CENTRIFUGALS FERTILISER SPREADERS

KC-RD EVO 2000

OPERATING MANUAL

ROCHA

INDEX

INTRODUCTION CHAP 1

By purchasing ROCHA equipment, you have made a truly wise choice and you will quickly realise the remarkable reliability and robustness of our product.

This equipment has been designed and built to high quality standards, in accordance with current regulations and respecting all the required safety levels. We hope that your work will fully meet your expectations.

The purpose of this manual is to enable users of the **Double plate mounted spreaders** to use and handle the equipment safely and effectively.

The advice and standards set out in this manual are intended to maximise the potential of your machine so that you can use it safely and with maximum efficiency.

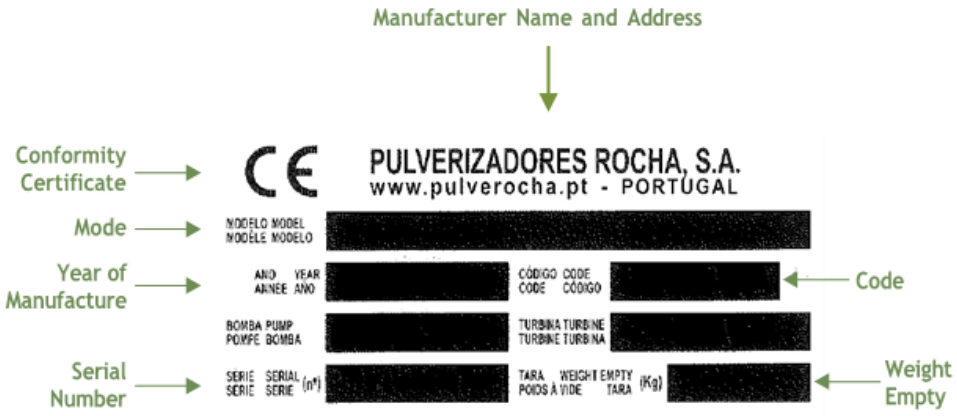
Any additional information should be obtained from our commercial technical services. Whenever necessary, use the information on the equipment's nameplate to help us identify the characteristics of your machine.

Only people who have received specific technical training should operate this equipment.

Make sure you understand the instructions in this manual before you start working with the equipment.

THIS MANUAL IS AN INTEGRAL PART OF THE MACHINE

MACHINE IDENTIFICATION CHAP2



The identification label placed on the machine chassis contains essential information that is required in order to correctly identify the equipment.

This data must be provided whenever accessories are requested or when technical support is necessary.

WARRANTY CHAP3

1. The products sold by PULVERIZADORES ROCHA are submitted to rigorous quality control testing in order to minimize the occurrence of any defects.
2. All equipment is guaranteed for 24 months (NON-PROFESSIONAL USE - DL 67/2003) or 12 months (PROFESSIONAL USE - CC Art. 921) from the date of purchase.

2.1. Any defective components or parts due to manufacturing and /or workmanship defects shall be immediately substituted at no additional cost. However, workmanship and travel costs will be applicable.

2.2. When complaints are submitted, the parts in question must be sent for examination by our Technical Department.

3. The occurrence of any of the facts described below shall result immediately in the invalidity of the warranty:

3.1. The use of the equipment under abnormal work situations or coupled with motors/tractors/hand tractors with power specifications that differ from those recommended in the respective technical documents.

3.2. The substitution of any components or parts by others from 3rd parties

3.3. Any structural alterations made to the equipment.

3.4. PULVERIZADORES ROCHA are not informed nor give their consent regarding any repairs made during the effective warranty period.

DESCRIPTION CHAP4

WARNING: Working with agricultural machinery can be dangerous. Incorrect or careless use can result in serious injury to the operator or the others!

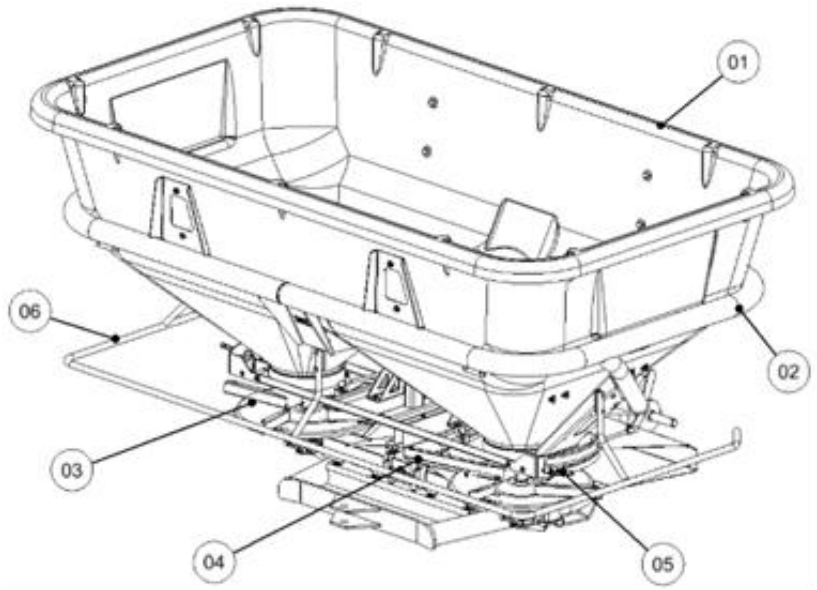
WARNING: It is mandatory to read the user manual carefully before starting any action with the equipment.

The KC-RD EVO 2000 centrifugal spreader has been developed with the aim of distributing granular products, mainly chemical fertilisers and seeds, by spreading them once they have been driven by the tractor's power shaft (PTO). Any other application is an inappropriate use.
The dimensions of this equipment are compatible with medium and large tractors. The high impact resistance capacity, the anti-corrosion components and the lightweight, easy-to-disassemble tank give this machine the necessary characteristics for use in jobs that require precision.
The components of this machine are made from a variety of materials, e.g. carbon steel, stainless steel, polyethylene, nylon, among others. The surface treatments applied are galvanisation, passivation and thermoset powder coating, which gives the machine's metal elements high resistance and durability, even in contact with highly corrosive products such as fertilisers.
This equipment has some particularly advantageous features, such as:

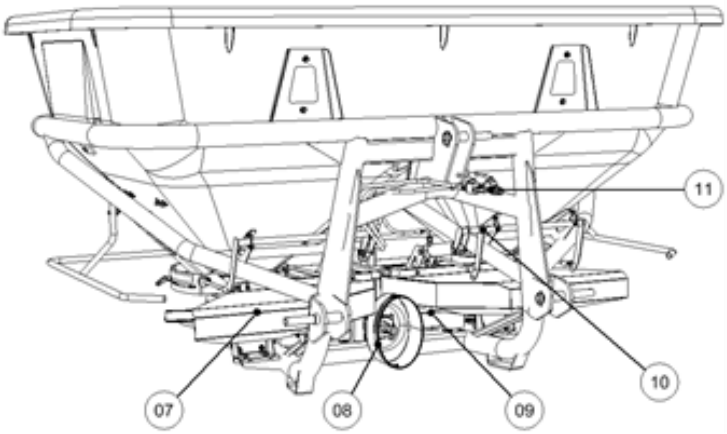
- Easy adaptation to agricultural tractors.
- Easy operation and adjustment, due to the built-in hydraulic and electro-hydraulic functions.
- Safety, quiet working and precision distribution.

This machine can be equipped with marginal distribution mechanisms, optional equipment developed and validated in accordance with environmental standard EN 13739-2.

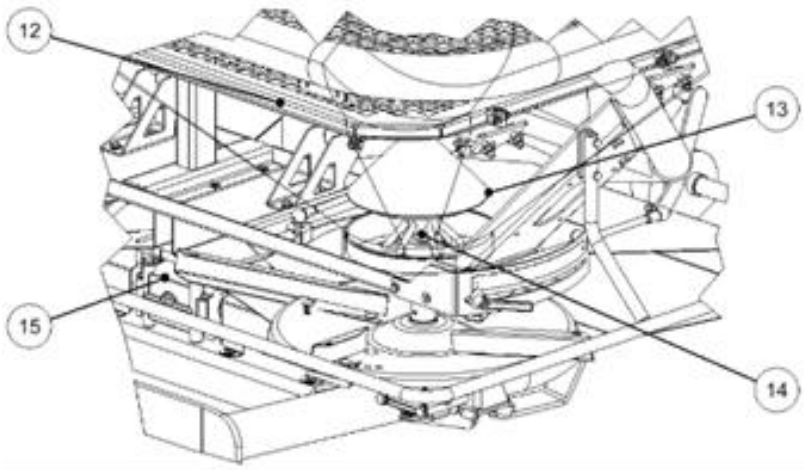
The following image identifies the main elements of the KC-RD EVO 2000 Spreader.



01- HOPPER
02- CHASSIS
03- DISTRIBUTOR PLATE
04- VANES
05- SCALE / FLOW CONTROL
06- PROTECTION RING



07- PLATE ARMOUR
08- SHAFT PROTECTION
09- GEARBOX ARMOUR
10- DOSING PLATES MOVEMENT MECHANISM
11- QUICK-CONNECT HYDRAULIC VALVE



12- SPRINGTOOTH NET
13- ANTI-COMPACTION CONE
14- AGITATOR
15- MECHANICAL TRANSMISSION UNIT

Figure 4.1 - KC-RD EVO 2000 Fertiliser Spreader

WARNING: This machine has been developed to distribute granulated products (chemical fertilisers and seeds). Its use for any other purpose is strictly forbidden!

The following table shows the main technical characteristics of the KC-RD EVO 2000 Mounted Spreader.

Volumetric capacity	1800 litres
Load capacity	1925 kg (fertiliser density 1.07)
Weight	410 kg
Height	1400 mm (without Coverage cloth)
Width	2600 mm
Length	1550 mm
hitch system	3-point (type II and III)
Input speed (PTO)	540 rpm
Effective working width	See chapter 12 of this manual
Gearbox	The unit consists of a centre box connected to two side boxes via splined shafts and sleeves.

Table 4.1 - KC-RD EVO 2000 technical characteristics

This fertiliser spreader has two centrifugal spreading plates and four types of vanes for each plate (Figure 4.1). The mounting and arrangement of the vanes on the plates depends on the type of product to be distributed and the desired range (see spreading tables).

The agitator mounted on top of each plate is designed to keep the flow of product to be dispensed constant and uniform. The geometry and movement of the agitator have been studied so as not to damage the integrity of the products to be dispensed and to divert any "blocks" of product that could block the dispensing openings (Figure 4.2).

The distribution quantity is adjusted manually by positioning two levers, one for each plate, arranged as shown in the following figure. The positioning of the levers is determined according to the desired working conditions (see spreading tables).

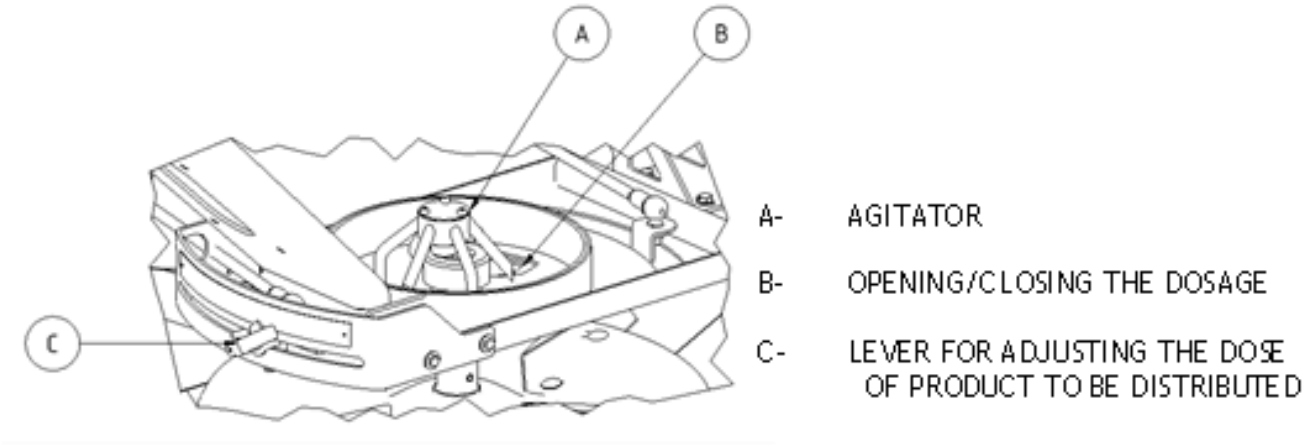


Figure 4.2 - Dosage mechanism

OPTIONAL ACCESSORIES:

The KC-RD EVO 2000 Spreader can be equipped with the following optional accessories:

- **COVERAGE SCREEN**

Figure 4.3 - Coverage screen with folding structure

The coverage screen (Figure 4.3) protects the fertilisers and seeds in the hopper from humidity and dirt. This optional accessory consists of a PVC screen attached to a collapsible metal frame. The frame has a lever to make it easier to open/close the mechanism. This accessory is easy to fit and remove.

- **BORDER LIMITERS:**

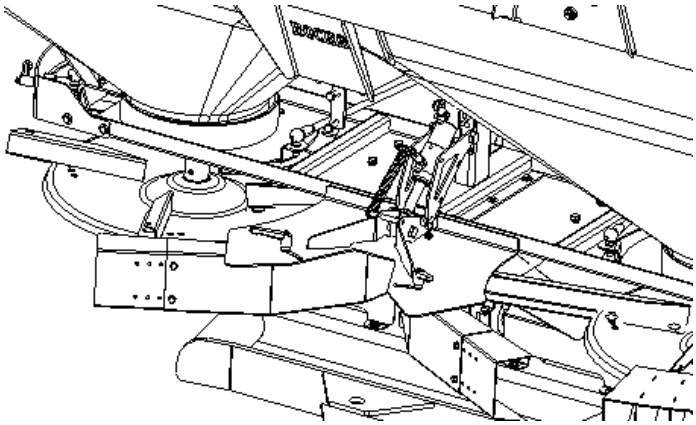


Figure 4.4 – Central Limiter "from the border"

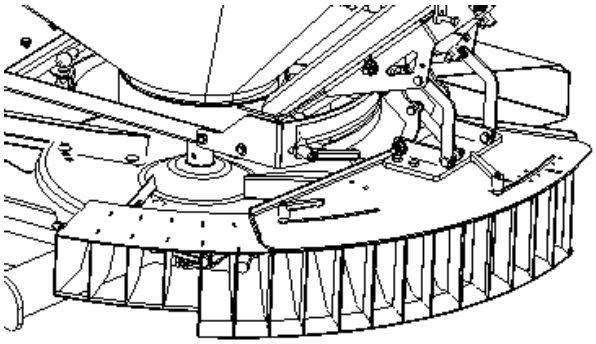


Figure 4.5 – Side Limiter "to the border"

You can limit spreading "from the border" by activating the optional Central Limiter (Figure 4.4) and closing the feed to the plate corresponding to the border (Figure 4.6). In this way you can complete half of the spreading scheme, with 100 per cent coverage, while driving along the border of the field.

