

# Operating manual

Vehicle

*PistenBully®*

**PAANA**

From WKU 858 10117.en



**Kässbohrer Geländefahrzeug AG**

Kässbohrerstraße 11

D-88471 Laupheim

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## OTHER ON-BOARD DOCUMENTS

- Log book
- Operating manual, diesel engine
- Maintenance Instruction



## YOUR OPINION IS IMPORTANT TO US.

To ensure that your operating manual is optimum in all  
ways.

Sender:

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Kässbohrerstraße 11

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### Quality of translation:

☐

Correctly translated

☐

Mistakes in translation

Comments:

### Graphics and photos:

☐

Provide good explanations

☐

More explanatory diagrams required

Comments:

☐

A CD-ROM would be good!



# INTRODUCTION

**This operating manual provides information about:**

- how to handle, maintain and care for your PistenBully.
  - important instructions concerning correct and economical operation.
  - warnings so that you recognise dangers in good time and avoid them.
- Make sure that the operating manual is always in the oddments tray in the driver's cab.

## SYMBOLS USED

- ☐ Compliance with the precondition is essential.
- Procedural instruction
- Result of the action.
- i This symbol draws attention to a practical tip.



### DANGER!

**Direct and imminent danger threatening life and limb unless appropriate precautions are taken.**



### WARNING!

**Potentially highly dangerous situation!  
Danger to life and limb unless appropriate precautions are taken.**



### CAUTION!

**Dangerous situation!  
Could lead to injury unless appropriate precautions are taken.**



**Important note!**

Possibility of damage to the machine or its immediate surroundings.



# TECHNICAL CUSTOMER SERVICE AND SPARE PARTS DEPARTMENT

Overview

Technical data

Safety

Use

Checks

Operation

## Service worldwide

Director of Service (GS)

Mr. Mayer

## Phone, office

+49(0)7392/900-150

## Technical customer service (TKD)

Fax +49(0)7392/900-100

Head of department TKD

Mr. Strähle

+49(0)7392/900-103

Area Manager TKD

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+49(0)7392/900-137

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+49(0)7392/900-116

Area Manager TKD

Mr. Dehm

+49(0)7392/900-117

**24-hour service emergency number: Phone. +49 171/7124096**

## Spare Parts department (ETV)

Director, ETV,

Mr. Heim

+49(0)7392/900-107

Fax

+49(0)7392/900-130

**Spare parts distribution (ETV) emergency number: Tel. 0171/3732230**

## Contact at my national office:

Technical customer service

Name:.....

Telephone number:.....

Spare parts department

Name:.....

Telephone number:.....

Repair mechanic

Name:.....

Telephone number:.....

- Always quote the vehicle number when making enquiries and ordering spare parts.  
The deployment of service mechanics is controlled centrally by TKD (Technical Service).



**i** In your own interests, please note the following:

We recommend the use of genuine spare parts from Kässbohrer Geländefahrzeug AG and parts for conversion and accessories expressly approved for your type of vehicle. These parts have been subjected to a special test procedure and they have been proven to be reliable, safe and suitable for Kässbohrer off-road vehicles. Despite continuous observation of the market, we are unable to assess these aspects of other products – even products that have been scrutinised by a technical inspector or for which an official approval has been issued – and consequently, we refuse to accept liability for them.

Genuine parts and approved accessories and parts for conversion are available from your Kässbohrer Geländefahrzeug AG service centre. The experts there will provide in-depth advice – including advice on permissible technical modifications – and install the components using the correct procedures.

The use of parts other than genuine spare parts voids your guarantee. We refuse to accept liability for consequential damage resulting from such use.

Kässbohrer Geländefahrzeug AG





## NOTES

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# TECHNICAL DATA

## Overview

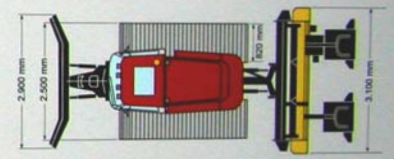
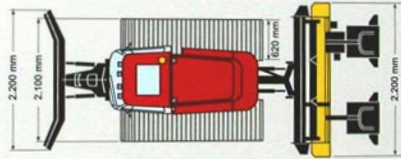
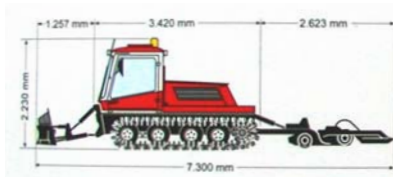
## Technical data

## Safety

## Use

## Checks

## Operation



## Dimensions

### Width

Vehicle width	2092 / 2518 mm
With tiller and pusher blade	2790 / 3090 mm
With tiller and pusher blade (with wings)	3900 / 4200 mm
Track width optionally	620 / 820 mm

### Height

2230 mm

### Length

With tiller and pusher blade	7300 mm
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## Weight

Dead weight with tracks	3100 kg
Permissible gross weight	3700 kg

## Operating parameters

Continuously variable speed	0 - 20 km/h
Ground pressure, 620 mm tracks	0.092 kg/cm <sup>2</sup>
Ground pressure, 820 mm tracks	0.070 kg/cm <sup>2</sup>

## Suggested garage dimensions

Length	8000 mm
Width	4500 mm
Height	2500 mm





## TECHNICAL DATA

### Engine

Type	Cummins QSB4.5
Number of cylinders	4
Displacement	4500 cc
Output, ECE rating	86 kW (115 hp)
Maximum torque	488 Nm at 1500 rpm
Oil capacity with filter	11 litres
Fuel consumption	at least 10 l/h
Tank capacity	120 litres
Exhaust-emissions standard	EURO 3A

### Sound and vibration levels

Sound level inside driver's cab	76 dB(A)
Vibration at steering wheel	3.9 m/s <sup>2</sup> max.
Vibration at seat	0.7 m/s <sup>2</sup> max.
Acoustic emission	105 dB(A)

### Brakes

Wear-free (hydrostatic)

### Electrical

Light-current circuit	24 V
Batteries	2 x 12 V / 64 Ah
Cold-start power	640 A

### Safety devices

Reversing alarm	1
Rotary beacon (roof)	1
Master switch inside driver's cab	1

### Auxiliary equipment weights

Front equipment weight	max. 350 kg / 3430 Nm
Rear equipment weight	max. 500 kg / 5300 Nm



## DIESEL FUEL

- If the engine is run on diesel fuels with a sulphur content of more than 0.3 percent by weight, the scheduled times between oil changes must be halved.

### Diesel fuels at low temperatures


Select the diesel fuel's resistance to the cold in accordance with the temperature characteristics in the area of use and source the fuel information from the fuel supplier.

- See the CD 'Cummins

## COOLANT

### Water quality

Free of contaminants (grease, dirt, lime...), because failure to comply with this requirement means: less efficient removal of heat, formation of deposits, and clogging of coolant ducts.

-  Drinking water often satisfies the water quality requirements.

### Changing coolant

- Make sure that container and funnel are free of residues of other fluids and lubricants.

### Select the correct antifreeze agent

- See the Cummins CD supplied with the vehicle  
Maintain a coolant mixture of 50% drinking water + 50% by volume of antifreeze in the engine throughout the year.



Risk of engine overheating!

Do not permit the proportion of antifreeze to exceed 55 percent by volume.

### Antifreeze change interval

At least: every 2 years  
by engine operating hours: every 2000 hours



## TABLE OF FLUIDS AND LUBRICANTS

Designation	Grade	Capacity	Interval between changes
<b>Cummins OSB4.5</b>	CES 20072 / DHD-1 / ALEA E-5 API-CH 4 SAE 5W40 See the CD 'Cummins Service Bulletin No. 381 0340-06' supplied with the equipment	11 litres	At least: once a year every 250 hours
<b>Fuel tank</b>	Diesel fuel see the CD 'Cummins Service Bulletin No. 3379 001-10' supplied with the equipment	120 litres	At least: once a year drain condensation.
<b>Fuel filter</b>			every 500 hours
<b>Air filter</b>			At least: once a year every 1000 hours
<b>Cooling / heating system</b>	50% water + 50% antifreeze agent See the Cummins CD supplied with the vehicle Service Bulletin No. 3666 132-04 supplied with the equipment	19 litres	At least: every 2 years every 2000 hours
<b>Wheel drive (planetary gears)</b>	<b>Poly Alpha Oleofin (PAO)</b> - CLP HC VG 150 / 220 ISO VG 220 (for summer operation) - API GL4, SAE 75 W 90 (PAO)	0.8 litres	At least: once a year every 400 hours new vehicle 100 hours



# TABLE OF FLUIDS AND LUBRICANTS

Overview

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Designation	Grade	Capacity	Interval between changes
<b>Hydraulics</b> Propulsion unit + auxiliary driven machinery (see customer's workshop information)	HVLP DIN 51524 DEXRON II D / III F ATF Type A Suffix A < -30°C -AVIA Synthofluid PE-B 30 (PAO)	40 l tank 70 l total	At least: once a year every 1000 hours
Hydraulic oil filter			at 100 hours every 1200 hours
<b>Hydrostatic vehicle drive</b> (see customer's workshop information)	OKS 250		
Grease wheel hubs	Calcium saponified grease KP2K-30, DIN 51502 e.g. Aviacal 2 LD		At least: once a year every 1000 hours
Other lubrication points	Calcium saponified grease KP2K-30, DIN 51502 e.g. Aviacal 2 LD		every 100 hours
<b>Electrical system</b> Battery terminals	Bosch FT 40V1 grease		





## NOTES

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## SAFETY INSTRUCTIONS

### Correct usage:

Snow groomers may only be operated as specified in the manufacturer's operating manual.

#### The PistenBully may be used for the following purposes only:

- Preparing trails for Nordic skiing.
  - Preparing slopes for downhill skiing.
  - Removing snow from paths.
  - Tracks in countryside (not public roads).
- If you wish to use the equipment for any other purpose, you must apply for and obtain prior written approval from the manufacturer.

