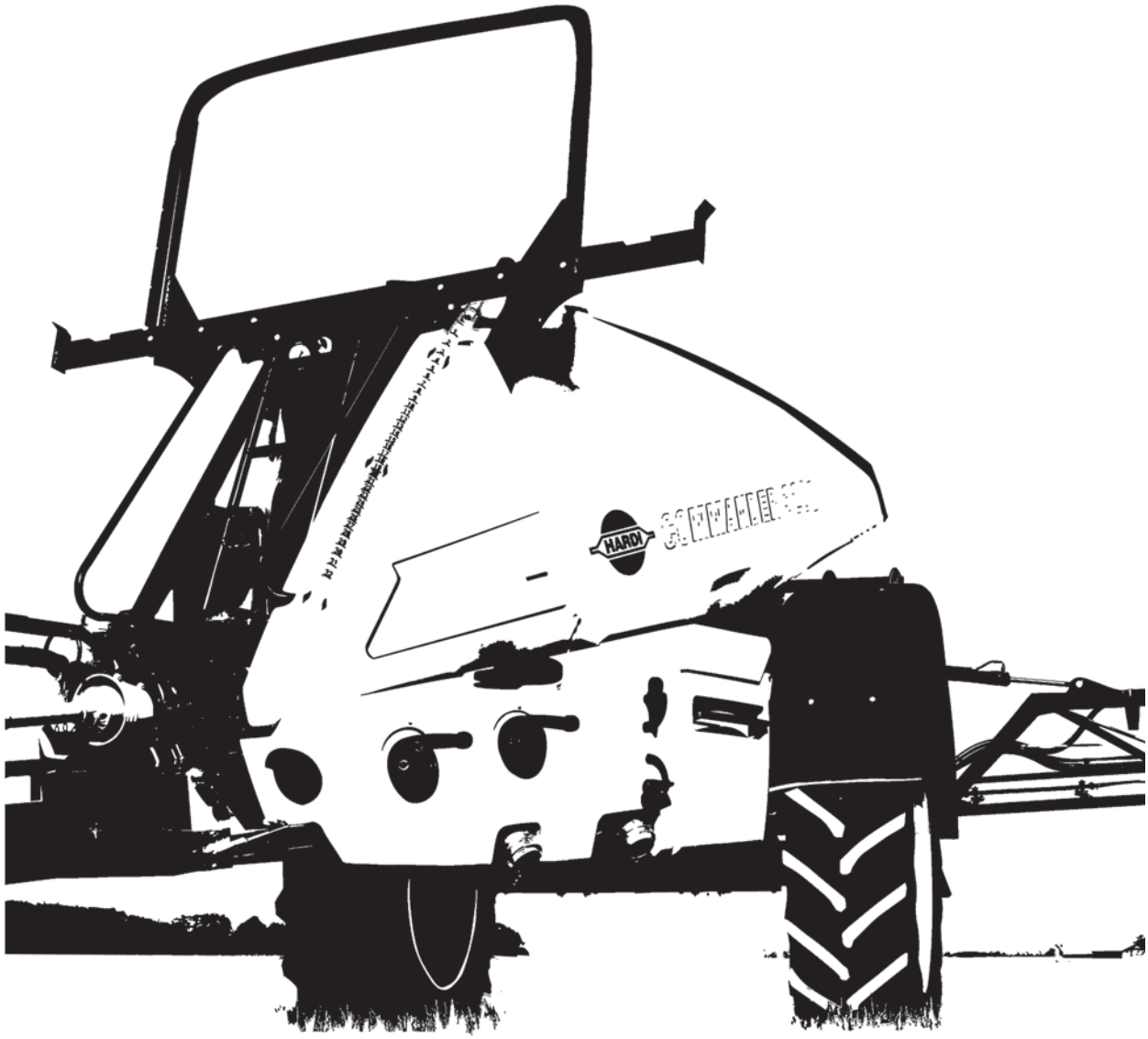
COMMANDER TERRA FORCE

Original

Instruction book

67033900-100 - Version 1.00
GB - 03.2013



www.hardi-international.com

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 '11 series.

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 INTERNATIONAL A/S

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EC Declaration of Conformity

As manufacturer:

HARDI INTERNATIONAL A/S

Helgeshøj Allé 38

DK 2630 Taastrup

DENMARK

hereby declare that the following product(s):

COMMANDER TERRA FORCE (TDZ)

- Fulfils all the relevant provisions of Machinery Directive 2006/42/EC, 2009/127/EC and later amendments
- All the relevant provisions of Council Directive 2004/108/EC (EMC)

Taastrup, 01.03. 2013

Lars Bentsen

Vice president, Product development

HARDI INTERNATIONAL A/S

1 - EC Declaration

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.

978434 Risk of squeeze!

Keep hands away, when parts is moving.

978446 Risk of sprayer tipping over!

Be aware when disconnecting the sprayer.

97802200 Not for drinking!

This water must never be used for drinking water.

97818100 Tank under pressure!

Beware when moving lid.

97829000 Lifting point!

97831500 Load index!

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

978445 Risk of squeeze!

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

978442 Risk of falling off!

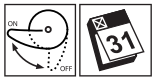
Do not ride on platform or ladder.

978438 Grapping area!

Manual handling of boom etc.

97802300 Not for drinking!

This water must never be used for drinking water.



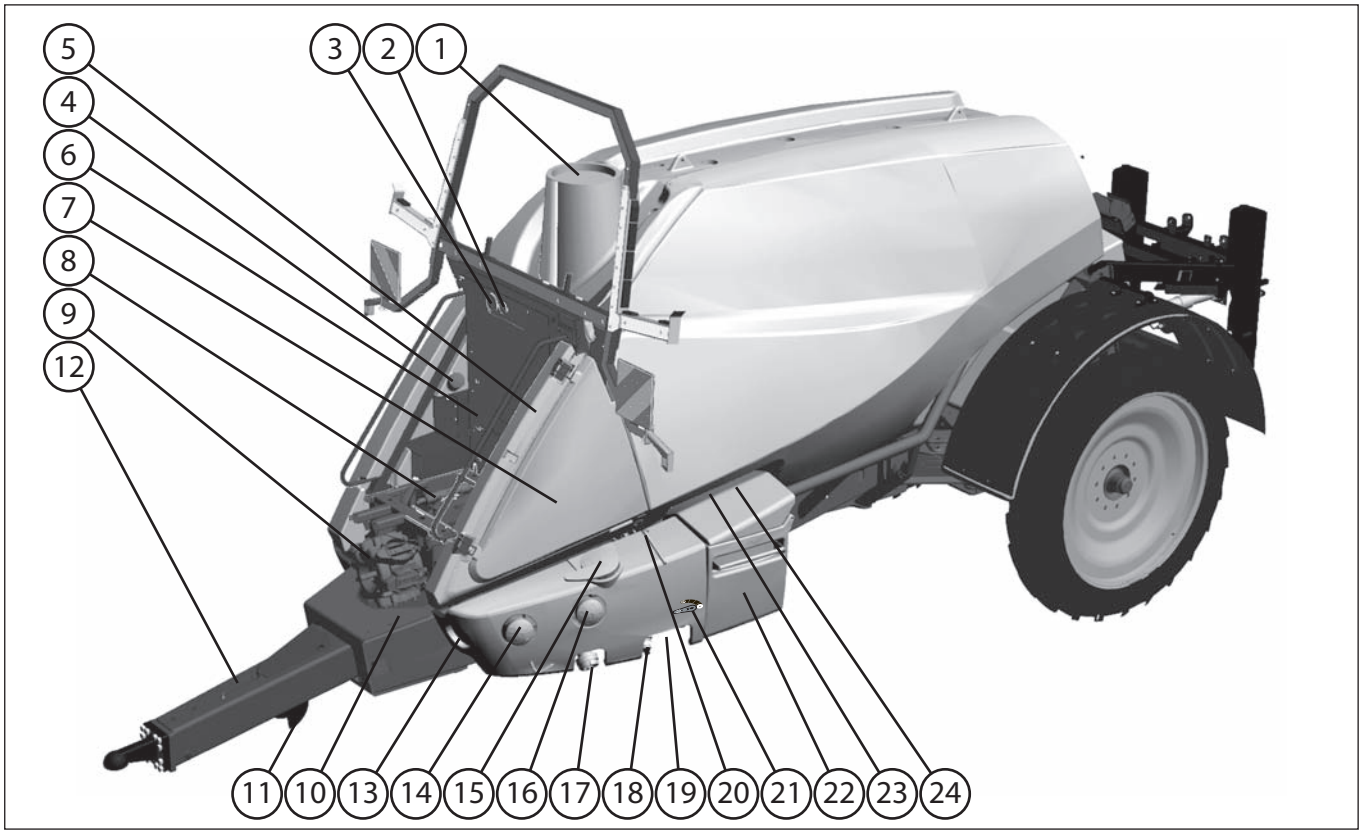
97827000 EasyClean filter service!

Open and clean filter monthly.

978439 Lifting point!

General info

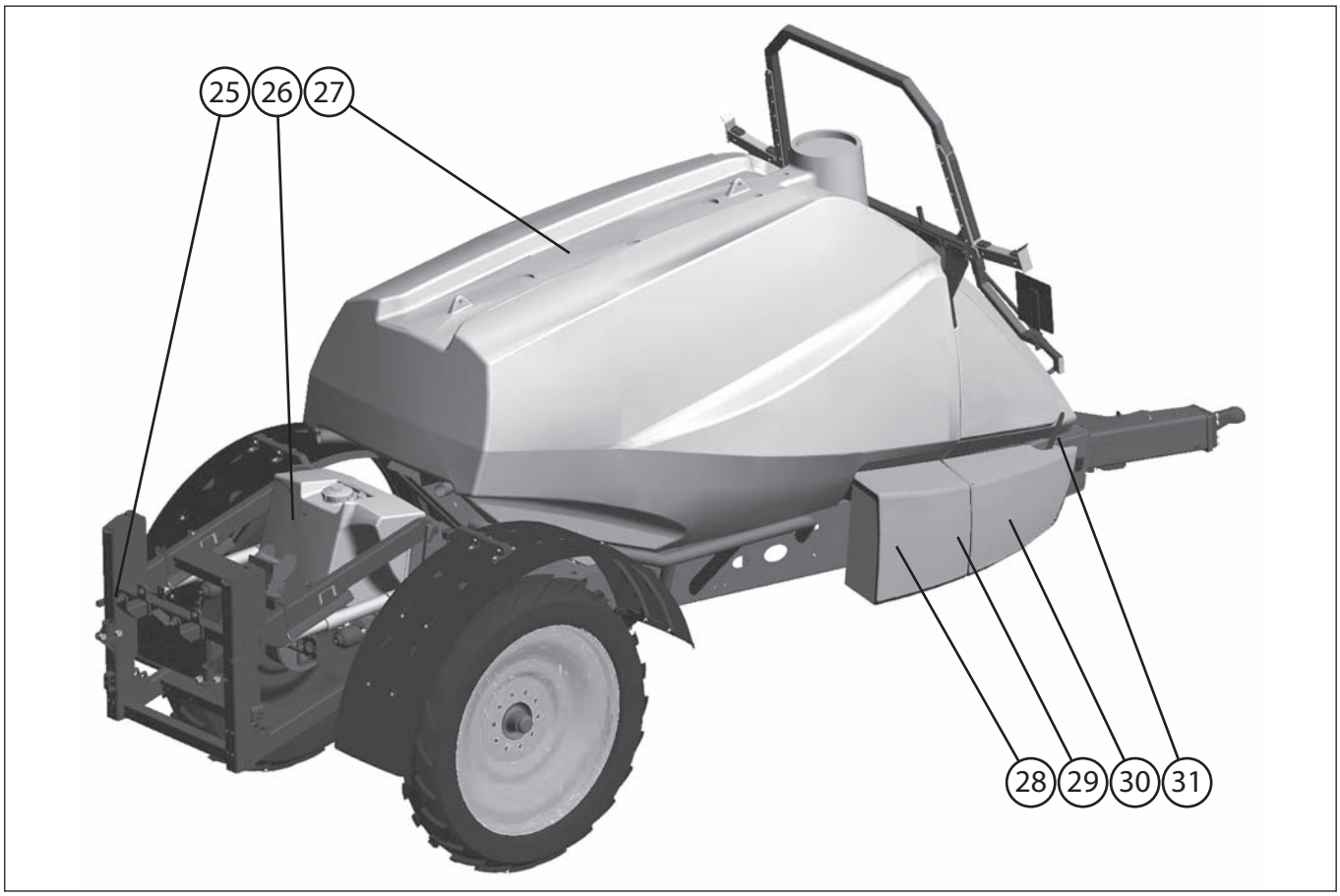
View



1. Main tank lid
2. EasyClean clogging indicator
3. Spray pressure gauge
4. Clean water tank lid
5. Main tank level indicator
6. Rinsing tank level indicator
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. TurboFiller
23. Lever for chemical container cleaning
24. TurboFiller Vortex nozzle valve

3 - Description

View

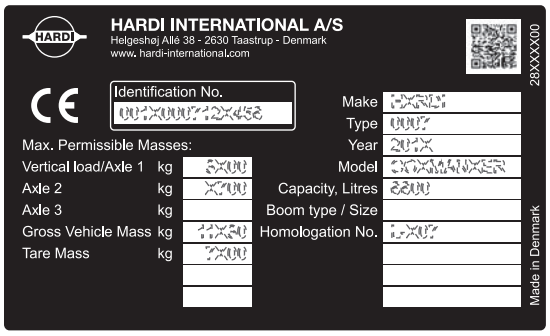


25. Distribution valves (not illustrated)
26. Rinsing tank
27. Main tank
28. ChemLocker with FoamMarker tank
29. Spray lance for External Cleaning Device
30. CycloneFilter
31. Parking brake

Identification plates

A CE identification plate fitted on the frame indicates producer name, model, sprayer weights, etc.

The identification plate also has a QR-code which can be read by e.g. smartphones to obtain more detailed data about the sprayer, which can be useful for service staff.



Roadworthiness

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 for models without brakes and for models equipped with brakes is different. Be aware that these speeds may differ due to local law. Contact local authorities for information of max. driving speeds!

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 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 filling hole is placed so it can be accessed from the platform. This ensures an easy access for the filling of sprays, 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 3300, 4500, 5500 or 7000 litres.

3 - Description

Liquid system

Pump

Diaphragm pump with 6 diaphragms, model 463. Standard = 540 r.p.m. (6 splines shaft). Optional = 1000 r.p.m. (21 splines shaft). 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 facilitates 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 pressure side and suction side. A function is activated by turning the handle towards the desired function.

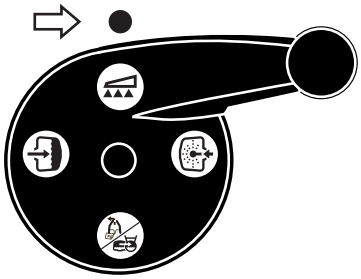
ATTENTION! Only the functions used should be open - always close remaining valves.

ATTENTION! If a valve is too tight to operate - or to loose (= liquid leakage) - the valve needs to be serviced. Please see "Pump valves and diaphragms renewal" on page 83 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.



Main tank

Spraying

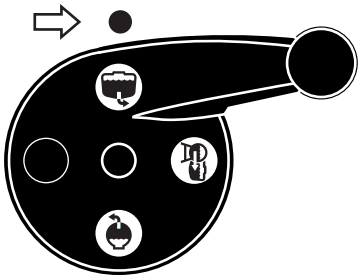
Internal tank cleaning (Rinsing nozzles)

Pressure draining (optional) or TurboFiller

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 vertical position (indicator not pointing at a label) then the valve is closed.



Main tank

Rinsing tank

External filling (optional)

DynamicFluid4 pressure regulation

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

The DynamicFluid4 use feed forward technology based on 5 sensors that feeds 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 angle 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 and at speed changes.
- Optimized AutoSectionControl feature that predict boom sections to open and nozzle pressure.
- Optimized for different P.T.O. 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.

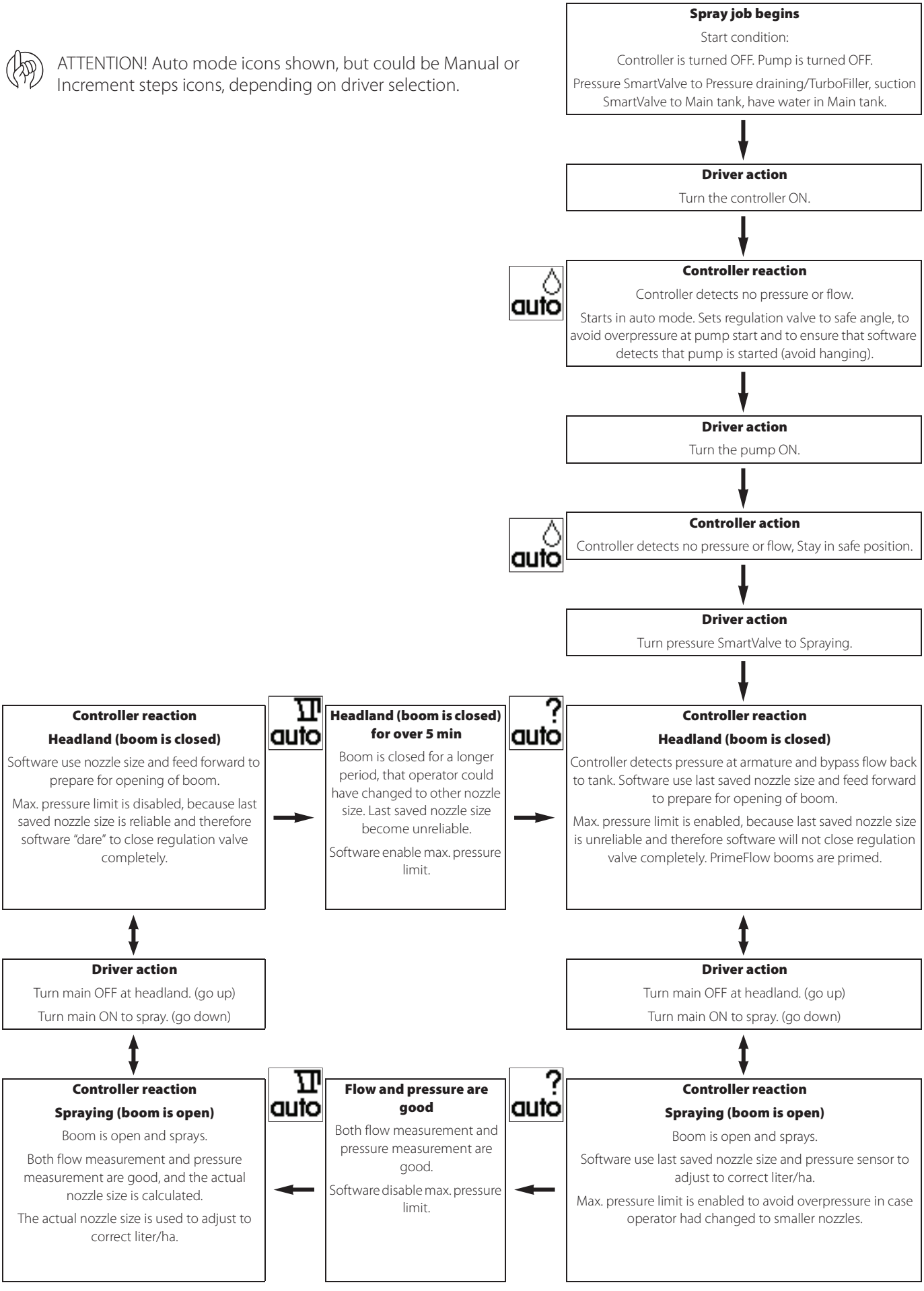
Screen icons

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.

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.
			**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.

Regulation valve function diagram

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

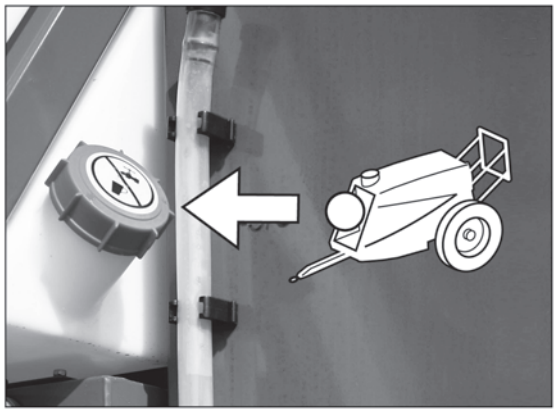


Clean water tank

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

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 are made of impact-proof and chemical resistant polyethylene.

Filling is done via the 1" threaded stud placed in the working area. The rinsing tank level indicator is placed at the platform.

Nominal content: approximately 450 litres.

Filters

A EasyClean suction filter is fitted in the working zone.

A Cyclone pressure filter is fitted to the sprayers right side just in front of the hose reel, 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 (standard for certain booms).

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 then turn it counterclockwise and pull it up, like shown on picture.
- Pull out the two locks (A) to remove filter element from the lid.

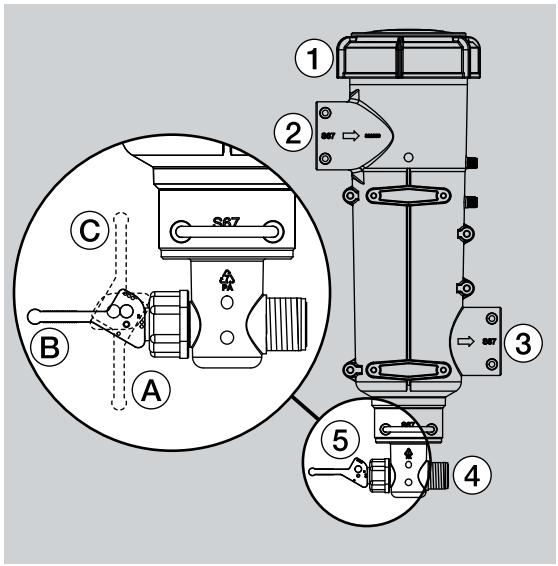
Beside the spray pressure gauge on the platform a EasyClean clogging indicator is located:

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.

3 - Description

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 76.

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

TurboFiller

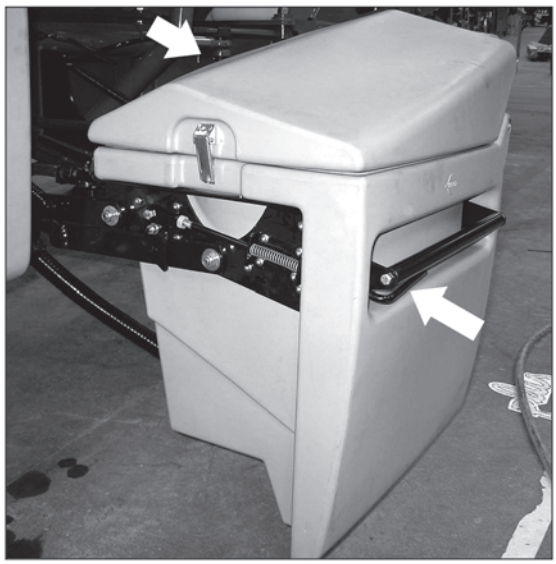
Before use

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

After use

- Push the handle (arrow) to unlock.
- 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!

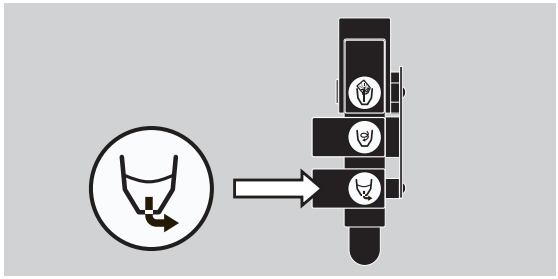


The TurboFiller valves and Chemical Container Rinsing lever are placed on the backside (arrow).

TurboFiller suction valve

The valve is used simultaneously with the TurboFiller. The valve has 2 settings: Continuously open or spring loaded normally closed. Open the valve when chemicals are to be filled into the TurboFiller and transferred to main tank.

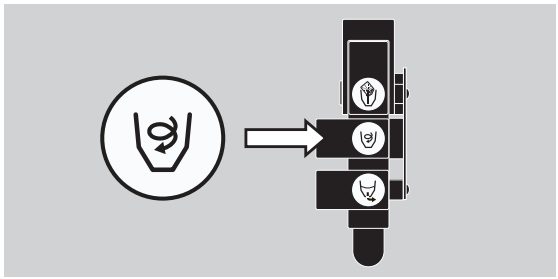
Suction from TurboFiller



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



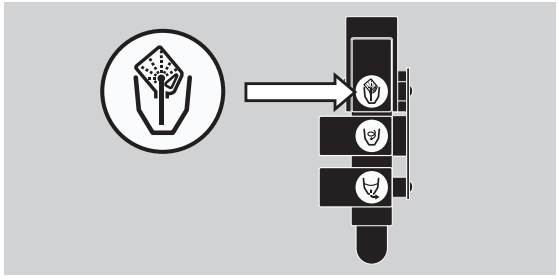
Chemical Container Rinsing lever

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.