You can adjust the spreading scheme, which varies depending on the characteristics of the product to be spreader, by adjusting the position of the Central Limiter or the position (distance) of the tractor in relation to the border of the field (see chapter 6). In this way you optimise the spreading scheme and reduce the environmental impact.

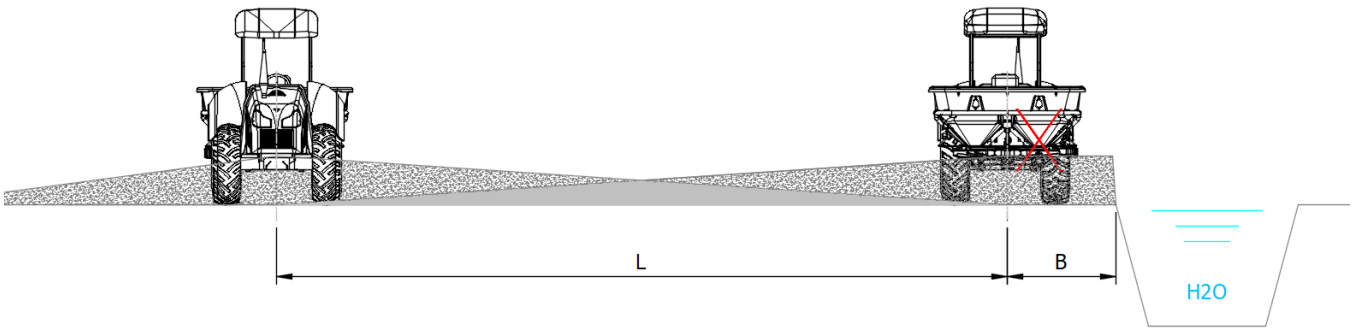


Figure 4.6 – Ex. Spreading "from the border"

Spreading "to the border" is also possible with the KC-RD EVO 2000 Mounted Spreader. To do this, you need to activate the optional side limiter (Figure 4.5) and normally drive in the lane closest to the border, according to the predefined working width (Figure 4.7). Under these working conditions, it is not possible to distribute 100 per cent of the desired dose without a small part going over the border of the field. Nevertheless, the admissible values are met, in accordance with the environmental standard that allows a minimum loss beyond the border of the field.

You can adjust the spreading scheme, which varies depending on the characteristics of the product to be spreader, by adjusting the position of the Side Limiter (see chapter 6). In this way you can obtain a spreading curve that is close to the ideal, and ensure that the loss outside the border is below the maximum quantity allowed by the environmental standard.

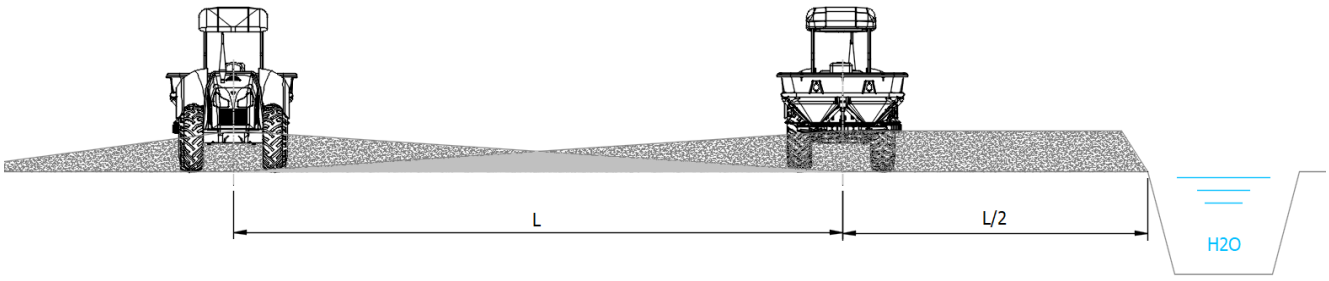


Figure 4.7 – Ex. Spreading "to the border"

The Mounted Spreader can be used to spreading to the full width (L) of the reach without using the devices shown above. For this type of work, which is the most common, the machine does a spreading scheme identical to the one shown in the following figure (Figure 4.8), usually in the shape of a triangle, with approximately 100 per cent overlap.

Sometimes, depending on the type of product, the dose to be applied, the working width, among other factors, a slightly different spreading scheme can be presented (trapezoid scheme). This type of spreading scheme usually has an overlap area of less than 100 per cent.

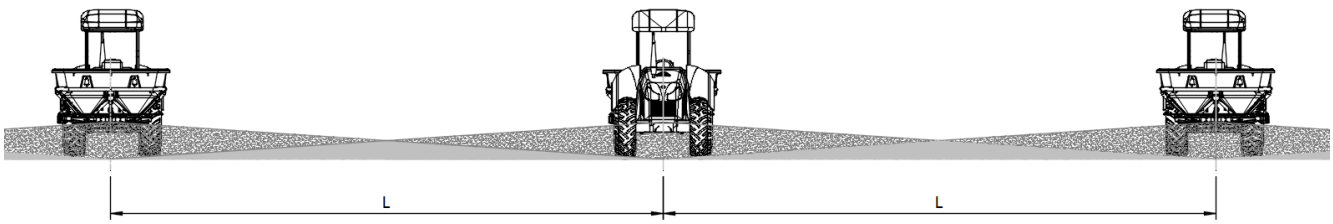


Figure 4.8 - Ex. triangle spreading - 100% overlap

Note: For border limiter settings, see chapter 6.

INSTALLATION AND CONNECTION TO THE TRACTOR

CHAP5

WARNING: It is essential to read the user manual carefully before starting any action with the machine.

WARNING: Coupling operations of agricultural machinery to tractors is dangerous! Make sure you comply with all safety rules.

In order to facilitate and protect the equipment, some accessories may be supplied disassembled from the machine. This is also why it is important to read and understand this user manual, which should be delivered with the machine. The user manual explains how to proceed when assembling these accessories.

WARNING: During coupling operations of agricultural machinery to tractors, the use of appropriate protective equipment is mandatory!

After receiving the equipment and before carrying out any operation, pay attention to the following:

- Check that the tank (hopper) of the Spreader is clean, with no foreign objects inside. If not, remove it;
- Check that the tractor to be used is suitable (e.g. braking system, stability, power, load capacity and total weight);
- The KC-RD EVO 2000 Spreader is mounted to the tractor through the 3-point mechanism of the hydraulic system,
- Make sure that the tractor's hydraulic system is capable of safely lifting at least 3000kg.

WARNING: Never stand under the equipment while it is suspended.

Working with agricultural implements involves risks. Therefore, before starting work on the KC-RD EVO 2000 and after carefully reading and understanding this instruction manual, we recommend that you carry out the following procedure for calculating maximum admissible loads and take the appropriate action to ensure your safety and that of others.

LETTER	DESCRIPTION	UNIT
A	Tractor weight without machine mounted (1)	Kg
B	Weight on tractor front axle without machine mounted (1)	Kg
C	Weight on tractor rear axle without machine mounted (1)	Kg
D	Total weight of machine or frontal counterweights	Kg
E	Total weight of machine or counterweights mounted at the rear	Kg
f	Distance between centre of machine or counterweights and centre of front axle	m
g	Distance between tractor axles	m
h	Distance between centre of rear axle and coupling point of lever arm	m
i	Distance between the centre of the machine or counterweights and the centre of the coupling point of the lever arm (2)	m
(1) Take into account accessories or the weight of water on the tyres.		
(2) If there are no indications, calculate i= half the length of the machine.		
* Consult the tractor's user manual for the necessary data.		
** Consult the tyre manufacturer for the necessary technical information.		
*** The data for the spreader is given in this user manual (table 4.1. page 8).		

Table 5.1 - Data for calculating maximum admissible loads.

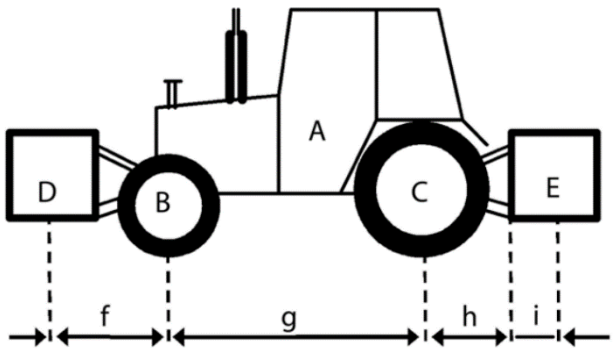


Figure 5.1 - Diagram for calculating maximum admissible loads

WARNING:
Incorrect or careless use of agricultural machinery can result in very serious injuries to the operator or others!

CALCULATIONS:

- **Total weight (kg) = A+D+E**

  The total weight must not exceed the maximum admissible weight.

- **Axial load of the front axle (kg) =** $\frac{D*(f+g)+(B+g)-E*(h+i)}{g}$

  The axial load of the front axle must not exceed its maximum admissible load.

- **Axle load of the rear axle (kg) =** ***Total weight - Axle load of the front axle***

  The axial load on the rear axle must not exceed its maximum admissible load.

  The minimum load on the tractor's front axle must be 20 per cent of its weight.

In this case, bearing in mind that the machine will be mounted on the rear 3-point hydraulic mechanism, you should calculate the minimum counterweight required (in kg) to be mounted on the front of the tractor as follows:

- **Front counterweight (kg) =** $\frac{E*(h+i)-(B+g)+(0{,}2*A*g)}{F+g}$

  If the result is negative, there is no need to mount extra counterweights on the front of the tractor.

  Important:

  o Make sure you work within the limit values indicated by the tractor manufacturer.
  o After installation, make sure that the actual axle loads are less than the maximum loads allowed on each axle (front and rear).
  o If you have a scale suitable for weighing vehicles at your disposal, use it to determine the total weight of the tractor and mounted equipment and the loads on the front and rear axles.

WARNING: Once loaded, at least 20% of the tractor's total weight must be supported by the front axle and 45% by the rear axle. This ensures a safe distribution of loads!

WARNING: Coupling and uncoupling agricultural machinery involves the risk of injury and can cause seriously injured!

WARNING: This equipment includes elements that can cause cuts or crushing. The use of appropriate protective equipment is mandatory!

In order to reduce the risk of accidents during the coupling and uncoupling the agricultural machine to the tractor, take the following instructions into account:

- Make sure the tractor is braked (parking brake);
- Check that the electrical, mechanical and hydraulic components of the tractor and implement are in good working order;
- Carry out the couple and uncouple operations on stable, dry and level surfaces so that the machine does not run the risk of tipping over or sliding out of control;
- Ensure that other people and animals are not in the danger zone during work;
- Do not stand between the tractor and the machine during couple and uncouple operations;
- Only couple the machine at the points provided for this purpose;
- Only couple and uncouple the machine when the Cardan shaft is stationary;
- Operate in accordance with the procedures described in this user manual;
- Attach the KC-RD EVO 2000 spreader to the hydraulic system's 3-point mechanism by first coupling it to the lift arms (2nd point) and only then to the 3rd coupling point;
- Adjust the lift arm stabilisers so that the machine is centred in relation to the width of the tractor,
- Adjust the working height of the KC-RD EVO 2000 Spreader, taking the distance between the ground and the spreading plates as a reference (Figure 5.2). After adjusting this dimension (800mm), you must now level the machine in relation to the ground (Figure 5.2).

Important: Position the Spreader at a height and level with the ground.

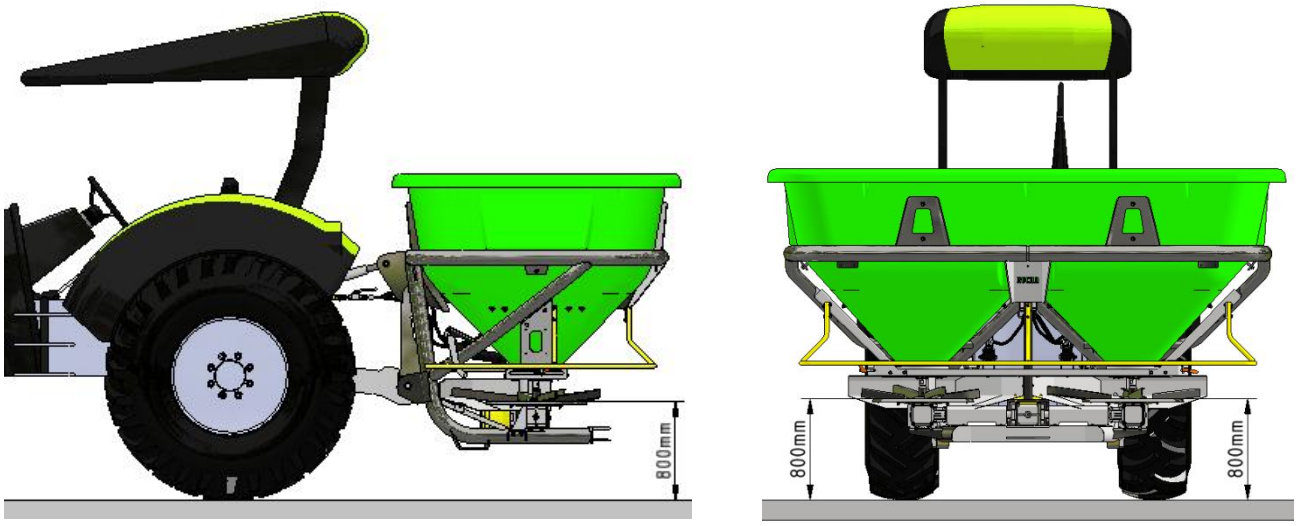


Figure 5.2 – Adjusting the machine to the working position.

NOTE: The cardan shaft supplied with the spreader is too long for most tractors.

During the up and down movements of the machine, the inner and outer shafts must slide freely relative to each other. At the same time, you must ensure that the overlap of the shafts is sufficient for safe and effective power transmission in any position, especially in the position where the working angle is most unfavourable (Figure 5.4).

WARNING: Incorrect mounting of the cardan shaft can cause serious injury to the operator and damage to the implement or tractor!

To adjust the length of the Cardan shaft correctly, proceed as follows:

- Raise the machine with the 3-point hydraulic mechanism until the tractor PTO and the implement PTO are at the same height (the position where the Cardan shaft will be shortest);
- If possible, support the machine on a stand;
- Switch off the tractor and remove the ignition key;
- Brake the tractor properly (parking brake);

- Slide the inner and outer shafts of the cardan shaft until they are completely separated;
- Mount one side in tractor;
- Mount another side in the implement,
- Using your hands, place both ends of the Cardan shaft parallel to each other, as shown in the following figure.

