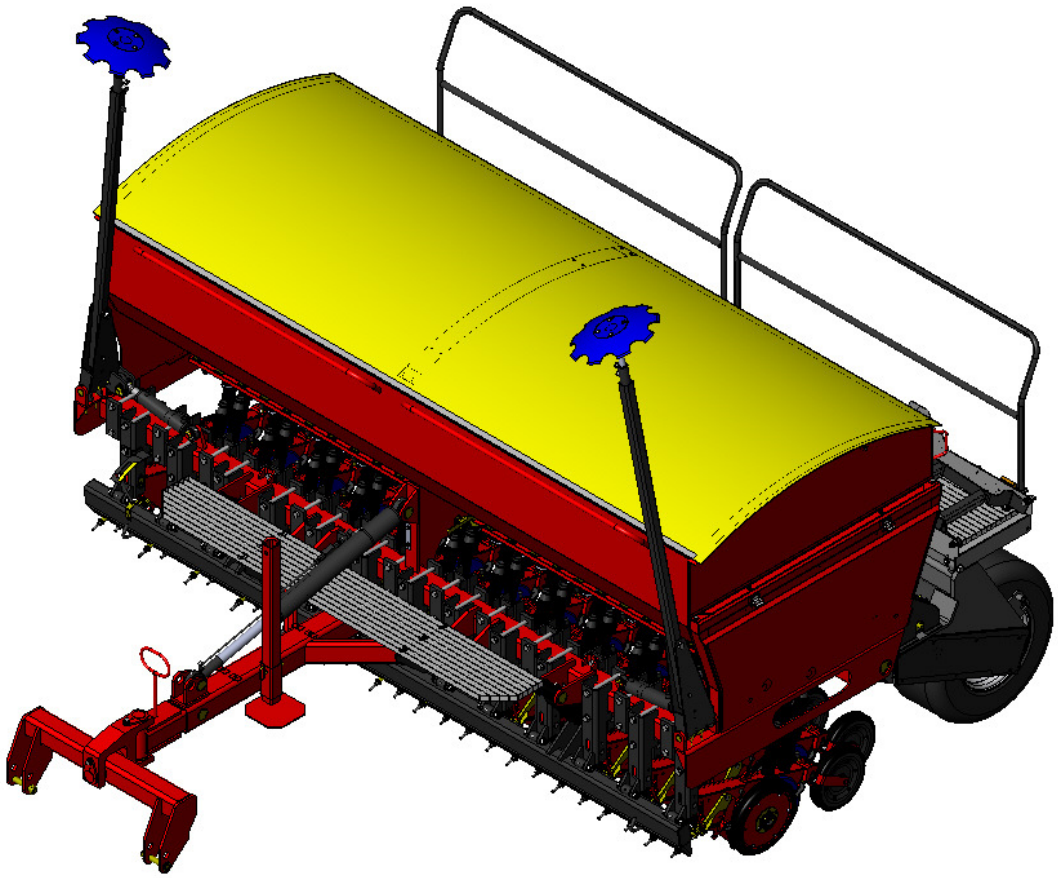
USER MANUAL
VM DIRECT SEEDING DRILLS
300C
400C
300DS
400DS



Vieskan Metalli Oy
Puurakenteentie 3
FI-85200 ALAVIESKA, FINLAND
Tel. +358 (0)8 430 9300
Fax +358 (0)8 430 509
Internet www.vieskanmetalli.com

ORIGINAL INSTRUCTIONS
English 2014 Versio 1.0

CONTENTS

FOREWORD

Congratulations on your excellent choice of seeding drill, we hope it serves you well for years to come.

Please familiarise yourself carefully with these operating instructions to ensure safe use and maintenance of your drill at all times.

The VM direct seeding drill is a very efficient and versatile machine, which can be used for seeding in stubble, grass or tilled soil. In addition, applying the direct seeding method save you time and expenses, and reduces emissions to the natural environment. Direct seeding also has a positive impact on the structure of the soil.

The VM drill is equipped with precision coulters that enable the seeding to be carried out at precisely the desired depth. Using the mechanical metering unit enables the seeds and the fertilizer to be smoothly routed to all the seeding coulters. The available range of efficient optional equipment enables the machine to be configured for even the most demanding user.

The VM direct seeding drill allows you to benefit today from the drilling method of the future.

Use in accordance with the regulations

The production of VM direct seeding drills draws on the manufacturer's extensive experience, the latest research results, and practical experience. All regulations concerning construction and operational safety of machinery, valid at the time of manufacturing, have been taken into account in designing and manufacturing the drills, and the latest technology has been applied. Irrespective of the above, use of the machine may involve situations that expose the user or others to risk of injury or cause some other hazardous situation.

Before using the seeding drill, users are obliged to familiarise themselves with the drill and its operating instructions, and to understand them well.

The seeding drill may not be operated unless technically in perfect order. The seeding drill must be operated in accordance with the regulations, the potential hazards must be identified, and the instructions for use and safe operation must be followed.

Genuine VM spare parts and optional equipment are designed just for this seeding drill. The manufacturer accepts no responsibility for spare parts or optional equipment sourced from other suppliers, which under certain conditions may impair the structure of the machine and jeopardize people.

The machine is intended for the application of seeds and fertilizer. The machine has been constructed to withstand the drill being transported with its seed hoppers full. Using the machine

for any purpose other than the above, such as using it for transportation of people, violates the definition of its intended use. The intended use of the machine includes observation of the instructions and regulations for use, servicing and maintenance given by the manufacturer.
The valid regulations on occupational safety of agricultural machinery and other general rules and regulations related to safety engineering and occupational health or road traffic must be followed at all times.

CE

ORIGINAL EC – DECLARATION OF CONFORMITY

In accordance with the Machine Directive 2006/42/EU.

Vieskan Metalli Oy, Puurakenteentie 3 FI-85200 ALAVIESKA FINLAND
declares that the machines below comply with the provisions of the Machine Directive 2006/42/EC.

The declaration above covers the following machines:
VM 300C, VM400C, VM400C and VM400DS DIRECT SEEDING DRILL, with serial numbers
0010114-------0010117

In designing the machine, the following harmonized standards have been applied:

EN ISO 12100-1
EN ISO 12100-2

Alavieska 30 / 10 / 2014

Jari Huotari

Jari Huotari
Managing director
Vieskan Metalli Oy
Puurakenteentie 3, FI-85200 ALAVIESKA, FINLAND

The person authorized to compile the technical construction file.

Matti Ojala
Puurakenteentie 3, 85200 ALAVIESKA FINLAND

RESPONSIBILITIES

These Operating Instructions are based on the manufacturer's long-term experience and on feedback from the customers. The advice and instructions given in this manual shall be considered indicative only and are by no means binding on Vieskan Metalli Oy or its representatives. Full responsibility for transporting the machine by road or operating or servicing it lies with the owner/driver of the machine.

Each VM direct seeding drill is quality-assured and operationally tested before delivery to the customer. Responsibility for operation of the machine under practical conditions, however, lies entirely with the buyer/user. Compensation claims for damage that are not related to the machine itself, will not be processed. As a consequence of this, we are not liable for any damage resulting from incorrect use of the machine or faulty adjustments.

The manufacturer will not accept responsibility if use of the machine breaches the law, the safety regulations, or the stipulations in the manual. As situations for which there are no instructions or regulations may sometimes occur, we recommend that the general instructions on safety of the machinery and the other relevant directives be followed.

Observe that use of fertilizers and plant-protective agents of the wrong type may cause damage to plants, people, animals, waterways and soil. For handling and use of these substances, always follow the relevant instructions issued by the manufacturer, other specialists or the authorities.

The manufacturer is not liable for any failure related to selection of the feeding rate of the seeds, plant-protective agent or fertiliser, or the seeding depth. The operator must continuously monitor that the desired seeding depth is being maintained. If the operator's empiric knowledge is not sufficient, he shall consult a specialist. The manufacturer assumes no liability for the result of the seeding. The operator is obliged at all times to keep an eye on the consumption of seeds and fertilizer , and thus make sure that the consumption in all seeding coulters stays on the level deemed appropriate.

The manufacturer is not responsible for damage resulting from the use of other manufacturers' components. The manufacturer is not responsible for any damage caused to other machinery or appliances resulting from the use of this machine. The manufacturer reserves the right to develop or alter the construction of the machine. The owner of the machine is responsible for making sure that anyone operating the machine has fully familiarised himself with its operating and safety instructions.

WARRANTY TERMS

1. The warranty of the machine runs for 12 months.
2. The warranty period starts on the date that the new unit is delivered by an authorised dealer.
3. The warranty covers faults in the manufacturing or raw materials. Damaged parts will be repaired or replaced with operable ones at the customer's premises, at the factory or at the contract workshop.
4. Repair under the warranty does not extend the warranty period.
5. The warranty does not cover the following:
    - damage, resulting from the use or maintenance against the stipulations of the instruction manual
    - excessive load
    - normal wear
    - loss of income, standstill days or any other consequential or indirect damage caused to the owner of the product or to a third party
    - travel or freight cost, daily allowances
    - modification of the product's original construction

For matters related to the warranty, please contact your dealer. The measures and possible costs must always be agreed upon with the manufacturer before any measures are taken.

1. SAFETY INSTRUCTIONS

Warning!

Before commencing any maintenance, cleaning, lubrication, installation or adjustment work, always make sure that the power take-off and the hydraulics have been switched off and that the engine has been stopped. Remove the ignition key to prevent the tractor or the implement from setting out inadvertently.
Prop up the machine properly before starting the maintenance work.

1.1 Warning decals

Read carefully through the operating instructions before putting the drill into operation and make sure that you understand them.

Never perform any service or maintenance work under the drill if it is not properly propped up. Also make sure that during lifting, the drill is standing on a firm surface to overcome the danger of getting squashed through sinking on loose surface.

Always make sure that the operating area of the drill is clear of obstacles! Before parking or transportation, always make sure that the automatic locking devices are fully engaged.

Ensure that the motion path of the markers is free of obstacles! Make sure that there neither are other persons inside the danger zone nor you are not in danger the get squashed yourself while the markers a lowered. For this reason keep the markers locked by means of ball valves while the drill is not in operation in the field.

Do not climb on the wheels when the drill is standing in position. They may rotate.

Do not transport anyone on top of the drill during transportation on the road or seeding!

As you get on or off the drill make sure that the rear grate is in place. You may drop off and get injured.

Only use genuine VM Real Direct Seeding drill parts to maintain the quality and reliability of operation. Any use of non-genuine parts will void the warranty and any claims under it.

Beware of getting squashed between moving parts while the machine is raised or lowered.

1.2 Hydraulics

After ending the operation, the hydraulic system always remains under high pressure. A jet of oil may get injected into the skin and cause severe injuries. This risk of injury is also present while searching for leaks.

Take care when handling all parts of the hydraulic system. During these operations you run the risk of getting cut or squashed.

The hydraulic system must not be under pressure while the hoses are being connected to the tractor.

1.3 Protect yourself against oil and grease.

Always use appropriate protective clothing and oil-proof gloves while handling oil or grease.

Avoid all skin contact with the oil and grease. An injury to the skin may result.

Never use oil or lubrication grease for cleaning skin. These substances may contain small metal particles that cause wounds which are worsened even more by the oil.

Follow all the operating instructions and safety instructions issued by the lubricant manufacturers.

Synthetic oils are often corrosive and cause severe irritation.

1.4 Waste oil

Collect and dispose of the waste oil in accordance with national regulations.

1.4.1 Accidents

If oil gets spilled onto the soil, soak it up with peat (for example) to prevent it from dispersing.

If injured by oil or lubricant, consult a doctor immediately.

1.5 Cleaning the drill

Always clean the drill in connection with change of cereal or fertilizer type.

Always before keeping the drill unused overnight or over a long-term rain, empty the fertilizer hopper and clean up the feeding grooves by turning the adjustment of feeding rate from one extreme position to the other. The fertilizer might dissolve, and clog the feeders.

Do not direct water jet on electric appliances.

Before using any detergent, ensure that it is suitable for the purpose. Follow the safety regulations and instructions issued by the manufacturer of the detergent.

