OPERATING INSTRUCTIONS VM 6000 DS PNEUMA



2011 Version 1.2

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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 6000 DS direct seeding drill is a very efficient and versatile machine, which can be used for seeding in stubble, grass or tilled soil. By applying the direct seeding method you can save time and expense, and reduce emissions to the natural environment. Direct seeding also has a positive impact on the structure of the soil.

The VM 6000 DS is equipped with precision coulters that enable the seeding to be carried out at precisely the desired depth. Using the pneumatic metering unit enables the seeds and the fertiliser to be smoothly routed to all the seeding coulters. The available range of versatile optional equipment enables the machine to be configured for even the most demanding user.

The VM 6000 DS 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 other purpose, such as, for example, transportation of people, violates the definition of the 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

EC – DECLARATION OF CONFORMITY

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

Vieskan Metalli Oy Puurakenteentie 3 FI-85200 ALAVIESKA, Finland Tel. +358 (0)8 430 9300 Fax +358 (0)8 430 509

declares that the **VM 6000 DS direct seeding drill** complies with the provisions of the Machine Directive 2006/42/EC

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

EN ISO 12100-1 EN ISO 12100-2

Alavieska 29/3/2011

Ari Koutonen

Ari Koutonen,

Managing director

The undersigned is fully qualified to draw up the technical construction file

RESPONSIBILITIES

These Operating Instructions are based on the manufacturer's long-term experience and the user experience of 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 owner/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 the use of fertilisers 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 fertiliser, and thus make sure that the consumption in all seeding coulters stays at 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 only 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 manufacturer. The measures and possible costs must always be agreed upon with the manufacturer before any measures are taken.

1. SAFETY INSTRUCTIONS

1.1 Warning decals



Read the Operating Instructions carefully before you start using the drill, and make sure that you understand their contents correctly.



Never perform any service or repair 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 tha danger of getting squashed through sinking on loose ground.



Always make sure that the operating area of the drill is clear of obstacles! Never go under an elevated side-block! 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, as 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 side grate is in place. You may drop off and get injured.



For optimum operational quality and reliability, only use genuine VM Real Direct Seeding drill parts. 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 being raised or lowered.

1.2 Hydraulics

- 1. The hydraulic system is always under high pressure during the operation. A jet of oil, bursting out from the hose or connector, may get injected into the skin and cause severe injury. This risk of injury is also present while searching for leaks.
- 2. Take care when handling all parts of the hydraulic system. During these operations you run the risk of getting cut or squashed.
- 3. The hydraulic system must not be under pressure while the hoses are being connected to the tractor. Depressurise the system before making any connections to the tractor or the drill. Switch off the tractor and reciprocate the valves to relieve the pressure from both sides. To relieve the pressure from the hoses of the seed drill, press the cone of the quick connector against something hard, or by twisting the quick connector loose of the hose.
- 4. When replacing the hydraulic system's components or pipes, only use spare parts with a sufficient pressure rating.

1.3 Protect yourself against oil and grease.

- 1. Always use appropriate protective clothing and gloves while handling oil or grease.
- 2. Avoid all skin contact with oil and grease. The skin may be irritated or damaged.
- 3. Never use oil or lubrication grease for cleaning skin. These substances may contain small metal particles that irritate your skin or cause wounds which are made even worse by the oil.
- 4. Follow all the operating instructions and safety instructions issued by the lubricant manufacturers.
- 5. 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.

1.5 Machine plates

The nameplate of the machine with a CE marking is located in the rear part of the electric centre (see Fig. 1).



Fig. 1

2. CONNECTING INSTRUCTIONS

2.1 Installing the Artemis Pro control unit in the tractor

The control unit comes with a mounting bracket to be attached to a convenient location in the tractor cabin where the unit is easy to use. After that, the control unit shall be attached to the mounting bracket, and adjusted to a comfortable position.

2.2 Power supply to the drill

To ensure an uninterrupted power supply, the cable shall be routed directly from the tractor's battery to the seeding drill. The metering unit of the drill requires at maximum a current of 60 amperes. The seeding drill comes with a wire harness for installation in the tractor. The harness is fitted with a fuse box.

3. INSTRUCTIONS FOR USE AND SETTINGS

3.1 Tractor

To avoid unwanted compaction of the soil, the tractor should be equipped with sufficiently wide tires or twin tires. Deflate the tyres sufficiently. Deflating the tyres also reduces the compaction of the soil.

3.1.1 Requirements for hydraulic system

The standard machine requires two double-acting hydraulic connectors of 1/2" for the following functions:

- 1. One double-acting hydraulic connector with a capacity of about 40 l/min and 180 bar for controlling the seeding coulters.
- 2. One double-acting hydraulic connector with a capacity of about 40 l/min and 180 bar for controlling the side-blocks of the machine.

