Operating and maintenance manual for the

BISON
BISON X
snow groomer

Vehicle numbers
908930245 to 908930367

41237353 | REV01

Prinoth®

■ Imprint

PRINOTH Ltd.

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Granby, Quebec, Canada

J2J 1E9

This manual may be translated into another language. In the event of any discrepancy, the English version shall prevail.

Important notes about this manual

Keep this manual in the cab of the vehicle as a handy reference for the safe and productive use of the BISON. Should you re-sell the vehicle, leave this manual with it for the next owner.

This manual is filled with important safety information - read and understand the content as well as all safety stickers installed on the vehicle.

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Original instructions - printed in Canada

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2 Notes about the documentation

2.1 Preface

■ To the reader

These operating and maintenance instructions will help you get to know and appreciate the performance and quality of your snow groomer.

Proper use of the snow groomer and conscientious maintenance are essential to ensure operational availability.

A hardcover copy of these operating and maintenance instructions is supplied with each snow groomer and must always be kept close at hand in the driver's cab behind the driver's seat. It should be considered an essential part of the snow groomer and its safety equipment.

These operating and maintenance instructions must be read carefully and all technical details understood.

To keep your snow groomer always in serviceable condition, make sure that the necessary maintenance work is carried out regularly at the specified intervals. The servicing dates and intervals as well as the maintenance instructions as specified by PRINOTH apply. The warranty obligation is immediately void in the case of damage to or removal of the lead seals on hydraulic valves and control units!

All warranty obligations lapse in the following cases:

- Failure to carry out the specified maintenance work
- Missing completed check sheets
- Damage or faults due to servicing work and/or settings not authorised by PRINOTH
- Installation of non-approved components or use of third party spare parts

Please note that regular inspection and maintenance work can prevent unexpected and unnecessary downtime.

Report any problems with the snow groomer or its attachments to Prinoth approved repair and maintenance personnel. If there is a possibility of consequential damage, the snow groomer must be taken out of service until the fault has been corrected.

The technical details for this snow groomer were up to date as of these operating and maintenance instructions' copy date. As part of our ongoing development programme, we reserve the right to make technical changes to our products. PRINOTH will endeavour to always keep the information in these operating and maintenance instructions up to date.

By following these instructions, you will ensure that your snow groomer has a long service life and remains in proper working condition.

PRINOTH

2.2 General

When operating a snow groomer, hazards can occur due to the vehicle itself and to the working environment, e.g., vehicle movements, operation of attachments, terrain formations, weather conditions, and risks of avalanche.

These operating and maintenance instructions advise about possible risks and provide guidelines that will help prevent injury and damage to property.

⚠ These hazards can be minimized by correct and level-headed action on the part of operating personnel.

⚠ In order to avoid damage, it is essential to read and understand the operating and maintenance instructions before operating the snow groomer.

⚠ Ensure that the snow groomer is in perfect technical condition. This provides the best conditions for avoiding accidents.

⚠ The operating and maintenance instructions are indispensable for the professional operation of the snow groomer and the attachments and should be close at hand in the driver's cab at all times.

2.3 Explanatory notes about the safety instructions

The safety instructions in this operating and maintenance manual are structured as follows:

■ Meaning of the signal words

⚠ DANGER

Signal word "DANGER"
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

► All safety instructions with the signal word "DANGER" are followed by respective safety measures.

⚠ WARNING

Signal word "WARNING"
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

► All safety instructions with the signal word "WARNING" are followed by respective safety measures.

⚠ CAUTION

Signal word "CAUTION"
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

► All safety instructions with the signal word "CAUTION" are followed by respective safety measures.

NOTICE

Signal word "NOTICE"
Refers to additional information and dangers that do not relate to personnel injury (e.g. information relating to property damage)

► All safety instructions with the signal word "NOTICE" are followed by respective safety measures.

■ Example for safety instructions

Example 1: CAUTION

⚠ CAUTION

Description of the danger
Description of possible consequences

- ► 1. Safety measures for avoiding the danger
- ► 2. Safety measures for avoiding the danger
- ► 3. Safety measures for avoiding the danger

⚠ CAUTION

Risk of scalding
Since the cooling system is pressurised, hot coolant can spray out when the cooling system is opened and scald skin and eyes.

- ► Only open the cooling system when the coolant temperature is below 40 °C.
- ► Slowly unscrew the cap and release the pressure before opening completely.
- ► Wear suitable protective gloves, clothing and safety glasses when handling coolants.

Example 2: NOTE

NOTICE

- ► 1. Information or safety measures
- ► 2. Information or safety measures

NOTICE

- ► Check the first-aid kit's use-by date regularly and replace the contents as required.
- ► Replace used dressing material immediately.

2.4 Pictograms and what they stand for

The pictograms on the snow groomer and attachments must always be kept in an undamaged condition and must remain clearly visible. Damaged pictograms must be replaced immediately. Pictograms can be obtained from PRINOTH agents and branch offices.

Familiarise yourself with the pictograms and what they stand for before operating the snow groomer and attachments.

In doing so, there are three different types of pictograms:

- Mandatory signs
- Warning signs
- Prohibition signs

⚠ WARNING

Risk of accident and injury
The pictograms on the snow groomer and attachments indicate possible hazards. Ignoring these pictograms can lead to serious or life-threatening injuries.

► The pictograms must be kept in an undamaged condition and must remain clearly visible.
► Replace damaged pictograms immediately.

2.4.1 Mandatory signs

Meaning	Symbol
Wear foot protection	
Wear protective gloves	
Wear eye protection	
Wear safety belts	
Wear ear protection	

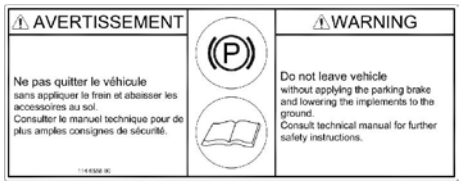
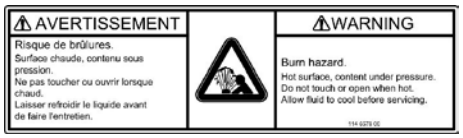
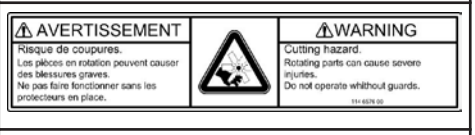
2.4.2 Warning signs

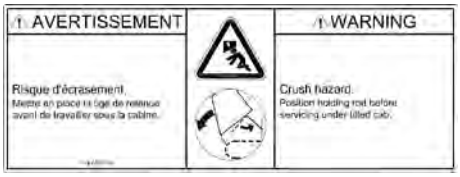
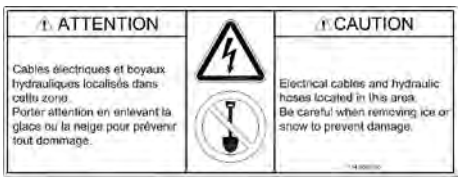
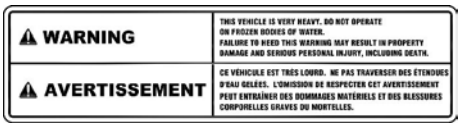
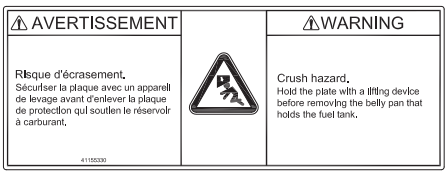
	EU standard ISO 3864 (black-yellow)	US standard ANSI Z.535 (black-white)
Indication of an immediate or potential risk		
Indication of a risk of burning on hot surfaces, components or fluids		
Indication of a risk of falling		
Indication of a risk of crushing		
Indication of a risk of severing injuries		
Indication of a risk of splintering		
Indication of a risk of crushing or severing limbs due to rotating parts		
Indication of a risk of collision: wear safety belt		

2.4.3 Prohibition signs

Meaning	Symbol
Prohibits certain actions or behavior	
The removal of safety devices is prohibited!	
Transporting persons is prohibited (except for the parts of the vehicle that are expressly intended for passenger transport)!	
Fire, open flame and smoking are prohibited!	
Forbidden for persons wearing heart pacemakers	
Hoisting by crane forbidden!	

2.4.4 Warnings

Meaning	Note
General safety alert ■ In order to avoid injury, it is essential to read and understand the operating and maintenance manual before putting the snow groomer and attachments into operation.	
Risk of rolling away ■ Never leave the vehicle unattended without applying the brakes and lowering the attachments to the ground. ■ Consult operating and maintenance manual for further safety instructions.	
Risk of collision ■ The brakes are automatically activated if the cab door is opened. ■ Consult operating and maintenance manual for further safety instructions.	
Risk of scalding ■ Hot surface, content under pressure. ■ Do not touch surface. ■ Do not open container. ■ Allow coolant to cool down before carrying out maintenance work.	
Risk of falling, risk of crushing and cutting ■ When transporting persons on the loading platform, there is a risk of falling and being crushed or cut.	
Fire hazard ■ When handling inflammable fuels and operating fluids, there is a risk of fire. ■ Do not smoke. ■ Do not refuel while the engine is running or warm. ■ Avoid direct contact with fuel.	
Risk of cutting injuries ■ Rotating parts can cause serious injuries. ■ Do not operate if safety devices are missing.	
Risk of collision ■ The snow groomer could come to an abrupt halt or run down a steep slope. ■ Wear safety belt.	
Risk of severing injuries ■ Moving parts can cause serious injuries. ■ While the engine is running, keep at a safe distance from front and rear attachments.	

Meaning	Note
Crush hazard ■ There is a risk of crushing when working under the driver's cab. ■ Secure the safety bar before working under the driver's cab.	
Risk of projectiles ■ Rotating parts can throw off projectiles. ■ Do not operate if safety devices are missing.	
Risk of damage to electrical and hydraulic systems ■ Electric cables and hydraulic lines running here can be damaged. ■ Exercise caution when removing ice and snow.	
Risk of cutting injuries and getting trapped ■ Rotating parts can cause serious injuries. ■ Keep loose-fitting clothing, hand and other body parts away from rotating parts.	
Risk of scalding ■ Hot fluids can cause scalding. ■ Do not touch. ■ Allow for cool-down before carrying out maintenance work.	
Risk of break-in ■ The snow groomer is a very heavy vehicle. ■ Do not drive on frozen waterways or lakes. ■ Failure to observe this regulation will lead to a risk of material damage as well as serious physical injury, and in the worst cases, death.	
Risk of crushing ■ The belly pan is heavy and holds one of the fuel tanks. Install a support for the belly pan before removing the bolts. ■ Failure to observe this precaution could cause injuries.	

3 Safety

3.1 General information

When operating the snow groomer and its attachments, follow all the operating instructions and safety regulations set out by the manufacturer in the operating and maintenance instructions.

In addition to the operating instructions, follow the general legal accident prevention and environmental protection regulations applying in the country concerned. This also applies to the provision and wearing of personal protective equipment (PPE).

The operating and maintenance instructions must remain available for the whole service life of the snow groomer for driver and service personnel reference.

Maintaining an additional vehicle log will help you keep track of the required inspection and maintenance work. This will ensure that the snow groomer is constantly in proper working condition and has a long service life.

Original spare parts and special accessories have been produced for the BISON snow groomer. The components of the snow groomer are tested to ensure the reliability, operational safety and functional reliability of the vehicle.

We would like to emphasize that spare parts and accessories not supplied by PRINOTH have also not been tested nor approved by us. The installation or use of such products can therefore, under certain circumstances, have a negative affect on the basic characteristics of the vehicle. This can adversely affect the snow groomer's operational safety and reliability. Warranty claims will only be accepted if the manufacturer's original spare parts and accessories are used exclusively.

NOTICE

Ensure for the correct operation of the snow groomer

► Operating and maintenance instructions are to be kept in the driver's cab at all times. There is a holder behind the driver seat intended for these.

3.2 Manufacturer's recommended use

The following country-specific regulations apply for using the snow groomer and its attachments on ski slopes. The snow groomer is designed mainly for preparing and maintaining ski slopes, and for clearing snow from access roads and connecting paths to the lifts. It is designed for autonomous operation.

The snow groomer and attachments embody the latest technological developments and they are built in accordance with the applicable safety regulations.

In brief, the vehicle has been designed for the following tasks:

- Moving and leveling snow using its front blade, ploughing and / or cutting snow
- Preparation of cross-country trails
- Transportation of loads of a total weight of up to **1000 kg** (2204 lb) on the loading platform, if equipped
- Carrying loads on a carrier mounted on the front blade, with a max. payload of **1000 kg** (2204 lb); in this case, the driving method must be adapted to prevent the load from falling off
- Carrying two passengers in the driver's cabin, in addition to the driver
- Operation in ambient temperatures between **-30 °C** (-22 °F) and **+25 °C** (+77 °F)
- Operation at an altitude of up to max. **4000 m** (13123 ft) above sea level

Using an anchoring hook attached to the front blade or the rear of the snow groomer, a trailer or sled with a maximum total weight of **2000 kg** (4409 lb) can be towed.

The snow groomer and its attachments can pose a danger to the operating personnel or others. Only qualified personnel authorized by the operator may be assigned to drive and operate snow groomers.

The BISON snow groomer is not approved for use in road traffic. When driving on snow-free roads, the driving style must be adapted in order to prevent damage to the vehicle and the roads.

Snow groomers must only be operated in accordance with the operating and maintenance instructions. Any use of the snow groomer other than described here requires written consent from the manufacturer.

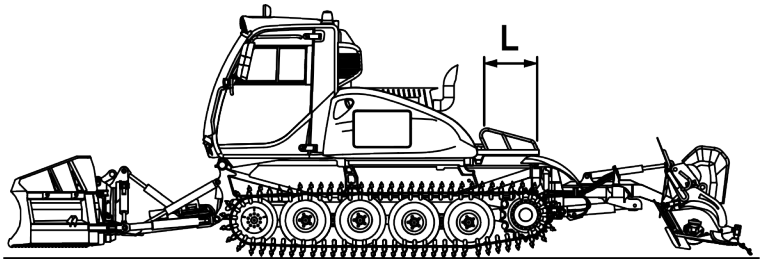


Figure 1: Loading platform position

Pos.	Name
L	Loading plaform

3.3 Qualification of the personnel

■ Driver

Only qualified personnel authorized by the operator may be assigned to drive and operate snow groomers.

Drivers must meet the following requirements and provide proof of meeting them:

- Be at least 18 years of age
- Possession of a driver's licence valid for motor vehicles or proof of qualification to drive a snow groomer by courtesy of the operator.
- Physical and mental fitness to perform the tasks assigned
- Received training on snow groomers and ability to provide the employer with documentation of their qualification to drive snow groomers
- Knowledge of the characteristic properties of snow, the causes and devastating effects of avalanches and, in particular, proper behavior when there is a risk of avalanche

To optimize operating safety, the driver must be familiar with the snow groomer, the ski slope conditions and the current snow conditions:

- Behavior of the snow groomer in different snow conditions
- Knowledge of the area of operation, particularly with regard to specific risks of accident (e.g., rock slide, risk of avalanche, areas prone to crashes)

The driver must also ensure that he has access to a communication system (radio receiver, mobile telephone) that provides a permanent connection to the outside world in order to be in a position to receive information about imminent risks or to summon immediate first aid and deal with unexpected events.

The driver must always be in charge of the vehicle key, and the key must not be copied without their consent.

■ Technicians and service personnel

Installation and maintenance work requires the use of in-house service personnel or of service personnel trained by the manufacturer.

Service personnel and persons assisting who enter the danger area around the snow groomer must meet the following requirements:

- Be at least 14 years of age
- Physical and mental fitness to perform the tasks assigned to them

Technical interventions, such as troubleshooting, diagnosis and repair work (these subjects are not covered by the operating and maintenance instructions) on mechanical, hydraulic and electrical / electronic components must only be undertaken by specialized personnel trained by PRINOTH.

The person responsible for the snow groomer must ensure that only authorized specialized personnel use the snow groomer. Service personnel must be familiar with the dangers and apply the safest methods.

The snow groomer including accessories must only be scrapped at an authorized and specialized scrap yard. The snow groomer and accessories must be disposed of in accordance with the relevant legal regulations.

3.4 Important notes

3.4.1 Before using the vehicle

Before starting and driving the snow groomer, the driver must make sure that all the components relevant for safe operation are functioning correctly.

The following guidelines must be observed:

⚠ Clear snow and ice from the snow groomer.

⚠ Make sure all safety devices are in proper working condition.

⚠ Check the lighting system and warning devices.

⚠ Check fluid levels (e.g., engine oil, coolant).

⚠ On vehicles with pneumatic tires, check the inflation pressure of the running wheels.

⚠ Check track tension.

⚠ Check the steering, brakes and auxiliary hydraulics.

⚠ Before starting the engine, check the accelerator for ease of movement (accelerator must automatically return to neutral position).

⚠ Check that attachments and loads are secure.

⚠ If safe operation of the vehicle requires the use of radios or mobile telephones, these must be checked before starting off to ensure that they work correctly and that a good connection can be established.

⚠ Do not operate the snow groomer if warning lamps come on.

3.4.2 When using the snow groomer

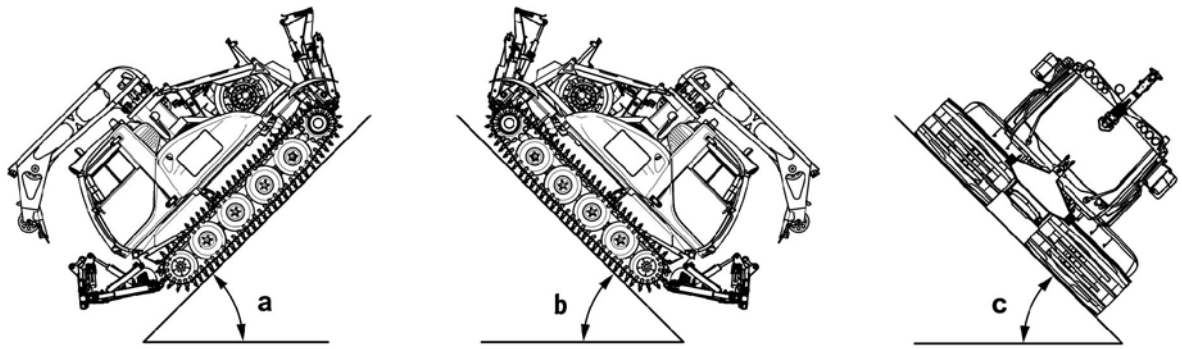
The driver must employ a driving style that ensures that they have command of the vehicle at all times and is able to stop within a safe distance. They must adapt the speed to the snow, ground and visibility conditions, as well as to the characteristics of the snow groomer, including those of the mounted attachments.

The following guidelines must be observed:

⚠ If required, wear personal protective equipment (e.g., protective goggles, gloves and shoes).

- Use the safety belts and grab handles.
- Always switch on the rotating beacons.
- Monitor the on-board instruments.
- Do not exceed the snow groomer's performance limits.
- Raise the attachments when turning the snow groomer on its own axis.
- If the tracks start to slip, reduce the track speed and adjust to a driving speed suitable for the ground conditions.
- If a warning lamp comes on or if there are traces of oil behind the snow groomer, immediately switch off the engine and fix the malfunction.
- When using attachments, brake evenly or take corners slowly.
- Do not use rear tiller or half-pipe tiller when persons are nearby.
- Reduce speed when approaching people or on difficult terrain; ensure that nobody is standing within the swivel range of the snow groomer.
- If people are at risk due to moving attachments or the vehicle itself, give audible and visual warnings.
- Make sure that any parking space intended for the snow groomer has sufficient load-bearing capacity (e.g., garages, bridges, snow-covered car parks).
- When parking the vehicle or leaving it unattended, engage the parking brake, lower the attachments to the ground, and remove the ignition key.
- Never leave the engine running unattended. Do not drive the snow groomer over ditches, knolls or scarps. Injuries or mechanical damage can occur as a result.
- When driving on steep ski slopes, the snow groomer may skid when braking. Maintain constant speed or accelerate slightly to regain control of the snow groomer.
- If slipping sideways, turn the snow groomer uphill and accelerate to avoid skidding. If slipping sideways, never turn the snow groomer downhill.
- Blind terrain can hide dangerous obstacles; drive slowly and extremely carefully.
- Before crossing a frozen lake or waterway with the snow groomer, ensure that the load bearing capacity of the ice is sufficient.
- On steep slopes where it is impossible to stop due to the gradient, the vehicle must be driven only if the driver is convinced there is no risk to himself or third parties. Otherwise another route must be chosen.

3.4.3 Permissible inclination angle



Pos.	Description	Value
a	Maximum permissible inclination angle downhill	**45°**
b	Maximum permissible inclination angle uphill	**45°**
c	Maximum permissible inclination angle to the side	**37°**

⚠ When driving in steep terrain, the maximum inclination angle specified for the vehicle in the diagram must be observed. If these values are exceeded, the vehicle may slip, fall or tilt.

⚠ The values specified above apply as general guidelines. The following additional factors may influence the maximum permissible inclination angle and must be considered when driving in terrain:

- ► snow conditions or general properties of the sub-surface.
- ► general conditions of the terrain or the permanently changing inclination angle in terrain.
- ► transportation of loads that change the centre of gravity and the vehicle handling.

⚠ The vehicle handling must be adapted to the factors specified above at all times in order to ensure for safe driving in terrain, and to prevent the vehicle from slipping, tilting or falling.

⚠ WARNING

Risk of slipping and falling

- ► The vehicle handling must be adapted to the changing conditions of the terrain or the sub-surface and the maximum permissible inclination angle at all times.
- ► Disregarding may lead to loosing control over the vehicle, severe injury and death.

3.4.4 Towing the snow groomer

Towing or salvaging the snow groomer by the user is not intended.

If the the snow groomer is no longer roadworthy:

- ► park and safeguard the snow groomer
- ► Contact Prinoth customer service

3.4.5 When maintaining the vehicle

Snow groomers may only be maintained in keeping with generally accepted technical standards and following the manufacturer's operating and maintenance instructions.

The following guidelines must be observed:

- ⚠ Always perform maintenance work according to directions.
- ⚠ Switch off the engine during lubrication and maintenance work.
- ⚠ Use protective clothing and equipment.
- ⚠ Follow the general safety directions when handling fuel.
- ⚠ Only mix fuels in well-ventilated areas.
- ⚠ Do not smoke, avoid open flame and sparking near the snow groomer.
- ⚠ Switch off mobile phones when fueling.
- ⚠ Do not refuel if the engine is running or hot.
- ⚠ Do not open the cap on the coolant expansion tank while the engine is still hot.
- ⚠ If you smell fuel while using the snow groomer, you must immediately switch off the engine and fix the malfunction.
- ⚠ Do not use any fluids as a starting aid when starting the engine.
- ⚠ Do not run the engine with the driver's cabin tilted.
- ⚠ Check the fuel system regularly.
- ⚠ Damaged components of the driver's cab suspension and driver's cab mounts must be replaced by original Prinoth spare parts immediately. For necessary welding work on the structure or suspension of the driver's cab, refer to the specialized personnel from Prinoth.
- ⚠ Do not climb on the roof of the driver's cab. Service measures on the roof headlights must be carried out at the front of the vehicle using a ladder or similar climbing aids.

⚠ WARNING

Risk of injury
There is a high risk of injury when working in the danger area around the front and rear attachments.

► If there are a number of people performing service and repair work, they must remain in visual contact with each other.

3.5 Safety equipment in the vehicle

■ Fire Extinguisher

The fire extinguisher is located on the cab floor between the driver seat and the passenger seat on the right-hand side.

Figure 2: Fire extinguisher

NOTICE

Check the fire extinguisher

- ► Have the fire extinguisher inspected every one or two years; otherwise it may fail in an emergency situation.
- ► Have the fire extinguisher refilled after every use.
- ► Ensure that the fire extinguisher is properly stored in the holder and is secured with the retaining strap.

■ First Aid Kit

The first aid kit is located on the cab rear wall behind the passenger seat on the right-hand side.

Figure 3: First aid kit

NOTICE

Check the first aid kit

- ► Check the first-aid kit's use-by date regularly and replace the contents as required.
- ► Replace used dressing material immediately.

3.6 Pictograms and safety instructions on the vehicle

3.6.1 Snow groomer

The pictograms and safety related instructions are located as follows on the snow groomer:

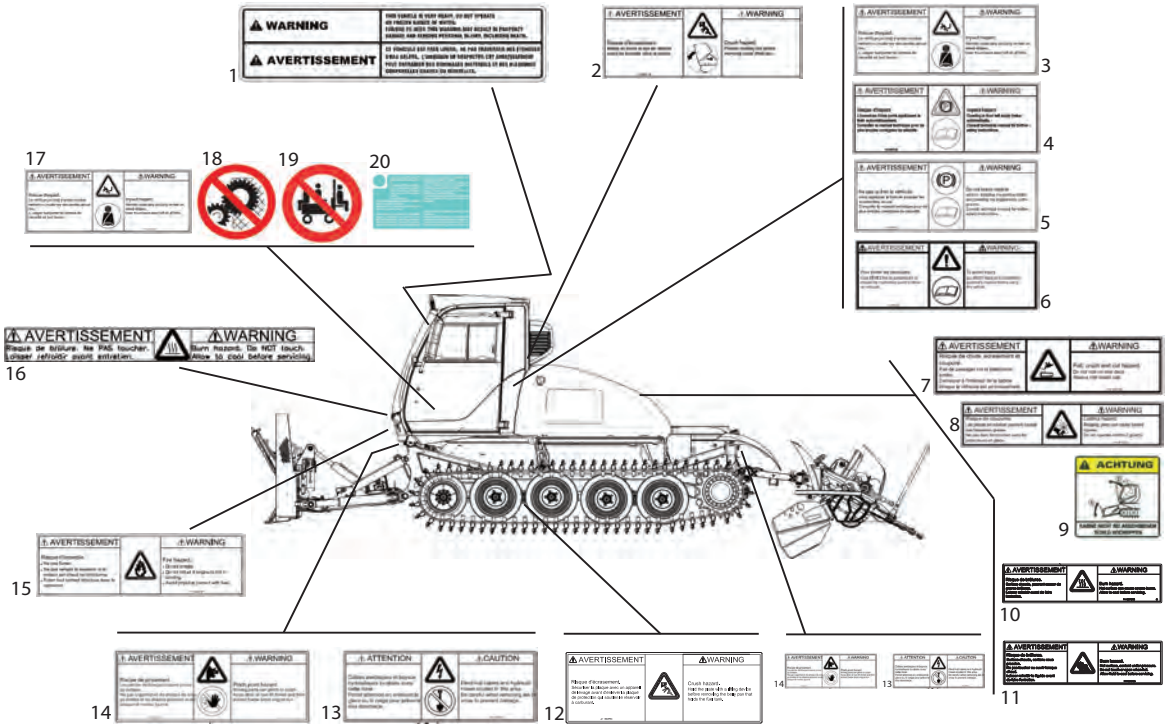


Figure 4: Pictograms and safety instructions on the snow groomer

Pos.	Name
1	Vehicle is heavy, do not ride on frozen body of water
2	Risk of crushing, install safety rod
3	Wear seat belt
4	Risk of impact, opening a door applies the brake
5	Do not leave the vehicle unattended
6	Read instruction manual
7	Fall, crush and cut hazard
8	Cutting hazard
9	Lower front implement
10	Hot surface
11	Burn hazard
12	Crush hazard
13	Electrical cables and hydraulic hoses
14	Pinch point hazard
15	Fire hazard
16	Hot surface
17	Wear seat belt
18	Removal of safety devices prohibited

Pos.	Name
19	Transporting personnel prohibited
20	Notes about safety instructions

3.6.2 Attachments

Pictograms are attached at the following points on the attachments:

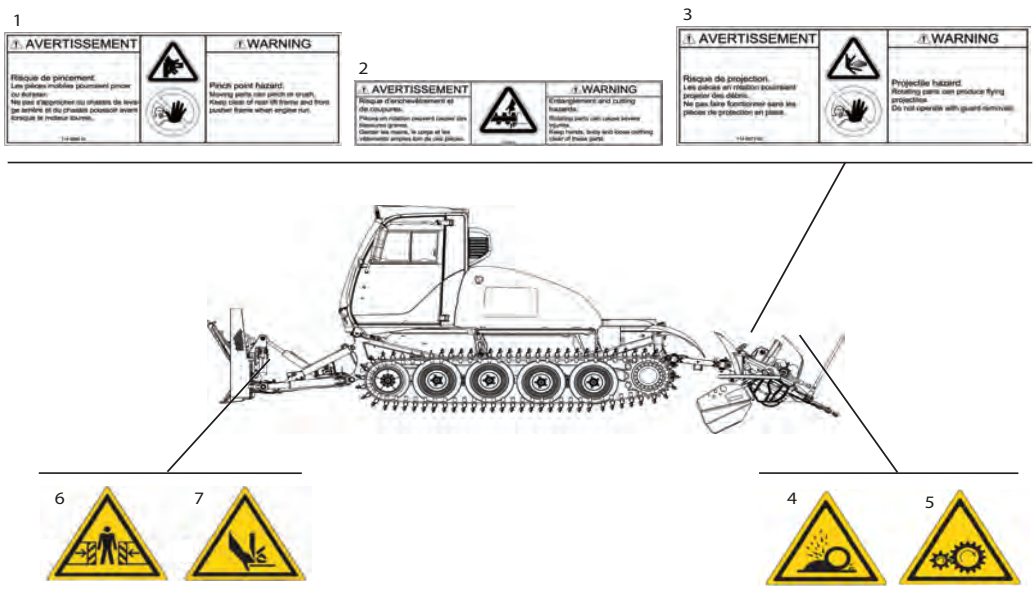


Figure 5: Pictograms and safety instructions on the attachments

Pos.	Name
1	Risk of crushing
2	Rotating parts: risk of crushing or severing limbs
3	Risk of splintering
4	Risk of splintering (POWER tiller only)
5	Rotating parts: risk of crushing or severing limbs (POWER tiller only)
6	Risk of crushing
7	Risk of cutting

3.7 Danger Zones

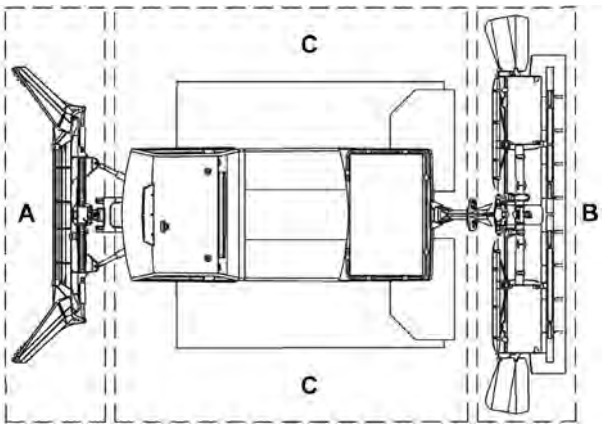


Figure 6: Danger zones when using the snow groomer

The working area around the snow groomer is divided into different danger zones.

In this chapter, alongside a diagram of the danger zones you will also find a list of which hazards occur in which danger zones.

Type of danger involved in operating the snow groomer	Danger Zones			Danger during						
	A	B	C	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	Disposal
- Dangers caused by mechanical parts -										
■ Crush hazard										
Around the driver and passenger doors			X	X		X			X	
Under the engine cover			X	X	X	X	X	X	X	
Under the driver's cabin when tilted			X	X	X		X	X	X	
Under the attachments	X	X		X	X	X		X		
Under the track bars			X			X		X		
Between the links that operate the attachments	X	X			X	X		X	X	
Under the loading platform when tilted			X				X	X		
■ Risk of cut and amputation										
Around the driver and passenger doors			X	X		X			X	
Under the engine cover			X	X	X	X	X	X	X	
Under the driver's cabin when tilted			X	X	X		X	X	X	
Under the attachments	X	X		X	X	X		X		
Under the track bars			X			X		X		
Between the links that operate the attachments	X	X			X	X		X	X	
Under the loading platform when tilted			X				X	X	X	
Around the cooling system's fan blades			X		X		X	X	X	
Around the rotating parts of the rear tiller		X			X	X	X	X	X	

Type of danger involved in operating the snow groomer	Danger Zones			Danger during						
	A	B	C	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	Disposal
■ Risk of crush and entanglement										
Around the rotating parts of the rear tiller		X			X	X	X	X	X	
Around the power transfer system of the rear tiller		X			X	X	X	X	X	
Around the power transfer system of the front attachments	X				X	X	X	X	X	
Around the sprocket wheels and track guides			X		X	X	X	X		
Between the engine's poly-V-belts and belt pulleys			X		X	X	X	X	X	
■ Risk of collision										
With loose objects inthe driver's cab			X			X				
The snow groomer cannot be steered due to lack of power	X	X	X				X			
The snow groomer cannot stop	X	X	X			X				
■ Risk of ejection of solid material										
Foreign bodies ejected by attachments with rotating parts	X	X			X	X	X	X	X	
■ Risk of ejection of fluid under high pressure										
From hydraulic hoses and bolt fittings	X	X	X		X	X	X	X	X	
■ Risks due to mass and stability (potential energy)										
Snow groomer tipping over			X			X				
Lateral slipping			X			X				
Slipping in direction of travel			X			X				
Backward slipping			X			X				
Falling attachments	X	X			X	X		X	X	
Loads falling off the loading platform		X	X			X				
■ Risks due to mass and speed (kinetic energy)										
Running down people present in the working area of the snow groomer			X			X				
Running down people present within the snow groomer's swivel range			X			X				
■ Risk of slipping										
From the tracks when climbing into or out of driver's cabin			X		X	X	X	X	X	
■ Risk of stumbling										
Over safety devices when climbing onto the loading platform			X		X	X	X		X	
■ Risk of falling										
From the tracks when climbing into or out of driver's cabin			X		X	X	X	X	X	
From the tracks when climbing onto or off the loading platform			X		X	X	X	X	X	
From the loading platform			X		X	X	X		X	
From the tracks during maintenance and repair work			X				X		X	
- Electrically caused dangers -										

Type of danger involved in operating the snow groomer	Danger Zones			Danger during						
	A	B	C	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	Disposal
■ Risk of touching electrical conductors										
Connecting cable for halogen headlamps	X						X	X	X	
Connectors for engine preheating			X			X			X	
■ Risk of touching electrical conductors indirectly										
When using third party batteries with connecting cables for jump starting			X						X	
■ Risks due to heat radiation and being splashed with molten materials										
When using third party batteries with connecting cables for jump starting			X						X	
- Dangers caused by noise -										
■ Risk of permanent damage to health										
Due to noise from engine and attachments			X			X		X		
- Dangers caused by vibration -										
■ Risk of permanent damage to health										
Vibrations at driver seat			X			X				
- Risks due to heat -										
■ Risk of burn and scalding										
When touching the engine block			X		X	X	X	X	X	
When touching the engine exhaust pipe			X		X	X	X	X	X	
When touching hot surfaces on the turbocharger			X		X	X	X	X	X	
When touching the radiator			X		X	X	X	X	X	
When touching the engine oil cooler			X		X	X	X	X	X	
When touching the hydraulic fluid cooler			X		X	X	X	X	X	
When touching the cooling system pipes			X		X	X	X	X	X	
When touching the lubricant system pipes			X		X	X	X	X	X	
When touching the hydraulic hoses and hydraulic units	X	X	X		X	X	X	X	X	
When touching the halogen lamps	X						X	X	X	
- Dangers caused by harmful substances -										
■ Caustic burns and poisoning										
Exhaust fumes entering the driver's cabin			X		X	X		X		
Exhaust fumes from the engine	X	X	X		X	X	X	X		

Type of danger involved in operating the snow groomer	Danger Zones			Danger during						
	A	B	C	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	Disposal
Gases escaping from broken halogen lamps	X								X	
Contact with battery acids			X						X	
■ Risk of fire or explosion										
Fire in the driver's cabin			X			X		X		
Fuel igniting when refueling			X			X				
Explosion of battery gases			X					X	X	
Explosion of halogen lamps	X								X	
- Risks due to neglecting ergonomic principles -										
■ Risk of permanent damage to health										
Driver's cabin interior temperature too low			X			X				
Damage to the health caused by storms			X			X				
■ Physiological effects										
Improper positioning of controls			X			X				
Stiff controls			X			X				
Seat unsuitable for operator physique			X			X				
Insufficient lighting			X			X				
■ Psycho-physiological effects										
Controls not arranged clearly			X			X				
Insufficient visibility of the work area			X			X				
Insufficient visibility of the rear of the snow groomer			X			X				
Insufficient visibility when maneuvering the snow groomer			X			X				
■ Human error										
Insufficient lighting	X	X	X			X				
Unauthorized use of the snow groomer			X			X				
- Other risks -										
■ Accidental starting										
Moving the snow groomer when starting the engine			X			X		X		
Snow groomer starting to move with no driver on board			X			X				
■ Risk of environmental pollution										
Fuel leakage			X			X				
Lubricant leakage			X			X				
Hydraulic fluid leakage	X	X	X			X				
Pollutant emissions from the engine			X			X				
Battery acid spillage			X						X	X

Type of danger involved in operating the snow groomer	Danger Zones			Danger during						
	A	B	C	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	Disposal
Leakage from storage batteries			X						X	X
Leakage from engine oil filters			X						X	X
Leakage from hydraulic fluid filters			X						X	X
Fuel spillage			X						X	X
Engine oil spillage			X						X	X
Hydraulic fluid spillage			X						X	X
Failure to contain used water when cleaning mechanical components			X				X		X	X
Coolant leaking from engine			X						X	X

4 Transport

4.1 Weights and lifting points

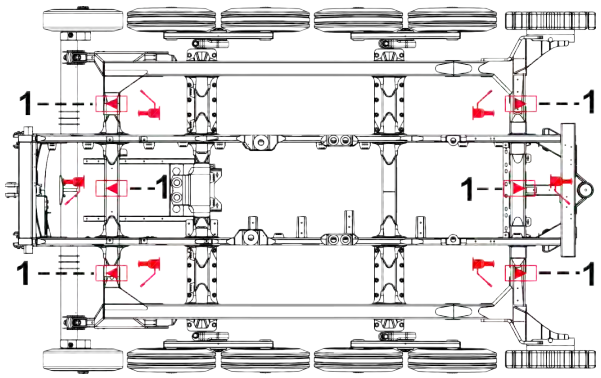
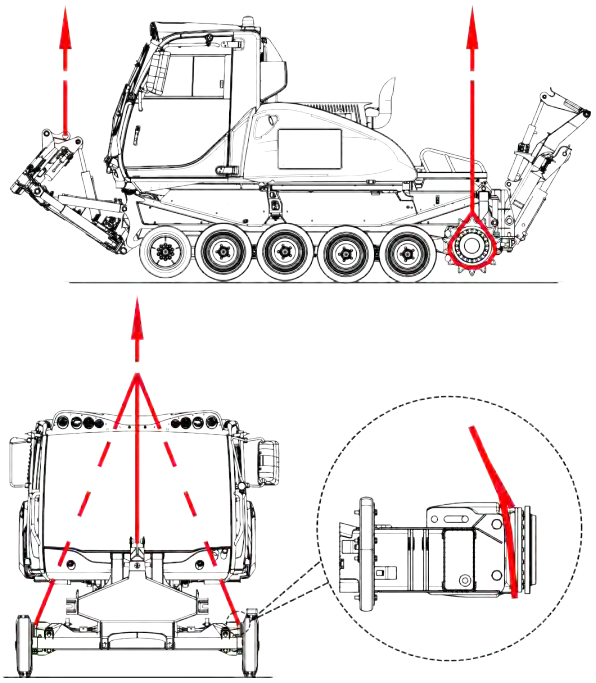
Snow groomer	
Description	**Overview**
Jacking points for hydraulic jack (1) (use shim plates to protect the frame)	
Lifting points for a crane Weight: ■ **6826 kg** (15018 lb) without AUTOMATIC winch ■ **9203 kg** (20248 lb) with AUTOMATIC winch	

Table 1: Snow groomer weights and lifting points

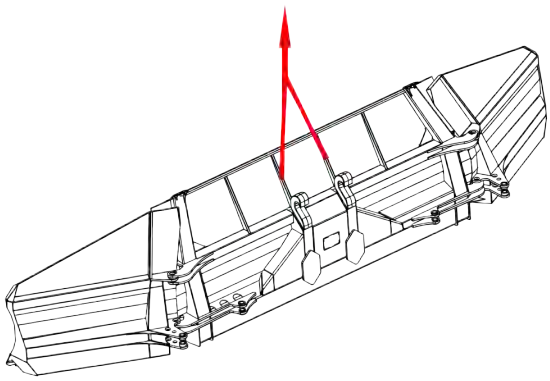
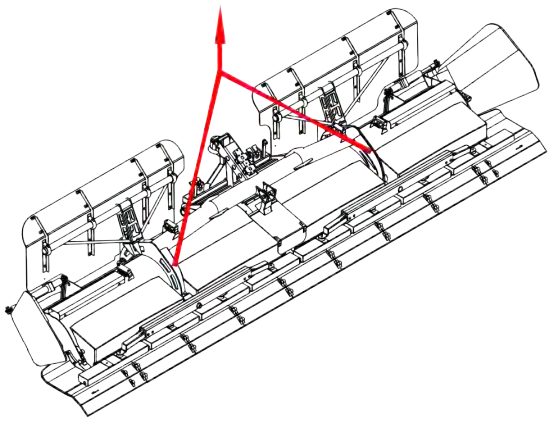
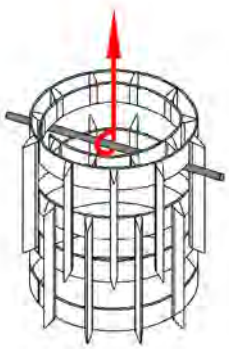
Attachments	
Description	**Overview**
Front blade lifting points Weight: ■ MASTER blade **523 kg** (1153 lb) ■ Park blade **740 kg** (1631 lb)	
Rear tiller lifting points Weight: ■ Posiflex rear tiller **838 kg** (1847 lb) ■ POWER tiller **910 kg** (2006 lb)	
Track lifting points Weight per track: ■ Steel version - open profile **913 kg** (2012 lb) ■ Aluminum version **885 kg** (1951 lb)	

Table 2: Weights and lifting points of the attachments

NOTICE

► Perform the lubrication of the lowered attachments.
► If the attachments have to be raised during maintenance, these must be safeguarded against lowering using appropriate measures.

4.2 Securing and transport

DANGER

Risk of falling
during transport, lifting and loading the snow groomer

► Personnel must not stand in the vicinity of the vehicle, or around it.

DANGER

Risk of tipping and crushing
during transport, lifting and loading the snow groomer

► Only use a suitable traveling crane and lifting gear with sufficient load capacity.
► No person must be underneath the raised snow groomer or within the danger area.

NOTICE

Lift the attachment frame

► Before lifting the snow groomer, the front and rear attachment frames must be raised all the way.

NOTICE

Use the intended lifting points

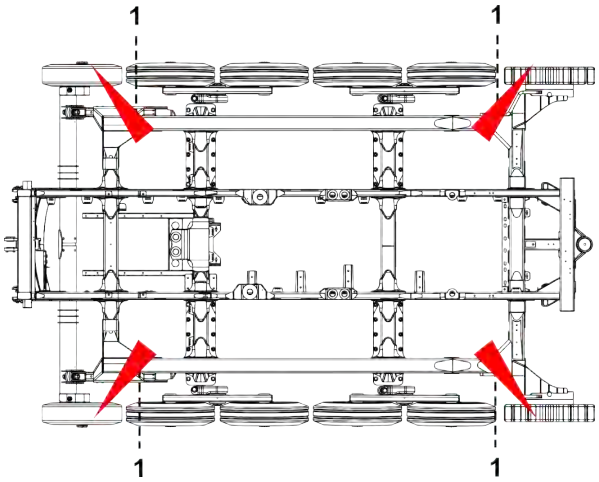
► Use only the indicated points to secure the snow groomer and attachments for transport.
► The weight of each assembly should be considered separately.

■ Lifting and loading the snow groomer

- To lift and load the snow groomer including attachments, only use a suitable crane or traveling crane with sufficient load capacity and a suitable implement with a hook for lifting.
- The transport company is required to check whether the load gauge meets the road traffic regulations of the country in which the transporting takes place.
- If the external dimensions are such that the transport must be treated as an abnormal transport, the transport company is required to observe the legal provisions applicable to the country concerned.
- To reduce risks during lifting and transport, the weight of each assembly group and each attachment must be stated separately.
- The snow groomer does not need to be covered or wrapped when being transported by land. If transporting by sea or air, they are placed in their own containers.

Anchoring for transport

- Secure the two front and back frame ends of the snow groomer diagonally (1) to the truck anchors using four lever operated clamps with safety locks.



- Each clamp must be designed to support a **5000 kg** (11023 lb) load, so that the snow groomer is held laterally stable in the direction of travel.

5 Vehicle

5.1 Identification data for the snow groomer and attachments

When obtaining spare parts, carrying out repair and maintenance work, making warranty claims etc., it is essential that all required identification data are provided.

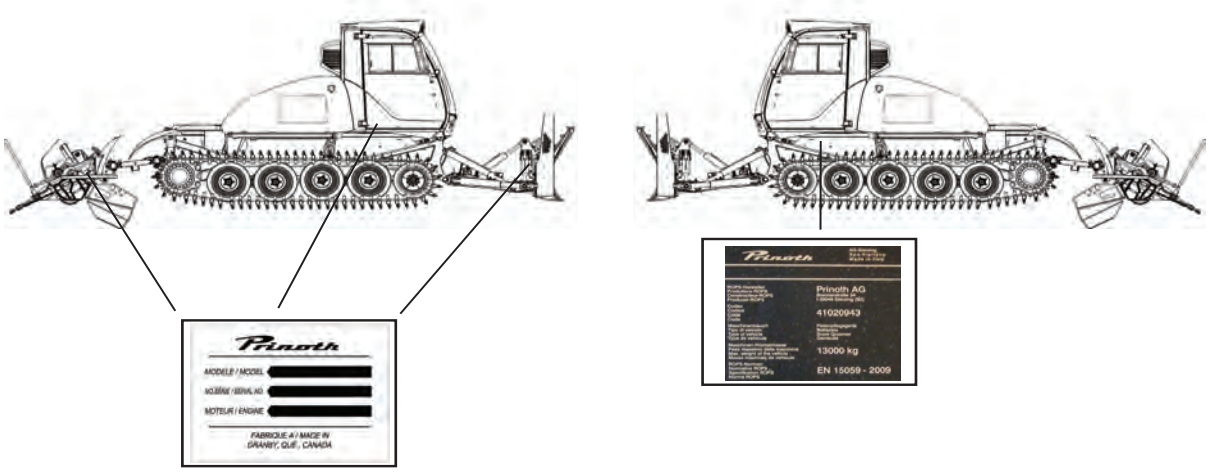


Figure 7: Data stickers on the snow groomer and attachments

NOTICE

- ► Keep the data stickers clean and legible.
- ► If any of the stickers are damaged, replace them immediately.

5.2 Vehicle concept

Description of the vehicle complete with attachments

- With its technically mature and futuristic solutions, the BISON snow groomer represents the state of the art in technology. It makes use of innovative snow vehicle construction technology, has a high performance capability and can be controlled under all circumstances.
- Its extreme economy and ride comfort, outstanding slope quality and high operational reliability in continuous operation, make the BISON a top-quality product.
- The front and rear attachments are operated using the push buttons on the joystick. A display positioned on the right hand side control console shows all functions (tiller shaft speed, tiller cutting depth and floating position of the link arm). All this makes for excellent slope quality while saving energy.
- With its swivelling rear link arm, the snow groomer keeps its outstanding manoeuvrability even in the harshest operating conditions. Due to the floating position of the rear attachment outside the track width, the link arm makes possible even surface preparation, even on bends and also when used in combination with other snow groomers. The rear articulated arm can swing to the left or right, self-adjust and can operate in floating position to allow for optimum accuracy.

- The new shape and arrangement of the teeth on the cutter bars reduce the power requirement, and improve piste quality and working speed. The centre-linked rear tiller adapts to surface unevenness and is equipped with finishers that help compact the snow layer. The centre mounted links can be fixed to cope with all operating conditions. Contact pressure, rear tiller cutting depth and tiller shaft speed can be adjusted and monitored according to snow properties.
- Environmental safety is achieved by the use of up-to-date technology in developing the engine with its high-pressure fuel injection system.
- Completely electronic management is used in the fuel-injection system. This procedure contributes to increasing overall efficiency, reduces fuel consumption and ensures the ability to start even in extremely cold conditions. Pollutant emissions meet the current standards and are well within the permitted limits.

Driver's cab

- The BISON is equipped with an EN15059 Roll-Over Protective Structure (ROPS) as standard. The driver's cab is an ergonomically designed composite fibre structure with an optimised field of view and noise-inhibiting interior lining. The four vibration dampers which were specially designed for the driver's cab suspension system ensure the utmost ride comfort.
- The problem of access to the crank assembly and work hydraulics has been optimally resolved by hydraulic tilting of the driver's cab and cargo area. The BISON also has a heating system with automatic, pre-programmed temperature control, defrosting of the front, rear and side windows, electrically adjustable, heated outside mirror and heated front windshield wiper blades. The long-range illumination of the work area increases the active operating safety.

Lighting System

- In addition to the normal lighting system, the BISON is fitted with newly-designed headlamps, which produce a light beam two and half times stronger than the prescribed intensity.

Display

- The display in the center is for display and electronic control of the most important vehicle functions.

Joystick

- The ergonomic joystick carries all the functions of the front and rear attachments, e.g. blade or rear tiller:
  - Start/stop the cutter shafts
  - Raise/lower the attachments
  - Adjust the cutter angle
  - Lateral swivelling and vertical and horizontal floating positions including control of contact pressure.
  - And more, according to vehicle model

High environmental compatibility

- The engine is fitted with an electronically controlled injection system. The use of hi-tech solutions in developing the engine helps make the vehicle more economic, reduces fuel consumption and pollutant emissions, and ensures excellent cold-start capability.

Steering system

- The electronically controlled steering system allows unlimited manoeuvrability through the use of a new digital electronic system, which optimally adjusts engine output to the operating conditions.

Hydraulic equipment

- The hydraulic units have been optimally designed to deliver full engine output to the tracks and attachments and thus ensure maximum working speed and reliability. This means an enormous amount of pushing power is delivered to the front blade.

Safety Equipment

- The double and independent functioning spring action multiple disc brakes ensures that the vehicle remains stationary after the engine is switched off.
- The brakes remain functional even in case of:
  - Drive train failure
  - Broken, ruptured or derailed track
  - Failure of the hydrostatic drive of one or both tracks
- In emergency situations, the engine can be switched off using the key in the ignition switch. This switches off the snow groomer standby and operational readiness of the attachments as well as the complete hydraulic system and engages the multi-disc brakes.
- If the "Parking brake activated" indicator lamp lights red continuously, this indicates a malfunction. Total failure of the braking system is therefore impossible.
- Pressing the Emergency OFF switch triggers the following actions:
  - The parking brake is activated.
  - The drive hydraulics are switched off.
  - The operational readiness of the attachments is switched off.
  - The power supply to the electronics circuit board is switched off.
- Separate standby modes for vehicle and attachment operation increases operational safety and also ensures better safety during maintenance work.
- Snow groomer standby must be switched on again if it has been switched off using the Emergency OFF switch or by opening the cab doors.
- The raising and automatic shutdown of the rear attachment when reversing not only increases the ease of operation, but also helps avoid mechanical damage and accidents due to rotating parts.
- The automatic raising of the rear attachment when reversing can be switched off. In the event of immediate danger, this can be used to go into reverse while the rear attachment is only half-raised.
- If the "Hydraulic fluid level insufficient" warning lamp is lit continuously, this indicates a possible malfunction in the hydraulic system. In this case, the vehicle driver must immediately switch off the engine in order to prevent serious failure of the hydraulic system.
- There are several more warning lamps:
  - Warning lamp "Insufficient coolant level" lights up red continuously = Check coolant level
  - Warning lamp "Engine failure" lights up yellow continuously = Stop and switch off snow groomer immediately
- The horn is operated from the operating console.
- The flashing of the rotating beacons is actuated by the ignition lock. When the engine is switched off, the rotating beacons can be switched off manually.
- When reversing, an audible warning buzzer is activated automatically. For night operations in populated areas, the warning buzzer can be temporarily switched off. If there are any people present, the warning buzzer must be permanently switched on.
- The electronic steering system can also function in emergency operation mode. This allows the snow groomer to continue moving even if there is a malfunction. However, some of the automatic functions are only available to a limited extent.
- A fault diagnosis can then be made using the menus on the display. This makes it easier and quicker to put the vehicle back into service afterwards.
- If one hydraulic circuit fails, both tracks are locked in one direction of travel. This allows the direction to be kept under control and accidents are avoided.
- If the steering system fails, the snow groomer is brought automatically to a standstill. In these circumstances, the vehicle can no longer be steered or moved.

- If one or both driver's cab doors is opened accidentally, both the vehicle and the cutter shaft are brought automatically to a standstill. This protects the passenger and/or driver from being run over by the tracks.
- If the left armrest is raised, the parking brake is automatically applied.
- The driver's cab can be titled forwards using an electro-hydraulic pump. When tilted to the front, the driver's cab is supported mechanically.
- In an emergency, the engine can be switched off using the easily accessible battery disconnection switch for switching the power supply on and off.
- The batteries (storage batteries) are placed in a protected position, and the battery terminals are insulated to prevent short circuits.
- The hydraulic circuits for the traction drive and attachments are protected by safety pressure cut-offs; this protects the hydraulic system and mechanical components from damage by external causes (impacts, stresses).

5.2.1 Tilting the driver's cab

⚠ DANGER

Risk of tipping
Tilting the driver's cab changes the vehicle's centre of gravity.

► Park the snow groomer on solid and level ground.

⚠ DANGER

Risk of crushing
if the driver's cab is lowered accidentally

► Insert the safety strut.

NOTICE

Risk of contact
When tilting, the driver's cab can collide with the raised front blade.

► Before tilting the driver's cab, drop the front blade to the ground.
► Remove front attachments e.g. snow plough, bucket loader, halfpipe tiller and the associated hydraulic/electrical connections before tilting the driver's cab.
► Swivel the AUTOMATIC winch boom to the rear.

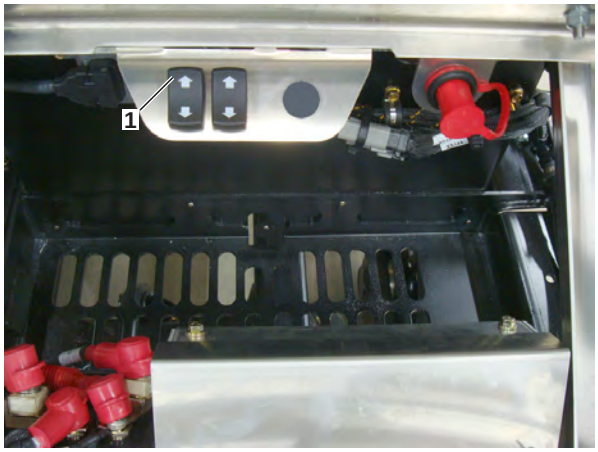
The tilt cab function can be activated up to **6 min** after the ignition key has been turned off.

The driver's cab is tilted using the push-button below the right maintenance flap.

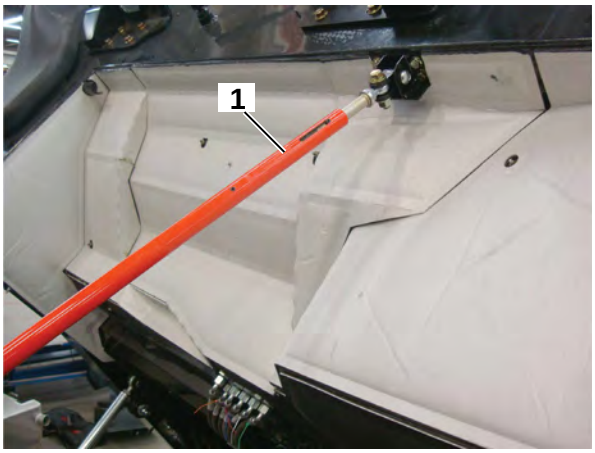
To tilt the driver's cab, proceed as follows:

1. Park the snow groomer on solid and level ground.
2. Remove all objects from the seats and instrument panel.
3. Observe the notes above.
4. Ignition key position: ON

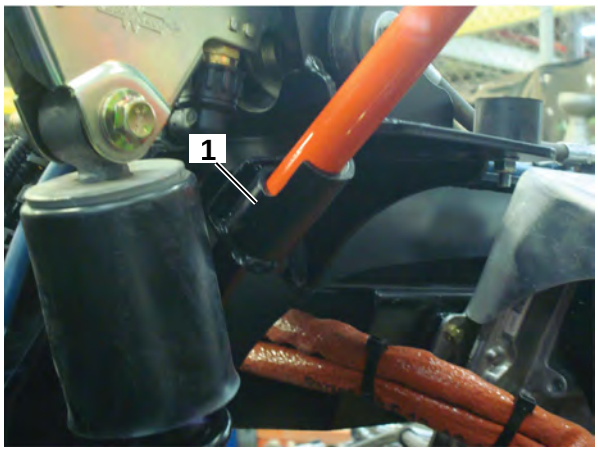
5. Press on the upper part of the push-button (1): the driver's cab is unlocked and tilts to the front automatically.



6. Once the cab is tilted, install the safety rod (1) to secure the cab. Compress safety rod spring to unlock the device and pivot it towards the accessory support frame.



7. Insert the free end of the safety rod into the holding block (1) of the accessory support frame.



5.2.2 Lowering the driver's cab

⚠ DANGER

Risk of tipping
An unsecured driver's cab can tilt forward while the snow groomer is moving.

- ► Check the driver's cab's locking status after lowering it.
- ► Only move the snow groomer if the driver's cab has been secured.

DANGER

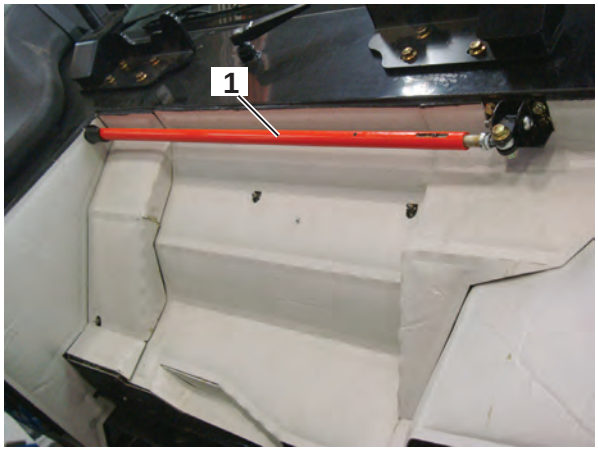
Risk of crushing
If the driver's cab is lowered accidentally

► Do not remain in the area of the driver's cab when lowering.

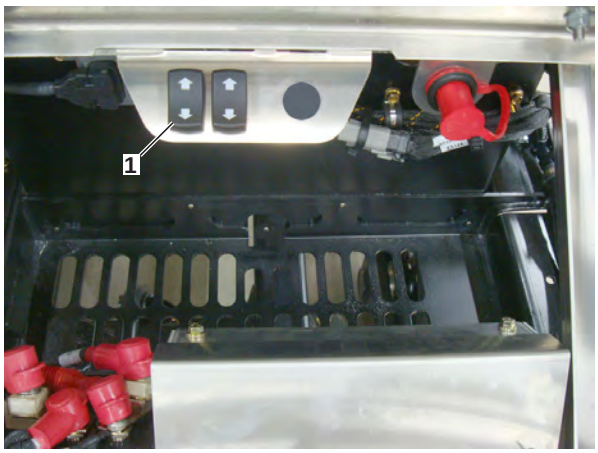
The driver's cab can only be lowered using the push-button located under the right maintenance flap.

To lower the driver's cab, proceed as follows:

1. Ignition key position: ON
2. Compress the safety rod spring and remove it from the holding block of the accessory support frame.
3. Fold the safety rod (1) under the cab and compress the spring again to lock the device into the stowed position.



4. Press on the lower part of the push-button (1): the driver's cab lowers.



5. After lowering keep the push-button pressed for approx. **10 s** (until the sound changes): the driver's cab is automatically secured.
6. Check the left and right driver's cab locking. Ensure the icon of "unlocked driver's cabin" on the display is not showing.

5.2.3 Tilting the rear cover

⚠ CAUTION

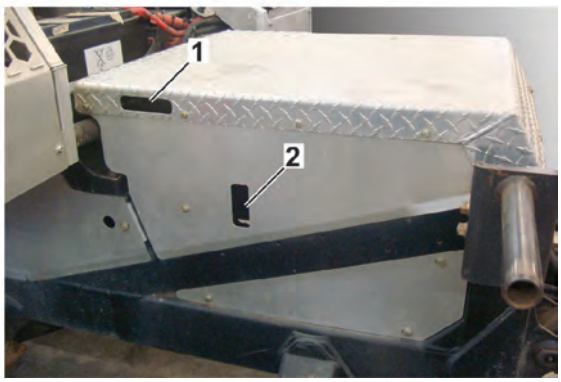
Risk of crushing
if the cover is accidentally lowered

- ► Keep hands clear.
- ► Only move the snow groomer with the cover lowered.
- ► There should be no people or objects on the cover if it is tilted or lowered.

It is possible to check the hydraulic oil level without lifting the cover. To do so, use the cavity (2) located in front of the sightglass of the oil tank.

To tilt the cover and access the components, proceed as follows:

1. Remove all objects from the cover.
2. Lower the rear attachment to the ground.
3. Using the upper cavity (1), raise or lower the cover. The cylinder will keep it in the chosen position.



5.3 Driver seat

Figure 8: Controls on the driver seat

Pos.	Name
1	Head rest
2	Seat belt
3	Side bolster adjustment (not visible on picture)
4	Control console (right armrest)
5	Left armrest fore/aft adjustment (not visible on picture)
6	Backrest release for forward folding (not visible on picture)
7	Steering console (left armrest)
8	Left armrest angle adjustment
9	Left armrest swivel locking lever
10	Backrest tilt adjustment
11	Lumbar support adjustment
12	Seat heating switch
13	Seat tilt angle adjustment
14	Seat height adjustment
15	Seat fore/aft adjustment

5.3.1 Adjusting the driver seat

⚠ CAUTION

Risk of accident
Adjusting the driver seat while driving can lead to accidents.

