

DALBO®

MINIMAX



EN
630 and 830 cm
Serial no.: 00100-XXXX

MADE IN **D**ENMARK

MINIMAX

Types 630 and 830 cm

Congratulations on the purchase of your new roller. 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 CONFORMITY

DALBO 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/CC 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.



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

DALBO A/S

Date: _____

Carsten Jensen, CEO

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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 extension radius before operating. Operate machine only from inside the tractor.
- When roller 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.
- It can be difficult to completely depressurise hydraulic systems with pilot-controlled non-return valves. Hold a cloth around the fittings/part to be removed to catch any oil.
- 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 roller.

Technical data

MINIMAX XL

Width (cm)	630	830
HP (recommended)	80	100
* Gross weight kg:	4440	5775
Transport width	2.55 m	2.55m
Sections (pcs.)	3	3
Axles (pcs.)	3	3
Wheels	11.5/80-15.3	400/60-15.5

* Depends on roller type (weighed with a 60 cm Cambridge)

All MINIMAX are available with 480/45-17 wheels. If fitted, the transport width will exceed 2.55 m.

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 main sections:

- Safety
- Description of the machine, including settings
- 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 roller is delivered complete on a trailer.

Always use a rig with straps attached to the mid section and ensure machine is balanced when lifting.

Limitations to use

The following describes what the machine can and cannot be used for:

- Can only be used for rolling and levelling ploughed or sown fields under cultivation. The roller can also be used for rolling grass fields on which the machine is used must be in a good state of agricultural maintenance, i.e. without major unevenness or potholes.
- The machine can only be used when drawn by a tractor, attached to the tractor towbar.
- Max. speed when in use is 10 km/h. Speed must always be adapted to suit the terrain.

Any other use of the machine which does not meet the above conditions will be considered as unauthorised use, and invalidate the guarantee.

Description of the machine

Construction

The MINIMAX is a robust roller, featuring the following construction:

- There are 3 sections. A centre section which is identical on the 630 and 830 versions. Two side sections, which can be hydraulically retracted into their transport position, resulting in a transport width of 2.55 metres. The side sections are 1 metre longer in the 830 version than the 630, to provide a wider working width.
- The side sections are fitted with tension springs designed to transfer some of the weight of the centre frame and drawbar to the side sections in order to achieve uniform rolling across the full width of the machine.
- The drawbar on the 830 version is extended to make room for the longer side sections when in transport position.
- MINIMAX is designed to take rollers up to 61 cm in diameter (but not 60 cm "Crosskill" rollers, due to the construction of the rings which require more room in the frame than is available).

MINIMAX is designed to be take the following optional extras:

- Heavy-duty crackerboard with hydraulic depth adjustment.
- "Greenline" 61cm diameter steel rollers for grass. These rollers can be filled with water to add weight.
- A hydraulically-adjustable levelling board can be fitted to Greenline rollers.
- All versions of MINIMAX can be fitted with Einböck Pneumatic box or P-Box Speed Seed Boxes and brackets.



Connecting and disconnecting

Connecting

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

Insert pin, retract support leg and place in working position (B)

Fig. 1



- The pin can be secured using a split pin or the like.
- Secure support leg with a split pin.
- 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 the roller up 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.

- Check hydraulic hoses for crimping



Disconnection

The roller must be retracted (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

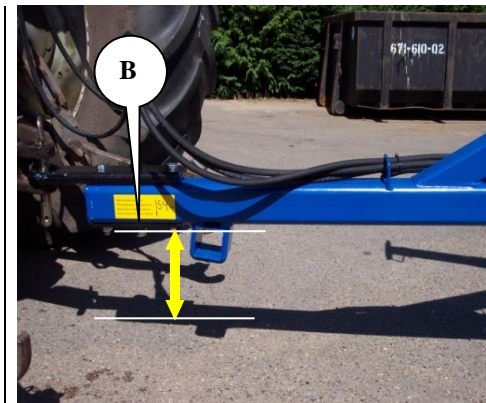
The roller is supplied with factory settings, but fine adjustment will always be required before use. Numerous adjustment options make the roller more flexible and ensure maximum use.

