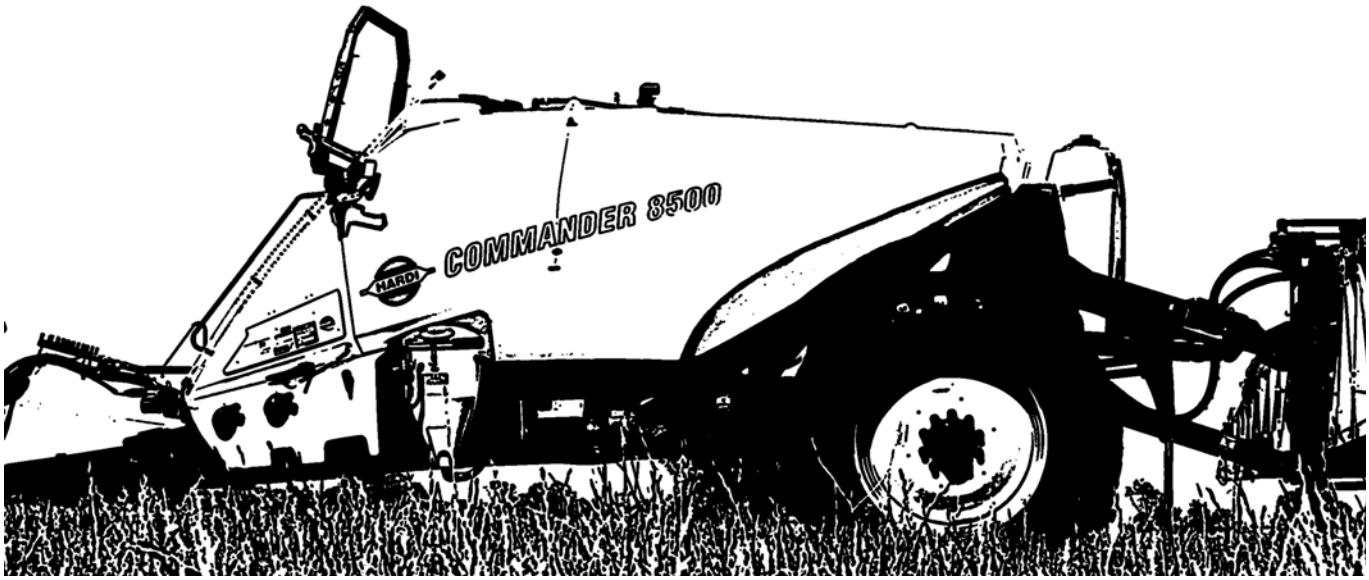
COMMANDER II

AU -Model Range

Instruction book

67028004-101 - Version 1.01
HAU - 07.2015



www.hardi.com.au

We congratulate you for choosing a HARDI plant protection product. The reliability and efficiency of this product depend upon your care. The first step is to carefully read and pay attention to this instruction book. It contains essential information for the efficient use and long life of this quality product.

This book covers updated COMMANDER models, also known as COMMANDER 'II series.

The original instruction book is approved and published in English. All other languages are translations of the original. In the event of any conflicts, inaccuracies or deviations between the English original and other languages the English version shall prevail.

Illustrations, technical information and data in this book are to the best of our belief correct at the time of printing. As it is HARDI AUSTRALIA policy permanently to improve our products, we reserve the right to make changes in design, features, accessories, specifications and maintenance instructions at any time and without notice.

HARDI AUSTRALIA is without any obligation in relation to implements purchased before or after such changes.

HARDI AUSTRALIA cannot undertake any responsibility for possible omissions or inaccuracies in this publication, although everything possible has been done to make it complete and correct.

As this instruction book covers more models and features or equipment, which are available in certain countries only, please pay attention to paragraphs dealing with precisely your model.

Published and printed by HARDI AUSTRALIA

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4 - Sprayer setup

5 - Operation

Operator safety

Symbols

These symbols are used thorough the book to designate where some sort of extra attention has to paid for the reader. The four symbols have following meaning.


This symbol means DANGER. Be very alert as your safety is involved!


This symbol means WARNING. Be alert as your safety can be involved!


This symbol means ATTENTION. This guides to better, easier and more safe operation of your sprayer!


This symbol means NOTE.

Precautions

Note the following recommended precautions and safe operating practices before using the sprayer.

General info


Read and understand this instruction book before using the equipment. It is equally important that other operators of this equipment read and understand this book.

If any portion of this instruction book remains unclear after reading it, contact your HARDI dealer for further explanation before using the equipment.


Local law may demand that the operator is certified to use spray equipment. Adhere to the law.


Tractor drivers seat is the intended working place during operation.


Wear protective clothing. Clothing may differ depending on chemical being sprayed. Adhere to the local law.

Wash and change clothes after spraying. Wash tools if they have become contaminated.


Do not eat, drink or smoke while spraying or working with contaminated equipment.

In case of poisoning, immediately seek medical advice. Remember to identify chemicals used.

Filling and spraying


No persons are allowed in the operations area of the sprayer. Be carefull not to hit people or surroundings when manoeuvring the sprayer, especially when reversing.


Slow down when driving in uneven terrain as the machine might be in risk of turning over.


Keep children away from the equipment!


Do not attempt to enter the tank.


Do not go under any part of the sprayer unless it is secured. The boom is secure when placed in the transport brackets.

Service


Pressure test with clean water prior to filling with chemicals. Never dismount the hoses if the machine is in operation.

DANGER! Do not exceed the P.T.O. max. recommended r.p.m.

2 - Safety notes

Rinse and wash equipment after use and before servicing.

Never service or repair the equipment while it is operating. Always replace all safety devices or shields immediately after servicing.

Disconnect electrical power before servicing and depressurize equipment after use and before servicing.

If an arc welder is used on the equipment or anything connected to the equipment, disconnect power leads before welding. Remove all inflammable or explosive material from the area.

The External Cleaning Device should not be used if important parts of the equipment have been damaged, including safety devices, high pressure hoses, etc.

Label explanation

The labels are designating potential dangerous places on the machine. Anybody working with or being in close range of the sprayer must respect these labels!

The labels should always be clean and readable! Worn or damaged labels must be replaced with new ones. Contact your local dealer for new labels.

Note that not all labels shown here will apply to your sprayer.

978437 Chemical handling!

Carefully read the informations about chemical preparation before handling the machine. Observe instructions and safety rules when operating.

978436 Service!

Shut off the engine and remove ignition key before performing maintenance or repair.

97802100 Risk of death!

Do not attempt to enter tank.

978444 Risk of injury!

Do not open or remove safety shields while engine is running.

978448 Risk of injury!

Keep sufficient distance away from electrical power.

978443 Service!

Carefully read operators instruction book before handling the machine. Observe instructions and safety rules when operating.

978440 Service!

Tighten to torque according to instruction book.

978447 Risk of burn!

Stay clear of hot surfaces.

978586 Risk of injury!

Flying objects, keep safe distance from machine as long as the engine is running.

978435 Risk of injury!

Keep hands away.

978441 Risk of squeeze!

Stay clear of raised unsecured loads.

978445 Risk of squeeze!

Never reach into the crushing danger area as long as parts are moving.

978434 Risk of squeeze!

Keep hands away, when parts is moving.

978442 Risk of falling off!

Do not ride on platform or ladder.

978446 Risk of sprayer tipping over!

Be aware when disconnecting the sprayer.

978438 Grip area!

Manual handling of boom etc.

97802200 Not for drinking!

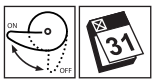
This water must never be used for drinking water.

97802300 Not for drinking!

This water must never be used for drinking water.

97818100 Tank under pressure!

Beware when moving lid.



97827000 EasyClean filter service!

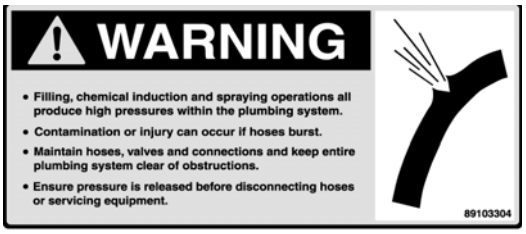
Open and clean filter monthly.

97829000 Lifting point!

978439 Lifting point!

97831500 Load index!

Max. permitted load rating is 164 at 40 km/h.



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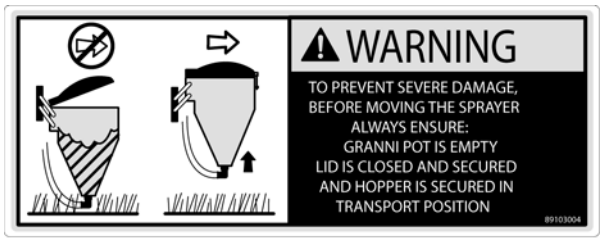

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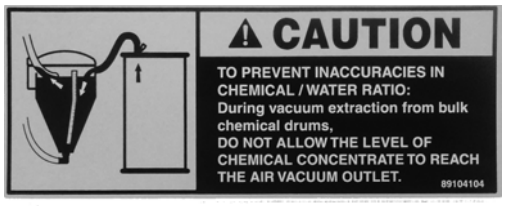

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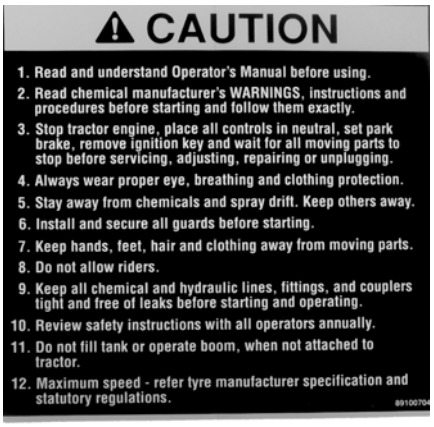

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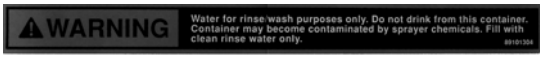

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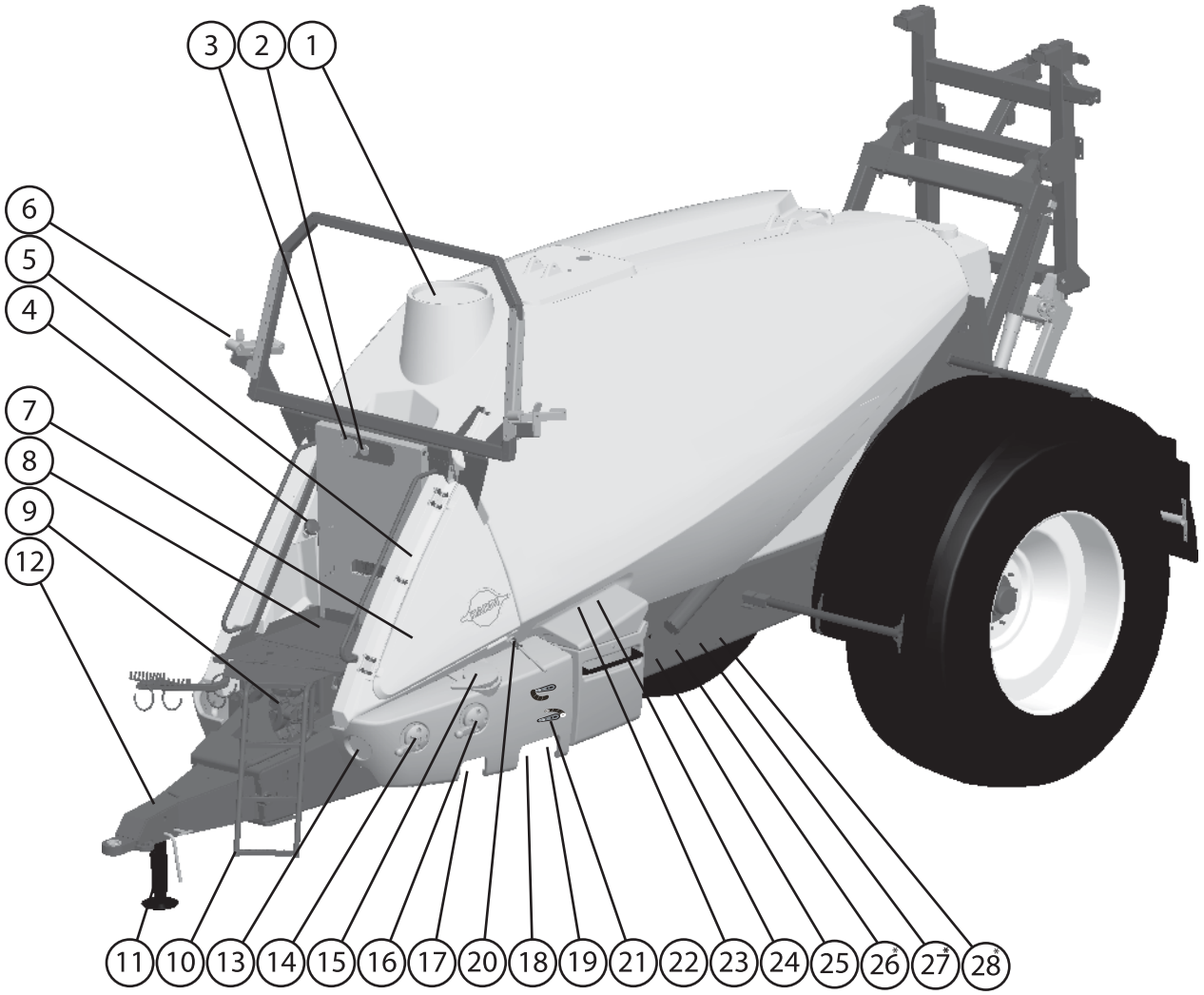
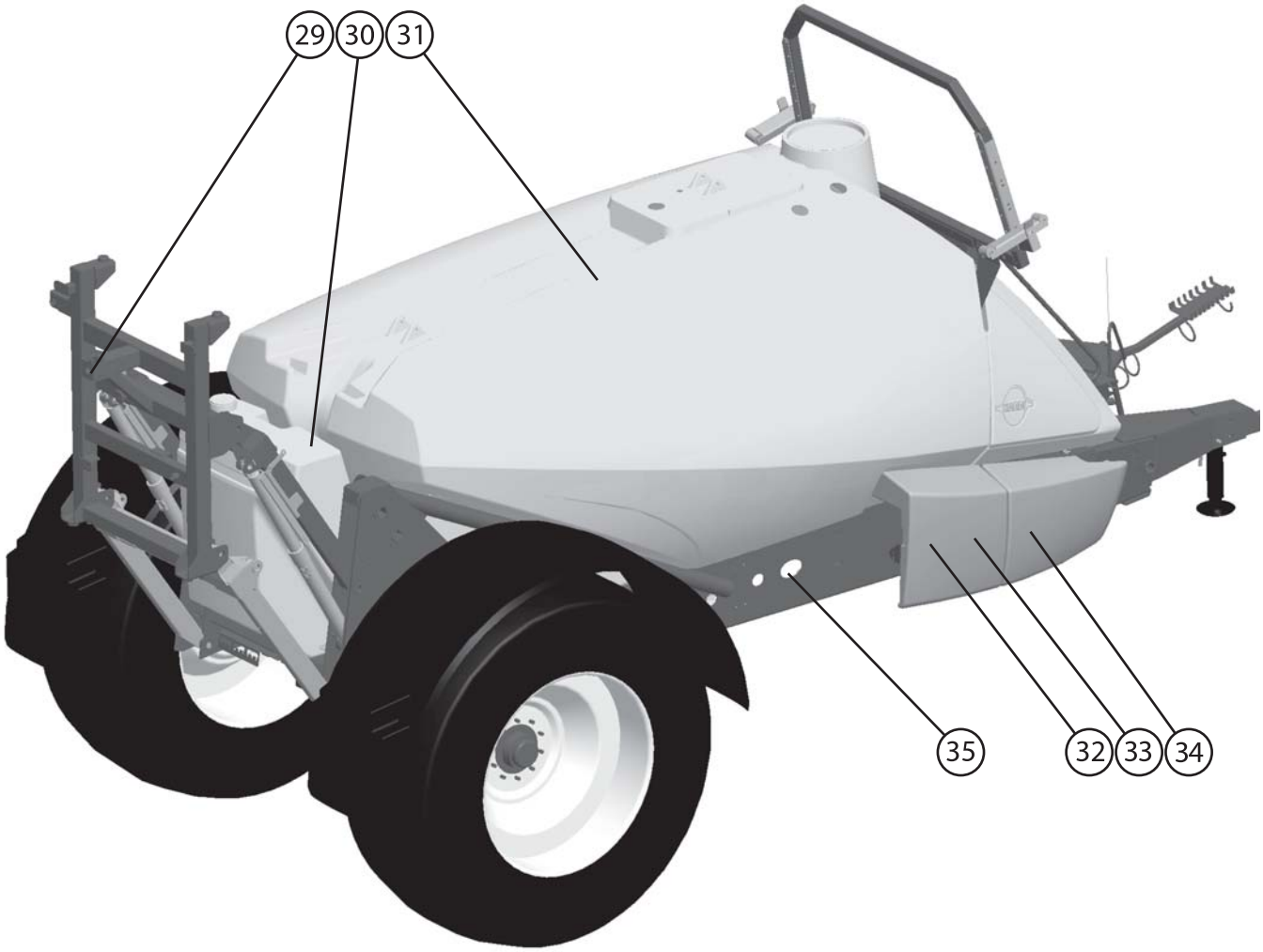
General info

View Front



1. Main tank lid
2. EasyClean clogging indicator
3. Spray pressure gauge
4. Clean water tank lid
5. Main tank level indicator
6. Boom rest
7. SafetyLocker
8. Platform
9. Pump
10. Ladder
11. Support leg
12. Drawbar hitch
13. Agitation/External Cleaning Device valve
14. Suction SmartValve
15. EasyClean filter
16. Pressure SmartValve
17. Pressure draining coupler
18. Rinsing tank coupler
19. External Filling coupler
20. Clean water tap
21. External Filling ON/OFF valve
22. Chemical Source valve
23. TurboFiller
24. Lever for chemical container cleaning
25. TurboFiller Vortex nozzle valve
26. Optional Directional Fill valve (not illustrated)
27. Optional Chem Probe/ Flush valve (not illustrated)
28. Optional Filtered Fill (not illustrated)

View Back



29. Distribution valves (not illustrated)
30. Rinsing tank
31. Main tank
32. ChemLocker with FoamMarker tank
33. Spray lance for External Cleaning Device
34. CycloneFilter
35. Optional FlexCapacity pump

Identification plates

An identification plate is located at the front of the chassis on the right hand side of the sprayer. The reference number on plate will help you and your HARDI dealer to clearly identify your machine and assist in the correct supply of spare parts and service information.

Road worthiness

When driving on public roads and other areas where the highway code applies, or areas with special rules and regulations for marking and lights on implements, you should observe these and equip implements accordingly.

ATTENTION! Max. driving speed is 25km/h for models without brakes and 40 km/h for models with brakes

Sprayer use

The HARDI sprayer is for the application of crop protection chemicals and liquid fertilisers. The equipment must only be used for this purpose. It is not allowed to use the sprayer for any other purposes. If no local law demands that the operator must be certified to use spray equipment, it is strongly recommended to be trained in correct plant protection and in safe handling of plant protection chemicals to avoid unnecessary risk for persons and the environment when doing your spray job.

Frame

Very strong and compact frame which also has a strong chemical and weather resistant electrostatic lacquer coat. Screws, nuts, etc. have been DELTA-MAGNI treated or are made of stainless steel to be resistant to corrosion.

Tanks and equipment

The main tank made of impact-proof, UV-resistant and chemical resistant polyethylene, has a purposeful design with no sharp corners for easy cleaning. The tank lid is placed so it can be accessed from the platform. This ensures an easy access for cleaning of the tank, etc. The sprayer is also equipped with a rinsing tank and a clean water tank. A large, easy to read tank contents indicator is placed beside the platform and is visible from the tractor cabin.

Nominal contents 6500, 8500 or 10000 litres.

3 - Description

Liquid system

Pump

Diaphragm pump with 6 diaphragms, model 464. Standard = 540 r.p.m. Optional = 1000 r.p.m. The design of the diaphragm pump is simple, with easily accessible diaphragms and valves which ensures liquid does not contact the vital parts of the pump.

FlexCapacity pump

Some sprayers feature a dual pump setup with an extra hydraulically driven pump of same type as the main pump, placed on sprayers right side.

The FlexCapacity pump is turned ON/OFF with a separate hydraulic lever in the tractor cabin.

Valves and symbols

The possible functions of valves are distinguished by coloured identification on the function labels. The modular valve system facilitates the addition of optional extras on both the pressure side and suction side. A function is activated by turning the handle towards the desired function.

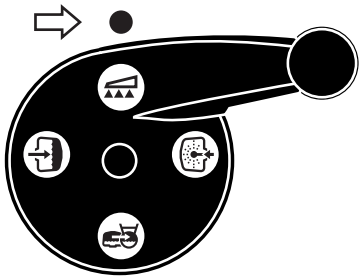
ATTENTION! Only the functions used should be open - always close remaining valves.

ATTENTION! If a valve is too tight to operate - or to loose (= liquid leakage) - the valve needs to be serviced. Please see "Drain valve seal renewal" on page 114 and ""Boom adjustment and service" on page 114 for further information.

Pressure SmartValve (Green symbols)

This valve is to select which function the pressurized liquid from the pump will be routed to.

The active function is indicated by the indicator. The handle is turned so the indicator points to the label for required function. If handle is turned to a position without label (unused function) then the valve is closed.



Pressure to main tank

Spraying

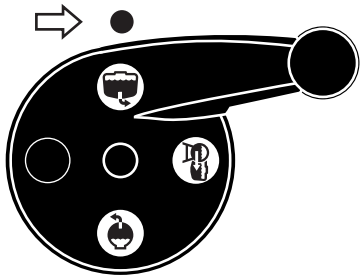
Internal tank cleaning (Rinsing nozzles)

Pressure draining (optional)

Suction SmartValve (Blue symbols)

This valve is to select suction from main tank or from the rinsing tank.

The handle is turned so the label for required function is directed to the indicator. If handle is turned to position where there is no label then the valve is closed.



Suction from main tank

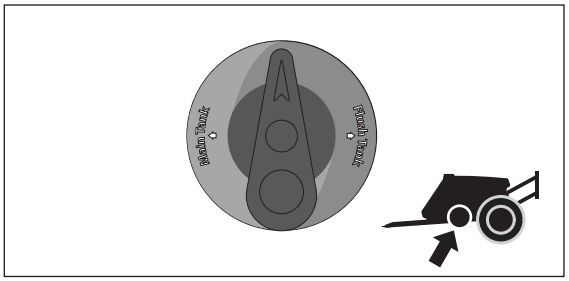
Rinsing tank

External filling (optional)

Directional fill valve

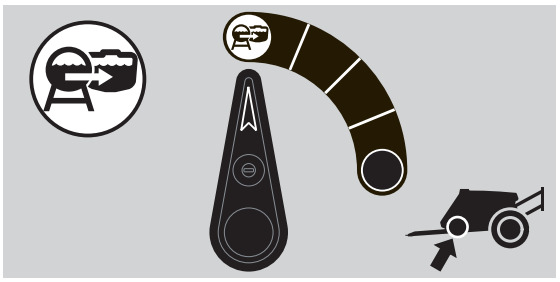
If the sprayer is equipped with Filtered Fill or a Banjo Fast fill System a directional fill valve is mounted on chassis left side.

1. Centre position "OFF" (leave in this position unless not filling).
2. Main Tank (use this position when filling the main tank).
3. Rinse tank (use this position when filling the rinse tank).



External Filling Device valve - Red labels (optional)

This valve is used to control filling from an external tank or reservoir. Note that the suction SmartValve should be positioned at "Suction from external source" and the pressure valve should be positioned at "Pressure to Main Tank" to activate the valve.



Chemical Source Valve -Red labels (only if equipped with TurboFiller)

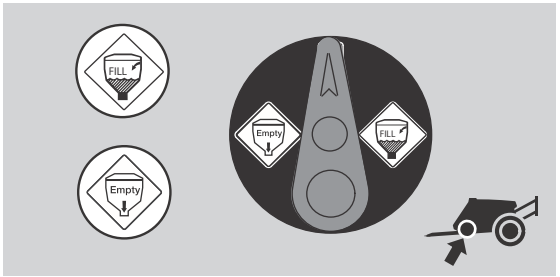
This valve is used to select the desired method of adding chemical.

1. Centre position "OFF" (leave in this position unless transferring chemical).
2. TurboFiller (use this position to activate and empty the TurboFiller).
3. Chem Probe / Chem Meter*...if fitted* (use this position when transferring liquid chemical concentrate from an external drum or container).

Vacuum Transfer Valve - (only if equipped with VACnMIX)

This valve is used to select the desired method of adding chemical.

1. Centre position "OFF" (leave in this position unless transferring chemical).
2. Fill use when filling the VACnMIX
3. EMPTY use this position to transferring liquid chemical from the hopper or ChemProbe to the Main Tank,

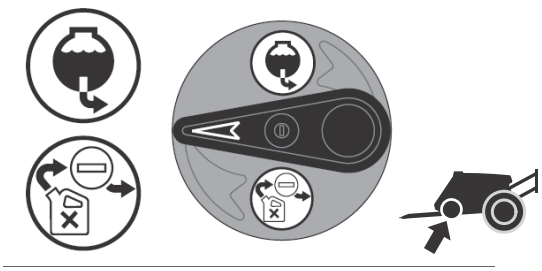


ChemProbe / Flush valve

This valve is used for filling liquid chemicals from a drum or a small container using the Chem Meter (if fitted).

Flushing the Chem Meter Circuit

The Chem Meter circuit can be quickly and easily flushed of neat chemical by reversing the direction of the valve to draw clean water from the flush tank.



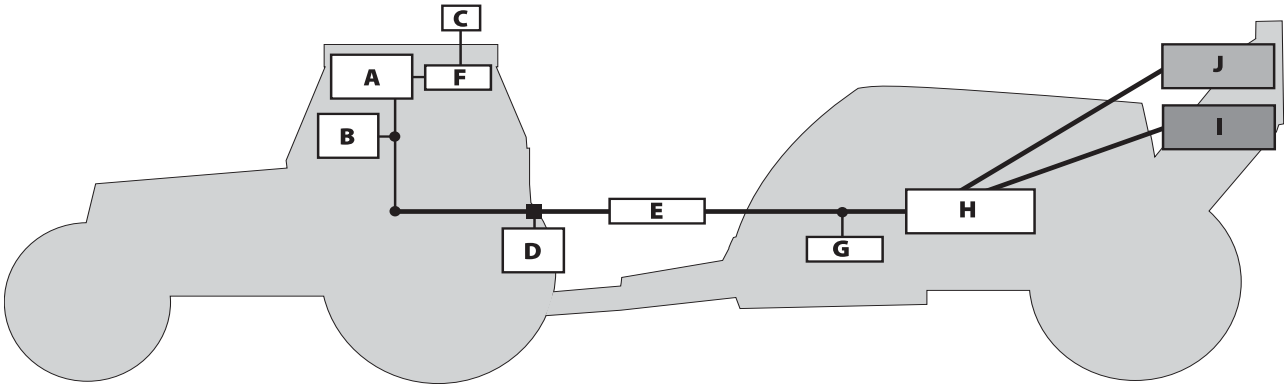
3 - Description

Electronic Control units

The COMMANDER II range of sprayer's are offered with a choice of two programmable electronic spray control systems. The controller is responsible for fluid management (ie: maintaining the calibrated chemical application rate) Both the HC 6500 controller and ISOBUS VT systems allow the operator full control of the spray and hydraulic functions of the sprayer from remote switching terminals inside the tractors cab.

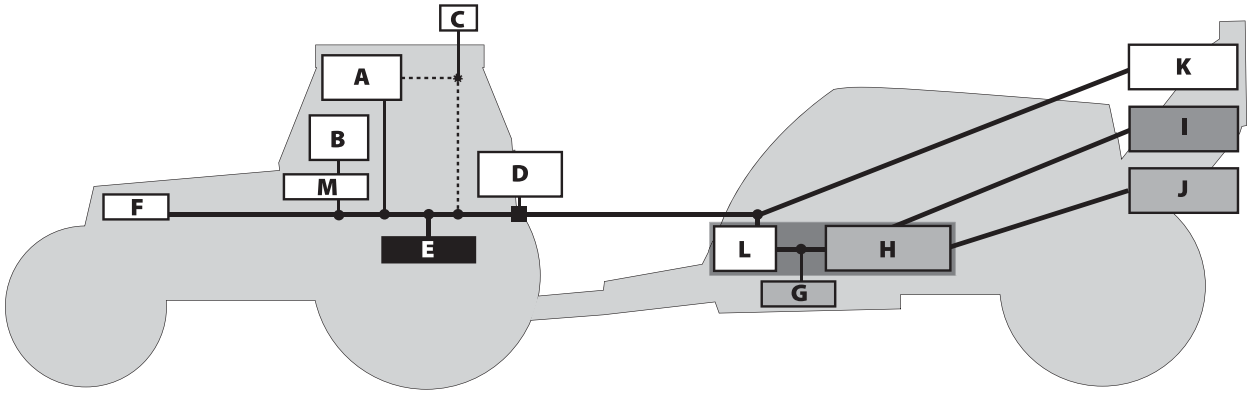
NOTE! For information regarding installation of control unit and how to operate it please refer to the: **67033200-100 Controller HC 6500 / Isobus VT** and **67032700-100 Controller HC 8500/9500** if equipped with a HC 8500/9500 controller

HC 6500 system



A. HC 6500.
B. SetBox and Grip.
C. GPS antenna (optional).
D. Implement connector.
E. HARDI-BUS.
F. AutoSectionControl (optional equipment).
G. FluidBox (i-sprayers only).
H. JobCom (Implement ECU).
I. Centre section junction box.
J. Hydraulics block.

ISOBUS system



A. HC 8500 or HC 9500 or VT Terminal.
B. SetBox and Grip.
C. GPS antenna (optional).
D. ISO power connector.
E. Tractor bus.
F. ISOBUS.
G. FluidBox (i-sprayers only).
H. JobCom (Implement ECU).
I. Centre section junction box.
J. Hydraulics junction box.
K. AutoHeight UC5.
L. ISOBUS bridge.
M. Cabin connector.

DynamicFluid4 pressure regulation

Traditional fluid regulation starts when the nozzles are opened. With DynamicFluid4 the regulation is a process that continues even if the nozzles are closed. Two ceramic discs regulates the pressure and ensures quick reaction and zero leakages. Sprayer speed, Pump. RPM and number of sections activated are parameters initially used, and the benefit is more precise application rates from the second the sprayer begins spraying.

The DynamicFluid4 use's feed forward technology based on 5 sensors that feed the JobCom computer with data necessary for optimal regulation. It auto-prime at start-up, starts and move the valve towards the final position immediately after the operator makes changes. E.g. when section valves are opened or closed, the regulation valve is started at same time as the section valve motors are started. This avoids overpressure situations e.g. after running empty and refill of main tank.

The 5 sensors are also back-up for each other and ensures the system can continue regulation even if one or more sensor signal fails. Sensors used are:

- Sprayer speed sensor
- Flow sensor
- Pressure sensor
- Pump r.p.m. sensor
- Regulation valve opening position sensor

The DynamicFluid4 pressure regulation features are:

- Very fast and accurate regulation when all sensors are ok, setup in menus are correct and pump, filters and valves are in good conditions.
- Quick reacting valve when sections are turned ON/OFF even if speed changes.
- Optimized AutoSectionControl feature that predict nozzle pressure when boom sections open.
- Optimized for different pump drive systems.
- Nozzle surveillance. No setup or tuning required for nozzle change.
- Warning in display if failures occur on boom plumbing, such as severe clogging of line or nozzle filters or large leakages on hoses and fittings.
- All functions work though with degraded performance (Limp home modes), if:

  Faults occur in fluid system, e.g. pump defects, clogged filters, leaking valves.

  Sensor failure appear on pressure sensor, flow sensor or RPM sensor.

  There is wrong setup of sprayer data in menus.
- Emergency mode if angle sensor or speed sensor fails.

3 - Description

DynamicFluid4 Screen icons

The sprayer driver selects one of three modes Auto, Manual or Increment steps. The sprayer computer detects one of three regulation modes Drop, Question mark or calibration jug. This makes 9 modes in total.

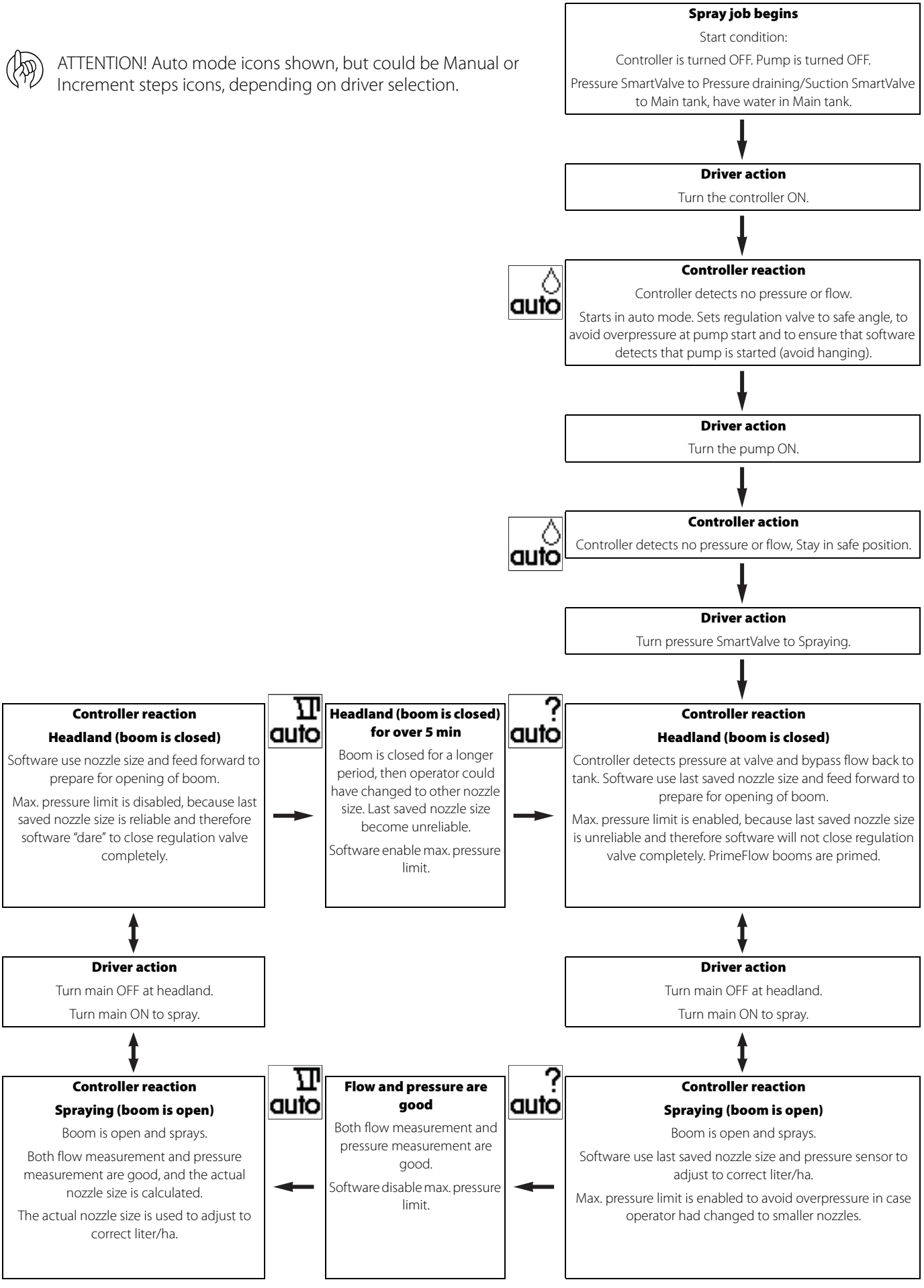
Driver selection				
Auto When Automatic Volume Rate button is pressed on the SetBox.	**Manual** When one of the Manual pressure control buttons is pressed on the SetBox.	**Increment steps** When the Volume Rate is changed in steps with %-up or %-down buttons on the Terminal.		
			**Calibration jug** There is flow to section valves. Nozzle size (L/min at 3 bar) has been calculated.	**Computer selection**
			**Drop** There is no flow to section valves. The pump is not started or the pressure SmartValve is set to other function than spraying.	
			**Question mark** There is flow to section valves but pressure and flow has not yet been stable, therefore the nozzle size (L/min at 3 bar) has not been calculated. The system uses the previously stored nozzle size.	

ATTENTION! The controller must be switched on before the pump is turned on otherwise there is risk of the regulation discs can break.

ATTENTION! If the main is turned off for more than 5 minutes in auto mode the auto question icon appear in the display.

Regulation valve function diagram

ATTENTION! Auto mode icons shown, but could be Manual or Increment steps icons, depending on driver selection.



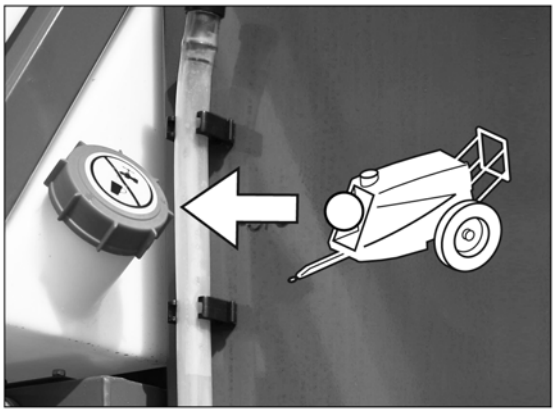
3 - Description

Clean water tank

The water in this tank is for hand washing, cleaning of clogged nozzles etc. Only fill this tank with clean water.

Capacity: approximately 20 litres.

WARNING! Although the clean water tank is only filled with clean water, this water must NOT be used for drinking.



Rinsing tank

A rinsing tank is mounted to the rear of the sprayer. The tank is made of impact-proof and chemical resistant polyethylene.

Filling is done via the 1½" cam-lock placed in the working area. If the sprayer has the option Filtered fill, filling is done through the filtered fill valve. The rinsing tank level indicator is placed at the rear of the tank.

Nominal content: approximately 730 litres.

Filters

The EasyClean suction filter is fitted in the working zone.

The Cyclone pressure filter is fitted to the sprayers right side, hidden behind the right front cover. It has a built-in self-cleaning function.

In-line pressure filters can be fitted at each boom section as an option.

Nozzle filters are fitted at each nozzle.

All filters should always be in use and their function checked regularly. Pay attention to the correct combination of filter and mesh size (see "Spray Technique" book).

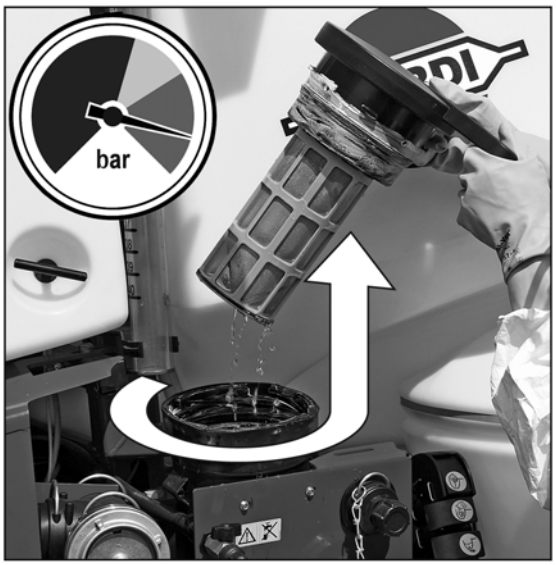
EasyClean filter

To ensure proper function of filter and its built-in valve the filter must be opened at least 1 time per month. A label on the lid also designates this.

- To open filter, turn it counterclockwise and pull it up, like shown on picture.

