RUT MFG

Owner’s Manual

Mini Excavator Drum Mulcher ShredX

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1. ABOUT THE DOCUMENT

1.1 General Information

Correct operation and careful maintenance are essential in order to prevent accidents and damage, keep the machine operational, and maximize performance. You must be familiar with this instruction manual in order to work on and with the machine. The manual must be in the driver's cab of the carrier vehicle at all times.

This instruction manual contains information about the setup and handling of the machine, as well as the regular inspection and maintenance work required. The operator and maintenance personnel must have read and understood this operation manual before operating or working on the machine. Carefully read the section titled “Safety”.

This instruction manual describes all the care, inspection, and maintenance tasks to be carried out regularly by the operator, and selected repair tasks. The care and maintenance tasks not described in this manual must be performed only by the manufacturer or a workshop authorized by the manufacturer. In particular, this includes welding work as well as work on all safety-critical parts of the machine.

This instruction manual describes the standard equipment on the machine, and various optional components. For the exact equipment supplied with your machine, please refer to your order confirmation.

1.2 Explanation of Safety Instructions

When operating the machine, dangers may arise due to both the machine itself and the work environment, e.g., as a result of carrier vehicle movements, the terrain, ground, vegetation, and weathering effects. These dangers can, however, be minimized by behaving correctly and remaining safety-conscious.

This instruction manual points out the potential dangers and provides behavior guidelines to help prevent injuries and damage to property. Read and follow the instructions in the "Safety" section. Warnings must be strictly observed.

Instructions accompanied by a yellow warning triangle indicate a danger to life and limb. Follow these instructions to avoid physical or fatal injuries. Instructions not accompanied by the yellow warning triangle indicate a risk of damage to property, or provide additional information on operational safety.

1.3 Explanation of Warning Levels

Warning notices are assigned different warning levels according to the severity of the potential consequences. The following signal words identify the different warning levels.

- The signal word “DANGER” indicates an immediate danger which, if not avoided by following the instruction, will result in death or serious physical injury.
- The signal word “WARNING” indicates a potential danger which, if not avoided by following the instruction, can result in death or serious physical injury.
- The signal word “CAUTION” indicates a potential danger which, if not avoided by following the instruction, could result in minor or moderate physical injury.
- The signal word “IMPORTANT” indicates a situation which, if not avoided by following the instruction, can result in damage to property or financial loss.

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2. SAFETY

2.1 Proper Use

The ShredX mini excavator drum mulcher is to be used solely for work in forests and for recultivating and maintaining areas of vegetation. The mulcher is not a stand-alone machine, but instead an attachment that needs to be mounted on a carrier vehicle. The carrier vehicle drives the mulcher over the surfaces requiring treatment, as well as providing the energy for and controlling all its movements.

When it is traveling forward, the attachment fells standing trees and shrubs, and shreds material lying on the ground. Root stocks can also be ground down to surface level. In addition, the mulcher works in reverse gear in order to finely grind down the organic material. The shredded material is left behind as mulch.

The mulcher is even able to shred heavy pieces of wood and can be used for tough jobs such as land clearing, vegetation management on pipelines and power supply lines, creation of firebreaks, and recultivation tasks in professional plantation and forestry applications. Any other type of use is considered improper use. Do not shred other materials such as inorganic, solid materials, construction waste, metal waste, or industrial waste.

"Proper use" also means following the operating, inspection, and maintenance instructions. Local regulations regarding accident prevention, environmental protection, and road traffic must also be observed in addition to the regulations stipulated in this instruction manual. Faults and defects on the machine must be rectified immediately by the manufacturer or one of their authorized service centers. The machine must be taken out of service until the fault has been rectified.

2.2 Personnel Requirements

The machine is operated exclusively by the carrier vehicle driver. The driver controls all the functions from the driver seat. Only qualified and trained personnel may be employed as drivers. The driver must meet the following requirements:

- Of legal age in the country and state where the machine is used.
- They must be physically and mentally capable of carrying out the tasks assigned to them.
- They must have been trained in how to operate the machine by the manufacturer or one of its agents.
- They must not be under the influence of narcotic substances.

The operator must take the appropriate measures and give instructions to ensure that the safety regulations in this instruction manual are observed. The operator must ensure that only those persons who meet the specified requirements are allowed to work on and with the machine. The operator must allocate the responsibilities for the transport, startup, operation, and maintenance of the machine. The operator must instruct the personnel to service and maintain the machine as indicated in the instructions. The operator must provide the required personal protective equipment.

The inspection and maintenance work described in this instruction manual must be performed only by persons who meet the following requirements:

- Of legal age in the country and state where the machine is used.
- Awareness of the dangers that can arise when carrying out technical work inside the machine.
- Training on how to maintain the machine by the manufacturer or one of its agents.
- Persons who perform repair work must have the necessary technical knowledge.

2.3 Basic Accident Prevention Rules

When the mulcher is running, there is an acute danger to life due to rotating tools. Body parts can be severed. There is a risk of body parts being pulled in and severed if items

of clothing or other objects are caught in the rotor. Trees and shrubbery can fall, and mulch lying on the ground can be launched in unexpected directions. The rotor continues to run after the power has been switched off. It can take several minutes for it to come to a standstill.