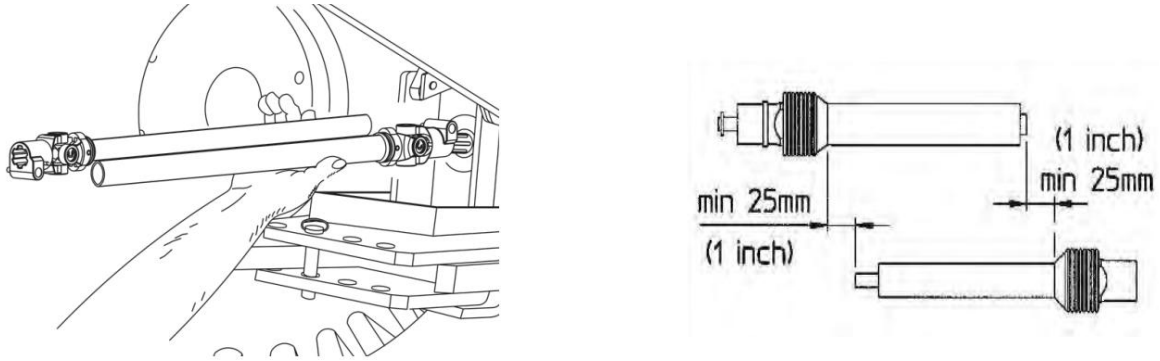


Figure 5.3 - Adjusting the length of the Cardan shaft

Note: The cardan shafts should overlap as much as possible, with a minimum of 150mm. At the ends, the shafts should have approximately 25mm of clearance when the tractor PTO the implement PTO are at the same height (Figure 5.3).

- Cut the shafts enough so that the gap is approximately 25mm;
- Cut the plastic protection at the same distance;
- Remove the burrs from the ends;
- Fit the shaft halves together;
- Couple the complete cardan shaft to the machine and tractor;
- Check that the safety pins on the cardan shaft are securely locked,
- Raise the machine to the highest working point.

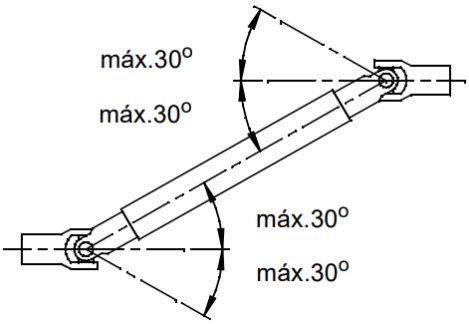


Figure 5.4 - Maximum working angle of the Cardan shaft

The maximum working angle allowed for the Cardan shaft is 30º on each side (Figure 5.4), taking the tractor PTO shaft and the implement PTO shaft as references.

This is the greatest admissible distance between the tractor PTO and the PTO machine.

To check the correct dimensions, proceed as follows:

- Raise the machine to its highest position;
- If possible, support the machine on a stand;
- Switch off the tractor and remove the ignition key;
- Brake the tractor properly (parking brake);
- Check that the angle of the Cardan shaft is less than 30º;
- Check that the inner and outer shafts of the Cardan shaft are at least 150mm apart;
- Release the cardan shaft from the tractor side and unlock it completely;
- Apply lubricant to the entire surface;
- Mount the cardan back on the tractor, without forgetting the protective plastic tubes;
- Check that the safety pins are securely locked;
- Fix the safety chains on the Cardan shaft,
- Properly fix the chains to a fixed point on the tractor and the machine respectively.

WARNING: Always fix the safety chains on the plastic protection tubes. Once the protection tubes are rotating, they can wrap around other elements and cause injury to the operator or damage to the equipment.

WARNING: Incorrect mounting of the Cardan shaft can cause serious injury to the operator and damage to the implement or tractor!

CONNECT HIDRAULIC HOSES AND CONTROL CABLES:

The KC-RD EVO 2000 spreader is not equipped with the following extra components as standard:

- Application computer;
- Border limiters;
- Weighing cells;
- GSP,
- Light kit.

In the standard configuration, to connect the hydraulic circuit of your tractor hydraulic control, you simply have to connect the hydraulic valves of the machine (Figure 5.5) to the hydraulic valves of the tractor (Figure 5.6), in order to control the opening and closing of the spreader's dosing mechanisms, independently.

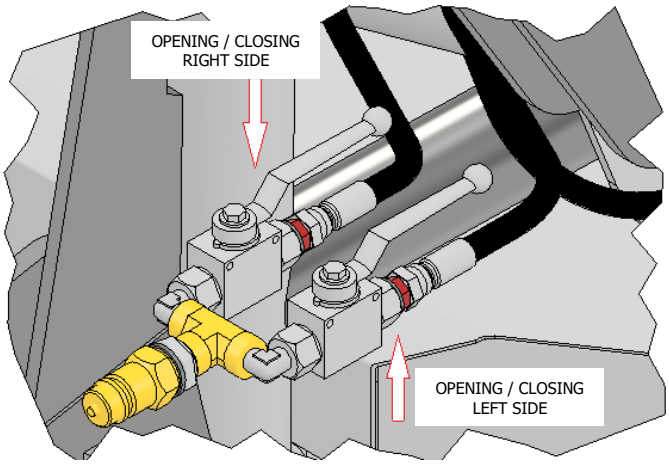


Figure 5.5 - Opening/closing the dosing mechanisms of the KC-RD EVO 2000

Figure 5.6 - Tractor quick coupling valve

- Check the state of conservation of the tractor's hydraulic quick coupling valves;
- Check that the hydraulic valve's control is in good condition;
- Connect the quick coupling valve to the tractor;
- Install the hoses in such a way that they do not get caught or damaged during the working movements of the equipment;
- Check that there are no leaks in the hydraulic circuit. If there are any leaks in the circuit, eliminate them immediately (See chapter 8 - checking and maintenance).
- For information on the tractor's hydraulic circuit, consult its instruction manual or contact the tractor's representative/manufacturer.

WARNING: Make sure that the machine's cables, hoses and control elements are properly stowed. Do not allow them to be activated or deactivated unintentionally.

OPTIONAL EQUIPMENT´S CONNECTION:

- **Border limiters:**

The border limiters (centre and side) must be connected to the KC-RD EVO 2000 spreader as follows:

- Check the state of conservation of the tractor's hydraulic quick valves;
- Switch on the hydraulic quick valves of the respective Border Limiter (Central Limiter or Side Limiter), taking into account the following:
  a) The hose marked with a red ring (Figure 5.7) - Pressure line,
  b) The hose marked with a blue ring (Figure 5.7) - Return line.

Figure 5.7 - Hose and quick valve identification for border limiters

- Install and position the hydraulic hoses so that they do not get caught or damaged during the working movements of the equipment;
- Check that there are no leaks in the hydraulic circuit. If there are any leaks in the circuit, eliminate them immediately (See chapter 8 - checking and maintenance).
- Test the operation (opening and closing) of the Border Limiters. Make sure their movement is controlled and free of obstacles.
- For information on the tractor's hydraulic circuit, consult its instruction manual or contact the tractor's representative/manufacturer.

- **Light Kit:**

To connect the optional light kit to the tractor, you must take the following into account:

- Check the tractor's electrical socket(s) for dirt and clean them properly if necessary;
- Plug the 7-pin electrical plug into the tractor's socket,
- Install the electrical cables in such a way that they do not get caught or damaged during the working movements of the equipment.

Figure 5.8 - 7-pin electrical socket

Figure 5.9 - 7-pin electrical plug

- Check that the light kit works correctly;
- Check that the different lights switch on according to their function;
- Check that the indicators light up in the correct order. If the flashing signals are switched, check the phase connection (See chapter 8 - checking and maintenance).

- **Application computer:**

If your Spreader is optionally equipped with an application computer, take the following into account when connecting it:

- Connect the plugs to the respective sockets between the control panel and the H-BLOCK control box (Figure 5.10);
- Connect the GPS plug to its socket (Figure 5.10);
- Install the electrical cables in such a way that they don't get tangled or damaged during the working movements of the equipment;
- Check that the cables are undamaged. If there are any anomalies in the wiring, replace the cable (See chapter 8 - checking and maintenance);

o Install the control panel in the tractor cab. Make sure it is secure, has good readability and easy access for handling;

o Install the GPS antenna on the tractor. Look for a safe location that guarantees good signal reception;

o For additional information regarding the application controller, please contact our technical and commercial services.

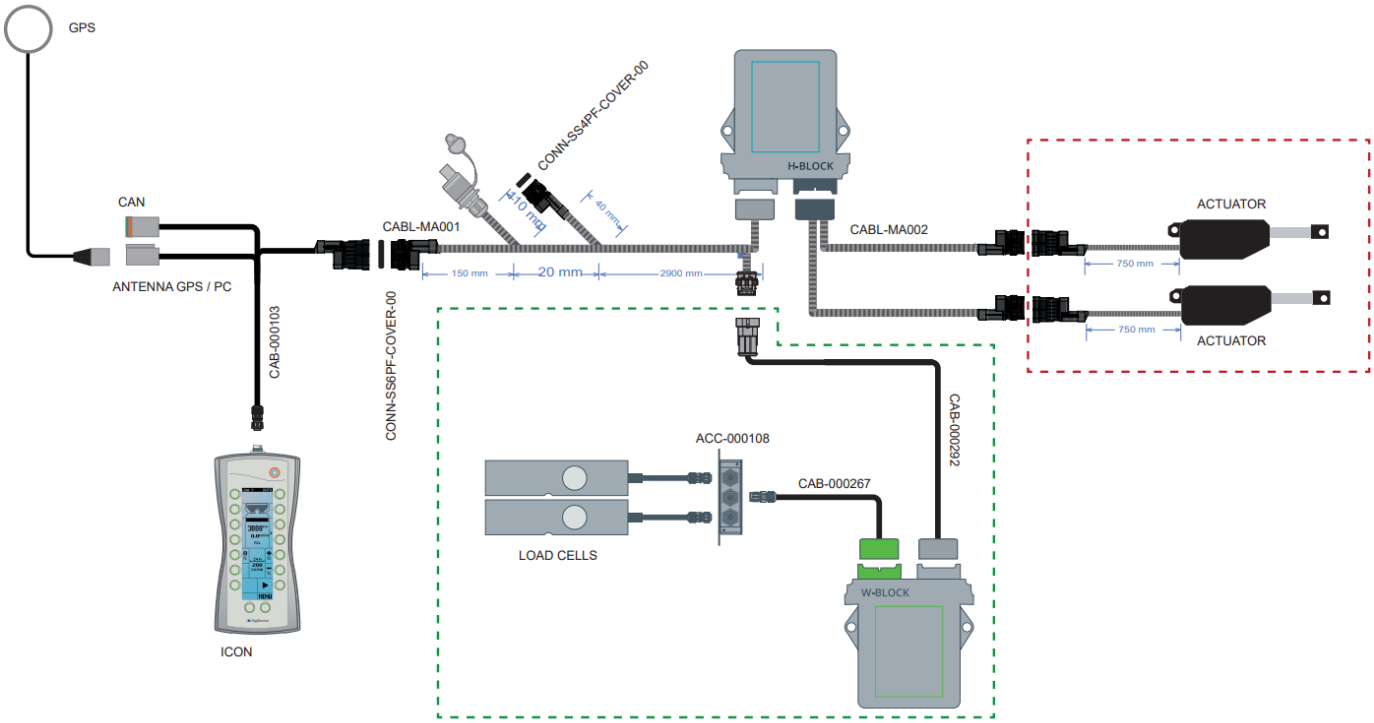


Figure 5.10 - Connection diagram for the weighing application controller

WARNING: It is mandatory to read the user manual carefully before starting any operation with the equipment.

WARNING: This machine may only be operated by qualified staff! Make sure that no-one is near the equipment during adjustment and operation.

INTENDED USE OF THE MACHINE CAHP6

SETTING THE MACHINE TO WORK:

Before starting work with the Spreader, you must take into account all the safety aspects applicable to this type of equipment. Read this user manual carefully, in particular chapter 7 (safety warnings and accident prevention).

WARNING: Adjustment operations must be carried out exclusively by the operator, whenever possible with the tractor switched off and the key removed from the ignition.

WARNING: This machine may only be operated by qualified staff! Make sure that no one is near the equipment during adjustment and operation.

Start by setting the working speed. To do this you must take into account the characteristics of the tractor, the product(s) to be spread, the state of the field and slope as well as the weather conditions (wind intensity, humidity, etc...).

To ensure that the product is applied correctly, make sure that the PTO speed is 540 rpm when working. On most tractors, the standardised PTO speeds are indicated on the revolution counter. Some tractors have a specific revolution counter for this parameter.

If in doubt about the PTO speed setting, consult the tractor's instruction manual or use a portable revolution counter (Figure 6.1) to check the output speed.

IMPORTANT: For correct spreading, it is important to keep the PTO speed at 540rpm when working!

Figure 6.1 - Revolution counter

- **COMBINING THE VANES:**

The KC-RD EVO 2000 Spreader has two spreading plates, with 205mm; 235mm; 250mm and 365mm long vanes, which must be combined in pairs on each plate (Figure 6.2). Each vane can be mounted in 4 different positions on the plate (F1, F2, F3 and F4) which allows the machine to be configured according to the products to be spread and the possible working width(s) (see chapter 12 - spreading tables).

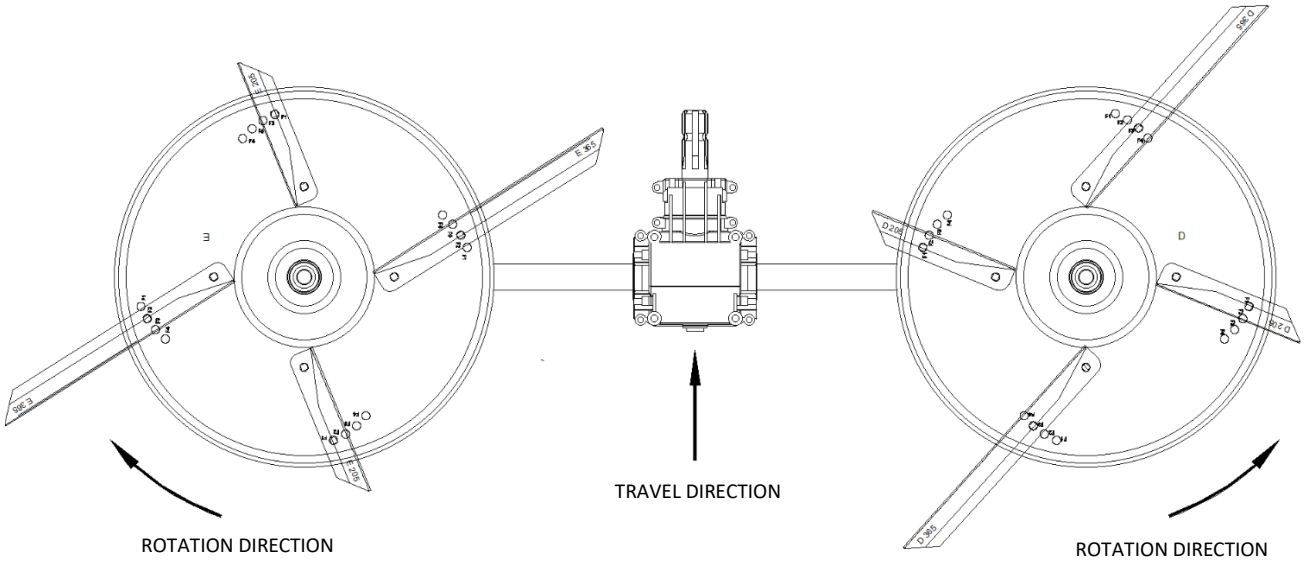


Figure 6.2 - Example of a vane combination.