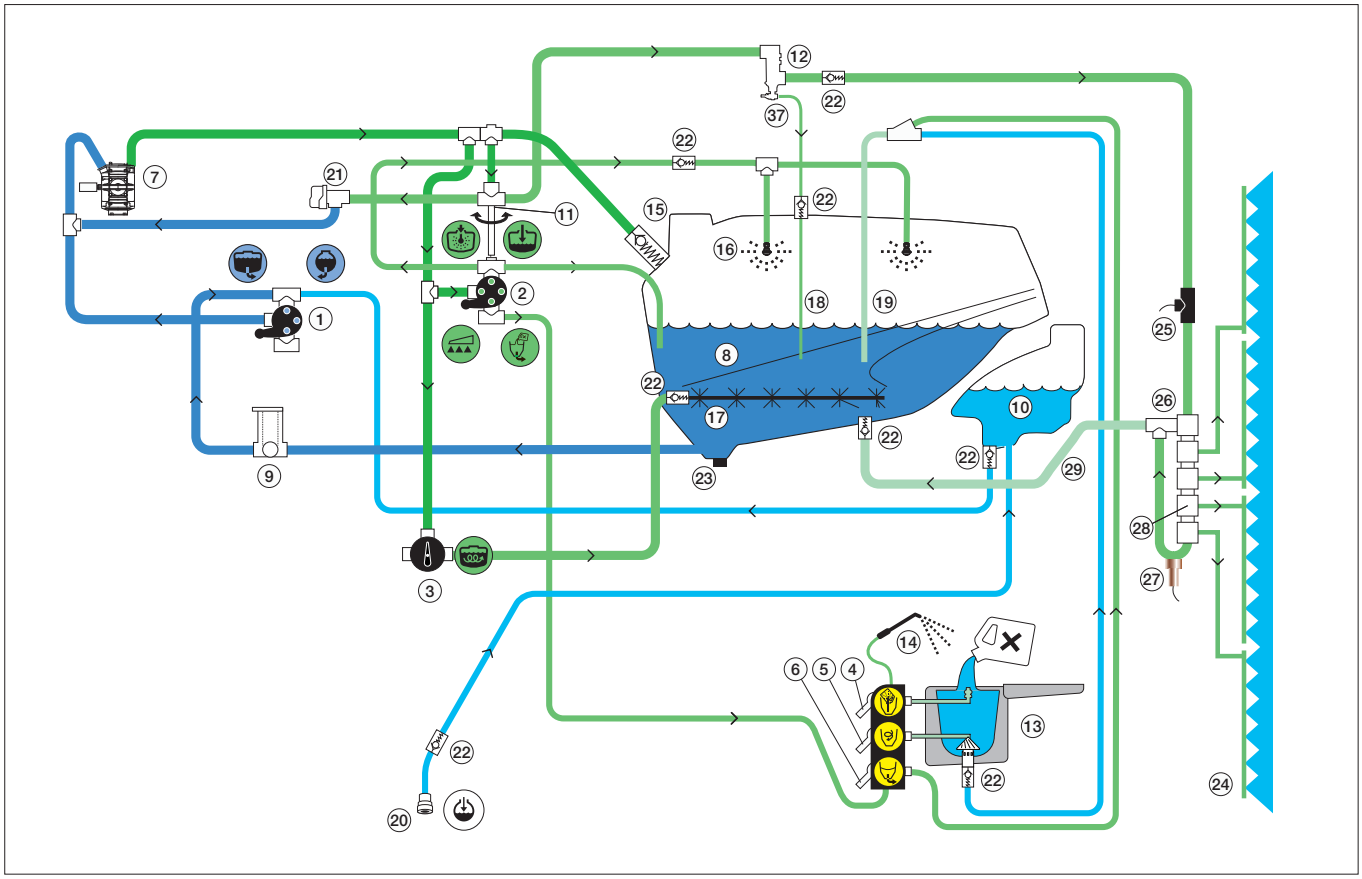
When the TurboFiller lid is closed: Use the Chemical Container Rinsing lever to rinse the hopper when the filling of chemicals is completed.

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.

Diagram - Basic liquid system

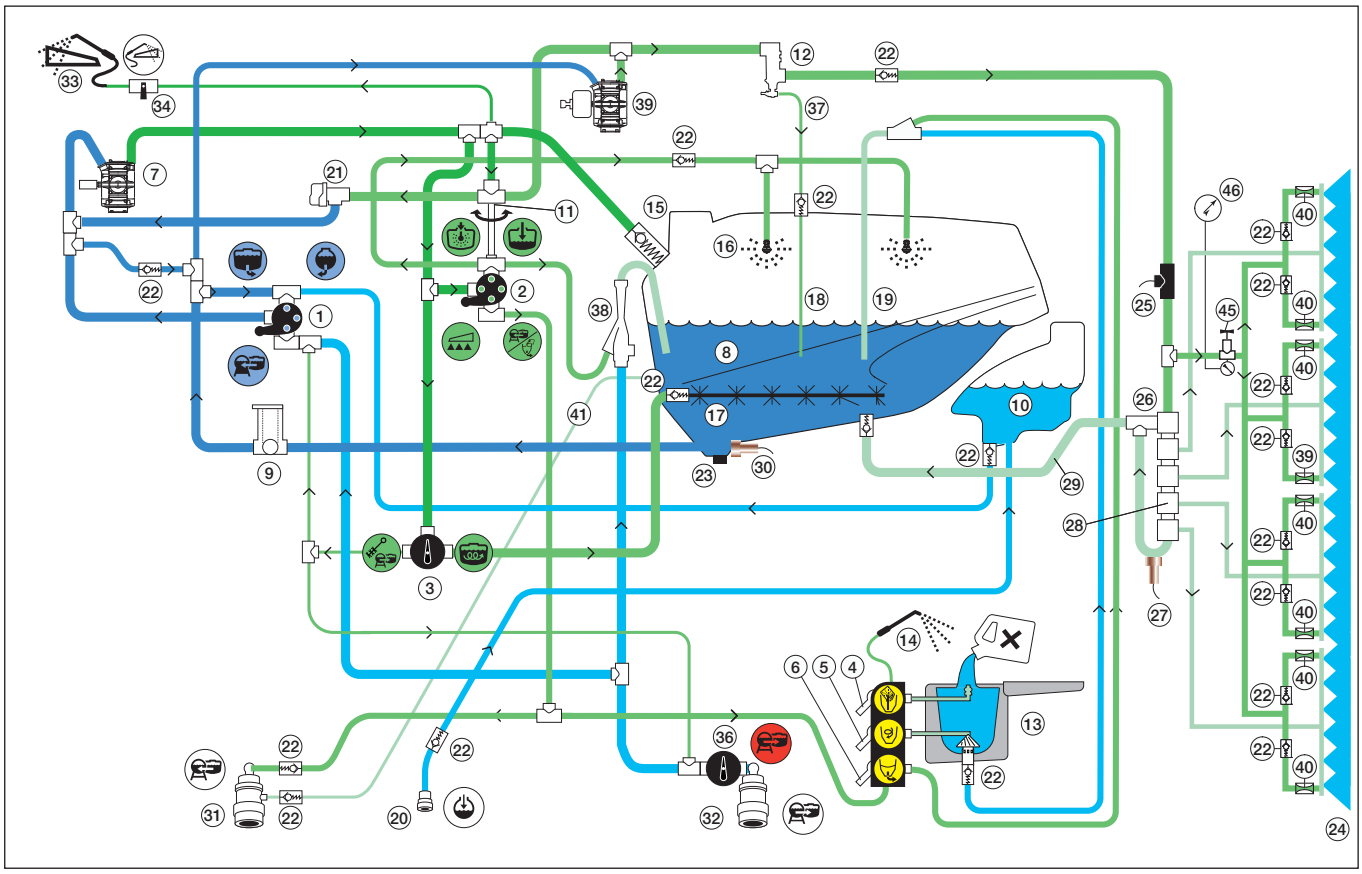


1. Suction SmartValve
2. Pressure SmartValve
3. Agitation valve
4. Chemical container cleaning valve
5. TurboDeflector ON/OFF valve
6. TurboFiller suction ON/OFF valve
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. TurboFiller
14. Lance for cleaning TurboFiller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

Options

37. Boost valve

Diagram - Liquid system with optional extras

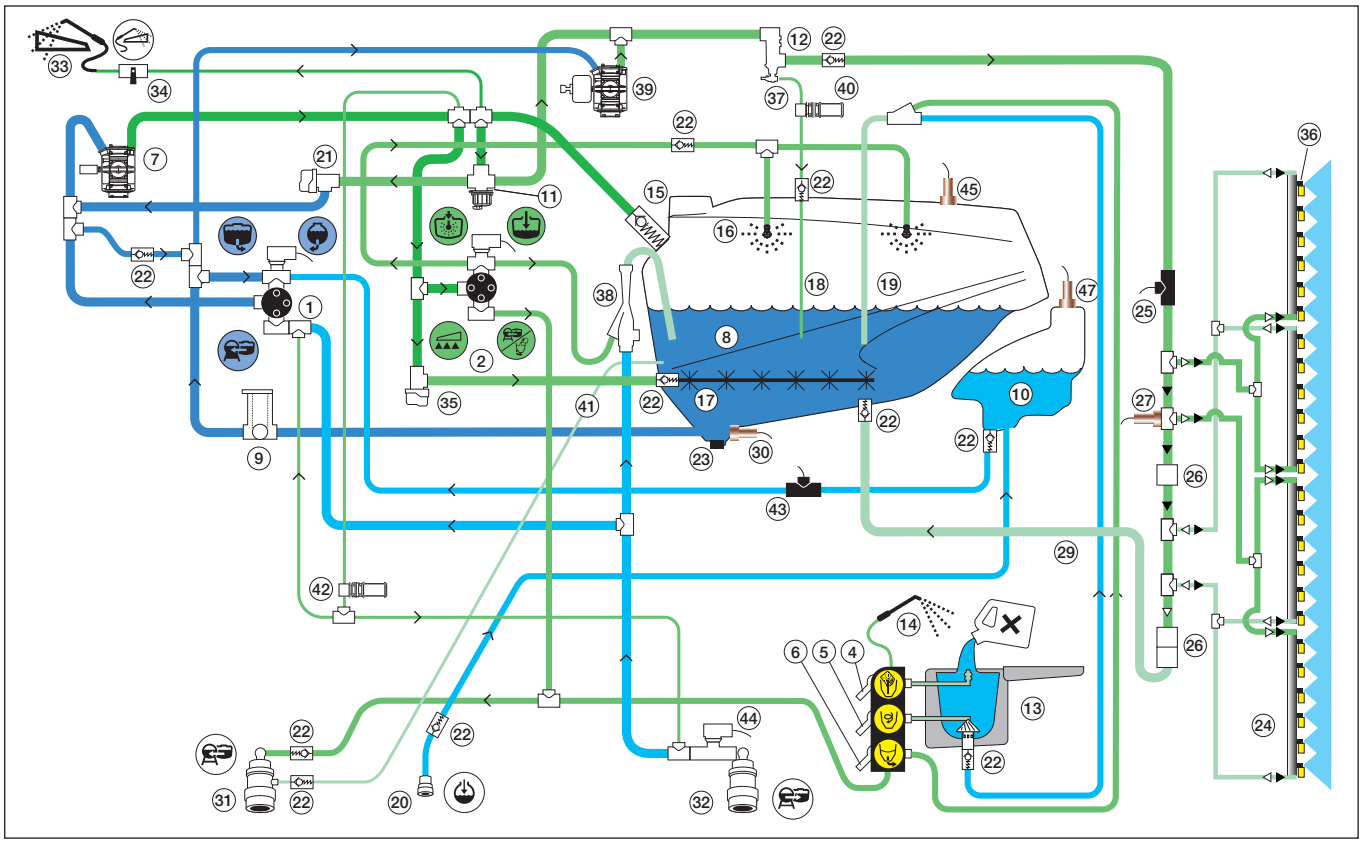


1. Suction SmartValve
2. Pressure SmartValve
3. Agitation/External cleaning valve
4. Chemical container cleaning valve
5. TurboDeflector ON/OFF valve
6. TurboFiller suction ON/OFF valve
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. TurboFiller
14. Lance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

Options

30. Main tank gauge sensor
31. Pressure draining coupler
32. FastFiller coupler
33. External cleaning device
34. External cleaning ON/OFF valve
36. External fast filling ON/OFF valve
37. Boost valve
38. Ejector
39. FlexCapacity pump
40. Boom prime restrictor
41. Pressure relief line
45. Boom prime pressure control valve
46. Pressure gauge for BoomPrime

Diagram - Intelligent liquid system with optional extras



1. Suction SmartValve
2. Pressure SmartValve
4. Chemical container cleaning valve
5. TurboDeflector ON/OFF valve
6. TurboFiller suction ON/OFF valve
7. Pump
8. Main tank
9. EasyClean filter
10. RinseTank
11. Spray valve
12. CycloneFilter
13. TurboFiller
14. Lance for cleaning TurboFiller
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22. One-way valve
23. Drain valve
24. Sprayer boom
25. Flowmeter
26. Distribution valves
27. Sensor for pressure gauge
29. Return from distribution valves

Options

30. Main tank gauge sensor
31. Pressure draining coupler
32. FastFiller coupler
33. External cleaning device
34. External cleaning ON/OFF valve
35. AutoAgitation valve
36. PrimeFlow ON/OFF valve
37. Boost valve
38. Ejector
39. FlexCapacity pump
40. Boost line valve ON/OFF
41. Pressure relief line
42. Clean valve
43. RinseTank flowmeter
44. External fast filling ON/OFF valve
45. Main tank full sensor
47. RinseTank full sensor

Boom

Boom and terminology

The TERRA FORCE boom is a pendulum suspended, fully hydraulically operated Z-version with all functions controlled via the Direct Hydraulic System (D.H.).

The TERRA FORCE boom is suspended in a parallelogram with nitrogen dampers and is available in 36, 39, 40 and 42 m working width. All booms are 3-folded.

Boom features:

- Hydraulic pendulum lock.
- Outer sections incorporate spring-loaded breakaway.
- Tilt control with individual suspension (option).
- Individual folding of outer sections. This enables alternative boom widths.

For 3-folded booms the terminology is as follows:

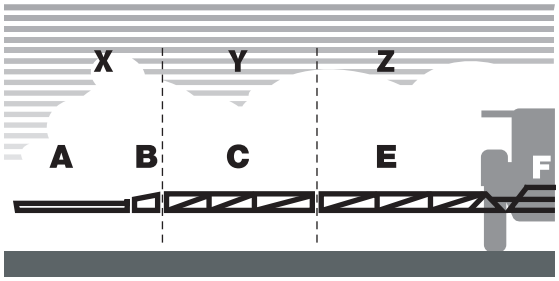
A. Breakaway section

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

DynamicCentre

The TERRA FORCE boom features a DynamicCentre system that can adapt the boom suspension for different conditions.

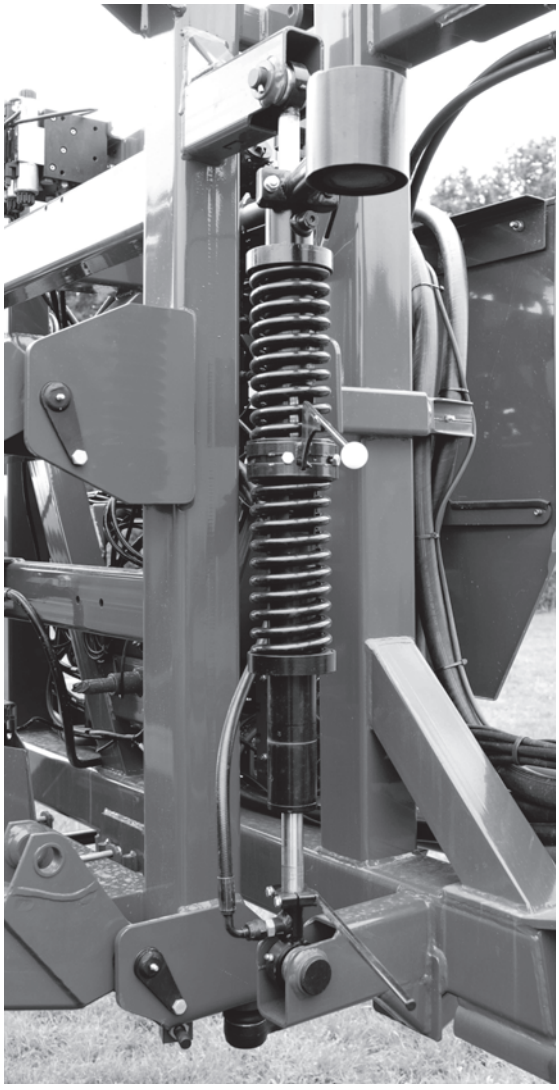
DynamicCentre has hydraulic remote control of the suspension resistance. The settings are selected on the go and will change the boom from being free to fully stabilized.

The system is adjustable in 5 steps between the two absolute points of adjustment:

DynamicCentre step	Pendulum state	Terrain
1	Free	Flat field
2-4	Partly stabilized	Field with slopes
5	Fully stabilized	Hilly field

AutoTerrain (optional)

AutoTerrain is a computer controlled pre-emptive boom stability and auto height control system which maintains the correct relationship and height of the boom to the different field conditions. AutoTerrain highly tuned computer controlled proportional electro-hydraulics and ultrasonic sensors help spray more safely, reducing potential ground strikes and prevents incorrect spray height.



WARNING!

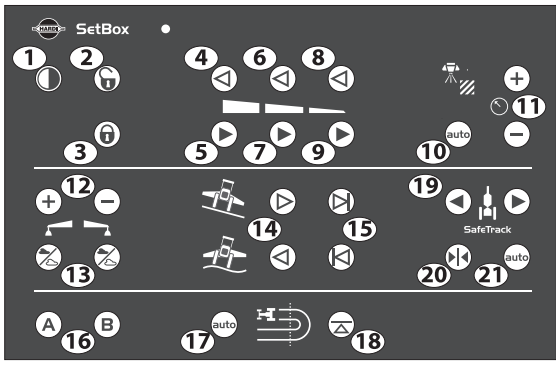
- Stability control roll sensor and indicator must be correctly aligned to prevent uncontrolled and continuous boom oscillation.
- The pendulum centre stability control linkage points must be regularly lubricated to protect swivel balls from moisture penetration and prevent swivel ball seizure.
- The boom should never be used to spray with the pendulum lock engaged.

ATTENTION!

- For optimum AutoTerrain performance the stability & height control sensors must be checked and cleaned regularly.
- Dusty, damp or missing sensors pads will not read accurately and AutoTerrain will be compromised. Foam pads must be washed and dried daily. The boom should not be used if foam pads are missing from the sensors.
- Regarding AutoTerrain, please refer to specific book for information about Operation, Calibration and Maintenance.

SetBox controls

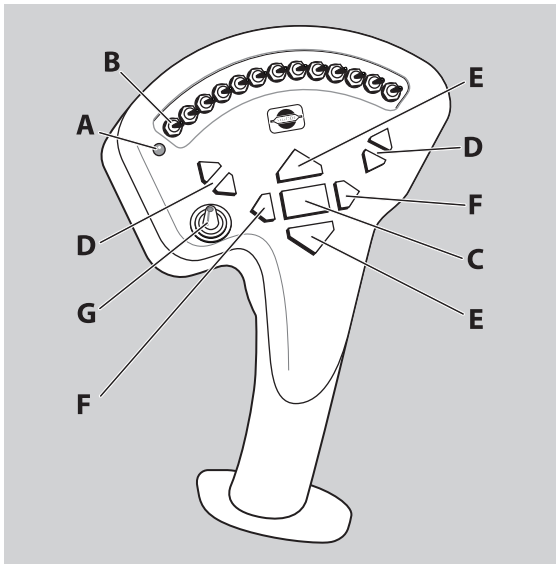
The SetBox controls the volume rate, foam marker, SafeTrack, HeadlandAssist, pendulum lock, boom folding and stability functions. Furthermore two optional functions can be controlled. The buttons on the SetBox control the following functions:



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).
15. DynamicCentre outer positions 1 or 5.
16. Optional function A-B.
17. HeadlandAssist automatic.
18. HeadlandAssist boom align.
19. SafeTrack manual control.
20. SafeTrack align selector.
21. SafeTrack automatic selector.

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

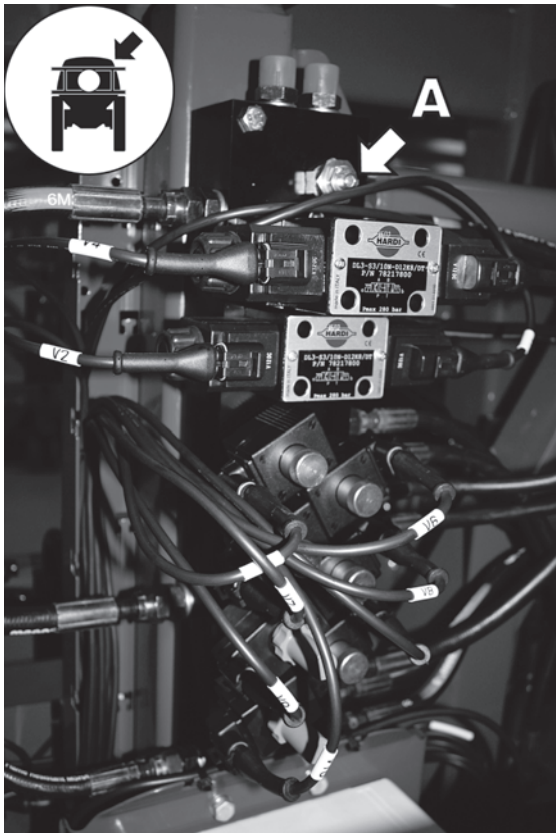
Hydraulic blocks

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.

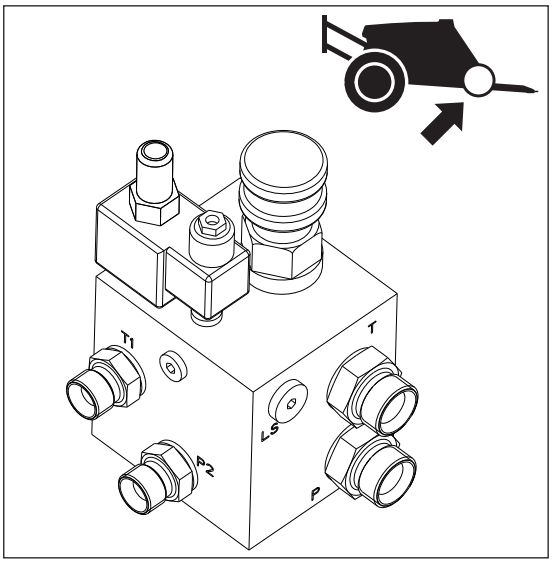


ParaLift

This hydraulic block manages hydraulic pressure for the ParaLift.

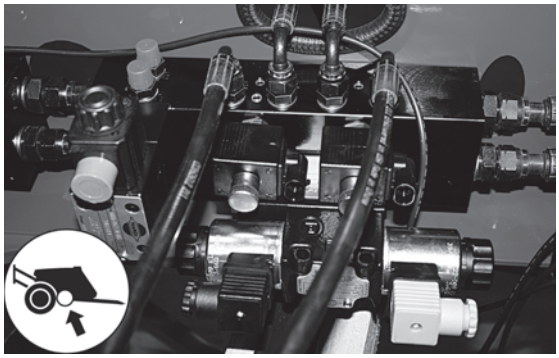
Open centre hydraulics

The open centre hydraulics block is necessary if the tractor uses open centre hydraulics and/or load sensing. For adjustment see "Open centre hydraulics (optional)" on page 42.



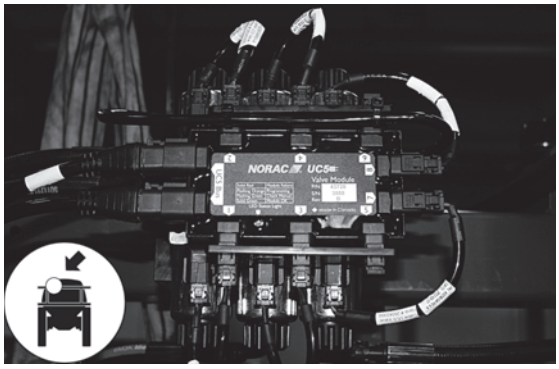
SafeTrack

On sprayers with SafeTrack steering this hydraulic block manages hydraulic pressure for the steering functions.



AutoHeight UC5

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



3 - Description

Equipment

SafeTrack

The SafeTrack will make the sprayer automatically follow the tractor when turning on headland. The SafeTrack can easily be operated with the hydraulic control unit. SafeTrack has an integrated safety feature which prevents over-steering when the driving speed is too high for the given turning radius. If a TankGauge is fitted, the tank filling level is also taken into account.

