

Troubleshooting

General

**Warning!**

Risk of personal injury. Most machine accidents occur during troubleshooting, 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.

To increase safety during troubleshooting, read and understand the Brokk manual, section “Risk factors during service and maintenance work” and ”Preparations for service and maintenance”.

Troubleshooting method

Downtime due to a machine fault often causes great irritation, but it is important to keep calm and to think clearly in order to carry out methodical troubleshooting. All the functions of a Brokk machine are driven by cooperation between the electric system, the control system and the hydraulic system. Troubleshooting becomes faster and more rational with an understanding of the relationship between the different systems.

Tips for the troubleshooting process can be obtained by following the quick guide for fault symptoms. Even if you are not a “fully-fledged mechanic” you can contribute to quick troubleshooting by carrying out some basic checks before contacting service personnel.

- First check that the power supply voltage is satisfactory.
- Ensure that the control unit functions. Eliminate problems with radio transfer by testing the radio controlled machines via cables. Ensure that the control cable is intact and correctly connected.
- Check if the display on the control unit of the machine shows a code that assists troubleshooting. Trouble codes are displayed for 15 seconds or until the fault is remedied.

To call service personnel

Be ready to answer the following questions when calling service personnel for advice:

1. Which machine is it regarding? Note the serial number.
2. How many hours has the machine been used? Read off the timer.
3. What are the environmental conditions of the machine, e.g. ambient temperature and dust?
4. What type of work is the machine carrying out, which tool is being used?
5. When did the fault occur? Was it during transportation, during operation etc.

Aids

The following aids may be required:

- Normal set of tools
- Extra control cable
- Manometer with hose and connection nipple for reading hydraulic pressure. The equipment must be approved for the relevant measurement range.
- Universal instrument for measuring voltage and resistance, approved for the relevant measurement range.
- Buzzer for open-circuit and redirection reading.
- Clip-on ammeter for reading current, approved for the relevant measurement range.

Fault symptoms quick guide

The electric motor does not start

- Check that main switch Q1 is activated.
- Check that all the safety stop buttons of the machine are turned up.
- Start the machine according to the instructions in the Brokk manual, section: “Control system”.
- Check that the phase sequence relay LED is lit which indicates the correct phase sequence (only direct start).
- Check, on the receiver’s display, that there is contact between the control unit and the machine. In the event of contact, the display shows



- Read off the trouble codes from the control unit’s display.

If there is no contact:

- Check that the control cable is properly connected at both ends. Also see “Checking the control cable” and “Checking the control unit” instructions.
- Test with cable.
 - If the machine functions via cable operation, the fault must be traced in the radio transfer, see “Troubleshooting radio control”.
- Check that there is power supply voltage on all phases to the machine. Measure voltage according to “Checking the power supply voltage”. Also check that the electric cabinet fuses are intact.
- Follow the troubleshooting instructions “Electrical and control systems, electrically powered machine”.
- See “Indications soft start”.

Diesel engine does not start

- Check that the main switch for the battery is in position 1.
- Check that all the safety stop buttons of the machine are turned up.
- Start the machine according to the instructions in section: "Control system, start control unit"
- Check, on the receiver's display, that there is contact between the control unit and the machine. In the event of contact, the display shows



- Read off the trouble codes from the control unit's display.

If there is no contact:

- Check that the control cable is properly connected at both ends. Also see "Checking the control cable" and "Checking the control unit" instructions.
- Test with cable.
 - If the machine functions via cable operation, the fault must be traced in the radio transfer, see "Troubleshooting radio control".
- If the starter motor does not turn – check that the battery is fully charged. Charge the battery or jump start.
- Follow the trouble shooting instructions "Control system", diesel powered machines".
- See the engine supplier manual.

Fuse F7 blows

- Defective phase sequence relay or power transformer.

Fuses at power transformer blow at start attempt

- Too low voltage, fast fuses in the socket or circuit breakers of the incorrect type. See “Guidelines for connection to the electrical supply” and the section “Connection to the electrical supply” in the Brokk manual.
- Burnt out electric motor. Request an electrical engineer to check.

During current consumption from the diesel powered electric plant, the start current must momentarily increase to approximately twice the engine voltage rating at soft start.

Overheat motor during operation - trouble code E02

Motor overloaded and needs to cool down. Can be restarted and run for 30 seconds before it stops again.

PT100 ERROR - trouble code E46

All PT100 sensors in the electric motor have a short-circuit or open-circuit in one of the sensors. Wiring and connection must also be checked.

Soft start - trouble code E01

Error message E01 (PHASE/SOFT START) appears during operation. The motor stops.

- Check the trouble code on the soft starter by counting the number of flashes of the RUN/FAULT indication. See section ”Display codes and indications”

**Warning!**

Risk of electric shock. In the event of insulation faults, the power cable can conduct current.

Disconnect the power cable connector from the wall socket before inspecting the cable.

The machine operates but reduces in speed when a function is affected

- Power supply voltage to the machine too low. This can be caused by a voltage drop in the electrical supply, in the joint connectors or because of a weak power cable. Check the power supply voltage according to instructions: “Checking the power supply voltage”.