Do not reach inside the mulcher when the carrier vehicle engine is switched on. Avoid the hazard area until the rotor has stopped. In the area surrounding the machine, there is a risk of becoming caught due to the movements of the carrier vehicle or mulcher. Do not enter or stand in the hazard area while the machine is switched on. Wear close-fitting protective clothing and safety shoes when carrying out all work on and with the machine.

2.3.1 Before Starting Work

During operation, it is necessary for high levels of force to be transferred between the carrier vehicle and the mulcher. The carrier vehicle must be able to carry the load of the mulcher safely. The drive shaft transfers a high level of power at high speeds. The hydraulic hoses are under high pressure. A defective connection between the carrier vehicle and the mulcher presents a high risk of accidents.

Only attach the mulcher to a carrier vehicle that has the required carrying capacity, drive power, and supply power, and whose interface corresponds to the technical specification for the mulcher. The carrier vehicle must be equipped with a rear windshield made from safety glass or with a protective grille. There is an increased risk of accidents when attaching the mulcher to the carrier vehicle and when removing it.

- Attach and remove the mulcher on level, firm ground only.
- Secure the carrier vehicle to prevent it rolling away.
- Wear protective clothing, safety shoes, and protective gloves.
- Do not enter the area between the carrier vehicle and the mulcher unless both machines have been secured to prevent unexpected movements.
- Machine defects that go undetected or are ignored can result in accidents and subsequent damage. Before starting work, check the operational safety of the machine and make sure of the following:
    - Make sure that all covers are attached.
    - All safety devices are present, in acceptable condition, and functional.
    - Check the condition of the machine, particularly the hydraulic hoses.
    - Do not put the machine into operation if in an unsafe condition.

There is a risk of fatal injury to persons located in the area around the machine. Technical equipment in acceptable condition and caution on the part of the driver are

essential for minimizing the dangers. Check the lighting and signaling devices, and make sure that no one is in the hazard area.

2.3.2 While Working

There is a risk of fatal injury to persons located in the area around the machine. Stop and switch off the machine immediately if anyone enters the hazard area. Malfunctions or overloads can cause accidents. The following are indications of technical faults:

- Unusual operating noises.
- Uneven running or vibrations.
- Leaking operating fluids or smoke.
- Unusual values indicated by on-board instruments.
- Fault messages on the on-board information system.
    - Stop operating the machine if faults are indicated. Identify the cause of the fault and rectify it.

2.3.3 When Leaving the Machine

Parking the machine in an unsecured manner can cause it to slide, result in the mulcher sinking, and lead to misuse by unauthorized persons.

- Park the machine securely after stopping work.
- Apply the parking brake.
- Lower the mulcher to the ground.
- Switch the carrier vehicle engine off.
- Remove the ignition key.

2.3.4 Other Safety Practices

The noise level at the machinist's ear depends on the carrier vehicle. The values may be above 80 dB(A) during work. Please pay attention to the following in order to counteract this load:

- Operate the machine only if all covers are attached.
- Keep the doors and windows of the carrier vehicle driver's cab closed.
- If in doubt, wear hearing protection.

Working in a forest environment poses an increased fire hazard. Flammable material can accumulate on hot surfaces and become mixed with flammable substances such as oils. Be sure to take the following precautions:

- Clean the machine regularly.
- Remove dust, woodchips, residual wood, and dirt at short intervals.
- Make sure that no flammable operating fluids escape.
- Remove any excess lubricants.
- Do not use flammable solvents to clean the machine.

- Store cleaning rags in fire-resistant containers.

If a fire does occur, however, proceed as follows:

- Immediate action:
  - Switch the carrier vehicle engine off.
  - Leave the immediate hazard area.
- Firefighting:
  - Try to extinguish the fire if it is possible to do so without putting yourself at risk. Take precautions to prevent the fire from spreading to the surrounding area.
  - If you cannot get the fire under control, seek assistance.

2.4 Hazard Area

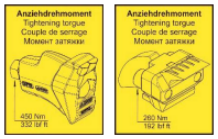
The hazard area refers to the space around the mulcher and carrier vehicle, extending out to 300 feet in all directions. There is a risk of fatal injury to persons located in the area around the machine. When the rotor is running, there is a risk of being pulled into the rotor and parts of the body being severed due to entanglement in branches.

The driver's steering maneuvers and environmental conditions can cause unexpected movements of the machine. Objects that become caught in the mulcher can fall or be flung out in unexpected directions. It is forbidden to enter or stand in the hazard area while the engine is switched on.

2.5 Graphic Warning Symbols

Ensure that the graphic warning symbols remain undamaged and fully legible. Replace damaged or unrecognizable graphic warning symbols immediately.

Symbol	Explanation
	**Warning of tools that are rotating or still running down.** Parts of the body that become caught in the mulcher will be severed. Switch the engine off and wait until the rotor has come to a standstill before entering the hazard area.

