OPERATING INSTRUCTIONS

INTENSIVE CULTIVATOR
KARAT 10

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Karat 10/350
Karat 10/400

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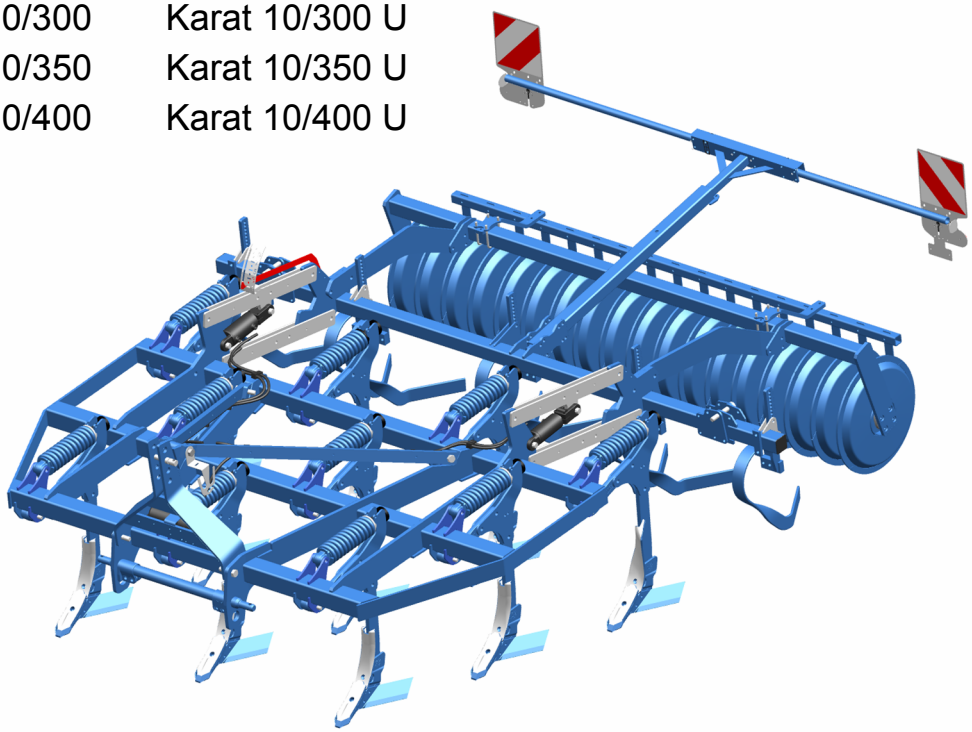

en-GB | Item no. 17516276 | BA 01/2023-09

Ensure that these instructions are always available when using the machine and can be accessed by all users..

•

Keep these instructions for the entire service life of the machine.

•

Pass these instructions to all users / owners.

Original instructions

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Table of contents

Table of contents

1 About these instructions

1.1 Introduction

These operating instructions are important and belong to the machine's scope of delivery.

These operating instructions must be available to the user at the place of use.

- Always read chapter "Safety" before using the machine for the first time.
- Read chapter "Operation - Basic operation" before using the machine for the first time.
- Before starting work, also read the relevant steps in the operating instructions.

INFORMATION

In other documents and in sections of these operating instructions, the **machine** is also referred to as an **implement**.

Validity range

These operating instructions describe operation of the machine after initial commissioning by the LEMKEN sales partner and handover to the operator.

Prior to operation, initial commissioning and instruction in operation, setting/adjustment and maintenance must have been carried out.

These instructions describe the machine in combination with a tractor. If the requirements placed on the tractor are also met by other machines or vehicles, the respective description can also be applied in these cases.

Operation of the tractor, including its relevant functions, is not part of these operating instructions. The operator and the user are responsible for observing the operating instructions of the tractor.

For an unambiguous assignment of this document to the machine, transfer the following data from the type plate of the machine:

Designation on the type plate	***Enter the machine data here:***
Series	
Type designation	
Model year	
Serial number	
Year of manufacture	

INFORMATION

Position of the type plate on the machine:
↳ *Chapter 3 'Design and description' on page 16*

Explanation of the full type plate content:
↳ *Appendix A 'Type plate variants' on page 88*

Equipment variants

The machines can be equipped differently at the factory.

Standard components, special equipment or optional accessories are not marked separately.

The contents of these operating instructions, e.g. illustrations, may therefore differ from the equipment of the machine.

Depending on the equipment, additional documents may be required for operation.

INFORMATION

↳ *Chapter 1.4 'Further applicable documents' on page 5*

1.2 Target groups

The target groups of these operating instructions are operators, users and service personnel of the machine.

The target groups must meet the requirements for operators, users and service personnel as defined in these instructions.

INFORMATION

Chapter 2.2 'Requirements of operators, users and service personnel' on page 7

1.3 Applied presentations

1.3.1 Signal words and hazard statements

Warning of personal injury

The following signal words and hazard statements are used to label warning signs and to warn of residual risks:

Signal word	Meaning
DANGER	Indicates an immediate hazardous situation that may result in serious injury or death.
WARNING	Indicates a hazardous situation that may result in injury or death.
CAUTION	Indicates a situation that may result in minor injury.

Warning of property damage

Signal word	Meaning
NOTICE	Indicates a situation that may result in material damage.

Other notices and information

Signal word	Meaning
NOTE	Indicates tips and useful information for the user
ENVIRONMENTAL PROTECTION	Indicates notices and special measures regarding environmental protection

1.3.2 Symbols and text markings

Symbol, text marking	Meaning
In front of and in texts	
•	Marking for routine maintenance tasks
	Activities that demand the help of service staff.
■	Listing
[1], 1, 1	Position numbers
Example: *'Settings'*	Software element
Example: *[OK]*	Softkey, key, switch and button
[kg]	Unit
	Cross reference
In work instructions	
√	Preconditions
▶	■ Working steps in single-step work instructions ■ Measures for hazard avoidance in safety information
1. 2.	Working steps in multi-step work instructions
⇨	Result
In illustrations	
Light grey coloured components	Non-relevant components, visible to facilitate orientation
Yellow coloured components	Action-relevant components

1.3.3 Direction specifications

The direction specifications used in the text (left, right, front and rear) refer to the driving direction of the tractor when moving forwards.

1.4 Further applicable documents

Required documents

Documents that are necessary and must be observed for operation:

- Operating instructions of the tractor
- For partially assembled or disassembled delivery: Mounting instructions

Latest versions of the documents

INFORMATION

The documents are regularly updated and brought into line with any changes.

The latest versions of the documents can be found in the **LE**MKEN **On**line **I**nformation **S**ystem (LEONIS).

Users can access LEONIS directly via the QR code or the LEMKEN website. In LEONIS, users can quickly find the latest versions of their instructions by setting filters.

2 Safety

2.1 Machine limits

Intended use

The machine is used for soil cultivation on agricultural land.

It may only be used in accordance with the recognised rules of good agricultural practice.

The permitted working depth is limited to the cultivatable soil horizons. Use on heavily or deeply frozen soils, in soil horizons with unweathered parent rock and soil horizons with loose rock or solid bedrock is not regarded to be in compliance with the designated purpose.

Further information on the performance limits of the machine can be found in *Chapter 12 'Technical data' on page 79* of these operating instructions.

The machine is carried or trailed by a suitable tractor. If necessary, other functions of the machine are driven by the tractor.

How to check the suitability of a tractor is described in *Chapter 4.1.2 'Ensuring suitability of the tractor' on page 26* of these operating instructions.

The machine with the defined hazardous area is operated and monitored by the user on the tractor. When using an autonomous tractor, monitoring by the autonomous tractor or additional systems must be ensured.

The power supply to the machine is provided by the tractor and includes hydraulic, electric and mechanical power.

Time limits

The actual service life of a machine is not limited to a specific time period as long as the machine is in efficient working order. The efficient working order depends to a large extent on the operating conditions, proper maintenance and the use of suitable operating materials, spare parts and wearing parts in accordance with the operating instructions.

Spatial limits

The dimensions of the machine must always be considered in combination with the tractor.

The dimensions of the machine vary in the operating position and the transport position and can be changed by swivelling components.

Information on the dimensions of the machine can be found in *Chapter 12 'Technical data' on page 79* of these operating instructions.

Hazardous area

The machine and the area in the immediate vicinity of the machine is deemed a hazardous area. This includes the space over the entire width, length and height of the machine, as well as an additional safety distance of two metres to the machine.

The hazardous area varies in the operating position and the transport position and can be changed by swivelling components.

The hazardous area moves with the machine when it is moved.

2.2 Requirements of operators, users and service personnel

Operator

Operators within the meaning of these instructions are obliged to inform all the users about correct application of the machine and the respective hazards.

This can be done on the basis of these operating instructions. Operators are responsible for ensuring that the operating instructions are always available at the machine and that the users observe the operating instructions.

Operators must also provide users with any necessary personal protective gear.

Users

Within the meaning of these instructions, users are persons who drive, adjust, operate or maintain the machine. Users must be able to use the machine safely.

This means:

- Users understand how the machine works.
- Users know and are able to avoid dangers.
- Users are physically capable of controlling the machine.

In order to use the machine as intended and in a professional manner, users must have the required technical (agricultural) knowledge.

Unless otherwise indicated, users may perform all of the activities described in these operating instructions themselves.

Certain activities should only be performed by service personnel, e.g. work on braking systems. These activities are indicated in the operating instructions by the symbol .

Service personnel

Service personnel within the meaning of these instructions are all persons who maintain and repair safety-relevant components.

Service personnel are qualified for these activities based on their training and expertise (for example agricultural machine mechanics).

Qualified specialists

For the purposes of these instructions, qualified specialists are all persons who, on the basis of their professional training and experience, carry out the tasks assigned to them in a professional manner. Qualified specialists have knowledge of the relevant standards and regulations, recognise possible hazards and avoid hazards independently.

2.3 General safety information

Operating instructions

The operating instructions are part of the machine. The machine is intended exclusively for use in accordance with these operating instructions. Applications of the machine not described in these operating instructions may result in personal injury or death or property damage. If applications other than those described in the operating instructions are planned, obtain the prior written consent of the manufacturer. This also applies to unauthorised modifications and alterations to the machine.

- Observe the operating instructions and follow the working steps given therein.
- Clarify questions of comprehension concerning the contents of these operating instructions before starting work. If necessary, contact the manufacturer's sales partner.

Technically perfect condition

Damage to the machine can impair the operational safety of the machine and cause accidents.

This may result in death or injuries.

In order to be able to operate the machine in a technically perfect condition, carry out the following measures:

- Check the machine according to the maintenance schedule.

  Chapter 9.2.1 'Maintenance schedule' on page 64
- Repair damage and eliminate causes of damage immediately.
- Use original spare parts or parts approved by the manufacturer.
- Only use the auxiliary and operating materials listed.
- Remove coarse dirt.

If safety-relevant damage cannot be repaired in accordance with these operating instructions:

- Have damage repaired by a qualified specialist workshop.

Spare parts

Permissible spare parts are available from *agroparts*.

The QR code takes the user directly to *agroparts*. There, the user can find spare parts for the machine.

Safety equipment

Existing and fully functional safety devices protect against death or serious personal injury.

- Keep the labels legible and renew them, if necessary.
- Replace damaged safety devices.
- Install dismantled safety devices before commissioning.
- Move the safety devices to the protective position.
- In case of doubt whether all safety devices are properly installed and fully functional: Commission a specialist workshop.

Technical limit values

If the technical limits of the machine are not complied with, the function of the safety devices may be impaired and the machine damaged.

This may result in death or injuries.

- Observe the machine-specific limit values.

Chapter 12 'Technical data' on page 79

Stored mechanical energy

The machine is equipped with components in which mechanical energy is stored (e.g. springs, overload safety units). Uncontrolled release of mechanical energy accelerates components like a projectile.

This may result in death or injuries.

- Only allow components with stored energy to be dismantled or opened by qualified specialists.

Hydraulic assembly

The hydraulic assembly might be under high pressure.

Hydraulic oil leaking under pressure can penetrate through the skin into the body.
Injury to body parts, face, eyes and unprotected skin may result.

The hydraulic assembly might be hot.

The hydraulic oil is harmful to health.

- NEVER touch leaks without hand protection.

  Working on the hydraulic assembly:

  - Wear protective goggles and gloves.
  - Switch the hydraulic assembly to depressurised.

- Check the condition of the hydraulic assembly according to the maintenance schedule.

- Replace damaged or worn components of the hydraulic assembly immediately.

  If hydraulic oil has entered the body: Risk of infection

  - Contact a doctor immediately.
  - Remove the hydraulic oil from the body as quickly as possible.

NO passengers

Passengers may fall from the machine and seriously injure themselves.

Scattered objects may hit and injure passengers.

- NEVER allow persons to ride along on the machine.

2.4 Safety information on hazardous areas of the machine

Workplaces

The main workplace for working with the machine is the driver's seat in the tractor. Further workplaces are described in the respective instructions for action.

Dangerous situations may occur if several persons operate the machine functions at the same time.

- Observe the hazardous areas.
- Pay attention to other persons in the vicinity of the machine.

Area between the tractor and machine

When standing between the tractor and machine, there is a risk due to tractor movements or sudden machine movements.

- ► Secure the tractor against rolling away.
- ► Before operating the linkage: Keep all persons away from the movement area of the linkage.

Lifted machine

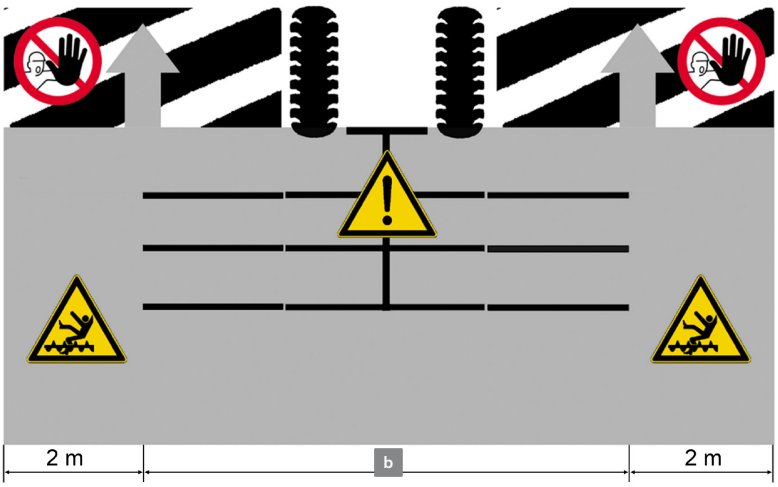
A machine with a high dead weight can move downwards independently.

This may result in death or injuries.

- ► NEVER walk or stand underneath unsecured machines.
- ► Use suitable equipment to secure machines against lowering.

Moving hazardous area

The hazardous area of the machine during operation.



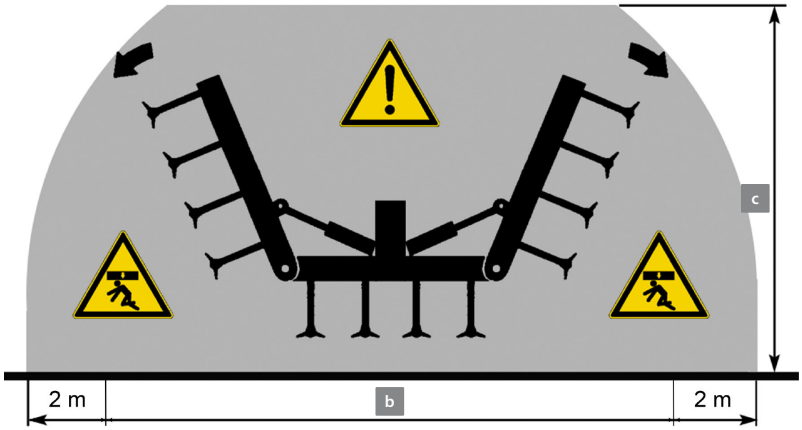
Moving hazardous area

The hazardous area includes the area in driving direction across the entire width b of the machine.

There must be NO persons in the hazardous area.
If there are persons in the hazardous area, may result in death or injury to persons.

- NEVER climb out of the tractor while it is moving.
- NEVER allow other persons to board the tractor while it is moving.
- In addition, maintain a safety distance of 2 m from the machine.
- While driving on the field, observe the entire hazardous area. Stop if required.

Folding range



Hazardous areas when folding the implement

There should be NO persons present in the folding range.
If persons are present in the folding range, it may result in death or serious injury.

Lateral sections may, due to their height c touch overhead lines during the folding processes and cause flashovers.
A flashover may result in death or serious injury.

Make certain before folding:

- Due to a risk of tipping: Machine is on a level surface with sufficient bearing capacity.
- NO persons are present in the folding range b.
- Persons keep a safe distance of 2 m to the folding range.
- There are NO overhead lines in the vicinity of the machine.

Running machine components

After the drives have been switched off, the machine components continue to run.

This may result in death or injuries.

► Only touch stationary components.

2.5 Safety information on structural modifications

Structural modifications

Structural modifications and extensions can impair the functionality and operational safety of the machine.

This may result in death or injuries.

Auxiliary equipment and spare parts must comply with the manufacturer's requirements.

- Modifications and conversions may only be carried out with the written consent of the manufacturer.
- Structural modifications and extensions must only be carried out by an authorised specialist workshop.
- Use original spare parts or parts approved by the manufacturer.
- Only use the auxiliary and operating materials listed.

Chapter 12.9 'Operating materials' on page 81

Welding work

Improper welding work endangers the operational safety of the machine.

This may result in death or injuries.

- Have welding work carried out by a qualified specialist workshop.

2.6 Safety information on situations

Driving behaviour

Mounted or trailed machines change the driving characteristics of the tractor.

The driving characteristics also depend on the operating status, the filling or loading and on the subsoil.

If the driver does not consider changed characteristics, accidents may occur.

- Observe changed driving behaviour when driving.

Chapter 5 'Road travel' on page 39

- If necessary, reduce the driving speed appropriately.
- Pay particular attention to the driving behaviour when driving on a slope.