- ► Only adjust the driver seat when the vehicle is stopped.
- ► Effective protection will be obtained only if head rests are correctly adjusted and safety belts are worn.

- Fold up the consoles and adjust the inclination and depth:
  The consoles (4 and 7) can be folded up to make it easier to get in and out of the cabin. The angle and depth of the consoles can be adjusted. For the steering console, use the knob (8) for the angle and the lever (9) to lock/unlock the swivel motion.
- Folding the backrest :
  Push down the button (6) to fold down (forward) the backrest if an access is required behind the seat.
- Adjusting the backrest angle:
  Push the button (10) in the desired direction until the backrest is in the desired position. Remove any pressure on the backrest to adjust it more easily.
- Adjusting the lumbar support:
  The button (11) can be used to adjust the lumbar support (up / down, forward / backward).
- Adjusting the side bolsters :
  Turn the knob (3) clockwise or counterclockwise to adjust the side bolsters in a narrower or wider position.
- Switching the seat heating on and off:
  The seat heating can be switched on and off (ON / OFF) by pressing the switch (12).
- Adjusting seat suspension and height:
  Seat suspension and height can be adjusted by pushing in or pulling out the spring loaded button (14).
- Adjusting the seat tilt angle:
  The tilt angle of the base cushion can be adjusted by turning the hand wheel (13).
- Adjusting the seat fore / aft position:
  Pull the lever (15) upward, then push the seat forward or backward to obtain the desired position. After releasing the lever, check that the seat frame is correctly engaged.
- Adjusting the head restraint:
  The angle and height of the head restraint (1) can be adjusted manually.
- Adjusting the seat belt :
  The seat belts (2) can be adjusted to fit the size of the driver.

5.3.2 Slide function (optional)

In addition to the standard functions, the driver seat can be equipped with a slide function to move the seat sideways. It offers the driver to sit in the center or on the left-hand side of the cab and to swivel the seat into three different positions.

⚠ CAUTION

Risk of accident
Adjusting the driver seat while driving can lead to accidents.

► Do not adjust the driver seat while driving the vehicle.
► Only adjust the driver seat when the vehicle is stopped.

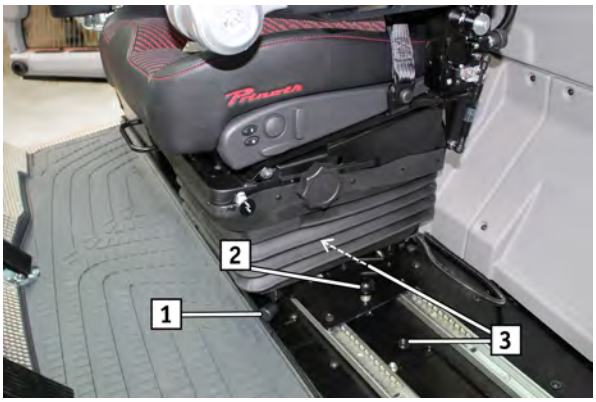
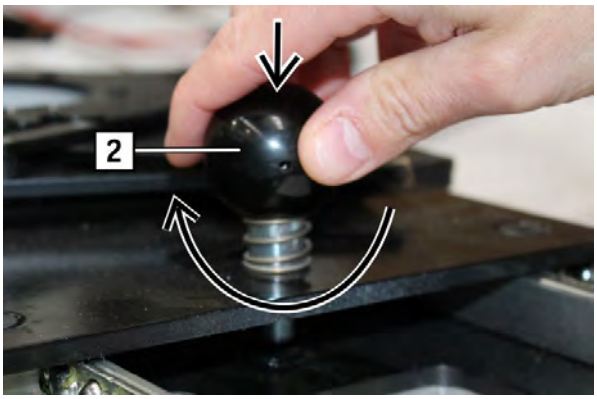


Figure 9: Swivel seat

Pos.	Name	Description
1	Seat rotation lever	To swivel the seat. ■ Push the seat rotation lever to the left and hold it. Then, swivel the seat manually and release the lever in the required position. The seat can be swivelled into three different positions.
2	Locking screw	To lock the seat when sliding the seat manually.
3	Threaded hole	To place the locking screw and lock it when sliding the seat manually.

■ To move the seat sideways, press the upper (4) or lower part (5) of the rocker switch on the control console. As soon as the rocker switch is released, the electric motor will stop and the seat will remain in its position.

- Use either the left or right accelerator pedal installed depending on the position of the driver seat.



If the electric motor fails, the postion of the driver seat can be changed manually: Slide the seat manually to the left or right so that the locking screw (2) can be placed in the threaded hole (3). To lock the seat, push the screw and turn it clockwise into the thread (To remove the screw, turn counterclockwise).

5.4 Passenger seat

Figure 10: Passenger seat

Pos.	Name
1	Battery emergency switch
2	Seat belt
3	Radio
4	Storage compartment
5	Cup holders
6	Seat
7	Storage compartment

5.5 Cabin roof

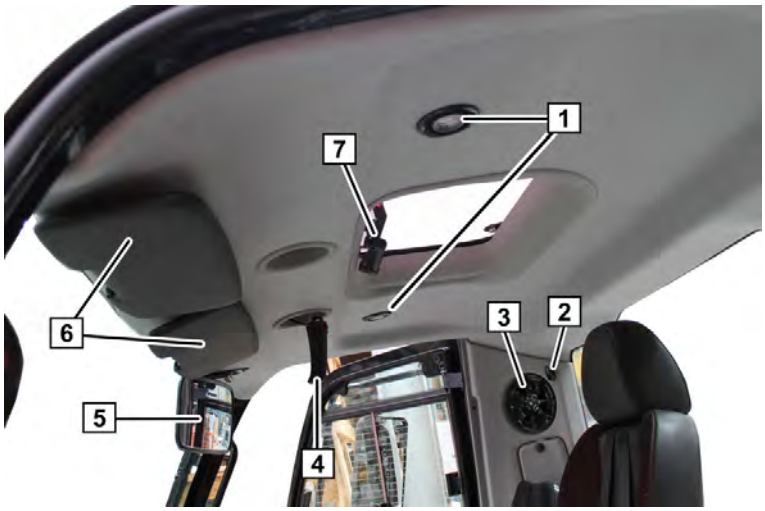


Figure 11: Equipment and controls located at the cabin roof

Pos.	Name	Description
1	Interior lamps	
2	Coat hook (2x)	
3	Speaker (2x)	
4	Adjusting lever for the spotlight	See "Using the spotlight" (p. 50)
5	Rear-view mirror	
6	Sun visors	
7	Closing lever of the glass sunroof	See "Open and close the glass sunroof" (p. 49)

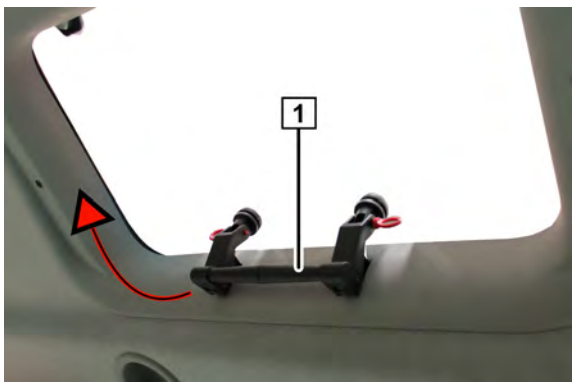
5.6 Open and close the glass sunroof

⚠ CAUTION

Risk of injury

► Do not lean out of the sunroof during operation of the vehicle.

- Open the sunroof
  Pull the handle (1) until it snaps open and then push it until the glass is lifted up to its maximum opening angle.



- Close the sunroof
  Pull the handle (1) until the glass is completely closed and the handle snaps into place.

The glass sunroof can be detached in order to be able to use it as an emergency exit. However, this possibility must only be used in emergency situations.

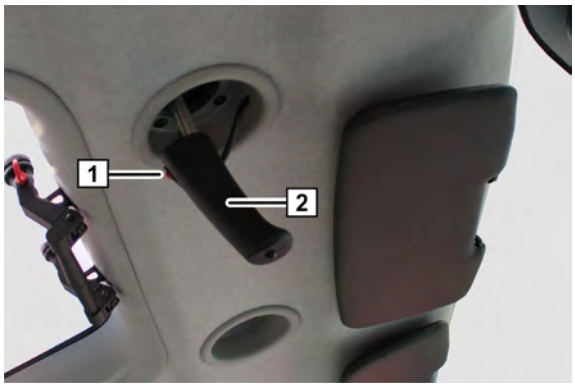
5.7 Using the spotlight

NOTICE

Risk of damage to electrical/electronic equipment
The spotlight's wiring can be damaged if the spotlight is turned by more than 360° in one direction.

► Do not rotate the spotlight's adjusting lever in one direction only.

- The spotlight is switched on and off using the toggle switch (1) on the adjusting lever (2).
  The adjusting lever (2) is located at the cabin roof. ➽ *See "Cabin roof" (p. 49)*



- The spotlight can be rotated by 360°. It can also be tilted 30° forward and 35° backward.

5.8 Steering console

Figure 12: Steering console

Pos.	Name	Description
B78	Left steering lever	Operate one or both levers to obtain the desired direction of travel.
B79	Right steering lever	Operate one or both levers to obtain the desired direction of travel.
S131	Limit switch	The limit switch signals that the steering console is located in the specified bottom position. This is required for the snow groomer standby.

5.8.1 Adjusting the steering console

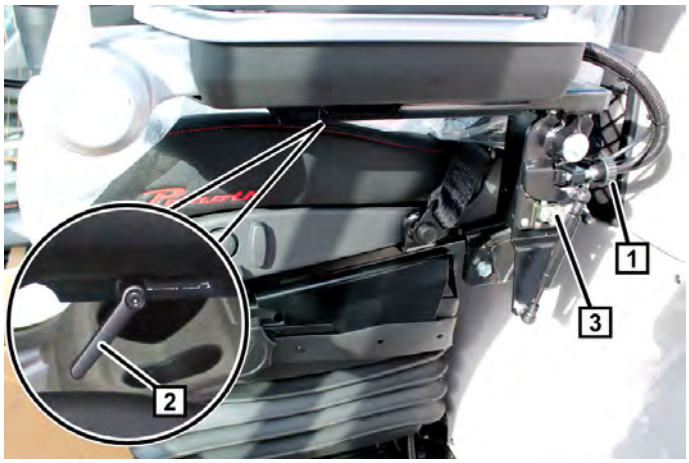


Figure 13: Steering console bracket

Pos.	Name
1	Hand wheel for adjusting the inclination
2	Lever for adjusting fore/aft position
3	Limit switch that signals that the steering console is located in bottom position

The steering console can be adjusted to suit the individual driver both in terms of angle and depth. The console can be folded up to make it easier to get in and out of the cab.

- Adjust the inclination

  - **NOTICE**

    Hand wheel

    ► The hand wheel must only be adjusted far enough that the limit switch still makes contact. This is required for the snow groomer standby.

    The inclination is adjusted by turning the hand wheel (1) at the back of the bracket.

- Adjust the depth

  1. Release the lever (2) located laterally underneath the steering console.
  2. Push the steering console forward or backward until the desired position is reached.
  3. Tighten the lever (2).

- Swivel the steering console

  The steering console can be swivelled to the left and right.

1. Release the lever (4) at the back of the bracket.

2. Swivel the steering console to the left or right until the desired position is reached.
3. Tighten the lever (4).

■ Folding up the steering console

- Lift the steering console until it is folded vertically upwards.

5.9 Control console

Figure 14: Control console

Pos.	Name	Description
1	A33 Display	See "Display description" (p. 75)

Pos.	Name	Description
2	Indicator lights	Grid heater (left), engine fault (right)
3	Ignition key	■ Position 1 = Engine and general power supply OFF. The ignition key can only be removed at this position. ■ Position 2 = General power supply ON ■ Position 3 = Engine is started. As soon as the engine is running, release the key. *See "Starting the engine" (p. 113)*
4	A36 Keyboard 1	Lights, tiller, defrost, wipers *See "Keyboard 1" (p. 56)*
5	A37 Keyboard 2	Winch (optional) *See "Keyboard 2" (p. 59)*
6	A35 Joystick	*See "Joystick" (p. 60)*
7	S62 Rocker switch: Parking brake / snow groomer standby	■ Press rocker switch down = parking brake ON ■ Press rocker switch up = parking brake OFF The parking brake must only be engaged if the vehicle is stationary. While driving the vehicle, do not: ■ Press the Emergency OFF switch ■ Open the cab doors ■ Lift up the left steering console ■ Switch off the ignition In any of these situations, the parking brake will engage automatically and the vehicle will come to an immediate stop. The snow groomer standby must be switched on again each time to avoid the vehicle being unintentionally put in motion by the engine. The snow groomer standby can only be engaged if the following conditions have been met: ■ The Emergency OFF switch has not been pressed. ■ The cab doors are closed. ■ The left steering console is down. ■ The ignition is switched on.
8	S85 Rocker switch: Operational readiness of the attachments	■ Rocker switch up = Operational readiness of the attachments ON ■ Rocker switch down = Operational readiness of the attachments OFF The operational readiness of the attachments must always be activated again after the following situations so that the attachments cannot be inadvertently set in motion: ■ The Emergency OFF switch has been pressed. ■ The cab doors have been opened. ■ The steering console has been raised. ■ The ignition has been switched off.
9	Rocker switch: Slide function driver seat (optional)	*See "Slide function (optional)" (p. 45)*
10	S23 Rocker switch: Horn and warning buzzer	■ Toggle switch down = horn ON ■ Toggle switch up = warning buzzer ON

Pos.	Name	Description
11	Constant up/down pressure potentiometer	Use this potentiometer to control the up/down pressure once the "Up/down pressure charge" button has been activated on the joystick. ➠ *See "Joystick" (p. 60)*
12	R34 Rotary switch: Engine speed potentiometer	By turning the rotary switch the idle speed of the engine can be set manually. This allows the driver to determine the desired engine speed and select the speed as well as the steering via the steering lever. ■ Turn the engine speed potentiometer clockwise = increase speed (up to MAX) ■ Turn the engine speed potentiometer counter-clockwise = reduce speed (down to MIN) The function is available for forward, neutral and reverse travel. ➠ *See "Driving with the engine speed potentiometer" (p. 118)*
13	R12 Rotary switch: Rear tiller shaft speed setting	
14	Rotary rocker switch: Outside mirror adjusment	➠ *See "Adjusting the outside mirror" (p. 64)*
15	B118 Rotary push-button switch: Menu navigation	➠ *See "Navigating in the menu" (p. 76)* With the rotary push-button you can also: Activate and deactivate the rear view camera manually ■ Press for **2 s** = rear view camera ON ■ Press for **2 s** again = rear view camera OFF Activate and deactivate the defrost function ■ Push forward once = defrost function ON ■ Push forward again = defrost function OFF ➠ *See "Activating the defrost function" (p. 66)* Control the driver's cab heating and ventilation Adjust the display backlight ■ Turn the push-button clockwise = increase backlight ■ Turn the push-button counterclockwise = decrease backlight
16	S29 Push-button switch: Emergency OFF switch for emergency stop	To park the vehicle and for emergency braking, press the red Emergency OFF switch. This activates the parking brake and switches off the snow groomer standby and operational readiness of the attachments. The Emergency OFF switch is released by turning clockwise.
17	Rocker switch: Cabin lighting	
18	Storage compartment	

NOTICE

Risk of battery discharge

► When the engine is switched off, switch off the interior lighting of the driver's cabin, otherwise battery discharge will occur.

5.9.1 Adjusting the control console

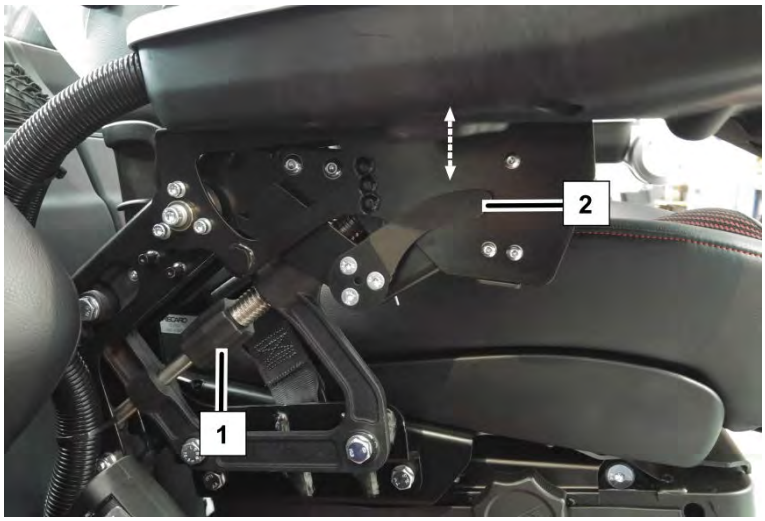


Figure 15: Control console bracket

Pos.	Name
1	Hand wheel for adjusting height position
2	Lever for unlocking the console and adjusting the inclination

The control console can be adapted to the driver by adjusting its angle and height. The console can be folded up to make it easier to get in and out of the cab.

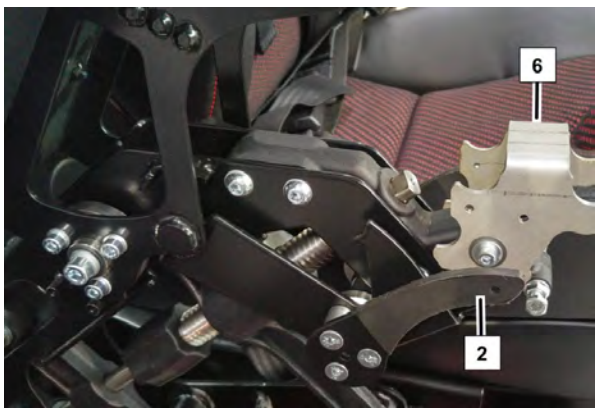
- Adjust the height position

The height position of the control console is adjusted by turning the hand wheel (1).

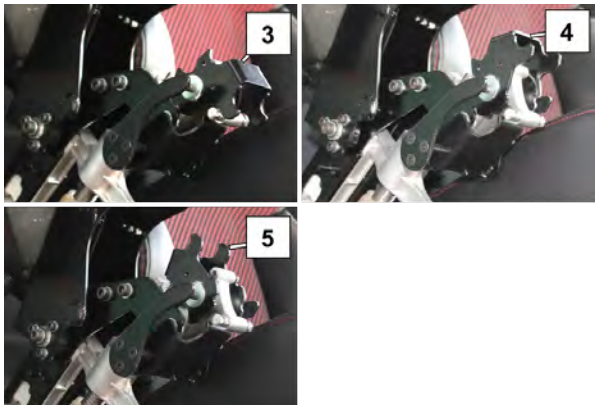
- Turn hand wheel (1) = control console moves up or down

- Adjust the inclination

1. Pull down the lever (2) and fold up the control console until it locks into place.



2. Pull down the lever (2) and position the bracket support (6) in one of the three settings available: control console down (3), horizontal (4) and up (5).



3. Pull down the lever (2) and fold down the control console until it locks into place.

- Folding up and down the control console
  - Pull down the lever (2) and fold up the control console until it locks into place.
  - Pull down the lever (2) and fold down the control console until it locks into place.

5.9.2 Keyboard 1

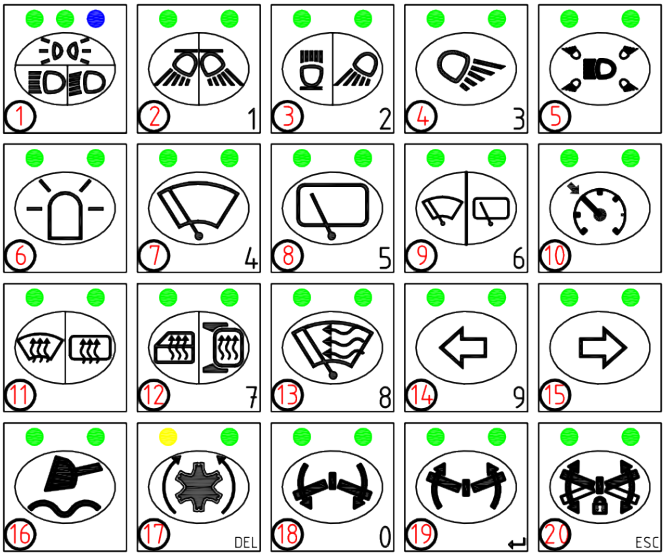


Figure 16: Controls on Keyboard 1 (A36)

Pos.	Name	Description
A36/ 1	Push-button: Parking lights / low beam / high beam	■ Press push-button once = parking light ON ■ Press push-button again = low beam ON ■ Press push-button again = high beam ON ■ Tap push-button (with high beam ON) = switch between low and high beam ■ Press the push-button for **2 s** = OFF
A36/ 2	Push-button: Work lights front/rear	■ Press push-button once = work light front/rear ON ■ Press push-button again = work light front ON ■ Press push-button again = work light rear ON ■ Press push-button for **2 s** = work lights OFF

Pos.	Name	Description
A36/ 3	Push-button: A-pillar work lights and front blade lighting	■ Press push-button once = work lamp A-pillar and front blade lighting ON ■ Tap push-button = switch between A-pillar / front blade / A-pillar and front blade ■ Press push-button for **2 s** = OFF
A36/ 4	Push-button: Side work lights	■ Press push-button once = side work lights ON ■ Press push-button again =side work lights OFF
A36/ 5	Push-button: Master light	■ Press push-button once = last used lighting system settings ON
A36/ 6	Push-button: Rotating beacon	The rotating beacons are activated automatically when the engine is started. ■ Press push-button = rotating beacons OFF The rotating beacons must always be switched on when the engine is running and the snow groomer is moving.
A36/ 7	Push-button: Windscreen wiper	■ Press push-button once = windscreen wiper in intermittent operation (**5 s**, can be adjusted in the menu) ■ Press push-button again = windscreen wiper ON ■ Press push-button again = windscreen wiper OFF
A36/ 8	Push-button: Rear window wiper	■ Press push-button once = rear window wiper in intermittent operation (**5 s**, can be adjusted in the menu) ■ Press push-button again = rear window wiper ON ■ Press push-button again = rear window wiper OFF
A36/ 9	Push-button: Select windscreen and rear window wipers for wiping once (double-click on Joystick push-button S3)	The setting "Windscreen wiper ON" is selected after every start of the snow groomer. ■ Press push-button once = rear window wiper ON ■ Press push-button again = windscreen and rear window wiper ON ■ Press push-button again = windscreen wiper ON
A36/ 10	Push-button: Assisted Drive	The Assisted Drive can be set to automatically maintain a chosen speed until cancelled. There are two driving styles: driving with the engine speed potentiometer and driving with the accelerator pedal. Driving with the engine speed potentiometer ■ Remove the brake. ■ Press the Assisted Drive button. ■ Set the engine speed potentiometer as desired. ■ Use the Steering Control Levers to steer the vehicle. ■ Press push-button again = Assisted Drive OFF. Driving with the accelerator pedal ■ Remove the brake. ■ Press the Accelerator Pedal. ■ Press the Assisted Drive button. ■ Use the Steering Control Levers to steer the vehicle. ■ Press push-button again = Assisted Drive OFF.

Pos.	Name	Description
		The Assisted Drive operates for forward and reverse travel and in neutral lever position in both driving styles. The inactivity alarm can deactivate the Assisted Drive for both driving styles. ➤➤ *See "Inactivity alarm" (p. 104)*
A36/ 11	Push-button: Windscreen and rear window heating	■ Press push-button once = windscreen heating ON / rear window heating OFF ■ Press push-button again = windscreen and rear window heating ON ■ Press push-button again = rear window heating ON / windscreen heating OFF ■ Press push-button **2 s** = windscreen and rear window heating OFF The heating time can be adjusted in the menu if engine is running at more than **1000 rpm**. The heating operates at fixed intervals if the engine is running at less than **1000 rpm**.
A36/ 12	Push-button: Side window and door mirror heating	■ Press push-button once = side window heating ON / door mirror heating OFF ■ Press push-button again = side window and door mirror heating ON ■ Press push-button again = door mirror heating ON / side window heating OFF ■ Press push-button for **2 s** = side window and door mirror heating OFF The heating time can be adjusted in the menu if engine is running at more than **1000 rpm**. The heating operates at fixed intervals if the engine is running at less than **1000 rpm**.
A36/ 13	Push-button: Windscreen wiper heating	■ Press push-button once = windscreen wiper heating ON ■ Press push-button again = windscreen wiper heating OFF The windscreen wiper heating only functions when the engine is running.
A36/ 14	Push-button: Left turn signal	■ Press push-button once = left turn signal ON ■ Press push-button again = left turn signal OFF ■ Press push-buttons for left/right turn signal simultaneously = hazard warning lights function
A36/ 15	Push-button: Right turn signal	■ Press push-button once = right turn signal ON ■ Press push-button again = right turn signal OFF ■ Press push-buttons for left/right turn signal simultaneously = hazard warning lights function
A36/ 16	Push-button: Front blade floating position (optional)	■ Press push-button once = floating position at function Lift / Lower ON ■ Press push-button again = floating position at function Lift / Lower OFF
A36/ 17	Push-button: Rear tiller shaft direction of rotation	After every start of the snow groomer, the rear tiller shaft direction of rotation is set to normal (green LED). ■ Press push-button once = opposite direction of the rear tiller shaft (yellow LED)

Pos.	Name	Description
		■ Tap push-button = switch between normal (green LED) and opposite direction (yellow LED)
A36/ 18	Push-button: Posi-flex tiller premium option	Rotor downward tilt
A36/ 19	Push-button: Posi-flex tiller premium option	Rotor upward tilt
A36/ 20	Push-button: Rear tiller blocked (fixed) or flexible (free), ESC, Flat lock (Premium option)	■ Press push-button once = rear tiller blocked (fixed) ■ Press push-button again = rear tiller flexible (free) ■ Press and hold push-button for **3 s** = Flat lock For menu navigation, this push-button (ESC) is used to return to the initial display.

5.9.3 Keyboard 2

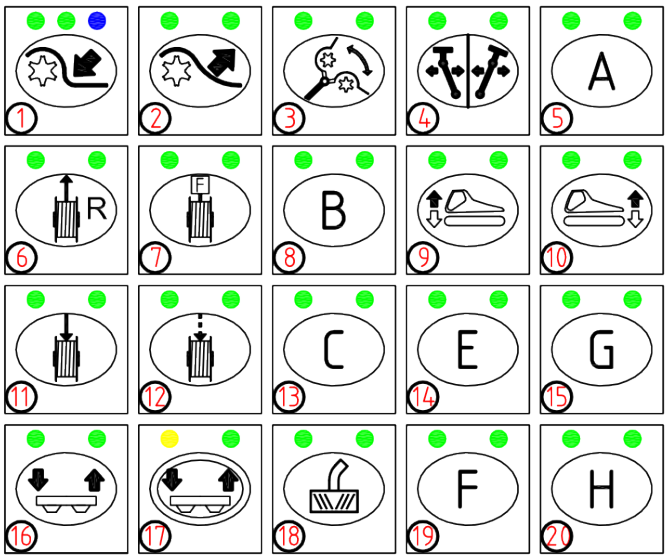


Figure 17: Controls on Keyboard 2 (A37)

Pos.	Name
A37/ 1-20	Push-buttons not used, unless front drive hydraulics or winch is installed.

5.9.4 Joystick

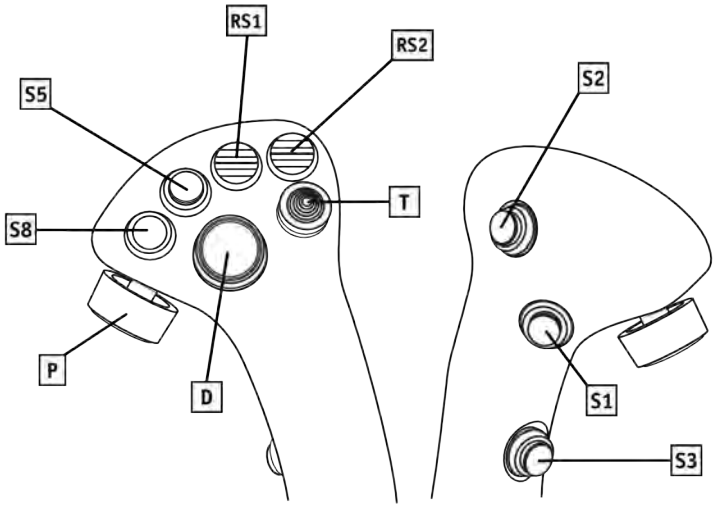


Figure 18: Joystick with controls

Pos.	Name	Description
S8	Push-button: Tiller ON/OFF, double click for Up and Go	
S5	Push-button: Up/Down pressure, Vertical floating	
RS1	Left tiller wing control	
RS2	Right tiller wing control	
T	Mini-joystick: Rear lift frame vertical/lateral displacement button	
S2	Push-button double click : Tiller On + Vertical floating	
S1	Push-button: Rear lift frame lateral floating/auto-centering; Blade angler, roll up/down button	
S3	Push-button: Blade wing positioning control, Front wiper	Double-click on push-button S3 = windscreen and rear window wipers wiping once
D	Joystick switch: Blade angler, roll up/down button	
P	Vehicle speed rotary switch	
S1 + T	Tiller depth control and tiller snow chamber opening control	
S3 + T	Winch pulling force (front/rear), winch boom rotation (left/right)	

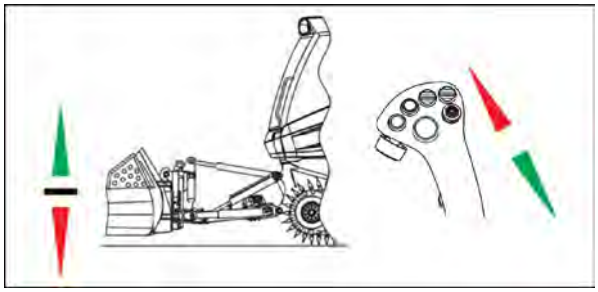
5.9.5 Joystick operation

The attachments mounted are operated using the joystick.

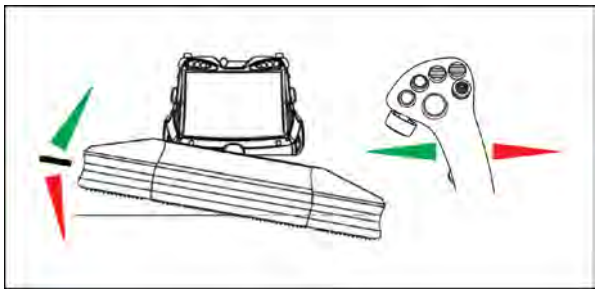
Used along with the push-buttons on the joystick, all the available attachment functions can be performed with one hand.

The individual functions of each of these push-buttons depend on the type of equipment and can therefore vary.

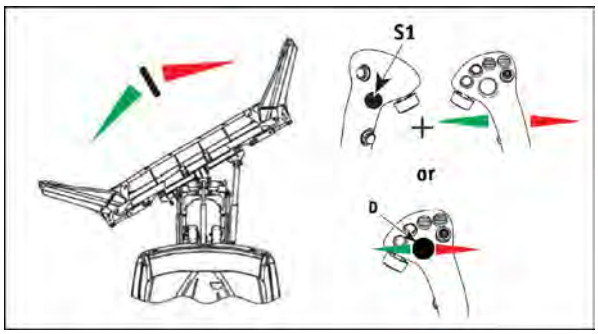
- Raising and lowering the blade
  - To raise the blade, pull the joystick backwards (float switch to off).
  - To lower the blade, push the joystick forwards (float switch to off).



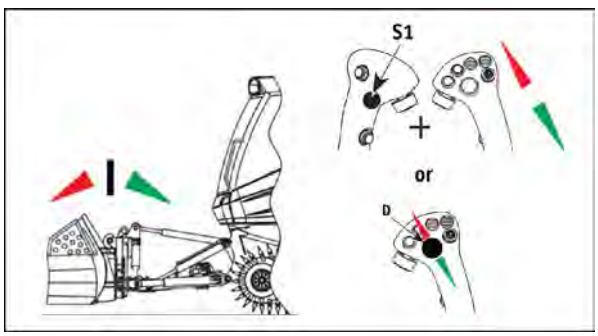
- Tilting the blade
  - Tilt left: To tilt the blade in the left direction, move the joystick towards the left side.
  - Tilt right: To tilt the blade in the right direction, move the joystick towards the right side.
  - Neutral: This position holds the blade at the desired height and angle. To select Neutral, leave joystick centered.



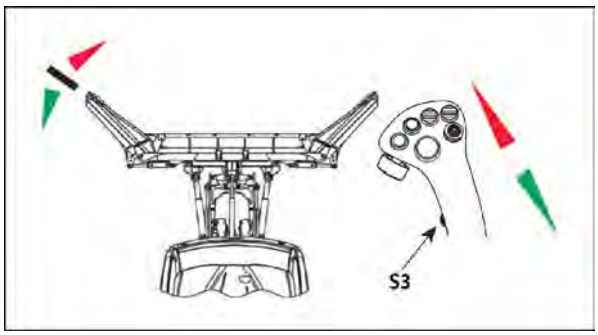
- Blade Angler (push-button S1 (BISON X) or joystick switch D)
  - Angle Left: To angle the blade in the left direction, press and hold push-button S1 and push the joystick towards the left side. If using the joystick on joystick, simply push the joystick switch D to the left.
  - Angle Right: To angle the blade in the right direction, press and hold push-button S1 and push the joystick towards the right side. If using the joystick on joystick, simply push the joystick switch D to the right.
  - Neutral: This position holds the blade at the desired roll and angle. To select Neutral, leave the joystick or joystick switch centered.



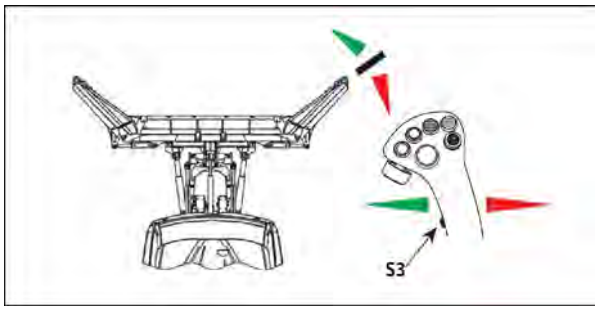
- Blade Roll Control (push-button S1 (BISON X) or joystick switch D)
  - Roll Down: To roll (or curl) down the blade, press and hold push-button S1 and push the joystick forwards. If using the joystick on joystick, simply push the joystick switch D forwards.
  - Roll Up: To roll (or curl) up the blade, press and hold push-button S1 and pull the joystick backwards. If using the joystick on joystick, simply pull the joystick switch D backwards.



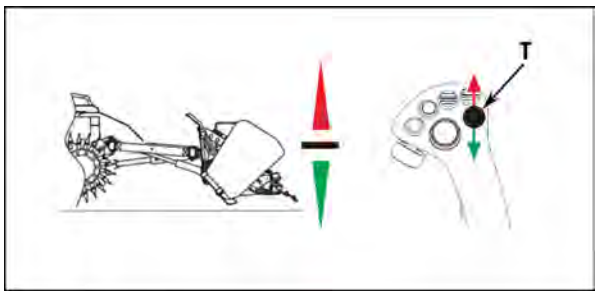
- Left blade wing positioning control (push-button S3)
  - To close the left wing, press and hold the button and push the joystick forwards.
  - To open the left wing, press and hold the button and pull the joystick backwards.



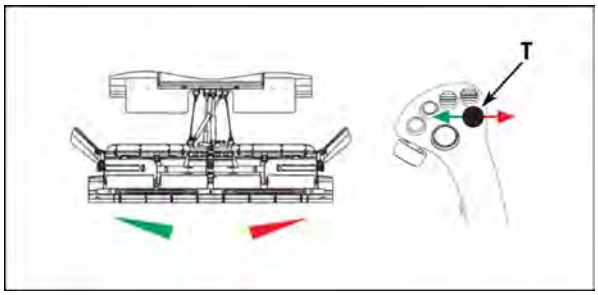
- Right blade wing positioning control (push-button S3)
  - To close the right wing, press and hold the button and push the joystick towards the left side.
  - To open the right wing, press and hold the button and push the joystick towards the right side.



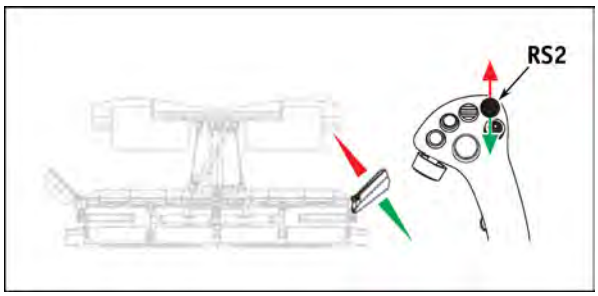
- Rear lift frame vertical displacement control (button T)
  - Raise: To raise the tiller, move the switch forwards.
  - Lower: To lower the tiller, move the switch backwards.



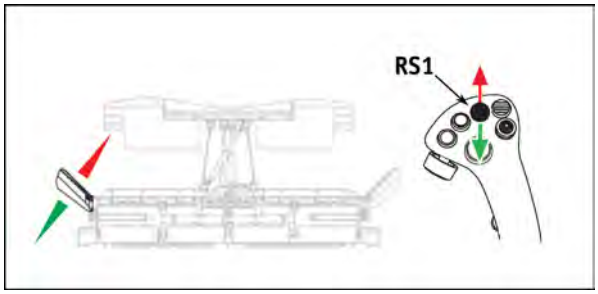
- Rear lift frame lateral displacement control (button T)
  - Swivel Left: To swivel the tiller in the left direction, move the switch to the left.
  - Swivel Right: To swivel the tiller in the right direction, move the switch to the right.



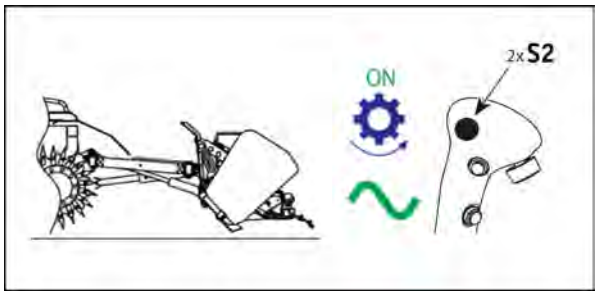
- Right tiller wing control (button RS2)
  - Lowering the right tiller wing: To lower the right tiller wing, push the button down.
  - Raising the right tiller wing: To raise the right tiller wing, push the button up.



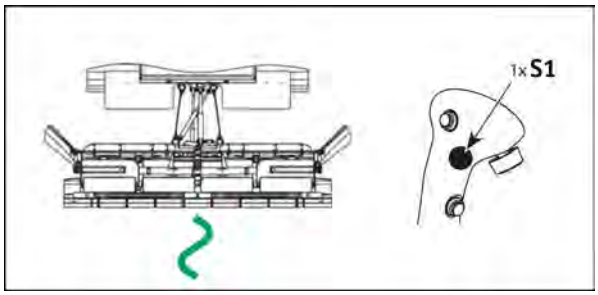
- Left tiller wing control (RS1)
  - Lowering the left tiller wing: To lower the left tiller wing, push the button down.
  - Raising the left tiller wing: To raise the left tiller wing, push the button up.



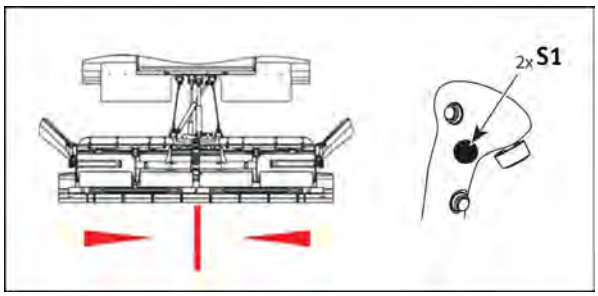
- Rear lift frame vertical floating (push-button S2)
  - Activate: To activate the rear tiller shaft and the vertical float system, double-click button S2.



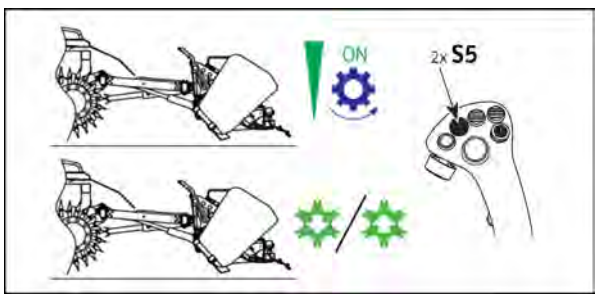
- Rear lift frame lateral floating: To activate the lateral floating option, push button S1 once.



- Rear lift frame auto-centering: To active the auto-centering option, double-click button S1.

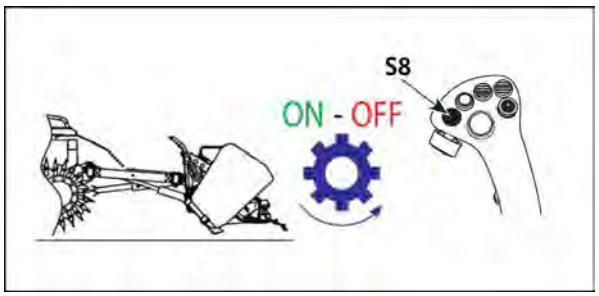


- Constant up/down pressure (push-button S5)
  - To activate the rear tiller shaft and the constant up/down pressure system at the same time, double-click push-button S5.

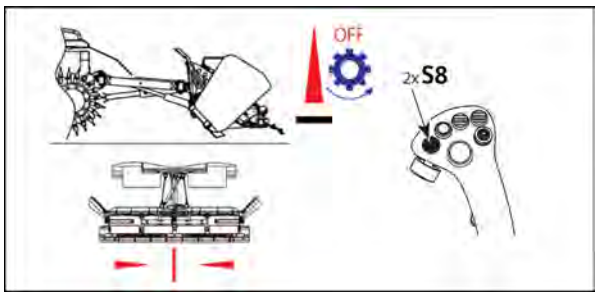


- Control up/down pressure: To control the up/down pressure, push the up/down pressure potentiometer (11) on the control console up- or downwards.

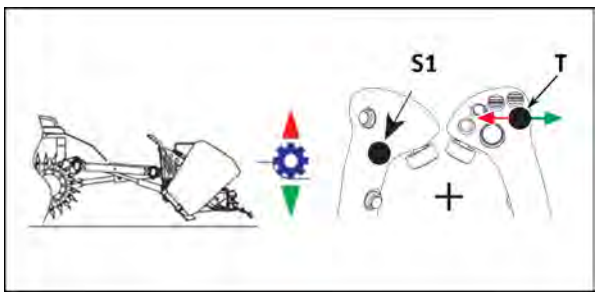
- Rear tiller ON/OFF control (push-button S8)
  NOTE: The tiller must be activated prior to this.
  - □ Rear tiller shaft OFF: To stop the rear tiller shaft, press push-button once.
  - □ Rear tiller shaft ON: To activate the rear tiller shaft, press push-button once.



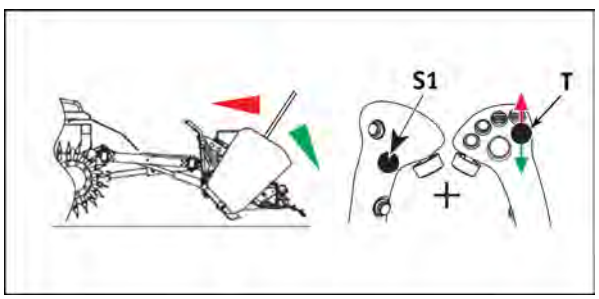
- Rear tiller up and go: To automatically raise, center and turn off the rear tiller, double-click button S8.



- Tiller Depth Control (push-button S1 and button T)
  - □ Decrease tiller cutting depth: Press and hold the S1 button then move the T switch to the left.
  - □ Increase tiller cutting depth: Press and hold the S1 button then move the T switch to the right.



- Tiller's Chamber Opening Control (push-button S1 and button T, on Posiflex only - not available on the POWER tiller)
  - □ Open chamber: Press and hold the S1 button then move the T switch backwards.
  - □ Close chamber: Press and hold the S1 button then move the T switch forwards.



5.9.6 Adjusting the outside mirror

Both outside mirrors can be adjusted on the operating console via the switch.

- Select the desired outside mirror by turning the rotary button: to the left (2) = left door mirror / to the right (3) = right door mirror / neutral (1) = no mirror selected.

- Set the outside mirror in the desired position using the rocker switch: the position at the rocker switch corresponds to the mirror movement (up/down, left/right)

5.9.7 Window and outside mirror heating

The windows (front, rear and side windows) and outside mirrors can be heated to also ensure optimum visibility, even in harsh weather conditions.

- Switch on:
  - Press the respective push-button on Keyboard 1 to switch on the heaters. ➽ *See "Keyboard 1" (p. 56)*

The switching on and off times of the front windscreen and rear window heaters can be set in the menu level "Operation" (menu item "Driver's cab operation").

The heaters only function when the engine is running.

5.9.8 Windscreen wiper heating

The windscreen wipers can be heated and are thus able to provide the best possible visibility even in harsh weather conditions. The heating of the windscreen wiper blades is independent of the heated windows and from the driver's cab heating.

- Switch on:
  - Press the respective push-button on Keyboard 1 to switch on the heater. ➽ *See "Keyboard 1" (p. 56)*

The heating only functions when the engine is running.

In order to prevent overheating of the wiper blades, it is recommended to only leave the heating switched on for as long as is necessary.

5.10 Driver's cab heating and ventilation

The heating and ventilation in the driver's cab is controlled using the heating operating panel on the display.

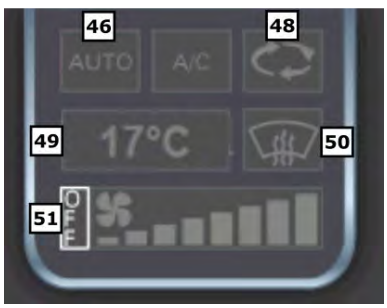


Figure 19: Heating operating panel on the display

Pos.	Name	Description
46	Heater control	Automatic or manual
48	Driver's cab recirculated air	ON - OFF

Pos.	Name	Description
49	Temperature or fault display	The temperature in the driver's cab is displayed here. ■ If a fault occurs in the heater control, the text "ERROR" appears in the display. A detailed fault description is available in the fault log in menu item B.10.
50	Defrost mode	
51	Fan speed control	

5.10.1 Controlling the driver's cab heating and ventilation

The heating is controlled using rotary pushbutton B118.

1. Move rotary pushbutton B118 to the right once. The navigation within the heating operating panel is activated.
2. Navigation in operating panel: Move rotary pushbutton B118 forwards and backwards or to the left and right until the required position is reached.
3. To change the setting, turn rotary pushbutton B118 until the required setting has been reached on the display.
4. To exit, press the escape button on the keypad or wait 3 seconds.

5.10.2 Activating the defrost function

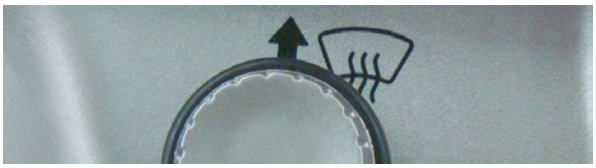


Figure 20: Defrost function on B118 rotary push-button

The defrost function will turn on the fan speed and the cab temperature heater to the maximum.

1. Push the rotary push-button B118 forward once.
2. Monitor the disappearence of the frost and the improvement of the visibility.
3. To terminate the activation, push the rotary push-button B118 a second time.

5.11 Fuses and relays

5.11.1 Fuses and relays in the driver's cab

NOTICE

Risk of damage to electrical/electronic systems
Fuses with a too high ampere rating can cause severe damage to the electrical system.

► Always use fuses with the specified rating.

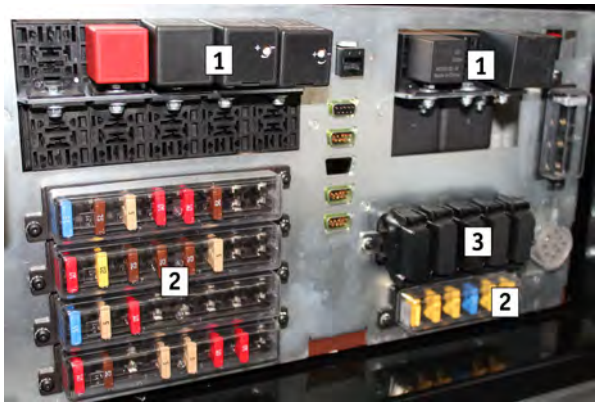


Figure 21: Fuses and relays under the right passenger seat

Pos.	Name
1	Relays
2	Fuses (5 to 20 A)
3	Fuses (40 to 60 A)

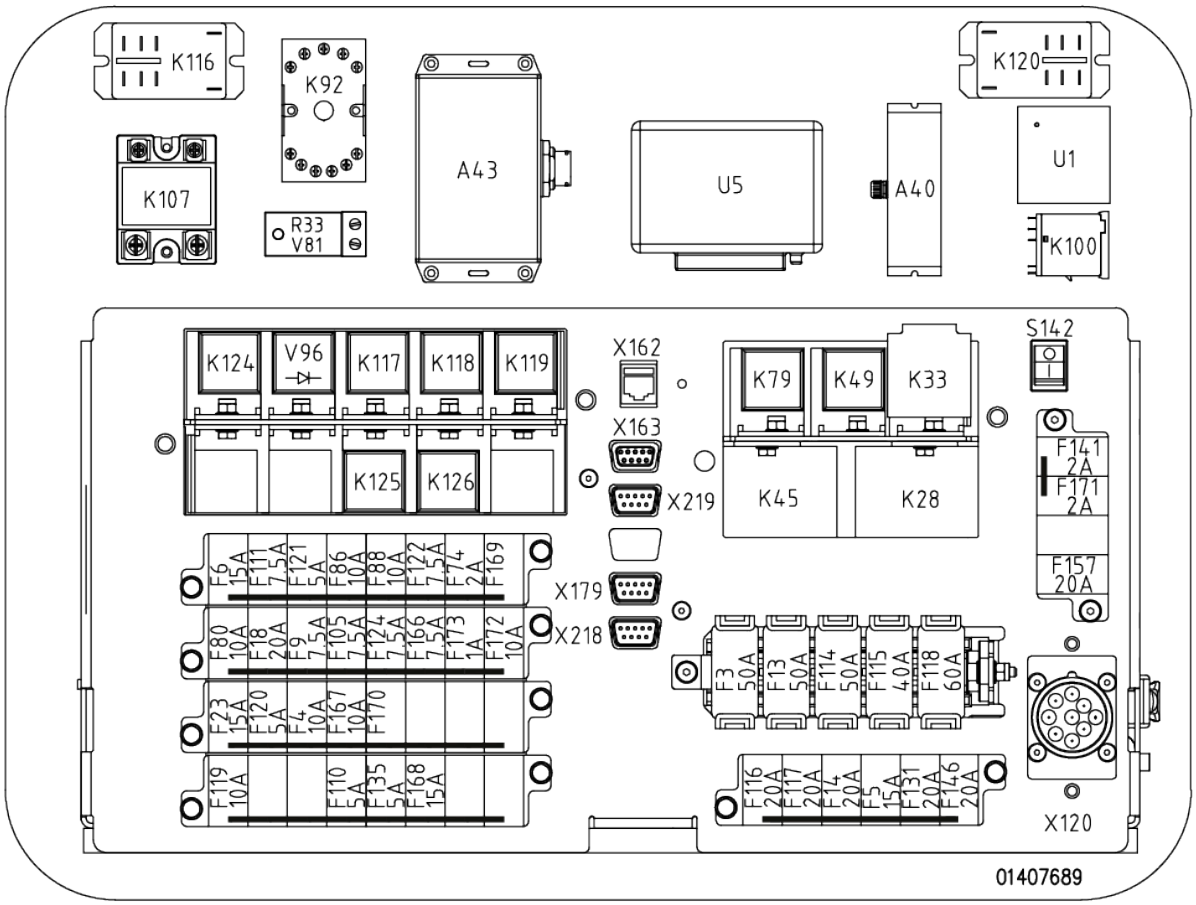


Figure 22: Schematic on the inside of the electrical box cover under the right passenger seat

Fuses under the right passenger seat		
F3	Side window heating	**50 A**

F4	Zero position front/rear wiper + impulse front wiper	**10 A**
F5	Wiper control	**15 A**
F6	Cabin heating fan	**15 A**
F9	Search light + switches	**7,5 A**
F13	Windscreen heating	**50 A**
F14	Power TTC60 Winch	**20 A**
F18	Voltage converter	**20 A**
F23	Rear window heating	**15 A**
F74	Drive approval	**2 A**
F80	Signal horn + mirror control + warning buzzer for reverse travel	**10 A**
F86	Supply ECM	**10 A**
F88	Diagnostic connector	**10 A**
F105	Fleet manager + fuel counter	**7,5 A**
F110	TTC Vision	**5 A**
F111	TTC Vision + Extension board + TTC94 + TTC48-1-2-3 + Winch + TSE	**7,5 A**
F114	Power Fuses Kl.30	**40 A**
F115	Power Fuses Kl.15	**40 A**
F116	Power TTC94	**20 A**
F117	Power TTC48-1	**20 A**
F118	Power Extension board	**60 A**
F119	Comfort seat	**10 A**
F120	Logic TTC94 / TTC48-1-2-3 + Winch + TSE + K107	**5 A**
F121	Keyboard + Joystick	**5 A**
F122	Preheating unit + control cab heating + relay fuel filter heating	**7,5 A**
F124	Automatic Roll-out	**7,5 A**
F131	Power TTC48-2	**20 A**
F135	Additional horn	**5 A**
F141	Rpm sensors (12V)	**2 A**
F146	Power TTC48-3	**20 A**
F157	Power TSE + TTC 48-4	**25 A**
F166	Sliding seat	**7,5 A**
F167	Power TTC30	**10 A**
F168	Air conditioner	**15 A**
F169	Optional customized	
F170	Optional customized	
F171	Joystick (V12)	**2 A**
F172	Passenger transport cabin	**10 A**
F173	Air conditioner	**1 A**
Relays under the right passenger seat		
K28	Windscreen heating	
K33	Main relay Kl.15	
K45	Side window heating	
K49	Cabin heating fan	
K79	Rear window heating	
K92	Receiver Roll-out	

K100	Acoustic signal central locking	
K107	Supply TTCs	
K116	Control relay battery switch	
K117	Impulse relay battery switch	
K118	Time relay "Coming Home" 1-30 sec.	
K119	Time relay "Leaving Home" 1-30 sec.	
K120	Switchover accelerator pedal	
K124	Switchover indicator accelerator pedal	
K125	Air intake flap open	
K126	Air intake flap closed	
Service connectors		
X120	Connector CAT	
X162	Ethernet	
X163	Debug TTC Vision	
X179	Debug CAN 1	
X218	Debug CAN 0	
X219	Debug CAN 3	
A40	Central Locking	
A43	Controller wiper	
R33-V81	Charging resistor	
S142	Termination CAN	
U1	Voltage Converter	
U5	Voltage Converter	
V96	Diode warning buzzer for reverse travel	

5.11.2 Fuses and relays in the accessory support

The auxiliary fuses and relays are located in the electrical box inside the cowling. To gain access, open the right side access panel, then remove the two wing nuts holding the cover of the electrical box.

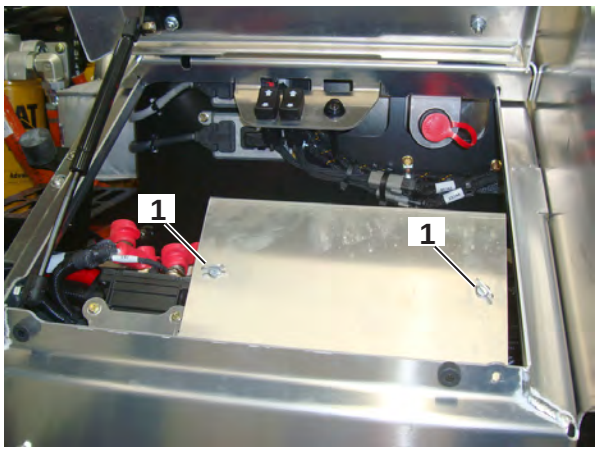


Figure 23: Right side access panel

Pos.	Name
1	Wing nuts of the electrical box

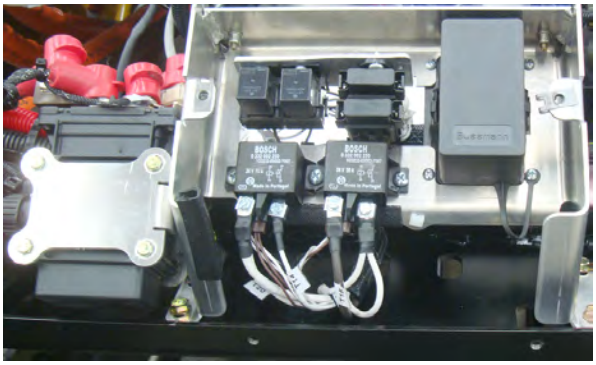


Figure 24: Interior view of the electrical box

NOTICE

Fire hazard

- ► Replacing a fuse with one of higher rating could cause overheating or even fire. Always replace a fuse with one of the same rating.

Next is a picture of the schematic on the cover of the electrical box with a list of the relays and fuses.

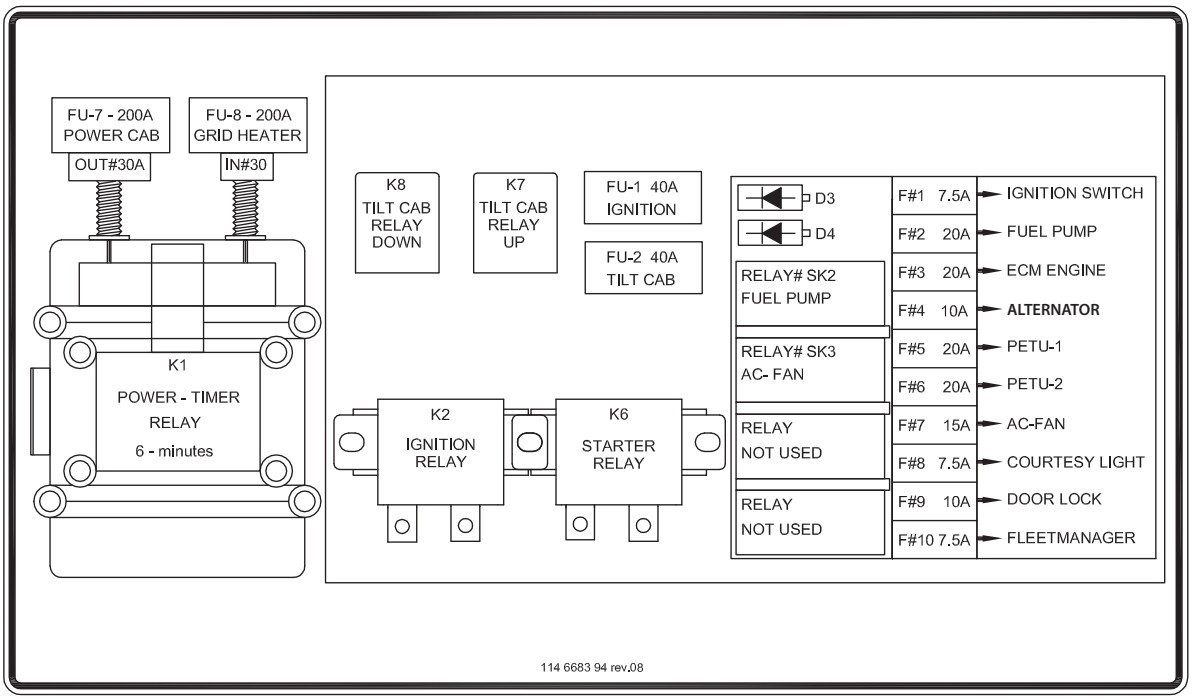


Figure 25: Schematic on the inside of the electrical box cover

POWER - TIMER RELAY 6 minutes	
IN	Terminal # 30
FU-8	200 A grid heater

OUT	Terminal # 30A
FU-7	200 A power cab

K8 TILT CAB RELAY DOWN
K7 TILT CAB RELAY UP
FU-1 40A IGNITION
FU-2 40A TILT CAB
K2 IGNITION RELAY
K6 STARTER RELAY

DIODE 03	Logic tilt pump
DIODE 04	Logic tilt pump
RELAY SK2	fuel pump
RELAY SK3	AC fan
RELAY	not used
RELAY	not used

F1	Ignition switch	**7.5 A**
F2	Fuel pump	**20 A**
F3	Engine ECM	**20 A**
F4	ALTERNATOR	**10 A**
F5	PETU 1	**20 A**
F6	PETU 2	**20 A**
F7	AC fan	**15 A**
F8	Courtesy light	**7.5 A**
F9	Door lock	**10 A**
F10	Fleet manager	**7.5 A**

5.12 Control units

Figure 26: Control units behind the right passenger seat

Pos.	Name	Description
1	TTC94	Control unit: Master
2	TTC48-1	Control unit: Input/Output rear lift frame, wiper, fuel
3	TTC48-2	Control unit: Input/Output rear lift frame, blade, tiller

Pos.	Name	Description
4	TTC48-3	Control unit: Input/Output rear lift frame, blade, tiller
5	TTC30	Heating control unit
6	A43	Wiper control unit

To avoid damaging the control units when connecting and disconnecting, follow the instructions below:

- Control unit connectors should only be disconnected or connected when the electrical system (master switch OFF) is switched off.
- Reversing the polarity may destroy the control units.
- Only start the engine if the batteries are connected firmly.
- Do not disconnect the batteries while the engine is running.
- Only start the engine if the rpm sensor is connected.
- Do not use a quick-charger to start the engine; only use external batteries to assist starting.
- To quick-charge the batteries, disconnect the battery terminals.
- Follow the user instructions for the quick-charger.