In addition, for the optional equipment two double-acting hydraulic connectors of 1/2" for the following functions:

- 3. One double-acting hydraulic connector with a capacity of about 20 l/min and 180 bar for controlling the Crossboard.
- 4. One double-acting hydraulic connector with a capacity of about 20 l/min and 180 bar for controlling the disc harrow.

3.1.2 Requirements for PTO

The machine's hydraulic pump is rotated by a power take-off shaft with a 1 3/8" splined shaft and a selected rotational speed of 540 rpm.

3.1.3 Requirements for electric system

The drill requires at maximum a current of 60 amperes, so the charging power of the tractor must sufficiently high to ensure uninterrupted power supply.

3.2 Checking the drawbar eye

The screw connection of the drawbar eye must be tightened after a few hours of operation, and after that, always at the beginning of sowing season. Torque 280 Nm.

The wear limit of the drawbar eye is 2.5 mm. If the drawbar eye has worn more than 2.5 mm, it must be replaced. The new drawbar eye shall be fitted with new bolts, which must be tightened to a torque of 280 Nm, and subjected to post-tensioning after beginning of the sowing seasong.

3.3 Connecting the drill to the tractor

Attach the drawbar of the seeding drill to the hydraulic towing hook of the tractor. Ensure that the towing hook locks properly.

3.1.3 Connecting the hydraulic pump

Attach the hydraulic pump to the power take-off shaft of the tractor. Make sure that the locking sleeve of the pump engages in the notch of the power take-off shaft. To release the locking, push the locking sleeve towards the tractor, and to re-engage the locking, transfer it towards the pump. Fix the eye of the hydraulic pump's torque arm to the top link pin of the tractor. As required, adjust the eye of the torque arm in such a position that you will be able to attach the eye.

In some tractors, the gear of the hydraulic pump must be turned to bring it in a level position. In this case, the breather nipple of the gearbox must be transferred to the threaded hole at the top to prevent the oil from dripping out of the gearbox. In this case, the check eye for the transmission oil level does not give correct indication. Turn also the torque arm into the correct position so that you can attach the torque eye to the top link pin.

NOTE! Do not start the pump on the PTO until all the hydraulic connectors are in place and the pump is locked in the closed position.

To demount the hydraulic pump, disconnect the torque arm from the top link bracket and push the locking sleeve of the pump towards the tractor. Then the hydraulic pump can be pulled off from the splined shaft.

3.3.2 Hydraulics

The hydraulic hoses have been grouped according to the colour of

the caps as follows: Yellow, lifting and lowering the sido-blocks

Red, lifting and lowering the coulters

Green, adjustment of the Crossboard (optional)

Blue, control of the front disc harrow (optional)

Attach the hydraulic hoses to the tractor in pairs, in such a way that the flow directions are correct. Make sure to depressurise the hydraulic system before plugging them in place.

To depressurise the system, press the taper in the hose connector against something hard or wrench the quick coupler open with a key. When you disconnect the machine, release the pressure from the hydraulic hoses in the same manner before disconnecting the connectors.

3.3.3 Control unit

Attach the Artemis Pro control unit to the bracket in the tractor's cabin and connect the outgoing cable to the cable coming from the seeding drill. The power supply cable must be installed last.

3.3.4 Disconnecting the drill

The seeding drill may only be disconnected on a hard, level ground. Lower the support leg to the ground. Place chocks in the front and rear of the tyres to prevent the machine from moving. Depressurise all the hydraulic circuits before you disconnect the machine from the tractor.

3.4 Bringing into work position

Lift up the side-blocks by means of the hydraulics.



Fig. 2

Sitting in the cabin, pull the ropes of the locking bolts to release the bolt. Hold the ropes tight, until the side-blocks start to lower. There are locking bolts on both sides, so the side-blocks can be lowered one by one. Thus, for example, when filling the hoppers, one of the blocks can be left in the upper position.

Fold down the side-blocks by means of the hydraulics. Keep the hydraulic valve active until the side-blocks have lowered to the horizontal position and the floating pressure for the side-blocks has been reached.



Fig. 3

3.5 Bringing into transport position

Lift the seeding coulters of the drill and the Crossboard/disc harrow to their

extreme positions. Fold up the side-blocks of the drill.

Ensure that the locking bolts of the side-blocks have engaged. Make sure that the spring of the locking bolt is in place.



Fig. 4

3.6 Straightness of the machine

Straighten the machine lengthwise when you connect the drill. The lengthwise straightness of the machine is influences by the height of the tractor's towing hook, and the type of the drawbar eye. Adjust the straightness of the drawbar by adjusting the length of the cylinder, and the number of the adjustment lamellas so that the machine will be brought to a horizontal position.

Fig. 5

3.8 Adjusting the driveline markers

Adjust the markers so that the distance between the centre line of the drill, and the groove scored by the markers is 3.0 m.

This adjustment is indicative only. Therefore, the adjustment must be checked in the field, in order to avoid overlapping passes or stripes, which may result because in some tractors the operator sits at an angle. The track left by the marker may be interpreted in a different way when the tractor and the operator change. Tighten the locking screw for the marker after a few hours of operation.