### DRIVER

- Drivers must be specifically appointed to drive snow groomers.
- You may appoint people to drive the snow groomers on their own only when you are certain that they will be able to reliably fulfil the tasks assigned to them.

#### In particular, they must satisfy the following:

- be at least 18 years old or of the minimum legal age required by national law.
- be physically and mentally suitable.
- be trained in how to drive the snow groomer and have proven their driving ability to the operator.

- be familiar with snow conditions and with the peculiarities of operating equipment in facilities for skiers.
- be familiar with the area where the vehicle is to be used, especially with regard to particularly dangerous areas.
- be familiar with first-aid procedures in the event of an accident.
- if avalanches pose a threat in the area where snow groomers are to be used, in addition to the aforementioned conditions, drivers must also be instructed about how avalanches are started, the consequences of them and how to behave when there is a risk of avalanches.





## ANGER ZONE FOR PERSONS

- No-one is permitted to enter the snow groomer's immediate danger zone.
- The driver may only operate and drive the snow groomer provided that there is no-one in the immediate danger zone.
- The driver must issue warnings to draw attention to potential dangers.
- Special protection measures must be taken if the snow groomer is being used in an area where the driver does not have a clear view of the surrounding terrain, or the nature of the terrain is such that the machine might not be immediately visible to people in its vicinity. Depending on the circumstances of

each case, these measures may take the form of warning signs, closed runs or off-limit markers.

## ENTERING

- Complete the daily checks and maintenance tasks.
- Walk right round the vehicle and make sure that the danger zone is clear of persons and objects.
- Step onto the track.  
Danger of slipping on the track when entering and exiting the driver's cab. Always take a firm grip on the handle of the driver's door when entering the vehicle. Wear sturdy footwear with non-slip soles.
- When parking on a slope, be particularly careful when opening the door. The door opens suddenly.
- Buckle the safety belt.

## DRIVING

- Do not leave the vehicle unattended with the engine running.
- Risk of poisoning from exhaust gases.  
Never leave the engine running in enclosed spaces.
- The driver may start and/or move the snow groomer only when seated in the driver's seat, after fastening the seat belt .
- Do not attempt to adjust the driver's seat or steering wheel when driving.
- Never open the door of the cab while the vehicle is on the move. The parking brake is applied automatically if a door is opened. The PistenBully brakes sharply to a complete stop.



## SAFETY INSTRUCTIONS

- Snow groomers must be used and operated in a manner which ensures their stability.
- Drivers must always restrict the vehicle to a speed at which they can stop within the distance visible. This does not apply to steep slopes where the vehicle cannot be stopped as a result of the angle of the terrain. Drivers may drive on such steep slopes only when certain that they can do so without putting themselves and others at risk.
- Drivers may drive the snow groomer only at a speed at which they maintain control at all times.
- They must adapt the speed to the snow, terrain and visibility conditions and to the characteristics of the snow groomer, with due allowance for the auxiliary equipment fitted.
- When driving past people, slow down, keep at a safe distance and always bear in mind that the people may behave unexpectedly.
- Driving with cruise control engaged! Engage cruise control only on long, easily negotiable stretches offering an unobstructed view of the terrain. Easing the accelerator will not produce a reduction in driving speed!  
Deactivating cruise control: Press the "cruise control" button or set the direction-of-travel switch to "Neutral" position.  
In the event of sudden danger, hit the STOP switch.
- In the event of danger, hit the STOP switch.  
The vehicle comes immediately to a complete standstill.
- Check that loads are correctly secured.
- Bring the vehicle to a complete stop before reversing the direction of travel.
- Do not apply the parking brake until the vehicle has come to a complete stop.
- Ensure that the area behind the machine is clear.
- Avoid crossing slopes at an angle because the PistenBully may slip downhill.
- When a tracked vehicle is being driven, the traction is so great that the vehicle may be driven well beyond the point at which it should start to tilt; if this happens the vehicle might then suddenly tip over.



## STOPPING / EXITING

- Do not park the vehicle where it cannot be seen.
- Lower the front and rear auxiliary driven implements, switch off the tiller, set the direction of travel switch to "neutral", and apply the parking brake.
- Risk of poisoning:  
Do not leave the engine running in an enclosed space.
- Before exiting the driver's cab:
  - Apply the parking brake.
  - Switch off the engine.
  - Remove the ignition key from the lock.
  - Move the armrest and the steering wheel to their upright positions.
  - Lock the driver's cab.
- Danger of slipping on the track when entering and exiting the driver's cab.  
Always take a firm grip on the handle of the driver's door when exiting the vehicle.  
Wear sturdy footwear with non-slip soles.
- Risk of explosion of due to formation of gas.  
Keep all possible sources of ignition when clear when the vehicle is being refuelled with diesel fuel.
- Emergency exits:  
1st emergency exit is the right-hand side window of the driver's cab.  
The emergency hammer is clipped to the A pillar on the right, inside the driver's cab.  
2nd emergency exit is the tilting roof.  
Pull the red emergency cord and push the tilting roof up at the side.



# SAFETY INSTRUCTIONS

## TERRAIN

- Never attempt right-angle crossover across a public road without first obtaining the permission of the appropriate authority.  
Angled or staggered crossover across public roads is permissible when in accordance with an approved routing plan.
- Before using the snow groomer, check that the intended terrain is drivable.

## Risk of break-through



- Driving on frozen rivers and lakes is very dangerous. Consequently, you are urgently advised not to do so.

## Snowdrifts



## Avalanches Rockfalls



- When using snow groomers at night-time, handheld searchlights must also be used.
- The driver must wear the seat belt at all times.



## DRIVING WITH PASSENGERS

- Do not drive the vehicle with people:
  - inside the driver's cab
  - on the load platform
  - on the auxiliary equipment
  - on an attachment.

## MAINTENANCE

- Snow groomers must be maintained by trained staff specifically appointed by the operator.
- Do not perform maintenance work under moveable parts in their open or raised positions unless they have been secured to prevent them from slamming closed or dropping.

- Snow groomers and raised equipment must be secured before maintenance work is started to prevent them from accidentally moving.
- Markings, warning signs and information plates on the PistenBully and auxiliary equipment must not be removed or covered over or made illegible in any other way.
- Compliance with the manufacturer's maintenance instructions is mandatory.
- Faults which could affect safety levels must be rectified immediately.
- Repair welding is an operation that invariably requires extensive safety measures. Please consult your nearest Service Support Centre.

## MONITORING

- Before starting off, the driver must check operation of the safety-relevant components, e.g.:
  - by testing the brakes.
  - switching on the lights,
  - function-testing the warning systems.
  - by checking the controls of the working machinery.
- If radios are required to ensure safe operation of the snow groomer, before starting off checks must be performed to ensure that the radio is functioning correctly and that there is a radio connection.
- The driver must immediately report defects to the supervisor and, on vehicle handover, to the replacement driver.
- In the event of damage, defects or changes that endanger operational



## SAFETY INSTRUCTIONS

safety, the driver must immediately cease operation of the vehicle.

- The supervisor must be notified immediately in the event of accidents involving injury to persons or damage to property or to the vehicle.
- The supervisor must perform random checks in order to ensure that the snow groomer is operated in a safe manner.

### INSPECTION

- The operator must ensure that the snow groomers are inspected whenever necessary, at least once a year and after maintenance work. This inspection must ensure that the snow groomers are safe and must be performed by a skilled specialist.

- Skilled specialists are people who have an extensive knowledge about vehicle technology as a result of their specialist training and experience. They are also sufficiently familiar with the appropriate national safety at work legislation, accident prevention guidelines, directives and generally accepted rules of engineering practice (e.g. DIN publications, VDE regulations or national equivalents) to ensure that they can judge whether snow groomers are in a condition suitable for operation.
- The results of the inspection must be recorded in writing and filed.

### FIRST-AID BOX

The first-aid kit is secured to the driver's seat.

- Always make sure that the first-aid kit is complete.

### FIRE EXTINGUISHER

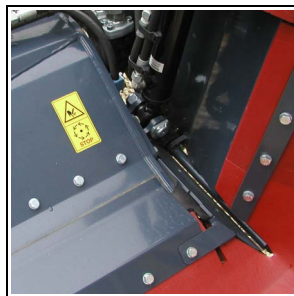
The first-aid box is stowed behind the driver's seat

- Note expiration date.  
Replace used fire extinguishers immediately.



## WARNING SIGNS

- Strict compliance with the warning signs on the PistenBully and on auxiliary driven implements is mandatory.
- Make sure that warning signs that are damaged or come loose are replaced immediately.



Warning sign, tiller



### Warning sign, 4x

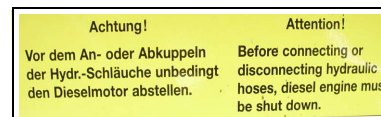
No. 8.762.660.000 E

Text:

**Risk of injury by cutting or crushing action. Wait until all parts have come to a complete standstill before touching.**



Warning signs, tiller



### Warning sign

No.: 8.762.271.053c

Text:

**Attention:**  
**Before connecting or disconnecting the hydraulic hoses, it is essential to shut down the diesel engine.**

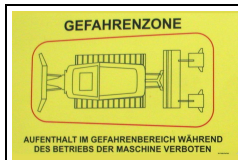




# SAFETY INSTRUCTIONS



Warning sign,  
load platform



## Warning sign, 2x

Location: Behind the driver's cab

No.

Text:

## Warning Danger zone

**It is not permissible to enter the danger zone while the machine is in operation.**



Sign

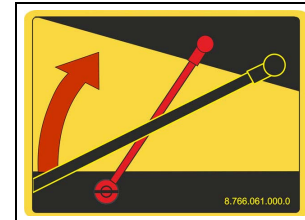
## Sign

Location: Behind the driver's cab

No.

Text:

**Radiated sound power level 105 dB**



Warning sign

## Warning sign

Location: Frame

No. 8.766.061.000.0

Text:

**Risk of injury by crushing:  
Always engage and lock the support to prevent downward movement of the load platform.**

## Sign

Location: Behind the driver's cab

No.

