YES SPRayers

Operating & Maintenance Manual

3 Point linkage mounted machines
200 – 800 Litres
6 – 12 Metre booms

Before starting operation, carefully read and adhere to this instruction manual and the safety advice.
Preface

Dear Customer,

Your new sprayer should improve your plant protection, reduce costs and minimise your workload as well as the danger of pollution.

With your YES Sprayer you will be able to apply exactly the correct amount of spray safely, economically and in comfort.

In order to make the fullest use of your YES Sprayer and to ensure trouble-free operation, we recommend that this instruction manual is carefully read and that the content is observed and the advice given therein is adhered to.

Please ensure that this instruction manual is made available to all operators before commencing to operate the machine.

This instruction manual refers to all YES Sprayers.

We thank you for buying YES and wish you good harvests and many years of trouble-free service with it.
General Safety & Accident Prevention Advice

1. Adhere to the general rules of health and safety precautions besides the advice in this manual.

2. Become acquainted with the sprayer, its controls and functions before using it.

3. Wear Protective Clothing, Gloves, Masks at All Times. Please avoid wearing any loose clothing that would possibly wrap or catch on moving parts.

4. Engage PTO Shaft only when all guards are fixed in position.

5. Never stay or allow anyone stay within the operation area of the sprayer.


7. When travelling with the sprayer, bring all devices into transport position and secure the booms.

8. Before leaving the tractor, lower the sprayer to the ground. Actuate the parking brake, stop the engine and remove the ignition key.

9. Pressure-test the sprayer with clean water before filling in the chemicals.

10. Make sure that when filling or spraying you always have fresh water close to hand.

11. Rinse and wash the sprayer after use and before you carry out any repairs.

12. Never open hoses or tubes which are pressurised.

13. Never enter the sprayer tank.

14. Wash tools that have come in contact with spray.

15. Never use anything that has come in contact with the spray, (e.g. buckets, hoses, etc) for feeding purposes.

16. When filling the sprayer do not exceed the nominal volume.

17. Keep children away from the sprayer.

18. Wash and change clothes after using the sprayer.

19. Do not eat, drink or smoke when working with the sprayer.

20. Always follow carefully the instructions on the chemical packages.
21. In case of poisoning, seek doctor or ambulance. Remember to identify the chemicals used. If chemicals come in contact with the skin or eyes follow the instructions on the chemical package.

22. Always hitch and unhitch the sprayer in a safe way. Park the sprayer on a level surface and in such a way that it can not be knocked or toppled over.

23. Wind drift can cause very serious damage to you and your neighbour’s health, let alone other crops. Only spray when there is no danger of wind drift.

24. Make sure that nobody is in the vicinity when the booms are being folded out, raised or lower.

25. If any section of this instruction remains unclear after reading, please contact your YES Dealer for further explanation before using the sprayer.

**Getting Started**

**Attaching The Sprayer To The Tractor**

Hitch the sprayer to the tractor linkage. Adjust the top link so that the boom carrying frame is vertical when the machine is in working position (As shown in Fig A). Tighten the check chains on the tractors linkage arms, to prevent the sprayer bouncing to and fro. Adjust Control unit to suit rear of tractor. Connect any hydraulics hoses and electric cables.

**Fitting The PTO Shaft**

Line up the tractor’s PTO shaft with the sprayers pump shaft. Fit shaft on tractor and sprayer pump (As shown in Fig B). Check the length of the PTO shaft. If the PTO shaft profiles are to be shortened, please remove equal amounts of each profile. Shorten PTO shaft covers the same amounts. Clean ends of profiles and grease shaft. Refit PTO shaft cover (As shown in Fig D) Refit PTO shaft to tractor and sprayer. Secure stop chains (As shown in Fig C).
3 / Mark shafts before cutting allow approx 40mm clearance
4 / Shorten inner and outer covers equally
5 / Shorten inner and outer profiles equally
6 / Round off edges
7 / Grease profiles
8 / Attach stop chains to both sprayer and tractor before use

Fig C

To remove PTO Shaft Cover follow above instructions in reverse from 4 to 1

Fig D

Always be sure to check the length of the PTO Shaft when fitting to different tractors. Failure to do so may result in damage to the sprayer pump.

Hint!
**Lubrication Of PTO Shaft**

Grease cross pieces before using sprayer for first time and then every 8 hours. Grease nipples on guards before using sprayer for first time and then every 40 hours. Grease profiles before using sprayer for first time and then every 20 hours.

**Preparing Your Pump For Use**

1. Check that the oil is at the correct level (See Fig E).

2. Check the air pressure in the Pulsation Damper (See Fig F)

![Fig E](image1)

![Fig F](image2)

**Filling Your Sprayer And Hand Wash Tank**

**Hand Wash Tank**

Remove the lid and fill the hand wash tank with Clean Tap Water Only.
There Are 3 Different Ways Of Filling The Sprayer Tank

Through The Top Opening Of The Tank

Through the top opening of the tank by hose or other means:
Remove tank lid. Place filling hose over hole and fill sprayer with clean water through the basket filter in the tank opening. Never let the filling hose enter the sprayer tank and always make sure that the basket filter is in place to prevent foreign particles entering the tank. Refit tank lid.

Indirect Self Filler

Remove tank lid. Remove cap on self filler unit on sprayer tank and connect the self filler hose to the unit on the sprayer. Fill approx 20 litres of water into the sprayer tank. Place self filler hose in water tank. Start tractor and engage PTO shaft. Increase sprayer pressure to approx 6 bars and switch on lever on control unit feeding the self filler unit. Sprayer tank should start to fill. When the sprayer tank has the amount of water you require, remove the self filler hose from the water. When the self filler hose is empty, switch off lever on control unit feeding the self filler unit and
disconnect self filler hose and refit cap. Decrease sprayer pressure, disengage PTO shaft and stop tractor. Refit tank lid and cap on self filler unit.

Direct Self Filler

Remove tank lid. Remove cap from self filler unit on the sprayer and connect the self filler hose. Place self filler hose in water tank. Start tractor and engage PTO shaft. Turn lever on 3 way valve on sprayer tank in direction off self filler hose. Sprayer tank should start to fill. When the sprayer tank has the amount of water you require, remove the self filler hose from the water. When the self filler hose is empty, turn the lever on the 3 way valve in opposite direction (towards the tractor), disengage PTO shaft and stop tractor. Refit tank lid and cap on self filler unit.
Preparing The Sprayer For Use

1. Open booms out fully.

2. Start tractor and engage PTO shaft. Set PTO speed at 450 – 540 rpm. (Max rpm is 540).

3. Select the correct nozzle size for your forward speed. Turn on control levers supplying each boom section and adjust to required pressure for spraying (See nozzle flow chart).

4. Check sprayer for leaks and blocked nozzles.

5. Turn off control levers supplying each boom section. Disengage PTO shaft and turn off tractor.

6. Adjust your boom height to have the nozzles spraying 50cms above the crop (When adjusting the booms, please be sure to brace or support them, so that they can only be adjusted under your control). Retighten boom brackets. Close booms for transport.

7. Only at this stage should you fill chemicals in to your sprayer tank. Remove tank lid. Start tractor and engage PTO shaft at approx 450rpm. Make sure the control levers supplying the boom sections are switched off. Fill chemical in to sprayer tank as per instructions on the packages. Leave sprayer PTO shaft running for several minutes so that the chemicals can be mixed in the tank. Disengage PTO shaft and travel to your spray job.
8. When you arrive at your spray job, engage PTO shaft at approx 450rpm and leave running for several minutes so that chemicals may mix up again in case they have settled on the journey.

9. Open out the booms, increase PTO speed to 450 – 540rpm. Turn on the control levers to the booms, check that you have the required spray pressure for your forward speed and commence your job.

10. Check all fasteners after the first 2 hours worked.

**Operation Of The Agitator**

The liquid is agitated in the tank, while the PTO is engaged and can only be varied by changing the PTO speed. Max agitation is achieved at 540 rpm.