Road travel

The user operates the machine via control elements such as tractor control units, touch screen, buttons or joystick. Touching the control elements may trigger functions and machine movements, even if touching the control elements was not intended.

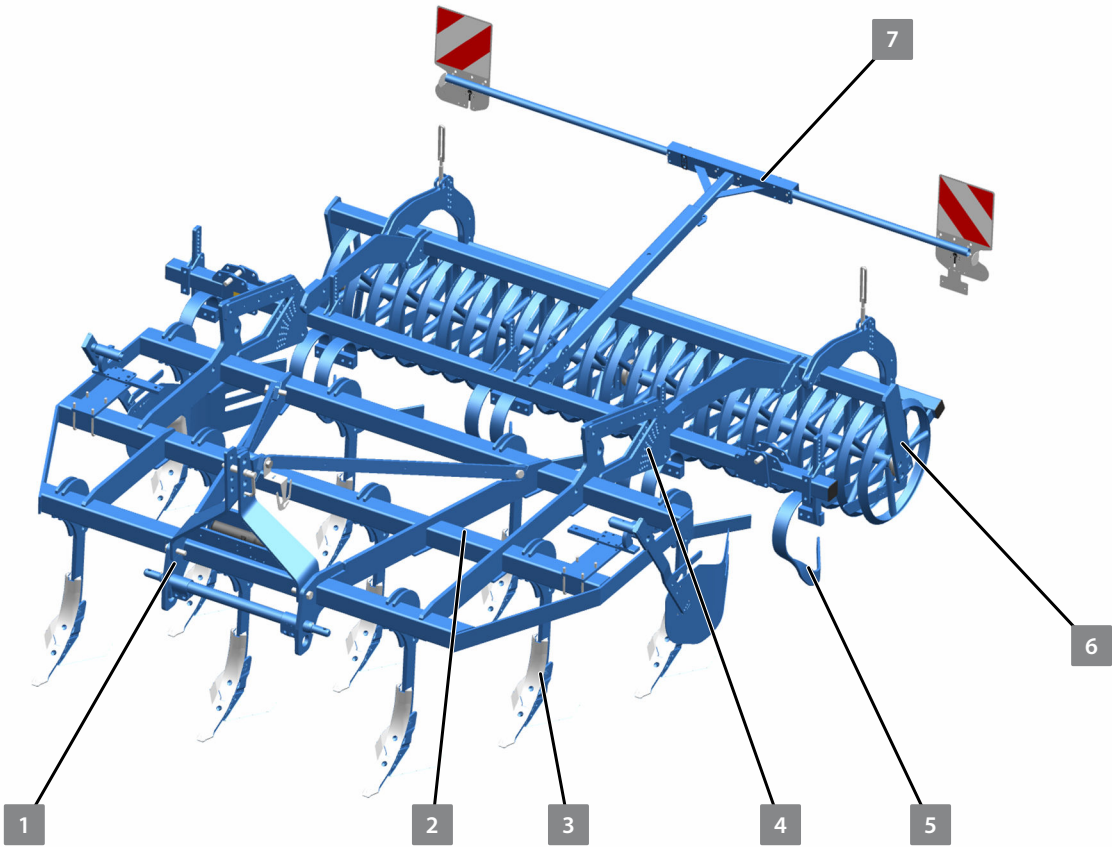
- ▶ Disabling machine functions before driving on the road.

3 Design and description

3.1 Machine overview

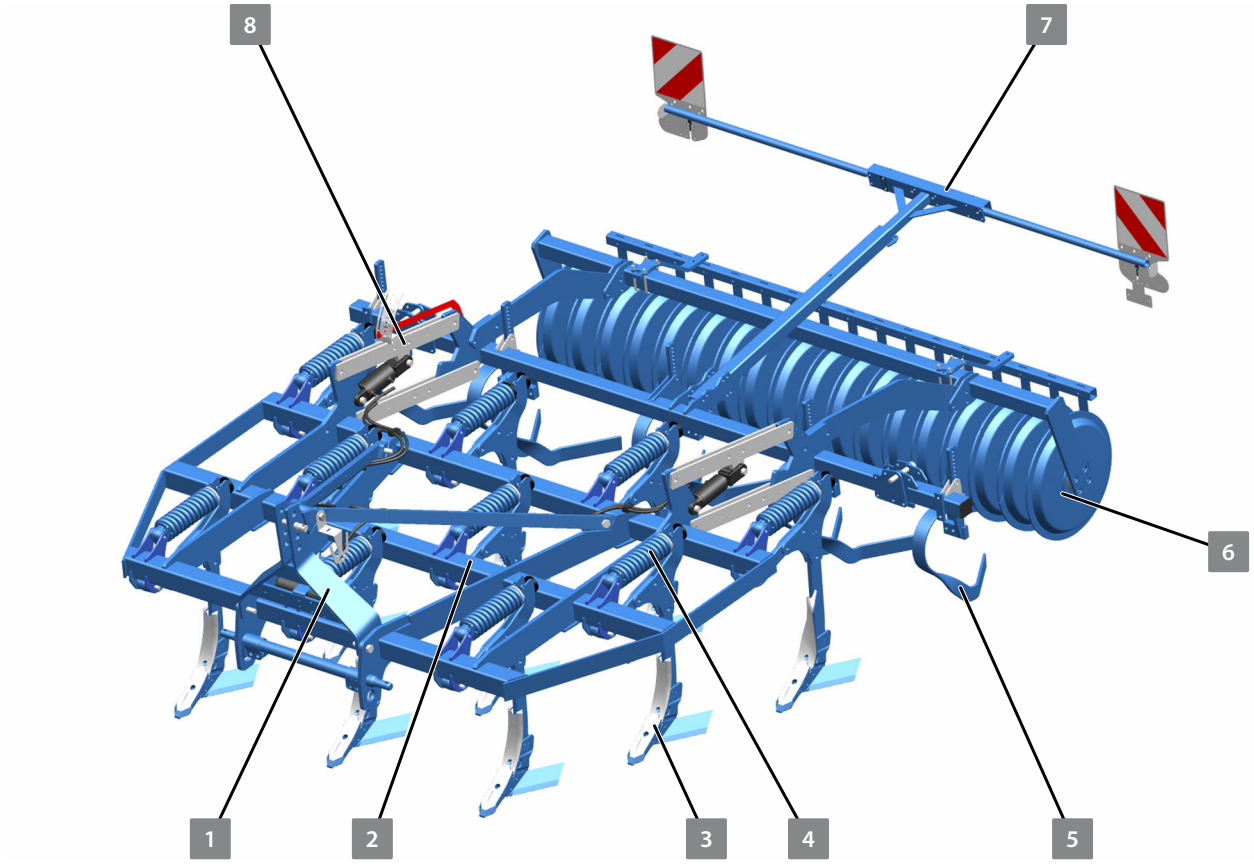
INFORMATION

Depending on the equipment of the machine and country-specific requirements, the assembly groups described below may be present on the machine.



Example of Karat 10

1 Connecting system, headstock
2 Frame
3 Tines / Shares
4 Depth adjustment for tines
5 Levelling tines
6 Roller
7 Lighting equipment



Example of Karat 10 U

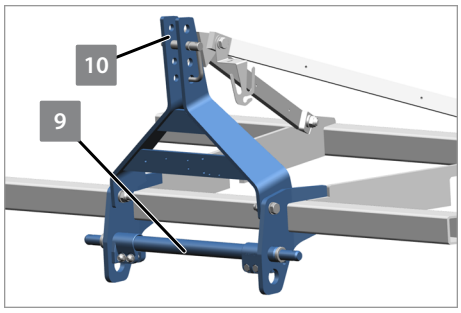
1 Connecting system, headstock
2 Frame
3 Tines / Shares
4 Automatic overload safety device of the tines / shares
5 Levelling tines
6 Roller
7 Lighting equipment
8 Depth adjustment

Type plate

The machine is marked with a type plate. The machine type can be identified uniquely by the type plate.

Further information about the type plate: *Appendix A 'Type plate variants' on page 88*

Headstock



The headstock with cross shaft 9 and top link pin 10 has been designed according to standard ISO 730.

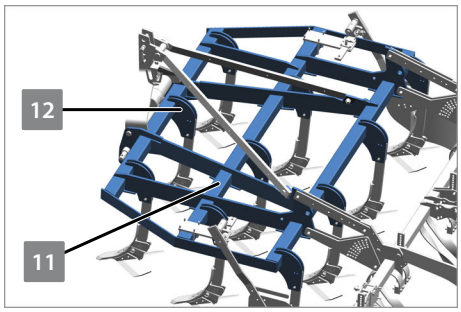
The headstock is used to connect the machine to the three-point linkage of the tractor.

The machine is suitable for attachment to Quick-Hitch couplings.

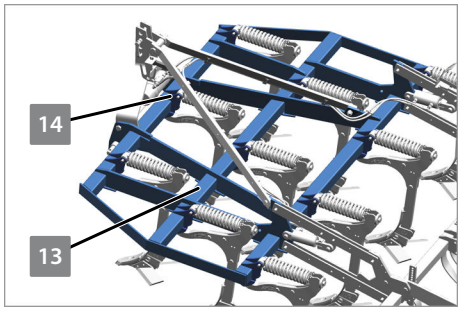
The approved options for connecting the machine to the tractor are indicated in the technical data.

Chapter 12.6 'Performance data' on page 80.

Frame



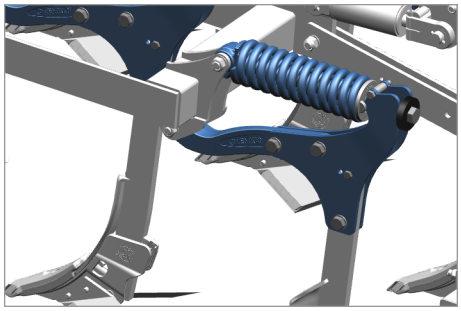
In the version with shearing protection, the frame 11 is equipped with leg brackets 12 for retaining the rigid tines.



In the version with the automatic overload safety device, the frame 13 is equipped with retainers 14 for the overload safety elements.

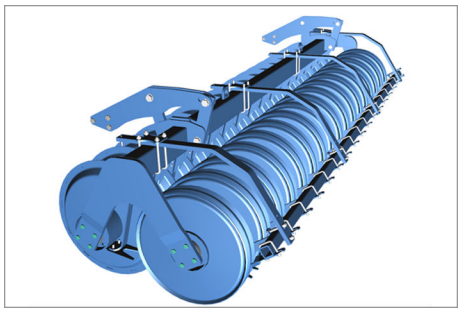
Overload safety elements cannot be used on a frame with leg brackets.

Overload safety device



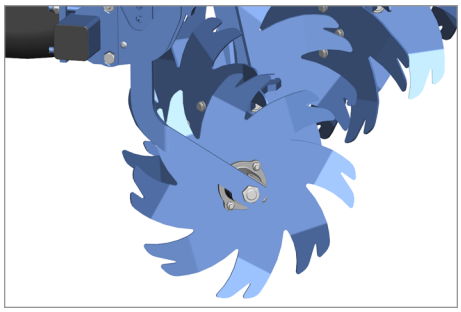
The automatic overload safety device of the tines protects the frame and the tines against overload. This ensures a smooth workflow on stony soils.

Roller



The rollers ensure reconsolidation and additional crumbling of the soil. When the machine is lowered for working, the rollers support its weight during operation in the field and ensure precise depth control. The weight of the rollers additionally supports the soil penetration of the machine. The machine is compatible with various roller types.

Levelling discs and outer discs



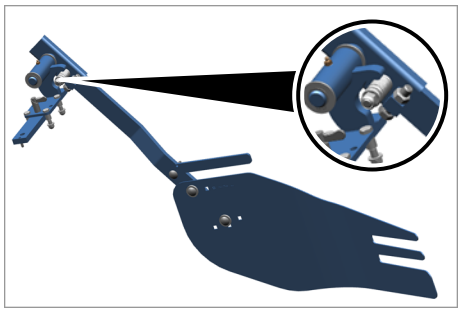
The levelling discs are serrated and level the ground behind the tines. They level the ridges left by the rear row tines.

The depth and work angle of the outer discs can be adjusted. The outer discs push back the soil that has been pushed to the side.

Levelling tines

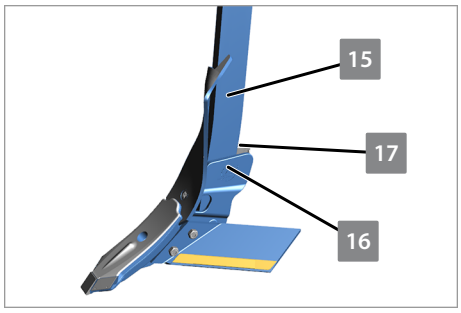
As an alternative to levelling discs, levelling tines can be mounted. They level the ridges left by the rear row tines.

Side shields



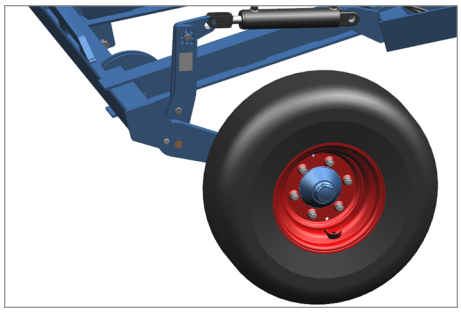
The side shields limit soil flow to the working width of the machine and ensure uniform edge levelling. The side shields are protected against overload by springs.

Tines and shares



Share bases 16 with various share systems can be attached to the stalks 15. Share bases are secured with linch pins 17.

Support wheels



The support wheels are mounted to the outside of the frame. The support wheels prevent the outer tines from working deeper than necessary. The machine is guided at the front by the lifting hydraulics of the tractor, while its working depth is guided at the rear via the rollers.

3.2 Machine safety

3.2.1 Position of the label

Keeping the labels legible

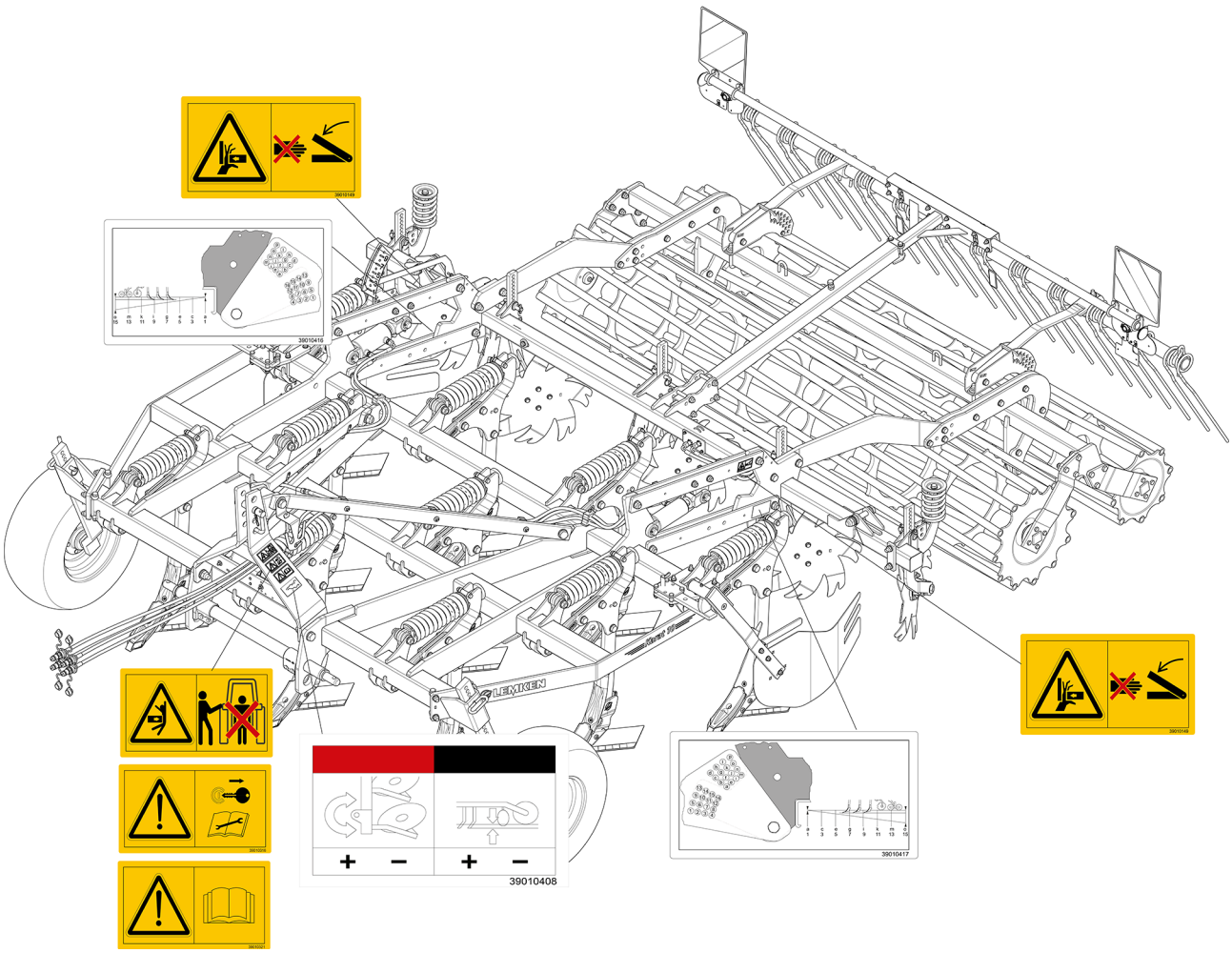
Labels on the machine warn of dangers at danger points and belong to the safety equipment of the machine.

Missing labels increase the risk of fatal and serious injury.

1. Clean dirty labels.
2. Replace damaged, illegible or lost labels immediately.
3. Provide spare parts with the provided labels.

