Machine manual

Orvin Baby Compact Tower Sprayer

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MOUNTED AND TRAILED SPRAYERS

USE AND MAINTENANCE MANUAL

- General information

Please read this use and maintenance manual carefully before performing any intervention on the machine.

1.1 - Typographical conventions

This manual is subdivided into chapters and sub-chapters with progressive numbering. Furthermore, we have adopted the following conventions in order to facilitate the individuation of the information:

shaded box	the information inside the box is very important for the correct use of the machine
highlighted text	descriptions that must be read with utmost attention
normal text	descriptions

1.2 - Aim of the manual

This use and maintenance manual has been drawn up by the Manufacturer and is integral part of the machine. It contains information concerning the use of the machine together with the safety rules to adopt.
Instructions are addressed to a professional user who must be able to drive the tractor to which the machine is connected. The user must be able to handle agrochemical products.
Follow the instructions in order to guarantee the safety of the operator and other persons and to ensure the perfect operation of the machine itself.

THIS USE AND MAINTENANCE MANUAL MUST BE KEPT THROUGHOUT THE OPERATING LIFE OF THE MACHINE.

1.3 - Machine identification label

Each machine is equipped with an aluminium identification label placed on the front side of the machine. It shows the EC mark (indicating that the machine complies with the regulations in force), together with the information required for the identification of the model, the year of manufacture, the serial number (it is necessary when spare parts are requested), weight (in kg).
We recommend the use of original spare parts.
The Manufacturer shall not be liable for any harm to people or damage to things owing to non-authorized modifications.

Identification label

1.4 – Description of the machine

The machines described in this manual are commonly called sprayers. They are engineered for the application of agrochemicals (fluid mixture) to cultivation. They are formed by the following components:

- main tank containing the mixture to spray
- additional tanks for hand-washing and circuit-cleaning
- fluid filtering system
- pump
- control unit
- nebulizing nozzles
- fan for the distribution of the drops on the target
- control levers

1.4.1 - Tanks

According to the models, tanks are made of fibre-glass reinforced polyester or polyethylene.
The main tank, that contains the mixture of water and agrochemicals, has a top opening for filling. The cap has a blocking system when it is closed. Inside the opening there is a basket strainer with synthetic meshes. It traps particles that can compromise the operation of the machine.

ALWAYS USE THE BASKET STRAINER WHEN INTRODUCING ANY FLUID INTO THE TANK.

The bottom of the main tank is shaped in such a way that it allows the total emptying even when the machine is leaning. The auxiliary tanks are placed in different positions according to the models, and they should only contain clean water. The smaller tank (15 litres capacity) holds water for the operator cleaning; it allows the operator to wash himself immediately if he should come into contact with the product used. It has a lever on the tap so that it could be left on.
The capacity of the circuit cleaning tank is proportional to the main tank and must be used for pouring the fluid out the pipes at the end of the treatment, or before performing any intervention on the pipes. For washing procedure read the pertinent chapter.

ALWAYS FILL THE AUXILIARY TANKS BEFORE EVERY TREATMENT.

1.4.2 – Filters

Besides the mentioned filter inside the top opening, the machine has other filters on the suction-pump circuit and the pipes connecting the control unit to the nozzles.
The suction filter is on the pipes connecting the main tank to the pump and a special device allows its dismantling even when the tank is full. Its function is to trap big particles that could arrive to the pump, block the operation and increase the machine wear.
The filters on the fluid-carrying pipes (conducing to the nozzles) have a finer mesh; they trap those particles suspended in fluid that could obstruct the nozzles and reduce the efficiency of the nebulizing system.

THE FILTERS NEAR THE NOZZLES SHOULD HAVE A MESH PROPORTIONAL TO THE NOZZLE SIZES.

For filter cleaning and maintenance read the proper chapter.

1.4.3 – Pump

According to the models, it could be a piston-diaphragm pump or a piston-pump. It sucks fluid from the tank (main or auxiliary tank according to the position of the adjusting valves) through the filter mentioned and produces an internal pressure. The pressure supplied to the fluid is set either by the position of the pressure regulator or the rotation rate of the pump. The piston-diaphragm pumps are equipped with an airdraulic compensator that reduces the variations in pressure due to the alternating motion of the pump. The pump can be worked by the cardan shaft connected to the tractor, or by a cog belt (in some models).
For the pump maintenance, follow this manual and the pump use and maintenance manual enclosed.

1.4.4 – Control unit

It could be mounted either on the machine or a movable board placed near the driver's seat. It can be worked by a manual, mechanical or electric control (by special cables).
It receives the pressurized fluid from the pump and sends a part of it to the nebulizing group; the liquid in excess is sent back to the tank. The pressure inside the nebulizing circuit can be adjusted by a handle placed on the control unit. Special levers control the supply and side of distribution (left-hand or right-hand side).

1.4.5 - Nozzles

They are mounted on the nebulizing unit. They produce a mechanical subdivision of the pressurized liquid sent by the pump and nebulize it into fine drops. They usually are jetting nozzles and produce a conical jet.
Near the nozzles are installed some anti-drip devices, that hinder the fluid from dripping when the distribution is interrupted. The quantity of fluid expanded can vary according to the nozzle dimensions.

1.4.6 - Fan

It produces a stream of air that helps the drops passing through vegetation. It is placed on the rear side of the machine and is moved by a multiplier group connected to the P.T.O (power take off) of the tractor. According to the models, the air suction occurs on the rear side (**Athos, Drag** series),

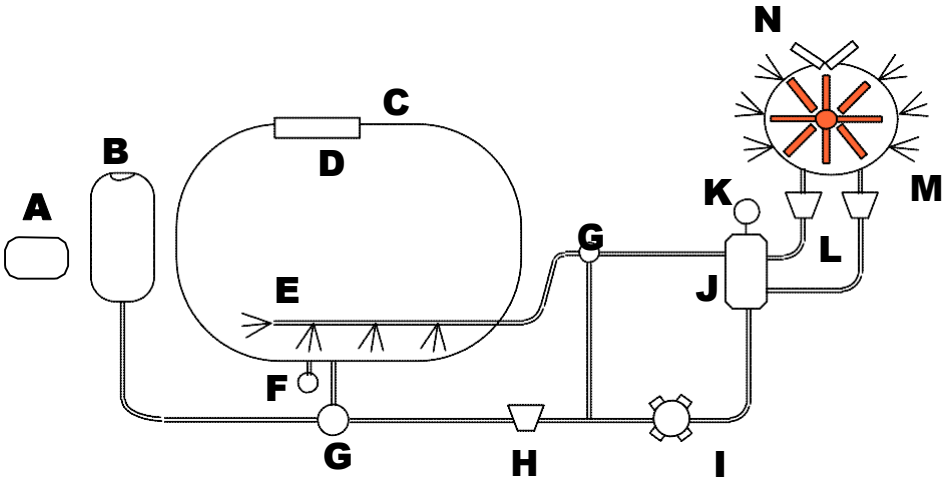
the front side (γ series) or on both sides (**K** series). In this case there are two contra rotating propellers.

1.4.7 - Pressure gauge

It measures the pressure inside the distribution group; on the basis of that it is possible to verify the correct operation of the machine.

1.4.8 - Hydraulic circuit

The following figure shows the position of the different components of the sprayers, but it does not refer to their real position. The arrangement of the different components changes according to the models and setting of the sprayers.



A	Hand-washing tank	**H**	Suction filter
B	Circuit-cleaning tank	**I**	Pump
C	Main tank	**J**	Control unit
D	Basket strainer	**K**	Pressure gauge
E	Shaking system	**L**	Carrying filter
F	Drain valve	**M**	Nozzles
G	3-way valve	**N**	Fan

1.5 – Operational conditions

The sprayers mentioned in this use and maintenance manual are addressed to the distribution of agrochemical products to the crops. For this application it is necessary to follow the precautions described in their labels, especially for the quantity to distribute, period of application and type of cultivation.

ANY OTHER USE OF THE SPRAYERS IS FORBIDDEN.
NEVER USE THE FOLLOWING PRODUCTS:

- paints and solvents of every kind
- inflammables
- foodstuffs
- mixture of other chemicals

The manufacturer shall not be liable for damages caused to things, people and the machine itself due to the improper use (not foreseen by the manufacturer) or the non-observance of the safety rules.

1.6 – Work station

The sprayer has not a work station; it is connected to the tractor that transfers the motion, by the PTO shaft, for the operation of the pump and the fan. It could also transfer the pressurized hydraulic liquid that is necessary for the operation of special accessories.
The operator's work station is in the cab: here the operator can easily use the machine controls and adjusting devices.

1.7 – Noise emission level

During specific tests, the sound level to which the operator has been exposed is higher than the noise produced by the tractor (of nearly 3 dB).

1.8 – Vibrations

In the use and maintenance conditions foreseen by the manufacturer, the level of vibrations produced by the machine is very low if compared to the vibrations of the tractor.
The operator shall take some precautions in order to avoid harmful effects for his health.

1.9 – Service life of the sprayer

Under stable operational conditions, the duration of the machine that has been estimated by the manufacturer is 3,000 hours of operation.

1.10 – Demolition of the machine

If the machine is in bad wear conditions such as to compromise its functionality and safety, it must be demolished by a company authorized in demolition.
Refer to specialized companies for the disposal of the oil of the hydraulic circuit.

