

# COMMANDER '22

AU - Model Range

## Instruction book

67029404-100 - Version 1.00

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We congratulate you for choosing a HARDI plant protection product. The reliability and efficiency of this product depends 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 '22 series.

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

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

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

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

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

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### Obligations and Liability

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#### Comply with the Instruction Book

Knowledge of the basic safety information and safety regulations is a fundamental requirement for safe handling and fault-free sprayer operation.

Lack of knowledge or non-compliance of the safety regulations can lead to injuries and fatal accidents as well as damage to the sprayer and its surroundings.

Follow the safety instructions in this Instruction Book.



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#### Before First Use of the Sprayer

The owner of the sprayer must take note of the following obligations before using the sprayer. These obligations also apply to the employer or the supervisor of the sprayer operators.

##### Workplace Assessment

This must be completed to start with. Check your local regulations regarding:

- The content of the workplace assessment.
- The frequency of repeating the workplace assessment.

##### Worker / Operator Instructions

Only let those people work with, or on the sprayer, who:

- Are aware of the basic workplace safety information and accident prevention regulations.
- Have been instructed in working with/on the tractor and sprayer and hereby achieving appropriate qualifications.
- Have read and understood this Instruction Book.

If you still have queries after reading the Instruction Book, or if something remains unclear after reading it, please contact the manufacturer or your HARDI dealer.

A worker is hereinafter called an operator. An operator is a person who installs, operates, configures, adjusts, maintains, cleans, repairs, transports or moves the sprayer.

##### Use of Work Equipment

Throughout the lifetime of the sprayer, the owner shall take every measure to ensure the safety of the sprayer and its equipment made available to operators.

The responsibility lies with the owner of the sprayer to ensure the safety of the operator in accordance with all of the relevant act (s).

## 2 - Safety notes

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### **Statutory Inspection**

Before first use of the sprayer, a surveyor must complete a statutory inspection of the tractor and sprayer. However, the rules often allow the tractor and the sprayer to be inspected separately before being connected. Contact your local HARDI dealer for more information on this inspection and when it has to be completed.

### **Restricted Use**

As the use of the sprayer is likely to involve a specific risk, the owner shall ensure restricted access to its use as needed, and any modification of the restrictions is to be allowed to specialized persons only.

Restricted use also applies to the selection of tractor to be used together with the sprayer. Usable tractors must be tested for driving the sprayer, and the owner must keep a document showing which tractors may be used for driving the sprayer, as well the information about the tests. This information must be available to the operator of the sprayer.

### **Maintenance Regulations**

Throughout its working life, the owner shall keep the sprayer compatible with the current safety regulations by means of adequate maintenance.

The owner shall ensure that the sprayer is installed and set up correctly and is operating properly by inspection/testing of the sprayer (initial, after assembly, periodic and special) by authorized persons. The results of inspection/testing shall be recorded and kept.

### **Health Issues**

Ergonomics and occupational health aspects shall be taken fully into account by the owner.

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### **Obligations of the Operator**

Before starting work, the operator or anyone in charge of working with/on the sprayer is obliged to:

- Comply with the basic workplace safety acts and accident prevention regulations.
- Read and follow the safety instructions as described in this Instruction Book.
- Read the section "Representation of Safety Symbols" in this Instruction Book and to follow the safety instructions represented by the danger, warning and attention symbols, when operating the sprayer.
- Get to know the sprayer.
- Connect the sprayer securely and correctly to a tractor, which has passed the test for driving the sprayer.
- Read the sections of this Instruction Book that are important for carrying out the work.
- Read the manufacturer's information regarding safety and use of chemical products for crop care, such as spray chemicals or liquid fertilizer.
- Keep all the danger, warning and attention labels on the sprayer in a legible state.
- Replace damaged labels on the sprayer.
- Know the importance of the use of genuine HARDI spare parts.

If the operator discovers that a function is not working properly, he must eliminate this fault immediately. If this is not the task of the operator, or if the operator does not possess the appropriate technical knowledge, then he should report this fault to his superior (a qualified operator).

### Risks in Handling the Sprayer

The sprayer has been highly developed and constructed to the recognized rules of safety. However, operating the sprayer may cause risks and restrictions to:

- The health and safety of the operator or third parties.
- The sprayer.
- Other property.

Only use the sprayer:

- For the purpose for which it was intended.
- In a perfect state of repair.

Eliminate any faults immediately which could impair the safety.

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### Disclaimer

Our "General Terms of Sale and Delivery" are always applicable. These shall be available to the owner at the latest on conclusion of the contract.

Warranty and liability claims for damage to people or property will be excluded by HARDI, if they can be traced back to one or more of the following causes:

- Improper use of the sprayer.
- Improper installation, commissioning, operation and maintenance of the sprayer.
- Operation of the sprayer with defective safety equipment, or improperly attached or non-functioning safety equipment.
- Non-compliance with the instructions in the instruction manual regarding commissioning, operation and maintenance.
- Unauthorized design changes to the sprayer.
- Insufficient monitoring of sprayer parts which are subject to wear.
- Improperly executed repairs.
- Spare parts used are not genuine HARDI spare parts. If the operator decides to use a spare part, which is not approved by HARDI, the operator immediately assumes responsibility for any accident, damage or malfunction, which can be traced back to the use of this spare part. HARDI accepts no liability for such incidents caused by the use of non-approved spare parts, wear parts or aids.
- HARDI accepts no liability for disasters through the impact of foreign bodies, natural disasters or force majeure.