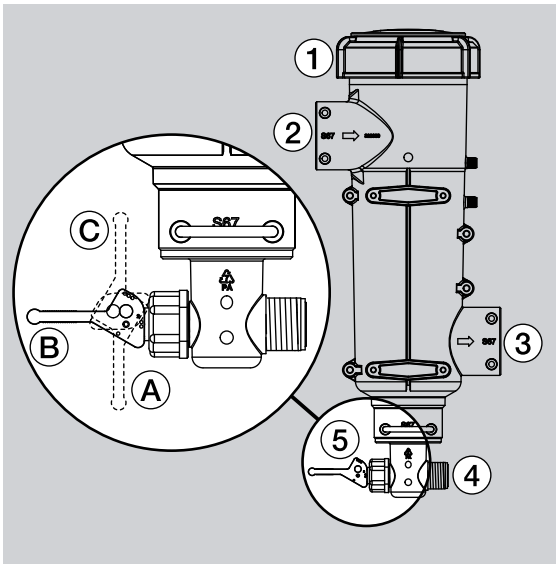
Beside the spray pressure gauge on the platform a EasyClean clogging indicator is located:

Clogging indicator colour	Filter status
Green indicator.	No cleaning necessary.
Yellow indicator.	It is possible to finish an ongoing spraying job and then clean filter afterwards.
Red indicator.	Clean EasyClean filter immediately as filter is clogged.



CycloneFilter

With the CycloneFilter any impurities in the spray liquid will by-pass the filter and be re-circulated back to the tank via the return flow.



Function diagram

1. Filter lid
2. From pump
3. To boom
4. Return to tank
5. Return valve

Valve (5) has three positions marked with small dots on the lever:

A. This position marked with 1 dot: There is no return flow. Position is used when rinsing the boom if there is spray liquid in the main tank. Also used when high spraying volume is required.

B. This position marked with 2 dots: Normal spraying position. With return flow to prevent filter is going to be clogged when spraying. This position is used when rinsing the boom if the main tank is empty.

C. This position marked with 3 dots: Flushing position which is used if filter is clogged. Lift and hold the lever to use this position which largely increases return flow and flushes the filter. The pressure SmartValve must be set to “Spraying”.

ATTENTION! Use of position C is no guarantee for a clean filter. Always regularly do a visual inspection and cleaning of the filter. If necessary see “10 hours service - Cyclone Filter” on page 104.

DANGER! Never open the Cyclone filter unless the pressure SmartValve is turned to “Main tank” and EasyClean filter is open. Otherwise, spraying liquid may hit you when opening the filter, and drain from the main tank!

3 - Description

TurboFiller

Before use

- Push the handle (arrow) to unlock from storing position.
- Grab the handle to pull TurboFiller down until it clicks into locked down-position.

After use

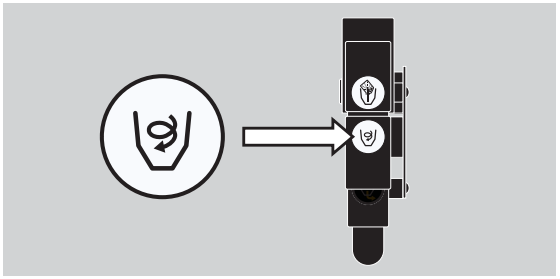
- Push the handle (arrow) to unlock from down-position.
- Grab the handle to push TurboFiller back in storing position until it locks.

WARNING! Before releasing the lock (arrowed) always keep a hand on the grip to avoid abrupt movement of the TurboFiller!

The TurboFiller valves and Chemical Container Rinsing lever are placed on the backside (arrow).

TurboDeflector valve

This TurboDeflector valve activates the Vortex flushing of the TurboFiller. Lift the lever to lock it in open position for continuous liquid rotation in the hopper.



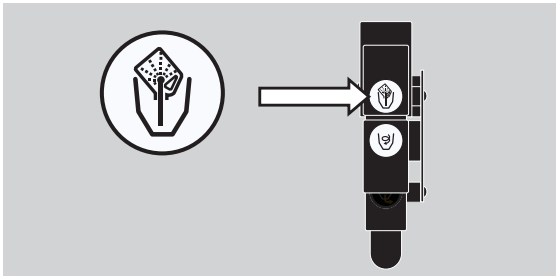
Start TurboDeflector

Chemical Container Rinsing lever

The upper lever is used for two purposes:

When the TurboFiller lid is open: For rinsing empty containers. Place the container over the rotating flushing nozzle in the middle of the TurboFiller to rinse the inside of the container.

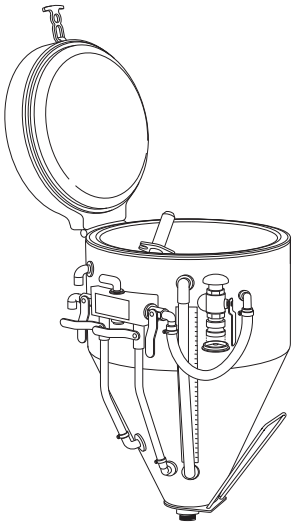
When the TurboFiller lid is closed: Use the Chemical Container Rinsing lever to rinse the hopper when the filling of chemicals is completed.



Chemical Container Rinsing

DANGER! Do not press the lever unless the multi-hole nozzle is covered by a container as spray liquid may otherwise hit the operator.

HARDI®VACnMIX (optional equipment)



The HARDI VACnMIX™ is used for the mixing of plant protection or liquid fertiliser chemicals into a solution, and transferring the solution to Main Tank.

Your Vacuum VACnMIX™ uses the latest design and technology to provide fast, safe and accurate transfer of liquids, powder or granules.

The VACnMIX is a multi-purpose hopper. It is designed for use in closed system transfer and utilises the tough and reliable Hardi pump on your sprayer. The rate of transfer is controlled by the operator.

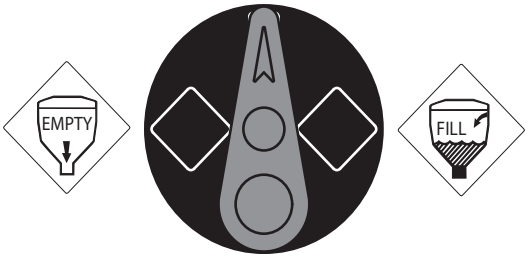
The VACnMIX is supported on a sturdy lift frame and is equipped with two vortex mixing jets, a control manifold and a rotating chemical drum rinse nozzle. The hopper flushing ring is connected to the sight tube to enable decontamination of both together. The unit has a water supply inlet port, and a vacuum suction outlet port — for transfer of either dilute or concentrated liquid chemicals to the spray tank.

The vortex jets provide vigorous operator-controlled agitation which mixes granules into solution, or allows liquid chemical concentrate to be pre-mixed. Any granules that do not dissolve are kept in suspension in the vortex until they disperse.

Featuring a Vacuum and Transfer Valve and an in-line venturi, the unit can transfer liquid from a clean water source or Envirodrum into the hopper, and from the hopper to the main sprayer tank.

Vacuum / Transfer Valve (only if equipped with VACnMIX)

This valve is located behind the Chemical Induction Hopper and is used to control the filling / emptying of the VACnMIX hopper.

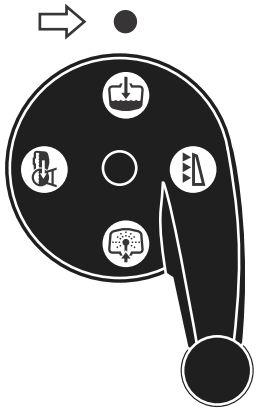


Control Manifold VACnMIX

NOTE! Please refer to chapter Chapter 5 Operation, on to operate the VACnMIX

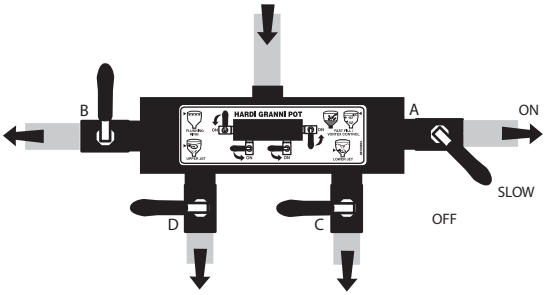
Fast Fill valve/Vortex Control valve

ATTENTION! The pressure Smartvalve must be set to Pressure to Main Tank to activate VACnMIX.



The Fast Fill valve (**A**) is used to fill the VACnMIX.

NOTE: Sight gauge is a guide only to fluid volume in hopper).



Vortex Generation

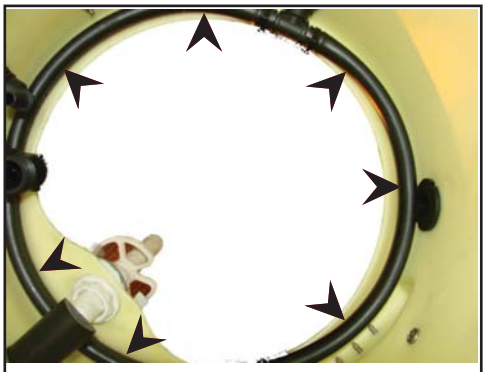
The Fast Fill/Vortex Control valve can also be used to activate a vortex flushing of the VACnMIX. To start a vortex in the hopper turn the Upper & Lower Jet valves (**C**) (**D**) to ON and turn the Fast Fill valve (**A**) to OFF.

Vortex force can be controlled by positioning the Fast Fill valve (**A**) between on/off to achieve desired rate of swirl action. Further control of the vortex action can be achieved by partially or fully closing one of the jets.

Hopper Rinsing Ring valve

The VACnMIX has a rinsing ring located under the upper lip of the hopper that uses spray liquid to flush the walls of the hopper.

The Flushing ring valve (**B**) is used to rinse the hopper after use. With the lid closed, flush the hopper using the rinse ring. Control the rinse by turning flush ring handle on VACnMIX control manifold to the ON / OFF position.



HOPPER RINSE RING

(viewed from inside hopper)

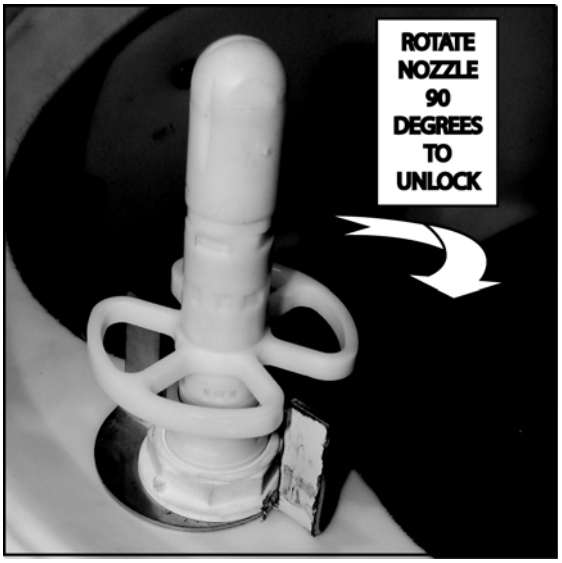
DANGER! Do not activate the rinse ring unless the hopper lid is closed to avoid spray liquid hitting the operator.

ATTENTION! Rinsing device uses spray liquid to rinse hopper. Always avoid contact with chemical solution.

ATTENTION! The hopper rinsing devices use spray liquid for rinsing the hopper. The VACnMIX must always be cleaned/decontaminated together with the rest of the sprayer with fresh water when the spray job is complete.

Chemical Container Rinsing Device

The VACnMIX comes equipped with a container rinsing nozzle which uses spray liquid from the main tank to rinse chemical containers.



DANGER! Do not press the nozzle unless it is covered by a container to avoid spray liquid hitting the operator.

ATTENTION! Rinsing device uses spray liquid to rinse containers. Always rinse the chemical containers with clean water several times before The rinse nozzle lock is released by turning the upper section 90 degrees

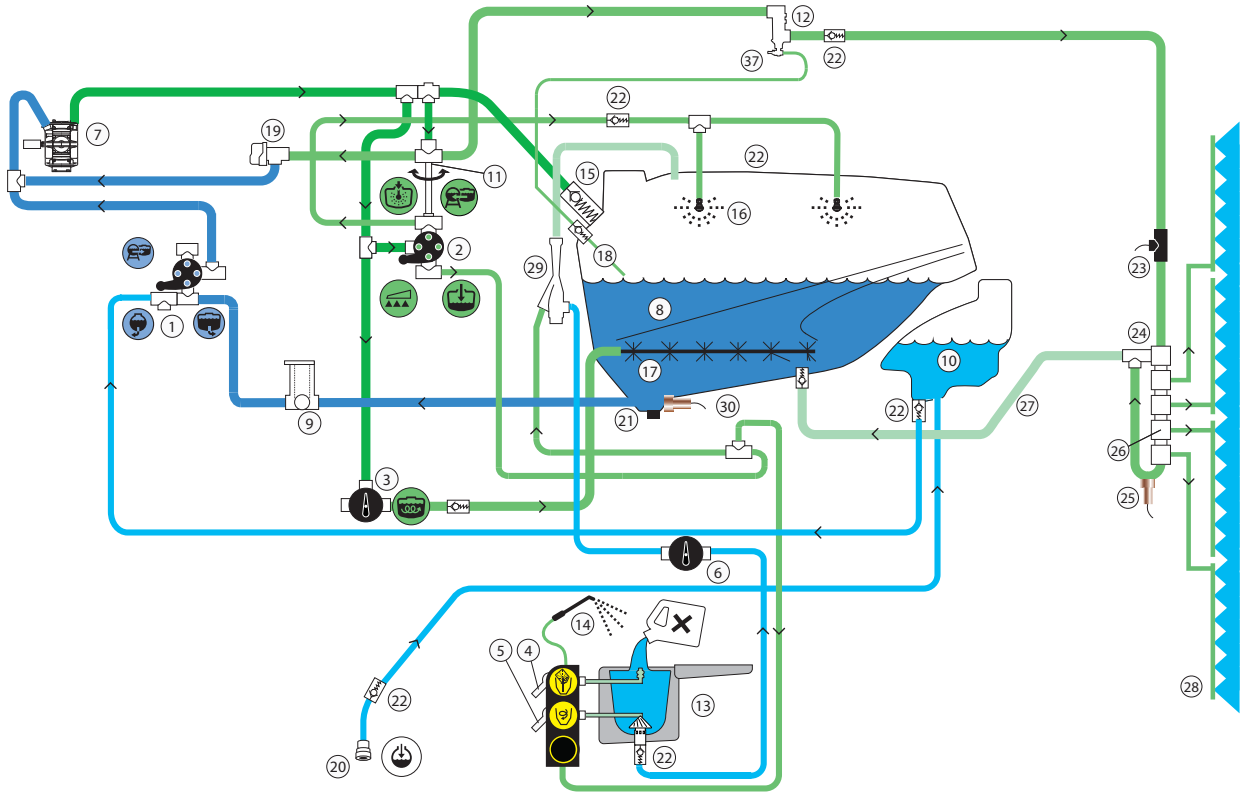
Note: This lock acts as a safety measure to prevent injury to operator. Ensure lock is repositioned correctly after use.

Chem Meter

The Chem Meter is a metering device for measuring the volume of liquid chemical dispensed from drums and small containers.

Basic instructions for the Chem Meter are provided in the "Operation Section" of this manual, however for more detailed information, see "Adding liquid chemical from a drum (Optional)" on page 79. or the manufacturers instruction sheet (supplied with your sprayer).

Diagram - Basic liquid system

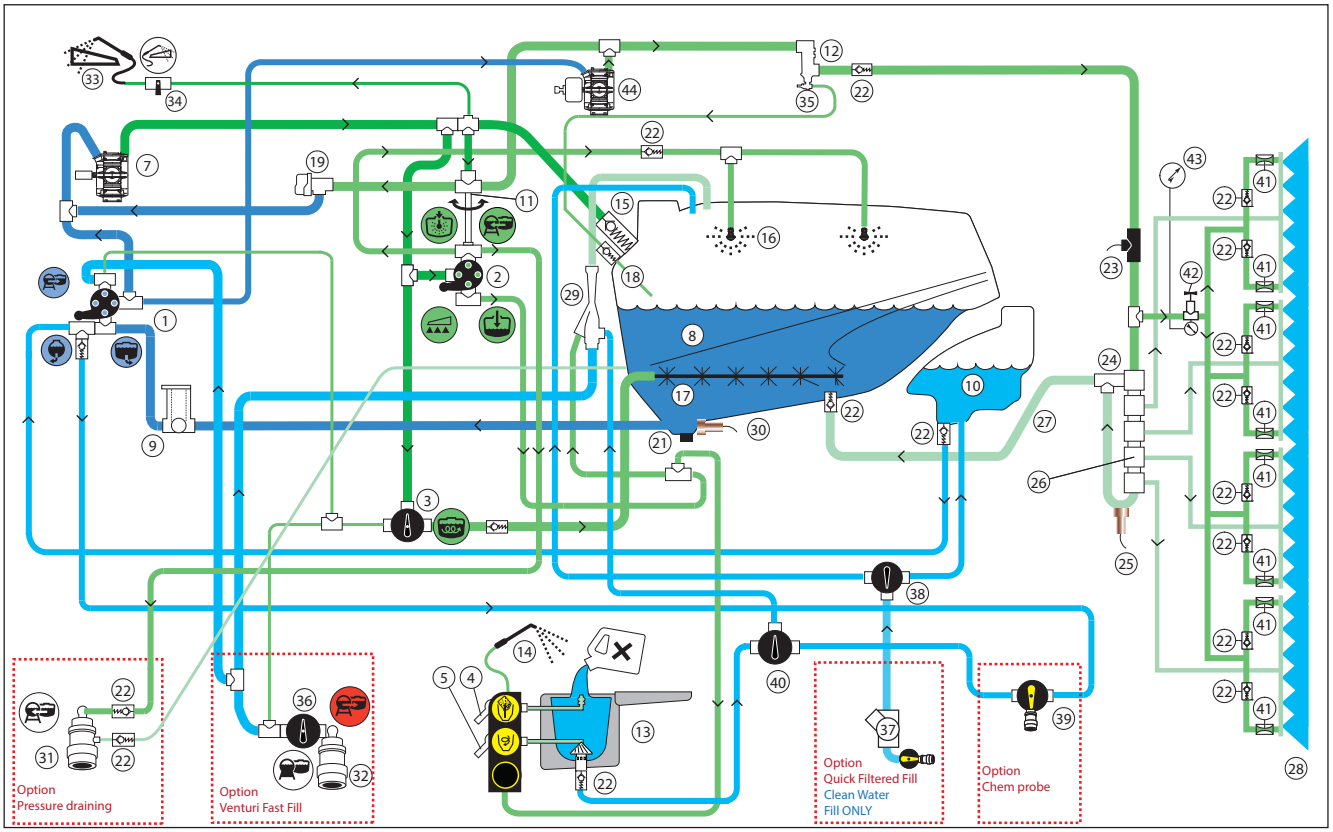


1. Suction SmartValve
2. Pressure SmartValve
3. Agitation valve
4. Chemical container cleaning valve
5. TurboDeflector ON/OFF valve
6. Chemical source valve
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. TurboFiller
14. Lance for cleaning TurboFiller
15. Safety valve
16. Internal tank cleaning nozzles
17. Agitation tube
18. Return line for boost function
19. DynamicFluid4 pressure regulation valve
20. RinseTank coupler
21. Drain valve
22. One-way valve
23. Flowmeter
24. Distribution valves
25. Sensor for pressure gauge
26. Distribution valves
27. Return from distribution valves
28. Sprayer boom
29. Ejector

Options

37. Boost valve

Diagram - Liquid system TurboFiller with optional extras

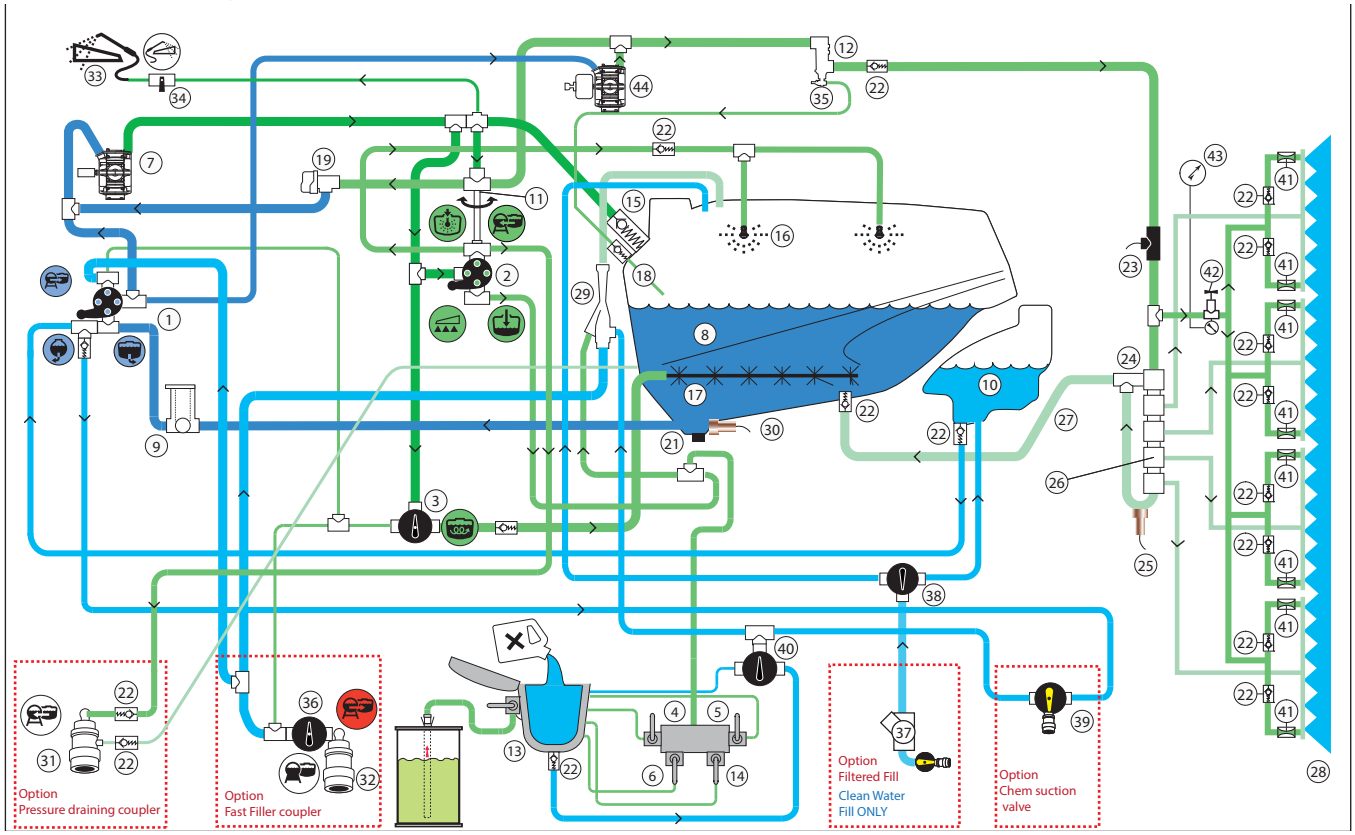


1. Suction SmartValve
2. Pressure SmartValve
3. Agitation valve
4. Chemical container cleaning valve
5. TurboDeflector ON/OFF valve
6.
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. TurboFiller
14. Lance for cleaning TurboFiller
15. Safety valve
16. Internal tank cleaning nozzles
17. Agitation tube
18. Return line for boost function
19. DynamicFluid4 pressure regulation valve
20. RinseTank coupler
21. Drain valve
22. One-way valve
23. Flowmeter
24. Distribution valves
25. Sensor for pressure gauge
26. Distribution valves
27. Return from distribution valves
28. Sprayer boom
29. Ejector

Options

30. Main tank gauge sensor
31. Pressure draining coupler
32. Fast filler coupler
33. External cleaning device
34. External cleaning ON/OFF valve
35. Boost valve
36. External fast filling ON/OFF valve
37. FilteredFill
38. Directional Fill valve
39. Chem Probe / Flush valve
40. Chemical Source valve
41. Boom prime restrictor
42. Boom prime pressure control valve
43. Pressure gauge for BoomPrime
44. FlexCapacity pump

Diagram - Liquid system VACnMIX with optional extras



1. Suction SmartValve
2. Pressure SmartValve
3. Agitation valve
4. Chemical container flush valve
5. Fill / Vortex control valve
6. Upper Vortex Jet valve
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. VACnMIX
14. Lower Vortex valve
15. Safety valve
16. Internal tank cleaning nozzles
17. Agitation tube
18. Return line for boost function
19. DynamicFluid4 pressure regulation valve
20. RinseTank coupler
21. Drain valve
22. One-way valve
23. Flowmeter
24. Distribution valves
25. Sensor for pressure gauge
26. Distribution valves
27. Return from distribution valves
28. Sprayer boom
29. Ejector

Options

30. Main tank gauge sensor
31. Pressure draining coupler
32. Fast filler coupler
33. External cleaning device
34. External cleaning ON/OFF valve
35. Boost valve
36. External fast filling ON/OFF valve
37. FilteredFill
38. Directional Fill valve
39. Chem Probe / Flush valve
40. Vacuum/Transfer valve
41. Boom prime restrictor
42. Boom prime pressure control valve
43. Pressure gauge for BoomPrime
44. FlexCapacity pump

3 - Description

Boom

Boom configuration, terminology and Operators Manual

The Commander II range is available with a choice of optional boom configurations and widths. For this reason a separate "Boom Operators and Maintenance Manual" is supplied with your sprayer and contains detailed information on boom safety, set-up, operation, maintenance and spare parts.

DANGER! Important information on Safety, Operation and Maintance specific to your boom configuration is detailed in the "Boom Operators Manual" supplied with your sprayer's documentation. It must be read and fully understood by anyone intending to operate this equipment. Failure to do so could result in serious personal injury or death.

Boom and terminology

For 3-folded booms the terminology is as follows:

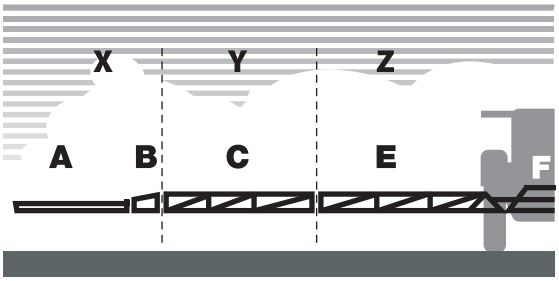
A. Breakaway section

B. 2nd outer wing

C. 1st outer wing

E. Inner wing

F. Centre section



NOTE! When controlling the boom at the SetBox, the folding sections are:

X. 2nd outer wing

Y. 1st outer wing

Z. Inner wing

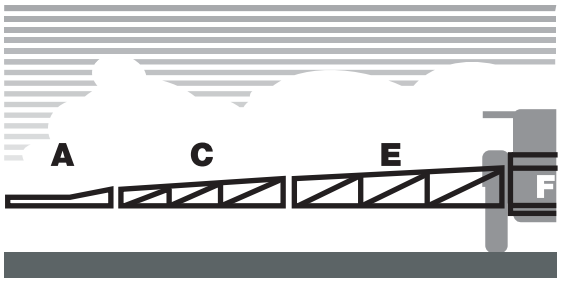
For 2-folded the terminology is as follows:

A. Breakaway section

C. 1st outer wing

E. Inner section

F. Centre section



Safety info

The boom must not be folded/unfolded while driving! Never use the folding/unfolding functions before the sprayer has been stopped! Failure to do so will damage the boom.

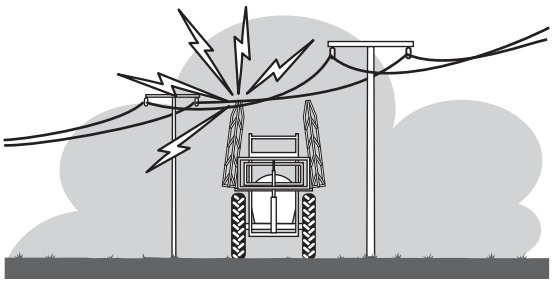
DANGER! Before unfolding the boom it is important to connect the sprayer to the tractor to prevent overbalancing of the sprayer.

DANGER! When folding or unfolding the boom, make sure that no persons or objects are within the operating area of the boom.

DANGER! Always follow the guidelines listed below when driving in areas with overhead power lines:

Never use the folding/unfolding functions in areas with overhead power lines.

Unintended boom movements may cause contact with overhead power lines.



ATTENTION! Only unfold and fold the boom on level ground.

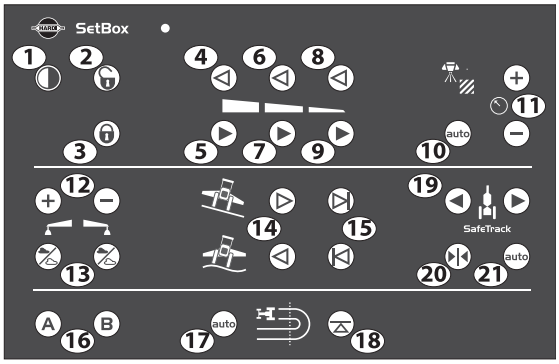
3 - Description

TERRA FORCE and B3 Aluminium SetBox controls

ATTENTION! For instruction how to operate the TERRA FORCE and B3 ALUMINIUM boom please see "" on page 62

ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

The SetBox controls the volume rate, foam marker, HeadlandAssist, pendulum lock, boom folding and stability functions. Furthermore two optional functions can be controlled. The buttons on the SetBox control the following functions:



1. Power ON/OFF.
2. Pendulum unlock.
3. Pendulum lock.
4. Inner wing fold.
5. Inner wing unfold.
6. 1st outer wing fold.
7. 1st outer wing unfold.
8. 2nd outer wing fold.
9. 2nd outer wing unfold.
10. Automatic volume rate selector.
11. Manual pressure control.
12. Foam marker regulation.
13. Foam marker Left/Right selector.
14. DynamicCentre adjustment (step wise) (not used).
15. DynamicCentre outer positions 1 or 5 (not used).
16. Optional function A-B.
17. HeadlandAssist automatic.
18. Centre self levelling (only if equipped with AutoTerrain)
19. SafeTrack manual control (not used).
20. SafeTrack align selector (not used).
21. SafeTrack automatic selector (not used).

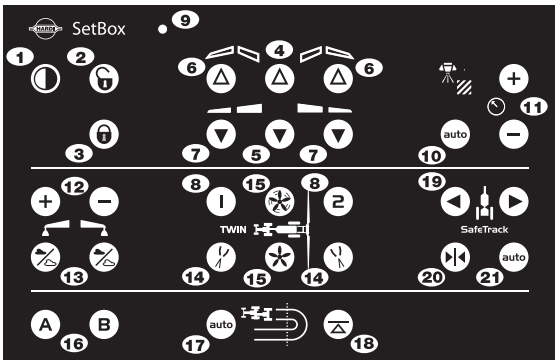
FORCE boom control (optional on Eagle boom)

ATTENTION! For FORCE and EAGLE boom control please see "Operating the Force Boom control (optional on EAGLE boom)" on page 64

ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

SetBox controls

The SetBox controls the volume rate, foam marker, HeadlandAssist, pendulum lock, boom folding and stability functions. Furthermore two optional functions can be controlled. The buttons on the SetBox control the following functions:

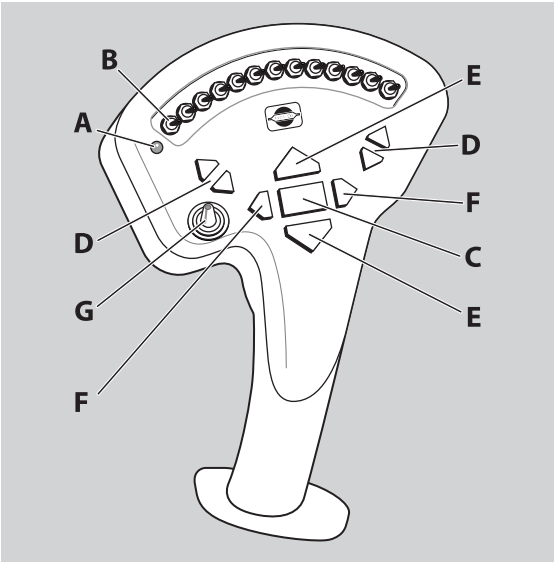


1. Power ON/OFF.
2. Pendulum unlock.
3. Pendulum lock.
4. Inner wing fold.
5. Inner wing unfold.
6. 1st outer wing fold.
7. 1st outer wing unfold.
8. TWIN presets (not used).
9. Power/status LED.
10. Automatic volume rate selector.
11. Manual pressure control.
12. Foam marker regulation.
13. Foam marker Left/Right selector.
14. TWIN air slot angle (not used).
15. TWIN air volume (not used).
16. Optional function A-B.
17. HeadlandAssist automatic.
18. Centre self levelling (not used).
19. SafeTrack manual control (not used).
20. SafeTrack align selector (not used).
21. SafeTrack automatic selector (not used).

Grip controls

The grip controls the following:

- **A.** Status LED.
- **B.** Boom section controls.
- **C.** Main ON/OFF.
- **D.** Tilt.
- **E.** Boom height.
- **F.** Boom slant.
- **G.** Option selection switch.



Hydraulic systems

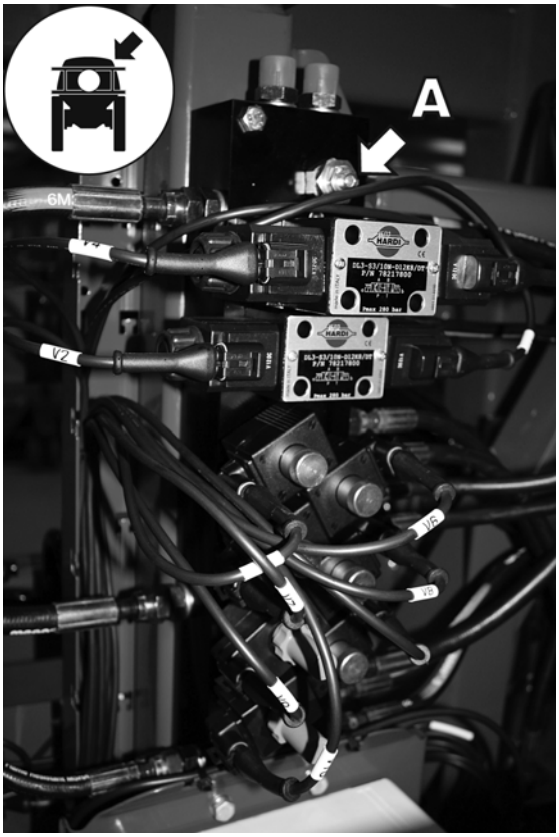
Hydraulic blocks

Hydraulic blocks fitted to the sprayer are:

Boom

The main boom hydraulic block that manages hydraulic pressure for the boom controls.

The throttle valve (A) can adjust the folding speed of the boom. Adjusting inwards = slower boom.



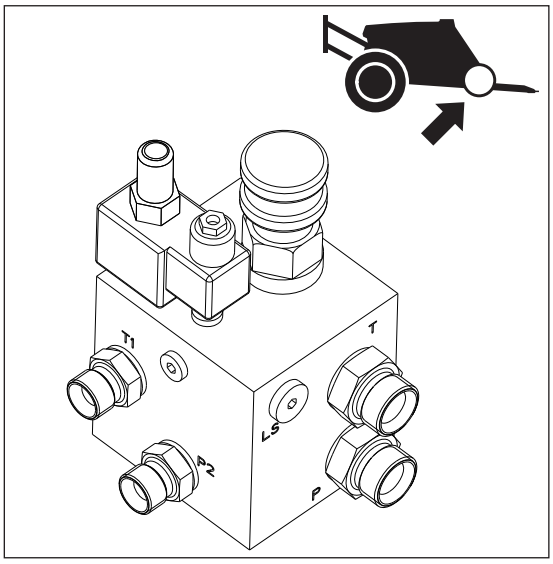
ATTENTION! Picture shows the boom hydraulic block on a TDZ centre,

ParaLift

This hydraulic block manages the hydraulic pressure for the ParaLift.

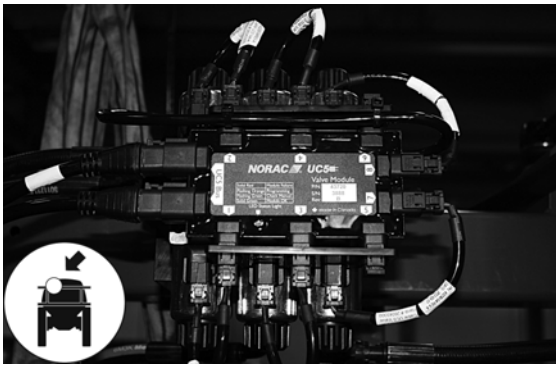
Open centre hydraulics

The open centre hydraulic block is necessary if the tractor uses open centre hydraulics and/or load sensing. For adjustment see "Open centre hydraulics." on page 50.



AutoTerrain

On sprayers with AutoTerrain this hydraulic block manages hydraulic pressure for the automatic boom height control functions.

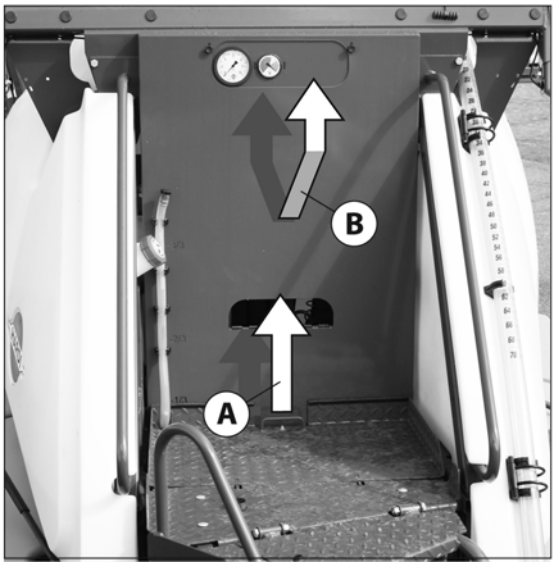


Platform

To get access to the platform pull and tilt the ladder down. In retracted position the ladder is secured by a rubber stop.

From the platform the following can be accessed:

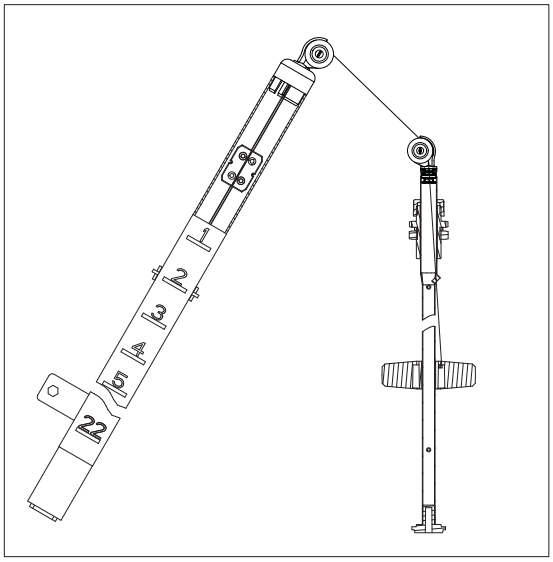
- Main Tank lid.
- Clean water tank lid, integrated to the side of the platform.
- Lift and remove the platform floor (A) to get access to hydraulic and MANIFOLD components underneath the platform floor.
- Electronics and optional fast filler are situated behind the cover (B).
- Pressure gauge, EasyClean filter clogging indicator
- ATTENTION! Always tilt up the ladder before driving.



Tank level indicator

The actual tank level in the main tank can be observed on the tank level indicator. The scale is displayed in litres or Imp. gal/US gal. (certain countries).

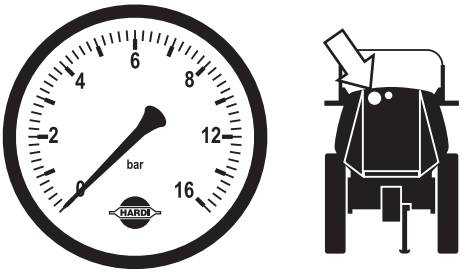
ATTENTION! The wire guide wheels should be directed so they follow the direction of the wire.



Nozzle pressure gauge

The remote pressure gauge is integrated at the top of the platform. This gauge measures the working pressure in the boom tubes as close to the nozzles as possible.

