TRAILER SPRAYER

CERES

ORIGINAL MANUAL

ROCHA

INDEX

INTRODUCTION CHAP 1

By purchasing a ROCHA product, you have made a truly wise choice and will quickly realise how reliable and robust our product is.

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

The purpose of this manual is to enable users of **CERES Trailed Sprayers** 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.

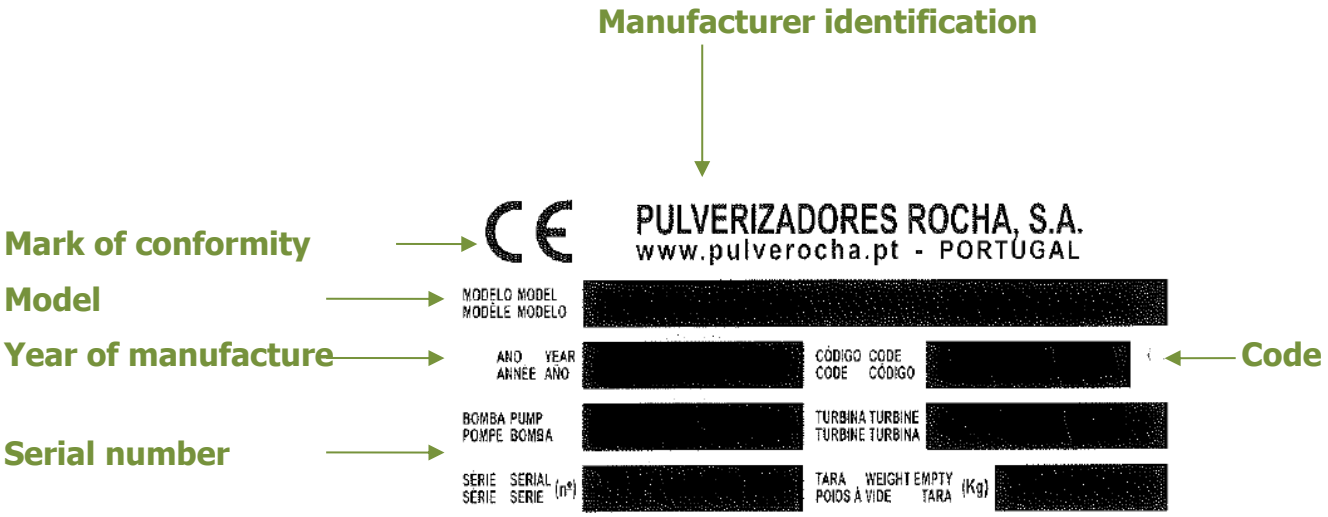
Any additional information should be obtained from our technical sales department. Whenever necessary, use the information contained on the equipment's identification plate to help us identify the characteristics of your machine.

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

Ensure that you understand the instructions in this manual before starting to work with the equipment.

THIS MANUAL IS AN INTEGRAL PART OF THE MACHINE

MACHINE IDENTIFICATION CHAP2



The identification plate affixed to the machine chassis contains essential information for the correct identification of the equipment.

This data is essential when ordering accessories or requesting technical assistance.

WARRANTY CONDITIONS CHAP3

1. The products sold by Pulverizadores Rocha S.A. are properly tested and checked to minimise the likelihood of faults occurring.

2. All equipment is guaranteed for a period of 24 months (NON-PROFESSIONAL USE – DL 67/2003) or 12 months (PROFESSIONAL USE – CC Art. 921) from the date of purchase.

2.1 Components or parts found to be defective in manufacture and/or assembly will be replaced promptly and free of charge. However, labour and travel costs will be charged.

2.2 It is mandatory to send the parts or accessories that are the subject of the complaint so that they can be analysed by our Technical Department.

3. The occurrence of the events listed below will result in the immediate loss of warranty.

3.1 The use of equipment under abnormal working conditions or coupled to tractors with power ratings other than those recommended in the respective technical documentation.

3.2 The replacement of any components or parts with non-original parts.

3.3 The introduction of any changes to the structure of the equipment.

3.4 Repairs carried out during the warranty period without the knowledge and authorisation of Pulverizadores Rocha S.A.

MACHINE DESCRIPTION CHAP4

WARNING: Working with agricultural machinery can be dangerous. Incorrect or careless use can cause very serious injury to the operator or third parties!

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

The CERES Trailed Sprayer was developed with the aim of applying crop protection chemicals and liquid fertilisers when attached to an agricultural tractor. The equipment should only be used for this purpose. The sprayer must not be used for any other purpose.

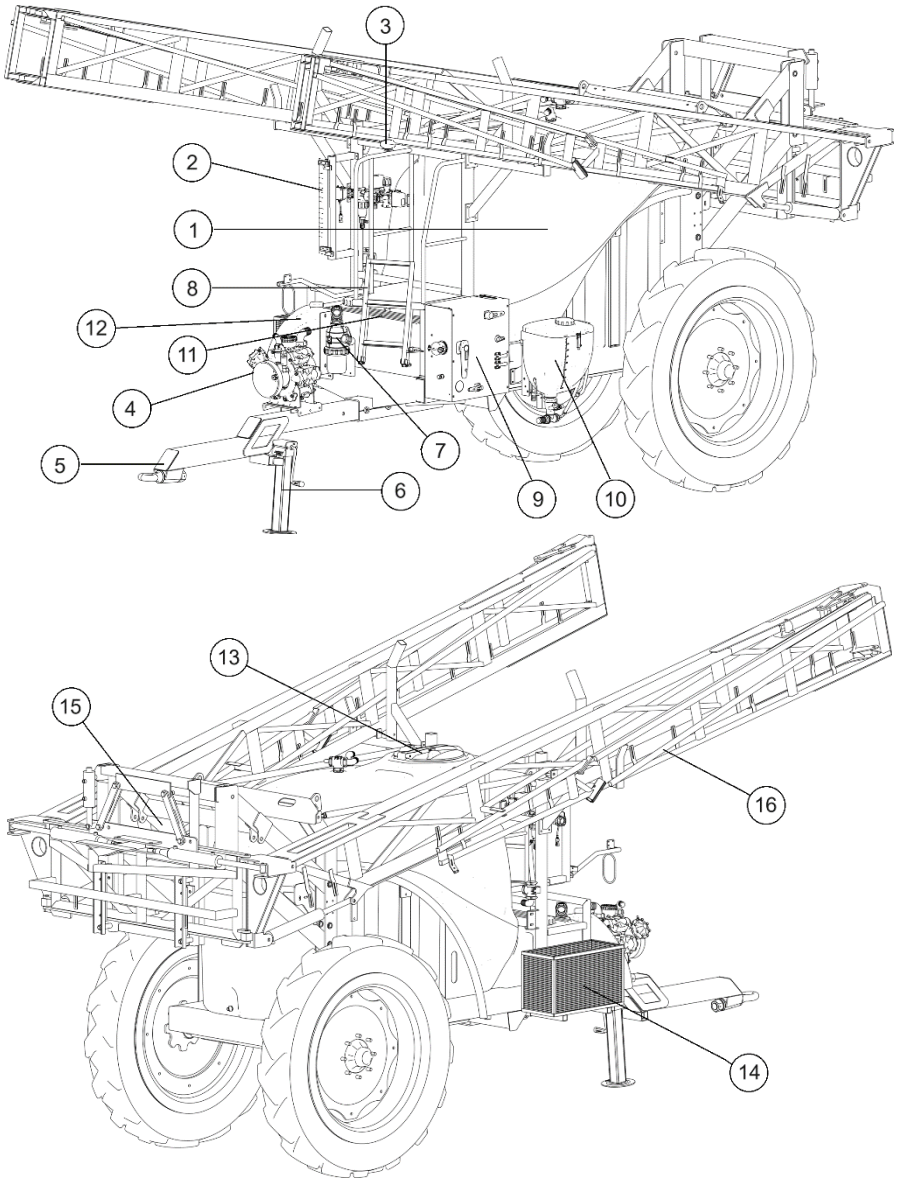
The dimensions of this equipment are compatible with medium and large tractors. Its high impact resistance, anti-corrosive components and lightweight, easy-to-disassemble tank give this machine the characteristics necessary for use in jobs that require precision.

The components of this machine are made of various materials, e.g. carbon steel, stainless steel, polyethylene, nylon, among others. The surface treatments applied are galvanisation, passivation and thermoset powder coating, which give the machine's metal parts high strength and durability, even when in contact with highly corrosive products such as plant protection products.

This equipment has some particularly advantageous features, such as:

- Ease of adaptation to agricultural tractors.
- Ease of operation and adjustment, due to the built-in hydraulic and/or electro-hydraulic functions.
- Safety, quiet operation and precision in application.

The following images identify the main components of the CERES Trailed Sprayer.



01- MAIN TANK
02- TANK LEVEL
03- PRESSURE GAUGE
04- PUMP
05- PULL
06- SUPPORT FOOT
07- SUCTION FILTER
08- LADDER
09- VALVE GROUP
10- PRE-MIXER
11- CIRCUIT WASHING TANK
12- HAND WASHING TANK

13- MAIN ENTRANCE OR TANK FILLING PORT
14- BOX FOR TOOLS OR TRANSPORT OF CHEMICAL PRODUCTS
15- ELECTRO-HYDRAULIC BLOCK LOCATION
16- BOOM (BTL MODEL IN THIS FIGURE)

Figure 4.1 – CERES EVO 3000l TRAILER SPRAYER + 24m BTL BOOM

WARNING: This machine has been designed to spray liquid chemicals. Its use for any other purpose is expressly prohibited!

The following table shows the main technical characteristics of the CERES Trailed Sprayer.

Volume capacity	2000, 2500 and 3000 litres
Load capacity	-
Weight	2400 kg
Height	3250mm
Width	2550 mm
Length	6350mm
Hitch system	Rear arms / Rear hitch point
Input rotation (PTO)	550rpm
Effective working width	12m to 24m
Mechanical transmission unit	Cardan

Table 4.1 – Technical characteristics of CERES EVO 3000l + BTL 24m BOOM

- **CHASSIS**

Very strong and compact structure, protected by an electrostatic paint finish that is highly resistant to chemicals and weathering.

The other metal elements, nuts, bolts, etc., have the same level of protection.

- **ACCESS PLATFORM**

The access platform is located at the front of the machine and is accessed from the left side via a folding ladder, which is normally retracted and locked in place by a mechanical latch.

The platform allows safe access to the main tank filler neck, valve assembly, pressure gauge and level gauge.

Figure 4.2 – Access platform for the CERES Sprayer

- **TANK**

The main tank, made of high-density polyethylene, which is highly resistant to UV rays and chemicals, has a "flat" design, without sharp angles, to facilitate complete emptying and cleaning. Capacities range from 2000 to 3000 litres. The level indicator is located so that it is easily visible from the tractor cab.

The filling hole, or filler neck, is positioned so that it can be accessed from the machine platform. This ensures easy access for filling, cleaning the tank, inspection, etc. The sprayer is also equipped with a product mixing tank (Pre-Mix), a clean water tank (Circuit Wash), and a tank for operator cleaning (Hand Wash).

- **VALVES**

The spray circuit functions are operated via the group of valves located on the sprayer (front left side), which are identified so that they can be operated easily and safely.

The functions of the valves are identified next to them. See the images and descriptions in CHAP 6 of this manual. They are activated by turning the handle to the desired function.

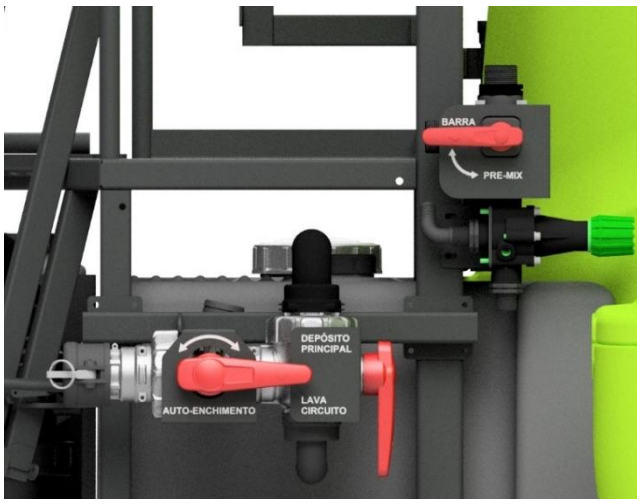


Figure 4.3 – Standard Valve Group

Figure 4.4 – Centralised Valve Panel – optional

- **PUMP**

The pumps on CERES sprayers are installed in an easily accessible location on the machine *(Figure 4.2)*.

These pumps were developed to work exclusively in Sprayers, at a maximum rotation of 540rpm.

The main technical characteristics (e.g. flow rate and pressure) are indicated on the pump's identification plate.

WARNING: Please note the following recommendations:

- Do not use the pump in potentially explosive environments;
- Do not suck up liquids with temperatures above 50ºC or below 5ºC;
- Do not use the pump with flammable, toxic, corrosive liquids or liquids with an unsuitable density;
- Do not use the pump with food products.
- Do not use the pump for washing or irrigation.

Figure 4.5 – Example of a piston pump

WARNING: Carefully read the pump instruction manual, which should be delivered with the machine.

- **PRE-MIX**

The product mixing tank (Pre-Mix) is located on the left side of the Sprayer, next to the valve group.

WARNING: Consult the Pre-Mix instructions (CHAP 6 of this manual) before operating it.

It is mandatory to wear appropriate protective equipment when handling chemicals!

Figure 4.6 – Product mixing tank (Pre-Mix)

- **SPRAY BOOM**

The CERES STD and CERES EVO trailed sprayers can be equipped with the following spray booms:

CERES STD MODEL – BRU booms from 12m to 18m and BRU EVO booms from 18m to 21m.

BRU model booms are equipped with a vertical hydraulic lift and suspension, and are hydraulically operated from the tractor. The sections are opened synchronously. The BRU EVO model booms are identical to the previous ones, with the main difference and added value being the independent opening of the sections. These booms can be optionally equipped with a hydraulic leveller.

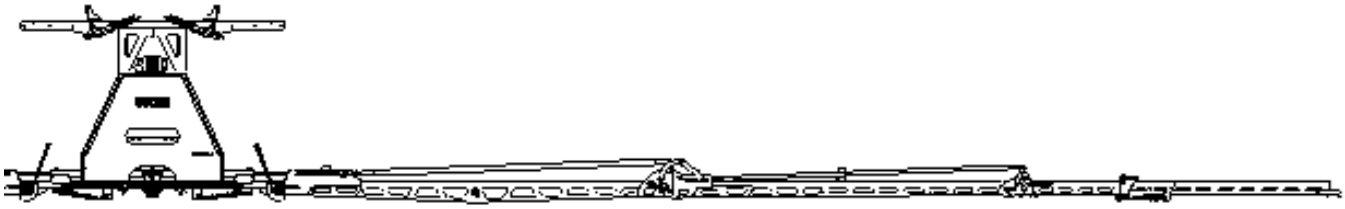


Figure 4.7 – BRU EVO boom

CERES EVO MODEL – 18m, 21m and 24m BTL booms.

The BTL model booms are equipped with a parallelogram-type hydraulic lift and are operated hydraulically from the tractor. The sections are opened independently, as is their angular adjustment in relation to the ground. These movements are performed by means of hydraulic cylinders.

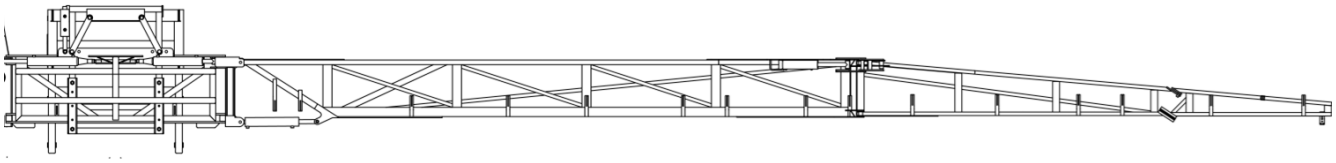


Figure 4.8 – BTL boom

- **TOOLBOX**

The toolbox can also be used to transport chemical product packaging. The box has a capacity of approximately 60 litres and is fitted to all versions of the CERES Trailed Sprayer.

Figure 4.9 – Toolbox

- **WATER CIRCUIT**

The water circuit of the CERES Sprayer, with standard valve group, has the following configuration *(Figure 4.10).*

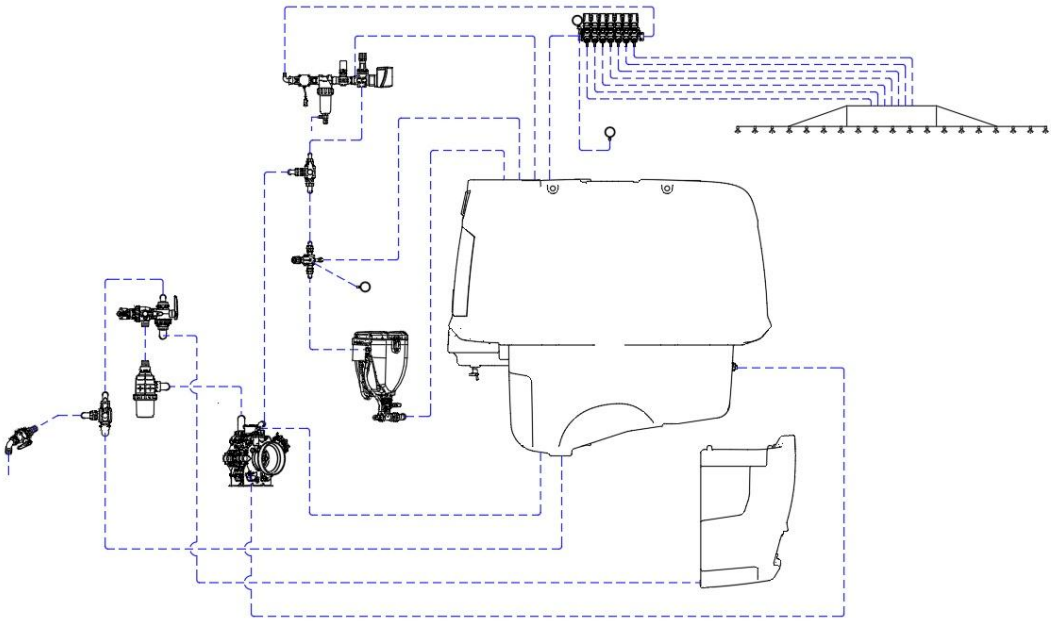


Figure 4.10 – Water circuit of the CERES Sprayer with Standard Valve Group

The water circuit of the CERES Sprayer, with Centralised Valve Panel, has the following configuration *(Figure 4.11).*

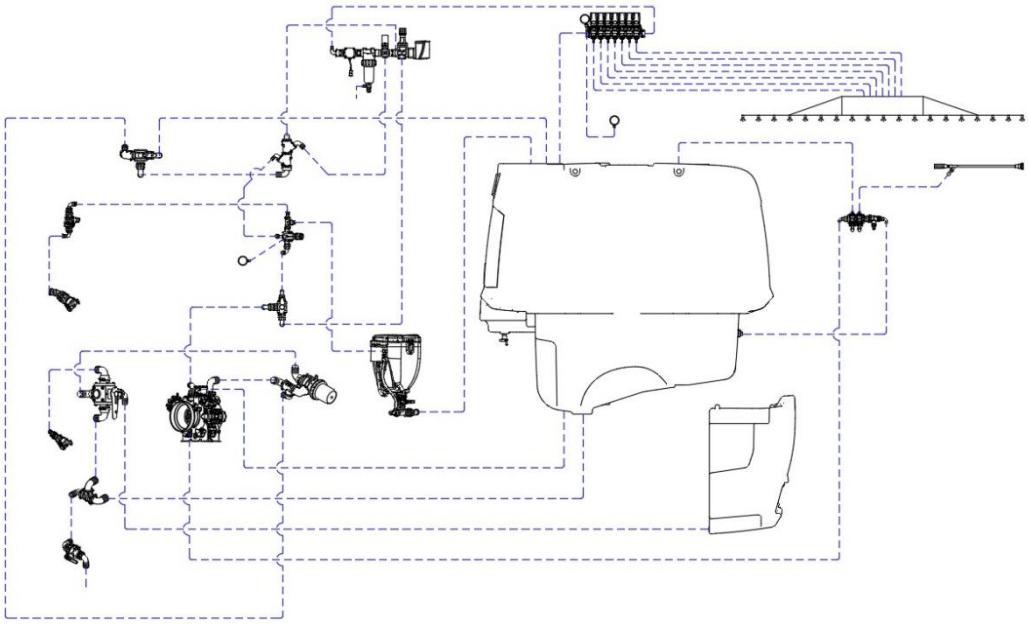


Figure 4.11 – Water circuit of the CERES Sprayer with Centralised Valve Panel, optional

INSTALLATION AND CONNECTION TO THE TRACTOR CHAP5

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

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

In order to facilitate and protect the equipment, some accessories may be supplied detached from the machine. For this reason, it is important to carefully read and understand this instruction manual, which should be delivered together with the machine. The instruction manual explains how to proceed when assembling these accessories.