↳ *Chapter 3.2.1 'Position of the label' on page 20*

↳ *Chapter 3.2.2 'Meaning of the labels' on page 21* ↳ *'Hydraulic equipment' on page 23* ↳ *'Depth adjustment, mechanical' on page 23*



Karat 10 - Label overview

3.2.2 Meaning of the labels

This section explains the information and warning signs that have been affixed to the machine.

Risk of crushing

Moving parts may cause crushing and shearing injuries.

► Keep hands and fingers away from moving parts.

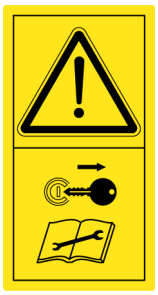
Reading the operating instructions

Incorrect use or operation of the machine can result in death or serious injury.

Before commissioning:

- ► Read and observe the operating instructions.
- ► Follow the instructions for action.

Turn off the engine



A tractor with the engine running can cause unintentional movements. This may even be fatal or result in serious injuries.

Before maintenance and repair work:

- ► Turn off the engine.
- ► Engage the parking brake of the tractor.
- ► Remove the ignition key.

Area between the tractor and machine

A tractor with the engine running can make or cause unintentional movements. This will result in death or serious injury.

When the tractor is running:

- ► Do NOT remain in the area between the tractor and machine.

Sling points

Sling points for lifting processes

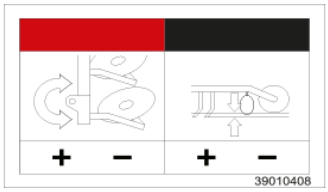
Lashing points

Lashing points for fixing during transport

Jack positioning points

Positioning points for jack

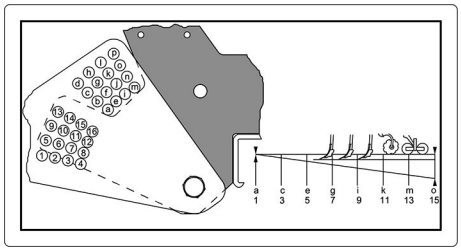
Hydraulic equipment



Connection overview of hydraulic hoses

- Black: Hydraulic depth adjustment
- Red: Outer concave discs

Depth adjustment, mechanical



3.2.3 Safety devices

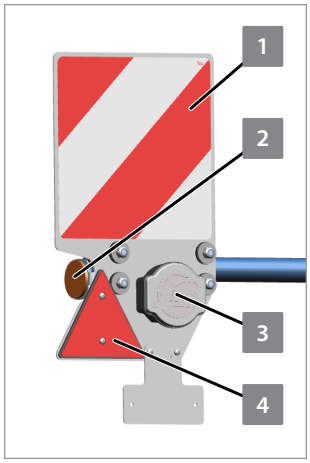
3.2.3.1 Lighting equipment and identification

The marking and the lighting equipment increase safety while driving on the road.

For public road traffic, the machine must be equipped with the following components in accordance with national regulations:

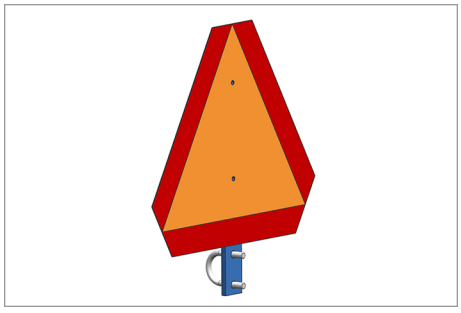
- Marking
- Lighting equipment

Rear lighting equipment



1 Warning board
2 Lateral reflectors
3 LED lighting equipment
4 Reflector (triangle)
- Reflector (round) (not shown)

Warning board



Depending on national regulations, a warning board may be required for slow-moving vehicles.

3.3 Working tools

Tool	Application/Special feature
Tines	The tines of the machine are equipped with a quick-change system. Share bases with various share systems are attached and secured with linch pins to tines equipped with a quick-change system. Depending on the machine equipment, the tines are protected against overload by automatic overload safety devices or shear bolts.
Levelling tools	The levelling tines and the levelling discs level the raised soil.
Weed harrow	The single-row weed harrow can only be used in combination with a roller.
Rollers	The rollers ensure additional crumbling of the soil. The machine may also be operated without rollers. The permissible roller types are shown in the technical data. *Chapter 12.12 'Permissible roller types' on page 82*

4 Commissioning

4.1 Preparing an attachment

4.1.1 Check machine for completeness

Scope of delivery and equipment of the machine may vary depending on the configuration of the purchase order.

1. Make certain that all LEMKEN original parts are present according to the purchase order.
2. Make certain that all parts are undamaged and correctly mounted (see corresponding mounting instructions if applicable).
3. Make certain that all other applicable documents are present in the correct language.

Chapter 1.4 'Further applicable documents' on page 5

4.1.2 Ensuring suitability of the tractor

4.1.2.1 Checking preconditions

WARNING

Risk of accident due to unsuitable tractor

If the tractor is not suitable for the machine, components of the machine may be overloaded and the tractor-machine combination may not be steered safely.

This may result in accidents with injuries or death of persons or damage to the machine.

– Prior to attachment, it must be ensured that the tractor is suitable for use with machine.

Checklist for compatibility of the tractor for a machine with headstock

Assembly group	Requirement	Check
Tractor power *Chapter 12.6 'Performance data' on page 80*	The tractor power must be within the permissible power range.	☐
	The tractor power is sufficient for the consumers of the connected machine.	☐
Connections of the machine to the tractor *Chapter 12.11 'Connecting systems at the machine' on page 82*	The categories of the three-point linkage of the tractor as well as of the cross shaft and the top link pin of the machine must match.	☐

Assembly group	Requirement	Check
	The categories of the three-point linkage of the tractor match the categories of the cross shaft or the lower link pin and the top link pin. If the categories differ, the three-point linkage of the tractor or the connecting system of the machine has been aligned.	☐
Electrical connections *Chapter 12.7.1 'Electrical connections' on page 80*	An electrical connection is available on the tractor for each consumer.	☐
Hydraulic connections *Chapter 12.7.2 'Hydraulic connections' on page 80*	A hydraulic connection and a suitable control unit is available for each consumer.	☐
Hydraulic oil *Chapter 12.9 'Operating materials' on page 81*	The hydraulic oils of the machine and the tractor are compatible.	☐
Axle loads *Appendix D 'Calculation of axle load and ballasting for mounted machines' on page 97*	The axle loads and the required ballasting have been determined and taken into account.	☐

4.1.2.2 Preparing tractor

Keep the tractor documentation ready

The tractor is prepared before attaching the machine. For this purpose, the user must carry out various checks and adjustments.

The following information about the tractor is required:

- Air pressure of tyres
- Instructions for adjusting the lifting rods
- Instructions for adjusting the check chains or stabilisers

WARNING

Risk of accident due to the machine tipping over

If the tractor's lifting rods are not set rigidly and the slots are not locked, the machine may tip over at the borders.

– Set the lifting rods rigidly.
– Lock the slots.

Checklist for preparing the tractor

Assembly group	Requirement	Check
Tyres *Chapter 12.10 'Tyres and wheels' on page 81*	The air pressure of the tractor tyres corresponds to the instructions of the tractor manufacturer.	☐
	The air pressure is the same in all the tyres of one axle.	☐
	Under difficult conditions: Additional wheel weights are used or the tyres are filled evenly with water.	☐
Lifting rods	The length of the lifting rods corresponds to the instructions of the tractor manufacturer.	☐
	The lifting rods of the tractor are adjusted to the same length.	☐
	The lifting rods are set rigidly. For this purpose, the slots are locked.	☐
Check chains and stabilisers	Working in the field: For sufficient lateral movement, the lower links move freely.	☐
	Road travel: To ensure the machine is positioned centrally behind the tractor, the lower links are secured in place (no lateral movement).	

4.2 Attaching the machine

4.2.1 Practical knowledge - Effects of the mounting position

INFORMATION

The following description of the cross shaft position also applies accordingly to the position of the lower link pins.

The top link mounting position can be changed at the tractor and at the machine.

The different combinations of the top link and the lower link mounting positions have an effect on the behaviour of the machine during operation.

INFORMATION

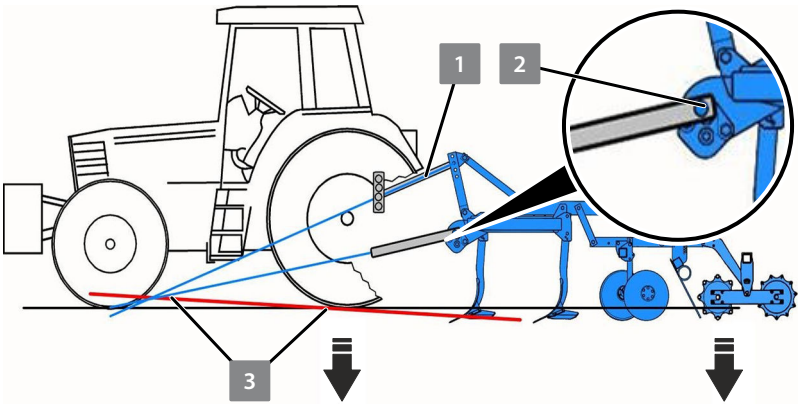
The traction line 3 between the machine and the tractor starts at the point where the extended lines of the top link and the lower link intersect.

Top link slightly inclined - cross shaft at top

ATTENTION

– Prior to attachment, the lifting rods must be adjusted to the same length.

Lower link in upper position and top link mounted slightly inclined:

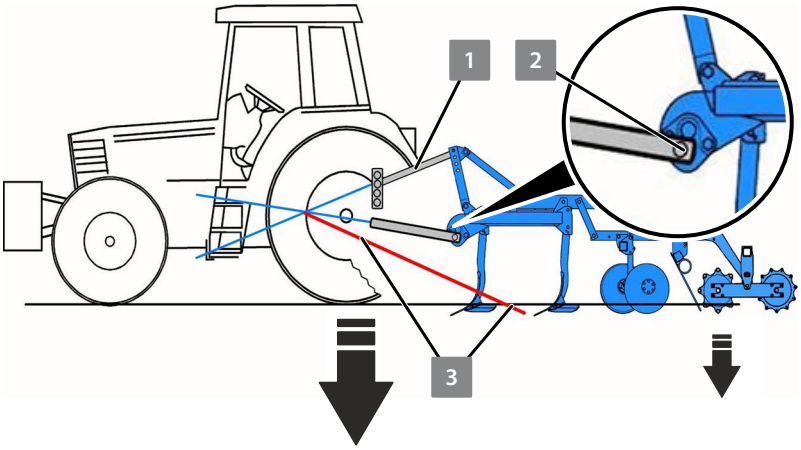


1 Top link slightly inclined
2 Cross shaft at top
3 Traction line slightly inclined

Behaviour with slightly inclined traction line	
Penetration of the machine	Medium
Roller pressure	High
Depth control	Optimal
Lift height	Medium
Slippage	Medium

Top link strongly inclined - cross shaft at bottom

Lower link in the lower position and top link mounted strongly inclined:

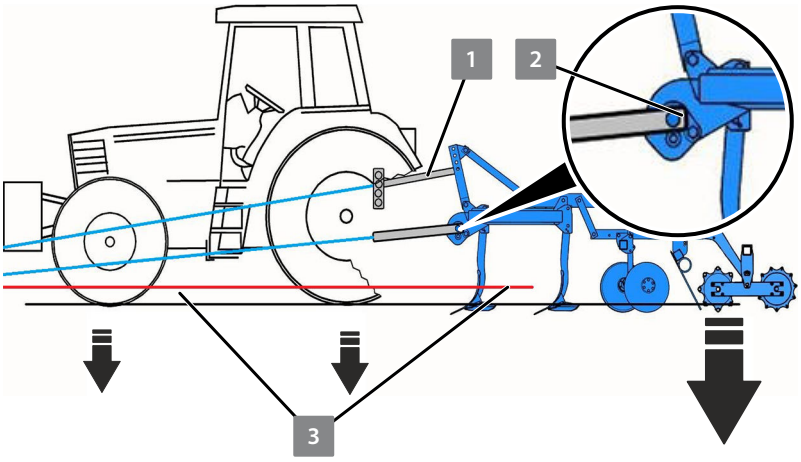


1 Top link strongly inclined
2 Cross shaft at bottom
3 Traction line steep

Behaviour with steep traction line	
Penetration of the machine	Low
Roller pressure	Low
Depth control	Worse
Lift height	Larger
Slippage	Low

Top link inclined - cross shaft at top

Lower link in upper position and top link mounted inclined:



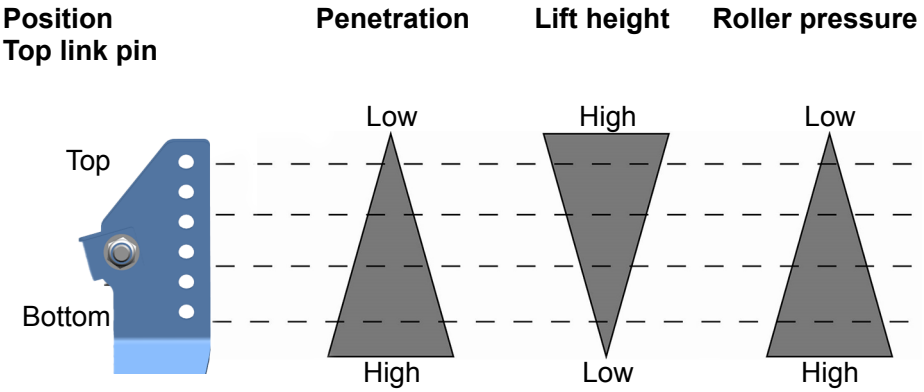
1 Top link inclined
2 Cross shaft at top
3 Traction line flat

Behaviour with flat traction line	
Penetration of the machine	High
Roller pressure	High
Depth control	Better
Lift height	Low
Slippage	Medium

Mounting position of the top link on the machine

The top link position influences the:

- Penetration
- Working depth
- Roller pressure
- Alignment of the frame



The higher **up** the top link is positioned, the:

- **worse** the soil penetration
- **higher** the lifting
- **lower** the roller pressure

The lower **down** the top link is positioned, the:

- **better** the soil penetration
- **lower** the lifting
- **higher** the roller pressure
- **finer** the crumbling
- **higher** the reconsolidation

INFORMATION

Position the top link higher on the machine if:

– the pressure applied to the roller is too high
– the roller starts to clog
– the roller sinks too deeply into the ground

4.2.2 Connecting the machine to the tractor

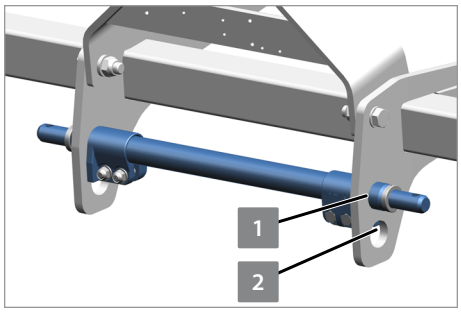
Preparing tractor and machine

1. Clean all hydraulic connections and hydraulic plugs on the tractor and the machine.
2. Ensure that the tractor is suitable for the machine.

   ↳ *Chapter 4.1.2 'Ensuring suitability of the tractor' on page 26*
3. Ensure that the tractor has been prepared.

   ↳ *Chapter 4.1.2 'Ensuring suitability of the tractor' on page 26*
4. Ensure that the machine has been prepared.

Changing cross shaft mounting position



Cross shaft in the upper mounting position

Two different heights (draw point positions) are provided at the machine for the cross shaft.

Mounting position	Effect
Cross shaft mounted at top 1	Low draw point ■ Improve penetration of the machine. ■ Increase roller pressure. ■ Reduce lifting force requirement.
Cross shaft mounted at bottom 2	High draw point ■ Increase lift height. ■ Reduce slippage. ■ Reduce roller pressure.

ATTENTION

Excessive pressure load on the rollers will cause them to become clogged or sink into the ground too much. Damage to the machine possible.

Reduce the weight load on the rollers:

– Mount the top link higher on the headstock.

INFORMATION

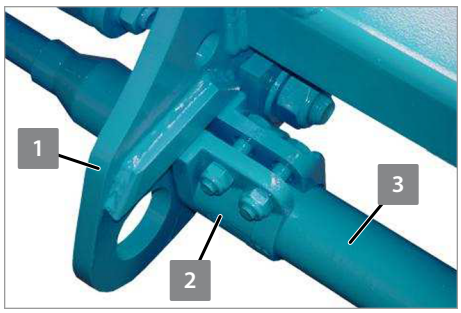
Insufficient pressure load on the rollers will cause insufficient reconsolidation or crumbling effect of the rollers.

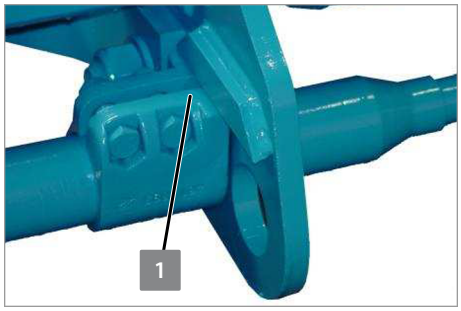
Increase the weight load on the rollers:

– Mount the top link lower on the headstock.

Preconditions:

√ The machine is parked on even subsoil.
√ Machine has been detached from the tractor.





1. Undo the nuts of the screws of the two stops 2.
2. Pull the cross shaft halfway out of the holes in the rail plates 1.
3. Remove the stops from the cross shaft 3.

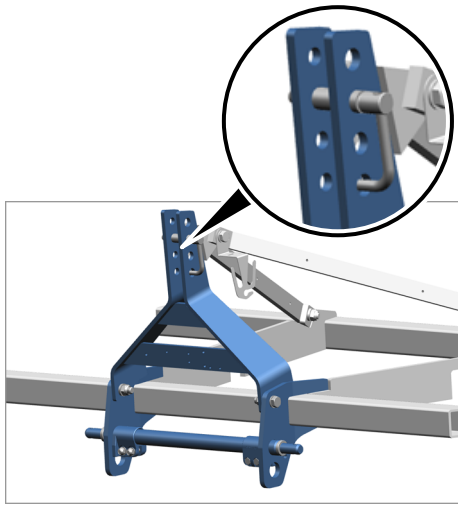
   Put them to one side.
4. Pull the cross shaft out of the holes.
5. Insert the cross shaft into the desired hole of the rail plate.