To achieve uniform pressure applied on the ground, the drawbar must be correctly set up for the tractor used. Towbar height on tractor must be approx. 45cm. on the 630 and approx. 55 cm. on the 830.

Adjusting drawbar height

Fig. 2

To achieve uniform pressure applied on the ground, the drawbar must be correctly set up for the tractor used.



*Height under
drawbar:
45cm on 630
55cm on 830*

Fig. 3

Operation

Correct operation is vital for optimum use of the roller. 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, and on a reasonably level surface.



Ensure there are no personnel within the machine's working radius when extending or retracting.

Extending

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



Fig. 4

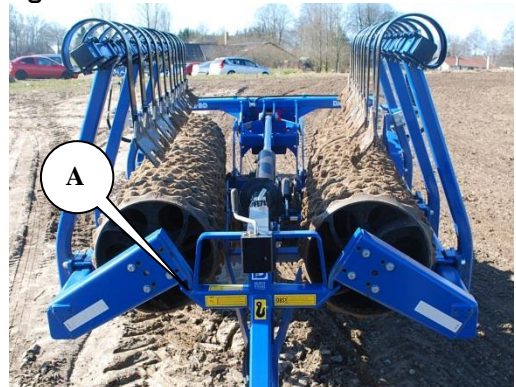


Fig. 5

- 2 Set extend cylinder (marked: Red) to fully extend side sections.
- 3 Activate raise/lower cylinder to lower roller to ground.
- 4 Set extend cylinder (marked: Red) into flow position.



Retract

1. Activate extend cylinder (marked: Red) to lift end of side sections as much as possible.

Fig. 6



2. Activate raise/lower cylinder (marked: White) to full length. Roller will lift from ground

Fig. 7



3. Activate extend cylinder to fold side sections in.
4. Activate raise/lower cylinder to lower roller into transport hooks.

Fig. 8



Fig. 10



Always **observe the correct sequence** when retracting. I.e.: operate the side section extend cylinders to maximum extension first, **and then take them out of flow position**. Activate raise/lower cylinder, lift rollers from wheels. If the extend cylinders are not taken out of flow position before the raise/lower cylinder is activated, the side sections will move forward during retraction, placing unnecessary strain on the frame of the machine.

Weight equalisation

To achieve uniform rolling across the full width of the machine, a weight equalisation system is fitted. The need for weight equalisation arises because the weight of the centre frame and drawbar alone will affect the central part of the roller. The system consists of 2 tension springs which tighten when the side sections are extended. The system is **correctly set** when the springs are **just hanging loosely** with the side sections in transport position.



Important!: The machine must always be fully retracted in transport position when setting up the weight equalisation system.

Operating speed

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

Power requirement will depend on soil type, terrain and speed. But the most important factor is whether the machine is fitted with a crackerboard, and if so, how hard it is applied to the ground.

Table 2, **Guide to power requirement in HP**

Working width	630	830
Power requirement, approx.	80 (140)	100 (180)

The figure in brackets states power requirement if the crackerboard is fitted and used at maximum depth.