	**Warning of flying materials, keep your distance.** Material caught up and shredded by the mulcher is ejected and can cause injuries to the skin and eyes.
	**Switch off the engine and remove the ignition key before performing maintenance work.** Various dangers are present when the engine is running, due to moving machine parts, hot surfaces, exhaust gases, or similar. Work must only be performed on the machine once the carrier vehicle engine has been switched off and the ignition key removed.
	**Warning symbol.** The warning symbol indicates areas where increased caution is to be exercised in order to prevent accidents.
	**Reading the instruction manual.** All persons operating or working on the machine must have read and understood this instruction manual.
	**Observe torque.** The rotor tools must be tightened to a specified torque.

2.6 Safety Devices of the Mulcher

The housing encases the rotor and the drive up to the work opening of the rotor. The rotor drive is covered by the drive box, which is screwed in place. Make sure that the machine is standing securely. The chain curtain traps any mulch that has been thrown outward.

The working side of the carrier vehicle driver's cab must be protected against trees and branches striking it. We suggest a 12 mm-thick polycarbonate safety glass with an overlap of at least 15 mm. Alternatively, a protective grille can be attached. A safety windscreen is essential as rotary heads or swiveling equipment may lead to incorrect machine operation, causing material that is ejected from the machine to be thrown onto the windscreen.

3. MACHINE COMPONENTS

3.1 Machine Overview

The identification plate is used to identify the machine. Referencing the serial number on the identification plate allows the technical status of the machine and its equipment to be established when ordering spare parts or in the case of technical queries.

The mulcher is installed on a stable housing. The main component of the mulcher is the rotor with the equipment that fells standing vegetation and shreds the material on the ground to mulch. A one-sided axial piston motor, which is on the left side, powers the rotor. The runners protect the housing from wear.

3.2 Rotor Drive

The rotor is driven by a toothed-belt drive on one side. The transmission from the carrier vehicle to the mulcher happens via an oil circuit, in which a hydraulic motor is driven via the hydraulic circuit of the carrier vehicle. The hydraulic motor drives the toothed belt drive and the rotor.

The complete housing lining and the counter-blades are made of highly wear-resistant steel. The counter-blades are used for shredding the mulch even further.

3.3 Additional Elements

The hydraulic system of the attachment machine is connected to the hydraulic system of the carrier vehicle.

- 60 ccm engine connection → 2x SAE 6000 PSI ¾ " (P+T)
- It is particularly important that the pressure and return lines are laid correctly.

The movements of the flap's hydraulic cylinder can be controlled by an electromagnetic directional control valve as an option. The directional control valve can be equipped with 12V DC and with 24V DC solenoids, depending on the on-board voltage of the carrier vehicle. Both valves are included, the 12V variant is mounted as standard.

This enables highly precise movement of the flap. The flap control can always be retrofitted as soon as a flap is available. The flap speed can be adjusted using the throttle on the hydraulic block.

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4. ADJUSTMENT OR MOUNTING ON THE CARRIER VEHICLE

4.1 Required Components

The connection for attaching the mulcher to the excavator must be established using the base plate adapters. The connection to the excavator may be screwed or welded onto the base plate. The relevant procedure can be found in the instruction manual for the carrier vehicle. If you have any questions regarding applications, service or maintenance, please contact your local carrier vehicle dealer.

- Wear safety shoes.
- Before entering the area between the carrier vehicle and the mulcher, make sure that they are not liable to make unexpected movements.
- Do not walk underneath the raised mulcher.
- If movements need to be triggered, do not enter the area between the carrier vehicle and the mulcher.

To connect the hydraulic hoses, switch the hydraulic devices on the carrier vehicle to the floating position. Connect the hydraulic lines for the drive and post-shredding flap using the quick couplings.

If the mulcher has been exposed to sunlight or high temperatures, the pressure in the hose lines may have risen to a level where the quick couplings cannot be connected. To reduce the pressure, loosen one of the hoses slightly or use a pair of pliers specifically designed for this purpose. Clean up any escaping oil using a pan or cloth.

4.2 Removing the Mulcher from the Carrier Vehicle

Detach the carrier vehicle from the attachment plate of the mulcher and attach the bleeder kit. The relevant procedure can be found in the instruction manual for the carrier vehicle.

To disconnect the hydraulic hose lines, you will need cloths to catch and wipe up escaping hydraulic oil.

- Prerequisites:
    - The machine is parked securely on level solid ground and the mulcher is on the ground.
    - The carrier vehicle is switched off and the mulcher rotor is at a standstill.
- Procedure:
    - Loosen the quick couplings on the hydraulic hoses for the drive and the post-shredding flap on the carrier vehicle. Use a cloth to clean up any escaping oil.

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5. DRIVING AND WORKING

5.1 Before Starting Work

Machine defects that go undetected or are ignored can result in accidents and subsequent damage. Before starting a trip, check the operational safety of the machine and make sure of the following:

- Make sure that all covers are correctly attached and in perfect working order.
- Check the machine for visible damage.
- Check the machine for visible leaks. Are there any fluid leaks?
- Check the accessible hydraulic cylinders and hydraulic hoses at the interface between the carrier vehicle and mulcher for leaks and to ensure that they are in perfect condition.
- Check the condition of the equipment and the runners of the mulcher. Replace worn parts.