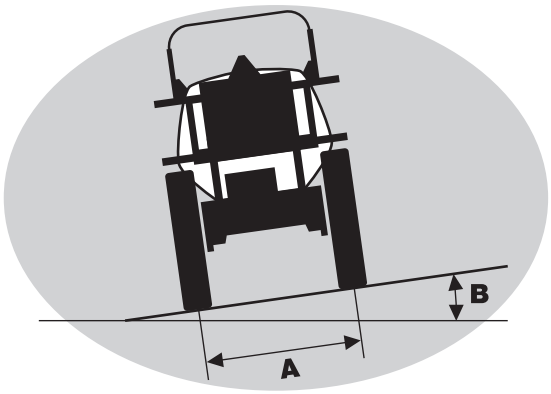
The SafeTrack is limited to speeds below 30 km/t. Driving in "Auto" with SafeTrack will trigger an overspeed alarm and sprayer will automatically align.

WARNING! During road transport the drawbar must be aligned in centre position. Refer to the HC 6500/9500 controller instruction book for specific instructions.

NOTE! IntelliTrack requires the HC 6500/9500 or ISOBUS controller. More information about the controller can be found in the separate instruction book.

Driving technique for SafeTrack

A trailer with SafeTrack behaves differently than a normal trailer. In tracking position the vehicle centre of gravity is displaced more outward compared to the vehicle centre line of a normal trailer. Compared to a conventional trailer a steered trailer has decreased stability when turning, especially when turning on hillsides (B).



To avoid overbalancing, pay attention to these guidelines:

- Avoid sudden, tight turns.
- Slow down before entering a curve or turning, and drive with a constant, low speed during the turn.
- Never slow down too fast, never brake heavily and never stop suddenly in a curve, or when turning on a hillside, when the sprayer is articulated.
- Be careful when turning on uneven ground.
- Set the track width (A) as wide as possible.
- The proper function of the hydraulic system is essential to obtain good stability.
- A filled rinsing tank will increase stability.

DANGER! No persons are allowed in the operations area of the sprayer when steering is unlocked!

WARNING! Never articulate steering when boom is in transport position.

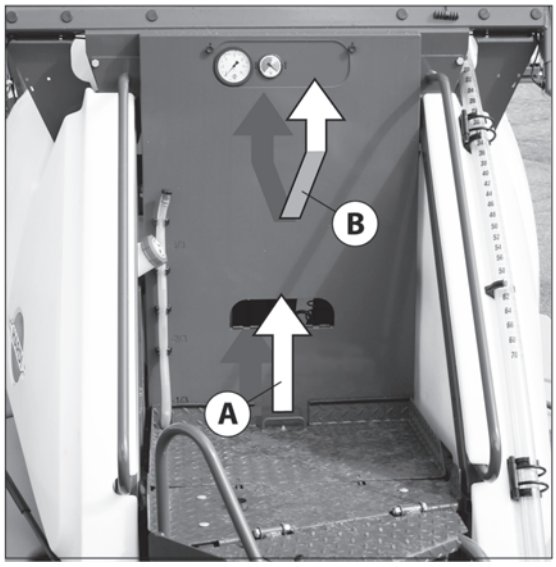
Platform

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 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 and level indicator for the rinsing tank are visible here.

ATTENTION! Always tilt up the ladder before driving.

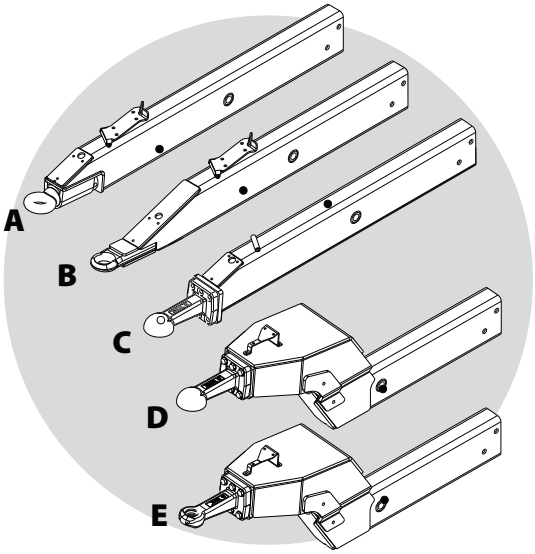


Drawbars

Following drawbar systems are available:

Drawbar	Hitch type	Hitch attachment	High/low
A	Swivel Ø50/33	Welded	Low
B*	Hitch Ø50	Welded	Low
C	Scharmüller Kugel K80	Bolted on	Low
D*	Scharmüller Kugel K80	Bolted on	High
E*	Zugmaul Ø40 high	Bolted on	High

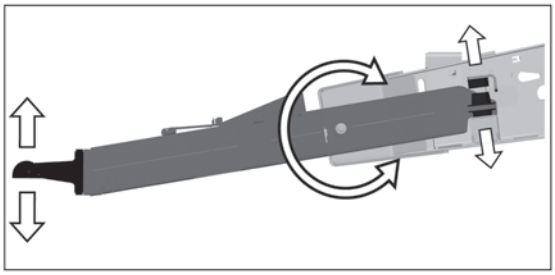
*not for COMMANDER 5500 and 7000 models.



Suspended drawbar

For COMMANDER 5500 and 7000 models the drawbar is fully suspended.

The full up and down load from the sprayer to the tractor are transferred through rubber dampers built into the chassis.



Hydraulic support leg

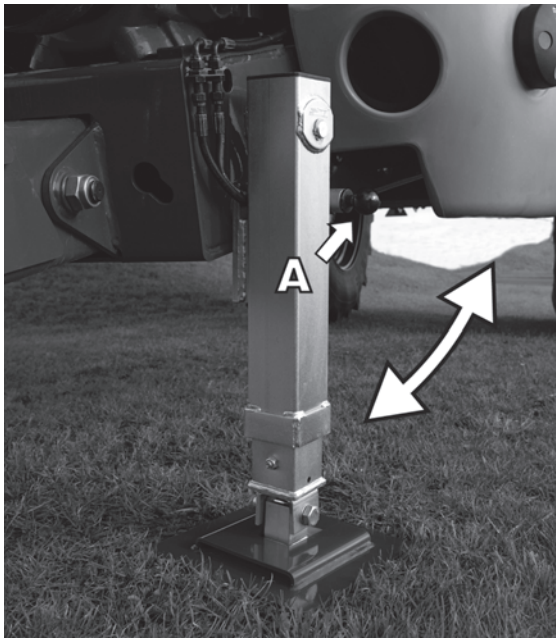
The hydraulic support legs are driven by a separate hydraulic outlet on the tractor. See "Hydraulic support leg (option for CM 3300/4500)" on page 38 for use of the support leg.

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

Optional for CM 3300/4500

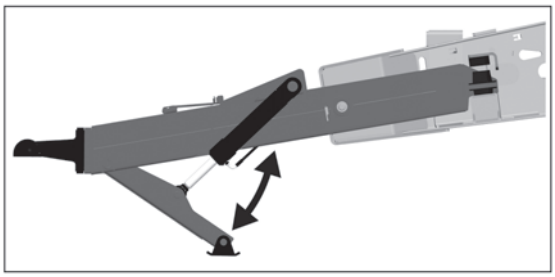
The support leg is stored in its retracted position when the sprayer is attached to the tractor.

Pull the knob (A) to fold-up the support leg to its storing position.



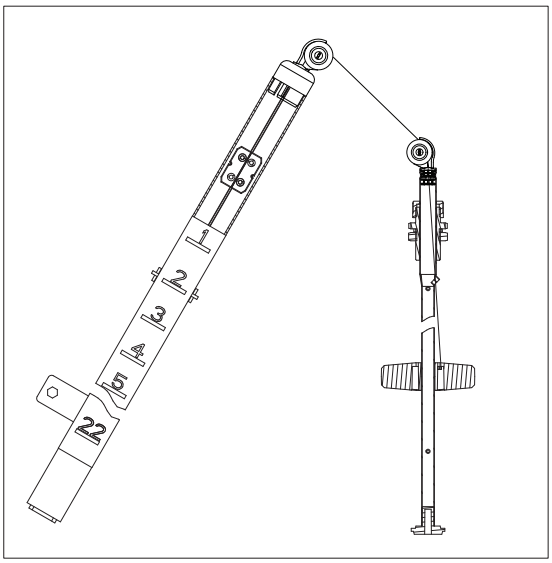
Standard for CM 5500/7000

The support leg is stored in its retracted position when the sprayer is attached to the tractor.



Tank level indicator

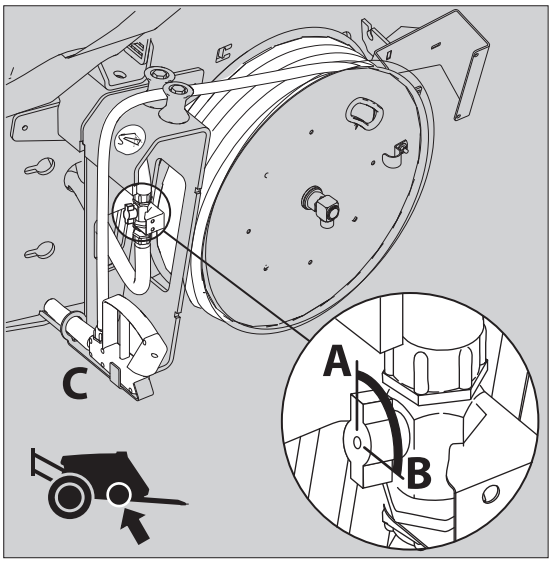
The actual tank level in the main tank can be observed on the tank level indicator. The scale is displayed in litres or Imp. gal/US gal. (certain countries).



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

External Cleaning Device (optional)

This equipment comprises a hose reel and spray gun (C) used to clean the complete sprayer externally in the field with clean water. The External Cleaning Device gun (C) is located on the sprayers right side behind the ChemLocker cover.



Ball valve:

A. Open

B. Closed

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

WARNING! The Cleaning Device produces a high pressure and incorrect use may result in personal injuries!

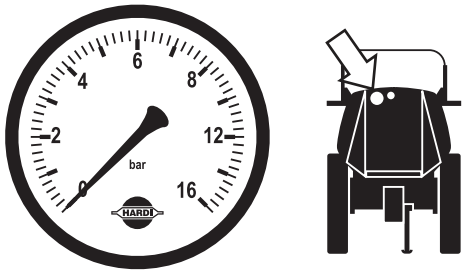
DANGER! Never work in bare feet or sandals. It is recommended to wear goggles during the work. It is recommended that the user or anyone near the cleaning place protects himself against particles bouncing up during the cleaning.

DANGER! For the safety of yourself and others, the following rules should always be observed:
Never point the water jet at people, animals, electrical installations or other sensitive objects.
Never try to clean clothing or footwear which you or other people wear.

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.

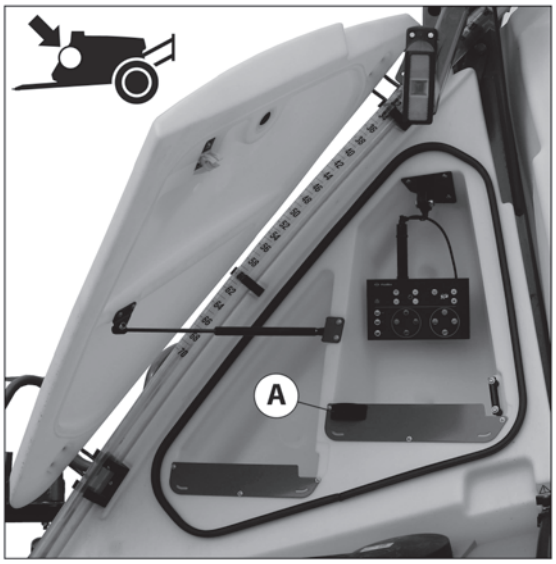
The outputs stated in the nozzle charts are always based on the pressure measured at the nozzle. Both when calibrating and spraying, the pressure must be adjusted according to the readings of this pressure gauge.



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).

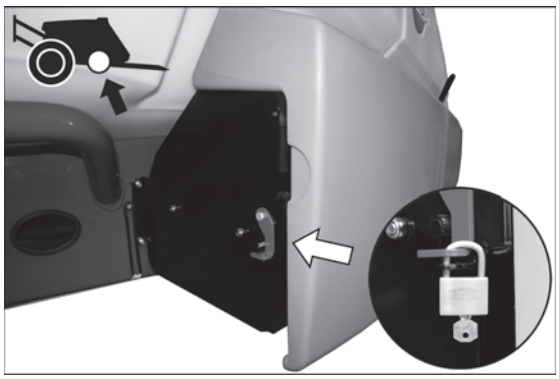


WARNING! Although this locker is meant for storing nontoxic items, it must never be used for storing food, beverage or other things meant for consumption.

ChemLocker

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.



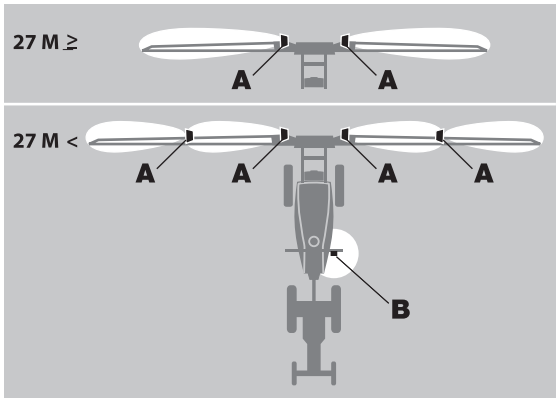
ATTENTION! Max. load 100 Kg./100 litre.

The ChemLocker has a drain-able plastic insert.

Night Spraying Light (optional)

The 2 boom floodlight lamps (A) are mounted to the booms (one at each side) and are positioned to illuminate both boom wings. Booms from 28 metres and up do have another two floodlights mounted in order to further illuminate the outer ends of the boom.

The work light lamp (B) is also mounted to the railing of the platform above the valves. This lamp is positioned to lighten the HARDI TurboFiller and the valve system. The boom and work lights selector switch is placed just below the SafetyLocker (between valve shield and EasyClean filter).



ATTENTION! It is recommended to switch OFF the rear working lights of the tractor in order to save power consumption and to avoid reflection. Power supply is via the 2-pin socket. Please see the Installation Instruction in the part Technical specifications.

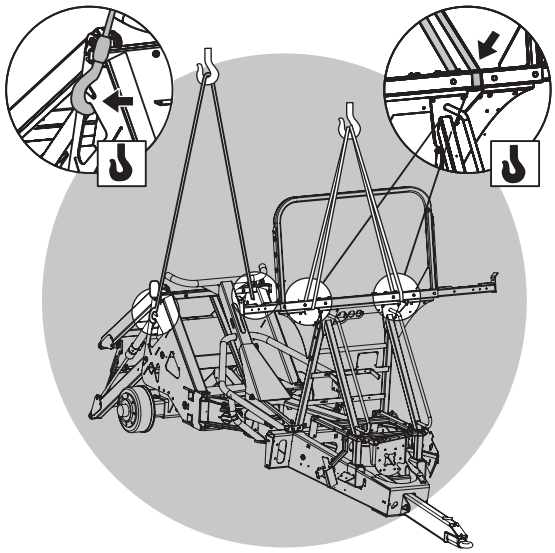
ATTENTION! Turn OFF all the work lights when driving on public roads!

General info

Unloading the sprayer from the truck

For the unloading of the sprayer, you need a crane. When unloading with a crane please observe the lifting points as shown in the picture, and make sure that the straps or belts used for lifting are strong enough.

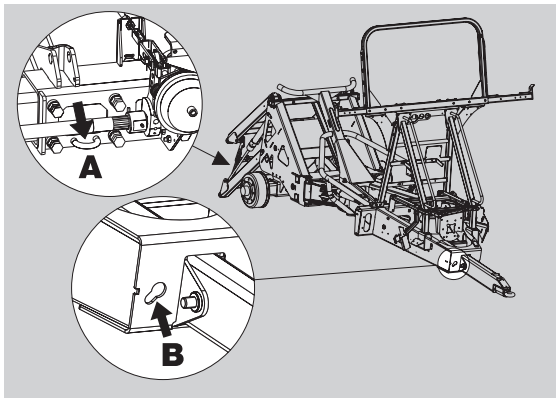
ATTENTION! Only lift the sprayer when the tanks are empty!



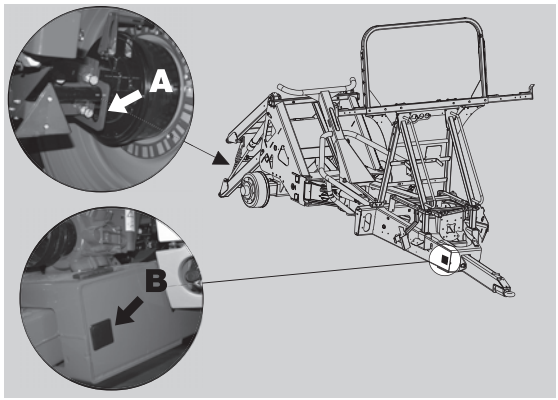
Pulling the sprayer at the tie down hooks

For moving the sprayer or loading it to e.g. a truck it can be pulled in the hooks at the rear-end (A) and front-end (B) as shown.

COMMANDER 3300/4500



COMMANDER 5500/7000



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.

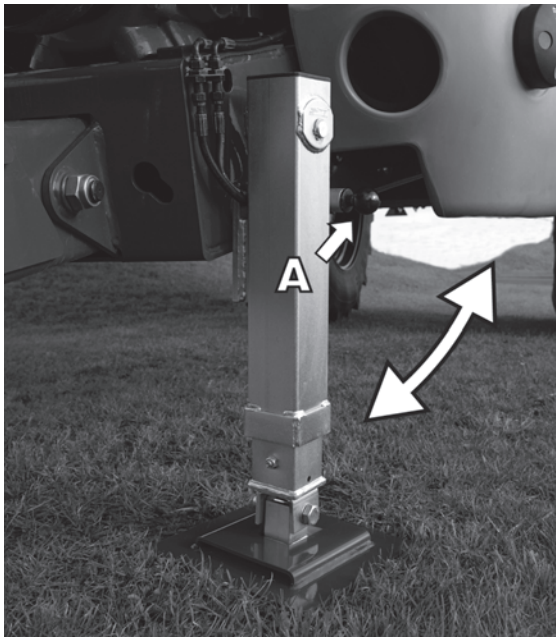
4 - Sprayer setup

Hydraulic support leg (option for CM 3300/4500)

The hydraulic support leg is driven by a separate double acting hydraulic outlet on the tractor. The support leg is stored in its retracted position when the sprayer is attached to the tractor.

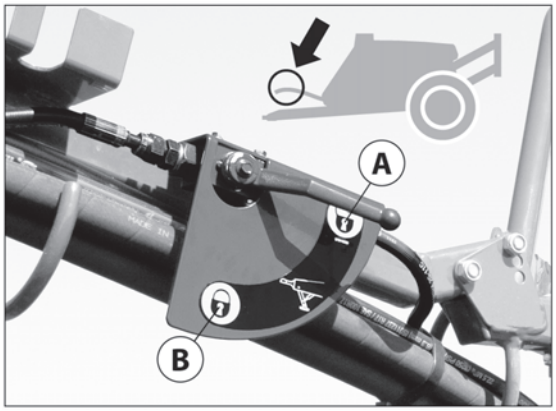
To raise/lower the support legs

1. Pull the knob (A) to fold-up/down the support leg to/from its storing position.



NOTE! This does not apply to the CM 5500/7000 support leg.

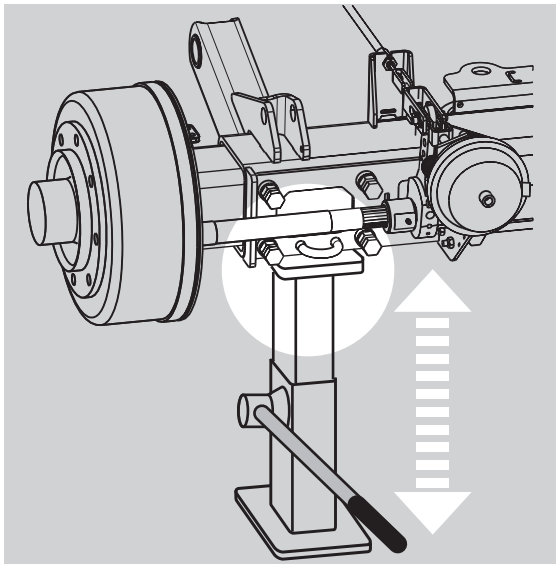
2. Unlock the leg by turning the securing grip to position (A).
3. Use the tractor's hydraulic lever to raise or lower the support leg.
4. Secure the leg by turning the grip to position (B).



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

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.



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

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

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.

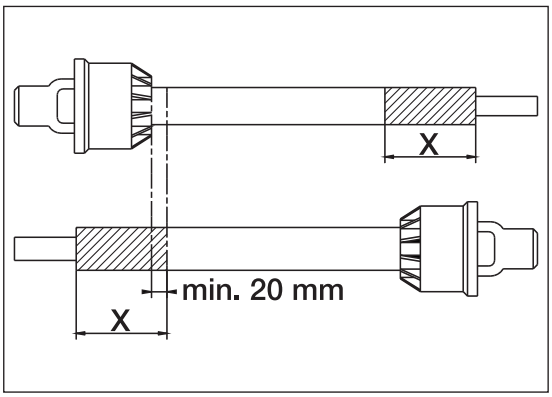
DANGER! ROTATING TRANSMISSION SHAFTS WITHOUT PROTECTION GUARDS ARE FATAL.

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.

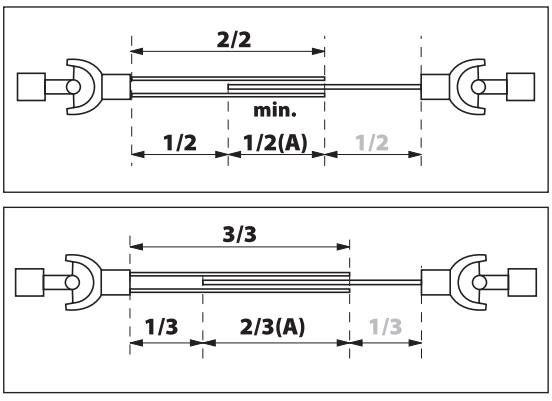


WARNING! Do only shorten the shaft if absolutely necessary!

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!



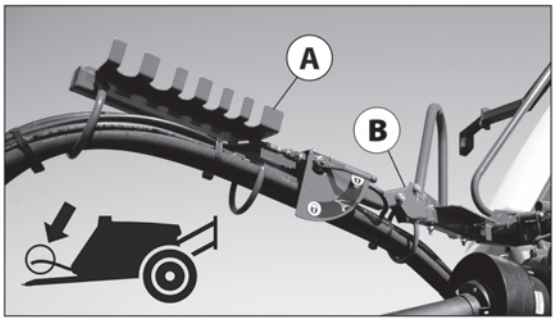
4 - Sprayer setup

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).

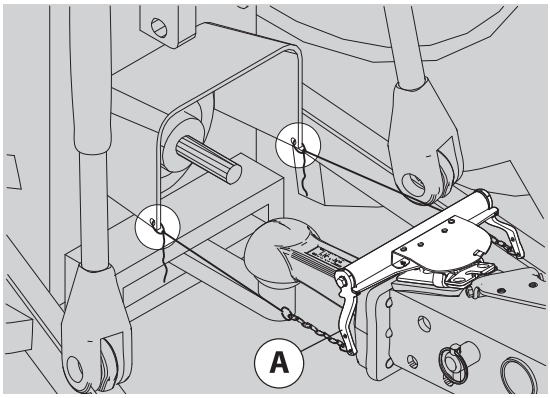


ATTENTION! Check that the length of the hoses and cables are sufficient by tight turns.

ATTENTION! A sprayer with SafeTrack requires more slack in the cables. Make sure cables are long enough in tight turns when fully steered.

SafeTrack potentiometer connection

When connecting the SafeTrack sprayer to the tractor it is important to set up the front potentiometer on the drawbar correctly. The potentiometer must be connected to the tractor with the supplied 2 chains.



NOTE! To ensure a high precision the chains must be parallel and horizontal.

NOTE! To ensure a high precision the tractor hitch point may not have any sidewards movement.

Procedure when connecting the sprayer to the tractor:

1. Connect the sprayer.
2. Drive forward to ensure the sprayer follows the tractor in a straight line.
3. Connect the two chains for the potentiometer, while ensuring the transverse potentiometer bar is perpendicular to the drawbar. The chains must be parallel and horizontal, and tightened so that the torsion levers (A) are vertical.
4. Check if the potentiometer is reading 2.50 Volt, i.e. in centre position. Go to:

   HC 6500 / ISOBUS VT: Menu 4.5.4.6 Track sensor test and check if the Front sensor reading is 2.50 Volt.
5. If the voltage reading is not correct, then adjust the chain connection until voltage = 2.50 Volt. Allowable deviation is ±0.05 Volt.

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.

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.