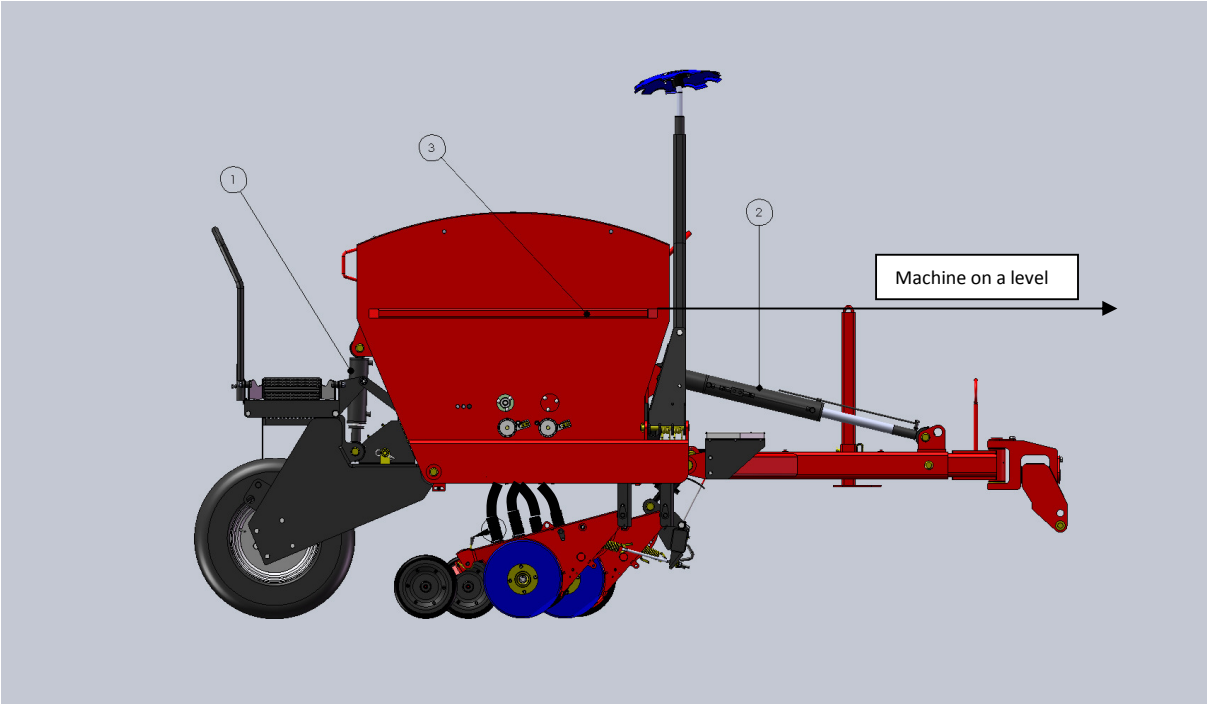
2. TECHNICAL DATA

Hopper volume litres	3500	4800	3500	4800
Coulter weight kg	50-175	50-175	50-200	50-200
Tyre size	15.0/55-17"	15.0/55-17"	15.0/55-17"	15.0/55-17"
Number of coulters pcs.	20	26	20	26
Coulter type	Classic coulter	Classic coulter	Precision coulter	Precision coulter
Row spacing mm	150	154	150	154
Working speed km/h	8-12	8-12	6-12	8-12
Horsepower requirement hp	90	120	90	120
Automation	RDS 200	RDS 200	RDS 200	RDS 200
Spraying tracks	standard	standard	standard	standard
Level guards	optional equipment	optional equipment	optional equipment	optional equipment
Centre-line marker	optional equipment	optional equipment	optional equipment	optional equipment
Remote control for the fertiliser	optional equipment	optional equipment	optional equipment	optional equipment
Blocking guards for hoses	-	-	-	-
Coulter pins: Inner	standard	standard	standard	standard
Outer	optional equipment	optional equipment	optional equipment	optional equipment
Front levelling board	optional equipment	optional equipment	optional equipment	optional equipment
Front disc harrow	optional equipment	optional equipment	optional equipment	optional equipment
Front harrow	optional equipment	optional equipment	optional equipment	optional equipment
Rear following harrow	optional equipment	optional equipment	optional equipment	optional equipment
Lubrication hoses for the coulters	optional equipment	optional equipment	optional equipment	optional equipment

The manufacturer reserves the right to make changes

3. ADJUSTMENT AND OPERATION OF THE DRILL

3.1 Seeding position DS



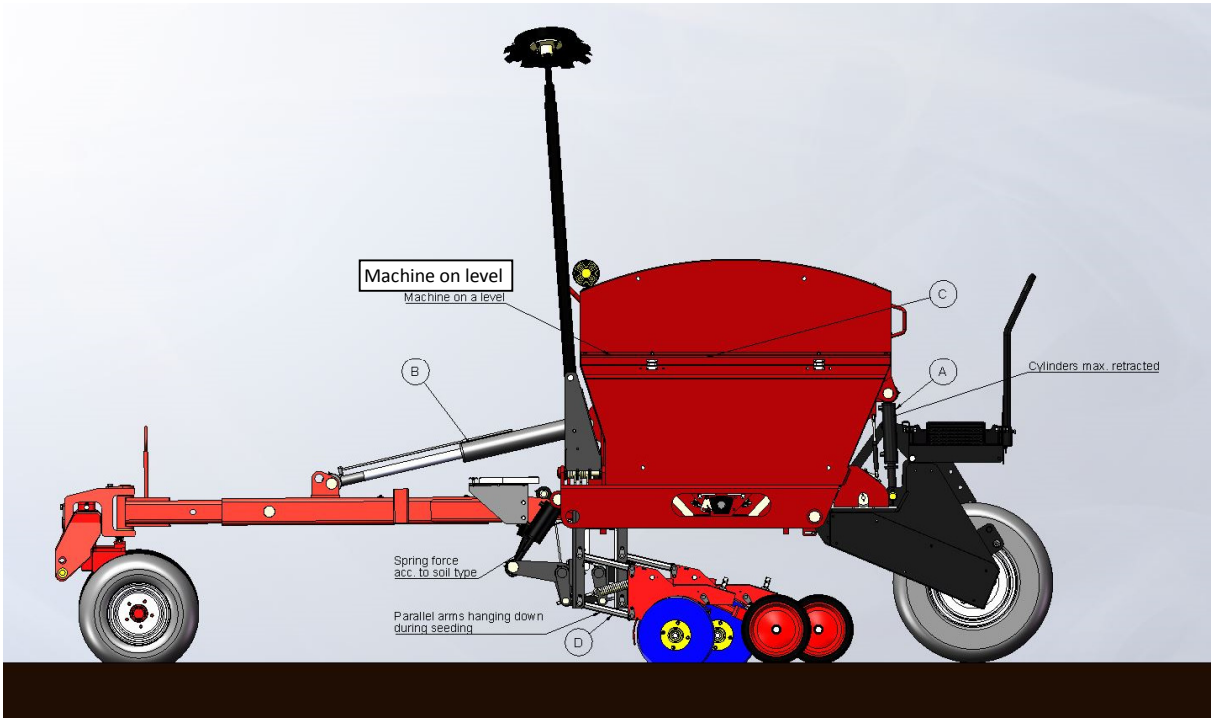
Adjust the seeding position of the drill so that its lifting cylinder (A) will be in the lowest position during seeding. To maintain the steerability, set the lower lift arms of the tractor level.

Use the hydraulic cylinder (2) to adjust the machine to the correct seeding position so that the side beam (3) will be on a level.

Note that adjusting the drill's position during seeding may affect the seeding depth. The most precise seeding result is achieved by keeping the machine in a horizontal position throughout the seeding operation.

Before using the front packer (optional), set the machine in the right position using the hydraulic cylinders (2). If you seed without using the front packer, make sure that the height position of the 3-point linkage does not change during the operation.

3.2 Seeding position C



Adjust the seeding position of the drill in a manner that the lifting cylinders (A) will be in the lowest position during seeding.
To maintain the steerability, set the lower lift arms of the tractor level.

Set the correct seeding position with the hydraulic cylinder (B) so that on hard soil the side beam (C) will be set on a level and on lighter soil types the front edge of the beam will be 20–50 mm higher than the rear edge.
Then the parallel arms (D) will be hanging down slightly, and the machine will sow at its best and is able to climb over even high obstacles.

Before using the front packer (optional), set the machine in the right position using the hydraulic cylinders (2). If you seed without using the front packer, make sure that the height position of the 3-point linkage does not change during the operation.

3.3 Adjusting the seeding depth of the precision coulter

The seeding depth of the precision coulter (see Fig. 3.2.1) is individually set by adjusting the height of the side-wheel (part 1.1). The elevation of the side-wheel with respect to the coulter is adjusted mechanically using the depth adjustment lever (part 1.2). Pull the lever outward from the coulter frame so that it comes out of the notch in the frame (15 pcs.). After that, it is possible to move the lever up or down to achieve the desired seeding depth.

- seeding depth lever in the lowermost notch: seeding depth = 0 cm
- the seeding depth lever in the uppermost notch: seeding depth = 7 cm

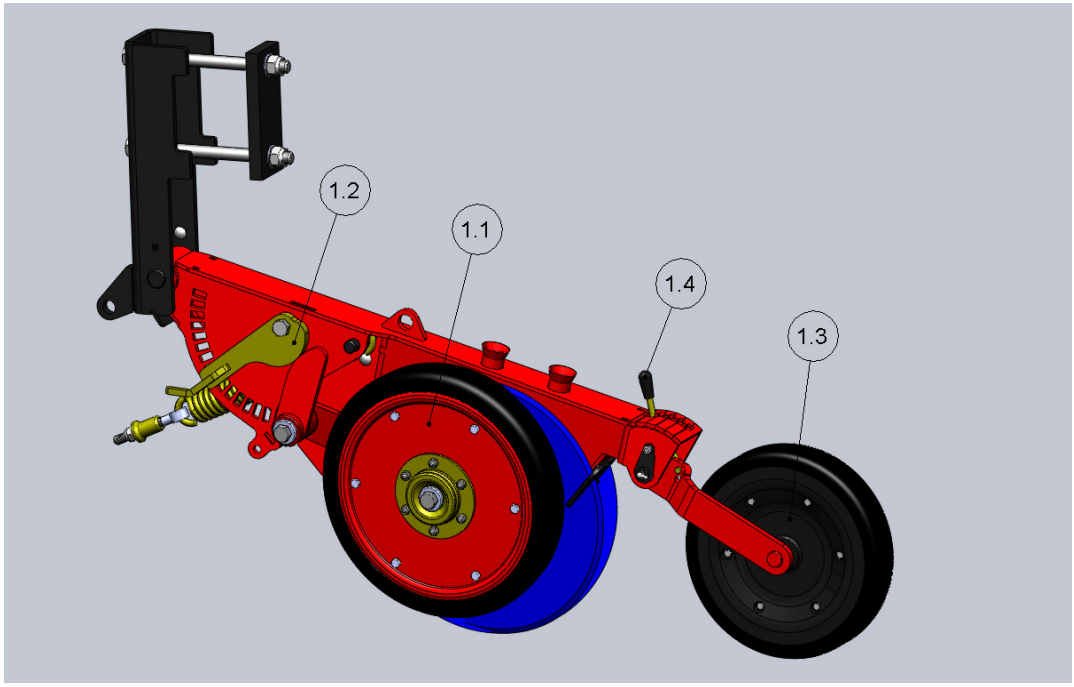


Fig. 3.2.1 Precision coulter.

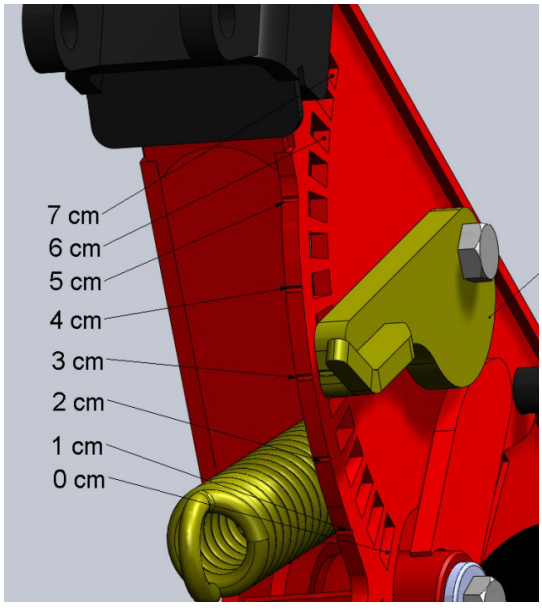


Fig. 3.2.2 Notches for depth adjustment.

The depth adjustment is staggered in intervals of 0.5 cm. The depth positions 1 cm, 2 cm, 3 cm, 4 cm and 5 cm are marked with notches on the front part of the coulter frame (see Fig. 3.2.2). After adjustments, make sure that the lever for adjusting the seeding depth locks up in its notch.

In addition to adjustment of the side-wheel, the seeding depth is also affected by the position of the drill, the springback factor of the coulter, and the softness of the soil. Observe that the coulter weight increases as the front end of the drill is lifted, and correspondingly, it lessens when the front end is lowered. The result is optimal when the machine is in a horizontal position with respect to the soil surface.

After adjustments, the seeding depth must be verified at a spot where the correct seeding speed has been applied. Recommended seeding speed is 8-13 km/h.