The toe angle of the marker can be adjusted by turning the shaft of the disc. Then the marker disc will score a larger or a smaller groove.

3.9 Determining the sowing depth

The sowing depth is adjusted individually for each coulter by adjusting the height of the precision coulter's side-wheel. (see Fig. 7) The height position of the side-wheel with respect to the seeding coulter is adjusted mechanically by means of the lever 1. When the lever is in its lower position, the seeding depth is 0 cm, and when it is in its upper position, the seeding depth is at its maximum, 7 cm. The height adjustment is staggered at intervals of about 0.5 cm.



The cover wheel at the back of the precision coulter closes the furrow. The weight of the cover wheel can be adjusted via the lever 2. 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. The weight of the cover wheel reduces the weight of the seeding coulter. On hard soil the weight of the cover wheel must not be adjusted too high, because then the coulter weight and the seeding depth might be too low. On soft soil and when the coulter weight is high, the coulter weight can be transferred to the cover wheel to prevent the side-wheel, that adjusts the seeding depth, from sinking into the soft soil.

3.10 Adjusting the coulter weight



The adjustment range of the coulter weight is 50 - 200 kg/coulter

The coulter weight is adjusted by means of "stopper clips", that are added to the lifting cylinder rods. The coulter weight is decreased by adding the clips, and increased by removing the clips. The maximum coulter weight is achieved, when there are no clips in place. Check that all the cylinders (4 pcs.), have the same number of clips in place in order to keep the weight of each coulter the same.

Fig. 7

3.12 Overview of the metering system

The seed and the fertiliser are metered from the designated hoppers into the injector tube by means of an electrical metering unit. They are carried by air flow generated by a hydraulically driven blower along the tube and via the distributors to the seeding coulters. The quantity of the seed and fertiliser are metered by the Artemis Pro control system (see point 4.4.3). There are separate feed units and distributors for both the seed and the fertiliser.

The fertiliser is placed in the front part of the drill's hopper and the seed is placed in the rear part. The partition wall inside the hopper can be adjusted according to the consumption of the seed and fertiliser when the hopper is empty.

3.13 Adjusting the airflow

The airflow is set at the factory suitable for the most common seed varieties. The airflow can be reduced suitable for small seeds by closing the flow restrictor flap on the blower (see Figure 9). The speed of the blower is shown on the display of the Artemis control unit (see point4.4.2).

The rotational speed of the hydraulic motors that propel the blowers is adjusted by the flow control valve located under the hydraulic oil tank (Figure 10). This way the speeds of the tractor engine and the drill's blower can be kept at appropriate levels. The correct speed range for the blowers is 3500-3800 r.p.m.



Flow control valve

Fig. 8

3.14 Preparatory measures before filling the seed hoppers

The hoppers are designed so that the front part of the tank is filled with fertiliser and the rear part with seed.

Before filling the hoppers, check the following:

- The hopper is empty, clean and dry. Likewise, the feeders must be dry.
- The emptying doors are closed (see point 3.16 Emptying the seed hoppers).
- The bottom flaps of the metering units are closed.
- The roller length of the metering unit is adjusted in accordance with the seeding chart (see point *8.1 Seeding chart*). The roller is kept fully open for large seeds and fertiliser grains and only partly open for small seeds.
- The partition wall in the seed tank is installed in the desired position.

3.15 Filling the seed hoppers

Exercise particular caution when filling the hoppers. Never go under a lifted load. Make sure that there is no one on top of the drill or inside the hoppers when the hoppers are being filled. It is recommended that that the hoppers be filled from the sides. Use preferably a knife with a long handle, or a billhook for opening a big bag. Avoid inhaling the seed dressing or fertiliser dust.

3.16 Emptying the seed hoppers

To empty the seed and fertiliser hoppers, open the drain valve next to the metering units in the bottom part of the hoppers. A plastic hose of \emptyset 100 mm can be connected to the drain valve for draining the goods from the hopper into a nearby receptacle

The small amount of seeds and fertiliser that remains on the metering unit, can be emptied by rotating the unit by depressing the "calibration test" button. (see point *3.17 Calibration of the seed and fertiliser rate*).

3.17Calibration of the seed and fertiliser rate

Both hoppers have their own metering unit and rate test.

Make sure that the grooves of the metering rollers are clean and have not taken up wet fertiliser.

Open the bottom hatch of the injector under the metering unit, and put a calibration test bag under it to collect the amount of seeds metered during the test.

The metering unit is started by pressing the "calibration test" button for either the seeds or the fertiliser at the side of the seed hopper. When the calibration test bag has been filled with sufficient amount of desired matter, the metering unit shall be stopped by depressing the same calibration test button a second time.



Fig. 11

When either of the calibration buttons is pressed, the control unit will be switched to calibration mode in which the weighing result can be directly entered in the control unit.

The amount of seeds shall be weighed and the result entered into the control unit and confirmed by pressing the ENTER key (Figure 12).