## 2 - Safety notes

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### Organisational Measures

#### **This Instruction Book**

- Must always be kept together with the sprayer.
- Must always be easily accessible for the operator.

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### Personal Protective Equipment

The operator must use the necessary personal protective equipment as per the information provided by the manufacturer of the plant protection product to be used, such as:



Chemical-resistant gloves



Chemical-resistant and disposable overalls



Water-resistant footwear



Face shield



Breathing protection



Eye protection



Head protection



Skin protection products

### **Safety and Protection Equipment**

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#### **Safety at Start up**

Each time before the sprayer is started up, all the safety and protection equipment must be properly attached and fully functional. Check all safety and protection equipment regularly. Repair or replace the equipment as needed.

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#### **Faulty Safety Equipment**

Faulty or disassembled safety and protection equipment can lead to dangerous situations.

## 2 - Safety notes

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### Informal Safety Measures

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#### Additional Safety Instructions

Together with the safety information in this Instruction Book, also comply with the general and national regulations related to:

- Accident prevention.
- Environmental protection.
- The applicable workplace safety.

Follow these regulations, especially when:

- Driving on public roads and routes. Comply with the appropriate statutory road traffic regulations. These vary from country to country, and there may be local regulations which need to be followed.
- Local law may demand that the operator is certified to use spray equipment.
- Using pesticides or liquid fertilizer. Make sure you understand the information from the supplier regarding their use.

### Operator Training

#### Authorised Persons

Only those people who have been trained and instructed may work with/on the sprayer. The operator must clearly specify the responsibilities of the people in charge of operation and maintenance work.

People being trained may only work with/on the sprayer under the supervision of an experienced operator.

	Person especially trained for the activity <sup>1)</sup>	Trained operator <sup>2)</sup>	Person with specialist training (specialized workshop) <sup>3)</sup>
<b>Loading / Transport</b>	X	X	X
<b>Commissioning</b>	0	X	0
<b>Setup and tool installation</b>	0	0	X
<b>Operation</b>	0	X	0
<b>Maintenance</b>	X	X	X
<b>Troubleshooting and fault elimination</b>	X	0	X
<b>Disposal</b>	X	0	0

Symbols: X - permitted, 0 - not permitted.

1. Persons who can assume a specific task, and who can carry out this task for an appropriately qualified company. Examples of these persons are truck drivers, machinery dealer and scrap dealers (depending on the activity).
2. Persons who have been instructed in their assigned tasks and in the possible risks in the case of improper behaviour, who have been trained if necessary, and who have been informed about the necessary protective equipment and measures. Examples of these persons are customers, farmers and farm workers.
3. Persons with specialist technical training shall be considered as a specialist. Due to their specialist training and their knowledge of the appropriate regulations, they can evaluate the work with which they have been appointed to and detect possible dangers. Examples of these persons are sprayer importers, dealers and service engineers and service technicians.

Comment:

A qualification equivalent to specialist training can be obtained from several years of experience in the relevant field.

If maintenance and repair work on the sprayer is additionally marked "Workshop work", or a similar marking, only a specialized workshop may carry out such work. The personnel of a specialized workshop shall possess the appropriate knowledge and suitable aids (tools, lifting and support equipment) for carrying out the maintenance and repair work on the sprayer in a way that is both appropriate and safe.

## 2 - Safety notes

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### Safety Measures Under Normal Operation

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#### Protection Equipment

Only operate the sprayer if all the safety and protection equipment is fully functional.

Check the sprayer at least once a day for visible damage and check the function of the safety and protection equipment.

### Residual Energy

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#### Possible Dangers

Note that there may be residual energy from mechanical, hydraulic, pneumatic and electric / electronic parts on the sprayer.

Use appropriate measures to inform the operators.

Prevent any accidents from happening due to residual energy.

Below are some examples on where the sprayer's residual energies may be present:

#### Mechanical Energy

- Springs under tension.
- Weights exposed to gravity.
- Heat from brake drums.

#### Hydraulic Energy

- Trapped oil under pressure in cylinders, hoses and accumulators.
- Heat from cylinders and oil tank.

#### Pneumatic Energy

- Air tank.
- Air activated brake system.
- Pressure dampers for fluid system.

#### Electric Energy

- Energy stored in capacitors.
- Tractor battery.

## 2 - Safety notes

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### Service and Maintenance Work

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#### Statutory Inspection

A surveyor must complete a statutory inspection of the tractor and sprayer prior to connecting the two. However, the rules often allow the tractor and the sprayer to be inspected separately before being connected.

Each country should regulate the level and frequency of this inspection. Contact your local HARDI dealer for more information, before using the sprayer the first time.