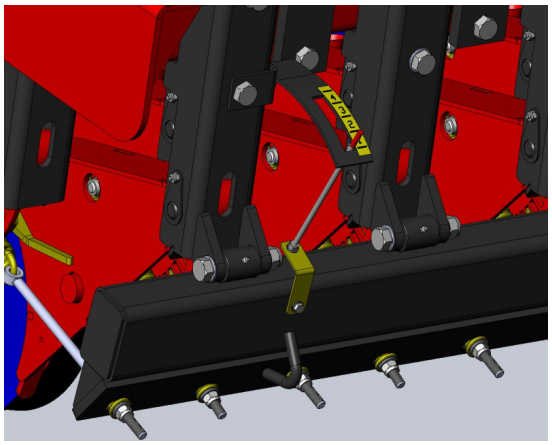
When seeding directly into stubble, the recommended seeding depth for cereal is 2-3 cm, and for small seeds 1-1.5 cm.
Do not sow too deeply when seeding in fine-grained and moist soil. Moist soil is easily compacted on the seed and the seedling will not be able to sprout through the compacted soil surface.

Thanks to the solid seed-bed and the rolled covering soil on the seed, the seeding depth in direct seeding is low. The capillary rise brings the water to the surface layer of the field. Thus the seed will germinate and the fertilizer dissolve well. The presence of stubble and straw material helps preserve the moisture even when it is dry.
For this reason the same seeding depth is good for all soil types.

When sowing in tilled soils, the same seeding depth recommendations shall be followed as for traditional seeding drills, i.e. 5-6 cm for hard clay soils and 3-4 cm for light, fine-grained soils. Take note that, to avoid leaving loose soil under the seed, which would impede the germination, the tilling depth must not exceed the seeding depth.

The cover wheel (part 1.3) at the rear of the precision coulter (see Fig. 3.2.1) closes the furrow. The weight of the cover wheel may be adjusted using the lever behind the coulter (part 1.4). The weight of the cover wheel should be adjusted in accordance with the sowing conditions, so that the furrow will close over so that no grains remain visible. Take into account that increasing the weight of the cover wheel decreases the weight of the coulter. This means that, at least on hard soils, applying too much weight to the cover wheel may lessen the coulter weight to such an extent that the desired seeding depth will not be reached.

The spring force of the coulter is adjusted according to the soil type and density. The spring force can be freely adjusted between 50 and 200 kilos. Less force is applied for light soil, and more force for heavier soil. The spring force of the cover wheel shall be adjusted so that the furrow will close. The spring force of the coulter is adjusted hydraulically, and may even be adjusted while driving. E.g. at the humous end of the field the coulter pressure can be reduced and at the clayey end of the field it can be increased. Thus the seeding depth can be kept desired. The indicator at the right side of the machine shows the value of the coulter weight (see Fig. 3.2.3).

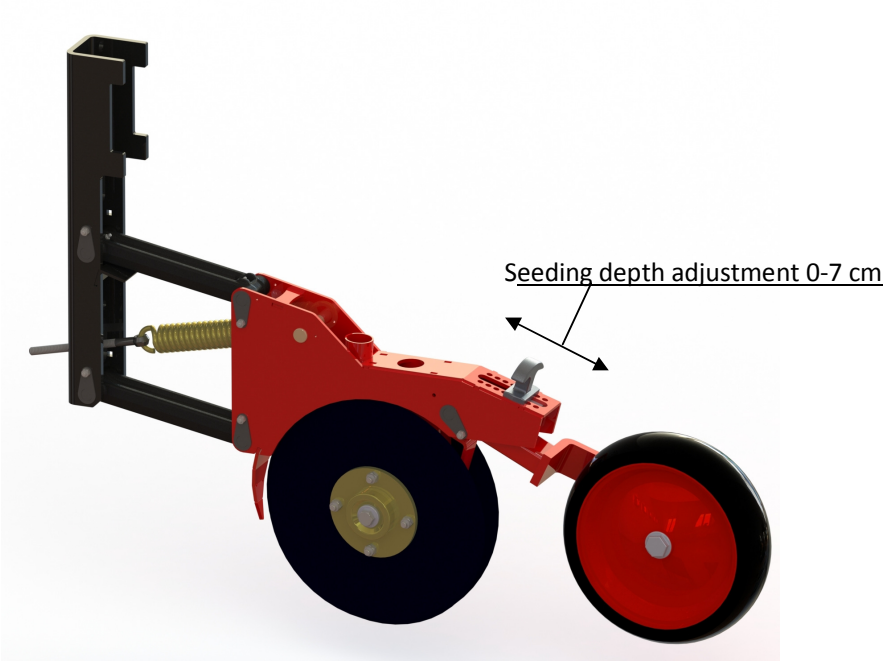


DS model

C model

Fig. 3.2.3 Adjusting the spring force of the coulter and its indicator

3.4 Adjusting the Classic coulter's seeding depth



The seeding depth of the VM-300C and 400C seeding drills is adjusted by means of a coulter-specific support wheel.
To adjust the seeding depth change the position of the seeding depth limiter. In addition to setting of the support wheel position, the seeding depth is also influenced by the position of the drill, spring force of the coulter as well as of how loose the soil is.
The support wheel which adjusts the sowing depth, closes the furrow and covers the seed.

3.5 Performing a calibration test

1. Using the lifting cylinders, lift the machine as much as is required to release the tooth contact or – while the machine is in its lower positions – remove the hairpin (see Fig. 3.3.1) to allow the transmission to rotate freely. Finally, lift up the transmission cover (see Fig. 3.3.2).

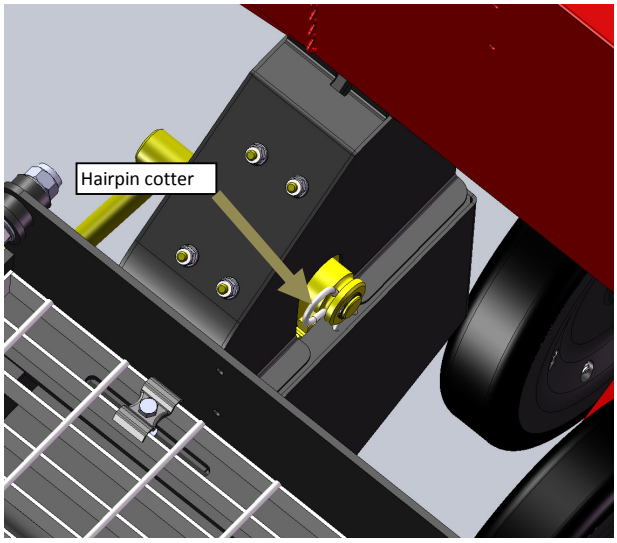


Fig. 3.3.1 Disengagement of transmission.

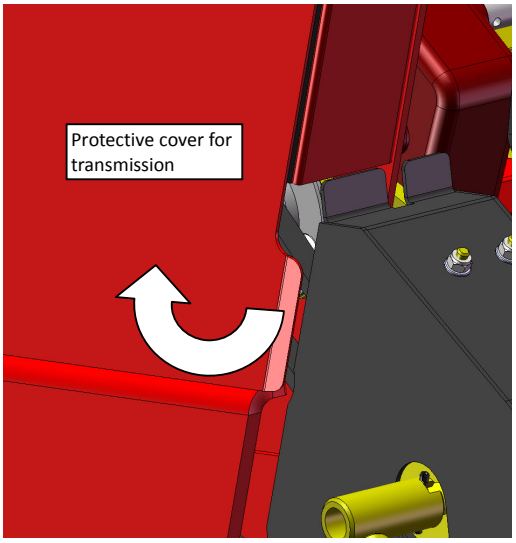


Fig. 3.3.2 Protective cover for transmission.

2. Transfer the calibration test trays to the desired feeding shaft by turning the crank.
   Turn the crank to the rear to perform a calibration test on the foremost hopper (=fertililizer compartment), and to the front to perform a calibration test on the rearmost hopper (=seed compartment) The centre position is the seeding position. Finally, check that the calibration test trays are at the feeders and that their lock has been turned to the side (see Fig. 3.3.3).

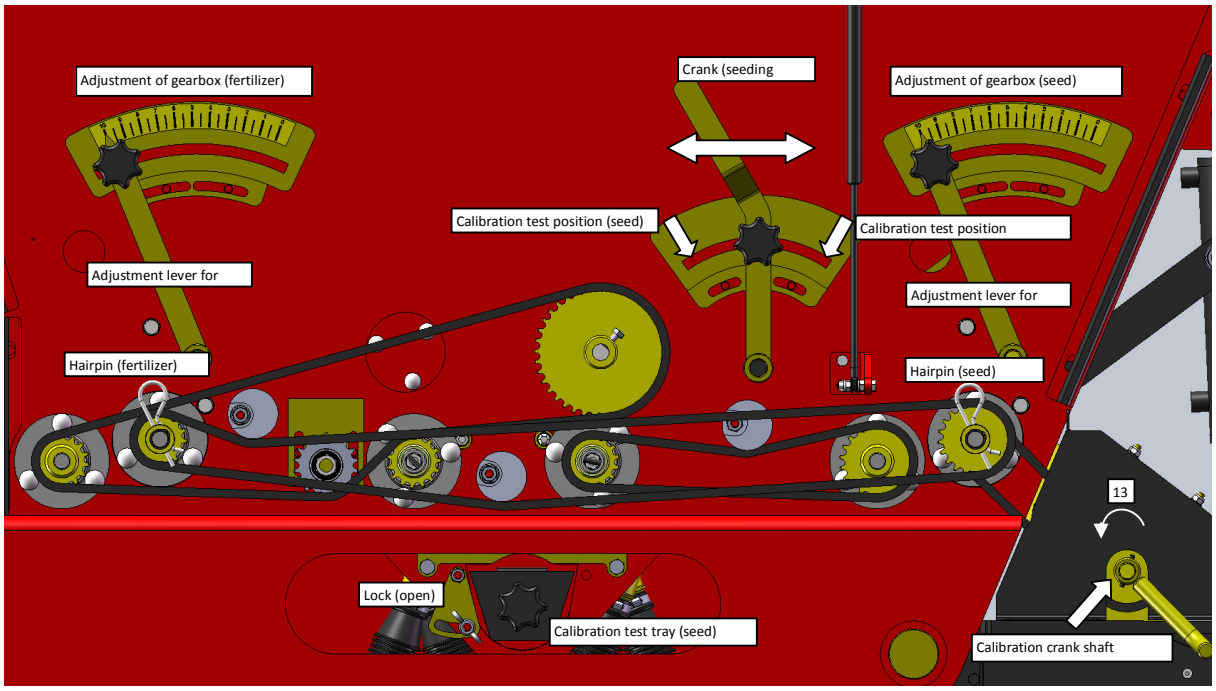


Fig. 3.3.3 Performing the calibration test.

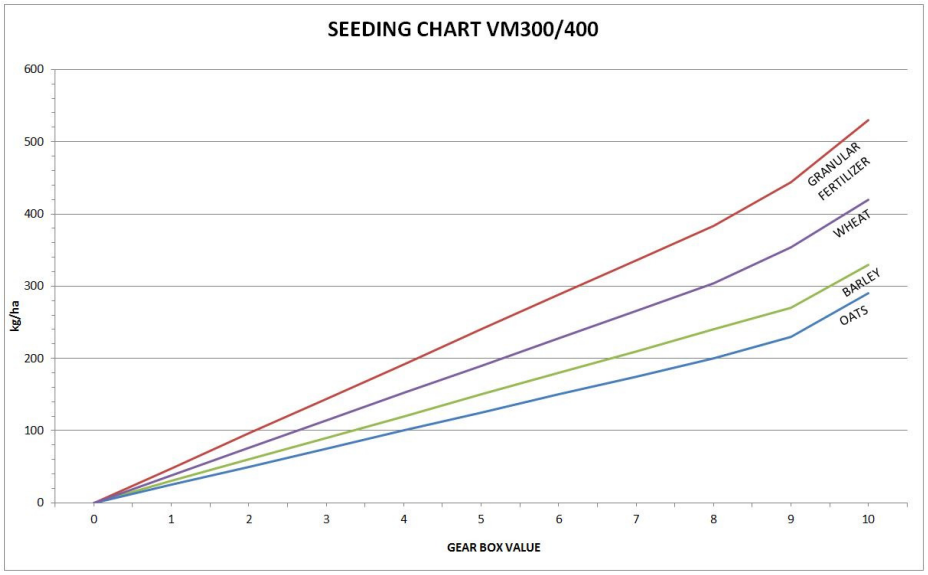
3. Remove the pin of the feeder shaft chain-wheel either on the fertilizer side or on the seed side (Fig. 3.3.3).

Perform the calibration test at a feeder row where the cotter still is in place. The machine's foremost hopper is intended for fertilizer, and the rearmost hopper is intended for seeds/small seeds.