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**Hint!**

To get familiar with this machine, we suggest that before you go to spray for the first time, that you fill the sprayer with clean water and go spray on a green or stubble field to get to know the workings of the machine.

**Control Units**

These are the standard control units fitted to the complete range of YES Sprayers. The pressure is regulated by turning the hand knob clockwise or anti clockwise. The supply to the booms / hose reel / indirect self filler is controlled by the flip type levers. If you switch off a boom section while working in the field, you may have to adjust your pressure.

The UCM 4 control unit operates the same way as the ECM 3 & 4, except that it also has a Main On/Off Lever. This will switch on / off the supply to the boom sections once the flip type levers are in the on position. This unit is available as an optional extra.
The Idrominus control unit regulates the pressure and maintains constant output to the booms. If any single section is shut off or the tractors rev increase or decrease by 15% in the same gear, there will be no change in the quantity of spray distributed. It also has a Main On / Off Lever. This unit is available as an optional extra.

Control Functions & Settings

Knob to Increase & Decrease Sprayer Pressure. To increase the working pressure of the sprayer turn the knob clock wise as shown by the arrow in the photo ---- + and to decrease the working pressure turn the knob anti clock wise ---- -

Supply to booms / hose reel / etc OFF

Supply to booms / hose reel / etc ON
To check and set the Idrominus control unit. Screw in all these knobs to their max and then turn back approx. 2.5 turns. Start tractor and engage PTO shaft to 450 – 540 rpm. Switch on the main on / off lever and switch on all flip levers supplying the boom sections. Adjust the pressure to 4 bars. Switch off the first section on the outer right side and adjust pressure up or down to 4 bars. Leaving this section off, switch off the next one and adjust and so on till all the boom sections are done. Now switch them all back on and the pressure should remain at 4 bars. NB: If one or two outlets aren’t used, leave the flip levers in off position and the knobs screwed into their max.

4 Section Electric Main On / Off Control Unit With Constant Pressure. This unit is available as an optional extra.
4 Section Full Electric Control Unit. Main On / Off – Pressure Control – Supply To The Booms All Controlled from The Cab. This unit is available as an optional extra.

Setting & Operating The 4 Section Control Unit With Main On / Off Control

2 FUNCTIONING OF THE PRODUCT
2.1 Composition of the manual control units
2.1.1 Manual control units with 471 SERIES main control valve

1. Gear Motor Of Main Control Valve
2. Maximum Pressure Valve
3. Proportional Valve
4. Filter
5 & 6 Boom Sections + Adjustable Compensation Cocks
1 Gearmotor of main control valve
Opens or closes main valve to let fluid flow through the system.
Gearmotor is operated via a suitable switch installed on the control device of the unit (e.g.: control box or computer).
• Valve open = liquid sent directly to the circuit for application;
• Valve closed = liquid sent to the tank;
the suction system, if present, starts functioning.

2 Maximum pressure valve
Eliminates the excess liquid when the set pressure level is reached.
Can be adjusted manually using the appropriate knob; the knob has a different colour according to the maximum pressure for the valve (refer to par. 7.1 - Correspondence between valve parts and maximum valve pressure).

3 Proportional valve
This is adjusted to control spraying pressure: when the vehicle progress speed changes during spraying, the volume of the liquid distributed per surface unit (litres/ hectare) remains stable.
The increase or reduction in delivery is proportional to the number of revs of the engine with a tolerance of ± 20%.
Can be adjusted manually using the appropriate yellow knob.

4 Filter
Protects nozzles from dirt, which would eventually reduce their performance.
With self-cleaning filters, there is less need for frequent cleaning of the cartridge inside the filter.

5 Boom section valves
Opens/closes the corresponding boom section. For valves with calibrated backflows, the closed valve position coincides with that for the discharge of the corresponding compensation cock.

6 Adjustable compensation cocks (calibrated backflows)
These are adjusted so the level of spraying pressure remains steady when one or more sections of the boom are closed.

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Set the relevant switch on the control device to "OFF" to set the main valve so as to allow discharge.

Turn the knob anticlockwise to completely open the hand wheel of the maximum pressure valve.
d. Turn the yellow knob anticlockwise and completely open the proportional valve.

e. Close all the section valves by lowering their levers ("OFF" position).

f. Open all the compensation cocks by turning their knobs anticlockwise.

g. Turn the knob clockwise and completely close the discharge to the self-cleaning filter.

End of the procedure for "Adjustments of the manual unit prior to operation"
4.2 Adjustment of maximum operating pressure
(Only applicable for units with proportional valve)

⚠️ Should either of the following be noted during operation:
- pressure above the maximum limit for the system and safety valve
- abnormal leaks of liquid
  stop work, switch the pump off and check that the installation and preliminary procedures have been completed correctly.

1 Start pump operation.

2 Set the relevant switch on the control device to "ON" to open the main valve; this will let fluid in through the system.

3 Gradually increase the number of rows of the pump until the maximum operating level is reached.
4 Close the proportioning valve completely by turning its knob clockwise.
5 Close all the compensation cocks by turning their knobs clockwise.

6 Adjust the maximum pressure valve by turning its knob counterclockwise until the pressure of the valve is about 20% above the unit's maximum operating pressure.
   The pressure levels are indicated on the pressure gauge.

5 USE

⚠️ For detailed information on operation or adjustment of unit valves, ALWAYS refer to the operating and maintenance instructions manual relevant to your control device.

Pressure readings are indicated by the pressure gauge or displayed at the control device (where unit is equipped with a pressure transducer).

5.1 Taratura della pressione di lavoro

1 Select the type of nozzle and the relative operating pressure according to the litres/hectare (ha) to be sprayed and the speed of progress.
2 With the machine off, start the pump and take it to its operating level.
3 Set the relevant switch on the control device to "ON" to open the main valve.
d Open all the section valves by raising their levers ("ON" position).

- Now take the unit pressure to the required level for spraying; there are two ways to perform this adjustment:

- Constant pressure units
  
  This kind of unit does not have a proportional valve, therefore the calibration of the operating pressure is carried out by the maximum pressure valve. The adjustment is made by turning the knob on the maximum pressure valve until operating pressure is obtained:
  - Turn clockwise to increase pressure.
  - Turn anticlockwise to decrease pressure.

- Units with proportional valve
  
  The calibration of the operating pressure is carried out by the proportional valve.
  
  The adjustment is made by turning the yellow knob on the valve until the required operating pressure is obtained:
  - Turn clockwise to increase pressure.
  - Turn anticlockwise to decrease pressure.

⚠️ In this case, the proportional valve must be used for pressure adjustment and not the maximum pressure valve since the proportional valve would not compensate the variations in speed correctly should the operating pressure be too close to the calibration of the maximum pressure valve.

### 5.2 Calibration of compensation cocks (calibrated backflows)

These cocks safeguard the constant distribution of liquid even in case of operation with one or two section valves closed.

Calibration must be carried out EACH TIME the type of nozzle is changed.

- Close a section valve by lowering its lever ("OFF" position).
- Adjust the corresponding compensation cock by turning the knob until the pressure level is reached on the pressure gauge that was previously set with all the section valves open.
- Turn clockwise to increase pressure.
- Turn anticlockwise to decrease pressure.

⚠️ If the level of pressure indicated on the pressure gauge changes, repeat the steps indicated at point b until there are no more variations.

- Open and close the section valve (lower the lever to close the valve and raise it to open it).
- Check that the level of pressure indicated on the pressure gauge is constant.

⚠️ If the types of nozzle are not changed, the adjustments made will safeguard a uniform distribution of liquid even when spraying needs differing levels of operating pressure.
Control Box For Above Unit

This control box is connected to the Gear Motor of the control unit. It can be used to switch On or Off the supply to the control valve.
Setting & Operating The 4 Section Full Electric Control Unit

2 FUNCTIONING OF THE PRODUCT
2.1 Components of electric control units
2.1.1 Electric control units with main control valve SERIES 471

![Diagram of control unit components]

Fig. 1

1. Gearmotor of main control valve
2. Maximum pressure valve
3. Proportional electric valve
4. Filter
5. Boom section electric valves
6. Metered by-passes
7. Pressure gauge adapter or pressure transducer connection

IN intake of liquid for spraying
OUT A drain for maximum pressure valve
OUT B drain for metered by-passes
OUT C drain for proportional valve
OUT D drain for self-cleaning filter
OUT E boom section delivery

The main control valve series 471 is an assembly made up of main control valve gearmotor (1) and maximum pressure valve (2).

