.

The temperature of hydraulic fluid is affected by both the ambient temperature and the type of work in progress. Continuous chipping using a hydraulic breaker produces most heat. Other factors are a blocked radiator, that the tool installed is not intended for the machine or that the machine has internal leakage in the pump and valves which makes it ineffective and hot.

The highest operating temperature for hydraulic fluid is 80°C. The temperature must not exceed 90°C for long periods. Overheating causes deposits, sediment and fixed particles, This leads to increased wear, damaged seals and leakage. Overheated hydraulic fluid does not lubricate effectively which leads to reduced performance.

Tips for avoiding overheating:

- Keep the machine, in particular the radiators, clean.
- Ensure that the airflow is good when working indoors.
- If there is radiant heat, the operator must note that the localised heating could damage parts of the machine. Screen off exposed components.
- Additional cooling is necessary when the ambient temperature exceeds 40°C. Supply the machine with forced cooling using compressed air. If the site is located more than 1000 meters above sea level the temperature limit falls to 35°C and at 2000 metres the limit falls to 30°C (5° per 1000 metres).

Tips for avoiding damage to machinery at high machine temperatures:

- Change the hydraulic fluid and filter more frequently.
- Check the seals on the machine. Seals wear out more quickly at high temperatures. Damaged seals can create dirt in the hydraulic system resulting in damage to the machine.
- Rubber tracks must not be exposed to temperatures exceeding 70°C. In hotter environments steel tracks must be used.

All temperature information applies to hydraulic fluid ISO VG 46.

Cold

Check the glycol content of the radiator if the machine is equipped with a diesel engine. The batteries on the machine must be kept charged. A discharged battery can freeze and split, if possible store batteries at room temperature.

When the hydraulic fluid temperature falls below 10°C, maximum pump pressure must not be used until the machine has warmed up slowly, otherwise the hydraulic system may be damaged.

The machine is warmed up as follows:

- Warming up the undercarriage. Move the outriggers downwards so that the tracks are just off the ground. Run both the drive motors, starting at a low speed and increasing speed as the temperature increases.
- Warming up the upper section. Swing the upper section backwards and forwards and operate all the cylinders in the arm system without any load.

Ensure that a temperature around 40°C is reached.

Moisture

When working in damp environments the operator must ensure that no electrical components, for example the connector, are in water.

The machine must not be moved in a water depth where water might reach the electrical equipment on the machine. The machine must not be started if water has penetrated electrical equipment when the machine was stationary and switched off. The motor must be taken to pieces and oven dried. Transformers and connectors must usually be replaced. Contact the machine supplier or an electrical technician.

The control unit is designed to tolerate moisture from above, such as rain. The control unit is equipped with a breather filter to prevent moisture damage caused by condensation. The switches of the control unit and the push buttons of the levers have protective rubber hoods. If these are damaged they must be replaced as soon as possible. The risk of damage caused by moisture is considerable. Never use a high pressure washer to clean the control unit or electrical cabinet. Wipe the control unit and electrical cabinet using a damp cloth.

Dust and dirt

If dust and dirt block the radiators of the machine, there is a risk of overheating. If dust from rubble penetrates the bearings of the machine it functions as a grinding paste causing bearings and shafts to wear much faster. This can be avoided by regular lubrication which expels the dust. The amount of dirt and dust can be reduced by water flushing. Clean the machine at regular intervals.

The hydraulic system

The hydraulic system is very sensitive to contaminants. Particles as small as several μm (0.001 mm) in size can get trapped in a valve and cause serious damage and accidents. Contaminants cause wear in components and can damage seals, valves and other moving parts.

A correctly functioning hydraulic system is closed, contaminants cannot penetrate the system. The risk of contaminating the hydraulic system is greatest when service and repair is carried out on components, requiring the hydraulic system to be opened. Damaged piston rods and seals cause the system to be exposed to contaminants.

Keep the hydraulic fluid clean:

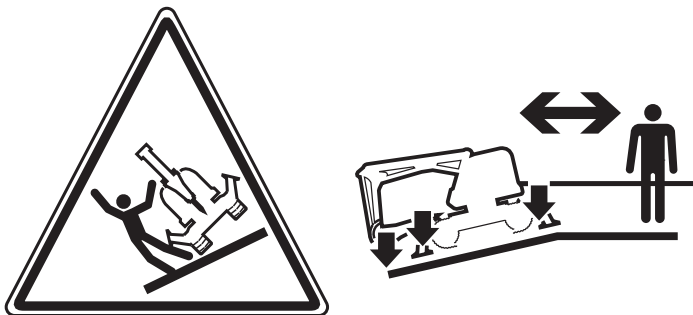
- Keep the machine clean, particularly before service or repair
- Carry out the daily inspection
- Carry out regular service
- Observe cleanliness when changing tools and carrying out service

Transporting and lifting

Loading and unloading using a ramp

Ensure that the ramp is complete, strong enough to bear the weight of the machine, and wide enough for the machine. Check that there is no oil or mud etc. on the ramp which could make it slippery. Secure the ramp correctly, both at the vehicle and to the ground. The transport vehicle must be secure so that it does not move.

The machine may start moving unexpectedly when moved on an inclined surface. Anchor the machine. Stand uphill of the machine. Keep your distance. Position the arm system and outriggers as low as possible to reduce the risk of the machine tipping over.



Risk of the machine tipping/sliding. Position the arm system and outriggers as low as possible. Anchor the machine. Keep your distance

Transportation

The machine may only be transported on a flatbed or trailer which is approved for the weight of the machine, see the type plate on the machine. The control unit must be well protected in the vehicle during transit.

The load position on the flat bed

The load must be placed as close to the front edge of the flat-bed as possible to prevent the load slipping forward under braking.

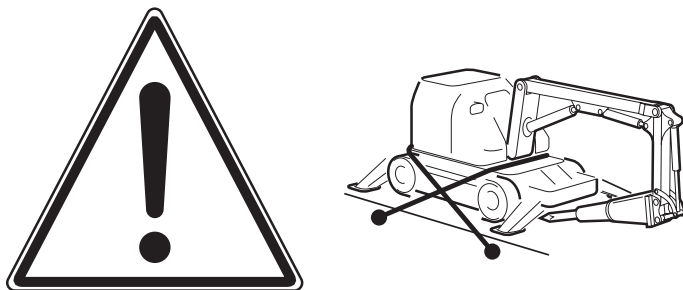
Move the arm system so that it is resting against the flat-bed as low as possible. Move the outriggers downwards without lifting the machine.

Secure the load

Secure the machine correctly using approved straps. Ensure that no machine components are crushed and damaged by the straps. Check that no components are loose and liable to fall off during transportation. If possible, cover the machine.

If tools or other equipment are placed alongside the machine ensure that they are secured using separate straps.

Regularly check that the load is secure when in transit.



Attention. Danger. Secure the load in transit

Lifting the machine

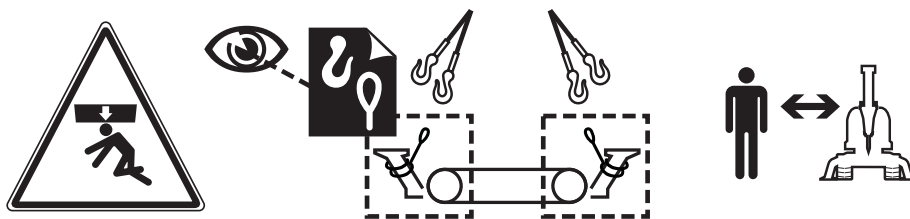
There is a risk of injury to personnel or damage to the machine or surrounding area when lifting the machine. Define the risk zone. Check that no one is within the risk zone when lifting.

Check that the lifting equipment and lift units used for lifting are fault free and approved for the weight of the machine. Follow any local regulations.

The weight of the standard machine can be found in the machine's technical data. Otherwise the machine should be weighed.

The centre of gravity must be as close to the centre of the machine as possible when lifting. Fold in the arm system before lifting.

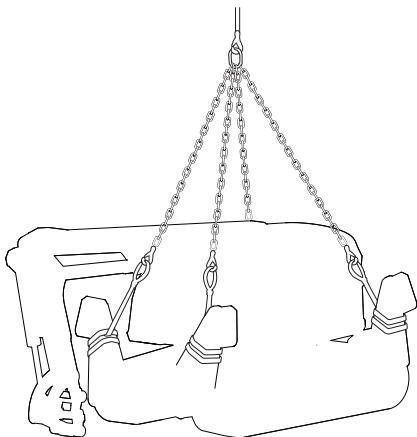
The machine must only be lifted at those points marked with a sticker. In order to lift the machine safely and effectively, the lifting equipment must be attached to all the lifting points.



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

Ensure that the weight is evenly distributed when lifting. Lift slowly and cautiously. If the machine has a tendency to lean, use another lift or change the position of the arm system.

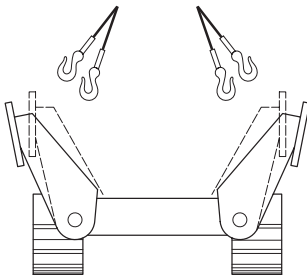
Ensure that no machine components are crushed and damaged by the lifting equipment. Lift very carefully. Ensure that no part of the machine touches any nearby objects.



Lifting heavy machines

When lifting the heaviest machine models, the outriggers should first be operated to the maximum retracted position and then operated down a little, approx. 100 mm. Otherwise the cylinders can lock during the lift.

If the cylinders still lock, secure a strap or similar at the top of the outrigger and then secure the strap in the arm system and use the arm system to pull the outrigger out until the lock releases.



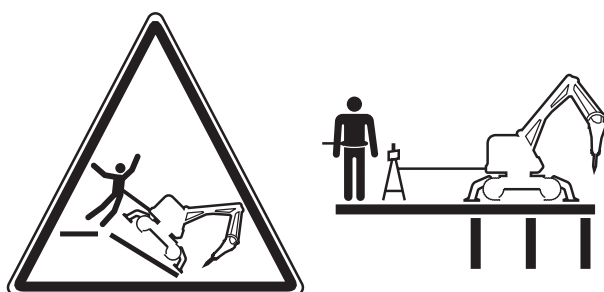
Do not lift the machine with the outriggers completely retracted.

Working in hazardous operating zones

Working near edges

When working on roofs, platforms, edges of shafts, holes, dykes or similar there is a risk of collapse. Collapse can be caused by the footing tilting or giving way, by an incorrect manoeuvre or the machine becoming unstable. The collapse can include rubble, tools, the machine and, in the worst case, personnel. The risk of the machine tipping increases when the arm is extended to maximum reach. Position the machine as close to the work object as possible.

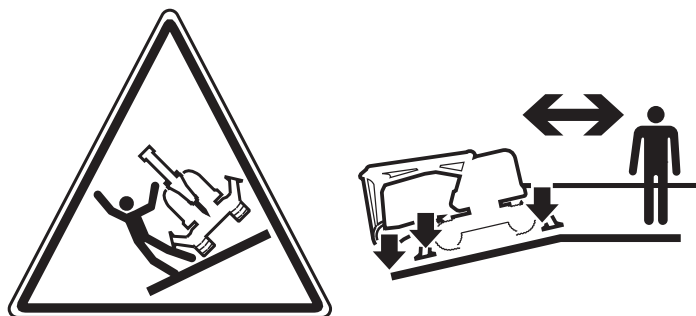
When cable controlled machines are used where there is a risk of collapse, the control unit must **not** be fastened to the operator. The control unit must be mounted on a stand.



Risk of collapse. Use a safety harness and a stand for the control unit where there is a risk of collapse.

The machine must be anchored if the ground surface is inclined or the machine is positioned less than one metre from an edge. If several tools are used for work on an inclined surface, those tools which are **not** fixed to the machine must be anchored so that they cannot fall over the edge.