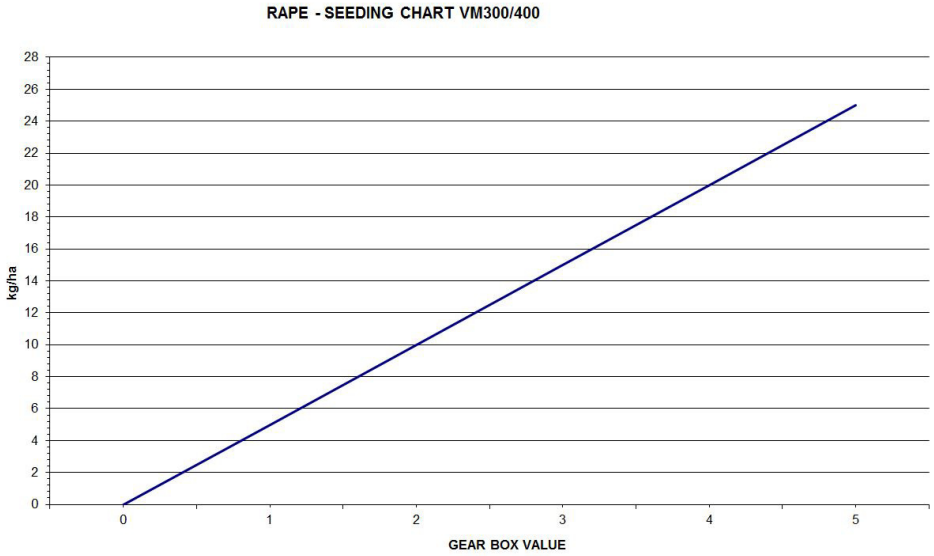
4. The feeding rate is adjusted by shifting the adjustment lever on the gearbox to the desired position (see Fig. 3.3.3).

The scale decal is graded from 1 to 10, where 0 stands for the lowest feeding rate and correspondingly 10 stands for the highest feeding rate.

The scale is indicative only, so the correct feeding rates must always be verified by performing a calibration test.



NOTE! Turn the feeder shaft roller fully open (value 10.0)
NOTE! Set the bottom flap to position 1



NOTE! Turn the feeder shaft roller to value 2.0
NOTE! Set the bottom flap to position 0

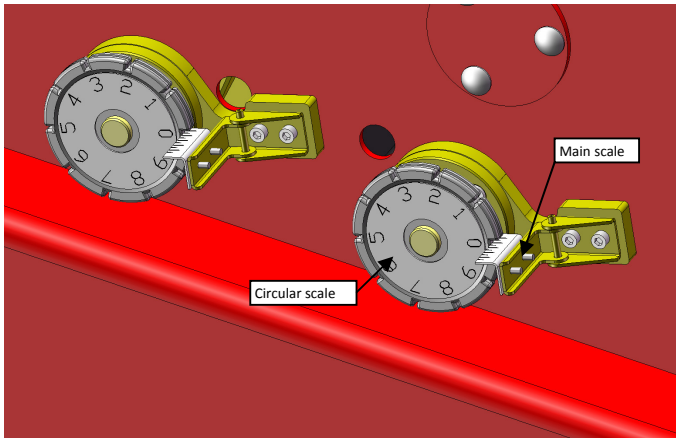


Fig. 3.3.4 Adjustment wheels of screw type.

The feeding rates can be finely-adjusted using the screw-type adjustment wheels of (see Fig. 3.3.4) on the right-hand side of the machine's hopper.
The main scale for the feeding rate is at the detent of the adjustment and the intermediate scale is on the adjustment wheel circle. As the adjustment wheel on the seed side is turned outward, the feeding rate of seed increases. As you turn the adjustment wheel on the fertilizer side inward, the feeding rate of fertilizer will increase.
It is possible to verify the correct feeding

5. Turn the shaft ***counter-clockwise*** 1 round/second by means of the calibration test crank. 17(300c/300DS) / **13**(400C/400DS) rounds of the crank corresponds to the area of 1 are (see Fig 3.3.3).

6. Pull out the trays and weigh their contents. As required, adjust the feeding rate from the gearbox until the desired weight is achieved. The calibration test only produces the amount required for one are, so the amount required for a hectare is a hundred times more.
   When returning the calibration test trays to the machine, make sure that they come in the correct order and also are joined together correctly (see Fig. 3.3.5).

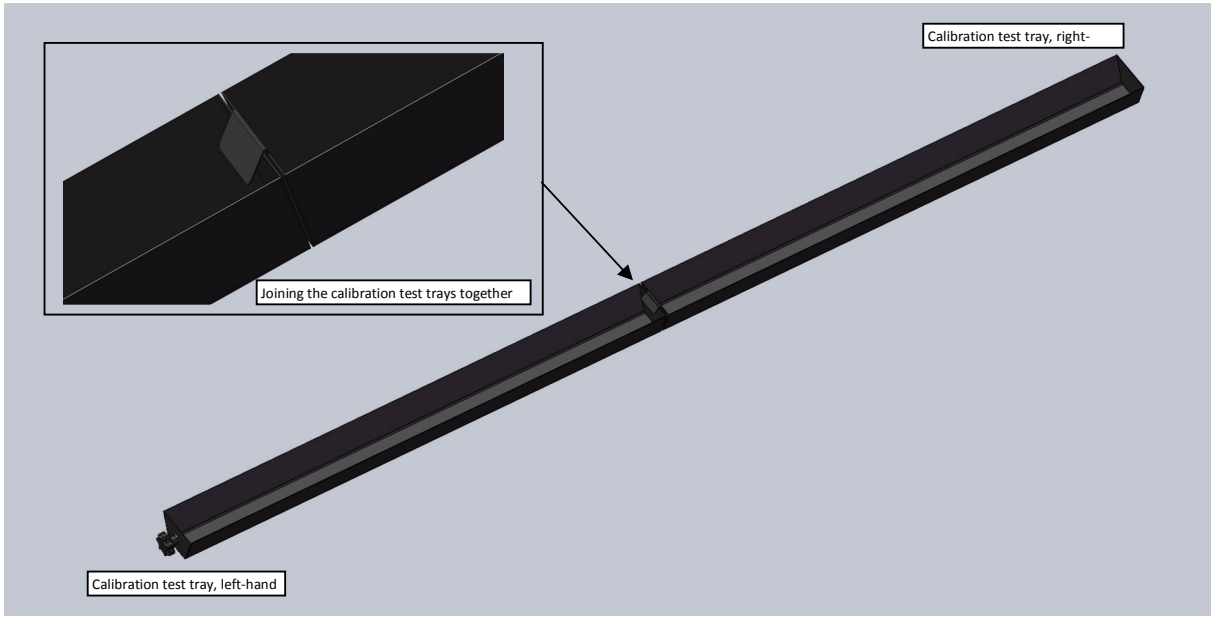


Fig. 3.3.5 Correct order and joining together of the calibration test trays.

7.Put the hairpins back in place after the calibration test is completed.

8. Put the transmission cover in place.

THINGS TO REMEMBER

It is important to remember to put all cotters in place in the feeder shafts as the feeder shafts without cotters will not operate.

The amounts in the seeding chart are average and therefore only indicative.

The calibration test should be repeated every time the feeding rate needs to be readjusted. Particularly on the fertilizer side, the rate may vary greatly depending on the moisture content and fluidity of the fertilizer.

On the seed side the dressing agent and the cleanliness of the seed affect on the flow. No straw bits are allowed amongst the seed. They will clog the feeders.

When driving on the road with the hoppers full of fertilizer/oat seeds, vibration may cause the hoppers to become arched.
Therefore, it pays to check that an even flow of fertilizer/oat seeds gets metered right from the start of the seeding operation. In autumn or after rain, the fertilizer may absorb moisture into the feeders, changing the fluidity of the fertilizer.

If you suspect that moisture has entered the feeders or, that the fertilizer has become arched due to vibration, perform a calibration test on the troughs and check visually that the seed flow from every feeder is even. After the test, put the cotter back in place.

3.4 Position of the bottom flap

The feeding rates of seeds and fertilizer are greatly affected by the position of the feeder´s bottom flap. The "0" position of the bottom flap is intended for seeding of small seeds (gap 0.5 mm). The "1" position is intended for drilling of seeds and fertilizer. The positions "2" and "3" is intended for large seeds, such as pea. The position of the bottom flap is adjusted by changing the position of the lever on the notched scale. (see Figs. 3.4.1 and 3.4.2). The position of the adjustment lever is essential for successful seeding. If the lever is wrongly positioned by one notch, the feeding rate may be affected by about 17%. It is possible to adjust the "0" position by changing the position of the notched scale. It is important to verify that, while the adjustment lever is in the "0" position, the gap between the bottom flap and the feeder rollers is 0.5 mm. This can be checked by pressing the bottom flap with a finger against the feeder roller. The gap of all feeders at every feeder shaft may be separately adjusted so that the gap will be equal at every feeder. Thus the feeding rate will be even over the whole seeding width.

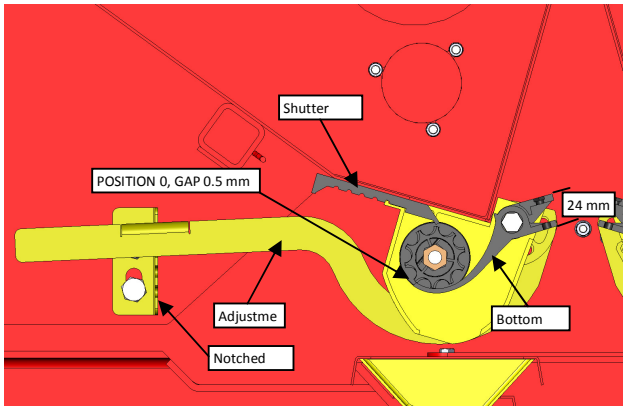


Fig. 3.4.1 Adjustment of bottom flap lever

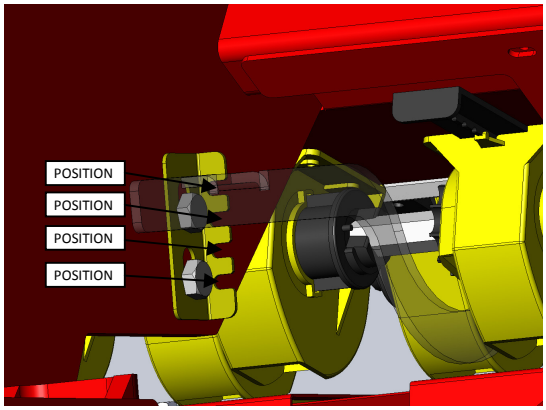


Fig. 3.2.4 Notched scale for adjustment

3.5 Metering units

The feeders are of the so-called push-grooved type. I.e. the feeding rate can be adjusted by changing the effective length of the groove. The feeders are powered by means of a chain by the gear system at the left side of machine.
There is shutter plate in the feeder between the feeder chamber and the hopper for shutting off the feeding into the feeder chamber completely. Closing the feeder system with the shutter plate enables seeding at limited width. For seeding turnip rape, the shutter plate must be closed by three notches and for seeding hay by two notches.
Empty the hoppers by draining the excess seeds or fertilizer from the hoppers through the coulters on a tarpaulin. If the drill is almost empty, the remaining small quantity can be drained through the feeders into the calibration test trough from where it can be emptied and put into storage. The quantity fed into the calibration test trough may be adjusted by means of the adjustment lever for the feeder bottom flap.
Finally empty the drill completely by opening the flap completely and turning the feeders using the calibration test crank You can ensure that the drill really gets empty by finally blowing all remaining seeds and fertilizer away from the hoppers an the feeders with a pressure-air gun.

3.6 Verifying the seeding depth

We recommend checking the seeding depth both at the tracks of the tractor wheel and between the wheels a few times a day. Checking of the seeding depth can be carried out by scratching the seeding furrow with e.g. a spatula.
Place the spatula with the flat side down on the soil surface at the furrow and measure the depth of the seeds in the furrow using a rule. Make note that the driving speed affects the seeding depth. We recommend 8-13 km/h for the driving speed.

3.7 Steerability of the tractor

As a part of the drill´s weight is transferred on the rear axle of the tractor, whilst towing a Real Direct Seeding Drill, the steerability of a small tractor may be impaired. If the steerability is reduced, we recommend using extra front weights on the tractor. Also the weight transfer system of the tractor should be switched off.
The reason for this is that, as the weight transfer system is applied, the height position of the lifting arms may vary in accordance with the loading which affects the seeding depth. You can fit the lifting arms with a 2-part chain with one part attached to the tow pins and the centre link attached to the attachment point of the top link. You can adjust the height position of the tow-bar suitable and lower the 3-point linkage supported by the chain.

4. DIRECT SEEDING METHOD

On average, direct seeding produces greater yields at lower costs compared with traditional seeding methods.

Farming applying the direct seeding method, however, is more demanding than farming based on traditional ploughing and tilling. It also requires a different kind of competence than traditional farming. Therefore, to avoid crop losses, it pays to gain proper insight into this method before starting to apply it.