2.2 Functions of components

1. **Gearmotor of main control valve**
   Opens or closes main valve to let fluid flow through the system.
   Gearmotor is operated via a suitable switch installed on the control device of the unit (e.g.: control box or computer).
   - **Valve open** = liquid sent directly to the circuit for application;
   - **Valve closed** = liquid sent to the tank;
   the suction system, if present, starts functioning.

2. **Maximum pressure valve**
   Eliminates the excess liquid when the set pressure level is reached.
   Can be adjusted manually using the appropriate knob; the knob has a different color according to the maximum pressure for the valve (refer to par. 7.1 - Correspondence between valve parts and maximum valve pressure).

3. **Proportional electric valve**
   Adjusted via a dedicated switch installed on control device (e.g.: control box or computer), this valve regulates spraying pressure; when the vehicle progresses speed changes during spraying, the volume of the liquid distributed per surface unit (litres/ hectare) remains stable.
   The increase or reduction in delivery is proportional to the number of revs of the engine with a tolerance of ± 20%.

4. **Filter**
   Protects nozzles from dirt, which would eventually reduce their performance.
   With self-cleaning filters, there is less need for frequent cleaning of the cartridge inside the filter.

5. **Boom section electric valves**
   These valves open/close the corresponding boom section; for valves with metered by-passes, the valve closed position is the same as the drain position for the respective metered by-pass.

6. **Metered by-passes**
   These are adjusted so the level of spraying pressure remains steady when one or more sections of the boom are closed.

7. **Pressure gauge adapter or pressure transducer connection (supplied on request)**
   Connection for pressure gauge or pressure transducer to provide working pressure indication when main control valve is open.
<table>
<thead>
<tr>
<th>Step</th>
<th>Image</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Set the relevant switch on the control device to “OFF” to set the main valve so as to allow discharge.</td>
</tr>
<tr>
<td>3</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Turn the knob anticlockwise to completely open the hand wheel of the maximum pressure valve.</td>
</tr>
<tr>
<td>4</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Push down the relevant switch on the control device to fully open the proportional valve.</td>
</tr>
<tr>
<td>5</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Set the relevant switches on the control device to ‘OFF’ to close all section valves.</td>
</tr>
<tr>
<td>6</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Open all the compensation cocks by turning their knobs anticlockwise.</td>
</tr>
<tr>
<td>7</td>
<td><img src="471" alt="Image" /> <img src="464" alt="Image" /></td>
<td>Turn the knob clockwise and completely close the drain to the self-cleaning filter.</td>
</tr>
</tbody>
</table>
4.2 Adjustment of maximum operating pressure
(only applicable for units with proportional valve)

⚠️ Should either of the following be noted during operation:
• pressure above the maximum limit for the system and safety valve
• abnormal leaks of liquid
stop work, switch the pump off and check that the installation and preliminary procedures
have been completed correctly.

1. Start pump operation.

2. Set the relevant switch on the control
device to "ON" to open the main valve;
this will let fluid in through the system.

3. Gradually increase the number of revs of the pump until the maximum operating level is reached.

4. Push up the relevant switch on the control device to fully close the
proportional valve.

5. Close all the compensation cocks by turning their knobs clockwise.

6. Adjust the maximum pressure valve
by turning its knob clockwise until the
pressure of the valve is about 20% above the unit's maximum operating
pressure.
For detailed information on operation or adjustment of unit valves, ALWAYS refer to the operating and maintenance instructions manual relevant to your control device.

Pressure readings are indicated by the pressure gauge or displayed at the control device (where unit is equipped with a pressure transducer).

### 5.1 Teraturo della pressione di lavoro

1. Select the type of nozzle and the relative operating pressure according to the line/hectare (l/ha) to be sprayed and the speed of progress.

2. With the machine off, start the pump and take it to its operating level.

3. Set the relevant switch on the control device to "ON" to open the main valve.

4. Set the relevant switches on the control device to "ON" to open all section valves.

5. Now take the unit pressure to the required level for spraying: there are two ways to perform this adjustment.

#### 5.1.1 Constant pressure units (Fig.7 e Fig.8)

This kind of unit does not have a proportional valve, therefore the calibration of the operating pressure is carried out by the maximum pressure valve.

The adjustment is made by turning the knob on the maximum pressure valve until operating pressure is obtained:

- Turn clockwise to increase pressure.
- Turn anticlockwise to decrease pressure.

#### 5.1.2 Units with proportional valve (Fig.9)

The calibration of the operating pressure is carried out by the proportional valve.

To adjust, operate the relevant switch on the control device until achieving the desired pressure.

⚠️ In this case, the proportional valve must be used for pressure adjustment and not the maximum pressure valve since the proportional valve would not compensate the variations in speed correctly should the operating pressure be too close to the calibration of the maximum pressure valve.
5.2 Calibrating the metered by-passes

These cocks safeguard the constant distribution of liquid even in case of operation with one or two section valves closed.

Calibration must be carried out EACH TIME the type of nozzle is changed.

The metered by-pass calibration knobs are equipped with a graduated scale. Once each metered by-pass has been calibrated, enter the value of the graduated scale for the type of nozzle in use in the tables on page 20. This means that it will not be necessary to recalibrate a given metered by-pass the next time the same nozzles are used, but simply set it to its value in the tables.

1

- Close one section valve by setting its corresponding switch on the control device to "OFF".

2

- Adjust the corresponding compensation cock by turning the knob until the pressure level is restored on the pressure gauge that was previously set with all the section valves open.

3

- Open and close the section valve (operate its switch on control device as needed) and make sure that pressure value remains steady.
  
  ! If pressure fluctuates, repeat the operations described at step 2 until no more fluctuation occurs.
4 Calibrate ALL section valves before running a treatment; the calibration can be done as follows, depending on the configuration of the control unit:

- the number of nozzles is **EQUAL** for all section valves
  you need only to calibrate one single valve, then set the graduated scales of the others to the same mark.
- the number of nozzles is **DIFFERENT** for each section valve
  each section valve must be calibrated independently.
- the number of nozzles for each section valve is **MIRRORED** (Fig. 10)
  you need to calibrate only one part of the control unit (right or left boom, valves A, B, C): calibrate the other part of the boom by setting the corresponding metered by-passes to match the valve settings on the section of boom already calibrated (Fig. 10).

If the types of nozzle are not changed, the adjustments made will safeguard a uniform distribution of liquid even when spraying needs differing levels of operating pressure.

**Control Box For Above Unit**

This unit controls all functions of the sprayer control unit.

### Use

<table>
<thead>
<tr>
<th>Description of the controls and their functions</th>
</tr>
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<tbody>
<tr>
<td><img src="image.png" alt="Control Box Image" /></td>
</tr>
</tbody>
</table>

- **Section valve switches (if present)**. 2, 3 or 5 according to the number of valves on the unit. Pushing the switch up, the relative valve opens and begins delivery. The warning indicator lights up when the section is activated. **NOTE:** if there is a main valve, it must be open to begin delivery.

- **Main valve switch (if present)**. Pushing the switch up, the main valve opens and begins delivery if the sections are open. The warning indicator lights up when the main valve is activated.

- **Proportional valve control (if present)**. The lever is normally in the center. Raising it increases pressure inside the unit; lowering it decreases pressure inside the unit. If the control box is fitted with a pressure gauge or digital pressure indicator, the latter will provide an instantaneous reading of pressure.

### Cleaning The Sprayer After Use
1. Always wash and clean your sprayer after use and before storing it away.

2. Take note of any particular instructions as regards cleaning and the need for deactivating agents on the label of the chemical package.