Maintenance

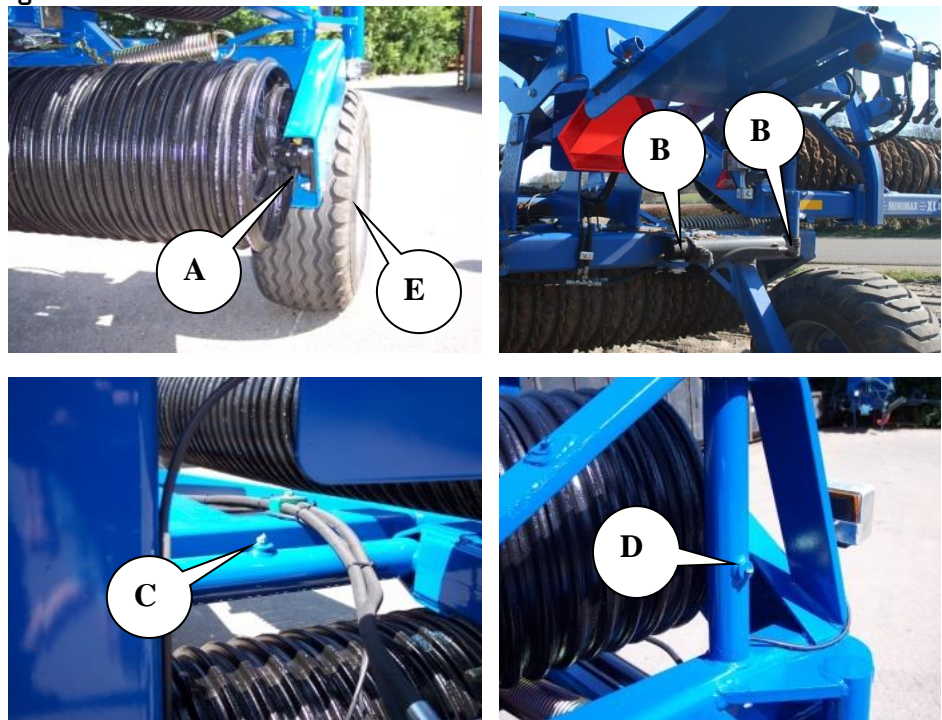
Good maintenance ensures long service life and optimum use. Grease nipples are fitted where wear is heaviest.



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. 9



Lubrication points	Number of nipples	Lubrication intervals, hours	Balloon
Flange bearings	6	50	A
Rotation pin for extending side sections	2	25	D
Extend cylinder	2	50	B
Rotation pin for raise/lower	2	50	C
Wheel hub	2	50	E



Lubricate all lubrication points at least once annually.

Adjustment

Wheels

Lubricate and adjust wheel bearings at least once annually. Check tyre pressures at least once annually (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.

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.



When replacing cylinders, always fill new cylinder with oil before pressurising system. We recommend fitting cylinder to frame first, fill with oil, before completing fitting at top.



All maintenance and repair work on the roller 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 extending and retracting side sections

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

1. Depressurise cylinder.
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. 17





Activate extend cylinder after fitting until cylinder shows movement. Reverse cylinder until it returns to start position. Move cylinder backwards and forward several times. Raise roller fully onto wheels, extend side sections fully to bleed system.



If a cylinder is not bled correctly as described above, there is a risk that part of the machine **can suddenly move much quicker than normal, and before the tractor driver can prevent it.** This is because air (in contrast to oil) can be compressed. A side section can therefore swing out very quickly if bleeding is not performed correctly. This represents a major risk of injury and personnel and damage to the machine.



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

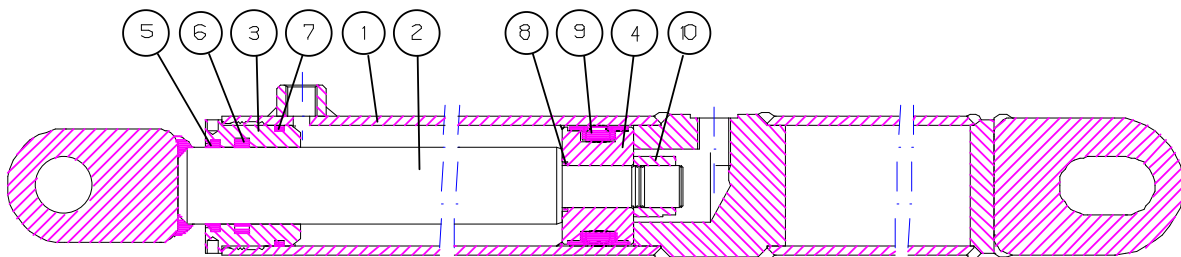
Replacing gaskets

REMOVAL:

1. Drain oil from cylinder, use compressed air to move ram backwards and forwards (if required) to force oil out.
2. Extend ram to centre position. Screw upper part (pos. 3) 30 mm outwards. If upper part is stuck, heat front of sleeve to approx. 300° C, and allow to cool.

When upper part has been unscrewed, extend ram towards upper part. Unscrew and remove upper part, extract ram.

