



Minimax



EN
Instruction Manual
950, 1030 cm

Minimax

Type 950, 1030 cm

Congratulations on the purchase of your new Minimax. For **safety reasons** and to achieve optimum service from the product, please read the User Guide **before use**.

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This product has:

Type no.: _____ Serial no.: _____
Month of manufacture: _____ Net weight kg: _____

If contacting the manufacturer regarding spare parts or service, please state type and serial number. A spare parts list is included at the back of this manual.

EU DECLARATION OF COMPLIANCE

DAL-BO A/S
DK-7183 Randbøl

declares herewith that the above machine is manufactured in accordance with the provisions of directive 2006/42/EC, which replaced directive 98/37/EC and change directives 91/368/ECC, 93/44/ECC and 93/68/ECC on harmonisation of member state legislation concerning health and safety requirements related to the construction and manufacture of machines.

CE

This machine corresponds to the safety requirements in the European Safety Guidelines.

DAL-BO A/S

Date: _____

Managing Director Kaj Pedersen

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Safety



This symbol appears in the instruction manual each time there is a safety warning concerning your safety, the safety of others or functionality of the machine. All safety instructions must be observed and made available to all users of the machine.

General

- Ensure you are familiar with all aspects of the machine before use
- There are safety stickers on the machine containing important instructions for the safety of yourself and others, and correct use of the machine.
- Do not carry passengers during operation or transport.
- Ensure there are no personnel within the machine's working radius before operating. Operate machine only from inside the tractor.
- When the machine is folded together, check the side sections are locked. Check all control handles are secured against accidental operation.
- Before leaving the tractor or making adjustments, performing maintenance or repairs on the roller, extend fully and lower to ground, or maintain in transport position, apply tractor handbrake, switch engine off and remove ignition key to secure the machine against accidental operation.
- Remember to secure support leg and lift arm (if relevant) with split rings.
- Never leave driver's seat whilst machine is moving.
- Always adapt speed to conditions.
- Do not use machine unless all safety devices are in place. Defective safety devices must be replaced immediately.

Hydraulics

- Lower machine fully for any repair work on the hydraulic system. Relieve hydraulic pressure, switch engine off and remove ignition key.
- Clean hydraulic connections thoroughly before reconnecting. When connecting hydraulic hoses to tractor hydraulics, ensure they are not under pressure.
- Bleed the hydraulic system thoroughly after any repairs.
- Check hydraulic hoses regularly for defects such as cracks, splits, crimps, wear or breaks. Defective hoses must be replaced immediately.
- Avoid spilling oil on the ground. If oil is spilt, collect and deliver to a destruction point.
- Clean hands thoroughly after contact with oil and grease. Change oil-stained clothing immediately. Hydraulic oil can be harmful to the skin.
- Hydraulic oil released under high pressure can penetrate the skin and cause severe injury. In the event of injury, seek medical help immediately.

Assembly

- Danger of crushing! Ensure no personnel are between implement and tractor, or between the parts to be connected.

Maintenance and repair

- Ensure machine is adequately supported or fully extended for all repair and maintenance work. Ensure tractor and machine are properly braked, engine stopped and ignition key removed.
- Tighten all screw connections after a few hours use. Check all screw connections regularly and tighten as required. Check all split pins and bolts to avoid mechanical failure.
- Dispose of oil, grease and filters in accordance with local environmental protection rules.

Road transport

- All safety and warning precautions mandatory by law must be fitted and tested before transporting the machine on public roads. The driver is responsible for correct lighting and warning signs in accordance with traffic regulations.

- Check with local traffic authorities whether transport on public roads is allowed given the machine's dimensions.
- When transporting, ensure permitted total weight for tractor is not exceeded and that loading on tractor front axle is not less than 20% of tractor net weight. If this is the case, use weights on tractor front

Correct use

- Correct use of the machine includes observing the manufacturer's operating, maintenance and repair instructions, and that original spare parts are always used.
- The roller may only be used, maintained or repaired by personnel familiar with it and who are aware of the risks that can be involved.
- The manufacturer cannot be held liable for injury or damage arising from modifications made to the machine performed without prior permission from the manufacturer. Neither can the manufacturer be held liable for injury or damage arising from incorrect use. Such liability rests solely with the user.
- Do not add extra weight to the machine

Technical data

Minimax

Size (cm)	950	1030
HP (recommended)	180-250	200-220
Gross weight kg:		
Cambridge 50	5100	5200
Cambridge 55	5750	5900
Crosskill 60	5750	5900
Crosskill 53	4260	4450
Sections (pcs.)	5	5
Accessories		
Crackerboard (kg)	1125	-

Wheels

Minimax 5 part: 400/60 x 15.5

How to use this manual

The sequence of subject matter in this manual can seem illogical. Please refer to the table of contents for page numbers for individual items.

The manual is divided into 5 main sections:

- Safety
- Starting routine and running
- Accessories
- Maintenance
- Repairs

The following symbols represent:



Points which are important to functionality and service life.



Points relevant to safety.

Delivery

The machine is delivered complete on a trailer.

If lifting the roller, we recommend the use of straps on the mid-section and drawbar to maintain balance.

Uses

Minimax is an extra-heavy roller designed specifically for the mounting of extra equipment for soil preparation.

Minimax is a three-piece roller, on which the sections are independent of each other. Hydraulic weight transfer is standard on all models.

Minimax 950/1030 has five axles.

Fig. 1



Minimax 950

Minimax is used prior to sowing to crush lumps and afterwards to prepare for shooting and to break down stones. Minimax can also be used for breaking up a compressed soil surface in wheat fields or grassed areas.

Can be fitted with accessories, such as hydraulic crackerboard.

The main purpose of the crackerboard is preparation for sowing. The vibrating effect of the teeth breaks up lumps, preparing and levelling ploughed and pre-prepared fields. If the crackerboard is not required, it can be raised and Minimax used exclusively as a roller.