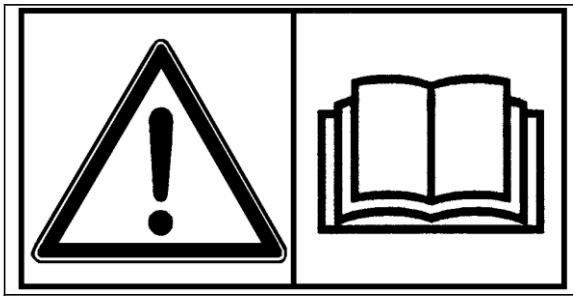
– Safety instructions

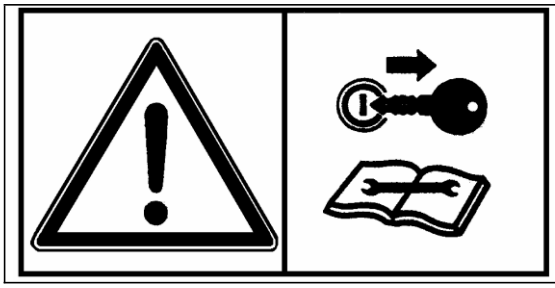
Never tamper with the safety devices of the machine.

2.1 – Labels and safety signals

On the machine there are some labels warning about the risks that may occur (symbol on the left) and the precautions the operator shall adopt (symbol on the right).

Make sure that all the labels and warnings are readable and in good conditions. On the contrary please proceed to their replacement.

	Look up the use and maintenance manual before carrying out any operation.

	Switch off the engine of the tractor and remove the ignition key before carrying out any interventions on the machine

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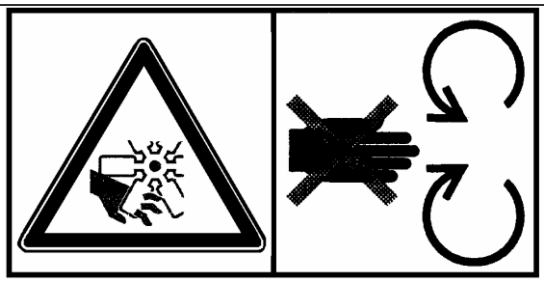
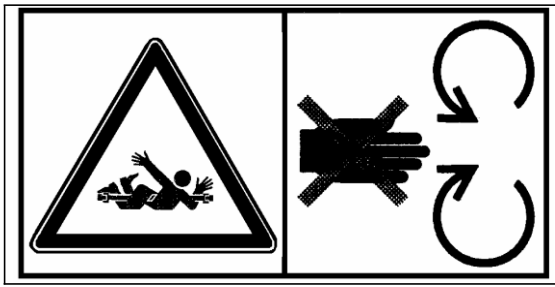
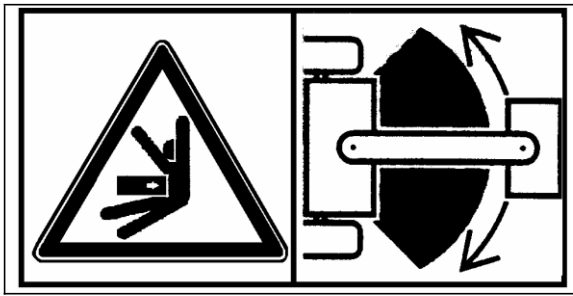
	Max rotation rate of the P.T.O. of the tractor: 540 rpm.
	Danger: fan in motion. Stay at safety distance
	Danger of contact with the rotating PTO shaft. Stay at safety distance
	Danger of crushing against the machine during the hydraulic drawbar motion. Stay at safety distance.

2.2 – Protective devices for the operator

The machine is engineered for the distribution of agrochemicals that may be harmful for man. So, the operator shall take the necessary precautions in order to avoid contamination and environmental waste of harmful substances. Moreover, the operator shall respect the indications given by the producer of those agrochemicals.
During the preparation of the mixture the operator shall wear appropriate personal protections: waterproof gauntlet, shoes and overalls, and a charcoal mask. Personal protections can vary according to the harmfulness and toxicity of the product. During the distribution it would be better to use a tractor with a cab with air filtration. If it is not possible the operator shall wear the mentioned personal protections even during the distribution.

The non-observance of these safety rules will be considered as improper use by the manufacturer.

2.3 – Safety rules concerning the operation

- do not use pipes and levers as handhold
- start up all the safety devices foreseen by the manufacturer before leaving the machine unguarded
- do not permit people to approach the machine when it is operating
- do not use the machine without the protections supplied by the manufacturer
- do not operate when the safety devices are deactivated or not operating
- do not use the machine as means of transport or trailer
- do not use the machine on steep fields
- during road circulation, use the appropriate devices requested by the highway code of your country
- do not use the tools contaminated by the chemical product for other purposes
- do not get in the tank, for any reason.

2.4 – Safety rules concerning adjustment and maintenance

- do not permit to non-authorized people to repair or perform maintenance or other interventions on the machine
- special maintenance and repairs must be carried out by an authorized garage with appropriate equipment
- any modifications must be carried out only after the manufacturer's approval.

– Handling and carriage

This chapter concerns exclusively the transport of the machine for any other causes different from the distribution of agrochemicals to the crops.

Never move the machine when the tank is full.

Lifting and handling operations shall be carried out by appropriate means and qualified hands.

If the machine must be moved by a different means (not a tractor) for which it has been engineered, please act in the following way.

3.1 – Mounted sprayers

If possible, place the machine on a pallet, fix it adequately and move it by means of a lift truck. If this is not possible, and it is necessary to lift the machine by means of a crane or an overhead traveling crane, fasten tight the machine with belts having an adequate lifting strength. The lifting ropes should be connected to the 3-point coupling and the fan unit. As for series **K**, connect the ropes to the upper pipes of the tower; for series **Athos**, it is necessary to wrap the whole fan unit.

3.2 – Trailed sprayers

If possible, transport the machine by means of a lift truck; insert the forks one before and one behind the sprayer wheel. If this is not possible, and it is necessary to lift the machine by means of a

crane or an overhead traveling crane, it is essential to fasten the machine with belts having an adequate lifting strength. The lifting ropes should be connected to the drawbar and the fan unit. As for series **K**, connect the ropes to the upper pipes of the tower; for series Athos, it is necessary to wrap the whole fan unit; for series γ connect the lifting ropes to the chassis extension near the fan intake.

– Use of the sprayer

4.1 – Control levers and adjustment

4.1.1 – Mounting the machine

4.1.1.1 – Drawbar length

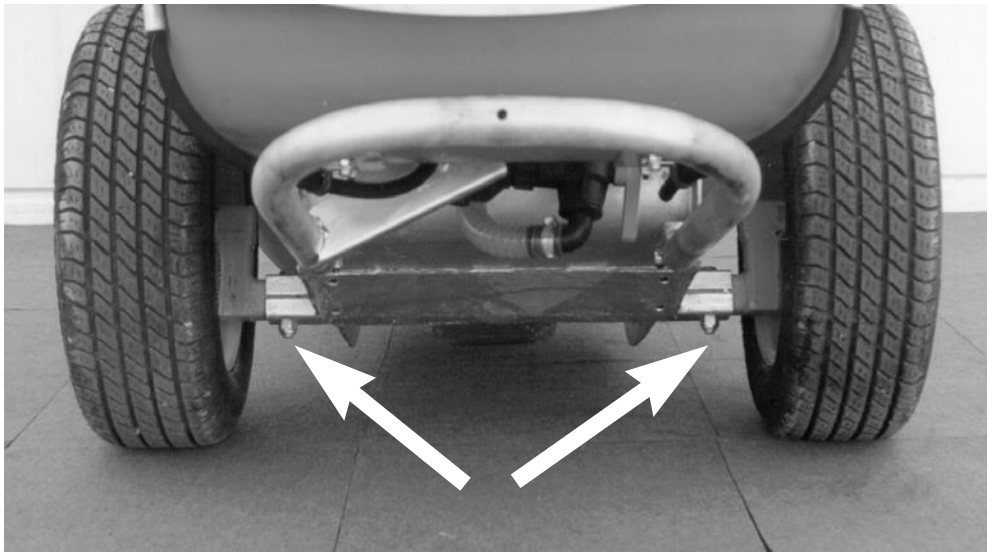
As for trailed sprayers, the length of the drawbar is adjustable. Adapt the drawbar length according to the length of the hauling structure of the tractor, so that it does not hit the tank when turning.
Proceed as follows:

- operate when the sprayer is unhooked from the tractor
- make sure the wheels are blocked by special wedges
- loosen bolt **A**
- remove bolt **B**
- run the movable part of the drawbar and insert bolt B in holes **1** and **2**
- fix bolt **B**
- fix bolt **A**
- within the first minutes of operation verify that bolts A and B are still well tightened.