Before entering the value, ensure whether the weight is indicated in kilograms or grams. Select in the menu the desired weight unit. If you enter the value in kilograms, remember to add a dot as a separator .



Fig. 12

Press the ENTER key a second time. Now the unit calculates the new calibration rate kg/round and shows it on the display. Also the maximum speed in km/h, calculated based on the metering setting for this variety, will be shown on the display (Figure 13).

The unit also calculates the difference between this calibration time and the previous one (Error = -58.3%). If the difference is significant and the maximum speed (Max Sp = 1.5 km/h) is remarkably small, it is probable that an error has occurred when entering the weight information. Press ESC to return to the top and repeat the calibration procedure from scratch. Note whether you are using kilograms or grams as weight units when entering the values, and that the dot comes in the right place.

Confirm the calibration factor by pressing the Enter key once more.



Fig. 13

If you accept an incorrect factor, the metering unit will run really slowly and the driving speed will be very low. Correct the error as follows:

Press the User setup button in the Settings menu, and then pressent the Drill configuration key.

| 1. | User setu | up. | ŕ |
|----|-----------|----------|-------|
| 2. | Drill cor | nfig | 1 |
| 4. | Diagnosti | ics | E |
| 5. | General F | °F setup | 6 6 0 |



In this menu, using the arrow keys, select the seed or the fertiliser, and manually enter 0.500 as the calibration factor.

After this, start the variety-specific calibration from the beginning.

Note:

If you wish to reduce the feeding rate, for example, from 250 kg per hectare to 3 kg per hectare (e.g. when switching from barley to rape), do the following:

- 1. Move the slider for the feeding rate to the fully closed position and turn the plastic stopper clip down (see Figure 11). Move the slider against the stopper clip.
- Run the variety-specific calibration and enter the weight information in the unit → the difference in the calibration data will be significant. Despite this great difference, accept it by pressing the ENTER key.
- 3. Repeat the variety-specific calibration. Now the error will only be marginal. Accept the difference and start seeding.
- 4. Program the required feeding rate (see section 4.4.3).

If you want to move from a small feeding rate to a large one, for example, from 3kg per hectare to 200 kg per hectare, do the following:

- 1. Move the slider for the feeding rate to the fully closed position and turn the plastic stopper clip up (see Figure 11). Move the slider to the fully open position.
- Run the variety-specific calibration and enter the weight information in the unit → the difference in the calibration data will be significant. Despite this great difference, accept it by pressing the ENTER key.
- 3. Repeat the variety-specific calibration. Now the error will only be marginal. Accept the difference and start seeding.
- 4. Program the required feeding rate (see section 4.4.3).

If you are sowing standard seeds less than 150 kg/ha, you can adjust the feeding rate more accurately by moving the slider to about half way.

More about this in Chapter 4 of instructions for the Artemis control system

4. Artemis Pro control system



4.1 Main operations

The Artemis enables the feeding rate of the drill to be automatically adjusted from the tractor's cabin. Where required by the sowing conditions, the pre-set values may be overridden by manual control.

The basic functions are:

- Adjustment of the feeding rate
- Making spraying tramlines
- Controlling the driveline markers
- Driving speed alerts
- Tank level alerts
- Blower speed and alerts related to it
- Summary data

The software of the device enables easy calibration of the metering unit(s). In normal operation the magnetic sensor starts and stops the control system automatically as the seeding work is started or stopped, and triggers the making of spraying tramlines in accordance with the settings.

4.2 Menu keys

All the functions of the device can be accessed via the nine menu keys positioned next to the LCD screen.



Via the four menu buttons placed on the right side of the display, you can access the views that will be used during the operation. There are four primary views, that will be needed during the operation; the MAIN-view, the HYD view, the RATE view and the INFO view, as well as the SET-UP view for the basic settings.

The five submenu keys, which are located under the display, are used for controlling the different display functions and settings in the primary views. The functions connected to these keys are displayed as text or symbols above the submenu keys.

4.3 **Operation**

Operating mode indicators

At the top of the control views is shown the time and a number of different icons. The icons indicate the following:



NOTE: The Memory card and GPS icons will only be displayed if these functions are activated in the SET-UP menu.

3.1.4 MAIN-view

The unit always starts in the MAIN view mode. The MAIN view is divided into five sections according to the following functions,



4.3.2 Advance speed display and alarm functions

Alignment of display

With the exception of situations where the speed changes suddenly, the advance speed is displayed as an average of three seconds.

Speed alerts in the MAIN-view

The alerts for both too high and too low speed have been pre-programmed in the device.

If the drill during the work is moving slower than 0.5 km/h, the following warning will be flashing in this section of the MAINview and a sound signal (beep) will be given



Reminder of the maximum speed

If the drill during the work is moving at a faster speed than what can be achieved by the proportional control (displayed in the RATE view), the following warning will be flashing in this section of the MAIN view and a sound signal (beep) will be given.