Text:

**Diesel fuel**





## Sign

Location: Driver's cab

No. 8.762.642.000E

Text:

**Read operating manual and safety instructions before startup and comply with both at all times.**



## Attention sign, emergency hammer

Location: Inside driver's cab

No.

Text:

**Emergency hammer for emergency exit!**

**Smash the side window on the co-driver's side with the hammer and knock the splinters of glass out of the frame.**



## Information sign, emergency exit

Location: **Inside driver's cab, at glass roof**

No.: 8.766.033.000 E

Text:

**Emergency release for emergency exit! Pull the red emergency cord (emergency release) and push the tilting roof up at the side.**





## NOTES

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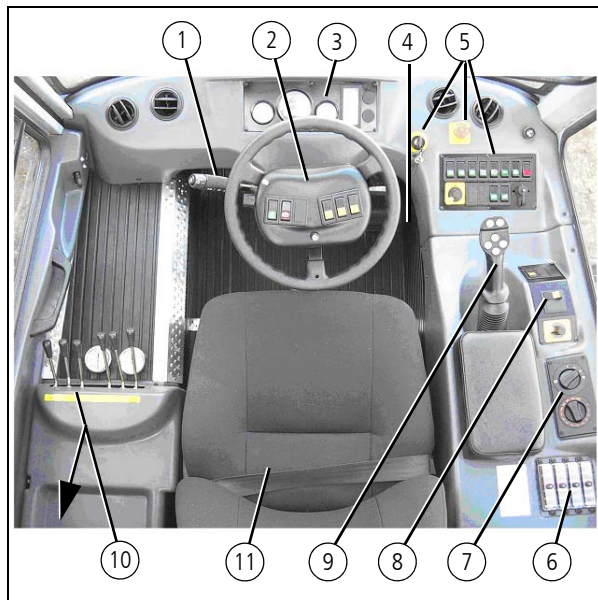
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# COCKPIT



Overview, cockpit

① **Multifunction switch**  
see Page 31

② **Steering wheel**  
see Page 32

③ **Instrument cluster**  
see Page 35

④ **Accelerator pedal**

⑤ **Control**  
see Page 38

⑥ **Fuses**  
see Page 42

⑦ **Heating**  
see Page 44

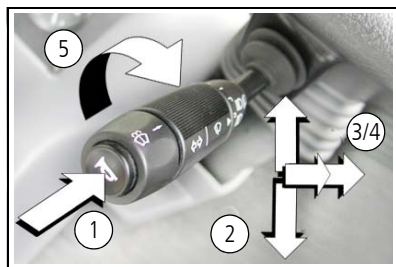
⑧ **Control, tiller**  
see Page 44

⑨ **Joystick**  
see Page 46

⑩ **Rear control / rear bulkhead**  
see Page 49

⑪ **Seat**  
see Page 51





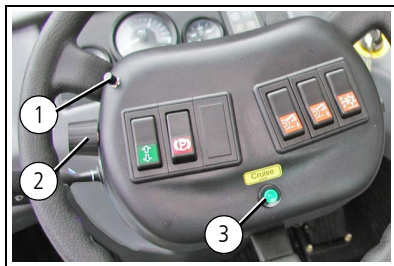
*Multifunction switch*

- ① **Horn**  
Press button
- ② **Flashing indicators for direction of travel**  
**Left or right without automatic cancellation.**  
Move control stalk past stop until it locks in position.
- ③ **Headlight flasher**  
**Push stalk to the right.**
- ④ **High beams and low beams**  
High beams = Push stalk to left until it locks in position.  
Low beams = Push stalk to the right until it locks in position.

- ⑤ **Wipers**  
Turn control stalk sleeve:  
Stage II = Fast  
wipe I = Normal  
speed 0 = Off  
INT = Intermittent wipe



# COCKPIT



*Steering wheel*

## ① Single wipe front wipers

## ② Potentiometer, driving speed

The speed at which the vehicle travels depends on engine rpm, on the setting of the potentiometer, and on drag. You bring the engine to the correct rpm by depressing or easing up the accelerator pedal, and set the maximum speed by turning the potentiometer.

- Turn clockwise
  - Reduce driving speed.
- Turn counter-clockwise
  - Increase driving speed.

## ③ Cruise control

Cruise control keeps the machine at a constant driving speed. It makes the groomer all the easier to operate over long stretches.

- Engage cruise control only on long, easily negotiable stretches offering an unobstructed view of the terrain.



## WARNING!

**Driving with cruise control engaged!  
Easing the accelerator will no longer  
produce a reduction in driving speed!**

## Engaging cruise control

- ☐ Engine speed is above 1600 rpm.
- ☐ Potentiometer for driving speed is set to maximum.
- ☐ You have used the accelerator pedal to bring the vehicle to the desired driving speed.
- Press the Cruise Control button and hold it down for at least 2 seconds.
  - The current speed is saved as the speed setting.
  - Easing the accelerator no longer produces a reduction in driving speed.





## Disengaging cruise control (3 possibilities)

- Press the Cruise Control button.
- Direction of travel switch in neutral position.
- Press the accelerator to increase driving speed.

## Switches on steering wheel



### Direction-of-travel pushbutton

- ☐ Engine running
- Bring the vehicle to a complete stop before reversing the direction of travel.
- Press top section
  - Direction of travel forward
- Neutral position = centred
- Press bottom section
  - Direction of travel reverse
  - Reversing alarm sounds



### Parking brake

- ☐ Engine running
- Press the pushbutton
  - Parking brake applied
  - Indicator light comes on
- Press again
  - Parking brake released
  - Indicator light goes out
- Do not apply the parking brake until the PistenBully has come to a complete stop.



### CAUTION!

Risk of injury!

The parking brake is applied automatically if a door is opened while the vehicle is on the move. The PistenBully brakes sharply to a complete stop!

Do not open the doors unless the PistenBully is at a standstill.



# COCKPIT



## 1st button Tracker plate left 2nd button Tracker plate right

- Press the pushbutton
  - Lift tracker plate
- Press again
  - Lower tracker plate
  - The tracker plates are automatically adjusted to the preset press-down or floating position.



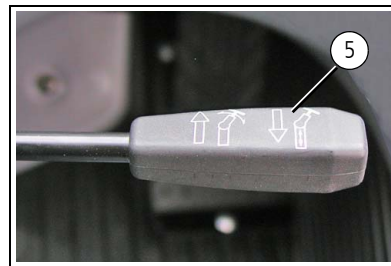
Risk of damaging tracker plates!

Do not attempt to turn the PistenBully unless the tracker plates are raised.



## Lifting / lowering rear equipment carrier

- Press top section of pushbutton
  - Lift the equipment carrier
- Press bottom section of pushbutton
  - Lower the equipment carrier



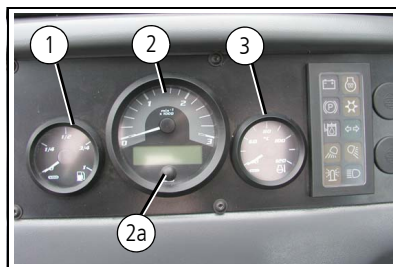
*Steering-wheel adjustment*

## ⑤ Steering-wheel adjustment

- Pull lever up
  - Steering wheel can be pivoted
- Push lever forward
  - Steering wheel height adjustment

**i** Pivoting the steering wheel forward as far as it will go makes it easier to exit the driver's cab.





Instrument cluster

## 1 Fuel supply

## 2 Engine rev. counter

## 2a Pushbutton with digital readout

- Press the pushbutton
  - Press repeatedly to read out:  
Hydraulic temperature / turbocharger pressure / fuel consumption / electrical voltage / fault codes / operating hours



## Fault code display

- Symbol flash

## Fault code readout

- Press the button and hold it down for 3 seconds
- Select ERROR.
  - Press the button and hold it down for 2 seconds.
  - Code appears in the display.
- Stepping through the fault codes: Briefly press the button.
- Back to start: Press the button and hold it down for 2 seconds.

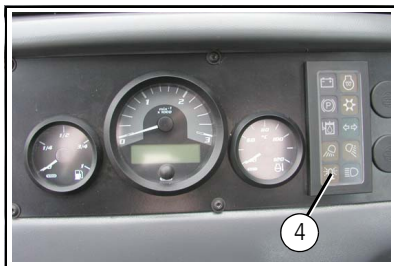
## Clearing a fault message from the display

- ☐ Display shows ERROR
- ☐ Engine OFF
- Press and hold down the button
- Switch on the ignition
  - Horn sounds
  - Instrument pointers swing to their full-scale readings
  - Horn stops sounding
  - Display shows PB Paana
- Release the button.
  - Fault codes have been deleted.

## 3 Coolant temperature



# COCKPIT



Indicator lights and warning symbols

## 4 Indicator light and warning symbol lights up



The acoustic warning (buzzer) sounds to indicate that an operating parameter has reached its minimum or maximum permissible value: Stop the vehicle – Apply the parking brake – Ascertain the cause. Do not drive the vehicle.



### Battery charge indicator, battery not charging

- If the indicator light comes on during operation:
  - Cease operation
  - Have the cause identified in the workshop
- i The indicator light comes on when the engine is idling.  
Increase engine revs: the indicator light goes out and battery charging commences.



### Warning light / indicator light, parking brake

- If the parking brake is **not** applied and the warning light comes on, release pressure has dropped.
  - Cease operation and ascertain the cause of the problem.
- Indicator light comes on when parking brake is applied.



### Hydraulic fluid level warning light

- Hydraulic fluid is below the minimum level



### Front worklights

- Switched on





## Rotary beacon

- Switched on



## Intake air preheating ON

- Lights up with ignition ON.  
When the light goes out: Start the engine.



## Tiller drive ON

- Tiller rotating



Indicator light flashes  
Tiller potentiometer above setting 0. The tiller  
does not rotate.