- **UNLOADING THE MACHINE**

To unload the sprayer, we suggest using a crane whenever possible. When unloading with a crane, pay attention to the lifting points shown in the following image, and ensure that the straps or belts used for lifting are strong enough and in good condition.

Figure 5.1 – Lifting points for the sprayer during unloading.

When unloading the sprayer with the boom mounted, pay special attention to the balance of the machine when lifting and manoeuvring.

DANGER: Coupling and uncoupling agricultural machinery involves a risk of injury and can cause serious injury!

WARNING: This equipment contains elements that may cause cuts and/or crushing. The use of appropriate protective equipment is mandatory!

- **BEFORE CONNECTING THE MACHINE TO THE TRACTOR**

Before putting the sprayer into operation, apply a film of anti-corrosive oil (e.g. CASTROL RUSTILO) to all metal parts to prevent chemicals and fertilisers from discolouring the galvanised parts. If this procedure is followed before the sprayer is used for the first time, it will be easy to clean the sprayer and keep the galvanised parts clean for many years. This treatment should be carried out whenever the protective film is washed off.

- Check that the Main Tank, Circuit Wash Tank and Pre-Mix Tank of the Sprayer are clean and free of foreign objects inside. If not, remove them.
- The Ceres Trailed Sprayer is attached to the tractor by means of the arm hitch or rear hitch hook.
- Perform coupling and uncoupling operations on stable, flat surfaces so that the machine does not run the risk of moving uncontrollably.
- Ensure that other people and animals are not in the danger zone during machine coupling and uncoupling operations.
- Do not stand between the tractor and the machine during coupling and uncoupling operations.
- Only hitch and unhitch the machine when the PTO shaft is stationary.
- Never attempt to disconnect the hydraulic hoses while the tractor is running or the PTO is engaged.
- Hitch the machine to the tractor using only standardised elements (pins, brakes, etc.) that are suitably sized for the loads to be handled.
- Always operate in accordance with the procedures described in this instruction manual.

- **CONNECTING THE MACHINE TO THE TRACTOR**

Working with agricultural implements involves risks. Therefore, before starting to connect the Sprayer and after carefully reading and understanding this instruction manual, we recommend that you carry out the following procedure to calculate the maximum permissible loads and take the necessary measures to ensure your safety and that of others.

Table 5.1 – Data for calculating maximum permissible loads

LETTER	DESCRIPTION	UNIT
T_L	Tractor tare weight without the machine attached (1)	Kg
T_V	Weight on the front axle of the tractor without the machine attached (1)	Kg
T_H	Weight on the rear axle of the tractor without the machine attached (1)	Kg
G_V	Weight of counterweights attached to the front (if any)	Kg
F_H	Maximum vertical load of the trailer	Kg
a	Distance between the centre of the counterweight and the centre of the front axle	m
a_1	Distance from the centre of the front axle to the centre of the lower link ball joint	m
a_2	Distance between the centre of the counterweight and the centre of the lower link ball joint	m
b	Distance between tractor axles	m
c	Distance between rear axle and centre of rear hitch (arms or tow hitch)	
(1) Take into account accessories or the weight of water in the tyres.		
* Refer to the tractor instruction manual for the necessary data.		
** Consult the tyre manufacturer for the necessary technical information.		
*** Data for the spreader is provided in this instruction manual *(table 4.1. page 8)*.		

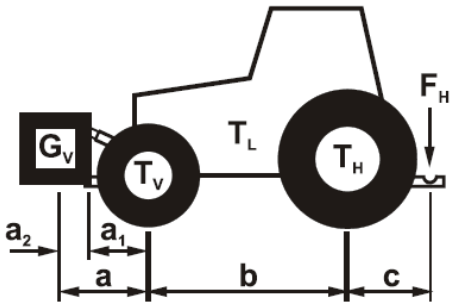


Figure 5.2 – Diagram for calculating loads

WARNING:
Incorrect or careless use of agricultural machinery can cause very serious injury to the operator or third parties!

CALCULATIONS:

- **Actual total weight of tractor and machine combination (kg) =** $G_V + T_L + F_H$

  The actual total weight must not exceed the maximum permissible weight. Consult the manual for the tractor to be used with the machine.

- **Actual axial load on the front axle (kg) =** $\frac{G_V * (a+b) + T_V * b - F_H * c}{b}$

  The actual axial load on the front axle must not exceed its maximum permissible load. Consult the manual for the tractor to be used with the machine.

- **Actual axial load on the rear axle of the tractor (kg) =** $Actual\ total\ weight - Actual\ axial\ load\ on\ the\ front\ axle$

  The actual axial load on the rear axle must not exceed its maximum permissible load. The minimum load on the front axle of the tractor must be 20% of its tare weight.

  Note: Considering that the machine will be attached to the rear of the tractor, you must calculate the minimum counterweight required (in kg) to be mounted on the front of the tractor as follows:

- **Front counterweight (kg) =** $\frac{F_H * c - T_{V*b} + 0{,}2 * T_{L*b}}{a+b}$

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

Ensure that you work within the limit values specified by the tractor manufacturer.

After installation, check that the actual axle loads are less than the maximum permissible loads on each axle (front and rear).

If you have a suitable vehicle weighing scale, use it to determine the total weight of the tractor and machine as well as the loads on the respective axles.

The tractor must be capable of achieving the deceleration value prescribed by its manufacturer, even with the machine attached.

CAUTION: Once loaded, at least 20% of the total weight of the tractor must be supported by the front axle and 45% by the rear axle. This ensures proper load distribution!

- **COUPLING THE MACHINE TO THE TRACTOR**

WARNING: When coupling the machine to the tractor, ensure that no one approaches the machine or tractor.

1. Ensure that the machine and tractor are on firm, level ground and that the machine is properly braked and stable.
2. Use the devices provided to attach the machine to the tractor properly. Check that they are all in good working order; if not, replace them.
3. Carefully move the tractor closer to the machine, leaving a distance of about 25 cm between them.
4. Check that the power take-off is disconnected.
5. Connect the hydraulic supply hoses, the cardan shaft and the control cables.
6. Reverse the tractor towards the machine and mechanically attach the sprayer to the tractor.
7. Raise the machine to the working position.
8. Retract the front support of the machine to the rest position (see description below).

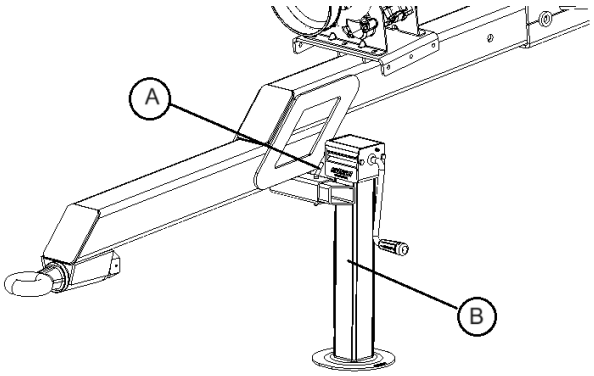


Figure 5.3 – Front Support

- Remove the safety pin **A**;
- Disengage the front support **B** from the drawboom;
- Turn the front support 90º counterclockwise;
- Reattach the front support **B** to the handle;
- Insert the safety pin **A**.

- **ADJUSTING THE LENGTH OF THE TRANSMISSION (CARDAN)**

The cardan shaft supplied with the sprayer is too long for most tractors.

When assembling the Cardan shaft, bear in mind that during the machine's upward and downward movements, the inner and outer shafts of the Cardan shaft must slide freely between each other. At the same time, 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)*.

DANGER: Incorrect assembly 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:

- Consult the Cardan instruction manual and follow the recommendations described therein;
- Once engaged, position the machine so that the power take-off shaft and the implement shaft are at the same height (or as close as possible), which is the position where the Cardan shaft will be most retracted;
- Switch off the tractor and remove the ignition key;
- Lock the tractor securely (parking brake);
- Slide the inner and outer shafts of the Cardan until they are completely disengaged;
- Mount the tractor side half of the Cardan shaft (fixed connection) on the tractor's PTO shaft;
- Mount the half of the Cardan shaft (constant velocity joint) on the implement side on the pump shaft;
- Use your hands to place both ends of the Cardan shaft parallel to each other, as shown in the following figure.

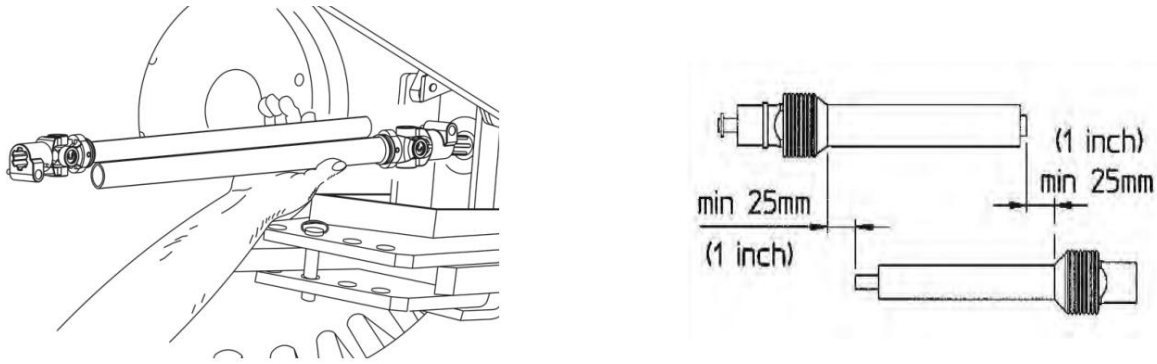


Figure 5.4 – Example of adjusting the length of the Cardan shaft

The Cardan shafts should overlap as much as possible, with a minimum of 150 mm. At the ends, the shafts should have approximately 25 mm of clearance when the power take-off shaft and the implement shaft are at the same height *(Figure 5.4)*.

- Cut the shafts enough so that the clearance is approximately 25 mm;
- Cut the plastic protection to the same distance;
- Remove any burrs from the ends;
- Fit the halves of the shaft together;
- Connect the complete Cardan shaft to the machine and the tractor;
- Check that the Cardan's safety pins are securely engaged in their respective shafts.
- Raise the machine to the highest working point.

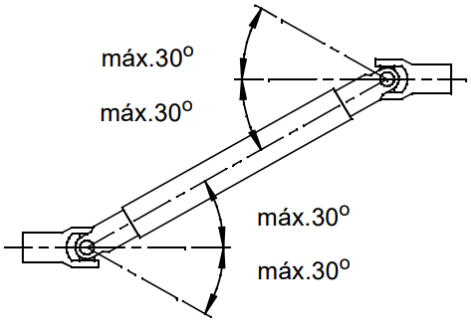


Figure 5.5 – Example of maximum working angle of the Cardan shaft

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

The maximum working angle allowed for the Cardan shaft is 30º to each side *(Figure 5.5)*, taking the PTO shaft and the implement shaft as references.

30º should be the maximum permissible **angle** between the PTO shaft and the sprayer pump shaft.

Avoid working angles greater than 15º. This will extend the service life of the transmission.

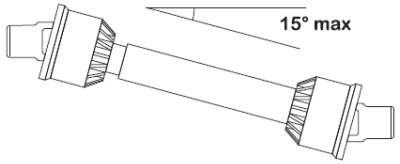


Figure 5.6 – Optimised working angle

To check the correct dimensions, proceed as follows:

- Raise the machine to its highest position;
- Switch off the tractor and remove the ignition key;
- Lock the tractor securely (parking brake);
- Check that the angle of the cardan shaft is less than 30º;
- Check that the inner and outer shafts of the Cardan are at least 150 mm engaged with each other;
- Release the cardan shaft on the tractor side and disengage it completely;
- Apply lubricant to its entire surface;
- Refit the Cardan shaft to the tractor, without forgetting the protective plastic tubes;
- Check that the Cardan's safety pins are properly engaged in their respective shafts;
- Secure the Cardan's safety chains.
- Securely attach the chains to a fixed point on the tractor and the machine, respectively.

WARNING: Always secure the safety chains of the plastic protective tubes. Once in rotation, the protective tubes can become entangled in other elements and cause injury to the operator and/or damage to the equipment.

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

- **CONNECTING MACHINE DEVICES**

The machine is supplied with various pre-installed control devices. The hydraulic hoses and control cables for connection to the tractor are attached to a bracket at the front of the machine, as shown in the following image (except for the version with manual distribution control).

Figure 5.7 – Stowing cables and hoses.

Unwind the cables and hoses from the support and, if necessary, adjust their length for correct connection to the tractor.

The CERES Trailed Sprayer can be equipped with the following equipment:

- Oil-hydraulic circuit controls.
  - Manual distribution control;
  - Electro-hydraulic control – Joystick;
  - Electro-hydraulic control - Control box;
- Computer controls.
  - Bravo computers (H_2O+Oil);
  - Isobus computers (H_2 O + Oil);
  - Waatic computer (H_2 O + Oil);
- GPS receiver.
- Light kit.

- **CONNECTING OIL HOSES TO THE TRACTOR**

To connect the machine's oil-hydraulic circuit to the tractor, simply connect the machine's hydraulic valves *(Figure 5.8)* to the tractor's hydraulic valves *(Figure 5.9)* to supply the machine's oil-hydraulic circuit.

Figure 5.8 – Quick-connect hydraulic valves

Figure 5.9 – Example of tractor quick-connect valve

- Check the condition of the tractor's quick-connect hydraulic valves.
- Check that the oil-hydraulic components show no visible damage;
- Connect the quick-connect hydraulic valves to the tractor;
  - The hose marked with a red ring *(Figure 5.8)* – Pressure line,
  - The hose marked with a blue ring *(Figure 5.8)* – Return line.
- Arrange the pipes so that they do not become trapped or damaged during the equipment's working movements;
- Check the hydraulic circuit for leaks. If there are any leaks in the circuit, eliminate them immediately *(see CHAP 8 – inspection and maintenance)*.
- For information regarding the tractor's hydraulic circuit, refer to the relevant instruction manual or contact the tractor dealer/manufacturer.

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

- **CONNECTING WATER AND OIL HOSES**

The sprayer can be supplied with the weeding boom separate from the rest of the machine. In this case, after attaching the weeding boom to the machine chassis, you must also connect the water and oil circuit hoses. The hoses are supplied with independent identification at the connection points. The following figure shows an example where the oil hoses are grouped on the left and the water hoses on the right.

Figure 5.10 – Example of oil and water circuit hose connections

- **INSTALLING MANUAL CONTROLS (HYDRAULIC OIL CIRCUIT)**

When equipped with manual controls (for moving the spray boom), the CERES Trailed Sprayer only requires the oil-hydraulic supply hoses to be connected to the tractor (procedure described in the previous point).

Figure 5.11 – Example: Manual controls of the CERES Trailed Sprayer

To install the controls in the tractor cab, you must create a support that is sufficiently robust, stable and adjusted to the space available in the tractor. Ensure that the controls, once installed, are in a position that is easy to access and operate. The support may be removable so that it does not take up space when not in use.

- **INSTALLING THE ELECTRO-HYDRAULIC CONTROL (JOYSTICK)**

The joystick is a device for controlling the hydraulic booms.

- Check whether the tractor's electrical socket(s) are dirty and, if necessary, clean them thoroughly.
- Remove the joystick cover.
- Connect the signal cable plugs to the solenoid valves *(Figure 5.13)*.
- Connect the power plug *(Figure 5.14)* to the tractor socket.
- Install the joystick in the tractor cab.
- Install the electrical cables so that they do not get caught or damaged during the equipment's working movements.

Figure 5.12 – Example: Joystick control

The joystick can be supplied separately.

When installing the joystick on the tractor, ensure that it is in a position that is easy to access and operate. If necessary, create a support in the tractor cab.

CAUTION: Do not expose the device to water jets. Do not use solvents or petrol to clean the external parts of the equipment.

Figure 5.13 – Example: Solenoid cable plug

Figure 5.14 – Example: Power plug

- **INSTALLING THE ELECTRO-HYDRAULIC CONTROL (CONTROL BOX)**

The control box is a device for controlling the hydraulic booms.

- Check whether the tractor's electrical socket(s) are dirty and, if necessary, clean them thoroughly.
- Remove the protection from the computer.
- Connect the power plug *(Figure 5.14 on the previous page)* to the tractor socket.
- Install the control box in the tractor cab.

Figure 5.15 – Example of an electrical control box

- Install the electrical cables so that they do not get caught or damaged during the equipment's working movements.
- Never place the box in areas subject to excessive vibration or shock, to avoid possible damage or accidental activation of the keys.
- Secure the device in a sufficiently visible and easily accessible area. The control box must not obstruct movement or limit the field of vision when driving and operating.
- Read the control box instruction manual carefully before starting operations.

The control box may be supplied in a separate package.

CAUTION: Do not expose the device to water jets. Do not use solvents or petrol to clean the external parts of the equipment.

WARNING: It is mandatory to read the control box user manual carefully before starting any action with it!

- **INSTALLING THE CONTROL COMPUTER**

The CERES Trailed Sprayer can be equipped with a computer *(Figure 5.16)* to control the sprayer's water circuit. Our range consists of several computer models, each of which is selected according to the type of sprayer and the customer's needs.

Before installing the computer on your tractor, carefully read the following recommendations, as well as those described in the computer manual, which should be provided with the equipment.

Figure 5.16 – Example of oil and water control computer

The computer can be supplied separately.

WARNING: It is essential to read the COMPUTER user manual carefully before starting any operation with it!

CAUTION: All installation operations must be carried out with the battery disconnected and using the appropriate equipment.

WARNING: Use ONLY clean water for any testing or treatment simulation operations!

- Check that the tractor's electrical socket(s) are not dirty and, if necessary, clean them thoroughly.
- Remove the protection from the computer.
- Connect the signal cable plug **(A)** to the computer *(Figure 5.17 on the next page)*.
- Connect the power plug *(Figure 5.14 on page 25)* to the tractor socket.
- Install the computer in the tractor cab.

- Install the electrical cables so that they do not become trapped or damaged during the equipment's working movements.
- Never place the monitor in areas subject to excessive vibration or shock, to avoid possible damage or accidental activation of the keys.
- Secure the device in a sufficiently visible and easily accessible area. The monitor must not obstruct movement or limit the field of vision when driving and operating.

CAUTION: Do not expose the device to water jets. Do not use solvents or petrol to clean the external parts of the equipment.

Figure 5.17 – Example: Computer cable connection

Figure 5.18 – Example: Suction cup attachment

Optionally, a suction cup can be supplied to attach the computer to the tractor cab, thus eliminating the need for the metal bracket.

- Position the suction cup *(Figure 5.18)* on the tractor cab.
- Take into account the safety and ergonomic instructions described above.
- Fit the computer into the suction cup.
- Adjust the position of the computer as required.
- Install the electrical cables so that they do not get caught or damaged during the equipment's working movements.
- Read the control box instruction manual carefully before starting operations.