When you set a new target feeding rate in the RATE view, the device re-calculates and displays the maximum advance speed at which this new feeding rate can be maintained (Figure 16). The speed is calculated using as initial data the set value for the feeding rate, the working width of the drill, the current calibration factor, the gearbox ratio and the maximum engine speed.





Press the key

to return to the RATE view.

NOTE: If the speed is too low, the user must increase the calibration factor by opening the slider for the metering unit and the re-running the calibration (see the Calibration instructions in section 3.17).

4.3.3Mode/functions of the spraying-track functionality

The state of the tramline function is displayed on the MAIN-view.



Adding lines

At the start, the tramline counter always starts from "1".

If necessary, change the correct line number in the display by pressing the key that is, if you start to work from another line than the first.

Maintaining the lane number

Press the key if you want to maintain the current lane number (i.e., you want to prevent the change of lane number, to interrupt the work, or - depending on the settings of the seeding drill - to raise up a marker, or to circumvent any obstacle in front of the machine).

*

The icon indicates that the lane number is on hold. Press the key to return to normal counting of lane numbers.

NOTE: The tramline counter is set in the SET-UP view (see chapter 4.4.5).

4.3.4 Feed motor - manual override



Press the key(s) $\frac{1}{1} + 0/1 + 0/1}{1}$ according to your choice.

The feed motor(s) can be stopped as desired, for example, if you want to seed a part of the field without fertilisation.

4.4 Menu views/functions

Press the menu keys at the side of the display to access the following views:



4.4.1 *HYD view*

The operation of the driveline markers can be set in the HYD view.



4.4.2 RATE view

The feeding rate is set in this view.



Setting/overriding the target feeding rate

Set the target feeding rate by entering the value, and confirming it by pressing the ENTER key.

If you want to set the target feeding rate or adjust the metering speed manually for either of the goods, press first the ENTER key, and after that the SEED or FERTILISER keys.

The feeding rate displayed on the MAIN view is the same as the one displayed on the RATE view.

If you wish to exceed or fall short of the target feeding rate, use the keys. Staggering is 5%.

If the value set in the RATE view has been manually adjusted over or below the target seeding rate, the figure on the display will be flashing (1 second on, 0.5 seconds off).

If you want to revert to the target feeding rate, press the key **the set of both** of the goods will resume to their target values.





4.5 Spraying-track functionality

Go to the SET-UP view, and whe configuration for the spraying tramlines by pressing the





The maximum number of lanes is 10, and the configuration of the tramlines can, according to your choice, be either symmetric or asymmetric to the left or right.



The device will show the width of the drill/sprayer combination at the selected lane number.

If the number of lanes is greater than10, you can select asymmetric configuration, which suits to the following drill/sprayer width combinations.

| 10 passes | drill of 6 m/sprayer of 15 m | |
|-----------|------------------------------|--|
| 10 passes | drill of 6 m/sprayer of 20m | |

The spraying tramline order ('L' – left 'R' – right) will be the following:

| Lane | 8 passes | 10 passes | 10 passes | 14 passes | 16 passes | 18 passes | 22 passes |
|------|----------|--------------|--------------|--------------|--------------|-----------|--------------|
| 1 | | | | | | | |
| 2 | R | R | L | | | | |

| 3 | | | | L | R | L | |
|----|---|---|---|---|---|---|---|
| 4 | L | L | | | | | L |
| 5 | L | | R | | | | |
| 6 | | | R | | | | |
| 7 | R | L | | R | | R | |
| 8 | | | | R | L | | |
| 9 | | R | L | | L | | |
| 10 | | | | | | | |
| 11 | | | | | | | R |
| 12 | | | | L | | R | R |
| 13 | | | | | | | |
| 14 | | | | | R | | |

4.6 Setting threshold values for the fan speed and the filling alarm



Set the threshold value by entering the value, and confirming it by pressing the ENTER key.

4.7 Simulation of speed

If the speed sensor of the radar stops working, you can continue the seeding by simulating the advance speed signal. *Remember, however, that your real advance speed must match the simulated speed as precisely as possible. Otherwise, the feeding rate will not be correct.* If you advance faster than the simulated speed, the feeding rate will fall short and vice versa.

Set the simulated advance speed in the SET-UP view by selecting "1. user setting", and then "2.m speed sensor setting"

Press the key E: (Fig. 29) and immediately after that, enter the desired simulated speed (Fig. 30). Start the simulation of the speed by pressing the ENTER key once more.



The advance speed will flash in the MAIN view for as long as the simulation of the speed is in progress (Fig. 31).

5. SEEDING TIPS

5.1 Seeding depth

The seeding depth must be adapted to the sowing method applied (direct seeding/conventional seeding) plant, soil type, moisture content of the soil, sowing date and tilling conditions.

The seeding depth is affected by the position of seed drill and the coulters, the force of the coulter springs, the advance speed, and the softness of the soil. For average seeding depth in real direct seeding directly in stubble, we recommend 2-3 cm, and for small seeds on average 1-1,5 cm.