The risk of tipping increases if the machine is carrying heavy tools. Anchor the machine and work as close to the work object as possible.



Risk of crushing. The operator must stand uphill of the machine. Anchor the machine. Deploy the outriggers. Keep your distance

Check the following points regularly during the course of operations:

- Ensure that the machine is stable.
- Check that the machine does not slip on the surface and move towards the edge.
- Check the characteristics of the floor surface and any changes in the surface. Vibration can reduce the load bearing capacity.
- Never stand on the control or power supply cables. Do not stand inside a loop of cable or between a cable and the edge.



Risk of crushing or entanglement. Keep your distance

Working and movement on uneven and inclined surfaces

- Height differences, steps and inclined surfaces can create large risks when working and moving. 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.
- The risk of tipping is reduced if the centre of gravity is as close to the centre of the machine as possible. Therefore fold the arm system in as far as possible. If the outriggers, arm and tool are placed near the ground they can be used as support when moving.
- Drive straight up or down inclines, never across. Plan the work so that the arm is uphill when working on inclined terrain.
- Obstacles or surfaces with poor load bearing capacity can cause the machine to change direction unexpectedly or even tip over. Always check the load bearing capacity and characteristics of the ground before starting the machine. Watch out for holes which have been covered by materials with low load bearing capacity.
- The caterpillar tracks give low friction against slippery surfaces. Water, dust and contaminants can reduce the friction further. When defining the risk zone bear in mind that the reduced friction increases the chances of the machine starting to slide.

When working with pipes and cables

Cables and pipes may be both visible and concealed within the work object. Survey the operating zone before starting work. Check what the risks are. Do not begin any work until you are sure that all lines are shut off as long as work is underway or while there is a risk.

Survey the work object for cables and pipes for:

Power supply

- Electricity
- Steam
- Hydraulics
- Gas

Fluids

- Flammable fluids
- Hot fluids
- Water

Communication

- Telephone lines
- Fibre optic lines

Electrical cables

Electrical cables in or near the operating zone must be unpowered. No parts of the machine must come anywhere near overhead power lines, the current can "jump" large distances. If the machine accidentally comes into contact with a powered electrical cable, seal off the area or organise supervision to prevent anyone from going near the machine or cable. Contact the owner of the electrical cable for further instructions.

Operating instructions

Instructions on how to operate the machine can be found in section: “Control system”

As the operator of a Brokk machine you are handling great power. A false move or incorrect handling can cause the machine to move, rotate or tip without warning which can cause personal injury and material damage.

Pay attention to the machine and surrounding risk zone during operation. Always be prepared to stop the machine in the event of a dangerous situation.

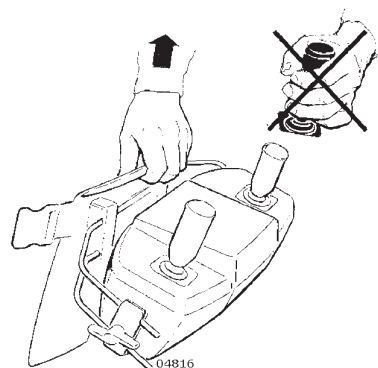
Plan the operation, otherwise there is a risk of “painting yourself into a corner”. Consider where to start and what the consequences will be, for example demolition mass, load bearing capacity and access.

Control unit

The impact resistance of the control unit is limited. Protect the control unit during transportation and after work is finished.

During operation the hand movements of the operator are transferred to the control system of the machine. The signal is proportional to the movement of the lever. Forcing the control lever violently will not cause the machine to operate more powerfully or faster, but can deform the control lever which may require unnecessary repair as a result.

The control levers are not intended to be used for lifting the control unit. Use the yoke provided.



The yoke for lifting the control unit

Safety when operating

Training is required to use the machine’s functions safely and effectively. Learn the limits of the machine, i.e. range, capacity and stability, by learning the controls in a secluded location where there is no danger of personal injury or material damage. Learn the following procedures.

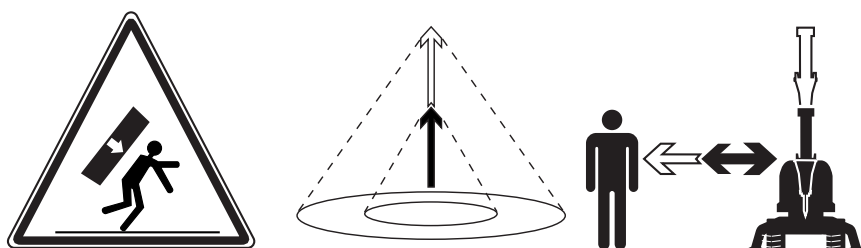
- Learn how to stop the machine. The ability to locate the stop button quickly can be life saving in a critical situation.
- Practice operating in different directions, at angles and on different surfaces. Also practice precise positioning and evacuation, i. e. moving away from the work object quickly.
- Practice using the outriggers, v i.e. not moving them up them more than necessary when moving. The machine can become unstable when the outriggers are moved upwards.
- Test the stability of the machine under controlled conditions.

Positioning in relation to the machine

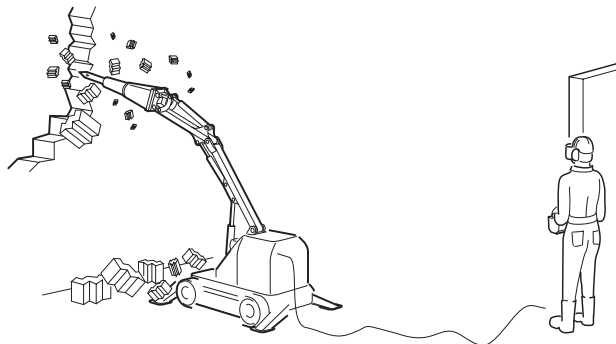
A remote controlled machine does not have a designated driver's position, therefore, the basic rule is never to stand within the risk zone of the machine during operation. Identifying the risk zone can be difficult. The risk zone can vary depending on the object being worked on, the materials, the working method and the tools used. Furthermore, the risk zone can vary during the course of the work.

Think ahead! The operator must decide on a safe control position at every job. Use the safety principle, no job is worth risking your own life, or the lives of others.

Continually define the risk zone during work. Neither the operator, nor surrounding personnel are permitted within the risk zone during work.



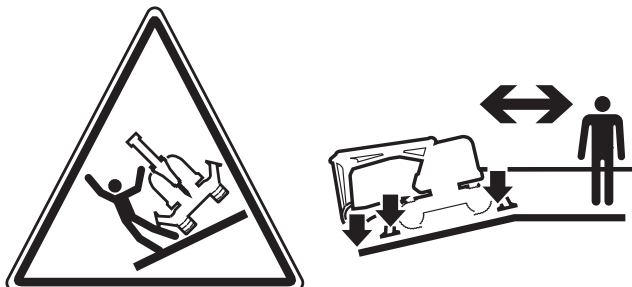
Attention. Danger. Keep your distance from the machine depending on the size of the risk zone. The size of the risk zone varies



Position yourself outside the risk zone of the machine, preferably protected behind a wall or pillar.

When moving the machine on a flat surface always walk behind or to the side of the machine, if there is sufficient room. When operating or moving the machine on an inclined surface position yourself uphill of the machine.

Do not begin any work before you are sure of your own safety and the safety of your surroundings.



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

Operating the undercarriage of the machine

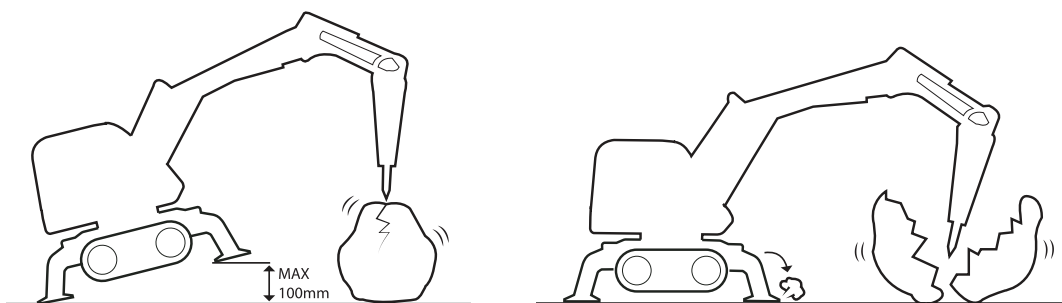
To reduce the risk of the machine tipping over, fold the arm system in and position it in the direction of travel of the machine before moving off. The machine is turned by the left and right-hand caterpillar tracks travelling at different speeds. To make tight turns, one track can be moved forwards whilst the other is reversed.

Because the front and rear of the track undercarriage look alike and the upper section swivels, it can be difficult to distinguish the front from the rear. The sticker on the track frame indicates forward. In the event of any doubt, carefully move the caterpillar track until direction of travel is established.

Outriggers

It is normal for the weight of the machine to lift the outriggers off the ground when working with hydraulic breakers or diggers. Do not allow the outriggers of the machine to lift off the ground more than necessary for the following reasons:

- The higher the machine lifts the greater the load becomes on the other support functions. If the load becomes too great the risk of the machine tipping or causing material damage is increased.
- When working with hydraulic breakers, the breaker will eventually break through. The higher the machine is raised when the breakthrough occurs the greater the risk that the machine will tip over or land with great impact on the outriggers.



Do not apply more pressure to the work object with the breaker than necessary. Breakthroughs with the outriggers raised can damage both the outrigger cylinders and other components on the machine. The outriggers must be lifted max 100 mm from the surface.

Simultaneously controlling the caterpillar tracks and upper section

The caterpillar tracks and upper section can be operated at the same time. See section “Control system”. The function is used to manoeuvre the machine in difficult terrain. The caterpillar tracks are operated using the control lever pushbuttons. Operation of the arm system is unchanged.

Be alert for unexpected movement. The caterpillar tracks can be driven at different speeds causing the machine to turn when moving. The function must not be used when moving onto ramps or during other precision manoeuvres.

Operating the upper section of the machine

Brokk machines are tool carriers; this means that the tool does the work. Do not use the arm system and swivel function to strike, tear or scrape. If the swivel function of the machine fails, the upper section can become loose causing damage to the machine and the surrounding area.

Swivel function

By swivelling the upper section of the machine, work can be carried out in several directions without moving the machine. Note that the stability of the machine varies depending on the direction of the arm in relation to the undercarriage. The machine is most stable when working straight ahead or straight behind. While the machine can work with the tool in the straight ahead position without stability problems, the machine can tip when the arm system is moved to the side. When the upper section of the machine is turned to the side, the outriggers must be deployed and the arm system moved as close to the ground as possible.

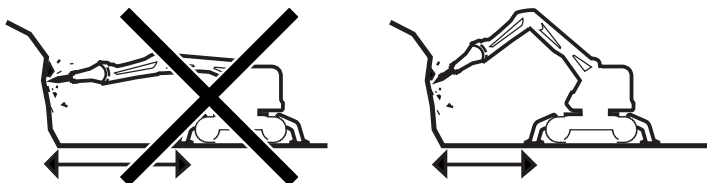
It can be difficult to anticipate the direction of rotation depending on the position of the operator in relation to the machine. In the event of any doubt, carefully operate the swivel motion to the determined direction of travel.

Arm system

Do not use the arm if the machine outriggers are folded up. The outriggers provide stability and reduce the risk of the machine tipping.

Work as close to the work object as possible because:

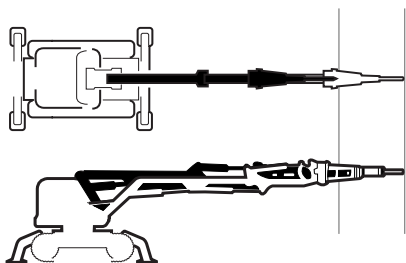
- The power of the arm system and cylinders is utilized best when operating near the machine.
- The load on components of the arm system and the turn table increases the further the arm system is extended. Move the machine closer to the work object instead of extending the arm system.