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#### Preventive Measures

Before carrying out service and maintenance work, secure all media against unintentional start-up. This goes for:

##### Hydraulic system

- Set the tractor's hydraulic levers in neutral position (or 'float') to relieve oil pressure.
- Turn off the tractor and remove the ignition key.
- Disconnect the hydraulic hoses connected from the tractor to the sprayer.

##### Electric system

- Turn off the tractor and remove the ignition key.
- Disconnect the electric cables from the tractor's battery.

##### Fluid system

- Turn off the tractor and remove the ignition key.

##### Compressed air

- Turn off the tractor and remove the ignition key.

Carry out prescribed service, maintenance and inspection work in due time. This will help to eliminate faults on the sprayer, including safety related functions.

Carefully fix and secure larger components to lifting gear when carrying out replacement work.

Check all the screw and bolt connections for firm seating. On completion of the maintenance work, check the function of the safety devices.

### Design Changes

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#### Operator Limitations

You may make no changes, expansions or modifications to the sprayer without an authorization from HARDI. This also applies when welding support parts.

Any expansion or modification work shall require the written approval from HARDI. Only use modification and accessory parts approved by HARDI, so that the type approval or other design approvals remain valid in accordance with national and international regulations.

Vehicles with an official type approval, or with equipment connected to a vehicle with a valid type approval, or approval for road transport according to the local road traffic regulations, must be in the state specified by the approval.

It is strictly forbidden to:

- Drill holes in the steel frame or in the running gear.
- Increase the size of existing holes in the steel frame or in the running gear.
- Weld support parts.

Risk of crushing, cutting, catching, squeezing, getting trapped, being drawn in or being struck by sprayer parts due to the failure of support parts.

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#### Spare Parts, Wear Parts and Aids

Immediately replace any sprayer parts which are not in a perfect state.

Only use genuine HARDI spare and wear parts or those approved by HARDI, so that the type approval remains valid according to national and international regulations. The use of spare and wear parts from third parties does not guarantee that they have been constructed in a way as to meet the requirements placed on them.

HARDI accept no liability for damage caused by the use of non-approved spare parts, wear parts or aids.

## 2 - Safety notes

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### Cleaning and Disposal

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#### Environmental Protection

Carefully handle and dispose of any materials used, in particular:

- When carrying out work on oiled or lubricated sprayer parts.
- When cleaning using solvents.

Always follow local legislation regarding disposal.

### **Workstation**

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#### **Intended Place for Operator**

There may be only one person sitting in the driver's seat of the tractor connected to the sprayer. This is the intended workstation for operating the sprayer.

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#### **Risks of Non-Compliance**

During the operation or transport of the sprayer:

If another person disturbs or interferes with the operator, or if the operator is trying to operate the sprayer from other places than the tractor's driver seat, this can result in negligent or incorrect handling of the vehicle.

- Risk of the operator losing his concentration and focus on operating the vehicle correctly.
- Risk of the operator losing his ability to operate the vehicle correctly.
- Risk of fatal accidents while driving.
- Risk of damages to the tractor, sprayer and foreign objects while driving.
- Risk of inefficient spraying due to incorrect operation of the sprayer.

## 2 - Safety notes

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### If the Safety Information is Ignored

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#### Possible Risks and Dangers

Non-compliance with the safety information:

- Can pose a danger to people, to the environment and to the sprayer.
- Danger to people through non-secured working areas.
- Danger to people through mechanical and chemical influences.
- Failure of important sprayer functions.
- Failure of prescribed methods of maintenance and repair.
- Leakage of hydraulic oil or spray fluid to the environment.
- Can lead to the loss of all warranty claims.

### Safety Information For Operators

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#### General Safety and Accident Prevention

Before use or starting up the sprayer and the tractor, always check their:

- Roadworthiness
- Operational safety

Risk of crushing, cutting, catching, squeezing, getting trapped, being drawn in or being struck by sprayer parts due to inadequate roadworthiness and operational safety.

Beside these instructions, comply with the generally applicable national safety and accident prevention regulations.

The warning symbols and other labels attached to the sprayer provide important information on safe sprayer operation. Compliance with this information is in the interests of your safety.

Keep the spray boom in folded position, whenever the sprayer is not coupled to a tractor. Unfolding the boom on an uncoupled sprayer will shift the balance point of the sprayer causing a risk of overturning.

Before driving off and starting up the sprayer, check the immediate area of the sprayer - look out especially for children and instruct them and other unauthorized persons to stay out of reach of the sprayer. Ensure that you can see clearly.

Drive in such a way that you always have full control over the tractor with the attached sprayer. In doing so, take your personal abilities into account, as well as the road, traffic, visibility, weather conditions and the driving characteristics of the tractor and of the connected sprayer.

Slow down when driving in uneven terrain or when making sharp turns, as the sprayer might be at risk of turning over.

It is forbidden to ride on the sprayer or use it as a means of transport.

It is forbidden to stay in the working area of the sprayer's drawbar, on the sprayer's platform or behind the operating area (the tractor), unless the hydraulic pressure to the sprayer has been switched off.

Only authorized persons are allowed inside or outside the tractor cabin during operation.