## Flashing indicator for direction of travel

- Left / right turn indicators switched on



## Rear worklights

- Switched on

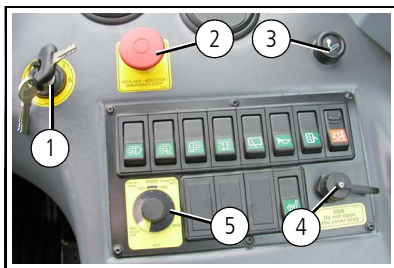


## High-beam headlights

- Switched on



# COCKPIT



Control, right

## ① Ignition lock

- **0 Inserting and removing ignition key.**
  - Switch off the engine.
- **I Ready for operation / Driving**
- **II Starting**
  - ☐ Potentiometer for tiller speed is set to 0
  - ☐ Doors closed
  - ☐ Direction-of-travel switch in the neutral position

## ② STOP button

The PistenBully does not have a separate service brake for stopping, it has only a parking brake. The PistenBully does not stop abruptly when you lift your foot off the accelerator pedal or set the direction-of-travel switch to the neutral position.



If you hit the STOP button, the PistenBully brakes sharply to a complete stop.

- Hit the STOP button in the event of sudden danger.
  - The PistenBully comes to an immediate stop and will not answer to the steering.
- Immediately apply the parking brake.

## Restart

- Turn the STOP button and pull it up.
  - The PistenBully is again ready for operation.

## ③ Cigarette lighter, 24 V supply

## ④ USB interface

The USB interface is required for software checks and for changing the electronics settings.



Only trained workshop personnel are permitted to undertake work of this nature (see workshop information).

- Always screw the cap back into position after disconnecting the USB cable.

## ⑤ Potentiometer for engine rpm, diesel engine

## The potentiometer has 2 functions:

### 1. Increasing engine idle speed

- Increase engine idle speed for cold starting  
Set to 800 rpm when engine reaches operating temperature.
- Press the accelerator to increase diesel engine rpm.

### 2. At 1300 rpm and higher (Mode range) setting engine rpm

- Turn the potentiometer clockwise at engine speed above 1300 rpm.
  - Pressing the accelerator pedal no longer produces an increase in engine rpm.

- i** The Mode range enables the vehicle to travel at very low speed and high tiller speed in extremely difficult terrain.



# COCKPIT

## Switches



### Driving light

- Press top section
  - Driving light off
- Neutral position
  - Parking lights ON
- Press bottom section
  - Low-beam headlights ON



### Front worklights

- Press top section
  - Worklights off
- Press bottom section
  - Worklights ON



### Rear worklights

- Press top section
  - Worklights off
- Press bottom section
  - Worklights ON



### Rotating beacon

- Always switch on the rotating beacon when the PistenBully is in operation.
- Press top section
  - Rotating beacon off
- Press bottom section
  - Rotating beacon ON



### Wipers, rear window

- Press top section
  - Wipers off
- Press bottom section
  - Wipers ON



### Acoustic warning

- Switch on the acoustic warning when the PistenBully is in operation in poor-visibility conditions or when visibility is obstructed and when persons are in the vicinity of the danger zone.
- Press top section
  - Acoustic warning off for forward direction of travel
- Press bottom section
  - Acoustic warning ON for forward direction of travel







## Outside-mirror heater

- Press top section
  - Heating off
- Press bottom section
  - Heating ON



## Deactivating automatic lifting

- Press top section (latch engaged)
  - The rear-mounted equipment is lifted for reversing. The tiller drive switches off.
- Release the latch and push bottom section.
  - The rear-mounted equipment is not lifted for reversing.
  - The tiller drive does not switch off.

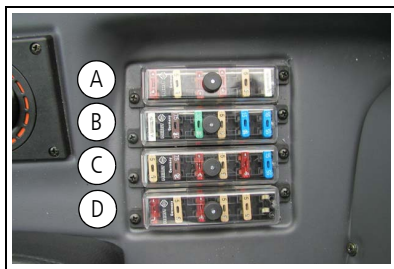


## Heating, driver's seat

- Press top section
  - Heating off
- Press bottom section
  - Heating ON



# COCKPIT



Fuses

## Fuses

Fuses are designed to provide protection against excessively high currents in the electrical system.



### WARNING!



**Risk of cable fire and short-circuit – Never attempt to jumper or repair fuses or insert replacement fuses with a higher ampere rating than the originals.**

## Fuses

- A 11** (10 A) Cigarette lighter  
**12** ( 5 A) Interior lights, door contact switch, control of timer relay of the master switch

- 13** (10 A) Worklights, front  
**14** (10 A) Worklights, rear  
**15** ( 5 A) Parking light  
**16** (25 A) Screen heating, front

- B 21** (25 A) Screen heating, rear/sides  
**22** (7,5 A) Radio, instruments, RTC timer relay  
**23** (30 A) Power supply, engine  
**24** ( 5 A) Control  
**25** (15 A) Master control MC-2  
**26** (15 A) Control XS-2

- C 31** ( 5 A) Indicator lights, instrument panel  
**32** (7.5 A) Rotating beacon system, radio  
**33** (10 A) Switch for wiper functions  
**34** ( 5 A) Control of worklights  
**35** (10 A) Heating  
**36** (15 A) Wipers, front, horn, alarm for driving forward

- D 41** (10 A) Seat heating, seat compressor, mirror heating  
**42** ( 5 A) Turn indicators  
**43** (10 A) Headlights  
**44** ( 5 A) Functions of front pusher blade  
**45** ( 5 A) Control, screen heating, front  
**46** Reserve





## Relay assignment (K)

- 1 Ignition lock
- 2 Worklights, front
- 3 Worklights, rear
- 6 MC2 / XS2 controller
- 7 Start disable
- 8 Parking brake
- 10 Flasher
- 12 High-beam / low-beam headlights
- 13 Lights
- 16 Intermittent wipe/wash
- 19 Screen heating, rear
- 20 Screen heating, side

**30 - 38** Joystick



# COCKPIT



Heating

## ① 3-stage blower controller

- Turn controller clockwise
  - Blower speed increases

## ② Temperature controller, heating for driver's cab

- Turn controller clockwise
  - Temperature increases



Control, tiller

## ③ Potentiometer, tiller speed

Turn the potentiometer to adjust tiller speed. Tiller speed is increased / reduced to suit the snow conditions.

- ☐ Equipment carrier set to "lower"
- ☐ Tiller set to "lower"
- ☐ Engine speed above 1000 rpm
- Turn potentiometer clockwise
  - Tiller speed increases
  - Indicator light for tiller comes on





## Equipment carrier centred / floating position

- Press top section
  - Equipment carrier centred
- Press bottom section
  - Equipment carrier horizontal in floating position

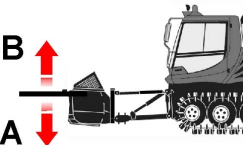
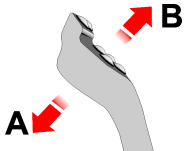
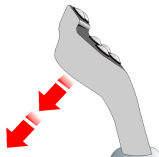
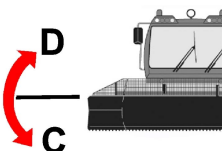
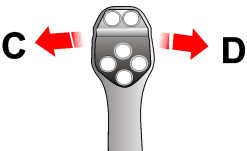
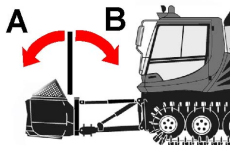
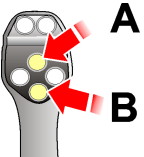


## Tiller, press down / floating position

- Press top section
  - Lower tiller
  - Knob for adjusting tiller *see Page 50*
- Press bottom section
  - Tiller set to floating position



# USING THE JOYSTICK

Front blade	Joystick	Pushbutton	Position
<b>Raise - lower</b> 			<b>Floating position</b> 
<b>Tilt</b> 			
<b>Dip</b> 			



# USING THE JOYSTICK

Overview

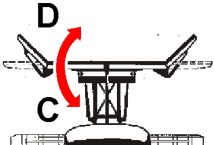
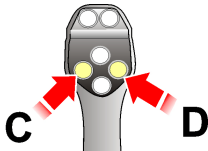
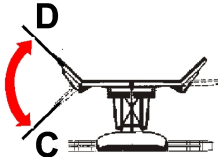
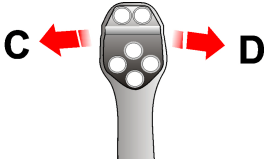

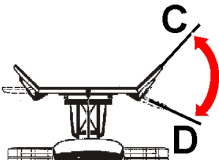
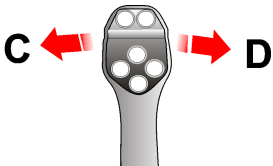
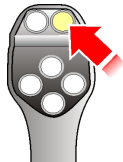
Technical data

Safety

Use

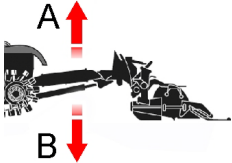

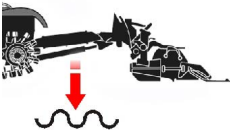

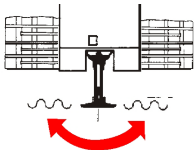

Checks

Operation

Front blade	Joystick	Pushbutton	Position
<b>Swivel</b> 			<b>C - Swivel left</b> <b>D - Swivel right</b>
<b>Wing, left</b> 			<b>D - Move wing in</b> <b>C - Move wing out</b>
<b>Wing, right</b> 			<b>C - Move wing in</b> <b>D - Move wing out</b>