Requirements - tractor (TERRA FORCE model)

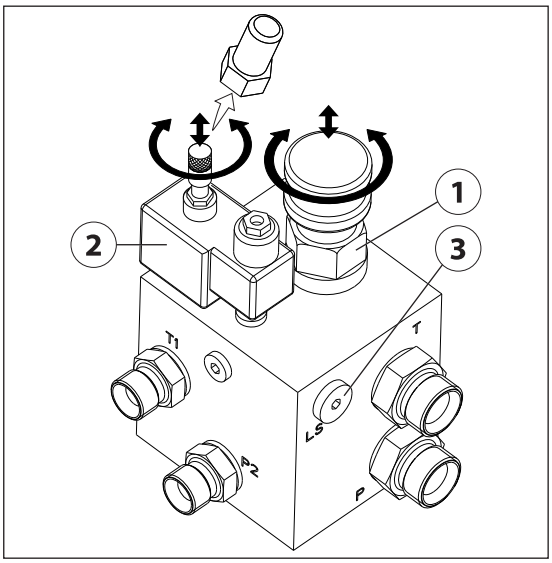
The hydraulic system requires:

- One double-acting outlet for the electro-hydraulic operation of the boom functions.
- One double-acting outlet for the operation of the FlexCapacity pump (optional).
- One double-acting outlet for the operation of the hydraulic support leg.

ATTENTION! The hydraulic hoses are marked with arrows to indicate the direction of oil flow.

- Oil flow between 50 and 130 l/min and a min. pressure of 190 bar.
- Maximum permissible oil pressure is 210 bar.
- Return flow restriction of the connected tractor must be maximum 15 bar.
- For Load Sensing systems an oil flow of approximately 3 l/min at 25 bar supplied by the sprayer hydraulics.

Open centre hydraulics (optional)



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 open centre hydraulics, but if closed centre hydraulics is used (also in combination with load sensing), screw in the valve (clockwise).

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.

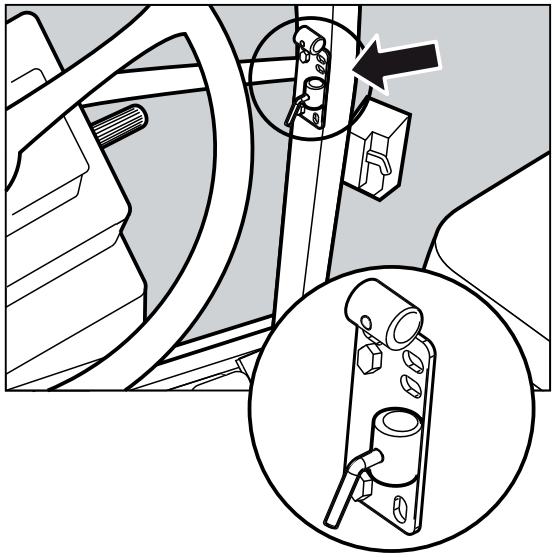
WARNING! Always be sure to fully open or close the open/closed centre selection valves. Failure to do so may cause damage to vital pump parts.

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.

Electrical connections

Installation of control unit brackets

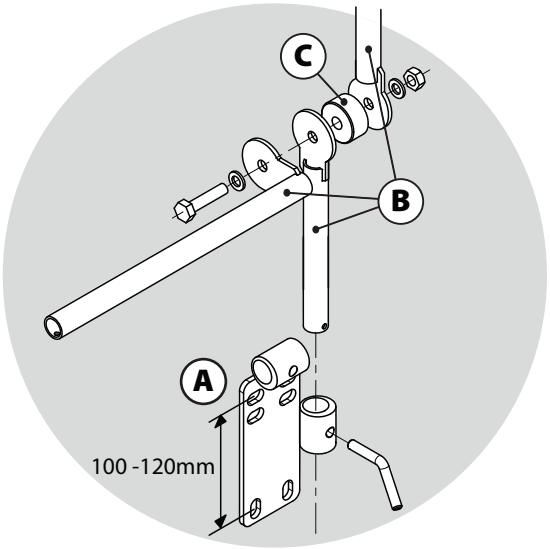
Find a suitable place in the tractor cabin to mount the control units. Best recommended position is to the right of the driver seat.



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".

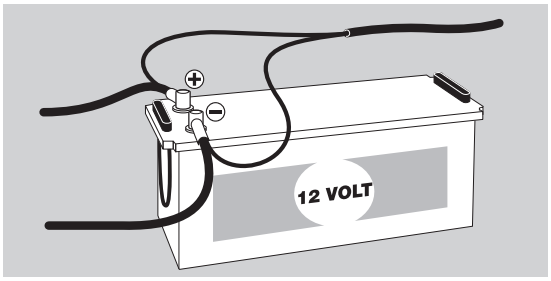
ATTENTION! Turn OFF all work lights when driving on public roads!

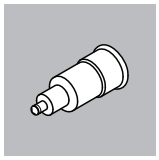
4 - Sprayer setup

Power supply

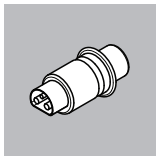
Power requirement is 12V DC. Always note polarity! For proper function of the electric equipment, the wires must have the following recommended cross sectional areas and correct fuses to ensure a sufficient power supply. The delivered power connectors follows the standard of most newer tractors. If you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



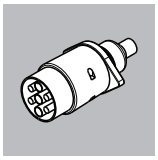


CIGAR CONNECTOR
Spray control unit requires:
Wire 2.5 mm^2, Fuse 10 Amp
Hydraulic control unit requires:
Wire 4.0 mm^2, Fuse 16 Amp

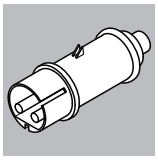


JOBCOM CONNECTOR
The unit requires:
Wire 6.0 mm^2, Fuse 25 Amp

ISO POWER CONNECTOR



7 POLE TRAFFIC LIGHT CONNECTOR

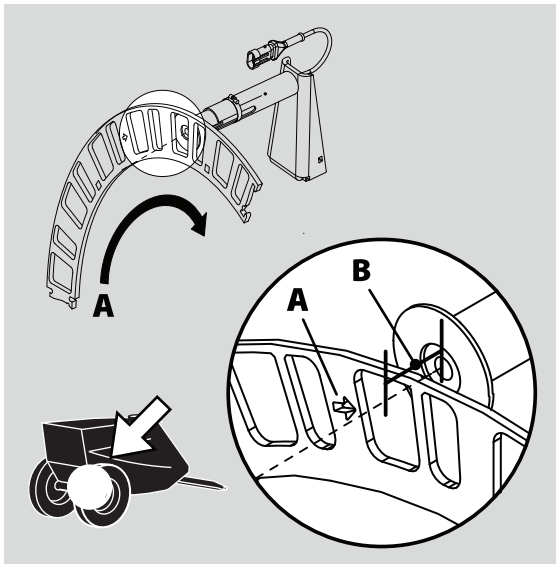


WORKING LIGHT CONNECTOR
The unit requires:
Wire 10.0 mm^2, Fuse 30 Amp

13 POLE POWER CONNECTOR

Speed transducer for sprayer

The speed 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.



Adjustment

1. Assure that the speed ring is correctly fitted to the wheel, so that the arrow (A) follows the forward rotation of the wheel.
2. Adjust so the sensor lines up in the middle of the gaps in vertical direction. Distance from centre of the sensor to top of the brake drum:
   - 412 mm brake drum = 60 mm
   - 400 mm brake drum = 75 mm

ATTENTION! If necessary readjust plate on the axle.

3. Adjust air gap (B) to 3.0 +/-0.2 mm. Use 3.0 mm feeler gauge or similar tool.

NOTE! Adjustment shall be made out of one of the carriage bolts for the speed ring.

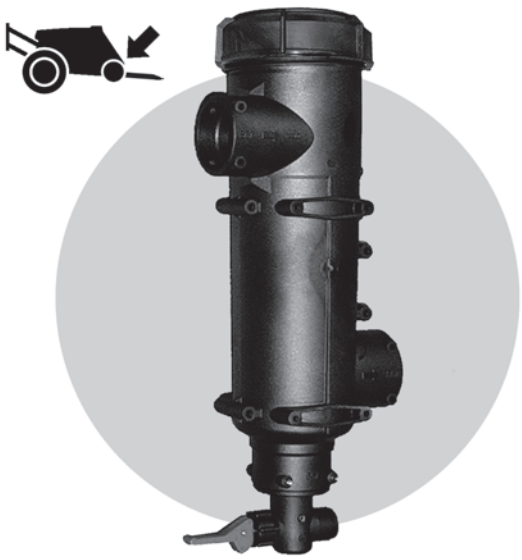
4. After adjustment then spin up the wheel. Verify air gap variation less than +/-0.5 mm. Check this at the entire circumference.
5. Verify Speed at the controller.

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

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.



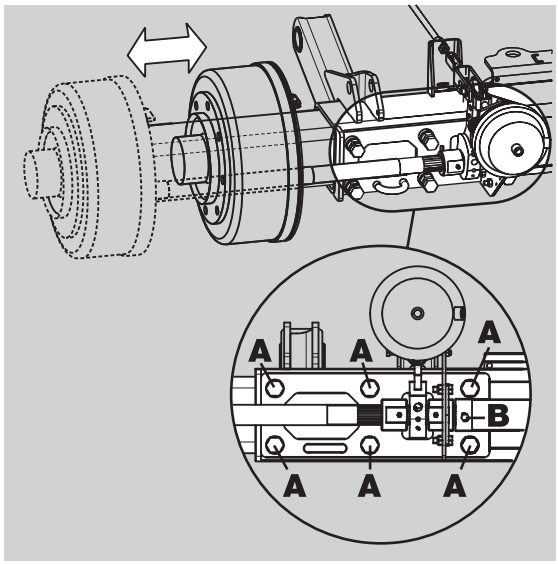
⚠ DANGER! Never open the Cyclone filter unless the suction SmartValve is turned to the unused position and the pressure SmartValve is turned to “Main tank”. Otherwise, spraying liquid may hit you when opening the filter, and drain from the main tank!

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. When having a handbrake, loosen the pointed screw (B) on the brake operating arm.
6. Extend or retract the axle. A sack barrow and a rod will facilitate the operation.
7. Lower down the LH wheel.
8. Tighten the clamp bolts (A) to a torque of 250 Nm and lock the bolts with the counternuts.
9. Repeat the procedure on RH wheel.
10. Check if the distance from centre tyre to centre of rear frame is equal at RH and LH.
11. Retighten bolts and wheel bolts to specified torque after 8 hours of work.

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

ATTENTION! Depending on configuration of the machine the track width can be altered in the range from 1500 mm to 2000 mm (narrow version), or from 1800 mm to 2250 mm (wide version) in combination of above adjustment and turning of the rims (offset).

Turning rim

Track width can be altered by turning the rim.

Offset:

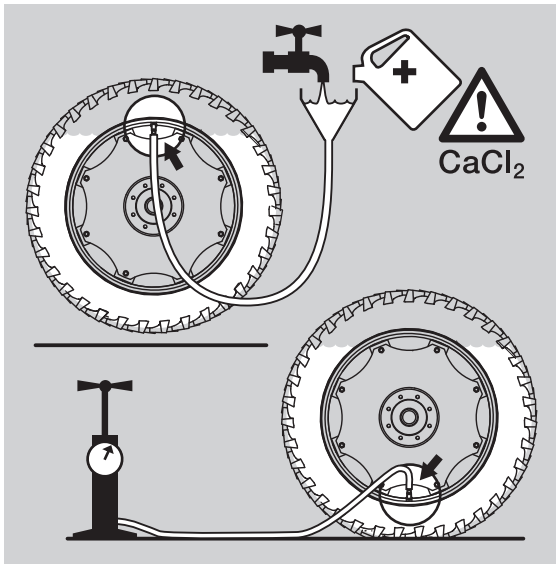
+ 61 mm

- 50 mm

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

Counter weight

To improve stability on articulated models, extra weight can be added by means of liquid-filled tyres. The standard tyre valve is an universal air-water valve. The tyres can be filled with liquid to max. 75% of their total volume.



Use a mixture of water and $CaCl_2$ to avoid frost damage as described below:

200 g (7.1 oz) $CaCl_2$ per litre water gives protection to -15°C (30.6°F)

300 g (10.6 oz) $CaCl_2$ per litre water gives protection to -25°C (12.6°F)

435 g (15.4 oz) $CaCl_2$ per litre water gives protection to -35°C (-5.4°F)

To fill the tyres

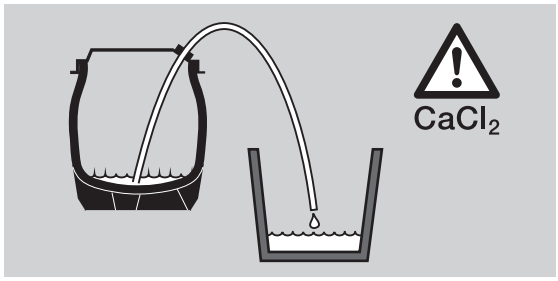
1. Jack up the wheel and rotate wheel till the valve is positioned at "12 o'clock".
2. Remove the valve body and fill liquid until it reaches the valve.
3. When surplus liquid is drained through the valve stem fit the valve body again.
4. Adjust tyre pressure and lower the wheel. Please refer to "Tyre pressure" on page 109.

DANGER! It is very important that the $CaCl_2$ is added to the water and agitated until it is fully dissolved. Never pour water on to $CaCl_2$! If you get $CaCl_2$ in the eyes, flush instantly with cold water for at least 5 minutes and seek medical advice afterwards.

WARNING! The tyres must be liquid filled to max. 75 % of total tyre volume. Fill only the qty. of liquid necessary to obtain sufficient stability of the sprayer. Do not fill liquid and $CaCl_2$ mixture in tyres without tubes!

ATTENTION! When filling the tyres the valve should be positioned at 12 o'clock and when adjusting the tyre pressure, the valve should be positioned at 6 o'clock.

To empty the tyres



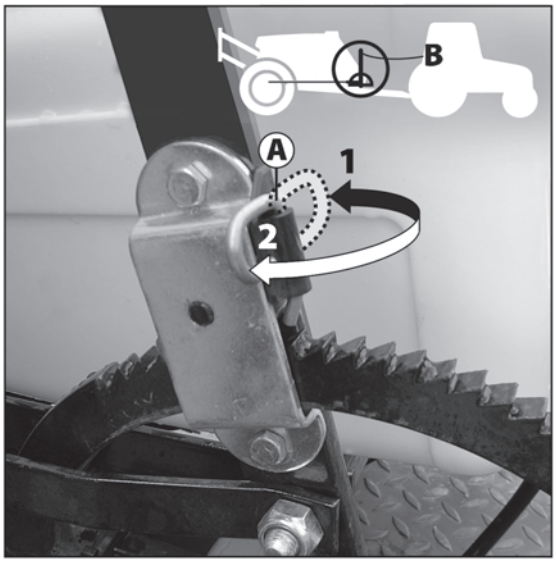
1. Rotate wheel till the valve is positioned at "6 o'clock".
2. Remove the valve body and let out the liquid. Retain liquid in an appropriate container.
3. To empty the tyre completely the tyre is inflated and a thin drain tube is lead to the bottom of the tyre. The air pressure will now empty the remaining liquid.
4. Remove the drain tube, fit the valve and inflate the tyre to specified pressure. See "Technical specifications" for the table "Tyre pressure".

ATTENTION! Disposal of $CaCl_2$ has to take place according to local legislation.

Brakes

Emergency and parking brake

The parking brake lever has two function modes, which are determined by the small pawl control clip (A). To change between the two modes, turn the clip.



Position	Rest position	Behavior
1	Rest against the pawl	Disengage parking brake
2	Point away from the pawl	Engage parking brake/Emergency brake

Disengage the parking brake

1. Set pawl control clip in position 1.
2. Pull the lever a little forward to release the pawl from the ratchet and then push the lever fully backwards.

Engage the parking brake

1. Set pawl control clip in position 2.
2. Pull the lever firmly forwards until parking brake is fully engaged.

Emergency brake

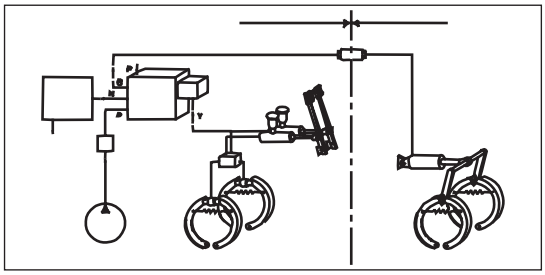
1. Set pawl clip in position 2.
2. Attach the rope from the hole in top of the hand brake lever to e.g. the tractor top link attaching point (B). If the sprayer is accidentally unhooked during transport the rope will apply the parking brake before the rope breaks.

ATTENTION! To ensure safe engagement and to avoid damages to the parking brake use rope with an ultimate stress between 690 N (155 lb.) and 785 N (176 lb.).

WARNING! Relieve the parking brake before driving!

Hydraulic activated brakes

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.

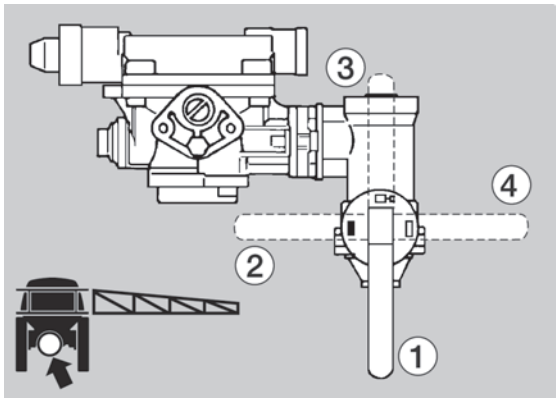
WARNING! Max. oil pressure is 150 bar (2175 p.s.i.) in the brake line.

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.

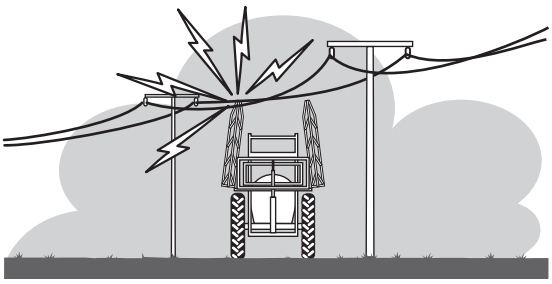
DANGER! Before unfolding the boom it is important to connect the sprayer to the tractor to prevent overbalancing of the sprayer.

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! A label (ref. no. 978448) follows the sprayer. This label must be placed in the cabin visible from the operator's seat.

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

Manoeuvring of the boom - TERRA FORCE

WARNING! The pendulum lock automatically turns ON when pressing one of the folding buttons. Boom folding is not possible if the pendulum is unlocked. A manual override of the pendulum lock is possible by activating switches 2 or 3.

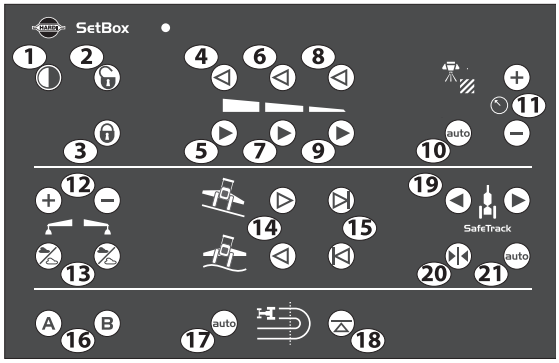
WARNING! Only operate the folding functions when the sprayer is stationary! Failure to do so may damage the boom. The pendulum lock automatically opens at speeds exceeding 1.5 km/h!

ATTENTION! If a folding sequence is not completed, a warning message will ask you to complete this sequence before starting next sequence.

ATTENTION! Only buttons relevant for boom functions are mentioned here. Refer to "Boom" on page 11 for descriptions of other buttons.

To unfold the boom

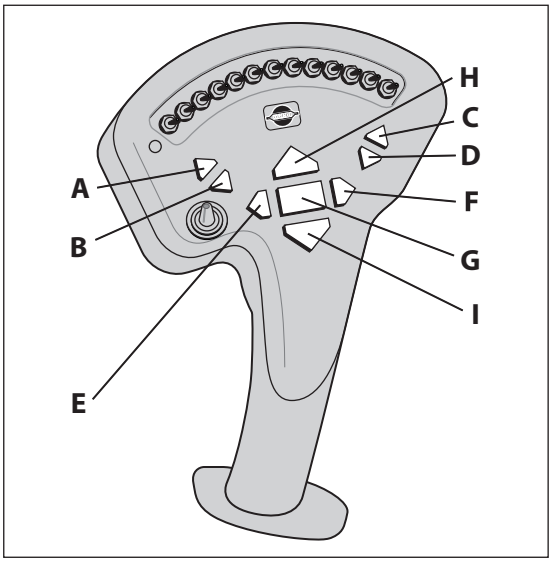
WARNING! The pendulum lock automatically opens when you begin to drive. Drive slowly until the pendulum is completely unlocked.



1. Push the lift up button (H) to lift the boom clear of the transport brackets. The symbol appears in display until pendulum is locked. This takes approximately 10 seconds.
2. Push the button (5) to unfold the inner wings completely (approximately 5 seconds or a warning will appear). Check that the pendulum locked symbol is visible in the display.
3. If no tilt wires fitted, press (B) and (D) to tilt boom wings down to working position.
4. Push the button (7) to unfold the 1st outer wings.
5. Push the button (9) to unfold the 2nd outer wings.
6. Push the lift down button (I) to lower the boom to the correct working height.
7. If not unlocked, then press (2) and symbol appears in display until pendulum is unlocked. This takes approximately 10 seconds.

To fold the boom

WARNING! If having SafeTrack is must be aligned and locked before folding.



1. Push slant buttons (E) or (F) to set neutral slant angle (no slant).
2. Push lift up button (H) to raise the boom to the highest possible position.
3. Push the button (8) to fold the 2nd outer wings. The symbol appears in display until pendulum is locked. This takes approximately 10 seconds.
4. Push the button (6) to fold the 1st outer wings. Check that the pendulum lock symbol is visible in the display.
5. If no tilt wires fitted, press (A) and (C) to tilt boom wings up.
6. Push the button (4) to fold the inner wings.
7. Push the lift down button (I) to lower the boom until it rests in the paralift locks.
8. If no tilt wires, press (B) and (D) to lower boom wings until they rests in the transport brackets.

5 - Operation

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

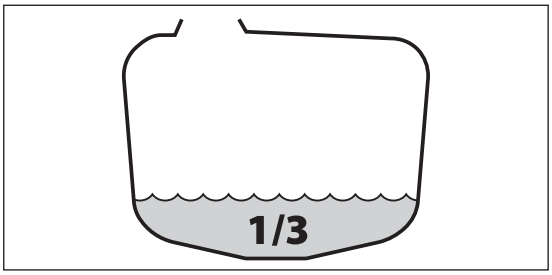
   2) 50 metres from surface water (watercourses, lakes and coastal waters), treatment sumps, cesspools of drainage systems, and nature reserves.

ATTENTION! Legislation and requirements vary from country to country. Always follow local legislation in force at any time.

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!

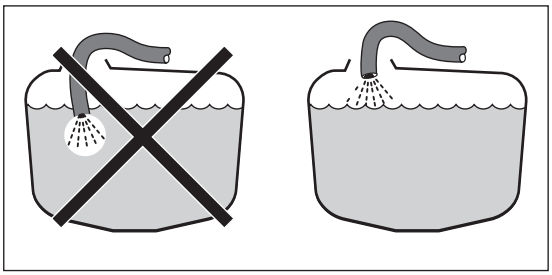


WARNING! If the sprayer is put aside with liquid in the main tank, all MANIFOLD valves must be closed.

Filling through tank lid

Water is filled into the tank by removing the tank lid located at front of the sprayer tank which is accessible from the platform. It is recommended to use as clean water as possible for spraying purposes. Always fill water through the strainer basket to prevent foreign particles from entering the tank. An overhead tank can be used in order to obtain high filling capacity.

WARNING! Do not let the filling hose enter the tank. Keep it outside the tank, pointing towards the filling hole. If the hose is led into the tank and the water pressure drops at the water supply plant, chemicals may be siphoned back and contaminate the water supply lines, plant and well.



WARNING! The water supply line should be provided with a check valve as additional safety precaution. Follow local legislation in force at any time.

WARNING! The water supply should be provided with a meter to avoid spillage by over-filling. Follow local legislation in force at any time.

Filling of rinsing tank

The rinsing tank is filled via the 1" threaded connection piece at the valve system:

1. Remove the filler cap, then fit the external water hose to the threaded 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 450 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

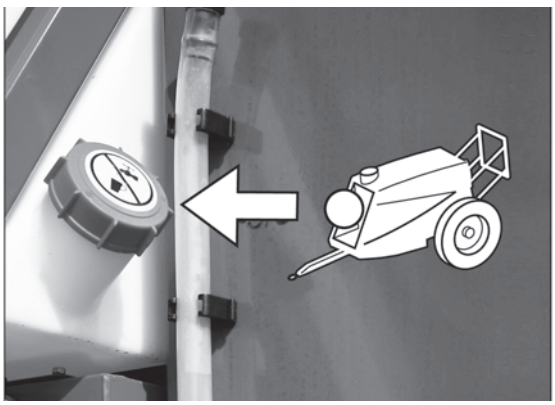
To fill the clean water tank:

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.