- Check the hydraulic fluid level of the carrier vehicle.
- Do not put the machine into operation if in an unsafe condition.

There is a risk of fatal injury to persons located in the area around the machine. Technical equipment in acceptable condition and caution on the part of the driver are essential for minimizing the dangers. Before working, check the safety devices of the carrier vehicle:

- Check the lighting and horn.
- Check that the steering and brake are working effectively.
- Make sure that no one is in the hazard area.

Working in a forest environment poses an increased fire hazard. Flammable material can accumulate on hot surfaces and become mixed with highly flammable substances such as fuels and oils. Make sure that there are no leakages of flammable operating fluids such as fuels and oils.

5.2 While Working

Failure to adapt your driving style and ambient conditions can cause the machine to move unexpectedly. Adapt speed and steering maneuvers to the terrain and visibility conditions. There is a risk of fatal injury to persons located in the area around the machine. Stop and switch off the machine if anyone enters the hazard area.

When working on very densely overgrown terrain, there is a risk of accident from concealed contours in the terrain (for example, sharp drops in the ground) or obstacles (for example, wire fences). Inspect the work area on foot before driving on it with the machine.

Working in a forest environment poses an increased fire hazard. Flammable material can accumulate on hot surfaces and become mixed with highly flammable substances such as fuels and oils.

- Remove dust, woodchips, residual wood, and dirt at short intervals.
- Do not use flammable solvents to clean the machine.
- Store cleaning rags in fire-resistant containers.

Malfunctions or overloads can cause accidents. The following are indications of technical faults:

- Unusual operating noises.
- Uneven running or vibrations.
- Leaking operating fluids or smoke.

- Unusual values given by instruments on the carrier vehicle.
- Fault messages from equipment on the carrier vehicle.
    - Stop operating the machine if faults are indicated.
    - Identify the cause of the fault and rectify it.

The mulcher is operated from the carrier vehicle driver's seat. Keep the doors and windows of the driver's cab closed to minimize the noise level and the impact of dust.

- Do not switch on the rotor drive under load.
- The mulcher must always pass slightly above the ground.
- The excavator boom must not exert any significant forces. Incorrectly supporting the excavator boom using the hydraulic mulcher is not permitted.
- The mulcher must not be pressed onto the ground under any circumstances.

5.3 When Leaving the Machine or Performing Maintenance

Parking the machine in an unsecured manner can cause it to slide and result in the mulcher sinking. If the engine is left running, there is a risk of machine malfunctions and interference by unauthorized persons.

- Park the machine securely after stopping work.
- Lower the mulcher to the ground.
- Always switch the engine off, even when stopping work for a short period of time.
- Remove the ignition key.

When the mulcher is running, there is an acute danger to life due to rotating tools. Body parts can be severed. There is a risk of body parts being pulled in and severed if items of clothing or other objects are caught up in the rotor. Trees and shrubbery can fall and mulch lying on the ground can be launched in unexpected directions. The rotor continues to run after the power has been switched off. It can take several minutes for it to come to a standstill.

- Do not reach inside the mulcher when the engine is switched on.
- Avoid the hazard area until the rotor has stopped.
- Do not enter or stand in the hazard area while the machine is switched on.

The raised mulcher can sink. Lower the mulcher to the ground before performing any work on the machine. Do not walk underneath the mulcher when working on it in the raised position. Support the mulcher. There is a danger of being crushed between the mulcher and carrier due to unexpected machine movements. Park the machine securely, preferably on level solid ground, before performing any work.

- Apply the parking brake.
- When working on uneven terrain, also secure the machine with wedges.

- Even when the rotor is at a standstill, there is a danger that the equipment will cause cuts and bruises due to trapped mulch.
- Wear protective gloves.

When performing land clearance work in areas of dense vegetation, there is a risk of driving into foreign objects, such as wires or manhole covers, which can obstruct the rotor. You must exercise particular caution when rectifying faults of this nature.

- Switch the rotor off immediately.
- Move the machine free.
- Park the machine on level and solid ground if possible.
- Apply the parking brake.
- Open the mulcher flap.
- Switch off the engine.

5.4 Driving on Roads or Terrain

Before using public paths and roads, make sure that the machine complies with the local authorization requirements for road transport.

- Lift the mulcher. Lock the operating lever to lower the mulcher.
- When using the machine on public paths and roads, always observe the local road transport regulations.
- Please note that, when attached, the mulcher affects the driving characteristics of the carrier vehicle.
- Adjust the vehicle speed and handling to the road conditions, and to the traffic and environmental conditions.

Raise the mulcher even when you are only performing driving maneuvers. Drive slowly and carefully when visibility is poor. Dense ground vegetation in the work area can conceal hazardous obstacles. Do not drive into objects that could become entwined in the mulcher rotor; for example wire fences or ropes.

- As far as possible, drive straight up and down slopes.
- Avoid sudden changes in direction when driving on uneven terrain, and up or down or across a slope.
- Drive over slippery slopes at constant speed, or accelerate slightly. Braking can cause the machine to slide.
- Since descents are more difficult to manage than ascents, drive up a slope only if you can drive down safely again or if you know an alternative downward route.
- Take particular care when driving downhill! Drive down slopes slowly, and as far as possible from a standstill. Even small obstacles can be hazardous.
- Never depress the clutch or change gear on gradients.