In direct seeding, the basics of the field, such as ditching, surface evenness, acidity, nutrient balance, harvesting, spreading of plant residues, weed control, plant diseases and extermination of pests, must be in order.

During the initial years of direct seeding, the yield tends to be more sensitive to varying conditions than if the soil were ploughed.
After the transition period, however, the differences will level out, and soil that has been a long time under direct seeding will withstand the varying conditions better.

4.1 Ditching and levelness of the field

The field's drainage ditching should be in order.
The field surface must be shaped with a gradient so that no standing water can gather on it. Any compacted areas, tracks or furrows in the soil must be removed before adopting the direct seeding method. Soil that is airy and even does not require any tilling after the transition to direct seeding. Soils that are compacted and suffer from moisture are generally not suitable for direct seeding.
The application of direct seeding over a longer period of time improves the structure of the soil, leading to a soil that will not suffer from wetness more than a traditionally cultivated soil. As a result of biological activity, root channels, macro channels and channels created by earthworms are formed in the soil, enabling water to penetrate it more deeply.
Soil under direct seeding withstands drought better and yields more compared with traditional methods of cultivation.
The load-bearing capacity of the soil will also increase significantly after a few years of direct seeding. Despite that, driving on the field with heavy loads should be avoided in wet conditions, in particular during the first years of direct seeding. If it is necessary for any reason to drive on the field, it shall be carried out in the direction of seeding.

4.2 Nutrient balance and degree of acidity of the field

Also when under direct seeding, if the field's nutrient balance is optimal, it will yield the greatest crop.
The nutrients are most available to the plants when the pH of the soil is just right.
The nutrient balance of the fields can be established by sampling the soil. Any deficiencies observed in the nutrient balance of the field must be rectified by adding missing substances. It pays to have already performed the initial amelioration before the transition to direct seeding.
Studies have proved that nutrients and lime gradually migrate over time from the field surface deeper into the soil.

4.3 Straw and plant residues

In direct seeding, the seedbed is prepared using the combine harvester and the sprayer.

So as to ensure that the spraying and seeding are successful, it pays to leave the stubble long while harvesting. This way the straw is spread over a wider area and covers fewer weeds on the field surface. Long stubble exposes a larger area of weed leaves, thus enhancing the overall efficiency of the spraying. Leaving the stubble long is also beneficial for seeding, because this way the straw falls in the driving direction and the coulters do not need to cut them off.

The crop should not be flattened, because then the stubble will be short after harvesting. If the crop is flattened, a greater amount of straw will also be created and the straw will be unevenly distributed on the field surface, thus covering the soil and weeds more effectively.

Cutting the stubble short also means that the straws will be cut at their roots, which means there are less leaves left exposed, and the efficiency of the control activities will be reduced.
Flattening of the crop can be avoided by reducing the amount of fertilizers used or by the application of growth regulators.

For the transition to direct seeding, it is beneficial if the previous plant has yielded a plentiful crop, leaving behind a large amount of straws and root mass. These provide the micro-organisms with nutrition and cover, favouring their reproduction.
In connection with harvesting, straw and chaff must be spread evenly on the field surface in such a manner that they will cover the weeds and also the field surface as little as possible.

Avoid stopping while harvesting so as to avoid creating straw heaps.
The uneven spreading of straw and chaff also delays drying of the field and postpones the start of seeding and ripening of the crop.

4.4 Weed control

In direct seeding, weeds are controlled chemically instead of by tilling. If even a small number of weeds is visible on the field surface after the harvesting, the weeds must be exterminated before seeding.
In direct seeding, the weeds can be kept under control, but the species of weeds may change. Therefore, it is beneficial if the farmer can recognise any new weed species and proactively select the right substances for controlling them.

Perennial weeds, such as couch grass, are controlled using glyphosate. The controlling process can be carried out in either spring or autumn. Carrying out the controlling process in autumn enables work on the field in spring to be started earlier.
The disadvantages with weeding in autumn are: a greater amount of herbicide will be required, the weeds may be dormant at the end of the growing season and, further, the weeding may not always be effective due to the cold conditions.
The advantage of carrying out the weeding in spring is that less herbicide may be required. Before carrying out the weeding in spring, the farmer must, however, wait until the growing season has properly started, so as to ensure that the spraying is effective.

Spraying with glyphosate also affects many other perennial weeds, such as scentless mayweed, thistle, sow thistle and bedstraw. If these sprout in large numbers, exterminating them may for a start require larger amounts of herbicide for the control.

As the weed species change, the spraying of annual weeds in a field under direct seeding shall be carried out later than in traditional farming, as in this case the spraying will be more effective on the weeds which have started growing later. In this case, in particular during the first years of direct seeding, more efficient herbicides should be used, as they are likely to take effect on a wider variety of weed species.

In direct seeding the deposit of weed seed in the soil is diminished and, after the transition period, the need for control activities will be reduced.

4.5 Plant diseases

In direct seeding, plant diseases do not occur more frequently than in traditional farming, provided that the straw and chaff are spread evenly over the field surface and crops are rotated.
The microbial activity on the surface layer of the field keeps the plant diseases under control. The straw on the field surface is a nutrition source for the microbes and micro-organisms and, therefore, it pays to leave it on the surface of the field.

Thanks to the activity of the micro-organisms and microbes, natural antibodies, which keep the diseases under control, are created on the field surface. Removing the straw from the field or moulding it into the soil increases predisposition to diseases.
Using seeds covered by dressing reduces their predisposition to diseases.
Controlling the diseases by spraying has been established to increase the yield as well in direct seeding as in traditional farming.

4.6 Rotating crops

Rotating the plant species diminishes the predisposition to diseases, as different plants suffer from different diseases. This means that rotating the crops reduces the occurrence of plant diseases.
Rotating the crops also improves the structure of the soil, because the root depths of the plants vary, which means the plants absorb their nutrition from different depths in the soil.

Direct seeding is easiest to apply for the growing of oats and wheat. These species are more tolerant of wetness and compacted soil. Barley in general is more demanding, but it can be grown successfully, provided that all the basic conditions of the field are in order. Direct seeding is especially well suited to growing malt barley, as the moisture content of the soil is good even in early summer and the vegetation benefits from the availability of nitrogen at the right time. Turnip rape as an intermediate crop reduces the amount of plant residues.

4.7 Seeding depth

In direct seeding of untilled soil, the seeding depth for grain is 2-3 cm and for small seeds 1-1.5 cm. In particular, if the soil is moist and fine-grained, seeding depths exceeding 3 cm should be avoided.

If the soil is tilled, and the conditions are dry and cloddy, the seeding depth may be greater.
The rear-wheel type machine crushes and compacts the aggregate layer on top of the seed, which makes it difficult for the seedling to emerge from the layer of deeper soil as the soil surface dries out.

In direct seeding, seeding too early in soil that is too moist must be avoided. The best result is achieved by waiting until the soil has dried up enough and the furrow closes by crumbling at its edges during seeding. The soil is too moist for seeding if the furrow remains firm at its edges and does not close properly by crumbling.

After the transition period of three to four years, organic matter, carbon and humus, will be created on the field surface.
The aggregate structure of the field's surface becomes crumbly and the conditions for direct seeding are improved.

4.8 Seeding time

The best time to start direct seeding is a few days later than that in traditional farming.

In most cases the best time for spraying in spring is when the other farmers are setting out to till their fields.

The seeding is carried out 1-3 days after the spraying.

After a few years, as the aggregate structure of the soil has changed, the seeding can be started at the same time as those farmers who still apply tradition farming methods, especially where the field has been sprayed in the preceding autumn.

4.9 Growing pace

Soil covered by stubble warms up and dries out more slowly than tilled soil. Therefore, the intensity of growth in fields under direct seeding picks up towards the autumn. The plant is able to catch up with the difference in seeding time during summer, and normally the harvesting can be started at the same time as it is started by those farmers who apply traditional farming methods.

5. MAINTENANCE

5.1 Preparations before the maintenance work

Before commencing any maintenance, cleaning, lubrication, installation or adjustment work, always make sure that the power take-off and the hydraulics of the tractor have been switched off and the engine has been stopped. Remove the ignition key to prevent the tractor or the implement from setting out inadvertently. Prop up the machine properly before starting the maintenance work.

5.2 Required service measures

5.2.1 Transmission

The transmission chains require some maintenance. They must be removed after the seeding and left to soak for winter in a vessel containing engine oil.

Hang the chains dry in spring before putting the machine into service.

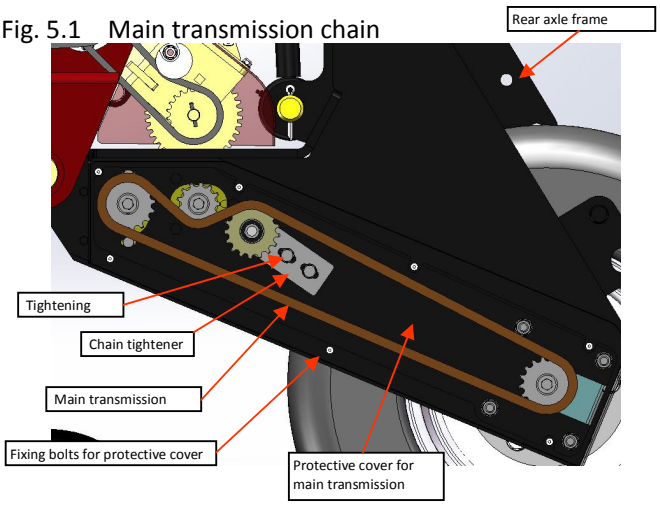
The chains shall not be greased during operating season.

Tighten the chains to correct tightness.

Check the bearings in the transmission by turning each shaft by hand when the chains are not in place.

The roller bearings are lubricated for life. The hairpin wheel is equipped with plain bearings that need to be lubricated once during every operating season.

Fig. 5.1 Main transmission chain



NOTE!
Check the principal transmission chain for tightness after the running-in and after that 2-3 times during the operating season.

The chain is located inside the side beam of the rear axle. The protective cover for the main transmission is fixed with bolts (7 pcs.) to the rear axle frame and it must be removed when checking the chain for tightness.

To tighten the chain, loosen the tightening bolts

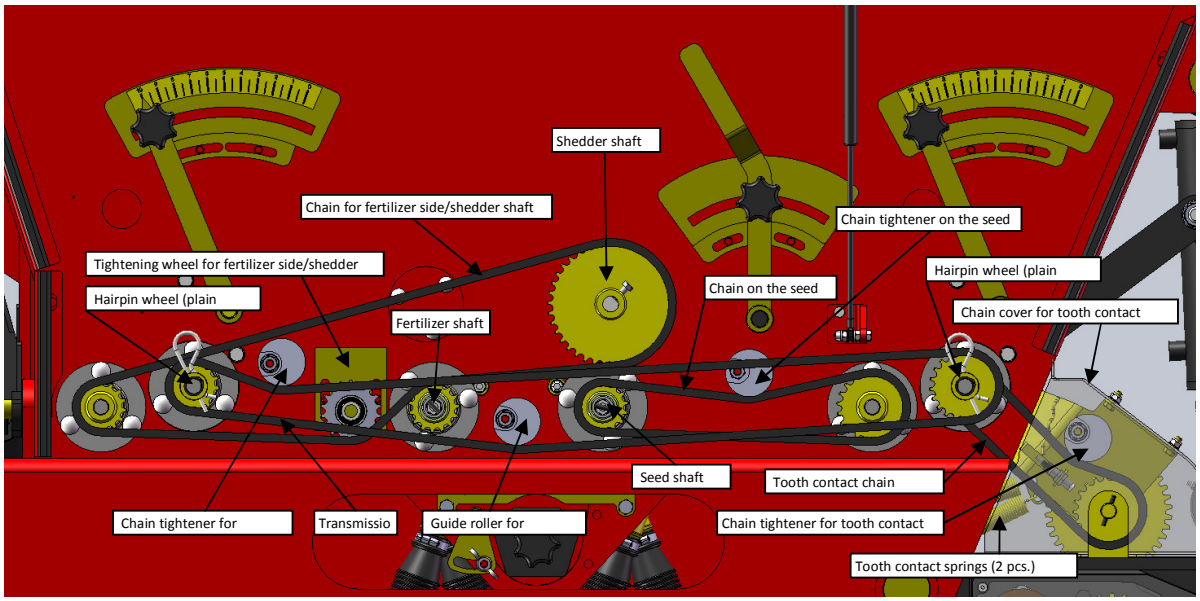


Fig. 5.2 Transmission chains.

The tightness of the tooth contact chain is adjusted by means of a plastic roller-type chain tightener. The cover for the tooth contact chain must be removed before the chain can be tightened.

- The tightness of the transmission chain is adjusted by means of a plastic roller-type chain tightener.
- The transmission chain on the seed side is tightened by means of a plastic roller-type chain tightener.
- The chain for the fertilizer side/shedder shaft is tightened by means of a tightener wheel. To tighten the chain, loosen the tightening nuts (2 pcs.) and press the tightening wheel lightly downward and/or rearward.
- Before each operating season, check the transmission's attachment bolts, such as the bolts of the bearing units and gearboxes. Check, however, the roller chains for tightness right during the first seeding day!