On ploughed and tilled soils, the same recommendations apply as for the traditional drills. The recommended seeding depth on heavy and cloddy clay soil is 5-6 cm. A suitable seeding depth on light and fine-grained, so called fresh soils, is 3-4 cm. 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 seeding depth should be checked frequently at a spot that is sown at normal driving speed. The correct seeding speed is 8-13 km/h.

Thanks to the solid seedbed and the rolled covering soil on the seed, the seeding depth in real direct seeding can be kept low. This enables the capillary rise of the water to the surface layer of the field. Thus the seed will germinate and the fertiliser dissolves well. The presence of stubble and straw material helps to preserve the moisture even when it is dry. As a result, a working depth of 2-3 cm is suitable for almost all soil types. If the soil surface is dry, the seeds must be placed deeper where the soil is more humid.

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.

5.2 Checking the feeding

In addition to checking the seeding depth, also check from time to time feeding, and that none of the seed hoses or the coulters is blocked. When checking the feeding, also verify that the amount of seeds fed from each of the coulters is the same.

Lift the seeding coulters in their upper position.

Start the blowers. Manually feed the seeds for a few seconds via the calibration test buttons. Check whether the metering of the seeds is operational. Repeat the procedure if you suspect that the metering is not operating well.

Start from the tramline position, where all the coulters, with the exception of those that are closed for the purpose of marking the tramline, should be feeding the seeds. Then check, taking a step forward, that the supply is operational also through the coulters that were closed.

The operator's responsibility is to use graded seed pickled with such dressing that does not adversely affect the seed hoses by blocking them or preventing the supply of seeds. The seeds exceeding the normal size of a pea, can cause damage to the seeding system.

Take note that wet fertiliser can adhere to the feed roller and the distributor, reducing the amount of seeds being fed. Check the roller and the distributor on a regular basis, and clean any dirt that has possibly adhered to them including any fertiliser residues.

5.3 Gauges of the drill

During the seeding, monitor the gauges in the front of the machine. These gauges give information about the operations of the drill.



The gauge for floating of the blocks shows the state of charge of the pressure accumulators. Normally, the pressure should be 90-100 bar. The floating pressure is adjusted by means of the lifting valve of the blocks. Keep the lifting valve of the blocks active until the desired floating pressure of the blocks is reached. The floating pressure can be adjusted via the cartridge of the pressure valve.

The maximum oil filter pressure is 2 bar (see chapter 6.7). You can check in the spring force gauge for the coulters that the seeding coulters are lowered. When seeding coulters are lowered, the pressure is about 180 bar and in the upper position it is less than 50 bar.

Monitor in the blowing pressure gauge that the hydraulic pressure of the blowers remains constant during driving. If the pressure varies a lot, check the level and temperature of the hydraulic oil (see chapter 6.7)

Fig. 35

6. MAINTENANCE AND SERVICE

6.1 Preparations before the maintenance work

Before commencing any maintenance, cleaning, lubrication, installation or adjustment work, 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 machine from strating up inadvertently. Prop up the machine properly before starting the maintenance work.

NOTE! When you are working under the machine or there is a risk of being squashed, prop up the machine using repair shop supports or similar. Make sure that the surface under the supports is sufficiently hard.

Before maintaining the hydraulic system, ensure that the side-blocks of the machine have been lowered, the seeding coulters are resting on the ground, and the pressure has been released from the hydraulic hoses by using the valves while the tractor's engine and the power supply of the Artemis Pro control system are switched off.

6.2 General

The machine works best when it is maintained well!

Before using the machine, check that all its nuts and bolts are tight. Check from time to time during the working season that the nuts and bolts have not loosened, and check the joints and the ends of the hydraulic valve spools for wear.

Correct tightening torques of the attachment nuts and

| bolts: Nuts of tyres with hubs M18 | 420 Nm |
|--|----------|
| M16 attachment bolts on the shaft | 310 Nm M |
| 20 attachment bolts on the rim | 400 Nm |
| Attachment bolts of bearing housings M20 | 400 Nm |

Tighten the wheel nuts after driving 10-15 km. Tighten the nuts also after changing a tyre. Tighten the nuts using a torque wrench.

The hydraulic system usually requires no maintenance, but the oil level and the oil filter pressure must be monitored. The pressure in the filter must not exceed 2 bar. Make sure frequently enough that the hoses and the connections are not damaged.

Make sure that no dirt can enter the hydraulic system when you work on it. If the drill is not used for a longer period of time, and always after it has been cleaned, grease or oil the piston rods.

To maintain quality, always use only genuine VM spare parts! 38

6.3 Cleaning

Check regularly that the seeds, fertiliser, pieces of straw or bag remnants have not blocked the seeding hoses or the feed openings. Also check this after each operating season. At the same time, check that the tramline units are clean and that they operate properly.

Clean the seed hopper, feeding units for seeds and fertiliser, distributors and other parts of the seeding system at the end of the seeding season. Check that no fertiliser has been left in the injector tubes or the air hoses.