- **INSTALL GPS RECEIVER**

Depending on the level of equipment installed, sprayers require a GPS receiver for their peripherals to function correctly and to get the most out of them. This equipment, developed exclusively for agricultural machinery, is compatible with signals from GPS and GLONASS constellations, compatible with the NMEA 0183 protocol.

The GPS receiver is designed to connect to computers and agricultural systems equipped with an input port for satellite receivers. This equipment should be used exclusively in an agricultural environment and within treatment and cultivation areas.

Figure 5.19 – Example of a GPS receiver

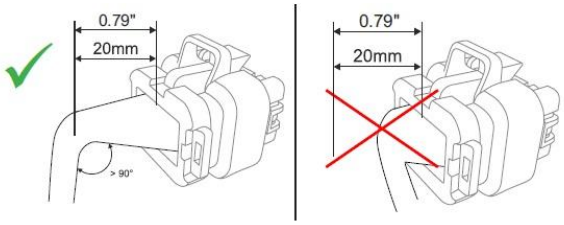


Figure 5.20 – GPS receiver cable connection

- Remove the receiver cover.
- Connect the signal cable plug to the GPS receiver *(Figure 5.20)*, following the instructions shown in the figure.
- Install the GPS receiver on the highest part of the tractor machine assembly *(Figure 5.21)*. The reception angle, directed towards the sky, should be as wide as possible.
- Install the electrical cables so that they do not get caught or damaged during the working movements of the equipment.
- The receiver has 3 magnets on the base that facilitate installation on a metal base, e.g. the top of the tractor cab.

The GPS receiver can be supplied in a separate package.

When disconnecting the machine from the tractor, do not forget to remove the GPS receiver if it is installed on the top of the tractor cab.

CAUTION: Do not expose the device to water jets. Do not use solvents or petrol to clean the external parts of the equipment.

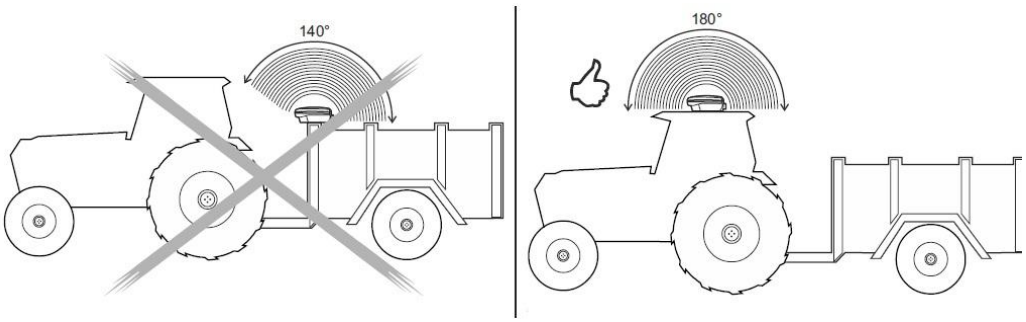


Figure 5.21 – Example of GPS receiver positioning

- **INSTALLING THE WAATIC Sprayer SYSTEM**

The CERES Trailed Sprayer can be equipped with the Waatic Sprayer system *(Figure 5.22)* to control the sprayer's water circuit. This system allows the user to interact with the machine in a more versatile way, using a tablet installed on the tractor and connected to the machine via Bluetooth.

Before installing the Waatic Sprayer system on your tractor, carefully read the following recommendations, as well as those described in the computer manual, which should be provided with the equipment.

Figure 5.22 – Example: Waatic Sprayer computer

WARNING: It is mandatory to carefully read the Waatic Sprayer user MANUAL before starting any action with it!

WARNING: Use ONLY clean water for any test or treatment simulation operation: the use of chemicals for treatment simulation can cause serious harm to anyone in the vicinity!

- Remove the tablet cover.
- Connect the power plug of the Waatic box *(Figure 5.22),* already installed on the Sprayer, to the tractor's power socket. Check that the ON and BYPASS LEDs are lit.
- Install the tablet in the tractor cab.
- Install the electrical cables so that they do not get caught or damaged during the equipment's working movements.

- Never place the tablet in areas subject to excessive vibration or shock, to avoid possible damage or accidental activation.
- Secure the tablet in a sufficiently visible and easily accessible location. It must not obstruct movement or limit the field of vision when driving and operating.
- Read the control box instruction manual carefully before starting operations.

The tablet may be supplied in a separate package.

CAUTION: Do not expose the device to water jets. Do not use solvents or petrol to clean the external parts of the equipment.

- **CONNECTING THE LIGHT KIT**

To connect the optional light kit to the tractor, please note the following:

- Check that the tractor's electrical socket(s) are not dirty and, if necessary, clean them thoroughly;
- Connect the 7-pin electrical plug to the corresponding socket on the tractor.
- Install the electrical cables so that they do not get caught or damaged during the equipment's working movements.

Figure 5.23 – Example of a 7-pin electrical socket

Figure 5.24 – Example of 7-pin electrical plug

- Check that the light kit is working properly.
- Check that the different lights come on according to their function.
- Check that the indicators light up in the correct order. If the indicator signals are reversed, check the phase connection *(see CHAP 8 – Checking and maintenance)*.

INTENDED USE OF THE MACHINE CHAP6

- **IMPORTANT RECOMMENDATIONS**

Before starting work with the Sprayer, you must take into account all safety aspects applicable to this type of equipment.

Read this instruction manual carefully, particularly *CHAP 7 (safety warnings and accident prevention).*

If no local law requires the operator to be certified to operate spraying equipment, it is strongly recommended that they receive training on plant treatment and protection and on the safe handling of plant protection products to avoid the misuse of chemicals.

The safe handling of plant protection products is essential to avoid unnecessary risks to people and the environment during spraying operations.

Use ONLY clean water for any testing or treatment simulation operations. The use of chemicals for treatment simulation can cause serious harm to anyone in the vicinity.

- **ADJUSTING THE MACHINE FOR WORK**

WARNING: Adjustments and fine-tuning 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 operators! Ensure that no one approaches the equipment during adjustment and operation.

- **BEFORE STARTING WORK**

  - **Road lights:**

Test the sprayer's road lights, located at the rear of the machine. Connect the 7-pin plug from the machine's light kit to the corresponding socket on the tractor *(Figures 5.23 and 5.24 in the previous CHAP)*, and check that the sidelights, brake lights and indicators on both sides are working.

  - **Sprayer control devices:**

Check the installation of your machine's control devices on the tractor. Pay attention to their attachment and location. Check the arrangement of hydraulic oil hoses, electrical cables and control cables. Refer to the specifications for each device in CHAP 5 of this instruction manual and/or the instruction manual for the device itself, which should be delivered with the machine.

  - **Speed sensor:**

Check whether your machine is equipped with a speed sensor.
The inductive speed sensor is located inside the right wheel of the sprayer.
In order to function, the sensor requires a metal protrusion (e.g. the wheel bolt head) to pass by, thereby emitting a signal.
The recommended distance (A) between the protrusion and the sensor is 3 to 5 mm. Adjust the position of the sensor if necessary.

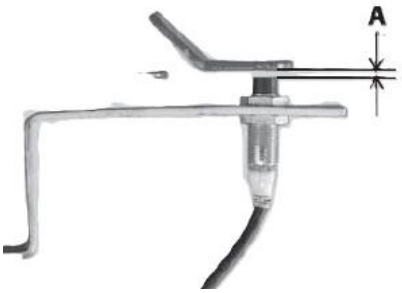


Figure 6.1 – Example of Inductive Sensor

  - **Suction Filter:**

The suction filter filters impurities contained in the spray mixture and the water filling the tank in the AUTO FILL function.
Check the condition of the filter before each use of the machine.
Remove the lower part of the filter by turning the ring shown in the figure.
Check that the inside is clean; if not, clean it properly.
Check the condition of the seal; if damaged, replace it.

Figure 6.2 – Example of suction filter

- **Axle track width:**

On the CERES Sprayer, the axle width *(distance H in Figure 6.3)* can be adjusted on one side, as the machine is equipped with a split axle (half-axle). To adjust the axle track width, proceed as follows:

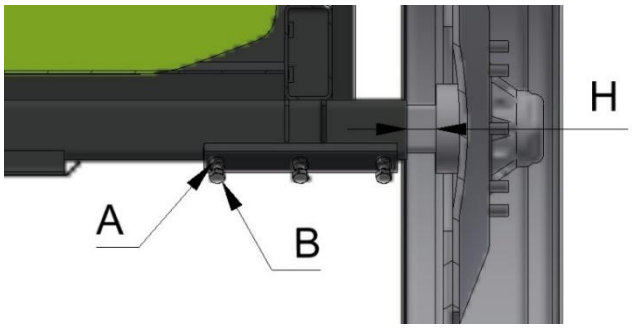


Figure 6.3 – Example of axle adjustment on a trailed sprayer

- Lock the tractor with the parking brake and switch off the tractor;

- Remove the ignition key;

- Ensure that you are working on flat, firm ground;

- Measure the current track width (from the centre of the right wheel to the centre of the left wheel);

- Place the chocks in front of and behind the right wheel. Lift the left wheel;

- Loosen nuts **A** and bolts **B** on the left wheel;

- Widen or narrow the axle shaft. **The maximum dimension H** *(Figure 6.3)* for widening the axle is **250 mm(!);**

- Tighten bolts **B** to a torque of 390Nm and secure nuts **A**;

- Repeat the procedure to adjust the wheel on the other side;

- Ensure that the **H** dimension is the same on both sides;

- Retighten screws **B** and the wheel bolts to the specified torque after 8 hours of operation.

Be careful not to damage the bracket and inductive sensor installed on the machine shaft.

- **Axle track width – changing wheel position:**

If you wish to change the axle track by swapping the wheels on the sprayer (rim offset), proceed as follows:

- Lock the tractor with the parking brake and switch off the tractor;

- Remove the ignition key;

- Ensure that you are working on flat, firm ground;

- Lift the chassis behind the two wheels, support and secure the sprayer.

- Remove the left and right wheels and swap their positions (keeping the same direction of the running surface).

- Tighten the wheel bolts to the specified torque.

DANGER: Support the sprayer firmly while adjusting the machine. Never attempt to adjust the axles and wheels with liquid in the tank.

WARNING: Position the jack under the axle and lift the wheels to remove the load on the bolts. Support the wheels on the ground before proceeding with the final tightening of the bolts and safety nuts.

WARNING: This machine may only be operated by qualified operators. Ensure that no one approaches the equipment during adjustment and operation.

- **Spray Boom:**

BRU and BRU EVO models:
Check that the boom sections are firmly against the stops on the central body of the boom *(Figure 6.4).* To adjust, proceed as follows:
- Using the control levers, slowly open the section and then close it again. Release the lever 1 or 2 seconds after the arm touches the stop.
- Perform the procedure on both sides of the boom.

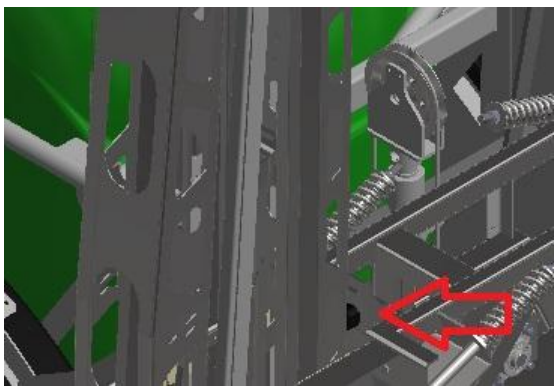


Figure 6.4 – Example: Arm rests

BTL models:

Check that the boom sections are firmly against the stops on the central body of the boom *(Figure 6.5).* To adjust, proceed as follows:

- Using the control levers, lift the section and then lower it again. Release the lever 1 or 2 seconds after the arm touches the stop.
- Perform the procedure on both sides.

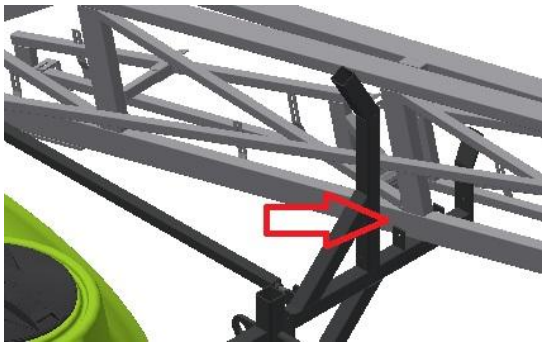


Figure 6.5 – Example: Arm stops

The spray boom must never be opened/closed while driving the tractor. Never open or close the boom before the tractor is stationary and locked. Doing so may cause damage to the spray boom.

DANGER: Never operate the boom under suspended electrical power lines.

CAUTION: When manoeuvring the spray boom, ensure that people and/or animals do not approach the area of operation.

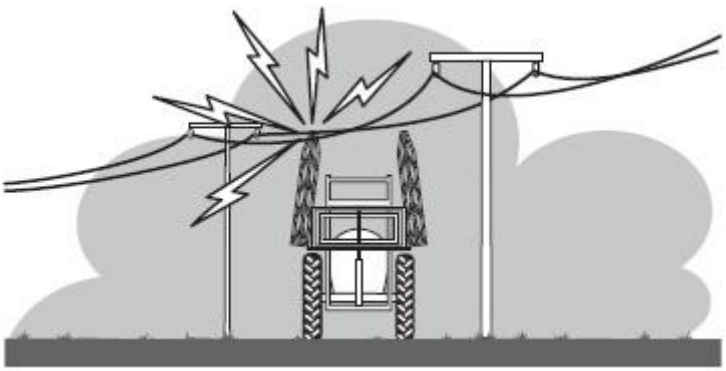


Figure 6.6 – Do not manoeuvre under electrical cables

- **WORKING WITH BRU AND BRU EVO BOOMS**

The BRU and BRU EVO booms (vertical booms) must be operated as follows:

- Using the control, open the boom sections (right/left) completely and simultaneously;
- After opening the boom completely, you can raise/lower the boom to the desired working height;
- Deactivate the mechanical brake (**2**) on the central body of the boom *(Figure 6.7)*;
- Activate the left/right levelling movement of the boom.

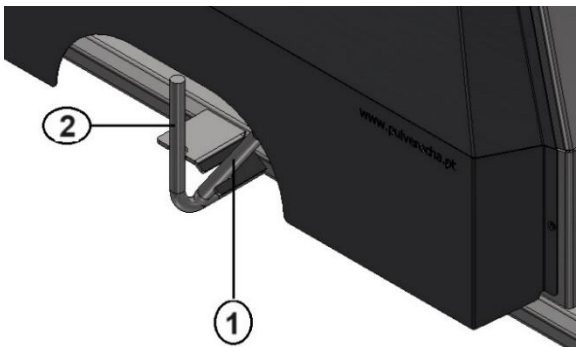


Figure 6.7 – Example: BRU EVO boom mechanical brake

On BRU boom models, the boom sections open simultaneously on the left and right. On BRU EVO boom models, the boom sections open independently on the left and right.

- **OPERATING WITH BTL BOOMS**

BTL booms (side booms) should be operated as follows:

- On the control device, lift the boom sections (right/left) simultaneously until the bottom of boom **B** is above the top of side stop **A**;
- Open the sections (right/left) completely at the same time;
- Level the boom arms (right/left) simultaneously until they are parallel to the ground;
- Once the boom has been fully opened, it can be raised and lowered;

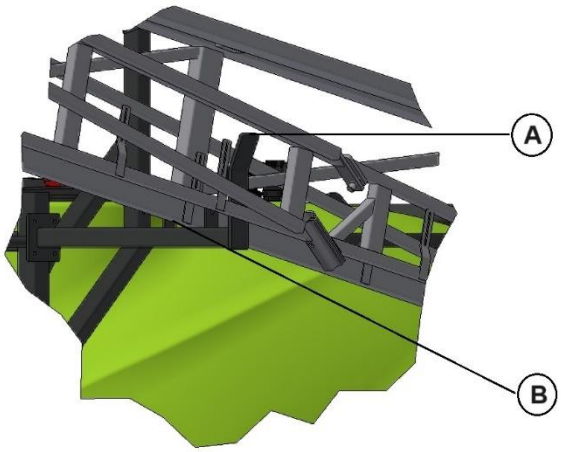


Figure 6.8 – Example of side support for the BTL boom

- Before closing the boom to the transport position, raise the arms above the top of side stop **A** *(Figure 6.8)*.
- Close the boom sections simultaneously and carefully so that there are no collisions.
- Ensure that the sections rest correctly on the side stops *(Figure 6.8)* before starting to drive the tractor/machine combination.

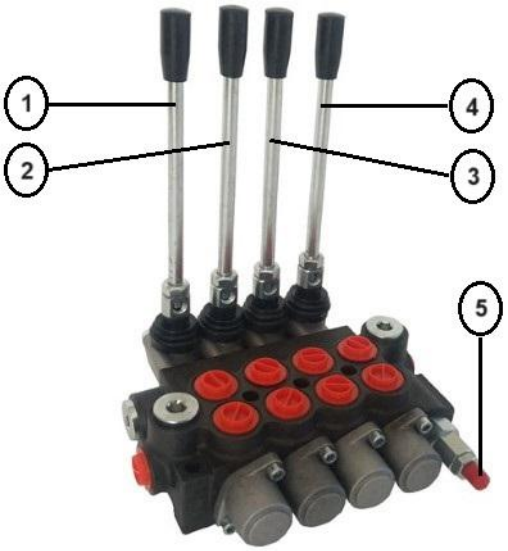
WARNING: Perform the opening/closing manoeuvres of the boom sections with the tractor stationary and on firm, level ground.

WARNING: This machine may only be operated by qualified operators. Ensure that no one approaches the equipment during adjustment and operation.

- **CONTROL OF THE MOVEMENTS OF THE BRU AND BRU EVO BOOMS**

  - **Manual Control**

The oil-hydraulic functions of the spray booms can be controlled using a manual control unit *(Figure 6.9).* The manual control consists of a hydraulic directional control valve operated by levers. The number of levers may vary depending on the number of movements of each boom.



LEVER FUNCTIONS:

1	⇧	LIFT: **RAISE** SPRAY BOOM
	⇩	LIFT: **LOWER** SPRAY BOOM
2	⇧	LEFT SECTION: **OPEN LEFT SECTION** OF SPRAY BOOM
	⇩	LEFT SECTION: **CLOSE LEFT SECTION** OF SPRAY BOOM
3	⇧	RIGHT SECTION: **OPEN RIGHT SECTION** OF SPRAY BOOM
	⇩	RIGHT SECTION: **CLOSE RIGHT SECTION** OF SPRAY BOOM
4	⇧	LEVELLER: **TILT** SPRAY BOOM SECTIONS **TO THE RIGHT**
	⇩	LEVELLER: **TILT** SPRAY BOOM SECTIONS **TO THE LEFT**
5		PRESSURE REGULATING VALVE

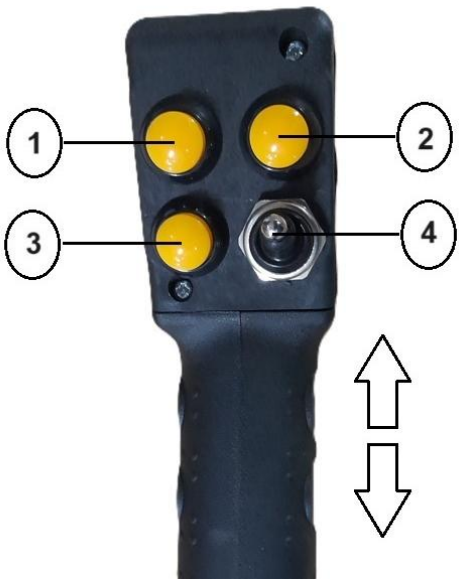
Figure 6.9 – Example of manual control

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

WARNING: This machine may only be operated by qualified operators. Ensure that no one approaches the equipment during adjustment and operation.