5.2.2 Lubrication points

The joint sleeves of the coulters must be lubricated after at least every 50 ha of seeding. Other lubrication points at least once every operating season. Ensure during lubrication that the grease nipple is open. Continue to press in the grease until the grease extrudes out of the joint. Wipe off the surplus grease. The bearings of the disc coulters and the transmission are life-lubed so they need not be lubricated. Pressing 1-2 times with the grease gun is usually enough. After the operating season before putting the machine into storage after the high-pressure washing and drying we recommend applying appropriate protective oil-spray to the machine. Do not spray the oil on walkboards!

Lubrication object	Lubrication interval (operating season)	Lubrication interval (50 ha)	Lubrication interval (100 ha)	Pc
Joint sleeves of coulters	X	X		26
Rear wheel bearings	X		X	6
Wheel arms	X	X		52
Lifting cylinder	X			2
Coulter weight shaft	X			13
Attachment of rear axle	X		X	2
Drawbar	X	X		2
Marker cylinders	X		X	4
Coulter weight cylinder	X		X	4
Front cylinder	X		X	2
Front packer	X	X		4
Roller chains	X			5
Chain-wheels with hairpin	X			3

Only apply viscous long-fibre grease to the joint sleeves of the coulters.

5.2.3 Lubricating the machine

Precision coulter

The joints of the precision coulter (see Figs. 5.3, 5.4 and 5.5) must be lubricated at intervals of 50 ha. During lubrication, check that the grease nipple is open and press the grease in until it extrudes from the joint. Wipe off the surplus grease.
The bearings of the side-wheel, disc coulters and the cover wheel are lubed-for-life, so they do not need to be lubricated.

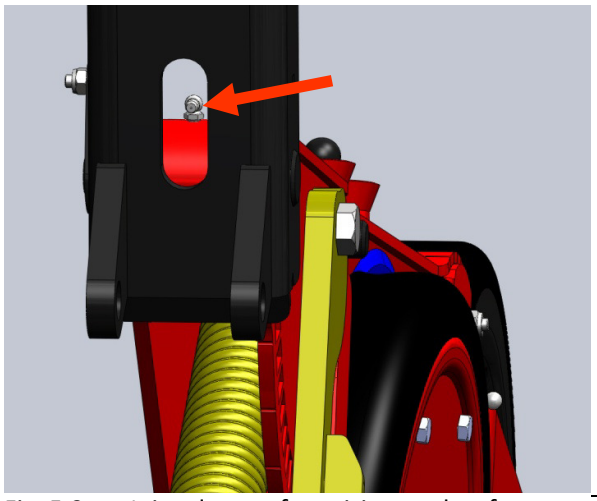


Fig. 5.3 Joint sleeve of precision coulter frame.

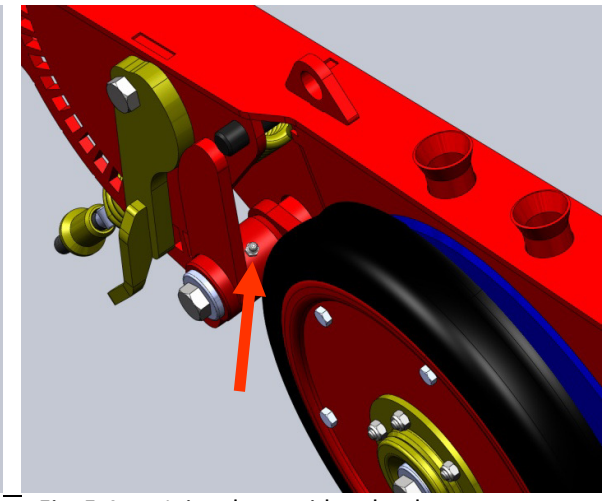


Fig. 5.4 Joint sleeve side-wheel arm.

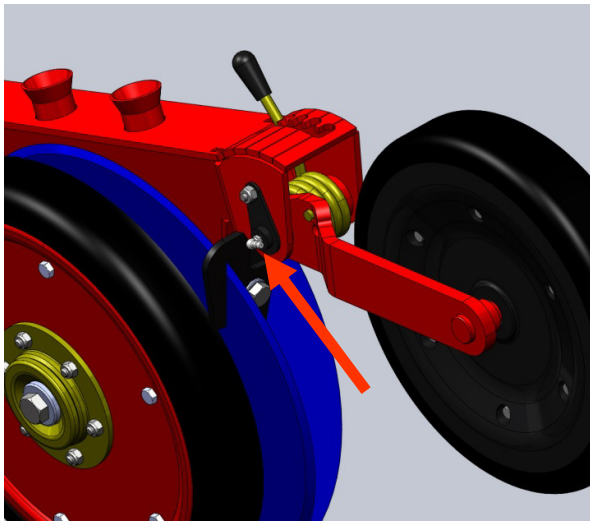
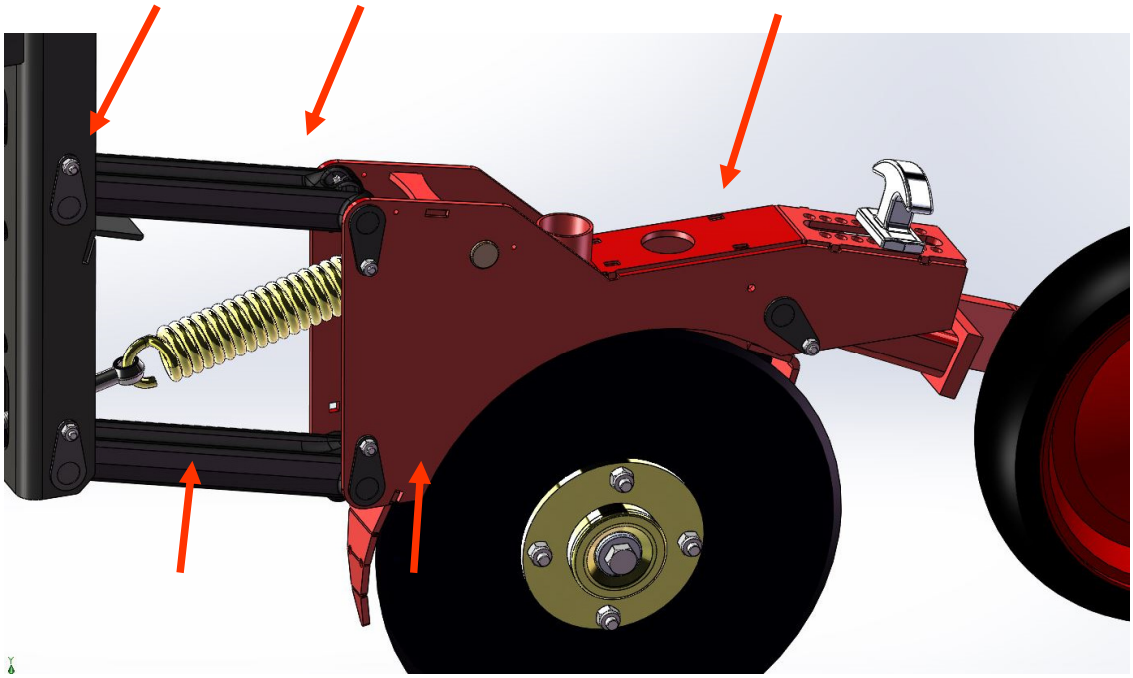
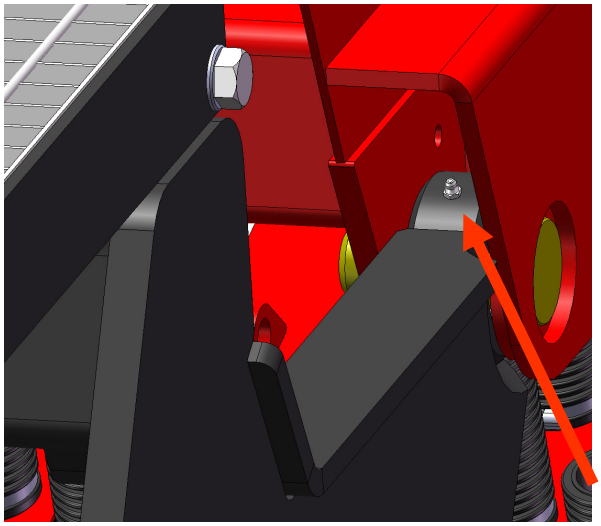


Fig. 5.5 Joint sleeve for cover wheel.

Classic coulter

The pivot points of the Classic coulter (see Figs. 5.3, 5.4 and 5.5) must be lubricated at intervals of 50 ha. During lubrication, check that the grease nipple is open and press the grease in until it extrudes from the joint. Wipe off the surplus grease.
The bearings of the disc coulters and the cover wheel are lubed-for-life, so they do not need to be lubricated.





The grease nipples on the joint sleeves of the drill's rear axle and at the rear corners of the hopper need to be lubricated. They need to be lubricated after every 50 ha of seeding. Press in the grease until it extrudes from the bushing. Wipe off the surplus grease.

Fig. 5.6 Rear axle joint of the drill.

There are grease nipples in the coulter weight joints (see Fig. 5.7). They must be lubricated before the seeding season. Press in the grease until it extrudes from the bushing. Wipe off the surplus grease.

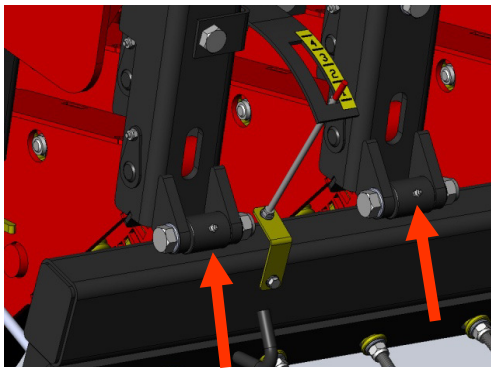
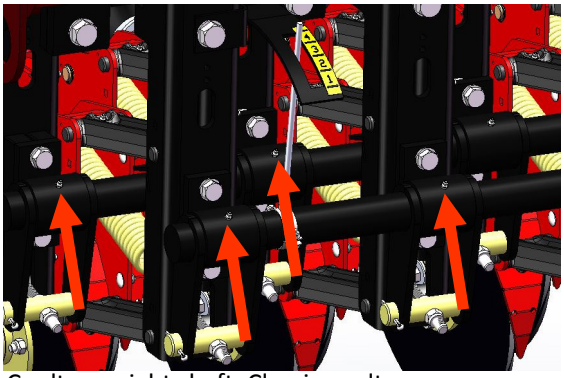


Fig. 5.7 Coulter weight shaft, precision coulter.



Coulter weight shaft, Classic coulter.

There are grease nipples in the drawbar. Because of the excessive strain, they must be lubricated daily!

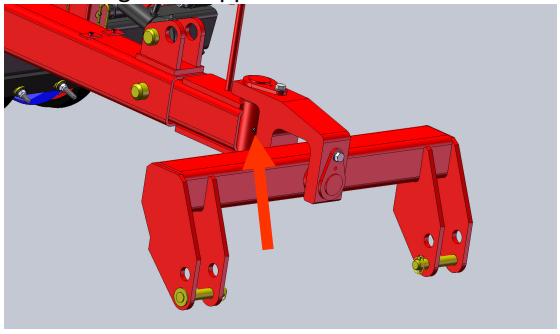


Fig. 5.8 Drawbar joint.