The engine runs but there is no hydraulic function

- Not enough hydraulic fluid in the tank. In this instance, a loud cavitation noise is heard from the pump. Stop the motor immediately. Refill and check for leakage.
- Dump valve open, check according to instructions “Checking the dump valve” (not applicable to all machine models).
- Defective pressure reducing valve VF8, or defective filter seal. Measure the servo pressure according to instructions: “Checking the servo pressure”.
- Defective pump regulator. The fault can give different symptoms:
 - The pump produces a reduced pressure so that functions with low pressure requirements can be operated.
 - The pump produces no pressure, which can occur if one of the control sliders has jammed in the open position.
- Static pressure setting on the pump too low. If the static pressure falls below 14 bar there is a risk of the system not “starting” because the servo pressure is too low. Measure according to: “Checking the static pressure”.

The functions of the machine have no power

Measure the load pressure according to “Checking the load pressure/signal pressure”.

- No or too low signal pressure to the pump.
 - Test drive the machine in emergency driving mode (not applicable to all machine models). If the problem remains, connect the pressure reducer UP1 on the signal cable of the pump and test drive. The pressure reducer is defective if the machine then works.
 - Defective pump regulator. Even if the regulator does not show any visible internal damage, its slider and race may still be worn. Wear can cause great internal leakage and the regulator must be replaced.
- Worn pump.

All functions have full power but the arm and tool functions operate slowly

- Check that "speed reduction" is not engaged on the control unit, see "Control unit functions" in the Brokk manual.
- Check whether the electronic unit display/LEDs indicate any trouble codes.
- Pump static pressure set too low. See: "Checking the static pressure".

A single function operates slowly in A- or B- direction

- Fault in the pre-control valve or mechanical stop of the lever, if the machine is equipped with these.
- Restriction in the hydraulic hose due to incorrectly pressed hose connection or similar. Check by operating the function without load at half speed at the same time as reading the maximum pressure. If the pressure then rises to the maximum pressure of the pump, despite low load, a fault can be suspected.

A single arm or caterpillar track does not work.

- Check that no function is being operated at start up of the control unit, safety function "Zero position indication" in the Brokk manual.
- Check whether the control unit display indicates any trouble codes.
- Poor contact in the control unit. Check according to "Checking the control unit".
- Burnt valve coil in the pilot valve. Measure the resistance between pin 1 and 2. The resistance must be 22 Ohm. Also check insulation by measuring between pins and material. Minimum permitted value is 10 KOhm. If the coil is defective, the entire pilot valve must be replaced.
- Contaminants in the pilot valve. The valve can be removed and cleaned but replacement is recommended due to the safety risk.

The machine sinks on the outriggers

- Leaking load retaining valves for outrigger cylinder or internal leakage in the cylinders.

Jerky arm movements

- A seized valve slide due to contaminants. The cause can also be hydraulic fluid, quickly and locally heating up in an otherwise cold machine.
- Air in the pilot valve.
- Defective O-rings in the pilot valves.
- Fault in the servo circuit.

Cylinder sinks

If the machine has run for many operating hours and the cylinder function has gradually deteriorated, this is because of internal leakage in the cylinder, load retaining valve, main valve or pressure reducing valve. Internal leakage is caused by normal wear.

There are contaminants in the hydraulic system or a hydraulic component is defective if the cylinder quickly starts to sink.

- Load retaining valve and pressure reducing valve may be defective, the valve seats can be damaged.
- Internal leakage in the cylinder can be caused by damaged seals, pistons or piston rods.
- Control section in the main valve may be defective. Control slider or race may be damaged or contaminated. Remove the cover and pull out the slider to check.

Overheating in the hydraulic system

- Radiator blocked or clogged by dirt.
- Ambient temperature too high, above 40°. Forced cooling using compressed air must be installed if the machine is operating in hot climates.
- Maximum or static pressure for the pump set too high. Check according to the instructions.
- Restriction in hose or quick coupling caused by damage, component fault or installation fault. Restriction in the main pipe or pipe to tool caused by extreme heat increase.
- Power output too high due to a defective or unsuitable hydraulic tool being used.
- Main pressure reducer is partially open. Carry out dump valve check.
- Worn hydraulic pump.
- Check that the cooling fan starts when all temperatures exceed 40°C.
- Fuse for cooling fan blown. Check for any problems on the 24VDC fan motor.
- Check that the fan has all its blades and that they are not damaged.

Noise from the hydraulic system

- Low hydraulic fluid. NB! The pump will be seriously damaged if it is operated with insufficient hydraulic fluid in the system.
- Air in the hydraulic fluid can occur after top up, causing cavitation. Use the machine, but at low load, until the air has separated from the fluid.
- Defective hydraulic pump.

It may be difficult to source and analyse the sound from the machine. Noise can change with operating conditions, temperature etc.

Discoloured hydraulic fluid

- Grey and thick hydraulic fluid often means mixing with water. Trace the source of water penetration into the hydraulic system and remedy the fault. Change hydraulic fluid and hydraulic filter. Clean the entire system or insert a water absorbing filter and run again.
- Black hydraulic fluid often means soot build up due to high operating temperatures. Trace the cause of overheating and remedy the fault. Change the hydraulic fluid and hydraulic filter.