4.1.1.2 – Tread width (outside tire-to-tire dimension)

On request, trailed sprayers can be supplied with special hubs for increasing or decreasing the distance from the ground.
For the tread width regulation it is necessary to remove the bolts fixing the hub on the axle.
Proceed as follows:

- block one of the wheels
- lift the other side of the machine as far as the wheel is raised from the ground
- place some safety supports under the chassis in order to avoid accidental falls of the machine
- remove the bolt fixing the hubs to the axle
- run the hub as far as the width required
- coincide with the fixing hole
- re-insert the fixing bolt and tight it till the bottom
- pull down the machine
- repeat the operation on the other side

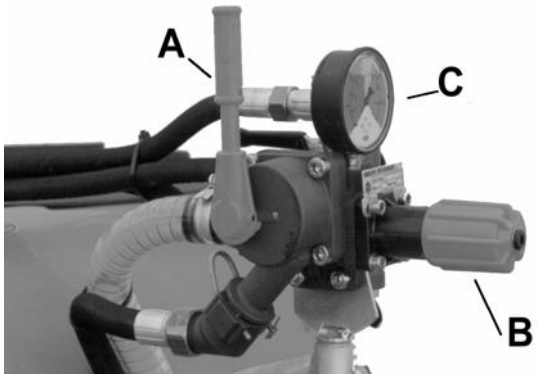


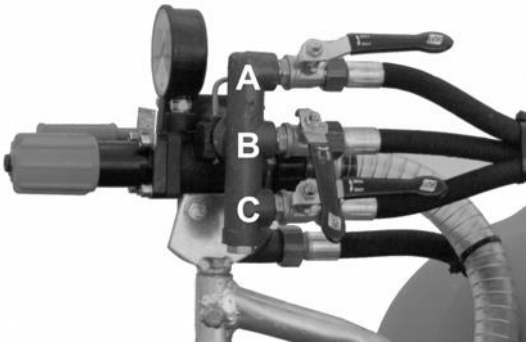
4.1.1.3 – Position of the joints

On mounted sprayers it is possible to adjust the position of the lower pivot pins. Proceed as follows:

- unscrew the fastening nut of pivot pin **A**
- unthread the pin and insert it in holes **1** or **2**
- fix the fastening nut.

4.1.2 – Adjusting the spray application





This is the most important aspect for a correct treatment.

According to the models and the arrangements, the position and the structure of the adjusting unit can vary, but the main components are the same in every group. Precisely:

- the general control lever – it allows to completely release the pressure from the circuit and stop the nozzle delivery (**A sx**)
- pressure regulating handle (**B sx**)
- pressure gauge – it indicates the pressure in the distributing circuit – **whilst the machine is operating, this is the instrument that indicates the operator the distribution efficiency (C sx)**
- distribution control levers on both sides and levers for optional services (**A,B,C dx**).

4.1.2.2 – Pressure control

Turning the control handle clockwise, the pressure inside the distributing circuit increases, otherwise it will decrease. During the distribution (at a constant engine rate) the pressure should be stable. Any drop or oscillation reveals failures on the hydraulic circuit of the machine. In this case it is necessary the intervention of qualified hands for failure individuation.

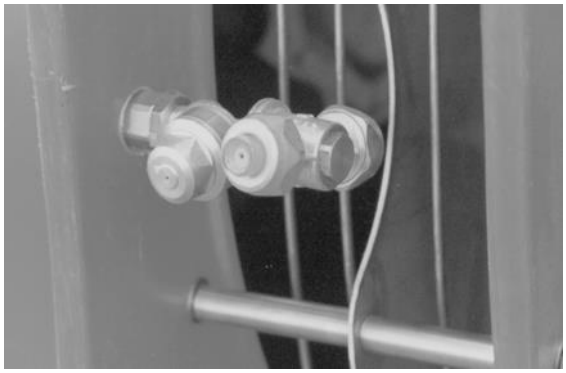
4.1.2.3 – Application process

The general control lever opens or closes the distributing circuit at the end of the area to treat.

Cut off the product distribution whilst turning: you will minimise the waste of product and avoid environmental contamination.

4.1.2.4 – Nozzles control

Each nozzle on the machine can be disconnected in order to avoid spreading liquid beyond the area of targeted vegetation.
The nozzle is open (it can supply) when it is outwardly turned; it is closed if it is rotated of 90°.



open

closed

4.1.3 – Air-stream control

The stream of air produced by the machine must be adjusted in order to be targeted to the area to treat. The wrong adjustment of the flow direction can cause a loss of efficiency. Moreover, it is necessary to adjust the air-flow intensity, by operating the suitable device. The intensity should be set according to the dimensions of the vegetative area. Higher intensity is necessary when the vegetation is considerably developed.

Perform every adjustment whilst the engine of the tractor is switched off.

4.1.3.1 – Position of the fins

The distribution units of all the machines have 4 steering fins, used to target the stream of air to the direction required. 2 of them are placed in the upper side and must be adjusted in function of the height of the plants. The others are near the lower side of the air output and are used to regulate the distance of the jet from the ground.

The fins are fixed and keep the position given by the operator. If the adjustment of the fins requires a big effort, loosen slightly the bolts fixing the fins on the chassis. On the contrary, if the fins do not hold the position, tighten up the bolts.

4.1.3.2 – Fan rotation speed

The fan rotation rate varies according to the rotation speed of the P.T.O. of the tractor and the technical characteristics of the machine. The operator can adjust the fan rotation speed by regulating the P.T.O. speed or (for the machines that are equipped) varying the fan velocity ratio. The models equipped with gear offer 2 different fan speeds. To select one of them apply the appropriate control lever near the gear box. This control lever has a central position – neutral – and 2 positions corresponding to the different speeds.
Proceed as follows:

- switch the engine off, apply the hand brake and remove the ignition key
- select the speed required
- help the engagement by rotating manually the PTO shaft.

Never operate the gear lever as long as the fan has stopped.

The P.T.O shall never exceed 540 rpm.

4.1.3.3 – Fan blades angle

As for the fans equipped with reclining propeller it is possible to vary the flow rate by reclining the fan blades. Proceed as follows:

- switch off the engine of the tractor, apply the hand brake and remove the ignition key
- insert the provided key in the central part of the propeller hub
- turn clockwise to increase the blades inclination or anticlockwise to decrease the inclination
- when the inclination required is obtained (the blades have a nick-mark), take out the key. The system is self-locking.

Do not perform any intervention on the blades adjusting system as long as the fan has stopped.

4.2 – Connecting the sprayer to the tractor

4.2.1 – Mounted sprayers

Before connecting the sprayer to the tractor, make sure that the tractor has an adequate horsepower and a sufficient mass in order to avoid overturning when the tank is full.

The total weight of the tractor and the sprayer (with full tank) should be allocated on the front axle of the tractor for at least 20%

During the connection to the tractor make sure that there are no persons between the tractor and the sprayer.

- Check the diameter of the pivot pins on the machine and the diameter of the poppets of the tractor; if necessary use appropriate adapter axle boxes
- Place the lower lifting booms of the tractor to the height of the lower pivot pins of the machine

- Move back with the tractor in such a way that the holes of the booms coincide with the pivot pins of the machine
- Apply the hand brake, switch the engine off and remove the ignition key
- Hook the 2 booms to the pivot pins of the machine and insert the spring clips in the holes of the pins
- Connect the boom of the 3-point coupling to the sprayer with the appropriate pin
- Adjust the length of the 3-point coupling in such a way that the machine is parallel with the ground
- Switch the engine on and lift the machine
- Adjust the tension rods of the lower lifting booms in such a way that the sprayer is at the centre of the tractor; block the tension rods to avoid lateral oscillations
- Adjust the position of the control unit in such a way that it does not interfere with the tractor during lifting operations and is easily accessible to the operator when he is in the driver's seat.

Always insert the safe clips to avoid the accidental disconnection of the booms from the pins. Do not use nails, bolts or clips of inadequate dimensions.

4.2.2 – Trailed sprayers

Before connecting the sprayer to the tractor, make sure that the tractor has an adequate horsepower in order to avoid hauling problems.

During the connection to the tractor make sure that there are no persons between the tractor and the sprayer.

- Set the height of the support foot in such a way that the lunette of the machine coincides with the pulling devices of the tractor
- Move back with the tractor in such a way that the hole of the pulling device coincides with the lunette of the machine
- Apply the hand brake, switch the engine off and remove the ignition key
- Insert the pivot pin and its spring clip
- Lower the support foot and slip it out
- Remove the wedges from the wheels
- Set the control unit

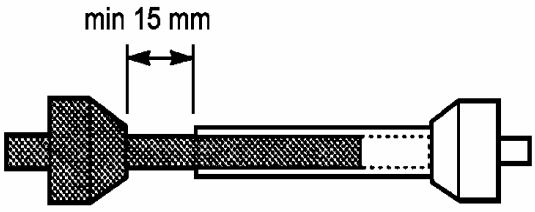
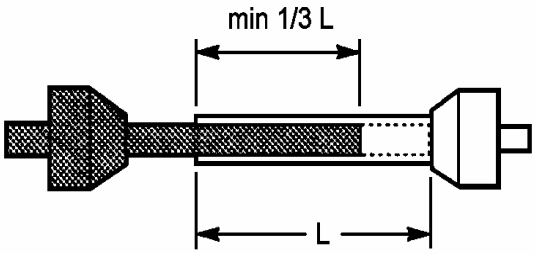
Always use connecting pins of adequate dimensions and always insert the spring clip.

4.2.3 – Connecting the PTO shaft

The tractor must be equipped with P.T.O. and a 6-splines 1"3/8 shaft, with a nominal rotation rate of 540 rpm.
The PTO shaft must have the EC mark as it is a potentially dangerous component.

Perform the connection whilst the tractor is off and the P.T.O. is disengaged.

The length of the PTO shaft must be such as to avoid any risks of jibbing in condition of minimum extension, or risks of excessive slipping in condition of maximum extension.

	
In condition of minimum extension, there must be a distance of 15 mm between the 2 elements of the PTO shaft.	In condition of maximum extension, the overlapping of the 2 elements of the PTO shaft must be equal to at least 1/3 of their length.

- Apply the hand brake, switch the engine off and remove the ignition key
- Connect one of the tips of the PTO shaft to the sprayer. Keep pressed the button on the mouth, insert the sleeve of the PTO shaft on the splined shaft of the machine. Release the button and run to and fro till the button hooks the proper seat (this operation can be performed before connecting the sprayer to the tractor)
- Repeat this operation connecting the other tip of the PTO shaft to the P.T.O.
- Make sure that the fixing buttons are correctly placed
- Anchor the chains hindering the rotation of the safety protections.