# USING REAR-MOUNTED AUXILIARY DRIVEN MACHINERY

Rear equipment carrier	Joystick	Pushbutton	Position
<b>Raise - lower</b> 			<b>A - Top section pressed = Raise</b> <b>Neutral position: Locked</b> <b>B - Bottom section pressed = Lower</b>
<b>Floating position</b> 			<b>Tiller, press down / floating position</b> <ul style="list-style-type: none"> <li>➤ Press top section <ul style="list-style-type: none"> <li>○ Press down tiller</li> </ul> </li> <li>➤ Press bottom section <ul style="list-style-type: none"> <li>○ Tiller set to float position</li> </ul> </li> </ul>
<b>Floating position</b> 			<b>Rear equipment carrier / horizontal</b> <p>Top section pressed = Centred</p> <p>Neutral position = Tiller locked</p> <p>Bottom section pressed = Floating position</p>





# USING REAR-MOUNTED AUXILIARY DRIVEN MACHINERY



*Tiller / Nordic-trail tracking plates*



## **Tiller, pivoting to side**

- ☐ Equipment carrier is centred
- Push lever
  - Pivot tiller to right
- Pull lever
  - Pivot tiller to left



## **Tiller, adjusting depth**

- Push lever
  - Increase tilling depth
- Pull lever
  - Reduce tilling depth



## **Nordic-trail tiller, adjusting depth**

- Push lever
  - Increase tilling depth
- Pull lever
  - Reduce tilling depth



## **Side finisher, left/right** *(optional extra)*

- Push lever
  - Lower side finisher
- Pull lever
  - Raise side finisher



## **Track-width adjustment**

- Push lever
  - Reduce track width
- Pull lever
  - Increase track width



## **Nordic-trail tracker plates**

- Push lever
  - Reduce spacing of Nordic-trail tracker plates
- Pull lever
  - Increase spacing of Nordic-trail tracking plates

Overview

Technical data

Safety

Use

Checks

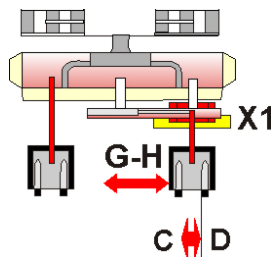
Operation





# USING REAR-MOUNTED AUXILIARY DRIVEN MACHINERY

## Nordic-trail tracker



plates

## C - D

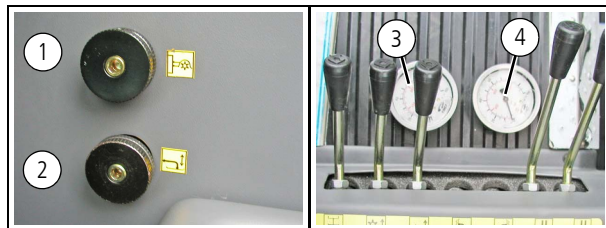


## G - H



## Nordic-trail tracking tiller X1

- ☐ Tiller is lowered
- ☐ Potentiometer for tiller speed is set.
- Briefly set switch for tracker plates to "lower".
  - The tracker plates are lowered.
- i** The Nordic-trail tracking tiller switches **ON** at approx. 30% of lowering movement.



Rear bulkhead / knob

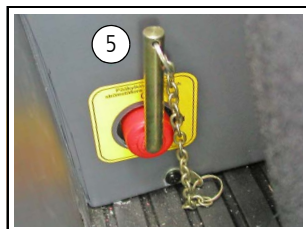
Gauge

### ① Knob for tiller press-down

- ☐ Tiller is lowered
- ☐ Potentiometer for tiller speed is set.
- Turn knob **1** to press the tiller down.
  - Pressure is shown by gauge **4**.

### ② Knob for tracker-plate press-down

- ☐ Tiller and Nordic-trail tracking plates are lowered.
- Turn knob **2** to press the Nordic-trail tracker plates down.
  - Pressure is shown by gauge **3**.

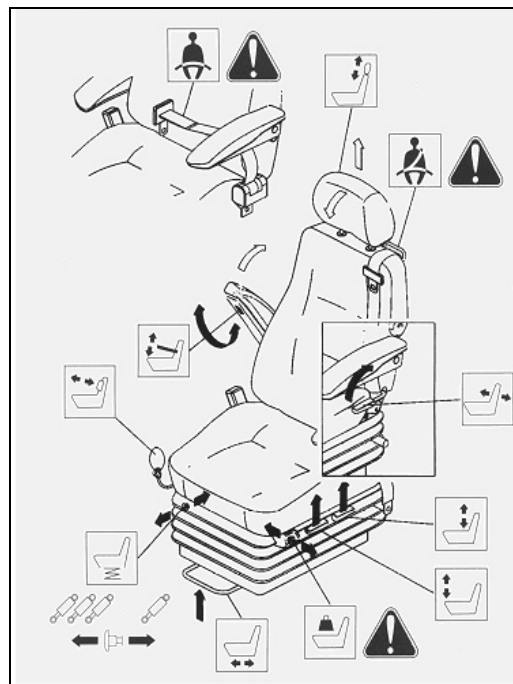


Battery master switch

## 5 Power supply via battery master switch

### Switching on power supply

- Turn battery master switch **5** all the way clockwise.
  - The power supply to all electrical consumers is ON.



Driver's seat / seat adjustment





## NOTE

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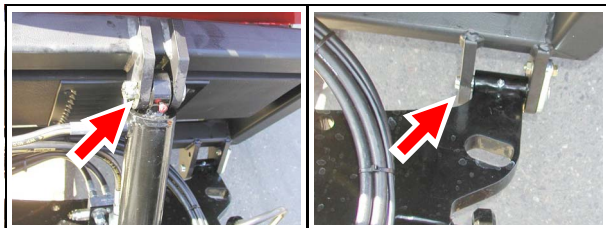
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## INSTALLING AUXILIARY DRIVEN IMPLEMENTS



*Hydraulic cylinder*

*Attaching front blade*

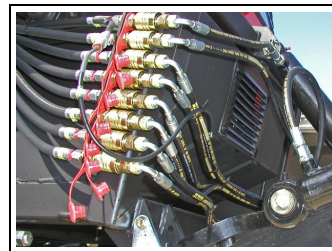
- i** Front blade and tiller are standard equipment for this vehicle.
- Clear all ice and snow off the attachments of the auxiliary equipment.



### WARNING!

**Do not permit anyone to enter the zone between the vehicle and the auxiliary driven implement while the engine is running.**

- Lower the carrier plate or blade frame.
- Drive the PistenBully up to the equipment.
- Apply the parking brake.



*Hydraulic coupling*

- Switch off the engine.
- Install the securing stud or studs and insert all split pins.
- Install hydraulic cylinder for front blade
- Connect hydraulics

The plug-in **high-pressure couplings** are for connecting and disconnecting hydraulic hoses.

Check valves that enable or disable flow, as applicable, are actuated automatically in the coupling process.

- Actuate the appropriate functions to depressurise the hydraulic lines. The ignition for the diesel engine must be switched ON.



## AUXILIARY DRIVEN IMPLEMENTS



When making the connections, always make sure that both parts of the couplings are perfectly clean.

- Connect the leak-off oil hose first.
- Connect the hydraulic hoses.
- Make sure that the codes match and that the hydraulic couplings are correctly seated.
- Function-test the auxiliary driven implement.



### WARNING!

**Make sure there is no-one in the danger zone.**

- Check the driven implement for fluid leaks and, if necessary, have the equipment repaired by trained, qualified persons.

## REMOVING THE AUXILIARY DRIVEN IMPLEMENT

- Lower the driven machinery onto firm, smooth ground.
- Removal is the reverse of the installation procedure.
- Disconnect the leak-off oil line last.



Protect the driven implement from the sun if it is to be out of use for a prolonged period of time.



## Tilting the load platform

- ☐ Remove all loose items from the load platform.
- ☐ Vehicle parked on a firm, horizontal and level surface.
- ☐ Front-mounted and rear-mounted auxiliary equipment lowered.
- ☐ Diesel engine switched off



### WARNING!

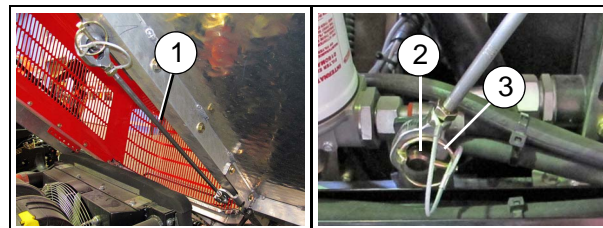
**Make sure there is no-one in the danger zone.**



### CAUTION!



**Danger of slipping on the track when raising the load platform.**



*Support*

- Fully raise the load platform.



### WARNING!



**Risk of injury by crushing:  
Possibility of load platform moving downward from tilted position! Secure the support to ensure that the platform cannot move downward of its own accord.**

- Release support **1** and swing it down.
- Engage it on pin **2** and install retaining ring **3** to secure.



# LOAD PLATFORM

## Lowering the load platform

- Disengage the support and swing it up.
- Engage the support and secure it with the retaining ring.
- Slowly lower the load platform to its fully lowered position.



### CAUTION!



**Risk of injury by crushing as load platform is lowered.**

**Keep well clear of all danger zones as the load platform is being lowered**

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## LIGHTS



Do not touch the glass of halogen bulbs.

- 1 **Front searchlight**
- 2 **High-beam headlight / parking light H4**
- 3 **Low-beam headlight H7**
- 4 **Worklights, front H3**
- 5 **Worklights, rear H3**
- 7 **Rotating beacon**
- 8 **Rear light R10 W**
- 9 **Turn indicators**

### Handheld searchlight

- The handheld is clipped to the A pillar on the right, inside the driver's cab.



*Lights*



*Handheld searchlight*



# ELECTRICS

## VEHICLE BATTERY

The **two 12 V, 64 Ah** batteries are mounted on the upper frame.

- Secure the battery in place with the retainer.



### WARNING!



#### Risk of explosion of oxyhydrogen gas:

Keep all sources of ignition well away from the battery.

Do not place metal objects on the battery.

## Topping up battery fluid



### WARNING!

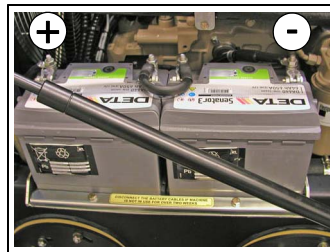


#### Risk of caustic burns by contact with battery acid!

Wear protective goggles and protective gloves.