Keep persons, children and animals away from the operation areas of the sprayer and from the sprayer's equipment. Be careful when manoeuvring the sprayer, especially when reversing, as there is a risk of hitting people or surroundings.

Avoid eating, drinking or smoking while spraying or working with equipment contaminated with chemicals.

The chemicals used for spraying are dangerous to your health! In case of ingestion, poisoning or damage to your skin or face, immediately seek medical advice. Remember to identify the chemicals used.

## 2 - Safety notes

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### Coupling and Uncoupling the Sprayer

Only connect and transport the sprayer with tractors suitable for the task. See the section "Technical Specifications" in this book to make sure that the tractor matches the requirements to operate the sprayer.

When coupling sprayers to the tractor's three-point linkage, the linkages of the tractor and the sprayer must always be the same.

Connect the sprayer to the prescribed equipment in accordance with the specifications.

When coupling sprayers to the front or the rear of the tractor, the following may not be exceeded:

- The approved total tractor weight.
- The approved tractor axle loads.
- The approved load capacities of the tractor tyres.
- The approved load capacities of the tractor hitch points.

Secure the tractor and the sprayer against rolling unintentionally before coupling or uncoupling the sprayer.

It is forbidden for people to stand between the sprayer to be coupled and the tractor, while the tractor is moving towards the sprayer.

Any helpers may only act as guides standing next to the vehicles, and helpers may only move between the vehicles when both are at a standstill.

If using the tractor's three-point linkage, including lift arms (lower links), secure the operating lever of the tractor's hydraulic system, so that unintentional raising or lowering is prevented when coupling or uncoupling the sprayer.

When coupling and uncoupling sprayers, move the support equipment, such as support leg or support wheels (if available), to the appropriate position (check stability and strength of the ground).

When activating support equipment comprising a hydraulic cylinder, there is a risk of injury from crushing and cutting.

Be particularly careful when coupling the sprayer to the tractor or uncoupling it from the tractor. There are crushing and cutting points in the area of the coupling point between the tractor and the sprayer.

It is forbidden to stand between the tractor and the sprayer when raising or lowering the three-point linkage.

Coupled supply lines

- Must yield to all movements while cornering without tensioning, kinking or rubbing.
- Must not rub against other parts.

Ropes or cords releasing quick couplings must hang loosely, and they must not release themselves when lowered.

Also ensure that uncoupled sprayers are in a stable position.

### Use of The Sprayer

Before starting work, ensure that you understand all the equipment and actuation elements of the sprayer and their function. There is no time for this when the sprayer is already in operation.

Only wear tight clothes. Loose clothing increases the risk of being caught by the drive shaft / PTO.

Only start-up the sprayer, when all the safety equipment has been attached and in the safety position.

Comply with the maximum load for the connected sprayer and the permissible axle and drawbar loads for the tractor. If necessary, drive only with a partially filled tank.

It is forbidden to:

- Stand in or near the working area of the sprayer.
- Climb the sprayer.
- Stand or sit on the sprayer.
- Stand in the turning and swivel range of the sprayer.

There are crushing and cutting points at externally actuated sprayer points, e.g. hydraulic cylinders.

Only actuate externally actuated sprayer parts when you are sure that no one is standing within the prescribed safety distance.

Before leaving the tractor:

- Lower the spray boom to around waist height above the ground or lower.
- Fold the spray boom into the transport position.
- Activate the tractors parking brake, put the transmission into (P).
- Turn off the tractor engine.
- Remove the ignition key.

Always keep the sprayer under supervision when:

- The vehicle is parked with the tractor engine running.
- The sprayer pump is running.
- The tank on the sprayer is being filled.

## 2 - Safety notes

---

### Road Transport

When driving on public roads or highways with the sprayer coupled to the tractor, the following instructions must be followed. Failure to do so will create a risk of:

- Traffic accidents or fatalities!
- Damage to the tractor and sprayer.

### General Instructions

Comply with the national or local road traffic regulations when using public roads and highways.

When driving in areas with special rules and regulations for markings and lights on sprayers, you should observe these and equip your sprayer accordingly.

Make sure that you have a clear field of vision when driving.

Check the immediate vicinity of the vehicle; no persons, children or animals must be near the vehicle!

No one is allowed outside the tractor cabin during road transport.

It is forbidden to use the sprayer as a means of transportation of people or goods.

The tractor driver must not be disturbed by other people in the cabin during driving.

Maximum driving speed for sprayer models equipped with brakes and for models without brakes is different. Be aware that these speeds may differ due to local law. Contact local authorities for information on maximum driving speeds.

Adjust your driving speed to the prevailing conditions.

Before driving downhill, switch to a low gear.

When making turns, lower your speed.

### Checking the Vehicle

Before transporting the sprayer on a road, complete the following check points for the tractor and sprayer.