3. A well calibrated sprayer will leave a minimal amount of spray liquid.

4. Always be sure when cleaning your sprayer that the seepage or run off of the residues can not enter streams, water courses, ditches, wells, springs, etc. When washing the outside of the sprayer, the washings must not enter sewers. Drainage must lead to a soak away.

5. Dilute the remaining spray liquid with at least 9 – 10 parts water and spray the liquid out in the field you have just sprayed. While doing this it is advisable to increase your forward speed and decrease the sprayer pressure.

6. Rinse and clean tractor and sprayer.

7. Remove Tank Filter and any other filters that need to be cleaned. Replace filter top.

8. With the pump running rinse the inside of the complete tank. Rinse all units that have been in contact with chemicals. Before spraying out this liquid decide if this needs to be done in the field that was just sprayed or a soak away area (This is an area of ground not used to grow crops).

9. Fill at least 1/3 of the tank with clean water and add detergent or deactivating agent if need be as per the instructions on the chemical package.

10. Start the pump and operate all the controls. Leave the boom section On – Off's till last. Leave the sprayer running for a period of time so that the water is cleaning the system well.

11. If there is a pressure filter on the control unit, please use the following advice. Stop the pump.

A / Idrominus Control Unit: Remove the filter cup and remove filter. Replace cup and start the pump. Leave running for a period of time.
B / Electric Control Valve Units: Follow the advice below.

⚠️ Make sure the drain on the self-cleaning filter is connected to the tank with a hose before starting cleaning.

- **Regular cleaning**
  This procedure can be carried out at the end of each use or any time it is deemed necessary:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protective gloves, goggles and clothing must be worn.</td>
</tr>
<tr>
<td>2</td>
<td>Start the pump and take it to its operating level.</td>
</tr>
<tr>
<td>3</td>
<td>Set the relevant switches on the control device to &quot;OFF&quot; to close all section valves.</td>
</tr>
<tr>
<td>4</td>
<td>Open the drain on the self-cleaning filter completely by turning the knob anticlockwise.</td>
</tr>
<tr>
<td>5</td>
<td>Set the relevant switch on the control device to &quot;ON&quot; to open the main valve.</td>
</tr>
<tr>
<td>6</td>
<td>Allow the system to operate for at least 2 minutes.</td>
</tr>
<tr>
<td>7</td>
<td>Set the relevant switch on the control device to &quot;OFF&quot; to close the main valve.</td>
</tr>
<tr>
<td>8</td>
<td>Close the drain on the self-cleaning filter completely by turning the knob clockwise.</td>
</tr>
</tbody>
</table>
12. Drain the tank and let the pump run dry. Rinse inside of tank and again let pump run dry. Stop the pump.

13. Wash and clean all the filters that were removed. Be careful not to damage the mesh. Replace filters and be sure to seat all cups and o rings correctly.

14. Store the sprayer under cover and leave the tank lid off.

<table>
<thead>
<tr>
<th>Hint!</th>
<th>Wash sprayer with a detergent (Pullspray, All Clear Extra, and Teepol) every 100 hours or at least once a year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hint!</td>
<td>Clean all filters after first trial run with water.</td>
</tr>
</tbody>
</table>

**Boom Height / Calibration / Nozzles / Basic Tables & Conversions**

1. The height of the sprayer nozzle should be approx 50cms above the height of the crop.
2. Stationary Calibrating From Single Nozzle Output

The calibrating can also be conducted by measuring the single nozzle output (l/min) with water when the forward speed of the tractor on the field is exactly known. This then allows the calculation of the liquid rate (l/ha) or to read it directly off the spray table.

Sensitivity the nozzle output should be checked on three different nozzles. Always check one nozzle at the left hand and right hand boom as well as in the centre of the sprayer boom as follows:

- Fill up tank with water.
- Ensure that all nozzles are operating correctly.
- Take the required spray rate (l/ha) from the spray table and set it.
- Determine the single nozzle output (l/min) on several nozzles, e.g. by a stop watch, metering cylinder and measuring cup.
- Calculate the average single nozzle output (l/min).

Example:

Nozzle size: 
Intended or measured
Forward speed: 
Nozzle output at the left hand boom: 
Nozzle output in the centre: 
Nozzle output at the right hand boom:
Calculated mean rate:

1. How to calculate the actual liquid amount (l/ha)

\[
\text{Liquid amount (l/ha)} = \frac{d \text{ [l/min]} \times 1200}{e \text{ [km/h]}}
\]

d: Nozzle output (calculated mean value) [l/min]
e: Forward speed [km/h]

\[
\frac{2.8 \text{ [l/min]} \times 1200}{6.5 \text{ [km/h]}} = 517 \text{ [l/ha]}
\]

2. Read the actual liquid amount (l/ha) off the spraying table for
- Nozzle size 08',
- Collected nozzle output (2.8 l/min).
- Intended forward speed (6.5 km/h).

Example:

Liquid amount read off the spraying table 617 l/ha: 517 l/ha.

- If the actual and the collected nozzle output do not coincide, correct the spraying pressure accordingly:
  - In case of too low liquid amount (nozzle output) increase the spray pressure.
  - In case the liquid amount is too large reduce the spray pressure.
- Check the nozzle ejection as long as the determined and the desired liquid amount coincide.

3. Determining The Actual Operation Speed

- Measure on the field accurately a distance of 100 m. Mark the starting and end point.
- Read off the tractor clock for which tractor gear will allow a forward speed of 0 to max. 6 km/h. Set on the hand throttle lever a constant tractor engine speed within the allowable pump drive speed (Min 350 rpm – Max 540 rpm)
4. Determine The Spraying Pressure

A / Find the column with the intended operational speed (KPH) in the spray Table below.

B / In this column find the line with the desired spray rate (Litres Per Hectare).

C / In this line find the column for the nozzle size used and read off the necessary spraying pressure on the point of intersection.

D / read the nozzle output flow necessary for calibrating the individual nozzle off the column output (Output L/Min).

Example:

Necessary Spray Rate: 238 Litres Per Hectare

Intended Forward Speed: 8 Kph

Selected Nozzle: ST 110 – 04 / LU 120 – 04
                    LD 110 – 04 / AD 120 – 04

Necessary Spraying Pressure: 3 Bar
## Spray Table

<table>
<thead>
<tr>
<th>Code</th>
<th>Pressure Range</th>
<th>Flow Rate</th>
<th>Spray Pattern Width</th>
<th>Spray Pattern Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1D</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1E</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1F</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1G</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1H</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1I</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1J</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1K</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1L</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1M</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1N</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1O</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1P</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1Q</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1R</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1S</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1T</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1U</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1V</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1W</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1X</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1Y</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
<tr>
<td>A1Z</td>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
</tbody>
</table>

### Pressure Range

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Flow Rate</th>
<th>Spray Pattern Width</th>
<th>Spray Pattern Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20 Bars</td>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
</tbody>
</table>

### Flow Rate

<table>
<thead>
<tr>
<th>Flow Rate</th>
<th>Spray Pattern Width</th>
<th>Spray Pattern Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 l/min</td>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
</tbody>
</table>

### Spray Pattern Width

<table>
<thead>
<tr>
<th>Spray Pattern Width</th>
<th>Spray Pattern Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
</tbody>
</table>

### Spray Pattern Height

<table>
<thead>
<tr>
<th>Spray Pattern Height</th>
<th>Spray Pattern Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.125 in</td>
<td>0.125 in</td>
</tr>
</tbody>
</table>
**Conversions Factors**

- **Metres to Feet**: $\times 3.281$
- **Feet to Metres**: $\times 0.305$
- **Kilometres to Miles**: $\times 0.621$
- **Miles to Kilometres**: $\times 1.61$
- **Hectares to Acres**: $\times 2.471$
- **Acres to Hectares**: $\times 0.405$
- **Litres to Gallons**: $\times 0.220$
- **Gallons to Litres**: $\times 4.541$
Test For Full Boom Width

In addition to the single nozzle check, you can do a test (with clean water) for extra accuracy. Mark the level in your tank, while it is parked on level ground. Spray exactly the distance listed in the chart below to suit your boom width to cover 1/40 Hectare at the speed and pressure which you have already calculated (Always from a running start). Now check the amount of water you have used by refilling the tank with a measuring jug, exactly to the mark (be sure to be on level ground). To be more accuracy do this test by covering the distance off 1/20 or 1/10 Hectare.