- When the vehicle slips sideways: Turn uphill and accelerate. Do not turn downhill!

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6. MAINTENANCE

6.1 General Notes

The machine is subjected to extreme loads and ambient conditions while in operation. It is therefore essential that you comply with the specified inspection and maintenance intervals in order to prevent damage to the machine. Have any defects rectified as soon as you identify them. If you operate the machine with damaged equipment, you risk consequent damage to the machine and putting yourself and others at risk.

This section describes the inspection and maintenance work that you must perform on a regular basis. It involves simple tasks that can be performed by persons who meet the following requirements:

- Of legal age in the country and state where the machine is used.
- At least basic technical knowledge.
- Awareness of the dangers that can arise when carrying out technical work inside the machine.
- Training on how to maintain the machine by the manufacturer or one of its agents.

Selected maintenance work is also described. Persons who perform this work must have the necessary technical knowledge. This requirement is specified for the work involved in each case.

All the work described here can be performed without the need to remove the mulcher from the carrier vehicle. This is particularly true of lubrication work as well as regular inspection and maintenance work. This work is described for cases where the equipment is attached. In cases where removing equipment is recommended in order to carry out repair work, this information is specified.

6.1.1 Spare parts

Spare parts must be compatible and at least meet the specifications of the original parts. We recommend only using genuine spare parts. The warranty is valid only if genuine spare parts are used.

To avoid errors and incorrect items being supplied, always state the serial number when making orders or raising technical queries. You will find the serial number on the machine's identification plate.

If you have any questions regarding applications, service or maintenance, please contact Rut Manufacturing directly.

6.1.2 Advanced Work and Operating Fluids

Advanced repairs, welding work as well as work on all safety-critical parts of the machine may only be performed in an authorized workshop. Supply settings (hydraulic system pressure levels and the like) may only be changed with the permission of the manufacturer.

Used operating fluids (greases, oils, cleaning agents, and solvents), oil-soaked auxiliary equipment (cleaning cloths), and dirt mixed with operating fluids from the machine will harm the environment and are therefore hazardous waste. Never let liquids that endanger groundwater seep into the soil or sewage system. Observe the local environmental protection regulations when disposing of these operating fluids.

6.1.3 Care During Maintenance Work

During all work, avoid using force. The force used must be limited to the amount necessary, for example the torque required to loosen or establish connections. Loose screw connections must be tightened immediately.

Replace damaged connecting elements such as screws and nuts with damaged heads or threads. A locking screw corresponding to the original must always be used. Elastic or deformed securing elements, such as safety plates, spring washers, and cotter pins, must not be reused and must be replaced.

6.2 Safety Instructions for Maintenance

When the engine is running, the machine poses dangers that can result in serious injuries or death. In the area surrounding the machine, there is a risk of becoming caught due to the movements of the carrier vehicle or the attached mulcher.

Perform work on the machine – cleaning, refilling operating fluids, inspection, and maintenance – when the engine is switched off.

- Switch off the engine.Remove the ignition key.
- Wait until the engine and assemblies have cooled down.
- Stay at a safe distance if the engine has to be started and the machine moved.

- The machine can start to slide if parked on uneven terrain.
- Park the machine securely, preferably on level solid ground, before performing any work.
    - Apply the parking brake.
    - If working on uneven terrain, also secure the machine with chocks.
- The raised mulcher can sink.
    - Lower the mulcher to the ground before performing any work on the machine.
    - Do not walk underneath the mulcher when working on it in the raised position. Support the mulcher.

When removed from the carrier vehicle, the mulcher may slide or tip over. Park the mulcher on level, firm ground. There is a risk of crushing at the rotor and at moving parts.

There is a danger of being cut by equipment and sharp-edged machine parts.
Wear protective gloves. Do not work with bare hands.

Raised loads can fall. Always use load lifting gear with sufficient load-carrying capacity for lifting and transporting heavy loads. Carefully fasten and secure the load lifting gear. Do not walk under suspended loads.

Fluids escaping under pressure – compressed air, water, and steam – can damage eyes and skin. Steam causes burns. Never point a compressed air or water or steam jet at anyone.

Splinters are thrown around when the machine is blown out with compressed air. Wear safety glasses.

Oil – especially used oil – and chemical cleaning aids and solvents irritate the skin. These fluids can damage the skin of some people.

- Protect your hands with gloves or a special cream.
- Follow the statutory safety regulations.
- Oil escaping at high pressure can penetrate the skin.
- Consult a doctor immediately.

6.2.1 Working on the Mulcher and Drive Train

When the mulcher is running, there is an acute danger to life due to rotating tools. Body parts can be severed. There is a risk of body parts being pulled in and severed if items

of clothing or other objects are caught up in the rotor. Trees and shrubbery can fall and mulch lying on the ground can be launched in unexpected directions.

- The rotor continues to run after the power has been switched off. It can take several minutes for it to come to a standstill.
- Do not reach inside the mulcher when the engine is switched on.
- Avoid the hazard area until the rotor has stopped.