- Spray boom is folded and resting in transport brackets with the intended locks engaged.
- Engage transport locks on the steering cylinders.
- Supply lines for hydraulic, electric and pneumatic systems (if installed) are correctly connected.
- Parking brake is completely disengaged. Safety line is secured (if applicable).
- Hydraulic pressure from tractor to sprayer is turned off.
- Pump drive is turned off, if the main tank is empty. If the main tank is filled with spray liquid, the need for agitation demands that the pump drive is turned on.
- Hitch bolt(s) between tractor and sprayer must be secured with a linchpin or other appropriate means.
- If the sprayer is coupled onto a lift link drawbar, the lower link should be laterally fixed.
- Traffic lights and reflectors are in good working order, clean and free from damage.
- Signs or markings on the vehicle regarding road transport are correctly placed and visible.
- Brakes are in good working order and free from visible damage.
- Tyre pressure is correct according to the load.
- No cables or other parts must be strained or caught in the tractors wheels when cornering.
- Crop residues and dirt are removed.
- All moveable or loose equipment are securely latched or stowed away in the designated compartments.

### **Three-Point Linkage**

If the sprayer is fixed to the tractor's three-point linkage or lower links, ensure sufficient side locking of the tractor lower links before driving off.

Before driving off, secure the operating lever of the three-point hydraulic system against the unintentional raising or lowering of the connected sprayer.

Carry out a visual check that the upper and lower link pins are firmly fixed with linchpins against unintentional release.

### **Braking and Steering**

Braking distance is increased and steering capabilities are influenced, both when the sprayer's tank is empty and even more so with a full tank.

Ensure that the tractor has sufficient steering and braking power. If necessary, use front weights to bring the tractor into a well-balanced and stable position.

Any sprayers and front/rear weights connected to the tractor influence the driving behaviour and the steering and braking power of the tractor.

The front tractor axle must always be loaded with at least 20% of the tractor's empty weight, in order to ensure sufficient steering power.

Always fix the front or rear weights to the intended fixing points according to regulations.

Comply with the maximum load for the connected sprayer and the approved axle and drawbar loads for the tractor.

The tractor must guarantee the prescribed braking distance for the loaded vehicle combination (tractor plus connected sprayer).

Before driving off, always switch off independent wheel braking on the tractor (e.g. lock the braking pedals together).

When turning corners with the sprayer connected, take the broad load and balance weight of the sprayer into account. Slow down as needed to avoid tilting or overturning of the vehicle, especially on sloping roads.

## 2 - Safety notes

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### Hydraulic System

The sprayer is supplied with hydraulic functions operating under a high pressure.

In case of malfunction, there is a risk that the hydraulic system may act inadvertently. This can lead to:

- Fatalities or serious injuries to persons or animals in the working area of the sprayer.
- Material damage to the sprayer when colliding with trees, vehicles or other objects in the working area of the sprayer.

Ensure that the hydraulic hose lines are connected correctly.

When connecting the hydraulic hose lines, ensure that the hydraulic system is depressurized on both the sprayer and tractor sides.

The operator-controls in the tractor, used for hydraulic and electrical movements of components must stay unlocked, e.g. for folding, swivelling and pushing movements. The movement must stop automatically when you release the appropriate control. This does not apply to equipment movements that:

- Are continuous.
- Are automatically controlled.
- Require a floating position or pressed position to function.

Before working on the hydraulic system:

- Lower the spray boom to its lowest position or into the transport position.
- Turn off / depressurize the hydraulic system.
- Turn off the tractor engine.
- Engage the parking brake.
- Remove the ignition key.

Have the hydraulic hose lines checked at least once during a calendar year by an expert to ensure that they are in safe working order.

Replace the hydraulic hose lines if they are damaged or worn, which is when:

- It is leaking.
- Reinforcement material inside the hose is visible due to cracks in the outer layers.

Only use genuine HARDI hydraulic hose lines.

The hydraulic hoses should not be in use for longer than 5 calendar years, including any storage time of maximum 2 years. Even with proper storage and approved use, hoses and hose connections are subject to natural ageing, thus limiting storage time and the time of use. However, it may be possible to specify the length of use from experience values, in particular when taking the risk potential into account. In the case of hoses and hose connections made from thermoplastics, other guide values may be decisive.

Never attempt to plug leaks in hydraulic hose lines using your hand or fingers. Escaping high pressure fluid (hydraulic oil) may pass through the skin and ingress into the body. Risk of serious injury or death.

If you are injured by hydraulic oil, contact a doctor immediately.

When searching for leaks, use suitable aids to avoid the risk of serious injury or death.

### **Electrical System**

When working on the electrical system and the sprayer is attached to the tractor, always disconnect the tractor's battery.

When disconnecting the battery, disconnect the negative terminal first, followed by the positive terminal.

When connecting the battery, connect the positive terminal first, followed by the negative terminal.

Always place the appropriate cover over the positive battery terminal. If there is accidental earth contact, there is a risk of explosion.

If climbing onto the sprayer during service work, be aware of the low voltage danger from electric components.

Only use the prescribed fuses. If the fuses used are too highly rated, the electrical system will be destroyed. Risk of fire.

The sprayer may be equipped with electronic components whose functions are influenced by electromagnetic interference from other units. Such interference can pose risks to people, if the following safety information is not followed:

- If retrofitting electrical units and/or components on the sprayer with a connection to the on-board power supply, the user is responsible for checking whether the installation might cause faults on the vehicle electronics or other components.