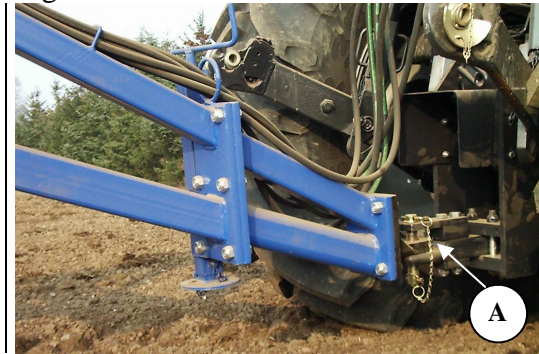
Connecting and disconnecting

Connecting

Connect roller to the tractor's fixed towbar, where drawbar (A) must fit between the towbar forks.

Insert pin and raise leg.

Fig. 2



- Remember to secure towbar pin with split pin or the like.
- Remember to raise the support leg



- If tractor towbar is too short, its lift arms can collide with the roller's support leg if cornering sharply to the left. Avoid by extending tractor towbar.

Hydraulics

The roller requires as standard a double-acting and single-acting hydraulic outlet, where the double-acting is used for extending and single-acting for raising/lowering.

Table 1. Hose markings

Cylinder name	Colour	Outlet	Function
Raise/lower cylinder	White	Single acting	Raises Minimax onto its wheels and down into working position.
Fold/weight equalisation	Red	Double acting	Folds side sections up/out and acts as weight equalisation from mid-section to side sections.



- Flow position is required on the outlet to which fold/weight transfer is connected.
- Check hydraulic hoses for crimping

Disconnection

The roller must be folded up (transport position) or extended before disconnection.

Lower support leg to lift roller drawbar from tractor towbar. Remove pin and disconnect hydraulic hoses.



Remember to depressurise hoses before disconnecting them.

Setting up

The machine is supplied with factory settings, but fine adjustment will always be required before use. Numerous adjustment options make the roller more flexible and ensure maximum use.

Adjusting drawbar height

To achieve uniform rolling, the bar (A, Fig. 3) on the mid-section must be parallel with the ground and the drawbar (B, Fig. 3) correctly positioned in relation to the tractor. There are two adjustment options to achieve the optimum position.

Fig. 3



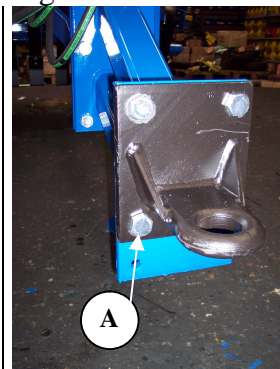
Adjustable drawbar

Incorrect drawbar height can cause uneven operation, as the roller will not apply equal pressure for all sections.

To achieve the correct drawbar height, the drawbar eye can be adjusted relative to tractor towbar height.

Stand Minimax on support leg. Slacken bolts (A) and adjust drawbar to tractor.

Fig. 4

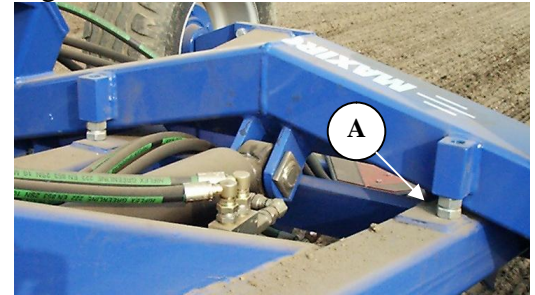


If Minimax is fitted with a crackerboard, see "Fine adjustment of crackerboard sections" under "Accessories"

Adjusting mid-section

Extend Minimax fully (see "Operation"). Check pipe (A, Fig. 3) on the mid-section is horizontal (parallel with the ground).

Fig. 5



If it is not, adjust the bolts (A, Fig. 5).

1. Slacken the lock bolt (A)
2. Adjust bolt (B) up/down
3. Tighten the lock bolt (A)
4. Check frame is horizontal and that the drawbar height is correct.
5. If the bolts (B) are not aligned with the draw bar, pull the tractor forward a little

Fig. 6

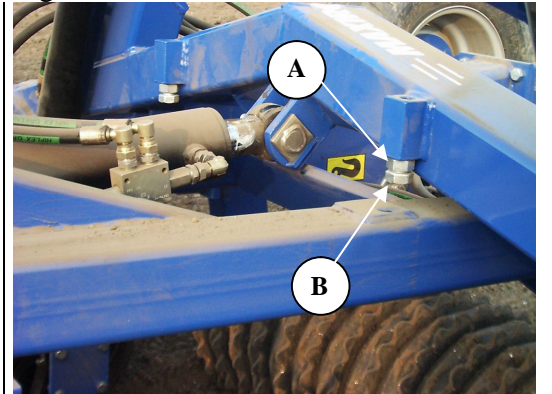
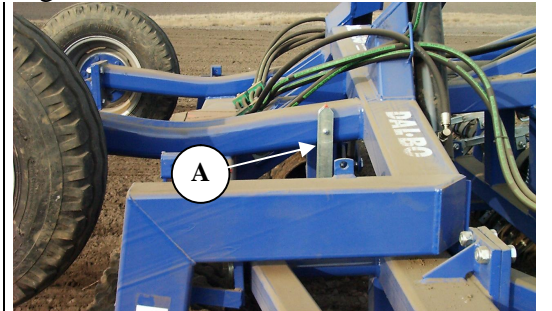


Fig. 7

A pendulum (A) is fitted to the mid-section as an aid to adjustment, which must be flush with the non-adjustable part.