3. Remove lock nut (pos. 10).
4. Remove collar shoe (pos. 4).
5. Remove upper part from ram, (pos. 2).
6. Remove gaskets in upper part and collar shoe, (pos. 5+6+7+8+9) using an awl or screwdriver if necessary.
7. Clean all parts, check for particles etc. Check for rust around scraper ring (pos. 5) on the upper part. If any is detected, remove thoroughly.



91800 - 63/40x500 Long

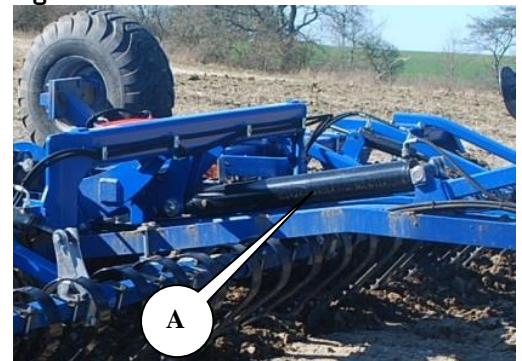
ASSEMBLY:

1. Fit new gaskets in upper part and collar shoe. Fit scraper ring pos. using a piece of pipe, passed around outside of lip, (or a special drift). Fit collar pos. 9 onto collar shoe using tubular bar or screwdriver.
2. Lubricate thread on upper part and cylinder tube with grease (rust-preventing anti-scratch).
3. Fit upper part pos. 3 on ram shaft.
4. Lock collar shoe pos. 4 and lock nut pos. 10 using 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 collar shoe pos. 9 and cylinder tube end inside using lubricating oil. Push ram into centre position.
6. Screw on and tighten the upper part pos. 3.

Replacing raise/lower cylinder

Extend roller and relieve pressure on raise/lower cylinder (A).

Fig. 18



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



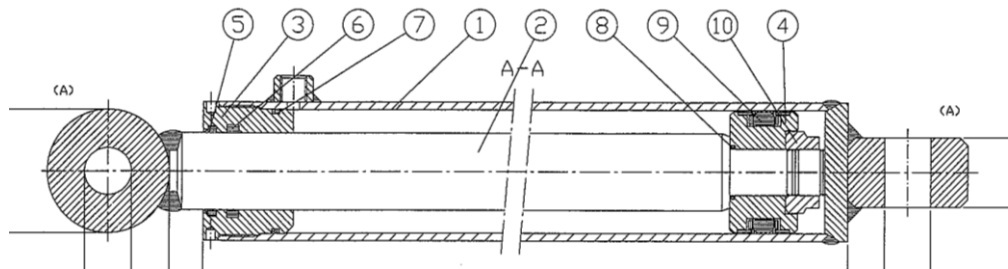
Activate raise/lower cylinder after fitting until cylinder shows movement. Reverse cylinder until it returns to start position. Move cylinder backwards and forwards several times. Fully extend cylinder several times to bleed system.



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

Replacing gaskets on raise/lower cylinder

Fig. 19



1. Drain oil from cylinder by moving ram carefully backwards and forwards.
2. Extend cylinder halfway. Unscrew and remove 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 shaft (pos. 2).
5. Remove upper part (pos. 3) from ram shaft (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) on upper part. If detected, remove thoroughly.

Assembly

1. Fit new gaskets (pos. 5+6+7+8+9) in upper part, plus collar shoe.
2. Apply oil to thread in upper part (pos. 3) and cylinder tube (pos. 1).
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".

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.



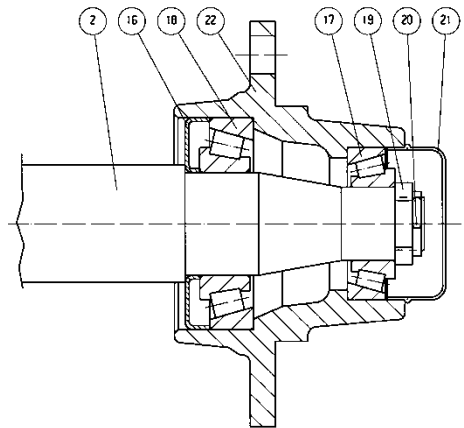
Ensure wheel nuts and wheel surfaces are clean to avoid nuts loosening.