## 2 - Safety notes

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### Universal Joint Shaft

A rotating shaft can catch clothes, tools or aids, if touching or getting in contact with each other. Risk of severe damage and injury as the rotating shaft is driven by a powerful torque from the tractor.

Use only the power take-off (PTO) shaft prescribed by HARDI, equipped with the proper safety devices.

Read and follow the delivered instruction manual from the manufacturer of the PTO shaft.

The protective pipe and PTO shaft guard must be undamaged, and the shield of the tractor and sprayer universal joint shaft must be attached and be in proper working condition.

Safety devices must be in good condition when you are working with the sprayer.

You may install or remove the PTO shaft only after you have done all of the following:

- Switched off the universal joint shaft drive.
- Switched off the tractor engine.
- Removed the ignition key.
- Applied the parking brake.

Always ensure that the PTO shaft is installed and secured correctly both at the tractor end and at the sprayer pump end.

When using wide-angle PTO shafts, always install the wide angle joint at the pivot point between the tractor and sprayer.

Secure the PTO shaft guard by attaching the chain(s) to prevent movement.

Observe the prescribed pipe overlaps in transport and operational positions. See the operating manual from the PTO shaft manufacturer.

When turning around corners, observe the permitted bending and displacement of the PTO shaft.

Before switching on the universal joint shaft, check that the selected universal joint shaft speed (rpm) of the tractor matches the permitted drive speed of the sprayer.

Stay below the maximum speed (rpm) suitable for the PTO shaft.

Instruct people to leave the danger area of the sprayer, before you switch on the universal joint shaft.

While work is being carried out on the universal joint shaft, there must be no one in the area of the universal joint shaft or PTO shaft, while it is rotating.

When the tractor engine is turned off, the universal joint shaft must also be switched off. This prevents an unintentional restart of the universal joint shaft immediately, when the tractor engine is turned on again.

Always switch off the universal joint shaft if it is not needed in action, or if excessive bending of the PTO shaft occurs.

You may work on the sprayer only after all moving sprayer parts have come to a complete stop.

Secure the tractor and sprayer against unintentional starting and unintentional rolling, before you perform any cleaning, service or maintenance work on universal joint shaft-driven sprayers or PTO shafts.

After disconnecting the PTO shaft, place it on the holder provided.

After removing the PTO shaft, attach the protective sleeve to the universal joint shaft stub.

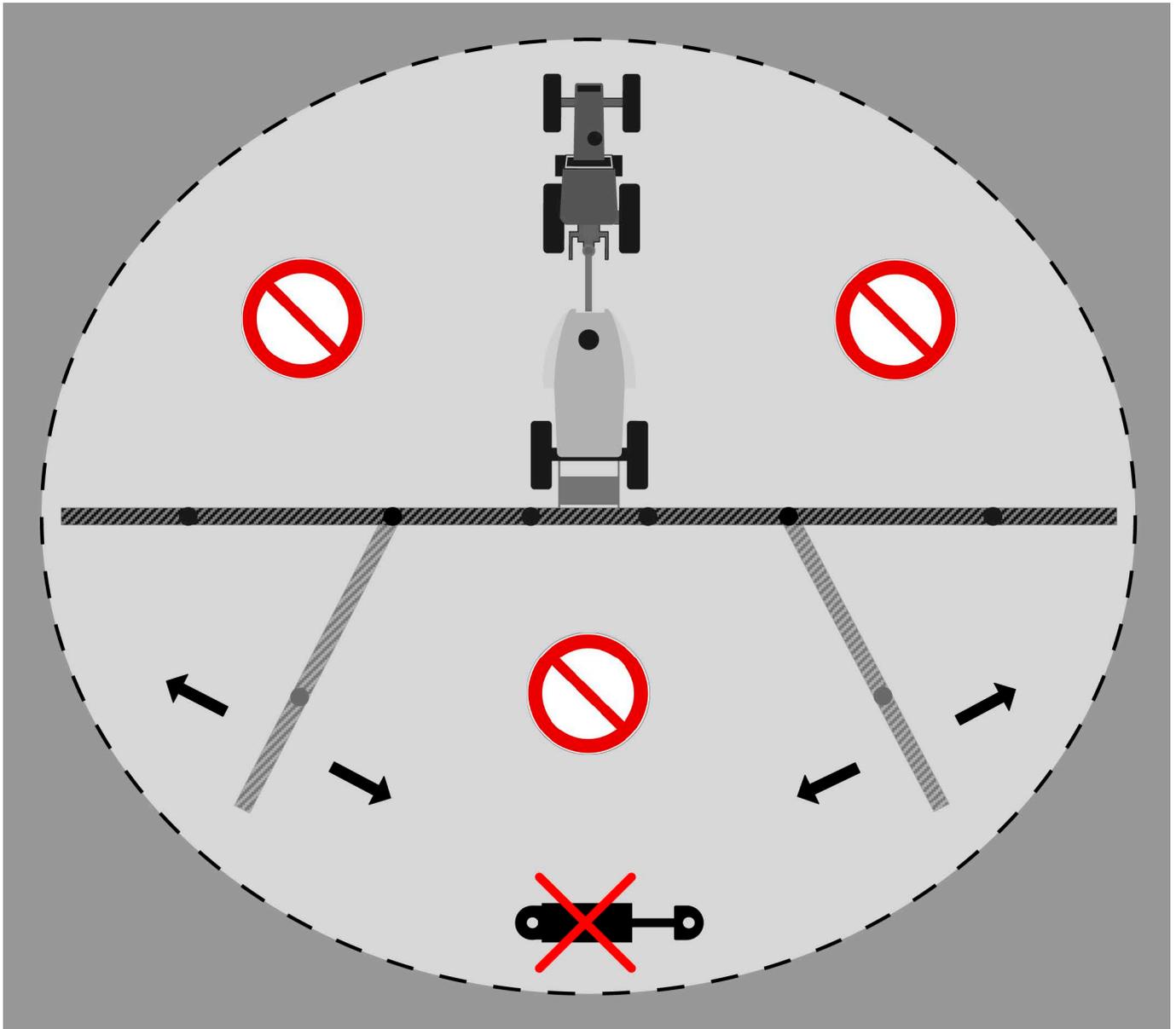
If using a travel-dependent universal joint shaft, note that the PTO speed depends on the drive speed of the vehicle, and that the direction of rotation reverses, when you drive in reverse.