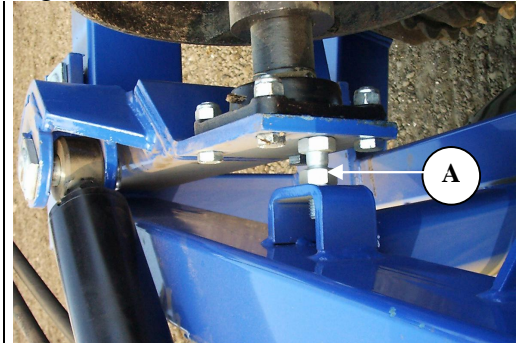


Always ensure machine is on a **level** surface to ensure correct setting.

Adjusting fold stop

To ensure correct positioning of the side sections during transportation, the side section backstop can be adjusted

Fig. 8



Operation

Correct operation is vital for optimum use. This applies to working in the field and for safety. Always ensure you are fully familiar with all safety aspects of the machine.

Extending and retracting

Extending and retracting the machine must always be performed with tractor parked.



Before extension and folding, check crackerboard is fully raised to avoid teeth colliding (see "Accessories, Crackerboard")

Extending

- 1 Lift side sections from transport hook (A) using raise/lower cylinder (marked: White).

Fig. 9



- 2 Activate extend/retract cylinder (marked: Red) to fully extend side sections.
- 3 Activate raise/lower cylinder to lower roller to ground. Set raise/lower cylinder in flow position (see "Setting up").

Fig. 10



Before starting rolling, ensure weight transfer is correctly adjusted (see "Adjustment of hydraulic weight transfer").

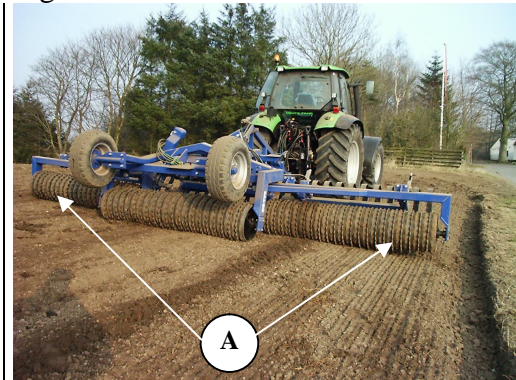
Relieve pressure from weight transfer to side sections (see "Adjustment of hydraulic weight transfer").



If there is a crackerboard fitted, check it is fully raised before starting folding (see "Accessories, Crackerboard, Operation")

1. Activate extend/retract cylinders (marked: Red) to full length, so that the outer side sections (A) are raised a little.

Fig. 11



- 2 Activate raise/lower cylinder (marked: white) to full length and the roller is lifted off the ground.

Fig. 12



3. Activate the extend/retract cylinders once more, and the side sections will retract (extend/retract cylinders will now be fully retracted).
4. Activate the raise/lower cylinder and the roller will be lowered into the transport rests.

Fig. 13



Adjustment of hydraulic weight transfer

Hydraulic weight transfer distributes the weight evenly between all roller sections.

1. Once the roller is extended, depressurise the extend/retract cylinder (marked: Red), and then activate the cylinder control handle in the opposite direction (retract cylinder).

- 2 After a moment, the the manometer will flicker. Pressure will increase (on the plus side of the cylinder, which will extend) to about 15 bar (A)

Fig. 14



- 3 Set cylinders to flow setting. Flow setting is necessary to achieve hydraulic weight transfer, allowing the sections to move independently
- 4 The pressure for hydraulic weight transfer may need adjustment. It can also be necessary to adjust pressure according to soil conditions.

Excessive pressure

- 1 Pressure on the side section outer rings will be too high. The rings will be pressed too heavily into the soil leaving a clear groove after the side sections.
- 2 The mid-sections will not apply sufficient pressure, leaving the soil higher and not as compressed as the sides.

Insufficient pressure

- 1 The pressure on the side section outer rings will not be high enough to press the outer rings sufficiently down to give an even finish.
- 2 The mid-sections will compress too much, leaving the soil lower than the sides.



To prolong service life and the final result in the field, Minimax must be set in flow setting when working in the field.



Failure to do so is incorrect use and can cause the frame to break in the worst scenario.

Operating speed

An operating speed of 6-10 km/h is recommended, but always operate according to conditions.

Increased speed will increase wear, particularly in dry conditions. The rings can also be damaged if operating at excessive speeds in unfavourable conditions.

Power

Power requirement will depend on soil type, terrain, speed and roller rings.

Table 2, Guide to power requirement in HP (with crackerboard)

Model (cm)	950	1030
HP (recommended)	180-250	200-220

Troubleshooting

Fault	Cause	Remedy
Mid-section applying too much pressure	<ul style="list-style-type: none"> • Insufficient pressure transferred to side sections 	<ul style="list-style-type: none"> • Activate hydraulic control handle for extend/retract to increase pressure to side sections (see "Operation").
	<ul style="list-style-type: none"> • Drawbar too high 	<ul style="list-style-type: none"> • Adjust drawbar and mid-section (see "Adjusting drawbar height" and "Adjusting mid-section")
	<ul style="list-style-type: none"> • Mid-section not horizontal 	<ul style="list-style-type: none"> • Adjust drawbar and mid-section (see "Adjusting drawbar height" and "Adjusting mid-section")
Side section extremities applying too much pressure	<ul style="list-style-type: none"> • Insufficient pressure in mid-section 	<ul style="list-style-type: none"> • Activate hydraulic control handle for extend/retract to increase pressure to mid-section (see "Operation").
	<ul style="list-style-type: none"> • Drawbar too low 	<ul style="list-style-type: none"> • Adjust drawbar and mid-section (see "Adjusting drawbar height" and "Adjusting mid-section")
	<ul style="list-style-type: none"> • Mid-section not horizontal 	<ul style="list-style-type: none"> • Adjust drawbar and mid-section (see "Adjusting drawbar height" and "Adjusting mid-section")
Pressure on manometer dropping	<ul style="list-style-type: none"> • Handle not in flow setting 	<ul style="list-style-type: none"> • Adjust pressure on weight transfer and set handle to flow setting (see "Adjustment of hydraulic weight transfer")
	<ul style="list-style-type: none"> • Driver-operated non-return valve defective • Cylinder (gasket set) leaking 	<ul style="list-style-type: none"> • Set weight transfer to 15 bar, set handle to flow setting. Leave Minimax standing for 30 mins. If pressure drops, the driver-operated non-return valve is defective, or there may be dirt in the valve (disassemble valve and clean parts)
Side sections not following terrain	<ul style="list-style-type: none"> • Weight transfer hydraulic system not in flow setting 	<ul style="list-style-type: none"> • Set hydraulic weight transfer in flow setting (see "Adjustment of hydraulic weight transfer")

Accessories

Minimax can be fitted with a range of accessories to suit requirements.