Never work with the PTO shaft leaning of more than 30°. If it is necessary to get over this tilts, use a constant-velocity universal joint.

Never operate when:
- the P.T.O. protection
- the PTO shaft protection
- the fixed protection on the shaft of the pump
are missing or damaged.

4.2.4 – Electric connection

If the machine is equipped with lights for road circulation, connect them to the plug of the tractor and verify if they work correctly.
For the machine equipped with electric control unit it is necessary to connect the connector of the control board to the 12V plug on the tractor. If the tractor is not equipped with this plug, install the plug supplied with the machine. This intervention must be carried out by qualified hands.

4.2.5 – Hydraulic connection

For the machines equipped with hydraulic adjusting devices it is necessary to connect the pipes to the tractor. The machines have ½" tap couplings; any different coupling can be supplied on request. The connection mode vary according to the plant of the tractor. Look up the instructions manual of the tractor.

4.3 – Preparation of the mixture

During the following operations the operator shall wear appropriate personal protections.

- Value the quantity of water and agrochemical product to pour in the main tank, following the instructions suggested in the proper chapter
- Put the machine on an even surface in such a way that the scale indicating the quantity of liquid provides the right indication
- Pour out 80% of the water required in the main tank
- Pour out the agrochemicals in a bucket with water and mix them
- Pour out the agrochemicals in the tank through the basket strainer
- Fill up the tank in order to achieve the quantity of mixture required
- Fill up the auxiliary tanks
- Work the agitation system for at least two minutes. Proceed as follows:
  - Shut the valves carrying the liquid to the distribution booms
  - Turn on the valve of the agitation system (if the hydraulic agitation system works with Venturi tube)
  - Make sure that the 3-way valve **V1** allows the fluid suction from the main tank
  - Make sure that the 3-way valve **V2** sends back to the main tank the fluid coming from the control unit
  - Switch on the pump with a rotation rate between 450 and 540 rpm. During this operation it is advisable that the fan be disengaged, in order to avoid waste of fuel.

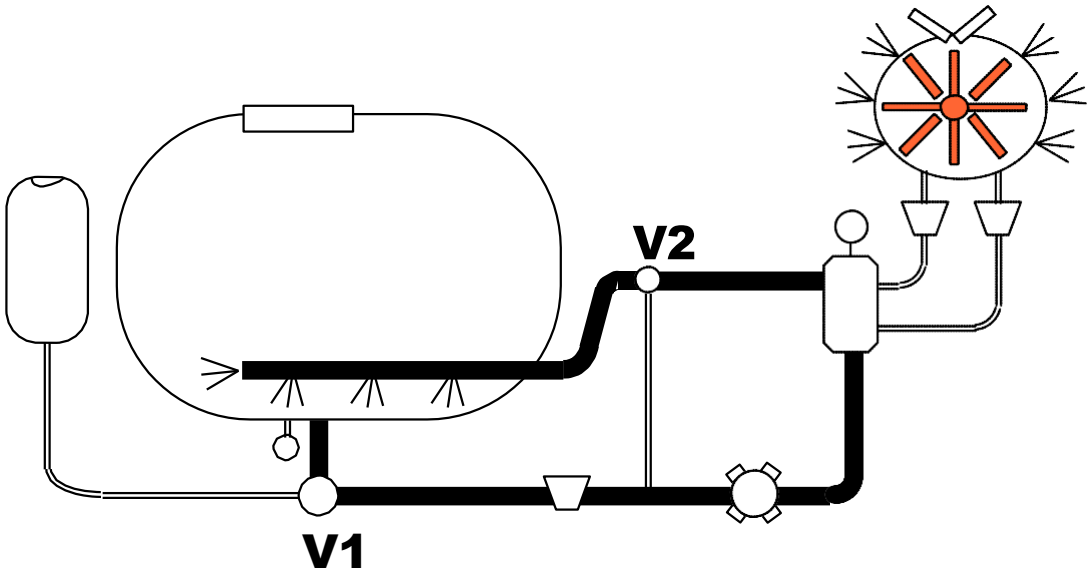


Diagram of the hydraulic circuit. Phase of agitation of the liquid in the main tank.

4.4 – Application to the crops

4.4.1 – Before performing the application

- Make sure that in the area to treat there isn't any person or animal
- Mark the field and the area where the sprayer will pass
- Make sure that the crop to treat is dry (on the contrary there will be dripping of product)
- Make sure that the weather conditions are suitable for the distribution (absence of wind)

- Verify on the labels of the agrochemicals that the weather conditions are suitable for the products (temperature, sun exposition etc.)
- Make sure that the 3-way valve **V1** sucks the liquid from the main tank (same position for mixing)
- Make sure that the 3-way valve **V2** sends the liquid coming from the control unit back to the main tank (same position for mixing)
- Check the adjustment and setting of the sprayer.

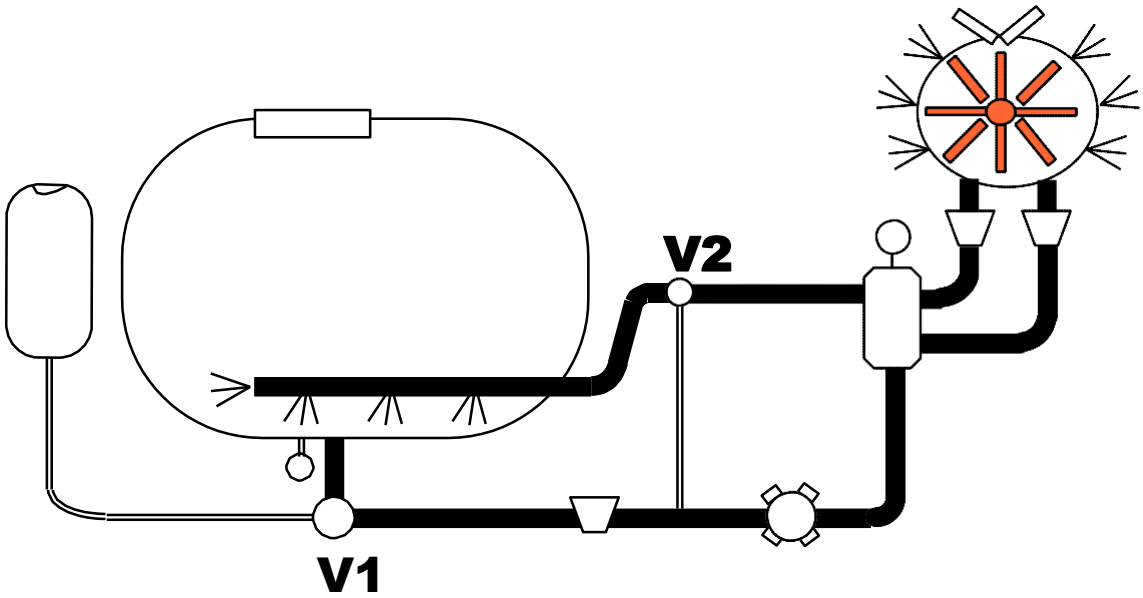


Diagram of the hydraulic circuit. Phase of distribution.

4.4.2 – During the application

- Hold the operating parameters (engine rate and speed) valued in the phase of adjustment
- Stop the fluid delivery when turning at the end of the lines
- Do not spread out of the area
- Interrupt immediately the distribution if someone comes up to the sprayer.

4.5 – Circuit-cleaning

This operation is very important for the health of the operator and the machine safety. At the end of the treatment, it eliminates any corrosive substance that could corrode the components or obstruct the nozzles.
The cleaning of the circuit should be performed before any interventions on the sprayer, in order to improve the safety of the operator.

- Verify that the auxiliary tank for the circuit-cleaning is full
- Place the 3-way valve **V1** in order to suck liquid from the auxiliary tank

- Place the 3-way valve **V2** in order to send the liquid coming from the control unit to the suction duct of the pump; in this way the dosage of mixture in the main tank does not change
- Turn on the valves regulating the delivery of liquid to the nozzles
- Turn the pump on, with a rotation rate of about 400 rpm and advance by tractor in the field.

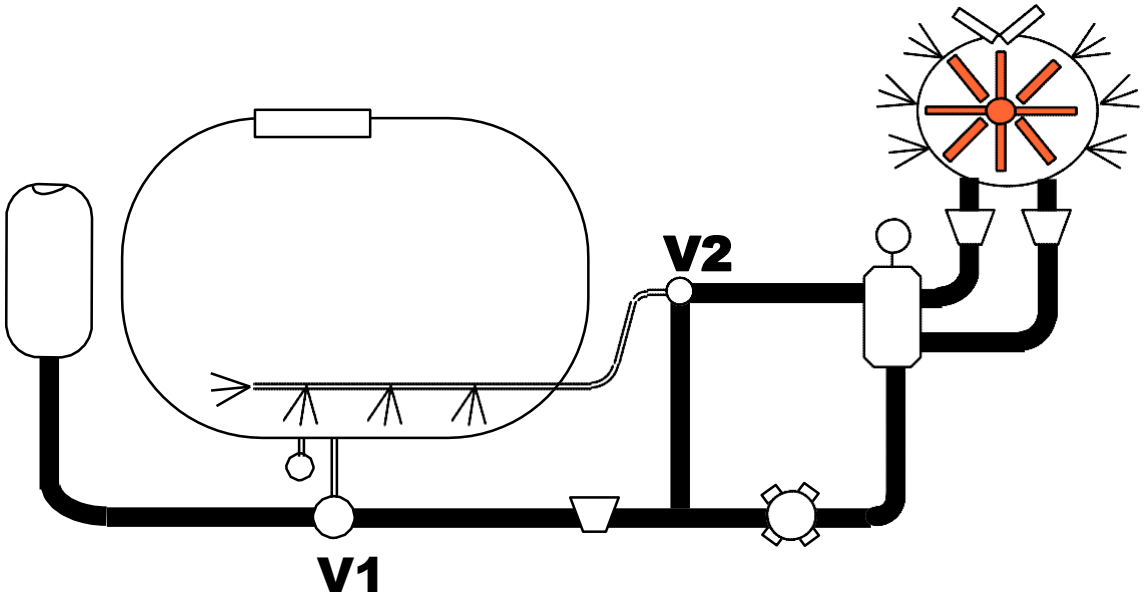


Diagram of the hydraulic circuit. Phase of circuit-cleaning.