5.13 Battery disconnect switch

The battery disconnect switch is located under the right access panel of the rear cowling. This switch connects or disconnects the batteries to prevent discharge. Operation of the switch is automatic but there is an override control in the cab.

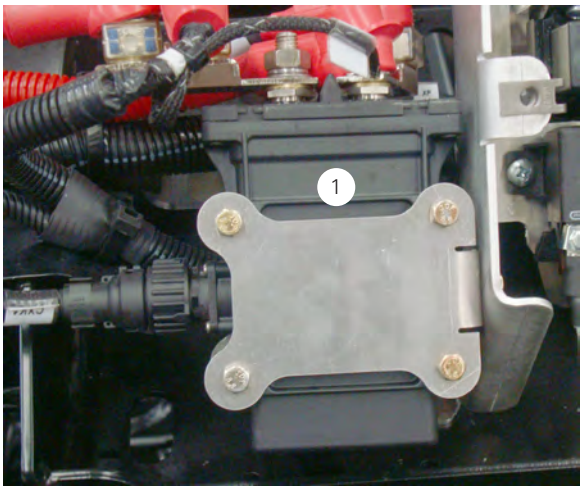


Figure 27: Under the right access panel of the rear cowling

Pos.	Name
1	Battery disconnect switch in the cowling

■ Functioning

The switch turns on when the key is inserted and turned ON in the ignition switch of the cab.

The switch turns off with a **6 min** delay when the key is turned to OFF in the ignition switch of the cab. The delay is required to permit a normal shutdown of the engine and its electronic systems.

5.14 Battery emergency switch

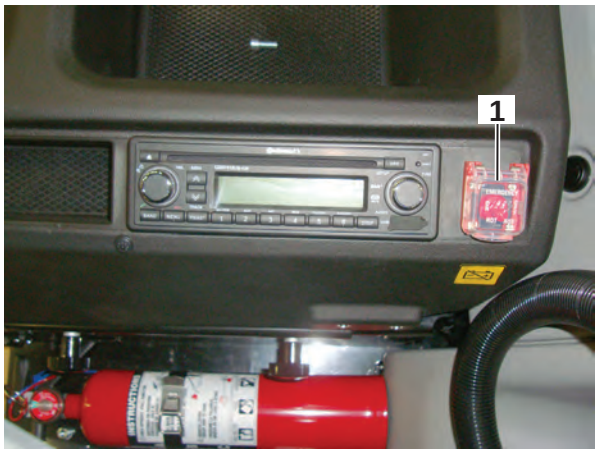


Figure 28: Passenger seat console

Pos.	Name
1	Battery emergency switch

■

The battery emergency switch (1) is located next to the radio on the console of the passenger seat. When actuated, it immediately disconnects the battery from the vehicle by opening the electronic master switch. The next time the ignition is switched on, the battery emergency switch will be active again.

5.15 Vehicle lighting

■ The vehicle lighting (with either halogen or LED lights) comprises the following components:

- Parking/back lights
- Low and high beam
- Front blade lighting
- Work lights on the A-pillar
- Work lights on the cab roof, with halogen or LED headlamps
- Work lights, front /rear
- Spotlight on top of the cab (controlled from inside)
- Door mirror lights (LED)
- Side work lights

The work lights can be switched on and off independently from each other using the push-buttons on Keyboard 1.

5.16 Warning and signaling equipment

■ The following warning and signaling equipment is available:

- Horn and warning buzzer
- Rotating beacons on top of the driver's cab
- Front, side and rear turn signals
  - Left turn indicator
  - Right turn indicator

5.17 Switching the air filter

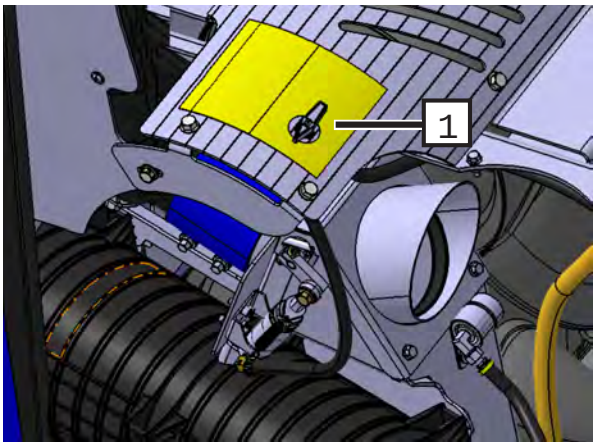


Figure 29: Air filter switch

Pos.	Name
1	Air filter switch in the NORMAL mode

In accordance with the external working conditions, the air intake can be switched from outside the cowling to inside the cowling and vice versa by rotating the selector switch. The selector switch is located on the rear cowling, on the aftertreatment top cover plate.

- STORM mode

  In the STORM mode, the engine draws air from inside the cowling (where the air is warm). Select the STORM mode to avoid a clogged engine air filter in the follwing conditions :

  - Powder snow or fine snow dust,
  - Intensive work near snowguns,
  - Any other condition that will clog the air filter.

  To use the STORM mode, the ambient temperature should be below freezing **0 °C** (32 °F). As the engine performance could be reduced in this mode, use only when required, not as a preventive action

- NORMAL mode

  - In the NORMAL mode, the engine draws air from outside the cowling. Return to the NORMAL mode or stay in this mode in the following conditions
    - Light snowfall, non-icing conditions,
    - Engine air filter is clear (not clogged),
    - Outside air temperature is above freezing, **0 °C** (32 °F).

  For optimal vehicle performance, always use the NORMAL air intake mode when the conditions allow it.

  Operating the engine with a clogged air filter will generate entries in the engine fault log, could reduce engine performance and could cause damage.

  Restriction caused by icing in the engine air filter will be indicated on the main page of the display by the yellow warning triangle and a 3-second audible alarm. Confirmation of the problem can be found on the display pages A20, B10 and B20.

6 Display

6.1 Display description

Figure 30: Control console

Pos.	Name
1	Display
2	Rotary pushbutton B118 for menu navigation

The display is located in the front part of the control console. Menu navigation is carried out using the rotary pushbutton B118 (2).

Once the ignition switch is in position 2, the display will provide current information about engine and vehicle status.

You can navigate through the following menus:

- Information
- Service
- Operation
- Password
- Exit

Some menus have restricted access and are only available to service personnel at PRINOTH or trained personnel via the password menu.

6.2 Adjusting the display backlight

The backlight of the display is adjusted using the rotary push-button B118.

- Return to the main display if necessary.
- Turn rotary push-button B118 clockwise = increase backlight
- Turn rotary push-button B118 anticlockwise = reduce backlight

6.3 Navigating in the menu

Figure 31: Control console

Pos.	Name
1	Rotary push-button B118

1. Press rotary push-button B118.
2. Turn rotary push-button B118 until the desired position is marked.
3. Press to confirm.
4. Turn rotary push-button B118 until the desired value is displayed.
5. Press to confirm.
6. In order to exit the menu, turn rotary push-button B118 until you reach the menu item in the higher level.
7. Press to confirm.
8. When changing to the next-highest level, there is a query concerning whether the changed selection should be saved.
   Confirm by pressing or press the ESC key on keyboard **<A36>**.
9. Accept change

10. Reject change

6.4 Indicators and controls on the display

Figure 32: Main display

Pos.	Name	Image	Description
1	Engine tachometer		The tachometer displays the engine rpm when the engine is running: ■ Lowest idle speed: **800/min** ■ Highest permissible speed: **2000/min**
2	Fuel Level		Indicates the fuel level; additional indicator lamp indicates when fuel reserve level is reached
3	AdBlue/DEF level		Display of the AdBlue/DEF level
4	Vehicle working hours		The operating hours counter starts when the engine is running and as a result also counts the time required for engine preheating and the waiting times with the engine running. The indicated number of working hours are essential for maintenance.
5	Date		Indicates the current date

Pos.	Name	Image	Description
6	Time		Indicates the current time
7	Outside temperature		This display monitors the current outside temperature
8	Parking brake warning lamp (red)		If the warning lamp lights up red continuously, the parking brake is active.
9	Emergency OFF switch warning lamp (red)		If this warning lamp lights up red continuously, this displays that the Emergency OFF switch has been pressed. ■  Yellow turtle = Power reduction When the yellow turtle is displayed, the power is reduced by 50%. This happens if one of the following situation has occured: □ Emergency mode steering levers active □ Emergency mode accelerator pedal active □ CAN communication problem □ Battery voltage to low □ Overspeed
10	Snow groomer forward/ reverse direction indicator		Indicator only with steering wheel: the travel direction of the snow groomer is shown when the respective symbol lights up. ■  Up arrow continuously lit white = Forward travel ■  Down arrow continuously lit white = Reverse travel
11/12	Travel direction indicator		The activation of the travel direction indicator is shown when the respective symbol is lit: ■ Right arrow flashing green = Right turn signal ON ■ Left arrow flashing green = Left turn signal ON ■ Both arrows flashing green = Hazard warning lights ON
13	Indicator lamp Regeneration disabled or Regeneration pending		■  Regeneration is pending ■  Regeneration is disabled and cannot be performed by the vehicle
14	Indicator lamp Low AdBlue/DEF level		
15	Indicator lamp for high exhaust gas temperature (HEST lamp)		Indicates that a regeneration is carried out. Do NOT turn the engine off.
16	Indicator lamp DEF system malfunction		■  DEF system malfunction
17	Engine coolant temperature indicator		
18	Coolant temperature warning lamp		■  If the warning lamp is continuously lit red, the coolant temperature is too high. The engine load must be reduced, the snow groomer stopped at a suitable place and the engine turned off. There is danger of engine damage.

Pos.	Name	Image	Description
			■  If the warning lamp is continuously lit blue, the coolant temperature is below **40°C** (104°F).
19	Warning lamp Low oil pressure		The warning lamp continuously flashes red when the ignition switch is in position 2 and the engine is at standstill. The warning lamp should go off just after starting the engine. If the warning lamp continuously flashes red while the engine is running, the snow groomer must be stopped at a suitable place and the engine turned off. There is a risk of engine damage.
20	Indicator lamp Engine ECM fault		An engine electronics fault is indicated if the indicator light lights yellow continuously.
21	Check indicator lamp for Engine fault		An engine electronics fault is indicated if the indicator light lights yellow continuously.
22	Warning lamp for battery and charge control		The warning lamp should go out shortly after starting the engine. If the warning lamp continuously flashes red when the engine is running, the battery is no longer being charged. In this case, check the drive belt, current generator and voltage regulator.
23	Indicator lamp Preheating monitor		The indicator light lights up yellow continuously. The engine can be started once this indicator lamp has dissapeared.
24	Error warning lamp		If the warning lamp lights up red continuously, this indicates an error. If the warning lamp lights up yellow continuously, this indicates a fault. Open menu item **B.20** and identify the fault.
25	Parking light indicator lamp		The parking light is activated if the indicator lamp lights up continuously green. If the indicator lamp lights up yellow continuously, a fault in the lighting system is indicated.
26	Full beam indicator lamp		
27	Indicator lamp for rotating beacons		
28	Locking the driver's cab		If the warning lamp lights up, check locking of the driver's cab.
29	Indicator lamp to restore snow groomer standby		These indicator lamps inform the driver about how to proceed to put the snow groomer back into standby. ■  Re-engage the parking brake ■  Close the doors ■  Turn the engine speed rotary switch to MIN ■  Put the steering levers in neutral position ■  Put the steering console down (only when steering levers are mounted) ■  Reduce accelerator pedal speed to MIN

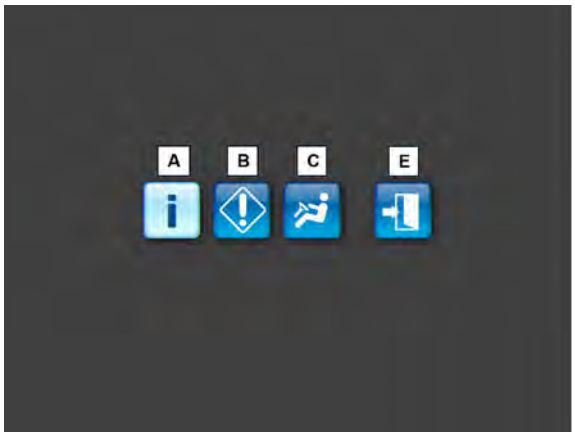
Pos.	Name	Image	Description
			■  Turn cable traction force rotary switch to MIN
31	Rear tiller side wings up/ down		If the respective symbol lights, the position of the side wings on the rear tiller is displayed: ■ Wing upwards continuously lit white = Left / right side wing up ■ Wing downwards continuously lit green = Left / right side wing down
33	Rear tiller (horizontal) center/floating/right/left position		The status of the rear tiller is indicated when the respective symbol lights up: ■ Arrows pointing to each other continuously lit white = Center position ■ Shaft continuously lit white = Floating position ■ Right arrow continuously lit white = Rear tiller swivelled to the right ■ Left arrow continuously lit white = Rear tiller swivelled to the left
34	Operational readiness of the attachments		If the rear tiller lamp is continuously lit grey, the operational readiness of the attachments is activated. If the grey rear tiller lamp goes out, the operational readiness of the attachments is deactivated. If the rear tiller lamp is continuously lit red, there is a malfunction.
35	Tiller cutting depth in %		Indicates the tiller cutting depth in the range from **0** to **100**: ■ **0** = Minimum tiller cutting depth ■ **100** = Maximum tiller cutting depth
36	Cutter shaft speed in % and direction of rotation		When the respective symbol is lit, the status of the tiller shaft and the set value from **0** to **100** is displayed: ■ Tiller shaft blinks green = Tiller shaft active but not rotating ■ Tiller shaft with arrow in counter-clockwise direction green = Tiller shaft turning in normal direction of rotation ■ Tiller shaft with arrow in clockwise direction orange = Tiller shaft turning in counter direction If other front attachments are in use, the following symbols are displayed: ■  = front-end blower ■  = Half-pipe front attachment
37	Contact pressure / floating position / counter pressure for rear tiller (vertical) and setting value in %		When the respective symbol is lit, the rear tiller status is indicated and the respective set value from **0** to **100** is displayed: ■ Down arrow continuously lit green = Down pressure ■ Wave continuously lit green = Floating position ■ Up arrow continuously lit green = Counter pressure

Pos.	Name	Image	Description
			■ 
38	Rear tiller locked (rigid) or flexible (free)		The rear tiller is locked (rigid) if the indicator lamp lights white continuously. ■  = Rear tiller locked ■  X = Rear tiller flexible
46	Heater control		Automatic or manual
48	Recirculated air in driver's cab		ON - OFF
49	Temperature or fault display		The temperature in the driver's cab is displayed here. ■ If a fault occurs in the heater control, the text "ERROR" appears in the display.  A detailed fault description is available in the fault log in menu item B.10.
50	Defrost mode		
51	Fan speed control		
52	BISON X inclinometer		The inclination angles of blade and frame are displayed here.
53	Track setting plate		Arrow up = Track setting plate lifted Arrow down = Track setting plate lowered Track setting plate continuously lit white = Track setting plate active Track setting plate continuously lit red = Error
54	Track tiller		Track tiller continuously lit green = Track tiller active Track tiller continuously lit gray = Track tiller not active

6.5 Menu structure

Figure 33: Overview of menu structure

6.5.1 Menu level "Information"



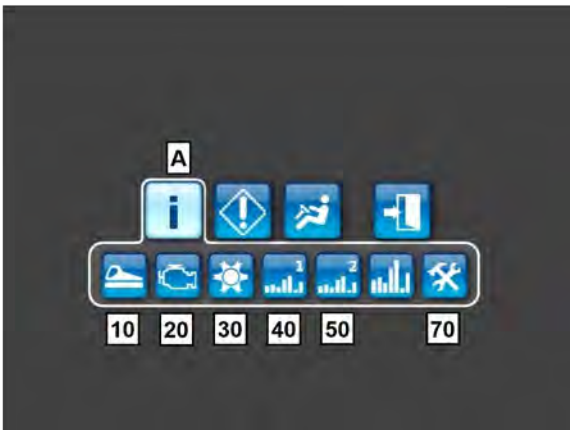
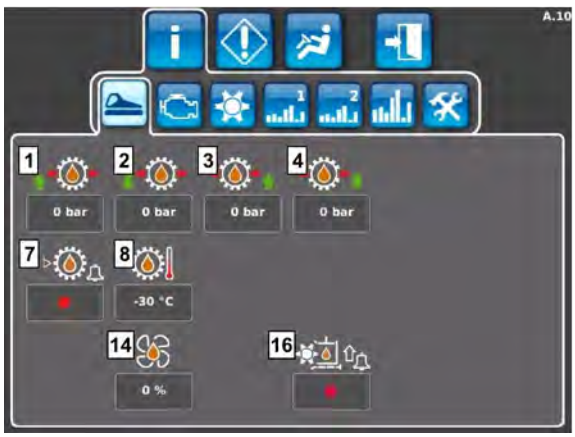


Figure 34: Main menu || Menu level "Information" (A)

Pos.	Main menu	Pos.	Menu level "Information" (A)
A	Information	10	Information: snow groomer
B	Service	20	Information: engine
C	Operation	30	Information: rear tiller / AUTOMATIC winch
E	Exit	40	Trip 1 statistics
		50	Trip 2 statistics
		70	Snow groomer configuration



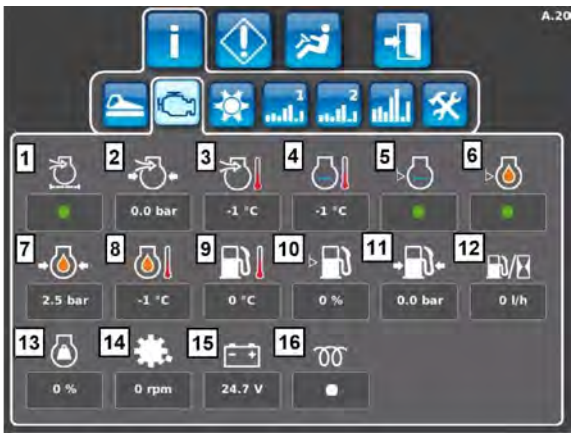


Figure 35: Information: snow groomer (A.10) || Information: engine (A.20)

Pos.	Information: snow groomer (A.10)	Pos.	Information: engine (A.20)
1	Hydraulic fluid pressure forward travel left hydraulic pump (bar) - only for machines with winch	1	Blocked air filter
2	Hydraulic fluid pressure reverse left hydraulic pump (bar) - only for machines with winch	2	Intake charge air (bar)
3	Hydraulic fluid pressure forward travel right hydraulic pump (bar) - only for machines with winch	3	Air intake temperature (°C)

Pos.	Information: snow groomer (A.10)	Pos.	Information: engine (A.20)
4	Hydraulic fluid pressure reverse right hydraulic pump (bar) - only for machines with winch	4	Coolant temperature (°C)
7	Hydraulic fluid level	5	Coolant level
8	Hydraulic oil temperature (°C)	6	Engine Oil Level
14	Fan speed (%)	7	Engine oil pressure (bar)
16	Filter blockage	8	Engine oil temperature (°C)
		9	Fuel temperature (°C)
		10	Fuel level (%)
		11	Fuel pressure (bar)
		12	Fuel consumption (l/h)
		13	Engine load (%)
		14	Engine speed (rpm)
		15	Battery charging voltage (V)
		16	Preheating monitor

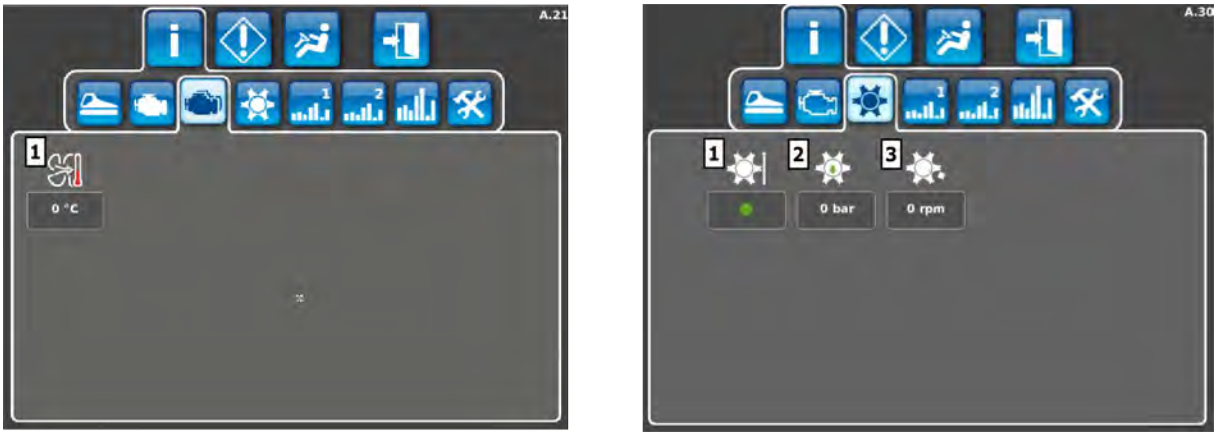


Figure 36: Information: engine (A.21) || Information: rear tiller (A.30)

Pos.	Information: engine (A.21)	Pos.	Information: rear tiller (A.30)
1	Air intake system discharge temperature	1	Automatic raising of tiller when reversing ■ Green = ON ■ Red = OFF
		2	Down pressure / counter pressure (bar)
		3	Rear tiller shaft speed (rpm)

Figure 37: Information: AUTOMATIC winch (A.35) || Trip 1 Statistics (A.40)

Pos.	Information: AUTOMATIC winch (A.35)	Pos.	Trip 1 Statistics (A.40)
1	Hydraulic fluid pressure hydraulic pump winch (bar) - if winch activated	1	Trip 1 - Total operating hours
2	Winch rope traction force - if winch activated	2	Trip 1 - Stationary with engine ON operating hours
		3	Trip 1 - Forward travel operating hours
		4	Trip 1 - Backward travel operating hours
		5	Trip 1 - Rear tiller operating hours
		6	Trip 1 - Snow plough operating hours
		7	Trip 1 - Hoist operating hours
		8	Trip 1 - Diesel consumption (l)
		9	Trip 1 - Area performance (Ha)
		10	Trip 1 - Area performance (Ha/h)
		11	Trip 1 - Kilometres travelled
		12	Trip 1 - Diesel consumption (l/h)
		13	Trip 1 - Reset (when activated via password level 1)

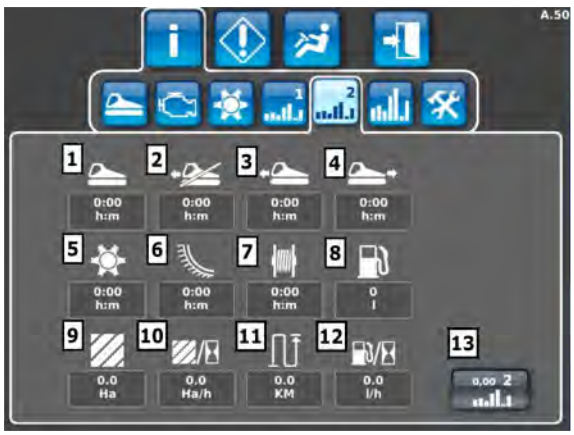


Figure 38: Trip 2 Statistics (A.50) || Total statistics (A.60)

Pos.	Trip 2 statistics (A.50)	Pos.	Total statistics (A.60)
1	Trip 2 - Total operating hours	1	Total - Total operating hours

Pos.	Trip 2 statistics (A.50)	Pos.	Total statistics (A.60)
2	Trip 2 - Stationary with engine ON operating hours	2	Total - Stationary with engine ON operating hours
3	Trip 2 - Forward travel operating hours	3	Total - Forward travel operating hours
4	Trip 2 - Reversing operating hours	4	Total - Reversing operating hours
5	Trip 2 - Rear tiller operating hours	5	Total - Rear tiller operating hours
6	Trip 2 - Snow plough operating hours	6	Total - Snow plough operating hours
7	Trip 2 - Hoist operating hours	7	Total - Hoist operating hours
8	Trip 2 - Diesel consumption (l)	8	Total - Diesel consumption (l)
9	Trip 2 - Area performance (Ha)	9	Total - Area performance (Ha)
10	Trip 2 - Area performance (Ha/h)	10	Total - Area performance (Ha/h)
11	Trip 2 - Kilometres travelled	11	Total - Kilometres travelled
12	Trip 2 - Diesel consumption (l/h)	12	Total - Diesel consumption (l/h)
13	Trip 2 - Reset (when activated via password level 1)	13	Total - Engine operating hours

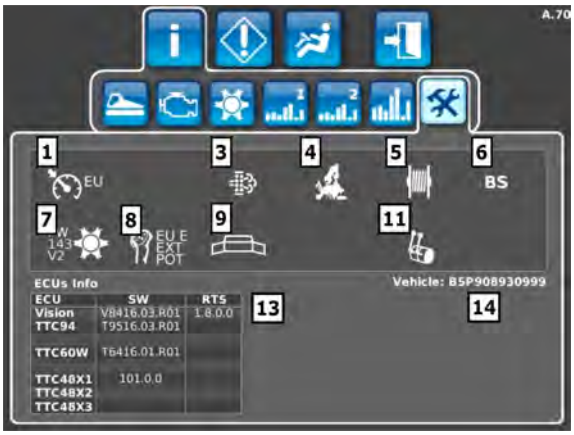


Figure 39: Vehicle configuration - information page (A.70)

Pos.	Vehicle configuration - information page (A.70)	Pos.	
1	Assisted Drive - Cruise control + Engine speed potentiometer		
3	Regeneration		
4	Country EU / NA		
5	Winch activated		
6	Vehicle type		
7	Tiller type (Power tiller, Posiflex, etc.)		
8	Joystick type		
9	Front attachment (blade, rotary snow plough, etc.)		
11	Steering lever / steering wheel		
13	Software version		
14	Vehicle frame number		

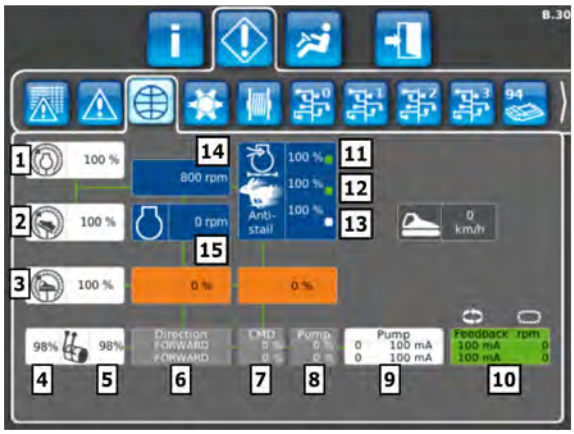
6.5.2 Menu level "Service"

Figure 40: Main menu || "Service" (B) menu level

Pos.	Main menu	Pos.	Menu level "Service" (B)
A	Information	10	Fault log
B	Service	20	Warning symbols display
C	Operation	30	Input / output traction drive
E	Exit	40	Input / output tiller drive
		50	Input / output winch
		60	Connection CAN 0
		70	Connection CAN 1
		90	Connection CAN 3
		100	Input / output TTC94
		110	Input / output TTC48-1
		120	Input / output TTC48-2
		130	Input / output TTC48-3
		140	Input / output TTC60 winch
		155	Input / output TTC30
		160	Backlight
		170	Input / output Joystick

Figure 41: Fault log (B.10) || Warning symbols display (B.20)*

Pos.	Fault log (B.10)*	Pos.	Warning symbols display (B.20)
1	Electronics box (TTC94, TTC48-1, etc.)	1	Error warning lamp (red)
2	Pin number or error code for electronics boxes / ADM / Eaton	2	Watchdog error warning lamp
3	Cause (value too high or too low, etc.)	3	Automatic braking function warning lamp (red)
4	Current value	4	Electronic control unit error warning lamp (red)
5	Time of the error	5	Driver's cab warning buzzer indicator lamp (white)
6	How long is (was) the error active	6	Operational readiness of the attachments warning lamp
7	How often has the error occurred	7	Warning lamp: insufficient hydraulic fluid level (red)
8	Error code list (which day)	8	Hydraulic fluid filter clogged warning lamp (red)
9	Error code list (which month)	9	Hydraulic fluid temperature too high warning lamp (red)
10	Error code list (which year)	10	Warning buzzer indicator lamp (white)
11	Error code list (which page)	11	Parking brake warning lamp (red)
	* The Eaton and ADM errors are also displayed on this page.	13	Warning lamp: insufficient coolant level (red)
		14	Coolant temperature too high warning lamp (red)
		15	Warning lamp: insufficient engine oil pressure (red)
		16	Intake air temperature too high warning lamp (red)
		17	Air filter clogged warning lamp (red)
		18	Battery and charge indicator indicator lamp (yellow)
		19	Restore snow groomer standby indicator lamp - activate parking brake
		20	Restore snow groomer standby indicator lamp - close doors
		21	Restore snow groomer standby indicator lamp - lock driver's cab
		22	Restore snow groomer standby indicator lamp - set the engine potentiometer to Min.
		23	Restore snow groomer standby indicator lamp - move control lever to neutral position
		24	Restore snow groomer standby indicator lamp - set the winch potentiometer to Min.
		25	Warning lamp, error CAN 0 (red)
		26	Warning lamp, error CAN 1 (red)
		27	Warning lamp, error CAN 2 (red)
		28	Warning lamp, error CAN 3 (red)
		30	Reduced vehicle speed indicator lamp



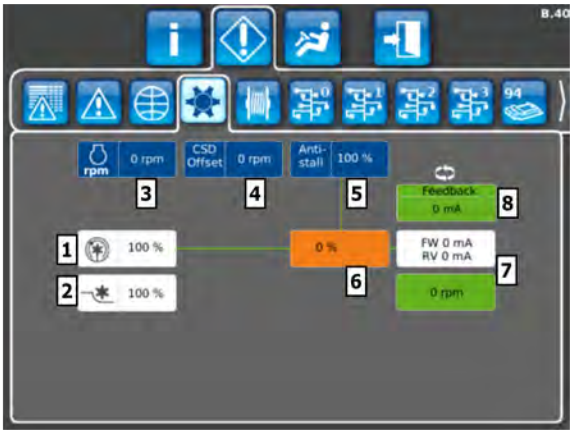


Figure 42: Input / output traction drive (B.30) || Input / output tiller drive (B.40)

Pos.	Input / output traction drive (B.30)	Pos.	Input / output tiller drive (B.40)
1	Engine RPM potentiometer (hand throttle potentiometer)	1	Rear tiller rotary switch
2	Accelerator pedal	2	Cutting angle
3	Vehicle speed (Inch potentiometer)	3	Acutal diesel engine speed
4	Control lever (FNR) left (excursion in %) or steering wheel	4	Actual hydraulic motor RPM (actual value) – sensor is mounted in the hydraulic motor of the tiller
5	Control lever (FNR) right (excursion in %)	5	Anti-stall
6	Control lever (FNR) position (forward - neutral - reverse)	6	Tiller pump – actual command for the tiller pump
7	Control lever (FNR) (default value in %)	7	Tiller pump – RPM + Current
8	Drive pump (default value in %)	8	Tiller pump – feedback current
9	Pump current		
10	Pump current feedback signal - RPM final drive		
11	Air filter clogging		
12	Overspeed RPM		
13	Anti-stall - maximum load control		
14	Default engine RPM (set value)		
15	Acutal RPM (actual value)		

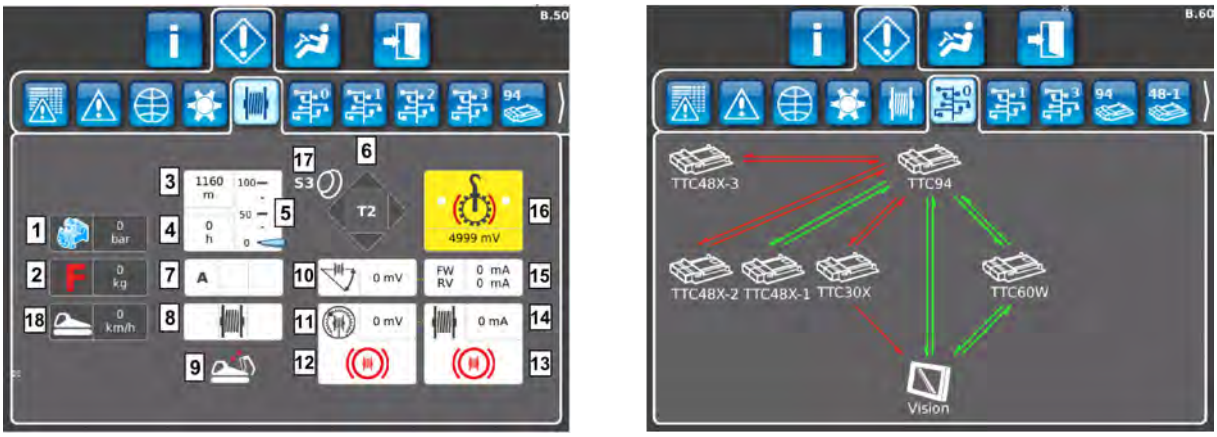
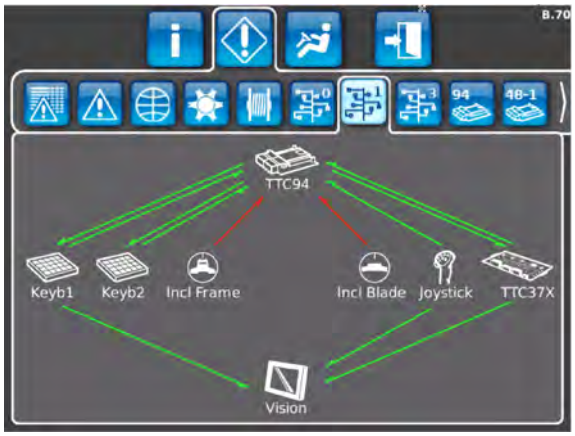


Figure 43: Input / output AUTOMATIC winch (B.50) || Connection CAN 0 (B.60)*

Pos.	Input / output AUTOMATIC winch (B.50)*	Pos.	Connection CAN 0 (B.60)
1	Winch pump hydraulic pressure	TTC94	Master
2	Winch traction force	TTC48X-1	Slave
3	Actual cable length	TTC48X-2	Slave
4	Winch operating hours	TTC48X-3	Slave
5	Winch traction force in %	TTC30	Heating control
6	Mini-joystick functions	Vision	Display (indicator)
7	Winch status (Manual / AUTO / A-ECO)	TTC60W	Winch - only displayed when winch mounted
8	Recommended winding direction and number of rotations		
9	Winch locking device		
10	Angle encoder - cable rocker		
11	Winch traction force potentiometer		
12	Winch drum brake		
13	Rotating winch arm brake		
14	Mooring valve (mA)		
15	FW (mA) = Winch pump forward RW (mA) = Winch pump backward		
16	Angle encoder - winch arm		
17	S3 Turning winch arm		
18	Vehicle speed		
* If no AUTOMATIC winch is installed then this page will not be displayed.			



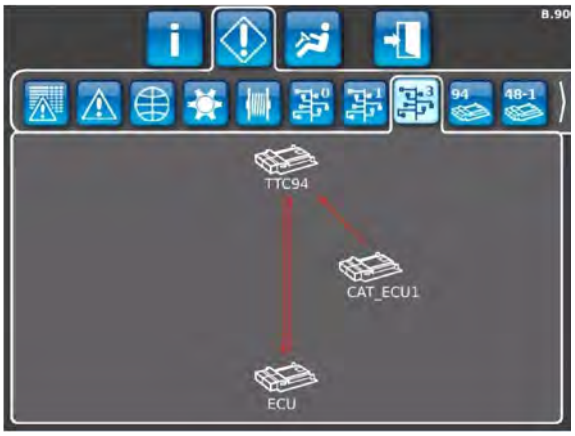
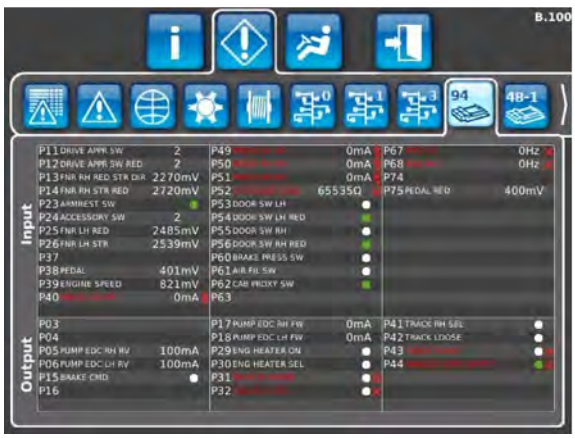


Figure 44: Connection CAN 1 (B.70) || Connection CAN 3 (B.90)

Pos.	Connection CAN 1 (B.70)	Pos.	Connection CAN 3 (B.90)
TTC94	Master	TTC94	Master
Keyb 1	Keyboard 1	CAT_ECU1	Engine electronics
Keyb 2	Keyboard 2	ECU	Engine electronics (at the accessory support frame)
Incl Frame	CAN Inclinometer vehicle		
Incl blade	CAN Inclinometer blade		
	Joystick		
TTC37X	Extension board		
Vision	Display (indicator)		



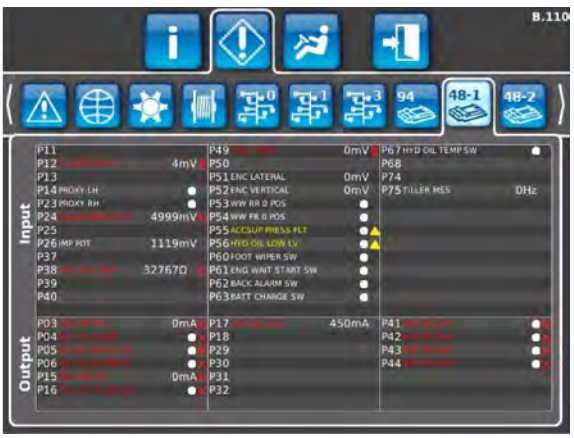
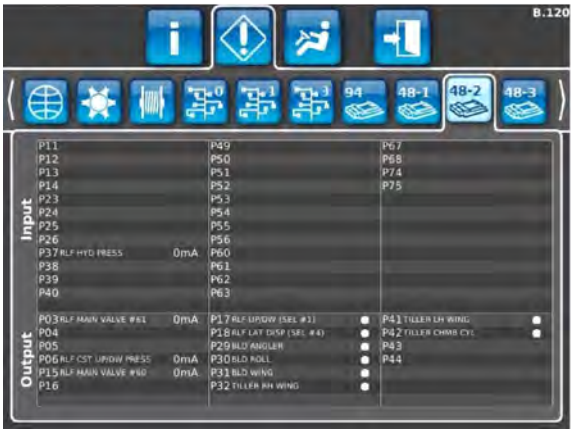


Figure 45: Input / output TTC94 (B.100) || Input / output TTC48-1 (B.110)

Pos.	Input / output TTC94 (B.100)	Pos.	Input / output TTC48-1 (B.110)



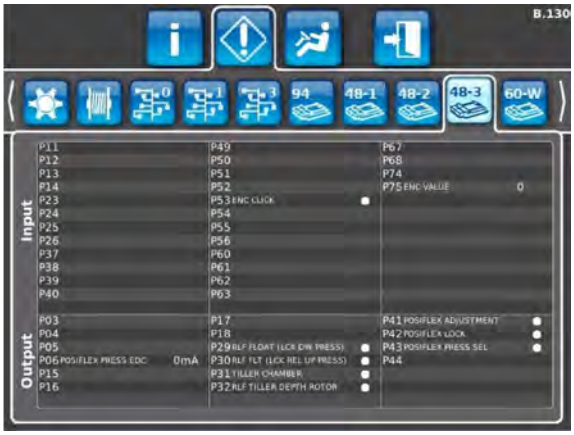


Figure 46: Input / output TTC48-2 (B.120) || Input / output TTC48-3 (B.130)

Pos.	Input / output TTC48-2 (B.120)	Pos.	Input / output TTC48-3 (B.130)

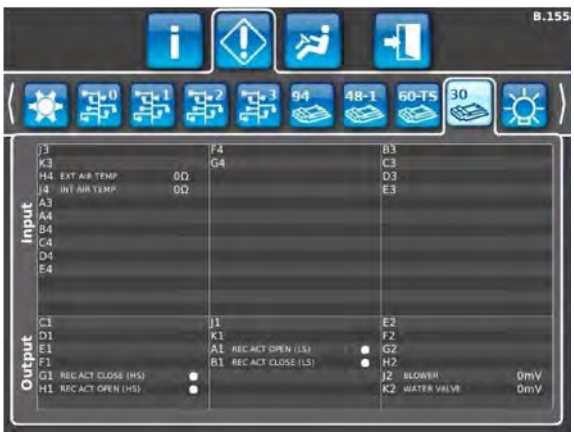
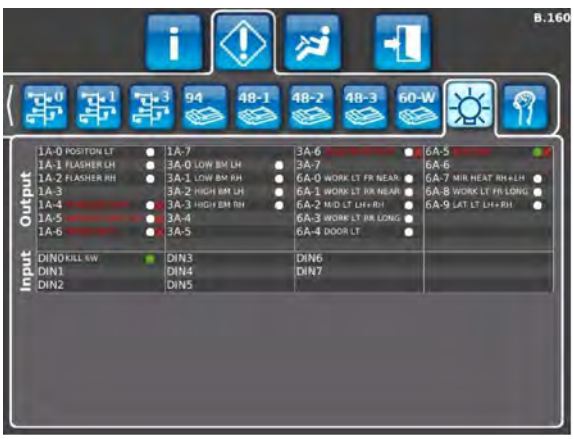


Figure 47: Input / output TTC60 (AUTOMATIC winch) (B.140) || Input / output TTC30 (B.155)

Pos.	Input / output TTC60 (AUTOMATIC winch) (B.140)	Pos.	Input / output TTC30 (B.155)



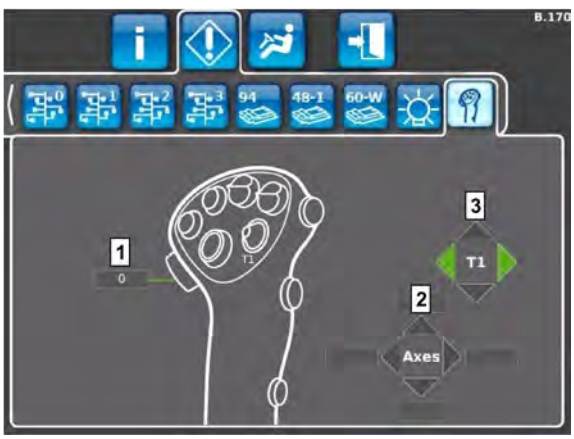


Figure 48: Lighting extension board (B.160) || Input / output joystick + D (B.170)

Pos.	Lighting (extension board) (B.160)	Pos.	Input / output joystick + D (B.170)
		1	Vehicle speed rotary switch (**0-1000**)
		2	Joystick axles forward / backward + left / right (**0-1000**)
		3	Mini-joystick T1

6.5.3 Menu level "Operation"

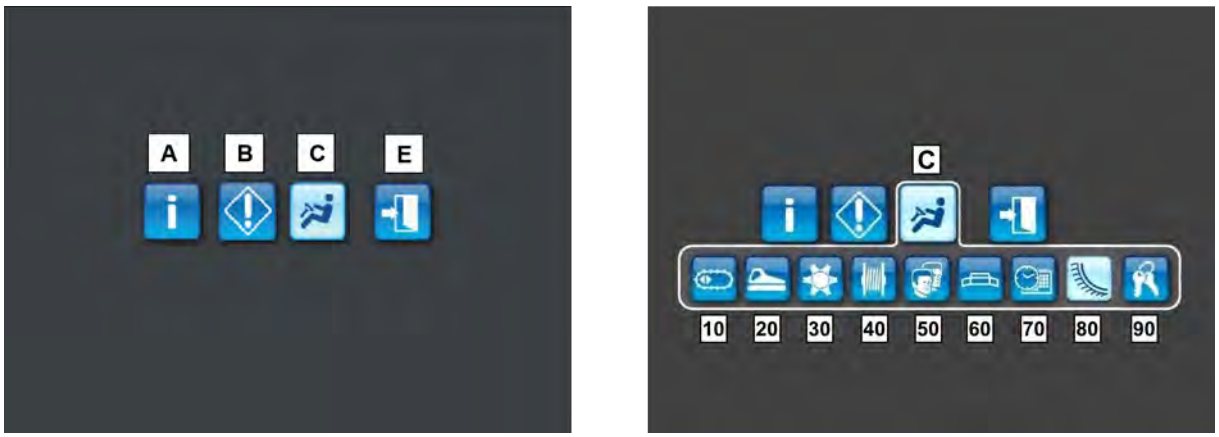


Figure 49: Main menu || Menu level "Operation" (C)

Pos.	Main menu	Pos.	Menu level "Operation" (C)
A	Information	10	Tension / loosen the tracks
B	Service	20	Driver's cab operation
C	Operation	30	Rear tiller operation
E	Exit	40	Winch operation
		50	User profile
		60	Front devices
		70	Set date / time
		90	Password entry

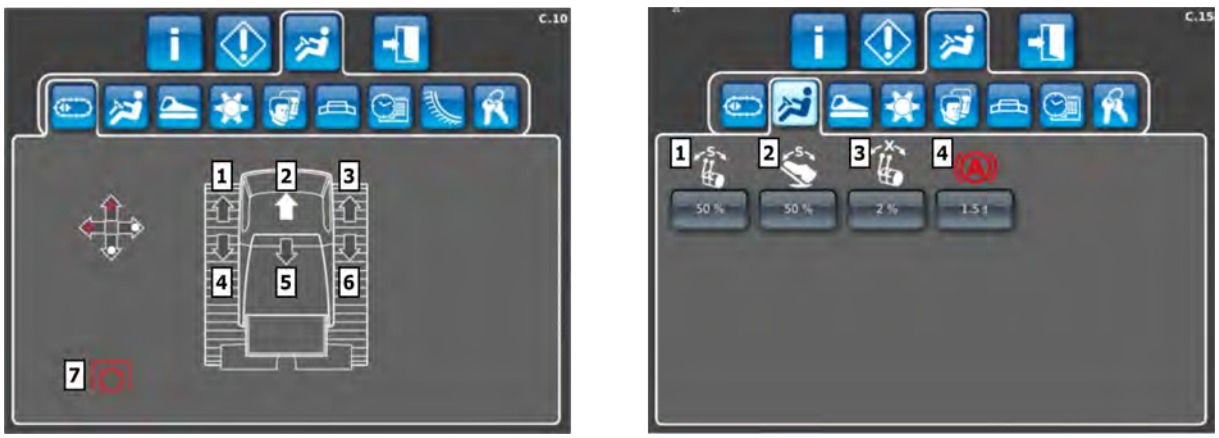


Figure 50: Tension / loosen the tracks (C.10) || Automatic brake operation (C.15)

Pos.	Tension/loosen the tracks (C.10)	Pos.	Automatic brake operation (C.15)
1	Tension tracks left side	1	Steering lever (FNR) sensitivity (**25–75%**)
2	Tension tracks both sides	2	Accelerator pedal sensitivity (**25–75%**)
3	Tension tracks right side	3	Steering lever (FNR) set steering reserve (0%-10%)
4	Loosen tracks left side	4	Automatic brake - reaction time
5	Loosen tracks both sides		
6	Loosen tracks right side		
	The track tension is only working when the operational readiness switch for the attachments is active, otherwise the symbol will be shown in the page here (7).		

Figure 51: Driver's cab operation (C.20) II Rear tiller operation (C.30)

Pos.	Driver's cab operation (C.20)	Pos.	Rear tiller operation (C.30)
1	Windscreen wiper(s) interval duration	1	Rear attachment selection ■  Rear tiller ■  Board ■  No attachment
2	Windscreen wiper heater ON / OFF	2	Automatic lowering of rear tiller when travelling forward ON / OFF - tiller ON
3	Front windscreen / rear window heating ON duration (min)	3	Automatic raising of rear tiller when reversing ON / OFF - tiller OFF
4	Front windscreen / rear window heating OFF duration (min)	4	Automatically raising of rear tiller side wings ON / OFF
5	Side window heating ON duration (min)	5	Automatically raising of rear tiller side wings ON / OFF
6	Side window heating OFF duration (min)	6	Tiller motion (speed) ON when raised. (Reverts to OFF on restarting the vehicle.)

Pos.	Driver's cab operation (C.20)	Pos.	Rear tiller operation (C.30)
7	Warning buzzer when reversing ON / OFF	7	Tiller - Anti-stall mode (adjustable from 1%-50% or OFF) 
8	Rear view camera ON / OFF	8	Raising of tiller sideways ON / OFF
9	Camera delay - duration for which the camera remains on once vehicle has been switched from reversing to forward travel. Symbol only appears when the rear view camera is switched on.		
10	Display brightness (**10–100%**) – can also be set via rotary knob B118		
11	Keyboard brightness (**10–100%**)		
17	Regeneration deactivation ON / OFF		
18	Regeneration ON / OFF		

Figure 52: AUTOMATIC winch operation (C.40) || User profile (C.50)

Pos.	AUTOMATIC winch operation (C.40)	Pos.	User profile (C.50)
1	Rope traction force control AUTO / A-ECO / MANUAL 		The following settings are saved: ■ Time cycles of window heating intervals ■ Wiper heating ON / OFF ■ Blade control, 3 profiles 1 / 2 / 3 ■ Automatic raising / lowering of tiller ■ Automatic raising of tiller side wings when reversing ■ Rear view camera ON / OFF ■ Sensitivity settings for steering lever and accelerator pedal
2	Winch characteristic curve FLAT / MEDIUM / STEEP (only for AUTO or A-ECO) 		

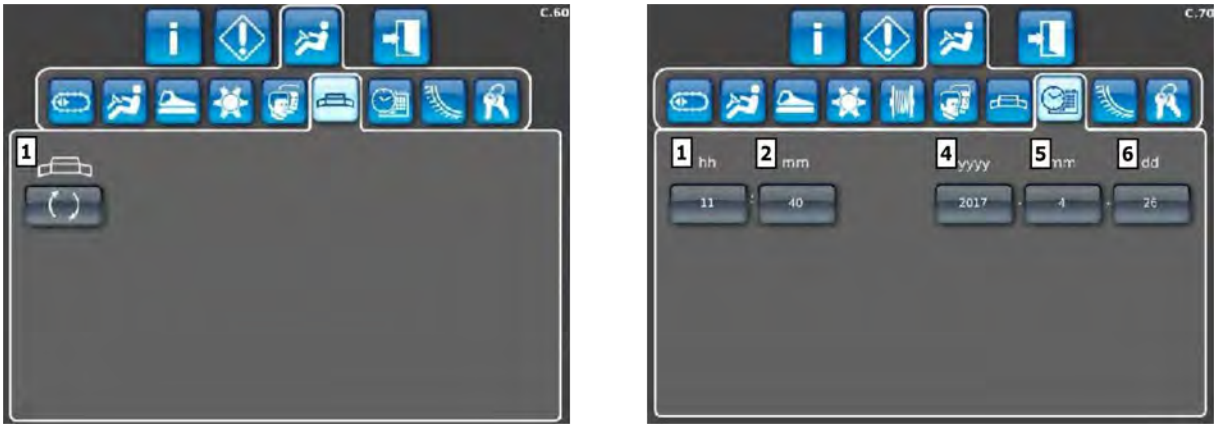


Figure 53: Front device selection (C.60) || Setting the date and time (C.70)

Pos.	Front device selection (C.60)
1	■ Front blade ■ Half pipe ■ Snow plough ■ Front winch ■ Front attachment OFF

Pos.	Setting the date and time (C.70)
1	Hours
2	Minutes
4	Year
5	Month
6	Day

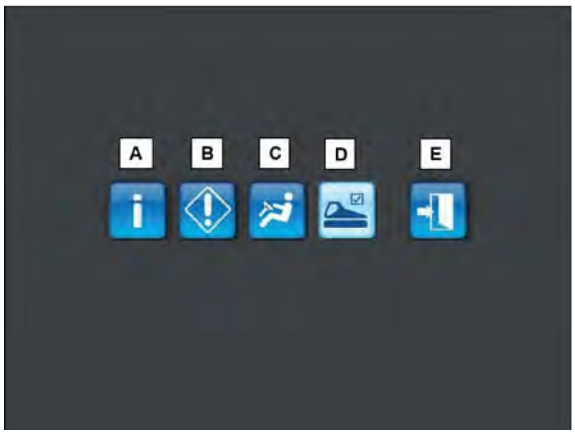
Figure 54: X Function (C.80) || Entering the password (C.90)

Pos.	X Function (C.80)
1	Driving direction
2	Covered distance
3	Distance measurement START/STOP
4	Distance set to 0 ON/OFF

Pos.	Entering the password (C.90)
	■ Press rotary pushbutton switch B118 ■ Turn rotary pushbutton B118 until desired position is marked

Pos.	X Function (C.80)	Pos.	Entering the password (C.90)
5	Set a distance		■ Press to confirm ■ Repeat this procedure for all other digits of the password ■ Turn rotary pushbutton B118 until ENTER is marked ■ Press to confirm ■ Turn rotary pushbutton B118 to exit the menu ■ Press to confirm ■ When changing to the next higher level, you will be asked whether the changed selection should be saved ■ Confirm by pressing or press the ESC key on keyboard A36
6	Acoustic signal when you reach the distance (5)		
7	Angle blade vertical		
8	Angle blade horizontal		
9	Angle blade set to 0 (in each postion possible)		
10	Angle vehicle vertical		
11	Angle vehicle horizontal		
12	Angle vehicle set to 0 (in each postion possible)		

6.5.4 Menu level "Password level 1"



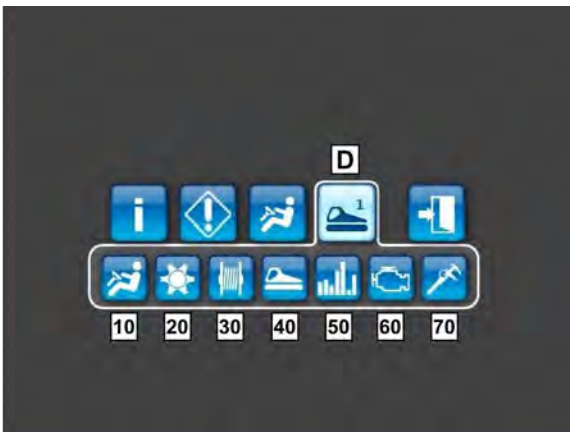


Figure 55: Main menu || Menu level "Password level 1" (D)

Pos.	Main menu	Pos.	Menu level "Password level 1" (D)
A	Information	10	Set vehicle handling
B	Service	20	Set the rear tiller
C	Operation	30	Set the winch
D	Password level 1	40	Set the vehicle
E	Exit	50	Statistics setting
		60	Engine settings
		70	Calibration

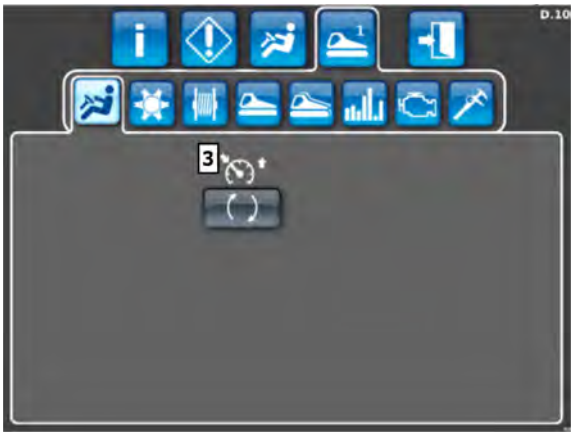


Figure 56: Vehicle handling settings (D.10)

Pos.	Vehicle handling settings (D.10)	Pos.	
3	Cruise control / Assisted drive mode ■  Assisted drive will not be disabled when driving backward ■  Assisted drive will be disabled when driving backward If the assisted drive has been activated with the combination accelerator pedal pressed + button on the keyboard, the assisted drive get disabled as soon as the accelerator pedal is touched again.		

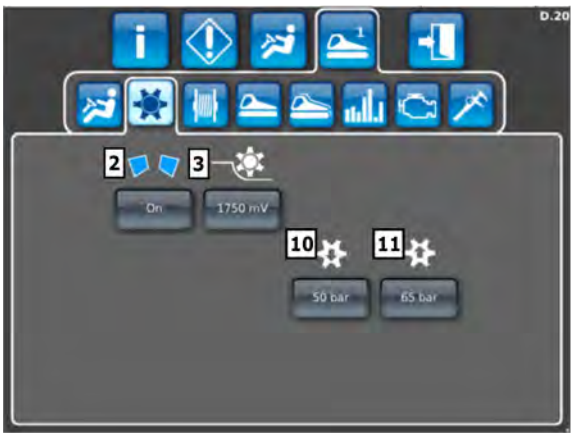


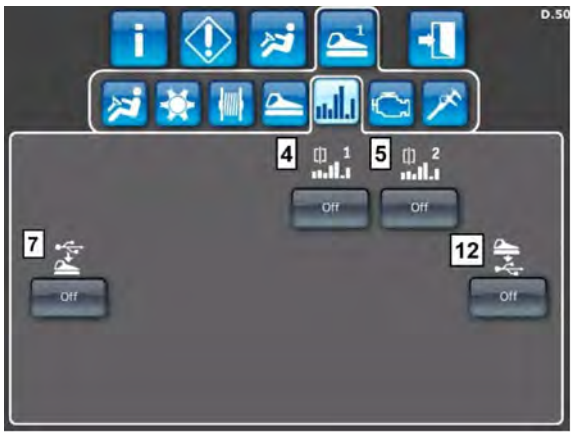
Figure 57: Rear tiller settings (D.20) || Rear tiller PF90 V3 settings (D.20)

Pos.	Rear tiller settings (D.20)	Pos.	Rear tiller PF90 V3 settings (D.20)
2	Tiller wings ON/OFF	7	Flat lock function 40% default
3	Presetting values for the depth of the tiller in millivolt (mV)	9	Lift timer option now in seconds
10	Downpressure **0-100 bar** (Default=**50 bar**)	10	Downpressure

Pos.	Rear tiller settings (D.20)	Pos.	Rear tiller PF90 V3 settings (D.20)
11	Counterpressure **0-100 bar** (Default=**65 bar**)	11	Counterpressure

Figure 58: AUTOMATIC winch settings (D.30) || Vehicle settings (D.40)

Pos.	AUTOMATIC winch settings (D.30)	Pos.	Vehicle settings (D.40)
2	Rope length (**0-1200 m**)	17	Winch - ON / OFF



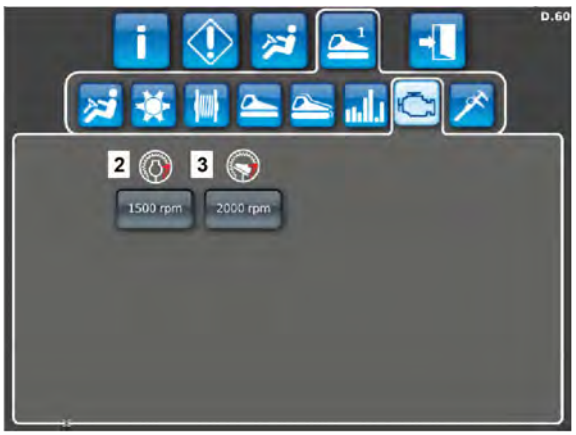
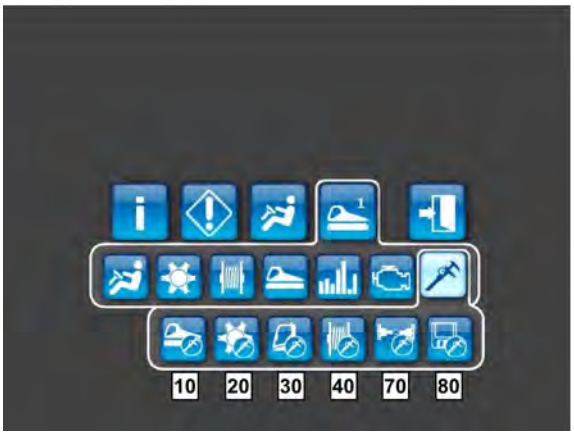


Figure 59: Statistics settings (D.50) || Engine settings (D.60)

Pos.	Statistics settings (D.50)	Pos.	Engine settings (D.60)
4	Statistic 1 to zero ON / OFF	2	Hand throttle potentiometer limitation (**800 - 2000 rpm**) (function only with brake applied)
5	Statistic 2 to zero ON / OFF	3	Accelerator pedal potentiometer limitation (**1500–2000 rpm**) (function only with brake applied)
7	Change standard parameters via USB stick ON/OFF		
12	Downloader (for parameter) ON / OFF Send parameter list and error log to USB port.		



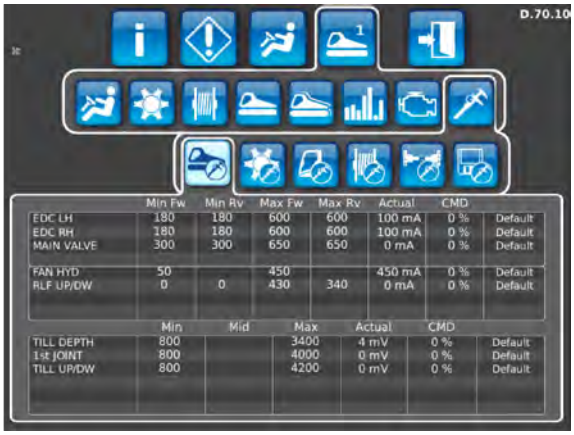


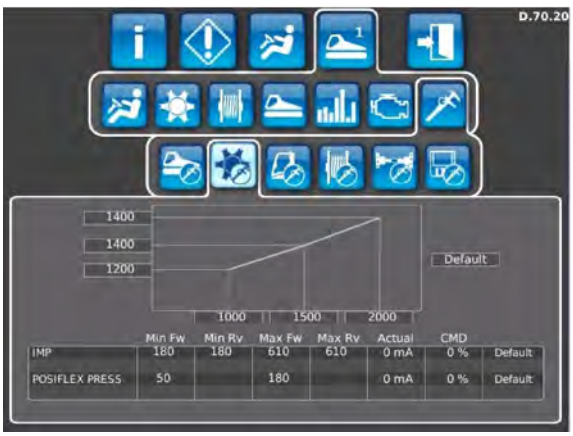
Figure 60: Calibration level (D.70) || Vehicle calibration (D.70.10)

NOTICE

Calibration

► May only be changed by trained service personnel. These changes may influence the driving characteristics.