- **Joystick**

The Joystick *(Figure 6.10)* is a device for controlling the movement of the hydraulic booms on some versions of the CERES Sprayer.



BUTTON		FUNCTIONS:
	⇧	LIFT: **RAISE** SPRAY BOOM
	⇩	LIFT: **LOWER** SPRAY BOOM
1 +	⇧	LEFT SECTION: **OPEN LEFT SECTION** OF SPRAY BOOM
1 +	⇩	LEFT SECTION: **CLOSE LEFT SECTION** OF SPRAY BOOM
2	⇧	RIGHT SECTION: **OPEN RIGHT SECTION** OF SPRAY BOOM
2	⇩	RIGHT SECTION: **CLOSE RIGHT SECTION** OF SPRAY BOOM
3	⇧	LEVELLER: **TILT** SPRAY BOOM SECTIONS **TO THE RIGHT**
3	⇩	LEVELLER: **TILT** SPRAY BOOM SECTIONS **TO THE LEFT**
4		LEVELLER: **LOCK/UNLOCK LEVELLER**

Figure 6.10 – Joystick example

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

WARNING: This machine may only be operated by qualified operators! Ensure that no one approaches the equipment during adjustment and operation.

- **Control Box**

The hydraulic control box *(Figure 6.11)* is a device for controlling the movement of the hydraulic booms on some versions of the CERES Sprayer.

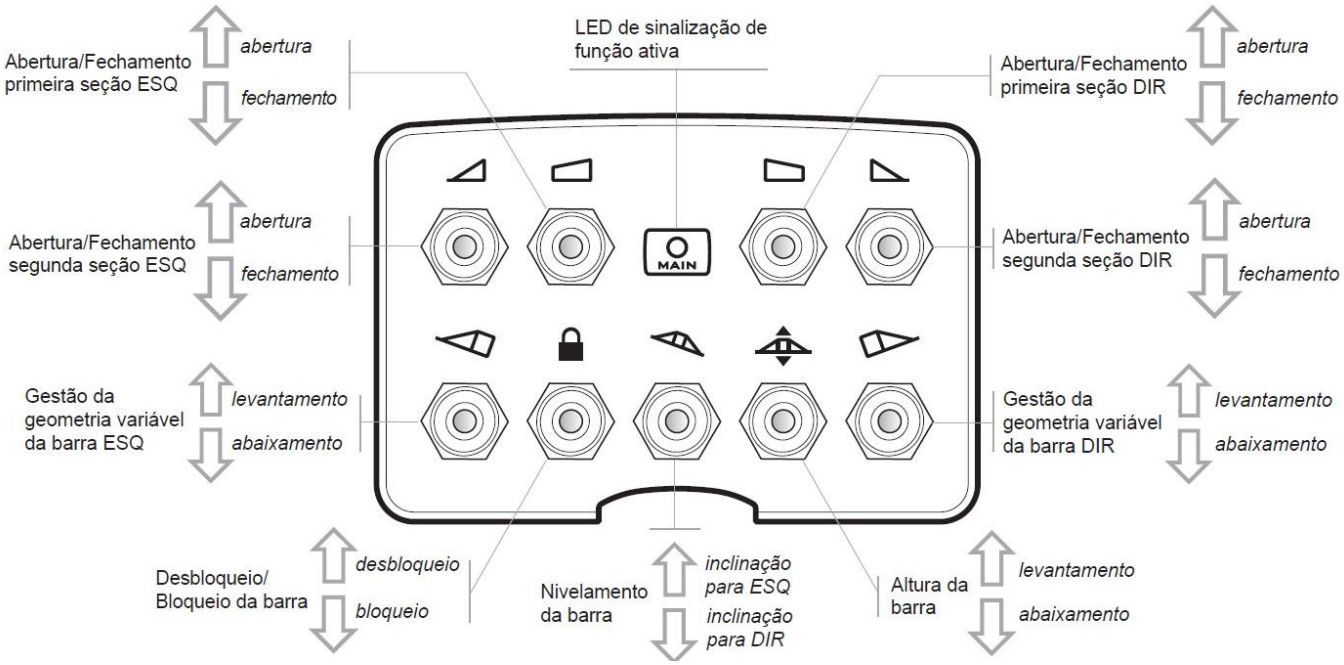


Figure 6.11 – Example of hydraulic control box functions

For more information about the hydraulic control box (installation, use, maintenance, etc.), please refer to the respective instruction manual. The instruction manual for the hydraulic control box should be delivered to you together with the Sprayer.

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

WARNING: This machine may only be operated by qualified operators! Ensure that no one approaches the equipment during adjustment and operation.

- **Computer with Control Box**

When the CERES Sprayer is equipped with a computer *(Figure 6.12)*. The water circuit commands are made through the control box **(2)**, and the oil-hydraulic circuit commands are made through the control box **(3)**.

1 – MONITOR

2 – WATER CIRCUIT CONTROL BOX

3 – OIL CIRCUIT CONTROL BOX

Figure 6.12 – Example: Computer + Control box

Figure 6.13 – Example: Functions of the hydraulic control box

The typical functions of the oil-hydraulic circuit control are shown in the previous figure *(Figure 6.13)*. For more information about the hydraulic control box (installation, use, maintenance, etc.), please refer to the respective instruction manual. The instruction manual for the hydraulic control box should be provided with the sprayer.

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

WARNING: This machine may only be operated by qualified operators! Ensure that no one approaches the equipment during adjustment and operation.

- **OPERATING WITH THE WATER CIRCUIT**

  - **Filling the Main Tank**

It is very important that you start operating the Sprayer using clean water in the machine's circuit. This allows you to safely check that the machine is working properly while safeguarding the safety of people and the environment.

Before adding chemicals, please note the following:

- Ensure that the Main Tank contains approximately 1/3 clean water.
- Always follow the instructions provided on the chemical product packaging.

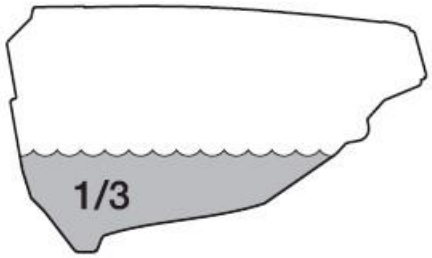


Figure 6.14 – Example of filling the Main Tank

  - **Filling the Main Tank through the filling opening**

If you fill the tank with clean water through the filler neck, proceed as follows:

- Remove the CHAP located at the top front of the Main Tank.
- Fill with water through the filler neck filter to prevent foreign particles from entering the spray circuit of your machine.
- Use the cleanest water possible for spraying purposes.

Figure 6.15 – Example of filling the Main Tank

CONTAMINATION HAZARD: Never allow the filling hose to "fall" into the tank *(Figure 6.15)*. If the end of the hose is submerged in the tank and the water pressure at the source drops, the hose may suck contaminated water into the source.

The use of appropriate protective equipment is mandatory when working with chemicals!

○ Filling the Main Tank with AUTO-FILL

If you fill the Main Tank using the Sprayer's AUTO-FILL system *(Figure 6.16)*, proceed as follows:

Figure 6.16 – Example of valve panel

Figure 6.17 – Example of filling hose

- Position the Sprayer next to the clean water filling source, safely and properly levelled;
- Connect the tractor's power take-off;
- Ensure that no one approaches the machine during this operation;
- Remove the CHAP from quick-connect valve **1** *(Figure 6.16)* on the AUTO-FILL inlet.
- Connect the filling hose *(Figure 6.17)* to the quick coupling valve*;*
- Turn lever **2** *(Figure 6.16)* to the AUTO-FILL position and fill the tank to the desired level;
- Monitor the tank fill level using the level gauge;
- When the water reaches the desired level, close lever **2** by turning it to the indicated position *(Figure 6.16)*.
- Remove the hose and place the CHAP on the quick coupling **1** *(Figure 6.16).*
- Use the cleanest water possible for spraying purposes.

CONTAMINATION HAZARD: There are places (rivers, lakes, etc.) where it is prohibited to fill water through the Sprayer. Check with the authorities about where it is permitted to fill the Sprayer.

CONTAMINATION HAZARD: The filling hose must not be in the Sprayer during spraying work, so as not to be contaminated by product drift.

MANDATORY: Wear appropriate protective equipment when handling chemicals!

○ Filling the Circuit Washer Tank

To fill the clean water tank, Circuit Washer *(Figure 6.18)*, proceed as follows:

- Remove the cap from the Circuit Washer tank **1**, located at the front of the Sprayer.
- Fill the tank with clean water.
- Replace the cap and close the tank again.

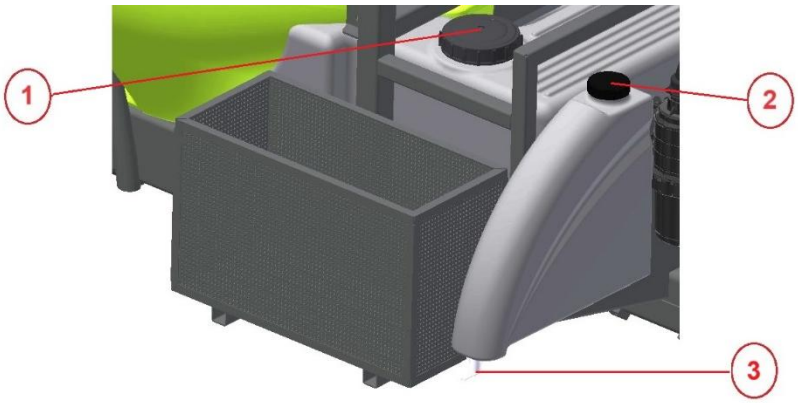


Figure 6.18 – Example of clean water tanks

The water in the Circuit Washer tank can only be used to wash the Sprayer circuit.

○ Filling the Hand Wash tank

To fill the clean water Hand Wash tanks *(Figure 6.18)*, proceed as follows:

- Remove the CHAP from the Hand Wash tank **2**, located at the front of the Sprayer *(Figure 6.18)*.
- Fill the tank with clean water.
- Put the lid back on and close the tank again.

The water in the Hand Wash tank can only be used for washing hands or unclogging nozzles.

To remove water from this tank, turn the ball valve lever **3** *(Figure 6.18)*, located directly on the tank, which is located on the front right side of the CERES Sprayer.

To prevent algae from developing inside the clean water tanks, empty these tanks completely before prolonged machine downtime.

- **Manual Valve Group – Regulation**

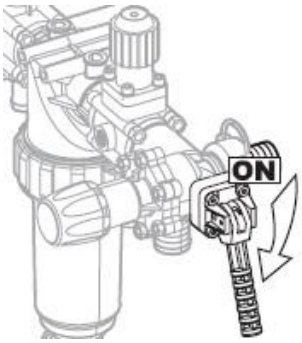
The electric valve group with manual regulation *(Figure 6.19)* is a device composed of individual manual modular valves. Once properly regulated, this device ensures the correct flow rate during spraying operations.

Figure 6.19 – Example of Manual Control Group

WARNING: Machine adjustment operations must be carried out EXCLUSIVELY with clean water.

The Manual Valve Group installed on the CERES Sprayer is supplied with pre-operational settings already made, including the maximum working pressure adjustment.

To **calibrate the working pressure and adjust the calibrated outputs**, proceed as follows:

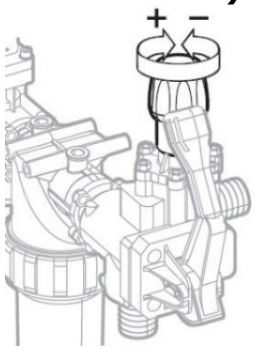


- Once the amount of product to be distributed (l/ha), the tractor's forward speed, the type of nozzle and the respective working pressure have been established;
- With the tractor properly braked, run the pump until it reaches normal working speed (540 rpm);
- Open the main valve by lowering the lever (to the "ON" position);

- Open all section valves by raising their respective levers (position "ON");

Now adjust the pressure of the unit to the value at which spraying will be carried out. This adjustment can be made in two different ways:

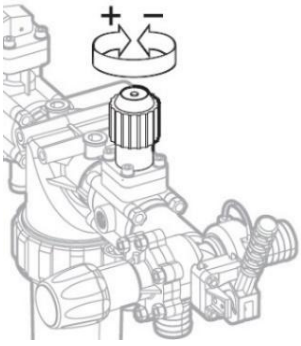
Groups with constant pressure (without proportional valve):



These groups are not equipped with a proportional valve, so the working pressure calibration is set by adjusting the maximum working pressure valve.
To adjust the desired working pressure, proceed as follows:

- Turn the pressure valve knob clockwise to increase the pressure;
- Turn the pressure valve knob anticlockwise to decrease the pressure;

Groups with proportional valve:



In this case, the working pressure calibration is performed through the proportional valve.
To adjust the desired working pressure, proceed as follows:

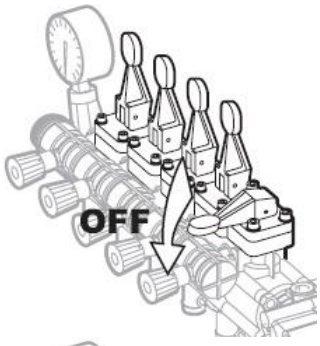
- Turn the proportional valve knob clockwise to increase the pressure;
- Turn the proportional valve knob counterclockwise to decrease the pressure;

In this case, the working pressure must be adjusted on the proportional valve and not on the maximum working pressure valve, because if the working pressure is very close to the maximum pressure, the proportional valve will not correctly compensate for the tractor's speed variations.

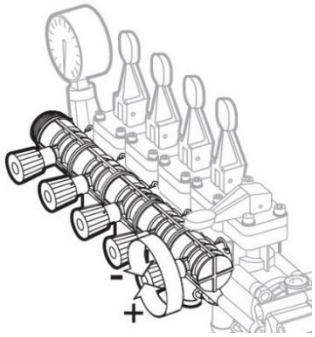
The pressure value is shown on the pressure gauge installed on the Valve Group.

Calibrating the compensation valves (calibrated returns) ensures constant liquid distribution, even when working with one or more valves closed.

This calibration must be performed whenever the nozzle type is changed.

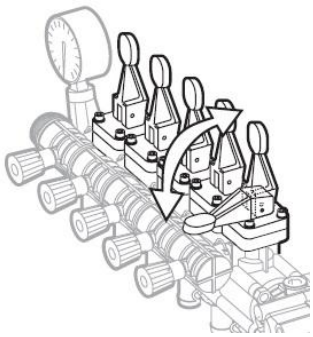


- Close one of the section valves by lowering the lever (to the "OFF" position).



Adjust the corresponding compensation valve by turning the knob until the pressure value previously set with all section valves open is reached.

- Turn the compensation valve knob clockwise to increase the pressure.
- Turn the compensation valve knob anticlockwise to decrease the pressure;



- Open and close the section valve (lift to open/lower to close) and check that the pressure value indicated on the pressure gauge remains constant.
  Note: If the value indicated on the pressure gauge varies, repeat the steps indicated in the previous points as many times as necessary until the pressure stabilises.
- Repeat the calibration steps for each of the section valves that make up the group.

If the nozzles are not replaced, the calibrations performed should ensure constant liquid distribution, even in treatments carried out at different working pressures.

For more information about the Valve Group (installation, use, maintenance, etc.), please refer to the respective instruction manual. The Valve Group instruction manual should be provided to you together with the Sprayer.

- **Electric Valve Group – Regulation**

The Electric Valve Group *(Figure 6.20)* is a device composed of individual modular electric valves. Once properly adjusted, this device ensures the correct flow rate during spraying operations.

Figure 6.20 – Example of an Electric Control Group

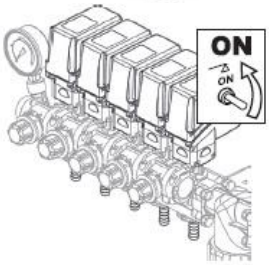
WARNING: Machine regulation operations must be carried out EXCLUSIVELY with clean water.

The Electric Valve Group installed on the CERES Sprayer is supplied with pre-operational settings already made, including the maximum working pressure adjustment.

To **calibrate the working pressure and adjust the calibrated outputs**, proceed as follows:

- Once the amount of product to be distributed (l/ha), the tractor's forward speed, the type of nozzle and the respective working pressure have been established;
- With the tractor properly braked, run the pump until it reaches normal working speed (540 rpm);

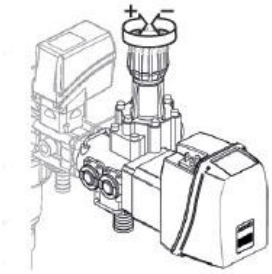
- Open the main valve by pressing the corresponding button on the control device (position 'ON'): this will allow the liquid to flow through the unit;



- Close all section valves by pressing the corresponding buttons on the control device (position 'ON').

Now adjust the pressure of the unit to the value at which spraying will be carried out. This adjustment can be made in two different ways:

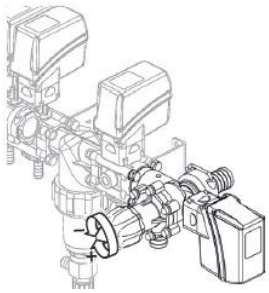
Groups with constant pressure (without proportional valve):



These units are not equipped with a proportional valve, so the working pressure calibration is set by adjusting the maximum working pressure valve.
To adjust the desired working pressure, proceed as follows:

- Turn the pressure valve knob clockwise to increase the pressure;
- Turn the pressure valve knob anticlockwise to decrease the pressure;

Groups with proportional valve:



In this case, the working pressure is calibrated using the proportional valve.
To adjust the desired working pressure, proceed as follows:

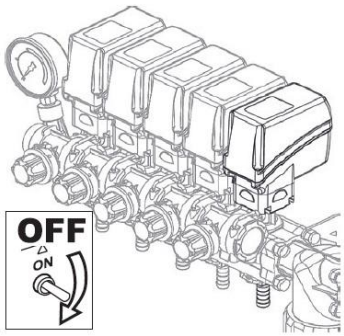
- Turn the proportional valve knob clockwise to increase the pressure;
- Turn the proportional valve knob counterclockwise to decrease the pressure;

In this case, the working pressure must be adjusted on the proportional valve and not on the maximum working pressure valve, because if the working pressure is very close to the maximum pressure, the proportional valve will not correctly compensate for the tractor's speed variations.

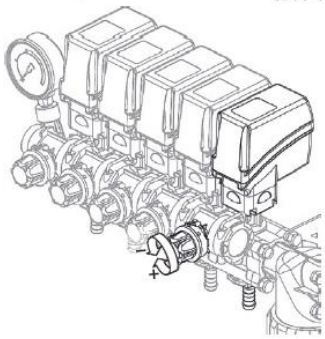
The pressure value is shown on the pressure gauge installed on the Valve Group.

The calibration of the compensation valves (calibrated returns) ensures constant liquid distribution, even in situations where one or more valves are closed.

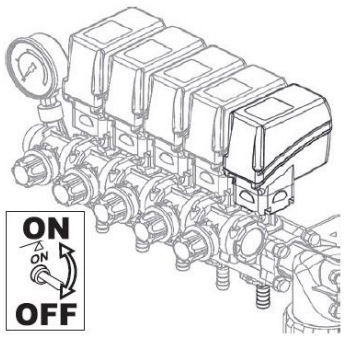
This calibration must be performed whenever the nozzle type is changed.



- Close one of the section valves by pressing the corresponding button on the control device (position "OFF").



- Adjust the corresponding compensation valve by turning the knob until the pressure value previously set with all section valves open is reached.



- Open and close the section valve (by pressing the corresponding button on the control device) and check that the pressure value indicated on the pressure gauge remains constant.

If the value indicated on the pressure gauge varies, repeat the steps indicated in the previous points as many times as necessary until the pressure stabilises.

- Repeat the calibration steps for each of the section valves that make up the group.