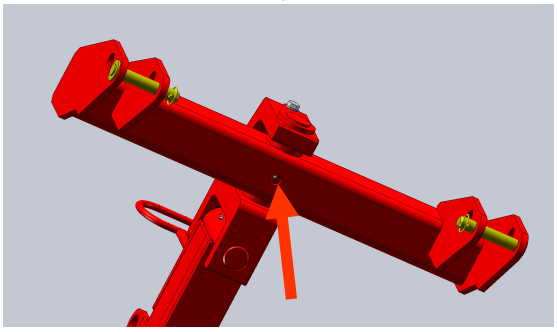


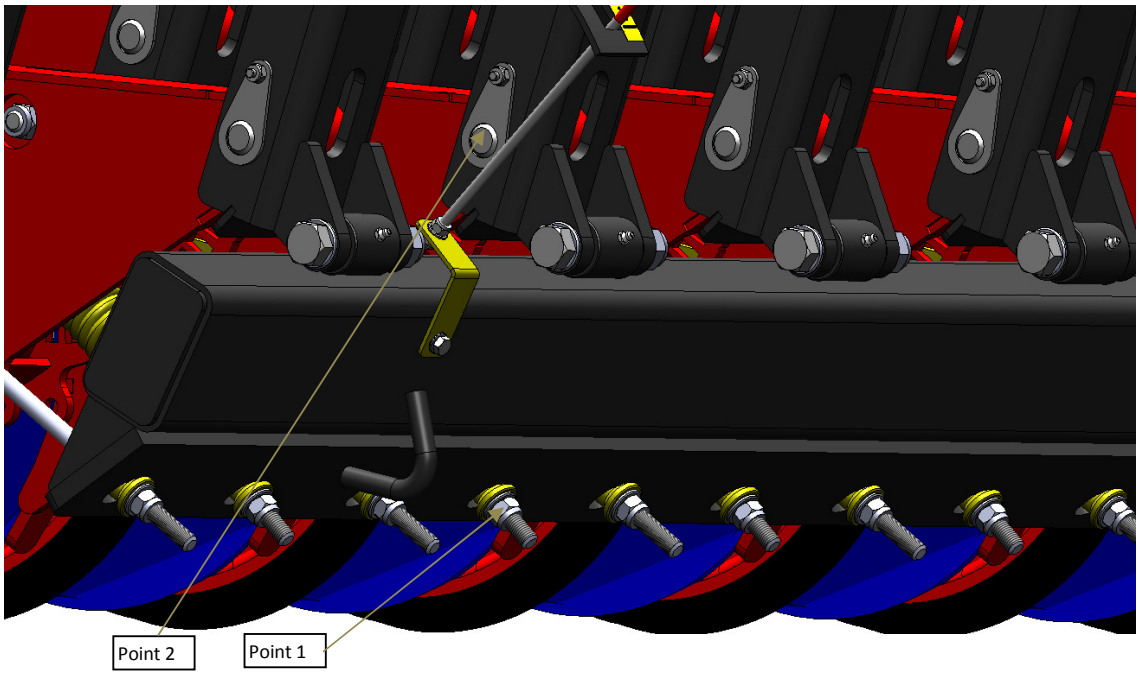
Fig. 5.9 Drawbar joint.

5.2.4 Removing the coulter, side-wheel and disc coulter, and replacing their bearings

Make sure that the machine is standing firmly in position, the lifting cylinder is in its lowest position, the tractor's parking brake is engaged and the engine has been switched off. Before the change wash the coulters preferably using a high-pressure washer. Wear protective gloves during maintenance and beware of sharp edges.

The coulter must be removed from the machine before replacing the parts.

Note! Removing the coulter involves great danger of being squashed or cut!



Removing the coulter from the DS machine

1. Remove the nut and sleeve of the adjustment bolt for coulter weight and release the adjustment screw from the coulter weight shaft (see Point 1).
2. Remove the pin from the coulter joint (see Point 2). The pin is locked with the coulter arm by means of a locking screw and nut.
3. Lift up the machine using the lifting cylinder. The coulter then stays on the ground and can be pulled out from under the machine.

Removing the side-wheel and the disc coulter and replacing their bearings

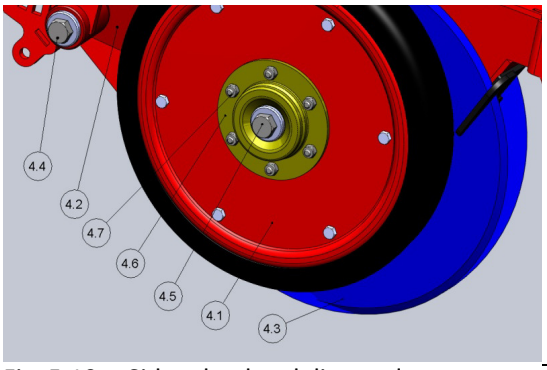


Fig. 5.10 Side-wheel and disc coulter.

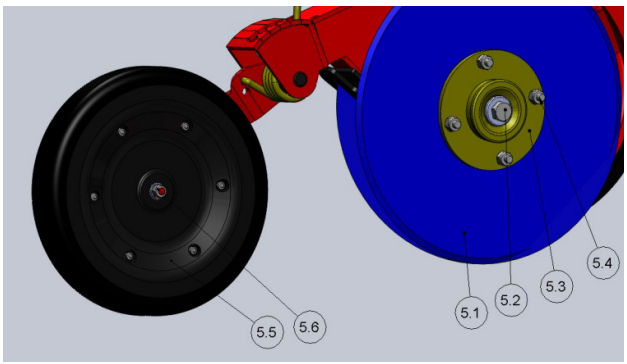


Fig. 5.11 Disc coulter and cover wheel.

The side-wheel (part 4.1) and its arm (part 4.2) must be removed before the disc coulter on the left-hand side (part 4.3) can be removed (see Fig. 5.10). Remove the attachment bolt for the side-wheel arm (part 4.4) and pull the arm loose from the coulter frame. To replace the bearing, remove the attachment bolt (part 4.5, left-handed thread) for the side-wheel and pull the wheel out from the side-wheel arm shaft. The bearing housing for the side-wheel (part 4.6) is attached to the rim by six bolts and nuts (part 4.7).

The disc coulters (parts 4.3 and 5.1, see Figs 5.10 and 5.11) are locked by attachment bolt (part 5.2) to the rim. The bolt on the left side has a left-handed thread and the bolt on the right side has a right-handed thread. The bearing housing of the disc coulter (part 5.3) is attached to the coulter by four lock bolts (part 5.4). Fix the coulter to a bench vice for removal of the bolts.

The bearings of the side-wheel and the disc coulters are fixed to their housings with lock rings. Use a set of pliers to remove the rings. After removing the lock, remove the bearing from its housing using a workshop press. The bearing is lubed-for-life and cannot be lubricated.

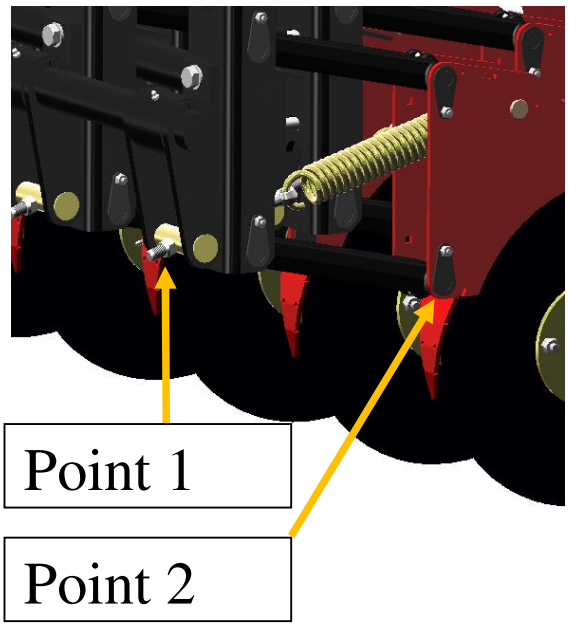
After having installed the new parts, ensure that the disc coulters are pressed together with sufficient force. The pressing force is suitable when the discs are in contact with each other over a distance of about 1/4 of their circumference. As the coulter wears, the pressing force may be increased by removing the shim from under the bearing or by replacing it by a thinner one. Under normal conditions the re-tightening or change of the disc coulters is required only after several operating seasons.

When installing the side-wheel, ensure it settles evenly against the disc coulter so that the side-wheel and the disc coulter come parallel to each other without any major chink between the two. The distance between the side-wheel and the disc coulter may be adjusted using shims.

The cover wheel (part 5.5) can be replaced by by removing the nut attaching it to the arm (part 5.6).

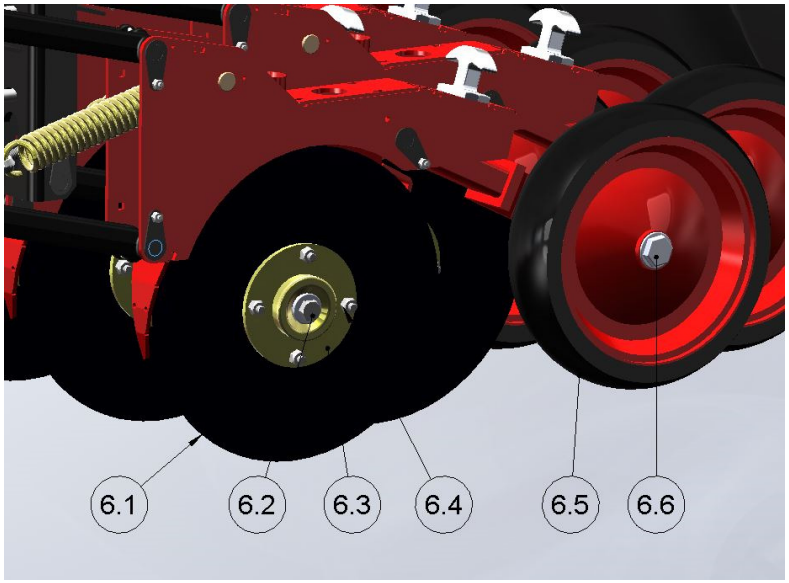
Note! Removing the coulter involves great danger of being squashed or cut!

Removing the coulter from the C model machine



1. Remove the nut of the adjustment bolt for coulter weight and release the adjustment screw from the coulter weight shaft (see Point 1).
2. Remove the pins from the coulter joint (see Point 2). The pins are locked with the coulter frame by means of a locking screw and nut.
3. Lift up the machine using the lifting cylinder. The coulter then stays on the ground and can be pulled out from under the machine.

Removing the disc coulter and replacing the bearings



The disc coulters (part 6.1 in Figs. 5.10 and 5.11) are locked by the attachment bolt (part 6.2) to the rim. The bolt on the left side has a left-handed thread and the bolt on the right side has a right-handed thread. The bearing housing of the disc coulter (part 6.3) is attached to the coulter by four lock bolts (part 6.4). Fix the coulter to a bench vice for removal of the bolts.

The bearings of the side-wheel and the disc coulters are fixed to their housings with lock rings. Use a set of pliers to remove the rings. After removing the lock, remove the bearing from its housing using a workshop press. The bearing is lubed-for-life and cannot be lubricated.

After having installed the new parts, ensure that the disc coulters are pressed together with sufficient force. The pressing force is suitable when the discs are in contact with each other over a distance of about 1/4 of their circumference. As the coulter wears, the pressing force may be increased by removing the shim from under the bearing or by replacing it by a thinner one. Under normal conditions the re-tightening or change of the disc coulters is required only after several operating seasons.

The cover wheel (part 6.5) can be replaced by removing the protective cap and the nut (part 5.6) under it, by which the cover wheel is attached to the arm.

5.2.5 Disconnecting the rear wheel set

Place, for example, battens on an even and firm surface at those wheel sets, which do not need to be removed.
Drive the drill onto the battens. The wheel set to be removed now comes slightly clear (about 5-7 cm) of the ground.
Switch off the tractor engine, engage the parking brake and remove the ignition key to prevent the tractor from inadvertently starting up. Remove the bolts of the flange bearings for the broken wheel set. The intact wheel sets on the battens will stay supported by the support irons although the attachment bolts of the flange bearings have been removed. Once the attachment bolts have been removed, the wheel set to be removed will drop down and can be rolled out.

It is vital to ensure that the drill cannot move in any direction at any stage of the operation!

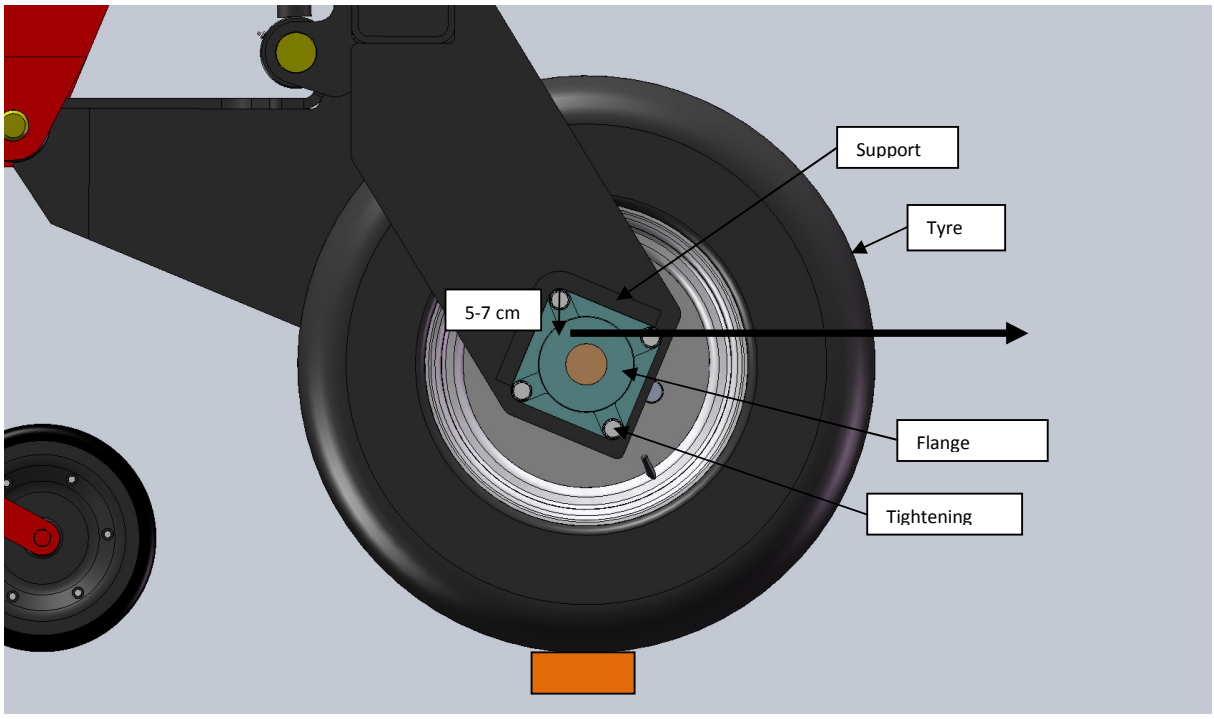


Fig. 5.12 Removing the wheel set.