Keep in mind that any leftover sprouted seeds can easily clog the air pipes and the seed hoses. Seeds also attract rodents, which can cause additional damage to the seeding drill.

After cleaning, let the blowers run for a while to allow the system to dry out completely.

6.3.1 Feeder unit

The seed hoppers shall be cleaned on the inside and the plastic and rubber parts checked once in a while for wear. It is particularly important to ensure that the dressing or the fertiliser does not adhere to the roller of the metering unit, as that might cause the feeding rate to be reduced.

Check all cables and connections.

6.4 Storing the drill

Store the drill indoors. This is particularly important because the seeding drill is equipped with electronic devices. The electronic components are of very high quality, and even if they are resistant to moisture, it is still recommended to keep the machine indoors. The Artemis control unit shall be stored at room temperature over the winter and between the sowing seasons.

Polished parts, such as piston rods and parts that are subject to wear, should be lubricated before storing for winter. The seeding coulter discs and the paint-coated surfaces of the machine can be sprayed with oil to protect them against corrosion.

Make sure that the drill is properly cleaned. Leave the drain doors open and disconnect the air hose from the injector pipe to allow the air to circulate, and enable removal of any dirt that has accumulated in the pipe.

Note that the seeding hoses lose their flexibility in cold weather so folding the machine into the seeding or transport positions should be avoided in such conditions.

6.5 Lubrication points

Grease the lubrication points indicated in the table below at the prescribed intervals and always after high-pressure washing and at the end of each sowing season.

Remember safety! Do not crawl under the drill, but lubricate it from above or support the machine safely with stands. See the general safety instructions in the beginning of this manual.



| | Lubrication points | Lubrication | Pc |
|-----|---|-------------|----|
| 1. | Lifting cylinder ends of the side-blocks | 300 | 2 |
| 2. | Hinge sleeves of the side-blocks, 4 pcs. | 300 | 4 |
| 3. | Lifting cylinder ends of the coulters, 4 pcs. | 300 | 8 |
| 4. | Fastening hinges of the coulters | 300 | 40 |
| 5. | Fastening hinges of the coulter's side-wheel | 300 | 40 |
| 6. | Fastening hinges of the coulter's cover wheel | 300 | 40 |
| 7. | Ends of the marker cylinders | 300 | 4 |
| 8. | Fastening sleeve of the marker | 300 | 2 |
| 9. | Hinge sleeve of the marker | 300 | 2 |
| | Optional equipment: | | |
| 10. | Hinges of the disc harrow | 300 | 12 |
| 11. | Disc bearings | 100 | 40 |
| 12. | Ends of the disc harrow's adjustment cylinders, 3 | 300 | 6 |
| 13. | Ends of the Crossboard's adjustment cylinders, 3 | 300 | 6 |

6.6 Changing the disc coulter and its bearing

Ensure that the machine is standing firmly in position. The lifting cylinders are locked in their upper position, and the machine is supported by the stands. Before the change, wash the coulters, preferably using a high-pressure washer.

Wear protective gloves and watch out for the sharp edges of the cutter discs!

- Open the attachment screw for the side-wheel (Part 1) on the left side of the precision coulter and remove the side-wheel (see Figure 37).



Fig. 37

- Open the locking screw for the bearing housing. Note! The cutter disc on the left-hand side has a left-handed screw, and the one on the right-hand side has a right-handed screw (see Figure 38).

Fig. 38



- After removal of the locking screw, you can pry the bearing housing of the cutter disc off the hub using, for example, a rim tool.

- You can make the bearing of the disc come off more easily from its shaft by inserting a locking screw in the end of the shaft and, at the same time, tapping it with a hammer as you twist the cutter wheel off the shaft.
- The cutter disc is fixed to the bearing housing with four locking bolts. The coulter must be fastened to a bench vice for removal of the screws.
- Use snap pliers for removal of the bearing's retainer ring. Use a press for pressing the bearing out of its housing. The bearing is lubed for life.
- When assembling the coulters, make sure to press the cutter discs against each other with sufficient force. The pressing force is suitable when the discs are in contact at a distance of 1/4 of their circumference.
- As the coulter wears, the pressing force of the discs may be increased by removing the shim on the disc shaft under the bearing or by replacing it by a thinner one.

6.7 Servicing the hydraulic system

The level of the hydraulic oil must be checked regularly in the gauge at the front of the oil tank (Figure 39). The oil level must reach the upper part of the gauge. The same gauge is used for monitoring the temperature of the oil. The temperature of the oil should not rise above 80 °C.



Fig. 39

The return filter of the hydraulics shall be cleaned after the sowing season. The oil filter pressure must not exceed 2 bar, if it rises near 2 bar (Fig. 40), the filter must be cleaned.