- Remove the screw caps.
- Top up the fluid in the cells to the max. mark with distilled water.



*Charging the battery*

## Charging the battery



### WARNING!



#### Risk of inhaling toxic gas!

Make sure the room in which the battery is charged is well ventilated.



#### Risk of electric shock when making connections!

Make sure that polarity is not reversed.

Do not bring the battery clamps into contact with each other.

Do not connect the cable terminals to the connections between the two batteries.

- Use a charger suitable for 24 V systems.

## Jump starting



### WARNING!



A mistake in the jump-starting procedure could result in fatality or severe burns due to electric shock.



Do not make a connection between the cable terminals.

Do not connect the jump-start leads to the connections between the two batteries.



### Risk of damaging electronics:

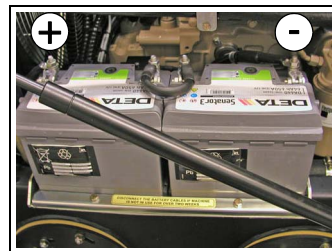
Do not attempt to start the engine using power boosters or power packs to boost the battery or as a substitute for the battery.



### Voltage spikes during the disconnection of the external current cable!

Danger of damage to the electronic components!  
Before the disconnection of the jumper cable on the vehicle, switch on large consumers (e.g. windscreen heater, seat heater).

Paana.10017.en



*Charging the battery*

## Connecting jump leads

1. From **+** pole terminal to **+** pole of donor battery (24 V).
2. From **-** pole terminal to **-** pole of donor battery (24 V).

- Connect the battery master switch to the on-board electrical system.



# ELECTRICS



Battery master switch

## BATTERY MASTER SWITCH

**Disconnect the on-board electrical system from the battery:**

- ☐ if the electronics are defective.
- ☐ to help prevent the battery from discharging during a prolonged storage.

### Disconnecting battery from on-board electrics

- Turn the battery master switch counter-clockwise.

The battery is now isolated from the vehicle's on-board electrics *see graphic*

### Connecting battery to on-board electrics

- Turn the battery master switch clockwise.
- Wait 30 seconds.
- Switch on the ignition.



### Voltage peaks:

While the engine is running, do not switch off the battery master switch except in an emergency.



### Data loss by engine electronics.

**Only 75% of rated engine power will be available when the engine is restarted.**

Before disconnecting the battery from the vehicle's on-board electrics:

- Switch off the ignition.
- Wait 30 seconds.
- Then operate the battery master switch.

### Situational help

If you make a mistake in the procedure: Switch off the ignition in the correct way and restart the engine. The engine will operate at full power.



## INSTRUCTIONS FOR CHECKS AND MAINTENANCE



### WARNING!



**Risk of injury by cutting or crushing action.**  
When the engine is running, keep at a safe distance from rotating parts.



- Always perform the specified checks before starting off.
- Perform all checks with the engine off and the vehicle parked on a horizontal surface.
- Make sure that the oil and coolant levels are always to specification (check at oil dipstick, overflow plug, etc.).
- **New vehicles**  
Check security of wheels after the first **5 operating hours**.



### WARNING!



Do not permit fluids or lubricants to come into contact with the skin (wear protective gloves, change wet clothing). Do not inhale or swallow fluids or lubricants (risk of poisoning).



### WARNING!



**Risk of explosion due to build-up of gas in fuel tank.**  
**Keep all possible sources of ignition when clear when the vehicle is being refuelled.**

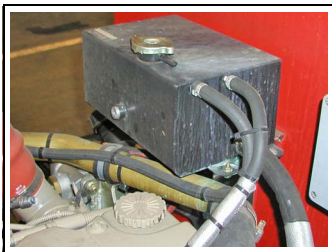


Do not spill fluids or lubricants (they are hazardous to soil and water). Always dispose of these substances in an environmentally compatible manner (comply with local laws).



# DAILY CHECKS

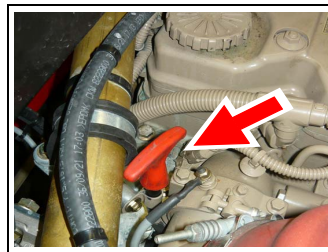
## CHECKING COOLANT LEVEL



*Reservoir for coolant*

- Check the coolant level and top up only when the engine is cold.
- Check the antifreeze of the coolant, (see the section on fluids and lubricants).
- Check that the hoses in the cooling and heating systems are tight and not leaking.

## CHECKING ENGINE OIL LEVEL



*Oil level*

- Tilting the load platform
- Use the dipstick to check the engine oil level.
- Top up the oil with the engine stopped and the PistenBully standing on level, horizontal ground. The oil level must be between the min. and max. marks on the oil dipstick.

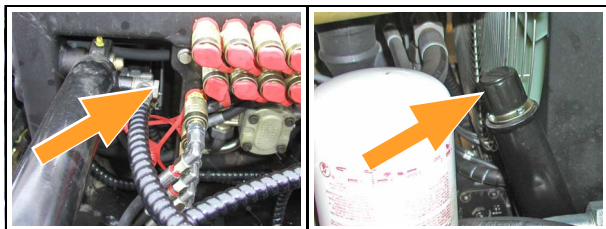


Use only approved engine oil (see fluids and lubricants specifications).



# DAILY CHECKS

## CHECKING HYDRAULIC FLUID LEVEL



*Fluid level, checking*

*Hydraulic-fluid filler neck*

- Check the hydraulic-fluid level and top up only when warm.
- The fluid level must be between the min. and max. marks.



Use only approved hydraulic fluid (see fluids and lubricants specification).

## CHECKING ELECTRICAL SYSTEM

- Check the lights and flashing indicators and the rotating beacon system; repair or replace components as necessary.
- Replace defective bulbs and fuses.
- Check the wipers, horn and back-up alarm.



Never operate the PistenBully if the warning lights and rotating beacon system are not fully functional.

Overview

Technical data

Safety

Use

Checks

Operation



## DAILY CHECKS

### VISUAL INSPECTION

- Visually inspect the tracks and sprockets, check for tire damage.
- Visually inspect the fasteners of the auxiliary driven implements (locking pins, bolts, nuts).
- Visually inspect the hydraulic system (drive hydraulics and hydraulics for auxiliary driven implement), hydraulic lines, connectors, hoses, hydraulic cylinders for leaks and chafing.



Do not operate the vehicle if the parking brake is defective.



The indicator light must be OFF when the parking brake is released.

### CHECKING PARKING BRAKE



#### WARNING!

**Make sure there is no-one in the danger zone.**

- Start the engine
- Applying parking brake
  - Indicator light for parking brake comes on.
- Set the direction-of-travel switch or the propulsion lever to "Forward" and briefly accelerate the engine to approx. 2000 rpm. **The PistenBully must remain motionless.**





## WEEKLY CHECKS

- Perform all the daily checks.
- Check the drive belts on the engine; make sure that belt tension is correct and that the belts are free of damage (see the manual supplied by the engine manufacturer).

## TRACK TENSION

### Checking track tension

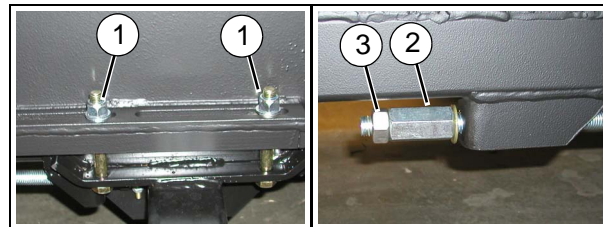
- Vehicle parked on horizontal, snow-covered ground.
- No load on vehicle and auxiliary driven implements lowered.

Equalise track tension by driving backwards and forwards.

**Track tension is correct** when the upper section of the track can be lifted **approx. 40 – 50 mm** midway along its run.

- Check the condition of the track cleats, track lacings, tire guides and backing plates, replace damaged components.

### Tensioning track



*Track tension*



It is important to ensure that both tracks are tensioned uniformly.

- Slacken hex nuts **1** on front axle at frame on left and right.
  - The tensioning axle can be moved forward or back.
- Turn tensioning nut **2** clockwise until the track is correctly tensioned.
- Tighten hex nuts and tighten locknut **2** to secure the tensioning nut.
- Check operation and test all instruments and indicators.
- Check running gear and engine / transmission unit for abnormal noises.



## WEEKLY CHECKS

### CHECKING WHEELS

- Check the wheel fasteners and check tyre pressures.

### Tightening torques

TYPE	TENSIONING AXLE	DRIVE AXLE
PistenBully Paana	140 Nm	140 Nm



In the case of a **new vehicle** and always after each tyre change, check the security of the wheel fasteners after the first **5 operating hours**.

### TEST DRIVE

- Visually inspect for smoke at the exhaust.
- Check the air filter element if the exhaust is smoky.



## ENTERING

- Before entering the cab, complete the daily checks and maintenance tasks.
- Walk right round the vehicle and make sure that the danger zone is clear of persons and objects.
- Always take a firm grip on the grab handle of the driver's door when entering the vehicle.
- Step onto the track.



### CAUTION!



**Risk of slipping on the track when climbing into and out of driver's cab. Always take a firm grip on the handle in order to step onto the track.**

**In order to help ensure safe operation of the PistenBully, operators must wear appropriate footwear with non-slip soles.**

- Press the door lock. The driver's door opens.  
Note: When parking on a slope, be particularly careful when opening the door. The door opens suddenly.
- Always take a firm grip on the grab handle of the driver's door.

- Take a grip on the steering wheel and swing yourself into the driver's seat.
- Close the door.
- Adjust the seat and the steering wheel to an ergonomically comfortable position.
- Buckle the safety belt.
- Visual check:  
Direction-of-travel switch in "Neutral" position, parking brake applied.



# ENTERING – DRIVING – EXITING

## STARTING THE DIESEL ENGINE



### WARNING!



The use of proprietary starting agents (such as Startpilot, for example) is prohibited on account of the risk of explosion.