Move the machine closer to the work object instead of extending the arm system

The risk of tipping is increased when the arm system is extended. The reach of the machine is an advantage in cases where the work object cannot be reached, but the machine must always be positioned as close to the work object as possible.

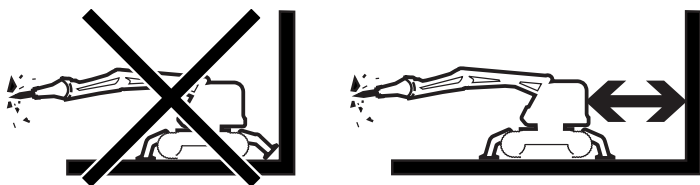
By operating cylinder 1 and cylinder 2 at the same time the reach of the machine can be adjusted without the machine having to be moved.



Changing the reach of the machine by operating cylinder 1 and 2 together

If the machine is equipped with a telescopic arm, cylinder 1 and 2 are initially used to extend the reach. Never use the telescopic arm to press the tool against the work object.

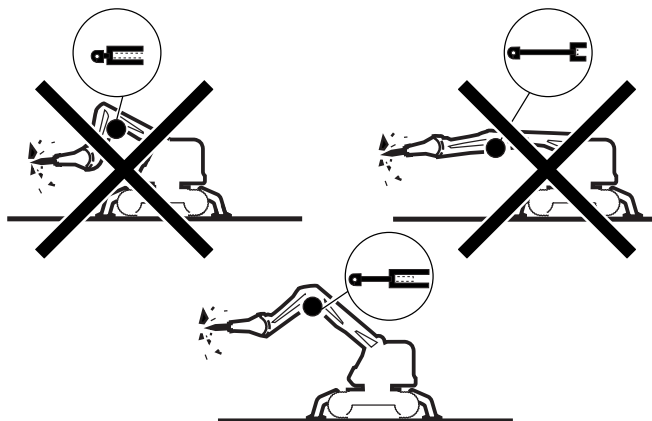
Do not secure the machine to fixed items, such as adjacent walls, to increase the force against the work object. Both the machine and tool can be overloaded.



Do not brace against walls using the outriggers. Keep a distance from the adjacent walls.

The arm system of the machine can be overloaded if incorrectly used. Avoid this by following this advice.

Do not work with the cylinders in the inner or outer limit positions. When a few centimetres of the cylinder maximum movement are left, the hydraulic fluid remaining in the cylinder acts as a shock absorber. The hydraulic fluid alleviates knocks and vibrations which can cause direct mechanical damage and material wear.



Do not work with the cylinders in the inner or outer limit positions

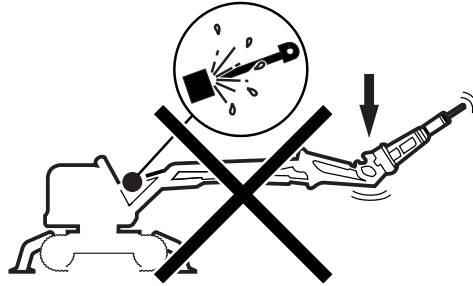
There are two operating positions that put extreme strain on each cylinder.

OPERATING POSITION 1

Condition: Cylinder 1 and 2 are moved to maximum out limit position, the breaker operates upwards.

Result: The arm system is forced downwards, the force acting on cylinder 1 will pull it apart.

Remedy: Never move cylinder 1 to the outer limit position.



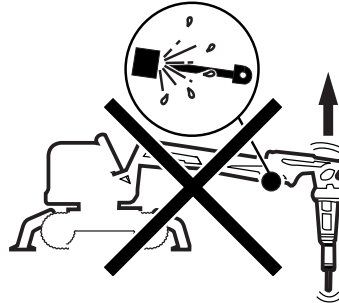
Operating position 1 subjects cylinder 1 to extreme load

OPERATING POSITION 2

Condition: Cylinder 3 moved to maximum out limit position, the breaker operates downwards.

Result: The arm system is forced upwards, the force acting on cylinder 3 will pull it apart.

Remedy: Never move cylinder 3 to the outer limit position.



Operating position 2 subjects cylinder 3 to extreme load

Starting and stopping

Instructions on how to operate the machine can be found in section: “Control system”

Pre work inspection

- Carry out a daily inspection before starting the machine.
- If the machine has been transported to the site, check that the machine is not damaged.
- Check that no tools or other objects are lying loose on the machine.

Connect the electrically driven machine

Check that the electrical socket used is supplied with the correct voltage and fuse. Check the diameter and length of the power supply cable. Check that the extension cable is of the correct length and diameter. Guidelines for the size of fuse and dimensions of the extension cable can be obtained from the table *“Guidelines for connection to the electrical supply”* in section “Machine data”.

Start the machine

Ensure that the correct machine is started, this is extremely important when there are two or more radio controlled machines, for example, cranes, on the same site. If these transmit radio signals on the same frequency, they can interfere with each other. For further information see section: “Control system”

If several Brokk machines are used on the same site, there is a risk of mixing the control units. Make a note of the machine’s reaction at start-up, do not activate the control circuit before being sure of which machine is being operated.

Check that the phase sequence is correct

The electric motor cannot start if the phase sequence is incorrect, the phase sequence is switched by the main switch of the machine. For further information see section “Electric cabinet's functions”.

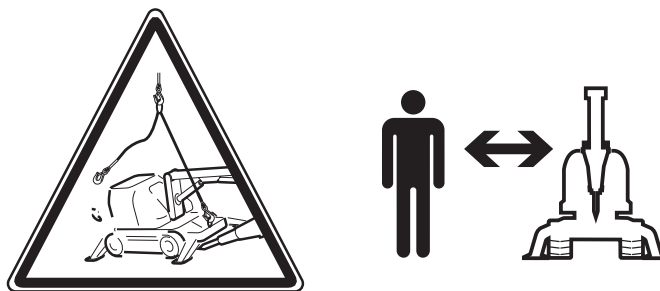
Post work inspection

Carry out an inspection after finishing work, if any damage is detected down time can be avoided the following day. Check that all fluids are at the correct levels, top up if necessary.

Towing

The machine is not designed for towing, damage to the machine can occur. Only tow if the position of the machine causes a hazard or if the position is a risk to service personnel carrying out repairs on site. Only tow if there is no other solution, e.g. lifting. Only tow the shortest possible distances.

- If possible, move the outriggers up before towing the machine, otherwise there is a risk of them getting trapped and damaged.
- The load on the towing equipment and machine components is affected by friction against the ground surface, reduce the friction by preparing the towing route of the machine.
- If possible, tow in the direction of the tracks.
- Connect towing equipment to a lifting point, these are marked by stickers. Use towing equipment intended for the relevant load.
- Chains and straps can become loose when towing. Therefore keep away from the machine.



Risk of personal injury. Chains and straps can become loose when lifting or transporting. Keep your distance

Diesel

General

Before starting a Brokk machine with a diesel engine, both the supervisor and operator must have read and understood the entire Brokk manual. The manufacturer's instructions apply to the diesel engine, these are in a separate section behind a dividing tab in the product folder for the Brokk machine.

Battery

General

The machine is equipped with two 12 V batteries which are serially connected and therefore supply 24 V. Never connect a fully charged battery to a discharged battery; there is a risk of explosion. Store batteries in a warm environment, if possible, indoors. In cold climates the battery must be kept fully charged otherwise there is a risk that it may freeze and split.

When the machine is not in use the current must be shut off to prevent the battery discharging.

Batteries contain environmentally harmful lead. Dispose of the old battery according to local regulations after replacement.

Connection

The battery must be connected with the correct polarity, negative terminal to earth. Remove the negative lead first when removing a battery. Connect the positive lead first when installing a battery.

Service and maintenance

Keep the battery clean. Check that the battery terminals are correctly tightened and clean. Apply grease to the terminals after cleaning to ensure a good connection.

Charging the battery

**Warning!**

Risk of explosion. Hydrogen gas is created when batteries are charged. Naked flames, sparks or short-circuits near the battery can cause violent explosions. Always break the charge voltage before the charger clamps are removed from the battery.

Connect the battery charger clamps to the battery first, then connect the battery charger to the electrical supply. Read, understand and follow the instructions supplied by the manufacturer of the battery charger.

Fuel

Filling

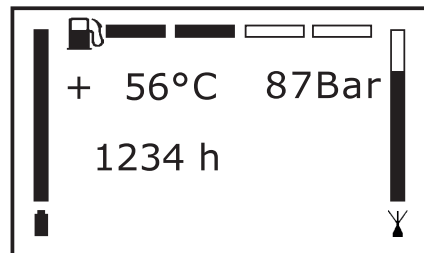
Fill the fuel tank in a well ventilated location well away from sparks or naked flames. Check that the correct diesel grade is used. Refer to the engine manufacturer's instructions for the correct diesel grade

- Switch off the engine.
- Earth the filler nozzle against the tank to prevent sparks.
- Fill with fuel but do not fill to the brim. Wipe up any spilled fuel.
- Check that the tank cap is correctly tightened after filling.

Fuel level in tank

The fuel level is displayed in the control unit display.

When all four bars are empty code E08 is displayed. There is then 1-2 hours of operating time remaining, depending on type of work.



Fuel level is shown in the display

Cleaning the machine

Safety when cleaning

When cleaning the machine there is a risk of dirt and hazardous substances entering the eyes. There is also a risk of slipping due to degreasing agents. Hydraulic fluids, oils and water cause the underlying surface to become slippery.



Attention. Danger. Use personal protective equipment.

Dirt and hazardous substances can be released from the machine when high pressure equipment is used. High pressure streams of water or air can penetrate the skin and cause serious injury or death. Never direct the flow of high pressure water or air towards the skin. Use protective equipment, goggles, gloves and protective clothing.

Cleaning methods

The method must be adapted to the amount of dirt on the machine, the type of dirt and whether covers are installed or not. A mild degreasing agent can be used but avoid contact with the skin.

Cleaning methods using high-pressure washing and compressed air must be carried out with great care, incorrect usage can damage the machine. Below are some examples:

- High-pressure washing using the incorrect nozzle or pressure can damage electrical components, electric cables and hydraulic hoses
- The stream of high pressure water can damage the seals, resulting in damage due to penetrating water and dirt.
- Stickers can be washed away
- The surface treatment can be damaged

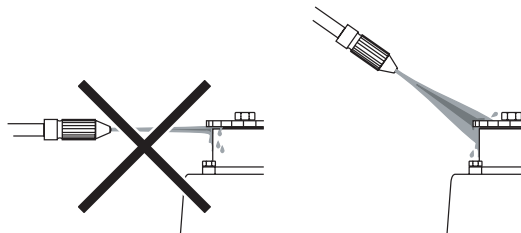
Cleaning components

There are a number of components which require special attention when cleaning

Tank

Do not direct the stream of water towards the tank cap, especially if high pressure washing.

Place a plastic bag over the air filter for the tank and seal the bag using a rubber band to prevent water from entering the tank.

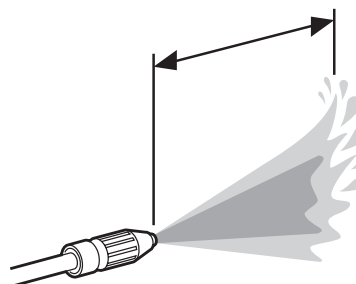


Do not direct the stream of water towards the tank cap

Radiator

Allow the radiator to cool before cleaning. Use compressed air to clean the plates. If necessary, use a high pressure washer and degreasing agent. Incorrect use of a high pressure washer or compressed air can deform the radiator plates and therefore reduce the cooling capacity of the radiator.