Pos.	Calibration level (D.70)	Pos.	Vehicle calibration (D.70.10)
10	Vehicle calibration		
20	Rear tiller calibration		
30	Driver's cab calibration		
40	Winch calibration		
60	Front blade / rear tiller calibration		
70	Drive calibration		
80	Vehicle parameter overview		



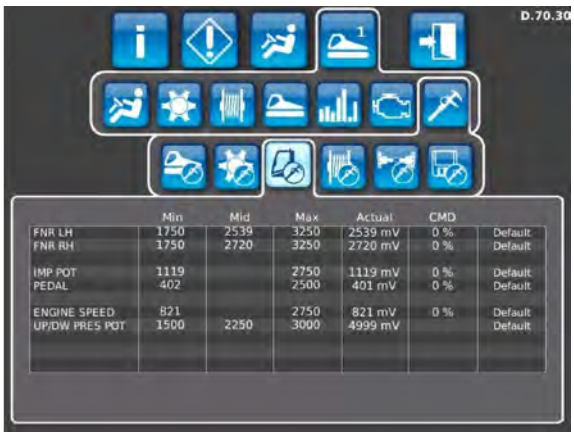


Figure 61: Rear tiller calibration (D.70.20) || Driver's cab calibration (D.70.30)

NOTICE

Calibration

► May only be changed by trained service personnel. These changes may influence the driving characteristics.

Pos.	Rear tiller calibration (D.70.20)	Pos.	Driver's cab calibration (D.70.30)

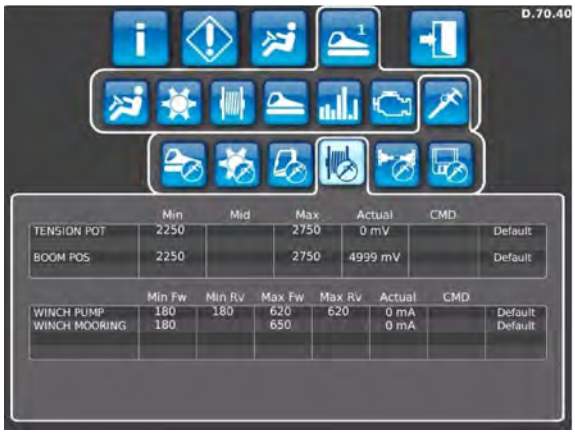


Figure 62: AUTOMATIC winch calibration (D.70.40) || drive calibration (D.70.70)

NOTICE

Calibration

► May only be changed by trained service personnel. These changes may influence the driving characteristics.

Pos.	AUTOMATIC winch calibration (D.70.40)	Pos.	Drive calibration (D.70.70)
		1	Remove tracks
		2	Engage the brake
		3	Set the diesel engine to idle speed
		5	The OK button appears only after both green checkboxes are visible.

Figure 63: Drive calibration (D.70.70) || Drive calibration (D.70.70)

NOTICE

Calibration

► May only be changed by trained service personnel. These changes may influence the driving characteristics.

Pos.	Drive calibration (D.70.70)	Pos.	Drive calibration (D.70.70)
1	Set both steering lever to neutral position	1	Leave the steering lever in the neutral position
2	Disengage the brake	2	Keep the accelerator pedal at max. speed during the calibration
3	The pump symbol appears only after both green checkboxes are visible. Click on the symbol.	3	If the accelerator pedal is released during the calibration, the calibration stops.

Figure 64: Drive calibration (D.70.70) || Vehicle parameter overview (D.70.80)

NOTICE

Calibration

► May only be changed by trained service personnel. These changes may influence the driving characteristics.

Pos.	Drive calibration (D.70.70)	Pos.	Vehicle parameter overview (D.70.80)
		1	Selection of the electronics - TTC94 / TTC60W
		2	Change the page
		3	Total Default Reset: resets all values to factory settings
		4	Partial Default Reset: resets all of the values taught by the driver to factory settings

Figure 65: Rear tiller operation (C.30 password level 1) || Information: engine (A.20 password level 1)

Pos.	Rear tiller operation (C.30 password level 1)	Pos.	Information: engine (A.20 password level 1)
9	Cutover for the actuation of down pressure/ counter pressure. ■  Actuation with the joystick (standard setting) ■  Actuation with the potentiometer (optional)	17	Time until the next regeneration

Figure 66: Automatic brake operation (C.15 password level 1)

Pos.	Automatic brake operation (C.15 password level 1)	Pos.	
7	Emergency mode steering lever ON/OFF - **50%** of the maximum vehicle speed		
8	Emergency mode accelerator pedal ON/OFF - **50%** of the maximum vehicle speed		

6.5.5 Software messages

Figure 67: Emergency OFF switch active message

This message appears when the Emergency OFF switch is pressed.

Figure 68: Wait to stop engine message

This message appears when the exhaust gas temperature is too high or the HEST lamp is on and the driver applies the parking brake or the Auto brake has been active for more than **30 s**.

See chapter "Regeneration" for more information about the HEST lamp ➳ *See "Regeneration" (p. 160)*

6.5.6 Inactivity alarm

The software monitors the activity on several controls while the vehicle operates: the steering levers, the joystick and certain potentiometers. To help lower the risk of accident if the driver falls asleep or is distracted while the vehicle is in motion, alarms and an automatic engine speed reduction will take place.

Figure 69: Icon and acoustic alarm triggered by lack of activity

The coffee cup icon appears and an acoustic alarm sounds when the assisted drive/cruise control function is engaged and the controls are not activated for a certain period of time.

- If the operator activates one of the controls monitored by the software, the alarm will stop and the icon will disappear.
- If the operator does not activate one of the controls, the engine speed will be reduced to idle after **5 s** and the vehicle will stop.

The inactivity alarm is only activated when the assisted drive/cruise control function is engaged.

7 Daily checks

7.1 Checking the snow groomer and attachments for irregularities

NOTICE

► If you detect any faults, damage, missing operating fluids, or potential electrical malfunctions, consult authorized PRINOTH maintenance personnel immediately.

► If secondary damage seems likely, put the vehicle out of service until the problem is corrected.

Everyday before starting the piste preparation, perform a visual inspection of the snow groomer. In particular, the parts, fluid levels, and functions mentioned in this chapter must also be checked.

- Checking components that contain fluids
  - All of the components on the snow groomer and its attachments that contain fluids (engine, hydraulic system, pump distributor gear, and final drive) must be checked for leak tightness in order to detect leaks as soon as possible.
    - Check the parts for leak tightness.
    - Correct any leaks immediately.
- Checking the electrical system
  - The electrical system, and particularly safety and warning devices, must be checked to ensure their functional reliability. If any malfunctions are found (fuses, relays, bulbs etc.), these must be corrected immediately.
    - Make sure the parts are working properly.
    - Address any problems immediately.
- Checking the batteries
  - Make sure that the batteries and their terminals are securely fastened.
- Checking the tracks

  Track tension affects the braking capacity of the vehicle.
  - Check the track tension.
  - Check the following parts for wear:
    - Crosslinks and track guides
    - Ice-gripping spikes (if installed)
    - Wheels
    - Sprockets
  - If necessary, replace missing locking pins or stop nuts on the attachments' bolts.
- Checking the front blade
  - Carry out a visual inspection.
  - Check the hydraulic connections.
  - Check that front blade/attachment frame connections are tight; tighten nuts if necessary.
- Checking the rear tiller and tiller shaft
  - Carry out a visual inspection.
  - Check the hydraulic connections.

- Check that rear tiller/attachment frame connections are tight, tighten nuts if necessary.
- Check welded tiller shaft teeth for wear.
- If there are damaged or bent teeth, use a welding torch to re-align and re-sharpen them.
- Replace broken or missing teeth and check the tiller shaft for imbalance.

7.2 Check fluid levels

There are several fluid levels that have to be checked every day before starting work on the ski slope. All fluid levels should only be checked with the snow groomer on level ground:

- Coolant level
- Engine oil level
- Hydraulic fluid level

7.2.1 Engine coolant level

⚠ WARNING

Burn hazard

- ► Never remove the coolant reservoir cap when the engine is hot.
- ► To avoid severe burns, do not inspect the coolant system or attempt to add coolant if the engine is hot.

NOTICE

Risk of damage to the engine
If the coolant level is low, the engine may overheat. This will cause damage to the engine.

- ► Repair any coolant leaks immediately.
- ► Observe the coolant change intervals.
- ► Only use the specified coolant.

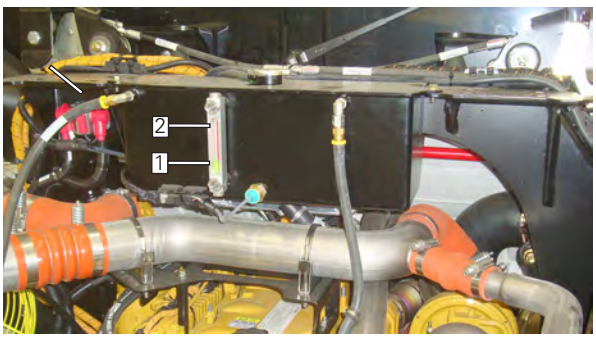


Figure 70: Engine coolant reservoir

Pos.	Name
1	Engine coolant low level on sight glass
2	Engine coolant high level on sight glass

The engine coolant reservoir and sight glass are located under the central access panel of the rear cowling.

- Check engine coolant level daily.
- At ambient temperature (cold fluid), the coolant level should reach the “LOW” mark on the sight glass.

- Top up with recommended fluid if level is low. Ensure the coolant temperature is cool before opening the cap. The cap is located on top of the reservoir and is accessible through a cavity on top of the rear cowling.

7.2.2 Engine oil level

⚠ CAUTION

Burn hazard
Fluids and hot components may cause injury

- ► Switch off the engine and wait for it to cool down.
- ► Never open or remove the oil filler cap while the engine is still hot.
- ► Keep a safe distance.

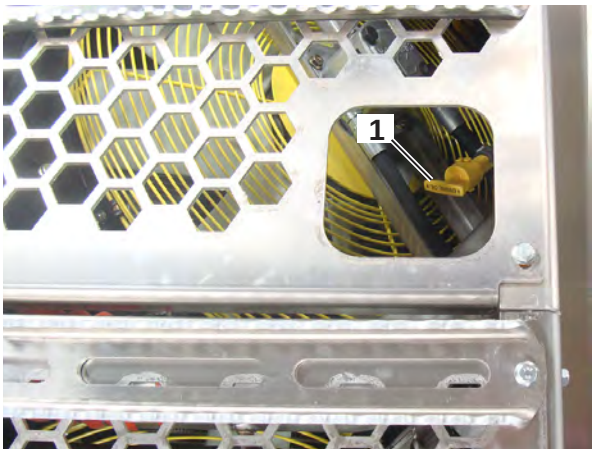


Figure 71: Engine oil dipstick

Check oil level daily when the engine is cool. Allow **30 min** between engine stop and oil level check.

1. To access the oil dipstick, reach through the round opening in the central access panel of the rear cowling or open the panel.
2. To unlock the dipstick, push the yellow handle and turn it a quarter of a turn counterclockwise.
3. Check oil level: The oil level should always remain within the high and low marks on the dipstick.

Top up with recommended oil if level is low. Do not overfill. Always use specified oil.

7.2.3 Hydraulic oil level

NOTICE

- ► Retraction or extension of any cylinder on the vehicle will change the quantity of oil in the reservoir.

Figure 72: Sight glass of the hydrostatic oil reservoir

The hydraulic tank is located under the loading platform or rear cover. The oil level should be checked daily.

- For an accurate reading, ensure the push frame at the front and the rear lift frame are on the ground.
- The oil level should be at or slightly above the “LOW” mark on the sight glass.
- Top up with recommended oil if level is lower than recommeded.

7.2.4 Pump drive oil level

NOTICE

► The level must be between the marks of the dipstick at ambient temperature, preferably near the “MAX” mark. Top up with recommended oil if level is low.

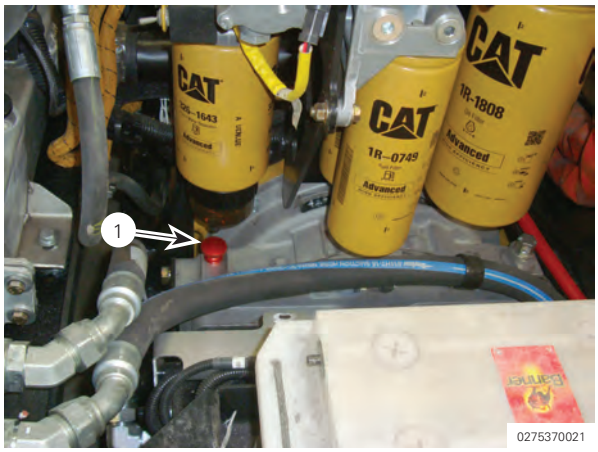


Figure 73: Dipstick on pump drive

Check oil level daily. Access the oil dipstick under the central access panel of the rear cowling. To check the oil level perform the following:

1. Unscrew and pull out the dipstick;
2. Using a clean rag, wipe oil from the dipstick;
3. Insert the dipstick back in the receptacle, until the dipstick threads contact the orifice edges on the housing. Do not screw it in;
4. Pull it out again slowly and check the level.

5. Insert the dipstick and screw it in the receptacle.

7.2.5 Primary fuel filter/ water separator

NOTICE

Environmental protection
Spilling fuel could harm the environment.

► Use a recipient to collect water and fuel, stop drainage as soon as the clear bowl is empty of water.

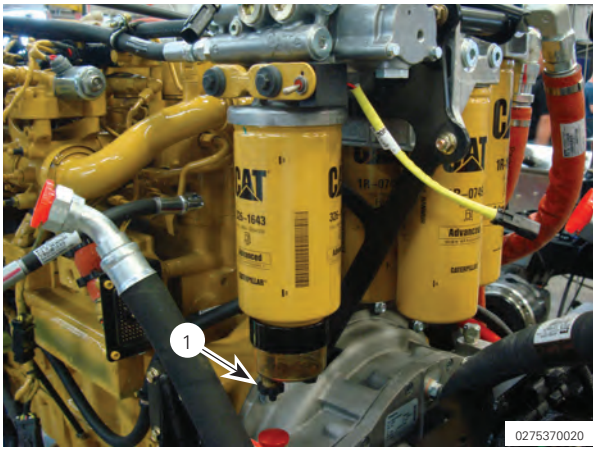


Figure 74: Drain valve of the fuel filter/water separator

The fuel filter/water separator can be found under the central access panel of the rear cowling.

- Check for presence of water daily.
- **NOTICE**

  ► Water is heavier than fuel and will flow to the bottom of the clear bowl.

  If water is detected in the clear bowl, position a recipient under the valve and turn the valve knob to drain the water. Return the valve knob to its original position once water is drained.

8 Driving

Observe the general safety regulations before and when using the snow groomer. ➠ *See "Safety" (p. 19)*

8.1 Before startup

⚠ CAUTION

Danger of slipping, falling, and injury
Due to snow and ice on the entrance / exit surfaces, or due to slipping on smooth areas

- ► Wear suitable shoes with non-slip soles.
- ► Use access aids when getting in or out.

NOTICE

Risk of damage to the engine
The engine may be damaged if the coolant temperature is too low.

- ► Ensure a minimum temperature of **60 °C** (140 °F) before placing the engine under load.

⚠ WARNING

Dangerous situations during ski slope preparation:

- ► To avoid accidents, take the utmost care when driving on steep, icy or unfamiliar ground.
- ► Unfamiliar or snow-covered ground can cause the driver to inadvertently leave the intended path and may conceal unexpected dangers.
- ► Before crossing a frozen lake or waterway with the snow groomer, ensure that the load bearing capacity of the ice is sufficient.
- ► It is absolutely forbidden to drive on marshy ground or areas subject to landslip.
- ► Do not fill the fuel tank while the engine is running.
- ► Keep open flames and sparks as far away as possible from the fuel. Do not smoke!

Before starting the snow groomer, the driver should check around the vehicle to make sure there are no people or obstacles in the hazard area. The driver should also check the parking area for any traces of fluids that have come from the vehicle or the attachments.

Apart from that, the following points should be remembered:

- ■ The daily checks and maintenance operations must be carried out.
- ■ When preheating or parking the snow groomer, leave the engine running only if the vehicle is supervised by the person responsible.
- ■ The vehicle should never be parked in enclosed spaces (e.g. a garage) where there is no aeration/ventilation system.
- ■ Before switching on the windscreen wipers, make sure that they are not frozen fast on the windscreen. Do not use the windscreen wipers when the windscreen is dry.
- ■ Make sure that the rotating beacons are switched on.
- ■ Before starting to work, close the cab doors and fasten the safety belts.

If there are any unauthorised personnel in the working area, remember the following points:

- ■ Do not use the attachments (front blade, rear tiller, half-pipe tiller, etc.).
- ■ Do not use the rear tiller's tiller shaft and do not reverse.

- If the vehicle must be used where there are people present, keep a safe distance, and switch on the warning devices and lighting system (headlamps, work lamps, rotating beacons).
- If there is a danger of injury to people, the driver must immediately alert them of the fact that the snow groomer is operating in their area.

8.2 Preheating system

Figure 75: Right maintenance flap

Pos.	Name
1	Preheating system connection (110/220 V)

■ Function

The preheating system makes it easier to start the engine even at extremely low outdoor temperatures.

The preheating system consists of two electric heating rods:

- heating rod in the engine block
- heating rod in the hydraulic oil tank

NOTICE

Risk of engine damage
The engine may be damaged if the coolant temperature is too low.

► Use the preheating system at an ambient temperature below freezing point.

8.2.1 Pre-heating

NOTICE

► Before getting into the driver's cab, check whether the preheating system cable has been disconnected from the mains.

The preheating system must be connected to the mains supply (110/220 V) to preheat the engine block and the hydraulic fluid.

- The preheating system must be connected to the provided connection (1) using an automatic fuse.
- Coloured connectors differentiate the mains electricity (110/220 V):
  - Yellow plug = mains supply 110 V
  - Blue plug = mains supply 220 V

8.3 Parking brake

Figure 76: Rocker switches on the control console

Pos.	Name	Description
1	S62 Rocker switch: Parking brake	Use the rocker switch (1) to activate the parking brake: ■ Press rocker switch down = parking brake ON ■ Press rocker switch up = parking brake OFF

■ The vehicle is equipped with a parking brake:

- Do not apply the parking brake until the vehicle has come to a complete stop.
- Never use the parking brake switch as a normal brake when the vehicle is moving. This could result in the driver losing control of the vehicle.
- Only use the parking brake or Emergency OFF switch in emergency situations when abrupt braking (a sudden stop) is absolutely necessary.

The snow groomer will lose its capacity to brake in the following conditions:

- The snow groomer has no tracks mounted.
- The tracks are slack (thus not properly tensioned).

8.4 Starting the engine

NOTICE

Tips for engine start

► Before starting in low outside temperatures, switch off all consumers of electrical power.

► Do not press the accelerator pedal when starting.

► Do not attempt to start the engine longer than **30 s** without interruption. If the engine does not start at the first attempt, wait for **120 s** before trying again so the batteries can refresh.

► Do not use the pre-heater function more than once.

NOTICE

Risk of engine damage

The turbocharger will be damaged if engine speed exceeds **1000/min** before the engine oil pressure gauge has reached **1,4 bar**.

► Never exceed **1000/min** when starting the engine.

Starting a warm engine

When at operating temperature, start the engine as follows, in any outside temperature:

1. Press the parking brake toggle switch to activate the parking brake.
2. Set both steering levers, rotary control for manual engine speed setting and the accelerator pedal to the zero position.
3. Turn ignition switch to position 2.
4. Turn the ignition switch to position 3 until the engine begins to run on its own power.
5. As soon as the engine is running on its own power, release the ignition switch.

Starting a cold engine

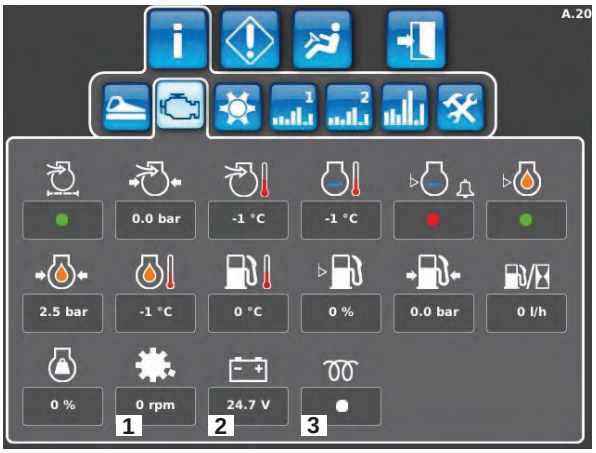
NOTICE

Risk of damage to the engine and hydraulic system
Damage may occur if the engine and hydraulic system are taken immediately to high rotational speeds from cold.

- ► Do not bring the engine up to high rotational speeds immediately.
- ► Before starting work, operate the attachments and hydraulic cylinders for a short time so that the hydraulic fluid can warm up in these circuits.

1. Press the parking brake toggle switch to activate the parking brake.
2. Set both steering levers, rotary control for manual engine speed setting and the accelerator pedal to the zero position.
3. Turn the ignition switch to position 2: on the main page of the display, the indicator for preheat monitoring is continuously illuminated yellow while the engine assisted starting is activated.

4. If the temperature is below **-10 °C** (+14 °F) and the vehicle is over **2500 m** (8000 ft) of altitude, go to page A.20 and monitor the following parameters to facilitate the cold start :



- □ Battery voltage (2) should be near **24 V**.
- □ Engine preheat indicator (3) is green while the preheat is activated.
- □ Engine preheat indicator (3) turns to white (preheat time can vary depending on the outside temperature).

5. Wait for the indication of the preheat system (3) to turn white.

6. Turn the ignition key to position 3 until the engine begins to run on its own power.
   Monitor the rotational speed (1) while the starter cranks the engine (minimum average cranking speed should be **100 rpm** to get engine start). If the engine does not reach **100 rpm** after **10 s**, stop cranking and install a booster pack to assist starting. If the engine does reach **100 rpm**, do not crank for more than **30 s**. Wait **5 min** before the next attempt.
7. As soon as the engine is running under its own power, release the ignition switch.
   Ignition key should be released when the engine reaches a minimum of **400 rpm**.
8. Wait until the engine reaches at least **800 rpm** before activating any component that apply an electric load to the engine/alternator.
   Let the vehicle warm up until the blue engine icon disappears on the main screen of the display ➠ *See "Indicators and controls on the display" (p. 77)*.

8.5 Shutting down the engine

NOTICE

Avoid premature wear

► Engine and lubricant life will be shortened if the engine is not properly cooled before shutdown. Allow the engine to run at idle speed for **5 min**to allow a gradual and uniform cooling.

⚠ WARNING

Accident hazard

► Never shut down the engine while the vehicle is in motion. Loss of control could occur. Stop the vehicle completely and apply the parking brake before shutting down the engine.

NOTICE

Risk of damage to the aftertreatment system

► Shutting down the engine when the "Wait to stop engine" popup is visible, can damage the aftertreatment system, and if shut down too many times, the warranty of aftertreatment components will be lost.

Stopping the engine applies the brakes instantly. Ensure the vehicle is immobilized before shutting down the engine.

Before shutting down the engine, perform the following:

1. Perform a complete stop of the vehicle.
2. Engage the parking brake.
3. If not already done, deactivate the equipment (if installed).
4. Turn rpm to idle to cool down the turbo. Let the engine run at idle for a few minutes.
5. Check the LCD display before turning off the engine. If the following popup (1) is visible, leave the engine running until it disappears.
   See chapter "Software messages" for more information about the popup ➠ *See "Software messages" (p. 104)*

6. Turn the key in the ignition switch to the “off” position.

8.6 Establish snow groomer standby

Prerequisites

- To prevent the vehicle from being set in motion unintentionally by the engine, the snow groomer standby must also be activated for the vehicle's operational readiness.
- Snow groomer standby can only be switched on under the following conditions:
  - The engine is running.
  - Both cab doors are closed.
  - The Emergency OFF switch is released.
  - The left steering console is down.
  - The steering levers are in the zero position.
  - The rotary switch for the engine speed setting is at zero.
- In the following conditions, snow groomer standby is switched off automatically and must be switched on again:
  - The engine has been switched off.
  - One of the cab doors has been opened.
  - The Emergency OFF switch has been pressed.
  - The left steering console has been raised.

Before starting off, the driver must make sure that there are no people or obstacles within the swivel range of the vehicle and/or the tracks. Driver and passenger must always fasten their safety belts.

- Use rocker switch S62 (1) on the control console to activate snow groomer standby:
  - Press rocker switch upwards = snow groomer standby ON
  - Press rocker switch downwards = snow groomer standby OFF

8.7 Driving with steering levers

⚠ WARNING

Risk of skidding
The snow groomer will change direction abruptly if the control lever is suddenly moved which may cause the driver to lose control of the snow groomer.

- ► It is essential for the driver to be familiar with driving and steering the snow groomer before preparing a ski slope.
- ► Never brake abruptly when descending a slope.
- ► Avoid uncontrolled manoeuvres at high vehicle speed.
- ► Both driver and passenger should always fasten their safety belts.

- Steering
  - To change the direction of travel, select the appropriate position of the steering levers. *See "Steering lever operation" (p. 117)*
- Brakes

The hydrostatic drive system acts as a brake, and slowly decelerates the snow groomer to a stop:

- To brake the vehicle, slowly push both steering levers to neutral position or gradually release the foot from the accelerator pedal.

- Driving forwards / backwards

Operating the accelerator pedal increases the speed of the engine and sets the snow groomer in motion. In order to reduce the speed and stop the snow groomer, gradually release the foot from the accelerator pedal. The engine speed and vehicle speed are reduced and the snow groomer comes to a halt. That way, the snow groomer slows down due the engine's braking effect only.

On steep slopes, when parking or during emergency braking, the parking brake must be activated by pressing the Emergency OFF switch.

To drive at reduced speed without reducing the engine speed, the vehicle speed rotary switch on the joystick can be used to bring down the forward or reverse ground speed until the vehicle comes to a standstill. This is suitable, for example, when working with the snow plough.

The warning buzzer and rear work lamps are automatically activated for reverse travel.

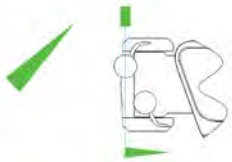
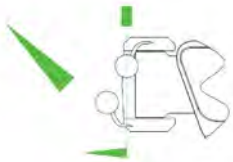
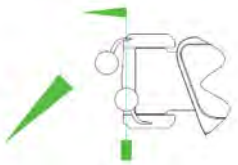
- To move forwards, push both control levers from the zero position to the front at the same time.
- To move backwards, pull both control levers from the zero position to the back at the same time.

- The following points must also be observed when reversing:
  - When reversing, take care to prevent the snow groomer from colliding with a snow wall.
  - Never reverse while automatic raising of the rear attachment is switched off.
  - Reversing is only to be used after the vehicle has been brought to a complete standstill. The rear attachment is automatically raised and the cutter shafts are stopped.

For night operations in populated areas, the warning buzzer can be temporarily switched off. The deactivation can be performed in the menu. Only use this function if special circumstances require it. If the warning buzzer is deactivated, pay particular attention that no persons are in the travel area of the snow groomer.

8.7.1 Steering lever operation

Lever movement	Function
A 	Left steering lever backward, right steering lever forward = Turn to the left around vehicle vertical axis
B 	Left steering lever forward, right steering lever backward = Turn to the right around vehicle vertical axis

Lever movement	Function
C 	Left steering lever backward, right steering lever in neutral position = Right turn in reverse
D 	Left steering lever in neutral position, right steering lever backward = Left turn in reverse
E 	Left steering lever forward, right steering lever in neutral position = Right turn forward travel
F 	Left steering lever in neutral position, right steering lever forward = Left turn forward travel
G 	Both steering levers backward = Straight reverse
H 	Both levers forward = Straight forward travel
I 	Both levers in neutral position = Standstill

8.8 Driving with the engine speed potentiometer

The engine speed potentiometer allows the driver to determine the desired engine speed and to select the speed as well as the steering via the steering lever.

This function is available in forward and reverse travel.

NOTICE

► Even when the speed is set with the engine speed potentiometer, the driver remains responsible for operating the vehicle in a safe and appropriate manner.

NOTICE

Vehicle standstill
Please note, particularly in hazardous situations, that the vehicle can be brought to a standstill as follows when the engine speed potentiometer is active:

► Turn the engine speed potentiometer counter-clockwise to MIN.
► Put the steering levers in neutral position.

The engine speed potentiometer is located on the control console.

- Turn the engine speed potentiometer clockwise = increase the speed (continuously variable up to MAX)
- Turn the engine speed potentiometer counter-clockwise = decrease the speed (continuously variable down to MIN)

8.9 Controlling front attachments

- Front blade
  - **NOTICE**

    Risk of contact
    Due to the large working range of the front blade, it may hit the outside mirror or the driver's cab itself.

    ► Apply the utmost caution when moving the front blade, snow plough or loader.

    The front blade attached at the front is controlled using the joystick.

    □ Used along with the push-button switches on the joystick, all the available attachment functions can be performed with one hand. The individual functions of each of the push-button switches depend on the type of equipment and can therefore vary.
- Snow plough (optional)

- ⚠ **WARNING**

  Risk of projection
  There is a risk that stones and/or other objects under the snow can be thrown up into the air, and these could cause physical injury to people and/or damage to property.

  ► Make sure that no one is standing within a radius of at least **50 m** (164 ft) around the snow plough while the engine is running.

  NOTICE

  Correct operation

  ► In case of strong, steady winds, it is advisable to only plough the snow in such a way that it is not directed against the wind.

  ► Drive at low speed when changing locations (e.g. from garage to work area), as the snow plough is heavier than the front blade.

  The snow plough can be used only if the snow groomer standby is activated. If the snow groomer is fitted with a snow plough, the push-button A36/17 is used to switch between the plough and the rear tiller. ➽ *See "Keyboard 1" (p. 56)*

- A snow plough cannot be used at the same time as the rear tiller. If the snow plough is used at increased engine speed (approx. **1600 rpm**) and low vehicle speed, adjust rotary control P. ➽ *See "Joystick" (p. 60)*

Front bucket loader (optional)

- When the front blade is mounted, a bucket can be used to load and relocate snow. With the bucket open, compact the snow with the front blade, then close the bucket. When loading snow, the front blade must be raised along with the bucket.

8.10 Controlling rear attachments

⚠ **WARNING**

Risk of accident
If any people or obstacles are located in the work area around the rear tiller, this can result in a serious accident.

► Take particular care to ensure that no persons or obstacles are present in the work area around the rear tiller.

Operating the rear tiller

The cutter shaft stops automatically when one of the following functions is selected:

- Rear attachment raised
- Reverse Motion
- Switching off the operational readiness of the attachments
- The rear articulated arm and rear tiller are moved using the joystick. ➽ *See "Joystick" (p. 60)*
  - Used along with the push-button switches on the joystick, all the available attachment functions of the rear attachment can be performed with one hand. The individual functions of each of the push-button switches depend on the type of equipment and can therefore vary.
  - When the rear attachment is raised, it automatically moves into centred position.
  - When reversing, the rear attachment is raised and centred automatically, and the tiller shafts are stopped.

The automatic raising of the rear attachment can be switched off, e.g. for the mounting work. The deactivation can be performed in the menu. The deactivation is signaled audibly by a warning tone.

- Setting the tiller shaft speed
  - Set the cutter shaft speed with the rotary control (P).
    The selected cutter shaft speed is shown on the display. *See "Menu level "Operation"" (p. 93)*
- Setting the cutting depth
  - The cutting depth is set using push-button S1 and button T on the joystick.
    The selected cutting depth is shown on the display. *See "Menu level "Operation"" (p. 93)*
- Set the floating position / counter pressure / contact pressure
  - Press push-button S5 repeatedly to select the cutting mode (floating position/counter pressure/ contact pressure).
    - □ The selected mode is shown on the display.
    - □ If a setting is changed, it is saved until the engine is switched off.
- Select the tiller shaft direction of rotation
  - The push-button A36/17 on keyboard 1 is used for selecting the tiller shaft direction of rotation. *See "Keyboard 1" (p. 56)*
- Operating the side wings
  - The side wings are operated with the switches RS1/RS2 on the joystick.
    When the side wings are lowered, a time cycle is started, which repeats the action (lowering) for **4 s** every **30 min**.
- Snow chamber position indicator stick (Posiflex tiller only)
  - The snow chamber is operated with the switches S1 and T (up/down) on the joystick.
    When the snow chamber is closed, the orange indicator stick on the tiller is vertical. When the snow chamber is opened, the indicator stick on the tiller is tilted toward the rear. Middle positions indicate that the snow chamber is partly closed or partly opened.

9 Attachments

9.1 Establish operational readiness of the attachments

The operational readiness of the attachments must be expressly activated so that the attachments cannot be inadvertently set in motion by the engine.

The operational readiness of the attachments can only be switched on under the following conditions:

- The engine is running.
- Both cab doors are closed.
- The Emergency OFF switch is released.

After the following situations, the operational readiness of the attachments is switched off automatically and must be switched on again:

- The engine has been switched off.
- One of the cab doors has been opened.
- The Emergency OFF switch has been pressed.

- Use rocker switch (2) on the control console to activate/deactivate the operational readiness of the attachments:
  - Press rocker switch upwards = operational readiness of attachments ON
  - Press rocker switch downwards = operational readiness of attachments OFF

9.2 Front blade

9.2.1 Adjusting the park pusher frame

⚠ CAUTION

Pinch point hazard
The roll cylinder is heavy, install a support before removing the holding pin.

► Use the appropriate tools to manupulate the cylinder and avoid back injuries

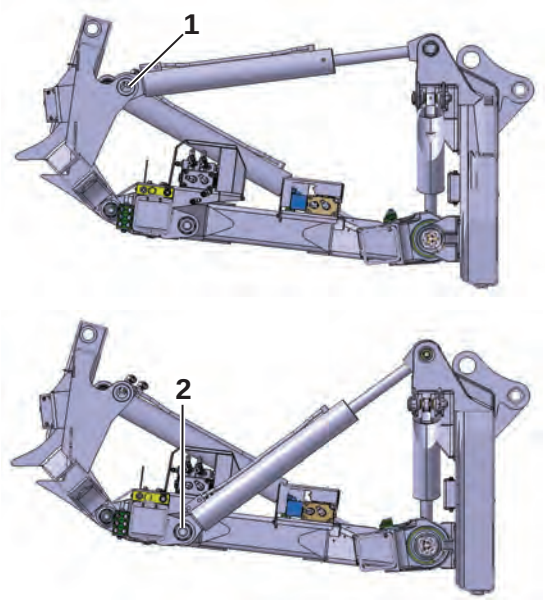


Figure 77: Cut out view of the park pusher frame mounting positions

Pos.	Name
1	Free grooming position (roll cylinder in the upper position)
2	Park position (roll cylinder in the lower position)

The pusher frame is mounted between the snow groomer and the blade.

The top cylinder can be mounted to the upper attaching point on the vehicle frame (1) or on the lower attaching point on the pusher frame itself (2):

It is recommended to use the roll cylinder in the free grooming position (1) for normal grooming activities. The park position of the roll cylinder (2) is more convenient when pushing snow to build a snow park.

9.2.2 Mounting the front blade

⚠ CAUTION

Pinch point hazard
When moving the snow groomer up to the front blade.

► Keep the danger zone clear of personnel.

NOTICE

Risk of damage to the hydraulic system
Even the smallest particles of dirt or impurities getting into oil the when connecting the front attachments can cause damage to the hydraulic system.

► Attachment mounted: store the protective caps in the driver's cab's tool compartment.
► Attachment not mounted: cover the quick-connect couplings with clean protective caps.

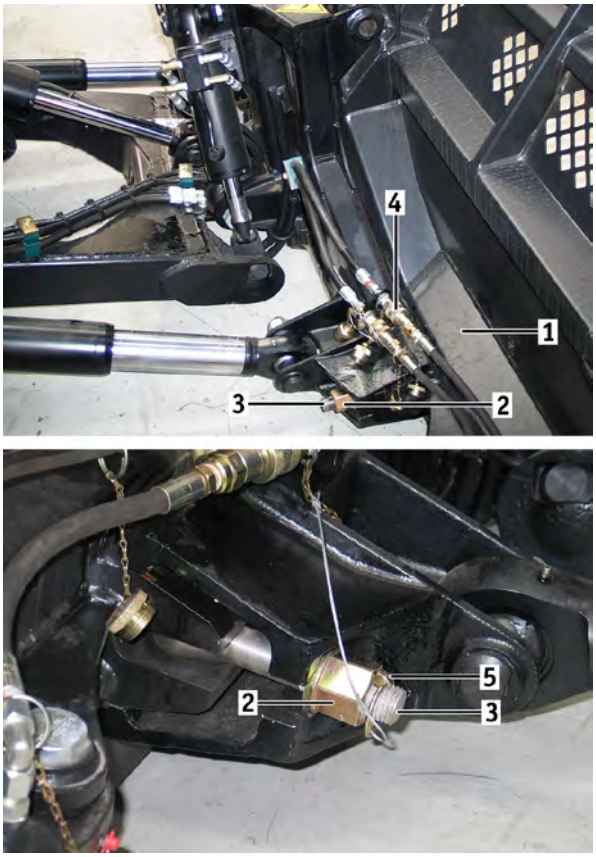


Figure 78: Front blade with quick-connect coupling

Pos.	Name
1	Front blade
2	Nut
3	Threaded rod
4	Hydraulic quick-connect couplings
5	Locking pin

The front blade is mounted on the pusher frame at the front of the snow groomer by means of quick-connect couplings:

1. Clean contact surfaces between the front blade and the quick-connect coupling.
2. Grease the coupling points on the top and bottom.
3. Loosent the front blade (1), nut (2) all the way to the stop.
4. Turn the two threaded rods (3) outwards to the stop.
5. Slowly bring the snow groomer up to the front blade (1).
6. Connect the front blade at the top.
7. Slightly raise the front blade and check if it is properly connected to the mounting point.
8. Turn the two side threaded rods (3) inwards.
9. Screw the nuts (2) onto the threaded rods (3) and torque to **600 Nm** (440 ft-lb) and secure with locking pin (5).
10. Clean the bolt fittings.
11. Connect the hydraulic hoses according to their colors.
12. Attach the quick-connect couplings and tighten the kurled nut with a spanner to **20 Nm** (15 ft-lb).

13. Make sure the hydraulic hoses are correctly routed.
14. Check the hydraulic hoses and bolt fittings for leaks; investigate any oil leak immediately.

9.2.3 Installing and stowing the side cutters

The side cutters are to be installed as follows:

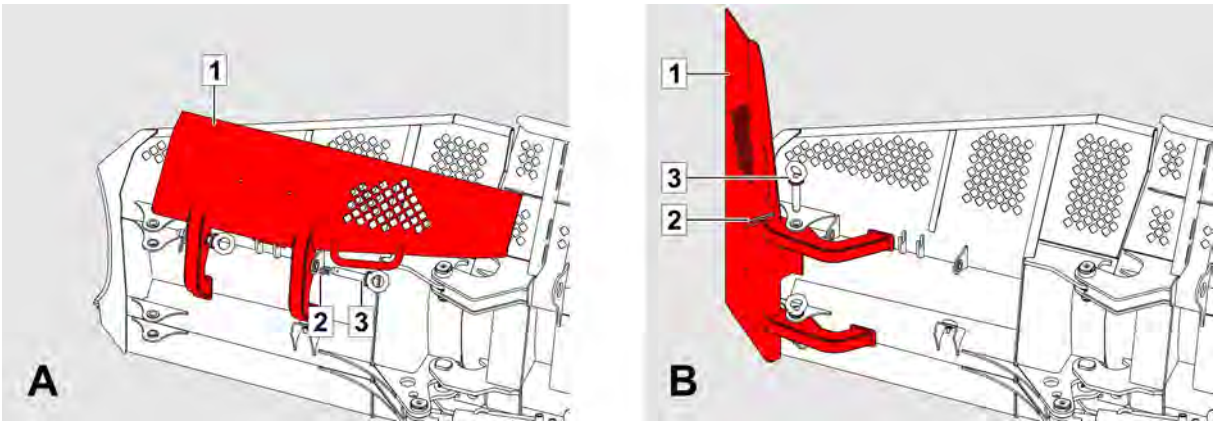


Figure 79: Park blade with side cutter

Pos.	Name
1	Side cutter
2	Locking pin
3	Bolt
A	Stow position
B	Work position

1. Lower the front blade to the ground and turn off the engine.
2. Remove the locking pins (2) from the bolts (3).
3. Hold the side cutter (1) and remove the bolts (3) locking the side cutter to the brackets of the stow position (A).
4. Position the side cutter vertically at the extremity of the blade wing in the brackets of the working position (B).
5. Insert the bolts (3) in the brackets. Secure with the locking pins (2).
6. Install the other cutter the same way.

9.3 Rear tiller

9.3.1 Mounting the POSIFLEX tiller

⚠ CAUTION

Risk of crushing
When moving the snow groomer up to the rear tiller.

► Keep the danger zone clear of personnel.

NOTICE

Risk of damage to the hydraulic system
Even the smallest particles of dirt or impurities getting into oil the when connecting the rear attachment can cause damage to the hydraulic system.

► Attachment mounted: store the protective caps in the driver's cab's tool compartment.
► Attachment not mounted: cover the quick-connect couplings with clean protective caps.

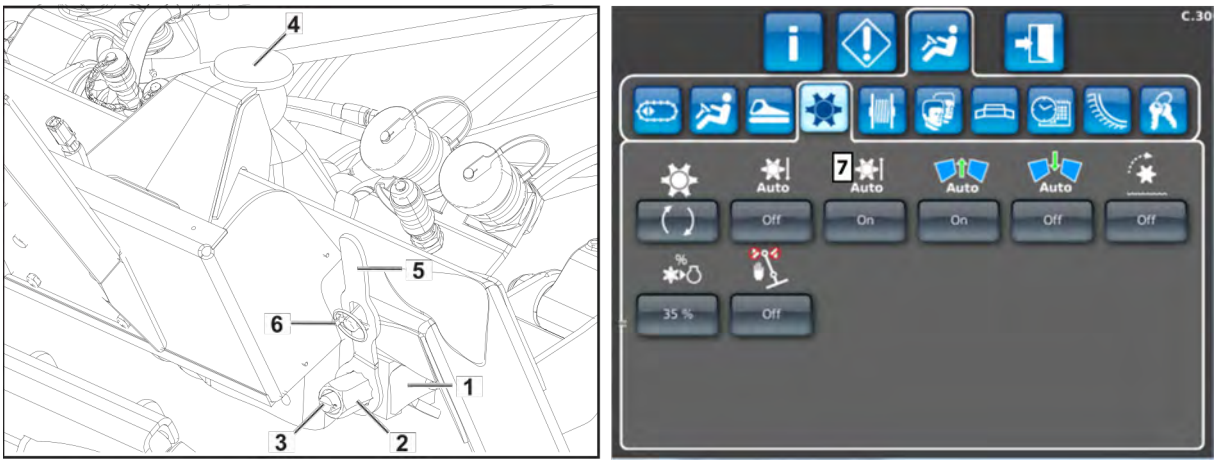


Figure 80: Mounting the rear tiller

Pos.	Name
1	Articulated arm
2	Nut
3	Threaded rod
4	Top coupling point
5	Tool
6	Locking pin
7	Automatically raise rear tiller when reversing ON/OFF

The rear tiller is mounted on the rear of the snow groomer using quick-connect couplings:

1. Clean the contact surfaces between rear tiller and quick-connect coupling.
2. Grease the top coupling point (4).
3. Loosen the nuts (2) on the articulated arm (1) all the way to the stop.
4. Deactivate the function "Automatically raise rear tiller when reversing" (OFF) in the menu (7).
5. Leave the menu and confirm the selection.

6. Press the Operational readiness of the attachment switch (S85) to "ON". ➳ *See "Control console" (p. 52)*
7. Drive the snow groomer slowly up to the rear tiller.
8. Connect the rear tiller at the top (4).
9. Slightly raise the rear tiller using button (T) and push-button switch (S1) and check if articulated arm pivot is properly connected to the mounting socket. If necessary, move the link arm to the left or right to facilitate mounting.
10. Make sure the rear tiller is correctly engaged.
11. Tilt both threaded rods (3) to secure the tiller to the articulated arm pivot (1).
12. Tighten both nuts (2) with the tools (5) supplied to **400 Nm** ((295 ft-lb)).
13. Secure both nuts (2) using the tools (5) supplied and the locking pins (6).
14. Reactivate the function "Automatically raise rear tiller when reversing" (ON) in the menu (7).
15. Leave the menu and confirm the selection.
16. Press the Operational readiness of the attachment switch (S85) to "OFF". ➳ *See "Control console" (p. 52)*

9.3.2 Mounting the POWER tiller with an adaptor

⚠ CAUTION

Risk of crushing
When moving the snow groomer up to the rear tiller.

► Keep the danger zone clear of personnel.

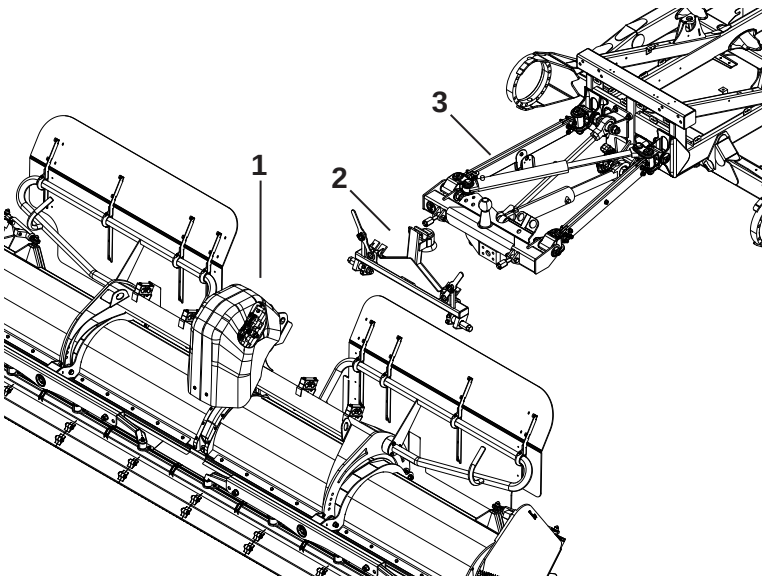


Figure 81: Adaptor between Power tiller and rear lift frame

Pos.	Name
1	POWER tiller
2	Adaptor
3	Rear lift frame of the vehicle

NOTICE

Risk of damage to the hydraulic system

Even the smallest particles of dirt or impurities getting into the oil when connecting the rear attachment can cause damage to the hydraulic system.

- ► Attachment mounted: store the protective caps in the driver's cab's tool compartment.
- ► Attachment not mounted: cover the quick-connect couplings with clean protective caps.

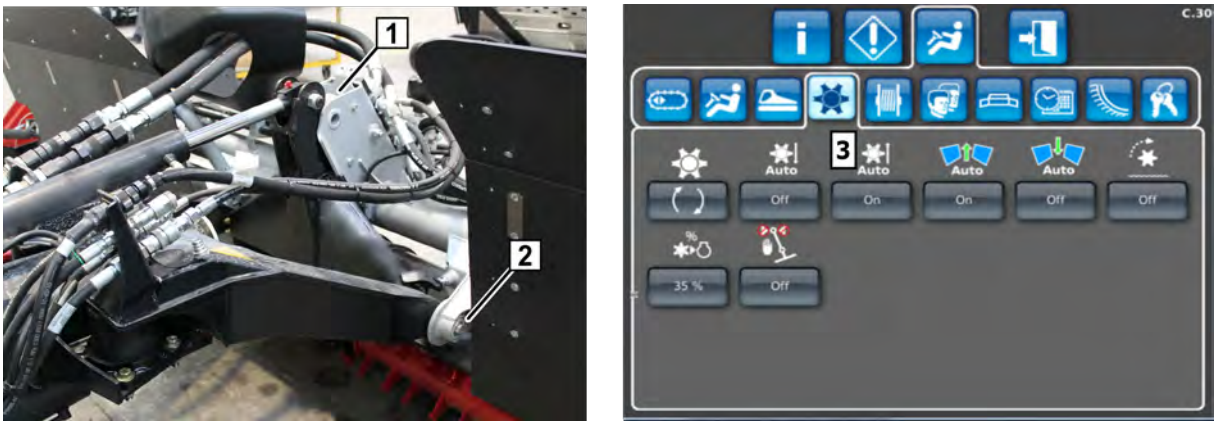


Figure 82: Quick-connect coupling / rear tiller operation (C.30)

Pos.	Name
1	Articulated arm with pivot
2	Screw bolt
3	Automatically raise rear tiller when reversing ON/OFF

The rear tiller is mounted on the rear of the snow groomer using quick-connect couplings:

1. Clean the contact surfaces between rear tiller and quick-connect coupling.
2. Grease the top coupling points.
3. Remove the screw bolts (2) of the quick-connect coupling.
4. Deactivate the function "Automatically raise rear tiller when reversing" (OFF) in the menu.
5. Leave the menu and confirm the selection.
6. Press the switch (8) to "ON". ➽ *See "Control console" (p. 52)*
7. Drive the snow groomer slowly up to the rear tiller.
8. Connect the rear tiller at the top.
9. Slightly raise the rear tiller using button (T) and push-button switch (S1) and check if articulated arm pivot is properly connected to the mounting socket. If necessary, move the link arm to the left or right to facilitate mounting.
10. Check that the rear tiller is correctly engaged.
11. Tighten the screw bolts (2) of the quick-connect coupling with **200 Nm** (148 ft-lb).
12. Activate the function "Automatically raise rear tiller when reversing" (3) in the menu.
13. Leave the menu and confirm the selection.

9.3.3 Connect hydraulic lines

NOTICE

Risk of damage to the hydraulic system
When connecting hydraulic lines, always connect the drain line first. When disconnecting the hydraulic lines, always disconnect the drain line last.
Introducing even the smallest dirt particles or oil impurities while fitting attachments to the front or rear can cause damage to the hydraulic system.

- ► Attachment mounted: store the protective caps in the driver's cab's tool compartment.
- ► Attachment not mounted: cover the quick-connect couplings with clean protective caps.

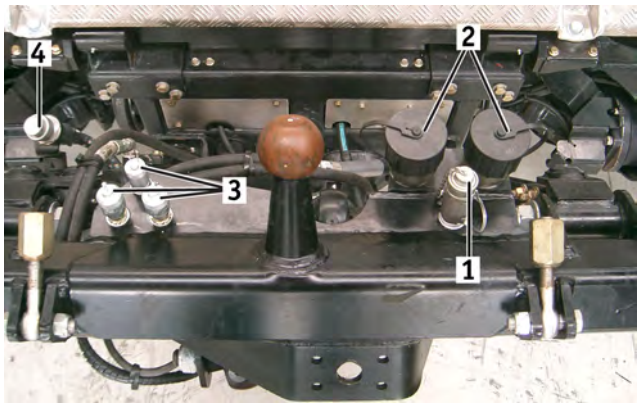


Figure 83: Hydraulic hose and electric cable connectors

Pos.	Name
1	Oil return (and leak) line of the hydraulic motor
2	Connectors of the hydraulic motor
3	Quick-connect couplings for snow chamber and wing cylinders
4	Electrical system connector

1. Switch off the engine.
2. Clean the fittings.
3. Connect the drain line of the tiller. Always connect this line first.
4. Connect the other hydraulic lines.
5. Connect the electrical wiring.
6. Attach the quick-connect couplings and tighten with a spanner.
7. Make sure the hydraulic hoses are correctly routed.
8. Check hoses and screw fittings for leaks; correct any oil leaks immediately.

9.4 Tracks

9.4.1 Mounting the tracks

⚠ DANGER

Risk of rolling away

With missing or loose tracks (track tension slack), the snow groomer will lose its ability to brake properly and may roll off the tracks.

- ► Secure the snow groomer to prevent it from rolling.
- ► Never disassemble both tracks at the same time.
- ► Never slacken the track tension on steep slopes or on impracticable ground.

NOTICE

Installation

- ► If possible, use another vehicle to pull the snow groomer over ramps onto the rolled out tracks.
- ► Rolled-up tracks should be secured at their ends using a suitable connection element (minimum diameter **3 mm** (0.1 in)).

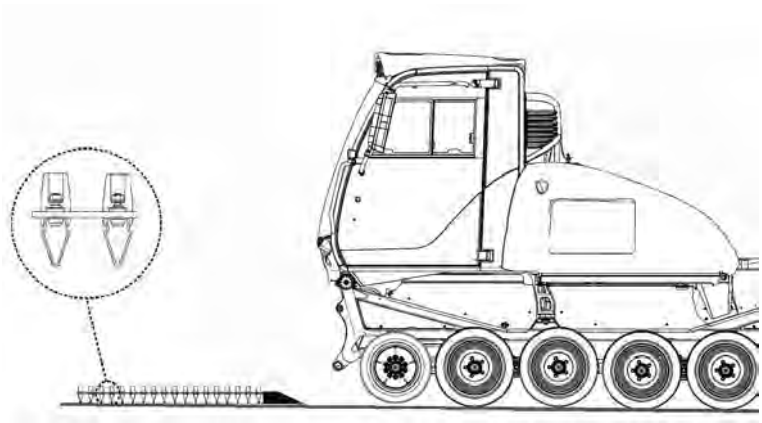


Figure 84: Track mounting

If no suitable hoisting cranes or crane lorries (truck mounted cranes) are available, assemble the tracks as follows:

1. Park the snow groomer on level ground.
2. Carry out a visual check of sprocket, tensioning and running wheels.
3. Remove straps from rolled-up tracks.
4. Roll out the tracks in front of the snow groomer, they have to be parallel and set at a distance from each other so the wheels will roll in the track guides of the crosslinks.
5. Perform visual check of the tracks (for wear, damage).
6. Ensure each track is in the correct orientation (front - rear).
7. Drive the snow groomer onto the tracks via a ramp so that the tracks do not jump up between the running wheels.
8. Using the "Track Tension" display menu, set the tensioning wheels to the back ("Slacken the Tracks").

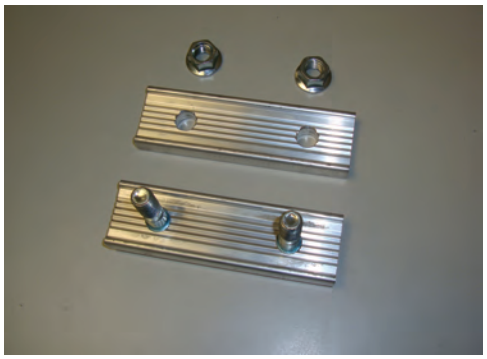
■ Joining overlapped tracks

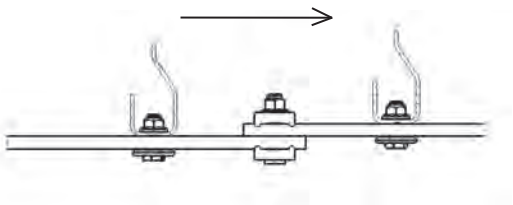
NOTICE

- ► Check the teeth on sprocket wheel for wear and damage.
- ► Mount the track bolts only in the direction indicated.
- ► Use the stop nuts only once.

The track ends are to be connected as follows:

1. Roll the track onto the sprocket wheel.
2. Rotate the sprocket wheel at low speed until the track end is on front of the tension wheel.
3. Roll the front end of the track around the tension wheel and pull it back as far as possible.
4. Place the track tensioner tool at the centre of the undecarriage and pull the track ends together until the belts can be joined on the overlap section as shown.
5. First insert clamping locks and nuts on the overlap of the inner belt and work on the overlaps toward the outer belts. Observe the direction of the bolts. Apply a torque of **102 ± 7 Nm** (75 ± 5 ft-lb) on belt overlapping nuts.





   - □ Properly align belt holes on overlapped section of the belts.
   - □ Install the clamping locks over the belt holes and keep in place using an appropriate tool (C-clamp or locking tool).
   - □ Install the nuts. Tighten evenly. On clamping locks with three nuts, tighten centre nut first.

     NOTE: if the belt overlap and clamping is not properly done, the belt could tear apart or sustain premature failure.
6. Remove the track tensioner tool.
7. If ice calks are installed, ensure they can rotate freely.

The second track is assembled in the same way.

■ Joining hinged tracks

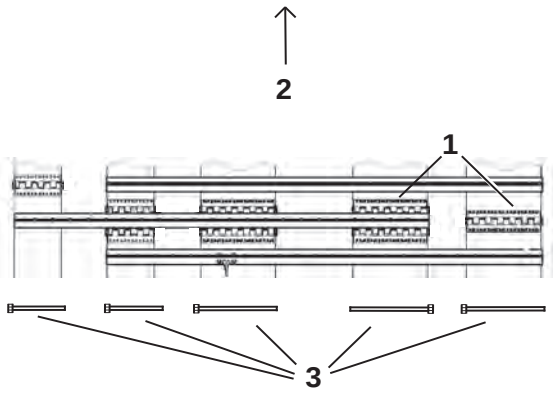
NOTICE

- ► Check the teeth on sprocket wheel for wear and damage.
- ► Mount the track bolts only in the direction indicated.
- ► Use the stop nuts only once.

The track ends are to be connected as follows:

1. Roll the track onto the sprocket wheel.
2. Rotate the sprocket wheel at low speed until the track end is on front of the tension wheel.

3. Roll the front end of the track around the tension wheel and pull it back as far as possible.
4. Place the track tensioner tool at the centre of the undecarriage and pull the track ends together until the belt hinges can be joined.
5. First insert bolts on the hinges of the inner belts (item 1, vehicle side) and then work toward the outer belt hinges. Bolts (3) should be oriented as illustrated when looking from above the track and foward (2). Apply a torque of**9.5 - 13.5 Nm** (7 - 10 ft-lb) on belt hinge bolts.



6. Remove the track tensioner tool.
7. If ice calks are installed, ensure they can rotate freely.

The second track is assembled in the same way.

9.4.2 Tension and loosen the tracks

NOTICE

- ► Overtensioning the tracks causes premature wear of the guide clamps and the wheels.
- ► Due to the greater friction, overtensioning also results in increased fuel consumption.

Go to menu item C.10 on menu level "Operation" to tension and loosen the tracks.

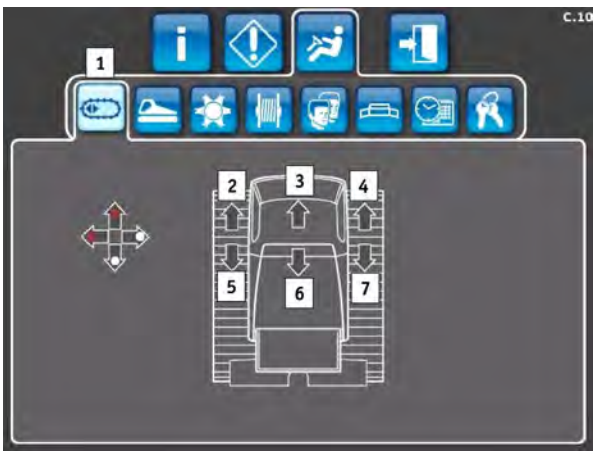


Figure 85: Tension / loosen tracks (C.10)

Pos.	Name
1	Menu item "Tension / loosen tracks" on menu level "Operation".
2	Tension track on the left
3	Tension both tracks
4	Tension track on the right
5	Loosen track on the left

Pos.	Name
6	Loosen both tracks
7	Loosen track on the right

Navigate in the menu using the rotary pushbutton B118. *See "Navigating in the menu" (p. 76)*

1. Press the rotary pushbutton B118.
2. Turn the rotary pushbutton B118 until menu item "Tension Tracks" (1) is displayed on menu level "Operation": confirm by pressing the rotary pushbutton.
3. Turn the rotary pushbutton until the desired track tension direction lights up on the display; holding down the button moves the tension axle in the desired direction.
4. Turn the rotary pushbutton to exit the menu.

"Tension tracks" function

- Normal use of the snow groomer will loosen the track belts. Track tension is important for maintaining the ability to brake.
- If the sprocket wheels jump the tracks, the tracks need to be re-tensioned. Before re-tensioning, carry out an inspection of the sprocket wheels, tension wheels and running wheels.
- The vehicle's tension wheels can be adjusted electro-hydraulically. In this way, the tracks can be tensioned and loosened using the "Tension tracks" menu.
- When tensioning: Slowly drive the snow groomer forward for a distance of approx. **10 m** (32 ft) to tension the tracks.
- The tracks should be re-tensioned at least every **50** operating hours.

10 Engine system

10.1 Proper use

The engine must not be modified.

Observing the instructions and maintenance intervals as well as the professional execution of maintenance work in keeping with these operating and maintenance instructions are all essential to proper use of the engine.

To prevent premature wear or damage to the engine, follow the instructions in this section:

- Do not place more load on the engine as is consistent with proper use.
- If a malfunction occurs, determine the cause immediately and have it removed so that it does not cause greater damage.

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death.

⚠ WARNING

Burn hazard
Contact with high pressure fuel may cause fluid penetration and burn hazards. High pressure fuel spray may cause a fire hazard.

► Failure to follow these inspection, maintenance and service instructions may cause personal injury or death.

⚠ WARNING

Sulfuric acid burn hazard
The exhaust gas cooler may contain a small amount of sulfuric acid. The use of fuel with sulfur levels greater than **15 ppm** may increase the amount of sulfuric acid formed. The sulfuric acid may spill from the cooler during service of the engine. The sulfuric acid will burn the eyes, skin and clothing on contact.