### WARNING!



Risk of poisoning from exhaust gases.  
Do not leave the engine running unattended or running in an enclosed space.

### Start procedure

- ☐ Doors closed
- ☐ Potentiometer for tiller speed set to 0
- ☐ Direction-of-travel switch centred, i.e. in the neutral position
- ☐ Power supply activated by means of the battery master switch.
  - Switch on the ignition
    - Indicator lights show, except the light for the tiller.

- Turn the ignition key to the position at which the indicator light for intake-air preheating shows.
- i Depending on the ambient temperature, the intake-air preheating light goes out after approx. 2 seconds (no preheating) or within 30 seconds (maximum preheating time).
- When the indicator light for intake-air preheating goes out.
- Start the diesel engine.
- Depress the accelerator to the midway position
  - Operate the starter until the engine is turning at 700 rpm
  - Maximum duration of start attempt 30 seconds

### Situational help Engine refuses to start

- Immediately repeat the start attempt (do not repeat the preheating procedure). Duration of start attempt, max. 30 seconds

### If it is necessary to repeat the reheating procedure

- Ignition OFF
- Wait 5 - 10 seconds
- Ignition ON



## Situational help

The warning light for air-intake preheating may stay lit for up to approx. 3 minutes after the engine starts.



Risk of damaging electronics:

If the warning light for air-intake preheating lights up during operation:

- Cease operation
- Proceed with caution to the nearest workshop
- Disconnect the battery from the on-board electrics.

## WARMING-UP PHASE

### Air temperature above 0° C to –20° C



- Allow the diesel engine to idle for approximately 3 mins.
- Drive with the engine operating in the partial-load range.
- The engine can be operated at full load as of a coolant temperature of + 80° C.

### Air temperature below –20° C



- Allow the diesel engine to idle for approximately 6 minutes.
- Drive with the engine operating in the partial-load range.
- The engine can be operated at full load as of a coolant temperature of + 80° C.



# ENTERING – DRIVING – EXITING

## INSTRUCTIONS FOR RUNNING IN THE ENGINE

### Up to 40 operating hours

- Operate carefully up to max. 3/4 full-load speed

### After 40 operating hours

- Gradually work up to full load

## DRIVING



### WARNING!

**Before driving, always check that there is no-one in the danger zone, in other words in the immediate vicinity of the vehicle or at or on the tracks.**

- Press the direction-of-travel switch to the position corresponding to the direction in which you want to travel. An audible signal (back-up alarm) sounds if you set the direction switch to the position to reverse.



Even though the vehicle is fitted with a back-up alarm, you remain under the obligation to check carefully the area behind the vehicle when reversing.



If the engine comes to a stop for whatever reason, immediately apply the parking brake.

- Release parking brake.
- Depress the accelerator pedal to increase engine rpm to above drive away speed: The PistenBully drives away.
  - The PistenBully accelerates steplessly to its maximum speed as engine speed increases.



When the vehicle is moving, the electronics monitor the engine speed set in response to movements of the accelerator pedal and adjust the hydraulic ratio in accordance with load, so that engine speed remains constant and only the speed of the vehicle changes.





When you turn, bear in mind that the left and right propulsion hydraulics switch to counter-rotation just before full lock is applied to the steering wheel. The PistenBully turns in its own length.

- Observe all instruments when driving.

## Engine oil pressure

- The warning light for the diesel engine comes on during the start procedure and if oil pressure drops.

## Engine operating temperature

Gauge showing that temperature is too high?  
Determine the cause, for example:

- Gauge in working order
- Not enough coolant in system
- Foreign matter clogging radiator on outside
- Check belt tension
- Check visco fan

## Fuel supply

Continually monitor the fuel supply and fill up in good time. This precaution will prevent the fuel supply from failing on a gradient, which would mean the engine stopping inopportunistically.

## Battery charge indicator

If the battery charge indicator lights up when the engine is running, the alternator is no longer charging the starter batteries. Determine the cause, for example:

- Loose cable connectors
- Generator dirty
- Drive belt slipping or broken

## Hydraulic fluid level warning light

Occasional flashing on descents is not indicative of a fault.

## Indicator light for parking brake

If the indicator lamp lights up, check the parking brake.



# ENTERING – DRIVING – EXITING

## BRAKING - STOPPING

The hydrostatic drive brakes the vehicle without causing wear. You reduce engine speed by easing the pressure on the accelerator pedal; engine speed lowers and the change in the hydraulic ratio causes the vehicle to slow down.

The PistenBully will come to a stop if engine speed drops below pull-away speed.

A parking brake (spring-loaded brake) operated by a parking-brake lever in the driver's cab acts on the driving wheels.



Use the parking brake only to keep the vehicle at a standstill.

## STOPPING AFTER USE

- Park the vehicle where it is clearly visible.
- Park the vehicle on a firm, level surface.
- Lower the front-mounted and rear-mounted auxiliary equipment.
- Set the potentiometer for the tiller to 0.
- Direction of travel switch in neutral position.
- Apply the parking brake.



Turbocharger - risk of overheating:

Do not immediately switch off the diesel engine after it has been run at full load. Drive for approx. 2 minutes in the part-load range and then switch off.

- Switch off the diesel engine.
- Remove ignition key and lock the cab.





## EXITING

- Move the steering column to the upright position.
- Be particularly careful when opening the door if the vehicle is parked on a gradient. The door opens suddenly.
- The procedure for exiting the vehicle is the reverse of the entry procedure.



### WARNING!



**Risk of slipping on the track when climbing into and out of driver's cab.**  
Always take a firm grip on the handle in order to step off the track.



*Diesel filler neck*

*Adapter*



### WARNING!



**Risk of explosion due to build-up of gas in fuel tank.**  
**Keep all possible sources of ignition when clear when the vehicle is being refuelled.**

- Refuel **1** the PistenBully immediately after operation, in order to prevent condensation forming in the tank.
- Then remove as much snow and ice as possible from the tracks, sprockets and wheels to prevent them freezing fast, in order to avoid damage when the machine is restarted.
- Secure raised auxiliary driven implements.



## ENTERING – DRIVING – EXITING



The 220 V **adapter 2** provides a means of preheating the coolant system and the hydraulic fluid with the thermostatically controlled preheater.

Use voltage transformer **3** if the available line voltage is 110 V.



1 - 2 hours of preheating prior to starting does not improve cold starting. Undertake preheating immediately after parking the vehicle.

- Use only cables that comply with the applicable regulations in the country of use.

## TOWING VEHICLE

### Towing the PistenBully

- Only trained, qualified persons are permitted to operate the emergency release of the parking brake.
- Towing a PistenBully is an operation requiring extensive safety measures. Please consult your nearest Service Support Centre.





Quantity is not as important as quality and economy.

### LOW FUEL CONSUMPTION

- **Diesel engine rpm** green zone on rev. counter.
- **Adjust tiller shaft speed** to suit snow conditions **by turning the potentiometer.**
- **Variably adjust tiller depth** to suit snow conditions **by observing the gauge and using the pushbutton controls.** Set the depth so that the tiller removes only as much snow as is absolutely necessary.
- **Use the lowest down-force setting** that is compatible with snow conditions

### MEDIUM SNOW

In the atmosphere, snow forms from water droplets at temperatures of at least  $-4^{\circ}\text{C}$ .

**Ice crystals** in widely varying shapes form:

**Hailstones** are snow crystals enlarged by the adhesion of ice; they are usually spherical or tapered in shape.

**Hoarfrost or rime** forms from water vapour or precipitation on chilled objects (fences, bushes, surface of snow).

White frost develops when the wind carries chilled droplets of water onto solid objects.

**Fresh-fallen snow** initially forms an airy structure of loosely intermeshed snowflakes. The original shapes soon disappear, however, and the individual flakes are no longer recognisable only a few days after falling.

Always work so as to cause as little damage as possible to the snow. The aggressive action of driven implements such as a tiller damages the snow crystals; these damaged crystals have lost their ability to mesh as a loose blanket, tending instead to ball and form gritty snow (often at entrances to garages, approaches to lifts, bottlenecks).



## DRIVING TIPS AND INFORMATION

### Preparing fresh-fallen snow

Fresh-fallen/powdery snow consists of crystals that are loosely attached to each other and which therefore trap a great deal of air. The process of preparation inevitably expels some of this air and packs the crystals more tightly together. This gives the surface layer of snow the ability to bear weight.

### Bumpy runs

The friction of skis over the surface causes some of the crystals to melt and form a film of water, and this produces sheets of ice and the softer spots beside them.

Over a period of time skiers break down the topmost layer – humps and hollows form and the run becomes bumpy.

Preparing slopes like this is a process in which old snow is mixed with relatively fresh-fallen snow (snow crystals) and this produces a durable surface.

If outdoor temperatures are correspondingly low the snow freezes and forms lumps - **when this happens the only way of making a ski run look well is to work with a tiller mounted on the rear of the vehicle.**



The teeth of the tiller break the lumps down into gritty snow, which fills the hollows in the surface of the run; the finisher shapes the surface and a water film forms to hold the grains of gritty snow together. Breaking down the lumpy snow also damages the ice crystals, so they lose a considerable proportion of their ability to cohere. This is the reason why only gritty snow, not powdery snow, can be produced from ice.

**i** A durable ski slope can be formed only by mixing this material with fresh-fallen snow or with unused old snow from deeper levels.

### Iced slopes/sheets of ice

Do not break up an iced slope unless the ice is of adequate thickness or fresh snow falls. The gritty snow produced by breaking up the ice needs fresh-fallen snow to cohere, or else it will cohere with water - and this will again cause ice to form. Consequently, it is advisable only to roughen the surface of the ice to make the slope skiable. Sheets of ice on slopes that are otherwise in good condition can be broken up and mixed with crystals from deeper in the snow.