5.2.6 Dismantling the wheel set for mending the tyre

Dismantling the wheel set (only the left one)

1. Loosen the tightener for the main transmission, and remove the main transmission chain (see Fig. 5.1).
2. Remove the chain-wheel from the end of the shaft. The chain-wheel is attached by means of a bolt.

Dismantling the wheel set (left, middle and right sets)

1. Remove the wheel set to be repaired from the drill.
2. Remove the flange bearing from the shaft. The flange bearing is tightened to the shaft by means of a hexagon socket retainer screw.
3. Remove the valve from the centremost tyre from the rim of the outermost tyre (only from one side).
4. Remove the innermost attachment bolts (6 pcs.).
5. Pull the wheel off the shaft.
6. As required, remove the attachment flange from the rim of the wheel (6 pcs. of attachment bolts).
7. Remove the attachment bolts (6 pcs.).
8. Pull the wheel off the shaft.

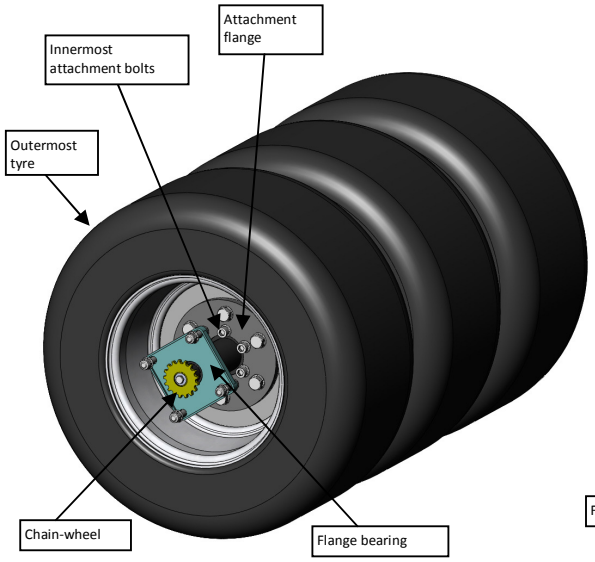


Fig. 5.13 Dismantling the wheel set (left one).

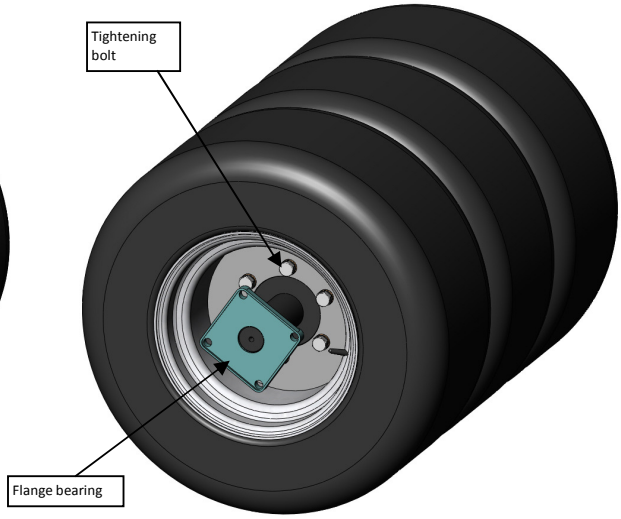


Fig. 5.14 Dismantling the wheel set.

Take the wheel to a tyre workshop because dismounting an 8-ply tyre from the rim is difficult using only handtools. The tyre is tubeless. Have the tyre repaired and, as necessary, fit an inner tube.

When reassembling, remember to attach the valve for the centremost wheel to the rim of the outermost rim.

In order to make the wheel set as straight as possible, tighten the attachment bolts evenly, increasing the torque several times. The final tightening torque shall be about 12 kpm.

Check the bolts for tightness during the next day of use.

5.2.7 Tyre pressure

The side-wheel of the coulter and the cover wheel are of solid rubber. The pressure in the solid rubber tyres cannot be regulated. Suitable pressure for the rear tyres is 1.0 bar. The tyre pressure in the wheels of the front packer, which is available as an option, is 3.0 bar.

5.2.8 Tightness of the bolts

After running-in, check the attachment bolts of the rear axle system for tightness. Check all bolts for tightness and that all cotters are in their due places during maintenance
Recommended tightening torques:

STEEL BOLTS AND NUTS STRENGTH CLASS 8.8 Zn

THREAD	TORQUE (kpm)	
M6	0,9	
M8	2,2	
M10	4,2	
M12	7,3	
M16	16,0	
M20	20,0	TIGHTENING BOLTS, REAR END
M20	25.0	TIGHTENING BOLTS, COULTER

5.2.9 Storing the drill

Keep the drill in a dry place covered against the sunlight. Clean properly the fertilizer hopper and the paint coating of the drill after the use.

The hoppers and the paint coating can be washed using appropriate detergent and warm water. Avoid splashing water on the electric applianaces.

After washing, lubricate all greasing points so as to displace any water from them.

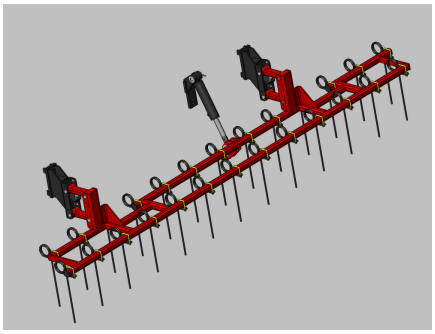
Clean the disc coulters using a high-pressure washer and after that spray a thin film of oil on them to prevent rusting.

Any damage on paint coating can be repaired by touch-up painting. You can protect the paint coating by applying a thin oil film on it.

Keep the drill in the storage with the coulters slightly raised from the ground and with the coulter pressure system at its lowest setting.

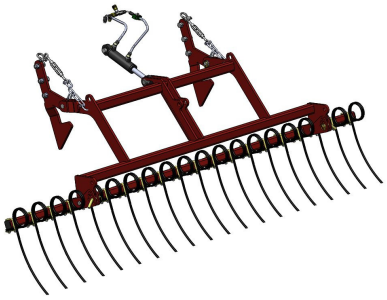
6. ACCESSORIES

6.1 Front harrow



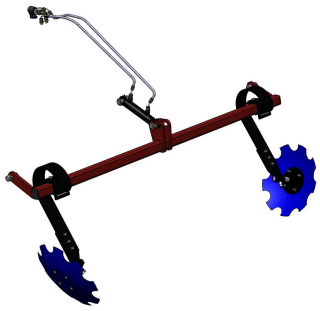
The front harrow takes along the straw heaps on the field and spreads them out to a uniform carpet. At the same time it scribes a seeding trace for the coulter in the plant residues on the soil surface. As it cleans the seeding furrow it also prevents the infested straw from infesting an other host plant. The elevation of the front harrow is adjusted by means of the adjustment screw and hydraulic cylinder.

6.2 Rear following harrow



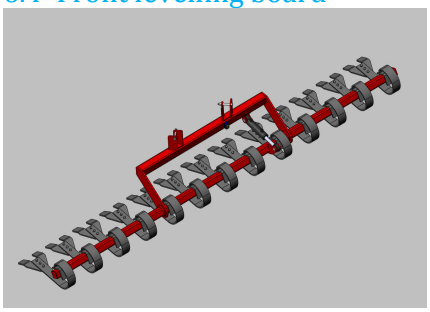
Rear following harrow is attached to the rear frame of the seeding drill The correct seeding depth is adjusted by altering the length of the chain. As the drill is raised to the transport position, the rear following harrow is also raised.

6.3 Disc-type tramline marker



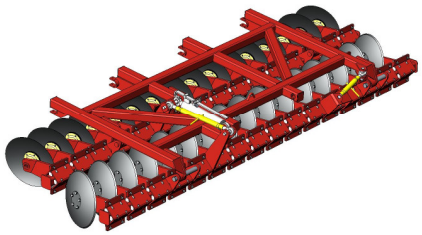
Disc marker is attached the frame of the rear following harrow.

6.4 Front levelling board



The crossboard is used for levelling out the field surface, while seeding into tilled soil. The crossboard is adjusted by means of a hydraulic cylinder

6.5 Front disc harrow

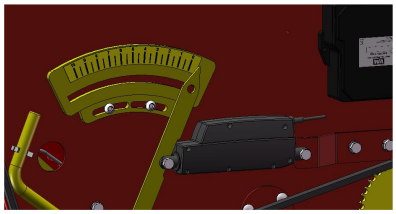


The disc harrow tills the stubble and the plough as well moulds the manure and the plant residues.

6.6 Centre-line marker

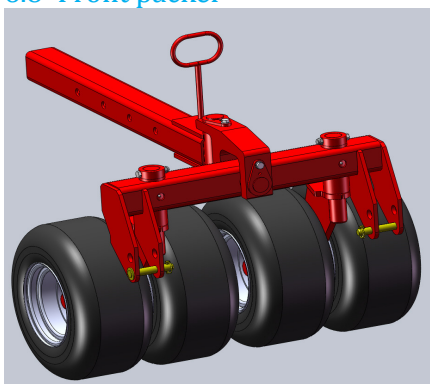
Centre markers, pole bypass functionality as standard.

6.7 Electric remote control for feeding of fertiliser



Adjustment of fertiliser flow from the RDS control during operation.

6.8 Front packer



The front packer may be used for compacting the space between the tractor wheels. Thus, after the seeding, the density of the soil will be the same all over. Thanks to this the germination is even and all the grain will ripen at the same time. The front packer is raised up for driving on road and it is kept low only during seeding.

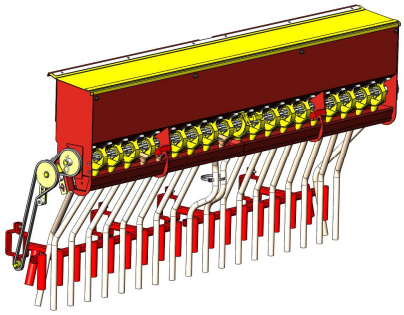
The bearings of the front packer (4 pcs.) must be lubricated before starting the operation. Their tightness shall also be checked after being used the first time, and after that,

6.9 Level guards in the hopper

The seed and fertilizer hoppers can be equipped with electric level guards that,by means of a buzzer and warning light located in the cabin, raise the alert if the hoppers are empty. The moment, when the alert is raised, may be calibrated by means of an adjustment screw on the sensor.

6.10 Hayseed hopper

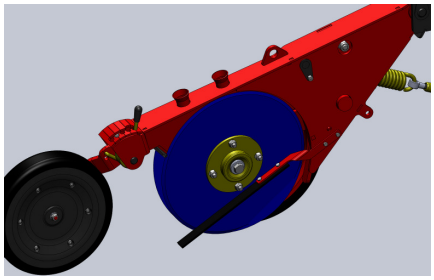
Hayseed hopper + hoses. Does not suit to start fertiliser.



6.11 Electric valve 3/8

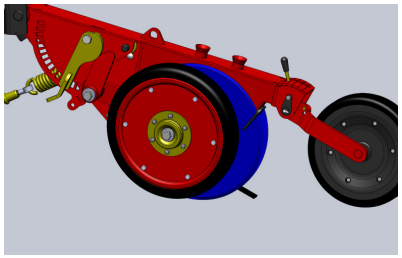
The electric valve is installed within the drawbar. Normally it is used for control of the coulter weight, front harrow and hydraulic top link. The valve is connected with the valve only by two hydraulic hoses. The electric valve is controlled by means of the regulator in the cabin.

6.12 Outer coulter tine



The outer coulter tine keeps the soil at the edges of the furrow in place, which helps to keep the seeding depth constant, while driving at a higher speed.

6.13 Inner coulter tine



The inner coulter tine prevents the seeds and fertilizer from jumping up from the bottom of the furrow to the upper soil layer, which enables the work to be done at greater driving speed. (Standard as of 2011.)