- Maximum pressure 100 Bar
- Spray directly against the radiator, parallel to the plates
- Maintain a distance of approximately 40 cm between the radiator and the nozzle



Maintain the recommended distance

Electrical components

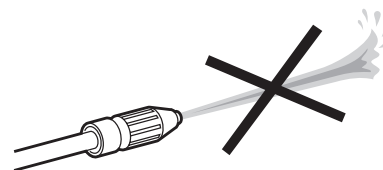
Clean the electric motor, electric cabinet, connectors and other electrical components using a cloth or compressed air. Avoid water contact with the electrical components. Wipe the control unit using a damp cloth. Never use high pressure water. Blow clean internally using compressed air.

Diesel engines

Protect the electrical components of the engine. Refer to the instructions of the engine supplier.

Electric motor

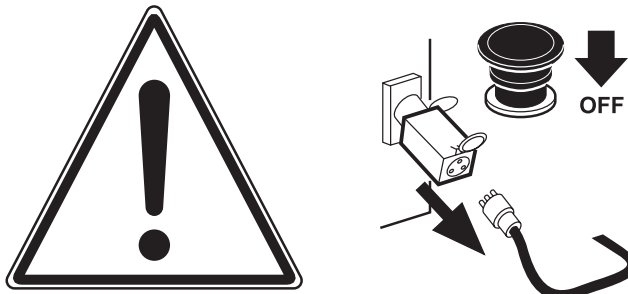
It is important to keep the area around the electric motor clean to avoid overheating: This particularly applies to machines where the motor is installed in the undercarriage. Overheating significantly shortens the service life of the electric motor.



Do not use a high pressure washer when cleaning moisture sensitive components

Before washing

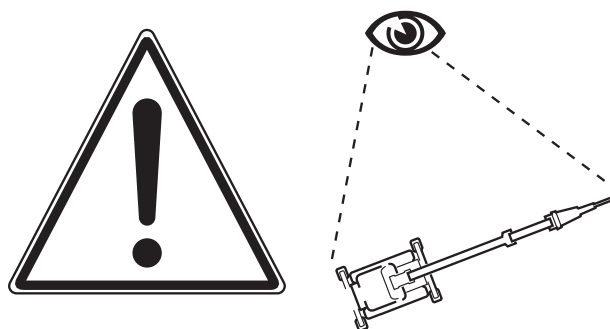
Switch off the motor. Remove the power supply cable and position it so that it cannot be reconnected by mistake. Disconnect the battery if the machine is equipped with a diesel engine.



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

After washing

- Lubricate all the lubrication points of the machine
- Blow electrical connectors dry using compressed air
- Take care when starting the machine after washing. If any component has become damaged by moisture, the operation of the machine may be impaired.



Attention. Danger. Take care when test driving.

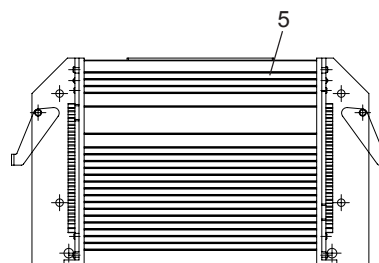
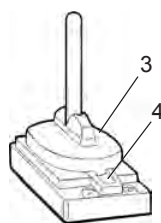
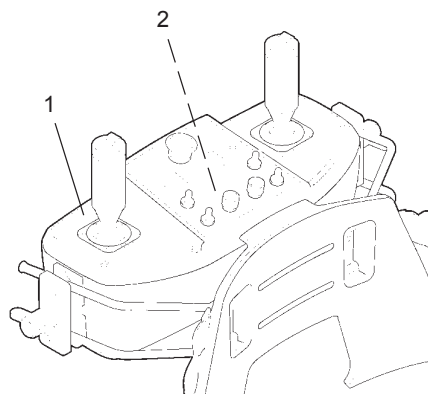
Control system

Control unit

The signal transfer from the control unit to the electronic unit of the machine is digital and by radio or control cable. A radio controlled machine can be controlled by cable.

The radio transmitter is located in the control unit. The radio receiver is located on the machine body, the location varies depending on machine model. The electronic unit is usually located in the electric cabinet of the machine.

This is a two-way radio, which means that information such as temperature, for example, is sent back to the control unit and can be read off from the display.



1. Control unit
2. Radio transmitter
3. Radio receiver
4. Display radio receiver
5. Electronic unit

Left control lever

B1

Right control lever

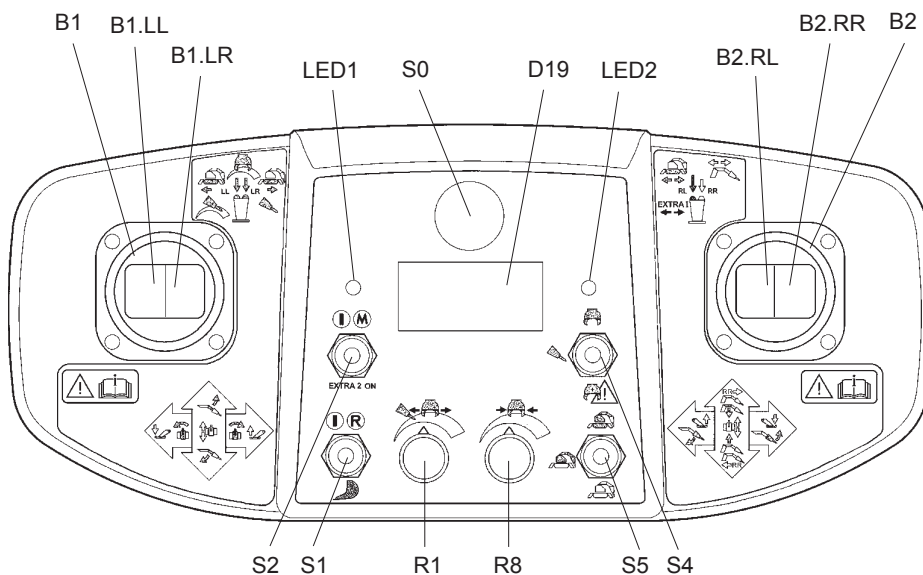
B2

Left pushbuttons

B1.LL B1.LR

Right pushbuttons

B2.RL B2.RR

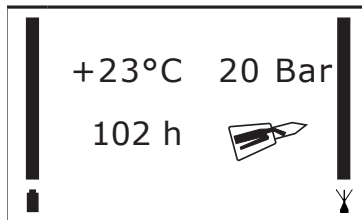


Battery

During remote control the battery is located in the battery holder on the underside of the control unit. The effective operational time of the battery is 8-10 hours on a single charge. During cable control the battery charges automatically. In extreme cold the battery capacity and charge are diminished.

When the machine is inactive for more than 5 minutes the control unit switches off automatically to preserve the battery, the motor will also stop.

The battery capacity is indicated on the display. LED1 flashes red at low battery capacity. When the battery capacity is too low the control unit cannot be activated.



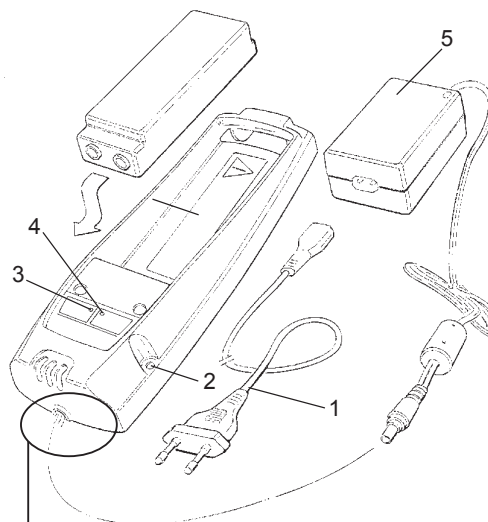
Battery charger and battery charging

The battery charger charges at two levels; first with a high current until the battery is charged, then with a maintenance charge until the battery is removed from the charger. For safety reasons the high current shuts off after three hours, whether the battery is charged or not.

Normal charging time, for a drained and discharged battery, is approximately 3 hours. The battery charger is adapted so that the battery cassettes are not damaged by long term continuous charging.

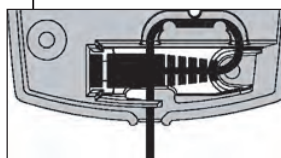
The connection voltage for the transformer must be 230 VAC in Europe and 94-240 VAC in the rest of the world. The battery charger is supplied with a variety of different plugs suitable for use in different countries.

The battery charger must be installed in a vibration free location, indoors for protection from moisture and temperature variations.



Battery charger for the control unit battery

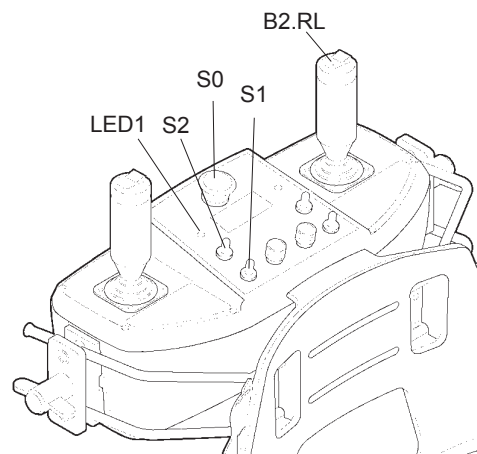
1. Connection cable
3. The LEDs light red when the battery is charging.
4. The battery is fully charged when the LEDs light green.
5. Power transformer



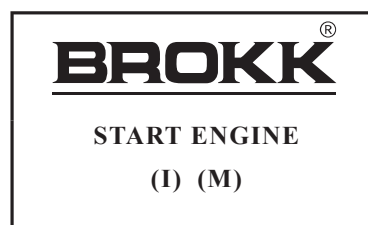
Secure the cable as illustrated.

Link radio transmitter – radio receiver

1. Connect the system with cable control.
2. Cut the power, wait 10 seconds and switch on the power again.
3. Pull up the stop button S0.
4. Press switch S1 up for a few seconds until a longer beep is heard. This must happen within 1 minute of point 2.
5. The radio receiver's display shows "Po/Id".
6. When identification is complete 5 short beeps sound.
7. Restart the control unit according to points 2 and 3.
8. Display shows "BROKK Start Engine".
Or display shows "Loading fonts".
Restart the control unit again according to points 2 and 3.
9. Disconnect the cable, the machine can now be operated.



Control unit



Display

Approval

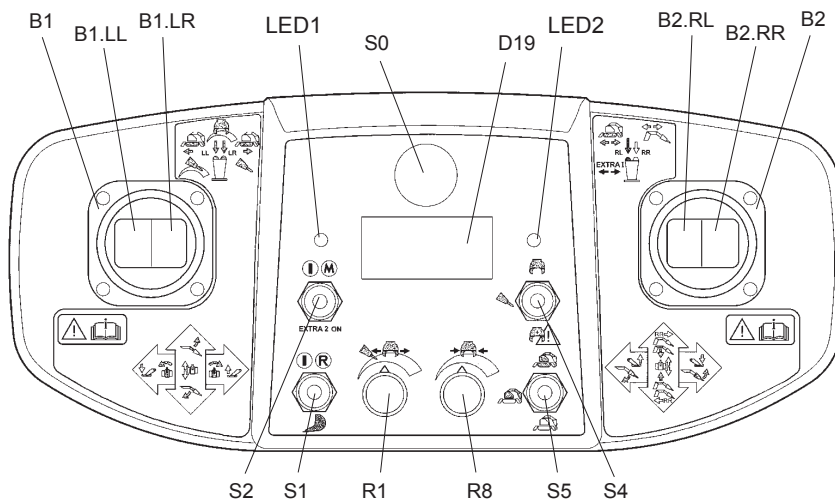
This equipment is approved under FCC regulations, section 15, and I-ETS 300,200. When using radio control the following two conditions apply:

1. The equipment must not cause interference.
2. The equipment must tolerate atmospheric interference without uncontrolled deployment occurring.