4.6 – Disconnection

Place the machine on an even and hard surface. Disconnect any electric or hydraulic connection. Protect adequately any electric or hydraulic ending. Disengage the cardan shaft, at least from the side of the tractor. Unhook the chain fixing the protection, push the button on the mouth and slip the clutch out of the P.T.O. of the tractor and/or the splined shaft of the machine.

4.6.1 – Mounted sprayers

- Put the machine on the ground, and make sure it is stable
- Apply the hand brake, switch the engine off and remove the ignition key
- Slip out the pin of the 3-point coupling. To make this operation easy, you can vary the length of the 3-point coupling
- Remove the spring clips from the lower pins and unthread the lower lifting booms.

4.6.2 – Trailed sprayers

- Insert the wedges under the wheels.
- Place the support foot in its seat and block it with the appropriate locks
- Lift up the support foot in such a way that the lunette of the sprayer slips out the pulling device of the tractor
- Remove the safe clips from the pivot pin and unthread the pin itself.

4.7 – Disposal of the empty packets of agrochemicals

The empty packets of agrochemicals must be washed with clean water. Pour this water into the main tank of the sprayer.
Before the disposal, these packets must be kept in premises suitable for the storage of agrochemicals.

During these interventions the operator shall wear appropriate individual protections.

4.8 - Optional equipment
4.8.1 - Tank filling device

There are two different system for filling the tank: the suction can be directed by the pump or by the hydraulic injector.

During the tank filling interventions disconnect the fan movement

4.8.1.1 - Pump-directed suction

This system operates the filling of the tank even if the tank is completely empty.

- Place the machine near the filling point and apply the hand brake
- Remove the yellow cap and connect the pipe to the intake filter
- Adjust the distributing circuit as indicated for the operations mixing the liquid inside the tank
- Turn the P.T.O. on with a rotation rate between 400 and 540 rpm, till the quantity of liquid required
- Turn the P.T.O. off
- Unhook the intake pipe and put the yellow cap

4.8.1.2 – Hydraulic injector

This system requires at least 10 litres of water inside the main tank. It is also possible to use part of the water of the circuit-cleaning tank for the operation of the filling system.

- Place the machine near the filling point and apply the hand brake
- Connect the pipe to the proper intake placed upon the tank
- Adjust the distributing circuit as indicated for the operations of distribution, turn off the taps carrying the liquid to the nozzles, turn on the tap feeding the hydraulic injector
- Turn the P.T.O. on with a rotation rate between 400 and 540 rpm; regulate the pressure between 20÷25 bar, till the level of water required
- Turn the P.T.O. off
- Unhook the pipe, turn off the tap feeding the hydraulic injector, turn on the taps carrying the liquid to the nozzles and adjust the pressure on the value used for the distribution

4.8.2 Support wheels for mounted sprayers

The support wheels keep constant the height of work and discharge on the ground the weight of the machine. They have a bascule axle connected to the fifth wheel under the chassis of the machine; it allows to correct the direction without having to lift the machine.

It is necessary to lift the machine when turning at the end of the line.

During the installation of this device, it is necessary to modify the sequence of the connection and detachment of the implement from the tractor.

4.8.2.1 Connection to the tractor

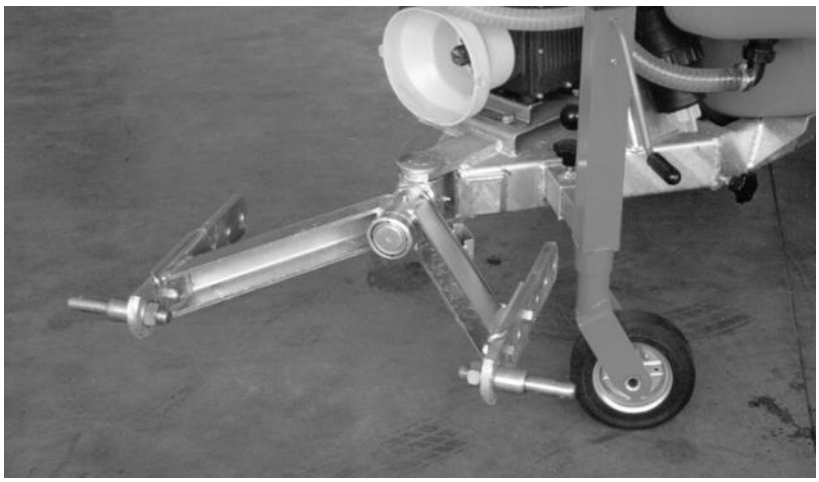
Besides what indicated in chapter 4.2.1, it is necessary to remove the supports placed in the front side of the machine.

4.8.2.2 Disconnection

Before carrying out the operations indicated in chapter 4.6.1, it is necessary to place the supports in the front side of the machine.

4.8.3 - Steering drawbar

Through this device it is possible to connect the trailed machines to the lower bars of the 3-point coupling, in order to improve the maneuvering. Adjust the length of the coupling according to the dimensions of the tractor.



4.8.3.1 - Connection to the tractor

When connecting the machine to the tractor make sure that there are no persons between the tractor and the sprayer.

- Check the diameter of the pivot pins on the machine and the diameter of the poppets of the tractor; if necessary use appropriate adapter axle boxes
- Place the lower lifting bars of the tractor to the height of the pivot pins of the drawbar
- Move back with the tractor in such a way that the holes of the bars coincide with the pivot pins of the machine
- Apply the hand brake, switch the engine off and remove the ignition key
- Hook the 2 bars to the pivot pins of the machine and insert the spring clips in the holes of the pins
- Lower the support foot and slip it out its seat
- Remove the wedges blocking the wheels and place them on their seat
- Adjust the tension rods of the lower lifting booms in such a way that the sprayer is at the centre of the tractor; block the tension rods to prevent the machine from moving sideways
- Adjust the position of the control unit in such a way that it does not interfere with the tractor during lifting operations and is easily accessible to the operator when he is in the driver's seat.

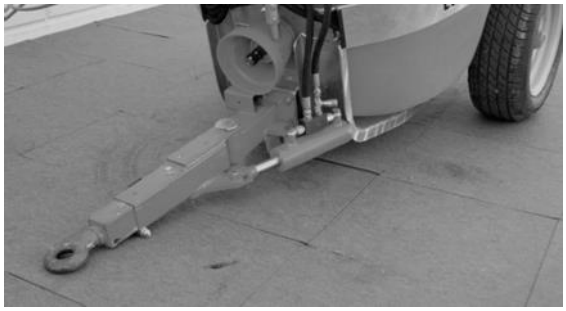
Always insert the safe clips to avoid the accidental disconnection of the bars from the pins. Do not use nails, bolts or clips of inadequate dimensions.

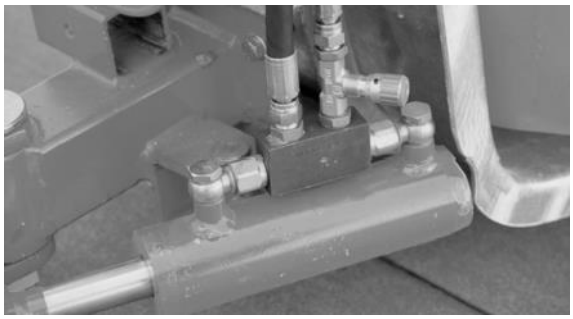
4.8.3.2 – Disconnection

- Apply the hand brake, switch the engine off and remove the ignition key
- Insert the wedges blocking the wheels
- Place the support foot in its seat and block it
- Heighten the support foot as far as the sprayer is lifted
- Remove the spring clips from the lower pivot pins and slip out the lower lifting bars

4.8.4 - Jointed drawbar with hydraulic control

The jointed drawbar facilitates U-turns and the end of the lines and offsets the lateral displacement when operating on transversal slopes. It is operated by the hydraulic control lever placed on the tractor. On the hydraulic cylinder are mounted a blocking valve that holds the cylinder in position, and a speed regulating valve. The latter must be adjusted to prevent the cylinder from moving too strongly. Adjust the valve by operating the handle placed on the valve itself. Operate repeatedly the cylinder till you get the level required (during the adjusting operations hold the engine rate on the value used for performing the treatment). Once you get the optimal control block the handle with the detent placed sideways.
As for the operations of connection and disconnection, follows what indicated for trailed machines.





4.8.5 - Reclining distribution group with hydraulic control

On some trailed models it is possible to mount a distributing group (fan and nozzles) on a fifth wheel which allows to vary the inclination of the group with respect to the body of the machine. This operation is performed by an hydraulic cylinder placed near the distributing group. As regards the speed regulation of the cylinder follows what indicated for the jointed drawbar.