Figure 6.2 shows the direction of rotation of the spreading plates in relation to the movement of the machine. In the same figure you can see the mounting order of the vanes, i.e. shorter and longer vanes interspersed in pairs on the same plate and in relation to the other plate.

To make adjustment easier, the plates on the KC-RD EVO 2000 Spreader are marked with the letters E (left) and D (right).

The holes in the plate that define the different positions of the vanes are also marked F1 (hole 1); F2 (hole 2); F3 (hole 3) and F4 (hole 4).

The vanes, in turn, are marked with the letter E (left) and D (right), followed by a number that identifies the length of the vane; (example: D 205 - right vane, length 205mm).

IMPORTANT: The Spreader's vanes are mounted depending on the work to be carried out. See chapter 12 of this manual!

ADJUSTING THE MACHINE ACCORDING TO THE PRODUCT:

The spreading tables are an important tool in the machine adjustment process, as they provide approximate data for the proper spreading of some of the most representative products. As such, it is important that you know the following product properties before consulting the tables.

- GRAIN TYPE - defines the shape and surface of the product,
- GRANULOMETRY - the relationship between grain sizes;
- SPECIFIC WEIGHT OR DENSITY - weight per unit volume (kg/dm^3).

In the spreading tables (chapter 12 of this manual), you'll find the information you need to adjust your machine according to the properties of the product to be spread.

IMPORTANT: Select the spreading table based on the product's properties and not its name!

Note: The properties of different types of products can differ to such an extent that the incorrect selection of a spreading table, whose values do not correspond to the properties of the product you are going to apply, can result in poor spreading and consequent crop damage.

- **CONTACT WITH CHEMICAL PRODUCTS:**

During filling, adjustments or testing, you may come into contact with fertiliser or other chemical substances. If this is the case, wear suitable protective clothing, gloves, a mask and footwear. Contact with chemicals can cause serious bodily injury.

WARNING: Avoid contact with fertiliser or other chemical substances!

WARNING: Before handling the chemicals to be spread, carefully read the product data sheet that should be made available to you by the product supplier!

- **DETERMINE THE TYPE OF PRODUCT BY ITS SHAPE AND SURFACE:**

TYPE	SURFACE	SHAPE
GRANULATE	Rough	Approximately round; sometimes ovalised; without sharp points.
GRANULATE	Very smooth	Approximately round; sometimes ovalised; without sharp points.
GRANULATE	--	Granulate of organic material.
GRANULATED AGAINST SLUGS	Variable	The grains can vary between the various types; they can have different characteristics.
MINERAL	Very rough	Angular, with sharp corners and edges.
PEARLED	Very smooth	Completely round, hollow, sometimes with a small cavity on the surface.
CRYSTALLINE	Smooth	Elongated, cylindrical, round-shaped, hollow, sometimes with a small cavity on the surface.
MIXED	Mixture of granules with different surfaces; can be differentiated according to previous descriptions	Mixture of granules with different shapes; can be differentiated according to the previous descriptions.

Table 6.1 - Characterisation of some product types.

Figure 6.3 - Some product types.

- **DETERMINE THE PRODUCT'S TYPE BY GRANULOMETRY:**

Determining the granulometry of a product means "measuring" the relationship between the number of grains of different sizes. In order to carry out this operation, you must have a grain sizer (not supplied with the machine) identical to the one shown below (Figure 6.4).

Normally the grain sizer has 4 compartments separated by sieves. The meshes of the sieves are different sizes so that they can separate the grains into different groups depending on their size.

Figure 6.4 - Example of a grain sizer

As an example, here is the procedure you should always follow to determine the particle size of products using this type of grain sizer:

- Fill the compartment whose sieve has the largest mesh and keep the other compartments closed with the cover (Figure 6.5);

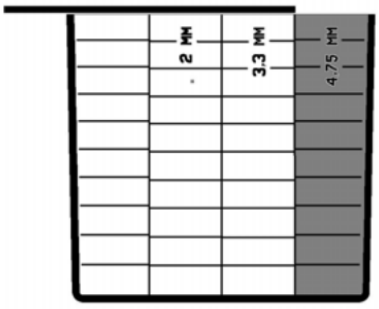


Figure 6.5 – grain sizer filling

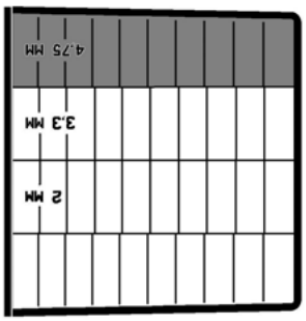


Figure 6.6 - Preparation of results

- Close the grain sizer with the cover and turn it 90° (Figure 6.6);
- Hold the position and shake the grain sizer until the smallest grains no longer pass through the smallest sieves;
- Place the grain sizer in its normal position and read the results in the different compartments (Figure 6.7);

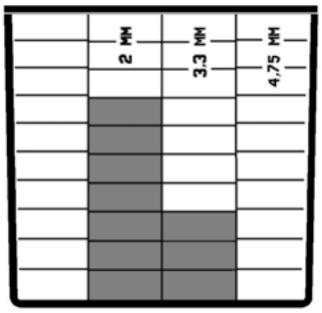


Figure 6.7 - Particle size reading

CONCLUSIONS:

- From the results obtained (Figure 6.7), a grain size of 0-70-30-0 can be seen on the scale;
- The total of the percentages should always be 100 per cent,
- With small, spherical grains it may be necessary to round up the values.

ABOUT MEASURING:

- Repeat the procedure 3 times, taking samples at random, and recording the values obtained. Then calculate the average.
- If the size of 10% or more of the grains in the product is less than 2.0mm, this type of product is usually difficult to spread, especially in medium/long-range applications.
- If the size of 80% to 100% of the grains in the product is between 2.0 and 4.75mm, this product is usually easy to spread, regardless of the size of the rest of the grains in the fertiliser.
- If 20% or more of the grains in the product are larger than 4.75mm, this product will be difficult to spread.

IMPORTANT: Granulometry is the most important product property when it comes to spreading quality.

- **DETERMINE THE PRODUCT'S SPECIFIC WEIGHT:**

The specific weight is the weight measured in kg of 1 litre of fertiliser and can be given in kg/l, kg/dm3 or tonne/m3.

To determine the product's specific weight, you need a scale and a measuring glass (Figure 6.8).

Figure 6.8 - Equipment for determining specific weight

PROCEDURE:

- Suspend the clean, dry glass on the scale;
- Calibrate the scale to 0;
- Fill the glass with the product;
- Hit the glass on a surface 4 to 5 times to "compact" the product;
- Complete the glass;
- Weigh the product;
- Repeat the procedure 3 times, record the values obtained and calculate their average.

- **WORKING WIDTH *(L)***

The definition of the working width (L) is another variable that must be taken into account when applying the product. The working width can be conditioned, as has already been explained, by the field conditions and the characteristics of the product to be spread. The working width should be chosen using the spreading tables - chapter 12 of this manual.

Spreading fertiliser or seeds with plate spreaders always leaves a lower concentration of the product at the ends of the working range (triangular spreading curve). For even spreading, each pass must be made in such a way that there is an overlap over the previous pass, to compensate for the ends where the product concentration is lower (see illustrative example in figure 4.8).

IMPORTANT: The overlap is made to even out the concentration of product over the entire working surface!

The range of the KC-RD EVO 2000 Spreader is, for most of the products to be spread, more than 12m wide, which can make it difficult to see and locate between passes.

If your spreader is not equipped with a GPS system and you want to ensure uniform spreading, we recommend that you mark the ground beforehand, after determining the working width, to help you when spreading (Figure 6.9).

IMPORTANT: Make a mark on the ground, e.g. with stakes, to guide you when driving.

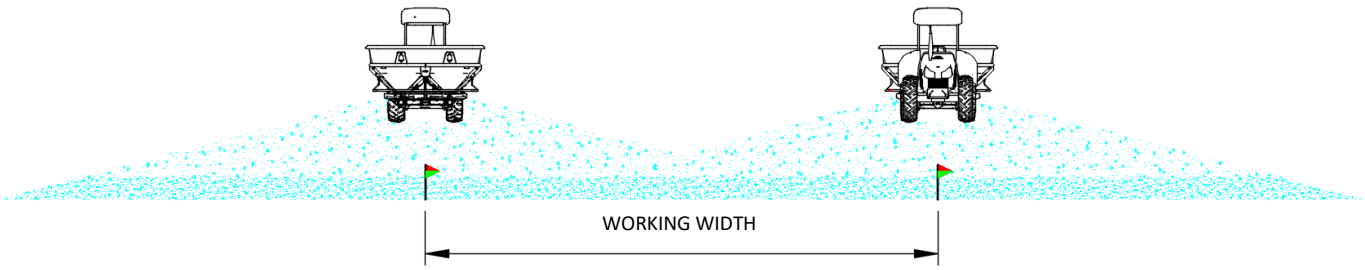


Figure 6.9 - Marking passages on the ground

- **PROTECT THE ENVIRONMENT:**

Applying doses that are too high or spreading chemical products outside the margins of the field will have serious consequences for the environment. Protect the environment by using correct product doses and working methods that guarantee precision in their application.

The KC-RD EVO 2000 spreader is built with the possibility of adapting border limitation systems. If you would like information on this optional equipment, please contact our technical and commercial services.

- **MARGIN REGULATION**

As we've seen before, it's sometimes necessary to make adjustments to the border of the field (see the examples shown in figures 4.6 and 4.7, page 11 of this instruction manual). With the KC-RD EVO 2000 spreader, this work can be carried out easily and precisely. To do this, the optional devices shown in chapter 4 of these user manual must be assembled on the machine.

LIMIT SPREADING FROM THE BORDER USING THE CENTRE BORDER LIMITER

If you want to limit spreading to complete half of the spreading scheme (Figure 6.10), limiting "from the border", you should proceed as follows:

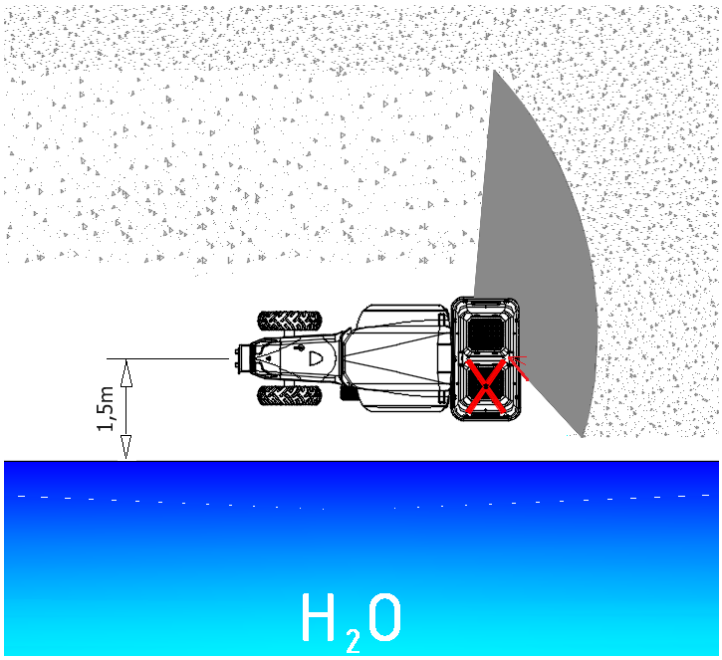


Figure 6.10 - Spreading limited "from the border"

- Close the manual hydraulic control valve of the desired dosing mechanism (see figure 5.5);
  From the tractor, activate the centre border limiter, which should initially be in the retracted position, and adjust the flap - B - to the position shown in the figure (Figure 6.11);
- Move the tractor 1.5 metres from the centre of the tractor to the borde, as shown in the image opposite (Figure 6.10);
- Drive parallel to the borde during application.

In this way it is possible to complete the spreading scheme, for most products, with a total coverage close to 100 per cent, see illustrative scheme (Figure 4.6), as long as you correctly adjust the centre border limiter according to the product to be spread, and thus reduce the environmental impact as required by the respective standard.

Adjusting the distance "from the border":

- Undo the handle **A**;
- Slide flap B along the slot where the handle works,
- Refit the handle and test the new distance.

Note: You can also adjust the position of the flap by using one of the four mounting positions of the extension C.

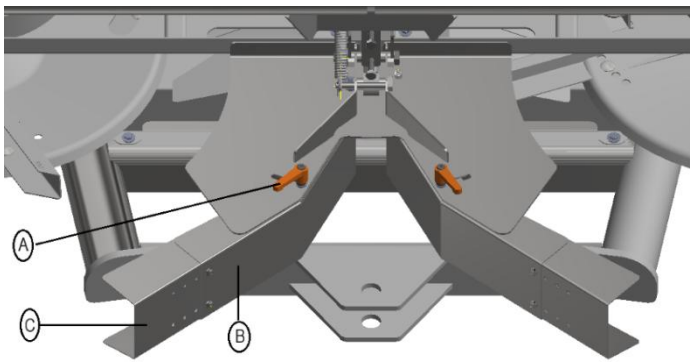


Figure 6.11 - Centre border limiter (working position)

- **LIMIT SPREADING TO THE BORDER USING THE LATERAL BORDER LIMITER**

If you want to limit the spread to complete half of the spreading scheme (Figure 6.12), limitation "to the border", you should proceed as follows:

- From the tractor, activate the side border limiter (Figure 6.13);
- Move the tractor 12 metres away, from its centre to the border, as shown (Figure 6.12),
- Drive parallel to the border during application.