A sticker with the approval number is located in the battery holder on the control unit, under the battery. Changes or modifications to this equipment, which have not been approved by an authorised testing institution, can cause the rights of the user to use the equipment to become void.

Control unit functions

B1 Left control lever
 B1.LL B1.LR Left pushbutton
 B2 Right control lever
 B2.RL B2.RR Right pushbutton



Switch

- S0  Stop button and safety stop. Pull the stop button up to reset it after stopping.
- S1  One press: Start of control unit, display illuminates.
 Two quick presses: Changes the radio frequency. Only applies to machines with radios without automatic search of radio frequency.
 Also used when programming and testing the control unit. Sprung to return to centre position.
-  Separate operation Arm 1. Changing reach, if the machine is equipped with telescopic arm
- S2  Starts the electric motor. Sprung to return to centre position.
- EXTRA 2 ON** Extra 2. Engagement of extra hydraulic function 2.
- B2.RL Extra 1. Engagement of extra hydraulic function 1.

S4

Switch S4 switches between three different settings for hydraulic tools. The switch is inhibited and must be lifted in order to set other positions.



Double-action position for, for example, hydraulic cutters.



Single-action position for hydraulic breakers. Hydraulic breakers in ON position with automatic.



Double-action position with increased working pressure.

This position must only be used with Brokk hydraulic crusher for machines with different working pressures.

NB! Single action hydraulic tools can be damaged if the operating pressure is fed to the return side. With increased operating pressure, the operating pressure is, for example, 25.0 Mpa which can damage tools not intended for use at that pressure.

S5



Position to operate the arm system and caterpillar tracks at the same time.

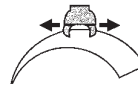


Operating position, the control levers affect the upper section of the machine.



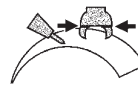
Transportation position, the control levers affect the lower section of the machine.

R1



Setting the flow to the hydraulic attachment. Functions only when pushbutton B1.LL on the left-hand control lever is depressed.

R8

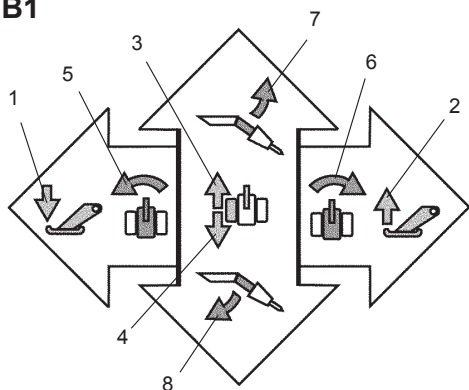


Setting the flow to the double action hydraulic tool. Functions only when pushbutton B1.LR on the left-hand control lever is depressed.

Left control lever B1
 Left pushbutton B1.LL B1.LR

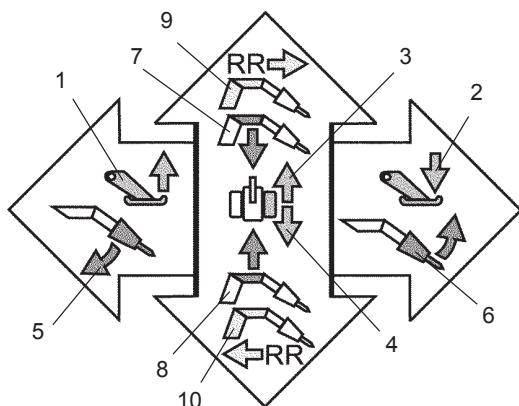
Right control lever B2
 Right pushbutton B2.RL B2.RR

B1



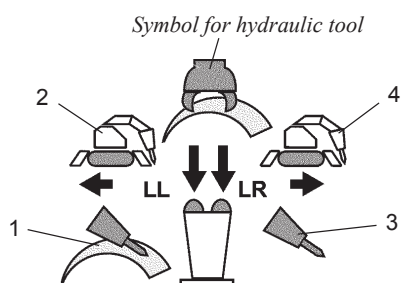
1. Outrigger down, left-hand side/rear
2. Outrigger up, left-hand side/rear
3. Left-hand caterpillar track forwards
4. Left-hand caterpillar track backwards
5. Slew anti-clockwise
6. Slew clockwise
7. Arm 3 up
8. Arm 3 down

B2



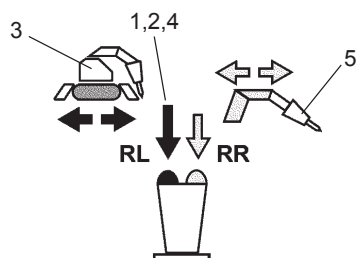
1. Outrigger up, right-hand side/front
2. Outrigger down, right-hand side/front
3. Right-hand caterpillar track forwards
4. Right-hand caterpillar track backwards
5. Tilt in
6. Tilt out
7. Arm 2 down
8. Arm 2 up
9. Increase reach
10. Reduce reach

B1.LL, B1.LR



- B1.LL**
1. Variable flow to hydraulic tool
 2. Caterpillar track backwards, when operating the caterpillar track at the same time as the upper section.
- B1.LR**
3. Maximum flow to hydraulic attachment
 4. Caterpillar track forwards, when operating the caterpillar track at the same time as the upper section.

B2.RL, B2.RR

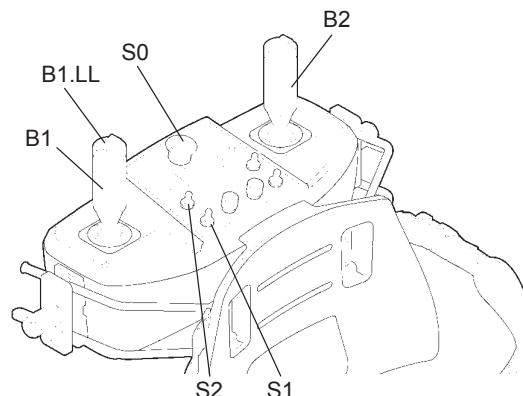


- B2.RL**
1. Engaging the control circuit.
 Separate operation arm 1, changing reach with telescopic arm.
 2. Engagement of extra hydraulic function 1
 3. Operating the caterpillar track at the same time as the upper section
 4. Arm 3 - rotation
- B2.RR**
5. Changing reach

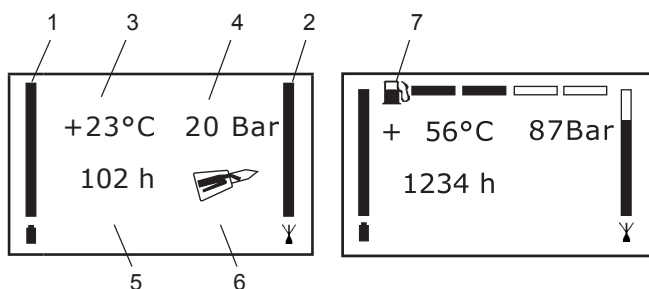
Menu management

Activation of the menu

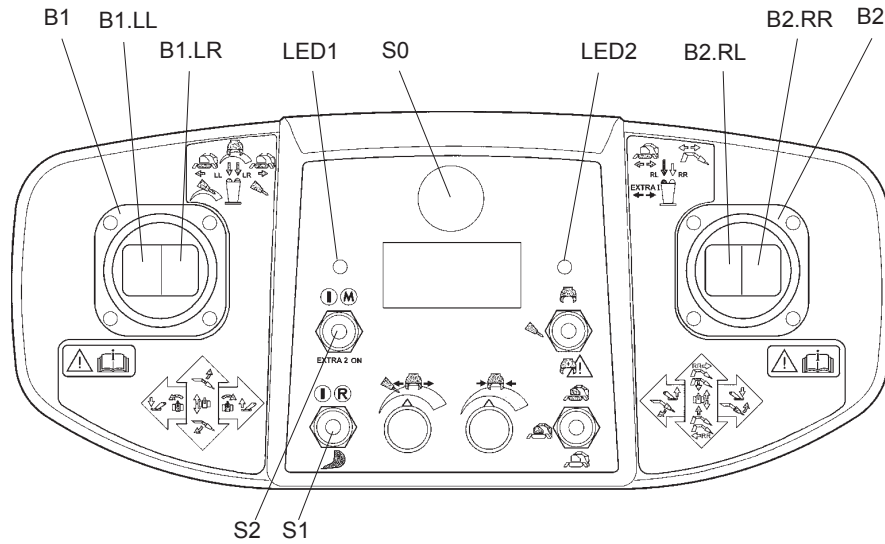
- Pull up stop button S0
- Hold the left control lever pushbutton down B1.LL
- Press switch S1 up
- Scroll through the menu using the left control lever B1 up/down.
- Switch to the next menu using left control lever B1 right/left.
- Select ON/Off using switch S1.
- Save settings using switch S2.



The following information appears in the display window when radio contact has been established on an electrically powered or diesel powered machine



Display text	Description
1. Battery status	Scale 0-3 dashes 0 = low battery level 3 = full battery level
2. Radio signal quality (measured by the receiver)	Scale x, 1-5 dashes x = no signal 1 = very weak signal 5 = very strong signal
3. Oil temperature	x°C
4. Oil pressure	xx bar
5. Operational time	xx h
6. Breaker lubrication	Breaker lubrication activated
7. Fuel level	Scale 0-4 dashes
Service Image	Service reminder, appears when service is required
Trouble codes	E01 – E58 see section "Troubleshooting"



Menu 1

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

Menu 3

SPEED REDUCTION	
1. LEVEL 1	OFF
2. LEVEL 2	OFF
3. LEVEL 3	OFF
4. LEVEL 4	OFF
5. LEVEL 5	OFF
SAVE (I) (M)	

Menu 2

TOOL SELECTION	
1. CRUSHER 2	OFF
2. SPECIAL	OFF
SAVE (I) (M)	

MENU 1 - HAMMER LUBRICATION

Lubrication pump activated. The function engages automatically when selecting a single action tool, e.g. hydraulic breakers. The function can also be switched off for single action tools that do not require lubrication

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

MENU 1 -POWER LIMITING

Reduces power output so that, for example, 16 A socket can be used. Not applicable to all machine models.

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

MENU 1 -WATER FLUSHING

Activate water flushing valve ON (when this is installed). Run together with tool.

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

MENU 1 -ONE LEVER DRIVE

During single lever operation, this function is set to ON.

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

MENU 1 -SERVICE RESET

Resetting after performed service, indicated on display.

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

MENU 2 -CRUSHER 2

ON if crusher is used, except hammer or any 2 different crushers.

TOOL SELECTION	
1. CRUSHER 2	OFF
2. SPECIAL	OFF
SAVE (I) (M)	

MENU 2 -SPECIAL

ON if other defined special tool is used.

TOOL SELECTION	
1. CRUSHER 2	OFF
2. SPECIAL	OFF
SAVE (I) (M)	

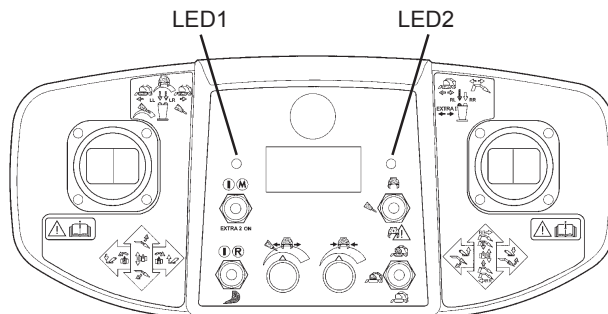
MENU 3 -SPEED REDUCTION

Each level set to ON reduces the speed by 20%

SPEED REDUCTION	
1. LEVEL 1	OFF
2. LEVEL 2	OFF
3. LEVEL 3	OFF
4. LEVEL 4	OFF
5. LEVEL 5	OFF
SAVE (I) (M)	

LED indication upon startup

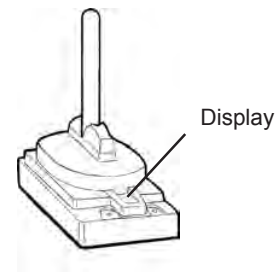
LED1	LED2	
Green	-	Reception OK, the machine can be started
Green	Green	Machine ready to use, control circuit activated
Flashing red	-	Weak machine reception
	Flashing red	Low battery level
Red	Red	No machine reception



Indications radio receiver

The following codes can appear in the radio receiver display in addition to trouble codes.