► Always wear the appropriate personal protective equipment that is noted on the material safety data sheet for sulfuric acid.

► Always follow the directions for first aid that are noted on a material safety data sheet for sulfuric acid.

10.2 Engine operation

Observing the following operation and maintenance guidelines is essential to the proper use of the engine.

Operation and Maintenance Guidelines

- Before starting the engine

  If the engine has not been run for several weeks, fuel may have drained from the fuel system. Air may have entered the filter housing. Also, when fuel filters have been changed, some air space will be left in the housing. In these instances, prime the fuel system.
- Cold weather starting

  Startability will be improved at temperatures below **10 °C** (50 °F) from the use of engine block heater or from other means.

- After starting the engine

  In temperatures from **0 - 60 °C** (32 - 140 °F) the warm-up time is approximately **3 min**. In temperatures below **0 °C** (32 °F), additional warm-up time may be required. Operate the engine at low idle until all systems achieve operating temperatures. Check all indications on the display during warm-up period.
- Extended idle at cold ambient temperature

  The engine may automatically change speed when the engine is idling in cold ambient temperature (typically less than **0 °C** (32 °F)) for extended periods. The engine speed may rise above idle for as long as **20 min**. The exhaust temperature indication may illuminate during extended idling conditions. This signal indicates that regeneration is in progress. Regeneration in these conditions may only last up to **17 min**.
- Stopping the engine

  While the vehicle is stopped, run the engine for **5 min** at low idle to allow hot areas of the engine to cool gradually. Then, turn the engine to off and remove the key.
- Oil and coolant analysis

  Take oil and coolant samples (sample analysis is not mandatory) every **250 h** of engine operation. Use the reports on oil and coolant condition to diagnose engine condition and anticipate problem areas such as premature wear.
- Severe service application

  An engine which operates outside of normal conditions is operating in a severe service application. An engine in such conditions may need more frequent maintenance intervals. Refer to your Prinoth representative for information on maintenance required according the your special needs.

⚠ WARNING

Suffocating hazard
Engine exhaust contains products which may be harmful to health. Failure to follow these instructions may cause personal injury or death.

► Always start and operate the engine in a well ventilated area.
► If in an enclosed area, vent the exhaust to the outside.

10.3 Engine warning labels

- There are various warning labels on the engine. Operating personnel must familiarise themselves with all warning labels.
- Take care that all warning labels remain legible. If a warning label has become dirty or illegible, it must be cleaned or replaced. Do not clean warning labels with solvents, petrol or other aggressive chemicals. These can dissolve the adhesive with which the warning label is attached to the surface. Loose warning labels may fall off.
- Warning stickers must be replaced if damaged or if they have been lost. If a damaged part that carries a warning label has to be replaced during repairs, a new warning label must be attached to the replacement part.
- Do not start up or carry out any work on the engine without having read and understood the instructions and warning information in this operating and maintenance manual. The operating personnel are responsible for taking the necessary precautions. If the instructions and warning information are not followed, there is danger of injury or death.

NOTICE

► Keep warning labels clean and legible.
► Replace damaged warning labels immediately.

10.4 Description of engine warning labels

■ Warning labels affixed to the engine

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions and heed the warnings could result in injury or death.	
Contact with high pressure fuel may cause fluid penetration and burn hazards. High pressure fuel spray may cause a fire hazard. Failure to follow these inspections, maintenance and service instructions may cause personal injury or death.	
Sulfuric acid burn hazard may cause serious personal injury or death. The exhaust gas cooler may contain a small amount of sulfuric acid. The use of fuel with sulfur levels greater than **15 ppm** may increase the amount of sulfuric acid formed. The sulfuric acid may spill from the cooler during service of the engine. The sulfuric acid will burn the eyes, skin and clothing on contact. Always wear the appropriate personal protective equipment that is noted on the material safety data sheet for sulfuric acid. Always follow the directions for first aid that are noted on the material safety data sheet for sulfuric acid.	

10.5 Overview

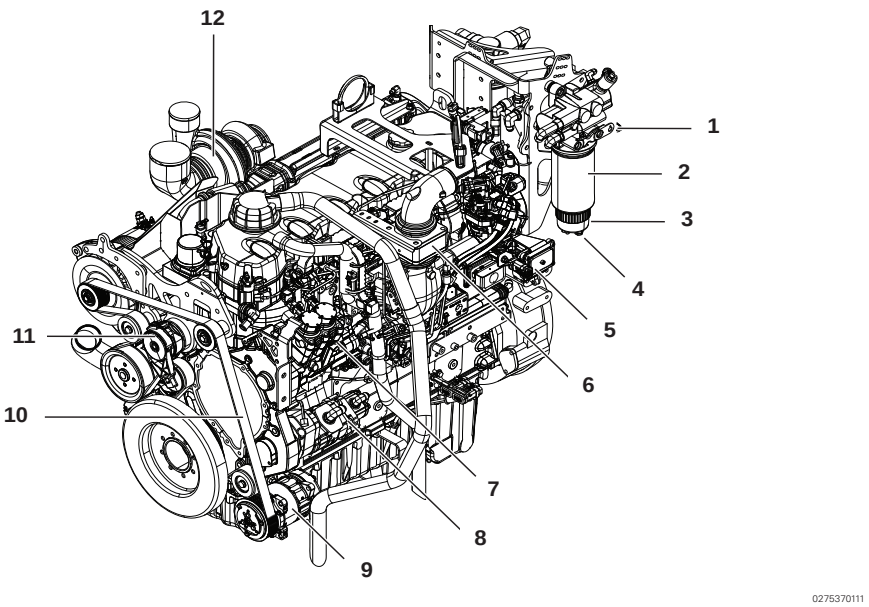


Figure 86: Diesel engine left side

Pos.	Name
1	Priming pump switch
2	Primary fuel filter and water separator
3	Transparent bowl
4	Water drain valve
5	Electronic control module (ECM)
6	Grid heater
7	Fuel injection pump
8	Twin hydraulic pumps
9	Air conditioner compressor (option)
10	Belt
11	Belt tensioner
12	Turbo unit

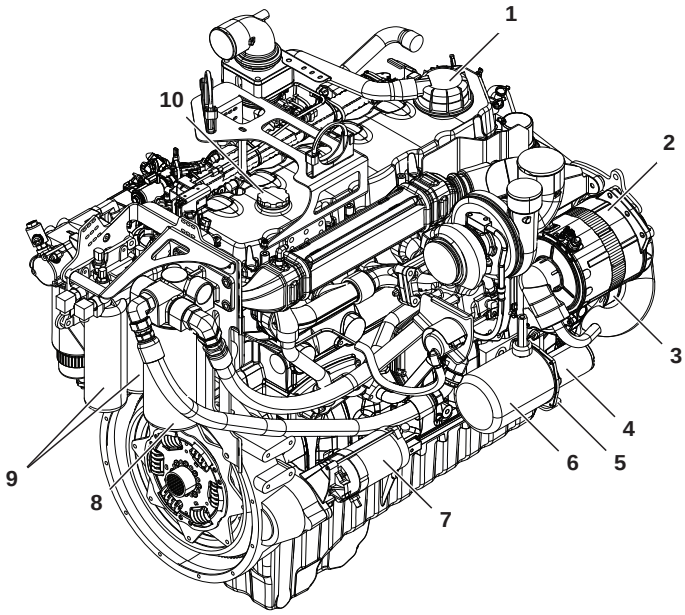


Figure 87: Diesel engine right side

Pos.	Name
1	Crankcase ventilation breather
2	Alternator
3	Water pump (partial view)
4	Electric motor
5	Hydraulic pump
6	Hydraulic reservoir
7	Starter
8	Engine oil filter
9	Secondary fuel filters
10	Oil filler cap

10.6 Aftertreatment and PETU

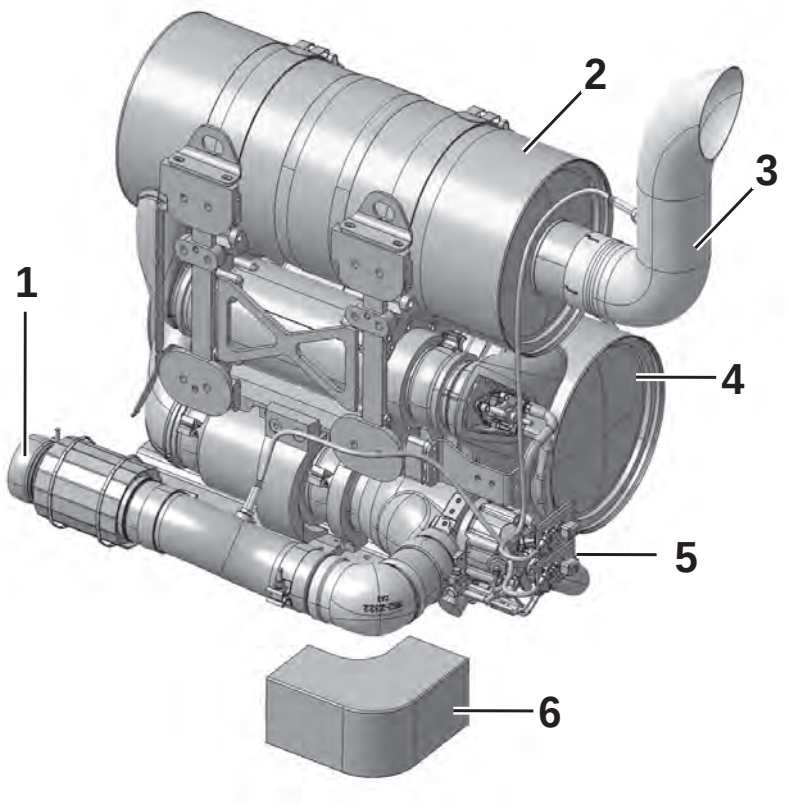


Figure 88: Aftertreatment components

Pos.	Name
1	Exhaust inlet tube
2	SCR (Selective Catalytic Reduction) cylinder
3	Exhaust outlet tube
4	DPF (Diesel Particulate Filter) cylinder
5	CRS (Cat Regeneration System)
6	Isolating elbow

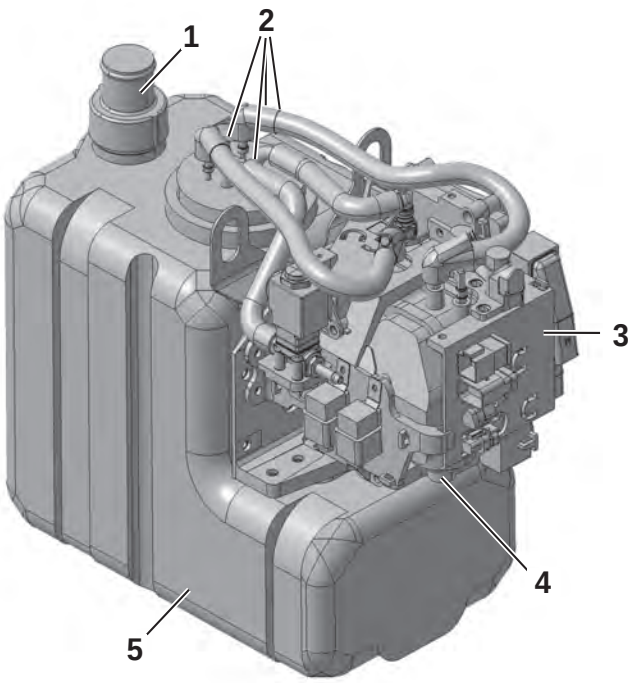
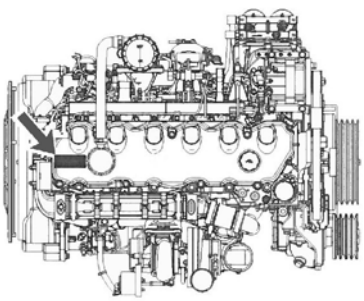
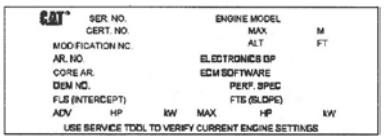


Figure 89: PETU (Pump Electronics Tank Unit)

Pos.	Name
1	Tank filler neck
2	AdBlue® / DEF line and coolant lines
3	Dosing unit
4	Filter cover (partial view)
5	Tank

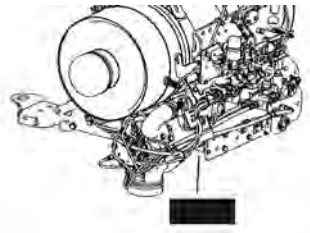
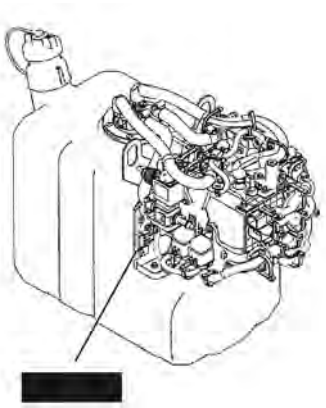
10.7 Engine identification plates

- Identification plate, engine designation and engine serial number

■ The identification plate is located on the valve cover of the engine. ■ The Caterpillar engines are identified by the engine designation and engine serial number. The Caterpillar service support point requires these numbers to determine which components have been used for the engine. The spare part numbers can thus be determined precisely.	 Location of identification plate
The engine identification plate contains the following information:	 Identification plate

10.8 PETU and Aftertreatment identification plates

■ Identification plate, component designation and serial number

■ The identification plate is located underneath the support structure of the unit.	 Location of the identification plate
■ The identification plate is located behind the dosing components.	 Location of the identification plate

10.9 Operating fluids

⚠ CAUTION

Fire hazard
Operating fluids are highly flammable.

► Fire, open flame and smoking are prohibited.
► Do not allow operating fluids to drip or splash onto electrical systems or hot surfaces.
► Immediately clean up any spilled fuel.

NOTICE

Risk of engine damage
Even very small dirt particles can cause engine damage and premature wear.

► Ensure the utmost cleanliness when handling operating fluids.

Structural components and lubricants must be compatible with each other. Therefore, only brands tested and approved by Caterpillar must be used.

Special lubricant additives are not required. Use of special additives may negatively affect warranty claims.

Operating fluids are:

■ Diesel fuels
■ Lubricants, such as engine and gear oils, hydraulic oil, greases
■ Antifreeze, coolant

- AdBlue® / DEF

Authorised operating fluids fulfill the highest standards of quality and are documented in the following sections. Damages resulting from use of unauthorised operating fluids may void warranty claims. Therefore, only use authorised operating fluids for the engine.

NOTICE

Suitable operating fluids

► Information about operating materials can be obtained from every Caterpillar service support point.

NOTICE

Risk of contamination of drinking water
Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

► Operating fluids, and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.

► Follow the legal provisions applicable to the place of operation.

10.9.1 Diesel fuels

NOTICE

Risk of serious engine damage
Mixing petrol with the diesel can cause serious engine damage.

► Never add petrol to diesel fuel.

► Mixing with paraffin is not permitted.

⚠ **WARNING**

Fire and explosion hazards

► Avoid static electricity risk when refuelling. Ultra low sulfur diesel (ULSD) poses a greater static ignition hazard than diesel formulation with a higher sulfur content. Follow fuelling standards for proper grounding and bonding practices.

The following situations can arise if the engine is operated using fuel that does not conform with Caterpillar recommendations:

- Starting problems
- Poor combustion
- Deposits in the fuel injectors
- Deposits in the combustion chambers
- Reduced service life of the engine

When filling in fuel, oil or coolant, always ensure the utmost cleanliness. Filter the operating fluids during filling.

For operating Caterpillar diesel engines, diesel fuels that meet the following standards are suitable:

- EN 590 (Europe)
- ASTM D 975 no. 1 D (USA)

Fuel may be contaminated by filling up from drums or other containers. This can cause problems in the fuel system. It is therefore advisable to filter the fuel while filling. Fuel must never be mixed with water (or snow). Wherever possible, use fuel pumps when filling up.

If diesel fuels with a sulphur content of more than 0.3% by weight are used, the engine oil change must be performed at shorter intervals. Consult information from Caterpillar.

AdBlue®/DEF is not a fuel additive and must not be filled into the diesel tank. If AdBlue®/DEF makes it into the diesel tank, engine damage may result.

Do not fill benzine into vehicles with diesel engines. Even small amounts of benzine cause damage to the fuel system and engine.

If you have accidentally fuelled up with the wrong fuel, do not start the engine. Otherwise the fuel can reach the fuel line. Inform a qualified service centre and have the fuel tank and fuel lines completely emptied.

It is important to use the proper fuel grade for the range of temperature : No. 1 : fuel for winter operation, No. 2 : fuel for summer operation.

- Before fuelling up:
- Switch off engine
- Secure the vehicle / equipment to prevent it from rolling
- Switch off the auxiliary heating
- Ensure the fuel is of sufficient quality. Cleanliness is a must as well as avoiding water or snow in the fuel supply.

10.9.2 AdBlue® / DEF

⚠ CAUTION

Risk of caustic burns and poisoning

- ► If you open the AdBlue®/DEF (Diesel Exhaust Fluid) reservoir cover at higher temperatures, ammonia fumes may be emitted. Such fumes have a pungent odour and primarily irritate the skin, mucous membranes and eyes. Exposure to these fumes may cause burning of the eyes, the nose and throat as well as the urge to cough and to tearing of the eyes. Do not inhale any ammonia vapours which may be emitted.
- ► If AdBlue®/DEF come in contact with your eyes or skin, immediately and thoroughly flush them with clean water.
- ► If you have swallowed AdBlue®/DEF, immediately rinse your mouth with clean water and drink plenty of water.
- ► Immediately change clothes that are contaminated with AdBlue®/DEF.
- ► If allergic reactions occur, immediately seek a doctor.
- ► Keep AdBlue®/DEF out of the reach of children. Store safely.

NOTICE

Risk of contamination

Contamination of AdBlue®/DEF, e.g by other operating fluids, cleaning solutions or dust, can cause:

- ► Higher emission values
- ► Damage to the aftertreatment system
- ► Damage to the engine
- ► Malfunctions of the exhaust gas aftertreatment system

NOTICE

- ► Service personal must be instructed in handling the AdBlue®/DEF operating fluid
- ► In event of queries, always contact the appropriate service organisation.

AdBlue®/DEF is a non-flammable, non-toxic, colour- and odourless as well as water soluble fluid. The terms "Urea" or DEF" (Diesel Exhaust Fluid) are also used for the fluid.

AdBlue®/DEF freezes at a temperature of about **-11 °C** (+12 °F). Winter operation is possible with the built-in heating systems at temperatures below **-11 °C** (+12 °F).

To prevent malfunctions in the exhaust gas aftertreatment, always ensure the purity of the AdBlue®/DEF.

When pumping AdBlue®/DEF out of the reservoir, for repairs or other tasks, do not return the fluid to the reservoir afterwards. The purity of the fluid could be compromized.

The following could interfere with the exhaust gas aftertreatment:

- Filling the AdBlue®/DEF reservoir with cleaning solutions or other operating fluids or fuels
- Mixing with additives
- Diluting the AdBlue®/DEF

Only use AdBlue®/DEF in accordance with DIN 70070 or ISO 22241.

If incorrect filling does occur, inform a qualified service centre for a safe solution to the problem.

Storage

- Only use containers of the following materials to store AdBlue®/DEF:
  - Cr-Ni steels complying with DIN EN 10 088-1/2/3
  - Mo-Cr-Ni steels complying with DIN EN 10 088-1/2/3
  - Polypropylene
  - Polyethylene
- Containers of the following materials are NOT suitable for storing AdBlue®/DEF:
  - Aluminium
  - Copper
  - Alloys containing copper
  - Unalloyed steel
  - Galvanised steel
- Storage in such containers may dissolve constituents of these metals and interfere with the exhaust gas aftertreatment.
- Individual components of the system react very sensitively to even the smallest traces of contaminants in the AdBlue®/DEF.
  - Only use clean containers and catch basins that are suitable for AdBlue®/DEF.
  - Do not reuse AdBlue®/DEF that contains traces of contaminants.
  - Keep AdBlue®/DEF strictly separated from other operating fluids.
  - Never use the same clean containers and catch basins used for AdBlue®/DEF for other operating fluids.

Incorrect filling with AdBlue®/DEF

- When filling the AdBlue®/DEF container, always ensure that only pure AdBlue®/DEF is filled.

- On systems where the AdBlue®/DEF container is filled incorrectly (with fuel for example), the following parts must be replaced:
  - AdBlue®/DEF container
  - All AdBlue®/DEF container hose lines
  - Pump module
- Cleaning of the components cannot be recommended as residues of the cleaning agent may damage the pump module and dosing unit.
- AdBlue®/DEF must only be filled into the special AdBlue®/DEF tank and never directly into the:
  - Hydraulic oil system
  - Engine oil system
  - Engine cooling system
  - Fuel system
- Damage or faults that result from the incorrect filling of AdBlue®/DEF will be denied a warranty claim.
- Service personal must be instructed with regard to handling the AdBlue®/DEF operating fluid. In event of queries, please always contact the appropriate service organisation.

10.9.3 Engine oils

NOTICE

Risk of engine damage
Even very small dirt particles can cause engine damage and premature wear.

► Ensure the utmost cleanliness when handling operating fluids.

- Engine oils are especially tested for suitability in our engines. Therefore, only use the engine oil brands approved for Caterpillar.
- Engine oils are specially tested for suitability in our engines. Therefore, only use the engine oil types approved for Caterpillar.
- If the SAE class (viscosity) of the engine oil used is not suitable for sustained low outdoor temperatures below **-20 °C** (-4 °F), the engine may be damaged.
- The temperature specifications of the SAE class always refer to fresh oil. Engine oil ages during driving operation due to soot and fuel residues. Especially at lower outdoor temperatures, the engine oil properties deteriorate considerably.
- Caterpillar strongly recommends the use of Caterpillar DEO-ULS (Diesel Engine Oil Ultra Low Sulfur) as the first choice of engine oil. Allowed are oils that meet the CAT ECF-3 (Engine Crankcase Fluid) requirement.

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase	Cat DEO-ULS Cold Weather	SAE 0W-40	−40	40	−40	104
	Cat DEO-ULS	SAE 10W-30	−18	40	0	104
	Cat DEO-ULS	SAE 15W-40	−9.5	50	15	122

Figure 90: Engine oil SAE classes

NOTICE

Suitable engine oil

- ► The use of non-approved engine oil type can limit the liability for any warranty claims.
- ► Adding a lower-grade engine oil will negatively affect the engine oil's properties, which necessitates oil and filter change at an earlier date.
- ► When topping up, only use engine oils of the same grade and SAE class.

NOTICE

Risk of contamination of drinking water
Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

- ► Operating fluids, and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation.

10.9.4 Coolant

⚠ **WARNING**

Risk of poisoning
Coolant is toxic. Swallowing coolant may cause poisoning.

- ► Never swallow coolant.
- ► Do not fill coolant into containers otherwise used for drinking.
- ► Coolant should be stored out of reach of children.

NOTICE

Risk of engine damage
Foaming of the coolant can cause the diesel engine to overheat.
If foaming occurs:

- ► Flush the cooling system with the mixture of water and Caterpillar recommended cleaner, drain off the coolant. Repeat this process until coolant foaming no longer occurs.
- ► Fill the cooling system with the specified antifreeze mixture.

NOTICE

Risk of contamination of drinking water
Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

- ► Operating fluids, and components that come into contact with operating fluids, e.g., filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation.
- ► When disposing of used coolants, follow the respective country's legal provisions and sewage regulations.
- ► We recommend clarifying the waste disposal options with your local water authorities.
- ► Due to the complex functions that modern coolants are expected to meet, incorrect recycling that consists solely of a mechanical pre-cleaning is to be firmly rejected.

Coolant is a mixture of water and anticorrosion / antifreeze agents. The anticorrosion / antifreeze agents in the coolant have the following properties:

- Corrosion protection
- Freezing protection
- Increases boiling temperature

Coolants that contain an unsuitable antifreeze, or have been insufficiently or incorrectly prepared, can cause the failure of assemblies and components in the cooling system through cavitation or corrosion damage. They can also cause heat-insulating deposits to form on heat transfer components, thus causing overheating and finally engine failure.

The cooling system only functions reliably when it is under a primary pressure. It is therefore essential to ensure that it is kept clean and leaktight, that the radiator closing/opening valves are functioning correctly and that the required coolant level is maintained.

Antifreezes tested and approved by Caterpillar ensure sufficient cold, corrosion and cavitation protection, do not attack seals and hoses, and do not foam.

Water

- Clean water without additives cannot be used as coolant even if no antifreeze properties are required.

  The coolant water must meet the following requirements which are not always met by drinking water:

  - Specific pH value
  - Free of impurities

  The water must be treated if the water quality is not sufficient.

Anticorrosion/antifreeze agents

- To prevent damage to the cooling system:
  - Only use approved anticorrosion/antifreeze agents. Information can be obtained from every Caterpillar service support point.
  - When replenishing coolant (after loss of coolant), ensure an anticorrosion/antifreeze agent ratio is correct.
  - Do not use more than **55 %** by volume (max. anti-freeze) anti-corrosion/anti-freeze agent. The antifreeze effect will otherwise be reduced and heat dissipation will deteriorate.

NOTICE

Risk of engine damage

Coolant loses its anti-corrosion properties over time. If the concentration is too low, engine damage may occur as a result of corrosion/cavitation. If the coolant level is low, the engine may overheat.

► Replenish coolant losses immediately.

► Only use the specified coolant.

Checking and replacing the coolant

- Check the concentration every three months, using a density measurement spindle or refractometer.
- Never allow the antifreeze concentration to fall below **40 %** by volume.
- Avoid concentrations above **50 %** by volume, as a high proportion of antifreeze will cause the coolant temperature to rise.
- If using CAT DEAC coolant, replace after **3000 h** or three years at the latest.

  If using Commercial heavy-duty coolant, replace after **3000 h** or one year at the latest.
- Irrespective of coolant change intervals, change the coolant if it appears brown or cloudy.

10.10 Engine monitoring system

⚠ WARNING

Risk of accident
Modifications made to the electronic system or to the wiring of the vehicle could cause an accident and severe injuries.

► Always have any work or modifications to electronic components carried out by an authorised service centre.

The engine is equipped with a comprehensive programmable engine monitoring system. The engine control unit monitors the operating statuses of the engine. If the value of one of the engine parameters leaves its permissible range, the engine control module responds immediately.

It will respond in one of three ways:

- Emit a warning message
- Reduce the power
- Shut down the engine

In many instances, the response actions can limit the engine speed and/or restrict power output.

Many of the parameters are monitored by the control unit.

The engine monitoring system keeps track of the following parameters:

- Altitude at which the engine is operated
- Coolant level
- Coolant temperature
- Engine oil pressure
- Engine RPM
- Fuel temperature
- Air temperature in the intake manifold
- System voltage

The version of the engine monitoring system can vary with the engine model and engine configuration. However, the monitoring system and engine control unit are similar for all engines.

11 Maintenance

Observe the general safety regulations before and when maintaining the vehicle. ➠ *See "Safety" (p. 19)*

11.1 Introduction

Operating and maintenance instructions

- The operating and maintenance instructions are indispensable for the professional operation of the vehicle and the attachments and should be close at hand in the driver's cab at all times. It is absolutely essential for the operator to read them and to understand all the technical information.
- The vehicle is equipped with a Caterpillar diesel engine. There should be no problems in handling the diesel engine and its supply of operating fluids, provided the operating, maintenance and service personnel have had the proper training and actively apply it.
- The safety instructions and information given in these operating and maintenance instructions must be observed. They will give you the information needed in order to prevent injuries to personnel and damage to property or the environment.
- The information in this document is intended as guideline data. Some of the pictures and representations may show items that differ from your particular engine. In addition, In some of the photos, safety devices and covers have been removed in order to provide a clearer view.
- However, the manufacturer may have made modifications for both technical and commercial reasons, and also in order to take account of the legal requirements in different countries.
- The customer is asked to contact one of the PRINOTH branches if further information is required.

NOTICE

Correct storage of the operating and maintenance instructions

► Operating and maintenance instructions are to be kept in the cab at all times.
► A holder for that purpose is provided behind the driver's seat.

Environmental protection

- Caterpillar is committed to a policy of integrated environmental protection. This means that, in making its corporate decisions, the company addresses the causes and considers all the effects of its production processes and products on the environment.
- Its aims are the economic use of resources and safeguarding of the environment, in order to protect both people and natural resources.
- You can also help protect the environment by operating your machine in an environmentally friendly way:
  - □ Monitor fuel consumption.
  - □ Do not allow the engine to warm up at low idle.
  - □ Shut down the drive motor during operational waiting times.
  - □ Carry out the specified maintenance tasks regularly.
  - □ Only use operating materials approved for Caterpillar.

NOTICE

Risk of contamination of drinking water

Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

► Operating fluids, and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
► Follow the legal provisions applicable to the place of operation.

Intended use

- The engine is only intended for installation as contractually specified. The end product's manufacturer is responsible for the end product's complete system and particularly for the correct installation and the compatibility of the engine with the rest of the system.
- The engine must not be modified. Caterpillar cannot accept liability for any damage caused by such changes.
- Proper use of the engine also means following the instructions, observing the maintenance intervals and carrying out the maintenance work properly as described in this operating and maintenance manual.
- To prevent premature wear or damage to the engine, follow the instructions below:
  - Only load the engine to the extent consistent with proper use.
  - If a malfunction occurs, determine the cause immediately and have it removed so that it does not cause greater damage.

Qualified service centre

- A qualified service centre has the required specialist knowledge, tools and qualifications to properly carry out necessary work on the engine. This applies especially to work related to safety.
- A qualified service centre must carry out the required service, maintenance and repair work and document it according to specifications set by Caterpillar. If these specifications are not taken into account, defect claims may be denied.
- The following work on the snow groomer should always be carried out at a qualified service centre:
  - Safety-related work
  - Service and maintenance work
  - Repair work
  - Modifications including installation and removal
  - Work on electronic components
- Please have guarantee and good will work carried out in the authorised workshops / support points

Engine servicing

- Refer to the chapter "Engine servicing" for instructions on how to maintain the engine. The instructions and procedures are compiled in relation to fuel consumption and/or service intervals, expressed in working hours or calendar time. The required maintenance intervals are indicated in the "Maintenance intervals" chapter.
- Maintenance intervals are determined by the number of operating hours completed. Calendar periods (daily, weekly, monthly, etc.) can be used instead of the intervals indicated by the operating hours counter, if these allow more convenient maintenance schedules and if they roughly correspond to the intervals shown by the operating hours counter.
- Maintenance must always be carried out at the specified time. The maintenance plan will also be affected by the particular environment in which the engine is being operated. In particularly tough operating conditions, for example in dust-laden environments, high humidity or cold weather, lubricating or maintenance work may have to be carried out more frequently than indicated in the maintenance intervals.
- Maintenance work should always be carried out with the engine switched off. If maintenance work has to be carried out with the engine running, particular attention should be paid to the possible dangers and precautions should be taken accordingly.

Commissioning the engine

- Before starting the engine, you should read the operating and maintenance instructions carefully and familiarise yourself with "critical" points. If you are unsure of anything, please contact your Prinoth authorised agent.
- The methods recommended here are limited to the most important features. The illustrations show operating personnel the correct method for checking, starting, stopping and operating the engine. Only authorised operating personnel are allowed to start the engine. Make sure that the engine is not started by an unauthorised person.

Operating safety

- Most accidents which occur while operating, maintaining or repairing vehicles are due to failure to observe basic safety rules and precautions. Accidents can often be avoided by identifying possibly dangerous situations in advance. Operating personnel must be aware of the dangers and must possess the correct training, skills and tools in order to be able to carry out these operations. The safety instructions must be read and understood before starting up the engine, and carrying out lubrication and maintenance work.
- An engine's operating safety depends on its professional installation in the overall system. The indicators and monitoring devices (charging pressure/oil pressure/coolant temperature, etc.) should also be checked to ensure they are functioning correctly. By observing the specified maintenance intervals and carrying out the required maintenance work correctly, you will fulfil some of the conditions required for operating the engine safely.
- For startup and maintenance, pay particular attention to the "Safety Instructions" section in this chapter!

11.2 Safety instructions

In order to prevent accidents with personal injury and property damage during the maintenance and servicing of the vehicle, pay particular attention to the following safety instructions:

⚠ CAUTION

Risk of accident
The risk of injury increases if personnel is not aware of the possible accidents during maintenance work.

► Before carrying out maintenance work and repairs, read the relevant sections of the technical documentation, such as the operating and maintenance manual.

► Familiarise yourself with the legal requirements such as health, safety and accident prevention regulations.

⚠ CAUTION

Risk of accident
An injury could occur if maintenance or servicing on the engine is carried out incorrectly

► Repair work on and modifications of the engine should always be carried out by an authorised service centre as only it has the necessary technical knowledge and tools for this kind of work.

⚠ WARNING

Risk of fire and explosion
Fuel is highly combustible and harmful to health.
Gas leaking from batteries may explode and cause injury.

- ► Avoid fire, open flame, smoking and sparking.
- ► Do not allow fuel to drip or splash onto electrical systems or hot surfaces.
- ► Spilled fuel should be wiped up immediately.

⚠ CAUTION

Risk of poisoning
Inhaling exhaust fumes can lead to poisoning.

- ► Ensure that there is sufficient ventilation for operation in enclosed spaces.

⚠ CAUTION

Risk of scalding and burns
Hot fluids and components can cause injury.

- ► Do not touch the engine with bare hands when it is at operating temperature.
- ► Wear suitable protective gloves, clothing, and safety glasses.

⚠ CAUTION

Risk of caustic burns
The acid contained in the batteries is toxic and caustic if in contact with skin or eyes.

- ► Wear suitable protective gloves, clothing, and safety goggles.
- ► Avoid contact with skin, eyes, or clothing.
- ► If splashed with acid, wash off immediately with clean water and seek medical assistance if necessary.
- ► Battery acid should be stored out of reach of children.

⚠ CAUTION

Risk of injury
Rotating parts can cause injuries.

- ► Keep a safe distance from rotating parts. Wait for them to stop completely.
- ► Do not wear too loose-fitting working clothes (no jewellery, a hairnet if needed).

NOTICE

Risk of electronic faults and damage

- ► Telephones and two-way radios not connected to an external antenna can lead to malfunctions in the vehicle on-board electronics system which could then put the operating safety of the engine at risk.
- ► Reversing the polarity of the batteries or the power supply to the control units can cause irreparable damage to the control units.

NOTICE

Risk of damage to electronic equipment
Improper interventions on electronic components and related software can impair the functionality of components. As the electronic systems are also networked, modifications made to these systems can also affect systems that have not been changed.

► Intervention on electronic components should be performed by authorized personnel.

11.3 Prescribed maintenance work

Personnel-Category
The service personnel appointed for the maintenance and repair work must be familiar with the engine and with mechanical, hydraulic and electrical systems. They must be aware of the dangers involved in technical operations on the vehicle and its attachments or accessories.

- Regular maintenance will extend the service life of the vehicle and its accessories. The lubrication and maintenance intervals should be shortened in the case of longer operating times or difficult operating conditions.
- When obtaining spare parts, carrying out repair and maintenance work, making warranty claims etc., it is essential that all required identification data are provided. The respective data can be found on the data stickers.
- Any defect or damage found during maintenance should be corrected immediately. If there is an obvious danger to operating personnel or to the equipment itself, the vehicle or accessory should be put out of service immediately, and should not be put back into operation until the fault or failure has been corrected.
- Failure to follow the instructions and the maintenance intervals can lead to reduced service, or damage to the vehicle or accessory. PRINOTH cannot accept liability for damage to property or physical injuries that result from failure to observe the maintenance intervals and carry out the required maintenance work. In these cases, all warranty claims are void.
- The maintenance work is to be carried out as indicated on the lubrication and maintenance tables and according to the intervals specified by the manufacturer.
- In carrying out the maintenance work, follow the safety instructions and the general and national accident prevention regulations of the appropriate safety organisations.

11.4 Removing a lateral cowling access panel

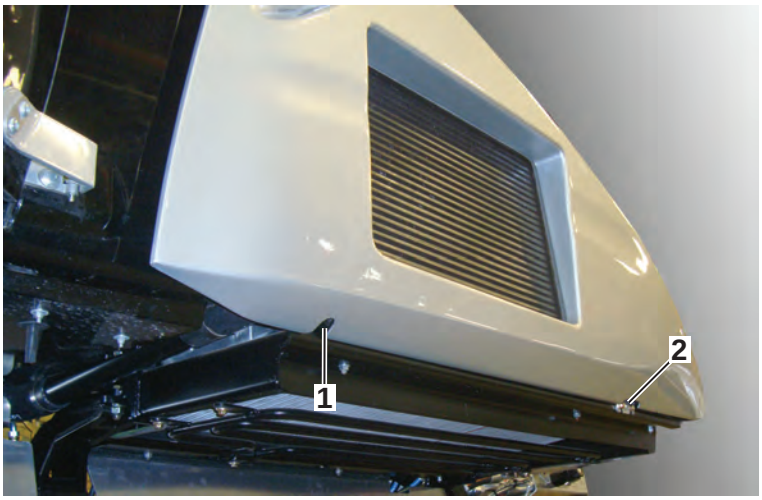


Figure 91: Lateral cowling panel

Pos.	Name
1	Front end lower attaching bolt (qty 1)
2	Rear end lower attaching bolts (qty 2)

To remove a lateral cowling access panel, proceed as follows.

1. Park the vehicle on level ground and turn off the engine;
2. Lay a clean piece of cloth on the tracks under the panel to be removed.
3. Remove the bolt (1) holding the lower front end of the cowling panel. Remove the two bolts (2) holding the rear end of the cowling panel. Grab the bottom edge of the panel and carefully pull it up few inches/centimeters to disconnect the alignment cones at the top.
4. Carefully pull away the panel, taking care not to damage the electrical cable between the panel and the accessory support frame.
5. Disconnect the electrical cable and lower the panel onto a suitable support.

11.5 Verification of the cab locking pins

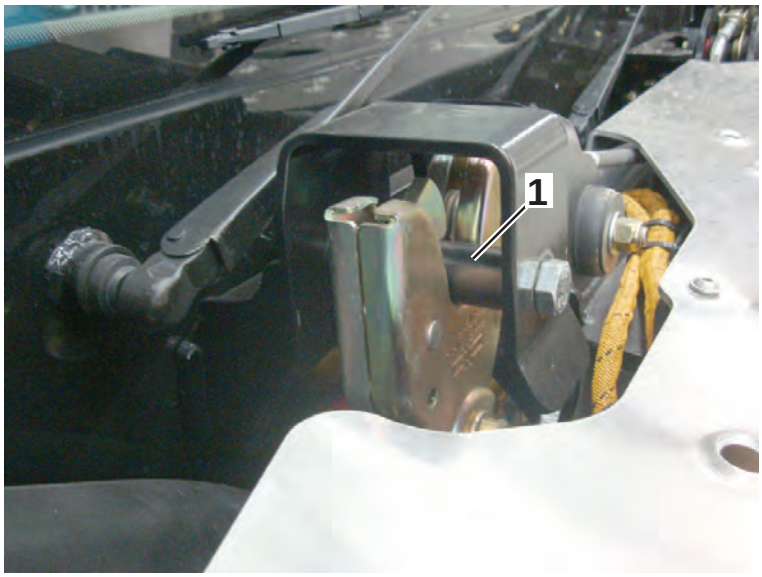


Figure 92: Cab locking hardware

Pos.	Name
1	Cab locking pins (qty 2)

When the cab is raised for maintenance, ensure the pins at the back of the cab can rotate freely. Jammed pins could cause premature wear of the cab locking system.

11.6 Lubrication points

NOTICE

Risk of damage to property
Failure to observe the lubrication intervals or to use the approved lubricants may cause damage to property.

- ► Observe the specified lubrication intervals
- ► Clean lubricating fittings before lubricating
- ► Replace damaged lubricating fittings immediately

- The required lubrication intervals are indicated on the maintenance schedule. Grease the lubrication points indicated with arrows on the following drawings, as well as the hydraulic cylinders for tilting the cab and load platform.
- Before lubricating, thoroughly clean the lubricating fittings in order to prevent dirt or foreign matter from entering.
- Damaged lubricating fittings are to be replaced immediately. Press the specified lubricating grease through the fitting until all the old grease has been evacuated.

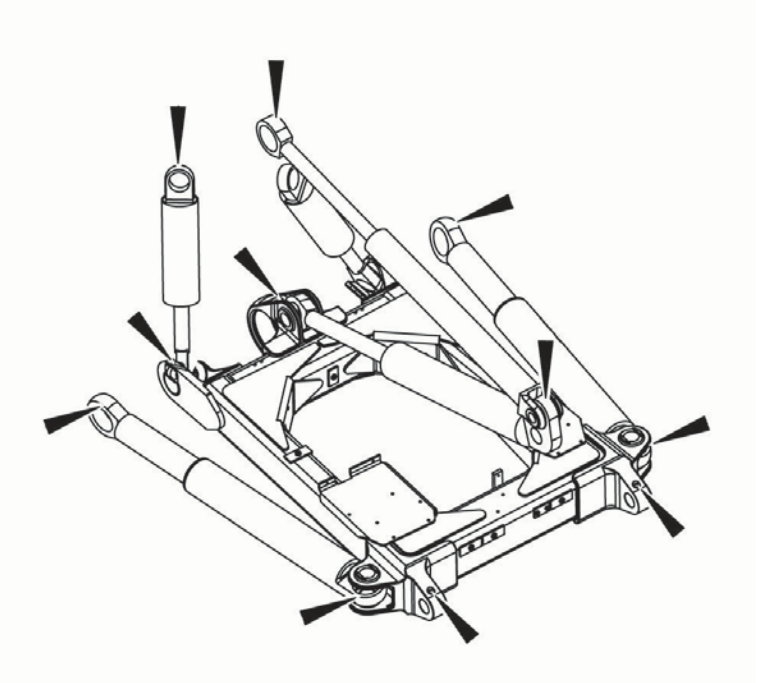


Figure 93: Lubrication points, standard push frame

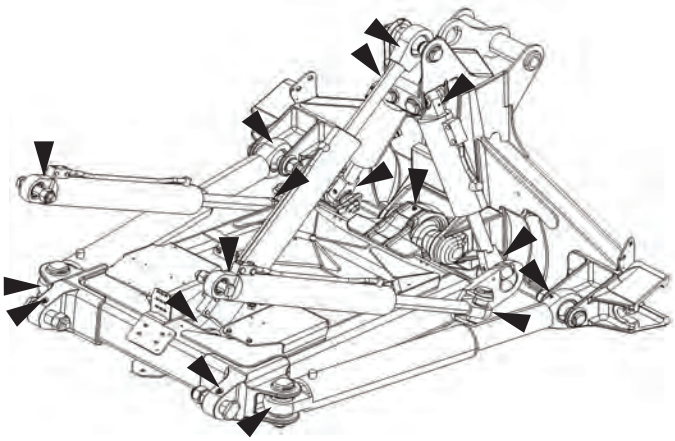


Figure 94: Lubrication points, park push frame

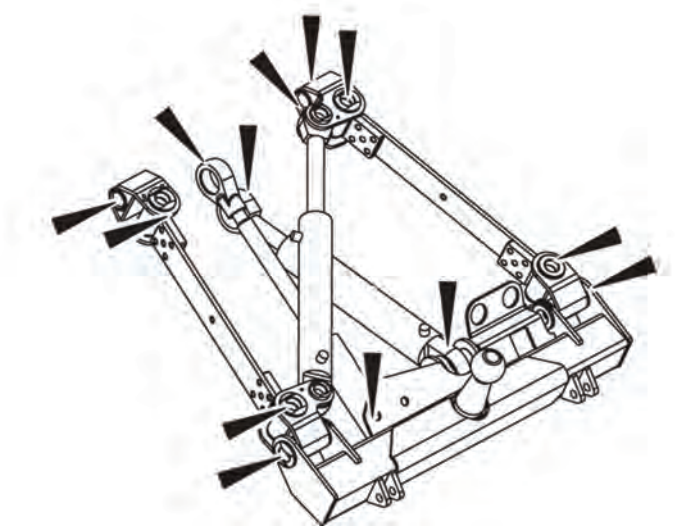


Figure 95: Lubrication points, std or long rear lift frame

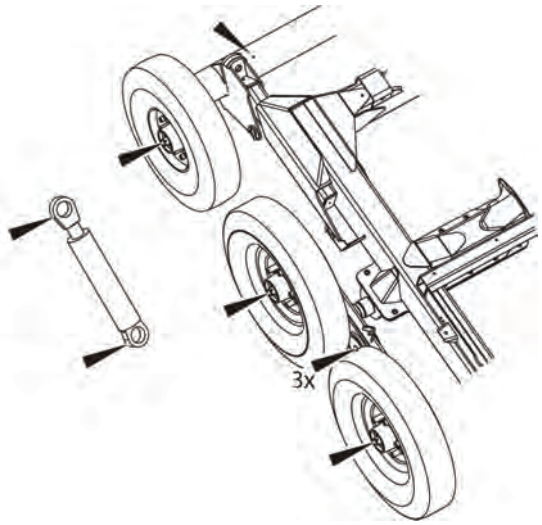


Figure 96: Lubrication points wheel running gear

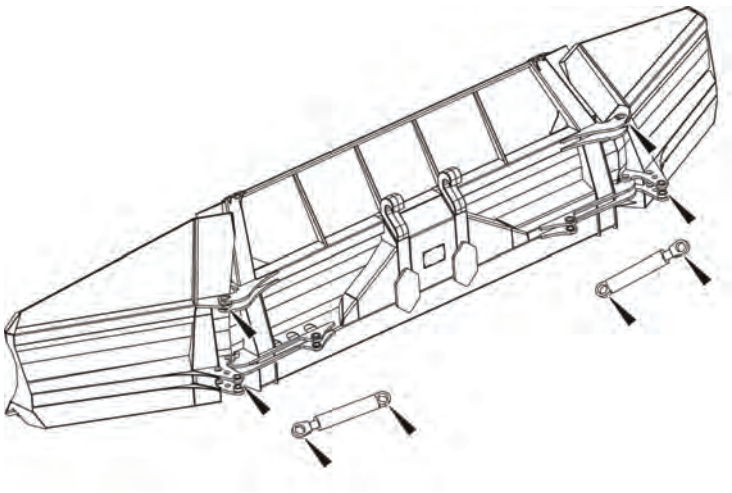


Figure 97: Front blade lubrication points

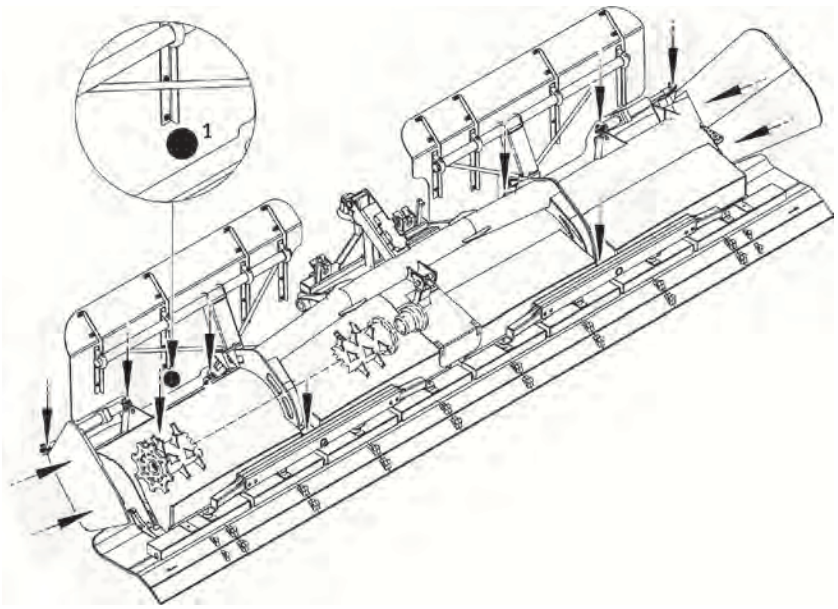


Figure 98: Lubrication points on the Power Tiller

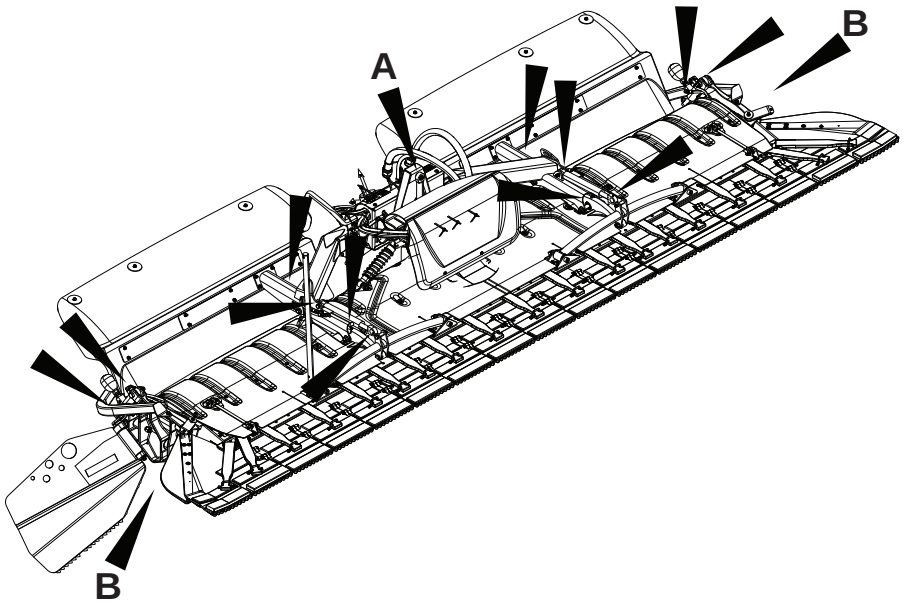


Figure 99: Lubrication points on Posiflex tiller - A: with Preminum option only - B: on each rotor (not visible on picture)

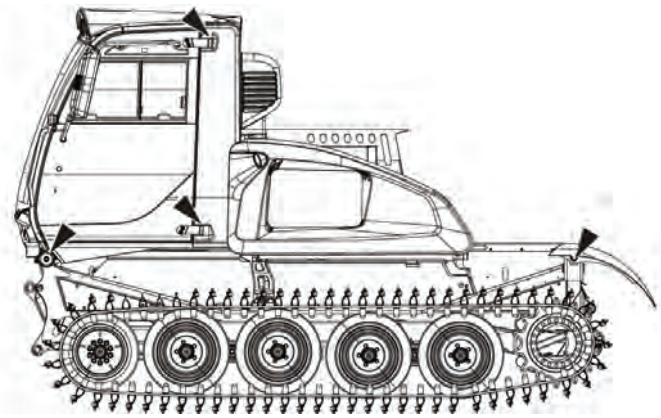


Figure 100: Miscellaneous lubrication points on the vehicle

11.7 Operating fluids

Operating fluids for the BISON		
Specifications	**Note**	**Quantity**
ENGINE OIL		
CAT DEO - ULS, CAT ECF-3, API CJ-4, ACEA E9. The viscosity depends on the ambient temperature (e.g., SAE 0W30, 5W30, 10W30, 10W40)	Initial filling CAT ECF-3: 0W40.	**32 l** (8.45 US gal)
DIESEL FUEL and AdBlue® / DEF		
Diesel fuel: EN 590, ASTM D975 N.1 D, Ultra Low Sulfur Fuel only, S<15 ppm (mg/kg)		**266 l** (70.3 US gal)
AdBlue® / DEF: DIN 70700, ISO 22241-1		**27 l** (7.1 US gal)
ENGINE COOLING FLUID		
Antifreeze/anticorrosion agent, **50 %** antifreeze, **50 %** water -------- CAT DEAC, Heavy-duty coolant according to ASTM D4985 (use supplement coolant additive SCA at initial fill) or ASTM D6210	For temperatures below **-35°C** (-31°F), contact the PRINOTH Service department.	**45 l** (11.9 US gal)
HYDRAULIC OIL		
ATF oil: Dexron III, Dexron II, Type F, Type A Suffix A Biodegradable oil: Panolin HLP Synth 46, York Bio 777 VG 46		**130 l** (34.3 US gal)
PUMP DRIVE OIL		
Synthetic gear oil PAO basis (polyalphaolefin), Viscosity: ISO 220, SAE 75W 90 or 75W 140, API GL-4 or GL-5		**2,7 l** (0.7 US gal)
FINAL DRIVE OIL		
Synthetic gear oil PAO basis (polyalphaolefin), Viscosity: ISO 220, API GL-4 or GL-5		(each) **1,8 l** (0.5 US gal)
GREASE SPECIFICATION		
AdBlue / DEF Filter sealing rings : MB-Silicon grease ------ Bearing and other lube points : Calcium or lithium soap grease according to DIN 51825 KP 2G -30, DIN 51502. For temperature below **-30°C** (-22°F) use NLGI grade 1, EP rated (temperature range **-40°C** (-40°F) to **100°C** (212°F)). ----- Power tiller spline coupling : Anorganic grease according to DIN 51825 MPF 1/2U - 30, DIN 51502 (NLGI grade 1/2, EP rated, temperature range**-30°C** (-22°F) to **200°C** (392°F)		2 X **150 g** (5.3 oz)
TILT CAB AND TRACK TENSION PUMP		
ATF oil : Dexron III, Dexron II, Type F, Type A Suffix A Biodegradable oil: Panolin HLP Synth 46, York Bio 777 VG 46		

11.8 Regeneration

NOTICE

Engine derate or shutdown

Terminating manually an automatic maintenance regeneration will leave residues in the aftertreatment unit.

- ► Repetitions of such action could cause an engine derate or, eventually, an engine shutdown.
- ► Damage to the engine could occur.

The purpose of the Automatic Maintenance Regeneration is to burn the soot and DEF deposits inside the Clean Emission Module (CEM) and to warm up the whole powertrain system at cold start.

- When a regeneration is pending, the diesel engine rpm will not increase automatically for a regeneration cycle. Instead, when the operator increases the engine speed above **1000/min** (1000 rpm), the regeneration cycle will begin. Then the **1000/min** (1000 rpm) engine idle speed is kept until the cycle is complete.
- There is no problem to work with the vehicle during the cycle.

The Automatic Maintenance Regeneration activates when:

- The engine coolant temperature reaches **40°C** (104°F) after an engine start with a coolant temperature at or below **30°C** (86°F).
- A predetermined amount of soot or DEF deposits has accumulated in the CEM.
- The engine runs at idle for a long time (more than **1 h**).

The normal duration of an Automatic Maintenance Regeneration is about **17 min**, but it can be longer.

In order to deactivate the Automatic Maintenance Regeneration (“Auto-Regeneration mode inhibited”) for an emergency or for a specific reason, use the controls on the vehicle display in the cab; do not shutdown the engine unless an emergency occurs.

Figure 101: Aftertreatment indications on the display

Pos.	Name	Description
1	REGENERATION PROCESS PENDING	The DPF is in need of regeneration.
2	AUTO-REGENERATION MODE INHIBITED	The auto-regeneration mode is manually turned off by the operator.
3	REGENERATION IN PROGRESS	The HEST lamp is ON when a regeneration process is running or if a regeneration process has just finished. DO NOT shut down the engine when the HEST lamp is ON.
4	LOW AdBlue®/DEF LEVEL	The AdBlue®/DEF level is under **19 %**.
5	SYSTEM FAILURE	The EESF (Engine Emission System Failure) lamp is ON. AdBlue®/DEF quality/Tampering/Dosing interruption

11.9 Maintenance plan

Table for maintenance work on the BISON												
Work to be performed	**Operating hours**											
	Daily	**250**	**First 50**	**Every 50**	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**Seasonal**
TRACKS												
Check track condition and tension, adjust tension if required	X											
Check bolt torque on tracks, retighten if required. If installed, check torque on ice caulk supports	First 150 hours											X
Check the polymer track guards on frame, replace if required							X				X	X
DRIVE												
Swap sprockets from side to side, replace if required												X
Check torque on sprocket retaining bolts, retighten if required			X				X				X	X
Change oil on planetary gearboxes	First 150 hours, then every 500 hours											
Check planetary for leak and damage	X											
HUB, WHEEL and TIRE												
Lubricate grease point on wheel hubs				X	X	X	X	X	X	X	X	X
Check retaining bolt torque on all wheels			X		X		X		X		X	X
Check and adjust wheel bearings												X
SUSPENSION												
Lubricate all grease points				X	X	X	X	X	X	X	X	X
Check bolt torque on flexitors and suspension crank arm threaded pin			X									X
Check suspension settings, adjust if required												X
Check and adjust spring washer arrangement on front beam axle retaining bolts												X
Replace the 2 bolts retaining the front axle to the frame	Every season											

Table for maintenance work on the BISON												
Work to be performed	**Operating hours**											
	Daily	**250**	**First 50**	**Every 50**	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**Seasonal**
Check and adjust tandem bearings												X
PUMP DRIVE												
Change pump drive oil					X		X		X		X	X
Check pump drive oil level		X										
Check for leaks and unusual noises	X											
Inspect internal components	Every 4000 hours											
BRAKE												
Check parking/emergency brake switch functioning	X											
Check parking/emergency brake operation		X										
Inspect brake condition (internal components)	Every 4000 hours											
ENGINE												
Check that removable connecting components (bolts, hose clamps, pipe connectors) are firmly seated and tighten if required.	First 150 hours, then every 500 hours											
Check condition of intake pipe between air filter, charge air cooler and engine as well as check for leak tightness	Before operating season											
Check turbocharger for damage as well as radial and axial play	Every 2 years											
Check air filter for restriction, replace if required					X		X		X		X	X
Check alternator fan belt and tensioner					X		X		X		X	X
Obtain engine oil sample (recommended)				X	X	X	X	X	X	X	X	
Change oil and filter					X		X		X		X	
Check engine oil level, add if required	X											
Check the engine air inlet heater (grid heater)	Check every season. Replace after 2 seasons.											
Inspect/clean/tighten grounding stud				X	X	X	X	X	X	X	X	
Check torque of bolts on engine mounts												X

Table for maintenance work on the BISON												
Work to be performed	**Operating hours**											
	Daily	**250**	**First 50**	**Every 50**	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**Seasonal**
Check valve clearance, adjust if required	First 500 hours, then every 2500 hours											
Check quality of AdBlue/DEF	Before the operating season											
Change DEF/AdBlue filter in PETU unit	Every 5000 hours											
Change or clean the Diesel Particulate Filter	Every 5000 hours, consult your local Caterpillar dealer for details											
FUEL												
Drain water in water/fuel separator	X											
Change (primary) fuel filter inside water separator					X		X		X		X	X
Change secondary fuel filters					X		X		X		X	X
Unscrew fuel tank drain plug and drain condensation	First 150 hours and then every 500 hours											
Fuel tank : check the strenght of the holding straps	Seasonal											
EXHAUST												
Check condition of engine exhaust system	X											
Check exhaust elbow securing clamp					X		X		X		X	X
ELECTRICAL												
Check condition of batteries					X		X		X		X	X
Check alternator and starter					X		X		X		X	X
Check condition of electrical system					X		X		X		X	X
COOLING												
Check radiator for debris	X											
Check engine coolant level, add if required	X											
Check additive	As per supplier recommendations											
Check pressure cap on surge tank												X
Obtain engine coolant sample (recommended)					X		X		X		X	
Test/add supplemental coolant additive (SCA)					X		X		X		X	

Table for maintenance work on the BISON												
Work to be performed	**Operating hours**											
	Daily	**250**	**First 50**	**Every 50**	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**Seasonal**
Drain oil and condensate from the charge air cooler					X		X		X		X	
Change engine coolant	Every 3000 hours or 3 years or according to supplier recommendations											
Check condition of cooler lines and hoses and check leak tightness	Before operating season											
Check pressure relief and vacuum valves	Every 3 years											
CAB and FRAME												
Check cab and frame condition					X		X		X		X	X
Lubricate all grease points on cab doors and frame				X	X	X	X	X	X	X	X	X
Check oil level in cab raising system												X
Check raising cylinder and its hardware, bolt torque, etc.					X		X		X		X	X
Check rubber supports (engine, radiators, reservoirs, cab, etc.)												X
REAR LIFT FRAME												
Lubricate all grease points and perform visual inspection				X	X	X	X	X	X	X	X	X
BLADE & PUSH FRAME												
Lubricate all grease points and perform visual inspection				X	X	X	X	X	X	X	X	X
HYDRAULIC AND HYDROSTATIC												
Check system pressures												X
Check system (pressure caps, leaks,...)	X											
Change oil												X
Change all filters in hyd. oil tank			X									X
Check oil level	X											
Check hydraulic hoses for leak tightness and chafe marks							X					
TILLER												

Table for maintenance work on the BISON												
Work to be performed	**Operating hours**											
	Daily	**250**	**First 50**	**Every 50**	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**Seasonal**
Check the condition of the finishers and the teeth of the rotors	X											
Lubricate all grease points		X										X
Change gearbox lubricant							X				X	X
Check gearbox lubricant level	X											
Check universal joints												X
Check tiller gearbox bearings and seals												X
Check tiller-wing fastener torque and angle of pivot frame							X					X
Perform engine verifications/tasks at 2500, 3000, 4000, 5000, 6000, 12000 hrs and up as per Caterpillar guidelines.												

Table 3: Maintenance intervals

11.10 Engine maintenance

In the following, all maintenance services relating to the engine are described.

The required extent and frequency of maintenance services depends on the various operating conditions.

Any work performed must be recorded in the service book. This proof of regular maintenance is an essential requirement for possible warranty claims.

Please observe also the maintenance instructions for optional equipment.

During maintenance work, pay particular attention to the "General safety instructions" section in this chapter.

11.10.1 Important notes

Improper maintenance and repair work on the engine may result in engine damage or premature wear.

To avoid damage to the engine, components and cable harnesses and thus prevent personal injury that might occur as a result, observe the following safety measures and instructions.

- Only start the engine if the batteries are firmly connected.
- Do not disconnect the batteries while the engine is running.
- Do not use a quick-charger for starting the engine.
- Do not use additional engine starting aids (e.g. starting fluid).
- Starting should only be assisted using separate batteries.
- For quick-charging the batteries, detach the battery terminals. Observe the quick-charger's user instructions.