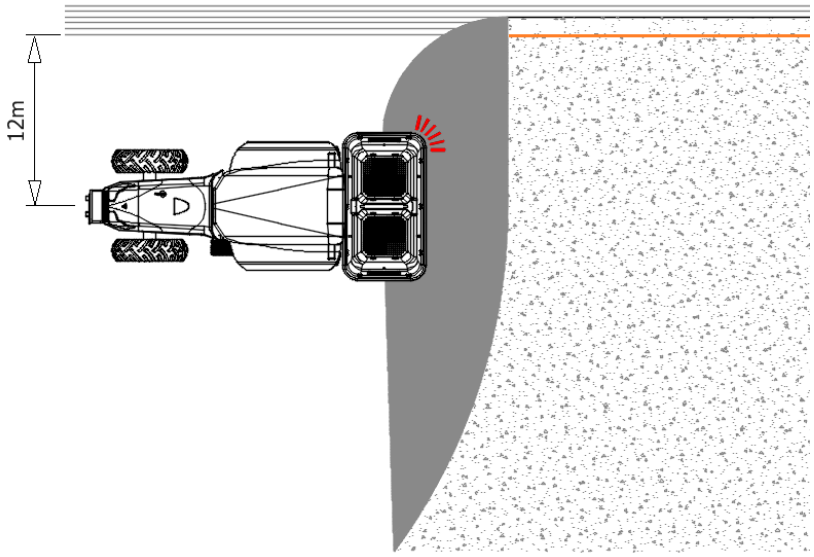


Figure 6.12 - Spreading - limitation "to the border"

In this way it is possible to spread towards the border with a total coverage of close to 100 per cent (Figure 4.7), as long as you correctly adjust the Side Border Limiter according to the product to be spread, and thus reduce the environmental impact as required by the relevant standard.

Important: The lateral border limiter is adjusted according to the type of product to be spread as follows:

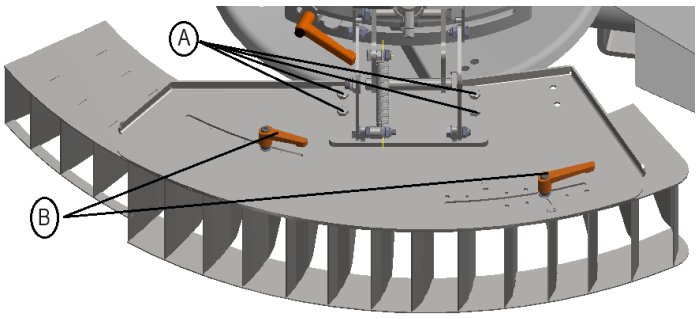


Figura 6.13 – Limitador de Bordas Lateral (posição de trabalho)

Adjust the side border limiter to spread **NAC27% (00-00-90-10)**:

- Mount the vane block in the position indicated, (Figure 6.13), i.e. the 4 bolts - A - in the leftmost hole in the block;
- Undo the handles - B - and slide the vane block until the right-hand handle is aligned with position 8.5 (Figure 6.15),
- Refit the handle.

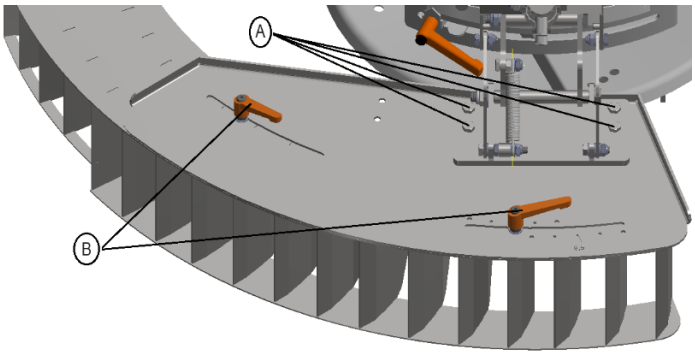


Figura 6.14 – Limitador de Bordas Lateral (posição de trabalho)

Adjust the side border limiter to spread **NPK 15-15-15 (05-10-85-00) e GRANULATED UREA (00-05-90-05):**

- Mount the vane block in the position indicated, *(Figure 6.14)*, i.e. the 4 bolts - A - in the rightmost hole in the block;
- Undo the handles - B - and slide the vane block until the right-hand handle is aligned with position 11 (Figure 6.16*),*
- Refit the handle.

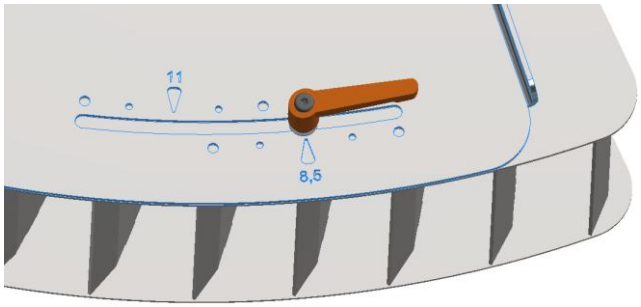


Figure 6.15 - Side border limiter
Position 8.5

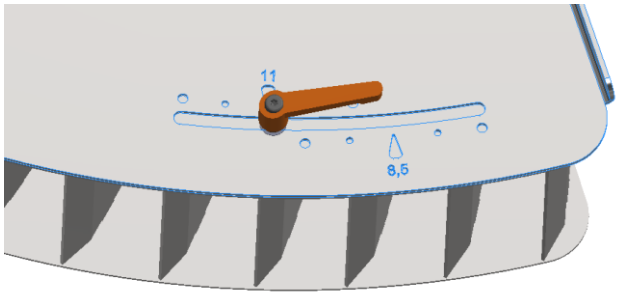


Figure 6.16 - Side border limiter
Position 11

Important points:

The data presented in this section ("border adjustment") refers to some of the nitrogen fertilisers most commonly used in agriculture in general, and is in line with current regulatory requirements.

The guidelines for regulating the border limiters (centre and side) presented here were determined in laboratory tests and refer specifically to the products described. In order to regulate the mechanisms when spreading other products, the equivalence of these products should be sought as closely as possible. To do this, you should use granulometry as the main property to determine this approximation.

The Border Limiters, centre and side (Figures 6.11 and 6.13), make it possible to limit spreading to the left or right of the machine. Unless specified by the customer, the standard Side Limiter will be manufactured and mounted on the right side of the machine, as shown above.

- **FILLING THE MACHINE**

During filling, adjustments or testing, you may come into contact with fertiliser or other chemical substances. If this is the case, wear suitable protective clothing and footwear. Contact with chemicals can cause personal injury.

WARNING: Avoid contact with fertiliser or other chemical substances!

WARNING: Before using the chemicals to be spread, carefully read the product information sheet provided by the product supplier!

Mixing various types of fertilisers can cause chemical reactions, resulting in the formation of vapours, solids or toxic liquids. The results can cause personal injury or material damage.

Only combine fertilisers if they are permitted by the manufacturers. If in doubt, consult your supplier.

Always read the safety data sheets of the products to be spread and follow the instructions therein.

WARNING: Chemical reactions can cause serious bodily injury and damage to equipment and nature!

When filling the Spreader, you will have to handle large quantities of products, often chemicals. To do this, use stable means of transport and lifting.

Never stand under suspended volumes while filling the machine.

If you need to leave the tractor, switch it off and remove the key from the ignition.

Never set the machine down on the ground during filling operations. Suspended machines are designed to be loaded in the suspended position on the tractor.

Do not place the filled machine on the ground. This could damage your machine!

Make sure that other unprotected people and animals do not approach the equipment during work.

- **THE FIRST PASS**

As mentioned above, this machine has spreading tables to help you regulate the equipment. The tables show data for the main fertilisers and seeds used in agriculture in general.

However, you may need to adjust the flow rate of a particular product depending on its properties (shape, granulometry, density) which, as we have seen, vary from batch to batch relatively easily.

To check the spreading flow, we recommend carrying out the following test, which is shown below as an example.

- Place a bag of product on each side of the hopper (e.g. 50kg + 50kg);
- Let's assume that we want to distribute NAC 27% with the following characteristics, already determined, as explained in this manual.
- Granulometry: 00-10-80-10;
- Density: ~1.10 kg/dm3;
- Dose to be distributed: 300 kg/ha.;
- Working width: 24m,
- Tractor forward speed: 10 km/h.

On page 54 of chapter 12 (spreading tables) we find a product whose characteristics are similar to the one we're going to apply (Figure 6.17).

NAC 27% (05-05-80-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.1	75	57	45	38	32					
2	41.1	171	128	103	86	73					
2.5	63.2	263	198	158	132	113					
2.7	74.6	311	233	187	155	133					
3	93.2	388	291	233	194	166					
3.5	~~121.6~~	~~504~~	~~378~~	303	252	216	24		F2		F4
3.7	132.2	551	413	331	275	236					
4	150.4	627	470	376	313	269					
4.5	172.3	718	538	431	359	308					
5	201.0	838	628	503	419	359					
5.5	229.6	957	718	574	478	410					
6	258.3	1076	807	646	538	461					

Figure 6.17 - Information taken from the spreading tables

As you can see in the figure above, these are the values closest to the desired ones.

- NAC 27%;
- Granulometry: 05-05-80-10;
- Density: ~1,06 kg/dm^3;
- Dose to be spread: 303 kg/ha, at a forward speed of 10km/h.
- Working width: 24m.
- Position of the distribution scales: Position 3.5.

From the same table we take the data for mounting the vanes on the spreading plates. For this case we have:

- D 250 and E 250 vanes in the holes F2
- D 205 and E 205 vanes in the holes F4

The assembly procedure for the vanes is described on page 24 of this user manual. Once the vanes are assembled,

- Adjust the position on the spreading scales (always the same on both sides). In this case 3.5 for a dose of 303 kg/ha!
- Adjust the rotational speed of the TDF, 540 rpm, every time!

Now do the following calculation:

- $d = \frac{P*10000}{Q*L} = \frac{100*10000}{303*24} \cong 138\ metros$

d= distance travelled in metres;
P= weight of the product placed in the hopper;
L= effective working width;
Q= dose to be applied in kg/ha.

- **CONCLUSION:**
  - If the product is used up before the 138 metres have been covered, close the opening on the scale proportionally and retest.
  - If there is any fertiliser left in the hopper after the distance has been covered, open the opening on the scale proportionally and retest.

WARNING: Adjustment operations must be carried out exclusively by the operator, whenever possible with the tractor switched off and the key removed from the ignition.

- **DURING THE SPREADING**

During spreading, whenever possible, work with the tractor cab closed, as the dust from the products, when inhaled, can cause serious injury.

Make sure that the filters in the air intakes of the tractor cab are suitable for this type of work. Consult the tractor's user manual and, if in doubt, replace the filters.

If the tractor does not have a cab or if the cab insulation is not effective, wear personal protective equipment suitable for this type of work.

WARNING: Inhalation of chemicals is dangerous. The use of suitable protective equipment is mandatory!

When exposed to adverse environments, most products absorb water, which easily causes their characteristics to change. In certain cases, large blocks can form which directly interfere with the spreading scheme.

If you are going to work with the Spreader in an environment where there is humidity, we advise you to use a properly sealed cover screen, which is optional equipment for this machine. See the description of this equipment on page 9 of these manual.

Do not leave the product inside the Spreader for too long. The humidity in the air contributes to block formation.

Clean the spreader thoroughly after each use, including the metering mechanisms, plates, vanes, etc.).

SAFETY WARNINGS AND ACCIDENT CHAP7

The operator's safety or that of other people and animals exposed to the operation of this equipment is our main concern.

A significant proportion of the accidents recorded in the use of machinery and equipment are due to non-compliance with basic safety, regulation and equipment handling rules.

WARNING: It is mandatory to read the user manual carefully before starting any operation with the equipment.

WARNING: This machine may only be operated by qualified staff! Make sure that no one is near the equipment during adjustment and operation.

This manual has been developed with the aim of ensuring safe and effective actions relating to the operation and handling of the Centrifugal Spreaders.

Make sure you have the necessary knowledge to operate the spreaders and the tractor from which you are using the implement. Information on agricultural tractors should be consulted in the respective user or manufacturer's manual.

It is the operator's responsibility to read, understand and comply with all the safety actions described in this manual before starting to work with the Spreader. If you have any questions, please contact our technical and commercial services.

Remember, you are the key to safety. Good practices not only protect you, but also the people around you. Study the instructions in this manual and make them an integral part of your safety programme.

Please note that this safety section is exclusive to this type of machine (Centrifugal Spreader). Follow all the safety recommendations described in this manual and always bear in mind:

SAFETY IS YOUR RESPONSIBILITY, THE ASSERTIVENESS OF YOUR ACTIONS CAN PREVENT SERIOUS ACCIDENTS!

The following information is intended to alert the operator to prohibitions, dangers and requirements, as well as other important safety information when using Centrifugal spreaders.

It is forbidden to approach the equipment while it is in operation.

It is forbidden to leave the equipment with the ignition key in the tractor.

No flames or hot objects near the hydraulic components.

It is forbidden to carry out any maintenance while the equipment is in operation.

It is forbidden for individuals under the influence of alcoholic beverages or narcotics to manoeuvre this equipment.

Danger! Keep a safe distance from the spreader when it is suspended during loading and unloading manoeuvres.

Danger! The spreader can cause serious cuts.

Danger! The spreader can cause crushing of limbs.

Danger! The spreader can project fragments. Do not let people or animals near the operating equipment.

Danger! The hydraulic pressure in the equipment must not exceed 200 bar.

Personal protective gloves must be worn.

The use of personal protective shoes is mandatory.

You must wear a personal protective mask with a suitable filter.

OTHER IMPORTANT NOTICES:

- Don't wear loose clothing, jewellery or other items that could get caught in the machine. If necessary, secure your hair properly.
- Switch off the tractor and remove the ignition key before carrying out any work.
- Take appropriate protective measures by wearing personal protection against dust and debris projection if the tractor does not have an enclosed cab.
- The use of this equipment by operators who are not in good health is prohibited.
- Always wear the personal protective equipment required by law, such as ear defenders, goggles, gloves, masks, safety footwear, etc.
- Respect environmental rules for the use of lubricants and/or other cleaning and maintenance products.
- Always have first aid equipment at hand.
- If you notice abnormal vibrations while using the equipment, stop immediately, switch off the equipment and the tractor and check the cause(s). Do not work with the equipment again until the problem has been resolved.
- Never work with the equipment if you detect leaks in the hydraulic elements.
- Drive carefully on uneven field.
- Carry out a risk analysis of the work site before any operation. Check if there are any obstacles that you need to pay special attention to (trees, walls, electricity or media poles, etc.).
- Never approach or allow to approach the machine when it is switched on, there is a high risk of being hit by the plates or projections.
- Before switching on the Spreader's plates, make sure that no one is near the machine.

CHECKING AND MAINTENANCE CHAP8

The use of machinery requires certain procedures to be taken into account, not only during operation, but also when checking and maintaining the equipment. These actions must be carried out with rigour because they directly affect the performance and durability of the equipment and the safety of the operators.
When carrying out checks and maintenance work, you should be aware of any hazards that may arise during these operations. This work must be carried out by qualified personnel. Please note the following warnings.

- **SAFETY WARNINGS**


Before carrying out any cleaning or maintenance work, switch off the tractor's engine and wait until all moving parts in the spreader have come to a standstill. Remove the key from the ignition!


All repair work should only be carried out in specialised workshops.


Welding work, work on the electrical and hydraulic system may only be carried out by specialised technicians.