The calibration buttons on the calibrated returns have a graduated scale. We suggest you use table 6.1 on page 51 to note down the calibration values and the corresponding nozzles. This way, the next time you use the same type of nozzles, you will not need to repeat the calibration procedure; simply adjust the calibration buttons to the previously determined values.

Depending on the configuration of the control unit, the compensation valves can be calibrated as follows:

- If the **number of nozzles is the same for all section valves**, calibrate a single valve. For the others, set the respective regulator to the same position as the calibrated valve regulator.
- If the **number of nozzles is different for each section valve**, calibrate each section valve;
- If the **number of nozzles is symmetrical for each section valve** *(Figure 6.21),* calibrate only one part of the control group (valves A, B and C). To calibrate the other part, set the calibrated return buttons in the same way, following the valve correspondence *(Figure 6.21)*.

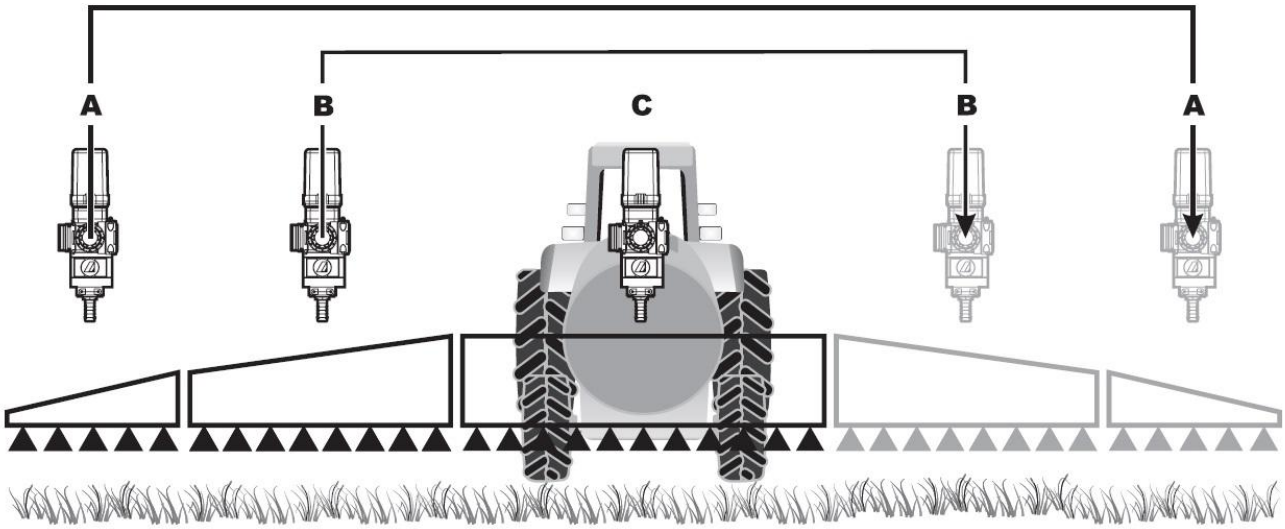


Figure 6.21 – Example of spray boom sectioning.

If the nozzles are not replaced, the calibrations performed should ensure constant liquid distribution, even in treatments carried out at different working pressures.

For more information about the Valve Group (installation, use, maintenance, etc.), please refer to the respective instruction manual. The Valve Group instruction manual should be provided with the Sprayer.

The pressure value is shown on the pressure gauge installed on the Valve Group or on the machine's computer (if a pressure sensor is installed).

Table 6.1 - Record of values for calibrating the compensation valves.

NOZZLE TYPE	NOZZLE COLOUR	ADJUSTMENT VALUE	NOZZLE TYPE	NOZZLE COLOUR	ADJUSTMENT VALUE

NOZZLE TYPE	NOZZLE COLOUR	ADJUSTMENT VALUE	NOZZLE TYPE	NOZZLE COLOUR	ADJUSTMENT VALUE

- **Before starting to prepare the machine**

DANGER: Always take great care when handling chemicals.

WARNING: Put on personal protective equipment correctly before handling chemicals.

MANDATORY: Wear appropriate protective equipment whenever handling chemicals!

Depending on the chemical you are handling, you must select and use personal protective equipment to minimise your exposure to these products.

Devices that must always be worn when handling chemicals:

- Protective gloves;
- Waterproof protective boots;
- Protective helmet;
- Protective mask;
- Protective goggles.

This equipment must be worn during the preparation of spray mixtures, during application and when cleaning the sprayer, always taking into account the instructions on the labels of the chemicals being handled.

WARNING: Mix and add the chemicals to the sprayer using the premix system (PRE-MIX).

WARNING: Mix the chemicals using the appropriate equipment and always following the manufacturer's instructions for these products.

DANGER: Do not prepare the mixtures near wells or surface waterways.

DANGER: Never leave mixtures, chemicals or their packaging unattended, even after they have been emptied and washed.

DANGER: Never leave the Sprayer unattended while filling the main tank.

WARNING: Clean the Sprayer thoroughly after each use.

- **Calculate the amount of spray mixture required.**

The following examples demonstrate the procedure to be adopted when calculating the amount of spray mixture required for a given treatment.

- **Example 1**

We have the following data:

Nominal tank volume:	2000 l
Residual quantity in the tank:	0 l
Water consumption:	400 l/ha
Amount of mixture required per hectare (litres/hectare)	
Product A:	1.5 kg
Product B:	1.0 l

Question:
How many litres of water, how many kg of product A and how many litres of product B will you need to prepare if the area to be treated is 5 ha?

Calculations:

Water:	400 x 5 = **2000 l**
Product A:	1.5 x 5 = **7.5 kg**
Product B:	1.0 x 5 = **5.0 l**

- **Example 2**

We have the following data:

Nominal tank volume:	2000 l
Residual quantity in the tank:	200 l
Water consumption:	500 l/ha.
Recommended concentration:	0.15%
Product A:	1.5 kg
Product B:	1.0 l

Questions:

1. How many litres or kg of spray mixture should be added to fill the tank?
2. What is the size of the area, in hectares, that can be treated with a full tank of spray mixture, if the tank can be emptied to a residual amount of 20 litres?

Calculations for question 1:

$$Quantity\ Spray\ mixture(l\ ou\ kg) = \frac{Filling\ quantity\ (l)\ x\ Concentration\ (\%)}{100}$$

$$Quantity\ Spray\ mixture\ (l\ ou\ kg) = \frac{(2000 - 200)x\ 0.15}{100} = 2{,}7\ (l\ ou\ kg)$$

Calculations for question 2:

$$Area\ to\ be\ treated\ (ha.) = \frac{Quantity\ Spray\ mixture\ available\ (l) - \ Remaining\ quantity\ (l)}{Use\ of\ water\ (l/ha)}$$

$$Area\ to\ be\ treated\ \ (ha.) = \frac{2000 - \ 20}{500} = 2{,}7\ (l\ ou\ kg) = 3.96ha$$

As an alternative to calculations, you can use the following table to calculate the refill quantity for a residual area in the last filling.

Table 6.2 - Record of values for calibration of compensation valves.

Distance (m)	Working width (m)												
	15	16	18	20	21	24	27	30	32	33	36	39	40
	Refill quantities (litres)												
10	2	2	2	2	2	2	3	3	3	3	4	4	4
20	3	3	4	4	4	5	5	6	6	7	7	8	8
30	5	5	5	6	6	7	8	8	10	10	11	11	12
40	6	7	7	8	8	10	11	11	13	13	14	15	16
50	8	8	9	10	11	12	14	14	16	17	18	19	20
60	9	10	11	12	13	14	16	17	19	20	22	23	24
70	11	11	13	14	15	17	19	20	22	23	25	27	28
80	12	13	14	16	17	19	22	22	26	26	29	30	32
90	14	15	16	18	19	22	24	25	29	30	32	34	36
100	15	16	18	20	**21**	24	27	28	32	33	36	38	40
200	30	32	36	40	42	48	54	56	64	66	72	74	80
300	45	48	54	60	63	72	81	84	96	99	108	114	120
400	60	64	72	80	84	96	108	112	128	132	144	152	160
500	75	80	90	100	105	120	135	140	160	165	180	190	200

Example given: Working width of 21 m; approximately 100 m left to spray.

The table is based on an application rate of 100 l/ha. For other application rates, the refill quantity increases in multiples, e.g. if the application rate is 300 l/ha, i.e. 3 times the values indicated in the table, then the quantity of spray mixture to be prepared should be 3 x 21 = 63 litres.

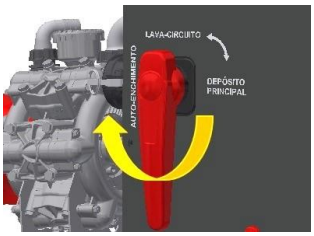
- **Mixing chemicals**

Avoid mixing chemicals directly in the sprayer's main tank. Use the mixing tank *(Figure 6.22),* included with the machine, to mix chemicals.
Before starting to prepare the mixture, calculate the amount needed to apply, as the ecological removal of spray mixtures is a very difficult process to carry out.

Figure 6.22 – Pre-Mix mixture tank.

WARNING: Take great care not to splash or spill chemicals during chemical pouring or mixing operations.

1. Turn on the tractor's power take-off and set the pump to run at 540 rpm.
2. Fill approximately 20% of the main tank with clean water (unless otherwise indicated on the label of the chemical product to be used). See "Filling the Main Tank with AUTO-FILL" on page 42 of this instruction manual.
3. Set the lever, shown in the figure opposite, to the "AUTO FILL" position.



4. Set the lever, shown in the figure opposite, to the "MAIN TANK" position.

5. Set the lever, shown in the figure opposite, to the "PRE-MIX" position.

6. Activate the agitator by turning the lever, shown in the figure on the right, to the "ON" position.

7. Unlock and lower the mixing tank *(Figure 6.19)* to the filling position.

8. Open the feed valve, shown in the figure opposite (position "MIX"), and fill the pre-mixer tank with approximately 2 to 3 litres of water.
9. Close the feed valve again.
10. Fully open the pre-mixer tank lid and add the product to be mixed.
11. Remove the chemical product from the packaging by inserting the valve shown in the figure opposite into the packaging. Then press on the packaging to activate the packaging rinsing jet.

12. Close the tank lid and lock it with the mechanical lock.
13. Reopen the feed valve, shown in the figure on the right (position "MIX").
    Be careful not to spill the liquid!

14. Open the discharge valve, shown in the figure opposite, to discharge the product into the sprayer tank.
15. Close this valve again after completely emptying the mixture tank.

16. Turn the lever, shown in the figure opposite, to the spray function (position "BOOM").

CONTAMINATION HAZARD: The Pre-Mix packaging rinsing valve uses water from the main tank (containing chemicals) for this purpose. After emptying the packaging, wash it thoroughly with clean water before sending it for recycling.

Note: After preparing the mixture and filling the main tank, leave the sprayer pump running during the journey to the spraying site. This will ensure that the agitator keeps the mixture dissolved inside the main tank.

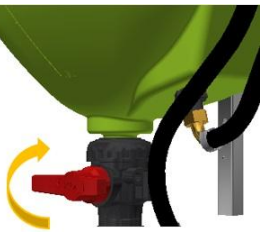
Note: After completing the mixing and transfer of chemicals to the main tank of the sprayer, you must thoroughly wash the mixing tank (Pre-Mix) of the sprayer. To do this, proceed as follows:

1. With the mixing tank CHAP closed, open the feed valve, shown in the figure opposite (position "MIX").

2. Open the discharge valve, shown in the figure opposite, to discharge the water into the sprayer tank.

3. Wait 15 to 20 seconds and close the feed valve, shown in the figure opposite (position "OFF").

4. After all the water has been transferred to the main tank of the sprayer, close the Pre-Mix discharge valve.



Always use a measuring jug to determine the exact amount of product to add to the mixture.

DANGER: The location of the Pre-Mixer in some Sprayers means that the operator has to perform operations close to the Cardan shaft while it is in operation. Take the utmost care not to be hit by the Cardan shaft while it is in operation.

WARNING: Put on personal protective equipment correctly before handling chemicals.

- **Spraying Operation**

After completing the product mixing and tank filling operations, and during the journey to the field, ensure that the agitator(s) remain(s) switched on in order to keep the mixture properly dissolved inside the tank.

Please note the following advice:

- Select a slow speed and reduced spray pressure to minimise drift.
- Do not carry out treatments if the wind speed exceeds 5 m/s (the leaves on thin branches move).
- Avoid overdosing due to overlap. Stop spraying outside the areas to be treated (e.g. at the edges of fields).
- If you increase the speed, make sure you do not exceed the maximum power take-off speed of 540 rpm!
- During spraying, constantly check the actual consumption of spray mixture in relation to the area treated. Also check the level of spray mixture in the tank.
- Calibrate the equipment if you notice any deviations between the amount applied and the amount indicated.
- If you have to interrupt spraying (e.g. due to weather conditions), clean the spray circuit immediately after stopping.
- Do not place additional loads on the spray boom structure. This may damage it.
- Reduce the speed of the tractor at the headlands and make turns at a constant speed.
- When turning at tight radii, always drive at less than 6 km/h.
- Avoid sudden changes in direction (e.g. lane corrections).
- Do not open or close the spray boom while the machine is moving. This can seriously damage the boom and/or the sprayer.
- When opening the boom, ensure that all sections are fully open (in the horizontal position).

- **Calibrating the Sprayer**

Before starting spraying, it is necessary to calibrate the machine. To do this, the following data must be determined:

a) Dose to be applied: Value provided by the manufacturer of the product to be applied.
b) Working width: Width of the spray boom.
c) Characteristics of the nozzles you will be working with.
d) Tractor forward speed.

If, for example, you have the following data available:

Dose to be applied *(consult manufacturer's data)*: 400 l/ha.
Working width / number of nozzles: 21 m / 42 jets
Nozzle data *(see manufacturer's data)*: 3.2 l/min / 3 bar;

You must determine:
Tractor forward speed?

$$Tractor\ speed\ (km/h) = \frac{[600\ x\ Nozzle\ flow\ rate\ (l/min)\ x\ Nº\ de\ bicos]/Applicable\ dose\ (l/ha)}{Working\ width\ (m)}$$

$$Tractor\ speed\ \ (km/h) = \frac{[600\ x\ 3{,}2\ (l/min)\ x\ 42]/400\ (l/ha)}{21\ (m)} = 9{,}6km/h$$

As an alternative to this calculation, we can consult the nozzle manufacturers' tables to obtain the required data.

FLOW RATE CHART

Colour	ISO code		Pressure (bar)		l/mn	Liters / hectare - Nozzle spacing: 50 cm										
						8 km/h	9 km/h	10 km/h	12 km/h	14 km/h	16 km/h	18 km/h	20 km/h	22 km/h	24 km/h	26 km/h
ORANGE	AVI 110 01	100 Mesh	3	VC	0,40	60	53	48	40	34	30	27	24	22	20	18
			4	C	0,46	69	61	55	46	39	35	31	28	25	23	21
WHITE	AVI 110 08	50 Mesh	3	XC	3,28	480	427	384	320	274	240	213	192	175	160	148
			4	XC	3,70	555	493	444	370	317	278	247	222	202	185	171
			5	XC	4,13	620	551	496	413	354	310	275	248	225	207	191

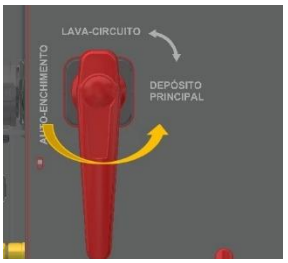
Figure 6.23 – Example of the spray nozzle data table - ALBUS®.

Note: In this case, the dose would be **384 l/ha** (closest approximation) for a forward speed of **10 km/h** and a working pressure of **3 bar**.

After determining the data required for calibrating the sprayer, perform the following procedure:

1. Turn the lever, shown in the figure opposite, to the position ("BOOM").

2. Turn the lever, shown in the figure opposite, to the ("MAIN TANK") position.



3. Check that the lever, shown in the figure opposite, is in the ("ON") position.

4. Adjust the pump rotation speed (540rpm).
5. Switch on the machine control device.
6. Configure the spraying data on the control device according to the calculations made. (Refer to the control device instruction manual).
7. Open the spray boom completely.
8. Adjust the height of the spray boom (distance between the nozzles and the crop) according to the nozzles used. (Refer to the nozzle manufacturer's tables).
9. Adjust the tractor's forward speed according to the calculations made and start driving.

If your sprayer is not equipped with a computer, you must adjust the working pressure at the respective valve (see pages 45 onwards of this instruction manual).

WARNING: Put on personal protective equipment correctly before handling chemicals.

○ Agitation before restarting spraying

If spraying has been interrupted for some time, the chemical and water may separate inside the main tank.

If this happens, you must shake the chemical inside the main tank again before restarting spraying.

Before restarting spraying, carry out the following procedure:

1. Turn on the tractor's power take-off and run the pump at 540 rpm.
2. Activate the agitator by turning the lever, shown in the figure opposite, to the "ON" position.
3. Allow the agitator to run for at least 10 minutes before restarting spraying.

○ Measures to reduce drift

Spray drift means that the plant protection products you apply are not reaching their primary target: the crops! This not only affects yield, but can also be harmful to the environment or neighbouring crops. It is in your interest to avoid it!

- Read the recommendations on the product labels regarding application.
- Ensure that the sprayer is properly calibrated and in good working order.
- Carry out treatments early in the morning or late in the afternoon, as there is generally less wind and temperatures are more stable.
- Reduce the spray pressure (keep the pressure between 2 and 3 bar).
- Respect the spraying height (distance between the boom and the crop).
- Minimise sudden movements of the machine. Use spray booms equipped with suspension.
- Reduce the tractor's forward speed (less than 8 km/h).
- Use anti-drift nozzles.

- **Cleaning the water circuit**

To get the most out of your sprayer for many years, while promoting your safety and that of others, you should follow the procedure described below.

WARNING: Read all paragraphs carefully. If anything is unclear or if you need tools that are not available, for safety reasons, refer this work to an authorised Rocha workshop.

WARNING: Clean sprayers are safe machines.

WARNING: Clean sprayers are fit for work.

WARNING: Clean sprayers cannot be damaged by chemicals or solvents.

MANDATORY: Wear appropriate protective equipment whenever working with chemicals!

1. Read the instructions on the chemical product labels thoroughly. Take the safety instructions into account.
2. Read the instructions on the detergents to be used thoroughly. If there are instructions for removing such products, follow them strictly.
3. Find out about local legislation for the disposal of sprayer wash residues or decontamination methods. Contact the local authorities, in particular the Ministry of Agriculture.
4. Pesticide washes must be drained into an approved drain. Find out about this!
5. Do not drain pesticide washes into areas where they may contaminate soil and/or water.
6. Clean the sprayer immediately after use. Cleaning is more effective, and the equipment is then ready for the next application.

7. Clean the sprayer immediately after use. Cleaning is more effective, and the equipment is immediately ready for the next application.
8. Select the appropriate cleaning products. If the products are corrosive, we recommend that you protect the metal parts of your sprayer. To do this, use a suitable lubricant.
9. Wash all equipment that has been in contact with the chemical, including the tractor and accessories.
10. With the pump running, thoroughly rinse the inside of the tank, including the "ceiling" of the tank.
11. After rinsing, turn off the pump and fill at least 1/5 of the tank with clean water. Add the detergent and/or deactivating agent.
    Note: Some chemicals require that you fill the tank completely.
12. Turn on the pump and activate all controls so that the liquid comes into contact with all components. Leave the distribution valves until last.
13. Disassemble and wash all filters thoroughly. Perform this procedure after washing the tank and the rest of the water circuit.
14. Some products work better if left to stand in the tank for a while. Refer to the product label.
15. If the pesticides used tend to clog the spray nozzles, remove the nozzles and wash them thoroughly.
16. Dry the inside of the tank.
17. Store the machine in a sheltered, dry place. Leave the main tank cap open.