The outputs stated in the nozzle charts are always based on the pressure measured at the nozzle. Both when calibrating and spraying, the pressure must be adjusted according to the readings of this pressure gauge.



3 - Description

SafetyLocker

The locker is integrated to the front just above the SmartValves. It is for the purpose of storing non-contaminated protective gear, soap for hand washing etc.

The locker is split in two compartments for the separation of clean clothes from gloves with risk of contamination and facilitates a soap dispenser (A).

WARNING! Although this locker is meant for storing nontoxic items, it must never be used for storing food, beverage or other things meant for consumption.

ChemLocker (optional equipment)

A ChemLocker for storage of chemical containers etc. is mounted on the sprayers right side.

If the optional FoamMarker are selected then the FoamMarker tank are placed into the ChemLocker.

ATTENTION! Max. load 100 Kg./100 litre.

External Cleaning Device (optional equipment)

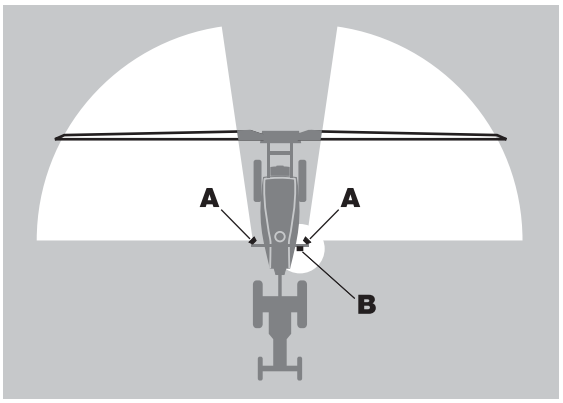
The optional External Cleaning Device comprises a hose reel and spray gun. To access the External Cleaning Device, open the door on the sprayer's right hand side.

DANGER! The External Cleaning Device operates at very high pressure and could potentially cause serious personal injury, it is therefore essential the following Safety rules be observed and strictly enforced:

1. Never point the water jet at people, animals, electrical installations or equipment, overhead power lines or other sensitive objects.
2. Never try to clean clothing or foot wear, especially if being worn by persons.
3. Pressure can penetrate skin and cause severe injury. Never work with un-protected eyes, bare feet or sandals.
4. Never operate without approved chemical safety wear including face mask, gloves, respirator, boots and cover-alls.
5. Beware of flying particles being dislodged by the cleaning jet.
6. The spray gun and hose are affected by "recoil" when the handle is released during operation - therefore always hold the insulation on top of the gun with one hand and the pistol grip with the other hand to facilitate better control of the device.

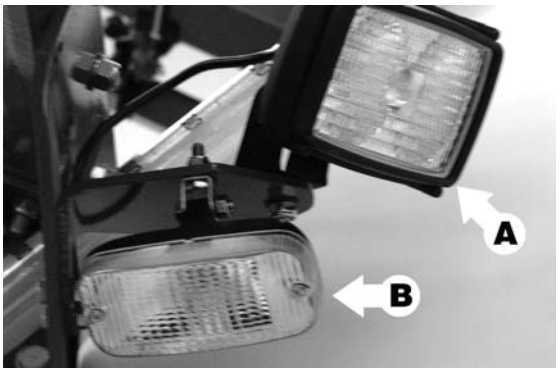
Night Spraying Lights (optional equipment)

The 2 boom lights **(A)** are mounted to the railing of the working platform (one at each side) and are positioned to illuminate both boom wings for night spraying.



Work Light

The work area light **(B)** is also mounted to the railing of the working platform, just above the Manifold valves, and illuminates the HARDI ChemFiller, Safety locker and Manifold valves.



ATTENTION! Switch OFF the rear lights of the tractor in order to save power and to avoid reflection problems. Power supply is via the 7-pin socket.

3 - Description

Optional Filling Systems

Optional Filling systems and equipment

1. Venturi Fast fill system (Venturi -Non Filtered fill)
2. Quick Filtered fill system (Filtered -External Pump)
3. Banjo Fast Fill (with high capacity Banjo Pump)

Venturi Fast Fill System

The "Fast Fill" option uses an on-board venturi system (powered by the HARDI 464 Diaphragm pump) to draw water directly from an external source.

A suction hose is run from an external water source and coupled to the sprayer via a trailer mounted aluminium quick coupler.

ATTENTION! The Fast Fill circuit does not include a filter or strainer! It is highly recommended you use a remote in line filter to remove any debris and impurities. For more information please contact your HARDI dealer.

Quick Filtered Fill System

The filtered "Quick fill" system allows the operator to fill the sprayer from an external water source using an auxiliary pump. The system includes a high capacity filter. The operator can also control the speed at which filling takes place by adjusting the quick fill ball valve on the sprayer.

By using the "Directional Fill" valve the "Quick Filtered Fill' system can be used to fill either "Main Tank" or "Rinse Tank".

WARNING! If a high capacity pump is used open the tank lid before filling, be prepared to quickly turn of the pump and valve when the tank is fill, otherwise there is a risk of overfilling causing structural damage to the tank.

ATTENTION! The Quick Filtered Fill system should only be filled with clean water.

Cam Lock coupling sizes:

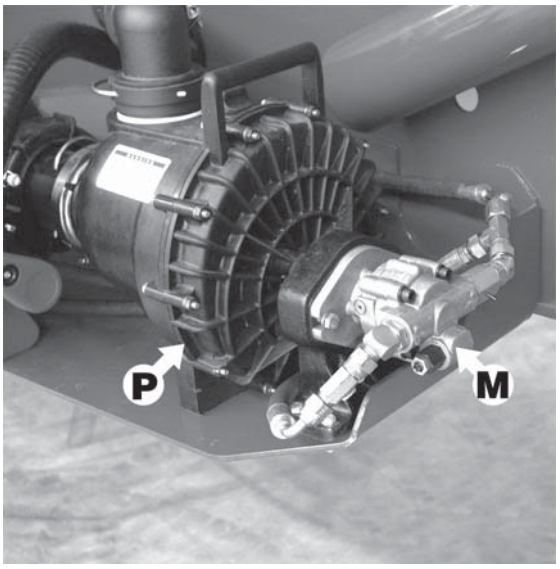
6500, 8500 and 10000 Litre models.....2 or 3 inch

Banjo Fast Fill System

The Banjo Fast Fill system employs a high capacity centrifugal pump (**P**) driven by a hydraulic drive motor **(M)**. The motor is powered by the tractors auxiliary hydraulic system and is protected from over revving by a hydraulic burst valve.

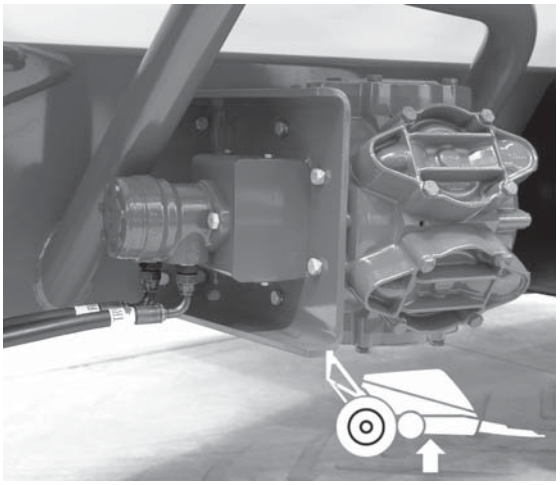
The operator can also control the flow rate by means of a variable speed control valve mounted on a panel just forward of the pump.

By using the "Directional Fill" valve the "Quick Filtered Fill' system can be used to fill either "Main Tank" or "Rinse Tank".



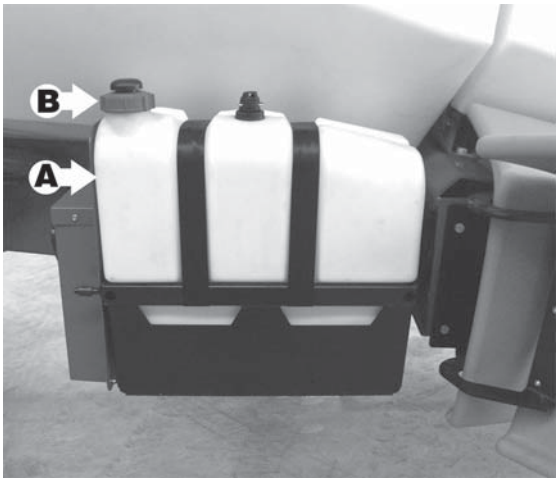
FlexCapacity pump (optional)

The FlexCapacity pump system incorporates a second standard 464 fluid pump mounted to the right side of the chassis. The second pump is driven by a hydraulic motor which is powered by the tractors auxiliary hydraulic system and so can be easily activated remotely. Connect the hydraulic lines (routed along the chassis and hose bundle support bracket) to a free auxiliary hydraulic outlet at the rear of the tractor being sure to connect the pressure and return lines correctly (which are clearly marked for positive identification).



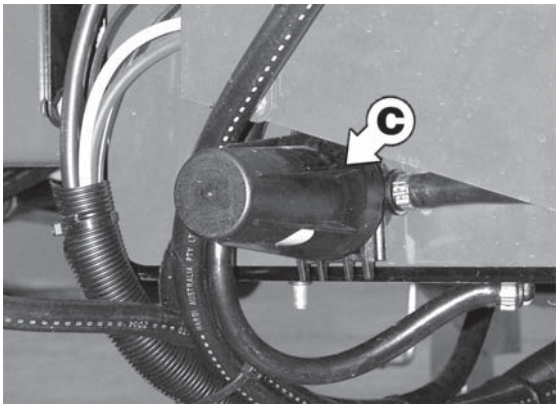
Foam Marker (optional)

An up-graded foam marker system is available as optional equipment featuring a new higher capacity tank **(A)** which greatly expands the system's working capacity and easy access to the tank lid **(B)** for filling. Electronic metering means greater precision and economy.



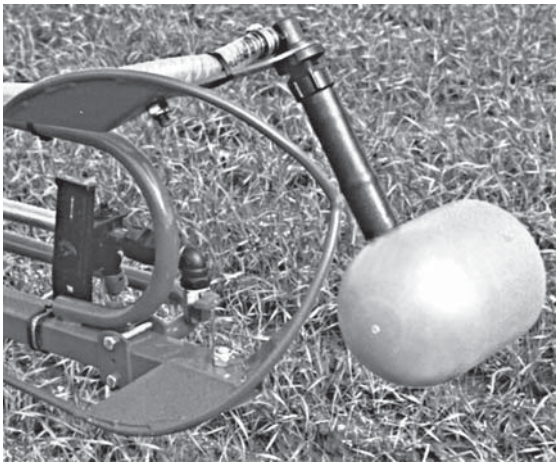
Foam Marker filter

A serviceable in line filter **(C)** is located at the rear of the foam marker tank just below the compressor.



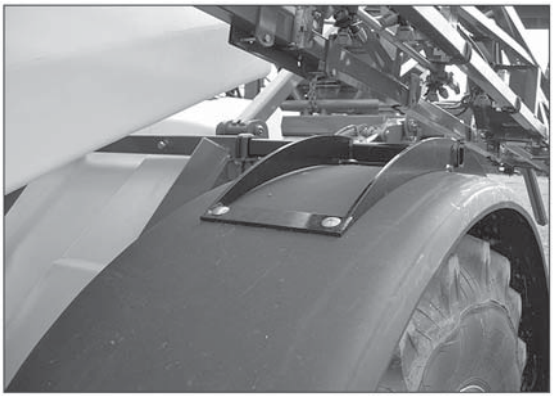
Foam Marker controls

Blob size and frequency are both controlled from the remote Spray box in the tractors cabin and foam solution can be purchased from your HARDI dealer in various size containers.



Mudguards (optional equipment)

Mudguards are available for all standard wheel configurations and are fitted to the trailer by means of a supporting frame which slides neatly into a mounting toward the rear of the chassis.



General info

Before putting the sprayer into operation

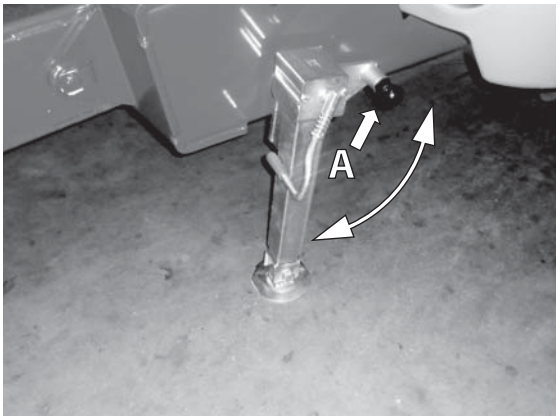
Although the sprayer has been supplied with a strong and protective surface treatment on steel parts, bolts etc. in the factory, it is recommended to apply a film of anticorrosion oil (e.g. CASTROL RUSTILO or SHELL ENSIS FLUID) on all metal parts in order to avoid chemicals and fertilizers discolouring the enamel.

If this is done before the sprayer is put into operation for the first time, it will always be easy to clean the sprayer and keep the enamel clean for many years. This treatment should be carried out every time the protection film is washed off.

4 - Sprayer setup

Support leg (6500 model)

The support leg for the 6500 Litre model is mounted toward the front of the sprayer on the left side of the chassis. When stowed for transport, it swings upward and is secured in it's "transport position" by a spring loaded locating pin.



⚠ DANGER! Do never leave the sprayer standing unlocked on the support leg. Always double check that the lever is in locked position.

⚠ DANGER! Only operate when tank is empty

Support leg operation

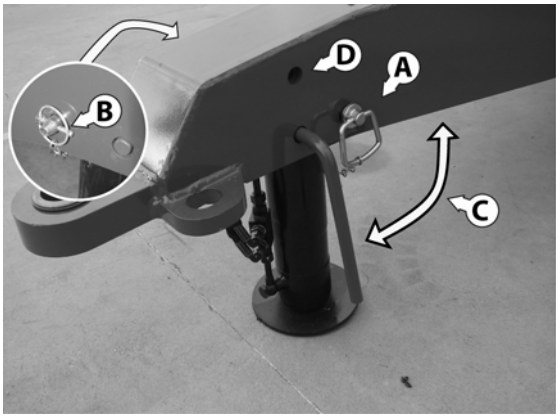
1. Hold the support leg with one hand and release the spring loaded locating pin with the other hand.
2. Swing the support leg down until the locating pin snaps into place.
3. Turn the crank handle into the operating position and wind the support leg up or down as required.

Returning the Support leg to the transport position

1. Retract the locating pin and swing the support leg back up towards the chassis until it "clicks" into place.
2. Push the crank handle down and turn it so the handle will rest neatly on the support leg while in transit.

Hydraulic support leg (8500 and 10000 model)

The 8500 and 10000 Litre models are fitted with a 'Hydraulic' support leg. The double acting cylinder is fed via a pressure line which connects to the tractors auxiliary hydraulic circuit via a conventional snap coupling.



⚠ DANGER! Do never leave the sprayer standing unlocked on the support leg. Always double check that the lever is in locked position.

⚠ DANGER! Only operate when tank is empty

Support leg operation

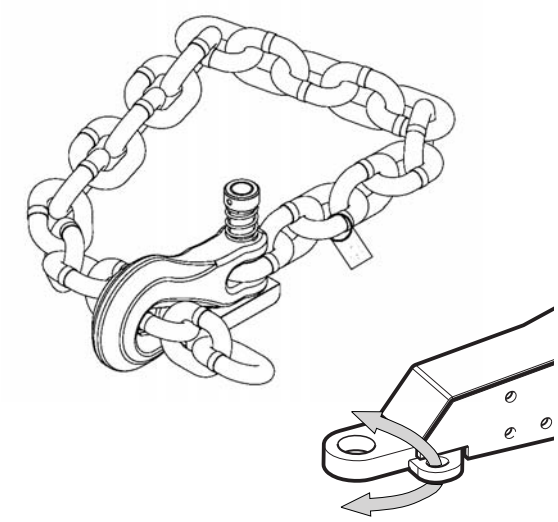
1. Reverse the tractor as close as possible to the sprayer's draw bar hitch and connect the support leg pressure line to a spare double acting outlet.
2. Operate the hydraulics to raise the trailers hitch to the correct height.
3. Reverse the tractor again into position and connect the sprayer.
4. Lower the hydraulics so the sprayer is fully supported by the tractor.

Returning the Support leg to the transport position

5. Remove the pins (A) & (B) and use the handle (C) to swing the support leg up into the transport position.
6. Secure the support leg in the transport position by re-fitting the retaining pins (A) & (B) into the second hole position (D).

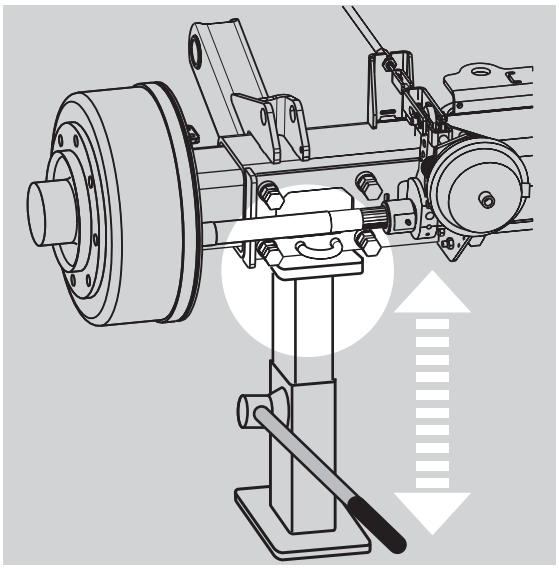
Safety chain (optional)

A safety chain can be used between the drawbar and the towbar on the tractor as an extra safety device. Pull the chain through the hole on the side of the drawbar and then around the towbar on the tractor.



Jack up the sprayer

When the sprayer needs wheel mounting, wheel changing, brake or wheel bearing changing etc. Then jack up the sprayer under the axle as shown, and place minimum two sturdy axle stands under the axle.



DANGER! Be sure to place sprayer on level and firm ground to avoid sprayer falling down from the jack.

DANGER! Sprayer should be connected to tractor. Tractor should be in park and key secured so others cannot start.

DANGER! Axle is high, correct jack stability is important.

Danger! Newer go under the sprayer when is just lifted with jack. Always let it rest on sturdy axle stands

ATTENTION! It is good practice to use stop wedges at the opposite wheel!

4 - Sprayer setup

Transmission shaft

Operator safety

1. Always STOP THE ENGINE before attaching the transmission shaft to the tractor P.T.O. - most tractor P.T.O. shafts can be rotated by hand to facilitate spline alignment, when the engine is stopped.
2. When attaching the shaft, make sure that the snap lock is FULLY ENGAGED - push and pull the shaft until it locks.
3. Always keep protection guards and chains intact and make sure that it covers all rotating parts, including CV-joints at each end of the shaft. Do not use without protection guard.
4. Do not touch or stand on the transmission shaft when it is rotating - safety distance: 1.5 meter. Also NEVER cross over a rotating P.T.O. shaft to reach the other side of the sprayer.
5. Prevent protection guards from rotating by attaching the chains allowing sufficient slack for turns.
6. Make sure that protection guards around the tractor P.T.O. and the implement shaft are intact.
7. Always STOP THE ENGINE and remove the ignition key before carrying out maintenance or repairs to the transmission shaft or implement.

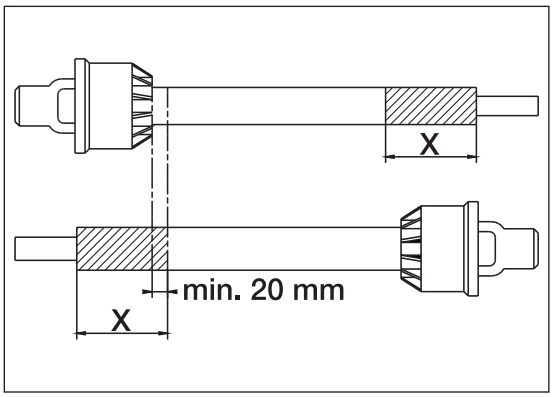
DANGER! ROTATING TRANSMISSION SHAFTS WITHOUT PROTECTION GUARDS ARE FATAL.

P.T.O. installation

Always read the manufacturer's instruction book before applying any installation of the transmission shaft!

First installation of the transmission shaft is done in the following way:

1. Attach the sprayer to the tractor and set the sprayer height in the position with the shortest distance between the tractor and the sprayer pump P.T.O. shafts.
2. Stop the engine and remove the ignition key.
3. If the transmission shaft needs to be shortened, pull the shaft apart. Fit the two shaft parts to the tractor and the sprayer pump and measure how much the shaft needs to be shortened. Also mark the protection guards with the same length to be shortened.

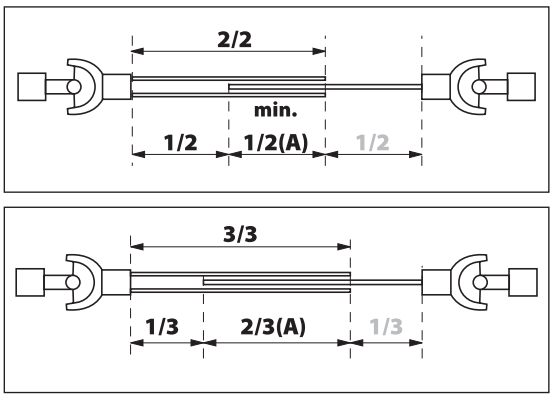


WARNING! Do only shorten the shaft if absolutely necessary!

WARNING! The shaft must always have minimum overlap of half a shaft length!

The recommended overlap (A) of the two shaft parts is 2/3 of the length. The shaft must always have minimum overlap (A) of 1/2 of the length.

DANGER! As P.T.O. shafts are dangerous, always read the manufacturer's instruction book before applying any changes to the transmission shaft!

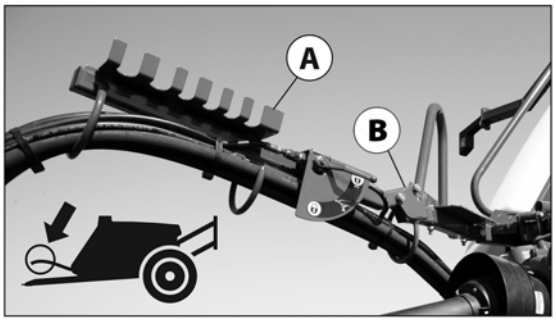


Mechanical connections

Hose package support

To prevent hoses and wiring from being damaged by the tractor wheels, P.T.O. shaft etc. all hoses, cables and wires are held by the hose package support fitted to the sprayer platform.

The bracket (A) is for the storing of hydraulic and electric connectors etc. when the sprayer is disconnected from the tractor. The height of the bracket can be adjusted by the means of the bolts (B).



ATTENTION! Check that the length of the hoses and cables are sufficient by tight turns.

ATTENTION! Hydraulic hoses are provided with plastic weather covers. It is recommended to always fit these when storing the sprayer.

ATTENTION! Electrical connections should not be left exposed. If storing the sprayer outside it is recommended to cover with some type of weather protection and it should be cleaned before use.

Hydraulic systems General info

Ensure that the snap couplers are clean before connection!

After having operated the boom and the system has been filled with oil, check the tractor's hydraulic oil level and top up, if necessary.

WARNING! Incorrectly fitting hydraulic lines can reduce component life and adversely affect sprayer performance. The hydraulic hoses are clearly marked "Pressure" and "Return" for positive identification. The tank return line (T) is fitted with a check valve positioned so the spring and ball symbol is facing away from the tractor

DANGER! Test of the hydraulic system should be done very cautiously. There may be air trapped in the system which can cause violent movements of the boom.

DANGER! Hydraulic leaks: Never use your fingers to locate a leakage in any part of the hydraulic system. Due to high pressure, hydraulic oil may penetrate the skin.

Open centre hydraulics.

The open centre hydraulics block is necessary if the tractor uses open centre hydraulics and/or load sensing.

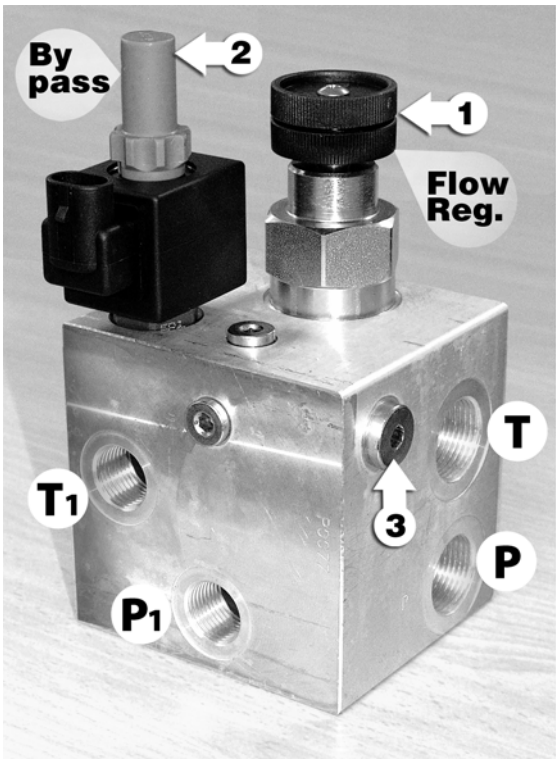
The valves (1) and (2) is factory set for closed centre hydraulics.

If open centre hydraulics is used, set the valves as following:

On valve 1: screw out the plastics nut (counter clockwise) until it is fully out then do the same for the plastic lock nut.

On valve 2: Remove the cap press the nut down and turn it counter clockwise. Refit the cap

Certain tractor models are able to use Load Sensing without connecting an external sensing line. But if optimal sensing control pressure cannot be obtained, an external sensing line needs to be connected (3). Please consult your tractor dealer for correct setup and correct connection.



WARNING! Before operating the hydraulics, the valve should be set according to the specific tractor model. If you are unsure of the type of hydraulic system in your tractor, please contact your tractor dealer.

Combinations of settings for flow element and circuit value:

Valve no.	1	2	3 (LS port)
Open centre	Out	Out	Not connected
Closed centre	In	In	Not connected
Load sensing (LS)	In	Out*	Connected

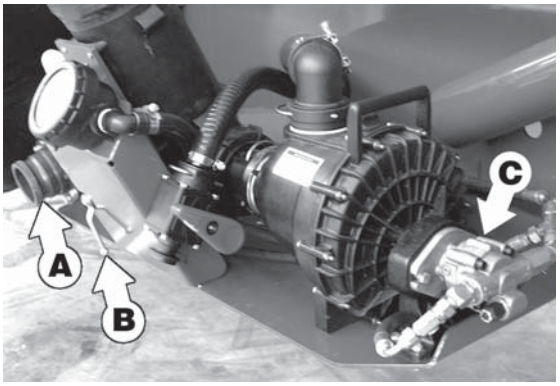
*if tractor requires pressure relief, contact your tractor dealer for further advice.

WARNING! Always be sure to fully open or close the open/closed centre selection valves. Failure to do so may cause damage to vital pump parts within the tractor.

WARNING! It is essential that connectors on sensing line are kept totally clean. Failure to do so can result in impurities entering the pump and thereby cause damages to vital pump parts.

Banjo Fast Fill

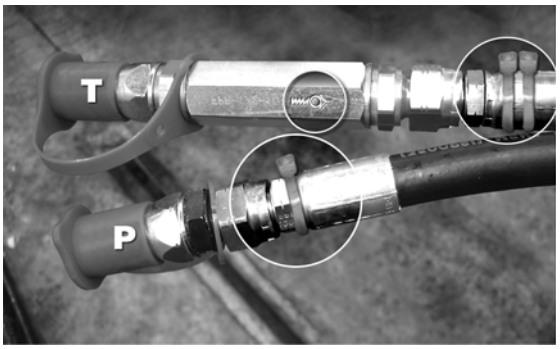
The Banjo Fast Fill system uses a high capacity Centrifugal pump, driven by a hydraulic powered motor (C). A suction hose (from the water source) is fitted to the Cam-lock coupling (A) and the pump speed can be controlled by an adjustable hydraulic by-pass valve (B). The fill rate can also be adjusted by means of the main ball valve (just in-board of the Cam-lock coupling).



NOTE! Water should always be present in the pump before running. To prime a dry pump remove the plug and fill with approximately 5 litres of water.

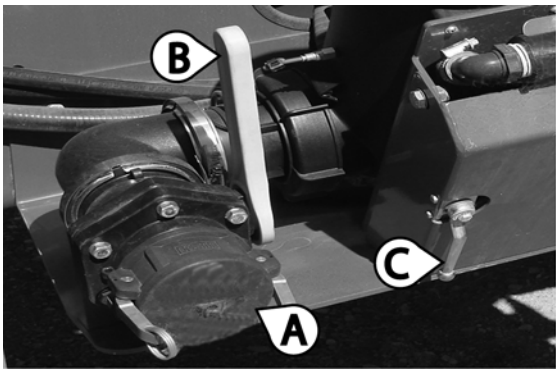
Set-up

1. Stop the tractor's engine, apply the hand brake, remove the ignition key and observe the safety warnings at the front of this section.
2. Standing at the drawbar, locate the hydraulic hoses for the Banjo pump motor (identified with white zip-tags).
3. Note the pressure line (P) (1 zip-tag) and the return line (T) (2 zip-tags).
4. Connect the hoses to a spare auxiliary hydraulic outlet on the tractor.
5. Secure the hoses to the hose bundle support bracket with zip ties allowing enough slack for turns.
6. Run the pump motor briefly and check for hydraulic leaks and correct operation.



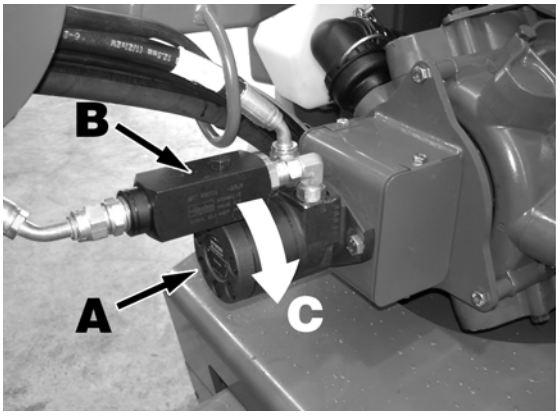
Start-up & speed adjustment

1. Attach Cam lock coupling (A) to a water source and open main fill valve (B).
2. Turn Speed control valve (C) to maximum speed position.
3. Turn the tractors hydraulic flow control for the auxiliary outlet to minimum position and engage the tractors auxiliary outlet.
4. Slowly increase the flow until the internal speed protection device stalls the pump.
5. Momentarily reverse the flow in the auxiliary outlet to reset the speed protection. Then reduce the tractors hydraulic flow control slightly to avoid further tripping of speed device.
6. The pump can now be operated from the Speed control valve (C) as per instructions in section 5.



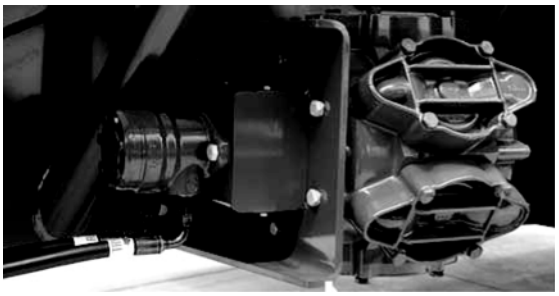
Hydraulic drive for Main pump (optional)

The optional hydraulic drive motor (A) mounts via an adaptor plate directly onto the front of 540 rpm 464 positive displacement pumps. The system is fitted with a Speed Limiting Valve (B) to control pump speed.
Note the correct direction of rotation (C) is clock-wise when viewing the motor with your back to the tractor.

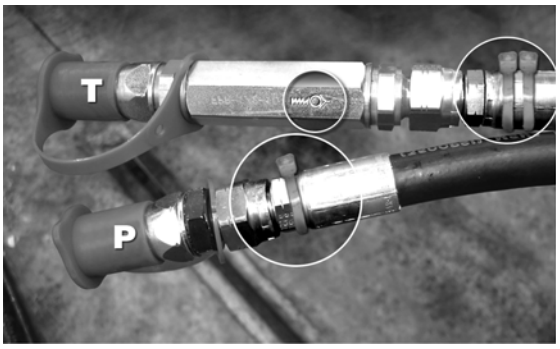


FlexCapacity pump (optional)

Warning: Incorrectly fitting hydraulic lines can reduce component life and adversely affect sprayer performance. The hydraulic hoses are clearly marked "Pressure"and "Return" for positive identification. The tank return line (T) is fitted with a check valve positioned so the spring and ball symbol is facing away from the tractor as shown in the illustration above.



Set-up

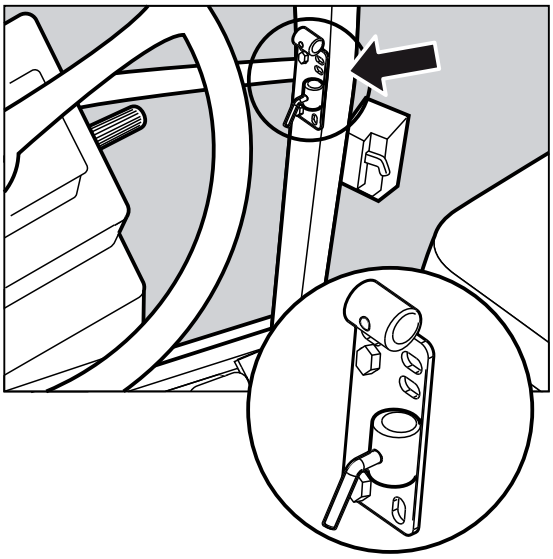


1. Stop the tractor's engine, apply the hand brake, remove the ignition key and observe the safety warnings at the front of this section.
2. Standing at the drawbar, locate the hydraulic hoses for the FlexCapacity pump drive motor (identified with Blue zip-tags).
3. Note the pressure line (P) (1 zip-tag) and the return line (T) (2 zip-tags).
4. Connect the hoses to a spare auxiliary hydraulic outlet on the tractor.
5. Secure the hoses to the hose bundle support bracket with zip ties allowing enough slack for turns.
6. Run the pump motor briefly and check for hydraulic leaks and correct operation.

Electrical connections

Installation of control unit brackets

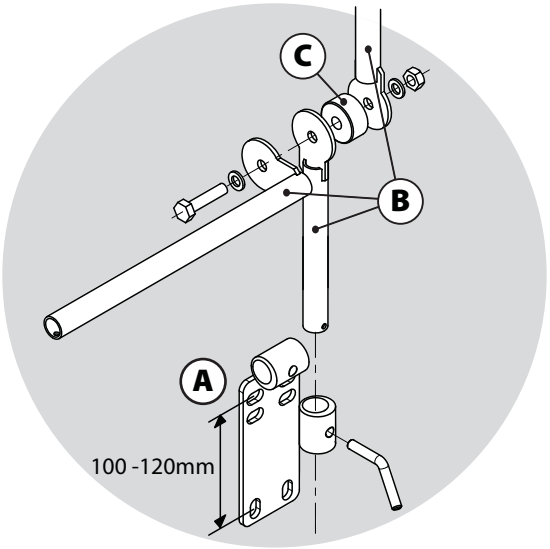
Find a suitable place in the tractor cabin to mount the control units. Best recommended position is to the right of the driver seat.



The supplied tractor pillar bracket (A) has a hole spacing of 100 and 120 mm that fits most tractors. Threaded mounting holes may be hidden behind front corner cover. Check tractor instructions manual for information regarding attachment points.

Three mounting tubes (B) are supplied. One, two or all three may be used. They can be bent and shortened. A spacer (C) is also supplied to allow further attachment possibilities. Find the best solution for your tractor or vehicle.

Tube (B) plate is staggered so that, if correctly orientated, all boxes will line up.



ATTENTION! See also the controllers instruction book for further details of fitting the controller equipment.

Road safety kit

Connect the plug for rear lights to the tractor's 7-pin socket, and check the function of rear lights, stop lights, side lights and direction indicators on both sides before driving.

The wiring is in accordance with ISO 1724. See section in "Technical specifications".

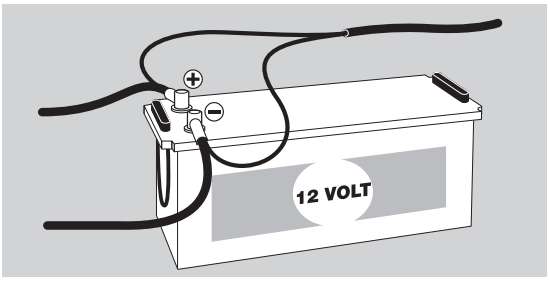
ATTENTION! Turn OFF all work lights when driving on public roads!

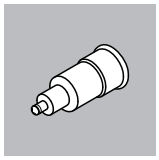
4 - Sprayer setup

Power supply

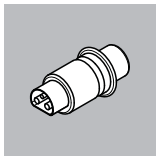
Power requirement is 12V DC. Always note polarity! For proper function of the electric equipment, the wires must have the following recommended cross sectional areas and correct fuses to ensure a sufficient power supply. The delivered power connectors follows the standard of most newer tractors. If you have a tractor with another power connector, it is necessary to disassemble the connector and fit it to the actual tractor connector.

The number and the type of connectors may vary on the specific sprayer, depending on its equipment.



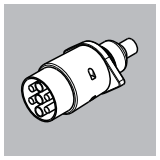


CIGAR CONNECTOR
Spray control unit requires:
Wire 2.5 mm^2, Fuse 10 Amp
Hydraulic control unit requires:
Wire 4.0 mm^2, Fuse 16 Amp

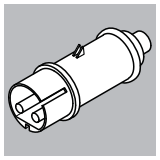


JOBCOM CONNECTOR
The unit requires:
Wire 6.0 mm^2, Fuse 25 Amp

ISO POWER CONNECTOR



7 POLE TRAFFIC LIGHT CONNECTOR



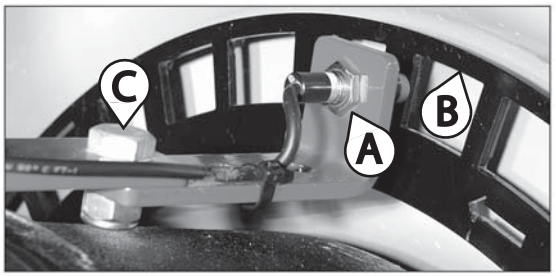
WORKING LIGHT CONNECTOR
The unit requires:
Wire 10.0 mm^2, Fuse 30 Amp

13 POLE POWER CONNECTOR

Speed transducer for sprayer

The speed sensor (A) is an inductive type and requires a metallic protrusion like a bolt head to trigger the signal. In this case a slotted ring (B) mounted on the inside of the right hand wheel rim is used.

The sensor should be located in the centre of the openings along the vertical axis. The recommended distance (or 'air-gap') between the sensor and the slotted ring is 3 to 5 mm. The air-gap can be adjusted if necessary by:



1. Loosen the bolt and nut holding the sensor mounting bracket (C).
2. Find something 3 to 5mm thick to use as a gauge and check that the clearance is within specification.
3. Re-tension the bolt and nut and re-check your adjustment.The speed transducer and speed ring are located at the inside of the sprayers right wheel. The sensor is an inductive type that requires a metallic protrusion like a speed ring to pass by it to trigger a signal.

ATTENTION! Correct fitting is indicated by continuous flashing from transducer when the wheel rotates.

Wheels fitted on these trailers are made for agricultural specifications and such have a 40km/h speed rating, some tractors are capable of speeds that exceed this. Safety is compromised if speeds are above 40km/h and damage to the components occur., therefore speed must be controlled to below 40km/h.

Liquid system

CycloneFilter

Standard filter size is 80 mesh and can be changed by opening the filter top. Check condition of O-rings and lubricate if necessary or replace if damaged before reassembly.