4.8.6 - Transmission with constant-velocity universal joint

This accessory is used for the operation of trailed machines when it is necessary to turn tightly without having to disengage the P.T.O. of the tractor. It is a transmission shaft: on the one hand it has a normal PTO joint and on the other hand it has a constant-velocity universal joint.
The constant-velocity universal joint is mounted in correspondence of the rotation point between machine and tractor; by the side of the tractor with the fixed drawbar or hydraulic joint – by the side of the machine with steering drawbar.
As regards the assembling and dismantling procedures refer to what indicated for hydraulic transmission.

4.8.7 - Hydraulic transmission

In some trailed models it is possible to mount the hydraulic transmission instead of the normal transmission by PTO shaft. This device completely avoids the transmission problems when turning. This system includes a pumping group placed on the P.T.O. of the tractor, that forces the oil delivered by a flexible hose to flow in the engine placed on the machine.
Pay attention when assembling the pump on the tractor, and carefully adjust the bracket fixing the group to the pivot pin of the 3-point coupling.

5 – Setting up the machine

The setting procedures have been developed to vary the volume of spray applied.
"Application volume" means the quantity of liquid applied to the unit of area. Its normal expression is liters by hectare **l/ha.**

1 ha = 10,000 m²

This process can be divided into 2 different stages:

- Verification of the volume delivered
- Machine adjustment and selection of the operational parameters in order to get a certain volume

Here after are described the procedures for the verification of the operational characteristics of the machine in order to value the volume of application.

The parameters affecting the quantity to deliver are:

- Feed velocity
- Intra-line width (distance between two lines)
- Number of lines treated at each passage of the machine (passage one by one, or every two lines)
- Delivery of the machine (the quantity of liquid delivered by the nozzles)

The machine delivery is based on:

- Number of working nozzles
- Dimensions of the nozzles
- Pressure (the delivery increases if the pressure increases)

5.1 - Operational parameters

5.1.1 – Feed velocity

To select the velocity proceed as follows:

- Work with the sprayer connected to the tractor that will be used when performing the treatment
- Fill the tank up to 50% of its max. capacity
- Define a certain distance (e.g. 50 m) inside a field with characteristics (inclination, turf etc.) similar to the field to treat
- Cover the distance indicated at the speed and rotation rate used for the treatment
- Calculate the time of run (outward and return)

The velocity will be calculated as follows:

$$\text{Velocity} = \frac{\text{distance} \times 7.2}{\text{Outward time} + \text{Return time}}$$

With the following units of measurement:

$$\text{Km/h} = \frac{\text{m} \times 7.2}{\text{s} + \text{s}}$$

For an easier calculation, the enclosed table indicates the time necessary to cover a stated distance at a velocity between 2 and 8 kmh.

Time (in seconds) necessary to cover the distance indicated in the second line at the speed indicated in the first column.

	Distance (m)					
Speed (kmh)	**20**	**30**	**40**	**50**	**75**	**100**
2.0	36.0	54.0	72.0	90.0	135.0	180.0
2.5	28.8	43.2	57.6	72.0	108.0	144.0
3.0	24.0	36.0	48.0	60.0	90.0	120.0
3.5	20.6	30.9	41.1	51.4	77.1	102.9
4.0	18.0	27.0	36.0	45.0	67.5	90.0
4.5	16.0	24.0	32.0	40.0	60.0	80.0
5.0	14.4	21.6	28.8	36.0	54.0	72.0
5.5	13.1	19.6	26.2	32.7	49.1	65.5
6.0	12.0	18.0	24.0	30.0	45.0	60.0
6.5	11.1	16.6	22.2	27.7	41.5	55.4
7.0	10.3	15.4	20.6	25.7	38.6	51.4
7.5	9.6	14.4	19.2	24.0	36.0	48.0
8.0	9.0	13.5	18.0	22.5	33.8	45.0

During the treatment it is advisable to go on at a speed between 4 and 6 kmh.

High speeds can decrease the capacity of penetration of the product inside the foliage.

5.1.2 - Nozzles delivery

For “nozzle delivery” we mean the quantity of liquid distributed within a given time (normally measured in l/m). It depends on the dimensions of the nozzle and the pressure.
Put on every nozzle a device able to collect the liquid delivered (e.g. a piece of inner tube of a bike). Operate the machine after having disengaged the fan; adjust the pressure on values normally used for the treatment. In a bucket, collect the liquid supplied by every nozzle in a minute and after gauge the quantity through a scale or a balance. The value obtained is the nozzle delivery (if the dimensions of the bucket and/or the nozzle delivery do not allow it, limit the time at 30s; in this case, it will be necessary to multiply by 2 the quantity collected). Repeat the operation for all the nozzles mounted on the machine. At the end, add the values obtained in order to get the total delivery of the machine.
It is useful to verify that the delivery of the right side of the machine (difference lowen than 1l/min) is equivalent to the delivery of the left side. If the delivery is not the same from both sides, replace the nozzle or, preferably, all the set of nozzle.

When setting up the machine, it is advisable to use clean water.

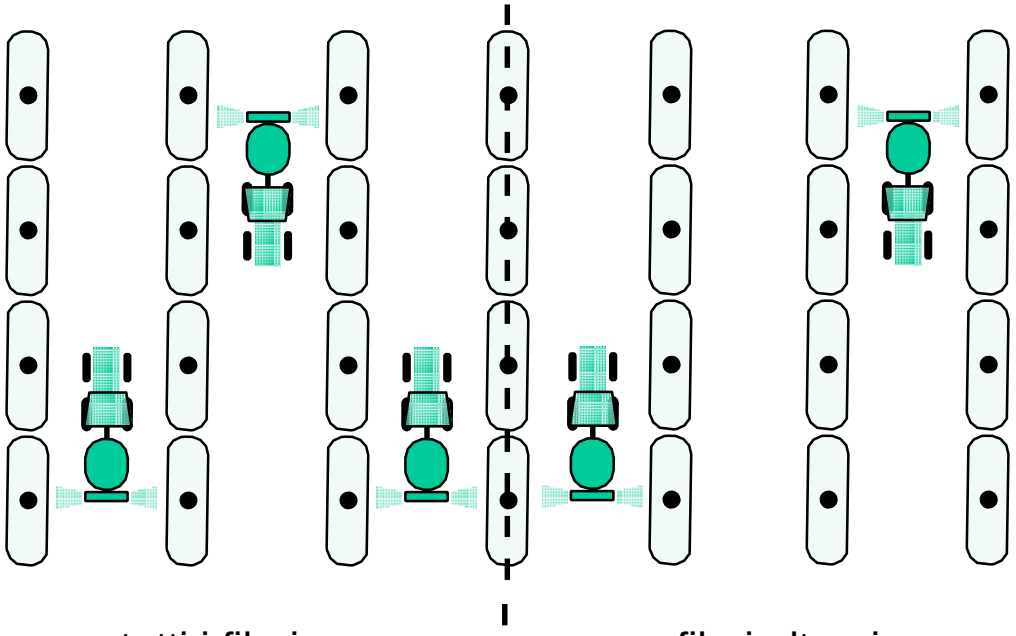
5.1.3 – Pressure

This parameter interacts with two important factors of the distribution: the nozzles delivery and the dimensions of the drops produced by the nozzles themselves.
Increasing in pressure the nozzle delivery rises. This variation is proportional to the square root of the pressure. The dimension of the drop is based on the characteristics of the nozzle, but it can vary according to the pressure. This variation is clear when the pressure is lower than 3 bars; over this value, the effect is limited.

It is advisable to work with pressures between 5 and 15 bars.
High pressures do not improve the quality of application and cause unnecessary stress to the circuit of distribution.

5.1.4 – Maneuvering

The passage of the sprayer can be performed in every line or every two lines.



All the lines Alternate lines

The passage on alternate lines allows a bigger operative capacity of the machine, reduces the time of work. When the vegetation is particularly thick it does not allow a uniform covering on both sides of the line.
The choice between the two applications must be made according to the foliage, the distance between the lines, the type of disease and the acting mechanism of the product.
In general, the passage on alternate lines can be performed during the first vegetative seasons, with a poor foliage. The passage in every line is advisable for the subsequent seasons and for treatments targeted to the bunch.

5.2 – Volume of liquid distributed

The parameters mentioned above are based on the following formula:

$$\text{Volume applied} = \frac{600 \times \text{machine capacity}}{\text{Speed} \times \text{intra-line} \times \text{no. Lines}}$$