<table>
<thead>
<tr>
<th>Distance To Drive</th>
<th>Boom Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>6mt</td>
<td>8mt</td>
</tr>
<tr>
<td>1/40 Hectare</td>
<td>41.67</td>
</tr>
<tr>
<td>1/20 Hectare</td>
<td>83.34</td>
</tr>
<tr>
<td>1/10 Hectare</td>
<td>166.67</td>
</tr>
</tbody>
</table>

E.g.: Amount used after covering 41.67mts with a 6mt boom = 5.5lts = 5.5 x 40 = 220 Litres per Hectare

<table>
<thead>
<tr>
<th><strong>Hint!</strong></th>
<th>Always test and calibrate the sprayer with clean water only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hint!</strong></td>
<td>Never clean the nozzles with pointed or sharp objects</td>
</tr>
</tbody>
</table>

**Extras**

<table>
<thead>
<tr>
<th>Indirect Self Filler</th>
<th>Direct Self Filler</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UCM 4</th>
<th>Idrominus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elect On Off</td>
<td>Full Elect</td>
</tr>
<tr>
<td>Mechanical Winch</td>
<td>Trapeze unit</td>
</tr>
<tr>
<td>Hyd Height / Trapeze</td>
<td>Chemical Mixer</td>
</tr>
<tr>
<td>(ram not shown)</td>
<td></td>
</tr>
<tr>
<td>In Line Filters</td>
<td>Triplet Nozzles</td>
</tr>
<tr>
<td>Heavy Duty Hose Reel + Hose</td>
<td>600 + 1000mm Lances</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Foam Marker</td>
<td>End Nozzles</td>
</tr>
</tbody>
</table>

1. **Mechanical Winch** can be fitted to CX 6 & CX 8 for raising and lowering the booms. Tighten wire rope and slacking the 4 nuts on the boom slide brackets. Raise or lower boom into position and tighten the 4 nuts. This unit can also be used in conjunction with the mech self levelling unit.

2. **Mechanical Trapeze Unit**: This unit allows the booms to stay level while working in the field, but must be locked for travelling on the road.
3. **Hydraulic Height & Trapeze Unit:** This unit allows the booms to be raised and lowered using the tractors hydraulic system. The trapeze unit works in the same way as the mechanical one.

4. **Chemical Mixer Unit:** This unit allows you to mix the chemicals being added to the sprayer with water and then transfers them to the sprayer tank.

### INFORMATION ON USE

#### DESCRIPTION OF CONTROLS

- **B)** Lever-operated control valve for equipment and chemical product container washing.
  - Press the lever to inject water.
- **D)** Valve for chemical product transfer from the equipment tank to the sprayer tank:
  1. Closed valve
  2. Open valve
- **E)** Valve for water supply to the equipment or the spraying boom:
  1. Boom liquid supply
  2. Equipment supply
- **F)** Tank water supply valve:
  1. Closed valve
  2. Open valve

#### PREPARATION OF CHEMICAL PRODUCT

**Caution - Warning**

Before starting the preparation of the chemical product, adopt all measures that are necessary to avoid contamination danger and risks for men, animals and environment.

In particular:
- Wear protection clothing to avoid the direct contact with parts of the body, especially in the presence of wounds.
- Wear protection devices to protect face, head, hands, using rubber gloves, gas masks, goggles and helmet.
- Do not use protection devices that are not in perfect operating conditions, in particular check the state of the gas mask and cab filters.
- Keep the chemical products out of the reach of unauthorised persons (especially children and disabled).
- Arrange all the equipment that is necessary to handle the chemical product and the mix during the preparation, filling, draining and cleaning of the tank, as well as during the product distribution, adjustment, replacement or add of plant protection products and maintenance operations.
- Calculate the exact quantity of product to be mixed according to the surface to be treated and comply with the instructions supplied by the plant protection product manufacturer. Do not mix different products.
In case of accidental contact of the product or mix with the skin, wash immediately with clean water. In case of illness refer to medical assistance, showing the product label.

**Caution - Warning**
Do not dispose of the product, the mix or other polluting material in the environment. Disposal must be performed in accordance with the current regulations on waste.

To mix the product follow the procedure below:
1. Make sure the system is clean and load the water necessary for the treatment of the tank.
2. Operate the pump.
3. Position the valve levers (D, E, F) as shown in figure.
4. Open the valve (F) and insert about 15 cm into the tank (A).
5. Open the cover (G), with the valve (F) open and load the chemical product to be mixed.
6. Open the valve (B) to rinse the chemical product container.

**Danger - Warning**
Do not operate the valve (A) until the container is placed on the nozzle, as to avoid water spills that might hurt the operator.

**Caution - Warning**
Do not pollute the environment with empty containers. Dispose of empty containers in accordance with the waste disposal regulations in force in the country of use.

7. Close the cover back and wait until the liquid level rises to approximately middle tank.
8. Open the valve (D) to empty the tank.
9. Shut off the valve (F).
5. Inline Filter: These units can be fitted to each spray line supplying the boom sections. They will add extra filtration to the prevent the nozzles blocking.

6. Triplet Nozzle Holders: These units can be fitted to the sprayer pipes and come complete with three sets of standard fan nozzles (other type nozzles can be supplied upon request and an extra cost).

7. Heavy Duty Hose Reel & Lances: These are mounted on the back off the sprayer with the bracket supplied. The supply is got from the main control unit.

Start tractor and engage PTO. Increase PTO shaft revs to 350rpm and set working pressure at 1.5 bars. Switch on lever to supply spray to hose reel. The spray pattern of the lance is controlled by the lever on the lance.
8. Foam Maker Kit: This unit is worked on a compressed air system and causes foam to blob out of the units fitted to the end off the boom to show the working width of the boom, so that the next spray run up the is kept the correct distance apart.

6. USE

6.1 Discharging remaining pressure

**OPENING THE TANK CAP CAN CAUSE FOAMING-AGENT TO SUDDENLY COME OUT!**

Whenever necessary, open the tank filler cap and depressurize the system as follows:
- Cut off the supply to the foam marker.
- Raise the safety valve ring on the tank filler cap and discharge the remaining pressure as shown in the figure.

![Fig. 13](image)

6.2 Control devices

A Lever control switch for foam delivery (Left / Off / Right)
B Pilot lights checking and controlling the treated portion

![Fig. 14](image)

6.3 Preliminary checks

After a long period of disuse and before every new use, check the tightness of the fittings.

6.4 Preparing foaming solution

- Pour an amount of concentrated foaming liquid into the tank according to the instructions given on the package of the product.
- Add clean water to fill the tank, using a pipe inserted down to the bottom of the tank so as to mix the product well and prevent foam from forming.
- Otherwise, it is necessary to carefully mix after filling the tank.
- Screw on the cap and tighten it carefully.
- For use during the winter, add antifreeze to the amount specified on the antifreeze package.

6.5 Starting and operation

- Start up the compressor with the lever selector "A" (Fig. 14) on the control panel.
- The respective lamp will light up and after a few seconds the circuit will reach operating pressure and deliver foam from the selected foam nozzle.
- Adjust the intensity of the foam outlet, using the flow-rate regulator on the tank cap (Fig. 15).
- During use it is possible to alternate the right or left-hand foam nozzle by moving the selector lever.
- To interrupt foam marker operation, set the switch to its central position (OFF).
- To shut off power to the foam marker set the starter key to OFF (if the electrical connections described in par. 6.7 - Mounting the control unit have been made).

![Fig. 15](image)

6.6 Topping up liquid

- Depressurize the tank as indicated in par. 6.1 - Discharging remaining pressure.
- Refill with liquid, observing the procedures described in the par. 6.4 - Preparing foaming solution.
9. End Nozzle Kit: These units are fitted to the end of the boom to increase the sprayer width. When used on one side only, it can be used to spray along fences, etc.