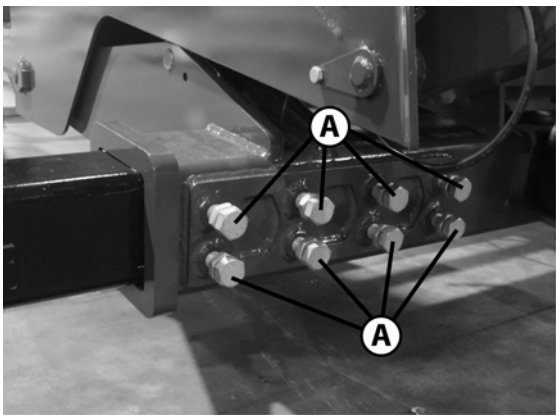
⚠ DANGER! Never open the Cyclone filter unless the suction SmartValve is turned to the unused position and the pressure SmartValve is turned to “Main tank”. Otherwise, spraying liquid may hit you when opening the filter, and drain from the main tank!

Track gauge, axles and wheels

Altering the track width

The track width of the sprayer can be altered stepless as follows,

Altering procedure



1. Measure the current track width (centre RH tyre to centre LH tyre). Each side must be extended or retracted half the desired alteration.
2. Attach the sprayer to tractor and engage tractor parking brake.
3. Place stop wedges in front of and behind RH wheel. Jack up LH wheel, support and secure sprayer body.
4. Loosen the counternut at the bolts (A) and the bolts (A) for LH wheel axle.
5. Extend or retract the axle.
6. Lower down the LH wheel.
7. Tighten the clamp bolts (A) to a torque of 640 Nm and lock the bolts with the counternuts.
8. Repeat the procedure on RH wheel.
9. Check if the distance from centre tyre to centre of rear frame is equal at RH and LH.
10. Retighten bolts and wheel bolts to specified torque after 8 hours of work.

WARNING! Bolts must always be locked and must always have contact. Never widening the axle beyond security of bolts (A)

ATTENTION! The wider the track width, the better the stability of the sprayer. HARDI recommends to work with widest possible track width.

Turning rim

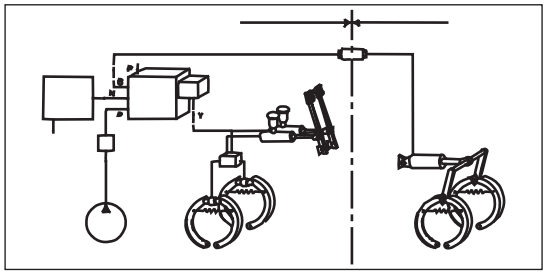
Track width can be altered by turning the rim, this will change the offset off the rim.

ATTENTION! When wheels has been mounted or re-tightened, the plastic nut covers must be placed on the nuts afterwards.

Brakes

Hydraulic activated brakes (optional equipment)

This requires a special trailer brake valve attached to the tractor hydraulic and brake system. Connect the snap coupler to the tractor brake outlet. When the tractor brakes are applied, the trailer brakes will work proportionally to the tractor brakes, and ensure safe and effective braking.



WARNING! Do not connect the brakes directly to the tractor hydraulics without the brake valve. The trailer brake power cannot be controlled, and braking will therefore be hazardous.

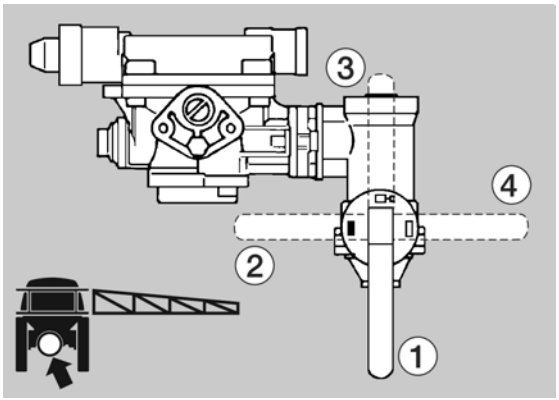
WARNING! Max. oil pressure is 150 bar (2175 p.s.i.) in the brake line.

Air activated brakes (optional)

This system requires a tractor with compressor and air brake system with outlet(s) for trailer brakes.

If the air hose(s) are disconnected with air in the brake air tank, control pressure will be dumped and the brakes will engage fully.

If the sprayer e.g. must be moved, the load apportioning valve must be set. Remember to reset the handle to brake position again afterwards.



Position	State	Use
1	Relieved	Move sprayer with air in the tank and without the air hose(s) connected to the tractor. Disengages the brakes.
2	Full	Use when driving with full tank.
3	Half full*	Use when driving with tank half full.
4	Empty	Use when driving with empty tank.

*If axle load exceeds 5250 kg. position 2 is required to be used.

ATTENTION! When parking the sprayer, always engage the parking brake, as the air brakes will only be engaged as long as there is air in the tank! Cover the couplings with the dust flaps when hoses are disconnected.

ATTENTION! The load apportioning valve must be set at the position corresponding to the load on the trailer, for obtaining optimal air pressure to the trailer brakes.

WARNING! Driving with wrong load apportioning valve setting, will make the brakes under or over apply, which can cause hazardous situations.

Single-line brakes (optional)

1. Flip the snap coupler protection flap away.
2. Connect the snap coupler to the tractor outlet (black).
3. Let the compressor fill the sprayer's air reservoir.
4. Check brake circuit for leaks.

Dual-line brakes (optional)

1. Flip the snap coupler protection flaps away.
2. Connect the two snap couplers for supply and control to the tractor outlets. The couplers are colour coded and secured against incorrect attachment:

Red	Supply line (RH)
Yellow	Control line (LH)

3. Let the compressor fill the sprayer's air reservoir.
4. Check brake circuits for leaks.

General info

Environmental info

For environmental info, please refer to the following parts in the Spray Technique book:

- Nozzles.
- Spray quality.
- Choosing Nozzles for arable crops.
- Spraying speed.

Boom

Safety info

The boom must not be folded/unfolded while driving! Never use the folding/unfolding functions before the sprayer has been stopped! Failure to do so will damage the boom.

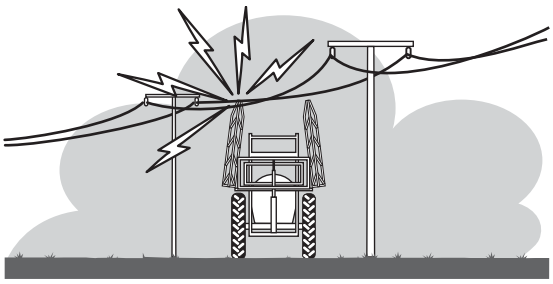
DANGER! Before unfolding the boom it is important to connect the sprayer to the tractor to prevent overbalancing of the sprayer.

DANGER! When folding or unfolding the boom, make sure that no persons or objects are within the operating area of the boom.

DANGER! Always follow the guidelines listed below when driving in areas with overhead power lines:

Never use the folding/unfolding functions in areas with overhead power lines.

Unintended boom movements may cause contact with overhead power lines.



ATTENTION! Only unfold and fold the boom on level ground.

Operating the boom control (Terra Force / B3 Aluminium)

ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

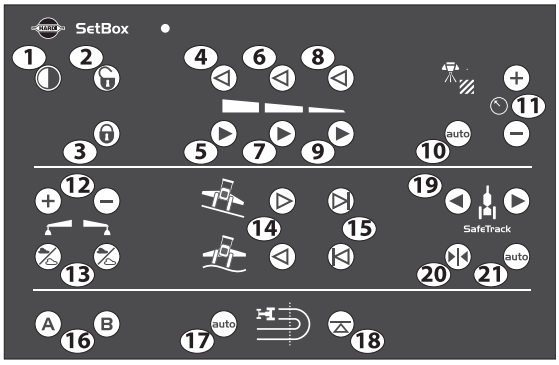
ATTENTION! The centre locks automatically when pressing 2nd outer folding button.

ATTENTION! The pendulum lock automatically opens at speeds exceeding 1.5 km/h!

Warning carefully follow steps below in order. Failure to do so may damage the boom and sprayer.

To unfold the boom

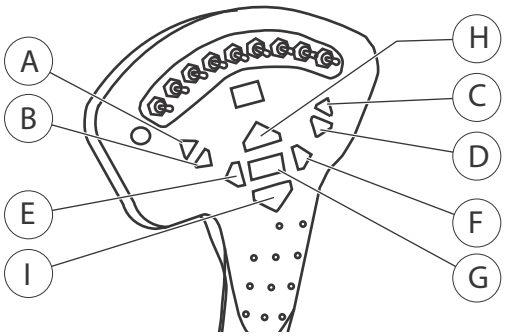
1. Turn on the tractors hydraulic if it is not already on.
2. Switch on the SetBox by pressing button (1)
3. On the grip press + hold button (A) and then (C) to tilt boom up until it's clear from the transport brackets.
4. On the grip press + hold the lift up button (H) to highest possible position. Check that the centre locked symbol is visible in the display
5. Press + hold button (5) to unfold the inner wing completely.
6. On the grip press + hold button (B) and (D) to tilt boom wings down until it is straight.
7. Press + hold the button (7) to unfold the 1st outer wing until it is completely out, make sure that the wing locks has engaged and that the fold cylinders is fully extended.
8. Press + hold button (9) to unfold 2nd outer wing until it is completely out make sure the fold cylinder is fully extended.



9. On the grip press + hold the lift down button (I) to lower the boom to the correct working height.
10. If not unlocked, then press (2) and symbol appears in display until pendulum is unlocked. This takes approximately 10 seconds. Drive slowly until the pendulum is completely unlocked.

To fold the boom

1. On the grip press slant buttons (E) or (F) to set centre to horizontal position.(If equipped with AutoTerrain press button (18) to automatically level the centre.)
2. Press button (3) to lock the centre. The symbol appears in display until pendulum is locked. This takes approximately 10 seconds.
3. On the grip press + hold lift up button (H) to raise the boom to the highest possible position.
4. Press + hold button (8) to fold the 2nd outer wings. Check that the pendulum lock symbol is visible in the display.



5. Press + hold button (6) to fold the 1st outer wings.
6. Press + hold the button (4) to fold the inner wing until the boom touch the side post. Make sure it is will pass the transport brackets, if not press button (A) and (C) to tilt the boom up.
7. Push the lift down button (I) to lower the boom until it rests on the paralift locks.
8. Press tilt button (B) and (D) to lower boom until they rests in the transport brackets.

Operating the Force Boom control (optional on EAGLE boom)

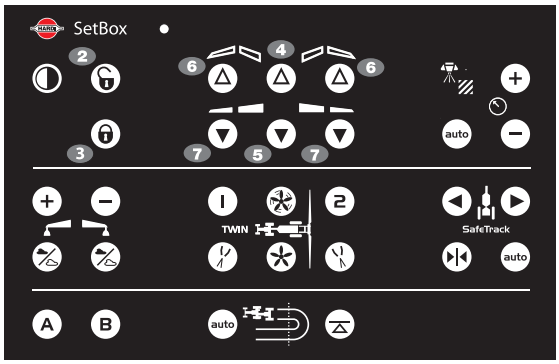
ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

WARNING! The pendulum lock doesn't automatically unlock when start driving. Always unlock the centre before start driving!

WARNING! The pendulum lock doesn't automatically lock when start folding. Always lock the centre before start folding the boom.

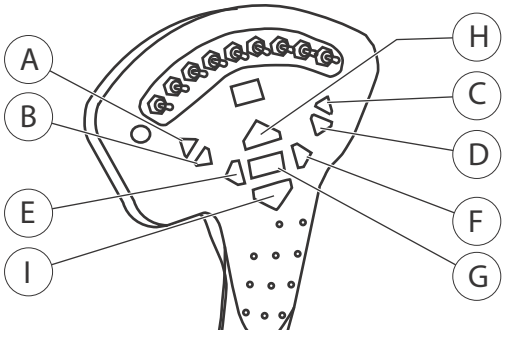
WARNING! Carefully follow steps below in order. Failure to do so may damage the boom and sprayer.

1. Turn on the hydraulic pressure if it is not already on.
2. Switch on the SetBox
3. Check that the pendulum locked symbol is visible in the display. If not press button (3) to lock the centre.
4. Press button (A) and (C) on the grip to tilt boom up until is clear from transport.
5. On the grip press + hold the lift up button (H) to highest possible position.
6. On the setbox press + hold button (5) to unfold the inner wings completely.
7. Press button (B) and (D) on the grip to tilt boom down until is horizontal.
8. On the setbox press + hold button (7) to unfold the outer wings completely.
9. On the grip press + hold the lift down button (I) to lower the boom to the correct working height.
10. Press button (2) to unlocked the centre. The symbol appears in display until pendulum is unlocked. This takes approximately 10 seconds.



To fold the boom

1. If the centre is not horizontal. Press slant buttons (E) or (F) on the grip to set centre to horizontal position.
2. Press button (3) to lock the centre.The symbol appears in display until pendulum is locked. This takes approximately 10 seconds.
3. On the grip press + hold lift up button (H) to raise the boom to the highest possible position.
4. Press + hold buttons (6) to fold the outer wings until it rest on the inner wing boom rest.
5. Press button (A) and (C) on the grip to tilt boom slightly upwards.
6. On the setbox press + hold the button (4) to fold the inner wing until the boom touch the side post. Make sure it is will pass the transport brackets, if not press button (A) and (C) to tilt the boom up.
7. On the grip press button (I) to lower the centre until the paralift transport lock locks.
8. On the grip press tilt button (B) and (D) to lower boom until they rests in the transport brackets.



Liquid system

Filling/washing location requirements

When filling the sprayer with chemicals and water it is important to avoid spot contamination by spray chemicals in order to protect the subsoil water resources.

A. If the sprayer is always filled at the same place, a special filling/washing location should be established. This should have a hard, liquid-impenetrable surface (e.g. concrete) securing against seepage and edges securing against run-off to the surrounding areas. The place should be drained to an adequate receptacle (e.g. slurry tank or similar).

   Any spillage or washings should be retained and diluted in order to be distributed on a larger area to ensure minimal environmental impact and avoid build-up of larger chemical concentrations at one spot.

   If no other requirements of distances exist, the following general recommendation of distance could be used. Not closer than:

   1) 50 metres from public water supplies for drinking purposes,

   2) 25 metres from non-public water supplies for drinking purposes and from treatment sumps and cesspools of drainage systems, and

   3) 50 metres from surface water (watercourses, lakes and coastal waters) and from nature reserves.

B. Alternatively the sprayer can be filled in the field where the spraying is to take place. If so, choose a different location for each refilling.

   If no other requirements of distances exist, the filling should not take place closer than:

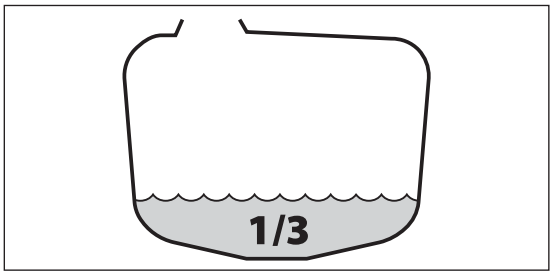
   1) 300 metres from public or non-public water supplies for drinking purposes and

   2) 50 metres from surface water (watercourses, lakes and coastal waters), treatment sumps, cesspools of drainage systems, and nature reserves.

NOTE! It is the responsibility of the sprayer owner/operator to comply with all relevant legislation. HARDI cannot undertake any responsibilities for incorrect operation and use.

Filling of water

The tank should normally be filled 1/3 with water before adding chemicals. Always follow the instructions given on the chemical container!



WARNING! If the sprayer is put aside with liquid in the main tank, all MANIFOLD valves must be closed.

WARNING! Sprayer must be connected to tractor before filling liquid in either main or flush tank.

WARNING! As long as there are liquid in either main or flush tank is should never be disconnected from tractor.

5 - Operation

Filling of rinsing tank

The rinsing tank is filled via the 1½"" cam-lock connection piece at the valve system:

1. Remove the cap, then fit the external water hose to the connection piece.
2. Engage external water pump, if any.
3. Keep an eye on the level indicator in order not to overfill the tank.
4. Stop filling and refit the cap.

Capacity: approximately 730 litres.

ATTENTION! Only fill rinsing tank with clean water! To avoid algae developing in the rinsing tank always drain the rinsing tank if the sprayer is not in use for a longer period of time.

ATTENTION! For cleaning purposes etc. the rinsing tank is also accessible via the tank lid on top of tank.

Filling of clean water tank

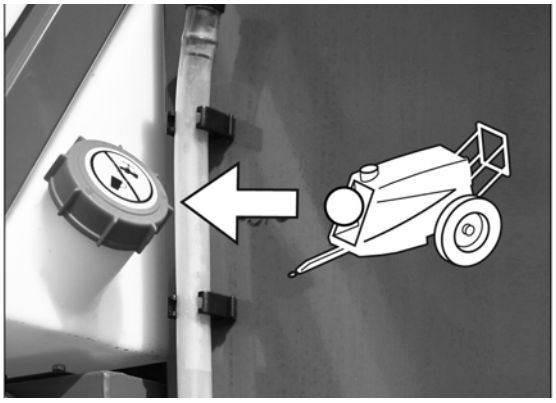
To fill the clean water tank:

1. Remove the tank lid
2. Fill with clean water
3. Reposition the tank lid.

For use of water:

- Turn the ball valve lever to open. The ball valve is located on the valve cover.

The water from this tank is for hand washing, cleaning of clogged nozzles etc. Only fill the clean water tank with clean water from the well.



WARNING! Although the clean water tank is only filled with clean water, this water must NOT be used for drinking

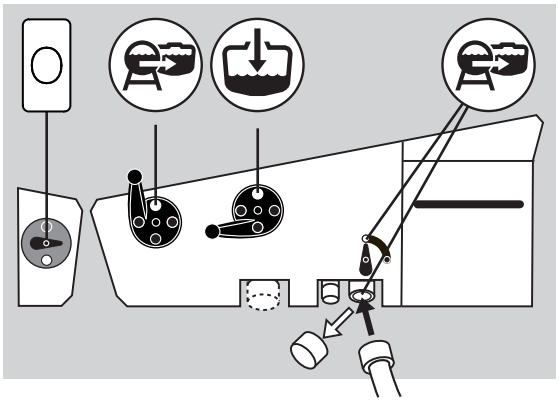
ATTENTION! Drain tank if not in use for long periods.

Optional Filling Systems

Venturi Fast Fill System

The External Filling Device is operated as follows:

1. Remove cover and connect suction hose to Suction Manifold.
2. Close the agitation valve, turn pressure SmartValve to “Main tank”.
3. Engage diaphragm pump and set P.T.O. revolutions at 540 r/min or 1000 r/min depending on pump model.
4. Turn handle on External Filling Device valve towards Filling Device.
5. The tank is now filled with water. Keep an eye on the liquid level indicator.
6. Turn handle on Suction Manifold away from Filling Device to discontinue filling process. Then disengage pump.
7. Disconnect suction tube and replace cover.



DANGER! Avoid contamination or personal injury. Do not open suction valve towards Suction Filling Device unless pump is running and filling hose is connected. If this valve is opened without pump running, liquid will stream out of the coupler.

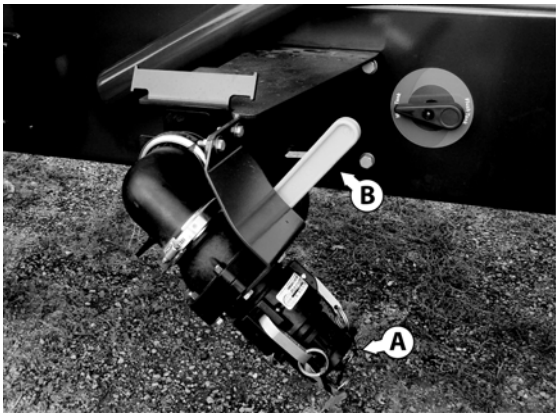
WARNING! Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator in order NOT to overfill the tank.

WARNING! If suction hose/filter is carried on the sprayer during spraying, it can be contaminated by spray drift which will be transferred to water source when filling!

ATTENTION! Observe local legislation regarding use of filling device. In some areas it is prohibited to fill from open water reservoirs (lakes, rivers etc.). It is strongly recommended only to fill from closed reservoirs (mobile water tanks etc.) to avoid contamination.

Filtered Fast Fill System

The 'Filtered Fast Fill' option allows the operator to fill the sprayer from an external water source (such as a dam or tank) using an auxiliary pump. It can be used to fill either main tank or flush tank. The system includes a Cam-Lock coupling on the inlet and a high capacity in line filter.



WARNING! If a high capacity pump is used open the tank lid before filling, be prepared to quickly turn of the pump and valve when the tank is fill, otherwise there is a risk of overfilling causing structural damage to the tank.

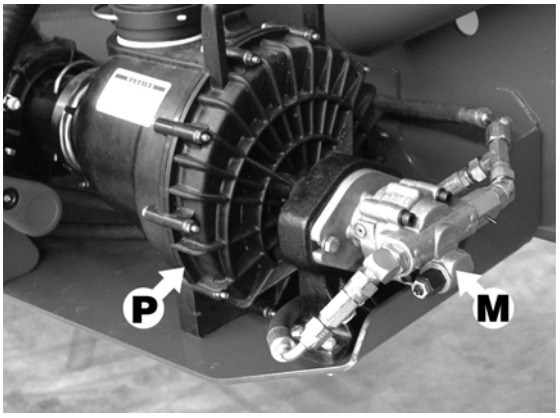
WARNING! Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator in order NOT to overfill the tank.

ATTENTION! The Quick Filtered Fill system should only be filled with clean water, and filter should be cleaned regularly

1. Remove the cover from the Cam-Lock coupling (A) and connect a hose being fed from an auxiliary pump and external water source.
2. Turn the directional valve towards main tank or flush tank.
3. Run the auxiliary pump and engage the Quick-Fill ball valve (B) to fill.
4. Watch the tank level indicator closely to prevent over filling.
5. To stop filling close the Quick-Fill ball valve (B), turn off the pump, disconnect the hose and replace the Cam-lock coupling dust cover.

Banjo Filtered Fast Fill System

The 'Banjo Filtered Fast Fill' system employs a high capacity centrifugal pump (P) driven by a hydraulic drive motor (M). The motor is powered by the tractors auxiliary hydraulics and Speed limited by a hydraulic burst valve. The operator can control the flow rate of the pump by use of a variable speed control valve (D) located on a panel just forward of the pump

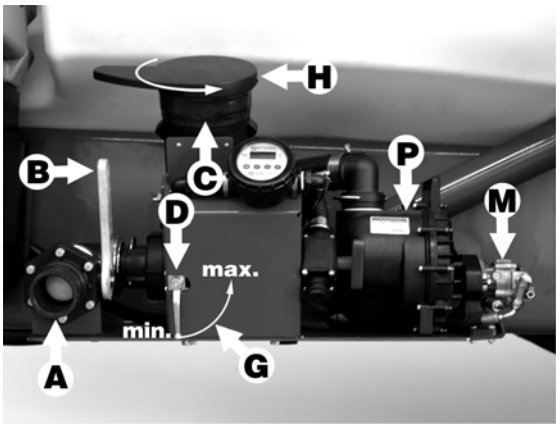


ATTENTION! Do not attempt to run the pump over the recommended Maximum speed.

WARNING! This is a centrifugal pump. Please always ensure that housing contains water otherwise seal damage can occur.

To fill the sprayer using the 'Banjo" fast fill system:

1. Park the tractor and sprayer on a level surface, select neutral gear, apply the hand brake and engage the auxiliary hydraulics.
2. Remove the cover from the Cam-lock coupling (A) and connect a suction hose to a water source.
3. Open the ball valve (B) and gradually engage the hydraulic speed control valve (D) until the desired flow rate is achieved (G).
4. When filling is complete dis-engage the hydraulic speed control (D) and close the ball valve (B).
5. Remove the suction hose and replace the cam-lock cap (A).



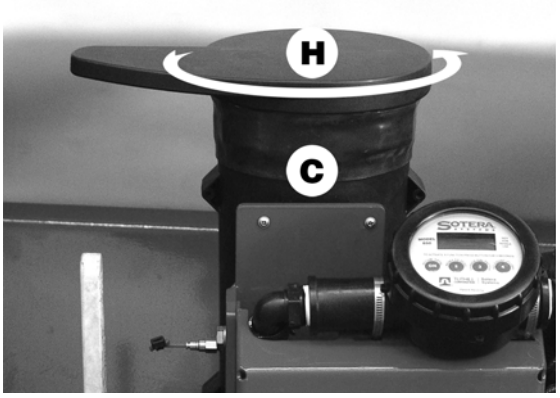
WARNING! Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator in order NOT to overfill the tank.

Banjo Fast Fill Filter

A high capacity HARDI Easy-Clean 3" filters are used (C) for the fast fill circuit:

To cleaning the filter:

1. Dis-engage the Hydraulic Speed Control valve.
2. Shut down the sprayer and the tractor's auxiliary hydraulics. Close the Fast Fill Cam-lock coupling ball valve.
3. Turn the filter casing lid (H) anti-clockwise to separate the lid and filter screen from the casing (C). Note: a built in isolation valve automatically closes when the filter lid and screen are removed.
4. Clean the filter screen and re-assemble.



ATTENTION! For ease of operation, always lubricates o-rings after cleaning filter.

ATTENTION! Continual periodic inspection of filter is advised.

ATTENTION! Never leave the sprayer un-attended while filling. Always watch the Main tank sight gauge to avoid over filling the tank.

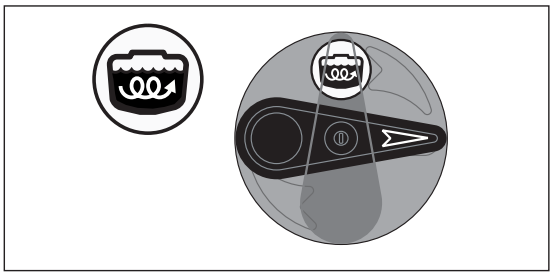
ATTENTION! It is recommended the filter be cleaned and serviced thoroughly after each spray job, before storage and at any time flow rate slows down due to debris causing a blockage. Wear appropriate safety gear.

Agitation

Adjustable Agitation

The adjustable agitation valve is a variable rate control valve, located at the front of the work zone (A). Some level of agitation is always present in the main tank unless the valve is closed completely by the operator. The level of agitation required during spraying is controlled by the valve position. For full operating instructions including "Auto agitation" for "Intelligent" models refer to the HC 6500 controller Operators Instruction book supplied with your sprayer.

ATTENTION! For high speed or high flow applications a reduced agitation setting or lower ground speed may be required, depending on the boom configuration.



Safety precautions - crop protection chemicals

Always be careful when working with crop protection chemicals!

WARNING! Always wear proper protective clothing before handling chemicals!

Personal protection

Depending on chemical type, protective gear/equipment should be worn to avoid contact with the chemicals, e.g.:

- Gloves
- Waterproof boots
- Headgear
- Respirator
- Safety goggles
- Chemical resistant overall

WARNING! Protective clothing/equipment should be used when preparing the spray liquid, during the spray job and when cleaning the sprayer. Follow the chemical manufacturer's instructions given on the chemical label and/or local legislation.

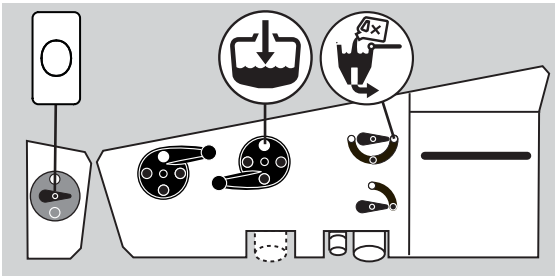
WARNING! It is always advisable to have clean water available, especially when filling the sprayer with the chemical.

WARNING! Always clean the sprayer carefully and immediately after use.

WARNING! Only mix chemicals in the tank according to directions given by the chemical manufacturer.

WARNING! Always clean the sprayer before changing to another chemical.

Filling liquid chemicals by HARDI TurboFiller



1. Fill the main tank at least 1/3 with water (unless otherwise stated on the chemical container label).
2. To activate the Venturi and hopper. Turn pressure SmartValve towards "Pressure to Main tank". Partially close the AgitationValve.

NOTE! If filling water from an external tank, this can be continued while doing the next steps.

3. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
4. Open TurboFiller lid. Measure the correct quantity of chemical and fill it into the hopper.

DANGER! Always wear face shield and other appropriate personal safety equipment when filling chemicals.

ATTENTION! The scale in the hopper can only be used if the sprayer is parked on level ground! It is recommended to use a measuring jug for best accuracy.

5. Turn the Chemical Source valve to hopper to activate suction from hopper this will transfer chemicals to the main tank. The Chemical Source valve must be open for at least 20 seconds after the chemical is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

DANGER! If the TurboFiller and the transfer hoses are not completely emptied there are risk of chemicals being siphoned out of the main tank!

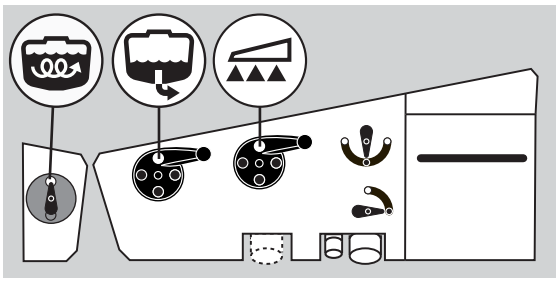
6. If the chemical container is empty, it can be rinsed by the Chemical Container Cleaning device. Place the container over the multi-hole nozzle and push the container cleaning.

DANGER! In order to avoid spray liquid hitting the operator, do not press lever unless the multi-hole nozzle is covered by a container as spray liquid may otherwise hit the operator!

ATTENTION! Rinsing device uses spray liquid to rinse containers for concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

7. Flush the TurboFiller with clean water from the Rinsing tank. The Chemical Source valve must be open for at least 20 seconds after the rinse water is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

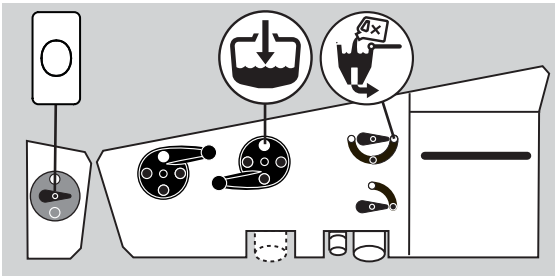
ATTENTION! If not flushed with clean water, the hopper rinsing device uses spray liquid for rinsing the hopper! Cleaning the TurboFiller must always be done when the spray job is ended and together with the entire sprayer - a cleaning after the last filling and before spraying the last tankful does not ensure a clean TurboFiller!



8. Close the Chemical Source valve when the hopper has been rinsed and close the lid.
9. Turn the AgitationValve towards "Agitation".
10. When the spray liquid is well agitated, turn handle of the pressure SmartValve towards "Spraying" position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

Filling powder chemicals by HARDI TurboFiller

1. Fill the main tank at least 1/3 with water (unless otherwise stated on the chemical container label). See section "Filling of water".
2. Turn the handle of the suction valve towards "suction from Main tank". Turn pressure SmartValve towards "Pressure to Main tank". Turn the AgitationValve towards "Agitation" if required. Close remaining valves.



ATTENTION! For increased suction from the TurboFiller the AgitationValve can be reduced.

NOTE! If filling water from an external tank, this can be continued while doing the next steps.

3. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
4. Open TurboFiller lid. Open TurboDeflector valve and turn the Chemical Source valve towards suction from hopper.
5. Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the transfer device can flush it down. The Chemical Source valve must be open for at least 20 seconds after the chemical is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

DANGER! If the TurboFiller and the transfer hoses are not completely emptied there are risk of chemicals being siphoned out of the main tank!

DANGER! Always wear face shield and other appropriate personal safety equipment when filling chemicals.

6. If the chemical container is empty, it can be rinsed by the Chemical Container Cleaning device. Place the container over the multi-hole nozzle and push the upper lever to the left of the TurboFiller.

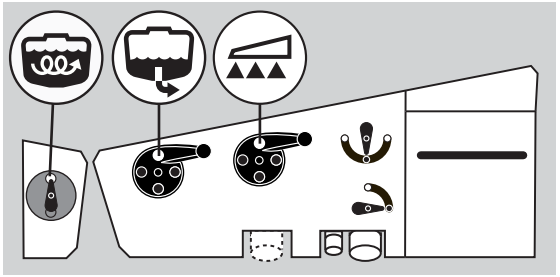
DANGER! In order to avoid spray liquid hitting the operator, do not press lever unless the multi-hole nozzle is covered by a container as spray liquid may otherwise hit the operator.

ATTENTION! Rinsing device uses spray liquid to rinse containers for concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

7. Flush the TurboFiller with clean water from the Rinsing tank. The Chemical Source valve must be open for at least 20 seconds after the rinse water is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

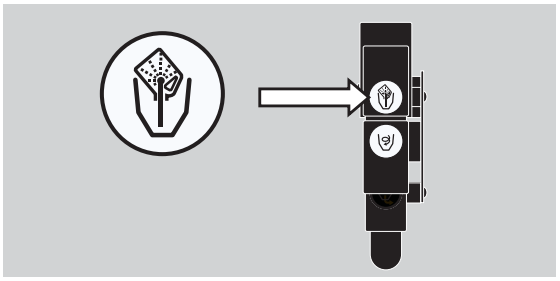
ATTENTION! If not flushed with clean water, the hopper rinsing device uses spray liquid for rinsing the hopper! Cleaning the TurboFiller must always be done when the spray job is ended and together with the entire sprayer - a cleaning after the last filling and before spraying the last tankful does not ensure a clean TurboFiller!

8. Close Chemical Source valve when the hopper has been rinsed and close the lid.
9. If closed, turn the AgitationValve towards "Agitation".
10. When the spray liquid is well agitated, turn handle of the pressure SmartValve towards "Spraying" position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.



TurboFiller rinsing

Rinsing the TurboFiller and chemical containers are done as follows:



Cleaning empty containers - TurboFiller lid is open

1. Put container over the rotating flushing nozzle in the middle of the TurboFiller so that the nozzle is inside the container.
2. Press the Chemical Container Cleaning lever and the turn the Chemical Source valve to suction from hopper. This rinses the chemical container with the flushing nozzle while the rinsing liquid is emptied out of the TurboFiller.

TurboFiller rinsing - TurboFiller lid is closed

1. Close TurboFiller lid.
2. Turn the suction SmartValve towards “Rinsing tank” or “External Filling Device” if clean water is available here.
3. Press the Chemical Container Cleaning lever and turn the Chemical Source valve to suction from hopper. This rinses the hopper with the flushing nozzle while the rinsing liquid is emptied out of the TurboFiller.
4. Rinse the hopper for 30-40 seconds. Then close the Chemical Source valve.
5. Open the lid to inspect if the TurboFiller is empty. If not, close the lid again and open Chemical Source valve until the TurboFiller is empty.
6. After the last flushing the TurboFiller suction valve must be open for at least 20 seconds after the rinse water is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

ATTENTION! The TurboFiller needs to be cleaned thoroughly after finishing spraying again to be sure it is clean before spraying other crops that may be sensitive to the chemicals just used. See section “Cleaning” on page 85 for details.

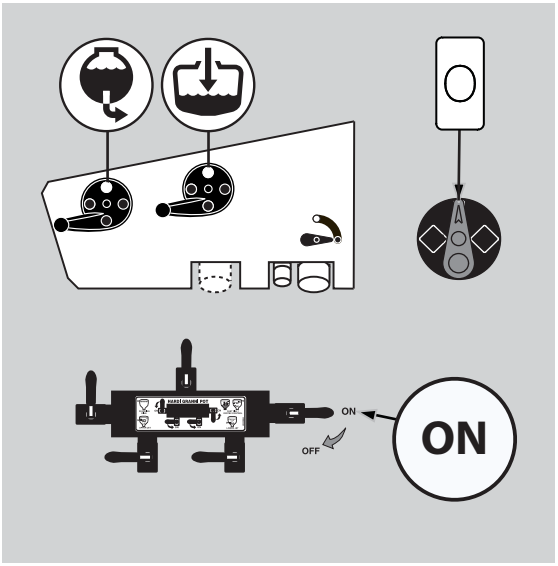
Chemical Filling by VACnMIX (optional)

The VACnMIX hopper chemical induction can be carried out in any one of the three following methods;

1. Induction of Dry Granules, Powders or Flowables by adding product to VACnMIX hopper
2. Induction of Liquids by adding product to VACnMIX Hopper
3. Using the optional Vacuum Feature to add Liquid Chemicals from Envirodrums and other containers

Filling the VACnMIX with water

Note! The VACnMIX can be filled with water from the Main Tank or the Rinse Tank. However it is recommend to use water from Rinse Tank. In the event of a or burst or a leak from one of the pressure hoses it will only come out clean water. Below instructions shows how to fill from Rinse Tank



1.Fill the Rinse Tank with clean water.

2.Turn the handle of the suction SmartValve towards "suction from Rinse Tank".

3.Set the Vacuum Transfer valve to Off position

4.To activate the Venturi and VACnMIX turn pressure SmartValve towards "Pressure to Main tank".

5.Engage the pump. Set at 540 or 1000 rpm, relevant to equipped pump.

6.On the VACnMIX controls, turn Fast Fill handle on, to fill hopper. Watch the level of water. Fill to the 25 Litre level, which will be just above the upper jet. (NOTE: Sight gauge is a guide only to fluid volume in hopper).

7.When sufficient water is in the hopper turn Fast Fill handle off.

ATTTENTION! Check operation by briefly operating all valves before introducing any chemical product. Check for leaks that may indicate loose fittings, faulty valves or damaged hoses.

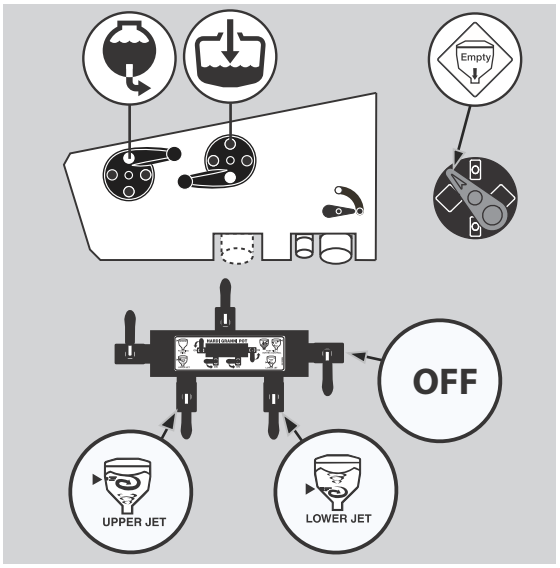
WARNING! Do not use faulty equipment.

Filling with liquid or granular chemicals by VACnMIX (optional equipment)

WARNING! Only compatible and complimentary chemicals should be mixed. When combined, incompatible chemicals may cause a potentially dangerous reaction, or result in unwanted effects on the crop to be sprayed.

ALWAYS follow label instructions! Always where

1. Fill the hopper with water to the 25 litre level. (See chapter "Filling the VACnMIX with water" on page 75.)



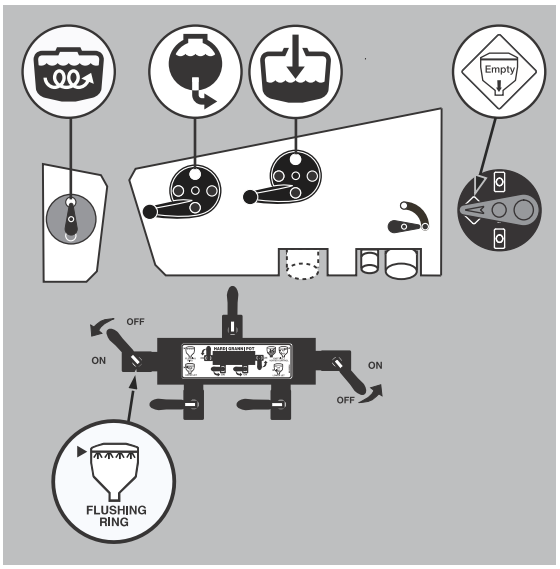
NOTE! If filling water from an external tank, this can be continued while doing the next steps.

2. Engage the pump (If not already on) and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
3. Start a swirling action in the hopper by turning ON the upper and lower jet handles and turning Off the Fast Fill handle.
4. Adjust the Vacuum and Transfer Valve to empty the hopper as fast that is filling.
5. Measure the correct quantity of chemical and sprinkle it into the into vortex stream (not into centre of hopper) as fast as the transfer device can flush it down.