   Push approx. 50 cm inwards.
6. Slide the stops onto the cross shaft.

   Make sure the side with the support surface 1 always faces the rail plate.
7. Push the cross shaft through the holes until the two ends of the cross shaft, on both the left and right, are an equal distance from the rail plates.
8. Push the stops up to the rail plates.

   Make sure that the support surfaces are in contact with the stop of the rail plates.
9. Tighten the nuts of the screws.

Changing top link mounting position



Example image

Several mounting positions are provided for the top link on the headstock. *Chapter 4.2.1 'Practical knowledge - Effects of the mounting position' on page 28*

Preconditions:

√ Machine has been lowered.

√ Hydraulic system of the tractor is set to the control position.

1. When the machine is mounted on the tractor:
   - Adjust the top link length until the top link pin is relieved of load.
2. Unlock and remove the top link pin.
3. Move the top link to its new position:
   - With the mounted machine, adjust the length of the top link until the top link pin can be inserted without having to actuate the hydraulics.
4. Secure the top link pin with a linch pin.

   CAUTION: Risk of injury due to unsecured top link pin An unsecured top link pin can slip out and become lost. This will result in personal injury or damage to the machine.
   – Always secure the top link pin.
   – Make sure nobody is in the hazardous area of the machine when it is lifted.

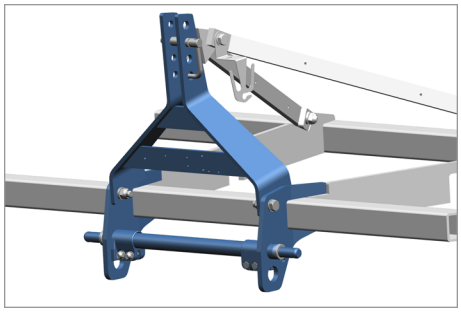
Mounting the machine

Preconditions:

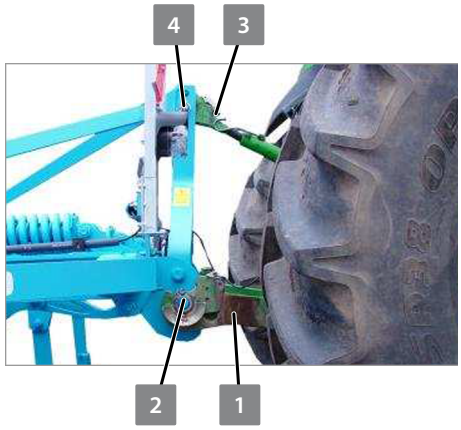
√ Cross shaft is mounted in the correct position.

√ Top link is mounted in the correct position.

1. Switch the hydraulic system of the tractor to position control mode.



2. Reverse the tractor straight up to the machine, ensuring the catch hooks of the lower links can be coupled with the cross shaft.



3. Connect the lower links 1 of the tractor to the cross shaft 2.
4. Secure the cross shaft 2 with the safety equipment.

   INFORMATION: Observe the tractor documents.
   ↳ *Chapter 1.4 'Further applicable documents' on page 5*
5. Connect the top link 3 to the headstock using the top link pin 4.

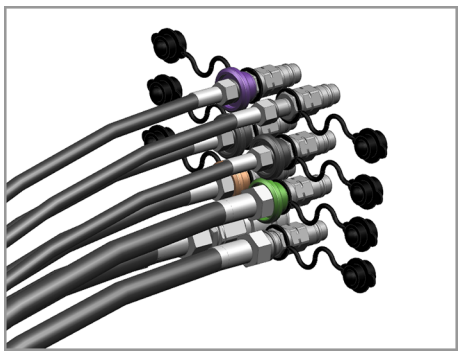
   INFORMATION: The position of the top link also presets the pressure load on the rollers and therefore the degree of crumbling and reconsolidation of the soil.
6. Secure the top link pin 4 with a linch pin.
7. Connect the lines and hoses of the electronics and hydraulics.

   ↳ *'Connect lines and hoses' on page 37*

Connect lines and hoses

1. Depressurise the additional tractor control units.
2. Secure the tractor and machine to prevent them from rolling away.

   ⚠ **WARNING:** When standing between the tractor and machine, there is a risk of the tractor rolling away or of sudden machine movements.



Example image

3. ⚠ **WARNING:** Hydraulic oil under pressure may squirt out of the hydraulic hoses when they are connected and disconnected.

   INFORMATION: Ensure that the hydraulic connections and hydraulic plugs are clean.

   Connect hydraulic hoses to the tractor.

   - Make certain they are assigned correctly. *Chapter 12.7.2 'Hydraulic connections' on page 80*

4. Connect the electric lines to the tractor.
5. Check correct installation and function of the lighting equipment.
6. If necessary, fix the control box or operation terminal into position in the tractor cab.
7. If necessary, connect the lines for the control box or operation terminal.
8. Prepare for driving.

   - *'Preparing for driving' on page 38*

Preparing for driving

Precondition:

√ Machine is mounted.
√ Lines and hoses are mounted.

1. Lift the machine.
2. Lock the additional tractor control units.

   ⇨ Machine is mounted and ready for driving.

   INFORMATION: Further measures are required before driving on public roads. *Chapter 5.2 'Preparing for road travel' on page 39*

5 Road travel

5.1 Information on road travel

INFORMATION

Laws on driving on public roads differ in many countries.

- ▶ Pay particular attention to local laws and regulations regarding the following points:
  - Driving on public highways
  - Maximum permissible transport height
  - Maximum permissible transport width
  - Maximum permissible transport weight
  - Lighting equipment
  - Markings
- ▶ NEVER exceed the maximum transport speed of the machine.
  ↳ *Chapter 12.6 'Performance data' on page 80*

5.2 Preparing for road travel

Check and prepare the following assembly groups, safety devices and functions in accordance with these operating instructions before each road travel:

Checklist for preparing to drive on public roads

Assembly group	Requirement	Check
Tractor-machine combination	Machine is mounted to the tractor ready for driving. ↳ *Chapter 4.2 'Attaching the machine' on page 28*	☐
Connections of the machine to the tractor	Top link pin is secured.	☐
	Connections of the lower links with the cross shaft are secured.	☐
	Headstock is vertical.	☐
	On the tractor: Hydraulic system of the three-point linkage is set to position control.	☐
Lighting equipment	Lighting equipment is mounted and fully functional.	☐
Control units of the tractor	To avoid unintentional movements of the machine, the control units of the tractor are locked. The instructions of the tractor manufacturer are observed.	☐

Assembly group	Requirement	Check
Overall machine	The side shields are swivelled to the transport position to ensure adherence to a transport width of 3 m.	☐
	Machines with a working width of 300 cm or 400 cm and equipped with the duckfoot-shares *KG37* or *KG37H*: To ensure adherence to a transport width of 3 m, the duckfoot-shares *KG35* or *KG35H* are mounted on the two outer tines.	☐
	Maximum permissible transport height of 4 m is observed.	☐

6 Operation

6.1 Changing the setup state

6.1.1 Converting the shares

Background

DANGER

Serious crush injuries

A machine with a high dead weight can move downwards independently.

Serious crush injuries and puncture wounds caused by sharp components, as well as deep lacerations caused by sharp-edged components, can lead to life-threatening harm.

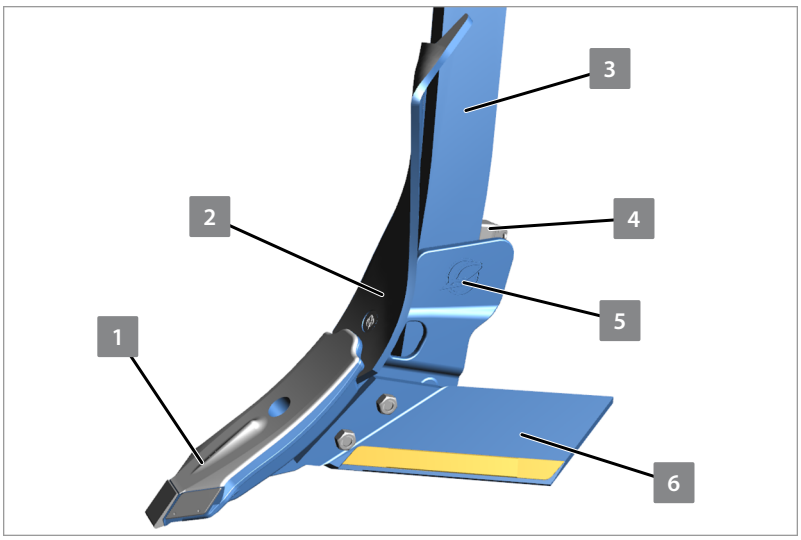
- NEVER walk or stand underneath unsecured machines.
- Use suitable equipment to secure machines against lowering.

CAUTION

Risk of being crushed at moving mechanical components

Components with a high dead weight can move downwards independently.

- NEVER reach between components that can move independently under their own dead weight.
- When moving the components manually: Wear protective gloves.



1 Point
2 Guide plate
3 Stalk
4 Linch pin with safety bar
5 Share base with quick-change system
6 Wing share

The machine can be used with various share systems that enable both deep soil cultivation and shallow full-surface soil cultivation.

The points and the wing shares can be mounted as hard-faced equipment.

Hard-faced points or wing shares have a significantly longer service life than points or wing shares that are not hard-faced.

When converting to another share system or when replacing worn parts, the share bases with a quick-change system are removed from the stalk.

The user can then replace the corresponding components separately on the share base.

INFORMATION

Adherence to the 3 m transport width:

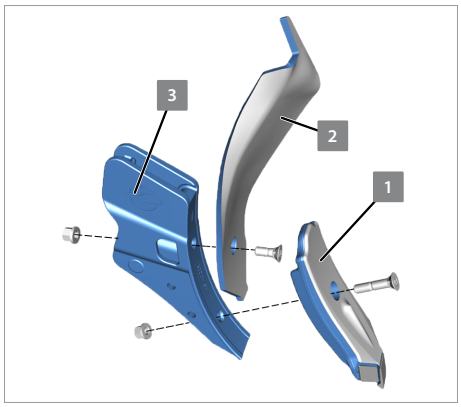
For machines with a working width of 300 cm or 400 cm and equipped with the duckfoot-shares *KG37* or *KG37H*:

– To ensure adherence to the 3 m transport width, the duckfoot-shares *KG35* or *KG35H* must be mounted on the two outer tines.

Converting the shares

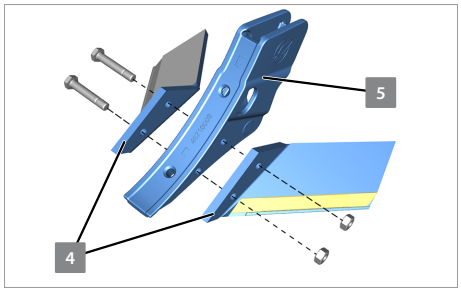
1. Remove the shares.

   Chapter 6.1.2 'Changing shares at the quick-change system' on page 44



2. Replace the guide plate 2 and the point 1 on the share base 3, if required.
   - Observe the information on the tightening torques.

     Appendix B 'Tightening torques screws ' on page 89
     Appendix B.4 'Points' on page 93



3. Replace the wing shares 4 on the share base 5, if required.
   - Observe the information on the tightening torques.

     Appendix B 'Tightening torques screws ' on page 89
     Appendix B.4 'Points' on page 93
4. Equip all the shares in the same manner.

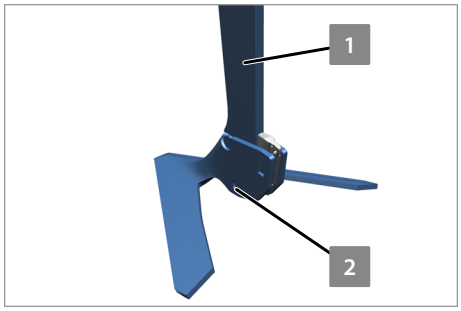
   INFORMATION: Share selection for adherence to a transport width of 3 m.
5. Mount the newly equipped shares on the quick-change system.

   Chapter 6.1.2 'Changing shares at the quick-change system' on page 44

   ⇨ The shares have been converted.

6.1.2 Changing shares at the quick-change system

Background



The quick-change system allows easy mounting and removal of the shares 2 on the tine 1.

Shares can be replaced quickly with another share and the entire machine can be converted in just a few minutes.

INFORMATION

Adherence to the 3 m transport width:

For machines with a working width of 300 cm or 400 cm and equipped with the duckfoot-shares *KG37* or *KG37H*:

– To ensure adherence to the 3 m transport width, the duckfoot-shares *KG35* or *KG35H* must be mounted on the two outer tines.

Preparing for change

DANGER

Serious crush injuries

A machine with a high dead weight can move downwards independently.

Serious crush injuries and puncture wounds caused by sharp components, as well as deep lacerations caused by sharp-edged components, can lead to life-threatening harm.

– NEVER walk or stand underneath unsecured machines.
– Use suitable equipment to secure machines against lowering.

1. Secure the tractor-machine combination to prevent it from rolling away.
2. Switch the rear lifting gear of the tractor to position control.
3. Lift the machine fully.
4. Fold the machine in.
5. Secure the machine against unintentional folding out.
6. Lock the tractor control units.
7. Switch off the tractor engine.

8. Secure the lifted machine with suitable supports against unintentional lowering.

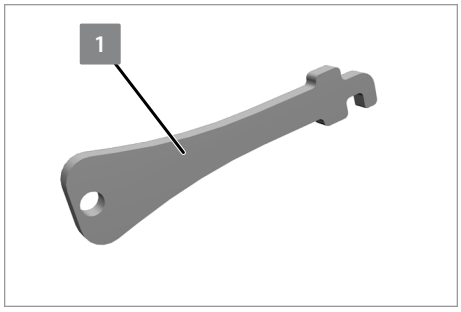
   ⇨ Conversion has been prepared.

Remove the share

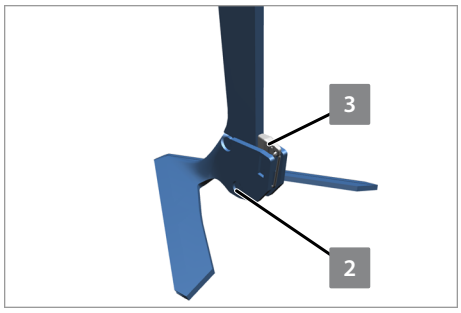
Protective equipment:
- Safety shoes
- Protective gloves, mechanical hazard

1. Wear protective gloves.

   CAUTION: Worn components may have sharp edges. There is therefore a risk of cuts.



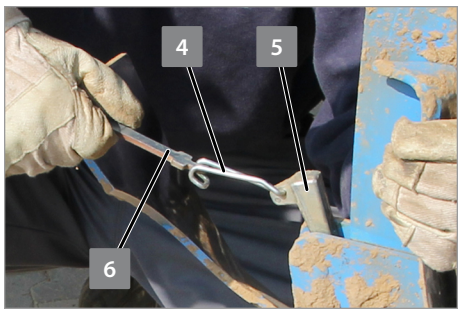
2. Take the hook wrench 1 from the document box.



3. At the share 2, insert the hook wrench 1 into the safety bar of the linch pin 3.

   CAUTION: Crush risk when folding in/out the linch pin

4. Hold the share in the detent position.



5. Swivel the safety bar 4 of the linch pin 5 to the rear with the hook wrench 6.
6. Extract the linch pin from the top.
7. To release the share from the tine:
   Hold the share with both hands and swivel it to the rear.
8. Pull the share downwards.
9. Place down the share outside the machine.

   ⇨ The share has been dismantled.

INFORMATION

The shares can be replaced or, if necessary, converted.

Chapter 6.1.1 'Converting the shares ' on page 41

Mount the share

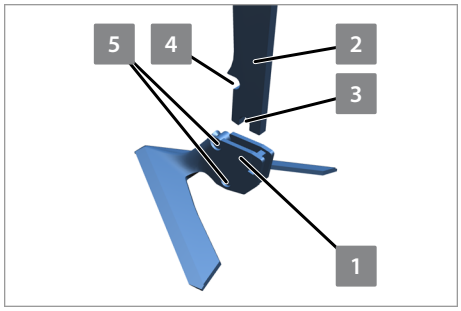
Protective equipment:
- Safety shoes
- Protective gloves, mechanical hazard

INFORMATION

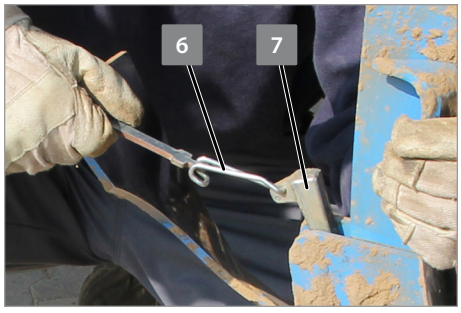
Adherence to the 3 m transport width:

For machines with a working width of 300 cm or 400 cm and equipped with the duckfoot-shares *KG37* or *KG37H*:

– To ensure adherence to the 3 m transport width, the duckfoot-shares *KG35* or *KG35H* must be mounted on the two outer tines.



1. Slide the share 1 onto the tine 2 from below.
2. Mount the share with its bracing rods 5 initially in the detent 3 and then in the detent 4 of the tine.



3. Insert the linch pin 7 from the top between the share guide and the tine.

   CAUTION: Crush risk when folding in/out the linch pin

   ⇨ The linch pin holds the share in the detent position.
4. Fold down the safety bar 6.

   ⇨ The safety bar holds the linch pin 7 in place.