Replacing wheel bearings

1. Remove hub cap pos. 21
2. Remove split pin pos. 20
3. Remove castle nut pos. 19
4. The axle (pos. 2) can now be tapped out.
5. Remove bearings pos. 17+18
6. Remove seal ring pos. 16

Fig. 22

FL55-6



Assembly

1. Fit bearings from pos. 17+18 in hub housing pos. 22
2. Fit seal ring pos. 16
3. Fit inner ring from bearing pos. 18 on axle pos. 2, and fit axle in hub housing.
4. Fit inner ring from bearing 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. Fit split pin pos. 20
7. Fill hub cap pos. 21 half full with ball bearing grease and fit to hub.

Replacing rollers

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 is recommended for removal and replacement procedures.

Replacing side section rollers

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



Fig. 23

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 rollers from wheels
4. Rings can be rolled off roller.



If there is no crane available, activate roller extend cylinder until bolts are loose and can be removed.

Assembly

1. Replace rings in a position corresponding to that when the roller is extended.
2. Extend roller, dropping carefully over rings.
3. Fit bolts (A)



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

Replacing centre section rollers

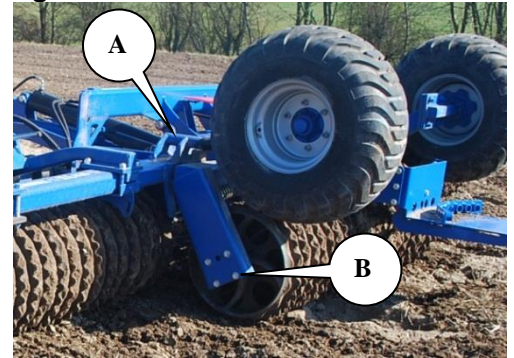


Lifting gear able to lift the whole weight of the roller must be available.

Replacing middle roller

1. Use lifting points (A) on both sides.
2. Slacken bolts (B)
3. Lift using crane until bolts are loose.
4. Remove bolts.
5. Lift using crane until rings can be rolled out.
6. Reverse procedure for assembly