Do not make any changes to the equipment's electrical or hydraulic circuits.


Centrifugal spreaders have cutting elements. Whenever possible, the cutting elements should be protected to avoid accidents.


All maintenance work must be carried out by trained personnel.


The use of appropriate protective equipment is mandatory for any maintenance work.


Spare parts must at least fulfil the technical requirements laid down by the manufacturer. This is ensured by using only original parts.


Make sure that maintenance and cleaning work is carried out under the appropriate safety conditions.

- **GENERAL MAINTENANCE - FREQUENCY**

Carry out a general check of your Spreader and any adjustments at the end of each working day (looseness, oil leaks, lack of lubrication, noises, foreign bodies, etc.). The frequency of other checks and maintenance should be carried out in accordance with the table below.
Note: Most of the components of the spreaders are secured with self-locking nuts. **For safety reasons, do not reuse self-locking nuts.**

WARNING: SPREADER CHECKS OR MAINTENANCE MUST BE CARRIED OUT WHEN THE TRACTOR IS STATIONARY AND WITHOUT THE KEY IN THE IGNITION.

POINTS TO BE CHECKED	DAILY	WEEKLY	ANNUALLY
LEAKS IN THE HYDRAULIC CIRCUIT	X		
GENERAL STRUCTURE INTEGRITY	X		
FOREIGN BODIES (clods, debris, stones, etc.) INSIDE THE GEARBOX	X		
GENERAL CONDITION OF PLATES AND VANES	X		
GENERAL CONDITION OF THE AGITATORS	X		
CARDAN SHAFT (state of repair and lubrication)	X		
BOLTING		X	
GEARBOX (noises; gaps; leaks, etc....)		X	
GENERAL CLEANING		X	
CRUSHING NETS AND ANTI-COMPACTION CONES		X	
AGITATOR BEARINGS			X
WEAR ELEMENTS			X

Table 8.1 - Checks to be carried out - frequency

ACTION TO TAKE	DAILY	WEEKLY	ANNUALLY
LUBRICATION	X		
CLEANING THE EQUIPMENT	X	X	
REPLACE AGITATOR BEARINGS AND RETAINERS (if necessary)			X
REPLACING LUBRICANT IN THE GEARBOXES			X
REPLACE VANNES (if necessary)			X
REPLACE AGITATORS (if necessary)			X

Table 8.2 - Preventive maintenance - frequency

Maintenance must be carried out at the defined intervals or whenever justified.
Pay attention to the procedures described below. These procedures are intended to help you carry out maintenance work on your Spreader in the most correct, safe and effective way.

- **Screws:** It is very important that you check the tightness of nuts and bolts 8 hours after first using the machine. Some components may need to be readjusted.

- **Leaks in the hydraulic circuit:** Whenever you detect a leak in any component of the hydraulic circuit, you should immediately have the damaged element repaired or even replaced. Oil leaks cause the equipment to lose efficiency and can lead to other serious machine malfunctions. Spilled hydraulic oil is a serious contributor to environmental pollution.

- **General integrity of the machine frame:** Make sure that the machine frame and its optional equipment are in good condition.

- **Foreign bodies in the machine:** Remove any debris that sometimes accumulates at the bottom of the hopper, next to the dewatering nets, or even next to the agitators. These bodies can cause blockages and thus reduce the dose of product to be spread.

- **Plates and vanes:** Check the state of repair of the Spreader's plates and vanes on a daily basis. If any of these elements show obvious signs of wear or damage, they should be replaced.

- **Agitators:** Regularly check the state of repair of the Agitators.

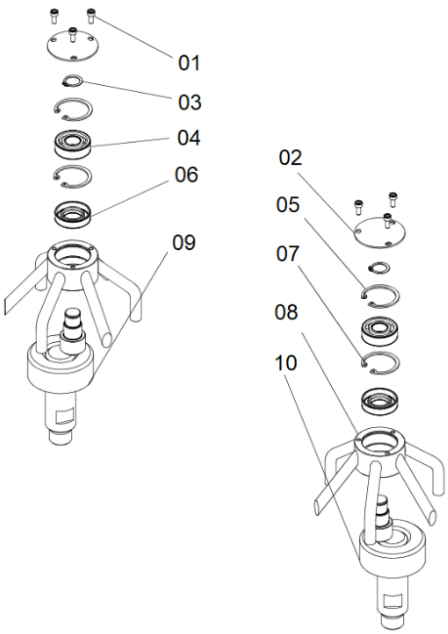


Figure 8.1 - KC RD 2000 EVO agitator's view

Replace Agitator Bearing and Retainer:

- Unscrew the screws - 01;
- Remove the cover - 02;
- Remove the brakes - 03 and 05;
- Remove and replace Bearing (6202-2Z) DIN 625 - 04;
- Remove the brake - 07;
- Remove and replace Retainer 18x35x8 CC DIN 3760 - 06,
- Reassemble in reverse order.

Note: This work should be carried out by a qualified technician.

- **Cardan shaft:** The Cardan shaft (Figure 8.2) is one of the components you should check every day you work with the machine and, in this particular case, lubricate properly at the same intervals.

    - **Inspection:** Check the general operation of the Cardan shaft. If you detect anything strange (noise and vibrations), stop the machine safely and check the anomaly. Correct the problem before putting it back into operation.
    - **Lubrication:** The Cardan shaft should be lubricated daily with **NLGI 1-4 grease.**

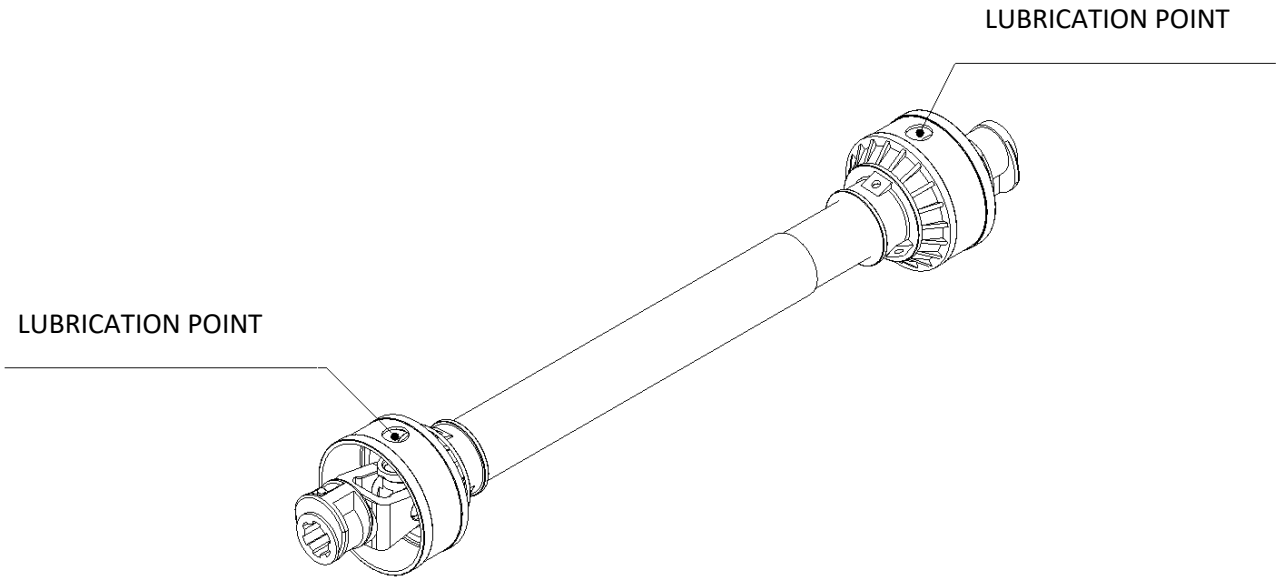


Figure 8.2 - Cardan shaft

To lubricate the points indicated, use a lubrication pump identical to the one in the following figure (Figure 8.3).

Figure 8.3 – Lubrication Pump

- **Gearbox:** Check the condition of this vital machine element carefully.

    - **Inspection:** If you detect noise, looseness or lubricant leaks, you must immediately stop the machine safely and identify their source. Have the damaged component(s) repaired or replaced if necessary.

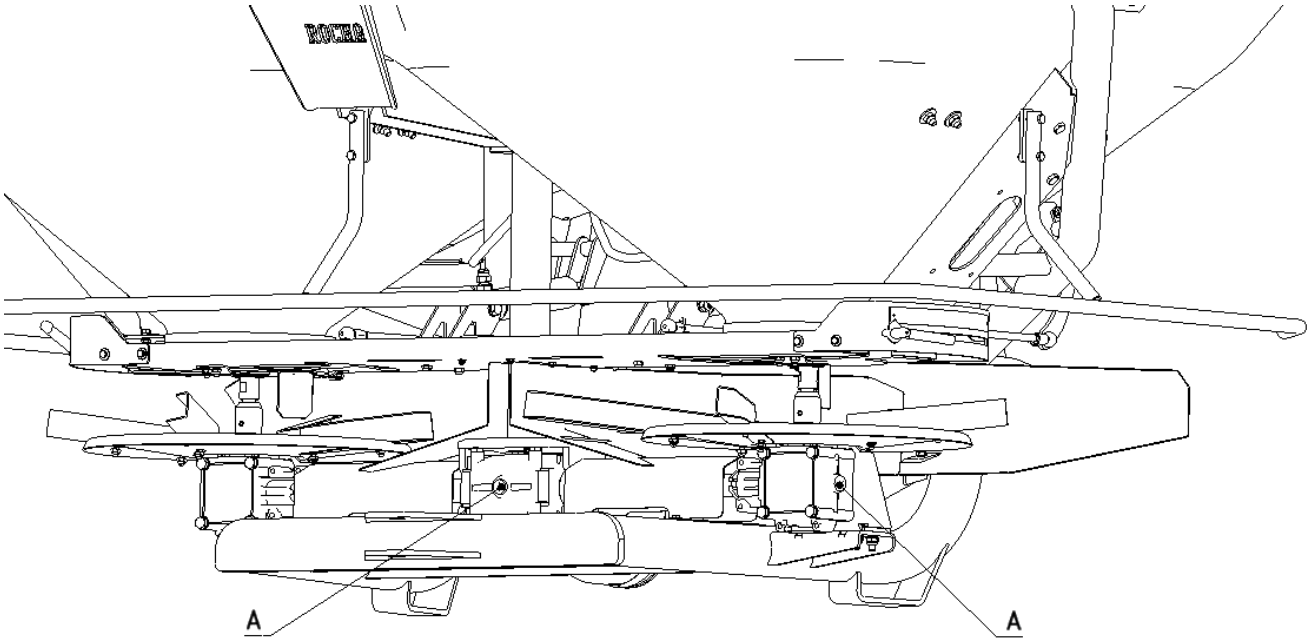


Figure 8.4 - Lubricant level of the gearbox

    - **Lubrication:** Under normal working conditions, gearboxes do not require lubricant replacement. However, we recommend replacing it after 10 years of work.
      This interval should be halved (5 years) if the spreader is subjected to intensive work and under severe conditions of fertiliser dust and frequent water jets (machine cleaning operations).

WARNING: REMOVE OIL IN AN ENVIRONMENTALLY FRIENDLY MANNER. FIND OUT ABOUT CURRENT REGULATIONS!

- **Checking the lubricant level:** To check the lubricant level of the gearbox, proceed as follows:

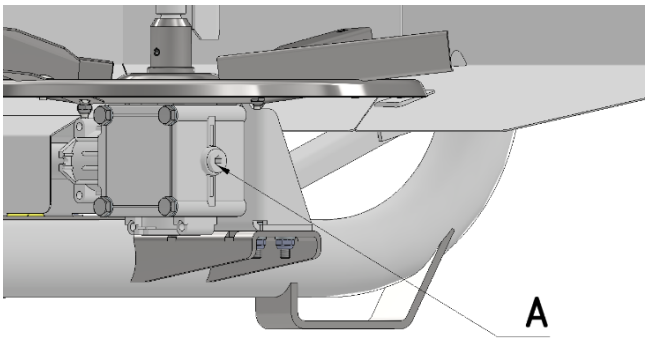


Figure 8.5 - Oil level indicator

- Unscrew the level plug - A
- The lubricant level is correct when it reaches the bottom edge of the hole.
- f it is below the level, you must replace the lubricant up to this point.
- Tighten the level plug again.
- Proceed in the same way with the 3 gearboxes.

Important: The lubricant to be applied to the 3 boxes should be GALP TRANSOIL HP FL 90, or equivalent. Each box takes a total of approximately 0.4 litres of lubricant.

- **Springtooth nets and anti-compaction cones:**
  - The springtooth nets (Figure 4.1), as already explained, prevent foreign bodies from passing through to the spreader mechanism.
    Check that they are in good condition.
  - The integrity of the Anti-Compaction Cones (Figure 4.1) is very important, as these elements have a direct effect on the proper functioning of the agitator and this, in turn, on the efficiency of the spreading.
  - After bringing the machine to a safe stop, lift the springtooth nets and check that the Anti-Compaction Cones are in good working order. If in doubt, replace them.

- **General cleaning:** Most of the products to be spread, especially fertilisers, are very corrosive and can therefore cause oxidation in some of the machine's components. This is mainly why cleaning the spreader is very important for its preservation.
  - Wash the spreader dosing mechanism properly (Figure 4.2).
  - If washing at high pressure, do not direct the water jet at the machine's electrical and hydraulic elements, or at the machine's stickers.
  - After washing and drying the equipment, protect the stainless-steel metal parts with an environmentally friendly anti-corrosive agent.

PROCEDURE IN THE EVENT OF A BREAKDOWN CHAP9

Abnormal situations may arise during the handling of the valves that interfere with their correct operation or prevent them from working. The following table lists the most common and how to solve them.

MALFUNCTION	CAUSE	SOLUTION
Product spreading is not uniform.	- Obstruction of the dosing plates; - The position of the scale is not correct; - Spreading vanes incorrectly fitted; - The PTO speed is not at 540 rpm, - The spreader is not levelled; - Misinterpretation of the spreading tables, - The agitator is crushing the product.	- Clear the dosing plates; - Check and adjust the position of the scale; - Confirm the assembly instructions given in the tables; - Adjust the PTO speed, - Level the spreader as indicated in this manual; - Read the instructions in chapter 12 carefully, - Check the condition of the agitator and replace the bearing if necessary.
Excess product during application.	- The product is of poor quality (soft, broken, several types mixed together); - The number of revolutions of the distribution plates is too high, - The tractor speed is slow.	- Check the granulometry of the product (see chapter 6 of this user manual). - Adjust the PTO speed to 540 rpm, - Adjust the tractor speed (See chapter 12 of these user manual).
Product failure during application.	- Poor grain quality. 80% of the grains must have a diameter between 2.0 and 4.75 mm; - Misinterpretation of the tables.	- Check the granulometry of the product (See chapter 6 of these manual). - Check the data in the most approximate table (See chapter 12 of these manual). - Work with a shorter range.