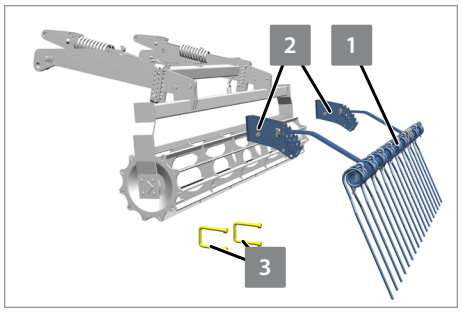
   ⇨ The share has been mounted.

6.1.3 Mounting the weed harrow

Preconditions

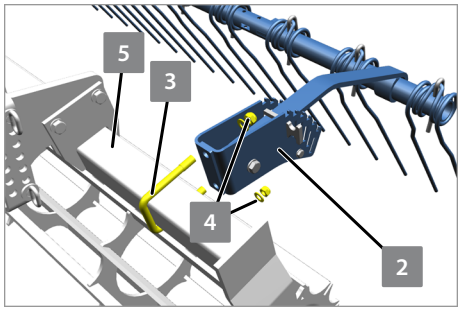
- The machine has been lowered fully.
- The tractor engine has been switched off.
- The tractor-machine combination has been secured against rolling away.

Mounting the weed harrow



Example image

The weed harrow 1 must always be mounted on a trailing roller. Brackets 2 and U-bolts 3 are available for mounting. There is one harrow segment for each trailing roller segment.

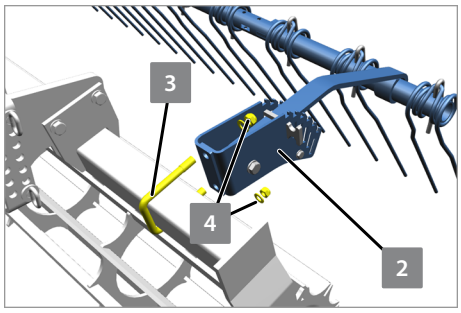


Example image

1. Position both U-bolts 3 on the supporting tube 5 of the roller.
2. Mount the brackets 2 of the harrow segment.
3. Install and tighten the washers and nuts 4. ↳ *Appendix B 'Tightening torques screws ' on page 89* ↳ *Appendix B.4 'Points' on page 93*
4. If necessary, adjust the weed harrow.

Removing weed harrow

1. Remove the washers and nuts 4.
2. Remove the brackets 2 of the harrow segment.
3. Remove both U-bolts 3.



Example image

6.2 Adjusting the machine

6.2.1 Adjusting working depth

Depending on the machine equipment, the working depth can be adjusted mechanically or hydraulically.

Adjusting working depth of tines mechanically

CAUTION

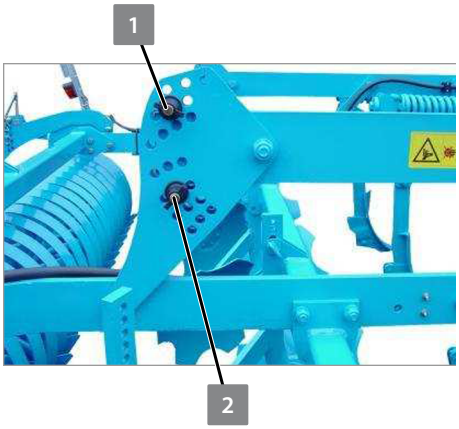
When performing adjustments, there is a risk of crushing, cutting, trapping and hitting hands, feet and other body parts on heavy and partly spring-loaded and/or sharp-edged parts.

- Park the machine on solid and level ground.
- Adjustments may only be performed by appropriately instructed personnel.
- Wear protective clothing.
- Switch off the tractor and remove the ignition key.
- Secure the tractor-machine combination to prevent it from rolling away unintentionally.

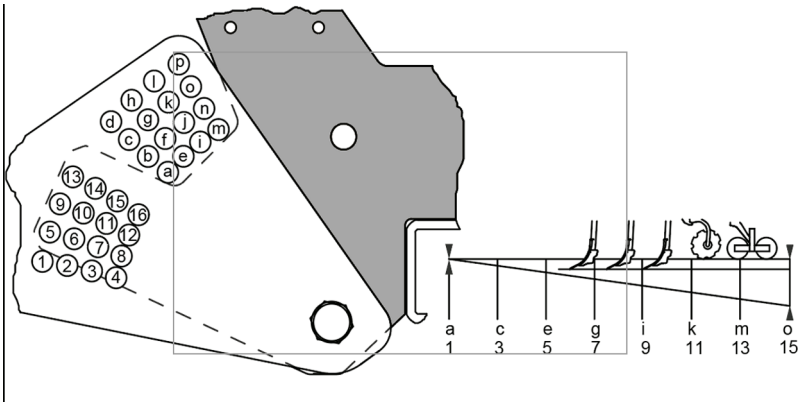
The working depth of the tines can be adjusted from approx. 3 cm to 30 cm.

The depth is adjusted using pins.

1. Lift the machine via the tractor's hydraulics.
2. Unlock the bottom pins 2 by removing the linch pins.



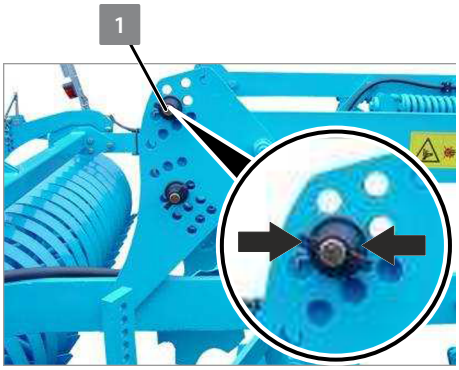
Example image



Example on the left

3. Insert the bottom pins according to the desired working depth into an appropriate hole in the adjusting plates:
   - lower hole = larger working depth
   - higher hole = smaller working depth
4. Use the machine.

   ⇨ When the working depth is reached, the top pins are relieved.



Example image

5. Insert the top pins 1 directly above the carrier to ensure the weight of the rollers additionally supports the soil penetration of the machine.

   INFORMATION: When the machine is lifted, the free space between the rollers and the soil is also increased.

6. Secure the pins with linch pins.

   INFORMATION: If the machine is equipped with touch wheels, the setting of the touch wheels must also be adjusted when changing the working depth.

Lowering depth of rollers

To prevent the roller from sinking too much when being lifted, the pins must be inserted as deeply as possible into a hole in the adjusting plates above the carrier in the working position.

INFORMATION

The pressure load on the rollers is determined by the position of the top link.

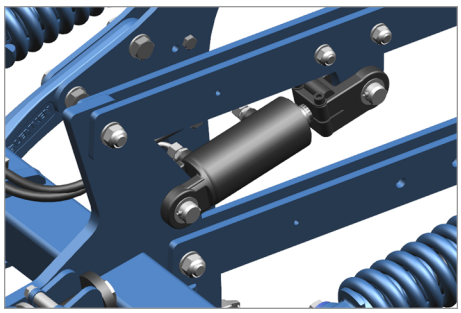
'Changing top link mounting position' on page 35

1. Move the machine to the working position.

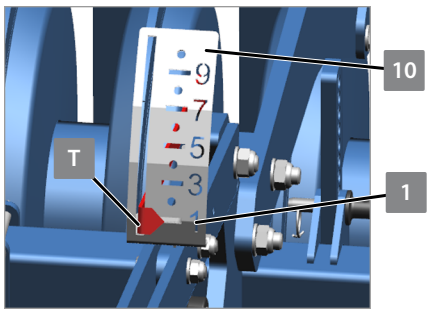
   ⇨ The pin is relieved.

2. Unlock and pull out the pin.
3. Insert the pin into a deeper hole of the adjusting plates.
4. Secure the pin.

Hydraulic working depth adjustment



Hydraulic rams are used to adjust the desired depth adjustment as required.

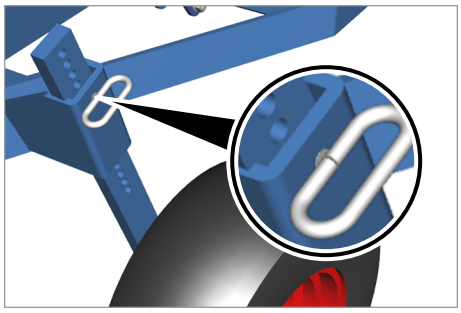


The currently adjusted working depth is displayed on the scale:

The working depth (red arrow T) is displayed on the scale:

- 1 = minimum depth (roller at bottom)
- 10 = maximum depth (roller at top)

Working depth of the support wheels

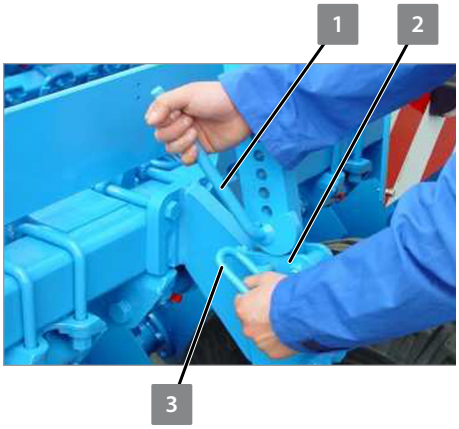


The support wheels are mounted to the outside of the frame at the front and improve the depth control of the machine.

Depth adjustment is carried out via the pin adjustment using the pin and the eccentric lever.

1. Lift the machine

   ⇨ The support wheels are not loaded.

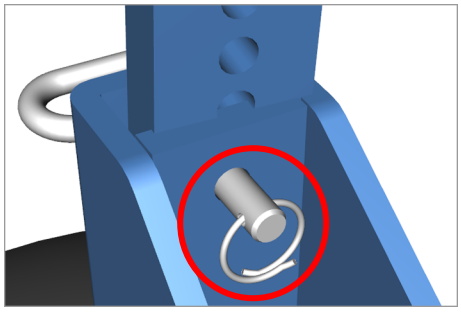


2. Insert the eccentric lever 1 directly above the bracket 2 and secure it with the linch pin.

   CAUTION: If the pin and the eccentric lever are dismantled at the same time, the support wheel is no longer held in place and will move downwards unsecured.
   - Never dismantle the pin and the eccentric lever at the same time.
   - Secure the eccentric lever with the linch pin.

3. To relieve the pin 3, swivel the eccentric lever 1.
4. Unlock and pull out the pin.
5. Swivel the eccentric lever 1 to move the support wheel to the desired position.

   INFORMATION: Support wheels that are set too low can have a negative impact on the soil penetration of the machine.



6. Insert and secure the pin 3.

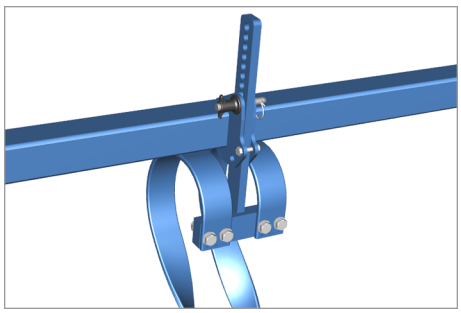
   INFORMATION: Adjust all the support wheels to the same depth.

7. Insert the machine again.
8. Check and, if necessary, adapt the adjustments.

   ⇨ The working depth of the support wheels has been adjusted.

Working depth of the levelling tools

The working depth of the levelling tools (e.g. levelling tines) is adjusted using pins:



1. Unlock the pin.
2. To relieve the pin, push the stalk upwards.
3. Pull out the pin.
4. Push the stalk to the desired position.
5. Insert the pin.
6. Secure the pin.

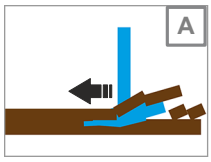
   ⇨ The working depth of the levelling tools has been adjusted.

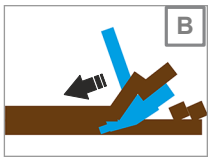
Working depth of outer discs

The outer discs are adjusted with the help of the pins as follows:

1. Unlock the pin.
2. To relieve the pin, push the disc carrier upwards.
3. Pull out the pin.
4. Push the disc carrier to the desired position.
5. Insert the pin.
6. Secure the pin.

6.2.2 Adjusting share position





The share position or the pitch angle of the tines can be altered.

A “flat” share position A in conjunction with wing shares ensures a flat tillage horizon (point and wing shares work at almost the same depth) and reduces the traction requirement, even in heavy soils.

A “steep” share position B ensures that the tines achieve good penetration even in hard and dry soils.

The user can alter the share position by inserting the shear bolt 2 in a different position.

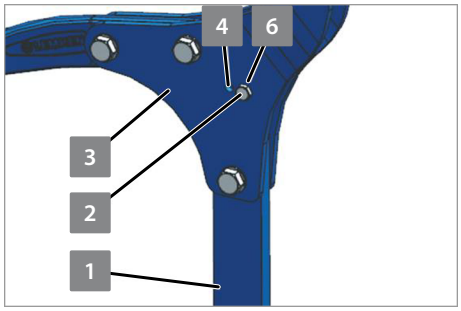
CAUTION

Risk of being crushed at moving mechanical components

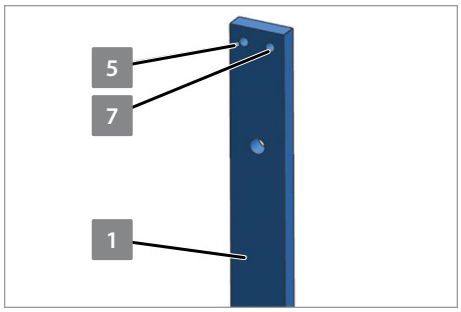
Components with a high dead weight can move downwards independently.

– NEVER reach between components that can move independently under their own dead weight.
– When moving the components manually: Wear protective gloves.

1. Lift the machine a few centimetres.
2. Secure the machine against lowering.
3. Remove the ignition key.
4. Secure the tractor-machine combination to prevent it from rolling away.



5. Loosen and remove the nut from the shear bolt 2.
6. Press out the shear bolt 2 using a suitable tool.

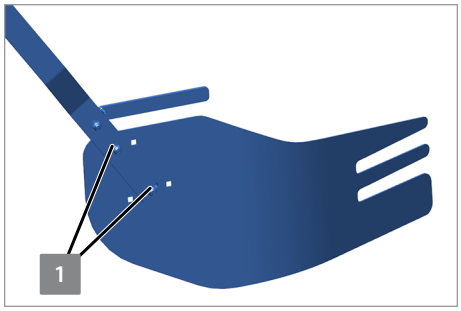


7. **For a flat share position:**
   - Swivel the tine so that the shear bolt 2 fits through the hole 4 of the tine pocket and the hole 5 of the tine.
   - Insert the shear bolt into the desired holes.
8. **For a steep share position:**
   - Swivel the tine so that the shear bolt 2 fits through the hole 6 of the tine pocket and the hole 7 of the tine.
   - Insert the shear bolt into the desired holes.
9. Screw on the nut.
10. Tighten the nut to a tightening torque of 113 Nm.
11. Make the same settings for all tines.

    ⇨ The share position has been set.

6.2.3 Adjusting lateral limiter

Adjusting side shields



The user can change the position and the inclination angle of the side shields. Various holes are available in the side shields and the stalks for this purpose.

1. Lift the machine.
2. Secure the machine against unintentional lowering.
3. Undo the two self-locking nuts 1.
4. Wear protective gloves.

   CAUTION: Worn components may have sharp edges. There is therefore a risk of cuts.
5. Fully unscrew the self-locking nuts and remove the side shield from the stalk.
6. If necessary, move the side shield on the stalk to a desired new position.
7. Screw on new self-locking nuts and tighten them to 80 Nm.

INFORMATION

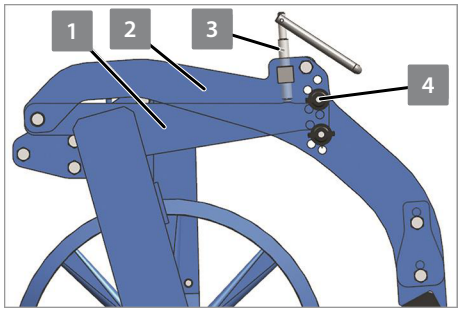
To maintain a 3 m transport width:

– Mount the side shields shifted towards the centre of the machine.

6.2.4 Adjusting rollers

6.2.4.1 Knife roller

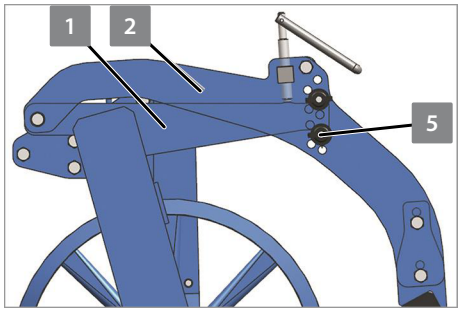
Working depth of the knives



On both sides of the roller:

1. ■ Secure the tractor and machine to prevent them from rolling away.
   ■ Secure lifted parts to prevent them from lowering.
   ■ Remove the ignition key.
2. Relieve the top pin 4.
   ■ To do so, turn the turnbuckle 3 clockwise.
3. Unlock the top pin 4.
4. Pull out the top pin 4.
5. Use the turnbuckle 3 to adjust the desired working depth.
6. Insert the top pin 4 into the hole of the adjustment plate 2.
   ■ Select the hole directly above the support plate 1.
7. Secure the top pin 4 with a linch pin or spring washer.
8. Relieve the turnbuckle 3.
   ■ To do so, turn the turnbuckle anticlockwise.

Deflection height of the knife bar



Low deflection height (standard):

On both sides of the roller:

√ The lower pins 5 limit the upward deflection height of the knife bar.

► Insert the lower pin 5 into the hole of the adjustment plate 2.

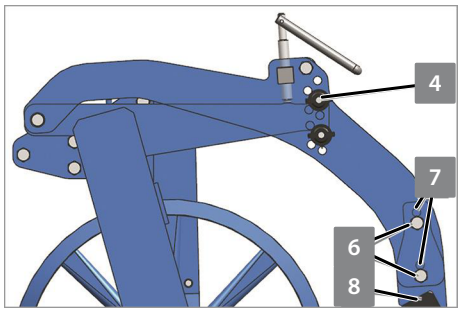
- Select the hole directly below the support plate 1.