### Working Area of the Sprayer

Before operating the sprayer, the operator must ensure that the area around the sprayer is free.

This working area is defined as the area within the dashed line:



The working area includes the total width of the spray boom as well as the area used for boom folding. Please note the area immediately behind the sprayer, which is also defined as working area.

The size of the working area depends on the boom type and boom width. The operator must familiarize with the boom at hand before using the sprayer.



**DANGER!** Before the hydraulics for the sprayer are activated, there must be no risk of persons, animals or other machines or vehicles entering the working area of the sprayer. Risk of damage and fatality!

## 2 - Safety notes

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### Field Sprayer Operation

Observe the recommendations from the manufacturer of the crop protection product in respect of:

- Personal protective equipment.
- Warning information on exposure to crop protection products.
- Regulations on dosing, applications and cleaning.

When there will be exposure to the crop protection product:

- Wear the proper personal protective equipment - this may differ depending on the chemical being sprayed.
- Wash and change clothes after spraying.
- Wash tools if they have been contaminated.

Observe the information in the national plant protection law.

Keep hoses, pipes or other lines closed, when they are under pressure.

When use of the TurboFiller or VACnMIX has ended, make sure that all valves on the TurboFiller or VACnMIX are closed / deactivated.

Only use genuine HARDI hoses and hose clamps for replacement, which stand up to chemical, mechanical and thermal requirements.

The rated volume of the spray liquid tank must not be exceeded during filling. If overfilled, some sprayer functions may be disabled. However, the MainTank is a little oversized to allow for foaming.

When using tractors with a cab with ventilation fans, replace the fresh air filters with activated carbon filters.

Observe the information on the compatibility of crop protections and substances for the field sprayer.

Be aware that some crop protection products have a tendency to stick together or settle when being mixed.

Do not fill the sprayer with water from bodies of water, which are open to the public. This is for the protection of people, animals and the environment due to the risk of contamination.

Only fill the sprayer using a free flow of water from the mains water supply or from an external water tank.

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### Environmental Precautions

It is essential to reduce the environmental impact of plant protection chemicals to a minimum. Particularly the soil, subsoil water, streams, lakes, flora and fauna must be in focus. Contamination of subsoil water must be prevented by paying particular attention to avoidance of spot contamination of the soil in connection with filling and washing and parking of the sprayer.

If any concentrated chemicals are spilled on the soil, the contaminated soil should be removed and sent for cleaning at a capable facility. Follow local regulations regarding disposal. This must be done to avoid seepage of chemicals to the subsoil waters. Avoid spillage - use the chemical filling device for filling the sprayer with chemicals.

Do not overfill the MainTank. The rated volume inside the MainTank is stated with large printed numbers on the outside of the tank. If overfilled, the spray liquid could leak from the sprayer causing contamination of the soil.

Before filling the sprayer with plant protection chemicals, the sprayer must be calibrated to apply the precise dose rate selected. The important input sensors are the flowmeter and the speed sensor.

It is recommended to establish a proper filling and washing location with hard, impenetrable surface drained to a receptacle if the sprayer is always filled or cleaned on the same spot at the farm. If a washing/filling location is NOT available, the following precautions should be taken:

- The sprayer should only be filled with clean water at the farm.
- The plant protection chemicals must be added and mixed in the field to be sprayed.
- Select a different location each time the sprayer is refilled.