NOTE! Large unmixed chemical will be held by centrifugal force to the outside wall of the hopper. Continue mixing in the hopper until chemical is fully integrated into water.

NOTE! Always ensure that enough pressure is maintained to drive the vortex. A drop in level may cause air to enter the suction line, and too high a level will cause slowing of the vortex, resulting in incomplete mixing of chemicals which may affect the accuracy of application rates when spraying.

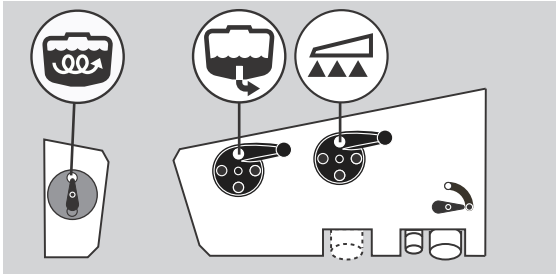
6. When all chemical has been thoroughly mixed, close vortex jet handles.
7. Close the lid and, flush the hopper using the hopper rinse ring between batches of chemical.
8. After all chemicals have been added to the sprayer tank, and the VACnMIX hopper is empty. Refill the hopper with clean water, operate all valves as in mixing procedure, empty and repeat until the system is clear of residue chemical.



ATTENTION!The Vacuum and Transfer Valve valve must be open for at least 20 seconds after the chemical is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank

9. If closed, turn the AgitationValve towards "Agitation". Close remaining valves.

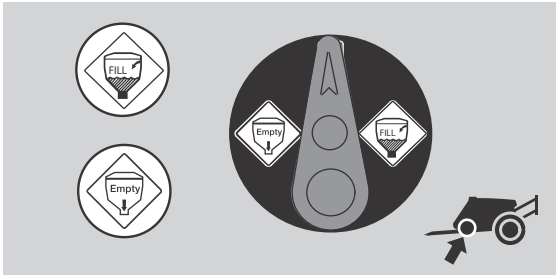
10. When the spray liquid is well agitated, turn handle of the pressure SmartValve towards "Spraying" position. And turn the suction SmartValve to suction from Main Tank. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.



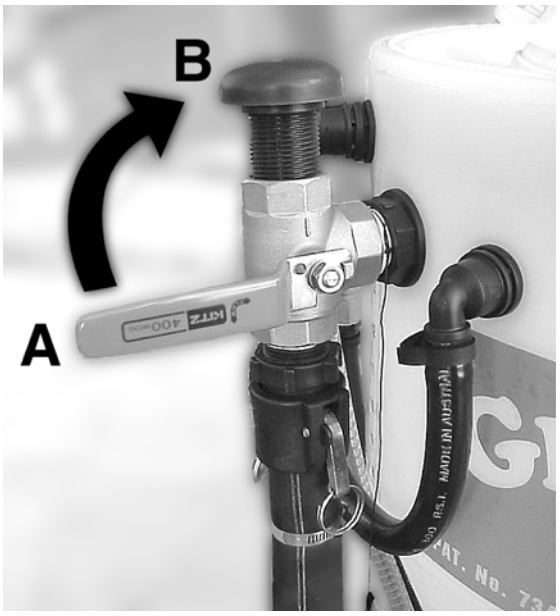
Filling chemicals by VACnMIX Chem Probe (optional equipment)

NOTE! Before adding any chemicals, fill hopper with water, to test functions see "Filling the VACnMIX with water" on page 75.

1. Connect Chem Probe suction hose to the camlock fittings on the ball valve on the hopper and the other end to the drum coupling.



2. With lid of VACnMIX closed, turn the Vacuum and Transfer Valve to FILL position.



3. The vacuum is controlled by the ball valve and vent. In the CLOSED (A) position, the ball valve is open to the suction line, and liquid chemical will be drawn from the drum into the hopper.
4. To stop the flow of liquid chemical from the drum, move the ball valve to OPEN (B) position - this allows air from the atmosphere to be introduced to the hopper through the vent, and closes off the suction line.
5. To transfer measured volume of chemical mixture to the sprayer tank, turn the Vacuum and Transfer valve to EMPTY.

NOTE! Chemical solution in the sprayer tank may need to be constantly agitated to keep particles in suspension. Particles which have been allowed to settle to the bottom of the tank may cause blockages in the plumbing system. You can keep the solution circulating by having sprayer tank agitators turned on.

To empty the ChemProbe hose with liquid:

1. Closed the lid of VACnMIX, turn the Vacuum and Transfer Valve to FILL position. Set the ball valve to (A) position. Disconnect the end of the hose that connects to the drum and attach it to a clean water source to clean the hose, when hose is clean turn the valve to (B) position.

ATTENTION! Flush hopper and sight tube between different chemicals with clean water.

ATTENTION! All components of the VACnMIX must be thoroughly cleaned and decontaminated, using recommended appropriate cleaning and / or neutralizing agents, before storage or using any different chemical concentrates. See"VACnMIX Rinsing" on page 78

VACnMIX Rinsing

NOTE! It is important to use clean water when rinsing. Always set suction from rinse tank or from external source with clean water when rinsing.

NOTE! Always refer to instructions on printed labels for individual chemicals for recommended methods of de-activation and disposal of unused chemical solution.

The entire sprayer, chemical handling equipment and the boom should be cleaned together see page “Cleaning” on page 85. Please read below for an overview of cleaning

Cleaning empty containers - VACnMIX lid open

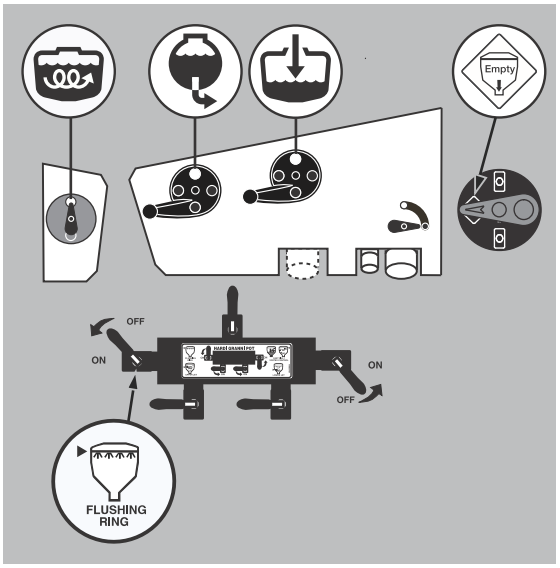
DANGER! Do not press the nozzle unless it is covered by a container to avoid spray liquid hitting the operator.

1. Rotate the nozzle 90 degree to unlock
2. Put container over the flushing nozzle so that the nozzle is inside the container and press bottom against the nozzle, this will force a powerful jet of water up into the inside of the container.

Note: This lock acts as a safety measure to prevent injury to operator. Ensure lock is repositioned correctly after use.

VACnMIX rinsing - VACnMIX lid is closed

1. Close VACnMIX lid.
1. Fill the hopper with clean water from the rinse tank. (See chapter “Filling the VACnMIX with water” on page 75.) Operate all valves as in mixing and transfer procedure.
2. Turn the Vacuum and Transfer Valve to EMPTY position, let valve be open for at least 20 seconds, after the rinse water is no longer visible in the hopper, in order to completely empty the transfer hoses into the main tank.
3. Repeat step 1-2 until empty until system is clear of residue.
4. After chemical induction and VACnMIX flushing is completed, continue filling the sprayer tank.



ATTENTION! The VACnMIX hopper needs to be cleaned thoroughly after finishing spraying. This is to ensure that it is clean, before spraying other crops that may be sensitive to the chemicals just used. See section “Cleaning” on page 85 for details.

Adding liquid chemical from a drum (Optional)

Operation of the SOTERA function keys are as follows:

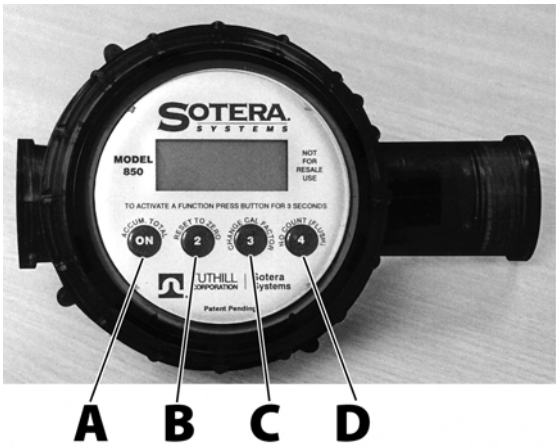
A. Power On / Displays the "Accumulated Total" when held on.

B. Resets "Total" to zero when held for 1 second / Resets the meter to normal function from "Cal" or "FLSH"mode.

C. Changes the "Calibration factor" (see instructions this section)

D. Changes to "FLSH" (flush) mode when held for 3 seconds (meter will not add to the Total or the Accumulated total when in this mode).

E. Turn the meter "ON" by pressing button (A).



Calibration of the Sotera Volumetric Flow Meter

1. Turn the meter "ON" by pressing button (A).
2. Hold the reset button (B) for one second to re-set the meter to zero.

Changing the "Calibration Factor

1. Hold the third button (C) for 3 seconds until the display shows nothing but the letters 'CAL' and a number.
2. Press the third button (C) again repeatedly until the desired calibration factor is displayed.
3. Press the second button (B) again to return to normal operating mode.

ATTENTION! The accuracy of the SOTERA Volumetric Flow Meter is affected by air and it is therefore important to manage the operation of the system with the flow control valve to ensue a correct reading.

ATTENTION! Containers that don't allow air into them will create vacuum resistance. Ensure all vents are clear.

ATTENTION! For complete operating instructions for the Chem Meter please refer to the instrument manufacturers Air induction from poor sealing of hose connectors like micromatic couplings will have a detrimental effect on performance by reducing the potential vacuum. Check all seals and fittings regularly instruction sheet (supplied with your sprayer).

ATTENTION! Simultaneous use of Chem Meter and HARDI Fast Fill system will affect vacuum performance. Operate only one system if increased vacuum is required.

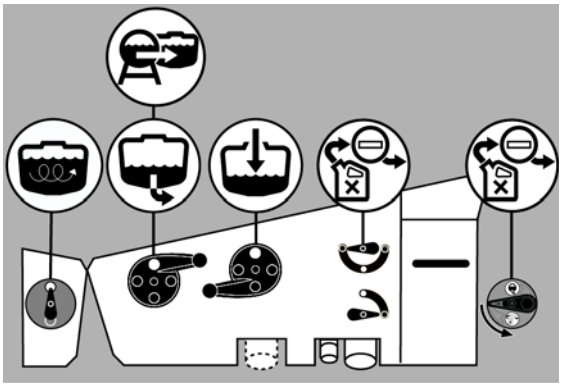
ATTENTION! The HARDI 463 diaphragm pump must be run at 500RPM or more to ensure the HARDI venturi produces maximum vacuum of - 0.85 bars. If uncertain of performance, fit a vacuum gauge and test actual vacuum produced.

WARNING! A well functioning HARDI venturi system creates a very powerful vacuum. It is therefore important to note that the internal flow mechanism will be irreparably damaged if it is left to suck high speed air. See correct operational procedure above.

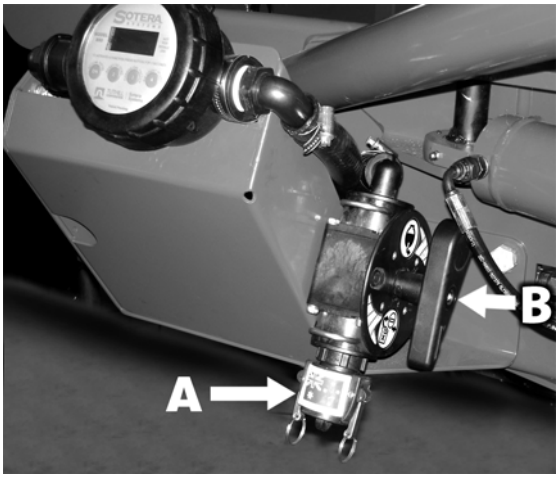
5 - Operation

Operate the Chem Meter - Sotera Volumetric Flow Meter

Operation of the control valves when using the SOTERA Volumetric Flow Meter are as follows:



1. Turn the suction Smart Valve towards either "Main Tank" or "External Tank"
2. Turn the pressure Smart Valve towards "Main Tank"
3. Ensure that the "Chem Probe / Flush Valve" (B) is closed.
4. Turn the Chemical Source Valve towards "Chem Probe" position.
5. Attach suction probe and connect or insert into chemical drum
6. To avoid false reading or damage to flow meter, gradually open "Chem Probe / Flush Valve" (B) until a steady flow is recorded. At this time the valve can be fully opened.
7. Carefully monitor the process. When the desired volume of chemical has nearly been metered or when the drum is near empty, gradually close the "Chem Probe / Flush Valve" (B) to a achieve a slow steady flow. When the desired volume is metered or air is being sucked, immediately turn the "Chem Probe / Flush Valve" (B) to the off position.
8. Rinse the suction probe and store. Briefly turn the "Chem Probe / Flush Valve" to "Flush Tank" position to clean out the Chem Meter.



Flushing the Chem-meter circuit

The Chem Meter and it's associated hoses etc have been exposed to concentrated chemical and therefore it is vitally important to flush the instrument and it's circuit Immediately after use. To flush the instrument and it's circuit:

1. Open the "Chem Probe / Flush Valve" in the opposite direction, towards the Flush Tank icon. This position draws clean water from the flush tank through the Chem Meter and it's hoses.
2. Allow it to run for a period of time until the circuit is flushed of chemical and close the valve.

Chem-meter Specifications

(1) Handles most liquid agricultural chemicals, (2) Stores up to 19 pre-set values, (3) 8 to 60 Litres per minute, (4) 0 to 5 Bar rating, (5) Powered by AA Batteries.

WARNING! It is essential you flush the Chem Meter circuit Immediately after chemical transfer is completed. Failure to do so can result in neat chemical being trapped and cause an unsatisfactory job when the sprayer is cleaned.

ATTENTION! For calibration charts and further information on calibration procedure, please see the instrument manufacturers instruction sheet supplied with your sprayer.

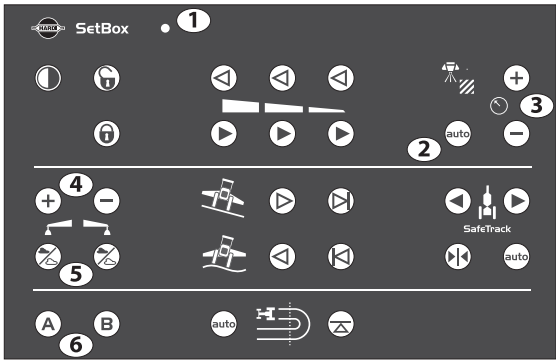
ATTENTION! High liquid viscosities will reduce performance. A heating blanket used to preheat hard to transfer chemicals will greatly improve performance.

Operating the control units for the TERRA FORCE and B3 Aluminium booms while spraying

ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

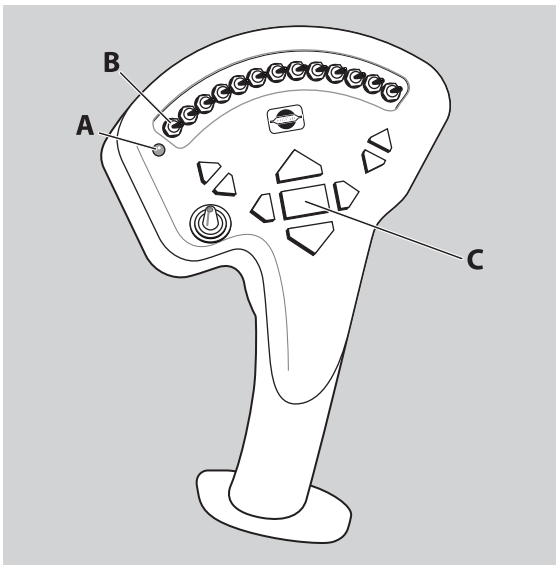
ATTENTION! The following information is intended as a general guide only. If equipped with HC6500 or HC8500/9500 controller please refer to controller Operators Instruction book supplied with your sprayer for detailed information regarding controls and settings.

The control units control the following spray functions:



1. Power ON/OFF/status LED. LED must be ON.
2. Automatic spray pressure regulation.

   The regulation valve controls the main spray pressure. This is default selection when the controller is powered ON, and it should remain here during normal spraying.
3. Manual spray pressure regulation. Under normal spraying these should not be used as the regulation valve does this automatically.
4. Foam marker blob interval. Regulates the blob interval for the optional foam marker.
5. Foam marker (Left/Right). Turns the optional foam marker ON for each side.
6. Optional function (A/B). If extra equipment is added, it can be controlled from here.

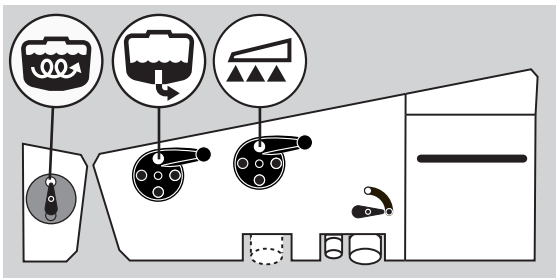


A. Power ON/OFF/status LED. LED must be ON.

B. Section valves. Turns single sections on or off. Lever up is OFF and down is ON.

C. Main valve ON/OFF.

Use when spraying



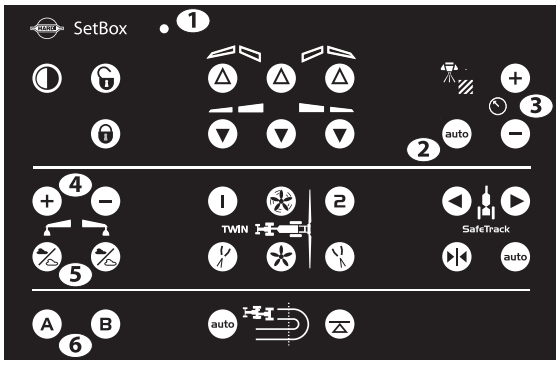
- On the sprayer, turn the suction valve toward “Suction from Main tank” and the pressure SmartValve toward “Spraying”. Turn the agitation valve to “Agitation” if necessary.
- In order to close the entire boom, switch main ON/OFF (C) to OFF position. This returns the pump output to the tank through the return system. The diaphragm Non-drip valves ensure instantaneous closing of all nozzles.
- In order to close one or more sections of the boom, switch the relevant distribution valve (B) to OFF position (upwards). The pressure equalisation ensures that the pressure does not rise in the sections that remain open.

NOTE! For checking the volume application rate, please refer to the spray controller instruction book.

Operating the control units for the FORCE and EAGLE booms while spraying

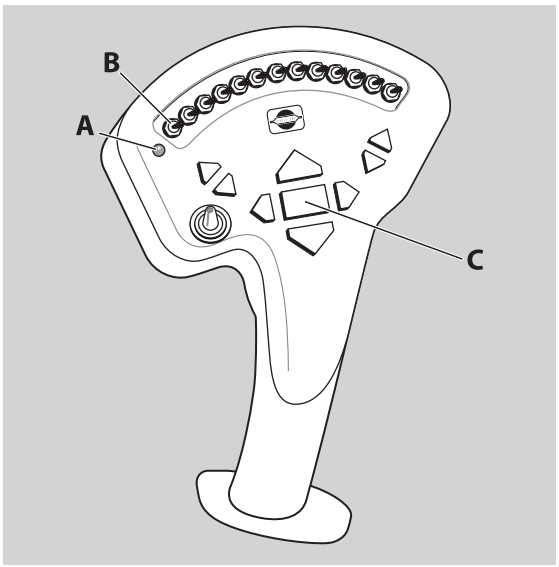
ATTENTION! The following information is intended as a general guide only. For detailed Safety, Set-up, Operation and Maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

The control units control the following spray functions:



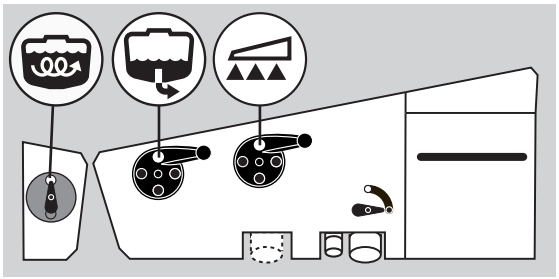
1. Power ON/OFF/status LED. LED must be ON.
2. Automatic spray pressure regulation.

   The regulation valve controls the main spray pressure. This is default selection when the controller is powered ON, and it should remain here during normal spraying.
3. Manual spray pressure regulation. Under normal spraying these should not be used as the regulation valve does this automatically.
4. Foam marker blob interval. Regulates the blob interval for the optional foam marker.
5. Foam marker (Left/Right). Turns the optional foam marker ON for each side.
6. Optional function (A/B). If extra equipment is added, it can be controlled from here.



A. Power ON/OFF/status LED. LED must be ON.
B. Section valves. Turns single sections on or off. Lever up is OFF and down is ON.
C. Main valve ON/OFF.

Use when spraying



- On the sprayer, turn the suction valve toward “Suction from Main tank” and the pressure SmartValve toward “Spraying”. Turn the agitation valve to “Agitation” if necessary.
- In order to close the entire boom, switch main ON/OFF (C) to OFF position. This returns the pump output to the tank through the return system. The diaphragm Non-drip valves ensure instantaneous closing of all nozzles.
- In order to close one or more sections of the boom, switch the relevant distribution valve (B) to OFF position (upwards). The pressure equalisation ensures that the pressure does not rise in the sections that remain open.

NOTE! For checking the volume application rate, please refer to the spray controller instruction book.

Before returning to refill the sprayer

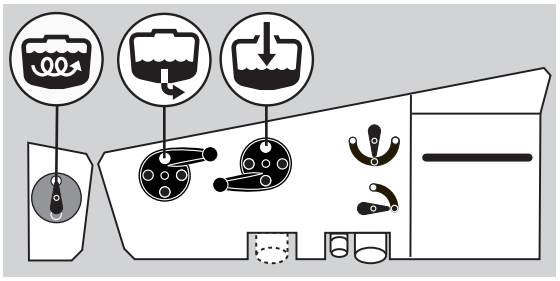
If the sprayer is to be refilled at the farm or at a fixed filling place without a filling space with hard surface and drain to closed reservoir, the sprayer should be rinsed before returning to refill.

Dilute the residues of the spraying circuit, and spray it on the crop. Then rinse the sprayer on the outside with the External Cleaning Device before returning to the farm.

WARNING! Always follow local legislation in force at any time.

Agitation before resuming a spray job

If a spray job has been interrupted for a while, severe sedimentation may occur depending on the chemicals being used. Before resuming the spray job, it might be necessary to agitate sediment material.



1. Turn the handle at the suction valve towards “Suction from main tank”. Turn the pressure SmartValve towards “Pressure to Main tank” and turn the Agitation valve towards “Agitation”. Other valves closed.
2. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
3. Agitation has started and should be continued for at least 10 minutes.
4. The spray job can now be resumed. Turn pressure SmartValve towards “Spraying” and start spraying.

Parking the sprayer

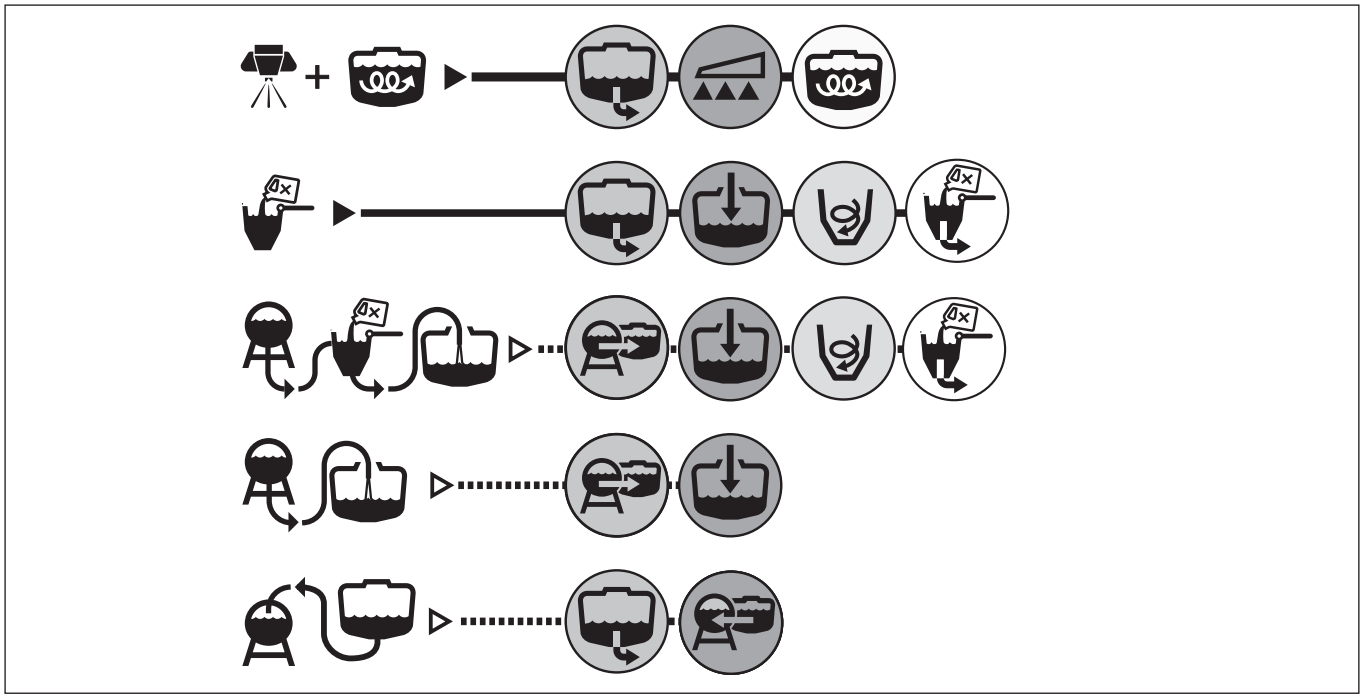
To avoid spot contamination the sprayer should always be parked at either the washing/filling place or under roof. This avoid rainfall to flush down chemical residues from the sprayer's surfaces.

- Parking at the washing/filling location will retain residues.
- Always park the machine out of reach of children, animals or unauthorized persons.

5 - Operation

Quick reference - Operation

In the following diagrams handle positions for different options are described.



Cleaning

General info

In order to derive full benefit from the sprayer for many years the following service and maintenance program should be followed.

ATTENTION! Always read the individual paragraphs. Read instructions for service/maintenance jobs carefully before starting on the job. If any portion remains unclear or requires facilities which are not available, then for safety reasons please leave the job to your HARDI dealer's workshop.

ATTENTION!

Clean sprayers are safe sprayers.

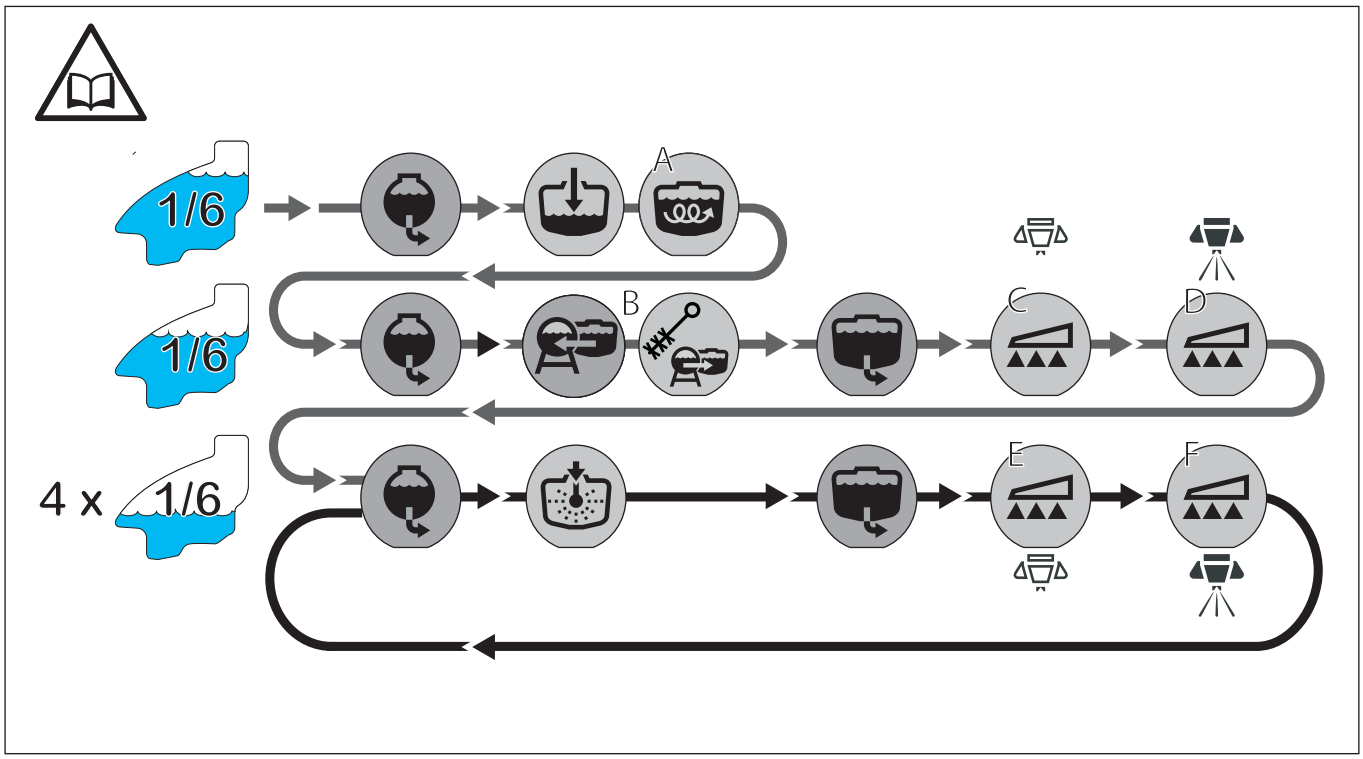
Clean sprayers are ready for action.

Clean sprayers cannot be damaged by pesticides and their solvents.

Guidelines

1. Read the whole chemical label. Take note of any particular instructions regarding recommended protective clothing, deactivating agents, etc. Read the detergent and deactivating agent labels. If cleaning procedures are given, follow them closely.
2. Be familiar with local legislation regarding disposal of pesticides washings, mandatory decontamination methods, etc. Contact the appropriate authority if you are in doubt.
3. Pesticide washings can usually be sprayed out on the field just sprayed or at a suitable cultivated area. Avoid emptying the washings at the same spot every time and keep sufficient distance to the water environment. You must prevent seepage or runoff of residue into streams, water courses, ditches, wells, springs, etc. The washings from the cleaning area must not enter sewers. Alternatively the washings can be retained in an appropriate receptacle, diluted and distributed over a larger cultivated area - see also "Filling/washing location requirements" on page 65.
4. Cleaning starts with the calibration, as a well calibrated sprayer will ensure the minimal amount of remaining spray liquid.
5. It is good practice to clean the sprayer immediately after use and thereby rendering the sprayer safe and ready for the next pesticide application. This also prolongs the life of the components.
6. It is sometimes necessary to leave spray liquid in the tank for short periods, e.g. overnight, or until the weather becomes suitable for spraying again. Unauthorized persons and animals must not have access to the sprayer under these circumstances.
7. If the product applied is corrosive, it is recommended to coat all metal parts of the sprayer before and after use with a suitable rust inhibitor.
8. The sprayer must always be parked under roof to avoid rain washing off pesticides and build-up of spot contamination in the soil. If parked outside the sprayer should be parked on the filling/washing location in order to retain possible pesticides.

Quick reference - Cleaning



A. Full agitation.

B. Wait 3 seconds before changing valve position.

C. Min. 45 seconds with nozzles OFF.

D. Spray until air comes out of nozzles. Engage FlexCapacity pump.

E. Min. 45 seconds with nozzles OFF.

F. Spray until air comes out of nozzles.

G. Repeat if necessary.

Cleaning and maintenance of filters

Clean filters ensure:

- Sprayer components such as valves, diaphragms and operating unit are not hindered or damaged during operation.
- Nozzle blockades do not occur whilst spraying.
- Long life of the pump. A blocked suction filter will result in pump cavitation. The main filter protecting sprayer components is the suction filter. Check it regularly.

Use of rinsing tank and rinsing nozzles

The incorporated rinsing tank can be used for three different purposes:

A. Full internal rinsing or cleaning.

B. External cleaning (can only be carried out on completion of "A").

C. Rinsing spray circuit without diluting main tank content.

ATTENTION! The cleaning procedures stated requires the TurboFiller to be cleaned on beforehand (directly after the last chemical filling). If the TurboFiller for some reason is not cleaned please carry out this cleaning before attempting the cleaning procedures A, B or C - see "TurboFiller rinsing" on page 74.
Note that this cleaning will then use water from the rinsing tank reducing the available quantity for cleaning procedures A, B or C.

ATTENTION! Do NOT fill any cleaning detergents into the rinsing tank. If cleaning agents are to be used this should be added the main tank.

A. Full internal rinsing

In-field diluting of remaining spray liquid residues in the spraying circuit for spraying the liquid in the field, before cleaning the sprayer.

NOTE! This rinsing is adequate/sufficient when the sprayer is going to be used again shortly (E.g. next day) in same or similar crops (No risk by cross contamination and subsequent crop damages).

WARNING! If the next crop to be sprayed is sensitive to the latest chemical used a full cleaning should be carried out. See "Full internal cleaning (Soak wash)" on page 90.

WARNING! Never clean the sprayer if there are risks of contamination of surface or underground water! Choose a different spot for cleaning every time to avoid spot contamination to build up.

DANGER! Before commencing this rinsing procedure ensure that the blind cap is securely fitted and tightened on the PressureEmpty quick-coupler! If this is not fitted and tightened properly it may burst off during the rinsing process and lead to personal injuries to the operator or persons in proximity of the machine!

This rinsing procedure will rinse the spraying circuit and main tank as follows:

1. Empty the sprayer as much as possible. Close the agitation valve (no agitation). Allow the pump to run for at least 1 minute after the liquid fan from the nozzles has collapsed to ensure that all relevant liquid has been expelled.
2. Turn suction SmartValve towards "Rinsing tank" and pressure SmartValve towards "Main tank". Set agitation valve to "Full agitation".
3. Engage and set the pump at approximately 300 rpm.
4. Use 1/6 (approximately 120 l) of the rinsing tank content at this valve setting.
5. Turn the pressure SmartValve towards "Pressure draining" for minimum 3 seconds to burst and flush the safety valve. If sprayer don't have the option Pressure draining, turn the pressure valve to the blank mark instead for 3 seconds. The TurboFiller is not flushed by this operation.

6. Turn the agitation valve towards “FastFiller flushing” and use another 1/6 (approximately 120 l) of the rinsing tank content for flushing the FastFiller lines.
7. Shut off all nozzles by the main ON/OFF button on the grip.
8. Turn suction SmartValve towards “Main tank” and the pressure SmartValve towards “Spraying”. Engage the auxiliary pump (FlexCapacity configurations only). Set the spraying pressure at 3-5 bar. If the pressure is set outside this range the rinsing result may be insufficient.
9. Allow the rinsing water in the main tank to circulate for minimum 45 seconds with the nozzles shut to flush the return lines from boom to tank.
10. Open all nozzles and spray the rinsing water from the main tank through the nozzles while driving in the field. Choose a different location each time to distribute the rinsing water over larger areas. Continue until all fluid is expelled from the boom tubes and nozzle - this may take several minutes after the spray fan has collapsed.
11. Shut off all nozzles by the main ON/OFF switch.
12. Turn the suction SmartValve towards “Rinsing tank” and the pressure SmartValve on “Tank rinsing”. Use another 1/6 (approximately 120 l) for this. The tank strainer should be removed to avoid shading for the rinsing nozzle.
13. Turn the suction SmartValve towards “Main tank” and the pressure SmartValve towards “Spraying”. With the nozzles shut allow the liquid to circulate for minimum 30 seconds to flush the return lines from boom to tank.
14. Open all nozzles by the main ON/OFF switch and spray the rinsing water from the main tank through the nozzles until all liquid is expelled from the boom tubes/nozzles.
15. Repeat step 11-14 another 3 times using 1/6 (approximately 120 l) of the rinsing tank content in each of the 3 sequences until the rinsing tank is empty.
16. Shut off the nozzles at the main ON/OFF button once the rinsing process is complete.

B. External cleaning

This procedure is used to rinse the sprayer on the outside in the field as required with the External Cleaning Device.

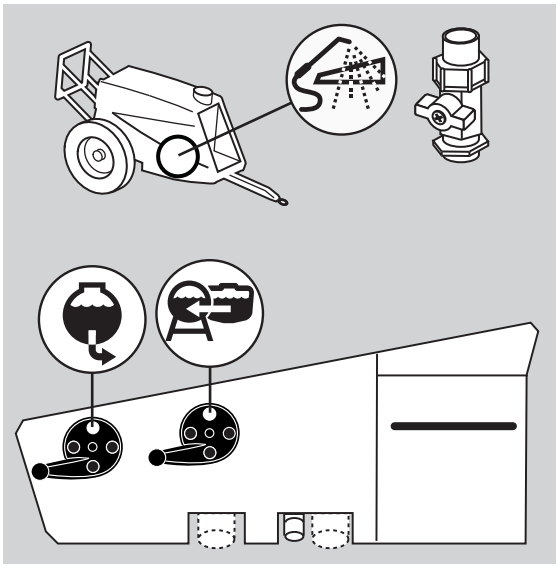
NOTE! Before attempting an external rinsing, make sure the main tank is rinsed (see “A. Full internal rinsing” on page 87) and empty! Any liquid left in the main tank will be mixed with the clean water for external rinsing!

NOTE! Approximately 100 l of clean water in the rinsing tank will allow approximately 15 minutes of rinsing (Cleaning nozzle consumption is 6 l/min at 10 bar pressure).

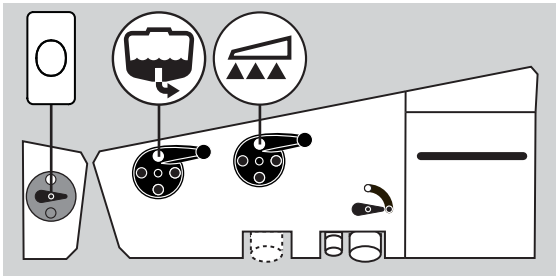
WARNING! Never clean the sprayer if there are risks of contamination of surface or underground water! Choose a different spot for cleaning every time to avoid spot contamination to build up.

1. Engage pump at approximately 300 r.p.m. or 560 r.p.m. depending on pump model.
2. Turn suction SmartValve towards “Rinsing tank” and pressure SmartValve towards “Pressure draining”.

DANGER! Before turning Pressure SmartValve to “Pressure draining” it is very important to be sure that the quick coupler lid is correct and completely mounted to the filling stud into its locked position. Failure to do so may cause risk of contamination and injury from quick coupler lid being “shot” off when pressurized! If not possible to mount lid completely, lubricate the rubber seal and the grip hooks.



3. When enough water from the rinsing tank is transferred turn suction SmartValve towards main tank.
4. Keep/turn pressure SmartValve towards “Spraying position” and close the agitation valve. Adjust the pressure manually to approximately 10 bar.
5. Open the ChemLocker cover. Cleaning gun is located in the holder at the frame (C).
6. Pull out the hose from the reel.
7. Turn the ball valve to position (A) to open.
8. Wash the sprayer with the cleaning gun.
9. Disengage the pump and close the ball valve again by turning it to position (B).
10. Retract the hose and place the cleaning gun in the holder (C)



NOTE! Do not let go of the hose. Gently restrict the roll-in of the hose.

C. Rinsing spraying circuit without diluting main tank content

This procedure is used to rinse the pump, operating unit, spray lines, etc. in case of stop in spraying before main tank is empty (e.g. beginning rain etc.).