The bearings become very hot during operation and are slow to cool down once the drive has been switched off. Liquid media such as oils can still cause burns even once the container surfaces appear to have cooled down.

- Allow parts to cool down below 122°F (50°C) before accessing them.
- Carefully check the temperature of the parts with your hand.

6.2.2 Hydraulics

The hose lines are under high levels of pressure that can reach up to 400 bar. Hoses that are not in perfect condition can rupture. Escaping oil can penetrate the skin. The system reaches high temperatures during operation.

- Wear protective clothing, gloves, and safety glasses.
- Check that the hydraulic hose lines are in acceptable condition before working near them.
- Do not adjust valves.
- Let oil cool off before draining.
- Before loosening connections, depressurize the hydraulic circuit.
- Have repairs to the hydraulics carried out by a specialized workshop only.

6.2.3 Welding Work

Improper welding work can result in accidents and serious damage to the machine.

- Have welding work performed by authorized, specialist personnel only.
- Observe the fire safety regulations.
- Protect nearby components, particularly components made of non-metallic materials, by using heat shields made of flame-resistant and insulating material.
- Before performing any welding work near lubricating or hydraulic systems, drain these systems and evacuate all gas by blowing them out with inert gas.
- Prepare electrical welding work as follows:
- Disconnect the cables from the negative terminal of the batteries.
- Disconnect the alternator.
- Connect the ground terminal near the welding point.

6.3 Operating Fluids

If possible, use the products specified by Rut Manufacturing; these have been tested and approved. Products from other manufacturers must have the same specifications as these reference products. If in doubt, contact your operating fluid supplier and provide them with the list of operating fluids used. If you have any questions regarding applications, service or maintenance, please contact Rut Manufacturing directly.

For manual lubrication points, use Total Energies "Ceran XS 80" operating fluid.

6.4 Lubrication

Before lubrication, clean the lubricating nipple thoroughly to prevent dirt and foreign matter from entering.Replace damaged lubricating nipples and remove any excess grease. Use the following operating fluid: Turmogrease LI 802 EP.KR, Lubcon.

Assembly, Component	Lubrication Points	Interval	Grease Quantity
Rotor drive, left lower bearing	1	8 h	2 strokes
Rotor drive, right lower bearing	1	8 h	2 strokes
Flap bolt	2	8 h	2 strokes
Hydraulic cylinder, above	1	8 h	2 strokes

6.5 Maintenance

The mulcher must be set down on the ground or securely supported/raised at working height. Ensure that the post-shredding flap is open, the carrier vehicle is switched off and parked securely, and the rotor is at a standstill.

Procedure:

- Check the tools and unscrew any worn tool.
- The screw and nut are not reusable.
- Screw the new tool onto the tool holder.
- To avoid imbalance, replace the tool opposite the one you have replaced as well.

Screws with the item number 01.80.20.S.155.C are used for every rotor. These are tightened to a torque of 450Nm and should be checked daily. The BCS rotor uses the screws with the item number 01.20.16040.C. These are tightened to a torque of 260Nm. The torque of the tool screw must be checked again after 8 hours and where necessary,

corrected. An additional check of all screws and their torque is carried out every 50 hours.

6.5.1 Replacing the Rotor Bearing

Personnel: trained technician
Aids: Removal tool, item number 991.94.07.00.00

Prerequisites:

- The mulcher has been removed from the carrier vehicle.
- The mulcher has been parked securely.
- The rotor is supported so that the rotor shaft does not drop when the bearing is pulled off.
- The drive box cover has been removed.
- The power belts have been removed.
- The belt pulley has been removed.

The radial runout of the rotor shaft stub measured at the shaft end must not exceed 0.5 mm. If this value is exceeded, the rotor bearing must be replaced and the shaft stub checked for damage.

Procedure:

- Clean shaft stub.
- Remove the mounting screws of the bearing.
- Grease the spindle of the removal tool so that it moves easily.
- Place the removal tool against the bearing.
- The holes in the removal tool must align with the through-holes in the rotor bearing so that the guide rods can be screwed in.
- The holes must align with the threads so that the removal tool can be screwed onto the bearing.
- Screw the removal tool firmly onto the bearing using the screws.
- Screw the guide rods through the through-holes in the bearing and into the nut flange on the mulcher housing.
- To remove the bearing, turn the spindle clockwise.
    - Do not use an impulse driver (e.g., impact wrench)! The torque during removal must not exceed 1,600Nm!
- Pull the bearing completely away from the shaft stub.
- Separate the removal tool and bearing from the guide rods.

The bearing arrangement of a rotating shaft always consists of a fixed bearing and a loose bearing. The fixed bearing positions and fixes the shaft in the axial direction and

absorbs axial forces. The loose bearing compensates for length differences because of production tolerances and thermal expansion, and keeps the system free of tension. When replacing bearings, make sure that you install the fixed bearing and loose bearing on the correct side.

6.5.2 Installing Rotor Bearings

Personnel: trained technician
Aids: Removal assembly tool, item number 991.94.08.00.00 and 991.94.12.00.00

Prerequisite: The mulcher is in the same condition as when the bearing was removed. When mounting a bearing on a shaft, you must ensure that the force is applied to the inner ring, not the outer ring. This will be the case if you use the assembly tool. In addition, the two seal rings must sit correctly in the bearing covers. If these conditions are not fulfilled, the bearing may be damaged.