- Crackerboard with curved wear parts.
- Crackerboard with crust-breakers.
- Harrow
- Stone boxes
- Lights

Crackerboard

The major benefit of the board is that the teeth can move individually, and flex when meeting local resistance. This provides a big advantage compared to a levelling board, avoiding having to raise the entire arm in the event of it meeting an obstacle.

Fig. 15



Power

Compared to a fixed levelling board, a crackerboard does not require so much power, although this can vary depending on how the board is used.

Table 3. Crackerboard power requirements in HP

950
55-100



By moving the minimum amount of soil, fuel consumption is reduced significantly along with wear and tear.

Hose markings

Table 4. Hose markings

Cylinder name	Colour	Outlet	Function
Depth adjustment	Green	Double acting	Adjust crackerboard depth.

Adjusting angle of tines

Crackerboard depth is hydraulically adjustable. The angle of the teeth is adjusted manually on the spindles (A). To ensure uniform crackerboard angle setting, there are numbers on the sides of the spindles.

The angle set will be retained regardless of depth, as the tines are mounted in a parallelogram.

Fig. 16



- For an **aggressive tooth** (vertical) make the spindles shorter.
- For a **passive tooth** (horizontal) make the spindles longer.



Raise crackerboard to highest position for adjustment of teeth angle.

The angle of the teeth depends on the nature of the job. If they are set aggressively while the depth is set for the upper soil layer, maximum vibration will be created for fine-crushing of lumps. This setting is recommended for most jobs.

If the teeth are more horizontal, it will allow them to avoid obstacles. It will also mean that the tips of the teeth can move more in the vertical plane, leaving an uneven field

Fine adjustment of crackerboard sections

The board is split into three sections which must work at the same depth. If the draw bar height is adjusted, the relationship between the board's sections will be affected.

The relationship between the sections and thus tine depth must be adjusted the first time Minimax is connected to the tractor and if another tractor is used. But it is important that the basic setting for Minimax is correct (see "Adjusting mid-section" and "Adjustable drawbar").

To adjust the basic setting of the crackerboard, we recommend extending Minimax on a flat surface and lowering the crackerboard until the tines are almost touching the ground. All the tines must be at the same distance from the ground. If the tines on the mid-sections do not have the same distance to the ground as the sides, adjust the draw bar at the tractor.

Operation

The crackerboard is a flexible unit with a range of uses. At depth setting of approx. 5 cm, the vibrating effect of the teeth will crush clumps.

A deeper setting will increase the levelling effect to that of a levelling board, as a small bank of soil builds up in front of the teeth.

Fig. 17



Its function is **not** as a dozer blade, but to break the soil down. As each tooth can move individually and thus yield to local pressure, the crackerboard is easy to use and requires little adjustment compared to a levelling board during operation.

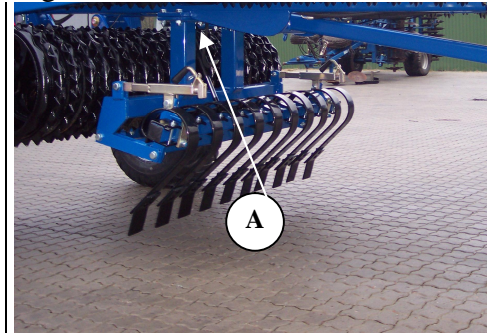
The board sections can run at different depths which means it may be necessary to reset the board by raising it to full height.

Retrofitting

The crackerboard can be factory-fitted, or supplied at a later date if required. A crane or other lifting device will be required for retrofitting.

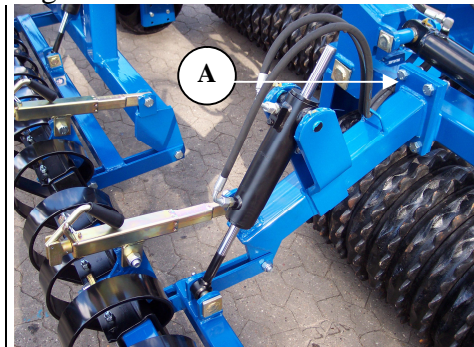
- 1 Extend Minimax.
- 2 Mount middle section first on drawbar flanges (A).
- 3 Mount cylinder

Fig. 18



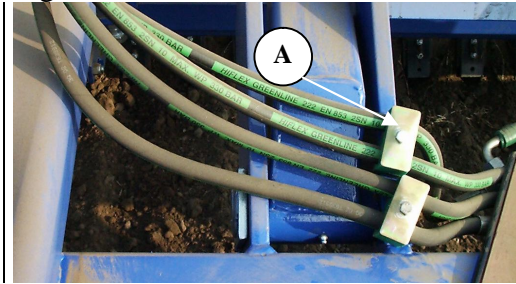
- 4 Mount side sections on flanges (A).
- 5 Fit hydraulic cylinders.
- 6 Fit hoses on cylinders.

Fig. 19



- 7 Secure hoses in hose holders (A) and pass through holders on drawbar.
- 8 Tighten all fittings securely. Connect board to tractor hydraulics.

Fig. 20



Bleed system thoroughly to avoid injury to personnel. Move depth-adjustment cylinders up and down fully several times to bleed system.