**i** The more frequently the ice is turned and the crystals damaged, the less will be their ability to cohere.

### Wet snow/slushy snow

The relatively large amounts of moisture and the formation of a film of water on the finisher can produce a relatively hard surface, which inexperienced skiers in particular find difficult.

In order to counteract this effect, Kässbohrer has developed a bolt mechanism for tilting the rear-mounted tiller comb. In combination with special finishers, this machine can change the uniform surface structure and produce a "powdery-snow" effect.

### Extremely slushy snow in spring

It is advisable to use the side wings, because the tiller can produce edge walls as it passes through the snow. We also offer an extra-wide side wing for more efficiency when used in combination with the rear frame steering – this also means that the machine can prepare on one side at a time.

If a satisfactory run cannot be prepared in **slushy snow**, it might be advisable to wait two or three hours to allow the temperatures to change. Work on preparing slopes at higher altitudes can proceed in the interim. Allow the snow to set-up, so that crystals can form.



## DRIVING TIPS AND INFORMATION

### CLIMBING ABILITY

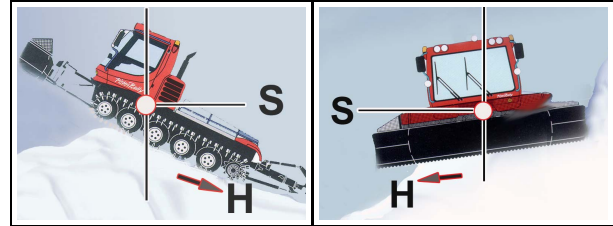
The climbing ability of the PistenBully depends on the limit of adhesion of the snow. The machine's centre of gravity is another factor influencing climbing ability. It is important for the driver to ensure that as much of the surface area of the tracks as possible is in contact with the ground, as otherwise there is a risk of the vehicle toppling. The limits are heavily dependent on the way in which the vehicle is used, on load, on the prevailing conditions, and on the skill and ability of the driver.

**S = Centre of gravity**

**H = Downgrade force**



Each situation must be assessed with care. Never assume that it is safe to operate in a certain area at any given time merely because a vehicle was in the area in question beforehand.



Inexperienced drivers, in particular, should familiarise themselves with the vehicle and equipment before undertaking operations in difficult terrain.



### DRIVING WITH THE PISTENBULLY



The basic rule is: Do not use the vehicle until the snow is deep enough to prevent damage to the underlying vegetation.

The objective in preparing a ski-slope is to achieve visually excellent slope quality:

Build up supplies of snow in good time at critical points, so that reserves will be available to make up for the snow removed from the slope.

Holes and snow heaped up by movement and by manoeuvring must be smoothed out with as little delay as possible.

If speed is excessive, the tracks will throw snow out sideways and over the auxiliary mounted implement onto the prepared surface.

Regularly remove snow from the load platform. Otherwise, the increase in weight will result in higher fuel consumption.

Always keep the engine revving in the most economical range (indicated by the green zone on the tachometer).

The drive electronics adjust speed to suit engine rpm.

### Driving: on upgrades

Always study upgrades and look for the easiest route; do not start at the steepest point. Frequently, it is better to detour to the highest point of a slope via an alternative route and then work from the top down to prepare the first part of the run.

Whenever possible, negotiate slopes by following the line of fall and by keeping steering movements to a minimum.

Do not overrev the engine: use only as much power as is necessary; note the level of traction. Overrevving will cause the tracks to slip, with the result that the vehicle will dig into the snow. If the tracks start to dig in stop immediately and try a different line.



Digging in ruins the ski-slope and destroys the surface beneath the snow.

### Turning

In order to avoid damaging the surface of the ski-slope, you must turn at or beyond the edge of the prepared slope. You should, of course, use areas that are free of vegetation (forestry plantations and the like) for this purpose.



## DRIVING TIPS AND INFORMATION

- Always keep the front-mounted and rear-mounted auxiliary driven implements raised when turning.

### Turning with counter-rotating tracks

You can turn the vehicle in its own length by counter-rotating the tracks. This causes the vehicle to dig in to some extent, so you should manoeuvre in this way only when the snow is of adequate depth. It is advisable to employ this method of turning in exceptional situations only. Turning with counter-rotating tracks places very high strains on the rubber belts and the track cleats.

### Driving: on downgrades

Always maintain a moderate speed on downgrades. This precaution will enable you to ensure that the engine does not overrev, the vehicle does not drift out of control and the snow is not dragged downhill by the action of the tracks. Use the speed potentiometer to reduce the speed of descent.

Restrict your steering movements to a minimum. Make sure that both tracks are turning.

Reduce speed as you crest rises, in order to ensure that you have the vehicle under control as it tips forward. This will prevent the front blade from digging in and the tracks from losing traction.

**Invariably, do not negotiate a downgrade unless you are sure that:**

- the adhesion of the snow is adequate.
- your run out at the bottom of the slope is adequate and safe.
- there are no skiers in the danger zone.

If the PistenBully starts slipping on a downgrade and drifts at an angle to left or right (vehicle's longitudinal axis drifts off the line of fall), you must immediately apply opposite lock (turning the steering wheel to the right or left, as applicable), counter-rotating the tracks if necessary, in order to bring the vehicle's longitudinal axis back onto the line of fall. Briefly increase engine speed in the process.

You can counteract slippage along the line of fall by reversing the tiller shaft's direction of rotation and carefully employing the front blade to re-stabilise the vehicle.





### PREPARING THE SKI-SLOPE

#### Notes on depth of tiller

**The tiller has to be set to the correct depth in order to achieve:**

- A visually attractive ski-slope.
- Retain the firmness of the slope's substructure.
- Operate within the most economical range.
- Apply least load to the PistenBully and the tiller.

#### Effects of incorrectly set tiller depth:

- Tiller shaft depth too high: Tiller quality output is negligible.
- Slope is not contoured in areas of hard snow.
- Tiller shaft depth too low: Insufficient snow processing, so the snow is forced out of the tiller at the side and forms an edge wall.
- The snow crystals' ability to cohere and the quality of the slope's substructure are impaired.
- More power input necessary – less economical.

#### Visual appearance of prepared slope not satisfactory:

- Tiller depth set too high (adjust height setting).
- Speed of rotation too low.

- Ball handle not locked in position (floating position).
- Vehicle travelling too fast.
- No smooth surface with the front blade (tiller is on a hump).

#### Vehicle comes almost to a stop:

- Tiller depth too low.
- Speed of shaft rotation too high.
- Cylinder of carrier plate significantly out of adjustment.
- Tiller shafts stopped – clogged, jammed, frozen.

#### Severe vibrations perceptible in vehicle when the tiller is switched on:

- Shaft imbalanced, tooth missing – have repairs carried out by specialists.
- Frozen with snow – remove.
- Imbalance means vibration – screws work loose, bearings are damaged – have the imbalance rectified.





## NOTES

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## Correct usage:

- Use of the front blade on steep slopes covered with fresh-fallen snow.
- Smoothing heavily worn ski slopes.
- Smoothing bumpy ski slopes.
- Making a location line.



Material wear due to load.

During dozing work (i.e. when pushing snow with the front blade), fully raise rear carrier plate.

A front blade is essential for modern ski-slope upkeep and preparation. It is ideal for smoothing bumpy runs and dozing snow clear. The front blade is also very useful for working uphill through fresh-fallen snow and it can be used as a brake to prevent the vehicle from slipping. Consequently, it is advisable to leave the front blade installed at all times.

## Smoothing bumpy ski slopes

The best method of smoothing low bumps or waves is to use the front blade in what is known as the "floating" position. This means that the front blade applies only its own weight to the surface, without being pushed downward by the hydraulics.

Paana.10017.en

The blade's angle of attack is set by means of the roll cylinder. Exercise great care when setting the roll cylinder, because if the angle of attack is too steep the front blade will tend to dig into the snow.

Approach large bumps with the blade at approximately half height and the float function switched off, so that the blade will push the snow forward off the bump and into the hollow on the other side. In this case, too, it is best to use the roll cylinder to adjust the depth of cut, instead of raising and lowering the front blade. This is the most dependable way of smoothing out the slope.



The ideal configuration is to have a leader snow roller mounted in front of the blade, as this will enable the equipment to adjust automatically to compensate for surface irregularities.



## FRONT BLADE

### Making a location line

The best way of doing this is to approach the downslope at an angle from above and, with the pusher blade swivelled to one side, doze a flat location line in the snow.

It is advisable to start with no more than a small amount of snow, picking up more and more snow as you proceed along the line. This should enable you to complete the full length in a single run.

The snow you push out on the downhill side inevitably widens your location line, increasing the margin of safety.

### Use of the front blade on steep slopes covered with fresh-fallen snow

When you prepare fresh-fallen snow you need the front blade not only to push the snow, but also to distribute the weight and apply pressure to the surface of the snow. You can use the front blade to help the vehicle climb steep slopes by stopping just before the PistenBully digs in, and reversing with the front blade lowered. This will smooth out the step. Raise the front blade and drive forward a few meters before repeating the procedure; this is one way of climbing difficult slopes.



### Smoothing heavily worn ski slopes

One consequence of modern skiing techniques is that the skiers carry the snow progressively further down the slope, finally depositing it toward the bottom of the slope. The objective, therefore, is to restore the snow to as uniform a depth as possible over the entire length of the slope. This entails pushing the snow back up the slope from the bottom. If necessary, winch the PistenBully into position.

Pivot the front blade to an angle at which the snow can slide along it toward the inside. If you are using a 12-way front blade you can set the wings to an angle that best suits this method of handling the snow. The front blade can be adjusted in a number of ways to the position that best suits the terrain. The end result is efficient transportation of the snow to the parts of the slope where it is needed.

Less experienced drivers in particular should bear in mind that transporting large amounts of snow quickly is not always the way to achieve the best results. The driver has to assess the terrain and decide whether it would be advisable to push snow downhill, or whether this might result in even more snow being lost.

A well-prepared slope is free of heaps of snow, does not have walls along the edges, and is contoured so as to be attractive to the eye.

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