Procedure:

- Grease the shaft stub using copper paste or a similar lubricant.
- Pay attention to the correct assignment of the fixed and loose bearings.
- Push the bearing onto the shaft stub and prevent twisting with the 2 screws.
- Screw the assembly tool onto the shaft stub.
- Turn the lock nut clockwise until the bearing is pulled onto the block.
- Screw in the mounting screws and tighten them to 210Nm.
- Loosen the lock nut of the assembly tool and unscrew the assembly tool from the shaft stub.

6.5.3 Maintenance Schedule

The time values in the tables below refer to operating hours. If the machine is used in difficult environmental conditions, the intervals are to be shortened accordingly.

Often after expiry or operating hours (op.hrs.) / Activity	Visual inspection	Lubricate	Check	Clean	Replace	Once after 8 op.hrs.	Acc. to requirements and conditions of use	Every 8 op.hrs./daily	Every 20 op.hrs.	Every 50 op.hrs./weekly	Every 500 op.hrs./6-monthly	Every 2000 op.hrs.
Rotor bearing (2 taps)		•						•				
Folding cylinder		•						•				
Flap bolt		•						•				
Toothed belt			•			•				•		
Tools/Wearing plates	•		•					•		•		
Dust, dirt in belt drive housing			•							•		
Hydraulic compo-nents	•							•				

7. SELF-HELP

7.1 Troubleshooting

Even when under time pressure, proceed systematically and purposefully. Random, indiscriminate disassembly and changing of the setting values can mean that the original cause of the error can no longer be determined.

- Gain an overview of the product function in the context of the overall system.
- Try to clarify whether the product performed the required function in the overall system before the error occurred.
- Obtain a clear idea about the cause of the error. If necessary, ask the immediate user or machine operator.
- Document the work performed.
- If you were not able to resolve the error, contact us directly at Rut Manufacturing.

	Fault	Possible Cause	Remedial Action

Hydraulics	Unusual sound	Improper fastening of the attached parts.	Check fastening of the hydraulic motor according to the specifications of Services. Observe tightening torques. Fasten attached parts according to the specifications of the coupling or fixture manufacturer.
		Mechanical damage to the hydraulic motor.	Replace hydraulic motor. Contact Service.
	Operating data is not achieved.	Too little volume stream of the hydraulic pump.	Check the function of the hydraulic pump.
		Too little control pressure or set pressure.	Check control pressure or set pressure; contact Service.
		Hydraulic fluid not in the optimal viscosity range.	Use suitable hydraulic fluid. Contact Service.
		Hydraulic motor wear.	Replace hydraulic motor. Contact Service.
		Mechanical damage to the hydraulic motor (e.g., bearing damage).	Replace hydraulic motor. Contact Service.
	The temperature of the hydraulic fluid and housing is too high.	Input temperature at the hydraulic motor too high.	Check the system, e.g., cooler malfunction, too little hydraulic fluid in the tank.
		Malfunction of the pressure regulating valves (e.g., high-pressure relief valve, pressure cut-off, pressure regulator).	Contact Service.

		Malfunction of the flush valve.	Contact Service.
		Hydraulic motor wear.	Replace hydraulic motor. Contact Service.
Rotor	The rotor is obstructed when work starts.	Heavy frost has caused the rotor to become obstructed.	Thaw out the rotor.
	The rotor becomes obstructed during operation.	Foreign objects are obstructing the rotor.	Remove the foreign matter.
	The rotor suddenly becomes heavily imbalanced while running.	One or more items of equipment are damaged.	Replace the equipment.
	The rotor is vibrating.	Bearing damage.	Check the bearing play.

7.2 Customer Service

Phone Number: 336-859-0328
Email: sales@rutmfg.com

If you need to contact the customer service department in the event of a fault, please have the following information ready:

- Serial number
- Telephone numbers of the contact person and the employee operating the machine.
- Presumed or identified causes of the fault.
- Any measures already taken.

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8. SPECIAL TOOLS

8.1 Flanged Bearing Disassembly Tool

To ensure that the flanged bearings used can be disassembled safely and easily, we have developed a disassembly tool that has been specifically designed for flanged bearings. The tool is available in 3 different sizes (small, medium and large), suitable for flanged bearings such as, e.g., rotor, transmission or fan bearings.

- Item Number: 991.94.05.00.00, 991.94.07.00.00, 991.94.06.00.00

8.2 Flange Bearing Assembly Tool

To ensure that the flanged bearings used can be assembled safely and easily, we have developed an assembly tool that has been specifically designed for flanged bearings. The tool is suitable for all flange sizes.

- Item Number: 991.94.08.00.00, 991.94.12.00.00

8.3 Torque Wrench

Controlled bolt tightening in the range of 110 Nm to 550 Nm. Adjustable, actuating and robust tubular torque wrench with 3/4" with sliding square.