Rinsing of the liquid system

1. Turn Suction SmartValve towards “Rinsing tank”. (Keep pressure SmartValve in “Spraying”-position).

NOTE! The main ON/OFF on the Grip must be ON. Closing the main ON/OFF will transfer the rinse water back to the main tank!

2. Close agitation valve (no agitation).
3. Turn off the Cyclone Filter Boost Valve to avoid dilution of main tank content.
4. Engage the pump and spray water from rinsing tank in the field until all nozzle tubes/nozzles are flushed with clean water.
5. Disengage the pump again.

ATTENTION! It is advisable to increase the forward speed (double if possible) and reduce the pressure to 1.5 bar (20 psi) when spraying diluted remaining liquid in the field just sprayed.

ATTENTION! If a cleaning procedure is given on the chemical label, follow it closely.

ATTENTION! If the sprayer is cleaned with a high pressure cleaner lubrication of the entire machine is recommended.

Full internal cleaning (Soak wash)

NOTE! This cleaning procedure is always used when:

A. The next crop to be sprayed is at risk to be damaged by the chemical just used, or

B. The sprayer is not going to be used again for same chemical or crop right away, or

C. Before any repair or maintenance job is going to be carried out on the sprayer.

NOTE! Wash of sprayer between jobs with incompatible crops must be done according to prescriptions from the chemical producer. Use e.g. AllClearExtra, as this is a commonly used cleaning agent. If your chemical prescribes another cleaning agent and/or another cleaning procedure, you must follow that.

Procedure for wash with a cleaning agent, e.g. AllClearExtra:

1. Rinse the sprayer in the field (See chapter "Use of rinsing tank and rinsing nozzles" subchapter A).
2. Drive to farm fill station.
3. Prepare sprayer for cleaning with cleaning agent, e.g. AllClearExtra. Fill water in the main tank to 10% of capacity (respectively 650 litres, 850 litres and 1000 litres. Fill the rinsing tank completely. This water is used later for rinsing.
4. Turn suction SmartValve towards "Main tank" and pressure SmartValve towards "Main tank". Set agitation valve to "Full agitation".
5. Engage and set the pump at approximately 300 r.p.m. Engage auxiliary pump (FlexCapacity configurations only).
6. Allow the liquid to circulate for 3 minutes.
7. Turn the pressure SmartValve towards "Pressure draining" for minimum 3 seconds to burst and flush the safety valve. If sprayer don't have the option Pressure draining, turn the pressure valve to the blank mark instead for 3 seconds. The TurboFiller is not flushed by this operation.
8. Turn the chemical source valve to TurboFiller and open the deflector valve and allow liquid to circulate for 3 minutes.
9. Close the lid and activate the container rinsing valve to clean the hopper inside.
10. Shut the 2 valves on the TurboFiller again, and the chemical source valve
11. Turn the agitation valve towards "FastFiller flushing" for 3 minutes to clean the FastFiller lines.
12. Verify that all nozzles are shut at the main ON/OFF button on the grip.
13. Turn the pressure SmartValve towards "Spraying".
14. Allow the liquid in the main tank to circulate for minimum 3 minutes with the nozzles shut to clean the return lines from boom to tank.
15. Turn the pressure SmartValve towards "Tank cleaning nozzles" and circulate liquid for further 3 minutes.
16. Spray out water with cleaning agent and chemical residue. Set the spray pressure at 3-5 bar. Note that the washing water still contains active chemical and choose an appropriate area to spray out this. Alternatively the washings can be dumped at the Filling/washing location and retained in an appropriate receptacle (E.g. slurry tank or similar) - see section "Filling/washing location requirements". Spot contamination and accumulation must be avoided. Continue to spray until all liquid is expelled from the boom tubes and nozzles.
17. Shut off all nozzles by the main ON/OFF switch.
18. Rinse the sprayer again with clean water to rinse out all remains of the cleaning agent. See section "Use of rinsing tank and rinsing nozzles" subchapter A. "Full internal rinsing" This to avoid that the cleaning agent remains in the fluid system. Remains could damage the next spray chemical filled into the main tank.
19. Include rinsing of the TurboFiller in step 17. Operate all 3 valves during this process.
20. Dismantle all filters (suction, pressure, in-line and nozzle filters) and clean the filter screens using clean water and detergent.

ATTENTION! The rinsing nozzles cannot always guarantee a 100% cleaning of the tank. Clean manually with a high pressure cleaner afterwards, especially if crops sensitive to the chemical just sprayed are going to be sprayed afterwards!

NOTE! It is the responsibility of the sprayer operator or owner that the sprayer is cleaned sufficiently to avoid contamination of the environment, crop damages and health & safety hazards to operator and the public. HARDI cannot be held responsible for any damages or incidents related to insufficient cleaning.

PrimeFlow - manual cleaning

in the event of a AutoWash failure machines equipped with PrimeFlow can follow the same manual washing procedure as described in this manual when the following detail is observed:

- Open all nozzles before flushing the boom spray lines to avoid chemical residues from the boom lines are returned into the main tank.

Use of detergents

It is recommended to use an appropriate cleaning detergent suitable for cleaning agricultural sprayers.

- The cleaning detergents which contains a suitable lube or conditioner is recommended.
- If for some reasons this is not available and e.g. triple ammonia water is used, it is important to rinse the circuit immediately after and add some lubricant to the rinsing water to avoid e.g. ball valves seizing up.
- Use of automotive antifreeze/radiator coolant (ethylene glycol) will protect the valves, seals etc. from drying or seizing up.

Technical residue

Inevitably a quantity of spray liquid will remain in the system. It cannot be sprayed properly on the crop, as the pump takes in air when the tank is about to be empty.

This Technical Residue is defined as the remaining liquid quantity in the system as the first clear pressure drop on the pressure gauge is read.

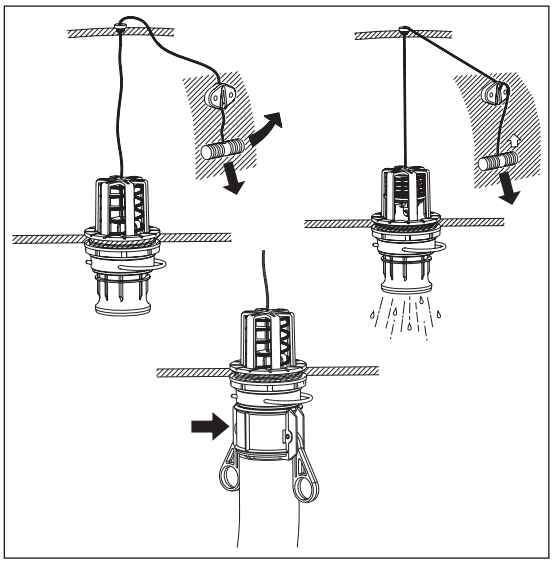
The residues in the tank should be diluted immediately in the relationship 1:10 with water and afterwards be sprayed to the crop just sprayed with increased driving speed. In addition, also pump, linkage and armature can be separately rinsed with water from the rinsing tank. It is to be made certain however that the liquid in the spray lines are in unchanged concentration. Therefore there should be an untreated patch available to spray this out.

Using the drain valve

The drain valve is operated from platform just beside the main tank lid.

1. Pull the string to open the drain valve.
2. The valve is spring-loaded, but can be kept open by pulling the string upwards in the V-shaped slit.
3. To release, pull the string downward and the valve will close automatically.

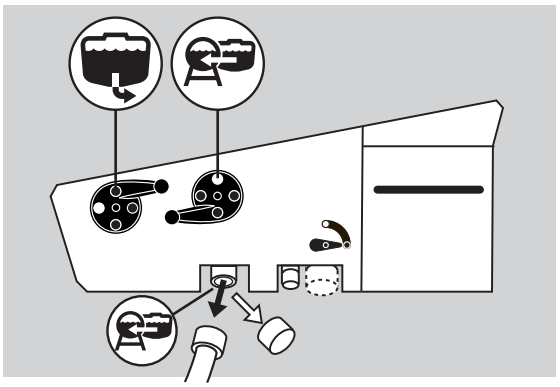
If draining residues, e.g. liquid fertilizer into a reservoir, a snap-coupler with hose can rapidly be connected to the drain valve and the liquid safely drained.



Pressure draining (optional)

It is possible to drain to an external tank. This is done the following way:

1. Connect a hose from an external tank to the pressure quick coupler on the sprayer.
2. Turn the Pressure SmartValve towards “External tank”.
3. Turn the suction valve towards “Main tank”.
4. Engage the P.T.O to start the pump.
5. When tank is drained then turn off P.T.O. again.
6. Disconnect hose and refit the quick coupler lid.



⚠ DANGER! Before turning Pressure SmartValve to “Pressure draining” it is very important to be sure that the quick coupler is correct and completely mounted to the filling stud into its locked position. Failure to do so may cause risk of contamination and injury from quick coupler being “shot” off when pressurized! If not possible to mount coupler completely, lubricate the rubber seal and the grip hooks.

Preparation

Introduction

This section of the manual deals with maintenance. It is vitally important that you prepare the service area, the sprayer and tractor to minimise any potential risk to the operator or service technician. The following suggestions are made in the interests of safe work practices. Performing service and maintenance procedures safely requires awareness, preparation and common sense. Below is a list of safety issues which must be observed before commencing service or maintenance procedures:

Safety

⚠ DANGER: Maintenance procedures involve:

-Reading and interpreting technical information and illustrations

-Lifting the sprayer's axle off the ground

-Cleaning of filters

-Brake adjustments

-Servicing hydraulic components

-Testing and servicing of fluid systems

-Servicing PTO shaft safety shields

-Lubrication

Before you get started...

Performing service and maintenance procedures safely requires awareness, preparation and common sense. Below is a list of safety issues which must be observed before commencing service or maintenance procedures:

⚠ DANGER: Before carrying out any service procedures observe the following:

- Clean and de-contaminate the sprayer and use chemical safety protection gear
 (see "Chemical Safety" section 2 and "Cleaning and De-contamination" section 5)
- Ensure your work area has lifting and safety equipment of a suitable load bearing capacity
- Always wear safety eye wear, overalls, safety boots and gloves where appropriate
- Keep animals and people away from the service area at all times unless involved in the procedure
- Keep children away
- Position the tractor and sprayer on a suitable flat surface with enough room for the boom to operate
- Never perform set-up, service or maintenance procedures with the tractor running
- Turn the tractor's engine off, place in park with the hand bake on and remove the ignition key!
- Fit the support leg and retaining pins and use wheel chocks in front and behind of each wheel
- Always use safety stands when lifting the sprayer off the ground
- Always re-fit all safety equipment and shields after service procedures
- Think each job through before commencing work and assess any potential risk
- Avoid working alone or at least have some-one check on you periodically
- Carry a mobile phone on you for emergencies
- Disconnect the power and clear the area of any flammable material before using an arc welder
- If any procedure is unclear or requires facilities which are not available, refer the job to your HARDI dealer.

6 - Maintenance

Lubrication

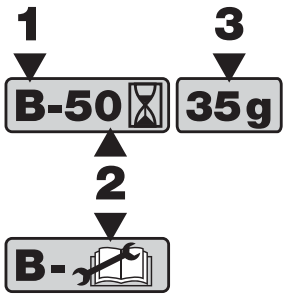
General Info

Always store lubricants clean, dry and cool - preferably at a constant temperature - to avoid contamination from dirt and condensed water. Keep oil filling jugs, hoppers and grease guns clean, and clean the lubricating points thoroughly before lubricating. Avoid skin contact with oil products for longer periods.

Always follow the quality and quantity recommendations. If no quantity is recommended, feed the lubricator until new grease becomes visible.

Pictograms in lubrication & oiling plans designate:

1. Lubricant to be used (see "Recommended lubricants" below).
2. Recommended intervals. Shown in hours or with a symbol for occasional maintenance.
3. Amount to be used. Only shown if an amount is specified.



ATTENTION! If the sprayer has been cleaned with a high pressure washer, lubrication of the entire machine is recommended.

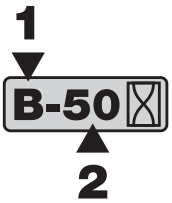
General info

Always store lubricants clean, dry and cool - preferably at a constant temperature - to avoid contamination from dirt and condensed water. Keep oil filling jugs, hoppers and grease guns clean, and clean the lubricating points thoroughly before lubricating. Avoid skin contact with oil products for longer periods.

Always follow the quantity recommendations. If no quantity is recommended, feed lubricator till new grease becomes visible.

Pictograms in lubrication & oiling plans designate the following:

1. Lubricant to be used (see "Recommended lubricants").
2. Recommended intervals (hours).



ATTENTION! If the sprayer is cleaned with a high pressure cleaner, lubrication of the entire machine is recommended.

Recommended lubricants

BALL BEARINGS:
Universal Lithium grease,
NLGI No. 2
Viscosity (@40°C) > 460 cSt

SHELL RETINAX EP2
CASTROL LMX GREASE

SLIDE BEARINGS:
Lithium grease with
Molybdenumdisulphide or
graphite
SHELL RETINAX HD 2 (or HDX 2)

OIL LUBRICATION POINTS:
TOTAL Transmission TM
SAE 80W/90
Castrol EPX 80W/90
SHELL Spirax 80W/90
Mobil Mobilube 80W/90

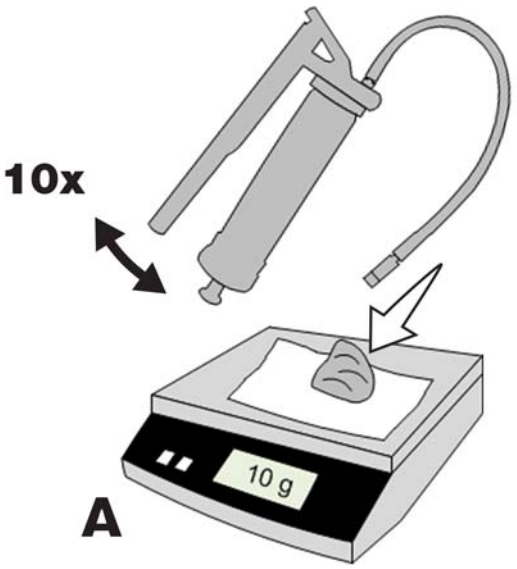
Grease Gun Calibration

Before lubricating the sprayer, you must calibrate your grease gun to ensure that the correct amount of grease is applied to each lubrication point. The correct amount of grease applied will prolong the lifetime of the sprayer.

Calibration example

1. Insert the correct grease cartridge in your grease gun.
2. Apply grease onto a tissue or a piece of paper. Complete 10 full strokes of the grease gun.
3. Place the paper with grease on a scale.
4. If your grease pile weighs for example 10 grams (A), then 1 stroke equals 1 gram of grease.

When calibrated you can count how many strokes to complete, when lubricating the different grease points on the sprayer according to the specifications.



Alternative method

1. Count the strokes, until you have 10 grams of grease piled up on the scale (A).
2. Now you can figure out how many strokes to use for applying a certain amount of grease to a lubrication point.

Greasing the Pump

The pump is greased as follows:

- Factory greased:

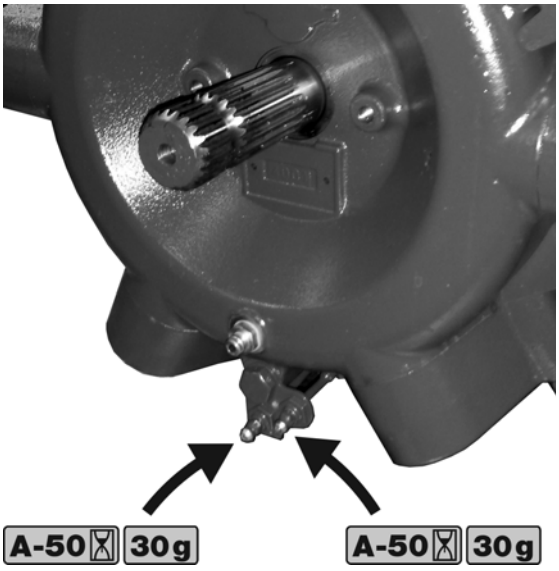
  300 g grease into each lubrication point (A).

- Normal operation:

  MUST be greased every 50 hours with 30 g grease into each lubrication point (A).

- After disassembling the pump (diaphragm renewal, etc.):

  MUST be greased with 200 g grease into each lubrication point (A).



50 Hours Service - Greasing the Pump

When operating the pump, it MUST be greased every 50 hours with 30 gram grease into each lubrication point.

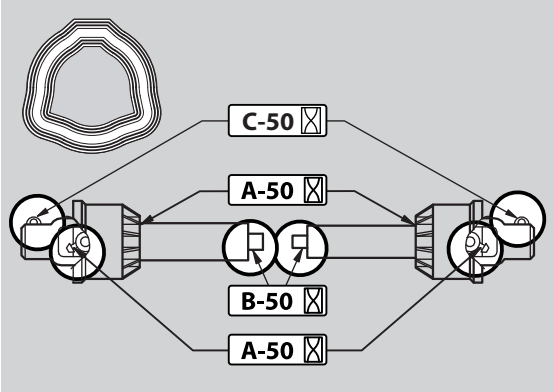
ATTENTION! In order to avoid excessive wear it is important to use a recommended lubricant! See recommended lubricants below.

ATTENTION! The pump MUST be stopped during greasing!

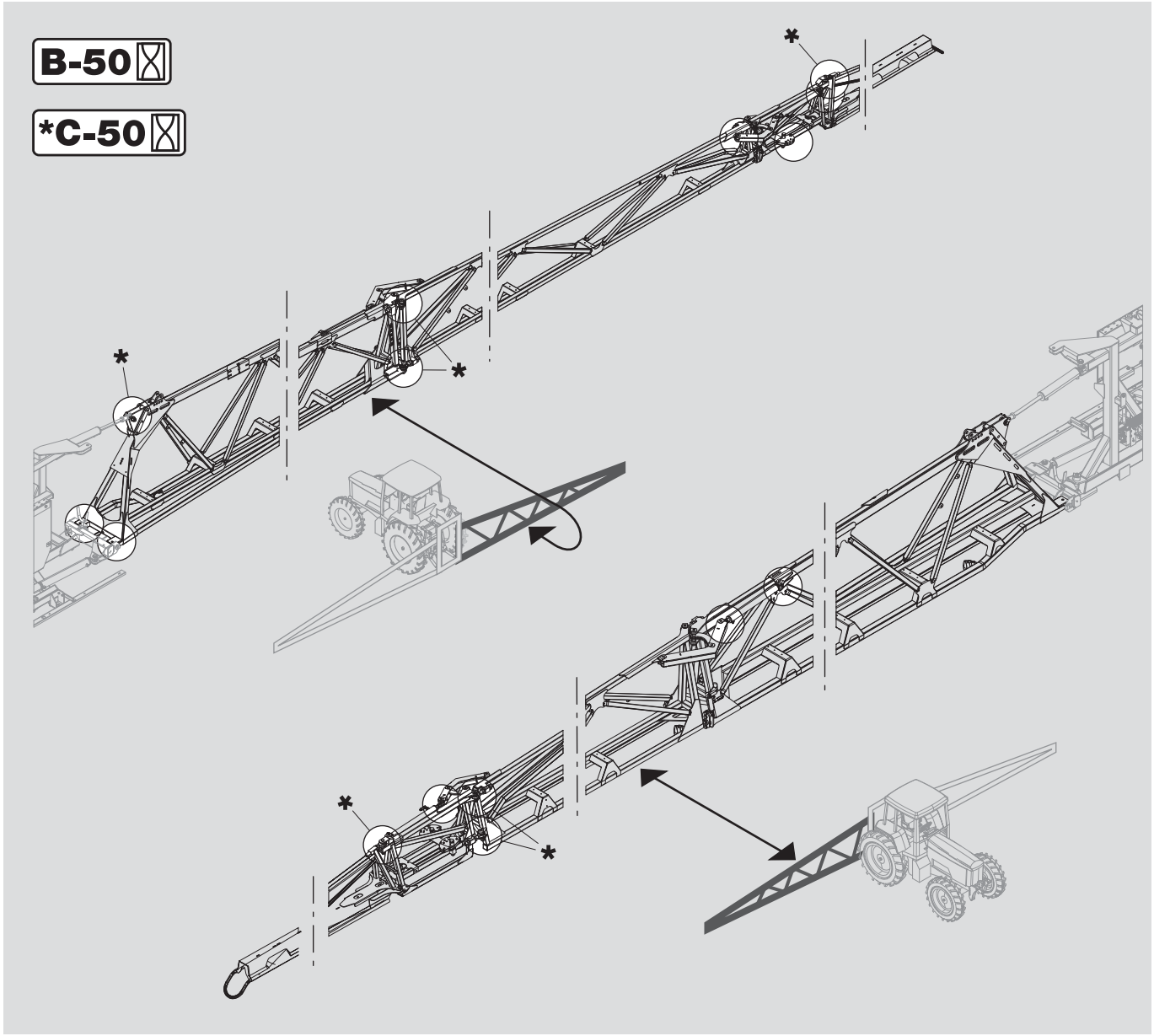
What to Lubricate?	Lubricant Type	Factory Use	Recommended Alternatives
A BALL BEARINGS and PUMP	Lithium based grease Consistency NLGI grade 2 Viscosity (@40°C) > 460 cSt	SHELL Gadus S3 V550L 1 Hardi pump grease cartridge (400g): Item no. 28164600	MOBIL grease XHP 462 TOTAL Multis Complex SHD 460
D BOLTS	Anti-corrosive wax	PAVA PV 700	TECTYL 506 WD
D VALVES and SEALS (O-RINGS)	NSF 51, NSF 61 silicone compound	DOW CORNING MOLYKOTE 111 Compound	

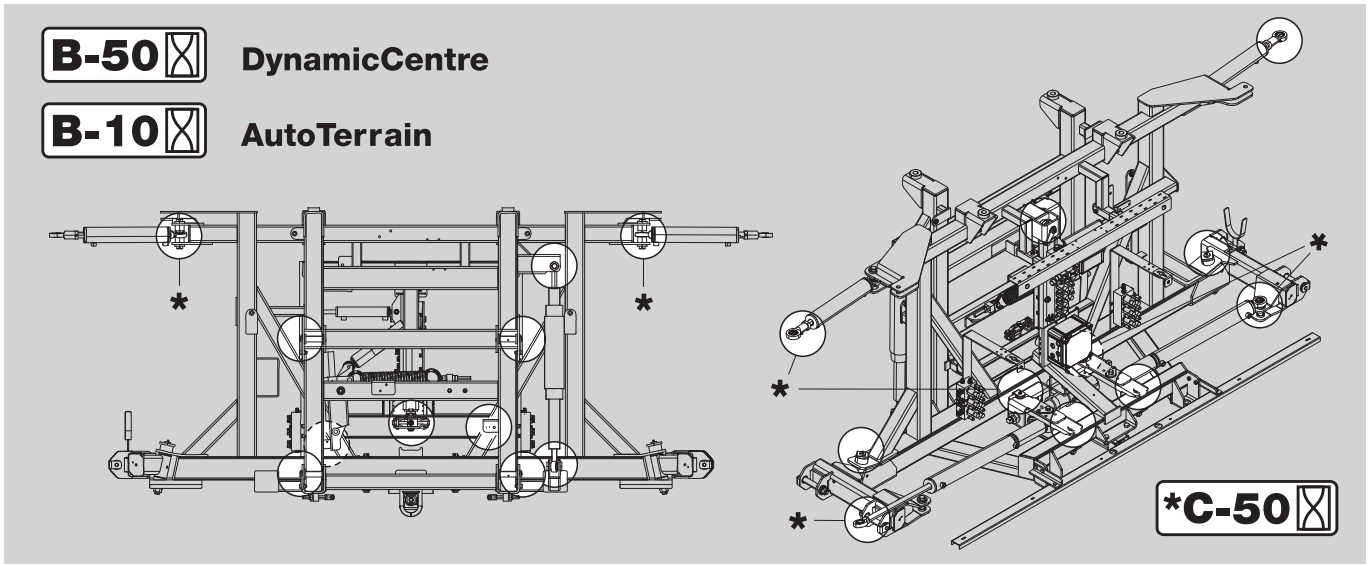
P.T.O. lubrication & oiling plan

Serie 100 type P.T.O. shaft

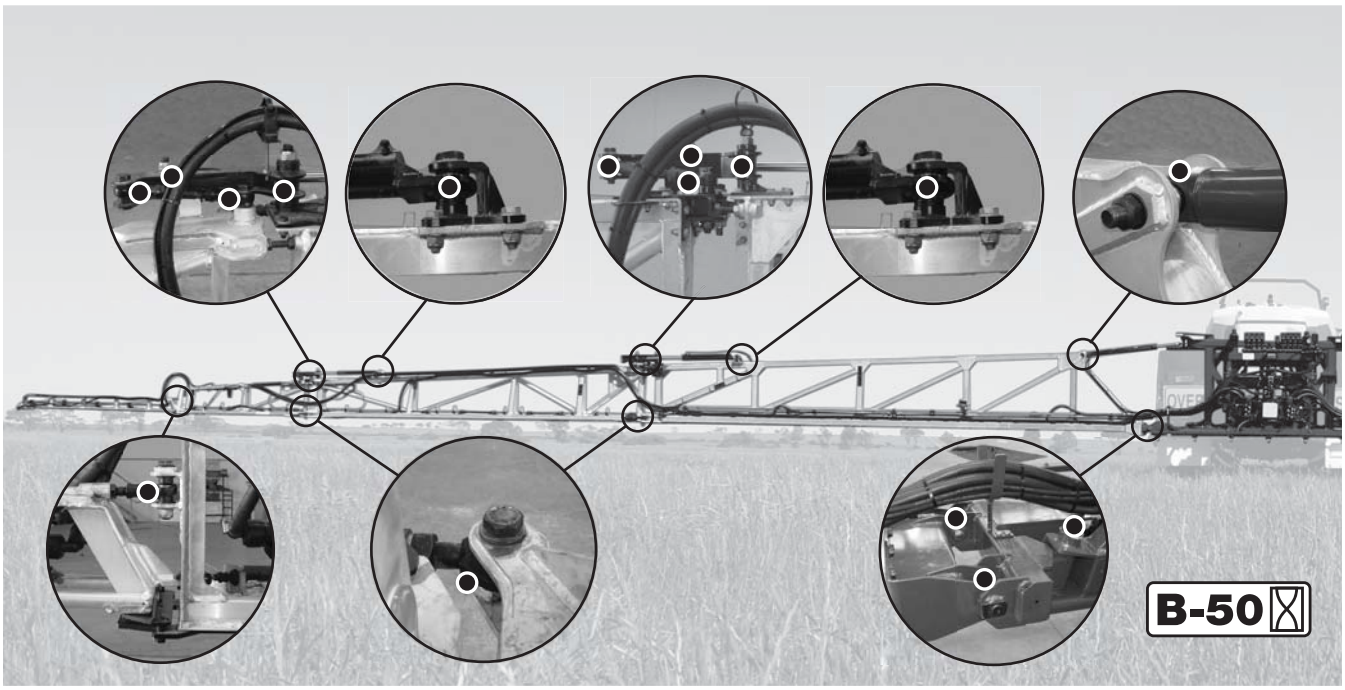


Boom lubrication and oiling plan TERRA FORCE

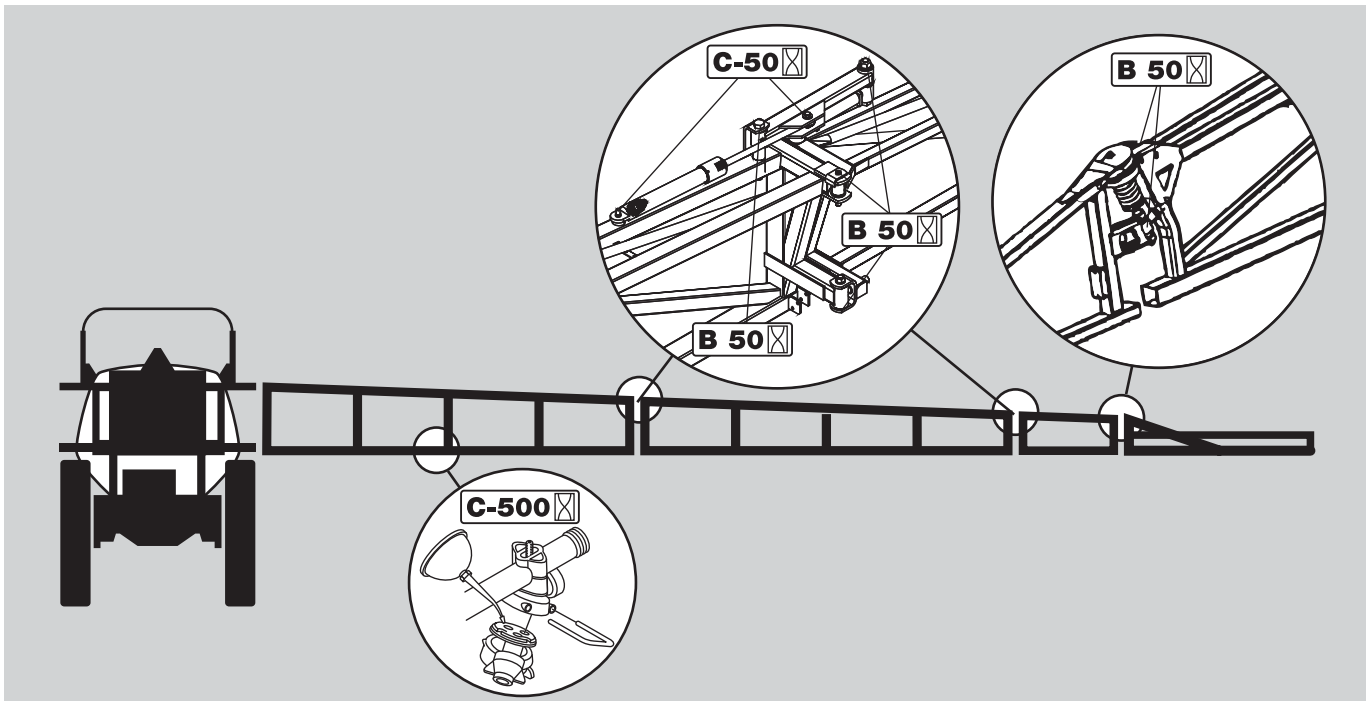


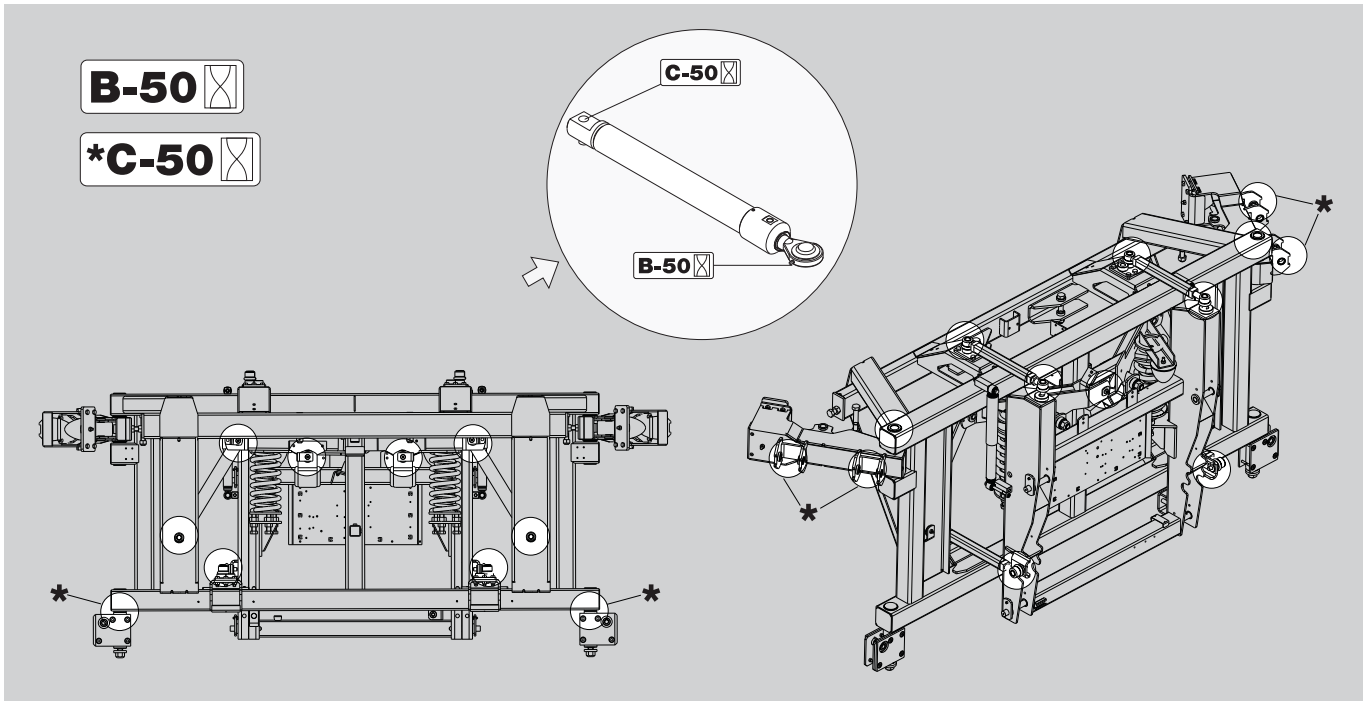


Boom lubrication and oiling plan B3 ALUMINIUM boom

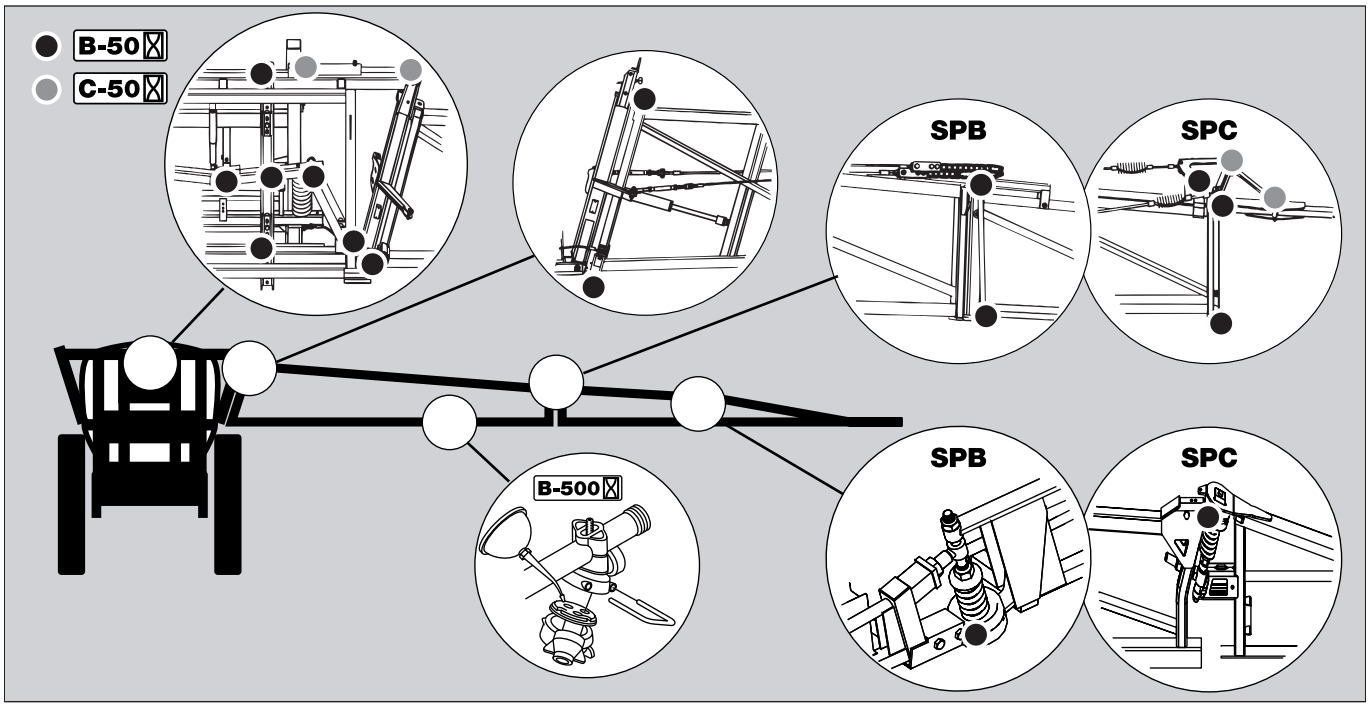


Boom lubrication and oiling plan FORCE boom

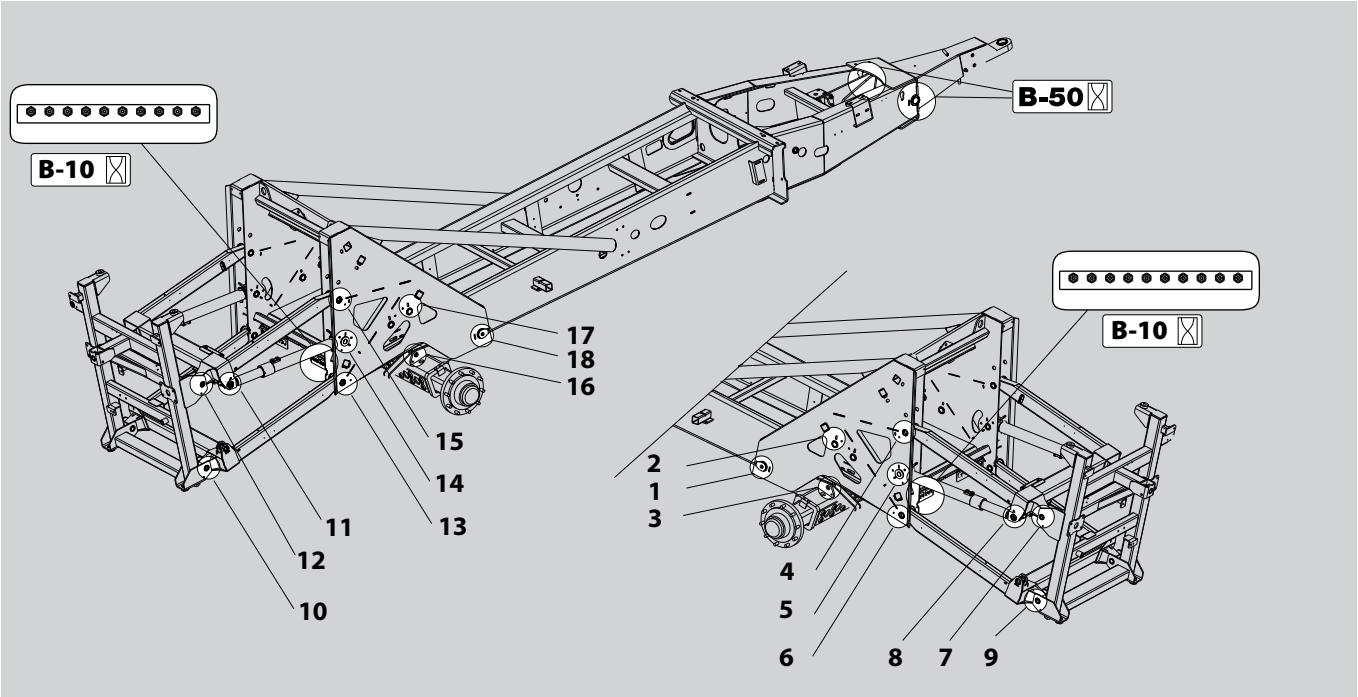




Boom lubrication and oiling plan EAGLE boom



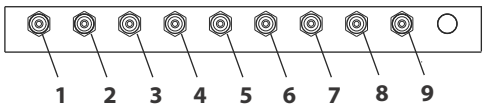
Trailer/ParaLift lubrication & oiling plan



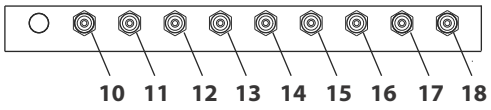
Central lubrication

The chassis and paralift is equipped with remote lubrications points. These are located from the inside of the trailer's rear end.