⚠ When carrying out arc welding work, disconnect the batteries and connect both cables (+ and -) firmly.

⚠ Only take out/re-insert the control units when the electrical system is switched off.

⚠ Tighten injection system connections with the specified tightening torque.

⚠ When temperatures are expected to rise over **80 °C** (176 °F) (e.g., in a drying oven), the control units need to be removed.

⚠ For measurements at connectors use only suitable test leads.

⚠ Never run the engine when dry, i.e. without lubricants or coolant being filled.

⚠ Do not switch off the engine immediately if it is hot, but allow it to run for about 5 minutes under no load, to allow for temperature equalization

⚠ Never add coolant to an overheated engine.

⚠ Do not refill engine oil beyond the "MAX" marking of the oil level dipstick.

⚠ Ensure cleanliness. Diesel fuel must be free of water.

⚠ CAUTION

Risk of accident
The risk of injury increases if personnel are not aware of the possible accidents during maintenance work.

- ► Before carrying out maintenance work and repairs, read the relevant sections of the technical documentation, such as the operating and maintenance manual.
- ► Familiarise yourself with the legal requirements such as health and safety and accident prevention regulations.

⚠ CAUTION

Risk of accident
Improper operation of the engine, maintenance work carried out incorrectly or simply neglected, and disregarded maintenance intervals can shorten the service life of the engine and can result in engine damage and accidents.

- ► Read the information about engine maintenance in this operating and maintenance manual.

⚠ CAUTION

Risk of accident
if the engine fails or is damaged

- ► Observe the specified lubrication and maintenance intervals.
- ► Only use spare parts and operating materials approved by the engine supplier.
- ► Have repairs carried out by specialised personnel at a engine supplier authorised workshop.

NOTICE

Risk of engine damage

All maintenance intervals and maintenance work relate to the original engine supplier parts and to the approved accessories for the engine.

Improper or insufficient maintenance work, e. g. not changing the oil filter, as well as skipped maintenance intervals may lead to engine damage. Engine damage can result in an increased risk of accidents.

► Refer to these operating instructions for information on engine maintenance.

NOTICE

Observe safe work procedures

► Observe change intervals in the maintenance table.

► Before starting maintenance work, switch off the engine and attach a "Do not operate" warning sign to the starter switch.

11.10.2 Handling used engine oil

NOTICE

Risk of contamination of drinking water

Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

► Operating fluids, and components which come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.

► Follow the legal provisions applicable to the place of operation

Prolonged or repeated contact between skin and any type of engine oil will remove natural skin lipids. This may result in dehydration, irritation, or inflammation. Used engine oil also contains hazardous substances. When handling used engine oil, damage to health can be avoided by following the basic rules of hygiene and safety at work.

To protect your health, you should take certain precautions when handling used engine oil.

- Avoid prolonged skin contact with used engine oil.
- Protect skin with suitable skin protection or protective gloves.
- Remove engine oil from skin: wash thoroughly with soap and water (nail brush). Special hand cleaners help clean dirty hands.
- Do not use petrol, diesel fuel, gas oil, thinners or solvents as cleaning agents.
- After washing, apply a skin cream containing fat.
- Change out of oil-soaked clothes and shoes.
- Do not put oily cloths into clothing pockets.

11.10.3 Engine oil and filter replacement

NOTICE

Risk of contamination of drinking water

► Used filter components, seals and residual oil must be disposed of in accordance with local regulations.

NOTICE

Precaution regarding engine oil and filter replacement

- ► Do not fill the oil filter with oil before installation. Unfiltered oil could cause contamination and accelerated wear of engine parts.
- ► Be careful not to drop fluid in the vent cavities of the bell housing.

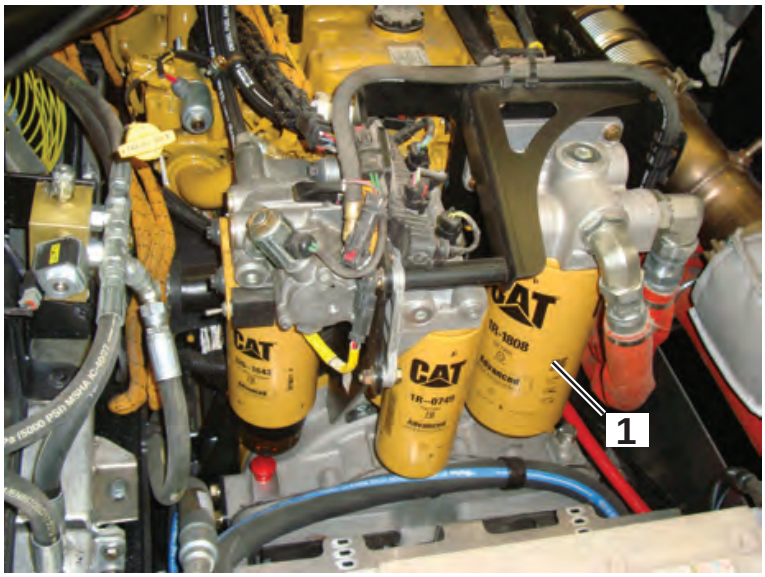


Figure 102: Engine oil filter

Pos.	Name
1	Oil filter

1. Park the vehicle on level ground and turn the key in the ignition switch to the off position.
2. If not already done, open the panels to access the oil filter.
3. Open the cap on the oil filler neck of the engine. Install a recipient to collect the used oil under the engine drain plug.
4. Open the drain plug and wait until all oil is drained.
5. Inspect the magnet of the drain plug for excessive wear material. The presence of metal debris could indicate a major failure or premature wear. Clean the drain plug. Replace the O'ring on the drain plug if required, reinstall the drain plug.
6. Remove the filter cartridge from the head.
7. Clean the sealing surface of the filter mounting head and apply clean engine oil on the seal of the new oil filter.
8. Install new filter cartridge on the head. Tighten by hand.
9. Fill the engine with new oil. Check level with the oil dipstick. Do not overfill.
10. Start the engine and run it for a two minutes at low idle.
11. Turn off the engine and wait 10 minutes (for oil to settle). Check for leaks.

11.10.4 Checking the engine oil level

See "Engine oil level" (p. 108)

11.10.5 Replacing the engine air filter

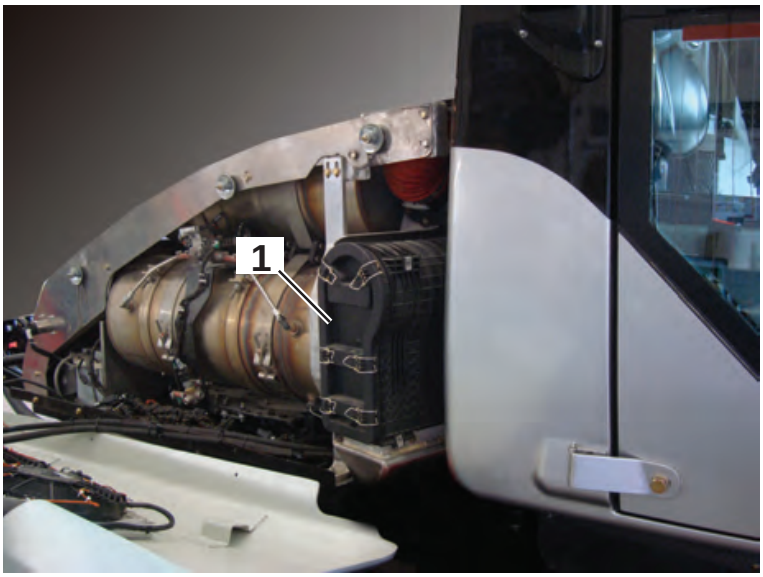


Figure 103: Engine air filter

Pos.	Name
1	Engine air filter

1. Park the vehicle on level ground and turn the key in the ignition switch to the off position.
2. Remove the right side cowling panel.
3. Open the 6 clips retaining the cover of the air filter housing.
4. Remove the housing cover. Remove both filter cartridges.
   Verifiy the filters are dry or wet. A wet filter will create restriction in the air flow and potential problems to the turbo and exhaust system.
5. Discard the top conical (secondary) cartridge.
6. Clean or replace the rectangular (primary) cartridge, as required.
7. Thoroughly clean and inspect the interior surfaces of the filter housing and of the cover. Repair any damage.
8. Install the new secondary cartridge.
9. Install the primary cartridge.
10. Install the cover and close the retaining clips.
11. Re-install the right side cowling panel.

11.10.6 Clean the engine

⚠ CAUTION

Fire hazard
Fuel is highly combustible and harmful to health.

- ► Avoid fire, naked flames, smoking, and sparks.
- ► Do not allow fuel to drip or splash onto electrical systems or hot surfaces.
- ► Spilled fuel should be wiped up immediately.
- ► Using fuel as a cleaning agent can lead to fire and skin injuries.
- ► Never use fuel as a cleaning agent.
- ► Accumulated oil and lubricating grease can cause fires.
- ► Repair any leaks immediately.
- ► Ensure cleanliness when handling operating fluids.

NOTICE

Risk of contamination of drinking water
Cleaning agents can contaminate water resources.

- ► Only clean the engine at a washing station intended for that purpose.
- ► Dispose of empty containers and used cleaning materials in an environmentally responsible manner.

A clean engine makes it easier to identify leaks, ensures maximum heat dissipation and allows easier maintenance:

- Clean the engine regularly with a high-pressure cleaner to remove oil and lubricating grease. In doing so, avoid water leakage into air intakes and ventilation openings.
- After cleaning, apply preservation agent. Protect belt drive from preservative agents.

■ Cleaning with high-pressure cleaner

⚠ CAUTION

Projection hazard
Compressed air and water pressure can cause serious injuries.

- ► Wear a face mask and protective clothing.
- ► Max. air pressure at the nozzle: **205 kPa** (30 psi)
- ► Max. water pressure: **275 kPa** (40 psi)

NOTICE

Risk of damage

- ► The exhaust gas after-treatment system must only be cleaned when cool. Otherwise the sensors may be damaged.
- ► When cleaning, never point the water jet at the exhaust pipe. The system may otherwise be damaged.

NOTICE

Risk of damage
Components may be damaged if the water pressure or air pressure is too high. Chemical substances can corrode the alloys in components.

- ► Only use moderate pressure when cleaning.
- ► Keep the water or air jet moving constantly.
- ► Do not use caustic soda, hydrochloric acid, or chemicals for cleaning.

NOTICE

Risk of damage
Water and pressure may cause damage to electrical and electronic components and therefore cause the failure of entire systems.

- ► Switch off electrical systems before cleaning the engine.
- ► Do not use too much pressure or water.
- ► Do not aim the water jet directly at electrical components, connectors, seals, tubes, etc.
- ► Do not wash the alternator, starter, or electrical control unit.

- ■ Follow the manufacturer's instructions.
- ■ Maintain a minimum distance between the high-pressure nozzle and the object being cleaned:
  - □ For needle jet nozzles approx. **70 cm** (28 in)
  - □ For **25°** flat-jet nozzles and mud cutters approx. **30 cm** (12 in)

11.11 Battery

11.11.1 Safety instructions

Observe the following safety instructions when handling batteries:

⚠ WARNING

Risk of caustic burns
The acid contained in the batteries causes caustic burns to skin and eyes.

- ► Avoid contact with skin, eyes, or clothing.
- ► Wear suitable protective clothing, protective gloves and safety goggles.
- ► If splashed with acid, wash off immediately with clean water and seek medical assistance if necessary.
- ► Battery acid should be stored out of reach of children.

⚠ WARNING

Explosion hazard
Gases leaking from batteries may explode and cause injury.

- ► Keep away from fire, naked flames and sparks, and do not smoke.

NOTICE

Risk of damage to electronic equipment
Short circuits can cause damage to electrical or electronic components.

► Do not place metal parts on the battery.

NOTICE

Risk of battery damage
The battery case will become brittle in direct sunlight.

► Do not expose batteries to direct sunlight unprotected.

NOTICE

Risk of pollution of the environment
Batteries should not be treated as normal household waste.

► Take discharged batteries to a recycling point for old batteries.

NOTICE

► Only connect batteries of the same type.
► Ensure that batteries have the same nominal voltage.
► Do not open the battery plugs as this will invalidate the manufacturer warranty.

11.11.2 Transport, store and maintain the batteries

■ Transport

- To prevent acid from leaking out, batteries should be transported while remaining:
  - □ Cool
  - □ Dry
  - □ Protected from the sun
  - □ Upright
  - □ Secured to prevent tilting
- Leave protective cap on the positive terminal.
- Use the FIFO stock management method (First In - First Out)
- Check the charge level regularly, recharge if necessary.

■ Storage

Battery performance is reduced in cold conditions; for example, at **-10 °C** (14 °F) output is only about **60 %** of normal level. If the engine is out of service for extended period, store the batteries in a room with heating. Ensure good ventilation when charging.

1. Charge the battery, disconnect negative terminal from snow groomer
2. Check the charge level regularly, charge battery if necessary.

■ Maintenance

At vehicle delivery, the batteries are charged and ready for use. Careful maintenance and limited electricity consumption will help to retain optimum charge.

1. Keep battery clean and dry, grease terminals if necessary.
2. Wipe the batteries only with a moist, anti-static cloth (otherwise there is a risk of explosion).

3. If starting power is insufficient, recharge the battery.

11.11.3 Clean the battery

⚠ WARNING

Explosion hazard
Gases leaking from batteries may explode and cause injury.

► Keep away from fire, naked flames and sparks, and do not smoke.

⚠ WARNING

Risk of caustic burns
The acid contained in the batteries causes caustic burns to skin or eyes.

► Wear suitable protective gloves, protective clothing and safety glasses.
► Avoid contact with skin, eyes, or clothing.
► If splashed with acid, wash off immediately with clean water and seek medical assistance if necessary.
► Battery acid should be stored out of reach of children.

NOTICE

Risk of pollution of the environment
Batteries should not be treated as normal household waste.

► Take discharged batteries to a recycling point for old batteries.

Batteries contain hydrogen, a highly inflammable gas, and sulphuric acid. Therefore, special safety instructions should be followed and safety measures taken when handling batteries:

The batteries are located on the left under the engine cover behind the driver's cab. Keep the batteries, terminal studs, and terminal clamps clean:

1. Clean the terminal studs and clamps, if necessary, loosen the terminals and clean the contact surfaces.
2. Smear the terminal studs with Vaseline or an acid-free, non-corrosive grease.
3. Re-tighten the terminal clamps if necessary

11.11.4 Removing battery

Do not place metal parts, such as tools, on the battery, they could cause a short circuit.

1. Turn ignition switch to position 0, switch off all electrical consumers. Wait at least **6 min** for the master switch to turn off.
2. Loosen and disconnect negative terminal clamp.
3. Release and disconnect positive terminal clamp.
4. After removing the terminal clamp, place a protective cap on the positive terminal stud to prevent short circuits and sparks.
5. Unscrew the battery holder (mounting).
6. Remove battery.

11.11.5 Installing battery

Batteries are to be used for starting the diesel engine and regulating the voltage.

1. Clean the battery terminals and apply a little terminal grease.

2. Turn ignition switch to position 0, switch off all electrical consumers.
3. Remove foreign bodies from the battery support surface.
4. Insert the battery.
5. Screw on the battery holder (battery fastening)
6. Only remove the protective cap from the positive terminal stud when connecting the terminal clamps, in order to prevent short circuits and sparks.
7. Attach the positive terminal clamp and ensure that the clamp is firmly connected.
8. Attach the negative terminal clamp and ensure that the clamp is firmly connected.

If two batteries are connected in series in 24 V systems, first connect the batteries to each other (positive terminal to negative terminal). Use only cables with the same cross section as the connecting cables or use the connecting cables from the old battery set.

11.11.6 Charging battery

NOTICE

- ► Keep fittings of the old battery in use for the new one, such as terminal caps, elbow fitting, hose fitting and terminal clamp holders (if available), use the existing blind plug or the one supplied with the new battery.
- ► Leave at least one gas outlet open, or fit it with the elbow fitting and hose.

1. Ensure good ventilation.
2. Open the battery compartment.
3. Loosen and disconnect negative terminal clamp.
4. Release and disconnect positive terminal clamp.
5. Only use suitable DC chargers with electronic regulation of the charging current.
6. Connect the positive pole of the battery or **24-V** series connection to the positive output of the charger.
7. Connect the negative pole of the battery or **24-V** series connection to the negative output of the charger.
8. Switch on charger after connecting the battery, and switch it off first after charging.
9. Recommended charging current **10 %** ampere of battery capacity Ah.
10. When recharging, use chargers with a constant charging voltage of **28,8 V** for **24-V** series connections.
11. Interrupt charging if the temperature of the acid exceeds **45 °C** (113 °F). Check temperature.

Accumulator is fully charged if the charge voltage does not rise for two hours.

11.11.7 Jump start

⚠ WARNING

Explosion hazard
Incorrectly connected jumper cables can lead to explosions and cause injury.

- ► Keep away from fire, naked flames and sparks, and do not smoke.
- ► The ends of jumper cables must never touch.

NOTICE

Risk of damage to property

If jump starting is carried out incorrectly, it can cause damage to property.

- ► Ensure that all batteries have the same rated voltage. Otherwise, a battery may be destroyed.
- ► Do not reverse the polarity of the battery cables as this can damage the alternator and electronic equipment.

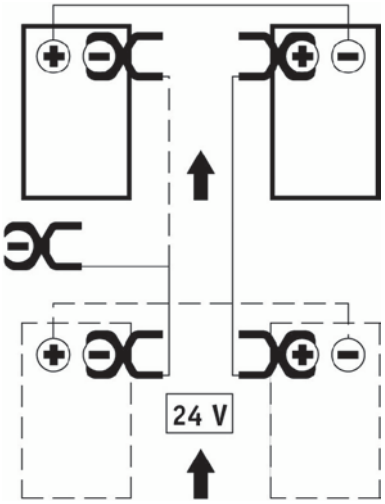


Figure 104: Connection diagram for jump starting

If the battery is discharged, the engine can be started using jumper cables and a booster battery. Only use jumper cables conforming to DIN 72553 and follow the instructions supplied.

Only use batteries with same nominal voltage for jump starting. This applies particularly to vehicles with 24 V systems. Only use insulated jumper cables (cable cross section approx. 70 mm²) with insulated terminal clamps (risk of short circuit).

A flat battery can freeze at approx. **-10 °C** (+14 °F); it has to be thawed before jump starting.

Use of cables for starting with a booster battery:

1. For jump starting with jumper cables, only use vehicles with the same nominal voltage (24 V).
2. Turn ignition switch to position 0, switch off all electrical consumers.
3. Attach red cable to positive terminal of flat battery.
4. Attach other end of red cable to positive terminal of donor battery.
5. Attach black cable to negative terminal of donor battery.
6. Attach the other end of the black cable to a stable, unpainted metal part of the frame or negative terminal (if necessary) of the flat battery.
7. Once the cables are properly and completely fixed, start the assisting vehicle.
8. Start the vehicle with the flat battery. Do not perform jump starting procedure for longer than **15 s**.
9. If starting is successful, leave the vehicle with the flat battery running.
10. Disconnect the jumper cables in reverse order (first black, then red).

11.11.8 Jump start using the boost lugs

⚠ WARNING

Explosion hazard
Incorrectly connected jumper cables can lead to explosions and cause injuries.

- ► Keep away from fire, naked flames and sparks, and do not smoke.
- ► The ends of jumper cables must never touch.

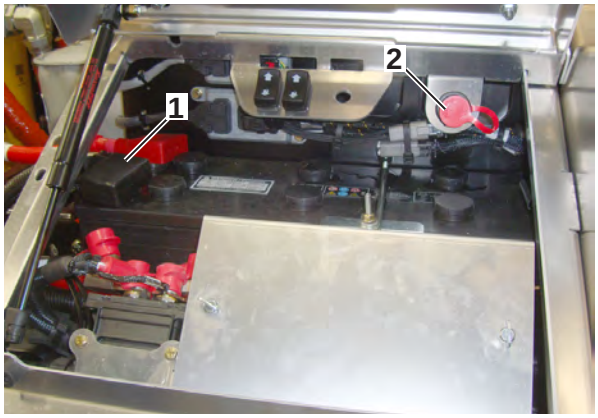


Figure 105: Boost lugs

Pos.	Name
1	Negative lug
2	Positive lug

When the winch is installed on the vehicle, use the boost lug (2) to access the positive pole of the batteries. Use the pole of the exposed battery under the black cap (1) to access the negative terminal.

11.12 Cooling system

11.12.1 Checking the coolant level

See "Engine coolant level" (p. 107)

11.12.2 Replacing the coolant

⚠ WARNING

Risk of scalding
The cooling system is pressurized. Hot coolant can spray out and scald skin and eyes when the cooling system is opened.

- ► Only open the cooling system when the coolant temperature is below **40 °C** (104 °F).
- ► Slowly unscrew the housing cover and completely release the pressure before opening.
- ► Wear suitable protective gloves, clothing and safety glasses when handling coolants.
- ► Do not add cold coolant to a hot cooling system (when the engine is still warm).

⚠ WARNING

Risk of poisoning
Coolant is toxic if swallowed.

- ► Never swallow coolant.
- ► Do not fill coolant into containers otherwise used for drinking.
- ► Coolant should be stored out of reach of children.

NOTICE

Coolant

- ► Only use anti-corrosion / anti-freeze agents approved by Caterpillar otherwise the manufacturer warranty is void.

The cooling system should be drained, cleaned and filled before the recommended maintenance interval if the following conditions are present:

- The engine frequently overheats.
- You observe foam formation.
- Oil has leaked into the cooling system and the coolant has been contaminated.
- Fuel has leaked into the cooling system and the coolant has been contaminated.

Using a non-approved coolant can cause the formation of limescale and rust deposits, which will affect performance and may cause damage to the drive engine and cooling system.

Always check the condition of the cooling and heating systems for leaks before replacing the coolant. Record the replacement of the coolant in the maintenance booklet.

11.12.3 Draining the coolant

NOTICE

Risk of contamination of drinking water
Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

- ► Operating fluids and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation.

1. Switch off the engine and wait for it to cool down.
2. Slowly loosen the cap on the filler neck of the expansion reservoir to release the pressure, then remove the cap.
3. Place a suitable vessel to collect the amount of drained coolant.
4. Attach the drainage hoses to the coolant discharge nozzle on the radiator and on the radiator tube.
5. Open both nozzles.
6. Collect the used coolant in a suitable container and dispose of it in an environmentally safe manner.
7. Clear drain openings which have been blocked by deposits.
8. Close the discharge nozzles. Remove drainage tubes.

11.12.4 Flushing the cooling system

⚠ WARNING

Risk of poisoning
Coolant is toxic if swallowed.

- ► Never swallow coolant.
- ► Do not fill coolant into containers otherwise used for drinking.
- ► Coolant should be stored out of reach of children.

⚠ WARNING

Risk of scalding
Since the cooling system is pressurised, hot coolant can spray out when the cooling system is opened and scald skin and eyes.

- ► Only open the cooling system when the coolant temperature is below **40 °C** (104 °F).
- ► Slowly unscrew the cap and release the pressure before opening completely.
- ► Wear suitable protective gloves, protective clothing and safety glasses.

NOTICE

Risk of contamination of drinking water
Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

- ► Operating fluids and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation.

- ■ Flush the cooling system with clean water in order to remove any debris.
- ■ Close the drain valves.
- ■ Fill the cooling system with a mixture of clean water and Caterpillar Fast Acting Cooling System Cleaner. Add **0.5 l** (1 pint) of cleaner per **15 l** (4 US gal) of the cooling system capacity. Install the cooling system filler cap. Fill the cooling system no faster than **19 l** (5 US gal) per minute to avoid air locks.
- ■ Start and run the engine at low idle for a minimum of **30 min**. The coolant temperature should be at least **82 °C** (180 °F). Improper or incomplete rinsing of the cooling system can result in damage to the copper and other metal components. To avoid damage to the cooling system, make sure to completely flush the cooling system with clear water. Continue to flush the system until all signs of the cleaning agent are gone.
- ■ Stop the engine and allow the engine to cool. Loosen the cooling system filler cap slowly in order to relieve any pressure. Remove the cap. Open the drain valves. Allow the water to drain. Flush the cooling system with clean water. Be sure to flush the heater and any related supply and return lines. Close the drain valve.

11.12.5 Filling coolant

NOTICE

Risk of damage to the engine and transmission
Even the smallest particles of dirt entering the engine or overfilling can cause engine or transmission damage and premature wear.

► Ensure the utmost cleanliness when handling operating fluids.
► Check for correct filling level.

NOTICE

Risk of contamination of drinking water
Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

► Operating fluids, and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
► Follow the legal provisions applicable to the place of operation.

The engine's cooling system must be filled with a mixture of tap water, ethylene-glycol based anti-freeze and possibly an anticorrosion agent:

- Fill cooling system with the specified coolant/antifreeze agent.
- Fill in coolant / antifreeze agent slowly, no faster than **19 l/min**, to avoid bubble formation.
- Do not put the engine cooling system cap back on.
- Start the engine and let it run for approx. **1 min** at low speed.
- Fill coolant continuously in the specified composition up to the bottom edge of the filler neck.
- Stop the engine and seal the cooling system again.
- Check the cooling system for leaks and correct the operating temperature.

11.12.6 Cleaning cooling systems

Compressed air is the preferred method for removing loose dirt. But pressurised water can also be used for cleaning:

- Remove contaminants on the radiator fins (dust, lubricating grease, oil, etc.) with a high-pressure cleaner (max. **70 °C** (158 °F)) or by blowing off with compressed air from behind the radiator.
- Direct compressed air in the opposite direction to the cooling air flow: the nozzle should be held at a distance of about **6 mm** (0.2 in) from the fins and moved slowly and parallel to the tubes.
- To remove oil and grease, use a degreasing agent and steam.
- Wash the radiator block with a cleaning agent and hot water, then rinse thoroughly with clean water.
- Clean both sides of the radiator block.

- Check the condition of the following parts:
  - Radiator fins
  - Welding seams
  - Mounting brackets
  - Compressed air lines
  - Connections
  - Clamps

- Seals

If the operating conditions require it, clean the cooling system and charge air cooler at more frequent intervals than specified.

11.13 Fuel system

⚠ CAUTION

Fire hazard
Fuels are highly combustible and harmful to health.

- ► Avoid fire, open flame, smoking and sparking.
- ► Do not allow fuel to drip or splash onto electrical systems or hot surfaces.
- ► Spilled fuel should be wiped up immediately.

Using diesel fuel that contains water can damage the injection system which often results in piston seizure. This can be partially avoided by filling up while the fuel tank is still warm after switching off the engine (which prevents condensation). Drain any water from the storage tank regularly. It is also required to install a water separator upstream of the fuel filter. Flow additives must not be used for winter operation.

Measures to ensure cleanliness:

- Protect fuel system from dirt. Clean the vicinity of the fuel system carefully before removing components.
- Put a suitable cover on components removed from the fuel system.

11.13.1 Checking the water separator

See "Primary fuel filter/ water separator" (p. 110)

11.13.2 Replacing the primary fuel filter

NOTICE

Risk of contamination of drinking water

- ► Used filter components, seals and residual fuel must be disposed of in accordance with local regulations.

⚠ WARNING

Fire hazard

- ► Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up any leaked or splilled fuel. Do not smoke while working on the fuel system.

NOTICE

Precaution regarding fuel filter replacement

- ► Do not fill the fuel filters with fuel before installation. Unfiltered fuel could cause contamination and accelerated wear of the fuel system parts.
- ► Be careful not to drop fluid in the vent cavities of the bell housing.
- ► Do not start the engine if air is not purged from the fuel lines. Always use the fuel priming pump prior to start the engine after a change of fuel filter.

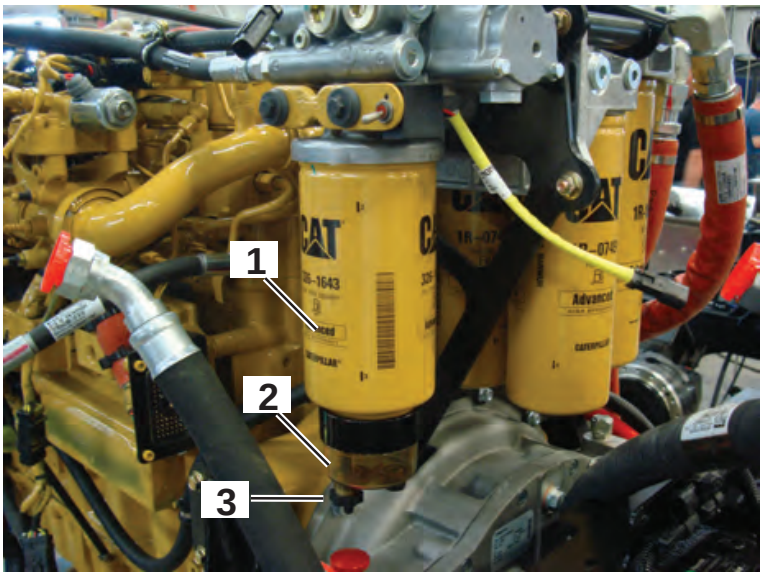


Figure 106: Primary fuel filter

Pos.	Name
1	Primary fuel filter
2	Transparent bowl
3	Drain valve

1. Park the vehicle on level ground and turn the key in the ignition switch to the off position.
2. Install a tube on the drain valve and a recipient to collect the water and fuel.
3. Drain the transparent bowl of the primary fuel filter.
4. Close the drain valve.
5. Remove the filter cartridge from the mounting head and discard it.
6. Hold the filter cartridge and remove the transparent bowl.
7. Remove O'ring from the threaded tube of the head. Clean the filter mounting head.
8. Clean the transparent bowl and inspect the seal. Replace the seal if required.
9. Lubricate the seal with clean diesel fuel and install on the transparent bowl.
10. Install the transparent bowl on the new filter cartridge. Tighten to **15 Nm** (11 ft-lb.).
11. Lubricate the seal of the new filter cartridge with diesel fuel. Install the new filter cartridge (with transparent bowl) on the head. Tighten by hand.
12. Insert the key in the ignition switch and turn it to the accessory position. Activate the fuel priming pump to fill the lines as described in the fuel priming procedure. Then start the engine;
13. Stop the engine and check for leaks.
14. Proceed to change the secondary fuel filters.

11.13.3 Replacing the secondary fuel filters

NOTICE

Risk of contamination of drinking water

► Used filter components, seals and residual fuel must be disposed of in accordance with local regulations.

⚠ WARNING

Fire hazard

- ► Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up any leaked or splilled fuel. Do not smoke while working on the fuel system.

NOTICE

Precaution regarding fuel filter replacement

- ► Do not fill the fuel filters with fuel before installation. Unfiltered fuel could cause contamination and accelerated wear of the fuel system parts.
- ► Be careful not to drop fluid in the vent cavities of the bell housing.
- ► Do not start the engine if air is not purged from the fuel lines. Always use the fuel priming pump prior to start the engine after a change of fuel filter.

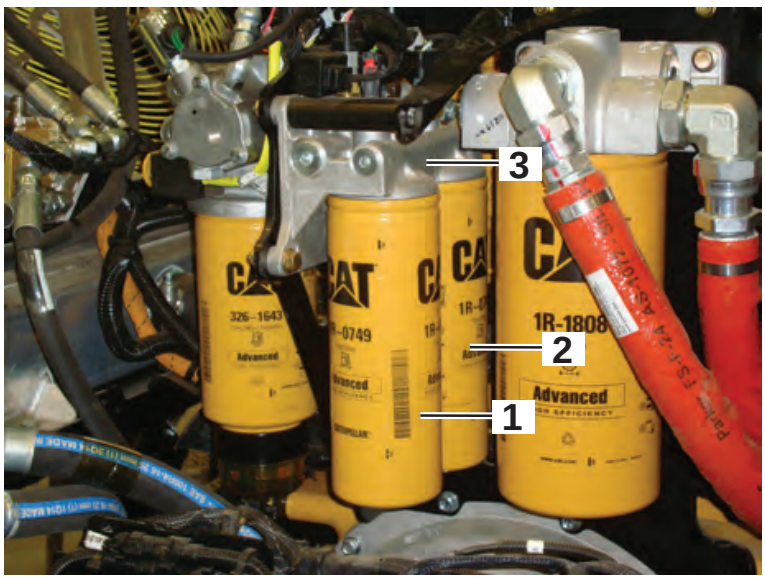


Figure 107: Secondary fuel filters

Pos.	Name
1	Rear filter
2	Front filter
3	Filter head

1. Park the vehicle on level ground and turn the key in the ignition switch to the off position.
2. If not already done, replace the primary fuel filter (fuel filter/water separator).
3. Install a suitable recipient under the filters to collect possible fuel spill.
4. It may be required to relieve residual fuel pressure before removing the filters. If so, loosen the one of the fuel supply connection to purge any residual pressure.
5. Remove the rear filter cartridge from the rear head.
6. Clean the sealing surface of the fuel filter head.
7. Remove the front filter cartridge from the front head.
8. Clean the sealing surface of the fuel filter head.
9. Lubricate the seal with clean diesel fuel and install new front filter cartridge on front head. Tighten by hand.

10. Lubricate the seal with clean diesel fuel and install new rear filter cartridge on rear head. Tighten by hand.
11. Insert the key in the ignition switch and turn it to the accessory position.
12. Activate the fuel priming pump to fill the lines and start the engine. Refer to the procedure for Priming the fuel system.
13. Stop the engine and check for leaks.

11.13.4 Priming the fuel system

⚠ WARNING

Fluid projection hazard

► Fuel under pressure. Never open the fuel lines, the fuel rail or crack fuel injectors to bleed the fuel circuit. Injectors operate at very high pressure and could cause severe injuries. Use the priming pump to fill the fuel lines.

NOTICE

Air in the fuel lines

Air in the fuel lines must be avoided to prevent premature wear and damage to the engine. If air is trapped in the system, the very high pressure of operation could permanently damage critical engine parts.

► Ensure to follow the priming procedure thoroughly.

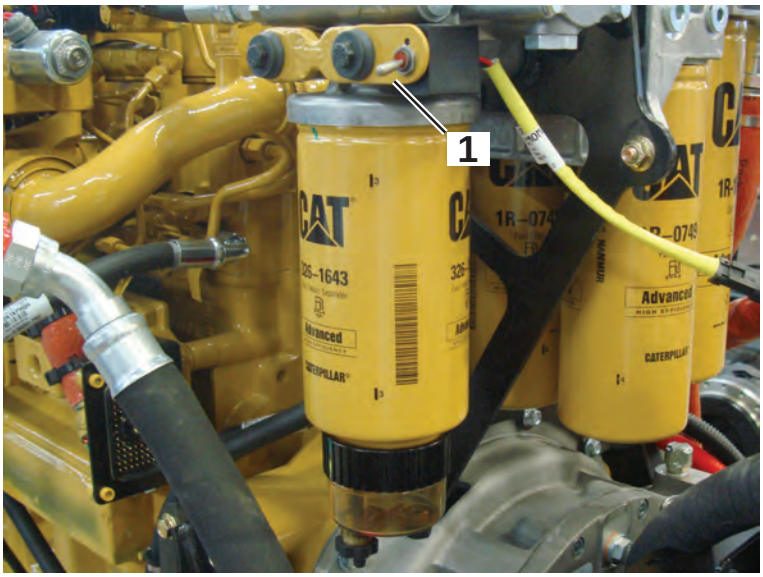


Figure 108: Fuel priming pump switch

Pos.	Name
1	Fuel priming pump switch

If the engine shuts down because it ran out of fuel or because a filter was replaced, refill the tank and activate the fuel priming pump. Use the momentary switch located on top of the primary fuel filter/water separator. Proceed as follows:

- Turn key in the ignition switch to the “ON” position;
- Open the rear cowling central access panel and locate the switch;
- Push and hold the momentary switch until the water separator bowl is filled with fuel;

- Once the bowl is full, hold the switch for **30 s** to fill the other filters and lines (fuel pressure can be seen on the display in the cab, pressure must raise to **2 bar** minimum otherwise there is still air bubbles in the system);
- Wait one minute and hold the switch a second time for **30 s**;
- Wait one minute and hold the switch a third time for **30 s**;
- Start the diesel engine.

When starting, do not crank for more than **20 s** as this could cause permanent damage to engine components.

If the engine fails to start, wait two minutes before cranking again. Before making an other try, investigate for a possible problem. Check the display in the cab to see if a diagnostic or event code helps to pinpoint the problem.

When the system is properly purged, the fuel pressure should reach **2 bar** within **5 s** of the switch activation. If it takes **10 s** or more, air could still be trapped in the system.

11.14 Wheels

11.14.1 Check tension wheels, running wheels and sprocket wheels

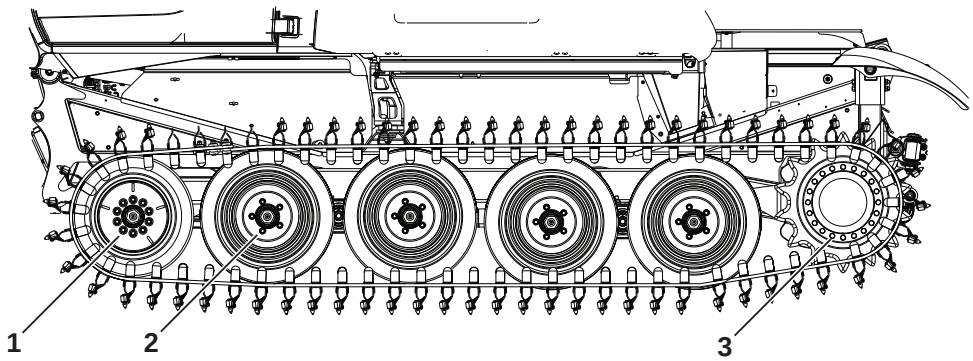


Figure 109: Tension wheels, running wheels and sprocket wheels

Pos.	Name
1	Tension wheels mounting torque : **340 Nm** (250 ft-lb)
2	Running wheels mounting torque : **230 Nm** (170 ft-lb)
3	Drive sprockets mounting torque : **145 Nm** (107 ft-lb)

NOTICE

► Check wheel nuts after the first **40** operating hours and tighten if required.

- Check the tension wheels (1) and running wheels (2)
  - □ Check tightening torque of the mounting nuts.
  - □ Carry out visual check of tyres and wheel rims.
  - □ Check tire walls for damage.

- Check the sprocket wheels (3)
  - Check tightening torque of the mounting nuts.
  - Check the sprocket wheels for wear:
  - Check whether the teeth are chipped or only damaged on one side.
  - Check whether there is any foreign matter stuck in the tracks.
  - Replace the sprocket wheels with tooth flanks worn on one side.
  - Check whether the wheel sides are damaged.

11.14.2 Checking the track guide

- Checking the condition of the track guide.
- Make sure that the track guides are firmly fastened.
- Immediately replace damaged and missing track guide clamps and locking nuts.
- If necessary, tighten the nuts on the track treads (**95 Nm**).

11.15 Tracks

11.15.1 Torque values for steel track fasteners

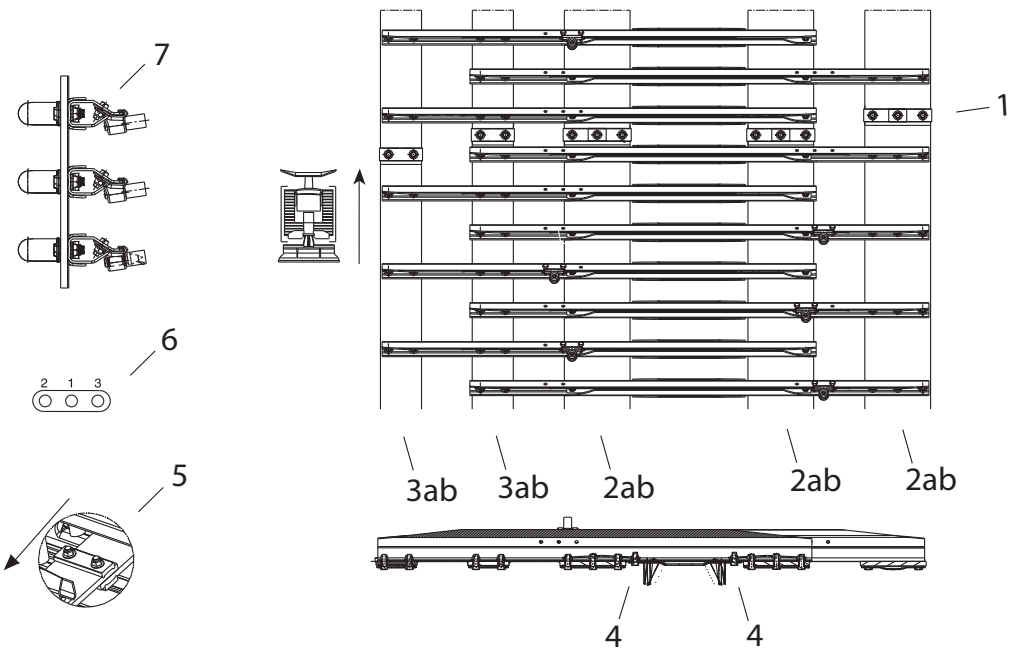


Figure 110: Standard and Preminum steel tracks

Cross-link retaining bolts/nuts on rubber belts must be tightened to specified torque after the first **150** hours of operation (torque value shown is the tightening torque). Then, reapply torque at the beginning of every season.

Name	Val
1	Overlap with bushings : **95 +15/-5 Nm** (70 +11/-3 ft-lb)
2a	Wide rubber belt without bushings : **54 - 61 Nm** (40 - 45 ft-lb)
2b	Wide rubber belt with bushings : **163 +15/-5 Nm** (100 +11/-3 ft-lb)
3a	Narrow rubber belt without bushings : **41 - 48 Nm** (30 - 35 ft-lb)

Name	Val
3b	Narrow rubber belt with bushings : **163 +15/-5 Nm** (100 +11/-3 ft-lb)
4	Track guides : **95 - 108 Nm** (70 - 80 ft-lb)
5	Overlap arrangement detail vs direction of travel
6	Order of bolt installation on backing plate
7	Retaining bolt for Ice calk supports : **54 - 68 Nm** (40 - 50 ft-lb)

11.16 Hydraulic components

11.16.1 Checking the oil level of the tilting mechanism

NOTICE

Precaution regarding oil level

► To obtain an accurate reading, the track tensioners should be retracted, the cab should be lowered as well as the winch unit if installed.

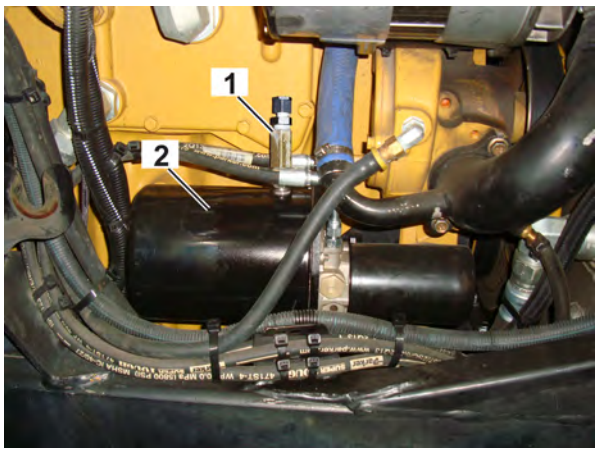


Figure 111: Tilting mechanism

Pos.	Name
1	Breather
2	Hydraulic tank

The oil reservoir for the tilt cab, track tension and optional tower winch circuits is located on the right side of the engine. It is required to remove the aluminium side panel to access the reservoir. The oil level should be checked when the oil is warm. Proceed as follows.

1. Park the vehicle on level ground and turn off the engine;
2. Lower the front blade and the tiller.
3. Remove the aluminum right side panel to access the reservoir;
4. Using the appropriate tool, unscrew (item1) the breather completely;
5. Use a clean metal rod or wood stick to evaluate the oil level in the reservoir. The level should be at the maximum in the reservoir.
   If the tracks are under tension, the oil level should be around 3/4 full. The last 1/4 of the tank is used for the track tensioning function.
6. If necessary, fill up with specified hydraulic fluid. Reinstall the breather.
7. Reinstall the aluminum right side panel.

11.16.2 Replacing the planetary gearbox oil

NOTICE

Risk of contamination and damage

► Do not allow dirt to enter the housing. Thoroughly clean the area around the plugs before proceeding.

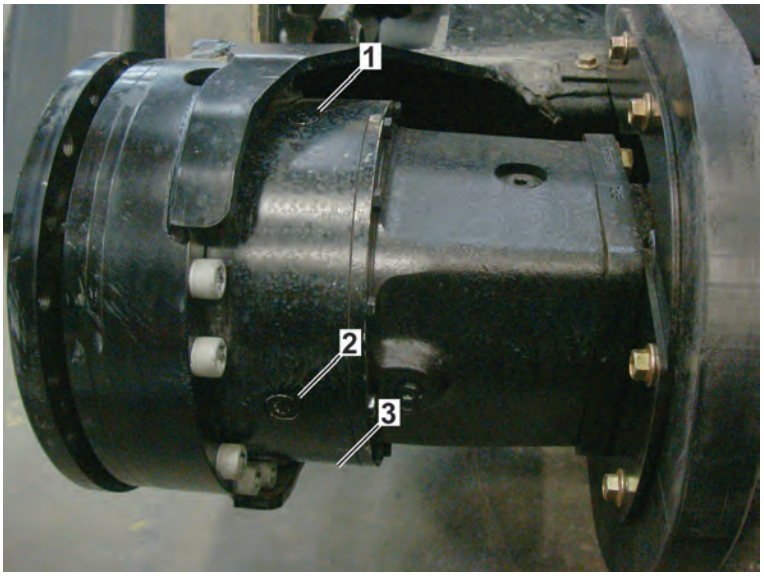


Figure 112: Planetary gearbox oil plugs

Pos.	Name
1	Fill plug
2	Level plug
3	Drain plug (not visible on picture)

1. Park the vehicle on level ground and turn the key in the ignition switch to the off position.
2. Install a recipient to collect the used oil.
3. Clean the areas around the plugs before removing them.
4. Remove the fill plug first. Then, remove the level and drain plugs of the gearbox and wait until all oil is drained.
5. Inspect the magnets of the plugs for excessive wear material. The presence of metal debris could indicate a major failure.
6. When all the oil is drained, reinstall the drain plug. Torque M16 plugs to **65 N.m** (48 lbf-ft). Torque M18 plugs to **80 N.m** (59 lbf-ft)
   IMPORTANT
   Make sure the sealing brass washer is replaced by a new one every time the plug is removed.
7. Using new oil, fill the housing until oil flows out of the level plug. Proper oil level is critical to the service life of this component.
8. Check level again after the oil has settled.
9. Reinstall the remaining plugs.
   IMPORTANT
   Make sure the sealing brass washer is replaced by a new one every time the plug is removed.
10. Repeat for the other gearbox.

11.16.3 Replacing the oil and filters of the hydraulic tank

Changing the hydraulic oil and filter will introduce air in the hydraulic/hydrostatic system and thus it requires an hydrostatic startup after the replacement. Refer to the training manual to perform an hydraulic/hydrostatic oil change, an oil filter change or an hydrostatic startup.

11.16.4 Checking the hydraulic oil level

➽ *See "Hydraulic oil level" (p. 108)*

11.16.5 Hydraulic oil change

NOTICE

Risk of damage to the hydraulic system
If the oil change is not carried out properly, the hydraulic system may become damaged.

► Only specialized staff are permitted to change the hydraulic oil.

NOTICE

Risk of damage to the hydraulic system
Even the smallest dirt particles can cause premature wear or damage to the system.

► Ensure the utmost cleanliness when handling operating fluids.
► Only use the specified types of hydraulic oil.
► Observe the hydraulic oil change intervals.
► Check the MAX mark: do not overfill.

NOTICE

► If the hydraulic oil was contaminated because of an operating fault, the hydraulic oil must always be changed (regardless of the maintenance schedule).
► Depending on the type of operating fault, directly connected components such as filters, hoses and coolers should be checked and, if necessary, rinsed or replaced.

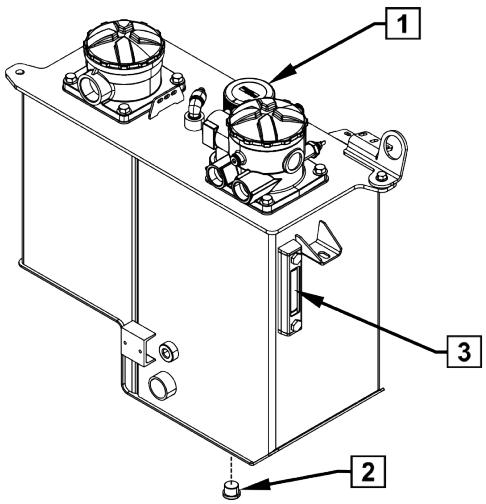


Figure 113: Hydraulic oil tank

Pos.	Name
1	Filler cap

Pos.	Name
2	Drain screw
3	Sight glass

1. First remove the filler opening cap (1).
2. Then remove the drain plug (2).
3. Empty the hydraulic oil from the hydraulic oil tank.
4. If necessary, check the connected filters, hoses and coolers, and rinse or replace them.
5. Once the hydraulic oil is drained, mount the drain plug (2) again with a new sealing ring.
6. Fill with hydraulic oil up to the marking on the sight glass (3).
7. Check oil level after **5 min** running time.

Hydraulic oil change intervals can be found in the maintenance schedule.

11.16.6 Maintaining the hydraulic hoses

NOTICE

Risk of damage to the hydraulic system
Introducing even the smallest dirt particles or overfilling can cause damage to the hydraulic system and premature wear.

- ► Ensure the utmost cleanliness when handling operating fluids.
- ► Check for correct filling level.

NOTICE

Risk of contamination of drinking water
Operating fluids (engine oil, fuel, coolant, etc.) can contaminate water resources.

- ► Operating fluids, and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation.

Service life of hydraulic hoses

- The hydraulic hoses and crush protections installed in the vehicle's high and low pressure lines and in the attachments have a maximum service life of 4 years.
- As a precaution, perform a check from time to time to ensure that the hydraulic hoses do not rub against each other or the body of the snow groomer.

Markings on hydraulic components

- The following information must be permanently attached to a visible location on all hydraulic units:
  - □ Name of manufacturer or supplier
  - □ Product description
  - □ Rated pressure
  - □ Date of manufacture

- Measures to ensure cleanliness
  - Before opening, thoroughly clean the filler, drain, and vent screws and the screw fittings for the hydraulic hoses.
  - Do not use woollen or plastic cloths for cleaning.
  - Use dry compressed air for blowing out.

- Cleaning the hydraulic hoses
  - Clean the hydraulic hoses and lines with a warm water jet, or using compressed air and benzine.
  - Blow out hydraulic hoses and lines with dry compressed air after cleaning.
  - Fit protective caps to hydraulic hoses.
- Damaged hydraulic hoses

If a hydraulic hose bursts, proceed as follows:

1. Switch off engine immediately.
2. Locate damaged hydraulic hose.
3. Slowly open the union nut to release the pressure.
4. Collect the hydraulic oil in a suitable container.
5. Close off the damaged hydraulic hose with a sealing plug.
6. Replace the damaged hydraulic hose.

11.17 Replacing halogen lamps

⚠ CAUTION

Danger of explosion
Incorrect connection can lead to explosions and cause injury.

► Before starting the replacement work, switch off the power supply to the headlamp.
► Wear protective gloves and safety glasses.

⚠ CAUTION

Risk of injury
Halogen lamps are under high voltage and get very hot.

► Do not interrupt the connecting cable to the headlamp.
► When replacing lamps, always wear safety goggles and protective gloves.

⚠ CAUTION

Risk of splintering
Halogen lamps are under high pressure.

► If a halogen lamp bursts in an enclosed space, leave the area and allow to ventilate for at least **20 min**, as the escaped gases are harmful to health.

NOTICE

Risk of pollution of the environment
Halogen lamps should not be treated as normal household waste.

► Dispose of faulty halogen lamps according to regulations.

When replacing halogen lamps, follow the instructions below:

- Switch off headlamps and disconnect the power supply.
- Ensure that the halogen lamp has cooled down.
- Never touch the halogen lamp with your hands, always hold them by the base instead.

- Remove any finger prints using a cloth moistened with alcohol.

11.18 Arc welding

NOTICE

Risk of damage to property
An incorrect ground connection can damage the bearings in the drive train, hydraulic components, electrical components, and other components.

► Do not connect the welding machine ground terminal to electrical components (such as electronic control units or sensors).

NOTICE

► For further information about welding chassis frames and supports, contact the OEM or your PRINOTH dealer.

The following must be observed for welding work:

To avoid damage to the electronic control unit, sensors, and associated components, the component to be welded should first be removed or detached if possible before carrying out the welding work. If it is not possible to remove or detach the component, the procedure described below must be followed.

This procedure minimizes the risk of damage to electronic components while welding:

1. Switch off the diesel engine.
2. Wait at least **6 min** for the battery disconnect switch to turn off.
3. Disconnect the battery cable from the negative terminal (right side battery).
4. Disconnect the battery cable from the positive terminal (central battery).
5. Isolate the connector of each battery cable previoulsy disconnected.
6. Unplug the electrical connector of the following devices:
   - the electronic control module (ECM) on the diesel engine.
   - the pump electronic tank unit (PETU).
   - the control units in the cab (TTCs).
7. Attach the welding device's ground terminal as near as possible or directly to the component to be welded: This will decrease the risk of damage.
8. The welding electrode and / or welding tongs must never touch electronic components and cables.
9. Protect wire harnesses from welding spatter.
10. Weld the materials according to the specified procedures.

12 Troubleshooting

12.1 Malfunction, cause, and remedy

In addition to careful operation and maintenance of the engine, it is important to resolve malfunctions quickly. For the causes listed in the following table, you can refer to the information from this chapter.

You can resolve some of the malfunctions on your own.

Have malfunctions that you cannot eliminate yourself rectified at a qualified specialist workshop. The engine supplier recommends that you use its service support point as this has the necessary specialist knowledge and tools to carry out the required work. Safety-related work and work on safety systems, in particular, must never be carried out by anyone else other than a professional service centre.

NOTICE

Risk of engine damage
Incorrect maintenance and repair work can cause damage to the engine and therefore increase the risks of accidents.

- ► Have engine maintenance and repair work carried out by suitably trained personnel only.
- ► Work on, or modifications to the engine must always be carried out by qualified personnel who have the necessary specialist knowledge and tools to carry out the required work.
- ► The engine supplier recommends that you use its service support point for this.

12.2 General troubleshooting

Symptom	Cause	Remedy	Ref.
Starter pinion does not turn or turns too slowly	1. Battery is insufficiently charged	► Charge battery	
	2. Starter connection cable is loose	► Tighten cable at terminal; if necessary, weld on new terminal	
	3. Starter solenoid or starter is defective	► Arrange inspection by specialist workshop	
Engine does not start or cuts out straight away	4. Fuel tank empty	► Fill up	
	5. Fuel filter or fuel pre-filter blocked	► Replace filter insert	
	6. Fuel pre-filter contains water	► Remove water from fuel pre-filter	
	7. Fuel system or filter is leaking	► Replace seals	
	8. Fuel not cold-resistant	► Clean pre-filter, Replacing fuel pre-filter, Use Winter fuel	
	9. Wrong engine oil viscosity	► Use engine oil suitable for the operating conditions	
Engine does not start properly	10. Fault in ECM control unit	► Retrieve information from the ECM, have checked by qualified service centre	

Symptom	Cause	Remedy	Ref.
	11. Leakage or insufficient pressure in the low-pressure fuel system	► Leak test (visual inspection), arrange pressure check by qualified service centre	
Engine switches itself off	12. ECM control unit defective (complete failure)	► Arrange inspection by specialist workshop	
	13. Voltage supply to the ECM interrupted or short circuit in the wiring	► Arrange inspection by specialist workshop	
	14. Leaks or insufficient pressure in the fuel low pressure circuit or fuel delivery pump drive defective	► Leak test (visual inspection); arrange pressure check by qualified specialist workshop	
Engine is in emergency operation mode	15. Data flow interruption to the ECM control unit	► Retrieve error log from control unit, consult professional service centre	
Engine rumbles, rattles or runs unevenly	16. Malfunction of the fuel system	► Retrieve error code, consult professional service centre	
Poor engine performance (low power)	17. Air filter dirty or blocked	► Replace filter insert	
	18. Charge air temperature too high due to dirty charge air cooler or radiator	► Clean charge air cooler and radiator from the outside	
	19. Engine coolant temperature too high	► Check temperature sensor, replace if necessary, check fan speed; defective thermostat: consult a professional service centre	
	20. Fuel system defect (blocked, leaking)	► Check for leaks visually, consult a professional service centre	
	21. Charge air system leaking, hose clamp on air inlet hose loose or defective	► Check leaktightness, check boost pressure sensor, replace if necessary, consult professional service centre	
	22. The engine diagnosis control lamp blinks. The AdBlue® / DEF reserve has been used up.	► Fill AdBlue® / DEF reservoir	
	23. The engine diagnosis control lamp lights up. Emission-relevant fault or malfunction in exhaust gas after-treatment system. Faults or malfunctions can cause damage to the exhaust gas after-treatment system.	► Have the exhaust gas after-treatment checked in a qualified service centre	
Excessive fuel consumption	24. Connection points (plug-in pump line and injection jets) leaking	► Leak inspection by qualified specialist workshop	
	25. Faulty combustion	► Have qualified personnel inspect the engine	

Symptom	Cause	Remedy	Ref.
Engine gets too hot (according to coolant temperature indicator)	26. Insufficient coolant	► Fill up, ventilate	
	27. Defective coolant temperature sensor or gauge	► Replace sensor or gauge	
	28. Drive belt damaged	► Replace drive belt	
	29. Fan is not activated correctly	► Consult a professional service centre	
	30. Inside of radiator dirty or calcified, outside of radiator very dirty	► Clean or descale	
	31. Defective thermostat	► Check components, replace if necessary, consult a professional service centre	
Charging current warning lamp comes on when engine is running	32. Insufficient drive belt tension	► Check if belt tensioner works properly	
	33. Drive belt ruptured	► Replace drive belt	
	34. Defective alternator or control unit	► check; contact qualified, specialist workshop	
Engine emits black smoke	35. Air filter dirty or blocked	► Replace filter insert	
	36. Defective turbocharger	►	
	37. Faulty combustion, defective injection	► Consult a professional service centre	
Blue exhaust gas	38. Engine oil level too high, crankcase ventilation defective, engine oil leaking into combustion chamber	► Rectify oil level, have qualified personnel check crankcase ventilation	
White exhaust gas	39. Coolant getting into the combustion chamber or poor fuel combustion	► Pressure loss test; consult a professional service centre.	
Engine "rattles"	40. Faulty combustion	► Consult a professional service centre	
Engine "knocks"	41. Bearing damage	► Consult a professional service centre	
Unusual noises	42. Leakage in intake and exhaust system causes whistling noise	► Fix leakage, replace seals if necessary	
	43. Turbine rotor or compressor wheel scrapes against case; foreign bodies in compressor or turbine; seized bearings in the rotating parts	► Have qualified personnel check the turbocharger	
	44. Excessive valve clearance	► Check valve clearance, adjust if necessary	

12.3 Electrical fuses

⚠ CAUTION

Risk of accident and injury
If you manipulate, bridge or replace a faulty fuse with a fuse of a higher amperage, the electric cables could be overloaded. This may result in a fire.

► Always replace faulty fuses with specified new fuses of the correct amperage.

The individual electrical circuits are protected by safety fuses or automatic circuit-breakers.

- Blown fuses or defective automatic circuit-breakers must be replaced by equivalent fuses with the fuse ratings recommended in the fuse allocation chart. Fuses with the same fuse rating are the same colour. Further information is available from the engine supplier or its service support point.
- The fuse allocation chart is vehicle-specific and is provided by the vehicle manufacturer. ➠ *See "Fuses and relays" (p. 66)*
- If the newly inserted fuse also blows, have the cause traced and rectified at a qualified specialist workshop.
- If a circuit fails, switch off the consumer equipment and switch the ignition lock to position 0.

■ Checking and replacing a safety fuse

1. Pull the fuse out of the module using the pliers and carry out a visual inspection.
2. If the fuse wire has melted, replace the blown fuse with a spare fuse.
3. Switch on consumers and check that they function correctly.

If the safety fuse burns out again, have the electrical system checked at a qualified specialist workshop.

13 Technical data

13.1 Vehicle dimensions

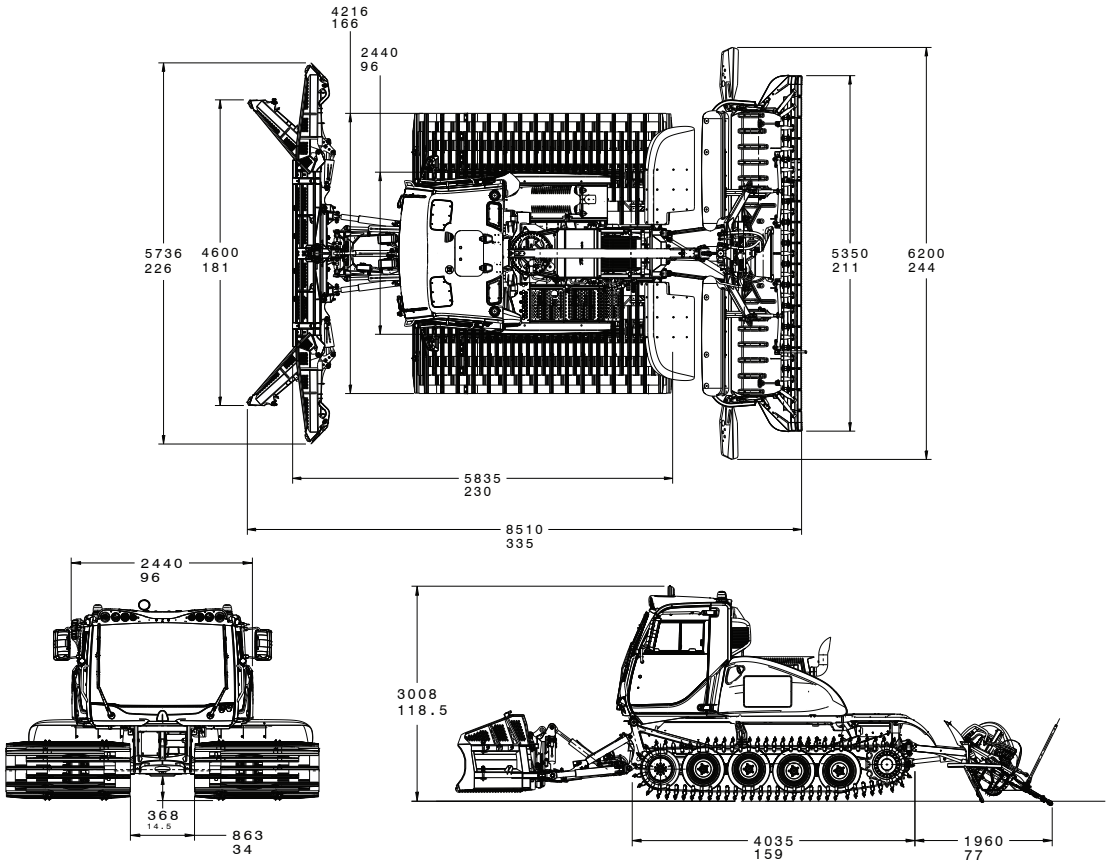


Figure 114: BISON dimensions

Dimensions are indicated in millimeter and in inches underneath.