- Item Number: 84.001.28

8.4 Exhaust Kit

Special attachment devices that can be separated from the tractor vehicle for longer periods of time form a closed hydraulic circuit, which does not permit pressure compensation. As soon as hydraulic components are subject to strong temperature swings, a very high pressure can build in the hydraulic circuit and can damage the shaft ring seal of the hydraulic motor. To prevent this pressure, the exhaust kit can be attached to a Minimess connection in order to reduce the pressure that arises.

- Item Number: 11.23.015

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9. TECHNICAL DATA

9.1 Dimensions and Weight

Working Width: 29.5 inches (750 mm)
Overall Width: 48 inches (1,218 mm)
Height: 28.2 inches (716 mm)
Length: 22 inches (561 mm)

Weight: 750 pounds (340 kg)

9.2 Drive

The mulcher is adjusted using adjusting screw item 1 of the variable displacement motor. The minimum swivel angle and, therefore, the maximum rpm are set with the adjusting screw. (min. swivel angle = max. rpm)

The default value of the set screw is determined by the supernatant "X" which must be measured and adjusted. Here, the adjusting screw is inserted or unscrewed and the supernatant "X" adjusted to the value for the desired minimum absorption volume.

Setting values for 60 ccm motor - 28073709 (displacement VG min.)

Carrier vehicle volume flow rate	Default value for distance "X" mm ± 3.6 mm	Set absorption volume	Rotor speed	Cutting speed
l/min	mm	cm^3/r	rpm	m/s
Translation i=0.75 (Belt pulley 56Z on drive – 42Z on rotor)				
50	27	20	3080	56
75	20	31	3080	56
100	14	41	3080	56
Translation i=1.33 (Belt pulley 42Z on drive – 56Z on rotor)				
120	22.5	28	3080	56
130	21	30	3080	56
150	17	35	3080	56

9.3 Shredding Rotor

BCS stands for “Bite Control System” and has been specially developed for mulching applications in low power classes. The BCS tool system results in a tool which prevents the mulcher from cutting too deep and therefore prevents the speed of the rotor being reduced too heavily. This makes it easier to maintain the speed of the rotor, even when using a low-power carrier vehicle.

- Rotor Diameter: 13.8 inches (350mm)
- Number of Tools: 16
- Tool Type: BCS

9.4 Noise Level

Guide Value at Idle: 70 db (A)

Guide Value at Full Load: Above 80 db (A)

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10. TAKING OUT OF SERVICE

10.1 Machine Shutdown

Incorrect storage can cause bare metal surfaces to corrode. Moving parts can be damaged as a result.

Preparations for Storage

- Clean the machine thoroughly.
- Remove rust.
- Spray bare parts with corrosion inhibitor oil.
- Grease bare moving parts.

Storage for up to 3 Months

- Store the mulcher in as dry a condition as possible, protected from dust and dirt.
- In all cases, protect the mulcher from direct wetness, such as rain or spray water.
- Park the mulcher securely.
- Protect the mulcher from damage caused by other objects.

Storage for more than 3 Months

- Store the mulcher in a roofed, dry, and ventilated space that is not in direct contact with the ground.
- Park the mulcher securely.
- Cover the mulcher with an air-permeable tarpaulin for protection.
- Protect the mulcher from damage caused by other objects.

Removal from Storage

- Clean the machine thoroughly.
- Remove rust.
- Lubricate all lubrication points.

10.2 Disposal of Operating Fluids

Operating fluids such as oils and greases are hazardous to water courses. When disposing of used operating fluids and parts that have come into contact with these

fluids, follow the locally applicable legal regulations or wastewater regulations. We recommend clarifying the possible disposal options with the competent local authorities.

The term "waste material" refers to operating fluid residues or operating fluids that have been used. In the context of these instructions, waste material is considered hazardous if it has one or more of the following characteristics:

- Potentially explosive
- Highly flammable and spontaneously inflammable
- Combustible
- Oxidizing
- Toxic or highly toxic
- Irritating or caustic
- Generally harmful to health
- Carcinogenic or possibly carcinogenic
- Mutagenic
- Hazardous to water courses or otherwise damaging

Details of hazardous properties can be found on the safety data sheets of the materials concerned.

10.2.1 Collecting, Packing, and Identifying Waste

Only properly packaged, sealed, and labeled containers and drums, or containers and drums approved by the environmental representative, should be taken to the corresponding disposal site.

- Never mix different wastes together. Mixing waste material generally makes recycling impossible and is prohibited.
- PCB-based synthetic oils and oil substitutes containing halogen must be kept separate from other used oils.
- Pack the waste so that it cannot leak or evaporate and can be transported safely.
- Remove old content details and supplier labels from containers and drums, or make them illegible.
- Rinse containers and drums before filling them with waste. The only permitted exceptions to this are where the original containers and drums contained the same material as the waste material.
- Before transportation, packages, containers, and drums should be identified, in a clearly legible and weather-resistant form, with the following details:
    - Source of danger
    - Name, designation of content, hazard category and sub-class number
    - Sender (name, signature, and department)
    - Date

10.3 Scrapping

Dispose of all the machine components and accessories in accordance with the locally applicable regulations. If you have any questions, please contact customer service. If you have any questions regarding applications, service or maintenance, please contact your local dealer.