1H	Connected by radio, frequency jumping
10- >1B	Connected by radio, frequency locked (the second digit indicates channel 0-11)
1-	Connected by cable, the systems are ID programmed to each other
2-	Connected by cable, the systems are NOT ID programmed to each other
Po.Id	The system performs ID programming
"Wandering cursor" in the display	Not connected by radio/cable, searching for connection



Radio receiver


Starting and stopping

Read the safety instructions before using the machine.

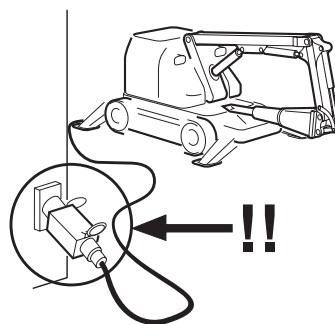
Before starting

The following points must be carried out each morning and before starting work at a new site.

- Carry out a daily inspection according to the "Service schedule".
- Ensure that the machine has not been damaged during transportation.
- Check that the power and control cables are undamaged.
- Check that the power socket has the correct voltage and fusing.
- Connect the power cable via an earth fault relay.



Warning!
Risk of electric shock. The machine can conduct current if the power cable is damaged. Always connect the machine via an earth fault relay. When working, for example, in a steel vessel that is electrically conductive the earth fault relay must always be located outside the steel vessel.



- Connect the control cable or select radio control.
- The operator must ensure that the correct control unit is used for the machine, and pay particular attention to the reaction of the machine on starting. This is especially important when there are two or more radio controlled machines on site.

Start, remedies on the machine

- Check that the safety stop buttons of the machine are turned up. They are turned clockwise.
- Turn switch Q1 to connect supply voltage and to select the correct phase sequence in positions 1 or 2. In the event of an incorrect phase sequence, E01 appears in the control unit display, turn the switch in the other direction.

The following switches are **not** available on all machine models.

- Ensure that the electric cabinet switch S8 is in the remote control position.



Starting the control unit

- Pull the control unit safety stop S0 up.
- Start the control unit by pressing switch S1 upwards until LED1 lights.

If no action is taken within 3 minutes after the stop button is pulled up, the transmitter switches off. The stop button must be pressed before a new attempt to start the control module can be made.

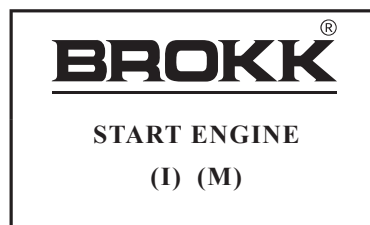


Zero-position check

A zero-position check is made during startup of the control unit. After the stop button has been pulled up, both control levers must be in the upright position and the pushbuttons must not be depressed for a session to be started. Other actuators are not covered by the zero-position checks.

Starting/stopping the engine

- The main switch of the machine must be switched on.
- Press switch S1 up (diesel engines: wait 5-10 seconds for glowplug heating)
- Press switch S2 up until the engine starts and the lights come on.



Engaging the control circuit

- Check that neither you nor anyone else are inside the risk zone of the machine.
- Engage the control circuit by pressing the left hand button on the right hand control lever B2.RL. The right LED lights green.

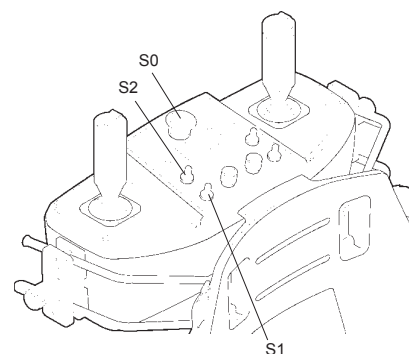


When the control circuit is engaged the control unit is always set in operating position, which means that the control levers affect the arm and rotation of the upper section. Set switch S5 to the drive position to operate the outriggers or to move the machine.

Stop

- Move the control levers to the neutral position.
- Press safety stop S0.
- Leave the stop button pressed in until the next time the machine is to be started.

Set the switch in the electric cabinet for selecting phase sequence, Q1, to position 0 if the machine is not to be used immediately.



Reset service message

When service is due a message is shown in the control unit display. This message must be reset when service is completed.

Reset the service message as follows:

- Pull up the stop button S0
 - Press and hold pushbutton B1.LL
 - Press switch S1 up
-
- Scroll down to line 5, "SERVICE RESET" using control lever B1

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	OFF
SAVE (I) (M)	

- Press switch S1 up, the control unit display then shows "SERVICE RESET ON"

FUNCTION SELECTION	
1. HAMMER LUBRIC	ON
2. POWER LIMITING	OFF
3. WATER FLUSHING	OFF
4. ONE LEVER DRIVE	OFF
5. SERVICE RESET	ON
SAVE (I) (M)	

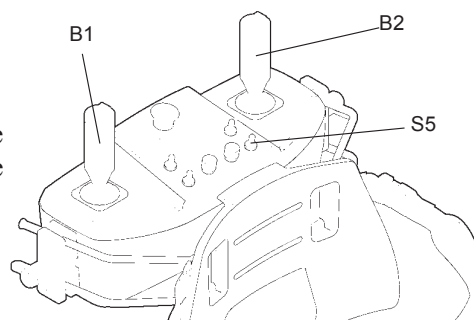
- Press switch S2 up, the display then shows:
"CHANGES SAVED"
"RESTART SYSTEM"

CHANGES SAVED
RESTART SYSTEM

Operating

Operating the undercarriage

To operate Brokk machines both the control unit and the machine must be started and the control circuit must be connected. See "Starting and stopping".



Operating the outriggers

Set switch S5 to the driving position.



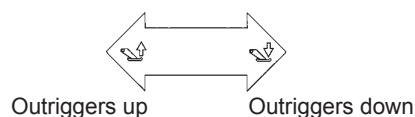
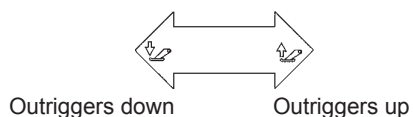
Switch S5 in the driving position

LEFT CONTROL LEVER B1

- With folding outriggers the left-hand side is operated
- With bulldozer blades the rear blade is operated

RIGHT CONTROL LEVER B2

- With folding outriggers the right-hand side is operated
- With bulldozer blades the front blade is operated



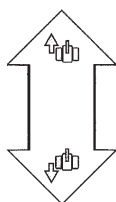
Operating the caterpillar tracks

The machine is turned by the left and right-hand caterpillar tracks travelling at different speeds. To make tight turns, one track can be moved forwards whilst the other is reversed.

Set switch S5 to the driving position.

LEFT CONTROL LEVER B1

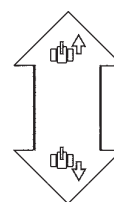
Left track drive forward



Left track drive reverse

RIGHT CONTROL LEVER B2

Right track drive forward



Right track drive reverse

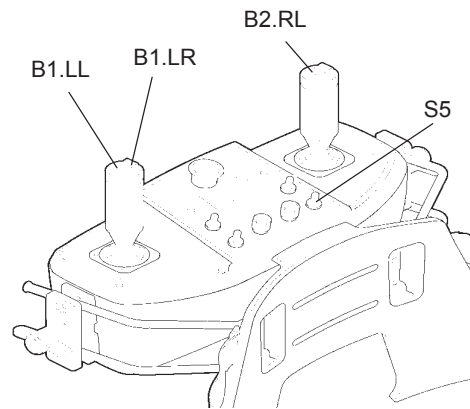
Operating the caterpillar tracks and arm system

With switch S5 in the position for simultaneous operation of the caterpillar tracks and arm system the caterpillar tracks can be driven backwards and forwards at the same time as the arm is operated. The function is used to manoeuvre the machine in difficult terrain. Use of the arm can increase the manoeuvrability of the machine.

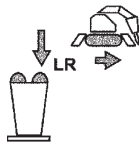
The function is equipped with twin command for safety. Both B1.LR and B2.RL must be held in while moving. Operation of the arm system remains the same but parallel and tool operation are inactive.

! **Caution!**
 Risk of unplanned turns. The caterpillar tracks can be driven at different speeds causing the machine to turn when moving. Because of this the function must not be used for moving on ramps or other precision driving. When movement requires precision, set switch S5 to the transport position so that the machine can be steered.

Set switch S5 in position as illustrated

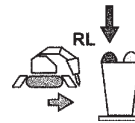


Moving forward



B1.LR

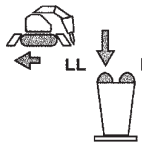
Right pushbutton on the left control lever



B2.RL

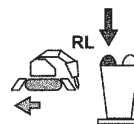
Left pushbutton on the right control lever

Moving backwards



B1.LL

Left pushbutton on the left control lever



B2.RL

Left pushbutton on the right control lever

Note that both B1.LL and B2.RL must be held in while moving.

Operating the caterpillar with two speeds – only Brokk 800

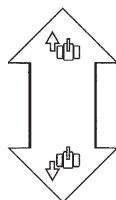
The machine is turned by the left and right-hand caterpillar tracks travelling at different speeds. To make tight turns, one track can be moved forwards whilst the other is reversed.

Set switch S5 to the driving position.

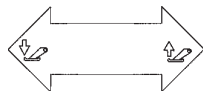
- Track drive always starts at low speed with high tractive force.
- To use the higher ratio, move the left control lever inwards on the control module. The displacement of the engine then changes from max to min displacement, i.e. the speed increases and the tractive force decreases.
- The speed and direction are regulated using the control levers.

LEFT CONTROL LEVER B1

Left track drive forward



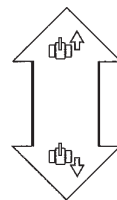
Left track drive reverse



Higher ratio

RIGHT CONTROL LEVER B2

Right track drive forward



Right track drive reverse

Operating the caterpillar with one lever

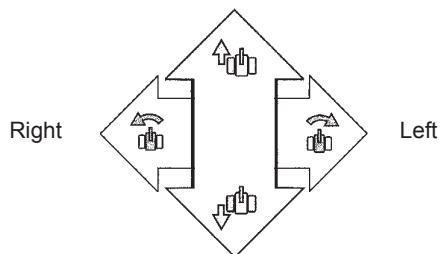
- Place ONE LEVER DRIVE on menu 1 to ON

The machine's caterpillar track is controlled by only operating left control lever B1.

Outriggers are controlled using the right control lever B2. By moving the lever to the right and up only the outriggers on the right side lower and so on, see illustration below.

LEFT CONTROL LEVER B1

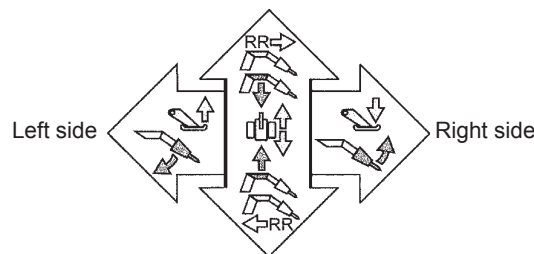
Track drive forwards



Track drive backwards

RIGHT CONTROL LEVER B2

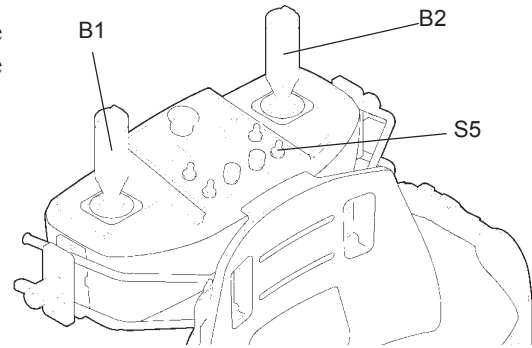
All outriggers down



All outriggers up

Operating the upper section

To operate Brokk machines both the control unit and the machine must be started and the control circuit must be connected. See "Starting and stopping".