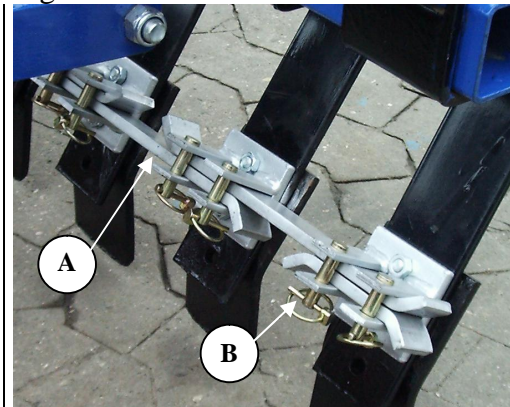
Locking set

A crackerboard locking set is available as an accessory to lock the teeth into one long board in three sections. The crackerboard will then act more like a levelling board.

Assembly

The locking set is mounted on the back of the teeth (see illustration) using longer bolts on the wear parts. The teeth are linked by an iron bar (A), secured by pins (B).

Fig. 21



Maintenance

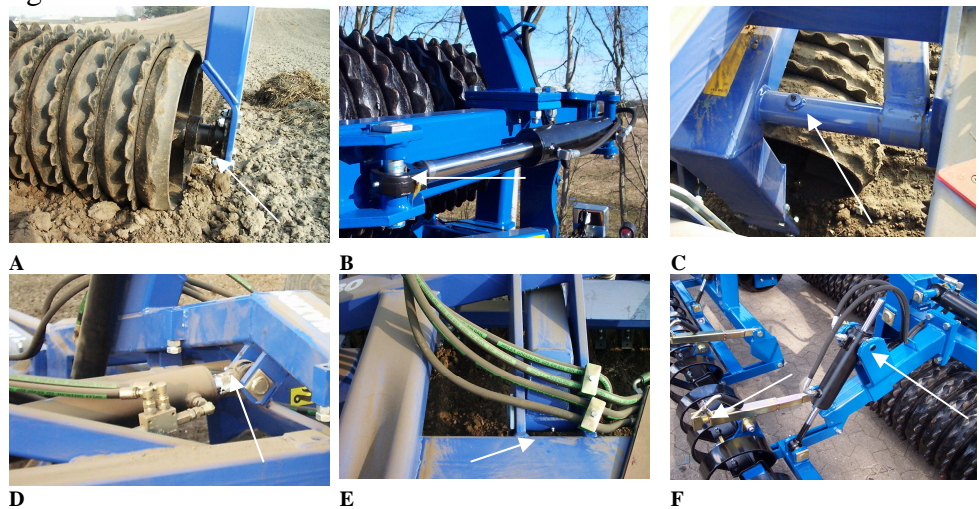
Good maintenance ensures long service life and optimum use. Grease nipples are fitted where wear is heaviest.



Tighten all screw connections after first working day. Check all split pins and bolts to avoid mechanical failure. Check hydraulic system for leaks.

Lubrication

Fig. 22



Lubrication points	Number of nipples	Lubrication intervals, hours	Illustration
Flange bearings	6	50	A
Cylinder for extending side sections	4	50	B
Rotation pin for extending side sections	2	50	C
Raise/lower cylinder	2	50	D
Rotation pin for raise/lower	2	50	E
Crackerboard cylinder	2/6	50	F
Crackerboard spindle	6	100	F
Wheel bearings	2	200	



Lubricate all lubrication points at least once annually.

Adjustment

Adjustment of rollers

After the first season, the rollers will have loosened on the shaft. Play can be eliminated by moving the stop rings on the shaft.

Adjustment is easiest when Minimax is folded together.

- 1 Slacken bolts (A) and push rollers together
- 2 Tighten and slacken stop ring bolts at the same place on the shaft several times to ensure they bite firmly into the shaft.

Fig. 23



Wheels

Lubricate and adjust wheel bearings at least once annually. Check tyre pressures (see recommended pressure on tyre).

Adjustment and lubrication of wheel bearings

1. Remove hub caps.
2. Remove split pin.
3. Tighten castle nut 1/6th of a turn until hole aligns with axle. Turn wheel, check for resistance. A little play should be detected in the hub housing when rocking wheel from side to side. If play is excessive, repeat process.
4. Replace split pin
5. Fill hub cap 3/4 full with grease. Replace.

Tips

Fig. 12

Wear parts (shoes) are factory-mounted in the upper holes on each tooth. Move down to the lower holes (A) before teeth are worn.

Once they are worn out (when in the lower holes), replace.

Fig. 24



Hydraulics



Check all hydraulic hoses for wear or cracks. Check all hoses for crimping.



Lubricate exposed rams with oil or pressure-resistant grease to avoid rust forming when storing for long periods. Remember to remove before use.

Replacement and repairs



Safety is vital for **all** repair work on the roller. Always observe the following points, plus those under Safety First in the instruction manual.



All maintenance and repair work can only be performed when the machine is lowered to the ground or locked in transport position, tractor is braked, engine stopped and ignition key removed to prevent accidental start.



Particular attention must be paid to safety when repairing hydraulics. Before commencing work, depressurise hydraulic system and support part being worked on.



Always ensure hydraulic system is bled after repairs and before use to prevent mechanical breakdown and injury to person.

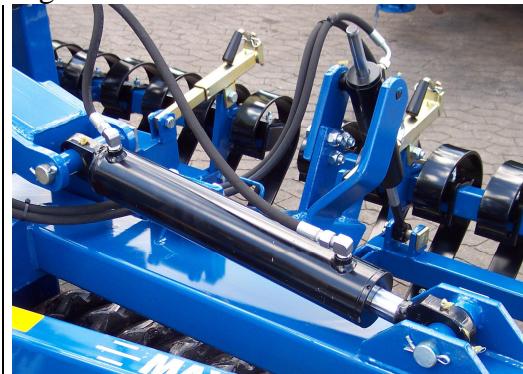
Hydraulics

Replacing extend cylinder for retracting side sections

Roller must be fully extended and standing on ground for repairs.