  ⇨ The knives work more aggressively at a low deflection height.

Large deflection height (with very light or stony soils):

1. Insert the lower pin 5 into the lower holes of the adjustment plate 2.
2. Secure the lower pin 5 with a linch pin or spring washer.

Position of the knife bar



The knife bar 8 has two mounting positions.

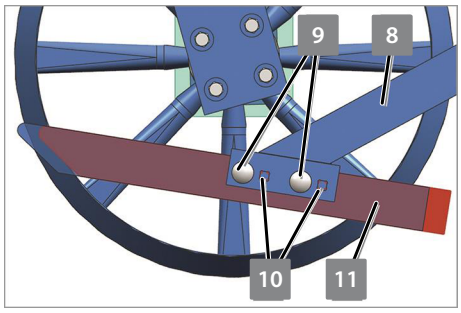
- **Upper mounting position 6 (lower hole):**
  - Default adjustment
  - Adjustment for extremely sticky soils
  - Adjustment for light soils
- **Lower mounting position 7 (upper hole):**
  - Greater working intensity, but increased risk of clogging
  - If the adjustment options via the pins 4 in the upper mounting position 6 are insufficient.

Set the knife bar lower:

On both sides of the roller:

1. Remove the screws from the holes 6.
2. Move the knife bar 8 to the lower mounting position 7.

Position of the knives



The knives 11 at the knife bar 8 have two mounting positions:

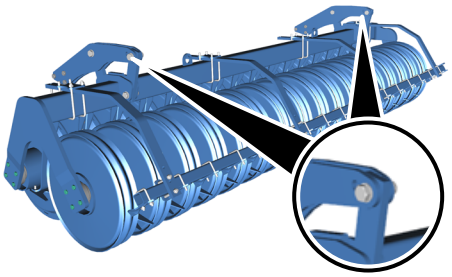
- Front position 9 (default).
- Rear position 10 (if worn).

If worn:

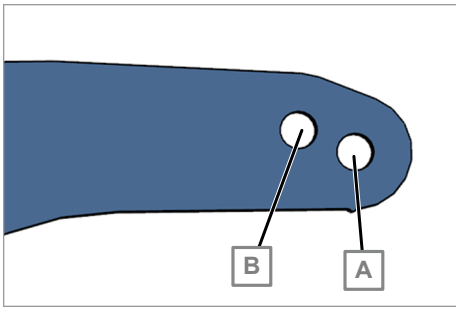
► Move the knife 11 to the rear 10.

6.2.4.2 Packer profile roller and packer double roller

Pressure load



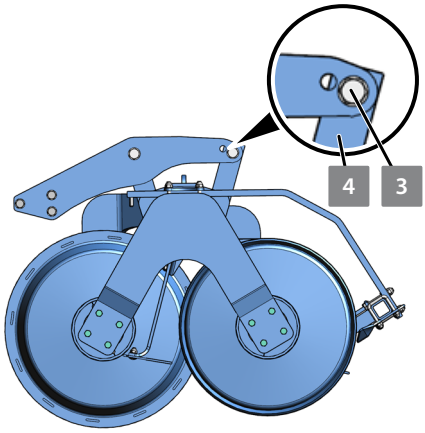
The pressure load on the packer rollers is changed via the two link positions of the rollers.



- Position A (heavy ground)
  - Higher pressure load on the front roller
  - Better reconsolidation

If the rollers no longer have sufficient drive, select position B.

- Position B (light ground)
  - Lower pressure load on the front roller
  - Less clogging



Changing the link position

1. Place the roller down on a subsoil with sufficient bearing capacity
2. To relieve the screws 3, lift the machine.
3. Unscrew the screws 3 on the link.
4. Position the link 4 until the holes are aligned.
5. Fit the screws 3.
6. Tighten the screws 3 to 200 Nm.
7. Adjust the same position for all the links.

   ⇨ The pressure load of the packer roller has been adjusted.

6.3 Working with the machine

6.3.1 Standard procedure

1. Position the tractor-machine combination.
2. If present, remove the safety guards.
3. With folding machine: Fold out machine.
4. Set the machine.
5. During forward travel, insert the machine into the soil.
6. Soil cultivation:
   - Drive the tractor over the land worked on.
   - Keep to the recommended operating speed.
   - Adapt the speed to the actual terrain.
   - Observe the working result.
   - Observe faults:
     - Blockages
     - Triggered overload safety devices
     - Sheared off shear bolts
   - Monitor hazardous areas. If necessary, stop and discontinue soil cultivation.
7. When reaching the headland: Lift the machine.
8. Once the machine has been lifted out, initiate turning at the headland.
9. Do not reinsert the machine until driving straight forward.
10. On completion of soil cultivation: Clean the machine and remove coarse dirt.
11. Prepare the machine for road travel.

6.3.2 Driving on the headland

1. Before the headland:
   Lift the machine fully.

   ATTENTION: If parts of the machine come into contact with the ground, the machine components may be damaged when turning.
2. On the headland:
   Adapt the driving speed to the actual ground and soil conditions.
3. After the headland:
   Do not lower the machine until driving straight forward.

7 Cleaning and care

7.1 After working in the field

- Remove soil from the machine.

7.2 Cleaning with high-pressure cleaner

The user can clean the machine with the high-pressure cleaner.

When cleaning, the user must observe the following:

ATTENTION

Damage due to cleaning with a high-pressure cleaner

Components may be damaged when cleaning with a high-pressure cleaner.

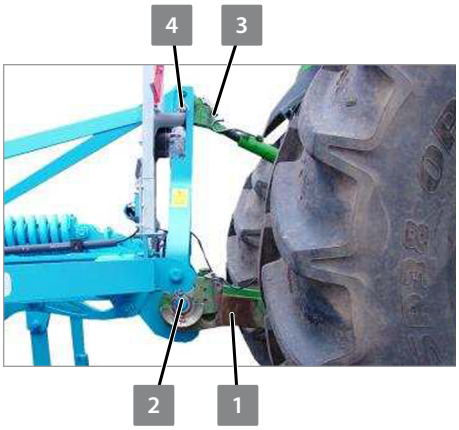
When cleaning with a high-pressure cleaner:

- Observe the position and meaning of the labels.
- Make sure that no water enters the electrical, electronic and hydraulic components.
- Do NOT point the jet of the high-pressure cleaner directly at the bearings or seals.

8 Decommissioning

8.1 Detaching the machine

Detaching machine with headstock



Precondition:

√ The subsoil is level with sufficient bearing capacity.

1. Secure the tractor and machine to prevent them from rolling away.

   ⚠ **WARNING:** When standing between the tractor and machine, there is a risk of the tractor rolling away or of sudden machine movements.

2. Lower the machine.
3. Depressurise the additional tractor control units.
4. ⚠ **WARNING:** Hydraulic oil under pressure may squirt out of the hydraulic hoses when they are connected and disconnected.

   Dismantle all the lines and hoses from the tractor and secure them on the machine.

5. Mount protecting caps on the hydraulic hoses.
6. Relieve the top link pin 4, e.g. by actuating the tractor hydraulics.
7. Secure the top link 3 to prevent it from lowering.
8. Dismantle the top link pin 4 and secure it on the tractor.

   ⇨ The top link 3 and the headstock have been disconnected.

9. Unlock the cross shaft 2 in the lower links 1.
10. Lower the lower links 1 of the tractor until the lower links are uncoupled from the cross shaft 2.
11. Make sure the tractor and the machine are not connected in any way.
12. Make sure that no machine parts can become caught on the tractor or dragged along by it, e.g. hydraulic hoses.
13. Carefully drive the tractor straight away from the machine.

    ⇨ Machine has been removed.

8.2 Storing and wintering the machine

INFORMATION

Before wintering, check the machine according to the lubrication schedule. Apply grease, if necessary.

Preconditions:

√ Machine is cleaned.

1. Store machine in a frost-free and dark place under cover.

   ATTENTION: Light (UV radiation) accelerates the ageing process of plastics.

2. Store moisture-sensitive components and the operating instructions in a dry and frost-free place.

9 Maintenance and repair work

9.1 Maintaining the machine properly

Personnel

Certain activities, e.g. working on hydraulic hoses, should only be carried out by service personnel.

These tasks are:

- Highlighted with the symbol
- Marked in the SERVICE PERSONNEL column in the maintenance schedule

Spare parts

Permissible spare parts are available from *agroparts*.

The QR code takes the user directly to *agroparts*. There, the user can find spare parts for the machine.

9.1.1 Preparations

INFORMATION

Necessary deviations from the following procedure are described in the respective maintenance chapters.

1. Turn off the engine.
2. Engage the parking brake of the tractor.
3. Remove the ignition key.
4. Secure the tractor-machine combination to prevent it from rolling away.
5. When working on folding machines:
   Fold out the folding parts of the machines or secure them against folding out.
6. When working on raised machines:
   Secure the machines against lowering (e.g. with support elements).
7. Inform other persons about the work on the machine.

9.1.2 During the maintenance and repair

To prevent accidents or injuries:

- Wear protective equipment.
- Use auxiliary equipment, e.g.:
  - Suitable tools
  - Climbing aids
  - Supporting elements
- For dismantling and mounting heavy components:
  Use hoisting gear.
- Check nuts and screw heads etc. for wear and tear. Consult a specialist if necessary.
- Follow maintenance instructions.

9.2 Maintenance

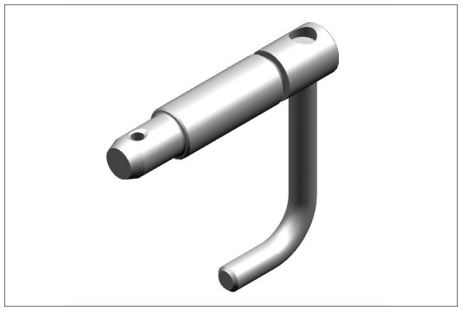
9.2.1 Maintenance schedule

Chap.	Task to execute	Before the season	After cleaning	After the first 2 operating hours	Every 10 operating hours	Every 20 operating hours	Every 50 operating hours	Every 100 operating hours	Every 200 operating hours	Every 4000 operating hours	Annually	At the latest 6 years after date of manufacture	*SERVICE PERSONNEL*	Page
9.2.2	*Checking the top link pin*	●					●							*66*
9.2.2	*Checking the cross shaft*								●		●		●	*66*
9.2.3.1	*Check tyres*				●									*66*
9.2.3.1	*Checking air pressure*				●									*67*
9.2.3.1	*Checking wheel nuts*	●		●			●							*67*
9.2.4	*Checking the lighting equipment*						●							*67*

Chap.	Task to execute	Before the season	After cleaning	After the first 2 operating hours	Every 10 operating hours	Every 20 operating hours	Every 50 operating hours	Every 100 operating hours	Every 200 operating hours	Every 4000 operating hours	Annually	At the latest 6 years after date of manufacture	*SERVICE PERSONNEL*	Page
9.2.4	*Check marking*						●							*67*
9.2.4	*Checking safety sticker*						●							*67*
9.2.4	*Checking other safety equipment*						●							*68*
9.2.5	*Checking hydraulic hoses*				●									*68*
9.2.5	*Replacing hydraulic hoses*											●	●	*68*
9.2.5	*Checking hydraulic connections*				●									*68*
9.2.6	*Checking connector plugs and cables*	●					●							*69*
9.2.7	*Check the concave discs*				●									*69*
9.2.7	*Checking soil cultivation implements*				●									*69*
9.2.8.1	*Checking bolted connections of roller oscillation*	●		●				●						*70*
9.2.8.2	*Checking the scraper of the trapeze packer roller*						●							*70*
9.2.8.3	*Checking the scraper of the flexring roller*						●							*70*

9.2.2 Tractor connection

Checking the top link pin



1. Visual inspection of the top link pin for:
   - Damage
   - Wear
2. Replace damaged or worn top link pins.

Checking the cross shaft

Personnel: ■ Service personnel

1. Visual inspection by the user
   - Wear
   - Damage
   - Peculiarities when driving

   Replace damaged, deformed or worn cross shafts immediately.
2. Ensure the cross shaft is fitted correctly.
3. Have wear limits measured once a year.

9.2.3 Support wheels

9.2.3.1 Tyres and wheels

Check tyres

▶ Visual inspection

- Damage
- Wear

Replace damaged tyres immediately.

Checking air pressure

WARNING

Risk of accident due to incorrect air pressure

Excessive air pressure in the tyres may cause them to burst. Insufficient air pressure can lead to overloading of the tyres. This will have a negative influence on accurate follow-on of the machine. This may result in accidents with injuries or death of persons or damage to the machine.

– Do NOT use the assembly air pressure stated on the tyres.
– Set air pressure according to the details in the technical data. *Chapter 12 'Technical data' on page 79*

▶ Check air pressure. Correct according to the details in the technical data. *Chapter 12.10 'Tyres and wheels' on page 81*

Checking wheel nuts

▶ Tighten the wheel nuts on the machine to the respective tightening torque.

9.2.4 Safety equipment

Checking the lighting equipment

▶ Ensure proper functioning.

Check marking

▶ Ensure proper functioning.

Checking safety sticker

▶ Ensure legibility and integrity.

Checking other safety equipment

► Ensure the functionality and integrity of all other safety equipment.

9.2.5 Hydraulics

Checking hydraulic hoses

1. Check hydraulic hoses for damage and leakages.
   ⇨ Replace damaged or defective hydraulic hoses immediately.
2. Check date of manufacture of the hydraulic hoses.
   ⇨ Have hydraulic hoses replaced at the latest after 6 years.

Replacing hydraulic hoses

Personnel: ■ Service personnel

► Replace hydraulic hoses every 6 years (according to date of manufacture).
   ⇨ Only use hydraulic hoses approved by the manufacturer, see spare parts list.

Checking hydraulic connections

1. Check the hydraulic connections for the following when pressureless:
   - Damage
   - Leakages

   ⇨ Repair damaged or leaking hydraulic connections immediately or have them replaced.
2. Connect the hydraulic connections pressureless.
3. Check leak tightness of the hydraulic connections under pressure.
   ⇨ Repair damaged or leaking hydraulic connections immediately or have them replaced.

9.2.6 Electrics

Checking connector plugs and cables

► Perform visual inspection of the connector plugs and cables.

- Watch for bent or broken contact pins in the plugs.
- Watch for exposed places in cables.

⇨ Repair damaged connector plugs or cables immediately or have them replaced.

9.2.7 Checking the soil cultivation tools

Check the concave discs

1. Visual inspection
   - Damage
   - Wear
2. Immediately replace damaged concave discs.
3. Replace worn concave discs that measure less than 460 mm in diameter.
   Chapter 9.4.1 'Replacing concave discs' on page 73

Checking soil cultivation implements

► Visual inspection

- Damage
- Wear

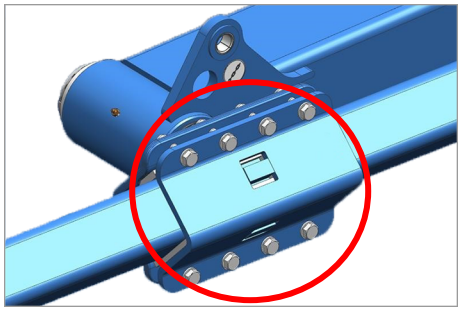
Replace damaged or worn soil cultivation implements.

Chapter 6.1 'Changing the setup state' on page 41

Chapter 9.4 'Work instructions' on page 73

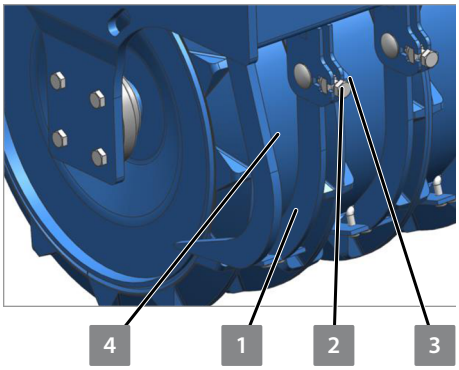
9.2.8 Rollers

9.2.8.1 Checking bolted connections of roller oscillation



▶ Tighten bolted connections in a criss-cross fashion to 120 Nm.

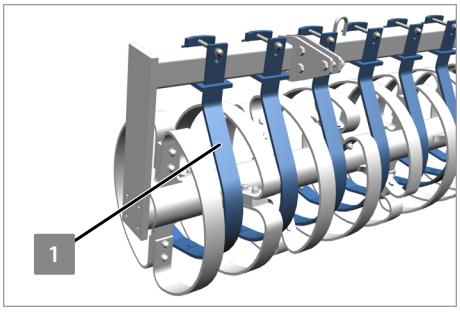
9.2.8.2 Checking the scraper of the trapeze packer roller



1. Check the distance between the scraper 1 and the roll sleeve 4:
   - Turn the roller through 360°.

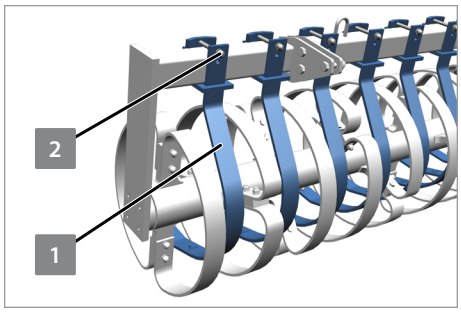
   INFORMATION: The scraper must not touch the roll sleeve at any position.
2. At a distance of < 0.1 mm or > 0.5 mm: Adjust the distance:
   - Undo the nut 3.
   - Adjust to a distance of 0.1 ... 0.5 mm using the adjusting screw 2.
   - Tighten the nut 3.
     – *Appendix B 'Tightening torques screws ' on page 89*
     Appendix B.4 'Points' on page 93
   - Check the adjustments and correct, if necessary.