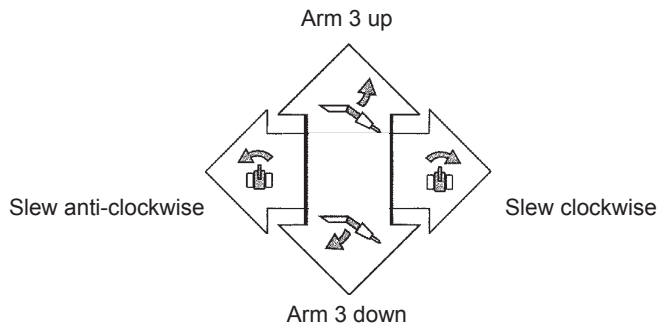


Set switch S5 to the operating position.

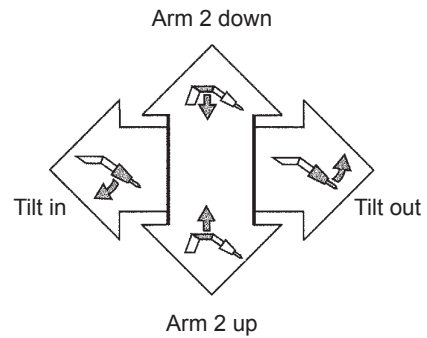


Switch S5 in the operating position

LEFT CONTROL LEVER B1



RIGHT CONTROL LEVER B2

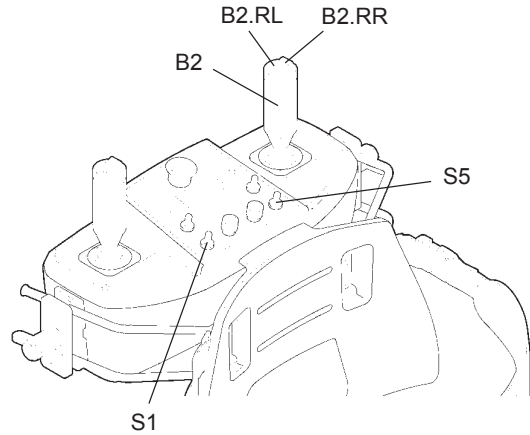


Changing reach

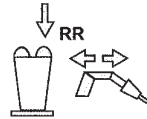
The reach of the machine is changed by operating cylinders 1 and 2 together.



Switch S5 in the operating position.



- Activate the function by pressing the right pushbutton on the right control lever B2.RR.
- Control movement using the right control lever B2.

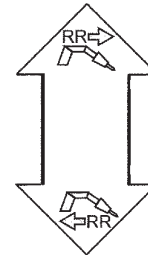


Separate operation Arm 1

- Activate the function by pressing the left pushbutton on the right control lever B2.RL.
- Keep pushbutton B2.RL depressed and regulate the movement with the right control lever, B2.



Increasing reach



Reducing reach

Separate operation Arm 1, telescopic

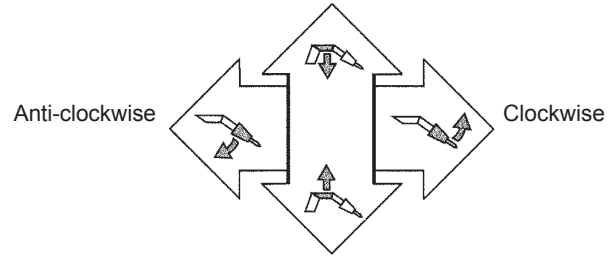
- Activate the function by first pressing switch S1 downwards.
- Then press the left pushbutton on the right control lever B2.RL.
- Keep pushbutton B2.RL depressed and regulate the movement with the right control lever, B2.



Rotation process arm

Separate operation Arm 3, rotation

- Activate the function by pressing the left pushbutton on the right control lever B2.RL.
- Keep pushbutton B2.RL depressed and regulate the movement with the right control lever, B2.

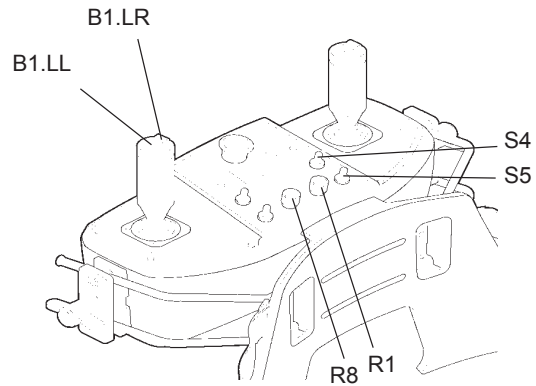


Operating hydraulic tools

Brokk machines can be equipped with a number of different types of tool. Operation of single-action and double-action hydraulic tools is described in this chapter. Machines with tools equipped with rotators or grapples which use proportional functionality are equipped with extra hydraulic functions which are described in the chapter "Extra equipment".

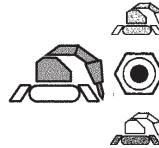
Always read the separate safety precautions and handling instructions from the relevant tool manufacturer before using a new tool.

To operate Brokk machines both the control unit and the machine must be started and the control circuit must be connected. See "Starting and stopping".

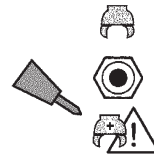


Operating single-action hydraulic tools

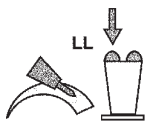
- Set switch S5 to the centre position as illustrated.



- Switch S4 set to the centre position as illustrated. Note that switch S4 is inhibited and must be lifted into position.

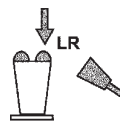


Select maximum hydraulic flow or adjustable flow to the tool.



B1.LL

The flow to the hydraulic tool can be varied using potentiometer R1.



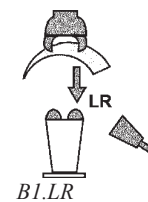
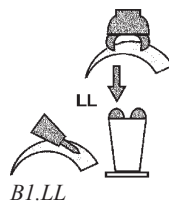
B1.LR

The flow to the hydraulic tool is maximum.

Operating double action hydraulic tools

NORMAL PRESSURE

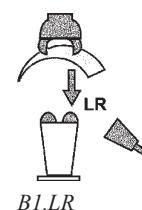
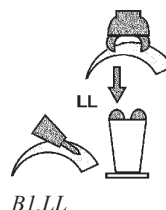
- Set switch S5 to the operating position.
- Set switch S4 to the position for double action tools. Note that switch S4 is inhibited and must be lifted into position.
- Activate the tool A-port using the left control lever pushbutton B1.LR.
- Activate the tool B-port using the left control lever pushbutton B1.LL.
- The flow to the hydraulic tool can be varied using potentiometer R1 and R8.



INCREASED PRESSURE

- NB!**
- This position must only be used for tools intended for increased pressure.
 - Ensure that the power output does not exceed the power rating of the machine.
 - Single action hydraulic tools can be damaged if the operating pressure is fed to the return side.
 - With increased operating pressure the operating pressure is 25.0 Mpa which can damage tools not intended for use at that pressure.

- Set switch S5 to the operating position.
- Set switch S4 to the position for double action tools with increased operating pressure. Note that switch S4 is inhibited and must be lifted into position.
- Activate the tool B-port using the left control lever pushbutton B1.LL. The flow to the hydraulic tool can be varied using potentiometer R1 and R8.
- Activate the tool A-port using the left control lever pushbutton B1.LR. The flow to the hydraulic tool is maximum.



Electric cabinet's functions

Q1

Main circuit breaker and phase switch.

S8

Emergency operation For further information see section: "Troubleshooting".

0

Power supply voltage to the machine interrupted.

1-2

Power supply voltage connected. Select position 1 or 2 for correct phase sequence.



Remote control. The machine is controlled via a control unit.

S02

Stop button and safety stop. Pull up to reset after stopping.

S20

Pressed in to activate the filler pump for hydraulic fluid.

S2

Starts the electric motor during emergency operation

Tools

General

Read, understand and practice the handling instructions in the Operator's Manual for the machine before starting work with tools. Always read the separate safety precautions and handling instructions from the relevant tool manufacturer before using a new tool.

Positioning of tools

When a tool is not being used it must be positioned so that it does not cause a hazard. Ensure that it is stable and cannot tip. If the tool is positioned at height or on an incline it must be secured so that it cannot be set in motion or fall. Position the hydraulic connectors for the tool so that they cannot be damaged or deformed and are protected from dirt.

Hydraulic settings

Depending on the Brokk machine being used the control unit has a number of settings that can be applied to different types of tool. The flow to the tool can be steplessly adjusted, in one direction, and different pressure levels can be selected. For further information see section "Control system". Ensure that the settings are correct for the relevant tool before using it.

Changing tools

Brokk machines have either fixed tool mountings or mechanical quick hitches. Regardless of the type of mounting the operator must always ensure that the mounting and tool are correctly installed and secured. A tool which comes loose unexpectedly can, in the worst case, cause personal injury, possibly death. Therefore, it is very important to check the tool and mounting. Carry out a daily inspection and regular service.



Warning!

Risk of personal injury, possibly death. Changing the tool can mean that the operator must be within the risk zone of the machine. Pay close attention to the machine. Be prepared to shut the machine down. Take care to keep hands and feet from being crushed.

Ensure that no one accidentally operates the machine during a tool change. Ensure that the machine is on a stable surface with lowered outriggers. Never change tools without first defining the risks and risk zone.

Fixed tool mounting Brokk 60

Installing

- Position the tool with the mounting turned towards the machine. The hydraulic pressure port of the tool on the left hand side seen from the machine. See illustration 1.
- Manoeuvre the link into the upper hole's guide. Raise the tool slightly and tap in the shaft (1). See illustration 2.
- Lock the shaft using the lock pin (2).
- Raise the tool so that it is freely suspended in the air. Operate the arm of the machine so that the holes in arm 3 align with the tool.
- Tap in the other shaft (3) and lock using the lock pin (2). See illustration 3.

Removal

- Operate the arm system and position the tool on the ground, turned away from the machine. Position the arm as flat and stable as possible.
- Disconnect any hydraulic hoses. See chapter "Connecting tools to the hydraulic system".
- Remove the lock pins.
- Knock the shafts out.