6.8 Repairing and changing the seeding hoses of the drill

Repairs

If the seeding hose of the drill gets damaged resulting from wear or excessive bending, it can be re-joined by using a sleeve with an outer diameter of 32 mm. Cut the hose where it is bent or damaged. If necessary, cut off a short piece from the it. If the hose becomes too stiff at the joint and does not bend sufficiently when the drill is lowered down, it may be necessary to replace the entire hose, or, alternatively, change one part of the hose and connect it at two places.

Changing the hoses of the drill

Use soapy water when removing or installing the hoses of the seeding coulters. When removing or installing a hose, turn it counter-clockwise. Doing so will slightly "unwind" the threaded hose reinforcement. Cut the replacement hose to the same length as the original hose.

6.9 Changing tyres and the tyre pressure

Park the machine on level and firm ground. Engage the handbrake of the tractor. Lower the side-blocks and press the seeding coulters, and the front disc harrow system (if installed) to their lowest position. If a tyre needs to be changed, support the machine in such a way that the tyre will be off the ground.

Fig. 41



The wheels of the side-blocks are bundled into sets of three. To demount the bundle from the block, disconnect end bearings of the set from the side-block frame. Lift the wheel set up from the side-block (see Figure 42).

Screw open the clamping screws of the bearing shaft. Remove the bearings from the shaft using an extractor. After this, demount the attachment flange that is attached by bolts to the centre of the wheel from the flange on the shaft. After removal of the attachment bolts, rotate the wheel to such a position that the wheel can be taken off at the notches in the shaft flange (see Figure 43).



When changing the outermost wheels of the middle wheel set, the seeding coulters of the machine must be in the transport position, and the side-blocks locked in their upper position. Drive the middle wheels onto an elevation so that the tyre to be changed rises off the ground. Engage the handbrake of the tractor and switch off the engine.

The outermost wheels of the middle set are fastened to a normal brakeless hub with 6 nuts.

To remove the middle wheels of the set, drive the outermost wheels of the set onto an elevation in such a manner that the tyre to be changed rises off the ground. Lower the side-blocks, and the seeding coulters. Engage the handbrake of the tractor and switch off the engine.



Disconnect the pipes that go to the distributor unit at points 1 and 2, and the fastening bolts at point 3. After this, turn back the distributor unit, supported by its hinge points (point 4.) (see Fig. 44). This way a sufficient space required for removal of the wheels will be provided above the wheels.

To enable lifting of the middle wheel of the set, the bolts of this wheel's attachment bracket shall be removed first (see Figure 45), and after that the wheel shall be raised. The attachment plates of the wheel with bearings can be removed from the shaft by turning the wheel on its side on the ground and lifting off the plate.

After the removal of the middle wheel, also the wheels with brakes can be removed. Reassembly of the wheel sets is performed in the reverse order. **NOTE! Refer to point 6.2 on page 45 for the correct tightening torques for the attachment bolts and nuts.** 44

Recommended tyre pressure:

| Tyres with hubs 4 pcs. | 2.5 bar |
|---|---------------|
| The middle wheel 1 pc. | 1.5 - 2.0 bar |
| Outer wheels of the side-blocks, 2 x 3 pcs. | 1.5 – 2.0 bar |

6.10 Locking device

Check the operation of the locking device regularly. Check the condition and attachment of the locking spring. Clean and lubricate, if necessary.



Fig. 46

7. FAULT FINDING

7.1 About fault finding

A major part of the drill's functions are controlled by various electric, hydraulic and mechanical components. To rule out possible locations of the fault, it pays to check first whether the fault is in the electric equipment. So, check first whether the circuit to the last electric component of the system is closed.

After that, continue troubleshooting by performing first a few simple checks to rule out potential locations of the fault.

Carefully read the *appendices*, "*Hydraulic diagram 7.2*" and "7.3 *Electric system*", which may be useful for troubleshooting.

7.2 Electric failures

Items to be checked:

- Is the Artemis Pro control unit connected to the tractor correctly?
- Does the tractor supply a voltage of at least 12 V to the Artemis Pro?
- Are the (brown) +conductor and the (blue) earth conductor connected correctly?
- Has the automatic fuse of the Artemis Pro tripped?
- Check the settings of the Artemis Pro.
- Are both connectors of the intermediate cable between the Artemis Pro and the drill connected correctly?
- Check whether the connectors and sockets of the 4-pole switches are intact and clean. If the terminals are corroded, spray the switches with contact spray.
- Is the intermediate cable flattened or otherwise damaged?

7.3 Hydraulic failures

Overall check of potential hydraulic failures:

- Check whether the hydraulic hoses have been connected correctly to the tractor's hydraulic connectors. Hoses of the same colour form a pair with each other.
- Make sure that the quick connectors of the hydraulic hoses are dimensioned to match the connectors of the tractor. There are a number of connectors on the market, and even though most of these are standardised, compatibility problems may occur. The reason for the problem might be that the male and female connectors act as non-return valves, i.e. the machine can be lifted but not lowered, or vice versa. The problem may even be worsened if the flow through the worn connectors is rapid.