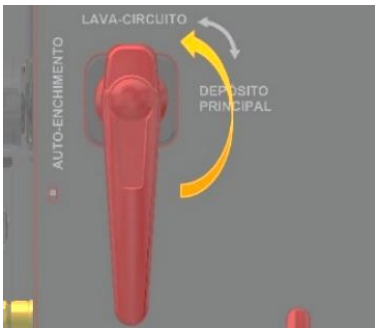
WARNING: Do not allow the pump to run dry, as this may damage the pump.

○ Operating with Circuit Washer

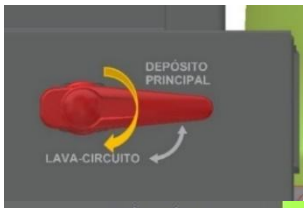
The CERES Sprayer is equipped as standard with a cleaning system (Circuit Washer). This system, which is fed with clean water from a dedicated tank, is designed to clean the most important and sensitive components of the machine automatically and with ease.

To clean the Sprayer circuit with the Circuit Washer system, proceed as follows:

1. Connect the tractor's power take-off and activate the pump at low speed (e.g. 300 rpm).
2. Empty the sprayer as much as possible.
3. Turn off the agitator and spray the water contained in the circuit.



4. Turn the lever, shown in the figure opposite, to the washing function (position "LAVA-CIRCUITO").



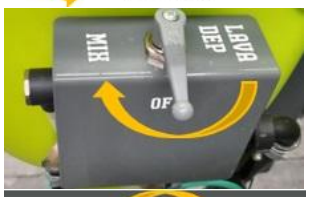
5. Set the lever, shown in the figure opposite, to the "LAVA-CIRCUITO" position.

6. Set the lever, shown in the figure opposite, to the "ON" position to clean the agitator.
7. After a few seconds, close the valve again.

8. Set the lever, shown in the figure on the right, to the "PRE-MIX" position to start cleaning the Pre-Mix tank.

9. Set the lever, shown in the figure on the right, to the "LAVA DEP" position to clean the Pre-Mix tank.

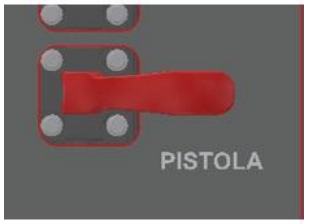
10. Open the Pre-Mix discharge valve to remove the water from the tank.



11. Close the valve (to the "OFF" position) after clean water comes out of the Pre-Mix jets.
12. Close the Pre-Mix discharge valve when there is no more water in the Pre-Mix tank.

13. Set the lever, shown in the figure opposite, to the "BOOM" position to clean the spray circuit.

14. Pull the lever, shown in the figure on the right, to activate the main tank wash. Use approximately 10% of the clean water for this function.
15. Then push the same lever to stop washing the main tank.



16. Pull the lever, shown in the figure on the right, to activate the manual jet wash (if available).
17. Use the manual jet to wash the outside of the machine.
18. Then push the same lever to stop washing the manual jet.
19. Using the machine's control device, switch the system on and off several times. This will properly rinse the machine's valves and returns.
20. Drain all the water from inside the machine.
21. Disconnect the tractor's power take-off.

WARNING: Do not allow the pump to run dry, as this may damage the pump.

MANDATORY: Wear appropriate protective equipment whenever handling chemicals!

SAFETY WARNINGS AND ACCIDENT PREVENTION

CHAP 7

The safety of operators or other persons and animals exposed to the operation of this equipment is our primary concern.

A significant proportion of accidents involving the use of machinery and equipment are due to failure to comply with basic safety rules, regulations and equipment handling procedures.

WARNING: It is mandatory to read the user manual carefully before starting any operation with this equipment.
WARNING: This machine may only be operated by qualified operators! Ensure that no one approaches the equipment during adjustment and operation.

This manual has been developed with the aim of ensuring safe and effective actions related to the operation and handling of the CERES Sprayer.

Ensure that you have the necessary knowledge to operate sprayers and the tractor from which you will be operating the machine. Information regarding agricultural tractors should be consulted in the respective instruction manual or with the manufacturer.

It is the operator's responsibility to read, understand and comply with all safety measures described in this manual before starting to work with the CERES Sprayer. If in doubt, please contact our technical and commercial services.

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

Please note that this safety section is specific to this type of machine (CERES Sprayer). Follow all the safety recommendations described in this manual and always keep in mind:

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

- **Technical training of personnel**

Remember that only properly trained persons will be able to perform work with/on the machine, complying with the necessary safety requirements. Therefore, we believe it is essential to clearly define the skills of the persons responsible for the operation and maintenance of the machines.

WARNING: Persons undergoing training should only perform work with/on the machine under the supervision of an experienced technician.

Table 8.1 – Matrix of skills required for the actions to be performed on the machine.

Operator / Action	Operator with specific training in the role (1)	Trained operator (2)	Operator with specialised training (3)
Load and/or transport	✓	✓	✓
Start up	x	✓	x
Prepare/equip	x	x	✓
Operate the machine	x	✓	x
Performing maintenance	x	x	✓
Locate and resolve faults	✓	x	✓
Remove waste	✓	x	x

KEY: ✓**SUITABLE** x **UNSUITABLE**

(1) – Person who can take on and perform a specific task for a qualified company.
(2) – Person who has received the necessary training to:

a) Perform the operational tasks entrusted to them.

b) Understand the risks associated with the misuse of machinery.

c) Understand the risks associated with not using personal protective equipment.

(3) – An operator with specialised training, or a specialised technician, is considered to be someone who has mastered the applicable techniques and regulations thanks to the training received and/or experience accumulated. This technician is able of assessing the work entrusted to them and identifying the associated hazards.

- **General safety symbols.**

Carefully read the following warnings regarding **prohibitions, hazards and requirements,** which you must take into account whenever operating agricultural machinery and associated tractors.


It is prohibited to approach the equipment while it is in operation without personal protective equipment.


Do not leave the equipment with the ignition key in the agricultural tractor.


Do not bring flames or hot objects near hydraulic components.


Do not perform any maintenance while the equipment is in operation.


Do not operate this equipment if you are under the influence of alcohol or drugs.


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


Danger! Some parts of the Sprayer, when in operation, can cause serious cuts.


Danger! Some parts of the Sprayer, when in operation, can cause crushing of limbs.


Danger! Do not allow people or animals to approach the equipment when it is in operation.


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


The use of personal protective gloves is mandatory.


The use of personal protective footwear is mandatory.


The use of personal protective clothing is mandatory.


The use of personal protective masks with suitable filters is mandatory.

- **Interpretation of safety symbols.**

Safety instructions are indicated by a triangular safety symbol and the signal word in front of it. The signal word (**DANGER, WARNING, CAUTION**) describes the severity of the imminent danger and has the following meaning:

DANGER: Indicates a **high-risk** hazard which, if not taken into account, can have fatal consequences or cause serious bodily injury (loss of body parts or permanent injury).
Failure to observe these instructions may result in death or serious injury.

WARNING: Indicates a moderate risk which, if not avoided, could result in fatal consequences or cause (serious) bodily injury and/or material damage.
Failure to observe these instructions may, under certain circumstances, result in fatal consequences or cause serious injury.

CAUTION: Indicates a low-risk hazard which, if not avoided, may result in minor or moderate injury and/or damage to property.

Indicates advice or an obligation to behave or act in a certain way in order to ensure correct operation of the machine.
Failure to observe these instructions may result in machine malfunction or inefficient operation.

- **Operator obligations**

The operator is responsible for ensuring that only persons who:

- are aware of occupational safety and accident prevention regulations;
- are familiar with the meaning of the various safety symbols on the machine;
- have received training to carry out work on/with the machine;
- have read and understood this instruction manual, as well as the other elements that complete the machine (control devices, valve groups, circuits, pumps, filters, etc.).

The operator is responsible for ensuring that:

- the warnings incorporated into the machine remain legible throughout its service life;
- damaged warnings are replaced or repaired.

All persons responsible for working with/on the machine, before starting work, are responsible for:

- comply with occupational safety and accident prevention regulations;
- read and comply with the instructions in the CHAP "SAFETY AND ACCIDENT PREVENTION WARNINGS" in this instruction manual;
- if in doubt, clarify any questions with the machine manufacturer or legal representative.

- **Danger when handling the machine.**

The CERES Sprayer has been constructed in accordance with the current state of the art and known regulations. However, during use, hazards or damage may arise with consequences for:

- the life or physical integrity of users or third parties;
- life itself;
- equipment or other material assets;

Only use the machine:

- for its intended purpose, i.e. spraying.
- if, from a safety point of view, it is in perfect condition.

WARNING: Immediately eliminate any malfunction that could compromise safety.

- **Hazards resulting from failure to comply with safety instructions.**

Failure to comply with safety instructions may:

- result in hazards to persons, the environment and the machine;
- in the event of an accident, result in the loss of all rights to compensation;
- result in the failure of important machine functions;
- result in the failure of procedures described for machine maintenance and repair;
- result in danger to persons and animals through mechanical and chemical effects;
- result in danger to people, animals and the environment due to oil spills.

- **General accident prevention warnings.**

When operating the machine, always bear in mind the following:

- Check with local authorities for current safety and accident prevention regulations;
- The warnings and other instructions on the machine provide important information for the safe use of the equipment;
- Before starting to operate the machine, make sure that there are no people and/or animals in the vicinity. If there are, take the necessary safety measures;
- Transporting people or objects on the machine is prohibited;
- On the tractor, adjust the driving mode and the machine's control devices before starting the journey and operation.
- Be especially careful when coupling and uncoupling the machine to the tractor! There are crushing and/or shearing points between the tractor and the machine.
- Ensure that cables and hoses connected between the machine and the tractor are suspended and can move with the machine's turning movements without ever becoming tense or trapped.
- Cables and hoses connected between the machine and the tractor must not rub against other objects. This causes wear and tear and breakage.
- Test the braking system of the machine/tractor combination before driving on public roads.

- Before starting work, test all the machine's devices and controls.
- Do not wear loose clothing, jewellery or other items that could get caught in the machine. If necessary, tie back your hair.
- Operate the machine when all protective devices are in place and in the protective position.
- Observe the maximum load of the machine and the permissible loads on the tractor's axle and tow ball.
- If necessary, only partially fill the circuit washing tank.
- Switch off the tractor and remove the ignition key before leaving;
- No persons are allowed to remain in the machine's rotation and movement area;
- Always use the personal protective equipment required by law, namely protective clothing, safety glasses, gloves, mask, safety footwear, etc.
- Comply with environmental regulations for the use of lubricants and/or other cleaning and maintenance products;
- Always have first aid equipment to hand;
- If you notice abnormal vibrations while using the equipment, stop immediately, turn off the equipment and the tractor, and check the cause(s). Do not resume working with the equipment until the problem has been resolved;
- Never operate the equipment if you detect leaks in the hydraulic components.
- Drive carefully on uneven ground;
- Carry out a risk assessment of the workplace before any operation. Check for obstacles that require special attention (trees, walls, electricity or communication poles, etc.);
- Do not allow people or animals to approach the machine when it is in operation. There is a high risk of inhaling toxic products.
- Before turning on the machine's spray circuit, make sure that no one is near the machine.
- Read and follow the instructions provided by the manufacturers of the products (pesticides) you will be working with;
- Understand what contingency measures to take in the event of extreme contamination of people or animals;
- Follow the instructions in the law regarding the use of pesticides;
- Follow the instructions on the chemical products regarding dosage, application and cleaning;
- Always wash empty chemical containers thoroughly. Never leave them in the environment.
- Ensure that empty containers are disposed of in accordance with the law;

Always read the safety data sheet requirements for the active substances used very carefully, as well as the recommendations on the personal protective equipment to be used.
Ensure that the personal protective equipment you use complies with the following requirements:

- Protective suit in accordance with DIN 32781.
- Rubber apron in accordance with standard EN 14605.
- Eye protection in accordance with standard EN 166.
- Respiratory protection mask in accordance with DIN EN 143/149/405/14387, at least a half mask with combined particle filter and gas filter A1-P2 (identification colour brown-white).
- Protective gloves with a rough surface in accordance with DIN 347/388/420.
- Waterproof protective boots in accordance with EN ISO 20345:2011 S5 SRC.

It is mandatory to wear safety equipment in the following situations:

- During the preparation and filling of the sprayer.
- During spraying.
- When regulating and adjusting the sprayer.
- When emptying and cleaning the tank.
- During maintenance operations.

- **Additional safety warnings.**

  - Assess the compatibility of chemicals with the materials of the sprayer and tractor. See what procedures to follow to minimise possible damage.
  - Avoid spraying products that tend to stick or solidify.
  - Due to toxic fumes, never enter the main tank of the sprayer.

- Repairs to the main tank of the machine may only be carried out by a specialist company.
- During cleaning and washing operations, if the tractor needs to be turned on, ensure that no one else approaches it.
- For your safety and to preserve the equipment, regularly check that all nuts and bolts are tight.
- Remove residues from the spray circuit in an appropriate manner. Consult local regulations and authorities regarding the removal and recycling of toxic waste.
- Do not perform maintenance operations for which you have not been trained. Use Rocha's after-sales services or legal representative.
- Do not weld other parts to the machine structure without consulting Rocha's technical services.
- Do not weld with the machine attached to the tractor. If you must do so, disconnect the power cable between the battery and the alternator.
- Remember that some chemical residues, often "stuck" to the machine, can be explosive when subjected to high temperatures (e.g. during welding or grinding operations).
- If you replace parts, make sure that the new ones comply, at a minimum, with the technical specifications defined by Rocha.
- Before carrying out any repairs on the sprayer, wash the entire machine thoroughly, especially the area where the repair will take place.
- There are specific products on the market for cleaning sprayers. Consult our after-sales services for appropriate advice.

CHECKING AND MAINTENANCE CHAP8

The use of machinery involves certain procedures that must be taken into account not only during operation, but also during equipment **inspection** and **maintenance**. **These actions must be carried out rigorously,** as they directly affect performance, material durability and operator safety.
When carrying out verification and/or maintenance work, attention must be paid to any hazards that may arise during these operations. This work must be carried out by persons with specialised training.

- **SAFETY WARNINGS**

DANGER: Before performing any cleaning or maintenance work, turn off the agricultural tractor engine and ensure that all necessary safety conditions are met. Remove the ignition key!

WARNING: All **repair work** must be carried out exclusively in **specialised workshops**.

CAUTION: Welding work and work on the electrical and hydraulic systems may only be carried out by specialised technicians.

CAUTION: Do not make any changes to the electrical and hydraulic circuits of the equipment.

WARNING: All maintenance work must be carried out by properly trained personnel.

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

WARNING: Spare parts must at least meet the technical requirements specified by the manufacturer. This is ensured by **using only original parts.**

CAUTION: Ensure that maintenance and cleaning are carried out under appropriate safety conditions.

Regular and proper maintenance keeps your sprayer operational for a long time and prevents premature wear. Regular and proper maintenance is a prerequisite for our warranty terms.

Specialised technical knowledge is essential for carrying out inspection and maintenance work. This technical knowledge is not provided in this Instruction Manual.

- **GENERAL MAINTENANCE - FREQUENCY**

Perform a general check of your sprayer and make any necessary adjustments at the end of each working day. Loose parts, oil leaks, lack of lubrication, noises, foreign objects, etc., are points to consider during checks and maintenance.
We suggest that you perform maintenance tasks at the intervals defined in the following tables:
(Table 8.1 – Checks to be performed – frequency);
(Table 8.2 – Preventive maintenance – general frequency).

Most of the components of the CERES Sprayer are secured with self-locking nuts. **For safety reasons, do not reuse self-locking nuts**.

WARNING: SPRAYER CHECKING OR MAINTENANCE ACTIONS MUST BE PERFORMED WITH THE TRACTOR STOPPED AND THE KEY REMOVED FROM THE IGNITION.

POINTS TO CHECK	DAILY	WEEKLY	EVERY 6 MONTHS
HYDRAULIC OIL CIRCUIT (hoses; valves; actuators; etc.)	X		
SPRAYER STRUCTURE AND SPRAY BOOM	X		
SPRAY NOZZLES	X		
FILTERS (suction filter; boom nozzle filters)	X		
MAIN TANK (leaks; general cleaning)	X		
CARDAN (condition and lubrication)	X		
SCREWS (looseness; condition)		X	
SPRAYER COUPLING ELEMENTS		X	
GENERAL CLEANING		X	
SPRAYER PUMP OIL LEVEL			X
SPRAYER TYRES (pressure; wear)			X

Table 8.1 – Checks to be carried out – frequency

ACTION TO BE TAKEN	DAILY	WEEKLY	EVERY 6 MONTHS
LUBRICATION	X	X	
SPRAYER CLEANING	X	X	
CLEAN/REPLACE FILTERS		X	X
REPLACE LUBRICANT IN SPRAY PUMP			X
CLEAN/REPLACE SPRAY NOZZLES		X	X

Table 8.2 – Preventive maintenance – general frequency

Table 8.2 indicates, in general terms, the intervals for maintenance actions.

- **DAILY ACTIONS**

  - **HYDRAULIC OIL CIRCUIT:** Whenever a leak is detected in any component of the hydraulic oil circuit, the damaged part must be repaired or replaced immediately.
    Oil leaks cause the equipment to lose efficiency and can cause other serious damage to the machine.
    Hydraulic oil spills contribute significantly to environmental pollution.

    DANGER: Risk of injury due to uncontrolled actions caused by hydraulic oil from the hydraulic system under high pressure!

  - **SPRAYER STRUCTURE AND SPRAY BOOM:** Ensure that the machine structure, spray boom structure and various mechanical accessories are in good condition. Check for signs of cracks in the welds.

    WARNING: Risk due to metal elements that may cause cuts!

  - **SPRAY NOZZLES:** After each use of the sprayer, you should check/clean all spray nozzles on the spray boom. Use clean water to clean the spray nozzles.

    WARNING: Risk due to contact with chemicals!

- **FILTERS:** After each use of the Sprayer, check/clean the suction filter and the spray boom nozzle filters. Remove the filter cover and clean the filter element with clean water. If you detect any damage, replace it.

WARNING: Risk due to contact with chemicals!

- **MAIN TANK:** After each use of the sprayer, wash the tank thoroughly (inside and out) and check for damage and/or leaks, especially around the water circuit accessories.

WARNING: Risk due to contact with chemicals!

- **CARDAN:** Check the integrity of the Cardan. Lubricate according to the manufacturer's specifications.
  The Cardan instruction manual should be provided with the machine.

CAUTION: Risk due to possible entanglement!

- **WEEKLY TASKS**

- **SCREWS:** Check and retighten, if necessary, nuts and screws on the sprayer and spray boom.
  If you detect damage, replace the damaged parts.

CAUTION: Risk of injury from metal parts!

- **MACHINE COUPLING ELEMENTS:** Check the integrity of the machine coupling elements (eyebolts and pins).
  If damage is detected, replace the damaged parts.

CAUTION: Risk of injury from metal parts!

- **GENERAL CLEANING:** Wash the sprayer regularly. A clean sprayer works better.

WARNING: Risk due to contact with chemicals!

- **ACTIONS TO BE PERFORMED EVERY 6 MONTHS**

- **SPRAYER PUMP OIL LEVEL:** Check the oil level in the sprayer pump regularly. If necessary, top up the oil level according to the manufacturer's instructions.
  The pump instruction manual should be provided with the machine.

WARNING: Risk of environmental contamination due to oil spillage!

- **TYRES:** Check the pressure and condition of the sprayer tyres regularly. Replace the sprayer tyres if necessary.

WARNING: Risk of injury caused by tyre blowouts!

- **LUBRICATION**

Lubricate the following parts daily. Carefully clean the lubrication points and the lubrication pump nozzle to avoid injecting dirt into the components.
Completely expel the used and dirty lubricant by pressure and replace it with new lubricant. Stop injecting when clean lubricant starts to come out.

WARNING: Risk of environmental contamination due to spillage of oils or lubricating greases!