1. Depressurise cylinders. **Check there is no pressure shown on the manometer**
2. Disconnect hoses.
3. Remove split pins and pins. Cylinder will now be free.
4. Fit new or repaired cylinder. Check pin locks into place, secure pins with split pins.
5. Connect hoses. Check there is no danger of hoses being ripped or crimped after fitting.

Fig. 25





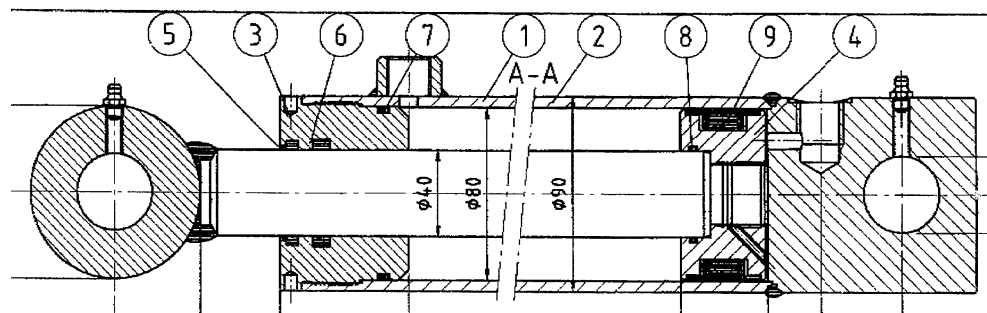
Activate extend/retract cylinders after fitting until they show a little movement. Reverse cylinders until they return to start position. Move cylinders backwards and forward several times. Raise roller fully onto wheels, extend side sections fully to bleed system.



Ensure no personnel are within the extension radius of the side sections.

Replacing gasket set for extend/retract cylinder

Fig. 26



1. For cylinder removal, see "Replacing extend cylinder for retracting side sections".
2. Drain oil from cylinder by moving ram carefully backwards and forwards.
3. Extend ram to centre position. Unscrew upper part (pos. 3) from cylinder tube (pos. 1). Use special tool to remove upper part. If upper part is stuck, heat front of sleeve. When upper part is detached from cylinder tube, pull ram up towards upper part and remove completely from cylinder tube.
4. Remove lock nut retaining collar shoe (pos. 4).
5. Remove collar shoe (pos. 4) from ram.
6. Remove upper part (pos. 3) from ram.
7. Remove gaskets in upper part and collar shoe, (pos. 5+6+7+8+9).
8. Clean all parts and check for particles etc. Check for rust around scraper ring (pos. 5) in upper part. If detected, remove thoroughly.

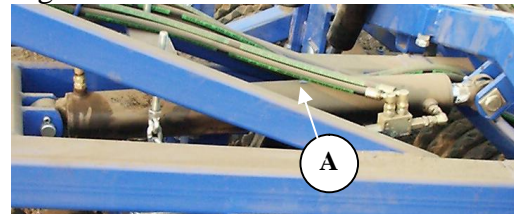
Assembly

1. Fit new gaskets (pos. 5+6+7+8+9) in upper part and collar shoe. Remember to check gaskets are facing the right way.
2. Lubricate thread in upper part (pos. 3) and cylinder tube with oil.
3. Fit upper part (pos. 3) on ram shaft.
4. Fit collar shoe (pos. 4) and screw on lock nut, **secure with Loctite**. Ensure that thread is absolutely clean and free of oil or other impurities before applying Loctite. **Do not fill with oil for 12 hours after use of Loctite.**
5. Lubricate outer collar shoe gasket in contact with cylinder tube and inside of cylinder tube with oil, push ram into centre position.
6. Fit upper part onto cylinder tube and tighten.
7. Fit cylinder (see "Replacing extend cylinder for retracting side sections").

Replacing raise/lower cylinder

Extend Minimax and depressurise the raise/lower cylinder (A) (there are two cylinders on the large models).

Fig. 27



1. Disconnect hoses from cylinder
2. Support cylinder
3. Remove split pins in pins, remove pins
4. Remove cylinder
5. Fit new or repaired cylinder



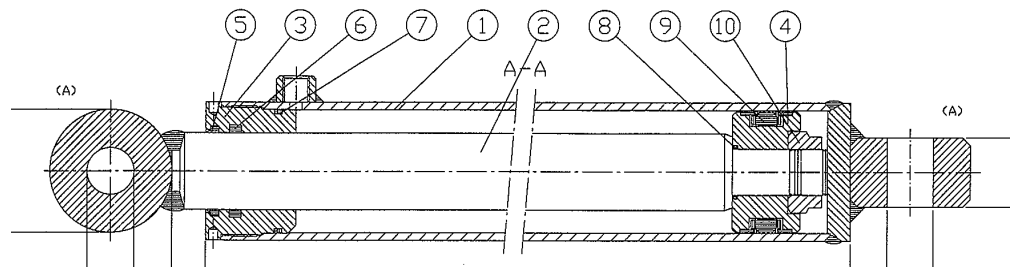
Activate raise/lower cylinder after fitting until cylinder shows movement. Reverse cylinder until it returns to start position. Move cylinder backwards and forwards several times. Fully extend cylinder several times to bleed system.



Ensure no personnel are within the extension radius of the side sections.

Replacing gaskets on raise/lower cylinder

Fig. 28



1. Drain oil from cylinder by moving ram carefully backwards and forwards.
2. Extend ram to centre position. Unscrew upper part (pos. 3) from cylinder tube (pos. 1). Use special tool to remove upper part. If upper part is stuck, heat front of upper part. When upper part is detached from cylinder tube, pull ram up towards upper part and remove completely from cylinder tube (pos. 1).
3. Remove lock nut (pos. 10) retaining collar shoe (pos. 4).
4. Remove collar shoe (pos. 4) from ram, (pos. 2).
5. Remove upper part (pos. 3) from ram, (pos. 2).
6. Remove gaskets in upper part (pos. 5+6+7+8+9) along with collar shoe.
7. Clean all parts and check for particles etc. Check for rust around scraper ring (pos. 5) in upper part. If detected, remove thoroughly.