13.2 Vehicle data

BISON	
Vehicle data	
■ Dimensions	
Vehicle length without : push frame, rear lift frame, blade and tiller	**4035 mm** (159 in)
Vehicle length with attachments	**8510 mm** (335 in)
Vehicle width without tracks	**2440 mm** (96 in)
Vehicle width with tracks	**4216mm** (166 in)
Max. vehicle height	**3008 mm** (118.5 in)
Min. clearance above ground (ground clearance)	**368 mm** (14.5 in)
■ Recommended garage dimensions for maintenance work	
Length	**11000 mm** (433 in)
Width	**8000 mm** (315 in)

BISON	
Vehicle data	
Height	**4000 mm** (158 in)
■ Weights	
Empty weight	**6826 kg** (15049 lb)
Permissible gross vehicle weight	**13500 kg** (29762 lb)
■ vehicle speed	
Continuous vehicle speed range	**21 km/h** (13 mph)
■ Noise emission values	
Sound power level (2000/14/EC)	**104 dB(A)**
Sound pressure level at operator's position (ISO 6394: 2008)	**68 dB(A)**
■ Vibration emission values (2002/44/EC)	
Hand-arm vibration	< **2,5 m/s²** (8.2 ft/s²)
Whole-body vibration*	< **0,5 m/s²** (1.6 ft/s²)
* The vibration emission values indicated are derived from testing production vehicles under typical operating conditions according to intended use.	
■ Diesel engine Caterpillar C9.3 / TIER 4	
Make	Caterpillar
Model	C9.3
Type	Turbodiesel with electronic fuel system
Total displacement	**9.3 L** (567.5 in³)
Power	298 kW / 400 bhp at 1700 to 2000 rpm
Max. torque	**1725 Nm** (1273 ft-lb) at **1400 rpm**
Fuel tank capacity	**266 L** (70.2 gal)
AdBlue® / DEF tank content	**27 L** (7.1 gal)
■ Electrical System	
Operating voltage (two batteries in series)	**24 V**
Rated voltage of individual battery	**12 V**
Capacity	**150 Ah**
Cold start capacity	**1200 A**

14 Storing and taking the vehicle out of service

14.1 Taking the engine out of service

NOTICE

- ► If an engine is not used, oil can run off the following parts that normally receive lubrication: cylinder walls, piston rings, main bearings, connecting rod bearings, crankshaft and gears.
- ► Lack of lubricant allows corrosion to begin to appear on the metal. This corrosion is worse in areas of high humidity.
- ► When the engine is started again, metal to metal contact will cause wear before the surfaces receive oil. To minimize this wear, use the starter to turn the engine with the ECM fuse (F86) removed to prevent engine start. When oil pressure is shown on the pressure gauge, reinstall the ECM fuse and start the engine.

■ Storage (for less than one year)

1. Clean engine of any dirt, rust, grease and oil. Inspect the exterior. Paint areas that have paint damage with a good quality paint.
2. Apply lubricant to all points shown in the Lubrication table.
3. Drain the crankcase oil. Replace the oil and change the oil filters. Add VCI oil to the crankcase oil. The volume of VCI oil in the crankcase should be **3 %** to **4 %**.
   If the engine crankcase is full, drain enough engine oil so the mixture can be added.
4. Remove the air filter cartridges. Turn the engine at cranking speed (remove fuse in position F86 in the cab prior to crank). Use a sprayer to add a mixture of **50 %** VCI and **50 %** engine oil in to the air inlet or turbocharger inlet.
   The mixture of VCI oil can be added to the inlet by removing the plug for checking turbocharger boost pressure. The minimum application rate for the VCI oil mixture is **5.5 ml/l** (3 oz/1000 cu in)of engine displacement.
5. Use a sprayer to apply a mixture of **50 %** VCI oil and **50 %** crankcase oil into the exhaust openings. The minimum application rate for the oil mixture is **5.5 ml/l** (3 oz/1000 cu in) of engine displacement. Seal exhaust pipe and seal any drain holes in the muffler.
6. Loosen the engine belt.
7. Remove the fuel nozzles. Apply **30 ml** (1 oz) of the mixture of oils (**50 %** VCI oil and **50 %** engine oil) into each cylinder. Use a bar or a turning tool in order to turn over the engine slowly. This procedure puts the oil on the cylinder walls. Reinstall all fuel nozzles and tighten to the correct torque.
   Step 7 is optional and should only be performed by a qualified technician.
8. Attach a tag to the engine and to the ignition switch in the cab with a notation of the date that the unit was preserved.

■ Cooling Systems

Cooling systems should be preserved with Caterpillar coolant or equivalent. Caterpillar coolant contains the necessary inhibitors to prevent corrosion and pitting. When used in the proper mixture, the coolant will prevent damage due to rust and freezing.

1. Determine the proper coolant for the engine.
2. Prepare the proper mixture.
3. Fill the radiator completely full to prevent rusting of the top tank.

Fuel and fuel tanks

There are two plastic fuel tanks in the vehicle, hence there is no need to protect them from rust.

1. Open the each fuel tank drain plug and allow any water or dirt to drain. Then, reinstall the drain plugs.
2. Add **0.15 ml/l** (0.02 oz/US gal)of commercial biocide such as Biobor JF or and equivalent to the fuel.
3. Seal all openings to the tanks to prevent evaporation of the fuel and preservative.

DEF/Adblue®

The ideal storage temperature for DEF/Adblue® is between **-9°C** (+15°F) to **+25°C** (+77°F). Additionally, DEF/AdBlue® should be protected from direct sunlight. Refer to **ISO 22241-3** for further information on DEF/AdBlue® handling, transportation and storage.

DEF/AdBlue® cleanliness is extremely important as contaminants can degrade the life of the DEF/AdBlue® and system components.

For known storage conditions, refer to the **ISO 22241** specification for storage duration guidance and follow accordingly.

For unknown storage conditions, measure the in-tank DEF/AdBlue® concentration using a refractometer (available from the Caterpillar service center).

1. If urea concentration is within the range of **29 %** to **35 %**, top off the tank with DEF/AdBlue® meeting the **ISO 22241** specification.
2. If the urea concentration is outside the range of **29 %** to **35 %**, top off the tank with DEF/AdBlue® meeting the **ISO 22241**specification and recheck the urea concentration.
3. After step 2, if urea concentration remains outside the range of **29 %** to **35 %**, drain the DEF/AdBlue® from the tank and refill with DEF/AdBlue® meeting the **ISO 22241** specification.
4. Ensure un normal shutdown. Allow Delayed Engine Shutdown, or properly cool the engine prior to shutting down.
5. Ensure a proper DEF/AdBlue® purge. Do not disconnect the battery disconnect switch within **2 min** after removing the ignition key.
6. Fill the DEF tank with DEF/AdBlue® that meets all requirements defined in **ISO 22241-1**.
7. Ensure all DEF/AdBlue® lines and electrical connectors are connected prior to prevent crystal from forming.
8. Ensure that the DEF/AdBlue® cap is properly installed.

Placing the engine back into service

1. Remove all outside protective covers, tags, tapes.
2. Check the condition of the hoses, belt, belt tensioner and bearings. Replace damaged or worn components. Readjust the belt to the correct tension.
3. Use a bar (or turning tool) to turn the engine in the normal direction of rotation to ensure there are no hydraulic locks or resistance.
4. Check and adjust all fluid levels, such as engine oil, coolant, and fuel.
5. Operate the fluid priming pump.
6. Remove the F86 fuse in the cab. Then, user the stater to turn the engine. When oil pressure rises on the pressure gauge, reinstall the fuse and start the engine. Operate the engine for **10 min** at low idle.
7. On the first day of operation, check the entire engine several times for leaks and correct operation.

14.2 Disposal of operating fluids

⚠ CAUTION

Danger of explosion and fire, poisoning and caustic burns
Waste materials may have one or more hazardous properties.

- ► Waste materials must never be mixed!
- ► Waste materials must be packed and transported as indicated in the current storage and transport regulations.

NOTICE

Risk of contamination of drinking water
Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

- ► Operating fluids and components that come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation

General

- When disposing of used operating fluids, observe your country's applicable legal provisions and waste water regulations. We recommend clarifying waste disposal options with your local authorities.

Definition of hazardous waste

- Left-over and used operating fluids are considered waste. For the purpose of these instructions, this type of waste is considered hazardous if it has one or more of the following properties:
  - □ Potentially explosive
  - □ Highly flammable or spontaneously inflammable
  - □ Combustible
  - □ Oxidising
  - □ Toxic or highly toxic
  - □ Irritant or caustic
  - □ Generally harmful to health
  - □ Carcinogenic or potentially carcinogenic
  - □ Mutagenic
  - □ Hazardous to water or damaging in some other way
- Refer to the substance's safety data sheets for information on harmful properties.

Collecting, packaging and labelling

- Waste materials must never be mixed! Mixing waste materials usually makes it impossible to recycle them and is prohibited by law.
- Waste materials must be packaged according to applicable storage and transport regulations in such a way as to prevent leakage or evaporation and ensure safe transport.

- Before transporting, the packaging and containers should be labelled clearly, legibly and in a weather-resistant way with the following information:
  - Hazardous material
  - Name and description of contents
  - Hazard category and number
  - Sender (name, signature and department)
  - Date
- Old content information or supplier labels on the containers must be removed or made illegible to avoid ambiguity. Containers should be rinsed before being filled with waste materials. The only exception to this requirement is if the original cask or container was filled with the same waste fluid.

Transporting waste

- Only correctly packaged, sealed and labelled containers, or alternatively containers approved by the environmental officer, may be taken to the waste disposal site (waste separation).
- PCB-based synthetic oils or substitutes containing halogen, particularly those used in transformers, condensers and hydraulic systems, must be collected and transported separately from other waste oils when disposing of lubricants in order to comply with the local legislation.

Scrapping

- Vehicle components and attachments must be disposed of in accordance with the relevant legal requirements.

15 AUTOMATIC Winch

15.1 General Information

Due to the purpose and structure of the AUTOMATIC winch, there are certain unavoidable dangers, e.g., due to the result of vehicle movements, land formation, weather factors and risk of avalanches.

These dangers can, however, be minimised by correct and level-headed action on the part of operating personnel.

These operating and maintenance instructions advise about possible risks and provide guidelines that will help prevent injury and damage to property.

Keeping the AUTOMATIC winch in perfect working condition is the best way of avoiding accidents. To do this, it is essential to carry out the maintenance work regularly at the time intervals indicated. The servicing dates and intervals as well as the maintenance instructions as specified by PRINOTH apply.

15.2 Pictograms and what they stand for

The pictograms on the AUTOMATIC winch must be kept in an undamaged condition and must remain clearly visible. Damaged pictograms must be replaced immediately.

Pictograms can be obtained from PRINOTH agents and branch offices.

Familiarise yourself with the pictograms and what they stand for before operating the AUTOMATIC winch. ➳ *See "Pictograms and what they stand for" (p. 14)*

There are three different types of pictograms:

- Instruction signs
- Prohibition signs
- Alarm Icons

⚠ WARNING

Danger of death and injury
The pictograms on the AUTOMATIC winch indicate possible dangers. Ignoring these pictograms can lead to serious or life-threatening injuries.

► The pictograms must be kept in an undamaged condition and must remain clearly visible.
► Replace damaged pictograms immediately.

15.3 Safety

15.3.1 Safety instructions

Operating the snow groomer with an AUTOMATIC winch mounted carries additional operating dangers. When using the AUTOMATIC winch, the same operating and safety instructions as in the snow groomer operating instructions apply.

The following specific operating and safety regulations must also be observed:

⚠ The AUTOMATIC winch must be operated by trained personnel only.

⚠ The responsible supervisor must ensure that the drivers operate the AUTOMATIC winch correctly.

⚠ It is strictly forbidden to carry personnel while the winch is in operation. This also applies to passengers in the driver's cab.

- ⚠ It is strictly forbidden to use the AUTOMATIC winch for towing people.
- ⚠ When using the AUTOMATIC winch, the ski slope being prepared must be cordoned off. The danger zones D + E must also be cordoned off. ➳ *See "Description of danger zones during use of the AUTOMATIC winch" (p. 206)*
- ⚠ Persons are not permitted to linger within the hazard area around the snow groomer or within the swivel range around the anchoring point.
- ⚠ If anyone is present within the operating area of the snow groomer, all work must be stopped immediately.
- ⚠ Never drive under tensioned cables, ski-lifts or lift systems with the AUTOMATIC winch.
- ⚠ When unwinding or rewinding the cable manually, the cable must always be gripped on the anchoring hook. Never touch the cable with bare hands; always wear protective gloves!
- ⚠ Safety equipment intended for accident prevention (such as alarm systems, electronic circuit boards, hydraulic valves) must be serviced on a regular basis and checked for functional reliability by trained personnel.

15.3.2 Manufacturer's recommended use

The AUTOMATIC winch is intended to increase the traction of the snow groomer when ascending or descending steep slopes. The improved traction effected by the rope winch increases the amount of snow that can be transported by the snow groomer. It is designed as an aid for preparing ski slopes in extremely steep and difficult terrain.

The anchoring points should preferably be made of reinforced concrete or metal bars. The route to be followed by the snow groomer with mounted AUTOMATIC winch must be taken into account when planning the anchoring points for the cable. The cable must be secured to a non-rotating anchoring point.

The AUTOMATIC winch was designed and built for outdoor operation in mountain ranges.

- Temperature range: **-35 °C** (-31 °F)...**+25 °C** (+77 °F)
- Max. air humidity: **90%** (without condensation)
- Max. altitude above sea level: **4000 m** (13123 ft)

Use for any other purposes requires written approval from the manufacturer.

The AUTOMATIC winch represents the state of the art in technology and its construction meets EU safety regulations.

The AUTOMATIC winch can present a danger to operating personnel and to others; it can be damaged if used incorrectly by personnel who do not have the appropriate training.

Proper use also includes observing the manufacturer's operating and maintenance instructions. Consequently, the AUTOMATIC winch may only be operated when in perfect working order and in compliance with these operating instructions. Malfunctions must be resolved immediately when they occur in order not to put operational safety at risk. If unauthorised modifications are made to the equipment as supplied, the manufacturer will not be liable for any subsequent damage.

15.3.3 Pictograms and safety instructions on the AUTOMATIC winch

Pictograms and safety related instructions are attached at the following points on the AUTOMATIC winch:

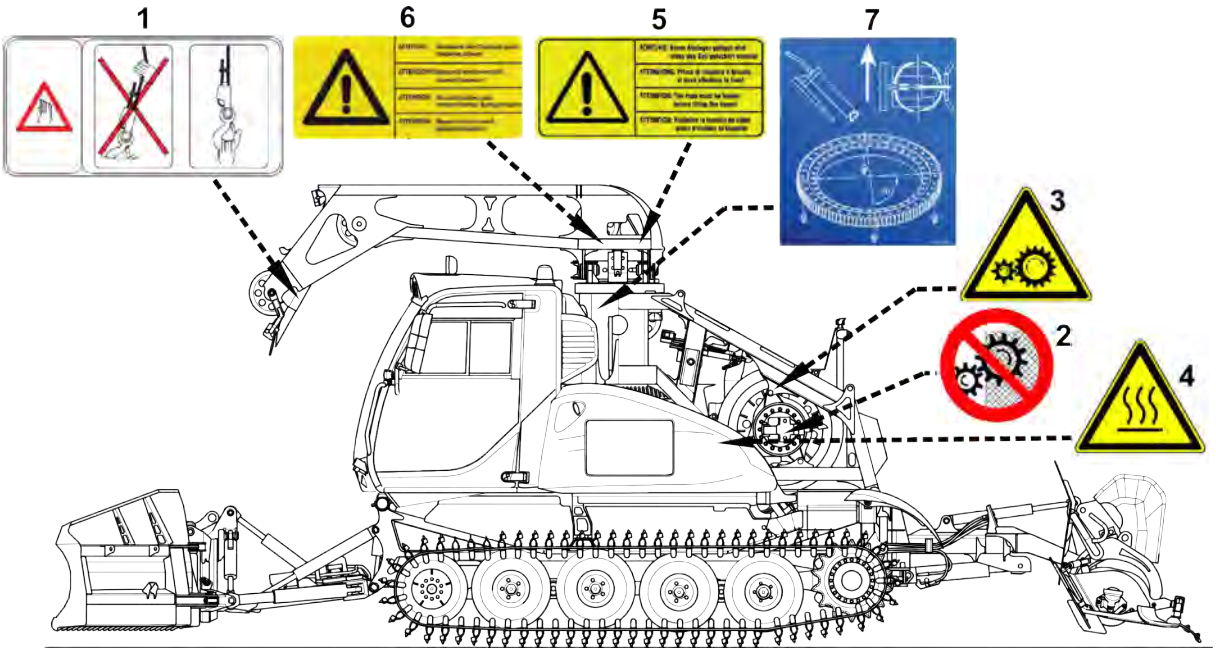


Figure 115: Pictograms and safety instructions on the AUTOMATIC winch

Pos.	Name
1	When winding/unwinding the cable, always hold it by the anchoring hook, never pull the cable itself!
2	The removal of safety devices is prohibited!
3	Warning of severing injuries or crushing danger due to rotating parts!
4	Warning against hot surfaces, components or fluids!
5	The cable must be slack before tilting the winch arm!
6	During transport, secure the winch arm to prevent twisting!
7	Lubrication points on the turntable

15.3.4 Description of danger zones during use of the AUTOMATIC winch

The working area around the snow groomer and AUTOMATIC winch is divided into different danger zones.

The diagram below shows the danger zones, and a list of which hazards occur in which danger zones.

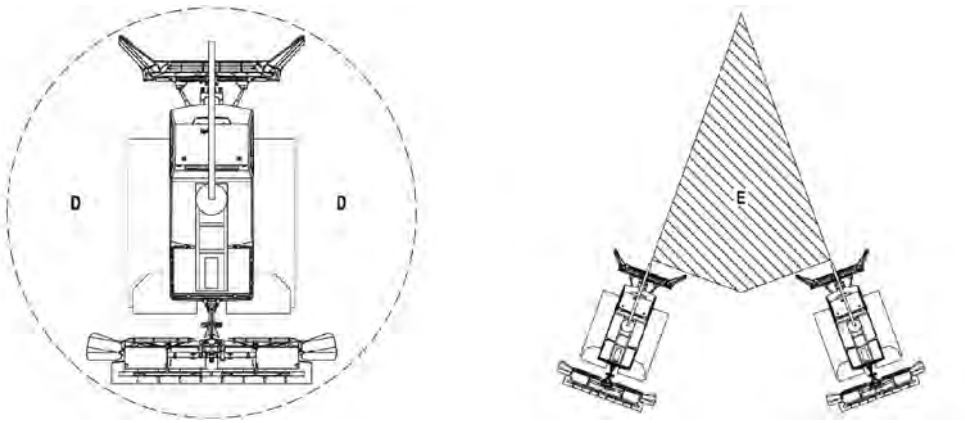


Figure 116: Danger zones when using the AUTOMATIC winch (D) and when using with anchoring points (E)

■ Danger Zones

Type of hazard when using the AUTOMATIC winch	Danger zones		Danger during						
	D	E	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	DISPOSAL
- Dangers caused by mechanical parts -									
■ Pinch point hazard									
Under the winch arm when tilted	X		X			X	X	X	
■ Risk of cut and amputation									
Between cable and winder (outlet)	X			X	X	X	X	X	
Between cable and cable guide rollers on the winch arm	X			X	X	X	X	X	
Between cable and winder	X			X	X	X	X	X	
Between cable and drum	X			X	X	X	X	X	
■ Risk of crush and entanglement									
Cable winding drum	X		X			X		X	
■ Impact hazard									
Against the winch arm	X			X	X	X	X	X	
By cable whiplash		X			X				
■ Risk of rubbing or abrasion									
Against the cable while winding/unwinding	X	X		X	X	X	X	X	
■ Risk of high-pressure fluid ejection									
From hydraulic system	X			X	X	X	X	X	
■ Risks due to mass and stability (potential energy)									

Type of hazard when using the AUTOMATIC winch	Danger zones		Danger during						
	D	E	Installation	Adjusting	Use	Cleaning	Troubleshooting	Servicing	DISPOSAL
AUTOMATIC winch tipping over when at rest (not in operation)	X				X				
■ Risks due to mass and speed (kinetic energy)									
Whiplash if cable breaks		X			X				
Objects moving quickly along the cable	X				X				
■ Risk due to insufficient mechanical strength									
Cable break	X				X				
- Thermal dangers -									
■ Risk of scalding									
Touching hydraulic units	X			X		X	X	X	
- Other risks -									
■ Risk of pollution of the environment									
Hydraulic fluid leakage	X				X		X	X	X

15.3.5 Cable and operating instructions

⚠ The service life of a cable depends mainly on how it is handled and maintained.

⚠ Use only the cable type specified by PRINOTH.

⚠ The cable is a product of high technical quality. Although the cable is very sturdy, it is nevertheless prone to damage if used improperly. At all events, do not allow the cable to rub against or even wind around solid or sharp-edged objects (stones, rocks, steel, etc.). The cable should never come under tension with a sudden, jerking movement.

⚠ Examine the cable at regular intervals. Do not carry out cutting or welding near the cable.

⚠ When not in use, store the cable on a drum, to prevent it from being run over and damaged by other vehicles.

⚠ The cable must be cleaned and lightly lubricated regularly. The cable should not be treated or come into contact with acids or other aggressive substances.

⚠ Use cleaning agents with volatilising properties that attack the lubricating grease and change its friction coefficient only very sparingly.

⚠ When driving a snow groomer on steep slopes with AUTOMATIC winch mounted, take the greater weight, higher center of gravity and related properties into account.

⚠ When using the AUTOMATIC winch, the snow groomer must perform alternating left and right turns.

⚠ Keep track of the control instruments at all times, and pay particular attention to the cable load indicator on the display.

⚠ If you hear the alarm sound, stop the winch immediately and determine the cause of the problem.

⚠ Only tilt the winch arm to the side, if this is absolutely necessary; in this case, the winch arm must be swivelled to the rear.

⚠ If the winch arm is tilted upward, ensure that the bolt is inserted and secured with a cotter pin.

⚠ If a new AUTOMATIC winch is used, or a new cable has been fitted, cable loading must be kept lower than in normal operating conditions for a brief period following installation (the run-in time for the cable is about **10** operating hours). This allows cable components to settle and adapt to normal operating conditions. Failure to observe this run-in time will subject the cable to excessive strain and may lead to malfunctions during operation.

⚠ The cable may only be replaced by specialized personnel authorized by PRINOTH.

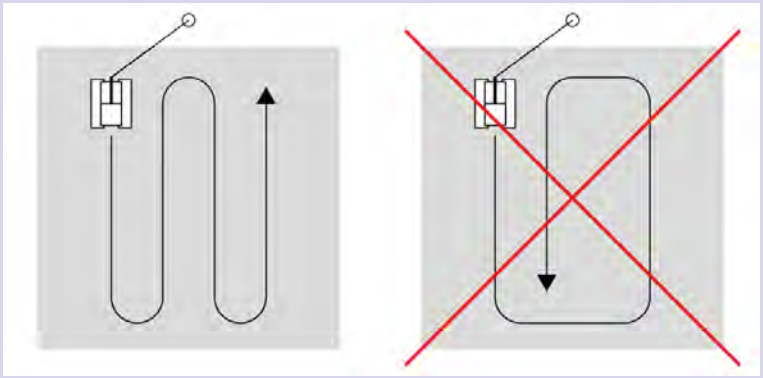
⚠ Before using the AUTOMATIC winch, it is essential to read the safety and operating requirements in these operating and maintenance instructions.

NOTICE

Preventing premature wear on the cable

An incorrect driving style can jerk the cable and result in premature wear. Particularly when there are mounds in the terrain, there is a risk that the cable will rest on or dig into the mound when driving downhill and will then be released with a jerk when driving uphill toward the point where the cable is resting.

► Make sure you follow the correct route.



► To extend the service life of the cable, avoid subjecting it to any jerky loads.

⚠ **CAUTION**

Risk of collision

During AUTOMATIC winch operation, the cable may dislodge snow and blocks of ice or tree branches which get caught on the cable to collide with the snow groomer.

► Slacken the cable immediately.

NOTICE

Risk of collision

If the extension arm is pointing forwards, it can collide with the driver's cab.

► Do not tilt the driver's cab while the extension arm is swivelled to the front.

15.3.6 Precautions for operating the AUTOMATIC winch

⚠ CAUTION

Risk of injury
If damaged, the cable may rupture and cause injuries.

► Immediately inform specialised personnel of any irregularities found in the cable and have it checked.

⚠ CAUTION

Risk of injury
There is a risk injury when handling the cable.

► Wear protective gloves.
► Only pull the cable by the anchoring hook; never pull the cable itself.
► Always keep the cable in front of you.

In order to ensure trouble-free operation, the following points must be considered before operating the AUTOMATIC winch:

- Take note of the operating conditions at the place of operation: snow conditions, snow layer properties, etc.
- The AUTOMATIC winch should only be used on ski slopes that allow the snow groomer to stop at the end of the slope. (For example, it is forbidden to work near sloping terrain).
- The vehicle driver must be informed of the degree of difficulty if the piste being prepared.
- The AUTOMATIC winch should only be operated by specially trained personnel.
- It is strictly forbidden to carry passengers outside the driver's cab.
- When operating the AUTOMATIC winch, the ski slope being prepared must be cordoned off; if operated at night, the ski slope must also be fenced off and signposted.
- The vehicle must not be driven under tensioned steel cables, ski-lifts or aerial cableways whenever the AUTOMATIC winch is mounted.
- If the drum is still turning after being deactivated, switch off the engine immediately and check the AUTOMATIC winch.
- Exercise the utmost caution when tightening the cable, in order to prevent any jerking of the cable.
- The cable may be unwound manually only when the engine is in low idle.
- When pulling the cable taut, take care to prevent the middle of the cable from catching on or winding around solid or sharp-edged obstacles (stones, rocks, etc.).
- If the cable becomes entangled, stop tightening immediately, slacken the cable and check it for damage carefully. If the cable is undamaged, you can start tightening again.
- Check that the cable is correctly positioned and that the locking lever attached to the anchoring hook is locked. All parts must be correctly anchored.
- Before starting to use a newly installed cable, or directly after installing it, the cable should be unwound at a low traction force all the way to the last coil, then rewound at maximum traction force.
- If the AUTOMATIC winch is not under power, no traction should be placed on the anchored cable while the snow groomer is moving.
- The loose cable must not be dragged over the snow.
- When the winch arm is being tilted, it must be swung to the rear.
- The tilted winch arm must always be properly fastened when tilted.

15.4 Transport

15.4.1 Weights and lifting points

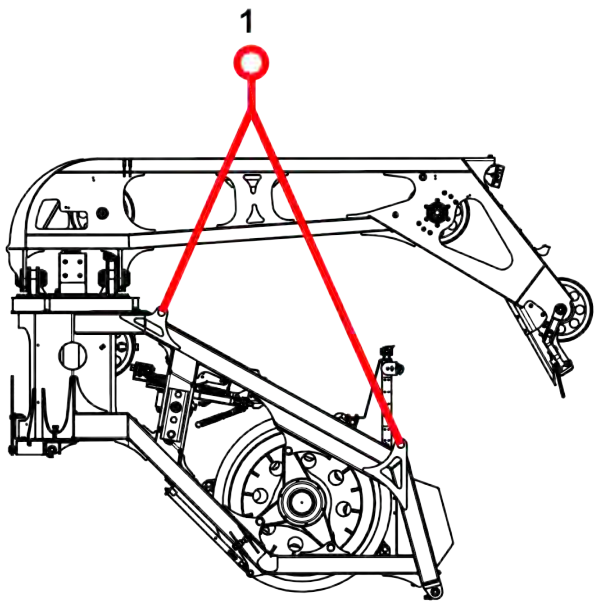
AUTOMATIC winch	
Description	**Overview**
Lifting points for a crane Weight: Winch (including roll-out and **1200 m** (3936 ft) winch cable) ■ **2300 kg** (5070 lb)	

Table 4: AUTOMATIC winch weight and lifting points

15.4.2 Anchoring points

⚠ We recommend placing the anchoring points during summer. Cable anchoring must meet the applicable safety regulations in your country.

⚠ The anchoring points must be constructed to withstand a traction force of at least **150 kN** and have to be inspected for functional reliability by a specialist.

⚠ Measurements of the height of anchoring points must take account of the height of the snow, the land, and allow for the turning area of the vehicle. The cable anchoring must be maintained regularly by qualified personnel and its condition must be checked.

⚠ The cable must not be wound around anchoring points. The cable can only be properly anchored using the anchoring point's eyelet.

⚠ Anchoring points have to be constructed in such a way that the cable will not be twisted.

⚠ If a pilot cable (wire rope with sliding hook) is used between the anchoring point and the anchoring hook, ensure that the pilot cable has the same running direction as the cable.

⚠ A double rope must be chosen as lead-in to avoid twisting the cable.

⚠ WARNING

Risk of skidding
The anchoring points must be secure and stable, otherwise the snow groomer can slip.

► Do not use boulders, wooden stakes, rock spurs, etc. for anchoring the cable.

15.5 Winch

15.5.1 Specifications

When obtaining spare parts, carrying out repair and maintenance work, making warranty claims etc., it is essential that all required specification data are provided.

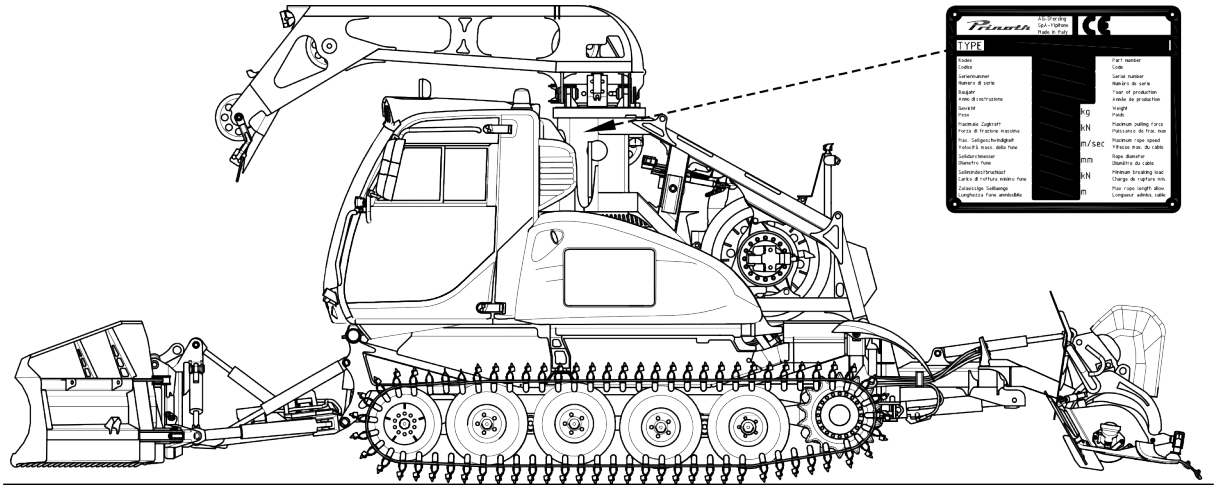


Figure 117: Data sticker on the AUTOMATIC winch

NOTICE

- ► Keep the data stickers clean and legible.
- ► If any of the stickers are damaged, replace them immediately.

15.5.2 AUTOMATIC winch concept

■ Description of the AUTOMATIC winch

■ The AUTOMATIC winch is an attachment for the BISON snow groomer. It has its own removable support structure which is mounted on the vehicle frame at four fastening points. The AUTOMATIC winch can considerably increase the snow groomer's climbing ability and snow moving power. It enables the snow groomer to prepare ski slopes even on extremely difficult slopes.

A work lamp is attached to the winch arm and a work lamp illuminates the cable magazine. The work lights are automatically switched on when the winch is in operation.

Drum with cable magazine

■ The cable drum with cable magazine is powered by a hydraulic motor and a planetary gear system. The hydraulic cable winder ensures that the cable is wound correctly and uniformly onto the drum.

Pivoting winch arm

■ The winch arm is mounted on the AUTOMATIC winch frame and is fitted with three guide pulleys. It allows the snow groomer to move in any direction within a 360° swivel range. From the driver's cab, the winch boom can be swivelled hydraulically into the desired direction, so that the cable can be anchored more easily. When the AUTOMATIC winch is stopped, the winch arm is locked by a spring-load multidisc brake.

Brake

■ The AUTOMATIC winch is fitted with a spring-loaded multi-disc brake.

Automatic cable traction force control

- This system automatically sets the required cable traction force in all operating conditions, so that the driver can concentrate fully on operating the front blade and rear tiller. To adjust the traction force manually, the automatic cable traction force control can be deactivated on the menu display.

15.5.3 Tilt and lower the AUTOMATIC winch

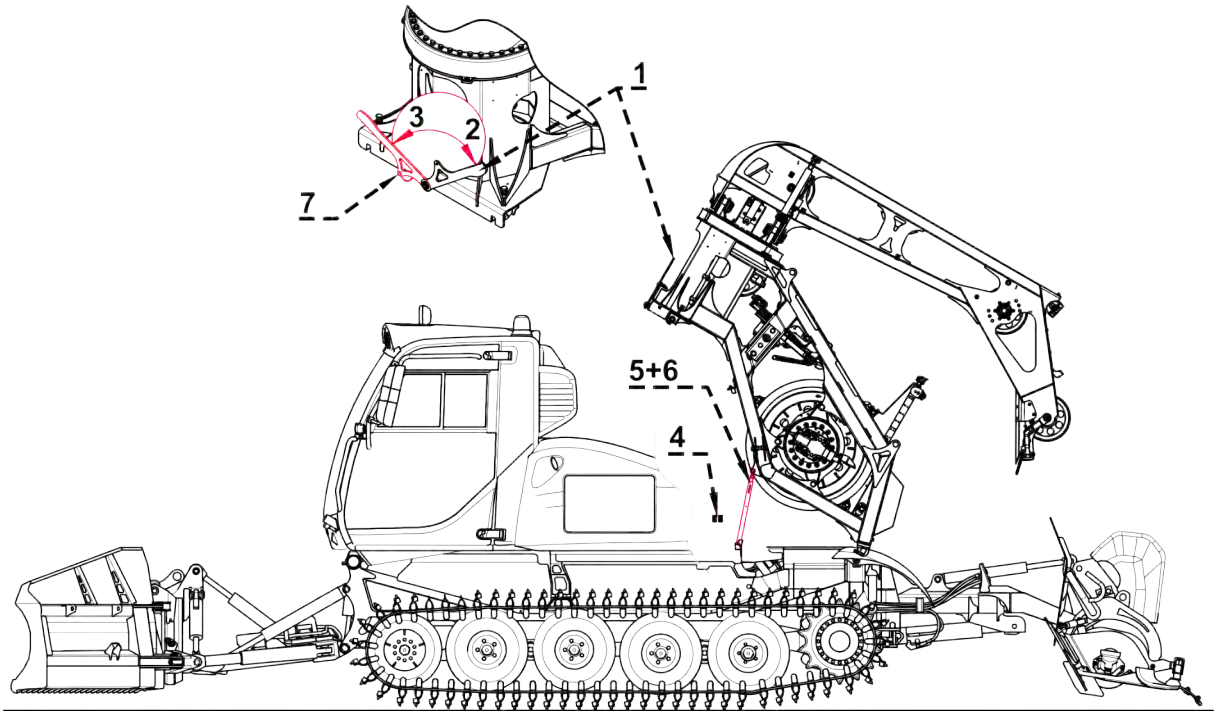


Figure 118: AUTOMATIC winch

Pos.	Name
1	Locking lever
2	AUTOMATIC winch unlocked
3	AUTOMATIC winch locked
4	Push-button switch
5	Safety bar
6	Bolt
7	Safety pin

- Tilt the AUTOMATIC winch

⚠ CAUTION

Risk of tipping
Tilting the AUTOMATIC winch changes the snow groomer's center of gravity.

► Park the snow groomer on solid and level ground.
► Do not drive the snow groomer while the AUTOMATIC winch is tilted.

⚠ CAUTION

Pinch point hazard
The AUTOMATIC winch may come down spontaneously.

► Insert and secure the safety bar.

NOTICE

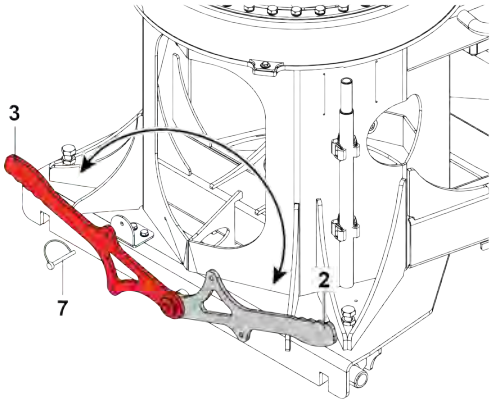
Risk of collision
If the AUTOMATIC winch is tilted, it can collide with the rear attachment.

► Do not tilt the AUTOMATIC winch when the rear attachment is raised.

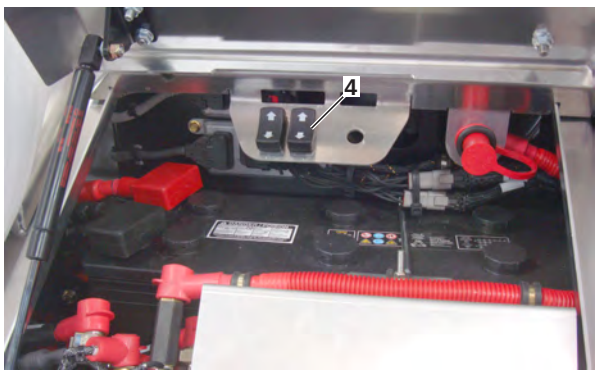
The AUTOMATIC winch is lowered using the push-buttons below the right maintenance flap.

To tilt the AUTOMATIC winch, proceed as follows:

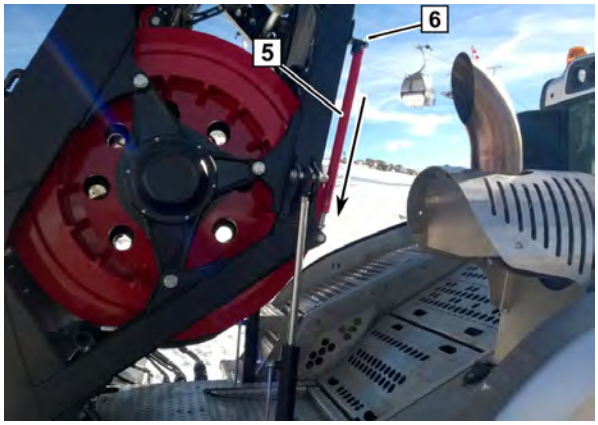
1. Park the snow groomer on solid and level ground.
2. Remove all objects from the loading platform.
3. Lower the rear tiller to the ground.
4. Turn the AUTOMATIC winch to the rear.
5. Turn locking lever upwards: AUTOMATIC winch unlocked (2).



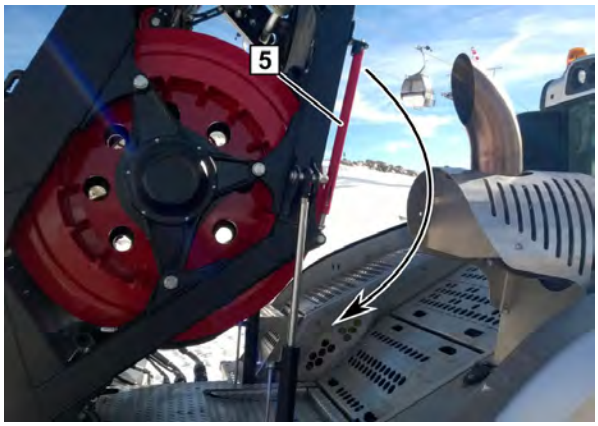
6. Ignition key position: ON
7. Press on the upper part of the push-button (4): the AUTOMATIC winch tilts back.



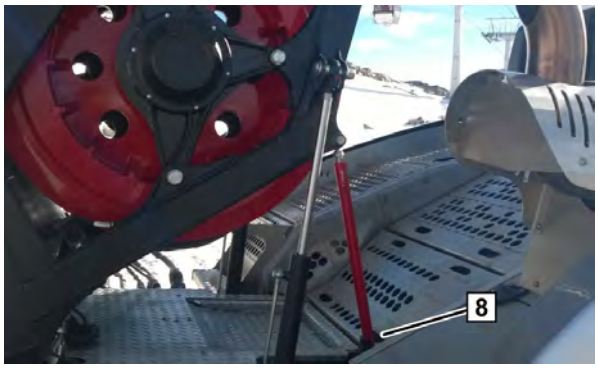
8. Once the winch is tilted, install the safety rod (5) to secure the winch. Compress the safety rod spring to unlock the device from its bracket (6).



9. Fold down the safety rod (5) towards the hydraulic cylinder.



10. Insert the free end of the safety rod into the bracket (8).



■ Lower the AUTOMATIC winch

⚠ CAUTION

Risk of tipping
An unlocked AUTOMATIC winch may tilt back during travel.

- ► Check the locking device after lowering the AUTOMATIC winch.
- ► Only move the snow groomer with the AUTOMATIC winch secured.

NOTICE

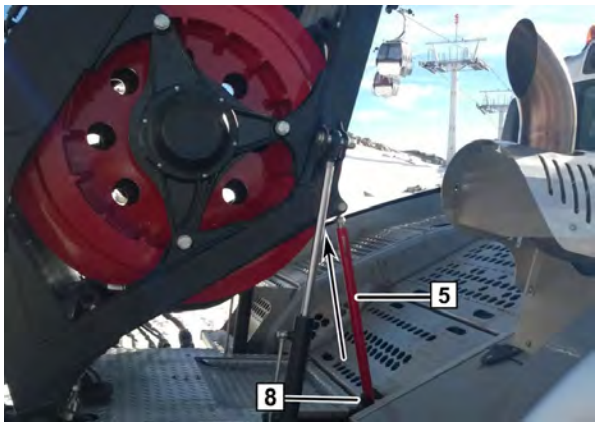
Correct maintenance

- ► Check the fittings and locking devices of the AUTOMATIC winch fastening every **10** working hours.
- ► Check oil level in the hydraulic hand pump tank.

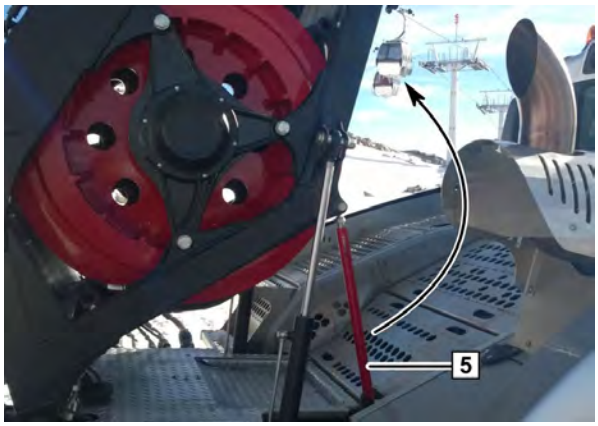
The AUTOMATIC winch is lowered using the push-buttons below the right maintenance flap.

To lower the AUTOMATIC winch, proceed as follows:

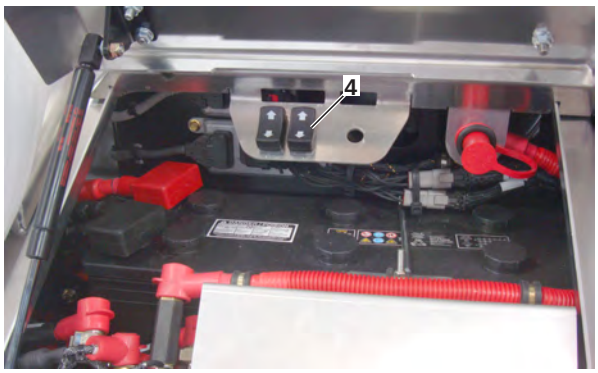
1. Compress the safety rod spring to unlock the safety rod (5) from its bracket (8).



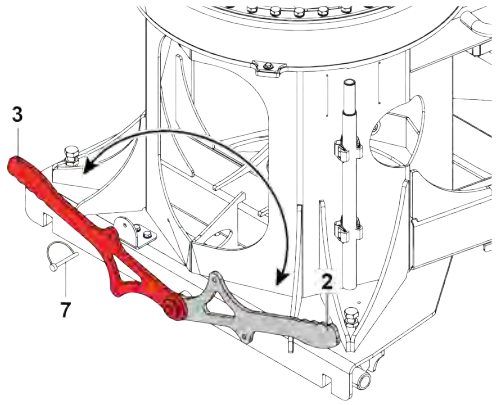
2. Fold up the safety rod (5) and lock the device into the stowed position.



3. Press on the lower part of the push-button (4): the AUTOMATIC winch lowers.



4. Turn down the locking lever and secure with the locking pin (7): AUTOMATIC winch locks (3).



15.5.4 Tilt and straighten the winch arm

NOTICE

Risk of collision

When tilted, the winch arm can collide with the driver's cab or other structures.

- ► Before tilting, turn the winch arm to the rear.
- ► Do not swivel tilted winch arms.
- ► Control the tilting speed with the hand pump lever.

NOTICE

Correct oil level

- ► Check the oil level in the hand pump tank.
- ► Only check the oil level with the winch arm tilted and with the vehicle on horizontal ground.
- ► The oil level must come up to the filler hole - if necessary, top up with the specified oil.

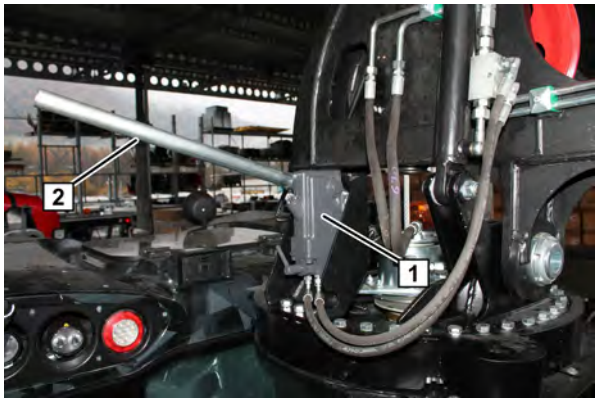
When swivelled to the rear, the winch arm can be tilted to the side. The winch arm can only be tilted and aligned using the hydraulic hand pump (1) at the front right on the drum winch frame. The pump lever (2) required for this is located on the front side of the drum winch frame.

- If necessary, tilt the winch arm to the side (e.g. height). There are two possible positions.
- Never use the snow groomer with the winch arm tilted in this way.

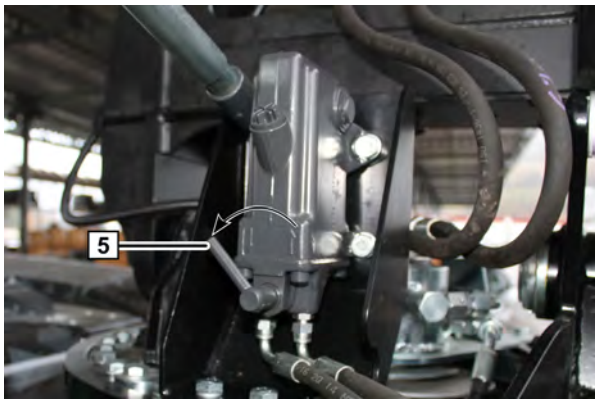
■ Tilt the winch arm to the side

1. Turn the winch arm to the rear.
2. Release cable (with manual cable unwind push-button switch).

3. Insert the pump lever (2) into the hydraulic hand pump (1).



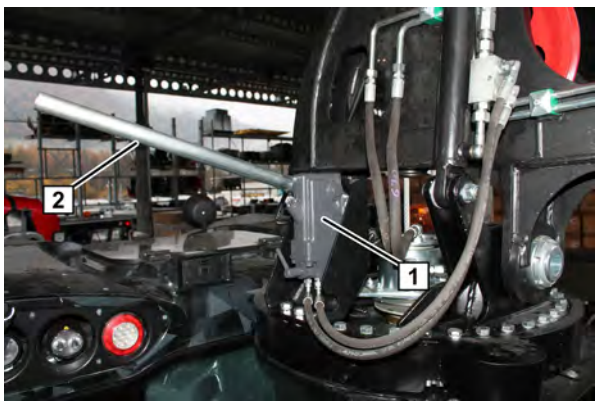
4. Turn the hand pump lever to the left (5) ("Tilt winch arm").



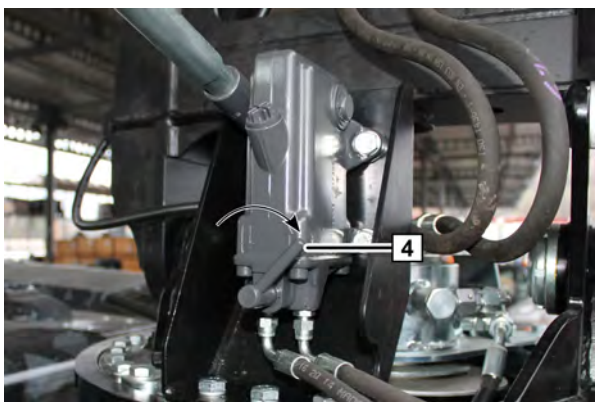
5. Operate the pump lever (2): winch arm tilts.

■ Straighten the winch arm

1. Insert the pump lever (2) into the hydraulic hand pump (1).



2. Turn the hand pump lever to the right (4) ("Straighten winch arm").



3. Operate the pump lever (2): winch arm is straightened.

15.6 Mounting

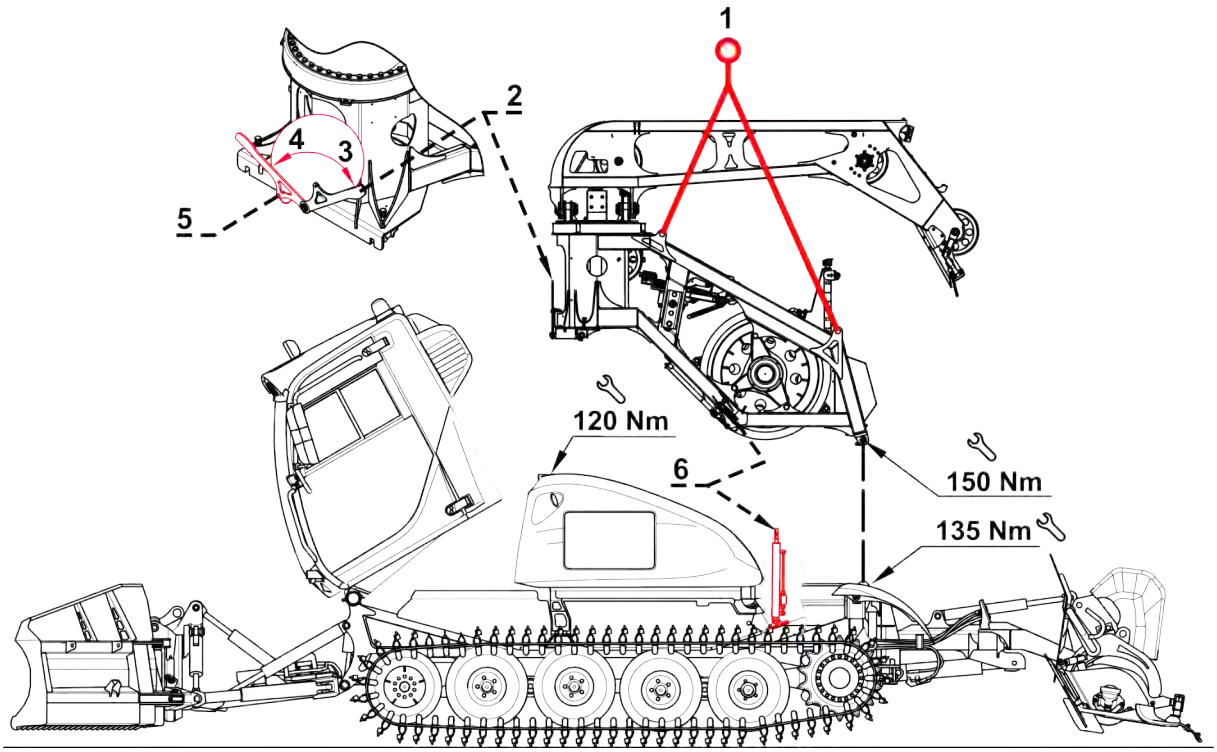


Figure 119: Mounting position and tightening torques

Pos.	Name
1	Lifting points
2	Locking lever
3	AUTOMATIC winch unlocked
4	AUTOMATIC winch locked
5	Safety pin
6	Hydraulic cylinder

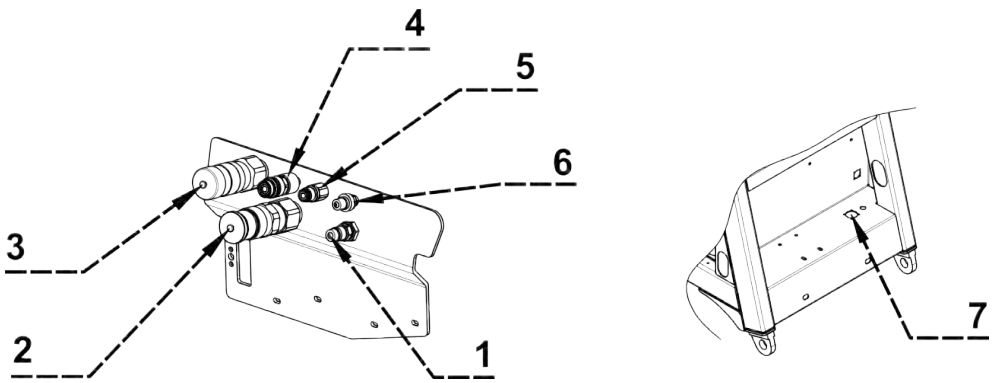


Figure 120: Connection sequence

Pos.	Name
1-2-3	**20 Nm**
4-5-6-7	**10 Nm**

NOTICE

- ► Tighten the fittings between AUTOMATIC winch and snow groomer frame using a tightening torque of **120 Nm** and **135 Nm**.
- ► Check the fittings and locking every **10** working hours.

15.6.1 Easy mounting and removal

If the snow groomer is to be used for an extended period for ski slope preparation only, it is advisable to remove the AUTOMATIC winch. This optimises the vehicle's performance, from the point of view of:

- Stability
- Manoeuvrability
- Fuel consumption
- Working speed
- Wear
- Safety

⚠ WARNING

Risk of accident
If not mounted properly, the AUTOMATIC winch may come loose and fall off, causing injuries.

- ► Check the condition and load capacity of the AUTOMATIC winch's lifting hook and ensure it is correctly inserted.
- ► Make sure the locking lever on the lifting hook is closed.
- ► Exercise utmost caution when working with suspended loads.

NOTICE

Risk of damage to the hydraulic system
Even the smallest particles of dirt or impurities getting into oil the when connecting the AUTOMATIC winch can cause damage to the hydraulic system.

- ► Ensure that the quick-lock couplings on hydraulic hoses are correctly mounted.
- ► AUTOMATIC winch mounted: store the protective caps in the driver's cab's tool compartment.
- ► AUTOMATIC winch not mounted: cover the quick-connect couplings with clean protective caps.

NOTICE

- ► Use suitable hoisting equipment when detaching the AUTOMATIC winch from the snow groomer. The hoist should have a minimum bearing load of **3000 kg** (6613 lb).
- ► Follow the legal provisions applicable to the place of operation.

The AUTOMATIC winch for the snow groomer is designed so that it can be mounted and removed with only a few simple steps.

When mounting or removing, observe that

- the AUTOMATIC winch is activated or deactivated in the vehicle configuration (See page A.70 on menu level "Information").
- the CAN termination of the AUTOMATIC winch under the right passenger seat is switched on or off.

The AUTOMATIC winch is fastened to the vehicle with four spherical self-centering seats and bolts:

- Tighten the bolts that fasten the AUTOMATIC winch to the snow groomer frame, applying the tightening torques indicated in the drawing.
- Check for cracks visible on the fastening system.

15.6.2 Mounting the winch

⚠ WARNING

Risk of accident
If not mounted properly, the AUTOMATIC winch may come loose and fall off, causing injuries.

► Before releasing the belt straps, ensure that the AUTOMATIC winch is properly fixed to the snow groomer.

NOTICE

Risk of damage to the hydraulic system
Even the smallest particles of dirt or impurities getting into the oil can result in damage to the hydraulic system.

► AUTOMATIC winch mounted: store the protective caps in the driver's cab's tool compartment.

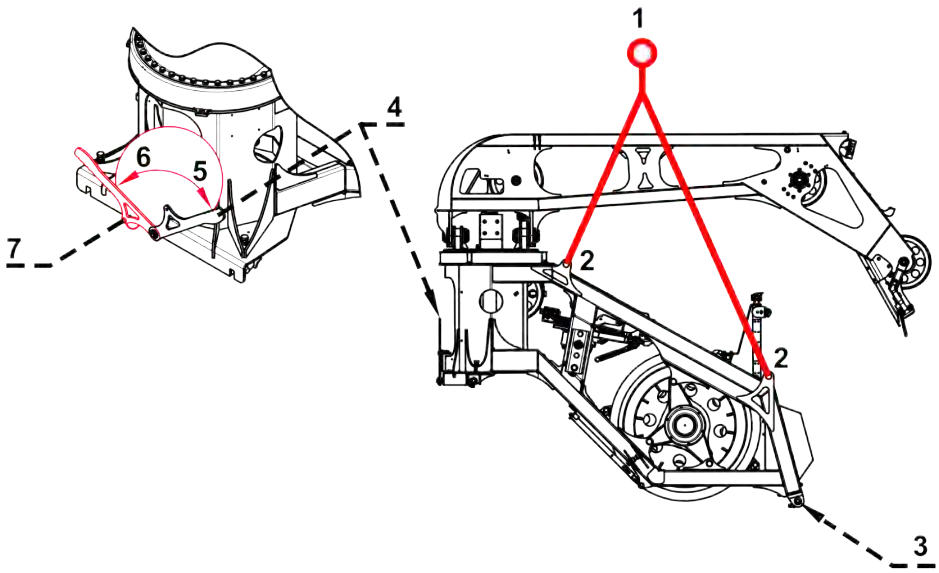


Figure 121: AUTOMATIC winch

Pos.	Name
1	Belt straps
2	Eyelet
3	Rear bolt
4	Locking lever
5	AUTOMATIC winch locked
6	AUTOMATIC winch unlocked
7	Safety pin

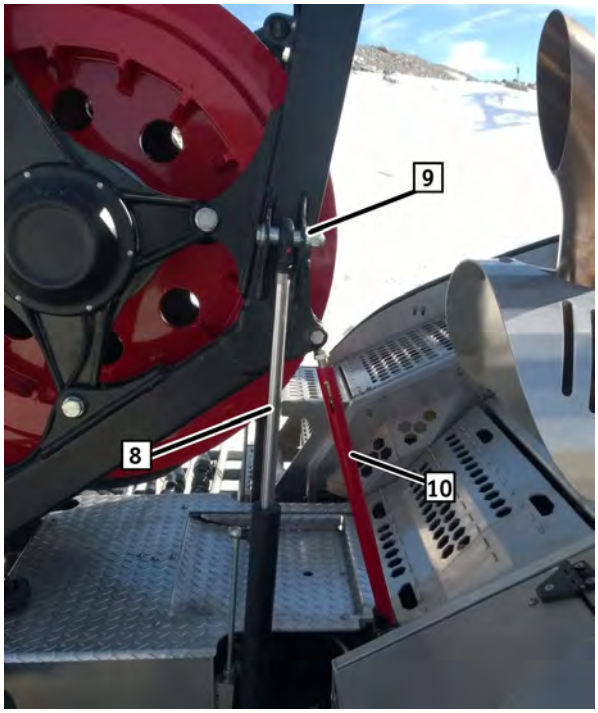
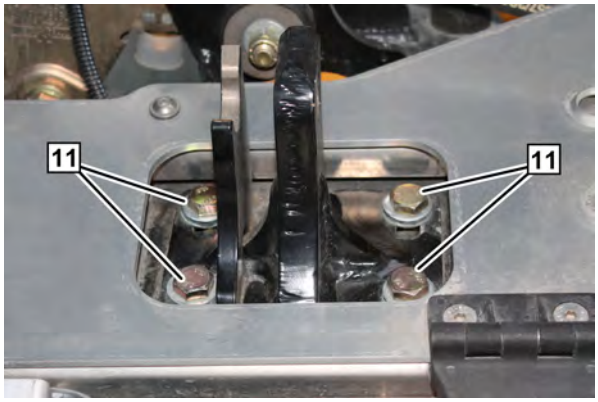


Figure 122: AUTOMATIC winch hydraulic cylinder

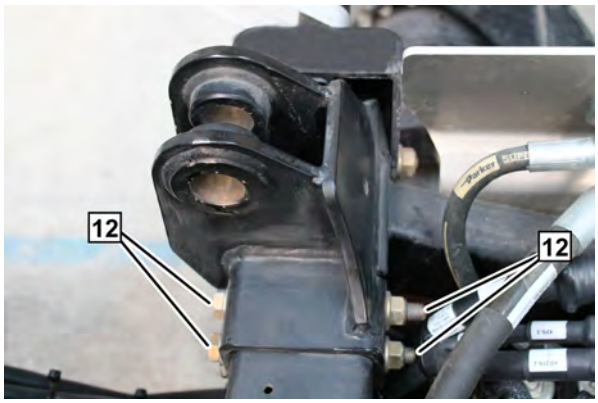
Pos.	Name
8	Hydraulic cylinder
9	Bolt and nut
10	Safety strut

1. Move the snow groomer to a suitable place for mounting the AUTOMATIC winch.
2. Lower the front blade and rear tiller to the ground.
3. Switch off engine.
4. Tilt the driver's cab forward.
5. Secure the driver's cab with the safety strut (10).
6. Remove the screwable cover plate, rear panelling, and the rear and center cross members.
7. Remove the rear bolt (3) on the snow groomer's frame and turn locking lever (4) upwards: AUTOMATIC winch unlocks (6).
8. Check whether the locking system and the mounting are clean.
9. Lubricate locking system, mountings and bolt threads using water-repellent grease.
10. Attach belt straps (1) to the eyelets (2) on the AUTOMATIC winch frame.
11. Pre-tension the belt straps, raise the AUTOMATIC winch and position it correctly over the snow groomer.
12. Lower the AUTOMATIC winch slowly into the fittings: be careful not to damage the driver's cab, hydraulic hose, the loading platform or the electrical system.
13. Turn down the locking lever (4) and secure with the safety pin (7): AUTOMATIC winch locks (5).
14. Fasten the AUTOMATIC winch with the rear bolt (3) on the snow groomer frame (**150 Nm**).