**Out Of Season Storage**

1. Clean and wash the sprayer both inside and outside as per the instructions in the section Cleaning Your Sprayer.

2. Check all hoses and joints for leaks. Carry out any repairs that need to be done.

3. Fill the tank with at least 10 – 15 litres of a 25 – 30% antifreeze mixture. Start the pump and leave running for a period of time. Open out the booms and switch on the levers supplying the nozzles, one section at a time. When the mixture starts to come out the nozzles, switch off this section. Carry this task out till all sections are covered.

4. Stop pump and park sprayer away safely, leaving the tank lid sitting on top of the tank. Remove pressure gauge and store it in a frost free area, standing vertical. Turn pressure knob out completely as if you were decreasing the spray pressure.

5. When starting the next season, refit pressure gauge and rinse tank out like you would while cleaning the sprayer.

| **Hint!** Anti freeze will help protect your sprayer from frost damage and will help stop the hoses, o-rings and gaskets from drying out. |
### Trouble Shooting / Maintenance

#### Pumps

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pump doesn’t draw water</td>
<td>One or more valves are seated improperly</td>
<td>Examine the valve seat and clean</td>
</tr>
<tr>
<td>Pressure Gauge fluctuates badly</td>
<td>The pump is drawing in air or the suction filter may be blocked or the cup not seated correctly</td>
<td>Check the suction hose. Remove and clean suction filter on top off tank. Reseat the filter cup correctly. Rotate the pump with the pressure control and section levers open</td>
</tr>
<tr>
<td>Liquid flow is irregular</td>
<td>Air pressure maybe be low in the pulsation damper</td>
<td>Check the pressure in the pulsation damper</td>
</tr>
<tr>
<td>Water is pumped at little or no pressure</td>
<td>Pressure control may be worn out</td>
<td>Replace valve and if necessary valve seat</td>
</tr>
<tr>
<td>Out put drops and the pump is noisy</td>
<td>Oil level is low</td>
<td>Add oil to bring to half way up the glass</td>
</tr>
<tr>
<td>Oil Glass keeps empting</td>
<td>One or more diaphragms are broken</td>
<td>Drain the pump. Dismantle the heads and fit new diaphragms. Turn pump by hand and fill oil to level in glass</td>
</tr>
<tr>
<td>Oil in glass goes milky</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil comes out of discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pump Maintenance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAE 30 Oil</td>
<td>Change the oil in the pump after the first 5 hours and then after the first 50 hours. Further oil changes every 100 hours after that or at least once a year. Remove drain plug at the bottom off the pump and turn pump by hand until the oil is drained. Refill with SAE 30 Oil while turning the pump by hand. To make sure the pump has being filled correctly prepare the correct amount of oil before hand and be sure to use it all. Start tractor and engage PTO, run pump at low revs for approx two minutes and recheck oil level in bowl.</td>
<td></td>
</tr>
</tbody>
</table>
## Control Units

### 4 Section Control Units With Main On / Off Control

#### 6.3.1 Troubleshooting - Units with constant pressure

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure is not reached when the main valve is opened</td>
<td>Intakes and outlets have not been connected up correctly</td>
<td>Check connections</td>
</tr>
<tr>
<td></td>
<td>The maximum pressure valve is completely unscrewed</td>
<td>Adjust the maximum pressure valve</td>
</tr>
<tr>
<td></td>
<td>The self-cleaning filter is completely open</td>
<td>Close the knob of the self-cleaning filter</td>
</tr>
<tr>
<td></td>
<td>The delivery filter is clogged</td>
<td>Clean the cartridge on the delivery filter</td>
</tr>
<tr>
<td></td>
<td>The suction filter is clogged</td>
<td>Clean the cartridge on the suction filter</td>
</tr>
<tr>
<td></td>
<td>Insufficient liquid entering the control unit</td>
<td>Check pump flow rate</td>
</tr>
<tr>
<td></td>
<td>Increase pump revs</td>
<td>Check there are no open offsets or discharges prior to the control unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is not possible to reduce operating pressure</td>
<td>The discharge line on the main valve is clogged</td>
<td>Check the discharge line is clear</td>
</tr>
<tr>
<td></td>
<td>There is a hydraulic stinger on the discharge line on the main valve</td>
<td>Remove the hydraulic stinger and leave the hole open</td>
</tr>
<tr>
<td></td>
<td>The discharge hose for the main valve is too small</td>
<td>Replace the discharge hose</td>
</tr>
<tr>
<td></td>
<td>The flow rate of the main valve is below the required flow rate</td>
<td>Replace the main valve</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid exits the section valves when the main valve is closed</td>
<td>The discharge line on the main valve is clogged</td>
<td>Check the discharge line is clear</td>
</tr>
<tr>
<td></td>
<td>There is a hydraulic stinger on the discharge line on the main valve</td>
<td>Remove the hydraulic stinger and leave the hole open</td>
</tr>
<tr>
<td></td>
<td>The discharge hose for the main valve is too small</td>
<td>Replace the discharge hose</td>
</tr>
<tr>
<td></td>
<td>The gasket of the main valve plug is worn</td>
<td>Replace the gasket</td>
</tr>
<tr>
<td></td>
<td>Chemical residues on gaskets and the relative seat in the hose tail for the main valve</td>
<td>Clean parts using the appropriate detergent as instructed in the &quot;MAINTENANCE&quot; section</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pressure gauge indicates pressure below the effective level</td>
<td>Pressure gauge fault</td>
<td>Replace the pressure gauge</td>
</tr>
<tr>
<td></td>
<td>The gasket inside the pressure gauge seat is crushed and has partially clogged the line</td>
<td>Unscrew the pressure gauge slightly</td>
</tr>
<tr>
<td>The pressure indicated by the pressure gauge is above the effective level at the nozzles</td>
<td>The lines between valve and nozzle are too small and are causing a large drop in pressure</td>
<td>Commission suitable hoses and hose tails for the section valves</td>
</tr>
<tr>
<td>One or more sections do not close correctly</td>
<td>The gasket of the main valve plug is worn</td>
<td>Replace worn gaskets</td>
</tr>
<tr>
<td></td>
<td>Chemical residues on gaskets and the relative seat in the hose tail for the section valves</td>
<td>Clean parts using the appropriate detergent as instructed in the &quot;MAINTENANCE&quot; section</td>
</tr>
<tr>
<td><strong>PROBLEM</strong></td>
<td><strong>CAUSE</strong></td>
<td><strong>SOLUTION</strong></td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>Operating pressure is not reached when the main valve is opened</td>
<td>Intakes and outlets have not been connected up correctly</td>
<td>Check connections</td>
</tr>
<tr>
<td></td>
<td>The maximum pressure valve is completely unscrewed</td>
<td>Adjust the maximum pressure valve</td>
</tr>
<tr>
<td></td>
<td>The proportional valve is completely open</td>
<td>Adjust the proportional valve</td>
</tr>
<tr>
<td></td>
<td>The self-cleaning filter is completely open</td>
<td>Close the knob of the self-cleaning filter</td>
</tr>
<tr>
<td></td>
<td>The delivery filter is clogged</td>
<td>Clean the cartridge on the delivery filter</td>
</tr>
<tr>
<td></td>
<td>The suction filter is clogged</td>
<td>Clean the cartridge on the suction filter</td>
</tr>
<tr>
<td></td>
<td>Insufficient liquid entering the control unit</td>
<td>Check pump flow rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase pump revs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check there are no open offsets or discharges prior to the control unit</td>
</tr>
<tr>
<td>It is not possible to reduce operating pressure</td>
<td>The discharge line on the proportional valve is clogged</td>
<td>Check the discharge line is clear</td>
</tr>
<tr>
<td></td>
<td>There is a hydraulic stirrer on the discharge line on the proportional valve</td>
<td>Remove the hydraulic stirrer and leave the hole open</td>
</tr>
<tr>
<td></td>
<td>The discharge hose for the proportional valve is too small</td>
<td>Replace the discharge hose</td>
</tr>
<tr>
<td></td>
<td>The flow rate of the proportional valve is below the required flow rate</td>
<td>Replace the proportional valve</td>
</tr>
<tr>
<td>Liquid exits the section valves when the main valve is closed</td>
<td>The discharge line on the main valve is clogged</td>
<td>Check the discharge line is clear</td>
</tr>
<tr>
<td></td>
<td>There is a hydraulic stirrer on the discharge line on the main valve</td>
<td>Remove the hydraulic stirrer and leave the hole open</td>
</tr>
<tr>
<td></td>
<td>The discharge hose for the main valve is too small</td>
<td>Replace the discharge hose</td>
</tr>
<tr>
<td></td>
<td>The gasket of the main valve plug is worn</td>
<td>Replace the gasket. Send the entire unit to your local service centre</td>
</tr>
<tr>
<td></td>
<td>Chemical residues on gaskets and the relative seat in the hose tail for the main valve</td>
<td>Clean parts using the appropriate detergent as instructed in the “MAINTENANCE” section</td>
</tr>
<tr>
<td>Pressure jumps considerably with the smallest of adjustments of the proportional valve (impossible to make accurate adjustments)</td>
<td>The proportional valve is not suitable for the system</td>
<td>Replace the proportional valve</td>
</tr>
<tr>
<td></td>
<td>Insufficient liquid entering the control unit</td>
<td>Check pump flow rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase pump revs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check there are no open offsets or discharges prior to the control unit</td>
</tr>
<tr>
<td>Pressure falls considerably when one or two sections are closed</td>
<td>Compensation cocks have not been adjusted</td>
<td>Adjust compensation cocks</td>
</tr>
<tr>
<td>The pressure gauge indicates pressure below the effective level</td>
<td>Pressure gauge fault</td>
<td>Replace the pressure gauge</td>
</tr>
<tr>
<td></td>
<td>The gasket inside the pressure gauge seat is crushed and has partially closed the line</td>
<td>Unscrew the pressure gauge slightly</td>
</tr>
<tr>
<td>The pressure indicated by the pressure gauge is above the effective level at the nozzles</td>
<td>The lines between valve and nozzle are too small and are causing a large drop in pressure</td>
<td>Commission suitable hoses and hose tails for the section valves</td>
</tr>
<tr>
<td>One or more sections do not close correctly</td>
<td>The gasket of the main valve plug is worn</td>
<td>Replace worn gaskets</td>
</tr>
<tr>
<td></td>
<td>Chemical residues on gaskets and the relative seat in the hose tail for the section valves</td>
<td>Clean parts using the appropriate detergent as instructed in the “MAINTENANCE” section</td>
</tr>
</tbody>
</table>
###Troubleshooting