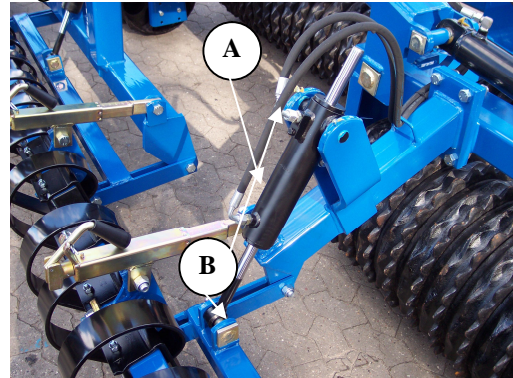
Assembly

1. Fit new gaskets (pos. 5+6+7+8+9) in upper part, plus collar shoe.
2. Lubricate thread in upper part (pos. 3) and cylinder tube (pos. 1) with oil.
3. Fit upper part (pos. 3) on ram shaft.
4. Fit collar shoe (pos. 4) and screw on lock nut, **secure with Loctite**. Ensure that thread is absolutely clean and free of oil or other impurities before applying Loctite. **Do not fill with oil for 12 hours after use of Loctite.**
5. Lubricate outer collar shoe gasket in contact with cylinder tube and inside of cylinder tube with oil, push ram into centre position.
6. Fit upper part onto cylinder tube and tighten.
7. For fitting cylinder see "Replacing raise/lower cylinder".

Replacing crackerboard depth-adjustment cylinder

Fig. 29

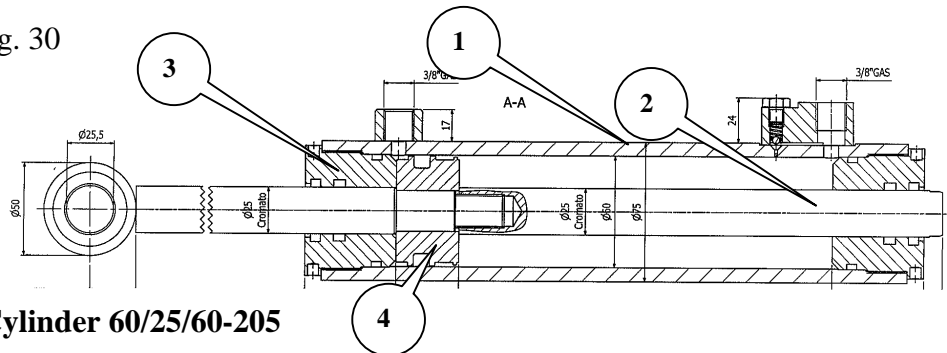
1. Extend roller resting on a level surface
2. Lower board, depressurise hydraulic system
3. Disconnect hoses from cylinders
4. Remove plates and pins (B)
5. Fit new or repaired cylinder (A)
6. Remember to replace split pins in pins



Activate depth-adjustment cylinders up and down a few times after fitting and with roller extended, to bleed system.

Replacing gasket set for depth adjustment

Fig. 30



Cylinder 60/25/60-205

- 1 Drain oil from cylinder by moving ram carefully backwards and forwards.
- 2 Extend ram to centre position. Unscrew upper part (pos. 3) from cylinder tube (pos. 1). Use special tool to remove upper part. If upper part is stuck, heat front of upper part. When upper part is detached from cylinder tube, pull ram up towards upper part and remove completely from cylinder tube (pos. 1).
- 3 Remove ram (Pos. 4) and collar shoe (pos. 4).
- 4 Remove collar shoe (pos. 4) from ram, (pos. 2).
- 5 Remove upper part (pos. 3) from ram, (pos. 2).
- 6 Remove gaskets in upper part and collar shoe.
- 7 Clean all parts and check for particles etc. Check for rust around scraper ring on upper part. If detected, remove thoroughly.

Assembly

- 1 Fit new gaskets in upper part and collar shoe.
- 2 Lubricate thread in upper part (pos. 3) and cylinder tube (pos. 1) with grease or oil.
- 3 Fit upper part (pos. 3) on ram shaft.
- 4 Fit collar shoe (pos. 4). Ensure that thread is absolutely clean and free of oil or other impurities before applying Loctite. **Do not fill with oil for 12 hours after use of Loctite.**
- 5 Lubricate outer collar shoe gasket in contact with cylinder tube and inside of cylinder tube with oil, push ram into centre position.
- 6 Fit upper part onto cylinder tube and tighten.
- 7 For fitting cylinder see "Replacing crackerboard depth-adjustment cylinder".

Removal/fitting wheel

Before removing wheel, fully extend roller with rings resting on ground. Wheels will then be raised free of ground. Remove wheel nuts. Remove wheel. Replace wheel, hand-tighten wheel nuts. Lower wheels to ground. Tighten wheel nuts to 300 Nm.



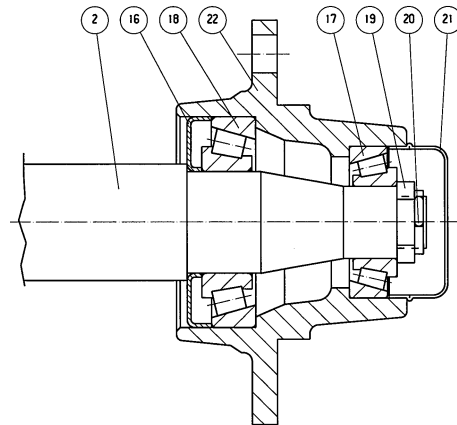
Ensure wheel nuts and wheel surfaces are clean to avoid nuts loosening.