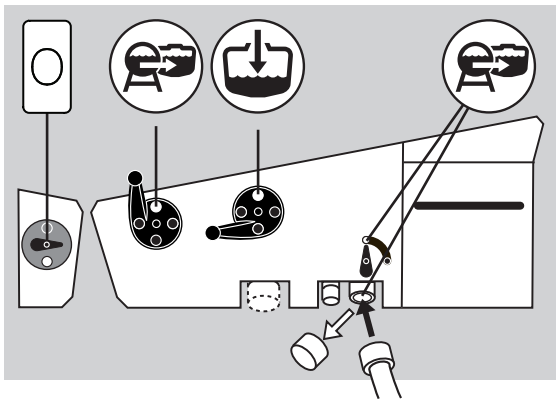


WARNING! Although the clean water tank is only filled with clean water, this water must NOT be used for drinking.

External Filling Device

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 lake/river 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.

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.

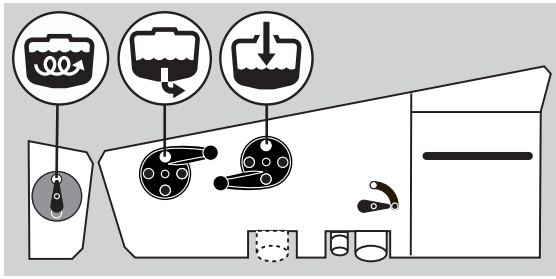
WARNING! Always clean the sprayer before changing to another chemical.

Filling chemicals through tank lid

The chemicals are filled through the tank lid - Note instructions on the chemical container!

WARNING! Be careful not to slip or splash chemicals when carrying chemicals up to the tank lid!

ATTENTION! Due to risk of spillage and spot contamination it is not allowed in several countries to fill chemicals directly through the tank lid. Use the TurboFiller for all induction of chemicals instead.



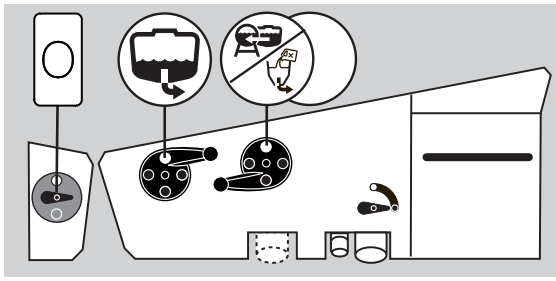
1. Make sure the spray control unit is switched off.
2. Set suction valve towards "Suction from main tank", Agitation valve towards "Agitation". Other valves should be closed or turned to unused function.
3. Engage the pump and set P.T.O. revolutions to 540 r/min or 1000 r/min depending on pump model.
4. Add the chemicals through the main tank hole.
5. When the spray liquid is well mixed, turn handle on 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.

DANGER! Before turning Pressure SmartValve to "Pressure draining/TurboFiller" 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.

NOTE! Local legislation may not allow filling through the tank lid, but will require use of the chemical inductor instead.

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. Turn the handle of the suction valve towards "suction from Main tank". Turn pressure SmartValve towards "Pressure draining/TurboFiller". Close the AgitationValve.



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

DANGER! Before turning Pressure SmartValve to "Pressure draining/TurboFiller" 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. 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. Engage the hopper transfer device by opening the TurboFiller suction valve transfer chemicals to the main tank. The TurboFiller suction 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.

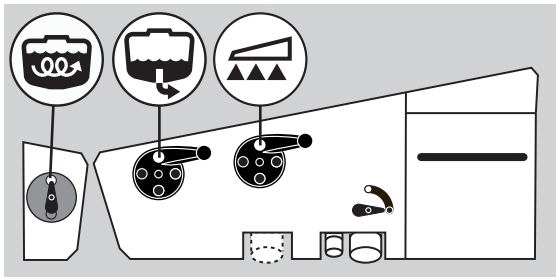
DANGER! In order to avoid spray liquid hitting the operator, do not press lever unless the multi-hole nozzle is covered by a container as spray liquid may otherwise hit the operator!

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.

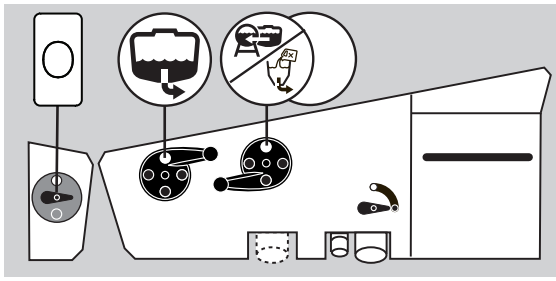
7. Flush the TurboFiller with clean water from the Rinsing tank. The TurboFiller suction valve must be open for at least 20 seconds after the rinse water is no longer visible in the hopper in order to completely empty the transfer hoses into the main tank.

ATTENTION! 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 TurboFiller suction 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 1/2 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 draining/TurboFiller". Turn the AgitationValve towards "Agitation" if required. Close remaining valves.

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

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

DANGER! Before turning Pressure SmartValve to "Pressure draining/TurboFiller" 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. 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 TurboFiller suction valve.
5. Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the transfer device can flush it down. The TurboFiller suction 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.

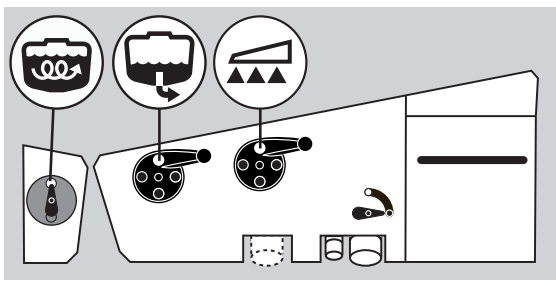
DANGER! In order to avoid spray liquid hitting the operator, do not press lever unless the multi-hole nozzle is covered by a container as spray liquid may otherwise hit the operator.

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 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.

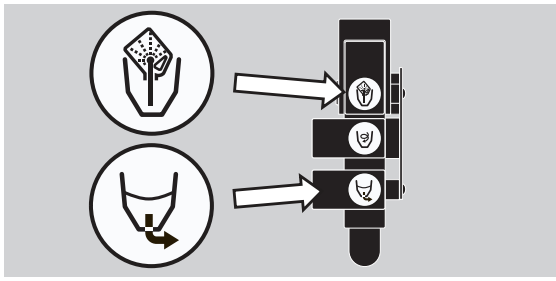
ATTENTION! If not flushed with clean water, the hopper rinsing device uses spray liquid for rinsing the hopper! Cleaning the TurboFiller must always be done when the spray job is ended and together with the entire sprayer - a cleaning after the last filling and before spraying the last tankful does not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

8. Close TurboFiller suction 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. Simultaneously press the Chemical Container Cleaning lever and the TurboFiller suction valve. This rinses the chemical container with the flushing nozzle while the rinsing liquid is emptied out of the TurboFiller.

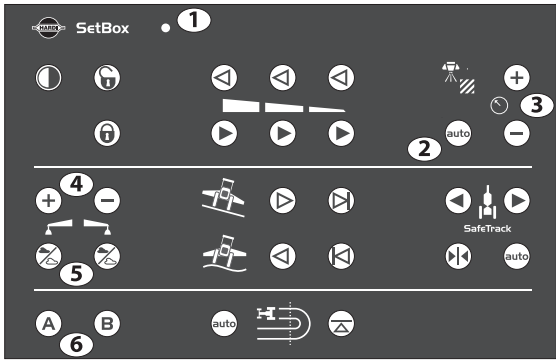
TurboFiller rinsing - TurboFiller lid is closed

1. Close TurboFiller lid.
2. Turn the suction SmartValve towards “Rinsing tank” or “External Filling Device” if clean water is available here.
3. Simultaneously press the Chemical Container Cleaning lever and the TurboFiller suction valve. 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.
5. Open the lid to inspect if the TurboFiller is empty. If not, close the lid again and press the TurboFiller suction 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 64 for details.

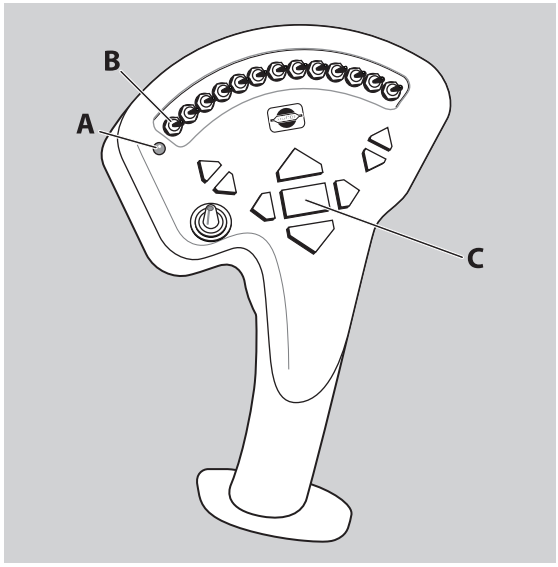
Operating the control units while spraying

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.

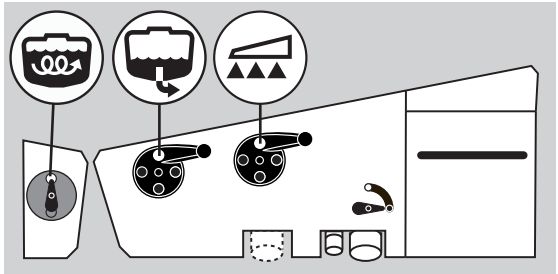


A. Power ON/OFF/status LED. LED must be ON.

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.

5 - Operation

Before returning to refill the sprayer

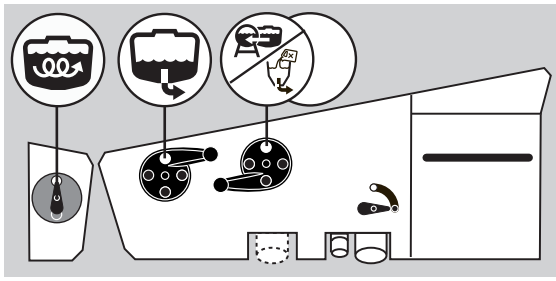
If the sprayer is to be refilled at the farm or at a fixed filling place without a filling space with hard surface and drain to closed reservoir, the sprayer should be rinsed before returning to refill.

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 draining/TurboFiller” 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.

DANGER! Before turning Pressure SmartValve to “Pressure draining/TurboFiller” 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.

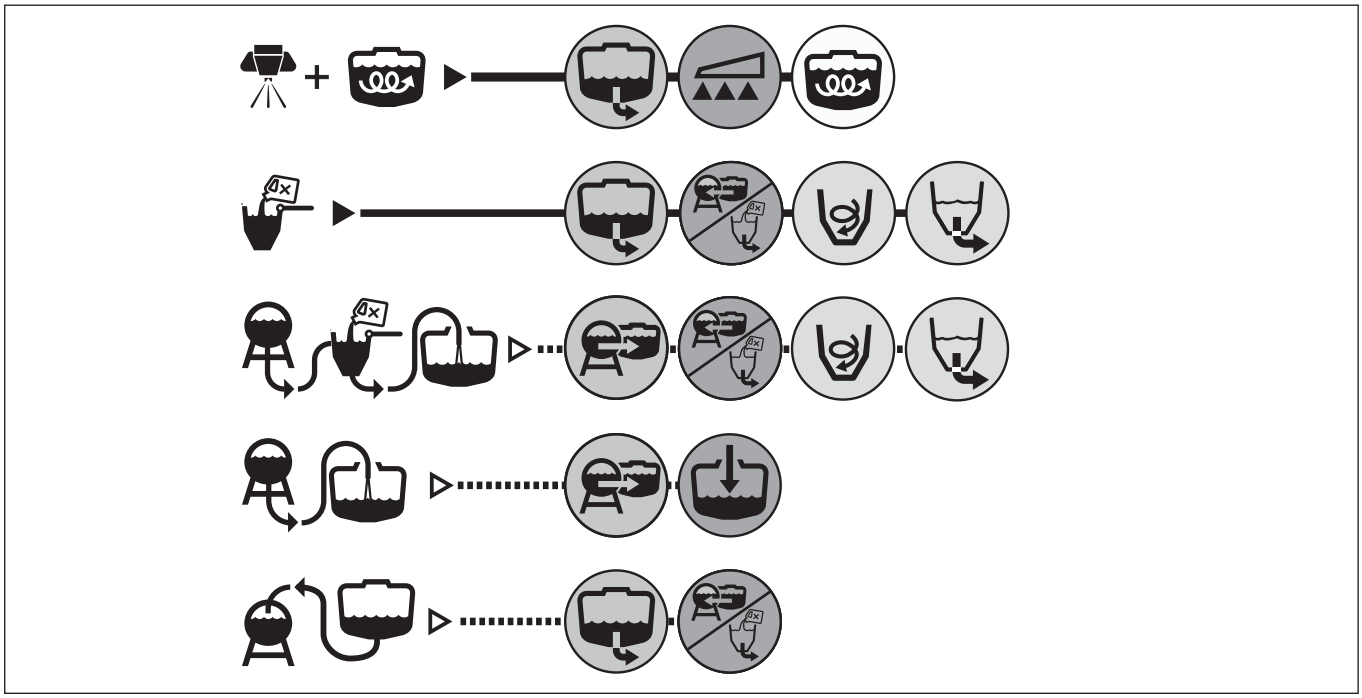
Parking the sprayer

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.

Quick reference - Operation

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



5 - Operation

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.

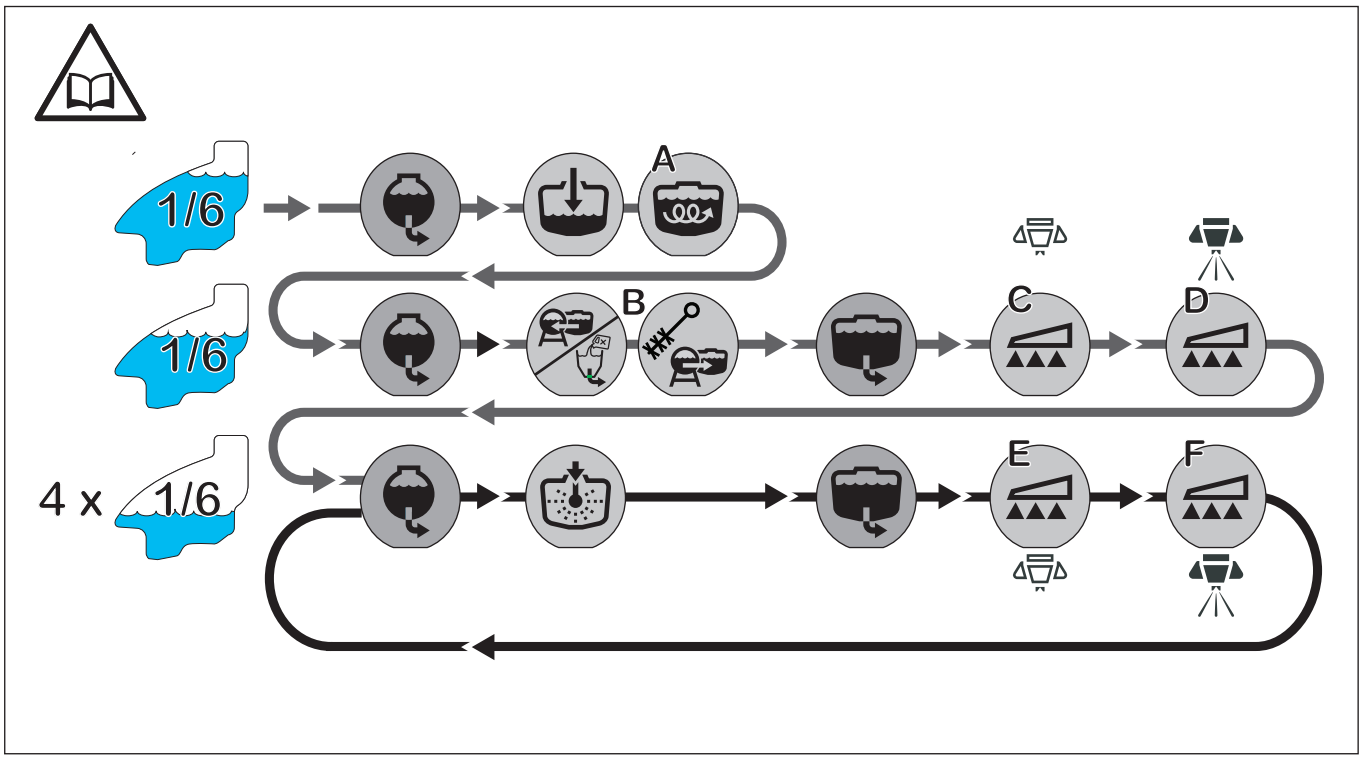
Clean sprayers are ready for action.

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 54.
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.

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 60.
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 68.

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 75 l) of the rinsing tank content at this valve setting.
5. Turn the pressure SmartValve towards "Pressure Empty/TurboFiller" for minimum 3 seconds to burst and flush the safety valve. The TurboFiller is not flushed by this operation.
6. Turn the agitation valve towards "FastFiller flushing" and use another 1/6 (approximately 75 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 75 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 75 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.

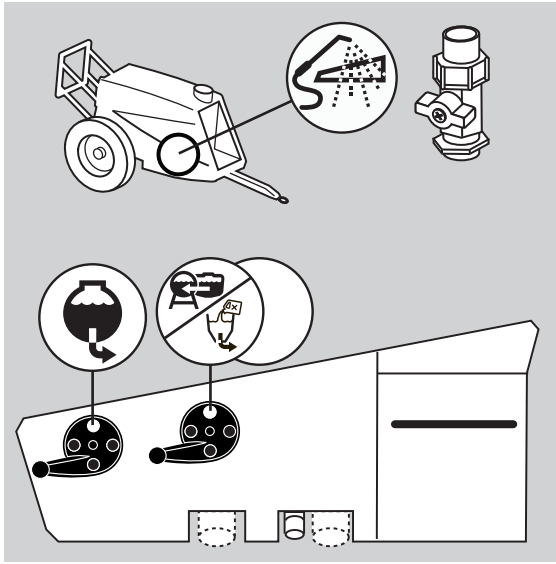
NOTE! Before attempting an external rinsing, make sure the main tank is rinsed (see "A. Full internal rinsing" on page 66) and empty! Any liquid left in the main tank will be mixed with the clean water for external rinsing!

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).

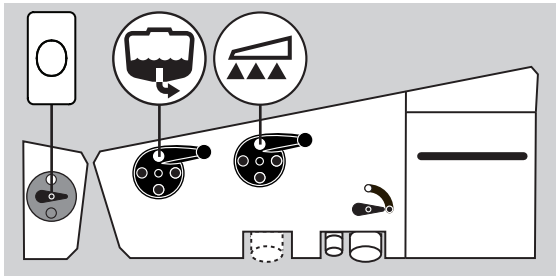
WARNING! Never clean the sprayer if there are risks of contamination of surface or underground water! Choose a different spot for cleaning every time to avoid spot contamination to build up.

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 "Internal Tank Rinsing".

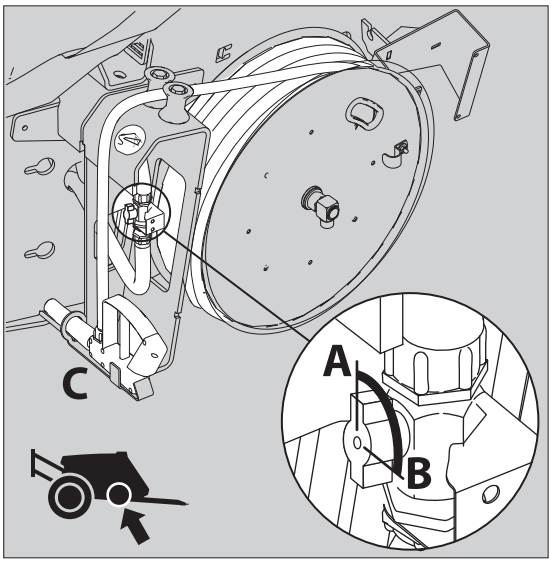
DANGER! Before turning Pressure SmartValve to "Pressure draining/TurboFiller" it is very important to be sure that the quick coupler lid is correct and completely mounted to the filling stud into its locked position. Failure to do so may cause risk of contamination and injury from quick coupler lid being "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 330 litres, 450 litres, 550 litres and 700 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 Empty/TurboFiller" for minimum 10 seconds without activating the TurboFiller in order to burst and flush the safety valve.
8. Open the TurboFiller transfer valve and 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 off all three valves on the TurboFiller again.
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. See “Technical residue” on page 107 for specific technical residues.

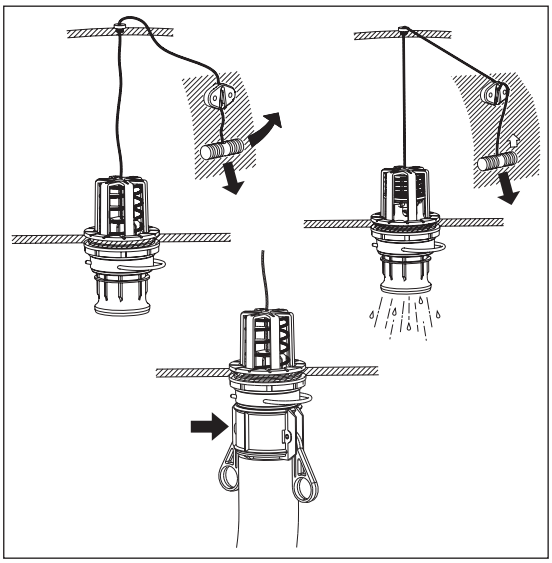
The residues in the tank should be diluted immediately in the relationship 1:10 with water and afterwards be sprayed to the crop just sprayed with increased driving speed. In addition, also pump, linkage and armature can be separately rinsed with water from the rinsing tank. It is to be made certain 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.

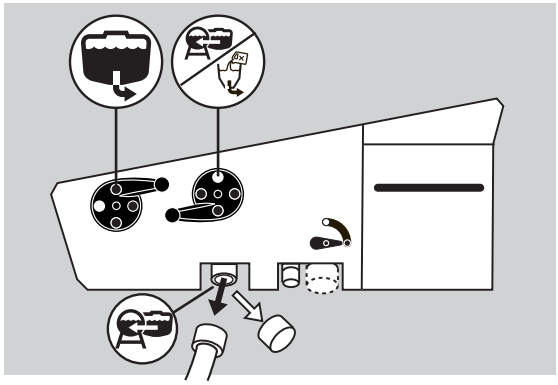
If draining residues, e.g. liquid fertilizer into a reservoir, a snap-coupler with hose can rapidly be connected to the drain valve and the liquid safely drained.



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/TurboFiller” 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.