15. Tighten the front fitting of the AUTOMATIC winch and snow groomer (11) using a tightening torque of **120 Nm**.



16. Tighten the rear fitting of the AUTOMATIC winch and snow groomer (12) using a tightening torque of **135 Nm**.



17. Insert hydraulic cylinder (8) using the hydraulic pump.
18. Insert bolt and secure with nut (9).
19. Clean the fittings.
20. Connect the hydraulic hoses according to their numbering.
21. Connect the electrical wiring.
22. Tighten the quick-connect couplings of the hydraulic hoses using a spanner (**10 Nm** and **20 Nm**).
23. Make sure the hydraulic hoses are correctly routed.
24. Check the hydraulic hoses and bolt fittings for leaktightness; correct any oil leaks immediately.
25. Remove the driver's cab safety strut (10).
26. Lower and lock driver's cab.
27. Carry out the specified checks before putting the AUTOMATIC winch back into service.

15.6.3 Removing the winch

⚠ WARNING

Risk of accident
If not mounted properly, the AUTOMATIC winch may come loose and fall off, causing injuries.

- ► Check the condition and load capacity of the AUTOMATIC winch's lifting hook and ensure it is correctly inserted.
- ► Make sure the locking lever on the lifting hook is closed.
- ► Exercise utmost caution when working with suspended loads.

1. Move the snow groomer to a suitable place for removing the AUTOMATIC winch.
2. Swing the winch arm toward the rear of vehicle.

3. Lower the front blade and rear tiller to the ground.
4. Switch off engine.
5. Tilt the driver's cab forward.
6. Secure the driver's cab with the safety strut.
7. Disconnect the quick-connect couplings and electrical plug connections.
8. Close quick-connect couplings tight: to do this, use the protective caps stored in the tool compartment.
9. Attach belt straps to the eyelets on the AUTOMATIC winch frame.
10. Pre-tension the belt straps and take care that the AUTOMATIC winch is raised from the snow groomer in a vertical line. If necessary, move the hoisting gear.
11. Turn locking lever (4) downwards: AUTOMATIC winch unlocked (6).
12. Unscrew the rear bolts (3) that fasten the AUTOMATIC winch to the snow groomer frame and put them aside.
13. Unscrew the bolts (9) that fasten the hydraulic cylinder (8).
14. Slowly raise the AUTOMATIC winch, taking care to prevent any damage to the driver's cab, hydraulic hoses, loading platform and electrical system.
15. As soon as the AUTOMATIC winch has been lifted off, drive the snow groomer forwards or move the hoisting gear away.
16. Check the hydraulic hoses and bolt fittings for leaktightness; correct any oil leaks immediately.
17. Remove the driver's cab safety strut (10).
18. Lower and lock driver's cab.
19. Attach the center cover panel to the load floor and middle engine cover.

15.6.4 Storing the winch

NOTICE

Risk of damage to the hydraulic system
Strong solar radiation can cause the hydraulic fluid to heat up and by that damage the hydraulic system.
Even the smallest particles of dirt or impurities getting into the oil can result in damage to the hydraulic system.

- ► Do not expose the AUTOMATIC winch to direct sunlight while detached from the snow groomer.
- ► If solar radiation cannot be avoided, drain the oil from the return line.
- ► AUTOMATIC winch not mounted: cover the quick-connect couplings with clean protective caps.

- ■ Store the AUTOMATIC winch in a dry and well-ventilated room with a roof, where it is not in direct contact with the ground.
- ■ To protect the AUTOMATIC winch, cover it with an air-permeable tarpaulin.

15.6.5 Checking the cable

⚠ CAUTION

Risk of injury
There is a risk injury when handling the cable.
If damaged, the cable may rupture and cause injuries.

- ► Immediately inform the personnel responsible of any irregularities found in the cable and have it checked.
- ► Wear protective gloves.
- ► Only pull the cable by the anchoring hook; never pull the cable itself.
- ► Always keep the cable in front of you.

Carry out a visual inspection of the cable:

- Check the cable for possible defects (e.g. broken wires, deformation).
- Take particular care when examining the cable clamps, anchoring hook and cable lock.
- Check the anchoring hook locking.

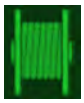
Detailed description of the cable inspection *See "Checking the cable" (p. 239)*

15.7 Operation

15.7.1 Indicators and controls on the display

Figure 123: Main display with AUTOMATIC winch

Pos.	Name	Image	Description
1	Winch operating status		The colour of the symbol indicates the winch operation status:

Pos.	Name	Image	Description
			■  Grey = winch operation OFF ■  Green = winch operation ON ■  Orange = error in traction pumps pressure sensors, winch pump pressure sensor, winch arm position sensor or load detecting cell ■  Red = malfunction ■ Flashing white = only approx. **30 m** (98 ft) of cable are left on the drum. An alarm also sounds. ■ Pop-up "F" flashing in the display = winch operation must be confirmed again (e.g. if the snow groomer standby mode was switched off in winch operation)
2	Recommended winding direction and number of rotations		The recommended winding direction and the number of rotations are indicated when the respective symbol is lit: ■ Arrow = winding direction ■ Number = number of rotations
3	AUTOMATIC winch not locked warning lamp		If the warning lamp lights continuously red, check locking of the AUTOMATIC winch.
4	Cable traction force control		The active cable traction control mode is displayed as a symbol: ■  = Manual mode ■  = Automatic mode ■  = A-ECO mode
5	Traction force status		MIN or MAX lighting up indicate the status of cable traction force: ■  = maximum traction force ■  = minimum traction force
6	Reduced vehicle speed		If the indicator lights up white continuously, reduced vehicle speed is activated. Winch operation has to be confirmed again. (e.g., when the snow groomer standby mode is switched off while operating the winch)
7	AUTOMATIC winch operating hours		The working hours counter starts when the drum is turning. The indicated number of working hours are essential for maintenance.
8	Remaining cable length		Indicates the length of cable remaining on the cable drum. When there are only approx. **30 m** (98 ft) of cable on the cable drum, an alarm is sounded and the "Drum" symbol flashes white.

Pos.	Name	Image	Description
9	Traction force as %		Indicates cable traction force in %. ■ In automatic cable traction control mode (A and A-ECO), the effective traction force is displayed. ■ In manual cable traction force control mode (hand), the specified cable traction force is displayed.
10	Economical range indication in tachometer		In winch operation, the economical range switches from **1300 - 1600/min** to **1400 - 1700/min**.

15.7.2 Keyboard 2

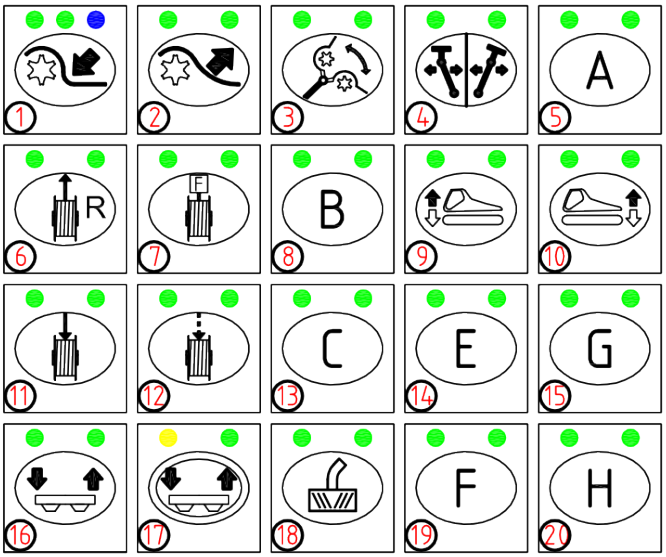


Figure 124: Keyboard 2 (A37) on the control console

Pos.	Name	Description
A37/6	Unwinding the cable	Pressing the push-button switch activates cable unwinding in manual mode or when using the ROLL OUT system. ■ Manual mode: This means that manually pulling the cable unwinds it. If the cable is released, unwinding will be stopped.
A37/7	Winch operation	Pressing the push-button switch activates winch operation.The menu can be used to select between manual or automatic traction force control. If the cab door is opened during winch operation, there are two possibilities: ■ If the cable is not tensioned, winch operation is deactivated. Winch operation must be reactivated again after the door is closed. ■ If the cable is tensioned, winch operation will remain activated.
A37/11	Rewinding the cable	Pressing the push-button switch for **2 s** activates manual cable rewind. This means that manually pulling the cable rewinds it. If the cable is released, rewinding will be stopped.
A37/12	Rewinding the last few meters of cable	Press the push-button switch to rewind the last approx. **2 m** (6 ft) of cable (this function may only be used for the last few meters of cable). ➤ *See "Rewind the last few meters of cable" (p. 230)*

NOTICE

Risk of injury

► Only hold the cable by the anchoring hook when pulling the cable manually.

15.7.3 Operation of the AUTOMATIC winch

NOTICE

Risk of collision
When the winch arm is swivelled, it can collide with the attachments.

► Do not swivel the winch arm when the attachments are fully raised or turned.

NOTICE

► It is possible to assign the cable traction force function directly on the mini-joystick T without pressing push-button S3. Go to menu item C.40 and switch the joystick button assignment.

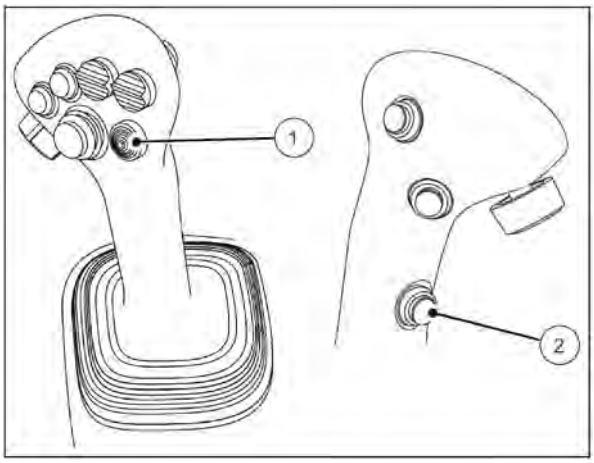


Figure 125: Joystick

Pos.	Name
1	Mini-joystick T
2	Push-button S3

Winch arm

- The AUTOMATIC winch's arm can only be swivelled when winch operation is switched off.

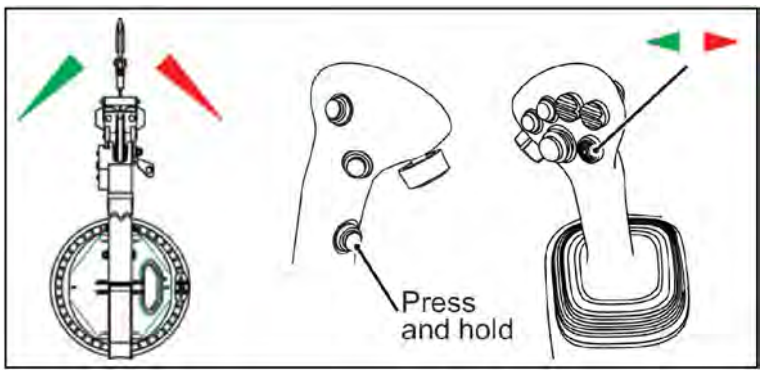


Figure 126: Functions with operation of push-button S3 and mini-joystick T

The winch arm movement corresponds to the movements carried out with the mini-joystick T:

- Keep push-button S3 pressed and move mini-joystick to the left = Swivel winch arm to the left
- Keep push-button pressed and move mini-joystick to the right = Swivel winch arm to the right

You do not have to move the joystick.

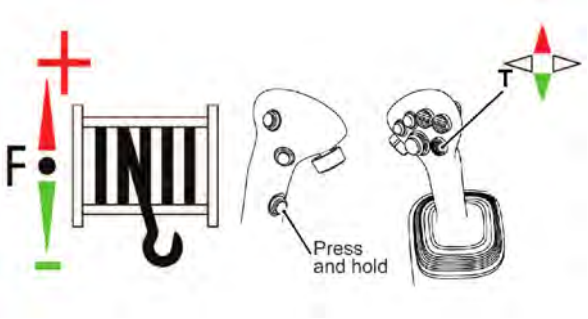


Figure 127: Functions available through mini-joystick T

Automatic cable traction control

- In some working conditions, more cable traction force may be required than the traction control is programmed to provide. The mini-joystick T can be used to control cable traction:
  - Keep push-button S3 pressed and push mini-joystick T forward for **2 s** = Cable traction force is increased to MAX
  - After **8 s** = Cable traction force is reduced to the preset level
- When mini-joystick T is pushed forward again within **8 s**, a time interval of **8 s** starts.
- In some working conditions, less cable traction force may be required than electronically specified. The mini-joystick T can be used to control cable traction:
  - Keep push-button S3 pressed and push mini-joystick T backward = Cable traction force is reduced to MIN
  - Keep push-button S3 pressed and push mini-joystick T backward again = Cable traction force is increased to the preset level
- You do not have to move the joystick.

Manual cable traction control

- If the mini-joystick T is pushed forward, the cable traction force is increased:
  - Keep push-button S3 pressed and push mini-joystick T forward = Cable traction force is increased gradually
  - Keep push-button S3 pressed and push mini-joystick T forward for **2 s** = Cable traction force is increased to MAX
- If the mini-joystick T is pushed backward, the cable traction force is reduced:
  - Keep push-button S3 pressed and push mini-joystick T backward = Cable traction force is reduced gradually
  - Keep push-button S3 pressed and push mini-joystick T backward for **2 s** = Cable traction force is reduced to MIN
- You do not have to move the joystick.

15.7.4 ROLL OUT remote control (optional)

With the ROLL OUT remote control, the operator can rewind or unwind the cable while standing alongside the vehicle. The ROLL OUT remote control is located in the driver's cab on the right behind the driver seat.

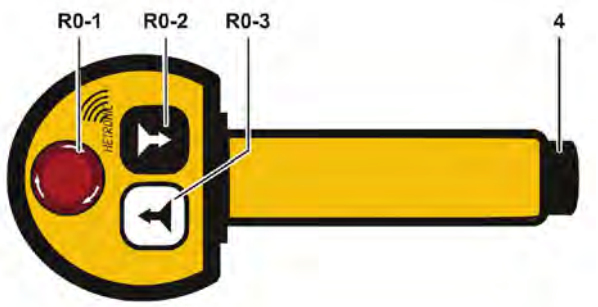


Figure 128: Controls of the ROLL OUT remote control

Pos.	Name	Description
R0-1	ON/OFF button	■ Press the ON/OFF button = remote control is turned off ■ Turn the ON/OFF button clockwise = remote control is switched on
R0-2	Push-button	■ Press the push-button switch = automatically unwind the cable
R0-3	Push-button	■ Press the push-button switch = automatically rewind the cable
4	Battery compartment	

15.7.5 Operating the ROLL OUT remote control

Functions when pressing the R0-1 push-button switch

- Before you use the ROLL OUT remote control, turn on the remote control by turning the ON/OFF button clockwise. Activation is confirmed by a short beep.
- While using the ROLL OUT remote control, automatic cable rewinding or unwinding is immediately brought to a standstill by pressing the ON/OFF button.
- After you use the ROLL OUT remote control, turn off the remote control by pressing the ON/OFF button.

Functions when pressing the R0-2 and R0-3 push-button switches

- Before using the R0-2 and R0-3 push-button switches to rewind and unwind the cable, you must observe the following points:
  - The remote control must be switched on.
  - The manual cable unwind function must have been activated with the A37/6 push-button switch.
  - At least one of the cab doors must be opened.
- Pressing the R0-2 push-button switch activates the automatic cable unwind function. As it automatically unwinds, the cable is fixed to the anchoring hook and guided to the mount point on the desired anchorage.
- If you stop or interrupt actuation of the R0-2 push-button switch, the cable also stops the automatic unwind function.
- Pressing the R0-3 push-button switch activates the automatic cable rewind function. As it automatically rewinds, the cable is fixed to the anchoring hook and guided to the mount point on the winch boom.
- If you stop or interrupt actuation of the R0-3 push-button switch, the cable also stops automatically rewinding.

15.7.6 Winding the cable with the ROLL OUT remote control

NOTICE

In order for the ROLL OUT remote control to work, you must observe the following points:

- ► The remote control must be switched on.
- ► "Unwinding the cable" must have been activated.
- ► At least one of the cab doors must be opened.

■ Unwind the cable with the ROLL OUT remote control

1. Drive the snow groomer approx. **10 m** (32 ft) from the anchoring point.
2. Engage the snow groomer's parking brake.
3. Make sure the winch arm is tilted up.
4. Swivel the winch arm so it points to the anchoring point by pushing the mini-joystick to the left or right.
5. Press the push-button switch for unwinding the cable **<A37/6>**.
6. The cable is slackened and the front cable guide is lowered.
7. Climb out of the driver's cab with the ROLL OUT remote control and leave the driver's cab door open.
8. Unhook the anchoring hook on the winch arm and automatically unwind the cable by pressing the R0-2 button on the ROLL OUT remote control.
9. As it unwinds, the cable is fixed to the anchoring hook and guided to the mount point on the anchorage. Once it has reached the desired length, release the R0-2 button to stop unwinding.
10. Attach the cable and secure it with the locking lever.

■ Rewind the cable with the ROLL OUT remote control

1. Drive the snow groomer approx. **10 m** (32 ft) from the anchoring point.
2. Press push-button switch **<A37/7>** to disable the winch operation mode.
3. Engage the snow groomer's parking brake.
4. Press the push-button switch for unwinding the cable **<A37/6>** until the cable is so slack that it can be detached from the anchoring point without pulling it taut.
5. Climb out of the driver's cab with the ROLL OUT remote control and leave the driver's cab door open.
6. Detach the cable from the anchoring point.
7. Press the R0-3 button on the ROLL OUT remote control to automatically rewind the cable. Automatic rewinding is indicated by a warning lamp on the winch arm. As it rewinds, the cable is fixed to the anchoring hook and guided to the mount point on the winch arm.
8. If approx. **2 m** (6 ft) of cable are still available, release the R0-3 button to stop rewinding.
9. Attach the anchoring hook to the winch arm.
10. Press push-button switch **<A37/12>** to rewind the last meters of cable. The remaining cable is then rewound.

15.7.7 Rewind the last few meters of cable

Prerequisites

- ■ For the function "Rewind the last few meters of cable", both doors must be closed.

NOTICE

► First attach the cable to the winch arm, then rewind the last few meters of cable.

Figure 129: Display image "Rewind the last few meters"

1. Press the push-button switch **<A37/12>** for rewinding the last few meters of cable. The remaining length of cable is rewound. This function is limited to **6 s**.
2. If the cable is not fully rewound within the **6 s**, the process must then be repeated:
   - □ Switch the push-button switch for unwinding the cable **<A37/6>** on and off.
   - □ Then press the push-button switch for rewinding the last few meters of cable **<A37/12>** and rewind the cable.

   This function keeps the cable under tension after it is completely rewound, and neither the function "Winch operation" or "Rewinding the cable" can be activated without first switching "Unwinding the cable" on and then off again.

15.7.8 Winch operation

⚠ CAUTION

Risk of accident
Tightening the cable with winch operation deactivated will cause brake failure.

► Never pull the cable taut by moving the snow groomer away from the anchoring point without first activating winch operation.

⚠ CAUTION

Risk of accident

► If the cable is pulled taut using the function "Rewind the last few meters of cable", winch operation will not automatically activate.

NOTICE

Display message "Risk of collision"
The winch arm may collide with the raised rear tiller.

► If the winch arm exceeds the swivel range of **90°** to the left and right with raised rear tiller, a message is shown on the display.

NOTICE

Opening the driver door

► If the driver door is opened during winch operation, the winch stays active and the traction force is maintained.

This function is activated by pressing the winch operation push-button switch **<A37/7>**. The display shows the "winch operation" symbol for **2 s**.

The following conditions are required for winch operation:

- Both doors must be closed.
- The cable must be tensioned.

If the cable is not pulled taut, back the snow groomer slowly away from the anchoring point until the cable is taut. The AUTOMATIC winch is ready for use once the cable is tensioned.

The system automatically sets the cable speed. The cable traction force is reduced automatically depending on the relation between the winch arm of the AUTOMATIC winch and the direction of travel.

If the snow groomer is moved while the cable is anchored without first activating the winch operation function, vehicle speed is reduced as soon as the angle sensor detects the cable tension signal. This is indicated by a flashing winch operation symbol and an alarm sound. The winch operation push-button switch must then be pressed immediately to put the AUTOMATIC winch into operation.

After getting into and out of the cab, both winch operation and drive standby mode must be activated again in order to continue operating the winch.

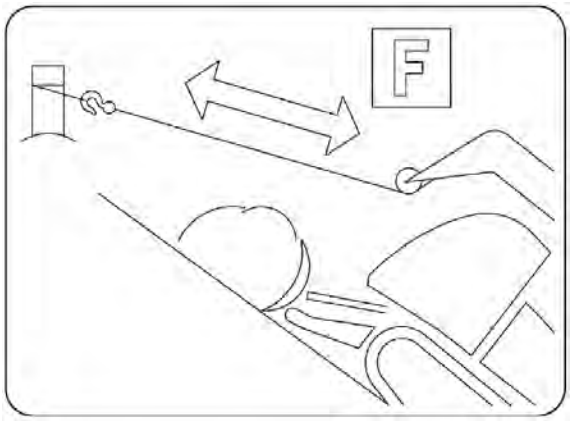


Figure 130: Display image

The display shows the "winch operation" symbol for **2 s**.

15.7.9 During winch operation

Strictly observe the operating and accident prevention regulations mentioned above and the following points during winch operation:

⚠ Monitor the display, especially during night operations and whenever the cable length between snow groomer and the anchoring point is not directly in the driver's field of view.

⚠ If manual control is selected, set the cable traction force using the cable traction force potentiometer on the joystick, taking the operating conditions into account.

⚠ Set the cable traction force in such a way that the tracks never slip so as to maintain stability and manoeuvrability. Do not load the cable any more than the operating conditions require.

⚠ When driving on extremely steep slopes, keep the snow groomer in the direction of the slope in order to maintain stability; drive slowly and don't turn.

⚠ If vibrations occur in the cable during winch operation, stop them by adjusting the engine speed or reducing the vehicle speed.

⚠ Watch the cable whenever you turn the snow groomer or raise the attachments. When the winch arm is turned automatically when the direction of travel changes, it can collide with the attachments if they are raised or turned.

⚠ Before changing the direction of travel, determine which way the snow groomer has to be turned. Do not carry out repeated turns in the same direction.

⚠ Check if the cable is winding onto the drum correctly; if not, unwind as much cable as necessary, then rewind.

⚠ If the cable slips off, do the following:

► Immediately switch off the snow groomer and AUTOMATIC winch and press the manual cable unwind push-button switch **<A37/6>**.
► Call up the cause of the malfunction on the display and eliminate it.
► Check whether the cable has been damaged. If you are not sure, consult qualified personnel.

⚠ If the winch is blocked and no longer works, do the following:

► Deactivate winch operation.
► Move the vehicle toward the mount point until the cable is loose.
► Go to the mount point and unhook the cable.
► Bring the anchoring hook to the vehicle.

⚠ **CAUTION**

Risk of injury
If the anchoring hook is brought to the vehicle, the cable can slip and injure the person who brings the hook.

► Always make sure that, during transport, the anchoring hook is located between the vehicle and the person who is carrying the hook.
► If the cable slips, let go of the anchoring hook.

15.7.10 Electronic traction control

The AUTOMATIC winch's functions are controlled by:

- Moving mini-joystick T on the joystick
- Pressing the push-button switches on keyboard 2 :
  - Push-button switch for unwinding the cable **<A37/6>**
  - Push-button switch for winch operation **<A37/7>**
  - Push-button switch for rewinding the cable **<A37/11>**
  - Push-button switch for rewinding the last few meters of cable **<A37/12>**

When the AUTOMATIC winch is mounted, vehicle speed is not reduced until the winch operation push-button switch is pressed.

Cable traction force depends on the winch arm's swivel angle.

Starting from an angle of **30°** from the vehicle longitudinal axis, cable traction force is progressively reduced, until it reaches the minimum of **50 %** of the preset traction force when the winch arm is at right angles to the vehicle's longitudinal axis.

This system controls the cable traction force in such a way that the required force is delivered automatically in all operating conditions. The "drum" symbol lights up continuously green on the display.

If necessary, the driver can manually change the automatic traction force control using the mini-joystick T on the Joystick:

- MAX continuously lit green = increase traction force
- MIN continuous green = reduce traction force

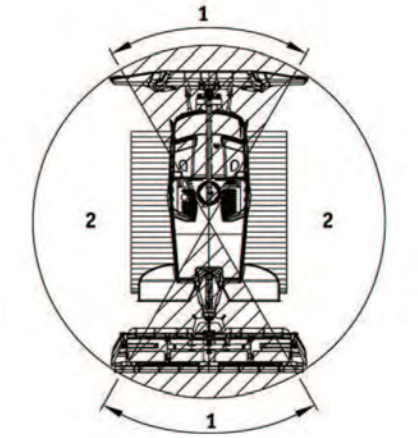


Figure 131: Cable traction force in relation to the winch arm's swivel angle

Pos.	Name
1	Max. cable traction force
2	Reduced cable traction force

15.7.11 Using the AUTOMATIC winch when ascending or descending slopes

⚠ WARNING

Risk of accident
Lack of knowledge of the terrain can lead to accidents, e.g. by colliding with snow slabs or concealed obstacles.

► The driver should never drive on slopes he is not familiar with.

⚠ WARNING

Risk of accident
Do not make any turns as a suddenly released cable may cause serious damage to the snow groomer and injury to persons.

► Always keep the cable taut, even when driving on level terrain, to prevent the cable from lying on the ground, snow or rocks.

Cable traction force is automatically adjusted by cable traction control. If necessary, the cable traction force can be manually increased or decreased using the joystick. When doing so, take terrain conditions into consideration.

Vehicle speed can also be reduced using the vehicle speed regulator. When negotiating extremely steep slopes, align the snow groomer in the direction of the slope in order to maintain vehicle stability.

15.8 Maintenance

15.8.1 General maintenance instructions

To avoid accidents and injury during maintenance and servicing, pay particular attention to the following instructions:

⚠ The service personnel assigned to maintenance and repair work must be familiar with the mechanical, hydraulic and electrical systems. They must be aware of the dangers involved in technical procedures performed on the AUTOMATIC winch and accessories.

⚠ Regular maintenance will extend the AUTOMATIC winch's service life. In case of extended operating periods or difficult operating conditions, lubrication and maintenance intervals should be reduced accordingly.

⚠ Any defects or damage found during maintenance should be corrected immediately. If there is an obvious danger to operating personnel or to the equipment itself, put the AUTOMATIC winch out of service immediately and do not put back into operation until the problem has been resolved.

⚠ Failure to observe the instructions and maintenance intervals may lead to reduced operational availability and damage of the AUTOMATIC winch. PRINOTH cannot accept liability for damage to property or physical injuries that result from failure to observe the maintenance intervals and carry out the required maintenance work. In these cases, all warranty claims are void.

⚠ The maintenance work are to be carried out as indicated on the lubrication and maintenance tables and according to the intervals specified by the manufacturer.

⚠ In carrying out the maintenance work, follow the safety instructions and the general and national accident prevention regulations of the appropriate safety organisations.

⚠ CAUTION

Risk of poisoning
Inhaling exhaust fumes can lead to poisoning.

► Ensure that there is sufficient ventilation for operation in enclosed spaces.

⚠ CAUTION

Risk of scalding and burns
Hot fluids and components can cause injury.

► Do not touch the engine with bare hands when it is at operating temperature.
► Wear suitable protective gloves, clothing, and safety glasses.

⚠ WARNING

Risk of injury and death
if maintenance or repair work on the engine is carried out incorrectly.

► Repair work on and modifications of the engine should always be carried out by an authorized service center as only they have the necessary specialist knowledge and tools for this kind of work.

⚠ CAUTION

Risk of injury
Rotating parts can cause injuries.

- ► Keep a safe distance from rotating parts. Wait for them to stop completely.
- ► Do not wear too loose-fitting working clothes (no jewellery, a hairnet if needed).

15.8.2 Checking the winch

Conduct a visual inspection of the AUTOMATIC winch:

- When required, clear snow and ice from the AUTOMATIC winch.
- Check for neat coiling of the cable on the drum.
- Check the bolts and bolt fittings on all mounting points, re-tighten the bolts as specified if necessary.
- Check the AUTOMATIC winch frame, winch mounting points and winch arm.
- The electrical system, and particularly safety and warning devices, must be checked to ensure they are functioning correctly.
- Carry out visual inspection of the complete hydraulic system for possible loss of oil:
  - □ Hydraulic hoses
  - □ Joints
  - □ Valves
  - □ Hydraulic motors
  - □ Quick-lock couplings
- Carry out a visual check of the hydraulic tilting mechanism.
- Check that the hydraulic cable guide is functioning correctly.
- Pull at the cable several times to check if the toggle switch is working properly.

The AUTOMATIC winch's actual working hours are displayed by the AUTOMATIC winch working hours counter. Depending on the number of hours, carry out the work as indicated in the maintenance table and lubrication schedule.

15.8.3 AUTOMATIC winch maintenance schedule

Table for maintenance work on the AUTOMATIC winch								
Work to be performed	**Operating hours**							
	Daily	**10**	**50**	**100**	**150***	**400**	**800**	**and then ...**
Check AUTOMATIC winch for proper function and potential damage	X				X*			
Check and, if necessary, re-tighten the bolts and locking system for the AUTOMATIC winch and the front and rear fittings on the vehicle frame		X			X*			every **10 h**
Lubricate the lubrication points			X		X*			every **50 h**
Lubricate cable guide rollers in the winch arm and check ease of movement			X					every **50 h**
Check oil level of winch gear *See "Check oil level of winch gear" (p. 242)*			X		X*			every **50 h**
Test the bearings for noise				X	X*			every **100 h**

Table for maintenance work on the AUTOMATIC winch								
Work to be performed	**Operating hours**							
	Daily	**10**	**50**	**100**	**150***	**400**	**800**	**and then ...**
Change winch gear oil ➽ *See "Change the winch gear oil" (p. 244)*				X	X*			every **100 h**
Check cable for damage ➽ *See "Checking the cable" (p. 239)*				X				every **100 h**
Check oil level in AUTOMATIC winch tilting mechanism					X*	X		every **400 h**
Check bolts and hose clamps; tighten if necessary					X*	X		every **400 h**
Replace hydraulic oil filter (at least every **2** years)							X	every **800 h**
Check the groove diameter of the cable guide rollers in the winch arm								before operating season and every time the cable is changed
* This work is also carried out by PRINOTH customer service personnel and does not affect the other maintenance intervals.								
■ Recommended spare parts Hydraulic oil filter								

15.8.4 Operating fluids

Operating fluids for AUTOMATIC winch			
	Specifications	**Note**	**Qty**
HYDRAULIC FLUID			
ATF oil	Dexron III, Dexron II, Type F, Type A Suffix A	Check initial filling! Oil type must be identical to the snow groomer oil type (initial filling: Dexron III)	**10 L** (2.6 gal)
Biodegradable oil	Panolin HLP Synth 46, York Bio 777 VG 46	Check initial filling! The oil type must be the same as that of the snow groomer	**10 L** (2.6 gal)
GEAR OIL			
Winch gear	Synthetic gear oil based on PAO (poly-alpha-olefin) Viscosity: ISO 220, SAE 75W 90 or 75W 140, API GL-4 or GL-5	(initial filling: 75W140)	➽ *See "Check oil level of winch gear" (p. 242)*
LUBRICANT			
Bearings and other lubrication points	Calcium or lithium soap grease, DIN 51825 KP 2G-30, DIN 51502; for temperatures below **-30 °C** (-22 °F): NLGI grade 1 (no EP, **-40 °C** to **100 °C**)		
ROLL OUT bearing	Lithium soap grease with mineral base oil and EP additives, type SKF LGEP2, temperature range **-20 °C** (-4 °F) to **110 °C** (230 °F)		
Cable lubrication	We recommend CIFAST-BRILUBE **30/40/50/60** or equivalent lubricating grease	Only required for non-galvanised cable	
Cable lubrication at the end of the season	We recommend using SHELL **2722** or equivalent lubricating greases	Only required for non-galvanised cable	
HYDRAULIC PUMP TILT SYSTEM WINCH ARM HYDRAULIC FLUID			
ATF oil	Dexron III, Dexron II, Type F, Type A Suffix A	Check initial filling! (initial filling: Dexron III)	**0.2 L** (0.05 gal)
Biodegradable oil	Panolin HLP Synth 46, York Bio 777 VG 46	Check initial filling!	**0.2 L** (0.05 gal)

15.8.5 Lubrication points

The required lubrication intervals are indicated on the maintenance schedule. Lubricate the points indicated on the following drawing.

- Before lubricating, thoroughly clean the lubricating nipples in order to prevent dirt or foreign matter from entering.
- Damaged lubricating nipples are to be replaced immediately. Press the specified lubricating grease through the nipple until all the old grease has been evacuated.

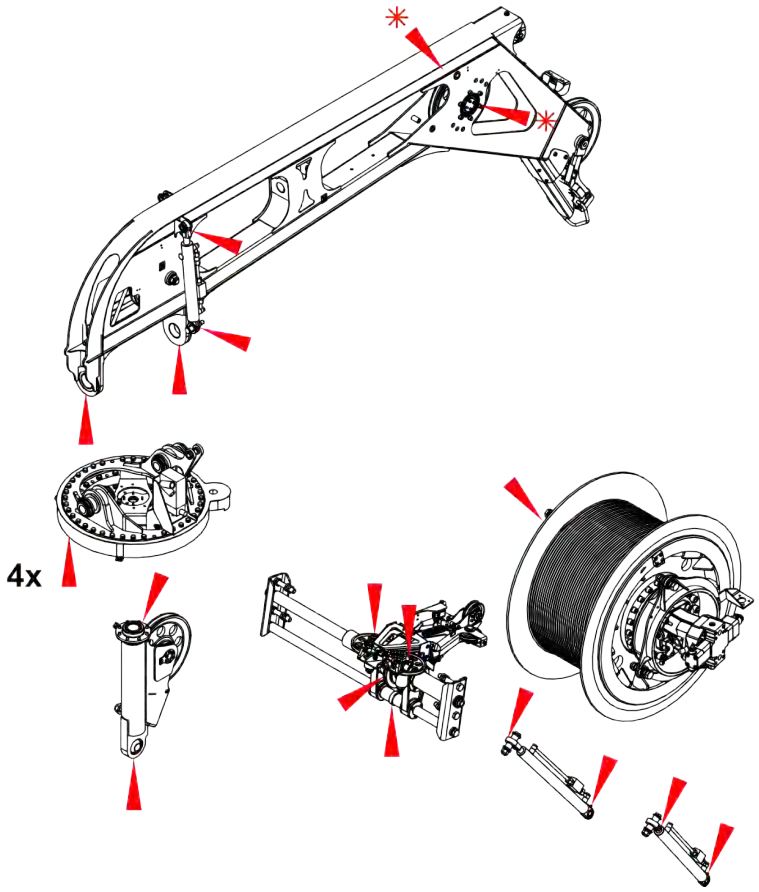


Figure 132: Lubrication points on the AUTOMATIC winch

Pos.	Name	Description
*	ROLL OUT bearing	A special lithium soap grease must be applied to these lubrication points. ➳ See "Operating fluids" (p. 238)

15.8.6 Checking the cable

⚠ CAUTION

Risk of injury
If damaged, the cable may rupture and cause injuries.

- ► Immediately inform specialised personnel of any irregularities found in the cable and have it checked.

⚠ CAUTION

Risk of injury
There is a risk injury when handling the cable.

- ► Wear protective gloves.
- ► Only pull the cable by the anchoring hook; never pull the cable itself.
- ► Always keep the cable in front of you.

Irrespective of the number of working hours on the AUTOMATIC winch, the cable must be examined thoroughly in the following cases:

- If the cable has been damaged (chafing, abrasion, etc.)
- If the cable is faulty and cannot be used properly (deformation, kinks, etc.)
- If cable is used in difficult working conditions

The following defects may occur in the cable:

- Broken wires and wire strands

- Clances

- Crushing

- Waviness

- Knoten
- Bird-caging
- Holes
- Cuts
- Kinks
- Overstretching

- Loss of diameter
- Oxidation
- Loops

Perform testing as follows:

- The whole length of the cable must be examined, especially the part that is used the most: to check for potential wire break, the cable should be bent.
- Check cable clamps for deformation, crushing, wear, cuts.
- Examine the cable's attachment point at the clamping plate thoroughly.
- Check the anchoring hook and safety lever at the end of the cable for deformation, wear, widened hook opening, cuts and elongation.

- Winches with plastic rope

The rope is not an antitwist rope, which means that it should always be moved in a figure eight configuration. In most cases, the same applies to the steel rope. The jacketing can be used to identify whether the rope is twisted. The stripes (markings along the length) indicate any twisting in this case.

- Running the rope through your hands will allow you to see and feel how worn the rope is, and therefore determine whether it needs to be replaced. If the core of the rope is visible, the rope must be cut away or, at the very least, the damaged part must be removed.
- Lateral markings on the rope also indicate whether there is any damage to the core: The distance between the lateral markings increases as the core tapers off.
- A rope always tapers off before it tears. This must be taken into consideration. What are known as corkscrews also indicate that the core is damaged.
  IMPORTANT
  Always contact a Prinoth technician if you are uncertain about anything.

15.8.7 Check the cable guide rollers

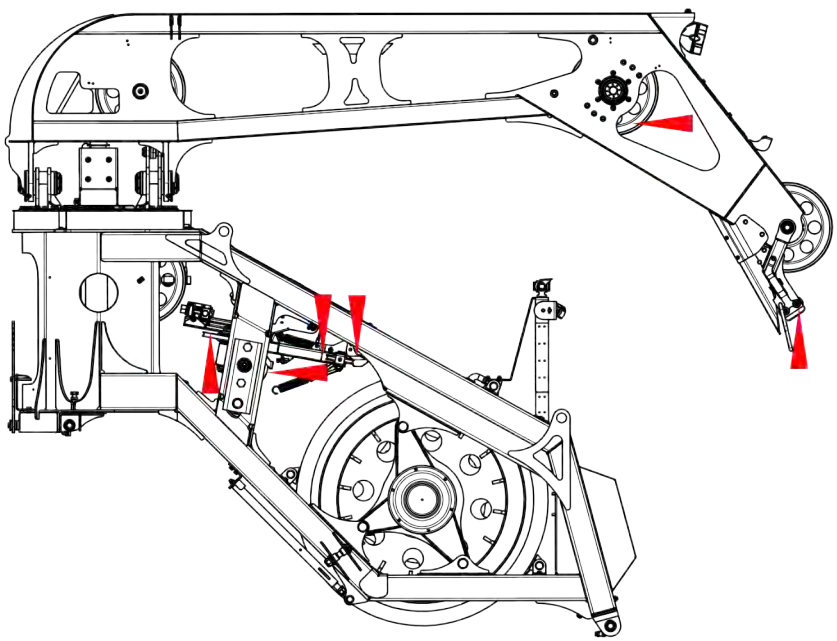


Figure 133: Cable guide rollers

- Check the condition of the cable guide rollers on the winch arm for wear.
- Make sure that the cable guide rollers are turning smoothly; replace the rollers if badly worn.
- Check the winch extension arm for wear, and replace or repair any damaged parts.

15.8.8 Replacing the cable

NOTICE

- ► Have the state of wear of the cable evaluated only by competent specialized personnel.
- ► Cable must be inspected as specified by DIN 15020/ Sheet 2.
- ► Replace the cable immediately if **6** load-bearing wires are broken over a length of **66 mm** or **13** load-bearing wires are broken over a length of **330 mm**.
- ► The cable must not be spliced.

The cable must be replaced if it is no longer able to ensure operational safety. The operational safety of steel cables can be assessed according to the following criteria:

- Number of broken wires and type of breakage
- Wire break at the end of the cable
- Position of wire break
- Frequency of wire break
- Broken wire strands
- Reduced cable diameter by **15 %** due to structural change
- Reduced cable diameter by **10 %** or more due to abrasion or corrosion
- Loss of elasticity
- Internal and external abrasion
- Internal and external corrosion
- Cable deformation, bunching, knots, crushing, notching, kinks
- Wear on the steel cable due to exposure to heat
- Excessive stretching
- Severe damage due to corrosion
- The number of visible wire breaks on a specified stretch of rope as defined by UNI ISO 4309

All inspections must take the above criteria into account. If cable damage is attributed to more than one of the above factors, there will be a variety of effects, which should be checked by the personnel responsible. These should then decide, after careful examination, whether the cable needs to be replaced or can be re-used.

In all cases, the technician responsible for cable monitoring must determine whether the damage is due to an equipment failure; if this is the case, he/she will set out the measures necessary for repairing the fault before a new cable is installed.

15.8.9 Check oil level of winch gear

NOTICE

Risk of damage to the engine and gearbox
Even the smallest particles can cause damage and premature wear to the engine and transmission.

- ► Ensure the utmost cleanliness when handling operating fluids.
- ► Check for correct filling level.

NOTICE

Risk of gear damage
Use of a lower grade or incorrect oil type can cause damage to the transmission.

- ► Only use the specified oil type ➠ See "Operating fluids" (p. 238)
- ► Adhere to maintenance intervals ➠ See "AUTOMATIC winch maintenance schedule" (p. 236)

NOTICE

Risk of contamination of drinking water
Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

- ► Operating fluids, and components which come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation

NOTICE

- ► Only check the oil level if the vehicle is standing on level ground.
- ► The winch gear must be shut down for at least **10 min** so that the oil can set.
- ► Always use the oil level screw to check the oil level.

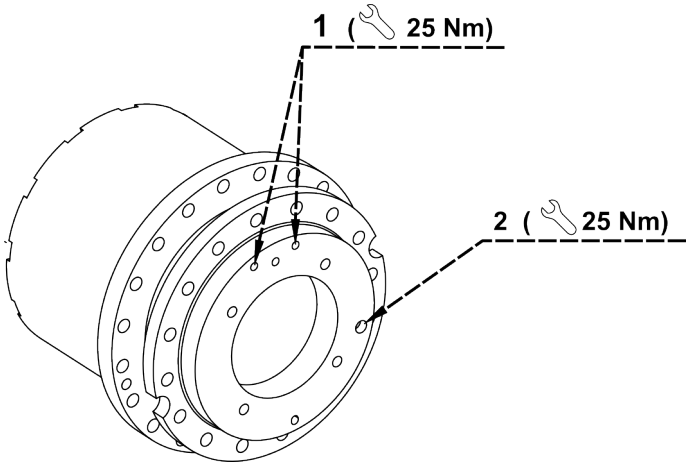


Figure 134: Winch gear

Pos.	Name
1	Oil filler screw
2	Oil level screw

1. Park the vehicle on a level surface at operating temperature.
2. Wait at least **10 min** before measurement so that the oil can set.
3. Clean the surroundings of the oil filler screw (1) and oil level screw (2).
4. Remove oil level screw (2).
5. The oil level must reach the threaded hole in the oil level screw (2), but must never be above it.
6. If necessary, top up the level using the specified gear oil, via the oil fill screw (1) or the winch cooling pump. ➠ See "Change the winch gear oil" (p. 244)
7. Insert the oil level screw (2) and oil fill screw (1) again.
8. Check that all screws are firmly seated.

15.8.10 Change the winch gear oil

NOTICE

Risk of damage to the engine and gearbox
Even the smallest particles can cause damage and premature wear to the engine and transmission.

- ► Ensure the utmost cleanliness when handling operating fluids.
- ► Check for correct filling level.

NOTICE

Risk of gear damage
Use of a lower grade or incorrect oil type can cause damage to the transmission.

- ► Only use the specified oil type See "Operating fluids" (p. 238)
- ► Adhere to maintenance intervals See "AUTOMATIC winch maintenance schedule" (p. 236)

NOTICE

Risk of contamination of drinking water
Operating fluids (oil, fuel, coolant, etc.) are water contaminating materials.

- ► Operating fluids, and components which come into contact with operating fluids, e.g. filters or sealing rings, should be disposed of in accordance with the environmental regulations.
- ► Follow the legal provisions applicable to the place of operation

NOTICE

- ► Only change the oil when at operating temperature.
- ► The winch gear must be shut down for at least **10 min** so that the oil can set.
- ► Always use the oil level screw to check the oil level.
- ► Only drain the oil using the oil drain plug.

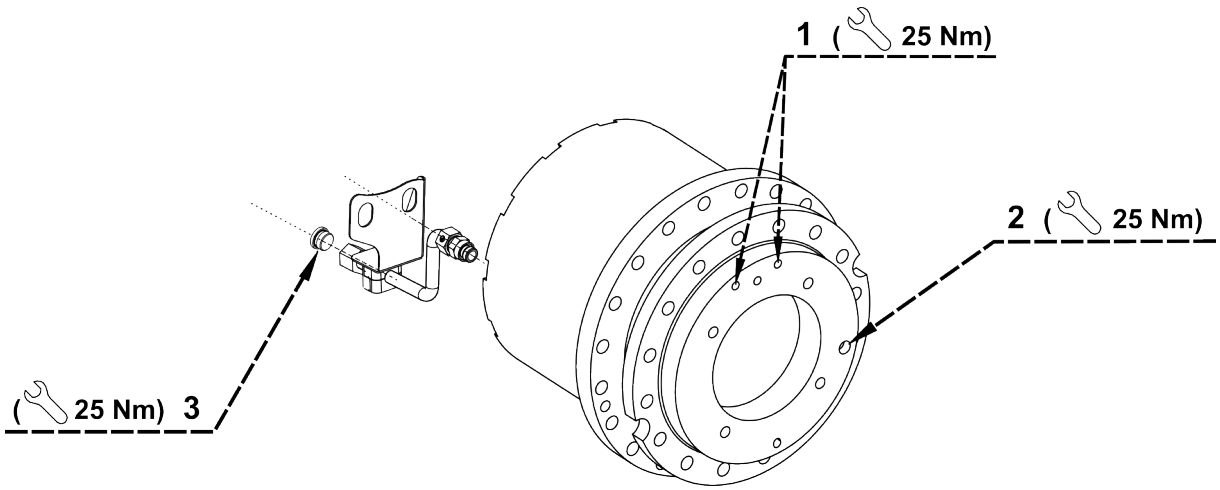


Figure 135: Winch gear

Pos.	Name
1	Oil filler screw
2	Oil level screw
3	Oil drain screw

1. Park the vehicle on a level surface at operating temperature.
2. Wait at least **10 min** before measurement so that the oil can set.
3. Turn the drum so that the oil drain plug (3) is at the lowest point.
4. Clean the surroundings of the oil filler screw (1), oil level screw (2) and oil drain plug (3).
5. Remove oil fill screw (1) and oil level screw (2).
6. Place a suitable collecting container under the oil drain plug (3).
7. Carefully remove the oil drain plug (3) and drain off the oil.
8. Once the oil has drained, screw the oil drain plug (3) back in with a new sealing ring and tighten.
9. Slowly fill the gearbox with the specified gear oil via the filler opening made accessible by the oil fill screw (1). The oil level must reach the threaded hole in the oil level screw (2), but must never be above it.
10. Insert the oil level screw (2) and oil fill screw (1) again.
11. Check that all screws are firmly seated.

■ Changing gear oil using the winch cooling pump

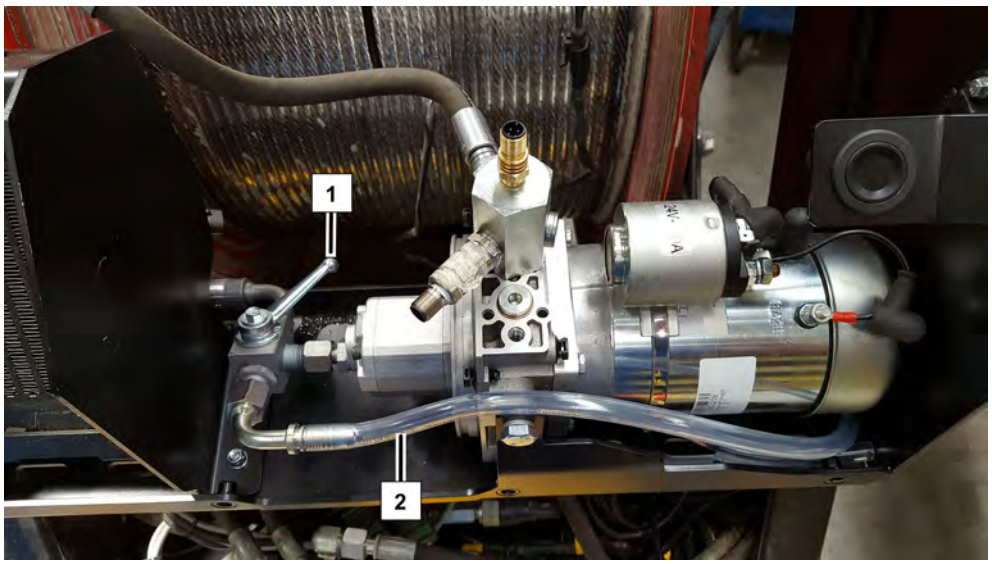


Figure 136: Winch cooling pump

Pos.	Name
1	Ball valve
2	Intake hose

1. Park the vehicle on a level surface at operating temperature.
2. Turn the drum until the oil drainage pipe is at the lowest point. Remove the plug and drain the oil.
3. Open the gear oil suction filter and check for particles. Contact Prinoth customer service if you find any large, coarse metallic particles in the filter.
4. Drain all the oil, including the oil from the adjoining pressure hoses.
5. Clean the suction filter as specified and then reinstall it.
6. Disconnect the pressure hose (protruding from the cooler) from the gearbox.
7. Insert the transparent intake hose (2) into a canister containing new gear oil.
8. Turn the ball valve (1) in reverse; see figure.

9. Activate the winch cooling pump using the push-button provided and collect any oil that is still present in the cooler and hoses until the new oil starts to come through.
10. Reattach the pressure hose to the gearbox.
11. Refit the oil drain plug.
12. Remove the oil level plug.
13. Fill with approximately **2 l** of oil using the pump.
14. Turn the ball valve (1) forward again and allow the pump to run for approximately **1 min** using the push-button; this allows the oil to circulate.
15. Turn the ball valve (1) in reverse again and briefly activate the pump until the required oil level is reached.
16. Check the oil level at the oil level plug.
17. Turn the ball valve (1) forward again and drain the oil from the intake hose.
18. Check that the ball valve (1) on the filter is completely open and unscrewed.
19. Check for any leaks.

■ Checking and cleaning the gear oil suction filter

The suction filter can be checked and cleaned without draining the oil from the gearbox.

1. Close the ball valve (1) on the suction filter (screw in completely).
2. Open the gear oil suction filter and check for particles. Contact Prinoth customer service if you find any large, coarse metallic particles in the filter.
3. Clean the suction filter as specified and then reinstall it.
4. Reopen the ball valve (1) on the suction filter (unscrew completely).
5. Using the pump, add any oil that is lacking from the gearbox (as described above).
6. Check the oil level at the oil level plug.

15.8.11 Check the carrier

Thoroughly examine all supports that fasten the AUTOMATIC winch to the vehicle frame:

- Check the supports for wear and damage.
- In particular, check the condition of weld seams (for cracks, deformation, bending, etc.).
- If any damage is found, inform the personnel responsible immediately.

15.8.12 Installing an anchoring hook

NOTICE

► Do not re-use a cable that was cut.
► Do not repair a worn anchoring hook by hardfacing.

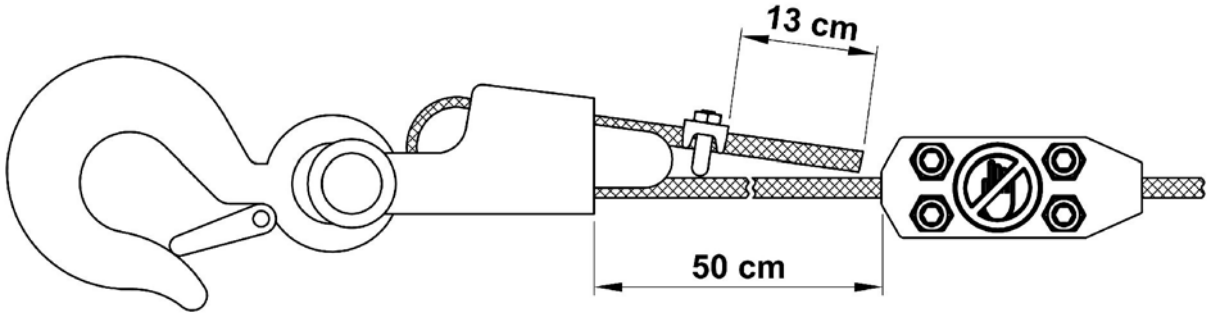


Figure 137: Anchoring hook

The anchoring hook on the cable is to be replaced if there is deformation of **10%** relative to the initial dimension, or if there is wear of **5%** or more:

- Weld the steel wires using a welding torch or electric welding equipment.
- Re-install the anchoring hook
- Attach the cable clamps as indicated in the drawing.
- Check the tightening torques on all bolts.
- After the first **10** operating hours of the AUTOMATIC winch, check that the bolts are firmly seated.

15.9 Technical data AUTOMATIC winch

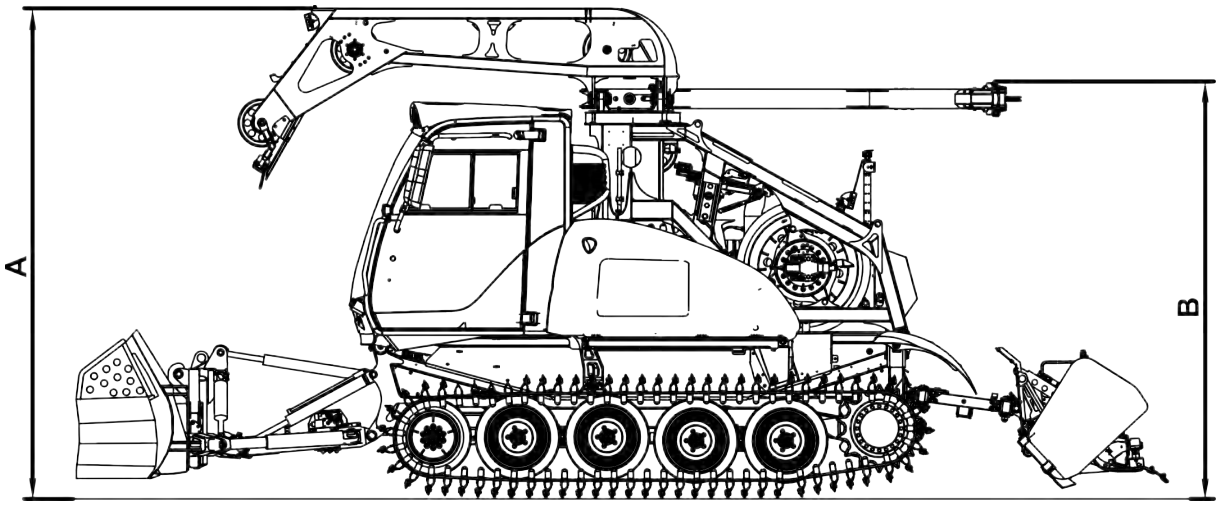


Figure 138: Dimensions BISON with AUTOMATIC winch

BISON with AUTOMATIC winch	
■ Dimensions	
A Max. snow groomer height AUTOMATIC winch	**3554 mm** (140 in)
B Max. vehicle height with winch arm tilted down	**3048 mm** (120 in)
■ Weight	
Dead weight with AUTOMATIC winch	**9203 kg** (20248 lb)
■ Cable	
Diameter	**11 mm** (0.43 in)
Minimum breaking strength of cable	**116 kN** (26080 lbf)
Max. cable length	**1200 m** (3940 ft)
■ Operating data	
Max. frontal climbing ability*	100 %
Max. lateral stability*	**45 °**
Max. cable traction force	**45 kN** (10116 lbf)
Snow groomer speed with AUTOMATIC winch fitted during winch operation	**0 km/h** (0 mph)...**17 km/h** (11 mph)
Turning radius (snow groomer turns on own axis)	**0 °**
* on snow	

15.10 Taking the winch out of operation for longer period

⚠ CAUTION

Risk of injury
If damaged, the cable may rupture and cause injuries.
There is a risk injury when handling the cable.

- ► Immediately inform the personnel responsible of any irregularities found in the cable and have it checked.
- ► Wear protective gloves.
- ► Only pull the cable by the anchoring hook; never pull the cable itself.
- ► Always keep the cable in front of you.

NOTICE

Risk of contamination of drinking water
Cleaning agents can contaminate water resources.

- ► Cleaning agents, especially those used for cleaning the engine and mechanical and hydraulic components, are to be disposed of in an environmentally responsible manner.
- ► Follow the legal provisions applicable to the place of operation

NOTICE

- ► Temperature range for storage: **- 40 °C** (- 40 °F) to **+ 40 °C** (104 °F)

When preparing the AUTOMATIC winch for storage at the end of the winter season, or if it is taken out of service for any extended period of time (more than **6** months), we recommend taking the following steps:

- In general, all advice on preserving the snow groomer as specified in the operating and maintenance instructions apply.

However, it is advisable to take the following additional measures:

- Clean the AUTOMATIC winch completely using a warm water jet and a suitable cleaning agent, rinsing thoroughly. Then let dry. Have cleaning carried out by qualified personnel who are aware of the possible hazards. Never wash the AUTOMATIC winch cable!
- Unwind cable, clean it, and have it inspected as per DIN 15020/ Sheet2 by qualified and authorised personnel.
- Lubricate cable using a deep-penetrating preservative grease that contains a solvent and can be easily applied with a brush (e.g. Shell **2722** or lubricating grease of similar quality).
- Wind the cable onto the drum; check if rewinding works smoothly.
- Apply preservative grease to the visible parts of the cable (drum, cable guide) once more.
- Clean all guide pulleys.
- Check the AUTOMATIC winch's attachment points and weld seams (AUTOMATIC winch frame, winch arm, etc.) on the snow groomer frame.
- Check the whole hydraulic system for leaks (firm seating and condition of hydraulic hoses, valves, sockets, threaded connections, quick-lock couplings, etc.).
- Make sure that all electrical consumers and alarm switches for the cable are functioning correctly.
- Repair any damaged paintwork; rub silicon wax onto painted parts and apply a thin layer of commercially available preserving agent to all metal parts.

16 List of Abbreviations

Abbreviation	Meaning
A/C	Air Conditioner
ADM	Adaptation Module as Vehicle Control
AltÖlV	Waste Oil Act (Altölverordnung)
ANSI	American National Standard Institute
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
ATF	Automatic Transmission Fluid
CAN	Controller Area Network
CAT	Caterpillar®
CE	European Conformity (Conformité Européenne)
CEM	Clean Emission Module
CRS	CAT Regeneration System
DEAC	Diesel Engine Antifreeze Coolant
DEF/AdBlue®	Diesel Exhaust Fluid
DEO	Diesel Engine Oil
DIN	German Institute for Standardization (Deutsches Institut für Normung)
DPF	Diesel Particulate Filter
ECM	Engine Control Module
ECU	Electronic Control Unit
EDC	Electronic Diesel Control
EN	European Standard
EP	Extreme Pressure
EU	European Union
HP	Horse Power
ISO	International Organization for Standardization
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MR	Engine Control Unit
OBD	On-Board Diagnostics
ÖNORM	Austrian Standard
PAO	Poly-alpha-olefin
PCB	Polychlorinated Biphenyl
PETU	Pump Electronic Control Unit
ROPS	Roll-Over Protective Structure
RPM	Revolutions Per Minute
SAE	Society of Automotive Engineers
SCA	Supplemental Coolant Additives
SCR	Selective Catalytic Reduction
Tier	Emission Standard
TTC	TT Control
ULS / ULSD	Ultra Low Sulfur / Ultra Low Sulfur Diesel

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