MALFUNCTION	CAUSE	SOLUTION
Excessive vibration or noise.	- Slack in the PTO crossheads due to excessive wear; - Cardan shaft assembly is not correct - Excessive slack in the tractor's hydraulic arms; - The spreading plate is damaged. - The agitator is damaged, - The gearbox is damaged.	- Replace the crossheads according to the instructions in the Cardan shaft manual; - Check the TPO shaft`s length and working angle (see chapter 5 of these user manual). - Stabilise the tractor arms, keeping the machine centred; - Repair the plate or if in doubt replace it. - Replace the agitator, - Check the gearbox conditions; - Check the oil level; - If the problem persists, contact your dealer.

TRANSPORT, HANDLING AND STORAGE

CHAP10

Transporting or moving the KC RD 2000 EVO Spreader, when it is not coupled to the tractor, is an operation that requires certain precautions. Before transporting the machine, pay attention to the following warnings.

- **SAFETY WARNINGS**

All work must be carried out by properly trained and authorised personnel.

Use suitable means of transport and lifting devices that comply with regulations and are in good condition.

Before selecting transport devices, check the weight of the machine. The exact weight of each model is engraved on the machine's nameplate.

Determine the transport route in advance and eliminate possible obstacles.

Check that all devices to be used are operational.

Secure all devices that could cause danger, even if they are only in use for a short period of time.

Move the equipment carefully and always empty.

Ensure the stability of the machine during handling or transport. If necessary, adjust the length of the cables or straps to ensure stability.

Transport the machine as close to the ground as possible.

Field the machine carefully on the loading platform of the transport vehicle or on firm ground.

DISMANTLING THE MACHINE CHAP11

- **ENVIRONMENTAL RESPONSIBILITY**

Protecting the environment is a growing concern for machinery and equipment manufacturers. The selection of recyclable materials, the use of biodegradable lubricants and the concern to build increasingly energy-efficient machines are just some examples of this responsibility.

By ensuring the regular maintenance of their machines and equipment, owners are contributing not only to optimising consumption, but also to reducing atmospheric pollution and environmental noise and, consequently, to the health of the planet.

- **DISMANTLING THE EQUIPMENT**

At the end of its useful life, don't dispose of this equipment in the environment. As well as contributing to environmental pollution, you are endangering people and animals.

When disposing of the machine, you must take into account the environmental regulations in force with regard to the environment and the recycling of the materials that make it up.

The materials used in the construction of this equipment are 100 per cent recyclable. Materials must be grouped by type before collection for dismantling.

Turn to companies that specialise in collecting and dismantling this type of equipment, or if in doubt, contact the manufacturer or legal representative of the equipment.

SPREADING TABLES CHAP12

TECHNICAL SPREADING ADVICE

The quality of mechanised fertiliser and seed spreading depends largely on the methods used in the field by the operator.

1) At the headfields and during manoeuvring operations, stop spreading and if possible, switch off the PTO. When starting, you should avoid spreading product beyond the field borders. To this end, and taking into account the equipment's settings, only start spreading once the machine is in a position where this is guaranteed.
2) Fertiliser and seed grains are generally very light and once thrown, their trajectory can vary depending on the wind. During spreading operations, if the wind speed is very high (over 3m/s), you should stop work, otherwise the spreading of the product on the ground could be very uneven.
3) Fertilisers with a regular grain size promote uniform spreading. We suggest that you take this into account when selecting the product(s) to apply.

WARNING: Spreading uniformity can vary significantly depending on the environmental conditions present. Wind and uneven field are factors to be taken into account during work.

WARNING: The spreading tests carried out with this equipment were carried out in the laboratory, under optimum atmospheric conditions, in the absence of field irregularities and with products of small size variations.

4) The diagram on the following page (Figure 12.1) shows, by way of example, one of several possible approaches to spreading fertiliser or seeds on the field. The purpose is to guarantee a complete spreading, with no gaps or repetitions over the area to be covered, while respecting the rules and limitations of the fields.

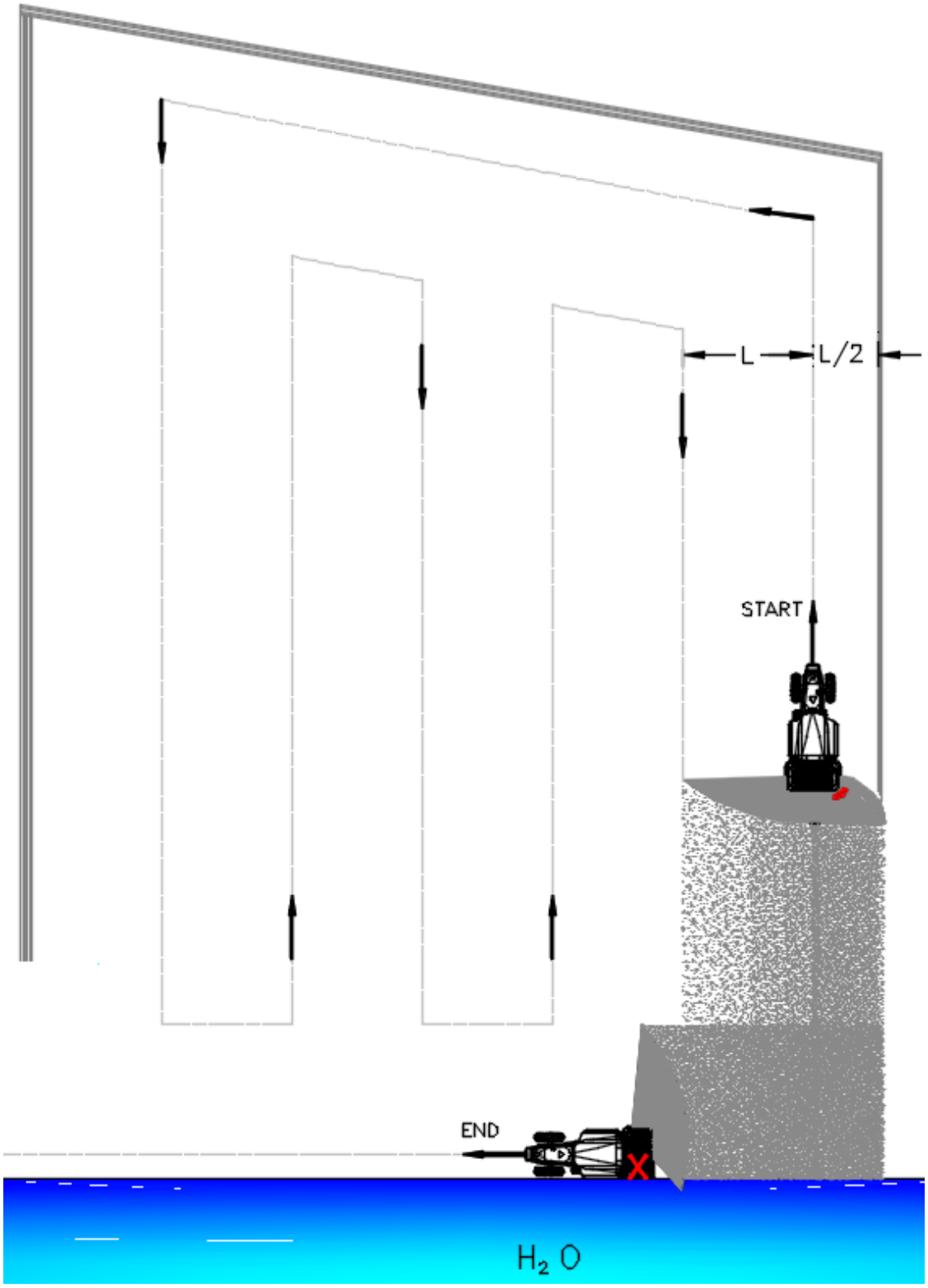


Figure 12.1 - Field spreading

CONSULT AND INTERPRET SPREADING TABLES

The spreading tables presented in this chapter refer to some of the fertilisers and seeds most commonly used in agriculture in general. These tables were drawn up by means of rigorous tests on the KC-RD EVO 2000 Spreader, carried out in an accredited laboratory (EECAS), and as such under optimum conditions for analysing and obtaining results.

The tests were carried out in accordance with the specifications of standard UNE-EN 13739-2, both in analysing the uniformity of the transverse spreading and in analysing the efficiency of the border limiters (from the border and to the border).

In the transversal spreading uniformity tests, it was possible to verify that the coefficient of variation (CV) is less than 15 %, as required by the standard.

The border limiter tests showed that the distribution outside the field borders is less than 3/1000, as required by the environmental standard.

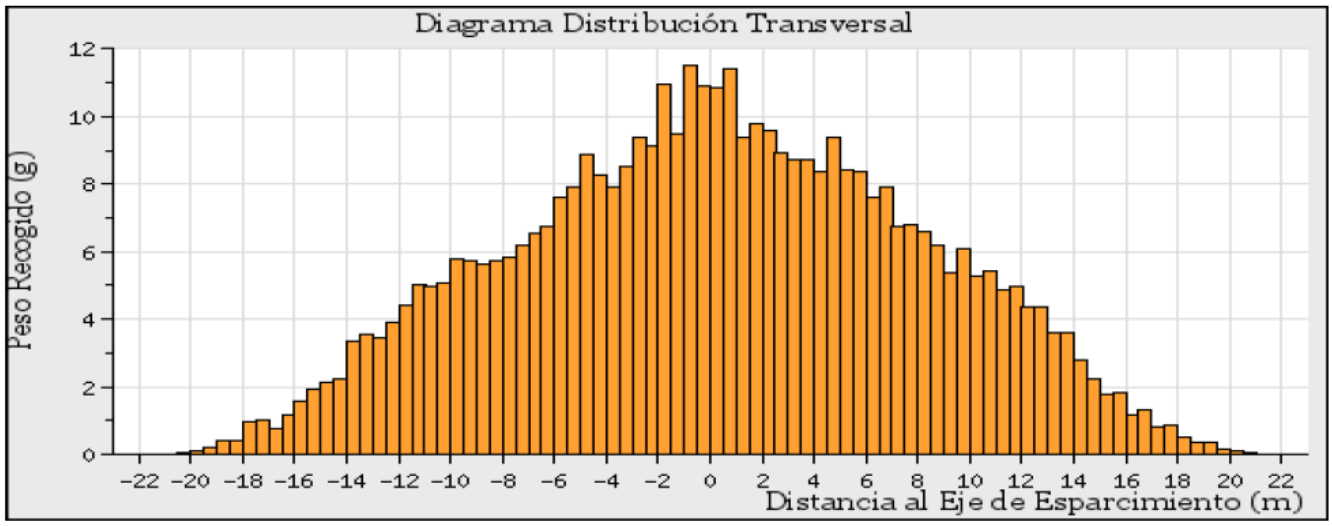


Figure 12.2 - Cross-sectional distribution with Nac27% at 22m with CV<15%

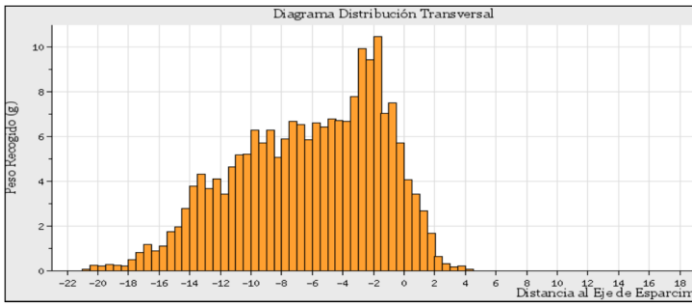


Figure 12.3 - Spreading "from the border" with Nac27% at 1.5m - with volume outside the field border <3/1000

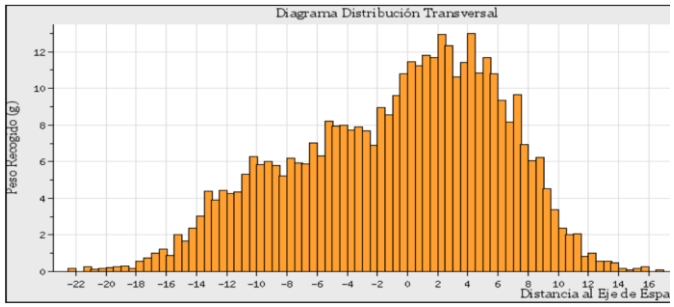


Figure 12.4 - Spreading "to the border" with Nac27% at 1.5m - with volume outside the field border <3/1000

The following example shows how to consult and interpret the spreading tables in order to obtain an optimised spread. Always use this method to determine the best possible setting for your KC-RD EVO 2000 spreader.

- **EXAMPLE:**

Product to spread: NAC 27% (05-05-80-10) - Density: 1,06 kg/dm³

Dose to spread: 300 kg/ha

Working width: 24m

Tractor speed: 10 km/h

a) Select table for **NAC 27%**; working width **24m** → **Pág.53**

b) Select the value closest to the desired dose (300kg/ha) in the column referring to the tractor's speed (10km/h). The closest value in this case is 303kg/ha, as shown in the following figure.

NAC 27% (05-05-80-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.1	75	57	45	38	32					
2	41.1	171	128	103	86	73					
2.5	63.2	263	198	158	132	113					
2.7	74.6	311	233	187	155	133					
3	93.2	388	291	233	194	166					
3.5	121.0	504	378	303	252	216	24		F2		F4
3.7	132.2	551	413	331	275	236					
4	150.4	627	470	376	313	269					
4.5	172.3	718	538	431	359	308					
5	201.0	838	628	503	419	359					
5.5	229.6	957	718	574	478	410					
6	258.3	1076	807	646	538	461					

Figure 12.5 - Example of a table consult

c) The table also provides data for adjusting the scales and fitting the vanes according to the desired results.
   - Scale position: 3.5
   - Mounting vanes: (D250 + E250) on hole F2; and (D205 + E205) on hole F4 (see mounting example on page 23 of this manual).

Note: The rotational speed of the PTO must always be 540 rpm.