Lubrication

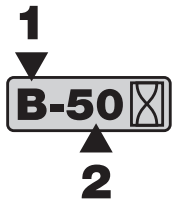
General info

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 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

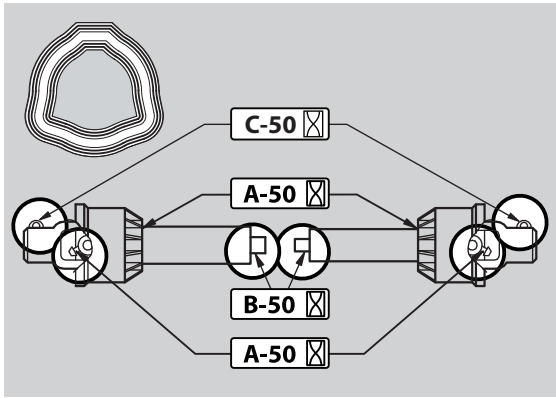
BALL BEARINGS:
Universal Lithium grease, NLGI No. 2
SHELL RETINAX EP2
CASTROL LMX GREASE

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

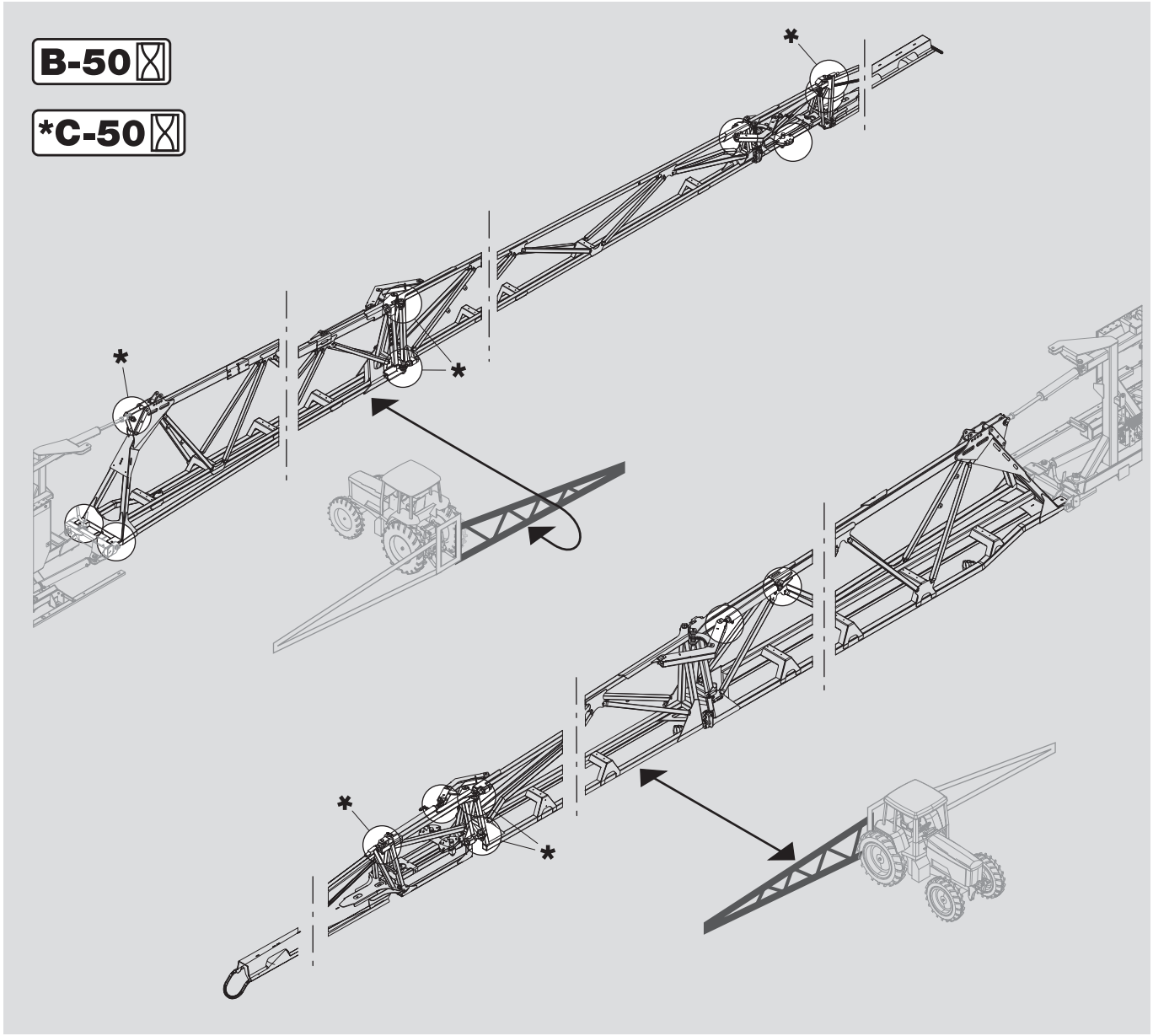
OIL LUB. POINTS:
TOTAL Transmission TM SAE 80W/90
Castrol EPX 80W/90
SHELL Spirax 80W/90
Mobil Mobilube 80W/90

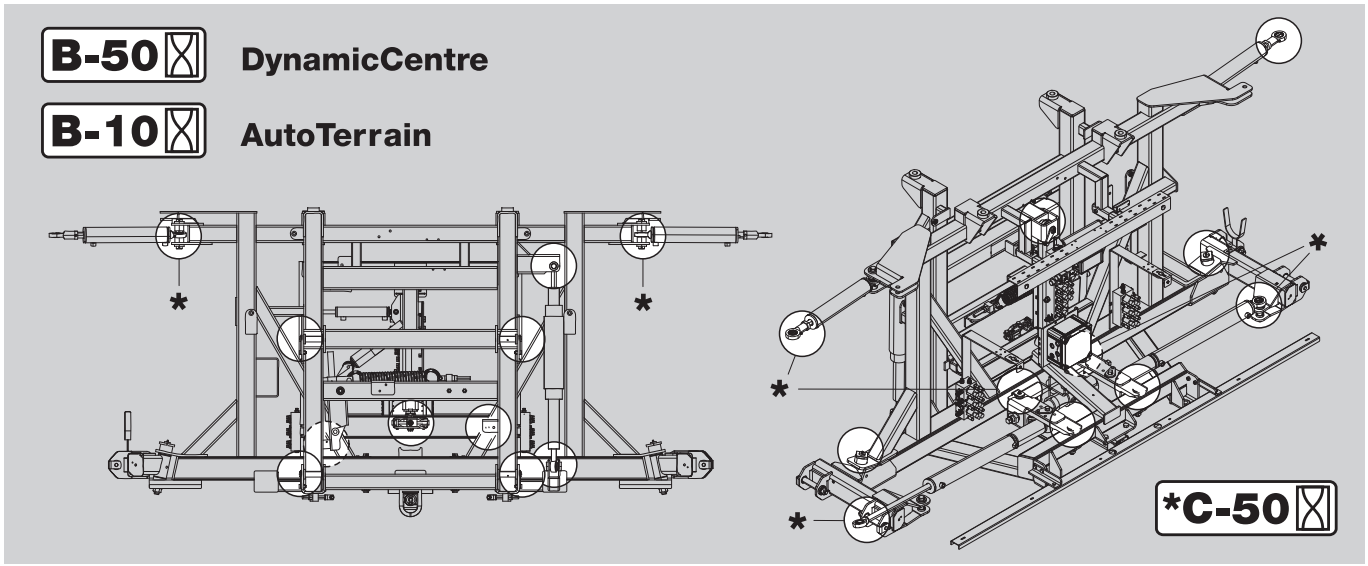
P.T.O. lubrication & oiling plan

Serie 100 type P.T.O. shaft

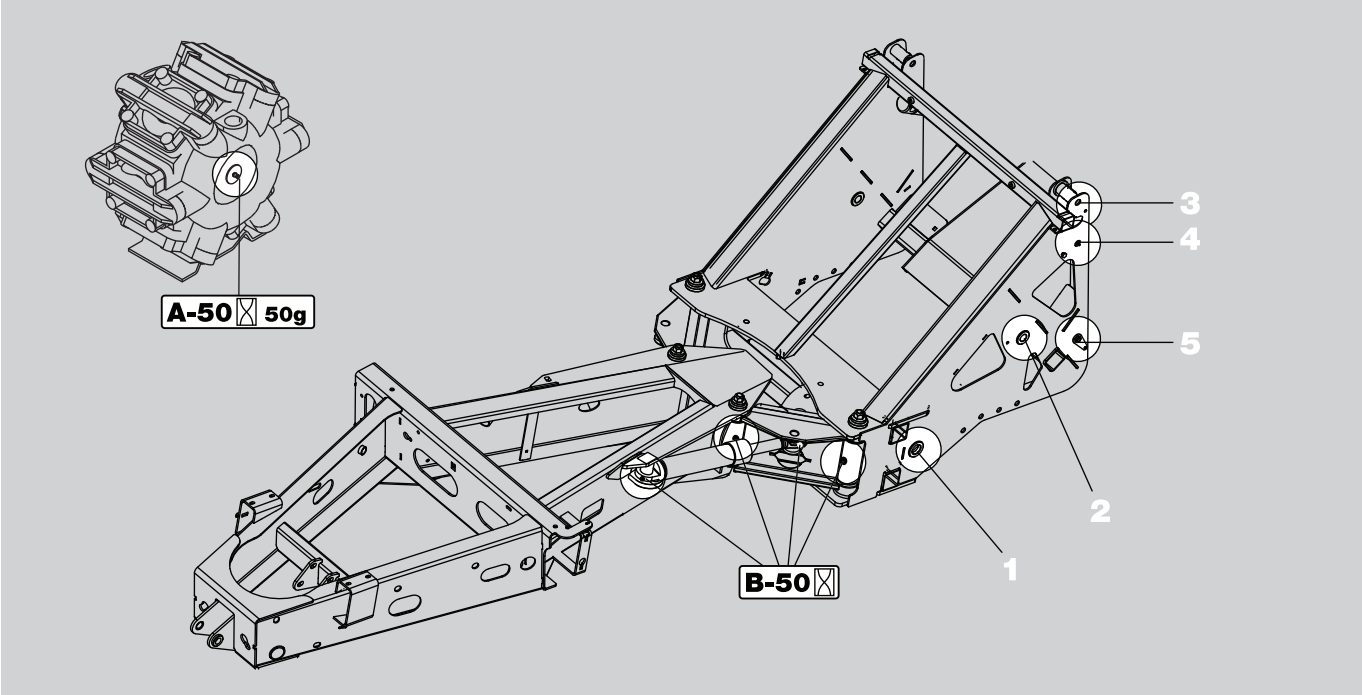


Boom lubrication and oiling plan





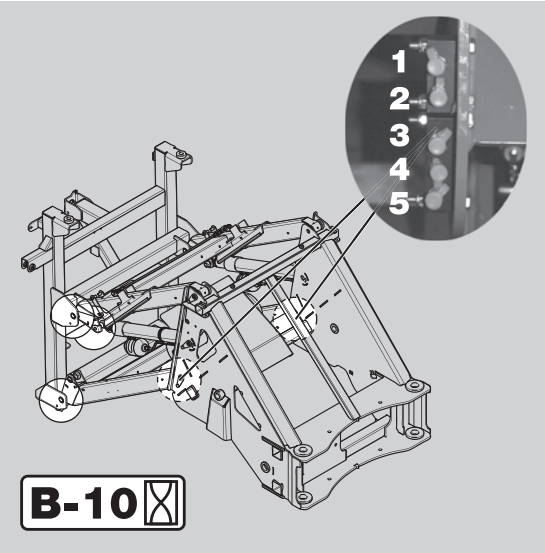
Trailer/ParaLift lubrication & oiling plan



The lift is remote lubricated from the inside of the trailer's rear end.

1. Suspended axle attach point.
2. Suspension cylinder attach point.
3. Upper lift arm attach point.
4. Lift cylinder attach point.
5. Lower lift arm attach point.

NOTE! Position 1 and 2 are for suspended sprayers only.



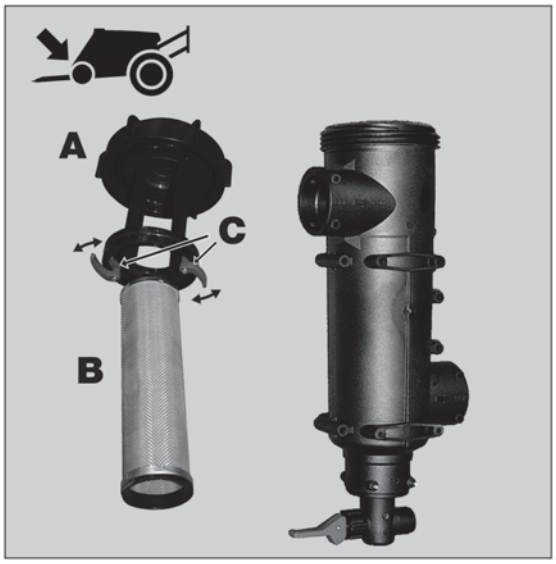
6 - Maintenance

Service and maintenance intervals

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

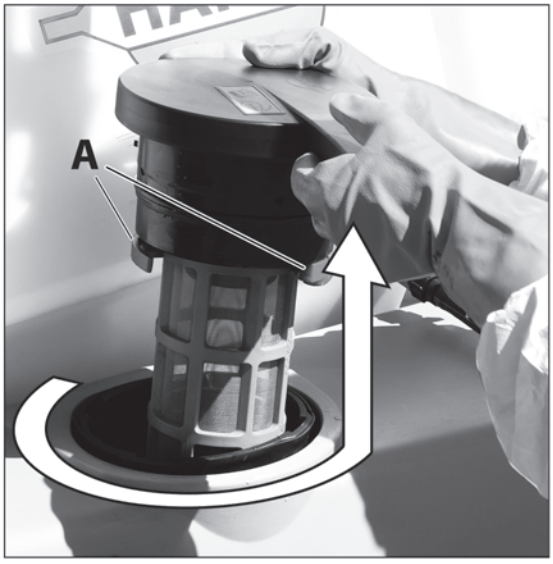
1. Grease the two O-rings on the lid/filter guide. Due to small space at lid for example use a brush to grease with.
2. Mount the filter onto the recess (which may not be greased) in the lid/filter guide.
3. Turn the two locks (C) inwards to lock the filter to the lid.
4. Place the filter/filter lid 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 "Emergency operation - EasyClean filter" on page 103.

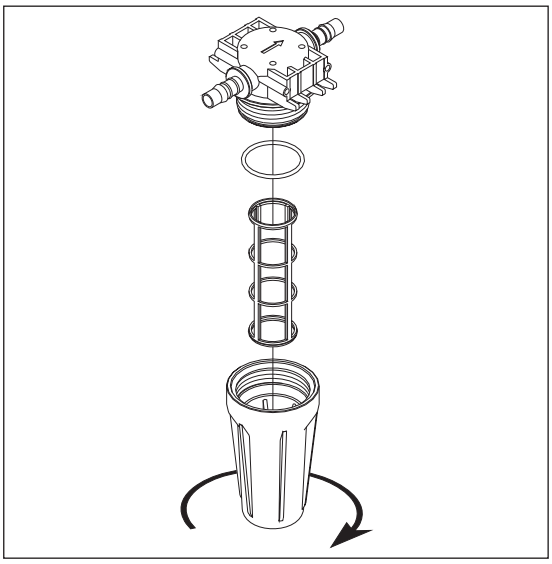
10 hours service - In-Line filter (not PrimeFlow)

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.

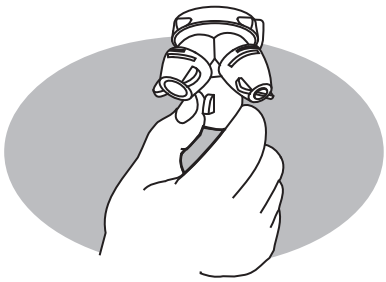
WARNING! Be careful not to splash out liquid when unscrewing the filter bowl.

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



10 hours service - Nozzle filters

Check and clean.



10 hours service - Spraying circuit

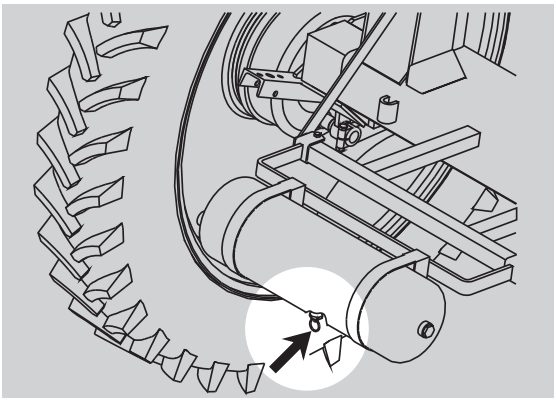
Fill with clean water, operate all functions and check for leaks using higher spray pressure than normal. Check nozzle spray patterns visually using clean water.

10 hours service - Brakes (Standard for CM 5500 and 7000)

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.



10 hours service - Lubricate boom and centre

Some lubrication points on the boom and centre parts need extra attention when having AutoTerrain system. These lubrication points, marked “10h” in “Boom lubrication and oiling plan” on page 74, need attention every 10 working hours to work correctly.

6 - Maintenance

50 hours service - Transmission shaft

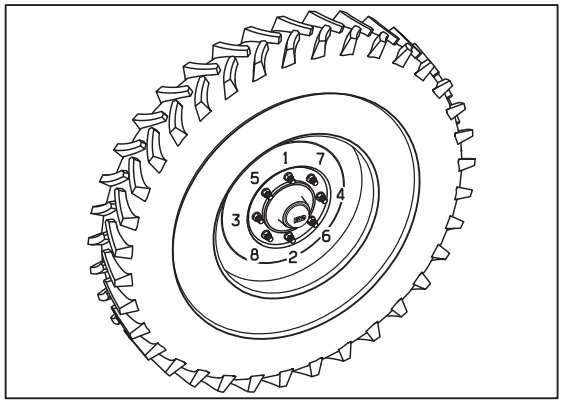
Check function and condition of the transmission shaft protection guard. Replace any damaged parts.

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".

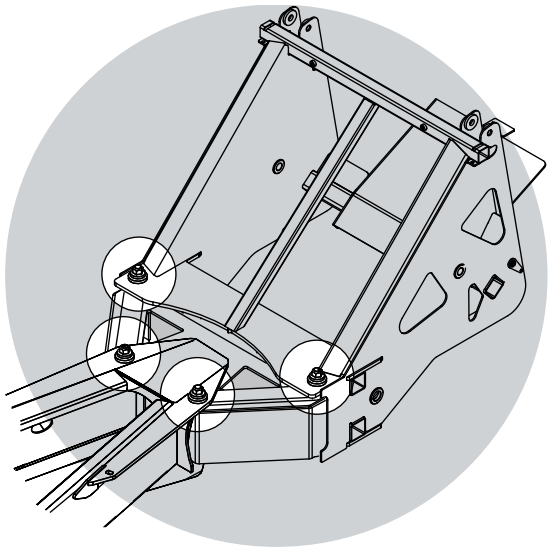
WARNING! If renewing tyres always use tyres with min. load index as specified.

100 hours service - Check/tighten steering

If too much play is found in the steering section it must be re-tightened. This applies to both steering and non-steering versions. Re-tighten the nuts on both sides to the specified torque.

NOTE! Specified torque is 250 Nm.

Be sure that the split pin is fitted (or re-fitted if dismounted) at the end of the big bolts.



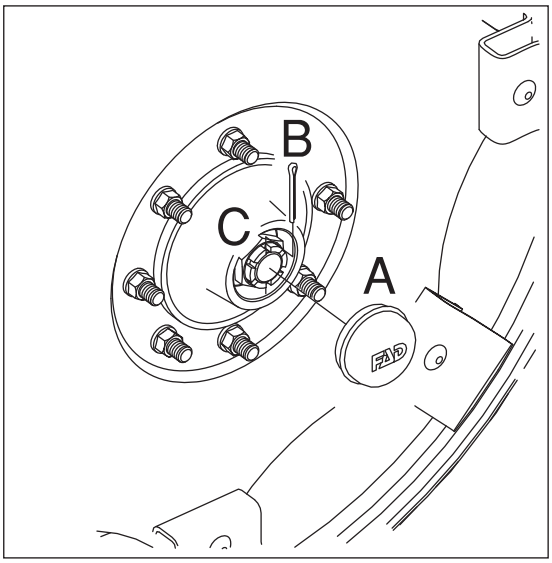
250 hours service - Readjustment of the boom

See section "Occasional maintenance" on page 83.

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.

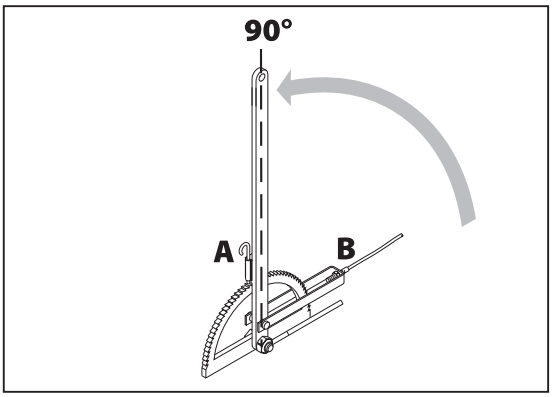
WARNING! Nitrogen accumulators may contain oil under pressure.

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 - Inspect parking brake (optional)

Inspect the following:



Parking brake lever

If it can be pulled further backwards than 90° (midway), using a traction of approximate 25 kg., the cable needs to be adjusted.

Parking brake cable

Inspect the parking brake cables for possible wear or damages. Replace worn or damaged parts.

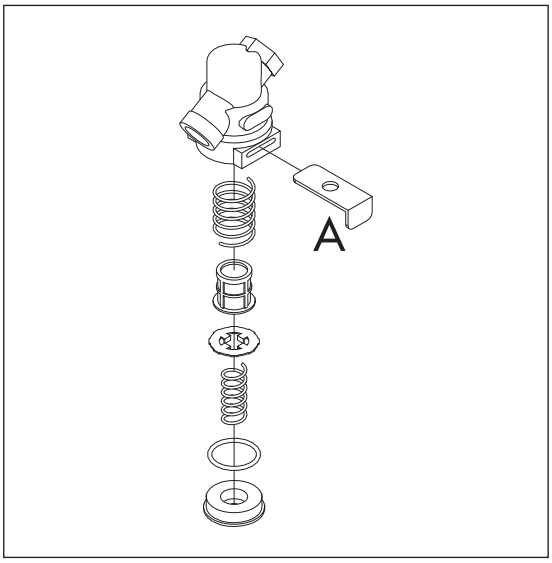
When the parking brake is relieved, the cable must be limp; otherwise it needs to be adjusted.

Correct length:

- When the brake is relieved the cable must be tight and yet not stretched.
- Lengthening/shortening of the parking brake cable is carried out by adjusting the turnbuckle located inside the chassis.

250 hours service - Air brake filters (optional)

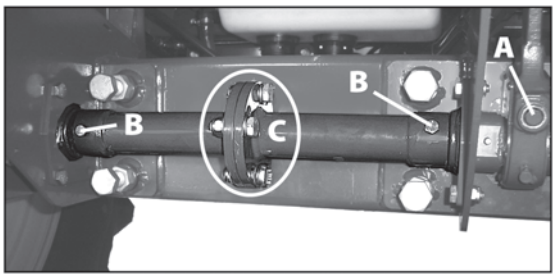
1. Clean the area around air filter(s) and disconnect air hose from the tractor.
2. Hold one hand under the filter housing, and pull out the retainer clip (A). The filter cartridge assembly will be pushed out by the springs inside the filter housing.
3. Clean the filter cartridge. Use water and an appropriate 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)

Lift the back of the sprayer from the ground. It is recommended to use two lifting jacks, placed underneath the axle. Make sure the sprayer is stable and secured before carrying out any adjustments.



1. Loosen the 4 bolts at the brake connector (C) between the brake arms. Also loosen the screw in each end of the brake connector and the hand brake cable.
2. Adjust the nut (A) counterclockwise. Turn the nut 60° (1/6 turn) at a time - alternately on both LH and RH brake. Continue adjustment till resistance occurs when rotating the hub/wheel.
3. Turn the nut 60° (1/6 turn) clockwise to loosen brake. Hub/wheel should rotate freely now.
4. Tighten the brake connector (C) bolts again.
5. Tighten the hand brake cable again - See "250 hours service - Inspect parking brake (optional)" on page 80.

WARNING! The adjustment must be carried out simultaneously on both brakes. Therefore, alternately adjust on both LH brake and RH brake.

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.

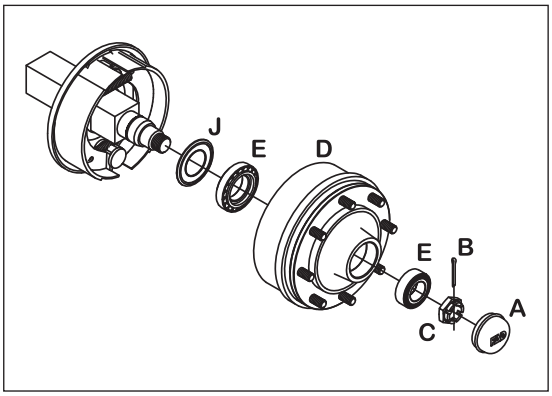
WARNING! Always prime the circuit if the hydraulic brake lines have been dismantled.

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.

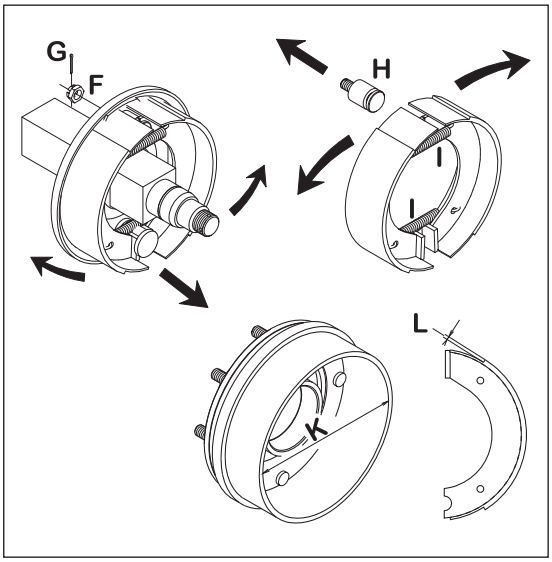
7. Rinse the remaining parts on the brake carrier plate with water and dry them.
8. Remove roller bearings (E), clean all parts in degrease detergent and dry them.
9. Check the brake drum diameter and lining thickness - renew if worn.