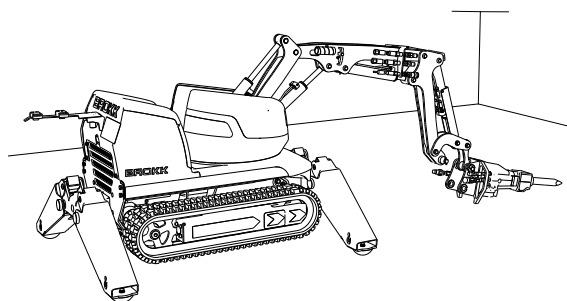


Image 1

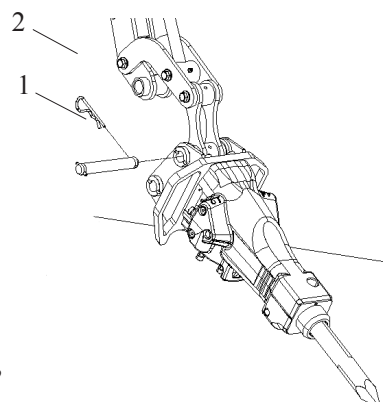


Image 2

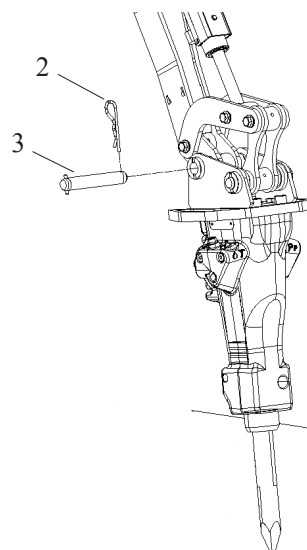


Image 3

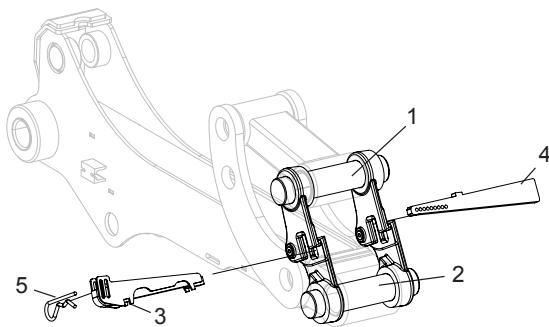
Mechanical quick hitch

The tool mounting has two shafts. When the piston rod in cylinder 4 is operated inwards, these two shafts fall away from each other and lock the tool. The mechanical quick hitch is secured using a single or two part wedge and a lock pin or locking screw.

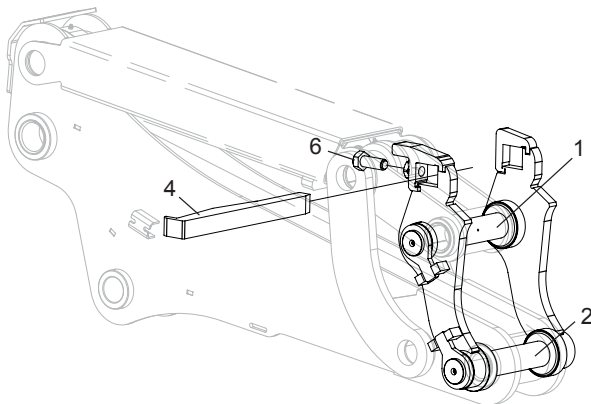
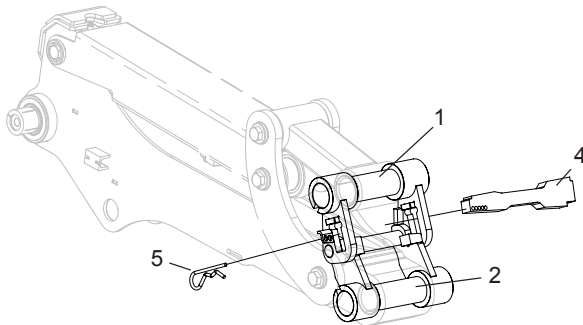


Caution!

Risk of injury if the tool comes loose. If the lock pin is not installed or comes loose, the wedges can slide out and the tool can come loose. Check that the wedges and lock pin are securely installed.



1. Upper shaft
2. Lower shaft
3. Fixed wedge
4. Moving wedge
5. Lock pin
6. Locking screw



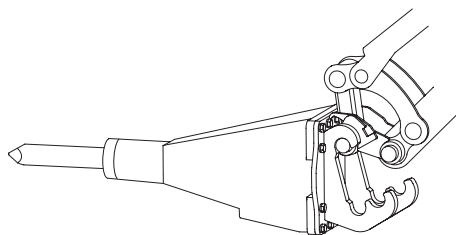
Mechanical quick hitch, versions vary between the different models of machine

Installing

- Position the tool so that it is turned away from the machine, the hydraulic pressure port of the tool on the left hand side seen from the machine.
- Move the quick hitch shafts together by moving cylinder four out.
- Operate the arm system so that the tool hooks into place against the upper shaft (1).
- Lift the tool carefully so that the shaft (2) moves into the correct position.
- Move the quick hitch shafts apart by moving cylinder four in.
- Insert the fixed wedge (3) into the quick hitch from the right-hand side of the machine.
- Insert the wedge (4) so that the shafts are locked against the hooks on the tool without any play. Ensure that the lug on the wedge (4) is turned as illustrated.
- Lock the wedge in the knocked in position. Insert the lock pin (5) through the one of the holes or grooves in the wedges.

Removal

- Operate the arm system. Position the tool on the ground, as flat and stable as possible.
- Disconnect any hydraulic hoses. See chapter “Connecting tools to the hydraulic system”.
- Remove the lock pin (5).
- Knock the wedge (4) out.
- Remove the wedge (3).
- Move the quick hitch shafts together by moving cylinder four out. The lower shaft disconnects from the tool. Moving the arm upwards facilitates this.
- Move cylinder three in so that the mounting separates from the tool.



The starting point for tool changes is that tools with mounting hooks must be located as illustrated.

Connecting tools to the hydraulic system

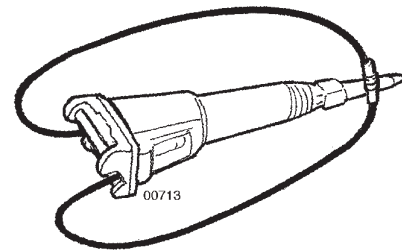
When connecting a tool to the hydraulic system ensure that:

- No dirt penetrates the hydraulic system
- Enclosed hydraulic pressure is released
- Hydraulic fluids of different types are not mixed
- The tool is installed correctly.

Cleanliness

Dirt in the hydraulic system is one of the most common causes of stoppages. The risk of contaminating the hydraulic system is greatest when the otherwise closed hydraulic system is opened, such as for tool changes. Prevent dirt entering the system by:

- Wiping any dirt from the connections, both before the tool is removed and before it is installed.
- Ensuring that hoses on the tool are always connected to each other when the tool is not attached to a machine.



Connecting the hydraulic hoses to each other when the tool is not connected to the machine

Correct connection of tools

Read the tool supplier's manual and ensure that the tool is correctly attached. Correct connection includes both correct attachment and correct pressure use.

NB! There is a risk of damage to the machine if operating pressure is fed to the return side of a single-action machine, or if the settings of the control unit are not correct for the relevant tool. For further information about the control unit settings see "Control system".

Connecting tools

The tool feed connection must be connected to the main valve A port for tools via the feed hose located on the left hand side of the machine. The machine is equipped with quick couplings, the connection is female.

The tool return connection must be connected to return line B1 located on the right hand side of the arm system. The connection is male.

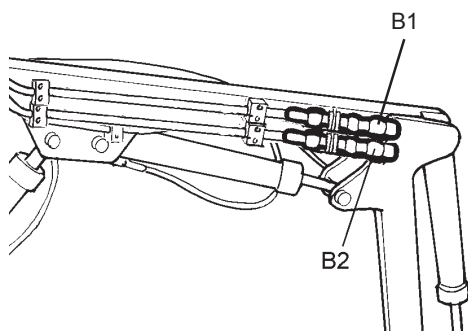
Main valve A and B ports can be found in the spare parts list.

Connecting positioning tools

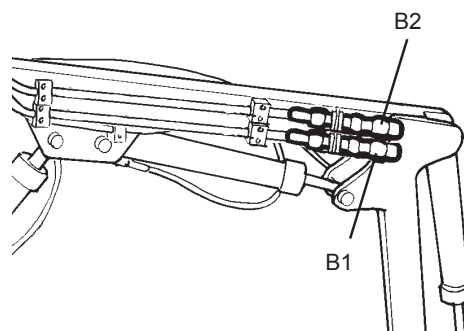
A side-angling device must be connected to extra hydraulic function 1 and a rotator to extra hydraulic function 2.

For further information; see the machine's hydraulic diagram and spare part list.

Double-action tools must be attached to return line B2, on the right-hand side of the arm, which leads to the main valve.



Connecting double-action tools



Connecting the double-action tool Brokk 260, Brokk 800.

Using tools

General

Before attaching a tool to a Brokk machine the operator must ensure that:

1. Use of the tool does not contravene the Brokk machine's intended use
2. Using the Brokk machine as a carrier does not run contrary to the tool manufacturer's recommendations

NB! Read, understand and follow the tool manufacturer's recommendations! It is very important that the instructions for safety, usage and maintenance are followed. Minimise the risk of stoppages by checking the limits of the tool. Check what materials can be handled and what sizes.

Selecting tools

Both mechanical and hydraulic tools can be used on the machine. Hydraulic tools can be single or double action. A single-action tool applies power in one direction only, for example a hydraulic breaker. A double-action tool applies power in two directions, for example a concrete crusher.

Check the following before attaching a tool to the machine:

- Does the machine have sufficient hydraulic functions available to operate the tool or must extra hydraulic functions be added?
- What requirements for hydraulic pressure and hydraulic flow does the tool have? Compare the requirements with the capacities for the Brokk machine given in the machine data.
- Does the tool have limits for pressure levels or similar. Tools with hydraulic motors may need the pressure to be reduced depending on the type of seals.
- How much does the tool weigh?
- Excessively heavy tools expose the components of the machine to overload with the resultant risk of breakdown. The load and stability diagrams for the machine only indicate the permitted weights for the stability and lifting capacities of the machine. Even if the stability of the machine is not affected by a particular tool, there is a risk of the machine being overloaded depending on the driving style of the operator, the performance of the tool, and the relevant work. Overload increases the wear on the arms, bearings, cylinders and slew functions. Overload can be caused by incorrect use, careless driving or use of excessively heavy tools.

Positioning equipment

The rotator and the side-angling devices are examples of equipment which, in combination with tools, can be used for positioning. Positioning equipment and tools must be combined in such a way that the operational safety of all components is good. A tool combined with a side-angling device gives a tool carrier increased loadings in other directions. The total tool weight must never exceed the recommended value. Contact the machine supplier for advice. Note that as the reach of the machine increases when the machine is equipped with positioning equipment, the risk of the machine tipping also increases.

Read the supplier's instructions.

Bucket

The bucket is intended for moving material. It is not intended for use as a lifting tool. When excavating it is important that straight edges are not dug because of the risk of collapse.

The bucket, supplied by Brokk AB, has a sticker with the CE mark, the name and address of the supplier and the following warning information:

- Attention. Danger. Read the tool carrier manual.
- Risk of crushing. Ensure that the tool is correctly and securely attached. Read the tool carrier manual.
- Risk of crushing. Keep your distance.



Warning and information sticker, on the Brokk bucket.

Hydraulic breaker

The hydraulic breaker is intended to demolish through chipping. It is not intended for use as a crowbar. Read the supplier's instructions. Continuous chipping by the hydraulic breaker can cause high temperatures in the hydraulic system. Read about the risks of high operating temperatures in the section: "The machine's working environment".

Concrete crusher

The concrete crusher uses the jaws to crush and cut materials. It is not intended for use, with Brokk machines, pulling and prying loose material. Read the supplier's instructions.

Cutters

The cutter is intended to remove surface material. Do not use the cutter tool without load from the intended material, this can cause the tool to damage the machine. Ensure that the cutters have the correct direction of rotation. Read the supplier's instructions.

Grapple

The grapple is intended to handle material. It is not intended for use, with a Brokk machine, as a lifting tool. Read the supplier's instructions.

Clamshell bucket

The clamshell bucket is intended for digging and handling material. It is not intended for use, with a Brokk machine, as a lifting tool. Read the supplier's instructions.

Steel shears

The steel shears are intended to cut material. Read the supplier's instructions.

Saw

The saw unit can be equipped with either a disc saw or a chainsaw. The saw unit is equipped for cutting and making holes in material according to the supplier's specification. Ensure that the guard is secured, if the saw blade shatters, material can be thrown. Read the supplier's instructions.

Drill

The drill is only intended for making holes. Read the supplier's instructions.