9.2.8.3 Checking the scraper of the flexring roller



1. Check the scrapers 1 for wear.
2. With a remaining thickness < 5 mm: Replace the scraper.

Replace scrapers



Target: Avoid consequential damage to the implement caused by fallen-off scrapers.

1. Dismantle worn scrapers 1.
2. Mount new scrapers.
   - Scrapers are mounted on the bar on the side facing the driving direction.
3. Tighten the screw 2 to 93 Nm.

9.3 Lubricating

9.3.1 Lubrication schedule

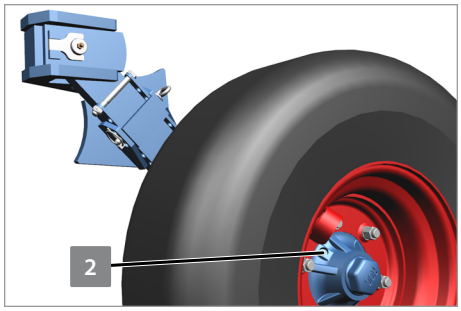
INFORMATION

The lubrication points are colour coded on the machine.

Chap.	Task to execute	Before the season	After cleaning	Every 10 operating hours	Every 20 operating hours	Every 50 operating hours	Every 100 operating hours	Page
9.3.2	*Lubricate wheel bearing*	•					•	*72*
9.3.2	*Lubricating hydraulic rams*	•	•		•			*72*
9.3.3	*Grease top link pin*	•	•		•			*72*
9.3.3	*Grease pin*	•	•					*72*
9.3.3	*Grease piston rods*	•	•					*73*
9.3.3	*Grease surfaces*	•	•					*73*

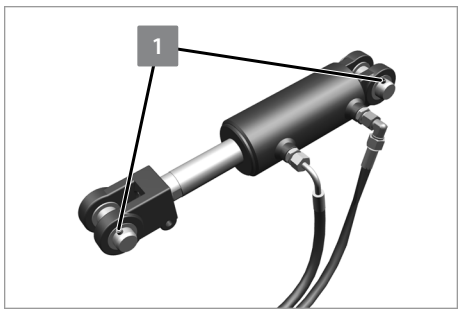
9.3.2 Lubricating components via grease nipples

Lubricate wheel bearing



- Lubricate 1 lubricating point at the wheel bearing 2.

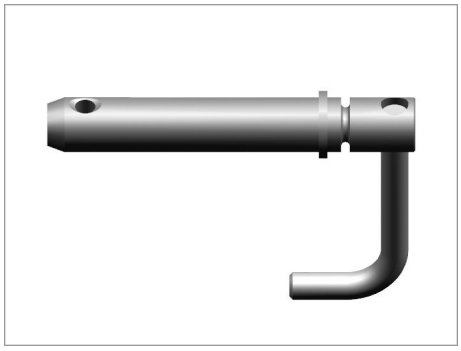
Lubricating hydraulic rams



- Lubricate 2 lubricating points at each hydraulic ram .

9.3.3 Grease components

Grease top link pin



- Dismantle, grease and reassemble the top link pin.

Grease pin

- Dismantle pin, grease and reassemble.

Grease piston rods

► Grease piston rods with an acid-free grease.

Grease surfaces

► Grease uncoated surfaces that can rust.

9.4 Work instructions

9.4.1 Replacing concave discs

DANGER

Serious crush injuries

A machine with a high dead weight can move downwards independently.

Serious crush injuries and puncture wounds caused by sharp components, as well as deep lacerations caused by sharp-edged components, can lead to life-threatening harm.

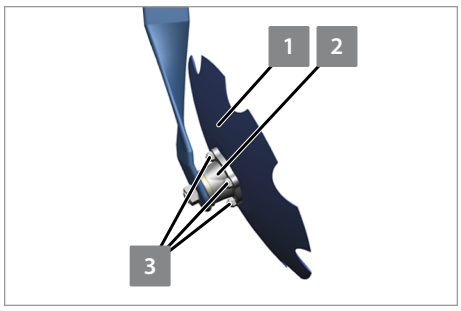
– NEVER walk or stand underneath unsecured machines.
– Use suitable equipment to secure machines against lowering.

Preconditions:

√ Tractor-machine combination is secured against rolling away.
√ The tractor rear lifting gear has been switched to position control.
√ The machine has been lifted fully.
√ Control units of the tractor are locked.
√ The tractor engine has been switched off.
√ The lifted out machine has been secured with suitable supports against unintentional lowering.

1. Wear protective gloves.

   CAUTION: Worn components may have sharp edges. There is therefore a risk of cuts.

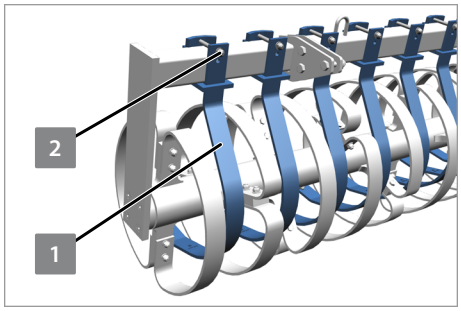


2. Carefully clean the concave disc 1 and bearing flange 2.

   ATTENTION: After dismantling the concave disc, a section of the bearing is openly accessible. Dirt must not get into this section.

3. Undo the self-locking nuts 3.
4. Remove the self-locking nuts fully.
5. Remove the concave disc from the bearing flange.
6. Clean flange area of the bearing flange.
7. Attach new concave disc.
8. Use new self-locking nuts for the flat head screws.
9. Tighten the nuts to 80...100 Nm.

9.4.2 Replace the scrapers of the flexring roller



Target: Avoid consequential damage to the implement caused by fallen-off scrapers.

1. Dismantle worn scrapers 1.
2. Mount new scrapers.
   - Scrapers are mounted on the bar on the side facing the direction of travel.
3. Tighten the screw 2 to 93 Nm.

10 Troubleshooting and error correction

10.1 Finding and eliminating errors correctly

INFORMATION

Necessary deviations from this procedure are described in the respective chapters on troubleshooting.

1. Park the tractor/machine combination.
2. Secure the tractor-machine combination to prevent it from rolling away.
3. When working on folding machines:
   Fold out the folding parts of the machines or secure them against folding out.
4. When working on a raised machine:
   Secure the machine against lowering.
5. Remove the ignition key.
6. Wear protective gear.
7. Use the following instruments:
   - Suitable tools
   - Climbing aids
   - Supporting elements
8. For dismantling and mounting heavy components:
   Use hoisting gear.
9. To avoid slipping of tools:
   - Use aids to reduce the amount of force required, e.g. extensions.
   - Check nuts and screw heads etc. for wear and tear. Consult a specialist if necessary.
10. Observe troubleshooting instructions.

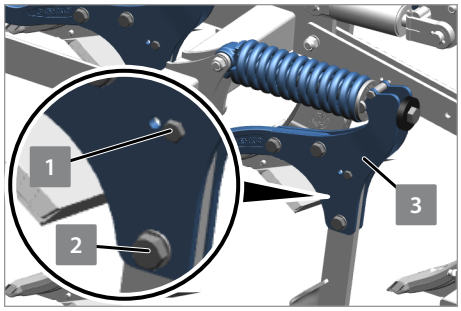
10.2 Replacing the shear bolt

CAUTION

Risk of being crushed at moving mechanical components

Components with a high dead weight can move downwards independently.

– NEVER reach between components that can move independently under their own dead weight.
– When moving the components manually: Wear protective gloves.



After actuating the overload protection:

1. Ensure that NOBODY is in the vicinity of the machine.

   ⚠ **WARNING: Risk of impact due to moving components**

2. Lift the machine.
3. Take up a position outside the swivel area of the affected stalk.
4. If the overload safety unit has triggered:
   - Place the overload safety unit in the neutral position.
5. To swivel the stalk: Undo the screw 2 on the stalk.
6. Swivel out the stalk manually.
7. Remove any remaining pieces of the old shear bolt 1.
8. Swivel the stalk back into the working position by hand.

   ⚠ **WARNING: Crush risk due to moving components** Keep hands and fingers away from the area of the stalk and the leg bracket.

   ⇨ The holes for the shear bolt are aligned precisely one above the other in the leg bracket 3 and in the stalk.
9. Have the new shear bolt at the ready.

   ATTENTION: Only use shear bolts that meet the specified dimensions and quality. Only these screws provide effective protection against damage.
10. Mount the shear bolt 1.
11. Tighten the shear bolt 1 and the screw 2.

    ⇨ The shear bolt has been replaced.

11 Shutdown and disposal

11.1 Final decommissioning

ENVIRONMENTAL PROTECTION

Do NOT leave machine parts exposed to weather conditions for an extended period, as operating materials, etc. could be released into the environment.

Precondition:

√ Further use of the machine within the meaning of these instructions is no longer intended.

1. Empty and clean all the hoppers, tubes and hoses.

   Chapter 7 'Cleaning and care' on page 60

   ⇨ All machine parts are free from auxiliary materials, e.g. fertiliser.

2. Remove all operating materials from the machine, e.g. grease.

   Chapter 12.9 'Operating materials' on page 81

3. Take the machine out of operation.

   Chapter 8 'Decommissioning' on page 61

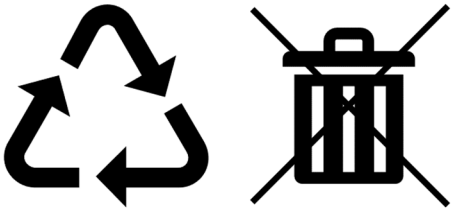
4. Have the machine disassembled by qualified specialists.

   ⚠ **WARNING: Risk of injury due to discharge of stored energy**
   Springs are under tension. Hydraulic components are pressurised.

5. Take machine parts and operating materials to a proper disposal point.

   Chapter 11.2 'Recycling and disposal ' on page 78

11.2 Recycling and disposal



Special knowledge is required for disposal of machine parts or operating materials.

1. Assign qualified specialists for disposal.
2. Recycle machine parts.
3. Dispose of auxiliary materials and operating materials in an environmentally responsible manner.

   ENVIRONMENTAL PROTECTION: Do NOT dispose of machine parts and operating materials in the environment or as residential waste.

12 Technical data

12.1 About the technical data

Machine variants

Machine variants may have varying technical data.

Different machine variants are potentially distinguished in the technical data by means of abbreviated product designations, e.g. type designation on the type plate:
Appendix A 'Type plate variants' on page 88

12.2 Dimensions

Karat 10	300	350	400
Transport length, max. [mm]	5000	5000	5000
Transport length, min. [mm]	4000	4000	4000
Transport width, max. [mm]*	3000	3500	4000
Working width, max. [mm]	2994	3440	3982

To determine the actual dimensions: Measure the machine.
* Transport width: Observe applicable national regulations.

12.3 Machine weights

Karat 10	300	350	400
Total weight, max. [kg]*	1600	1800	2000

* For determining the actual weights: Weigh the machine.

12.4 Permissible mass and loads

The maximum permissible total mass, drawbar load and axle load of the machine are listed on its type plate.

If the load capacities of the wheels are lower than the permissible axle loads, the permissible axle load is limited to the permissible load capacity of the wheels.

INFORMATION

Observe the national regulations / laws and, if necessary, approval documentation.

12.5 Required drawbar load

Specification	Value
Required drawbar load	At least 4% of the weighed machine weight or 500 kg

12.6 Performance data

Ambient and operating conditions

- Recommended operating speed 12 km/h
- Working on slopes max. +/- 20°
- Operating temperature range 0°C to 50°C

Tractor power requirements

Permitted tractor power

Karat 10		300	350	400
Tractor power	[HP]	105...180	123...210	140...240
minimum...maximum	[kW]	77...132	90...154	103...176

12.7 Connection data

12.7.1 Electrical connections

Voltage sources

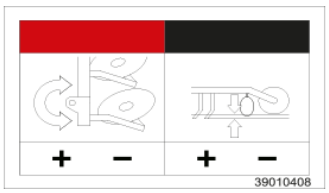
Consumer	Voltage [Volt]	Direct connection to the tractor battery	Power socket
Lighting equipment	12	-	According to DIN ISO 1724
Lighting equipment (Canada, USA)	12	-	According to ISO 1185

Voltage tolerance range: 10 V to 15 V

12.7.2 Hydraulic connections

Design according to ISO 4413

Hydraulic equipment



Connection overview of hydraulic hoses

- Black: Hydraulic depth adjustment
- Red: Outer concave discs

12.8 Noise, airborne sound

Noise level of the machine while working	≤70 dB(A)

12.9 Operating materials

Operating material	Karat 10
Hydraulic oil [type]	HLP 46 according to ISO 4406 21/19/16
Acid-free grease	According to DIN 51 502

12.10 Tyres and wheels

Tyre size	Manu-facturer	Profile	Ply rating [PR]	Load + speed index	Air pressure [bar]	Rolling circumfer-ence [mm]
10.0/80-12		AW	8		2.6 ... 2.8	

The PR number, the load and speed index and the profile designation have been vulcanised in the tyres.

12.11 Connecting systems at the machine

Permitted categories for cross shafts and top link pins			
Karat 10	**300**	**350**	**400**
Cross shaft category 3N	●	●	●
Cross shaft category 3	●	●	●
Top link pin - category 3 (∅ 32 mm]	●	●	●

12.12 Permissible roller types

Permissible roller types	
Tube bar roller	RSW 600
Double roller	DRF 400 / 400
	DRR 400 / 400
	DRR 540 / 400
Knife roller	MSW 600
Double profile ring roller	DPW 540 / 540
Flexring roller	FRW 540
Packer profile roller	PPW 600 / 540
Packer double roller	PDW 600 / 600
Packer single roller	PEW 600

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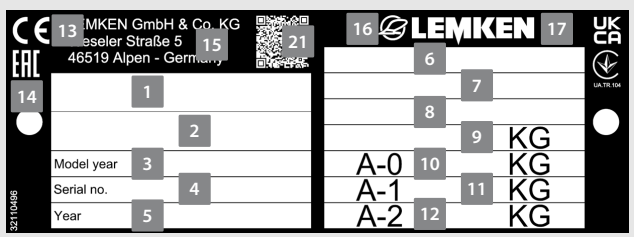
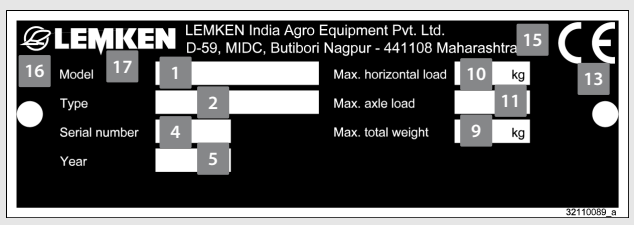
Appendix

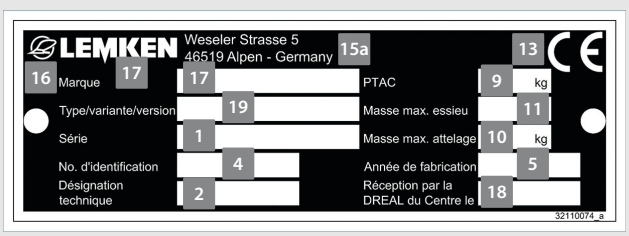
A Type plate variants

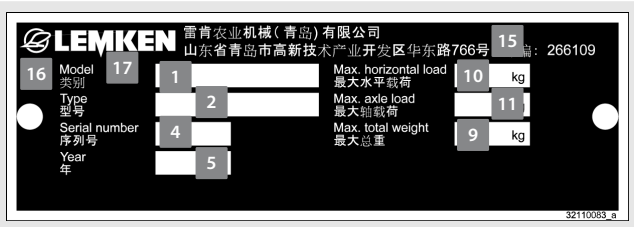
1 Series
2 Type designation
3 Model year
4 Serial number
5 Year of manufacture
6 Vehicle class, subclass, speed index
7 EU type approval number
8 Vehicle identification number. The vehicle identification number is also engraved in the frame near the type plate.
9 Permissible total mass [kg]*
10 Permissible drawbar load [kg] (axle 0)
11 Permissible axle load [kg] (axle 1)
12 Permissible axle load [kg] (axle 2)
13 CE label
14 EAC label
15 Company name and address of the manufacturer
15a Address of the manufacturer
16 Company logo
17 Manufacturer
18 Date of homologation
19 Type / Variant / Version
20 Technical conditions
21 QR code to call up LEONIS (LEMKEN Online Information System)

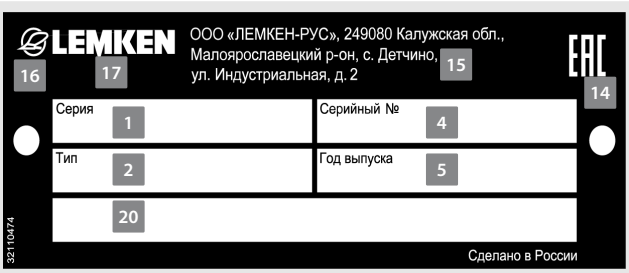
*For machines with an EU type-approval number, the permissible total mass is equal to the sum of the permissible axle loads, without a drawbar load.











B Tightening torques screws

B.1 Bolted connections, general principles

The following tightening torques refer to screw connections not specifically mentioned in these mounting instructions. Special tightening torques are indicated in the text.

- Identify screw connection:
  - Identification on the screw head
  - Parts list of the mounting set
  - Spare parts list

► Tighten screw connections with a torque wrench.

Self-locking nuts

- Self-locking nuts that have been loosened
  - Replace with new self-locking nuts.
  - Use a high-strength locking compound.

Pins with anti-rotation device

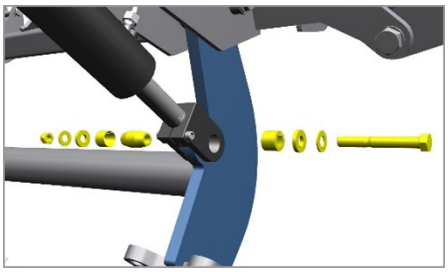
Bonded screws that have been loosened MUST be bonded again during mounting:

WARNING

Components can fail suddenly otherwise.