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 80.
22. Fit the wheel again and tighten the wheel nuts. See “50 hours service - Wheel nuts” on page 78 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

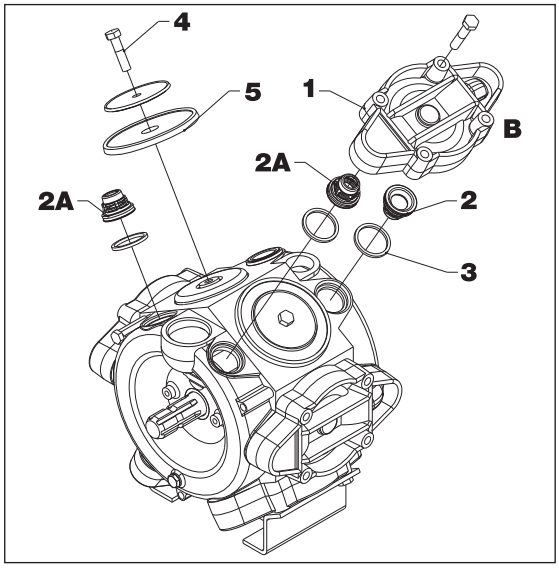
The maintenance and renewal intervals for the following will depend very much on the conditions under which the sprayer will be operated and are therefore impossible to specify.

Pump valves and diaphragms renewal

Model 463 pump:

Diaphragm pump overhaul kit (valves, seals, diaphragms etc.) can be ordered. Detect the pump model - kit can be ordered at following HARDI part No.:

Model 463: part No. 75073900



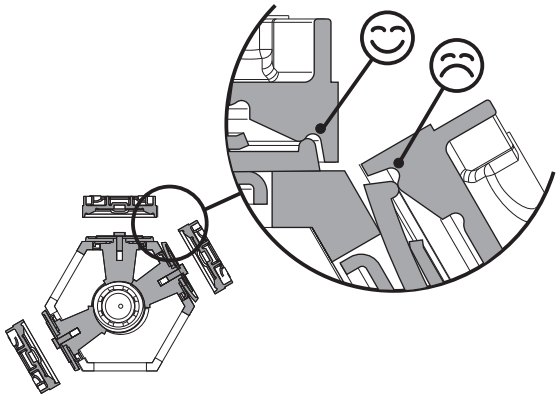
Valves

Remove valve cover (1) before changing the valves (2) - note their orientation so they are replaced correctly!

ATTENTION! A special valve with white flap (2A) is used at the two upper side inlets. It has to be placed in the valve openings as shown. All others are the type with black flap. It is recommended to use new gaskets (3) when changing or checking the valves.

Diaphragms

Remove the diaphragm cover (4). The diaphragm (5) may then be changed. If fluids have reached the crankcase, re-grease the pump thoroughly. Also check that the drain hole at the bottom of the pump is not blocked. Reassemble with the following torque setting.



Reassemble pump model 463 with the following torque setting.

Diaphragm cover: 90 Nm / 66.6 lbft

Diaphragm bolt: 90 Nm / 66.6 lbft

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

Level indicator wire renewal

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

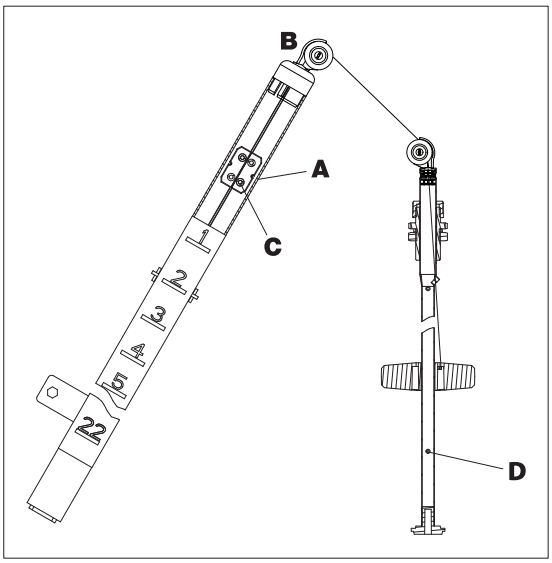
1. Remove the tank drain valve (see paragraph "Drain valve seal renewal") and loosen the fitting holding the pole in position.
2. Pull the pole down through the drain valve hole till it is free in the top of the tank.
3. The pole can now be taken out of the tank through the filling hole.

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

6 - Maintenance

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.

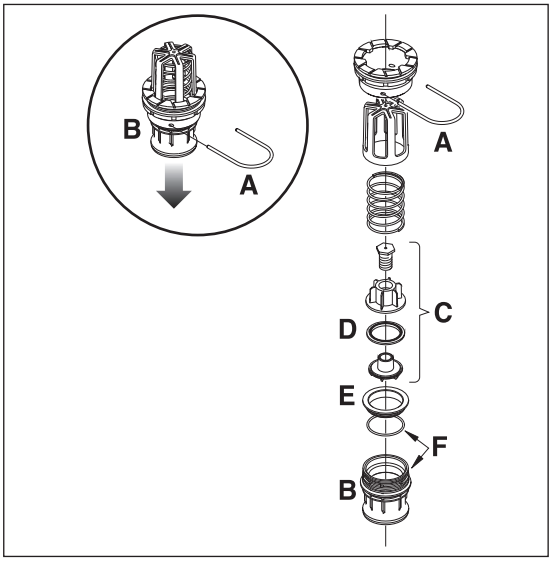
If any deviation is found, do:

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.

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.

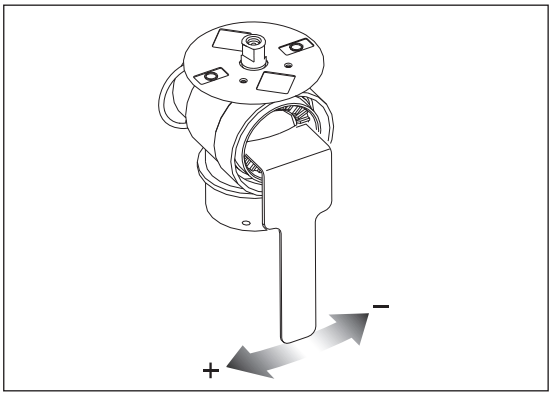
Adjustment of 3-way valve

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.



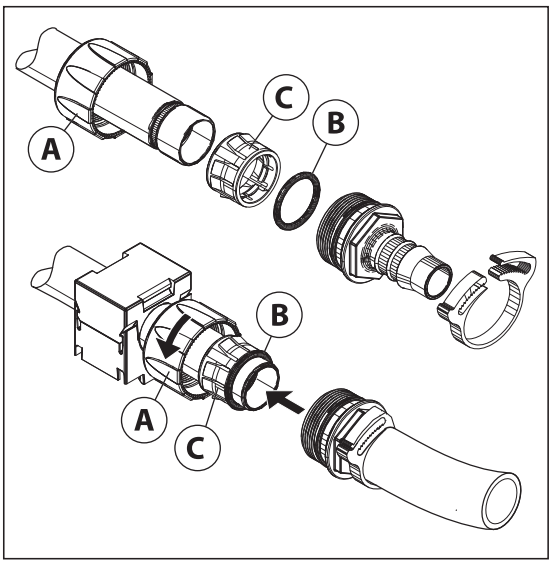
Feed pipe snap-lock assembly

Disassembly

1. Screw the union nut (A) completely off.
2. Pull the feed piping and hose barb apart.
3. Take out the O-ring (B).
4. Inspect and oil O-ring (B). Change the O-ring (B) if worn, before reassembly.

Reassembly

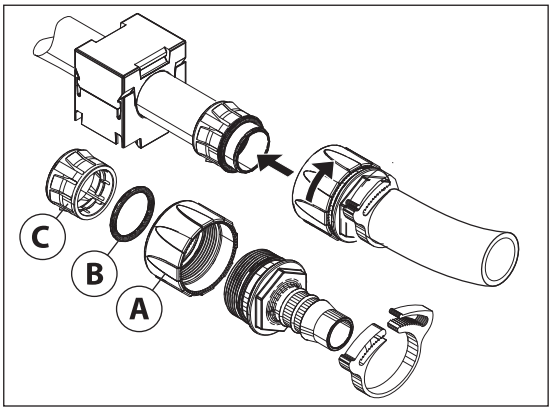
1. Check that the barbed lock ring (C) is fitted to the feed pipe with barb pointing away from pipe opening.
2. Fit the oiled O-ring (B) on top of the lock ring (C).
3. Push the feed pipe and hose barb together.
4. Screw the union nut (A) on the hose barb and tighten union nut (A) by hand.



Initial fitting of fittings

ATTENTION! This method can only be used for pipes not fitted into pipe clamps.

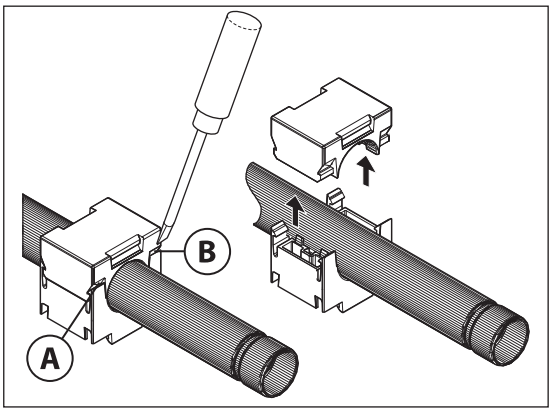
1. Fit the barbed lock ring (C) to the feed pipe with barb pointing away from pipe opening.
2. Fit the oiled O-ring (B) on top of the lock ring.
3. Screw the union nut (A) partly on the hose barb.
4. Press the feed pipe and hose barb together.
5. Tighten the union nut (A) by hand.



Feed pipe clamp assembly

A feed pipe can be removed from the pipe clamps the following way:

1. Use a flat bladed screwdriver to prize the cover off the first corner (A).
2. Hold the clamp top with your hand and prize off the opposite corner (B) with the screwdriver.
3. Prize off the other side of the pipe clamp with the screwdriver.
4. Take out the feed pipe.



Opening the cable trays

The cable trays on the boom can be opened for servicing or re-wiring.

Disassembly

1. Use a screwdriver at the end of a cable tray to prize the cable tray cover off the lock hooks.
2. Pull the cable tray cover off.

Assembly

1. Press the cover on by hand until it hits the hooks of the cable tray.

Readjustment boom - general info

Before commencing adjustment jobs please go through this check list.

1. The sprayer must be well lubricated (see section about lubrication).
2. Connect the sprayer to the tractor.
3. Place tractor and sprayer on level ground (horizontal).
4. Unfold boom.
5. Set slanting angle to neutral position (horizontal).

ATTENTION! For information on boom terminology see "Boom and terminology" on page 25.

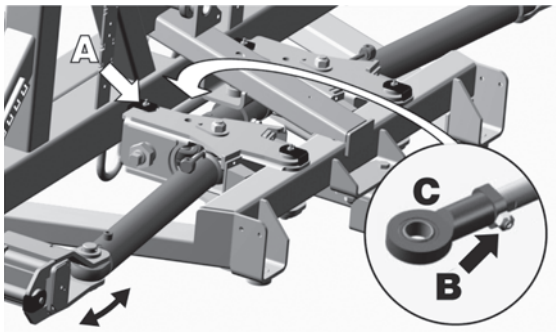
NOTE! Adjustment of hydraulic cylinders is to be carried out without pressure in the system.

WARNING! Nobody is allowed to be under the boom whilst adjustment is carried out.

Horizontal alignment of centre and inner wing sections

The boom must be completely unfolded before adjustment.

ATTENTION! The "Yaw adjustment" on page 91 must be done prior to this adjustment.



1. Loosen nut on the underside of the beam in order to remove pin bolt (A).
2. Loosen the set screw (B).
3. Adjust eye (C). If screwed outwards the boom tips will point more forwards.

   The boom tips must point slightly forward (100-500 mm at boom tips).
4. Turn eye (C) until the set screw is at one of the millings. Then tighten the set screw again.
5. Fit pin bolt (A) again and tighten its nut. Be aware to place washers correctly again.
6. Do the "Yaw adjustment" on page 91 to remove play in boom movements.

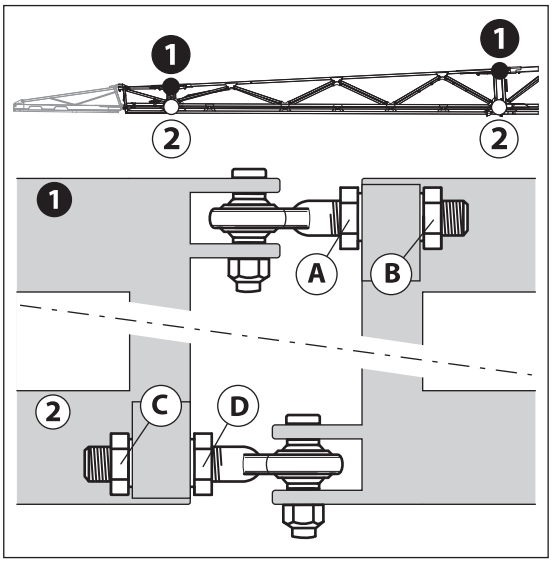
Vertical alignment of boom between inner, 1st outer and 2nd outer wings

NOTE! This is a basic adjustment of the boom. This is only to be carried out if the next boom wing does not raise 0 - 35 mm measured on the lower tube of the wings.

ATTENTION! Illustration shows left boom wing.

Procedure is:

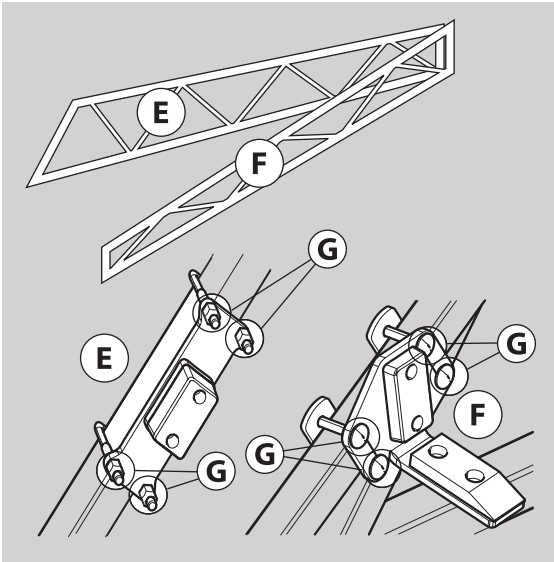
1. Unfold the boom
2. Loosen the lock nuts (A) and (C).
3. Adjust the nut (D) until the next boom wing raises 0 - 35 mm measured on the lower tube of the wings.
4. Tighten the lock nuts (A) and (C) again.
5. Fold the boom and check if the wing hits and rests correctly in the transport brackets. The upper tubes of the boom wings must align.
6. If adjustment is necessary then unfold the boom again.
7. Readjust all 4 nuts (A), (B), (C) and (D) equally. If the boom tip, when folded, must be raised the nuts are turned outwards (1 rotation gives approximately 50mm).
8. Fold the boom and check again as in step 5. If not ok, repeat step 6 and 7.
9. When ok, tighten the nuts to 300-500 Nm.



When folded, check if the boom rests correctly at the transport pads between inner wing and 1st outer wing (E) and between 1st outer wing and 2nd outer wing (F).

If adjustment is necessary:

1. Loosen the four bolts (G) holding the bracket.
2. Reposition the bracket.
3. Tighten the four bolts (G) again.



Horizontal alignment of boom between inner, 1st outer and 2nd outer wings

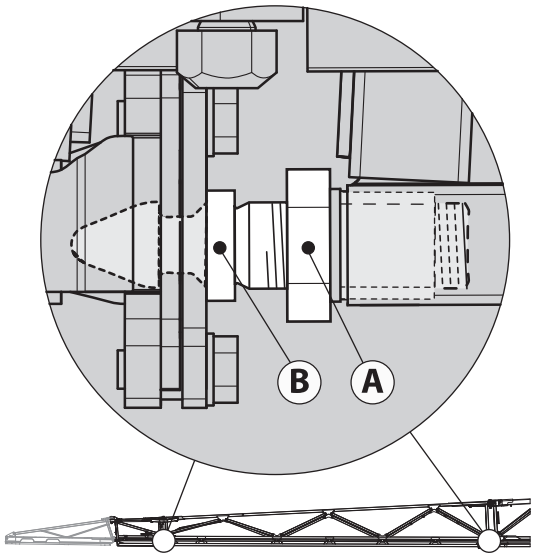
Boom must be unfolded and the hydraulic lock locked.

Procedure is:

1. Loosen lock nut (A).
2. Adjust the lock bolt (B) until the boom sections align.

NOTE! The lock bolt (B) is eccentric. Therefore it is important to check that it centres on the hole in the lock mechanism while adjusting.

3. Tighten the lock nut (A) again.



Fold lock adjustment

The "Vertical alignment of boom between inner, 1st outer and 2nd outer wings" on page 88 must be done prior to this adjustment.

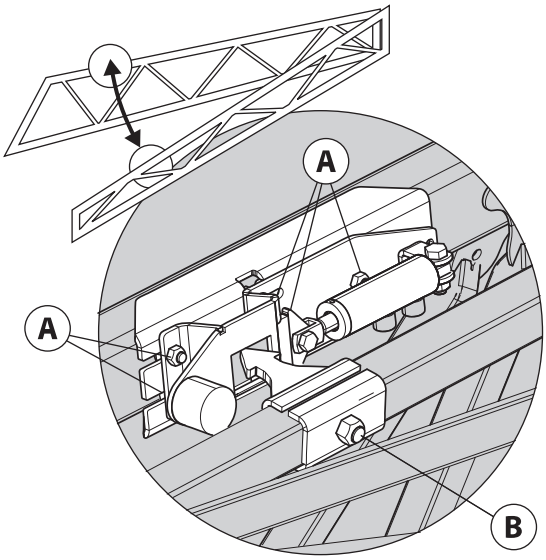
The fold lock adjustment is divided into two parts: Vertical and horizontal adjustment:

Horizontal adjustment

1. Loosen the five bolts (A) on the fold lock bracket.
2. Reposition the fold lock until the hook is aligning to the centre of the fold lock hole.
3. Tighten the five bolts (A) on the fold lock bracket.

Vertical adjustment

1. Loosen the bolt (B).
2. Turn the hook upside down if needed for better fit.
3. Tighten the hook bolt (B) again.



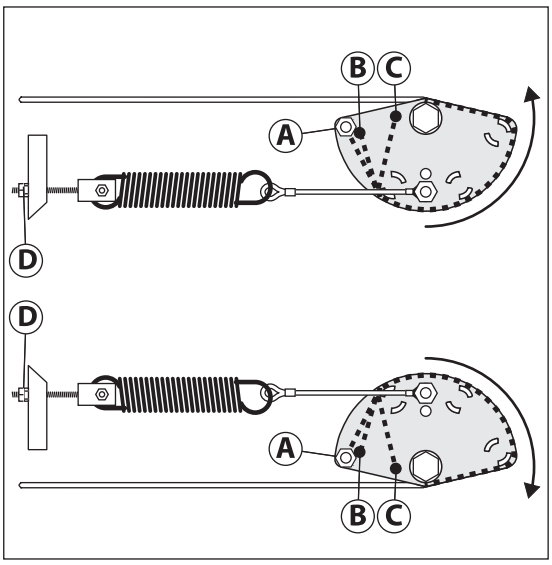
Breakaway section adjustment

The progressive breakaway function is adjusted by altering the spring attachment point on the progressive mechanism.

The turning "half circle" part should be in a rest position as in the picture. If out of adjustment, the "half circle" part is turned more or less as in the picture and needs adjustment:

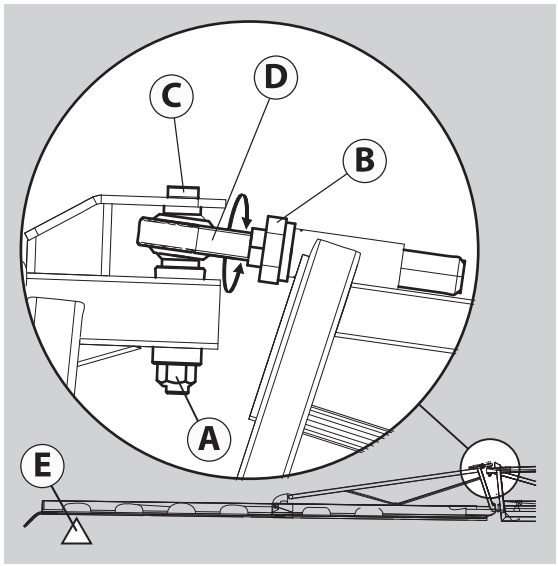
1. Loosen the nut (D) on the fork bolt to slacken the spring.
2. Remove the bolt (A) on the turning progressive mechanism that holds the breakaway wire.
3. Reposition the bolt into hole (B) or (C) to adjust the "half circle" rest position.
4. Tighten the nut (D) on the fork bolt until a suitable spring load is achieved.

ATTENTION! Observe the amount of spring load required when driving with the sprayer. If the breakaway sections release too much, the spring load must be increased.



Vertical alignment of 2nd outer wing and breakaway section

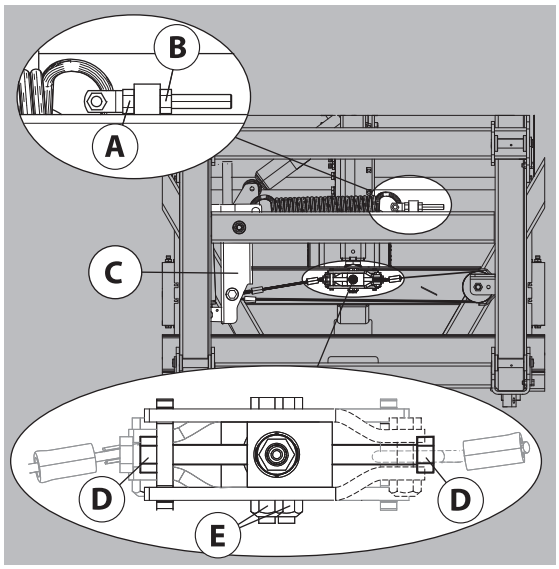
1. Support the breakaway section with a jack stand (E).
2. Loosen lock nut (B).
3. Remove nut (A).
4. Take out bolt (C).
5. Turn eye rod (D) to adjust the section.
6. Refit the bolt (C).
7. Remove the jack stand to see if the sections align.
8. If not, support the breakaway with the jack stand (E) again and repeat point 4-7 until the sections align.
9. Refit bolt (C) and tighten nut (A).
10. Tighten the lock nut (B) again.



DynamicCentre wire adjustment

Before commencing adjustment the sprayer must be placed on level ground, with boom unfolded and in level position.

1. Loosen counter nut (A) and slacken the spring at the nut (B).
2. Position the lever (C) with the cylinder into vertical position.
3. Tighten the horizontal spring on nut (B) without tensioning it.
4. Loosen the nuts (E) and adjust the bolts (D) to tighten the two wires equally.
5. Tighten nuts (E) again.
6. No further tightening of the spring required. But when driving in hilly terrain with high speed you may tighten the nut (B) another 10-20 mm.
7. Tighten the counter nut (A) at the horizontal spring again.

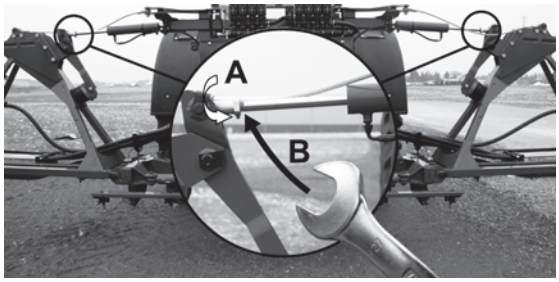


Wing tilt adjustment

NOTE! This adjustment is only relevant for sprayers with DynamicCentre.

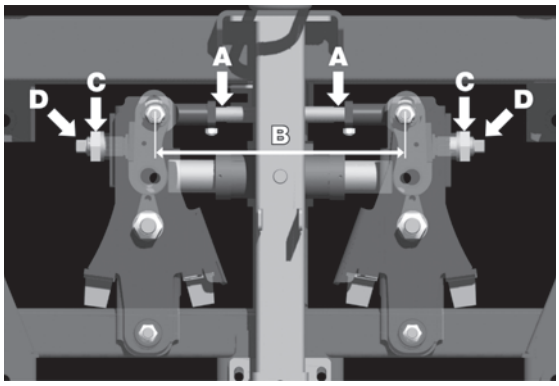
The horizontal adjustment of the wings is done by the tilt cylinder. The boom must be unfolded and tilted completely down to horizontal position. If necessary, adjust the wing as follows:

1. Support the boom on jack stands to relieve the load from the hydraulic cylinder.
2. Loosen grub screw (A).
3. With a 27-wrench on key profile (B) at end of the ram, adjust the cylinder ram to get the desired wing level.
4. Tighten the grub screw (A) again.
5. Repeat steps for the other side.