<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main valve motor malfunctioning</td>
<td>Check electric connection</td>
<td>Have gearmotor inspected at the nearest service center</td>
</tr>
<tr>
<td>Inlet and outlet tubes not connected correctly</td>
<td>Check delivery and outlet tube connections</td>
<td></td>
</tr>
<tr>
<td>Maximum pressure valve fully loosened</td>
<td>Adjust maximum pressure valve</td>
<td></td>
</tr>
<tr>
<td>Self-cleaning filter drain fully open</td>
<td>Tighten knob of self-cleaning filter</td>
<td></td>
</tr>
<tr>
<td>Delivery filter clogged</td>
<td>Clean delivery filter cartridge</td>
<td></td>
</tr>
<tr>
<td>Suction filter clogged</td>
<td>Clean suction filter cartridge</td>
<td></td>
</tr>
<tr>
<td>Insufficient liquid delivery to control unit</td>
<td>Check pump rate</td>
<td></td>
</tr>
<tr>
<td>Proportional valve fully open</td>
<td>Operate pressure control switch to close proportional valve</td>
<td></td>
</tr>
<tr>
<td>Proportional valve motor not working</td>
<td>Check electric connection</td>
<td>Have gearmotor inspected at the nearest service center</td>
</tr>
<tr>
<td>Proportional valve drain passage clogged</td>
<td>Clean drain passage</td>
<td></td>
</tr>
<tr>
<td>A hydraulic agitator is connected to drain passage of proportional valve</td>
<td>Remove hydraulic agitator and leave hole open</td>
<td></td>
</tr>
<tr>
<td>Drain tube of proportional valve undersized</td>
<td>Change drain tube</td>
<td></td>
</tr>
<tr>
<td>Proportional valve flow rate lower than desired rate setting</td>
<td>Change proportional valve</td>
<td></td>
</tr>
<tr>
<td>TROUBLE</td>
<td>CAUSE</td>
<td>REMEDY</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Liquid coming out of section valves when main valve is closed</td>
<td>Drain passage of main valve obstructed</td>
<td>Clean drain passage</td>
</tr>
<tr>
<td></td>
<td>A hydraulic agitator is connected to drain passage of proportional valve</td>
<td>Remove hydraulic agitator and leave hole open</td>
</tr>
<tr>
<td></td>
<td>Drain tube of proportional valve undersized</td>
<td>Change drain tube</td>
</tr>
<tr>
<td></td>
<td>Main valve plug gasket worn out</td>
<td>Gasket needs replacing; bring complete unit to the nearest service center</td>
</tr>
<tr>
<td></td>
<td>Chemical residue on gaskets and seat of main valve hose tail</td>
<td>Clean parts with suitable detergent as indicated in cap. 6 - Maintenance / diagnostics / repairs</td>
</tr>
<tr>
<td>Adjustment inaccurate; minor movements of switch on proportional valve control device lead to significant change in pressure</td>
<td>Proportional valve not correctly sized for system</td>
<td>Change proportional valve</td>
</tr>
<tr>
<td></td>
<td>Insufficient liquid delivery to control unit</td>
<td>Check pump rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase pump rpm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for open branches or drain outlets upstream of control unit</td>
</tr>
<tr>
<td>Large amount of pressure fluctuation when one or two sections are closed</td>
<td>Metered by-passes not adjusted</td>
<td>Adjust metered by-passes</td>
</tr>
<tr>
<td>Pressure gauge reading higher than actual pressure</td>
<td>Pressure gauge malfunctioning</td>
<td>Change pressure gauge</td>
</tr>
<tr>
<td></td>
<td>Squashed gasket inside pressure gauge is partially obstructing passage</td>
<td>Slightly loosen pressure gauge</td>
</tr>
<tr>
<td></td>
<td>Passages across valve and nozzle undersized, leading to significant pressure drop</td>
<td>Choose section valve tubes and hose tails of correct size</td>
</tr>
<tr>
<td>Pressure transducer reading higher than actual pressure</td>
<td>Transducer malfunctioning</td>
<td>Change data settings in computer; if problem persists, change transducer</td>
</tr>
<tr>
<td></td>
<td>Passages across valve and nozzle undersized, leading to significant pressure drop</td>
<td>Choose section valve tubes and hose tails of correct size</td>
</tr>
<tr>
<td>One or more sections not closing correctly</td>
<td>Section valve motor not working</td>
<td>Check electric connection</td>
</tr>
<tr>
<td></td>
<td>Section valve plug gasket worn out</td>
<td>Have gearmotor inspected at the nearest service center</td>
</tr>
<tr>
<td></td>
<td>Chemical residue on gasket and seat of section valve hose tail</td>
<td>Clean parts with suitable detergent as indicated in cap. 6 - Maintenance / diagnostics / repairs</td>
</tr>
</tbody>
</table>
Control Box