1. Left suspension pivot pin attach point.
2. Left suspension cylinder top attach point.
3. Left suspension cylinder bottom attach point.
4. Left trailer upper lift arm attach point.
5. Left trailer cylinder bottom attach point.
6. Left trailer lower lift arm attach point.
7. Left paralift upper lift arm attach point.
8. Left paralift cylinder end attach point.
9. Left paralift lower lift arm attach point.
10. Right paralift lower lift arm attach point.
11. Right paralift cylinder end attach point.
12. Right paralift upper lift arm attach point.
13. Right trailer lower lift arm attach point.
14. Right trailer cylinder bottom attach point
15. Right trailer upper lift arm attach point.
16. Right suspension cylinder top attach point.
17. Right suspension cylinder bottom attach point.
18. Suspension pivot pin attach point.



LEFT HAND SIDE



RIGHT HAND SIDE

6 - Maintenance

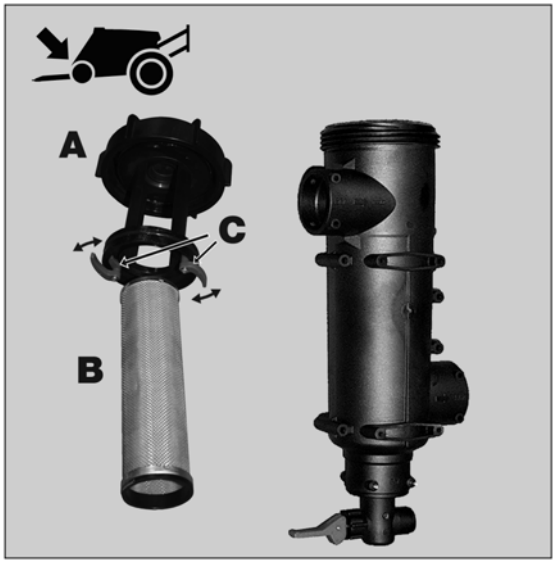
Service and maintenance intervals

ATTENTION! For detailed maintenance information for your specific boom configuration please refer to your individual Boom Operators Manual supplied with you sprayer.

10 hours service - Cyclone Filter

To service the Cyclone filter

1. Turn the pressure SmartValve towards the unused function or to tank cleaning nozzles.
2. Unscrew filter lid (A).
3. Lift the lid and filter (B) from housing.
4. Turn the two locks (C) outwards to unlock the filter from the lid.
5. Separate filter from the integrated filter guide in the lid and clean the filter.



To reassemble

1. Grease the two O-rings on the lid/filter guide. Due to small space at lid for example use a brush to grease with.
2. Mount the filter onto the recess (which may not be greased) in the lid/filter guide.
3. Turn the two locks (C) inwards to lock the filter to the lid.
4. Place the filter/filter lid into housing and screw the lid until it hits the stop.

WARNING! Always wear protective clothing and gloves before opening the filter!

DANGER! The pressure SmartValve must always be turned to the unused function or to tank cleaning nozzles before opening the Cyclone filter! If not then spraying liquid can hit you when opening the filter and drain the main tank content!

10 hours service - EasyClean filter

This filter has a clogging indicator as mentioned in the "Description" chapter, but even if this indicator does not show clogging it should mostly be cleaned every 10 hours.

To service filter

1. Turn the filter lid counter clockwise to open.
2. Remove lid and filter from filter housing.
3. Separate filter element from lid/filter guide.
4. Clean filter and if necessary clean the housing for larger impurities.

To reassemble

1. Grease the O-ring on the filter lid.
2. Press the filter onto filter guide/lid and be sure it has cached the guides.
3. Reassemble filter/filter lid into housing and be sure it has cached the guides in the bottom of housing.
4. Turn filter lid clockwise to close lid.

WARNING! Always wear protective clothing and gloves before opening the filter!

ATTENTION! If difficulties with opening the filter occur, then it can be emergency handled. See page 126.

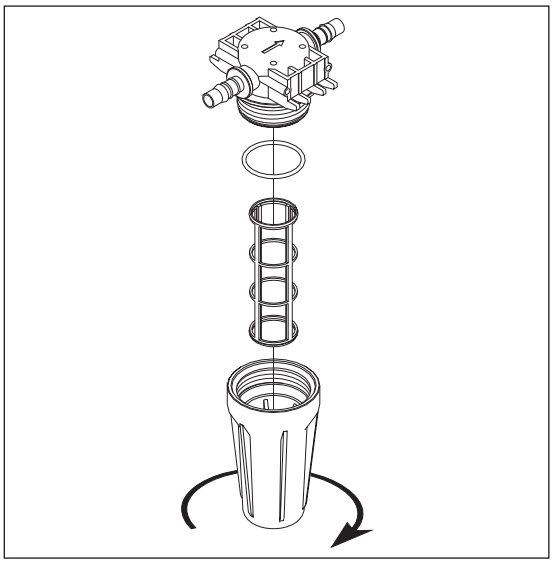
10 hours service - In-Line filter (not PrimeFlow)

If the boom is equipped with In-Line Filters, unscrew the filter bowl to inspect and clean the filter. When reassembling, the O-ring should be greased.

Alternative filter meshes are available. See section on Technical specifications - Filters and nozzles.

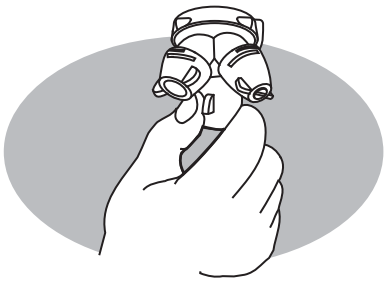
WARNING! Be careful not to splash out liquid when unscrewing the filter bowl.

WARNING! Always wear protective clothing and gloves before opening the filter!



10 hours service - Nozzle filters

Check and clean.



10 hours service - Spraying circuit

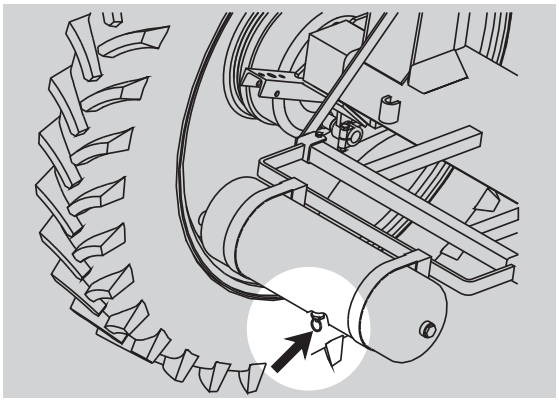
Fill with clean water, operate all functions and check for leaks using higher spray pressure than normal. Check nozzle spray patterns visually using clean water.

10 hours service - Brakes

Apply brake pedal and check function of trailer brakes.

10 hours service - Brakes air tank (optional)

Drain the air tank for condensed water at the drain valve.



50 hours service - Transmission shaft

Check function and condition of the transmission shaft protection guard. Replace any damaged parts.

50 Hours Service - Greasing the Pump

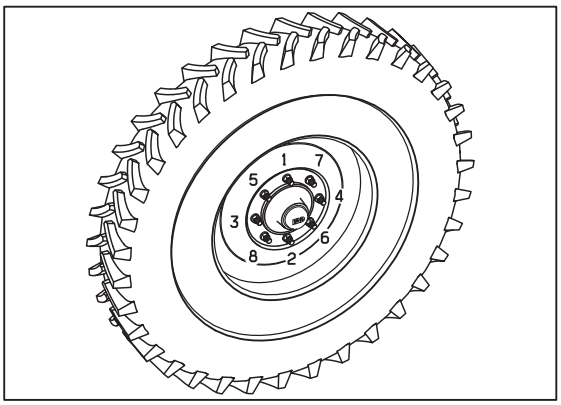
See page “Greasing the Pump” on page 97

50 hours service - Wheel nuts

Tighten wheel nuts as follows with following torque wrench settings:

Wheel hub to rim plate: 490 Nm (362 lbft)

Tightening sequence: See illustration and tighten in order of numbering.



ATTENTION! Some wheel configurations has 10 wheel bolts. Cross-tighten the same way!

ATTENTION! When wheels has been mounted or re-tightened, the plastic nut covers must be placed on the nuts afterwards.

50 hours service - Air brakes (optional)

The air brakes are checked for leaks by following procedure:

1. Connect the snap couplers to the tractor and fill the trailer air tanks.
2. Check for leaks with brakes released.
3. Apply the brake up to full pressure.
4. Check for leaks with brakes applied.

50 hours service - Tyre pressure

Check the tyre pressure according to the table in “Technical specifications”.

DANGER! Never inflate tyres more than to the pressure specified in the table. Over-inflated tyres can explode and cause severe personal injuries! See the part “Occasional maintenance - Change of tyre”.

WARNING! If renewing tyres always use tyres with min. load index as specified.

250 hours service - Readjustment of the boom

Boom adjustment and service

Because of the range of optional boom configurations being offered on COMMANDER II sprayers, a separate Boom Operators and Maintenance manual is supplied with your sprayer.

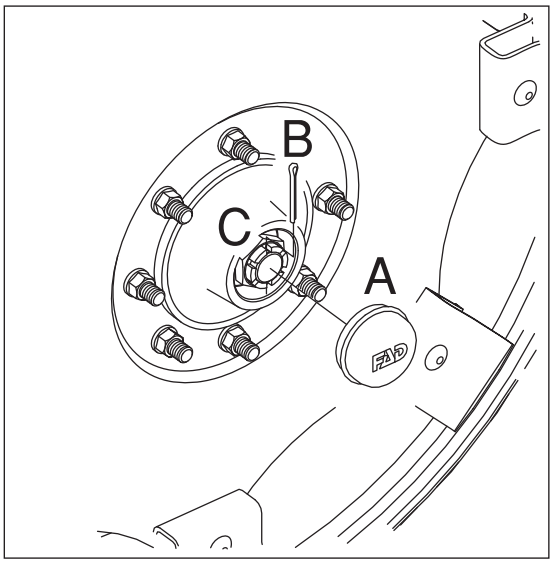
ATTENTION! See your Boom Operators and Maintenance manual supplied with your sprayer for detailed technical information and service procedures specific to your boom configuration.

WARNING! Nobody is allowed to be under the boom whilst adjustment is being carried out. Never walk under the boom unless it is safely folded and stowed on the transport brackets.

250 hours service - Wheel bearings

Check for play in the wheel bearings:

1. Place stop wedges in front of and behind LH wheel and jack up RH wheel.
2. Rock the RH wheel to discover possible play in the bearings.
3. If any play, support the wheel axle to prevent the trailer from falling down from the jack.
4. Remove hub cap (A) and cotter pin (B). Turn the wheel and tighten the castellated nut (C) until a slight resistance in the wheel rotation is felt.
5. Loosen the castellated nut until the first notch - horizontal or vertical - is aligned with the cotter pin hole in the shaft.
6. Fit a new cotter pin and bend it.
7. Fit the hub cap to the hub again.
8. Repeat the procedure on LH wheel.



NOTE! Some hub caps are attached with screws. Make sure the seal is intact or replace if worn!

250 hours service - Hydraulic circuit

Check the hydraulic circuit for leaks and repair if any.

Refill Nitrogen accumulators for:

- ParaLift
- Yaw system
- Suspension (if fitted)

WARNING! Hoses for boom lifting device must be changed after every 5 years of use.

WARNING! Nitrogen accumulators may contain oil under pressure.

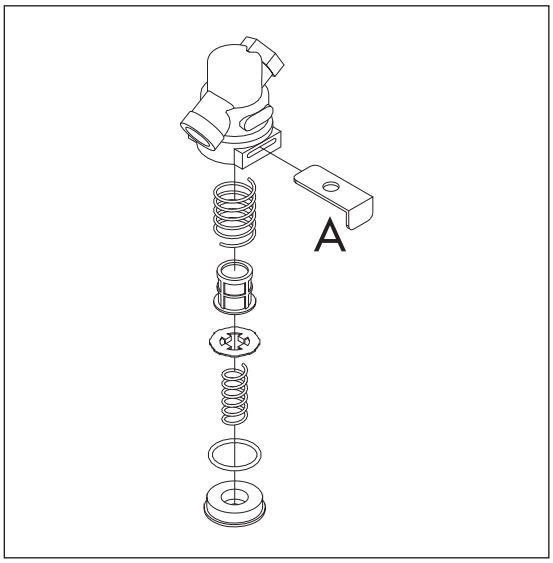
250 hours service - Hoses and tubes

Check all hoses and tubes for possible damage and proper attachment. Renew damaged hoses or tubes.

250 hours service - Air brake filters (optional)

1. Clean the area around air filter(s) and disconnect air hose from the tractor.
2. Hold one hand under the filter housing, and pull out the retainer clip (A). The filter cartridge assembly will be pushed out by the springs inside the filter housing.
3. Clean the filter cartridge. Use water and an appropriate detergent or compressed air.
4. Dry the parts and reinstall in the order shown. The O-ring should be lightly lubricated with silicone grease before installation.

WARNING! Never dismantle the filter without having the tractor disconnected and pressure relieved.



250 hours service - Brake adjustment (optional)

As the brakes become worn through normal service in the field, the clearance between the brake shoes and the brake drums increases resulting in slower braking response and the need for adjustment.

Adjustment procedure

To adjust the brakes proceed as follows:

1. Prepare the sprayer for maintenance / service procedures (see"Preparation" in the safety notes at the beginning of this section).
2. Lift the axle assembly off the ground (two lifting jacks, placed underneath the axle is recommended) and secure with safety stands.
3. Adjustment can now be checked by rotating the wheel/drum and feeling the amount of contact between the drum and the brake shoes.
4. To adjust the brakes, depress the locking collar (A) and turn the hex head adjuster (B) clockwise through 90° (1/4 turn at a time) until light resistance is felt from the brake shoes coming in contact with the drum (there should be some light resistance when turning by hand).
5. Adjust each side equally and remember to apply lubricant to the grease nipple (C) in the usual fashion.
6. Once service is completed test the brakes for response and binding.

WARNING!: This adjustment must be carried out on both sides of the sprayer at the same time.

250 hours service - Hydraulic brakes (optional)

Apply brakes to full pressure and inspect brake lines for damages or leaks. Replace damaged parts. If the hydraulic brake lines have been dismantled the circuit must be primed afterwards:

1. Loosen brake hose at both brake cylinders.
2. Apply brake until oil without air bubbles come out.
3. Tighten brake hose before relieving the brake again.

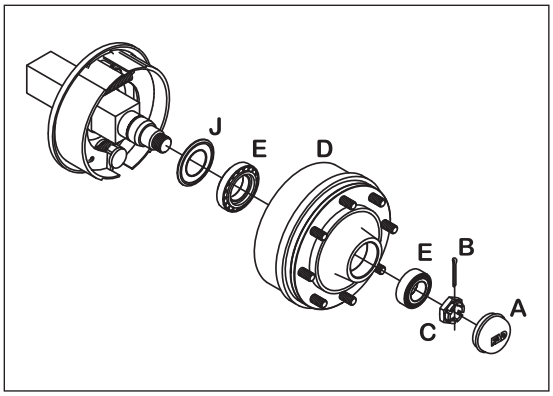
WARNING! Always prime the circuit if the hydraulic brake lines have been dismantled.

1000 hours service - Wheel bearings and brakes

Check the condition of the bearings and brake wear parts in the following way:

WARNING! If you do not feel totally confident changing wheel bearings or brake shoes contact your HARDI dealers workshop.

1. Place stop wedges in front of and behind the opposite wheel to the one to be serviced (e.g. LH wheel). Jack up the wheel to be serviced (e.g. RH wheel).
2. Support the trailer with axle stands.
3. Remove the wheel.
4. Unscrew the 6 Allen bolts and remove the hub cap (A), cotter pin (B) and castle nut (C).
5. Pull off the brake drum (D). Use a wheel puller if necessary.
6. Vacuum clean the brake drum (D) for brake dust or rinse with water.



DANGER! Brake dust can cause severe health injuries! Avoid inhalation of brake dust! Use respirator when servicing the brakes. Do not clean brakes with compressed air! Use vacuum cleaner or rinse with water to avoid brake dust being blown around.

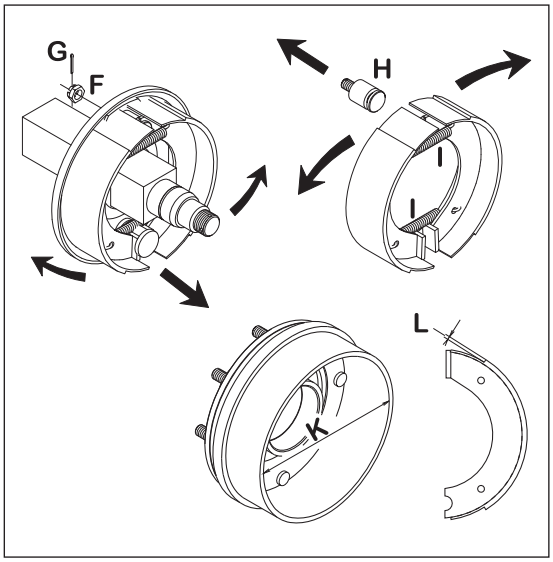
7. Rinse the remaining parts on the brake carrier plate with water and dry them.
8. Remove roller bearings (E), clean all parts in degrease detergent and dry them.
9. Check the brake drum diameter and lining thickness - renew if worn.

WARNING! The specified min. thickness is the absolute minimum which must never be exceeded. Renew the parts if they would reach the above dimensions before next service inspection.

WARNING! Renewal of brake linings or brake drums must be done both sides at the same time.

ATTENTION! If the brake drum must be removed from the wheel hub, a hydraulic press is required to press the wheel studs out.

10. Remove the clevis pin between the air diaphragm cylinder and brake cam lever.
11. Remove the cotter pin (G) and castle nut (F), the brake shoe anchor bolt (H) and slide the brake shoes over the cam. Twist the pair of brake shoes to remove the shoe return springs (I). Replace brake shoes if the linings are worn.
12. Apply a small quantity of copper paste on moving parts and assemble the brake shoes and shoe return springs (I) again.



WARNING! Do not get copper paste in contact with the brake linings and drums.

13. Fit the shoe assembly with the anchor bolt (H) first. Then pull the shoes away from each other and slide them over the cam afterwards. Tighten the anchor bolt castle nut (F) again and fit a new cotter pin (G).
14. Check roller bearings for discolouration and wear - renew if worn or damaged.
15. Assemble drum (D) and bearings (E) using a new sealing ring (J).
16. Fill the hub and bearings with fresh grease before fitting it to the shaft.

WARNING! Do not get oil or grease in contact with the brake linings and drums.

17. Fit the castle nut (C). Rotate the brake drum (D) and tighten the castle nut (C) until a slight rotation resistance is felt.
18. Loosen the castle nut (C) again until the first notch is aligned with the cotter pin hole in the shaft.

ATTENTION! The shaft has a vertical and an horizontal cotter pin hole. Use the one first aligned with the notch when loosening the castle nut.

19. Fit a new cotter pin (B) and bend it.
20. Fit the hub cap (A) to the hub. Slightly tighten the 6 Allen bolts.
21. Adjust the brakes as described in “250 hours service - Brake adjustment (optional)” on page 108.
22. Fit the wheel again and tighten the wheel nuts. See “50 hours service - Wheel nuts” on page 106 regarding torque wrench setting. Tighten all bolts to half the specified torque first, then to the full specified torque.
23. Tighten again after 10 hours of work. Check the torque every day until it is stabilized.

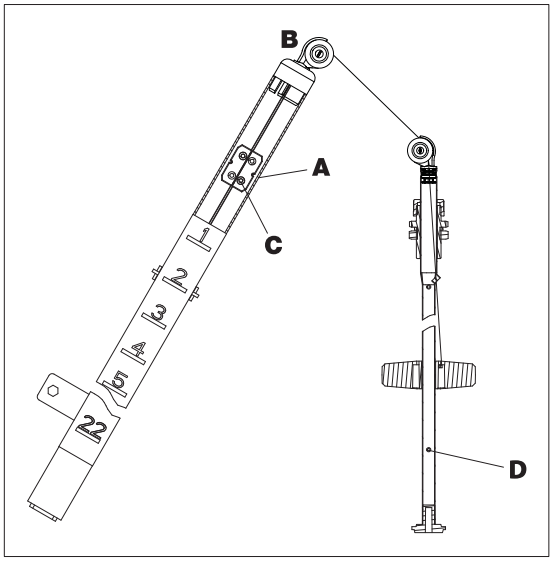
Occasional maintenance

General info

The maintenance and renewal intervals for the following will depend very much on the conditions under which the sprayer will be operated and are therefore impossible to specify.

Level indicator adjustment

The level indicator reading should be checked regularly. When the tank is empty, the float should lie on the stop pin (D) of the rod, and the O-ring on the indicator should be positioned at the top position line (A).



ATTENTION! The wire guide wheels should be directed so they follow the direction of the wire.

If any deviation is found, do:

1. Pull out the plug (B).
2. Loosen screws (C).
3. Adjust the length of the cord until it reads correctly.
4. Push plug (B) back in place.

NOTE! For best accuracy adjustment shall be done with the sprayer attached to the tractor normally used.

Level indicator wire renewal

If the wire on the level indicator has to be changed, the float guide pole is removed:

1. Remove the tank drain valve (see paragraph "Drain valve seal renewal") and loosen the fitting holding the pole in position.
2. Pull the pole down through the drain valve hole till it is free in the top of the tank.
3. The pole can now be taken out of the tank through the filling hole.

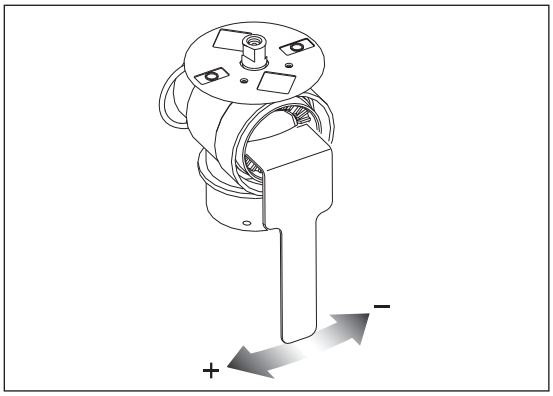
DANGER! Do not enter the inside of the tank - the parts can be changed from the outside of the tank!

Adjustment of 3-way valve

The large ball valve (s93) used for SmartValves and valves for filling equipment can be adjusted if it is too tight to operate - or if it is too loose (=liquid leakage).

- Correct setting is when the valve can be operated smoothly by one hand.

Use a suitable tool and adjust the toothed ring inside the valve as shown on the drawing.



ATTENTION! The small ball valves (s67) cannot be adjusted.

6 - Maintenance

Lifting and Removing the Pump

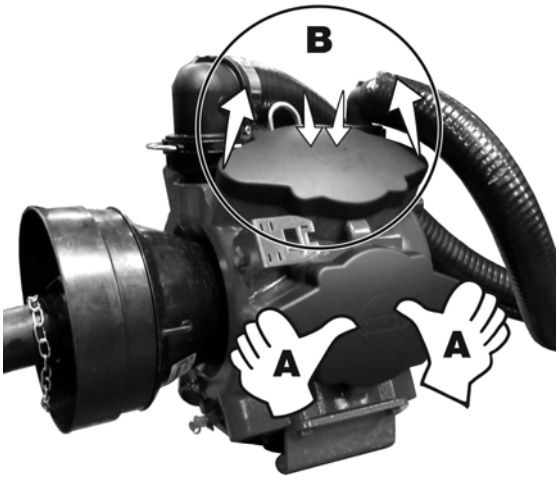
When lifting and removing the pump, use a shackle fitted to the built-in lifting eye located between the heads (A).

WARNING! To avoid damages in case of a free-falling pump, use lifting gear and a steel shackle with at least 3.5 tonnes max. tensile strength.

NOTE! Pump weight is approximately 75 kg.

Pump Valves and Diaphragms Renewal

1. Lift off the plastic covers (C) with your hands (A) by pulling with the finger tips while pushing with the thumbs in the centre, as shown in (B).



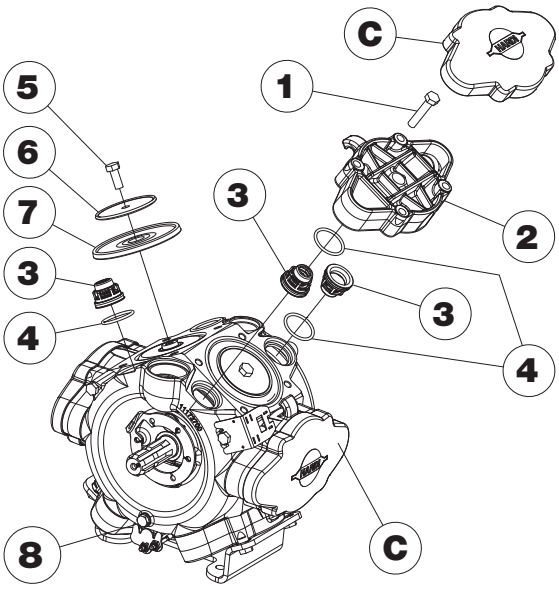
Valves

2. Loosen the 4 head bolts (1).
3. Remove the head (2).
4. Change the valves (3) - note their orientation, so that they are replaced correctly!

ATTENTION! It is recommended to use new gaskets (4), when changing or checking the valves.

Diaphragms

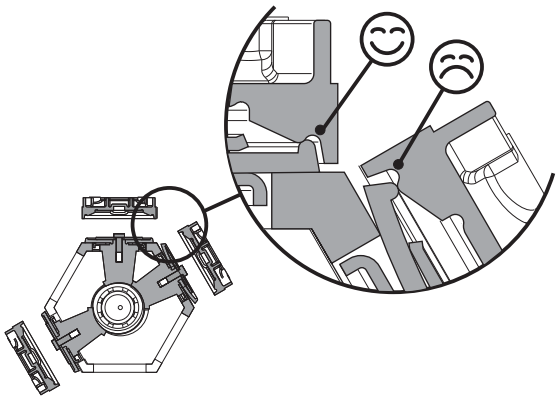
5. Loosen the diaphragm bolt (5).
6. Remove the diaphragm washer (6).
7. The diaphragm (7) may then be changed.
8. Check that the drain hole (8) at the bottom of the pump is not blocked.
9. Apply a small amount of pump grease on the underside of the diaphragms (between diaphragm and conrod washer).



10. Reassemble the pump with the following torque setting.
    - Diaphragm head bolts (1): 90 Nm.
    - Diaphragm bolt (5): 90 Nm.
11. Refit the plastic covers (C).

NOTE! The diaphragm bolt on 1000 r.p.m. pumps must be secured with locking compound.

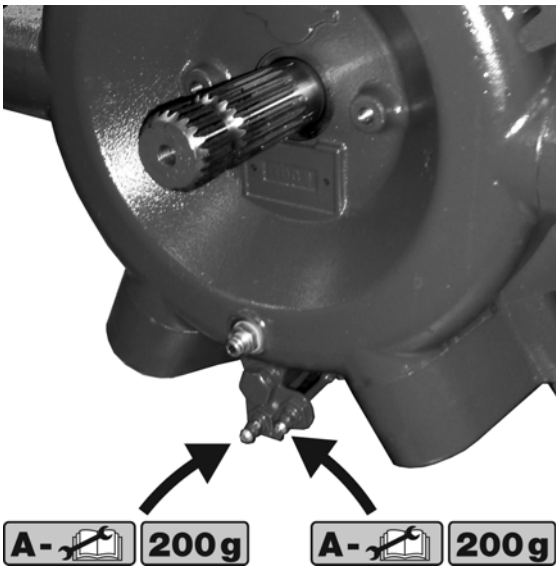
ATTENTION! Before tightening the 4 bolts for the head (2), the diaphragm must be positioned between centre and top to ensure correct sealing between diaphragm pump housing and diaphragm cover. Turn the crank shaft if necessary.



Re-lubrication after assembly

After disassembling the pump (diaphragm renewal, etc.) the pump MUST be lubricated with 200 g grease into each lubrication point.

Hardi pump grease cartridge (400g): Item no. 28164600



Overhaul Kit

Pump model: 364 and 464.

Diaphragm pump overhaul kit (valves, seals, diaphragms etc.) can be ordered. Detect the pump model - the overhaul kit can be ordered by your local dealer.

Model 364: Item no. 75585900.

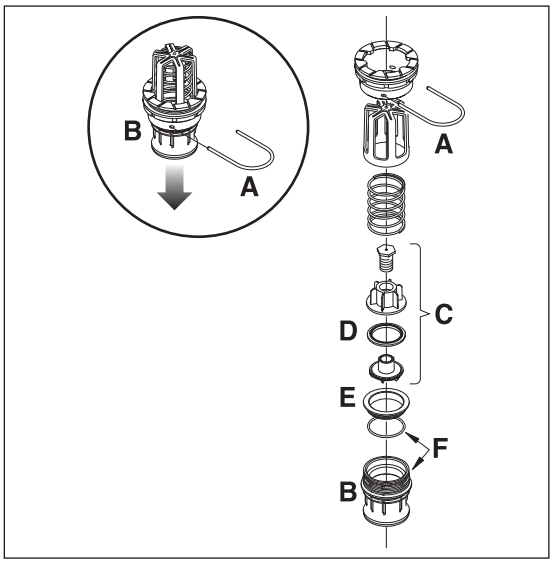
Model 464: Item no. 75586000.

What to Lubricate?	Lubricant Type	Factory Use	Recommended Alternatives
A BALL BEARINGS and PUMP	Lithium based grease Consistency NLGI grade 2 Viscosity (@40°C) > 460 cSt	SHELL Gadus S3 V550L 1 Hardi pump grease cartridge (400g): Item no. 28164600	MOBIL grease XHP 462 TOTAL Multis Complex SHD 460
D BOLTS	Anti-corrosive wax	PAVA PV 700	TECTYL 506 WD
D VALVES and SEALS (O-RINGS)	NSF 51, NSF 61 silicone compound	DOW CORNING MOLYKOTE 111 Compound	

6 - Maintenance

Drain valve seal renewal

If the main tank drain valve leaks, the seal and seat can be changed the following way.



DANGER! Do not enter the inside of the tank - the parts can be changed from the outside of the tank!

WARNING! Use eye / face protection mask when dismantling the tank drain valve!

1. Make sure the tank is empty and clean.
2. The valve must be closed and the string loose.
3. Pull out the clip (A) and pull down connecting piece (B). The entire valve assembly can now be pulled out.
4. Check cord and valve flap assembly (C) for wear, replace seal (D) and assemble again.
5. Assemble the valve assembly again using a new valve seat (E). Lubricate O-rings (F) before assembly.
6. Fit clip (A) again.

ATTENTION! Check function of valve with clean water before filling chemicals into the tank.

Boom adjustment and service

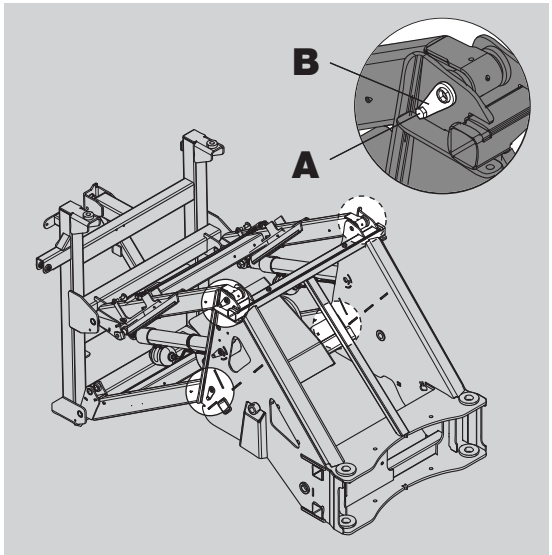
Because of the range of optional boom configurations being offered on COMMANDER II sprayers, a separate Boom Operators and Maintenance manual is supplied with your sprayer.

ATTENTION! See your Boom Operators and Maintenance manual supplied with your sprayer for detailed technical information and service procedures specific to your boom configuration.

WARNING! Nobody is allowed to be under the boom whilst adjustment is being carried out. Never walk under the boom unless it is safely folded and stowed on the transport brackets.

Wear bushing renewal on boom lift

Inspect and replace the wear bushes before they are worn through.



1. Connect the trailer to a tractor and unfold the booms to working position.
2. Lift the boom centre frame with a lifting device and support it until the load is taken off the parallelogram arms.
3. Remove the screws (A), pull out the pins (B) at one of the upper parallelogram arms and replace the wear bushes.
4. Refit the arm.
5. Repeat this on the other upper arm.
6. The lower arms must be disconnected simultaneously.
7. Grease all grease nipples.
8. Remove the lifting gear again.

Change of bulbs (conventional work lights)

1. Switch off the light.
2. Loosen the screws on the lamp and remove the cover or lens.
3. Remove the bulb.
4. Fit a new bulb, refit the cover and tighten the screws.

ATTENTION! If halogen bulbs are used, never touch the bulb with your fingers. Natural moisture in the skin will cause the bulb to burn out when the light is switched on. Always use a clean cloth or tissue when handling halogen bulbs.

Wear bushing renewal on steering

If too much play is found in the steering, the wear bushes must be renewed. This should be done at your local HARDI dealer.

Shield renewal on transmission shaft

See the manufacturer's instruction book.

Replacement of transmission shaft cross journals

See the manufacturer's instruction book.

Safety valve activation

To make the fluid system work perfectly over time, it is good practice to regularly provoke opening of the safety valve.

This avoids clogging and ensures proper function of the safety valve. This is done by turning the pressure SmartValve to "Pressure draining" or an unused function when pump is running. This is good practice for all but particularly for sprayers without optional equipment.

DANGER! Before turning pressure SmartValve to "Pressure draining" it is very important to be sure that the quick coupler lid is correct and completely mounted to the filling stud into its locked position. Failure to do so may cause risk of contamination and injury from quick coupler lid being "shot" off when pressurized! If not possible to mount lid completely, lubricate the rubber seal and the grip hooks.

Change of tyre

If necessary to replace tyres, it is recommended to leave this to a specialist and follow the mentioned rules.

- Always clean and inspect the rim before mounting.
- Always check that the rim diameter corresponds exactly to the rim diameter moulded on the tyre.
- Always inspect inside of the tyre for cuts, penetrating objects or other damages. Repairable damages should be repaired before installing the tube. Tyres with non-repairable damages must never be used.
- Also inspect inside of the tyre for dirt or foreign bodies and remove it before installing the tube.
- Always use tubes of recommended size and in good condition. When fitting new tyres always fit new tubes.
- Before mounting, always lubricate both tyre beads and rim flange with approved lubricating agent or equivalent anticorrosion lubricant. Never use petroleum based greases and oils because they may damage the tyre. Using the appropriate lubricant the tyre will never slip on the rim.
- Always use specialised tools as recommended by the tyre supplier for mounting the tyres.
- Make sure that the tyre is centred and the beads are perfectly seated on the rim. Otherwise danger of bead wire tear can occur.
- Inflate the tyre to 100-130 kPa (14.5-19 p.s.i.) then check whether both beds are seated perfectly on the rim. If any of the beads do not seat correctly, deflate the assembly and re-centre the beads before starting inflation of the tyre. If the beads are seated correctly on the rim at 100-130 kPa inflate the tyre to a maximum of 250 kPa (36 p.s.i.) until they seat perfectly on the rim.
- Never exceed the maximum mounting pressure moulded on the tyre!
- After mounting tyres adjust inflation pressure to operation pressure recommended by the tyre manufacturer.
- Do not use tubes in tubeless tyres.

⚠ DANGER! Non observance of mounting instructions will result in the bad seating of the tyre on the rim and could cause the tyre to burst leading to serious injury or death!

⚠ DANGER! Never mount or use damaged tyres or rims! Use of damaged, ruptured, distorted, welded or brazed rim is not allowed!

Off-season storage

Off-season storage program

To preserve the sprayer intact and to protect the components, carry out following off-season storage program.

Before storage

When the spraying season is over, you should devote some extra time to the sprayer. If chemical residue is left over in the sprayer for longer periods, it may reduce the life of the individual components.

1. Clean the sprayer completely - inside and outside - as described under "Cleaning" on page 64. Make sure that all valves, hoses and auxiliary equipment have been cleaned with detergent and flushed with clean water afterwards, so that no chemical residue is left in the sprayer.
2. Renew any damaged seals and repair any leaks.
3. Empty the sprayer completely and let the pump work for a few minutes. Operate all valves and handles to drain as much water off the spraying circuit as possible. Let the pump run until air comes out of all nozzles. Don't forget to drain the rinsing tank also.
4. Pour approximately 50 litres (11 Imp.gal) anti-freeze mixture consisting of 1/3 automotive anti-freeze and 2/3 water into the tank.
5. Engage the pump and operate all valves and functions, operating unit, chemical inductor etc. allowing the anti-freeze mixture to be distributed around the entire circuit. Open the operating unit main ON/OFF valve and distribution valves so that the anti-freeze is sprayed through the nozzles as well. The anti-freeze will also prevent O-rings, seals, diaphragms etc. from drying out. On sprayers with FlexCapacity pump, this must also be engaged and flushed.
6. Lubricate all lubricating points according to the lubricating scheme - regardless of intervals stated.
7. When the sprayer is dry, remove rust from scratches or damage in the paint, if any, and touch up the paint.
8. Remove the glycerine-filled pressure gauges and store them frost-free in vertical position.
9. Apply a thin layer of anti-corrosion oil (e.g. SHELL ENSIS FLUID, CASTROL RUSTILO or similar) on all metal parts. Avoid oil on rubber parts, hoses and tyres.
10. Fold the boom in transport position and relieve pressure from all hydraulic functions.
11. All electric plugs and sockets are to be stored in a dry plastic bag to protect them against damp, dirt and corrosion.
12. Remove the control boxes and computer display from the tractor, and store them dry and clean (indoor). A non-condensing environment is recommended.
13. Wipe hydraulic snap-couplers clean and fit the dust caps.
14. Apply grease on all hydraulic ram piston rods which are not fully retracted in the barrel to protect against corrosion.
15. Chock up the wheels, to prevent moisture damage and deformation of the tyres. Tyre blacking can be applied to the tyre walls to preserve the rubber.
16. Drain air brake tank for condensed water.
17. To protect against dust the sprayer can be covered by a tarpaulin. Ensure ventilation to prevent condensation

Operational problems

General info

Operational incidents are frequently due to the same reasons:

1. A suction leak reduces the pump pressure and may interrupt suction completely, it also causes pulsing in the pressure hoses.
2. A clogged suction filter may damage suction or interrupt and prevent the pump from running normally.
3. A clogged pressure filter increases pressure in the fluid system in front of the pressure filter. This may blow the safety valve.
4. Clogged In-line or nozzle filters increase pressure in the pressure gauge but decrease pressure at the nozzles.
5. Impurities sucked by the pump may prevent the valves from closing correctly, thus reducing the pump flow.
6. A poor reassembly of the pump elements, especially the diaphragm covers, causes air leaks and reduces the pump flow.
7. Rusted or dirty hydraulic components cause bad connections.
8. A badly charged or faulty battery causes failures and misbehaviour in the electrical system.

Therefore ALWAYS check

1. Suction and pressure filters, as well as nozzles, are clean.
2. Hoses for leaks and cracks, paying particular attention to suction hoses.
3. Gaskets and O-rings are present and in good condition.
4. Pressure gauge is in good working order. Dosage accuracy depends on it.
5. Operating unit functions properly. Use clean water to check.
6. Hydraulic components are clean.
7. The good condition of the tractor battery and its connectors.