NAC 27% (05-05-80-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.1	101	75	60	50	43	18		F2		F4
2	41.1	228	171	137	114	98					
2.5	63.2	351	263	211	176	150					
2.7	74.6	414	311	249	207	178					
3	93.2	518	388	311	259	222					
3.5	121.0	672	504	403	336	288					
3.7	132.2	734	551	441	367	315					
4	150.4	836	627	501	418	358					
4.5	172.3	957	718	574	479	410					
5	201.0	1116	837	670	558	478					
5.5	229.6	1276	957	765	638	547					
6	258.3	1435	1076	861	718	615					
1.5	18.1	91	68	54	45	39	20		F2		F4
2	41.1	206	154	123	103	88					
2.5	63.2	316	237	190	158	135					
2.7	74.6	373	280	224	187	160					
3	93.2	466	350	280	233	200					
3.5	121.0	605	454	363	303	259					
3.7	132.2	661	496	397	331	283					
4	150.4	752	564	451	376	322					
4.5	172.3	862	646	517	431	369					
5	201.0	1005	754	603	503	431					
5.5	229.6	1148	861	689	574	492					
6	258.3	1292	969	775	646	554					
1.5	18.1	82	62	49	41	35	22		F2		F4
2	41.1	187	140	112	93	80					
2.5	63.2	287	215	172	144	123					
2.7	74.6	339	254	203	170	145					
3	93.2	424	318	254	212	182					
3.5	121.0	550	413	330	275	236					
3.7	132.2	601	451	361	300	258					
4	150.4	684	513	410	342	293					
4.5	172.3	783	587	470	392	336					
5	201.0	914	685	548	457	392					
5.5	229.6	1044	783	626	522	447					
6	258.3	1174	881	704	587	503					

NAC 27% (05-05-80-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.1	75	57	45	38	32	24		F2		F4
2	41.1	171	128	103	86	73					
2.5	63.2	263	198	158	132	113					
2.7	74.6	311	233	187	155	133					
3	93.2	388	291	233	194	166					
3.5	121.0	504	378	303	252	216					
3.7	132.2	551	413	331	275	236					
4	150.4	627	470	376	313	269					
4.5	172.3	718	538	431	359	308					
5	201.0	838	628	503	419	359					
5.5	229.6	957	718	574	478	410					
6	258.3	1076	807	646	538	461					
1.5	18.1	70	52	42	35	30	26	F1	F4		
2	41.1	158	119	95	79	68					
2.5	63.2	243	182	146	122	104					
2.7	74.6	287	215	172	143	123					
3	93.2	358	269	215	179	154					
3.5	121.0	465	349	279	233	199					
3.7	132.2	508	381	305	254	218					
4	150.4	578	434	347	289	248					
4.5	172.3	663	497	398	331	284					
5	201.0	773	580	464	387	331					
5.5	229.6	883	662	530	442	379					
6	258.3	993	745	596	497	426					
1.5	18.1	65	48	39	32	28	28	F1	F4		
2	41.1	147	110	88	73	63					
2.5	63.2	226	169	135	113	97					
2.7	74.6	266	200	160	133	114					
3	93.2	333	250	200	166	143					
3.5	121.0	432	324	259	216	185					
3.7	132.2	472	354	283	236	202					
4	150.4	537	403	322	269	230					
4.5	172.3	615	462	369	308	264					
5	201.0	718	538	431	359	308					
5.5	229.6	820	615	492	410	351					
6	258.3	923	692	554	461	395					

NAC 27% (05-05-80-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	6	6	6	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.1	60	45	36	30	26	30	F1	F4		
2	41.1	137	103	82	69	59					
2.5	63.2	211	158	126	105	90					
2.7	74.6	249	187	149	124	107					
3	93.2	311	233	186	155	133					
3.5	121.0	403	303	242	202	173					
3.7	132.2	441	331	264	220	189					
4	150.4	501	376	301	251	215					
4.5	172.3	574	431	345	287	246					
5	201.0	670	503	402	335	287					
5.5	229.6	765	574	459	383	328					
6	258.3	861	646	517	431	369					
1.5	18.1	57	42	34	28	24	32	F1	F4		
2	41.1	128	96	77	64	55					
2.5	63.2	198	148	119	99	85					
2.7	74.6	233	175	140	117	100					
3	93.2	291	218	175	146	125					
3.5	121.0	378	284	227	189	162					
3.7	132.2	413	310	248	207	177					
4	150.4	470	353	282	235	201					
4.5	172.3	538	404	323	269	231					
5	201.0	628	471	377	314	269					
5.5	229.6	718	538	431	359	308					
6	258.3	807	605	484	404	346					
1.5	18.1	53	40	32	27	23	34	F1	F4		
2	41.1	121	91	73	60	52					
2.5	63.2	186	139	112	93	80					
2.7	74.6	219	165	132	110	94					
3	93.2	274	206	164	137	117					
3.5	121.0	356	267	214	178	153					
3.7	132.2	389	292	233	194	167					
4	150.4	442	332	265	221	190					
4.5	172.3	507	380	304	253	217					
5	201.0	591	443	355	296	253					
5.5	229.6	675	507	405	338	289					
6	258.3	760	570	456	380	326					

NPK 15-15-15 (10-30-50-10) - DENSITY: 1,06 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.2	101	76	61	51	43	18	F1	F4		
2	38.5	214	160	128	107	92					
2.5	63.0	350	263	210	175	150					
3	85.0	472	354	283	236	202					
3.5	101.5	564	423	338	282	242					
4	128.6	714	536	429	357	306					
4.5	160.4	891	668	535	446	382					
5	193.1	1073	805	644	536	460					
5.5	212.9	1183	887	710	591	507					
6	232.7	1293	970	776	646	554					
6.5	248.8	1382	1037	829	691	592					
1.5	18.2	91	68	55	46	39	20	F1	F4		
2	38.5	193	144	116	96	83					
2.5	63.0	315	236	189	158	135					
3	85.0	425	319	255	213	182					
3.5	101.5	508	381	305	254	218					
4	128.6	643	482	386	322	276					
4.5	160.4	802	602	481	401	344					
5	193.1	966	724	579	483	414					
5.5	212.9	1065	798	639	532	456					
6	232.7	1164	873	698	582	499					
6.5	248.8	1244	933	746	622	533					
1.5	18.2	83	62	50	41	35	22	F1	F4		
2	38.5	175	131	105	88	75					
2.5	63.0	286	215	172	143	123					
3	85.0	386	290	232	193	166					
3.5	101.5	461	346	277	231	198					
4	128.6	585	438	351	292	251					
4.5	160.4	729	547	437	365	312					
5	193.1	878	658	527	439	376					
5.5	212.9	968	726	581	484	415					
6	232.7	1058	793	635	529	453					
6.5	248.8	1131	848	679	565	485					

NPK 15-15-15 (10-30-50-10) - DENSITY: 1,02 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.2	76	57	46	38	33	24	F3			F4
2	38.5	160	120	96	80	69					
2.5	63.0	263	197	158	131	113					
3	85.0	354	266	213	177	152					
3.5	101.5	423	317	254	211	181					
4	128.6	536	402	322	268	230					
4.5	160.4	668	501	401	334	286					
5	193.1	805	603	483	402	345					
5.5	212.9	887	665	532	444	380					
6	232.7	970	727	582	485	416					
6.5	248.8	1037	778	622	518	444					
1.5	18.2	70	53	42	35	30	26	F1			F3
2	38.5	148	111	89	74	63					
2.5	63.0	242	182	145	121	104					
3	85.0	327	245	196	163	140					
3.5	101.5	390	293	234	195	167					
4	128.6	495	371	297	247	212					
4.5	160.4	617	463	370	308	264					
5	193.1	743	557	446	371	318					
5.5	212.9	819	614	491	409	351					
6	232.7	895	671	537	448	384					
6.5	248.8	957	718	574	478	410					
1.5	18.2	65	49	39	33	28	28	F1			F3
2	38.5	138	103	83	69	59					
2.5	63.0	225	169	135	113	96					
3	85.0	304	228	182	152	130					
3.5	101.5	363	272	218	181	155					
4	128.6	459	344	276	230	197					
4.5	160.4	573	430	344	286	246					
5	193.1	690	517	414	345	296					
5.5	212.9	760	570	456	380	326					
6	232.7	831	623	499	416	356					
6.5	248.8	889	666	533	444	381					

NPK 15-15-15 (10-30-50-10) - DENSITY: 1,02 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	18.2	61	46	36	30	26	30	F1	F4		
2	38.5	128	96	77	64	55					
2.5	63.0	210	158	126	105	90					
3	85.0	283	213	170	142	121					
3.5	101.5	338	254	203	169	145					
4	128.6	429	322	257	214	184					
4.5	160.4	535	401	321	267	229					
5	193.1	644	483	386	322	276					
5.5	212.9	710	532	426	355	304					
6	232.7	776	582	465	388	332					
6.5	248.8	829	622	498	415	355					
1.5	18.2	57	43	34	28	24	32	F1	F4		
2	38.5	120	90	72	60	52					
2.5	63.0	197	148	118	98	84					
3	85.0	266	199	159	133	114					
3.5	101.5	317	238	190	159	136					
4	128.6	402	301	241	201	172					
4.5	160.4	501	376	301	251	215					
5	193.1	603	453	362	302	259					
5.5	212.9	665	499	399	333	285					
6	232.7	727	545	436	364	312					
6.5	248.8	778	583	467	389	333					
1.5	18.2	54	40	32	27	23	34	F1	F4		
2	38.5	113	85	68	57	49					
2.5	63.0	185	139	111	93	79					
3	85.0	250	188	150	125	107					
3.5	101.5	299	224	179	149	128					
4	128.6	378	284	227	189	162					
4.5	160.4	472	354	283	236	202					
5	193.1	568	426	341	284	243					
5.5	212.9	626	470	376	313	268					
6	232.7	684	513	411	342	293					
6.5	248.8	732	549	439	366	314					

GRANULATED UREA (05-10-80-05) - DENSITY: 0,75 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	13.8	86	65	52	43	37	16	F3	F4		
2	30.2	189	142	113	94	81					
2.5	50.7	317	238	190	158	136					
3	71.2	445	334	267	223	191					
3.5	91.7	573	430	344	287	246					
4	106.9	668	501	401	334	286					
4.5	128.5	803	602	482	402	344					
5	151.6	948	711	569	474	406					
5.5	181.0	1131	848	679	566	485					
6	198.1	1238	929	743	619	531					
1.5	13.8	77	58	46	38	33	18	F3	F4		
2	30.2	168	126	101	84	72					
2.5	50.7	282	211	169	141	121					
3	71.2	396	297	237	198	170					
3.5	91.7	509	382	306	255	218					
4	106.9	594	445	356	297	255					
4.5	128.5	714	535	428	357	306					
5	151.6	842	632	505	421	361					
5.5	181.0	1006	754	603	503	431					
6	198.1	1101	825	660	550	472					
1.5	13.8	69	52	41	35	30	20	F3	F4		
2	30.2	151	113	91	76	65					
2.5	50.7	254	190	152	127	109					
3	71.2	356	267	214	178	153					
3.5	91.7	459	344	275	229	197					
4	106.9	535	401	321	267	229					
4.5	128.5	643	482	386	321	275					
5	151.6	758	569	455	379	325					
5.5	181.0	905	679	543	453	388					
6	198.1	991	743	594	495	425					

GRANULATED UREA (05-10-80-05) - DENSITY: 0,75 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	13.8	63	47	38	31	27	22	F3	F4		
2	30.2	137	103	82	69	59					
2.5	50.7	230	173	138	115	99					
3	71.2	324	243	194	162	139					
3.5	91.7	417	313	250	208	179					
4	106.9	486	364	292	243	208					
4.5	128.5	584	438	350	292	250					
5	151.6	689	517	413	345	295					
5.5	181.0	823	617	494	411	353					
6	198.1	900	675	540	450	386					
1.5	13.8	58	43	35	29	25	24	F3	F4		
2	30.2	126	94	76	63	54					
2.5	50.7	211	158	127	106	91					
3	71.2	297	223	178	148	127					
3.5	91.7	382	287	229	191	164					
4	106.9	445	334	267	223	191					
4.5	128.5	535	402	321	268	229					
5	151.6	632	474	379	316	271					
5.5	181.0	754	566	453	377	323					
6	198.1	825	619	495	413	354					
1.5	13.8	53	40	32	27	23	26	F3	F4		
2	30.2	116	87	70	58	50					
2.5	50.7	195	146	117	98	84					
3	71.2	274	205	164	137	117					
3.5	91.7	353	265	212	176	151					
4	106.9	411	308	247	206	176					
4.5	128.5	494	371	297	247	212					
5	151.6	583	437	350	292	250					
5.5	181.0	696	522	418	348	298					
6	198.1	762	571	457	381	327					

BARLEY SEED (00-00-90-10) - DENSITY: 0,70 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	5.1	32	24	19	16	14	16		F1		F4
2	21.7	136	102	81	68	58					
2.5	39.7	248	186	149	124	106					
3	59.0	369	277	221	184	158					
3.5	77.3	483	362	290	242	207					
4	97.3	608	456	365	304	261					
4.5	117.2	733	549	440	366	314					
1.5	5.1	28	21	17	14	12	18		F1		F4
2	21.7	121	90	72	60	52					
2.5	39.7	221	165	132	110	95					
3	59.0	328	246	197	164	140					
3.5	77.3	429	322	258	215	184					
4	97.3	541	405	324	270	232					
4.5	117.2	651	488	391	326	279					
1.5	5.1	26	19	15	13	11	20		F1		F4
2	21.7	109	81	65	54	47					
2.5	39.7	199	149	119	99	85					
3	59.0	295	221	177	148	126					
3.5	77.3	387	290	232	193	166					
4	97.3	487	365	292	243	209					
4.5	117.2	586	440	352	293	251					
1.5	5.1	23	17	14	12	10	22		F1		F4
2	21.7	99	74	59	49	42					
2.5	39.7	180	135	108	90	77					
3	59.0	268	201	161	134	115					
3.5	77.3	351	264	211	176	151					
4	97.3	442	332	265	221	190					
4.5	117.2	533	400	320	266	228					

SEED OATS (15-70-15-00) - DENSITY: 0,55 kg/dm³ (benchmark)

Position Scale	Flow rate (kg/min)	Tractor speed (km/h)					Working width (m)	Spreading vanes Position			
		6	8	10	12	14		365	250	235	205
		Spread rate (Kg/ha)									
1.5	2.2	18	14	11	9	8	12	F1			F4
2	10.5	88	66	53	44	38					
2.5	24.7	206	154	124	103	88					
3	39.7	331	248	199	165	142					
3.5	54.3	453	339	272	226	194					
4	70.5	588	441	353	294	252					
4.5	86.5	721	541	433	360	309					
5	101.1	843	632	506	421	361					
5.5	115.8	965	724	579	483	414					
1.5	2.2	16	12	9	8	7	14	F1			F4
2	10.5	75	56	45	38	32					
2.5	24.7	176	132	106	88	76					
3	39.7	284	213	170	142	122					
3.5	54.3	388	291	233	194	166					
4	70.5	504	378	302	252	216					
4.5	86.5	618	463	371	309	265					
5	101.1	722	542	433	361	309					
5.5	115.8	827	620	496	414	354					
1.5	2.2	14	10	8	7	6	16	F1			F4
2	10.5	66	49	39	33	28					
2.5	24.7	154	116	93	77	66					
3	39.7	248	186	149	124	106					
3.5	54.3	339	255	204	170	145					
4	70.5	441	330	264	220	189					
4.5	86.5	541	405	324	270	232					
5	101.1	632	474	379	316	271					
5.5	115.8	724	543	434	362	310					