(Lubrication gun) The lubrication points on the machine are marked with this symbol.

Recommended lubricant: Type EP-2 with a lithium/calcium base, according to DIN 51818:2024-02

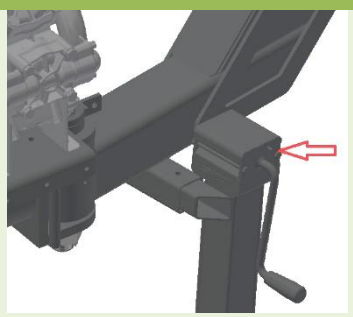
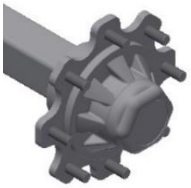
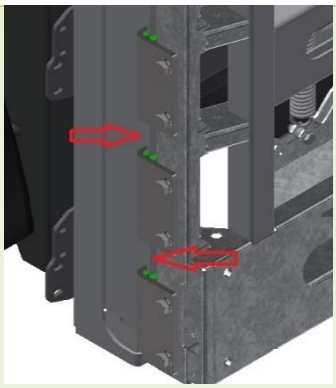
Description Component	Location	Interval (hours)	Procedure
Sprayer support foot		Every 500 hours	Inject lubricating grease into the lubrication nipple.
Sprayer traction pull eye		Every 100 hours	Inject lubricating grease into the lubrication nipple.
Transmission cardan		Every 8 hours	Inject lubricating grease into the lubrication nipple.
Sprayer wheel hubs		Every 1000 hours	Change the wheel hub grease. Check/replace bearings and seals; *See procedure on page 83 of this instruction manual.*
Support structure rails and lift slides (all models).		Every 100 hours	Remove dirty lubricant. Spread (brush) lubricant on the lift slide rails on both sides.

Table 8.3 – Preventive maintenance – intervals

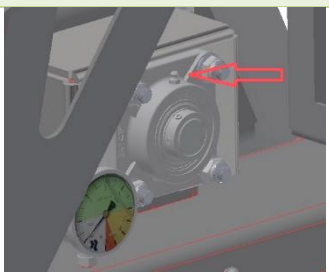
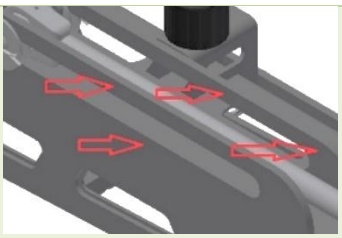
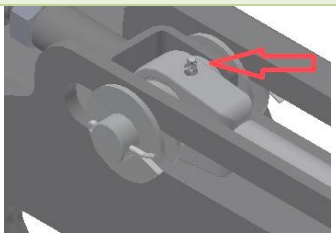
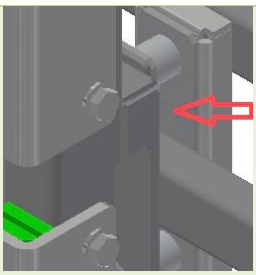
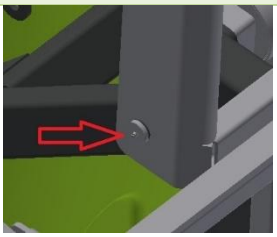
Description Component	Location	Interval (hours)	Procedure
All spray boom bearings;		Every 100 hours	Inject lubricant into the lubrication Grasser.
Bearings on the central body of the spray booms.		Every 100 hours	Inject lubricant into the lubrication Grasser.
Guide booms for the spray boom opening/closing tie rods (all models)		Every 100 hours	Remove dirty grease. Spread (brush) lubricant on the guide booms of the spray boom opening/closing tie rods on both sides.
All hydraulic cylinder ball joints (all models)		Every 100 hours	Inject grease into the lubrication nipple.
Nylon guide booms of the central body of the spray booms.		Every 100 hours	Remove dirty grease. Spread (brush) lubricant on the nylon guide booms of the central body.
Spray boom parallelogram pins (CERES EVO).		Every 100 hours	Inject lubricant into the lubrication Grasser.

Table 8.3 – Preventive maintenance – intervals

- **SPRAYER WHEEL HUBS**

  - Position the machine on firm, level ground;
  - With the machine empty, lift the rear of the machine and rest the axle on firm, sturdy trestles;
  - Remove the wheels from the axle hubs;
  - Remove the hub CHAP, the safety nut and unscrew the nut;
  - Using a suitable extractor, remove the wheel hub, tapered bearings and seals;
  - Mark the hubs and their respective axles so that they are not mixed up when reassembling;
  - Thoroughly clean the inside and outside of the wheel hubs. Completely remove the used grease. Thoroughly clean the hub supports and seals. Check whether the seals need to be replaced;
  - Before fitting the bearings and seals, lubricate the respective housings and fit the parts in reverse order. Use suitable tools to avoid damaging the components;
  - Before mounting the hubs on the axles, apply grease to the hollow space in the hubs (between the bearings and the hub cover). The amount of grease to be applied should fill about 1/3 of the free space in the hub;
  - Tighten the nuts and fit the safety washers.
  - Refit the wheels.

Recommended lubricant: Type EP-2 with a lithium/calcium base, according to DIN 51818:2024-02

Incorrect or excessive lubricant may damage the wheel hubs.

- **SPRAYER WHEELS**
  - Check the condition of the wheel nuts and bolts;
  - Check and adjust the tyre pressure according to the values indicated by the manufacturer;
  - Check the tyres for wear and fit on the rim;

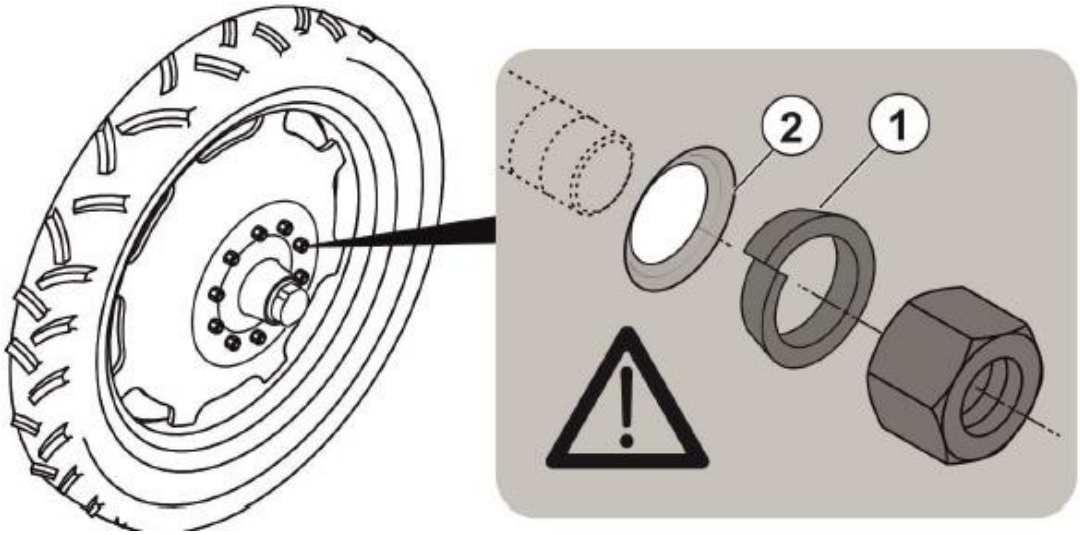


Figure 8.1 – Example of wheel and accessories for agricultural trailer.

Always use conical washers **(1)** to correctly tighten the rim to the hub.

If you need to replace the rim, make sure that the rim has a conical hole **(2)** to accommodate the conical washer.

Only use tyres and rims that are suitable for the machine. If in doubt, consult our technical services.

Tyre repairs must be carried out by specialised technicians in specialised workshops.

Tyre fitting requires sufficient knowledge and the use of suitable tools.

Remove any signs of corrosion from the rim surfaces before fitting a new tyre. Corrosion can cause damage to the rims.

Always screw on the valve CHAPs with a suitable liquid sealant.

- **TRACTION PULLS**

Check the coupling device (fixed pull eye; booms and pins coupling to the arms; booms and bushings of the wolf's mouth, rudder, etc.) with regard to:

a) Damage, deformations and cracks;

b) Wear;

c) Firm tightening of the fixing bolts.

DANGER: Immediately replace any drawboom that shows damage (except paintwork).

DANGER: Repairs to the Pulls may only be carried out by the manufacturer.

DANGER: For safety reasons, welding and/or drilling the handles is prohibited.

- **HYDRAULIC CIRCUIT**

DANGER: Risk of injury due to uncontrolled actions caused by hydraulic oil from the hydraulic system under high pressure!

WARNING: Only a specialist workshop may carry out work on the hydraulic system.

WARNING: In case of injuries caused by hydraulic oil, seek medical attention immediately. Risk of infection!

Check the hydraulic pipes and fittings daily for damage and/or leaks. Keep these components clean at all times.

In the event of damage or leaks, have the damaged hoses or fittings replaced. Ensure that the new parts comply with the technical specifications.

As a rule, hydraulic hoses should not be used for more than 6 years.
Hoses, even when not in use, are subject to natural ageing. Whenever hoses show signs of wear, have them replaced.

After the first 10 hours of operation and then every 50 hours, perform the following procedure:

- Check all components of the hydraulic system for leaks;
- Retighten the fittings if there is a leak. If the leak persists, have the fittings replaced;
- Check the hydraulic pipes for visible defects;
- Eliminate friction points on the hydraulic hoses.
- Have worn or damaged pipes and/or other hydraulic fittings replaced immediately.

Hydraulic hoses must be replaced whenever they meet one of the following criteria:

- Damage to the hose coating (e.g. friction points, cuts, cracks, etc.).
- Hardening of the outer layer (dried-out rubber) and formation of cracks in the rubber.
- Deformations that do not correspond to the natural position of the hose, both in pressurised and unpressurised states (e.g. separation of layers, formation of bubbles, crushing areas, creases, etc.).
- Leaks;
- Assembly criteria not met;
- Installed in the machine for more than 6 years (including downtime);

Leaks in hose connection elements and elsewhere are often caused by the following situations:

- Missing or incorrectly sized O-rings or seals;
- Damaged O-rings or seals;
- Foreign bodies (dirt) present in the joint.
- Hoses not properly secured.

The electro-hydraulic blocks *(Figure 8.2)*, which equip sprayers controlled by electric control units, must also be subject to periodic inspection and preventive maintenance.

Figure 8.2 – Example of an electro-hydraulic block.

Figure 8.2 – Example of solenoid valve electrical plug.

At the start of each campaign, or every 6 months, perform the following procedure to ensure the proper functioning of the machine's hydraulic controls:

- Clean the electro-hydraulic block thoroughly, without using water jets;
- Check for damage to the electrical plugs of the solenoid valves *(Figure 8.3)* and/or whether they are properly fitted and tightened;
- Check the integrity of the electrical cables;
- Check the electro-hydraulic block for leaks;
- Clean and lubricate the magnetic valves of the electro-hydraulic block as follows:

a) Unscrew the cover **(1);**

b) Remove the magnetic coil **(2);**

c) Unscrew the valve stem **(3)** and clean it thoroughly (compressed air gun);

d) Reassemble in reverse order;

c) Repeat the procedure on all valves.

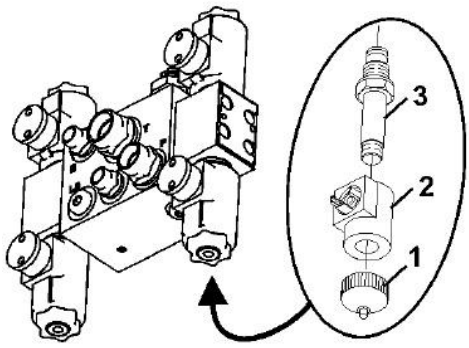


Figure 8.3 – Example: Solenoid valve.

Flow control valves or throttle valves *(Figure 8.4)* are responsible for regulating the speed of the spray boom's hydraulic actuators.

Check the condition of these valves regularly. If you detect any damage or leaks, have them replaced immediately.

If you detect, for example, that there is a difference in speed between the right and left arms of the spray boom, you must equalise the speed by adjusting the flow control valves.

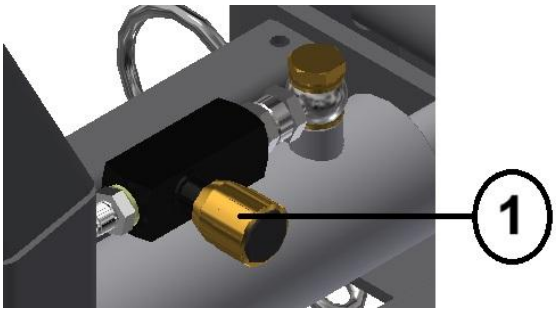


Figure 8.4 – Example of a flow control valve.

For safety reasons, the movements of the spray booms must be smooth.

The flow control valves are installed next to the spray boom actuators. The speed is adjusted on the flow control valves as follows:

- Turn the knob (1) to the right, clockwise, to decrease the speed of the actuator;
- Turn the knob (1) to the left, counterclockwise, to increase the speed of the actuator;

DANGER: Risk of injury due to uncontrolled actions caused by hydraulic oil in the hydraulic system under high pressure!

WARNING: Only a specialist workshop may carry out work on the hydraulic system.

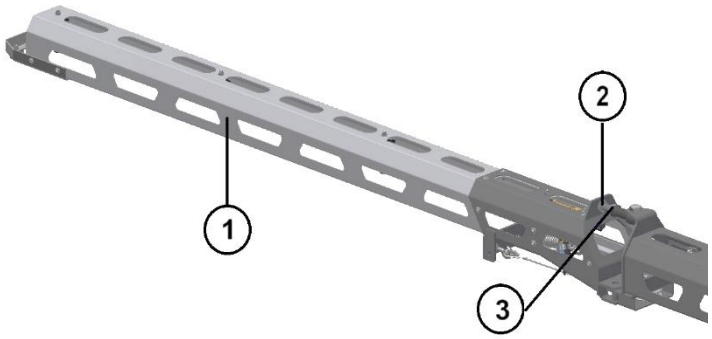
WARNING: In case of injuries caused by hydraulic oil, seek medical attention immediately. Risk of infection!

- **SPRAY BOOM**

Before starting work with the Sprayer, and after performing the verification and lubrication procedures described above, you must also check the parallelism of the boom in relation to the ground. On BRU and BRU EVO booms, to adjust the parallelism, proceed as follows:

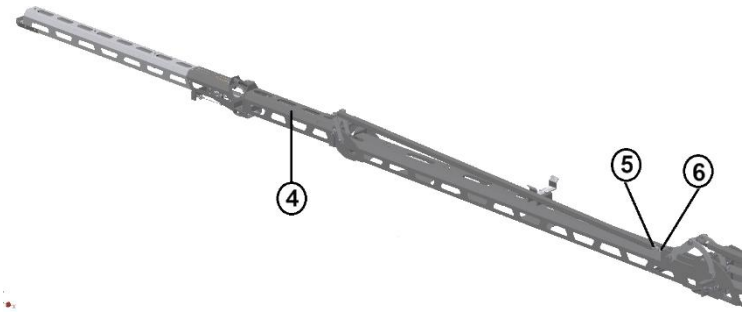
Boom end **(1)**

- Loosen the locknuts on **(2)** of the eye bolt on **(3)**;
- Tighten the screw on the eye bolt **(3)** to raise the section;
- Loosen the screw on the eyelet at **(3)** to lower the section.
- Once adjusted, retighten the lock nut.



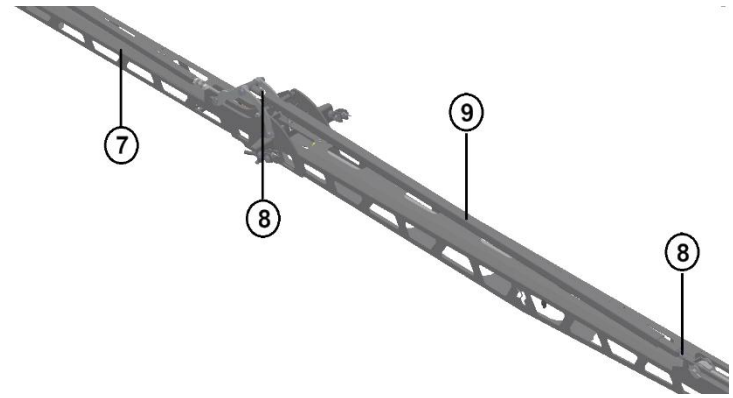
3rd section of the boom **(4)**

- Loosen the lock nut at **(5)** on the adjustment bolt at **(6)**;
- Shorten the bolt at **(6)** to raise the section;
- Lengthen the bolt at **(6)** to lower the section.
- Once adjusted, retighten the lock nut.



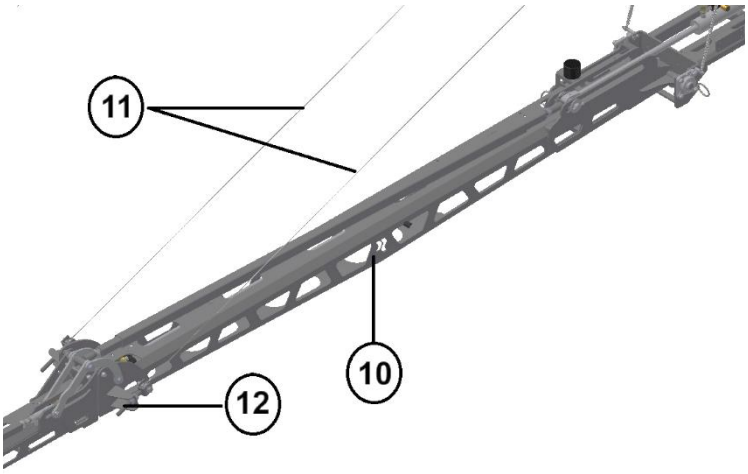
2nd section of the boom **(7)**

- Loosen the locknuts **(8)** on the adjustment bolts;
- Shorten (unscrew) the tie rod **(9)** to raise the section;
- Extend (screw in) the tie rod **(9)** to lower the section.
- Once adjusted, retighten the locknuts.



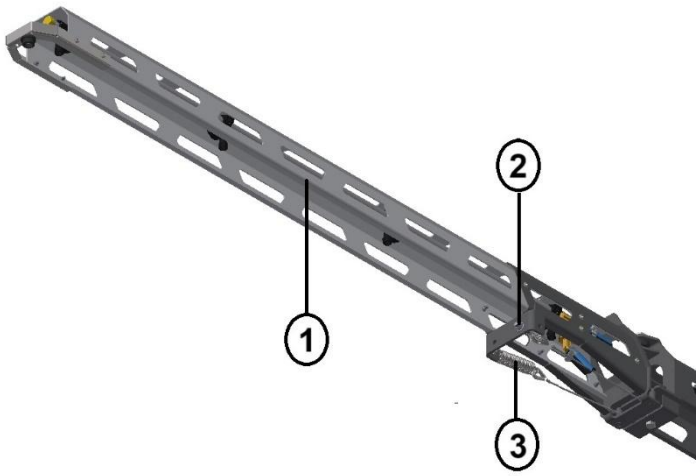
1st section of the boom **(10)**

- Loosen the lock nut **(12)** on the adjustment bolts;
- Tighten the nut at **(12)** on the tie rod to shorten the steel cable **(11)** and raise the section;
- Loosen the nut on **(12)** of the tie rod to lengthen the steel cable **(11)** and lower the section;



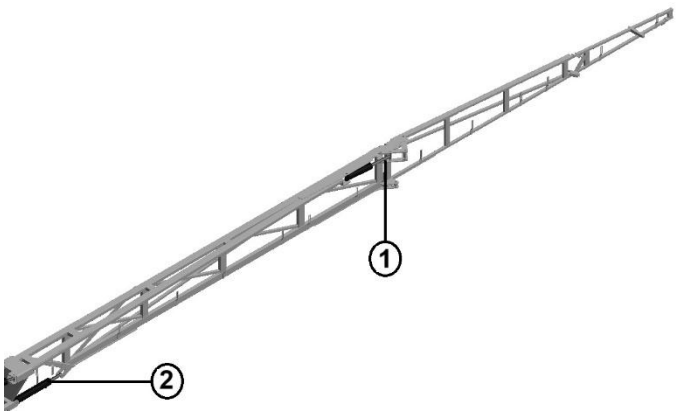
BRU and BRU EVO booms are equipped with an oscillating shock protection system at the end of the boom. To ensure the mechanism works correctly, check the spring tension regularly.
To adjust the mechanism, proceed as follows:
Boom end **(1)**

- Loosen the lock nut on **(3)** of the adjustment bolt;
- Tighten the nut at **(3)** to tension the spring **(3)** and position the mechanism correctly;
- Once adjusted, retighten the lock nut.