7 - Fault finding

Liquid system

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
No spray from boom when turned on.	SmartValve positions wrong.	Set correct valve positions for spraying.
	Suction/pressure filters clogged.	Clean suction and pressure filters.
	No suction from tank.	See if suction fitting in main tank sump is free of sedimentation.
Lack of pressure.	Incorrect assembly.	Boost valve is open.
	Air in system.	Fill suction hose with water for initial prime.
	Too much agitation.	Close the agitation valve.
	Pump valves blocked or worn.	Check for obstructions and wear.
	Blocked filters	Clean all filters.
	Defect pressure gauge.	Check for dirt at inlet of gauge.
Pressure dropping.	Filters clogging.	Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.
	Nozzles worn.	Check flow rate and replace nozzles if it exceeds 10%.
	Sucking air towards end of tank load.	Lower pump r.p.m.
Pressure increasing.	Pressure filters beginning to clog.	Clean all filters.
Formation of foam.	Air is being sucked into system.	Check tightness/gaskets/O-rings of all fittings on suction side.
	Excessive liquid agitation.	Reduce pump r.p.m.
		Check safety valve is tight.
		Ensure returns inside tank are present.
		Use foam damping additive.
Liquid leaks from bottom of pump.	Damaged diaphragm.	Replace. See changing of valves and diaphragms.
Vibrations in system and unpleasant noise from pump.	Air is being sucked into system.	Check for leaks, holes in hoses, tightness/gaskets/O-rings of all fittings on suction side.
	Blocked suction filter	Clean suction and pressure filters
Operating unit not functioning or having malfunction.	Blown fuse(s).	Check mechanical function of microswitches. Use cleaning/lubricating agent if the switch does not operate freely.
		Check motor. 450-500 milli-Amperes max. Change motor, if over.
	Wrong polarity.	Brown to positive (+). Blue to negative (-).
	Valves not closing properly.	Check valve seals for obstructions.
		Check microswitch plate position. Loosen screws holding plate a 1/2 turn.
	No power.	Wrong polarity. Check that brown is pos. (+), Blue is neg. (-).
		Check print plate for dry solders or loose connections.
		Check fuse holder is tight around fuse.
	Not fully 12volt supply	Check cable connection between trailer and tractor

Hydraulic system - Z model

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
No boom movements when activated.	Insufficient hydraulic pressure.	Check oil pressure.
		Check tractor hydraulic oil level.
	Insufficient oil supply.	Oil flow must be min. 50 l/min. and max. 130 l/min.
		Check tractor hydraulic oil level.
	Blown fuse(s).	Check / replace fuse in junction box.
	Bad / corroded electrical connections.	Check / clean connections, multi plugs etc.
	Insufficient power supply.	Voltage on activated solenoid valve must be more than 8 volts.
		Use wires of at least 4 mm for power supply.
	Defect relay / diodes in junction box.	Check relays, diodes and soldering at PCB in junction box. LED diodes indicate boom functions.
	Clogged restrictors in bypass block.	Remove and clean restrictors in bypass block (See hydraulic diagram). Change hydraulic oil + filter.
	Wrong polarity.	Check polarity. Red positive (+) Black negative (-).
ParaLift lock does not lock. Boom lift raises to max. position when tractor hydraulics are engaged.	Back pressure in return line exceeds 15 bar.	Connect the return line with free flow to hydraulic oil reservoir.
		Divide return line in two and lead return oil back to reservoir via two spool valves.
Oil heats up in Closed Centre systems.	Bypass valve does not close properly.	Check / close (screw in) by-pass valve.
	Internal leaks in flow regulator.	Replace flow regulator O-rings and backup rings. Replace flow regulator.
Individual ram does not move.	Clogged restrictor.	Dismantle and clean restrictor.

7 - Fault finding

Controller fault codes TERRAFORCE/B3 ALU

Below is a table of Alarms, Warnings etc. relevant for TERRA FORCEthe boom, which may occur in the Terminal display. See separate instruction book for a full list of fault codes.

NOTE! The ID is the fault identifier, and Pr is alert priority. These are useful for service staff.

ID	Type	Text at display detail	Criteria for fault Operations disabled	Full screen Help text	Pr
08	Alarm	Track Boom sensor failure	The boom sensor signal is less than 0,5V. The boom sensor changes state, without "Boom fold inner" button is active. Auto and Manual is disabled. Only "Align" function is possible.	Track Boom sensor failure. Automatic and manual tracking is aborted. Only "Align" function is possible.	15
28	Illegal action	Track Boom fold. Align sprayer	User starts to fold the boom, and the sprayer trapeze is not locked. BoomFoldInner is disabled.	Track Boom fold Align sprayer. The alarm is present while the sprayer is not locked, and a "fold inner" button is pressed. No folding takes place.	38
29	Illegal action	Track unfold Boom	Alarm for attempt to switch to "Manual" or "Auto" mode in a situation where boom is not detected unfolded. When the boom is detected unfolded the trapeze lock is unlocked and the message disappears. Auto and manual is disabled.	Track unfold Boom. Alarm for attempt to switch to "Manual" or "Auto" mode in a situation where boom is not detected unfolded. Unfold the boom. In half steer mode: Risk of bending folded side. Contact service.	39
89	Reminder	Grease boom and track	Periodically, period defined in extended menu. (Only checked at power up)	The boom now needs to be lubricated. Yellow labels indicate lubrication points other- wise see operators manual.	99
103	Warning	Fold with unlocked pendulum	When pressing FoldCenterIn, FoldLeftIn or FoldRightIn and pendulum is unlocked.	Fold with unlocked pendulum.	111
104	Warning	Boom wing loose	Buttons FoldLeftIn or FoldRightIn are not pressed but the 4 sensors on outer boom wings change from "In spray" to "Not in spray" respectively when they change from "In transport" to "Not in transport".	Boom wing loose.	112
108	Alarm	Boom height sensor fault	Alarm is active when 2.2.4.2 Boom height at headlands is enabled. The alarm is generated, if the sensor signal is less than0.2 Volt or exceeds 4.8 Volt.		116
118	Warning	Pendulum locking failed.	Time-out on sensor signal AI1 when attempting to lock. See table "TerraForce Pendulum lock" in terminal specification xxxx Reset by attempt to lock.	Attempt to move Pendulum lock cylinder did not succeed within the given time frame. Check the hydraulics connections and pressure. Check Pendulum lock position sensor adjustment.	5
119	Warning	Pendulum release failed.	Time-out on sensor signal AI1 (E0.7.4 setting) when attempting to unlock. See table "TerraForce Pendulum lock" in terminal specification xxxx Reset by attempt to release.	Pendulum is locked unintentionally. The suspension will be damaged. Check the hydraulics connections and pressure. Check Pendulum lock position sensor adjustment.	6
120	Warning	STOP! PENDULUM LOCKED!	Time-out on sensor signal AI1 (E0.7.4 setting) when attempting to unlock and speed >E0.7.2 setting. See table "TerraForce Pendulum lock" in terminal specification ver 35 Reset by removal of coarse (either unlock succeded or speed<E0.7.2).	Pendulum is locked unintentionally when attempting to spray. The suspension will be damaged. Check the hydraulics connections and pressure. Check Pendulum lock position sensor adjustment.	7

ID	Type	Text at display detail	Criteria for fault Operations disabled	Full screen Help text	Pr
121	Alarm	Pendulum lock sensor.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7 The alarm is generated: • if the sensor signal on AI1 is less than 0,5V. • Illegal transition. See table "TerraForce Pendulum lock" in terminal specification ver 35	No or wrong signal from sensor. Shorted or disconnected. Check Pendulum lock sensor adjustment and/or connection.	8
123	Warning	Folding not allowed.	Attempt to fold when speed >E0.7.2 km/h. Folding blocked. Reset when speed <E0.7.2 km/h or when fold buttons are released.	It is not allowed to fold or unfold the boom whilst driving. Stop the vehicle.	123
131	Warning	Boom not in transport.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8 The alarm is generated, if an attempt to bring the boom into transport position failed, or if the user forgot to bring it there.	Place boom in transport position before driving. Check transport lock function. Check boom height sensor.	10
132	Illegal action	One function only!	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8 Appears on TERRA FORCE booms when the user tries to us more than one function at a time.	It is not allowed to use multiple folding buttons/functions simultaneously.	133
133	Illegal action	Unfold inner wing.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8. Wrong folding sequence.	Do not attempt to fold outer wings, if inner wing is not fully unfolded.	134
134	Illegal action	Keep folding 1st outer wing.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8. Wrong folding sequence.	Finish the folding of 1st outer wing.	135
135	Illegal action	Keep folding 2nd outer wing.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8. Wrong folding sequence.	Finish the folding of 2nd outer wing.	136
136	Warning	Lift the boom.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8. The boom lift is in a too low position, to ensure proper function of the transport lock.	The boom lift is in a too low position, to ensure proper function of the transport lock.	137
137	Warning	Boom not in transport.	See state machine table "TERRA FORCE transport lock and suspension relief".	Place the boom correctly in transport position before driving. Check transport lock function. Check boom height sensor.	138
140	Alarm	Pendulum unlock sensor.	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7 The alarm is generated: • if the sensor signal on AI5 is less than 0,5V. • Illegal transition. See table "TerraForce Pendulum lock" in terminal specification ver 53	No or wrong signal from sensor. Shorted or disconnected. Check Pendulum unlock sensor adjustment and/or connection.	9

Controller fault codes FORCE/ EAGLE boom

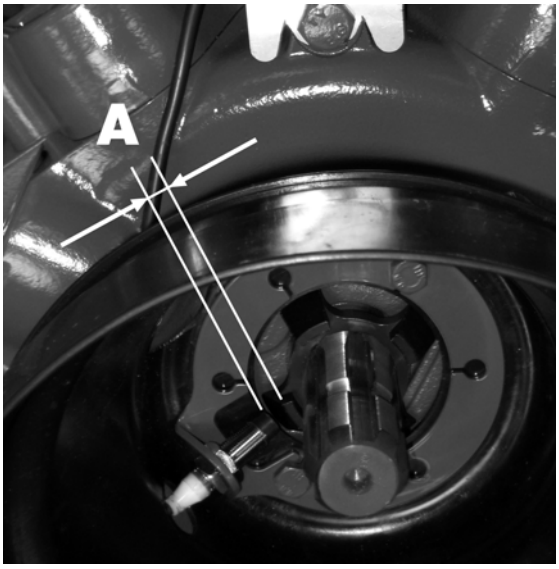
Below is a table of Alarms, Warnings etc. relevant for FORCE/EAGLE boom, which may occur in the Terminal display. See separate instruction book for a full list of fault codes.

NOTE! The ID is the fault identifier, and Pr is alert priority. These are useful for service staff.

ID	Type	Text at display detail	Criteria for fault Operations disabled	Full screen Help text	Pr
08	Alarm	Track Boom sensor failure	The boom sensor signal is less than 0,5V. The boom sensor changes state, without "Boom fold inner" button is active. Auto and Manual is disabled. Only "Align" function is possible.	Track Boom sensor failure. Automatic and manual tracking is aborted. Only "Align" function is possible.	15
28	Illegal action	Track Boom fold. Align sprayer	User starts to fold the boom, and the sprayer trapeze is not locked. BoomFoldInner is disabled.	Track Boom fold Align sprayer. The alarm is present while the sprayer is not locked, and a "fold inner" button is pressed. No folding takes place.	38
29	Illegal action	Track unfold Boom	Alarm for attempt to switch to "Manual" or "Auto" mode in a situation where boom is not detected unfolded. When the boom is detected unfolded the trapeze lock is unlocked and the message disappears. Auto and manual is disabled.	Track unfold Boom. Alarm for attempt to switch to "Manual" or "Auto" mode in a situation where boom is not detected unfolded. Unfold the boom. In half steer mode: Risk of bending folded side. Contact service.	39
89	Reminder	Grease boom and track	Periodically, period defined in extended menu. (Only checked at power up)	The boom now needs to be lubricated. Yellow labels indicate lubrication points other- wise see operators manual.	99
103	Warning	Fold with unlocked pendulum	When pressing FoldCenterIn, FoldLeftIn or FoldRightIn and pendulum is unlocked.	Fold with unlocked pendulum.	111
104	Warning	Boom wing loose	Buttons FoldLeftIn or FoldRightIn are not pressed but the 4 sensors on outer boom wings change from "In spray" to "Not in spray" respectively when they change from "In transport" to "Not in transport".	Boom wing loose.	112
108	Alarm	Boom height sensor fault	Alarm is active when 2.2.4.2 Boom height at headlands is enabled. The alarm is generated, if the sensor signal is less than0.2 Volt or exceeds 4.8 Volt.		116
123	Warning	Folding not allowed.	Attempt to fold when speed >E0.7.2 km/h. Folding blocked. Reset when speed <E0.7.2 km/h or when fold buttons are released.	It is not allowed to fold or unfold the boom whilst driving. Stop the vehicle.	123

R.P.M. Transducer for Pump

The R.P.M. transducer is located at the inner side of the P.T.O. shield. The sensor is an inductive type that requires metallic protrusions to pass by it to trigger a signal.



Adjustment

1. Adjust air gap (A) to 4 mm (+/-0.5 mm). Use a feeler gauge or similar tool.
2. After adjustment then spin up the shaft. Verify air gap variation less than +/-0.5 mm. Check this at the entire circumference.
3. Verify transducer function:
    - HC 5500:

      Correct fitting is indicated by continuous flashing from transducer, when the shaft rotates.
    - HC 6500/ISOBUS VT:

      Monitor the menu [4.5.4.9.6 PTO pump frequency].

7 - Fault finding

Operational Problems

Pump

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Liquid leaks from bottom of the pump.	Damaged diaphragm.	Replace diaphragm. See relevant section.
Grease leaks from the bottom of the pump.	Grease used has too low viscosity.	Change to recommended grease type.
Grease leaks from the shaft grease seals.	Grease used has too low viscosity.	Change to recommended grease type.
	Bearings worn/too high friction.	Replace pump bearings and grease seals.
Lack of pressure.	Pump valves are blocked or defect.	Check for obstructions or if needed replace valves.
	Plugged filters in fluid system.	Clean filters.
Vibrations in system and unpleasant noise from the pump.	Pump valves are blocked or defect.	Check for obstructions or if needed replace valves.
	Air is being sucked into system.	Check for leaks, pinholes in suction hoses, tightness/ gaskets/ o-rings of all fittings on the suction side.
Lack of flow/capacity.	Internal wear on conrod and conrod ring.	Poor greasing. Replace parts as needed and observe proper grease quality and intervals.
	Pump valves are blocked or defect.	Check for obstructions or if needed replace valves.
Extreme internal erosion on diaphragm covers and housing.	Too high vacuum coursed by plugged suction filter or excessive pump rpm.	Replace affected pump parts. Clean suction filter and observe max. pump rpm.
	Lack of internal cleaning.	Use recommended cleaning procedures and add ex. cleaning agents.
	Lack of conservation of the fluid system during storage.	Always use a proper mixture of antifreeze during storage.
Short diaphragm lifetime.	Over speeding of the pump.	Observe max. pump rpm.

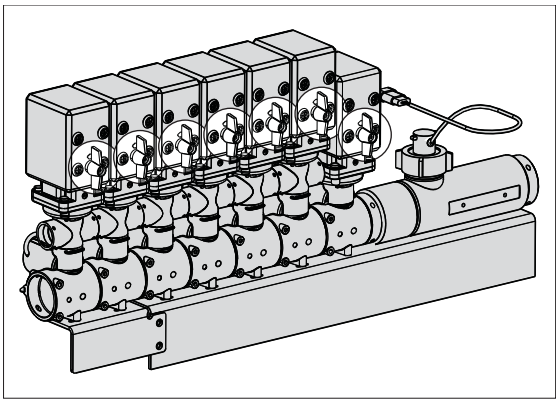
7 - Fault finding

Mechanical problems

Emergency operation - Liquid system

In case of power failure it is possible to operate all functions of the operating unit manually. First disconnect the multi-plug from the control box. Now manually turn the emergency control knobs.

The problem may be due to a blown fuse. A fuse is placed inside the box. Fuse type: Thermo

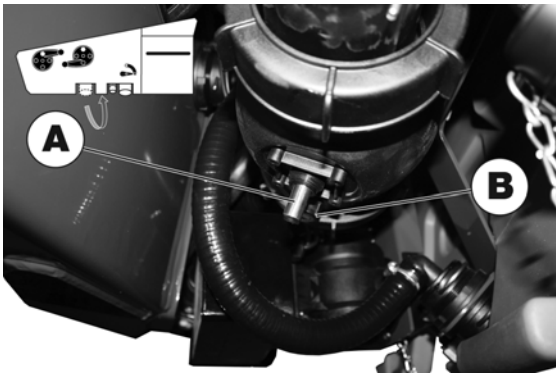


Emergency operation - EasyClean filter

If difficulties with opening the filter and closing the built-in valve occur, it can be emergency handled by using a 13 mm wrench on the key profile (A).

Also the filter can be drained before filter element at the drain plug (B).

WARNING! Always wear protective clothing and gloves before opening the filter!

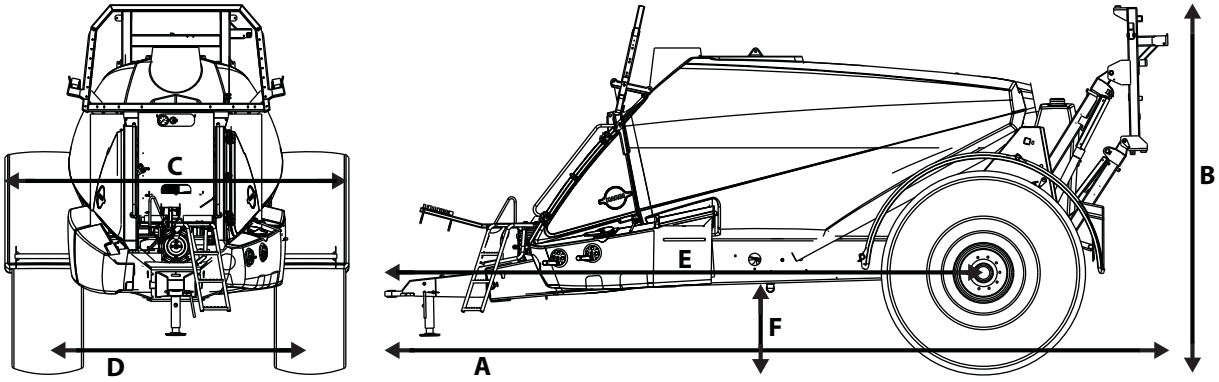


Dimensions

General info

All measures, values and weights are depending on mounted options and specific adjustments.

Overall dimensions



	A	B	C1	C2	C3	C4	D	E	F
6500	8.9	3.8	N/A	3.6	3.6	3.6	2.2-3.0	6.6	0.77
8500	8.4	3.8	N/A	3.6	3.6	3.6	2.2-3.0	6.0	0.77
10000	8.4	3.8	N/A	3.6	3.6	3.6	2.2-3.0	6.0	0.77
C1 = EAGLE BOOM									
C2 = FORCE boom									
C3 = TERRA FORCE boom									
C4 = B3 ALU boom									

All measures are in metres.

Wheel and axle dimensions

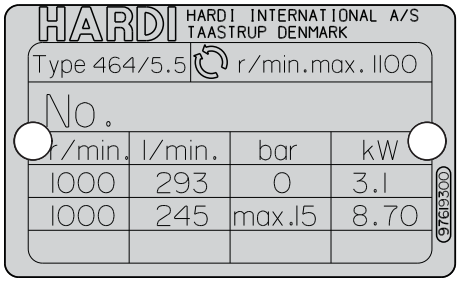
Wheel	Sprayer	Axle
520/85R42 (167A8)	6500-8500	2200-3000 mm
520/85R46	8500	2200-3000 mm
650/70R42 (173A8)	10000	2200-3000 mm
650/70R42 (block tread)	10000	2200-3000 mm
710/70R42	10000	2200-3000 mm

*under axle

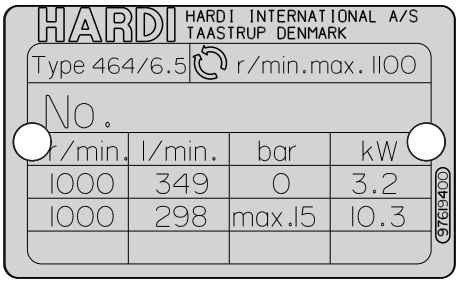
8 - Technical specifications

Specifications

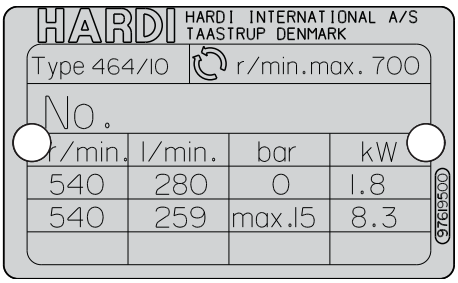
Pump Model 464/5.5



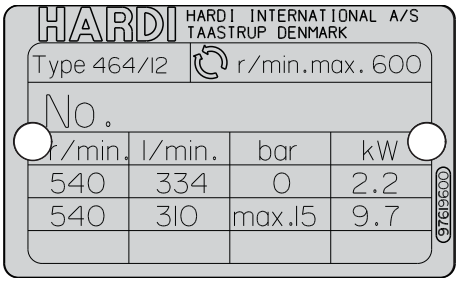
Pump Model 464/6.5



Pump Model 464/10.0



Pump Model 464/12.0



Filters and nozzles

Possible options:

Mesh	Filter gauze width	EasyClean	Cyclone	In-line**	Nozzle
30	0.58 mm	Yes	-	-	-
50	0.30 mm	Yes, standard	-	Yes*	Yes*
80	0.18 mm	Yes	Yes, standard	Yes*	Yes*
100	0.15 mm	-	-	Yes*	Yes*

*depends on selected nozzles

**not with PrimeFlow

Power consumption

Recommended tractor engine power output are as follows.

Sprayer	Hp	kW
6500	130	97
8500	170	127
10000	200	150

ATTENSION! Sprayers fitted with the Twin Force booms require an additional 60Hp (45kW) to be added to the above figures.

ATTENSION! The amount of power needed is also depending on the terrain were sprayers is used.

Brakes

Sprayer litre	Drum dimensions
6500	412 x 160 mm
8500	412 x 160 mm
10000	412 x 160 mm

Hydraulic brakes

Max. hydraulic pressure: 150 bar (2176 p.s.i.)

Air brakes

Load apportioning valve pressure settings:

Relieved	0 bar
Empty main tank	2.8 bar
Half main tank	4.3 bar
Full main tank	Max. air tank pressure (6.5 bar)

8 - Technical specifications

Tyre pressure

Tyre pressure depends on:

- Actual axle load.
- Tyre size.
- Actual speed of the sprayer.

This means that it is often not possible to drive fully loaded sprayer at maximum speed when having narrow wheels mounted.

NOTE! Be aware of specific data for your sprayer.

		10km/h		20km/h		30km/h		40km/h	
Tyre size (“)	**Load index**	**Max axle load (kg)**	**Rec. tyre pressure (bar)**	**Max axle load (kg)**	**Rec. tyre pressure (bar)**	**Max axle load (kg)**	**Rec. tyre pressure (bar)**	**Max axle load (kg)**	**Rec. tyre pressure (bar)**
520/85R42	168A8	15540	2.8	12280	2.8	11920	2.8	11340	2.8
520/85R46	173A8	17400	3.2	13740	3.2	13340	3.2	13280	3.2
620/70R42	173A8	19500	2.7	14400	2.7	13920	2.7	13000	2.7
650/70R42 (block tread)		24140	3.2	15480	3.2	14980	3.2	14200	3.2
710/70R42	179A8	25500	2.6	20400	2.6	18192	2.6	16992	2.6

*Limited by rim

ATTENTION! Legislation and requirements regarding max. allowable axle load when driving on public roads may vary from country to country. Always follow local legislation in force at any time.

WARNING! Liquid fertiliser is significantly heavier then all plant protection mixes. It is recommended that tire/axle load is increase and road and spray speed is decreased by 10km/h.

WARNING! If renewing tyres always use tyres with min. load index as specified.

DANGER! Never inflate tyres more than to the pressure specified in the table. Over-inflated tyres can explode and cause severe personal injuries!

Materials and recycling

Disposal of the sprayer

When the equipment has completed its working life, it must be thoroughly cleaned. The tank, hose and synthetic fittings can be incinerated at an authorized disposal plant. The metallic parts can be scrapped. Always follow local legislation regarding disposal.

Materials used:

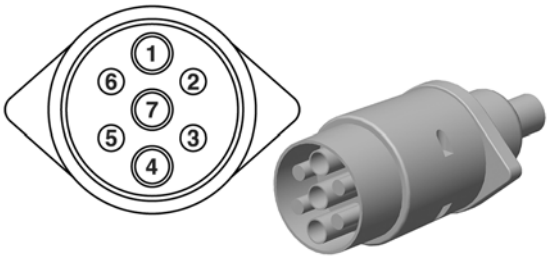
Tanks:	HDPE
Frame etc.:	Steel
Pump:	Cast iron
Diaphragms:	PUR
Hoses (suction):	PVC
Hoses (pressure):	EPDM
Valves:	Glass reinforced PA
Filters:	PP
Nozzles:	Unfilled POM
Fittings:	Glass reinforced PA

8 - Technical specifications

Electrical connections

Rear lights

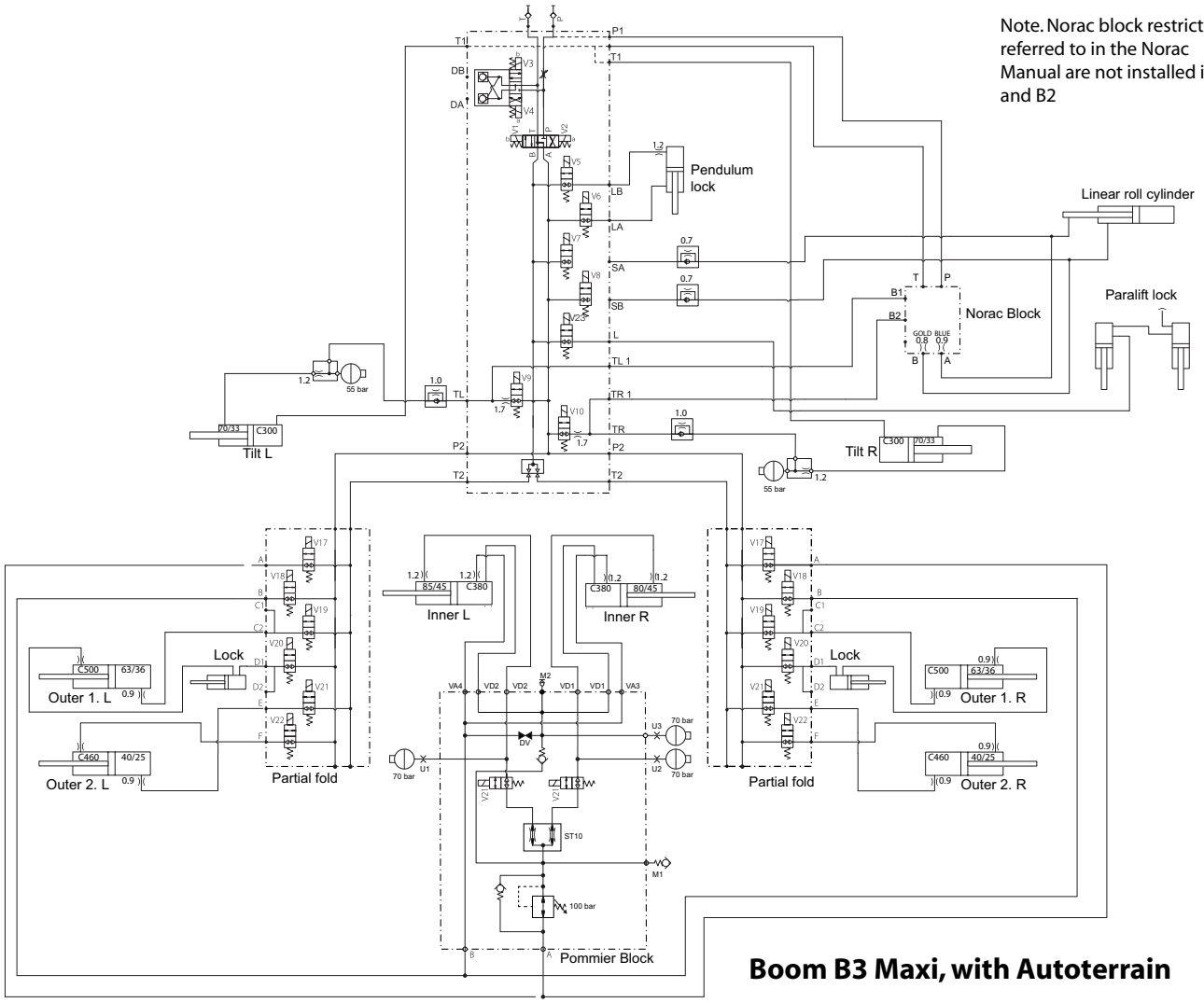
The wiring is in accordance with ISO 1724.



Position	Wire colour
1. LH direction indicator	Yellow
2. Free	Blue
3. Frame	White
4. RH direction indicator	Green
5. RH rear position lamp	Brown
6. Stop lamps	Red
7. LH rear position lamp	Black

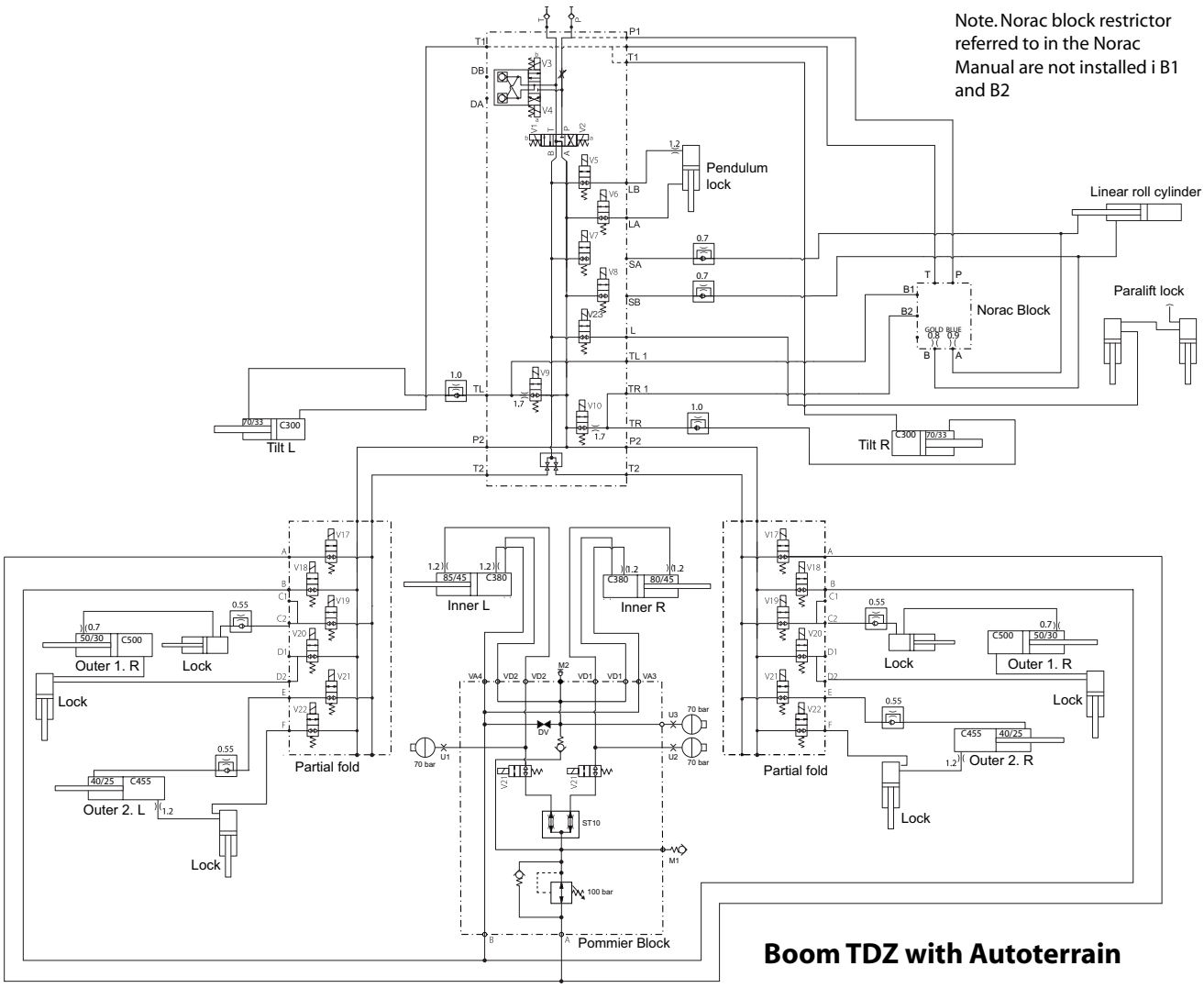
Charts

Boom hydraulics B3 MAXI

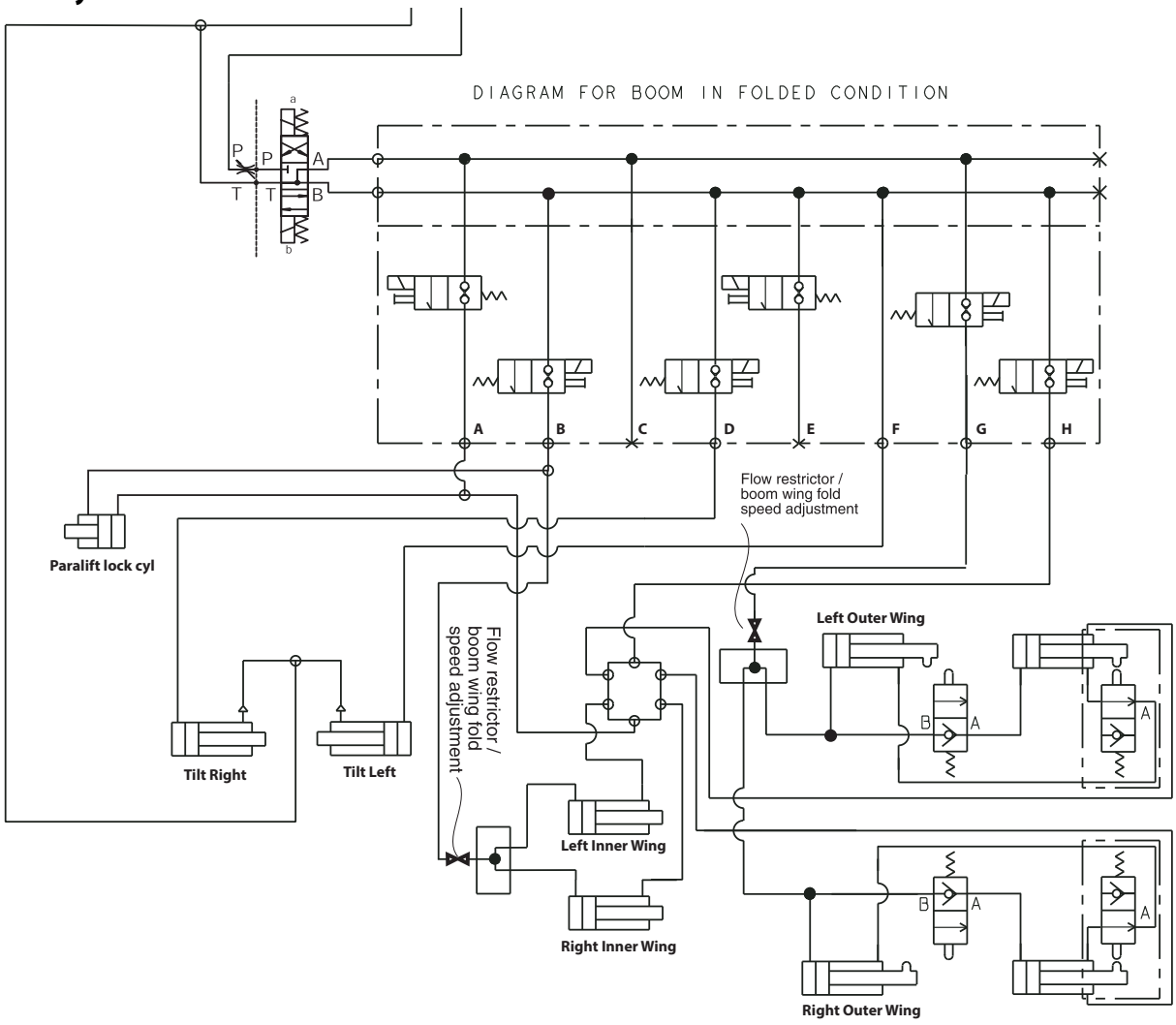


Boom B3 Maxi, with Autoterrain

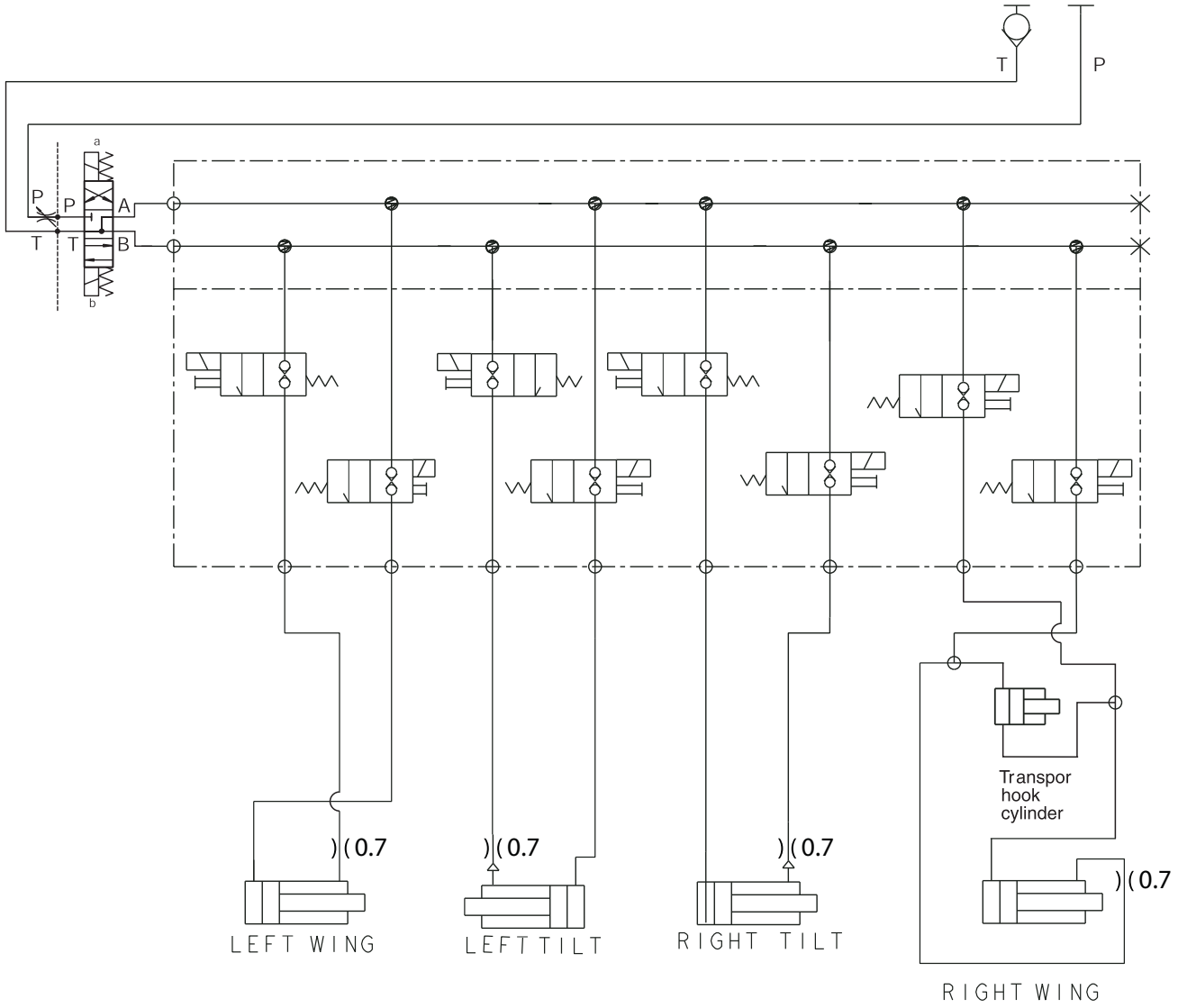
Boom hydraulics TDZ



Boom hydraulics FTZ FORCE 3-fold



Boom direct hydraulics Eagle



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Spare parts

To see updated spare part information the website www.agroparts.com can be visited. Here all parts information can be accessed when free registration has been made.

HARDI Australia P/L

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