1. Clean screws of grease and bonding residues.
2. Fill threads of screws with the locking compound supplied with the mounting set.
3. Tighten screws with a torque wrench.
4. Leave the bonded connection to harden for 24 hours.

Clamping pin connection (Cone Lock screws)



Clamping pin connections

- must be re-tightened after 25 operating hours.

Micro-encapsulated coated screws

Micro-encapsulated coated screws

- must be immediately re-tightened to the appropriate tightening torque. The adhesive hardens within a short time.
- cannot be re-used.

Stainless steel bolted connections

Stainless steel screws

- A suitable lubricant must be applied to the screw thread before assembly
- The friction coefficient of 0.14 ... 0.15 must be complied with.
- Never tighten with an impact wrench

B.2 Tightening torques for bolted connections

The following tightening torques apply with all bolted connections used by LEMKEN, unless specified otherwise:

Screws and nuts made of steel

Diameter	Strength category		
	8.8 [Nm*]	10.9 [Nm*]	12.9 [Nm*]
M5	5.2	7.6	8.9
M6	9.0	12.0	14.0
M8	20.0	28.0	33.2
M10	38.9	54.7	72.0
M12	68.0	95.0	114
M14	108	152	183
M16	167	235	283

Diameter	Strength category		
	8.8 [Nm*]	10.9 [Nm*]	12.9 [Nm*]
M20	327	460	552
M24	565	795	954
M27	870	1245	1450
M30	1121	1570	1892
M36	1958	2753	3304

* $\mu_{tot} = 0.09$

Diameter	Strength category		
	8.8 [Nm*]	10.9 [Nm*]	12.9 [Nm*]
M8 x 1	22.8	32.0	38.4
M10 x 1	40.9	57.5	68.9
M10 x 1.25	44.4	62.5	75.0
M12 x 1.25	79.0	111	133
M16 x 1.5	188	264	317
M20 x 1.5	375	528	634
M24 x 1.5	656	922	1106
M24 x 2	642	902	1083
M30 x 1.5	1295	1820	2185
M30 x 2	1275	1792	2151
M36 x 1.5	2254	3170	3804
M42 x 1.5	3597	5058	6070

* $\mu_{tot} = 0.09$

Screws and nuts made of stainless steel

Diameter	[Nm*]	
	A2-70	A4-80
M5	4.5	6.0
M6	8.0	11.5
M8	19.0	25.5
M10	38.0	51.0
M12	65.0	87.0
M14	105	140
M16	160	215
M20	315	420
M24	545	735

* $\mu_{tot} = 0.14$

B.3 Tightening torques for wheel bolts and wheel nuts

Implements	Diameter / thread	[Nm]
Every	M14 x 1,5	125
Every	M18 x 1,5	290
Every	M22 x 1,5	510

Exceptions:

Implements	Diameter / thread	[Nm]
Diamant 12	M18x 1,5	380
Karat 9 KA to 8/2016	M12 x 1,5	380
Karat 12 KA to 8/2016	M22 x 1,5	380
Gigant 10	M12 x 1,5	380

WARNING

Unsafe bolted connections due to altered friction value.

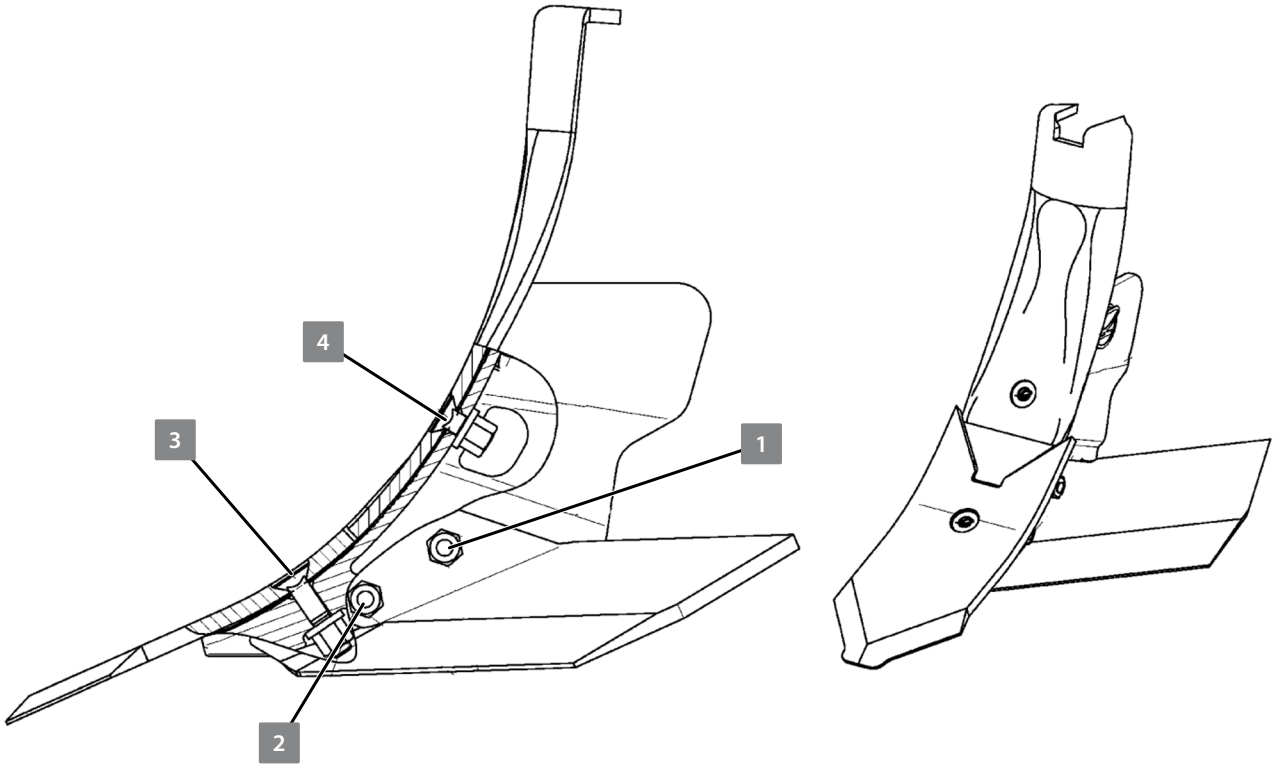
The tightening torques are calculated for the friction values μ_{tot} specified in the tables.

The required tightening torque deviates:

- If any screws other than LEMKEN original screws are used.
- If screws are re-used.

Only use LEMKEN original screws!

B.4 Points



Posi-tion	Screw	Nut	Tightening torque [Nm]
1*	M12-10.9/12.9	M12-10	114
2*	M12-10.9/12.9		
3	M12-10.9/12.9		
	M12x80-8.8		68
4	M12x8.8/12.9		
*** Observe the tightening sequence (1), (2) and then (1) again.**			

C LEMKEN overview of operating materials

F - fluid grease

Designation	LEMKEN item number	Container size	Reference	Specification / Standard
F-1	877 1595	5 kg	■ Castrol Tribol GR 100-00 PD ■ Shell Gadus S2 V220 00	■ LEMKEN specification ■ Lubricant code: – Castrol Tribol GR 00 PD: DIN 51502 GP00N-35 – Shell Gadus S2 V220 00: DIN 51002 GP00K-20

Gm - gear oil, mineral

Designation	LEMKEN item number	Container size	Reference	Specification / Standard
Gm-1	877 1270	20 l	■ Mobil Mobilube HD 85W-140 ■ BP Energear FE SAE 80W-140 ■ Shell Spirax HD 85W-140 ■ Fuchs Titan Supergear SAE 85W-140 ■ Agip ENI Rotra MP 85W-140 ■ Aral HYP 85W-140	■ SAE 85W140 ■ API GL-5

Gs - gear oil, synthetic

Designation	LEMKEN item number	Container size	Reference	Specification / Standard
Gs-1	877 1271	20 l	■ Mobil SHC 632 ■ Fuchs Renolin Unisyn 220 ■ Klübersynth GEM 4-220N ■ Agip Blasia SX 220 ■ Castrol OptiGear Synthtic PD320	■ DIN 51517-3 CLP ■ DIN 51562 Viskosität 35 cSt (100°C) / 320 cSt (40°C)

H - hydraulic oil

Designation	LEMKEN item number	Container size	Reference	Specification / Standard
H-1	877 1280	-	■ Castrol Hypsin AWS 46 ■ Motul Rubric HM 46 ■ Mobil DTE 25	■ DIN 51524-2 (HLP) ■ ISO 4406 21/19/15 (degree of purity) ■ DIN 51519 ISO VG 46

Mp - assembly paste

Designation	LEMKEN item number	Container size	Reference	Specification / Standard
Mp-1	877 1601	1 kg	■ Castrol Molub-Alloy Paste TA	■ Assembly paste with solid lubricants
Mp-2	877 1600	0.4 l	■ Castrol Molub-Alloy Paste TA Spray	■ Assembly spray with solid lubricants

LEMKEN overview of operating materials

S - lubricating grease				
Designation	**LEMKEN item number**	**Container size**	**Reference**	**Specification / Standard**
S-1	-	-	■ Standard lubricating grease	■ Multi-purpose lubricating grease 2 EP ■ DIN 51502 KP2K-30 ■ DIN 51818 NLGI 2
S-2	877 1620	400 g	■ Castrol-Molub-Alloy 370-2	■ High-performance grease with MoS_2 solid lubricants ■ LEMKEN specification
S-3	877 1617 877 1618	20 g 400 g	■ Castrol Tribol GR 1350-2.5 PD	■ Water and dirt-repellent special grease ■ LEMKEN specification
S-4	877 1621	400 g	■ BPW ECO-Li 91	■ LEMKEN specification

As of: 2023-05-02 - The overview of operating materials is regularly updated and brought into line with any changes.

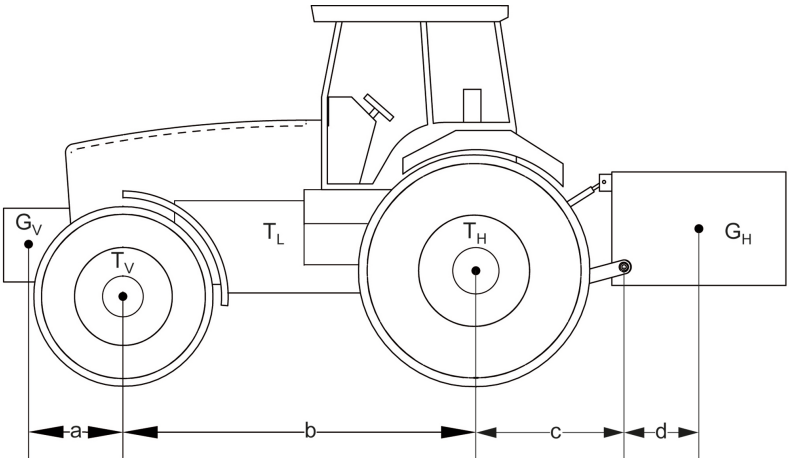
The latest versions of the documents can be found in the **LE**MKEN **On**line **I**nformation **S**ystem (LEONIS).

Users can access LEONIS directly via the QR code or the LEMKEN website. It is where the user can find spare parts for the latest versions of the documents.

D Calculation of axle load and ballasting for mounted machines

The calculation of the axle loads and required ballasting is based on data from the operating instructions for the tractor and machine. The result of the calculation is a guide value for an initial assessment of the axle loads and the required ballasting. For exact results weigh the tractor "empty" and "with mounted machine" (tractor, front axle, back axle).

D.1 Data



To calculate axle loads, the following data items are required for each tractor that is used:

- Data from operating instructions for the tractor
- Data from operating instructions for the machine
- Data from measurements on the tractor
- Data from measurements on the tractor/machine combination

Data acquisition for calculating axle loads			
Abbreviation	**Description**	**Value**	**Unit**
Tractor data from the operating instructions or determined by weighing			
T_{G_zul}	Permissible gross weight of the tractor		[kg]
T_{V_zul}	Permissible front axle load		[kg]
T_{H_zul}	Permissible back axle load		[kg]
T_L	Tare weight of the tractor		[kg]
T_V	Front axle load of tractor when empty		[kg]
T_H	Back axle load of tractor when empty		[kg]
Data from the operating instructions for the tractor or from the tyre manufacturer's documentation			
	Permissible tyre load-carrying capacity[2], front axle (per tyre)		[kg]
	Permissible tyre load-carrying capacity[2], back axle (per tyre)		[kg]
Data from the operating instructions for the implement and data from documentation for the front weight or rear weight			
G_H	Gross weight[1] of rear-mounted machine or rear weight		[kg]
G_V	Gross weight[1] of front mounted machine or front weight		[kg]
d	Distance between the centre of the lower link ball and the centre of gravity of the rear-mounted machine or rear weight		[m]
Data from measurements on the tractor/implement combination			
a	Distance between the centre of gravity of the front-mounted machine and the centre of the front axle		[m]
b	Tractor wheelbase		[m]
c	Distance between the centre of the back axle and the centre of the lower link ball		[m]

[1] Determine values by weighing.

[2] Observe permissible speed and air pressure.

D.2 Calculations

Perform calculations for each tractor that is used.

Minimum ballasting, FrontG_{Vmin} for rear-mounted machine

$$G_{V\,min} = \frac{G_H * (c+d) - T_V * b + (0{,}2 * T_L * b)}{a+b}$$

Enter the calculated value in the result table.

Minimum ballasting, RearG_{Hmin} for front mounted machine

$$G_{H\,min} = \frac{G_V * a - T_H * b + (0{,}45 * T_L * b)}{b + c + d}$$

Enter the calculated value in the result table.

Actual gross weight G_{tat}

$$G_{tat} = G_V + T_L + G_H$$

Enter the calculated value in the result table. Enter the permissible gross weight (see tractor operating instructions) in the result table.

Actual front axle load T_{Vtat}

$$T_{V\,tat} = \frac{G_V * (a+b) + T_V * b - G_H * (c + d)}{b}$$

Enter the calculated value in the result table. Enter the permissible front axle load (see tractor operating instructions) in the result table.

Actual back axle load T_{Htat}

$$T_{H\,tat} = G_{tat} - T_{V\,tat}$$

Enter the calculated value in the result table. Enter the permissible back axle load (see tractor operating instructions) in the result table.

Front axle load as a percentage $T_{V\%}$

$$T_{V\,\%} = \frac{T_{V\,tat} * 100}{T_L}$$

Enter the calculated value in the result table.

Tyre load-carrying capacity

Permissible tyre load-carrying capacity from the documentation of the tractor manufacturer or tyre manufacturer.

Enter twice the value (for 2 tyres) in the result table.

D.3 Results for tractor/implement combination

Create a result table for each tractor that is used:

	Actual value according to calculation or measurement			Permitted value according to tractor operating instructions			Double permissible tyre load-carrying capacity (2 tyres)	
Minimum ballasting, front[1]	G_{Vmin}		kg			-		-
Minimum ballasting, rear[1]	G_{Hmin}		kg			-		-
Gross weight[2]	G_{tat}		kg	≤		kg		-
Front axle load[2, 3]	T_{Vtat}		kg	≤		kg		kg
Back axle load[2, 3]	T_{Htat}		kg	≤		kg		kg
Percentage of front axle relief[4] $_{TV\%}$	20 ≤		%					-

[1] Positive values: required ballasting, negative values: Appropriate ballasting.

[2] The actual values must be less than or equal to the permitted values.

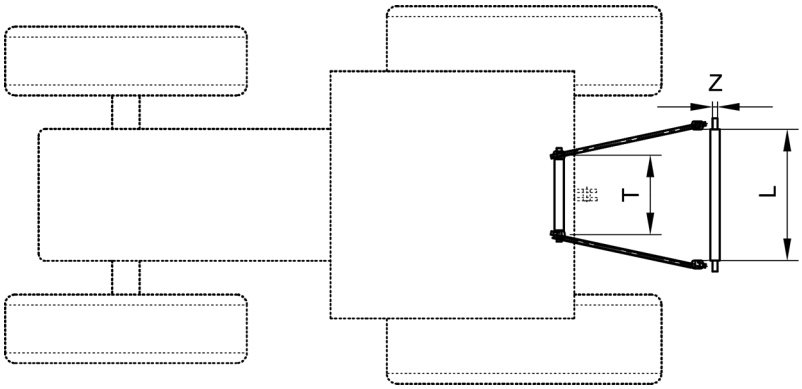
[3] The actual values must be less than or equal to two times the load-carrying capacity of a tyre (2 tyres).

[4] The front axle load must be at least 20% of the tractor's empty weight.

E Cross shaft overview

To determine the cross shaft or lower link connection:

- Determine the dimensions shown in the sketch on the machine.
- Compare the dimensions with the data in the table.
- The category of the three-point linkage must match with the category of cross shaft or lower link connection.



Tractor power		Category	Designation	L [mm]	ØZ [mm]	T [mm]
kW	HP					
30 - 92	40 - 125	2	L2Z2	825	28	390 - 505
30 - 92	40 - 125	**	L3Z2	965	28	
60 - 185	81 - 251	3N*	L2Z3	825	36.6	390 - 505
60 - 185	81 - 251	3	L3Z3	965	36.6	480 - 635
110 - 350	149 - 476	4N*	L3Z4	965	50.8	480 - 635
110 - 350	149 - 476	4	L4Z4	1166	50.8	480 - 635
		***	K700	1100	58	

*) Intermediate category according to ISO, e.g. suitable for the use of wide tyres

**) Category with special length: If distance (T) is too large, a mounted machine is not guided well laterally during work. Using a longer cross shaft will optimise guidance of the implement.

*** Special category for lower link balls with diameter 58 mm

LEMKEN GmbH & Co. KG
Weseler Strasse 5
D-46519 Alpen
Telephone: +49 2802 81-0
Fax: +49 2802 81-220
Email: info@lemken.com
Internet: www.lemken.com