With the following units of measurement:

$$\text{l/ha} = \frac{600 \times \text{l/min}}{\quad}$$

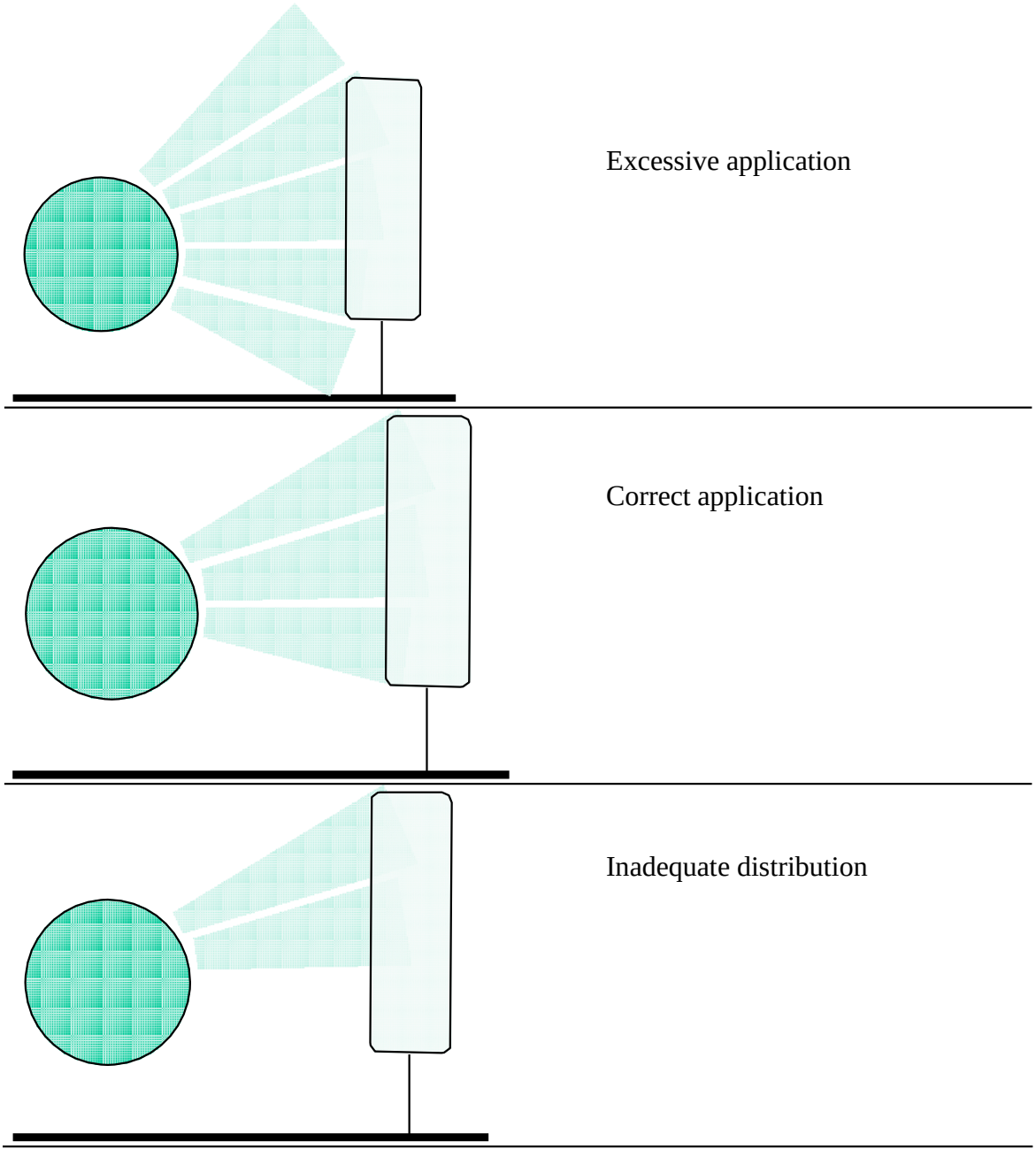
kmh x m

The volume distributed must vary according to the foliage, the thickness of the leaves and the type of disease to fight. During normal operational conditions, the volumes suggested vary between 200 and 500 l/ha. If the crops have bigger foliage (e.g. orchards) the delivery suggested varies between 700 and 1,000 l/ha.

5.3 – Adjusting the sprayer

5.3.1 – Number of operative nozzles

The number of nozzles which are operative must be set in such a way that the jet covers the target entirely and minimizes the waste.
Beyond the number of nozzles, it is possible to modify their inclination, in order to regulate the position of the jet.



5.3.2 – Nozzles dimensions and pressure

The choice of the dimensions of the nozzles should base on the following parameters:

- Intra-line (in metres)
- Number of lines treated (1 or 2)
- Volume to deliver (l/ha)
- Feed velocity (km/h)
- Number of operative nozzles

At this point it is possible to value the delivery of every nozzle in order to get the volume required. For an easier evaluation, here after are supposed some values.

Suppose that:

I	Intra-line	2.5 m
Nf	No. lines	1
V	Volume	300 l/ha
V	Feed velocity	5 km/h
Nu	No. nozzles	8

The nozzle delivery (**q**) will be calculated in the following way:

$$\mathbf{q} = \frac{\mathbf{V} \times \mathbf{v} \times \mathbf{I} \times \mathbf{Nf}}{600 \times \mathbf{Nu}}$$

therefore, according to the values indicated above:

$$\mathbf{q} = \frac{300 \times 5 \times 2.5\ 1}{600 \times 8}$$

After the evaluation of the delivery, we have to select the nozzle. The following table indicates the values required when operating with **intra-line of 2.5 m, feed velocity of 5 km/h, passage in every line**, different volumes of distribution and different number of operative nozzles.

Delivery of one single nozzle (l/min) necessary to get the volume indicated in the first column, with a number of nozzles indicated in the first line.

Intra-line 2.5 m Speed 5 km/h	Number of operative nozzles				
Volume (l/ha)	**6**	**8**	**10**	**12**	**14**
150	0.52	0.39	0.31	0.26	0.22
200	0.69	0.52	0.42	0.35	0.30
250	0.87	0.65	0.52	0.43	0.37
300	1.04	0.78	0.63	0.52	0.45
350	1.22	0.91	0.73	0.61	0.52
400	1.39	1.04	0.83	0.69	0.60
450	1.56	1.17	0.94	0.78	0.67
500	1.74	1.30	1.04	0.87	0.74
550	1.91	1.43	1.15	0.95	0.82
600	2.08	1.56	1.25	1.04	0.89
650	2.26	1.69	1.35	1.13	0.97
700	2.43	1.82	1.46	1.22	1.04
750	2.60	1.95	1.56	1.30	1.12
800	2.78	2.08	1.67	1.39	1.19

On the basis of the necessary delivery and pressure, the appropriate tables indicate the type of nozzle to use. Here after are indicated the values (in l/min) of the nozzles series Albuz ATR.

	Pressure (bar)				
Colour of nozzle	**5.0**	**7.5**	**10.0**	**12.5**	**15.0**
Violet	0.36	0.44	0.51	0.57	0.62
Brown	0.47	0.58	0.67	0.75	0.82
Yellow	0.74	0.91	1.05	1.17	1.29
Orange	0.98	1.20	1.39	1.55	1.70
Red	1.39	1.71	1.97	2.20	2.41
Green	1.79	2.19	2.53	2.83	3.10
blue	2.47	3.02	3.49	3.90	4.27

According to the previous example, it is possible to get the delivery required by using both the brown nozzle (at the pressure of 12.5 bar) and the yellow nozzle (at the pressure of 5.0 bar). The choice between the two nozzles should be made considering the delivery that is necessary: high delivery (due to a bigger distance between the lines, higher feed velocity etc.) or low delivery. In the first case, you will chose the bigger nozzle (yellow) because, at a high pressure, it can deliver higher flows; vice versa if it will be necessary to decrease the flow.

For an easier choice of the dimensions of the nozzle and pressure, the following tables indicate the value in pressure to use with the different nozzles, in order to deliver the volume indicated in the first column, with different widths of the intra-line and different feed velocities.
In every square, the number indicates the pressure to use while the colour indicates the nozzle.
The values indicated concern the passage in every line. If the passage is made every two lines, it is possible to look up the same tables, but the volume of distribution should double (the delivery of the sprayer is the same if are supplied 200 l/ha with a passage in every line or 400 l/ha with a passage every two lines).

The quantity of agrochemicals distributed per unit of surface shall be the one suggested by the producer. During the preparation of the mixture it is necessary to vary the dosage of the product according to the volume delivered.

Ugelli Albuz ATR

interfila 2.0 m **velocità 4 km/h**

volume (l/ha)	numero ugelli in funzione									
	6		8		10		12		14	
150										
200	7.5									
250	7.0	12.0	6.7							
300	10.5		5.5	9.5	6.0					
350	5.5	13.5	7.5	13.0	5.0	8.5	5.8			
400	7.2		10.0		6.5	11.0	7.5		5.5	
450	5.0	9.0	5.0	12.5	8.0	14.0	5.5	9.5	7.0	
500	6.5	11.0	6.2	15.0	10.0		7.0	12.0	5.0	9.0
550	7.8	13.5	4.8	8.0	5.0	12.0	8.0	14.0	6.0	10.5
600	4.8	9.5	5.0	9.0	6.0	14.4	10.0		7.4	12.5
650	5.5	11.0	6.0	10.5	7.0		5.0	12.0	8.5	15.0
700	6.4	12.6	7.0	12.5	7.8		5.5	13.5	10.0	
750	7.2	14.5	8.0	14.0	5.0	9.0	6.2	15.0	5.0	12.0
800	5.0	8.5	4.8	9.5	6.0	10.5	7.2		5.3	13.0

interfila 2.0 m **velocità 5 km/h**

volume (l/ha)	numero ugelli in funzione									
	6		8		10		12		14	
150	7.0		5.0							
200	7.0	12.0	6.7		5.0					
250	10.5		6.0	10.5	6.7		5.0			
300	6.2	15.0	8.7	15.0	5.5	9.5	7.0		5.0	
350	5.0	8.5	5.0	12.0	7.5	13.0	5.5	9.5	6.7	
400	6.5	11.0	6.2	15.0	10.0		7.0	12.0	5.0	9.0
450	8.0	14.0	5.0	8.0	5.0	12.5	8.7	15.0	6.5	11.4
500	5.0	10.0	5.6	10.0	6.2	15.0	10.5		8.0	14.0
550	6.0	12.0	7.0	12.0	4.8	8.0	5.0	13.0	9.5	
600	7.2	14.5	8.0	14.0	5.0	9.0	6.2	15.0	4.8	11.4
650	5.0	8.5	5.0	10.0	6.0	10.5	7.4		5.4	13.4
700	6.0	9.7	5.5	11.0	7.0	12.5	5.0	8.5	6.4	15.0
750	6.8	11.0	6.4	12.6	8.0	14.0	5.6	10.0	7.5	
800	7.5	12.5	7.2	14.5	4.8	9.5	6.5	11.0	5.0	8.2