On BTL booms, to adjust the parallelism, proceed as follows:
Complete arm of the boom **(1)**

- Activate the hydraulic cylinder **(2)** to raise or lower the complete boom arm;



- **SPRAYER PUMP**

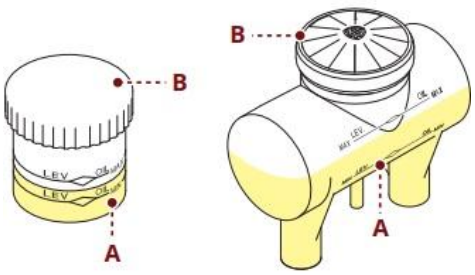
Wash the sprayer pump with a water jet before inspecting and/or maintaining it.

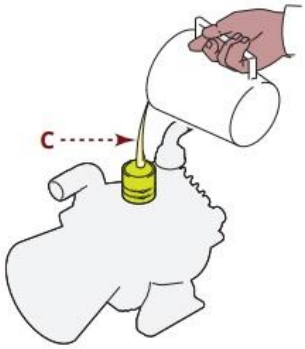
WARNING: Risk due to contact with chemical substances!

WARNING: Depressurise the pump circuit and switch it off before carrying out any work. Disconnect it from all power sources.

Checking the oil level in the sprayer pump is one of the items that should be checked every day. If necessary, top up the oil level. To top up the oil level, proceed as follows:

- Check the oil level in the pump, with the pump levelled and running normally for at least 5 minutes.
- If the oil level is outside the MIN and MAX limits, add or remove oil from the tank until the level is between the two indicators. Check again, while in operation, that the level remains within the limits.
- To top up the oil, remove the cap **(B)** and add oil **(C)** until the level is between the MIN and MAX limits **(A)**;
- Replace the cap **(B)**.





For more information on operation, maintenance and troubleshooting, please refer to the sprayer pump manual that should be supplied with the machine.

Do not forget to clean the pump after each use by pumping clean water through it for a few minutes.

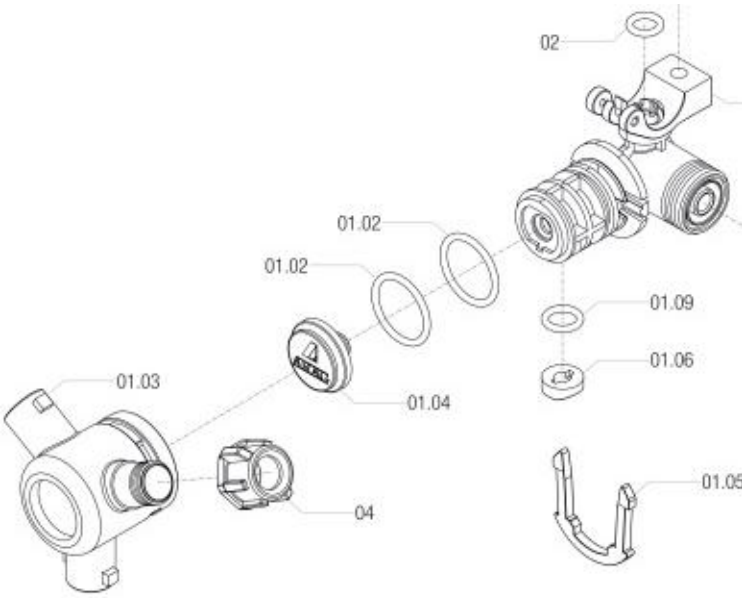
- **SPRAY NOZZLES**

Wash the spray nozzles with a water jet before inspecting and/or maintaining them.

WARNING: Risk due to contact with chemicals!

To clean the nozzle(s):

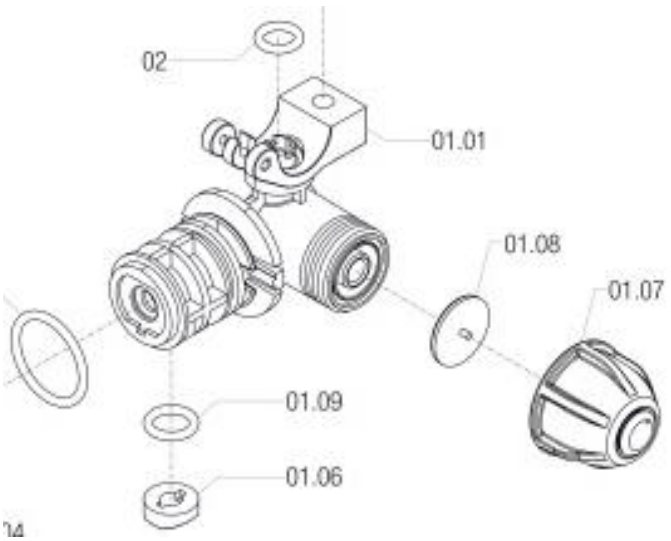
- To remove the nozzle, unscrew the bayonet nut **(4)**;
- Disengage the nozzle from inside the nut;
- Clean the nozzle with a water or air jet;
- Replace the nozzle if it is damaged;
- Refit the nozzle to the nut and tighten the assembly in the nozzle holder.



As a rule, the membrane should be cleaned when the nozzle drips after being turned off.

To clean the membrane(s):

- To remove the membrane, unscrew the nut **(01.07)**;
- Remove the membrane **(01.08)**;
- Clean the membrane using a water or air jet;
- If the membrane is cracked, replace it;
- Reassemble the membrane.



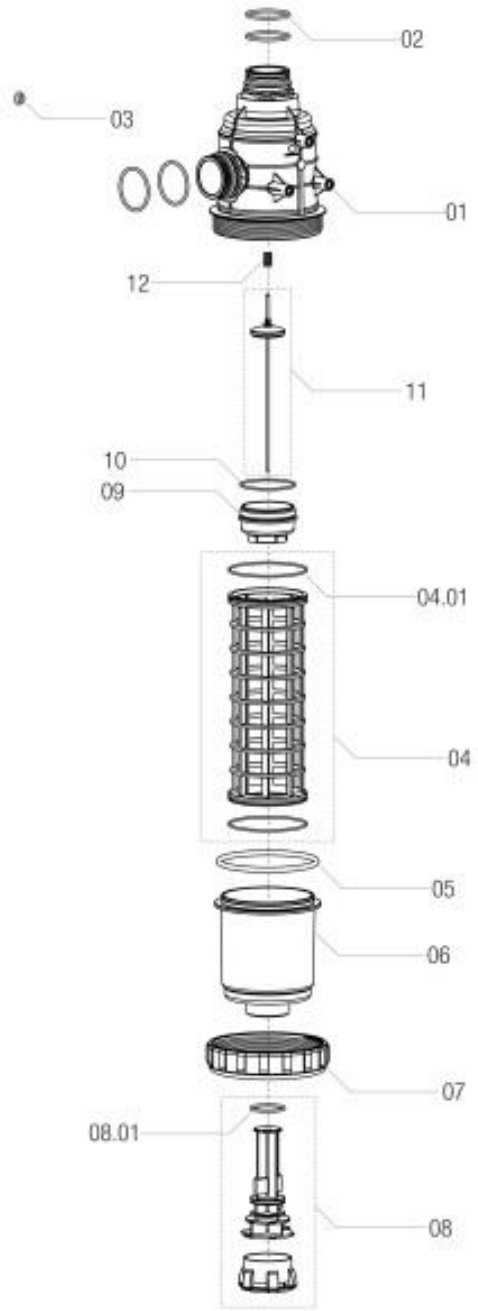
- **SUCTION FILTER**

Wash the suction filter with a water jet before inspecting and/or maintaining it.

WARNING: Risk due to contact with chemicals!

To clean the suction filter:

- Unscrew the nut **(07)** from the filter cover;
- Remove the filter element **(04)** from inside the filter body **(06);**
- Clean the filter element using a water or air jet;
- If the filter element is damaged, replace it;
- Check the condition of the seals;
- If any seals are damaged, replace them;
- Reassemble the filter.



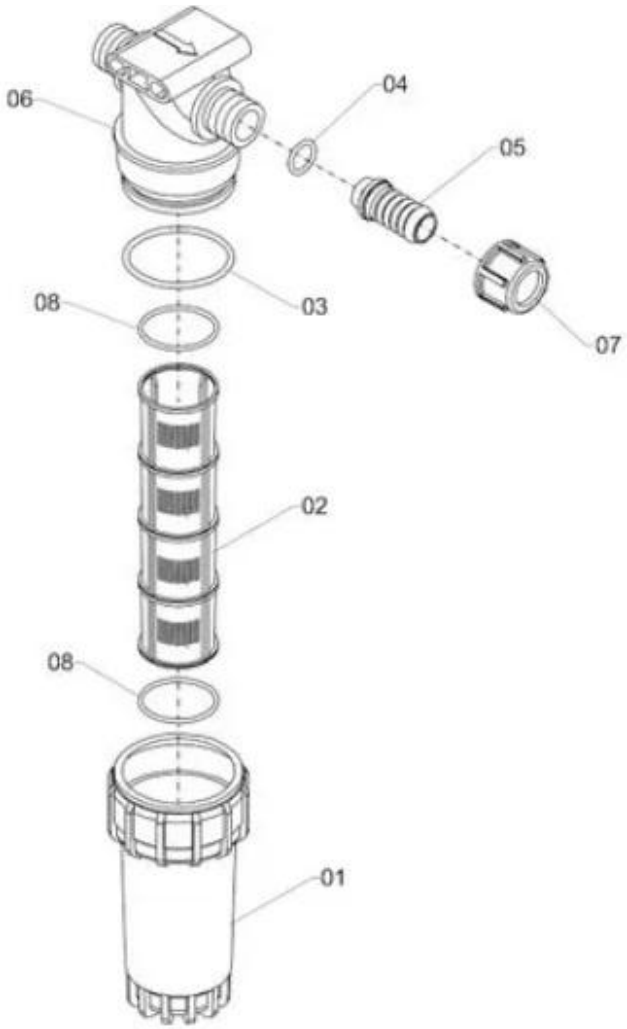
- **LINE FILTERS**

Wash the line filters with a water jet before inspecting and/or maintaining them.

WARNING: Risk due to contact with chemicals!

To clean the line filters:

- Unscrew the lower part of the filter body **(01)**;
- Remove the filter element **(02)** from inside the filter body**;**
- Clean the filter element using a water or air jet;
- If the filter element is damaged, replace it;
- Check the condition of the seals;
- If any seals are damaged, replace them;
- Reassemble the filter.
- Repeat the procedure for all filters in the spray boom.



- **REMOVING LIME SCALE FROM THE MACHINE**

Excessive limescale in the water, which varies from region to region, can cause problems in the sprayer's water circuit, such as the formation of crusts in the pipes and clogging of the spray nozzles.
Hard and very hard water are the types of water with the highest lime content and cause the most problems in machines.

WARNING: Risk due to contact with chemicals!

To clean and prevent the appearance of these elements in the sprayer circuit, we suggest that you perform the following procedure at least every 6 months:

- Clean the empty sprayer thoroughly;
- Fill the main tank of the sprayer with approximately 50 litres of clean water;
- Turn on the sprayer pump and activate the agitator;
- Add approximately 3 litres of liquid anti-scale descaler through the filling hole in the main tank;
- Circulate the mixture through the various internal circuits of the sprayer for about 10 minutes.
- Circulate the mixture and let it flow out through the spray circuit (make sure you wash all the nozzles).

The diluted mixture is harmless. You can drain the mixture onto the ground without having to take any special precautions.

Type of water	Calcium carbonate level
Soft	0-75 mg/l (CaCO3)
Medium-hard	75-150 mg/l (CaCO3)
Hard	150-300 mg/l (CaCO3)
Very hard	>300 mg/l (CaCO3)

Table 8.4 – Classification of water according to the presence of limestone

PROCEDURE IN CASE OF FAILURE CHAP9

When operating the CERES Sprayer, abnormal situations may arise that interfere with its correct operation or prevent it from working. The following table lists the most common situations and how to resolve them.

WARNING: Adjustments and fine-tuning should only be carried out by the operator, whenever possible with the tractor switched off and the ignition key removed.

FAULT	CAUSE	SOLUTION
No liquid comes out of the nozzles.	- The nozzles are clogged.	- Clean the nozzles (see page 92).
The pump does not suck.	- Obstruction on the suction side; suction filter clogged. - The pump is sucking in air.	- Check and clean the suction filter (see page 93). - Check the suction pipe connections; check for leaks in the suction circuit.
The pump delivers irregularly.	- Dirty filter element. - Valves stuck or damaged. - The pump is sucking in air (identified by air bubbles in the main tank).	- Check and clean the suction filter (see page 93). - Replace the valves. - Check the suction pipe connections; check for leaks in the suction circuit.
The flow rate at the jet outlet is not constant (the cone vibrates).	- Irregular flow rate at the pump outlet. - Pipes with very tight bending radii (bends, creases).	- Check valves in the suction and pressure circuits; - Check the position of the pipes; reposition pipes.
Mixture of oil and syrup in the pump oil filler nozzle.	- Damaged pump membrane.	- Have the pump membranes replaced (refer to the pump instruction manual).

Table 9.1 – Procedures in case of malfunction

BREAKDOWN	CAUSE	SOLUTION
The required amount of spray mixture is not being applied.	- The pre-set tractor forward speed has been increased; - The preset pump rotation speed has been reduced;	- Reset the tractor's forward speed to the present value; - Readjust the pump rotation speed to the predetermined value;
The pressure at the nozzle outlet has been altered.	- Tractor forward speed changed from the preset speed;	- Readjust the tractor's forward speed to the predetermined value;
Excessive vibrations or noise.	- Play in the Cardan cross joints due to excessive wear; - The cardan shaft is not correctly assembled - Looseness in the spray boom structure. - Lack of lubrication in the joints of the spray boom arms. - Damage to the boom joints.	- Replace the cross joints according to the instructions in the Cardan manual; - Check the length and working angle of the Cardan shaft. (see page 20). - Check the tightness of the screws in the spray boom structure. - Lubricate the boom components (see page 80). - Have the boom joints repaired/replaced.
The spray boom arms do not open/close. **Or,** **The spray boom lift does not raise/lower.**	- Mechanical jam between boom elements. - Lack of pressure in the oil-hydraulic circuit. - Leak in the hydraulic pipe joints.	- Check for any jamming/collision between boom elements or foreign objects. - Check the setting of the pressure relief valve on the tractor's oil-hydraulic circuit (refer to the tractor's instruction manual). - Have the damaged elements replaced.
The machine's hydraulic movements are too slow/too fast.	- Actuator flow control valves are incorrectly adjusted.	- Check the adjustment of the flow control valves (see page 88).
The machine's hydraulic movements are not constant (command signal failure)	- Control device incorrectly connected. - Dirty solenoid valves.	- Check the connection of the control devices, power supply and control cable plugs (refer to the control device instruction manual); - Clean the solenoid valves (see page 87)

Table 9.1 – Procedures in case of malfunction

TRANSPORTATION, HANDLING AND STORAGE CHAP 9

Transporting or handling the CERES Sprayer when it is not attached to the agricultural tractor is an operation that requires certain precautions. **Before transporting the machine, pay attention to the following warnings.**

- **SAFETY WARNINGS**

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

DANGER: Use appropriate means of transport and lifting devices that comply with standards and are in good condition.

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

WARNING: Determine the transport route in advance and remove any possible obstacles.

WARNING: Check the operability of all devices to be used.

WARNING: Protect all devices that may cause danger, even if they are only used for a short period of time.

CAUTION: Always move the equipment when empty and with care.

DANGER: Ensure the stability of the machine during movement or transport. Adjust the length of the cables or straps, if necessary, to ensure stability.

DANGER: Transport the machine as close to the ground as possible.

DANGER: Carefully place the machine on the loading platform of the transport vehicle or on firm ground.

- **OFF-SEASON MACHINE STORAGE**

When the spraying season ends, and before storing the sprayer, certain aspects must be taken into account in order to prolong the life of the machine. Residues from chemical products can seriously damage certain components of the machine.

WARNING: Risk due to contact with chemical substances!

To keep the sprayer operational and its components intact, we suggest you follow this procedure:

- Thoroughly clean the empty sprayer, inside and out;
- Ensure that all elements of the water circuit are properly washed with detergent and rinsed with clean water (see page 63 of this instruction manual);
- Replace any damaged seals and repair any leaks;
- Completely drain the clean water from the main tank, water circuit, nozzles, etc.;
- Be careful not to let the pump run dry for more than 3 seconds. This can seriously damage the pump;
- Also drain the water from the clean water tanks;
- Pour a mixture of approximately 50 litres of antifreeze into the main tank, consisting of 1/3 car antifreeze and 2/3 clean water;
- Run the liquid through the entire water circuit and let it out through the spray nozzles. The antifreeze also prevents O-rings, seals, diaphragms, etc. from drying out;
- Lubricate all lubrication points, regardless of the intervals indicated (see page 80 of this instruction manual).
- When the sprayer is dry, remove rust from any scratches or damage to the paintwork and touch up the paintwork;
- Remove the glycerine pressure gauges and store them in an upright position;

- Apply a thin layer of anti-corrosion oil (e.g. SHELL ENSIS FLUID, CASTROL RUSTILLO or similar) to all metal parts. Avoid applying oil to rubber parts, hoses and tyres.
- Place the traction pull in the transport position and relieve the pressure in the oil-hydraulic circuit.
- Remove the control devices and computer screen from the tractor and store them in a dry, clean place (indoors). A condensation-free environment is recommended;
- Clean the quick-connect valves of the oil-hydraulic circuit and put the dust protection CHAPs on;
- Apply grease to all hydraulic cylinder rods that are not fully retracted inside the tube to protect against corrosion;
- Apply protective liquid to the tyres to prevent the rubber from drying out;
- If possible, cover the sprayer with an oilcloth or plastic to protect it from dust and moisture;
- Ensure that the place where you store the sprayer is sufficiently dry and ventilated.

- **PREPARING THE SPRAYER AFTER OFF-SEASON STORAGE**

After storage, the sprayer must be prepared for a new working season as follows:

- Remove the cover;
- Adjust the tyre pressure;
- Clean any grease or lubricating oil applied to metal surfaces;
- Reinstall the pressure gauges. Seal them properly with Teflon tape;
- Couple the machine to the tractor and switch on the control devices;
- Check all electrical and hydraulic functions;
- Empty any antifreeze still stored in the tank and remaining circuit;
- Clean the entire circuit with clean water;

DISMANTLING THE MACHINE CHAP 11

- **ENVIRONMENTAL RESPONSIBILITY**

Environmental protection is an increasing concern for machine and equipment manufacturers. The selection of recyclable materials, the use of biodegradable lubricants and the focus on building increasingly energy-efficient machines are some examples of this responsibility.

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

- **DECOMMISSIONING OF EQUIPMENT**

At the end of its useful life, **do not abandon this equipment in the environment**. In addition to contributing to environmental pollution, **you are endangering people and animals**.

When 'disposing' of the machine, you must take into account the environmental standards in force with regard to the environment and the recycling of the materials it contains.

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

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