Fig. 24

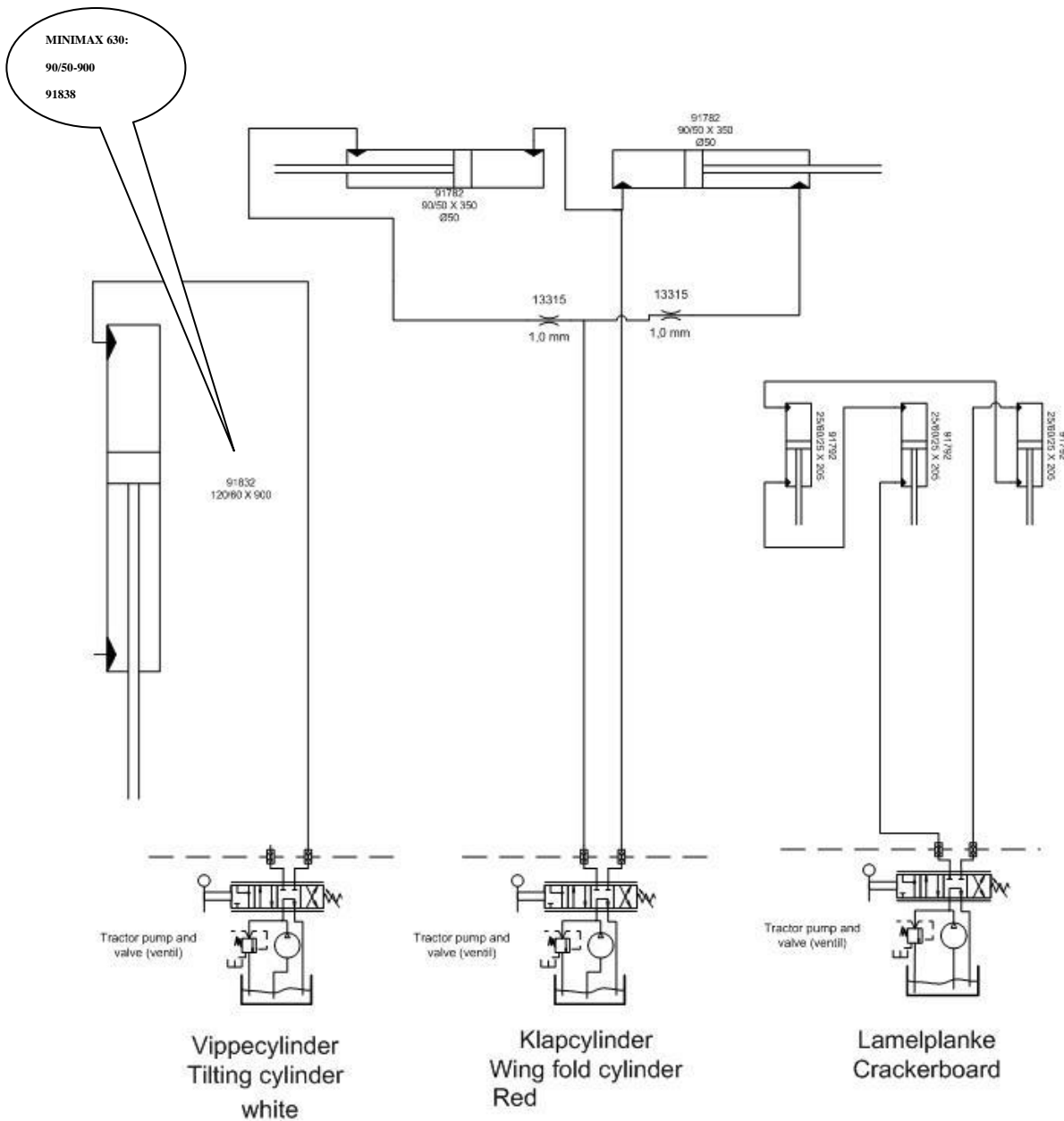


Do not activate hydraulics if there are personnel within machine extension radius.

Hydraulic diagram

Hydraulik diagram for

Minimax XL



Accessories

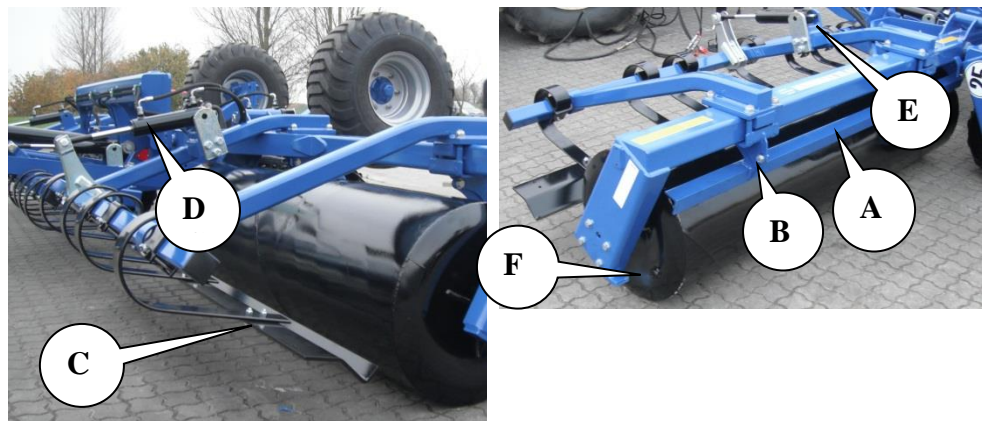
Greenline roller for grass

MINIMAX can be supplied with welded water-filled rollers, with a diameter of 610 mm for use on grass.

These rollers can be filled with water to add weight.