4.3 Problems and solutions

<table>
<thead>
<tr>
<th>Defect</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The warning lights are on, but the relative valves cannot be controlled</td>
<td>Connectors disconnected</td>
<td>Connect the connectors</td>
</tr>
<tr>
<td>The warning lights are off and the valves are not operating</td>
<td>Internal safety device activated</td>
<td>Turn off power and wait at least 20 seconds, then try to restart the control box. If the problem persists, contact the nearest after sales service</td>
</tr>
<tr>
<td></td>
<td>Fuse on the power supply circuit (relay) blown</td>
<td>Replace the fuse. If the problem persists, contact the nearest after sales service</td>
</tr>
<tr>
<td>No power</td>
<td></td>
<td>Check the power supply</td>
</tr>
<tr>
<td>Leakage of water between the reducer-adapter and the connection of the pressure gauge</td>
<td>The reducer-adapter is not screwed down</td>
<td>Screw the reducer-adapter down using sealing glue</td>
</tr>
<tr>
<td></td>
<td>The reducer-adapter is screwed down without sealing glue</td>
<td></td>
</tr>
<tr>
<td>The pressure gauge always displays zero pressure</td>
<td>Faulty pressure gauge</td>
<td>Verify the pressure gauge works and contact a service centre for its replacement if necessary</td>
</tr>
<tr>
<td></td>
<td>Pressure gauge hole logged</td>
<td>Clean the pressure gauge hole and screw the reducer-adapter back down</td>
</tr>
<tr>
<td>The switches are in the OFF position (leaves down) but the valves are open</td>
<td>Inverted power supply cable</td>
<td>Check the connection of the power supply cable</td>
</tr>
<tr>
<td>(465/555 series) The main valve operates in the opposite direction</td>
<td>The intermediate cable has not been used</td>
<td>Use the intermediate cable</td>
</tr>
</tbody>
</table>

Chemical Mixer

INFORMATION ON MAINTENANCE

DAILY MAINTENANCE

⚠️ Important
Accurate and constant equipment maintenance ensures top performance and extra long life.

At the end of each working day (when the system is being washed), rinse hoses with the equipment valve levers (D and E) in the position shown in Fig. 140. Once this operation has been completed, return the levers to their original position.

ROUTINE MAINTENANCE - EVERY 40 HOURS
+ Check that all the screws are intact and properly tightened.
+ Retouch the damaged painted parts.

EXTENDED INACTIVITY

We advise you to perform all cleaning and maintenance operations before putting away the equipment for the winter break. If circuits have not been protected with antifreeze, empty completely all hoses, so as to avoid ice to damage circuit components.

INFORMATION ON TROUBLES

TROUBLES, CAUSES, CURES

Problem: the equipment does not work.
Causes: incorrect position of the three-way valve.
Solution: turn the valve lever (E).

Problem: the equipment and the boom control unit do not work.
Causes: the pump does not inject water.
Solution: verify the functionality of the pumps and of the pump suction system.
Foam Marker

7 MAINTENANCE / DIAGNOSTICS / REPAIRS

7.1 Safety valve

Safety valve on the tank cap needs no maintenance.

Use the vent ring on the filler cap to avoid formation of incrustations on the safety valve and also to check the operation of the valve itself.

7.2 Machine down for up to 7 days

For periods of disuse up to 7 days, proceed as follows:

- Slacken the band “B” and remove the diffuser “A”.
- Wash the diffuser “A” with water.
- Remove the grid “C” turning it anticlockwise.
- Extract the sponge “D” from the generator “E”.
- Carefully wash the foam diffusers and sponge with water.
- Reassemble the parts taking care when inserting the sponge that must go into its seat freely and without compression, as this may compromise foam marker operation.
- Repeat the above operations for the other foam nozzle as well.

7.3 Machine down for up to 30 days

For periods of disuse up to 30 days, proceed as follows:

- **Depressurize the tank as indicated in par. 6.1 - Discharging remaining pressure.**
  - Slacken and remove the cap “C”.
  - Remove the screws “A” and take off the tank bracket “B”.
  - Remove the tank and wash with clean water.
  - Wash the bottom filter “D” with clean water.
  - Insert the tank into the support bracket.
  - Add a few litres of water into the tank, put the cap back on.
  - Restore the electrical connections.
  - Wash the hydraulic circuit, operating alternately the lever selector in the position corresponding to the boom section involved until clean water comes out of the diffusers.

- **Depressurize the tank as indicated in par. 6.1 - Discharging remaining pressure.**
  - Unscrew and remove the cap and immediately empty the tank of any remaining water.
  - Remove the water/air hoses from the cap and connect them to each other with the provided snap fitting as shown in Fig.18.
  - Empty the hydraulic circuit by operating the lever selector in the position corresponding to the boom section involved until only air comes out of the diffusers.
  - Fit all the parts back together to restore the initial conditions.
  - Clean the diffusers as described in par. 7.2 - Machine down for up to 7 days.
7.4 **Machine down for longer than 30 days**

For long periods of inactivity, proceed as follows:
- Run the operations described in par. 7.2 - Machine down for up to 7 days and par. 7.3 - Machine down for up to 30 days.
- Depressurize the tank as indicated in par. 6.1 - Discharging remaining pressure.
- Clean the compressor unit:
  - remove the cover by taking out the screws "A".
  - clean the inside with compressed air (wearing a face-mask and safety goggles).
  - spray the self-cleaning liquid for electrical contacts through the slots on the electric motor.
  - fit the cover back on.

![Fig. 19](image.png)

7.5 **Reactive maintenance**

To ensure dense and lasting formation of foam, replace the sponges code 520000.160 ("D", Fig. 16) every year.

7.6 **Pipe repairs**

If the hoses break, repair them with one of the snap fittings (code 520004.352 or 520004.353) provided with the package.

Proceed as follows:
- Use a pair of scissors to trim the broken ends of the hose.
- Fit the two ends into the fitting.

![Fig. 20](image.png)

7.7 **Fuse replacement**

Before replacing the fuse, disconnect the control box from the battery.
- Remove the control box from its slide by lifting it.
- At the rear of the box (Fig. 21), undo the screws and remove the fuse box cover.
- Extract the fuse.
- Replace the fuse with another of the same type (10 A rapid); a spare fuse is provided in the package.
- Close the fuse box cover, making sure its gasket (1) is correctly located.
CAUTION: if the gasket is not correctly located, the control box is no longer waterproof!

7.8 Inconvenient remedied

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>The electric compressor will not work, the pilot lights fail to come on.</td>
<td>No power to control unit.</td>
<td>Check the fuse.</td>
</tr>
<tr>
<td></td>
<td>Electrical connection between control unit and electric compressor broken.</td>
<td>Check the electrical connections of the control box.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The tank will not pressurize.</td>
<td></td>
<td>Check the connections between the control box and the electric compressor.</td>
</tr>
<tr>
<td>No foam comes out of the foam nozzles.</td>
<td></td>
<td>Close the tank cap properly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Break in the pneumohydraulic circuit.</td>
<td>Check the tightness of the pipes connecting the compressor with the cap.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foam formation is not good.</td>
<td>Sponge dirty or hardened.</td>
<td>Clean or replace the sponge in the generator.</td>
</tr>
<tr>
<td></td>
<td>Water-foaming agent mix old.</td>
<td>Redo the water-foaming agent mix.</td>
</tr>
<tr>
<td></td>
<td>Flow-rate adjustment wrong.</td>
<td>Use the flow-rate regulator on the tank cap to obtain a sufficiently dense foam.</td>
</tr>
<tr>
<td></td>
<td>Constrictions in pipes.</td>
<td>Check the pipes towards the foam nozzle.</td>
</tr>
<tr>
<td>Air bleeds from the safety valve on the cap.</td>
<td>Constrictions in the pipes.</td>
<td>Check the pipes towards the foam nozzles.</td>
</tr>
<tr>
<td>Air or liquid leaks from the fittings.</td>
<td>Incorrect fitting seal.</td>
<td>Detach the hose at the snap or threaded fittings and shorten it by around 10 mm to eliminate deformations at the fitting.</td>
</tr>
</tbody>
</table>

7.9 Problems due to the solenoid valves locking up

If air or fluid issues from the fittings, or the foam continues being delivered even from the unselected foam nozzle, the solenoid valves (Fig. 22) may have locked up.

Before doing anything else, disconnect the control box from the battery.

Free up the solenoid valves as follows:

- Disconnect the pipes going from the compressor unit to the foam nozzle.
- Blow with compressed air into the unions of the solenoid valves towards the compressor (Fig. 22).

If the problem persists, contact your local service centre.