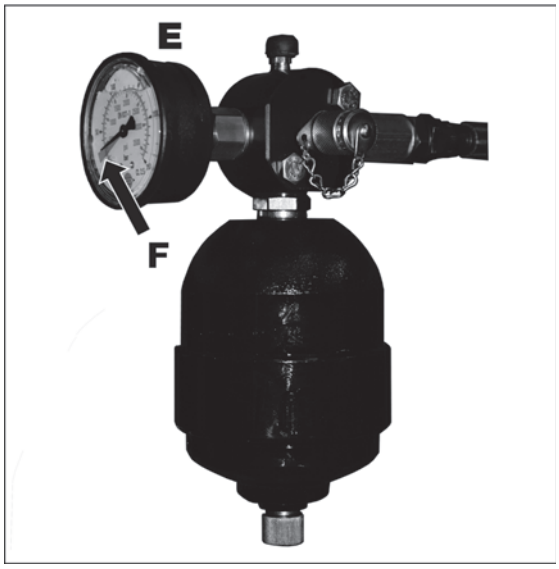


Yaw adjustment

Initial set up (if dismantled)



1. Adjust the pressure in yaw nitrogen accumulator to be 25 bars on the pressure gauge (E).
2. Refill the hydraulic yaw cylinder with oil. Ensure both pistons are fully extended and there is no air in the system. Use the bleed screw on top of cylinder to release air and pressure from the system. Ensure the system is full of oil.



3. Pump up oil pressure on the nitrogen unit to be 30 bar on the pressure gauge (E).
4. Adjust the shock system distance (B) to 452 mm (+/-2 mm), by adjustment of screws (A).
5. Loosen nuts (C), then adjust screws (D) in to remove slack and ensure the longitudinal brackets are perpendicular to the centre frame.

WARNING! Verification and refill/adjustment of the nitrogen pressure in the damper must be carried out by your HARDI dealer's workshop.

In field adjustment

After some use the screws (D) may be tightened to remove slack.

1. Ensure both pistons are fully extended.
2. Tighten screws (D) to remove slack.
3. Check the nitrogen accumulator pressure gauge to be in the green area (F).

WARNING! Do not use the sprayer if the pressure in nitrogen accumulator pressure gauge is not in the green area (F). Doing so may cause damage to the boom.

Over-tightened screws

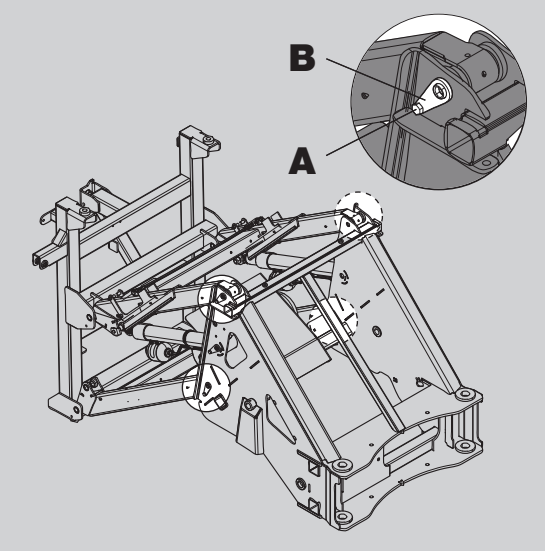
If screws (D) have been tightened too much and start pressing the pistons into the yaw cylinder, the system gets unstable and has uncontrolled movement. In this case do the following:

1. Loosen screws (D), then re-adjust screws (A) 452 mm (+/-2 mm).
2. Readjust screws (D) as described above.

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

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.

After storage

After a storage period the sprayer should be prepared for the next season the following way:

1. Remove the cover.
2. Remove the support from the wheel axle and adjust tyre pressure.
3. Wipe off the grease from hydraulic ram piston rods.
4. Fit the pressure gauges again. Seal with Teflon tape.
5. Connect the sprayer to the tractor including hydraulics and electrics.
6. Check all hydraulic and electric functions.
7. Empty the tank for remaining anti-freeze.
8. Rinse the entire liquid circuit of the sprayer with clean water.
9. Fill with clean water and check all functions.
10. Check function of brakes. Please note that brake power will be reduced until the rust are worn off the drums. Always brake lightly until the drums are clean.

Operational problems

General info

Operational incidents are frequently due to the same reasons:

1. A suction leakage reduces the pump pressure and may interrupt suction completely.
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 bad reassembly of the pump elements, especially the diaphragm covers, causes air intakes or leaks and reduces the pump flow.
7. Rusted or dirty hydraulic components cause bad connections and early wears.
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.
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.

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

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
112	Changed	Flat 1 Level 1 Hilly 5	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7, the setbox TWIN buttons are dedicated to select the Dynamic centre setting. The information pops up when a button has been pushed.	Defines current Dynamic centre setting for the TERRA FORCE boom. Flat means the boom is free hanging. Hilly means the boom will follow the sprayer movements.	118
113	Changed	Flat 1 Level 2 Hilly 5	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7, the setbox TWIN buttons are dedicated to select the Dynamic centre setting. The information pops up when a button has been pushed.	Defines current Dynamic centre setting for the TERRA FORCE boom. Flat means the boom is free hanging. Hilly means the boom will follow the sprayer movements.	119
114	Changed	Flat 1 Level 3 Hilly 5	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7, the setbox TWIN buttons are dedicated to select the Dynamic centre setting. The information pops up when a button has been pushed.	Defines current Dynamic centre setting for the TERRA FORCE boom. Flat means the boom is free hanging. Hilly means the boom will follow the sprayer movements.	120

ID	Type	Text at display detail	Criteria for fault Operations disabled	Full screen Help text	Pr
115	Changed	Flat 1 Level 4 Hilly 5	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7, the setbox TWIN buttons are dedicated to select the Dynamic centre setting. The information pops up when a button has been pushed.	Defines current Dynamic centre setting for the TERRA FORCE boom. Flat means the boom is free hanging. Hilly means the boom will follow the sprayer movements.	121
116	Changed	Flat 1 Level 5 Hilly 5	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7, the setbox TWIN buttons are dedicated to select the Dynamic centre setting. The information pops up when a button has been pushed.	Defines current Dynamic centre setting for the TERRA FORCE boom. Flat means the boom is free hanging. Hilly means the boom will follow the sprayer movements.	122
117	Warning	D-centre incorrect position	Time-out on sensor signal AI25. TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7 Buttons has been activated to move the Dynamic centre. The selected setting has not been reached within 10 seconds. Reset by keypress "enter" or attempt to move Dynamic centre.	Attempt to move Dynamic centre cylinder did not succeed within the given time frame. Check the hydraulics connections and pressure. Check Dynamic centre position sensor.	37
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
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
122	Warning	Dynamic Centre 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 AI25 is less than 0,2V or exceeds 4,8V. Reset by keypress "enter".	Signal from sensor out of range. Shorted or disconnected. Check Dynamic centre position sensor adjustment and/or connection.	11
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

7 - Fault finding

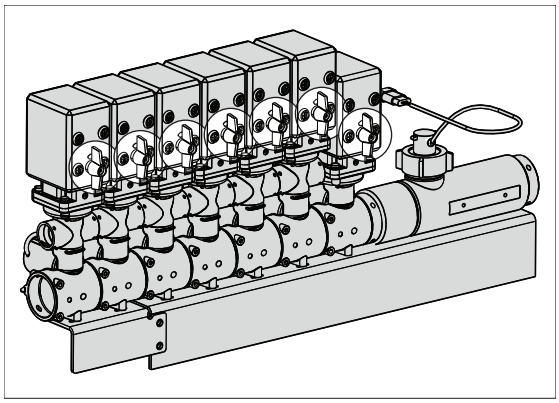
ID	Type	Text at display detail	Criteria for fault **Operations disabled**	Full screen Help text	Pr
132	Illegal action	One function only!	When TERRA FORCE boom hydraulics set-up has been selected in menu E8.6.3.7+8 Appears on TERRA FORCE booms when the user tries to us more than one function at a time.	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
139	Alarm	Dynamic centre sensor.	When dynamic centre function is enabled in menu E.8.6.7		139
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

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

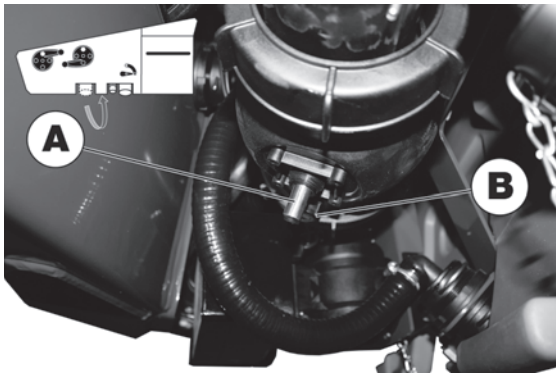


Emergency operation - EasyClean filter

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!

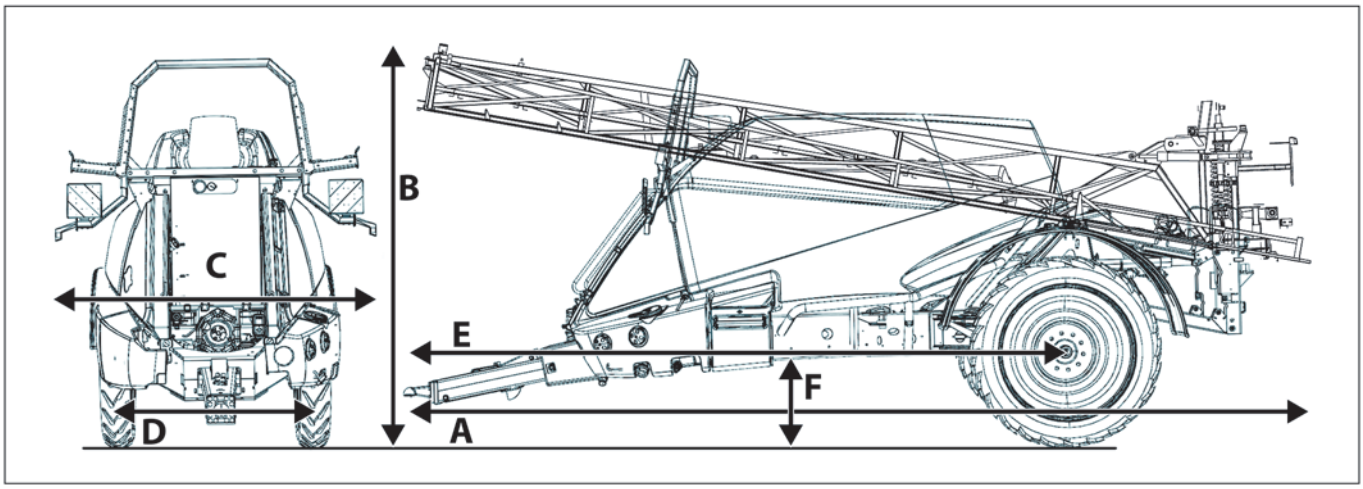


Dimensions

General info

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

Overall dimensions



	A	B	C1	C2	C3	D	E	F
3300	7.30	3.60 (13.6 x 48)	2.55	3.00	N/A	1.50 to 2.25	4.80	0.80 (13.6 x 48)
4500	7.80	3.60 (13.6 x 48)	2.55	3.00	N/A	1.50 to 2.25	5.30	0.80 (13.6 x 48)
5500	8.60	3.90 (20.8 x 42)	2.55	3.00	3.00	1.80 to 2.25	6.05	0.78 (20.8 x 42)
7000	8.60	3.90 (20.8 x 42)	N/A	3.00	3.00	1.80 to 2.25	6.05	0.79 (650/65)

C1 = DELTA boom

C2 = FORCE and TWIN FORCE boom

C3 = TERRA FORCE boom

All measures are in metres.

Weight

All weights in Kilograms (kg) and weighted with 20.8x42 wheels.

5500 litre:

	Empty tank			Full tank*		
Boom width	**Axle load**	**Drawbar load****	**Total weight***	**Axle load**	**Drawbar load****	**Total weight**
36 m	5628	1501	7129	9847	3242	13089
39 m	5644	1537	7181	9863	3278	13141
40 m	5659	1542	7201	9877	3284	13161
42 m	5670	1568	7238	9889	3309	13198

*Rated tank volume incl. full RinseTank

**Hitch weight calculated from support leg weight.

8 - Technical specifications

7000 litre:

	Empty tank			Full tank*		
Boom width	**Axle load***	**Drawbar load***	**Total weight***	**Axle load****	**Drawbar load****	**Total weight****
36 m	5733	1417	7150	11025	3585	14610
39 m	5749	1453	7202	11041	3621	14662
40 m	5763	1459	7222	11055	3627	14682
42 m	5775	1484	7259	11066	3653	14719

*Rated tank volume incl. full RinseTank

**Hitch weight calculated from support leg weight.

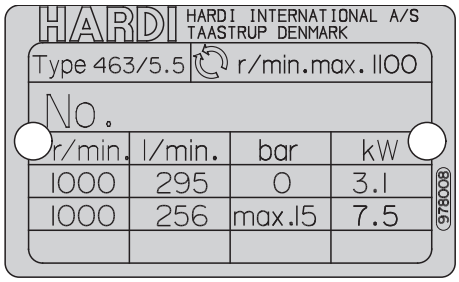
Wheel and axle dimensions

Wheel	Short axle	Long axle	Mudguards	Clearance*
11.2x48"	1500-2000 mm	1800-2250 mm	345 mm	700 mm
12.4x46"	1500-2000 mm	1800-2250 mm	345 mm	705 mm
12.4x52"	1500-2000 mm	1800-2250 mm	N/A	790 mm
13.6x48"	1520-2000 mm	1800-2250 mm	345 mm	735 mm
18.4x38"	1650-2000 mm	1800-2250 mm	590 mm	675 mm
20.8x38"	1720-2000 mm	1800-2250 mm	590 mm	695 mm
20.8x42" (10-bolt wheel)	N/A	1800-2250 mm	590 mm	780 mm
520/85x46	N/A	1800-2250 mm	590 mm	835 mm
650/65x42" (10-bolt wheel)	N/A	1950-2250 mm	590 mm	780 mm
900/50x42	N/A	2115-2250 mm	890 mm	785 mm

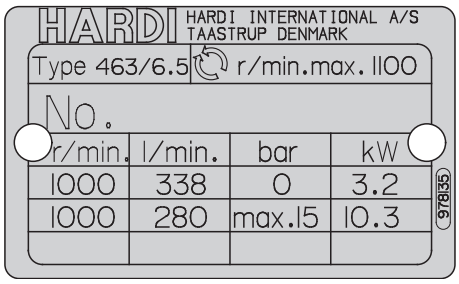
*under axle

Specifications

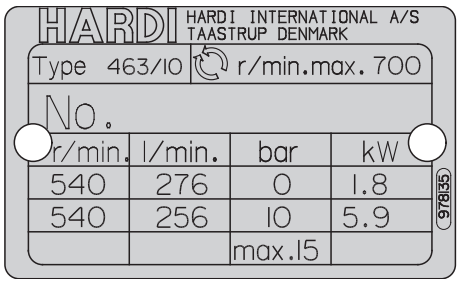
Pump model 463/5.5



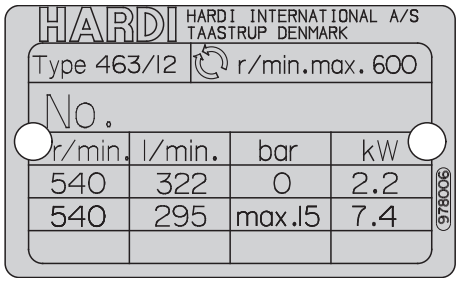
Pump model 463/6.5



Pump model 463/10.0



Pump model 463/12.0



Technical residue

Worst case technical residue with largest tank, largest fluid system and boom. Narrower booms and fluid systems with less options will have less residues than stated below.

Sprayer combination	**Dilutable volume - Tank and fluid system**	**Non-dilutable volume - Boom**	**Total residual volume**
7000 Litres, 42 m TERRA FORCE, FlexCapacity and PrimeFlow.	47 litres	58.8 litres	105.8 litres
7000 Litres, 42 m TERRA FORCE, FlexCapacity and 9 sections.	47 litres	69.1 litres	116.1litres

8 - Technical specifications

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
3300 (not TERRA FORCE)	100	75
4500 (not TERRA FORCE)	115	86
5500	130	95
7000 (not DELTA)	150	110

Brakes

Sprayer litre	Drum dimensions
3300	400 x 80 mm
3300/4500	400 x 120 mm
5500/7000	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)

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		25km/h		40km/h		50km/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)**
11.2x38	139 A8	7290	4.4	5395	3.6	4860	3.6	N/A	N/A
11.2x48	142 A8	7950	4.4	5883	3.6	5300	3.6	N/A	N/A
12.4x46	147 A8	9225	4.4	6827	3.6	6150	3.6	N/A	N/A
12.4x52	147 B	10125	4.4	7493	3.6	6750	3.6	6143	3.9
13.6x48	151 A8	10350	4.4	7659	3.6	6900	3.6	N/A	N/A
16.9x38	138 B	7725	2.0	5717	1.6	5150	1.6	4687	1.6
18.4x38	143 B	9000	2.0	6660	1.6	6000	1.6	5460	1.6
20.8x38	150 B	10950	2.0	8103	1.6	7300	1.6	6643	1.6
520/85x46	173 A8*	19500	3.0	14430	2.5	13000	2.5	N/A	N/A
650/65R42	158B	12750	2.0	9435	1.6	8500	1.6	7735	1.6
900/50x42	168 A8*	17000	1.9	12440	1.6	11200	1.6	N/A	N/A
20.8x42	152B	11630	2.0	8603	1.6	7750	1.6	7053	1.6

*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! 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! See the part “Change of tyre” on page 93.

8 - Technical specifications

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.

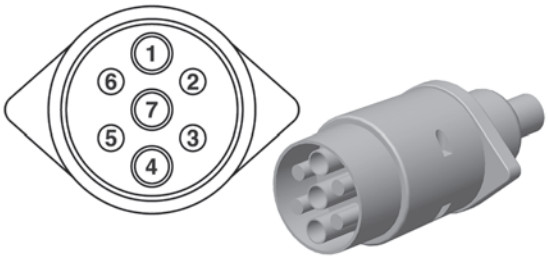
Materials used:

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

Electrical connections

Rear lights

The wiring is in accordance with ISO 1724.

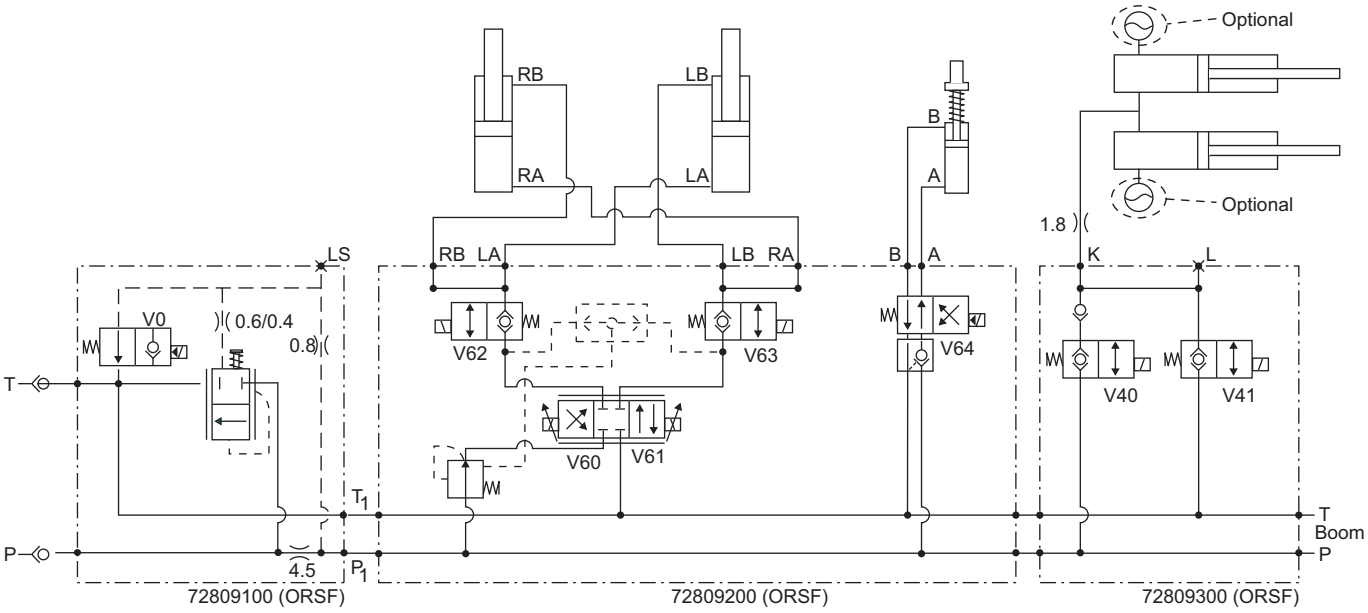


Position	Wire colour
1. LH direction indicator	Yellow
2. Free	Blue
3. Frame	White
4. RH direction indicator	Green
5. RH rear position lamp	Brown
6. Stop lamps	Red
7. LH rear position lamp	Black

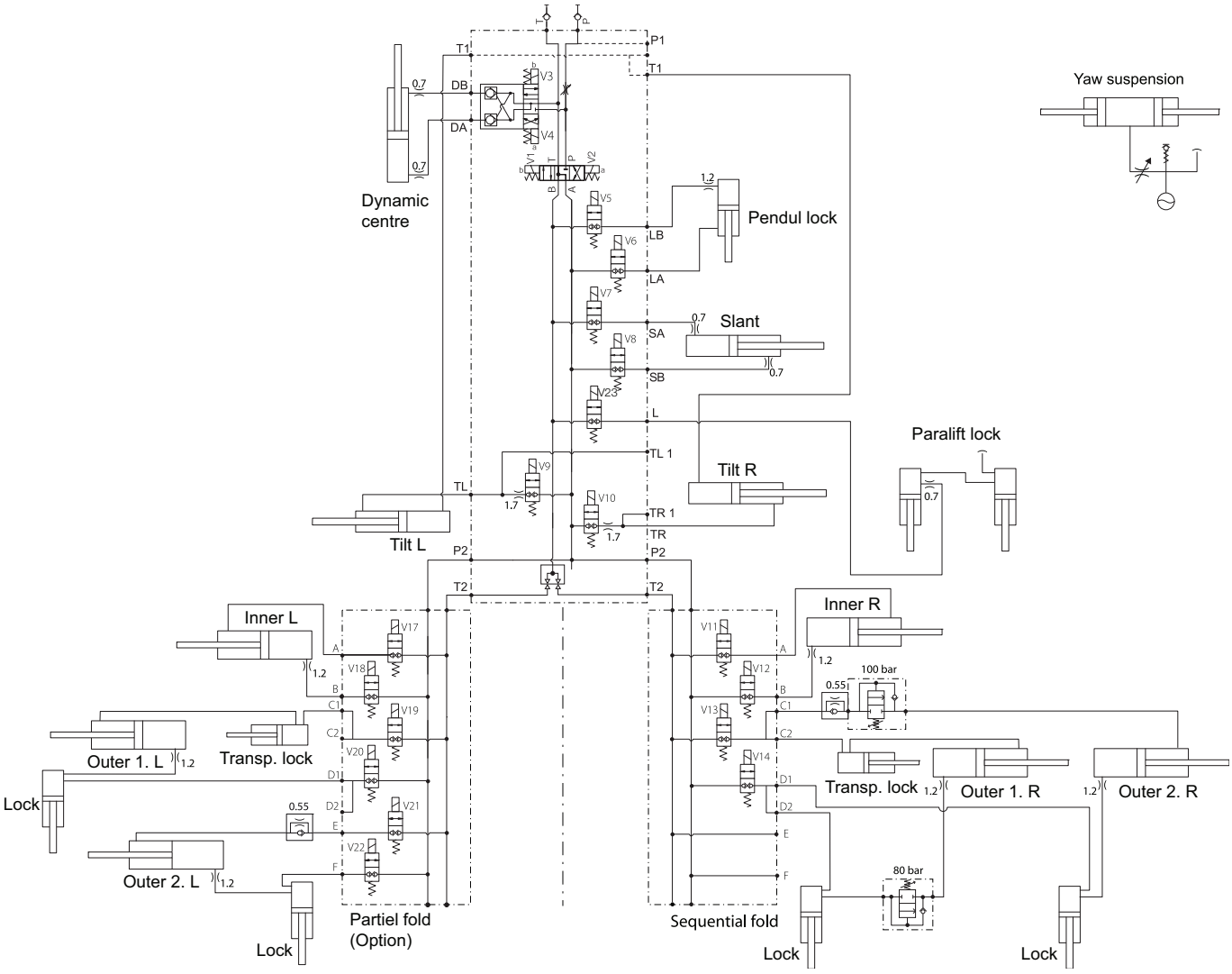
8 - Technical specifications

Charts

Sprayer hydraulic



Boom hydraulic - Z



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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 INTERNATIONAL A/S

Helgeshøj Allé 38 - DK 2630 Taastrup - DENMARK