Replacing wheel bearings

1. Remove hub cap pos. 21.
2. Remove split pin pos. 20.
3. Remove castle nut pos. 19.
4. Tap out axle pos. 2.
5. Remove bearings pos. 17+18.
6. Remove seal ring pos. 19.

Fig. 31

FL55-6



Assembly

1. Fit bearing outer rings pos. 17+18 in hub housing pos. 22
2. Fit seal ring pos. 16.
3. Fit bearing inner ring pos. 18 on axle pos. 2 and fit axle in hub housing
4. Fit bearing inner ring pos. 17 on axle pos. 2
5. Screw castle nut onto axle pos 2, whilst turning hub housing pos. 22. Tighten castle nut until hub housing revolves slowly. Slacken castle nut a quarter turn or until hub housing revolves easily.
6. Remove split pin pos. 20.
7. Remove hub cap pos. 21 half full with ball bearing grease and fit to hub

Removing roller axles

Repairs must be performed with the roller connected to a tractor, resting on a level surface, fully extended with the rings resting on the ground. A crane or similar is recommended for removal and replacement procedures.

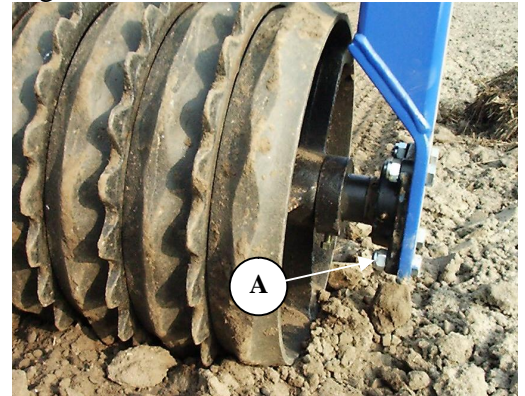
Replacing side section axles



If no crane is available, remove both side section axles to prevent roller tipping over.

1. Slacken bolts (A)
2. Attach lifting gear to box section arm on side section. Tighten straps until bolts (A) are loose and can be removed.
3. Activate raise/lower cylinder, lift roller onto wheels
4. Roll axle with roller rings from roller.

Fig. 32



If there is no crane available, activate roller weight transfer a little until bolts are loose and can be removed.

Fitting axles with roller rings

1. Position axles with roller rings and bearings corresponding to that when Minimax is extended, resting on the ground.
2. Extend roller and carefully lower over the axles.
3. Fit bolts (A)

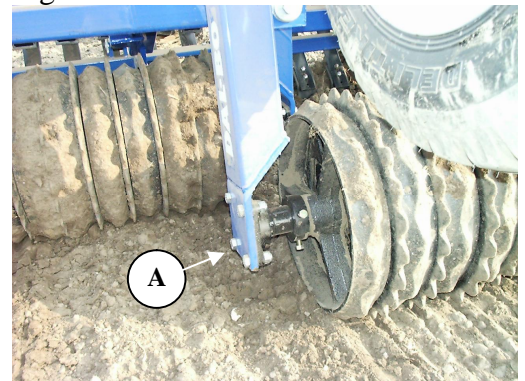


Ensure no personnel are within the machine's extension radius when activating hydraulics.

Replacing the centre axle

1. Slacken bolts (A)
2. Activate raise/lower cylinder and lower roller until wheels are resting on ground and bolts are loose.
3. Remove bolts
4. Raise roller until the wheels lift from the ground again as high as they can go.
5. Roll axle with roller rings from roller.
6. Reverse procedure for assembly

Fig. 33

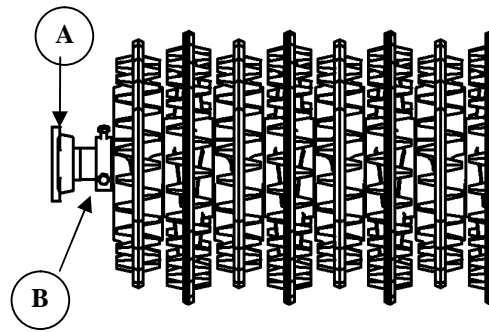


Do not activate hydraulics if there are personnel within machine extension radius.

Replacing axles, bearings or roller rings

1. Slacken bearing screws (A) and withdraw bearings
2. Slacken stop ring bolts. Pull stop rings (B) off.
3. The roller rings can be drawn off the axle.
4. Reverse order to reassemble
5. Apply Loctite to bearing screws

Fig. 34

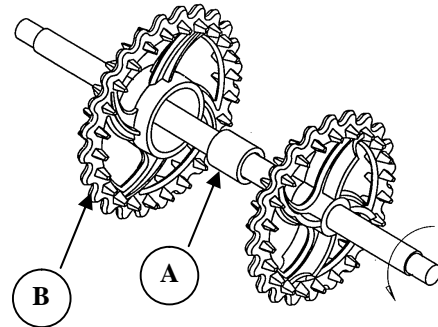


Crosskill ring

Note axle direction of rotation.

1. Start with a small ring after the outermost stop ring (Fig. , B).
2. Fit bolts (A)
3. Fit large ring (B)
4. Finish off with a small ring, and then fit a stop ring.

Fig. 35



Tighten and slacken stop ring bolts a few times to ensure they bite into the axle



When fitting axles with bearings, remember to ensure the bearing lubrication nipples face backwards. This gives easy access for lubrication and protects the nipples from stones.



Check that the roller rings are close together and the direction of rotation for the Crosskill rings. Always finish with the small rings (smallest hole) at the axle ends (see "Spare part drawings")

Scrapping



Fully extend roller. It is essential that **all** cylinders are removed.



Beware of the weight of any given part when removing or disassembling. All parts **must** be supported or lifted to avoid danger of falling.

Disconnect hydraulic hoses and cylinders and drain oil. Collect oil in container to avoid pollution. Send oil and hoses for destruction.

All iron used in the machine can be recycled.

Spare parts