viola	marrone	giallo	arancio
rosso	verde	blu	

Ugelli Albuz ATR

interfila 2.5 m velocità 4 km/h

volume (l/ha)	numero ugelli in funzione									
	6		8		10		12		14	
150	6.7		5.0							
200	7.0	12.0	6.7		5.0					
250	10.5		6.0	10.5	6.7		5.0			
300	6.2	15.0	8.7	15.0	5.5	9.5	7.0		5.0	
350	5.0	8.5	5.0	12.0	7.5	13.0	5.5	9.5	6.7	
400	6.5	11.0	6.2	15.0	10.5		7.0	12.0	5.0	9.0
450	8.0	14.0	5.0	8.0	5.0	12.5	8.7	15.0	6.5	11.4
500	5.0	10.0	5.6	10.0	6.2	15.0	10.5		8.0	14.0
550	6.0	12.0	7.0	12.0	4.8	8.0	5.0	13.0	9.5	
600	7.2	14.5	8.0	14.0	5.0	9.0	6.2	15.0	4.8	11.4
650	5.0	8.5	5.0	10.0	6.0	10.5	7.4		5.4	13.4
700	6.0	9.7	5.5	11.0	7.0	12.5	5.0	8.5	6.4	15.0
750	6.8	11.0	6.4	12.6	8.0	14.0	5.6	10.0	7.5	
800	7.5	12.5	7.2	14.5	4.8	9.5	6.5	11.0	5.0	8.2

interfila 2.5 m velocità 5 km/h

volume (l/ha)	numero ugelli in funzione									
	6		8		10		12		14	
150	6.0	10.5	5.8		5.0					
200	10.5		6.0	10.5	6.7		5.0			
250	6.8		9.5		6.0	10.5	7.0		5.0	
300	5.6	10.0	5.5	13.5	8.7	15.0	6.0	10.5	7.5	
350	7.8	13.5	7.5		5.0	12.0	8.0	14.0	6.0	10.5
400	5.0	10.0	5.6	10.0	6.2	15.0	10.5		8.0	14.0
450	6.4	12.6	7.0	12.5	5.0	8.0	5.5	13.5	10.5	
500	4.8	7.8	8.8	15.0	5.6	10.0	6.8		5.0	12.0
550	5.8	9.3	5.5	11.0	7.0	12.0	5.0	8.0	6.2	15.0
600	6.8	11.0	6.4	12.6	8.0	14.0	5.6	10.0	7.5	
650	8.0	13.0	7.2	14.5	5.0	10.0	6.5	11.5	5.0	8.2
700	9.2	15.0	5.0	8.5	5.5	11.0	7.8	13.5	5.6	10.0
750	5.6	10.6	6.0	9.7	6.4	12.6	8.8	15.0	6.5	11.0
800	6.4	12.0	6.8	11.0	7.2	14.5	5.0	10.0	7.4	13.0

viola	marrone	giallo	arancio
rosso	verde	blu	

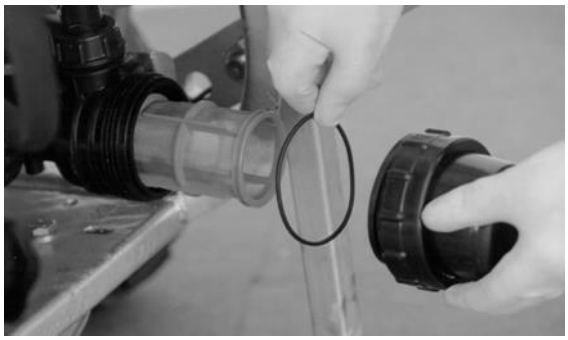
– Periodical maintenance

The interventions indicated in this chapter are essential in order to assure the correct operation and preservation of the machine. Beyond the following suggestion, the general cleaning of all the components of the machine is advisable.

6.1 – Filters-cleaning

The filters supplied with the machine protect the circuit of distribution from any damage caused by particles. Their correct maintenance is required. The filters placed inside the opening of the tank can be cleaned by removing and washing them under water, or turning them upside down.
The filters placed inside the pipes must be dismantled and reassembled:

- Unscrew the filter
- Pull out the filter
- Clean the mesh with water or a jet of compressed air
- Put the filter back
- Pay attention to the gasket
- Screw in the filter.



The frequency of these interventions depends on the quality of water used during the preparation of the mixture.
For the self-cleaning filters, it is sufficient to open the proper valve placed on the filter during the operation in order to discharge the particles.
Once a year, it is advisable to dismantle the filter to check its condition.

6.2 – Pressure of the airdraulic compensator

The airdraulic compensator placed on the pumps must have a correct pressure in order to assure the correct operation of the machine. The pressure of the compensator must be equal to 8/10 of the normal pressure. Too high or too low pressures cause oscillations inside the circuit of distribution, indicated by the pressure gauge.
Since the pressure of the airdraulic compensator must be as stable as possible, we suggest to operate as follows:

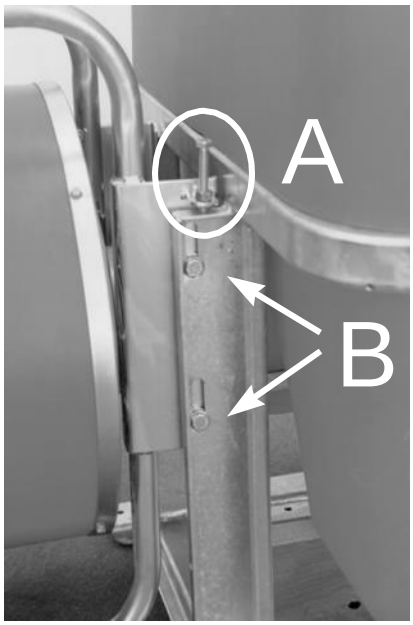
- Inflate the compensator till a pressure of 10÷12 bar
- Operate the machine, adjust the pressure on the value used for the treatment and start up the delivery from the nozzles

- Slowly discharge the pressure from the compensator, till the pressure gauge stops oscillating
- Close the valve
- If the oscillations continue during the discharge of the air it means that the compensator deflates. Repeat the operation from the beginning.

6.3 – Belt tension

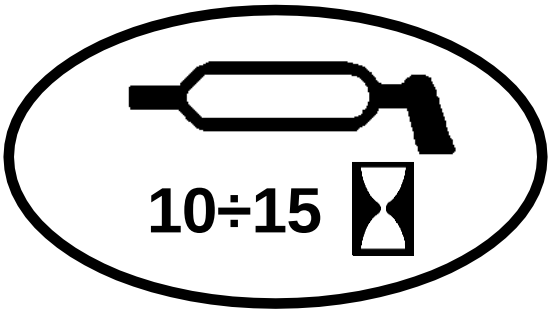
The mounted sprayers are equipped with V belts that transmit motion to the fan. Periodically (every 10÷15 hours of operation) it is necessary to verify their tension. The tension is correct when their flexion (after a compression in the area between the two pulleys) is lower than 10 mm. If there is no flexion, the belts are too tightened.
For the regulation of the belts tension proceed as follows:

- Loosen the locknut of bolt **A**, loosen bolts **B** on both sides
- Screw in bolt **A** slightly and check the belts tension
- Screw in the bolts (on both the right and left side)
- Block the locknuts of bolts **A** and **B**.



6.4 – Lubrication

The components of the machine that must be periodically greased are the joints of the PTO shaft, all the pin joints (steering or jointed drawbar, reclining distribution group, fifth wheel for the support wheels on mounted sprayers) and the hubs of the wheels.
The position and frequency of these interventions are shown by appropriate labels near the main points of lubrication.



Moreover, periodically it is necessary to check the oil level of the pump, the gear and the tumbler gears.

- **Nozzles**: annual lubrication
- **Pump**: follow the indications in the use manual of the pump. Use oil SAE 20-30. Before any intervention check the oil level.
- **PTO shaft**: grease every 8÷10 hours of work with MP oil.
- **Gear**: use oil SAE 90-140. Check the oil level. Replace the oil after 100 hours of work.
- **Tumbler gears**: use oil SAE 90-140. Check the oil level. Replace the oil every 100 after 100 hours of work.
- **Hubs of wheels**: annual lubrication with grease MP.

Correctly dispose of the exhausted oils.

6.5 – Winter garaging

Before winter it is necessary to clean the machine properly, with the greatest care for the main tank and filters. The sprayer must be kept in dry places sheltered from the chill. If this is not possible, empty completely the tank, add some antifreeze (used for radiators) and operate the pump for some minutes in such a way that the fluid reaches the pipes.

7. – Main anomalies and remedial actions

ANOMALY	CAUSE	REMEDY
Lack of pressure in the circuit	The tank is empty	Pour water into the tank
	3-way valve in position of suction from the circuit-cleaning tank	Turn the lever in position of suction from the main tank
	The general drain valve is open	Close the valve
	The suction filter is obstructed	Clean the filter
	Seeps of air in the circuit	Tighten the pipe fittings on the pipes connecting the tank to the pump (*)
	Valve/Valves dirty or worn	Clean or replace it (*)
Variations in pressure	Airdraulic compensator with pressure not correct	Restore the pressure
	Valve/Valves dirty or worn	Clean or replace it (*)
Dripping from the nozzles	Test the diaphragm of the anti-drop device	Clean or replace it
Presence of water in the oil (the oil turns white)	One or more diaphragms are broken	Replace (*) – If the replacement is not immediate, drain water and oil from the pump to avoid the pump to corrode

(*) – these interventions must be performed by a qualified technician.