Machine	MINIMAX 630	MINIMAX 830
Net weight without water / (with water)	2100 (3900) kg	2600 (4860) kg

The rollers are fitted with a scraper **(A)** as standard to keep them clean. The scrapers can be adjusted in relation to the roller surface. Adjustment is performed by slackening the bolts **(B)**, making adjustment, and then tightening the bolts again. Adjustment is correct when the scraper is as close as possible to the roller **without** touching the roller surface at any point during rotation.



Frost safety



If the machine is exposed to frost, it is very important that the rollers are drained. Failure to do so can mean a risk of the rollers deforming or splitting. Fill/drain the rollers via the plugs **(F)**.

Levelling board

Machines with Greenline rollers can be fitted with a levelling board **(C)** which can level such irregularities as mole hills. How hard the levelling board is applied to the ground can be adjusted via the tractor hydraulics. The levelling bar therefore requires an extra double-action hydraulic outlet from the tractor in relation to the standard machine.

Board hydraulic system

The hydraulic cylinders (**D**) are linked in series to the corresponding cylinders on the other side section and centre section. The cylinders are fitted with a free ram shaft (**E**). This design means that the amount of oil moved either side of the ram is identical for a given movement. The oil flowing out of cylinder 1 from a movement is used to move cylinder 2, and so on. This ensures that all 3 cylinders move exactly the same as the first cylinder. The 3 boards therefore follow each others' movements precisely.

Bleeding the system

Air can enter the system if the machine is unused for an extended period. The presence of air can be seen when the boards do not follow each other 100%. The system needs bleeding. Set the board to maximum depth using the hydraulics (the cylinders must be as short as possible). Maintain pressure in the system in this position for a while (try to make the cylinders even shorter) even if the cylinders are fully retracted. The cylinders are designed to allow oil to pass the ram via a channel even when at maximum retraction. This forces any air out of the system.

Crackerboard

MINIMAX can be fitted with a hydraulically-operated crackerboard. The board is very effective for levelling soil, e.g. ploughed soil. The crackerboard hydraulic system is identical to that of the levelling board above.



In contrast to the levelling board (which has a one-piece board), the crackerboard has a single broad replaceable tip on every fourth tine. This means that the crackerboard can be used more aggressively (applied harder to the ground), without building up a bank of earth in front of it, because much of the crumbled soil can be slip between the individual tines. A one-piece board is available.

Seed drill

All variants of MINIMAX can be fitted with a seed drill. For more details on seed drills, please see the accompanying user manual. Seed drills can be supplied as both P-Box Speed seed box (requires a constant speed) or pneumatic box (a jockey wheel runs on the ground or the centre roller to ensure the correct amount of seed regardless of the tractor speed) variants.



P-Box Speed seed box mounted on a MINIMAX 630 in operational setting.

Filling seed



The machine **must be fully extended** before filling the seed box. When fully extended, the seed box is at a height above the ground which makes filling easy and safe without the use of ladders or stools.

Guarantee

Dalbo A/S provides a 1 year guarantee on all new machines sold by an authorised Dalbo dealer. The guarantee applies for 1 year from the date of delivery to the end-user.

The guarantee covers the remedying of material or manufacturing defects.

The guarantee will lapse in the following instances:

- **The machine is used for purposes other than those described in the user guide**
- **The machine is abused or treated with neglect**
- **Damage arising from incorrect setting of the machine**
- **Lack of maintenance**
- **Accidental circumstances such as weather, falling objects etc.**
- **Transport damage**
- **Unauthorised repair**
- **Modifications without the written consent of Dalbo A/S**
- **Non-original spare parts used.**

Dalbo A/S cannot be held liable for consequential damage, loss of earnings or profit or as a result of defects. Dalbo A/S cannot be held liable for labour costs other than those reasonably incurred for repairs or the replacement of parts covered by the guarantee.

Dalbo A/S cannot be held liable for the following costs:

- **Setting up the machine**
- **The costs of normal maintenance, washing, lubrication or replacement of wearing parts**
- **Transport of the machine to and from a repair workshop**
- **The dealer's costs, such as transport of personnel or parts to and from the machine and/or the repair workshop.**

The following aspects have decisive influence on the guarantee:

- **The guarantee will lapse if the dealer has not prepared the machine, and instructed the user in its use.**

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