### Service Work Precautions

Before carrying out any service work, all of the following instructions must be followed in order to prevent damages to the sprayer, injuries and fatalities:

- Do not walk under any part of the sprayer, unless it is secured. The spray boom is secured when placed in the transport brackets.
- If the spray boom is folded up and resting in the transport brackets for service, check visually that the ParaLift locks are engaged (the boom is locked in place).
- If the spray boom is unfolded for service, the boom must be lowered, until it reaches its end stop. Place strong trestles under the boom for support or use a lifting crane for support.
- Never service or repair any equipment while it is operating.
- Any service work should be carried out on level ground with only authorized persons nearby.
- Depressurize the hydraulic system for the sprayer to prevent unintentional movements of the sprayer.
- Switch off the PTO.
- Switch off the tractor and remove the ignition key to prevent unintentional starting.
- Activate the parking brake to prevent rolling.
- Put wheel chocks in front and behind of the wheels to prevent the sprayer from rolling.
- Electric power must be disconnected from the sprayer.
- Any service work on electronic /electric parts must be carried out under dry conditions - no rain or splashes from water or other liquids.

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### Cleaning

When cleaning nozzles and filters, lower the spray boom to around waist height above the ground. For safety reasons, do NOT! walk or stand below the boom or ParaLift during this cleaning work!

Dispose of oils, greases and filters in the appropriate way to protect the environment.

Cleaning of tanks:

- Due to toxic vapours from spray liquids in the MainTank, climbing into this tank is very hazardous. Cleaning should only be done from the outside.
- Do NOT! enter the MainTank.
- Do NOT! inspect any of the tanks with the liquid pump running.

Rinse and wash the equipment with clean water after use and before servicing.

## 2 - Safety notes

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### Service and Maintenance

Always reassemble all safety devices or shields immediately after servicing.

After a longer period of storage, the sprayer must be inspected by a qualified operator. Contact your HARDI dealer for more information.

Repair work in the MainTank must only be carried out by a specialized workshop.

Do NOT! enter the MainTank.

Access to the RinseTank must only take place with the spray boom in transport position, and after it is verified that the transport locks are engaged.

Regularly check the nuts and bolts for firm seating and re-tighten them as necessary.

If electrical welding is used on the tractor and on the attached sprayer, disconnect the cable to the tractor's alternator and battery before carrying out electrical welding work on the tractor and on the connected sprayer. Remove all inflammable or explosive materials from the area to prevent fire.

Pressure test the spray functions with clean water prior to filling with chemicals.

Do NOT! disconnect hoses, pipes, or any equipment, if the sprayer is in operation.

Stay below the maximum speed (RPM) suitable for the PTO shaft.

When replacing spare parts, use suitable tools and personal protective equipment.

Spare parts must at least meet the specified technical requirements of HARDI. This is ensured through the use of genuine HARDI spare parts.

### Operator safety

#### Symbols

These symbols are used through the book to designate where extra attention is required by the reader. The four symbols have the following meaning:



This symbol means DANGER. Be very alert as your safety is involved! The DANGER symbol indicates a high risk for an immediate death or serious physical injury, if the instruction is not followed.



This symbol means WARNING. Be alert as your safety can be involved! The WARNING symbol indicates a medium risk for immediate death or serious injury, if the instruction is not followed.



This symbol means ATTENTION. This indicates an obligation to special behaviour or an activity required for proper sprayer handling. This instruction will help you to avoid faults on the sprayer or disturbance to the environment.



This symbol means NOTE. This instruction will help you to use all the functions of your sprayer in the best way possible for better, easier and safer operation

#### 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.



978443 Service!  
Carefully read operators instruction book 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.



978440 Service!  
Tighten to torque according to instruction book.



97802100 Risk of death!  
Do not attempt to enter tank.



978447 Risk of burn!  
Stay clear of hot surfaces.



978444 Risk of injury!  
Do not open or remove safety shields while engine is running.



978586 Risk of injury!  
Flying objects, keep safe distance from machine as long as the engine is running.



978448 Risk of injury!  
Keep sufficient distance away from electrical power.



978435 Risk of injury!  
Keep hands away.

## 2 - Safety notes



978441 Risk of squeeze!  
Stay clear of raised unsecured loads.



978445 Risk of squeeze!  
Never reach into the crushing danger area as long as parts are moving.



978434 Risk of squeeze!  
Keep hands away, when parts is moving.



978442 Risk of falling off!  
Do not ride on platform or ladder.



978446 Risk of sprayer tipping over!  
Be aware when disconnecting the sprayer.



978438 Grip area!  
Manual handling of boom etc.



97802200 Not for drinking!  
This water must never be used for drinking water.



97802300 Not for drinking!  
This water must never be used for drinking water.



97818100 Tank under pressure!  
Beware when moving lid.



EasyClean filter service!  
Open and clean filter monthly.

97827000



97829000 Lifting point!

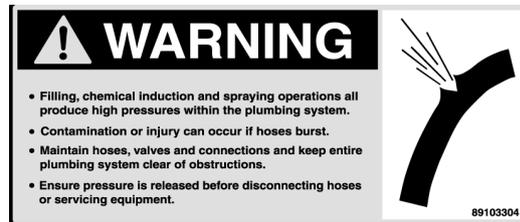


978439 Lifting point!



97831500 Load index!  
Max. permitted load rating is 164 at 40 km/h.

Load index  
**164 A8**

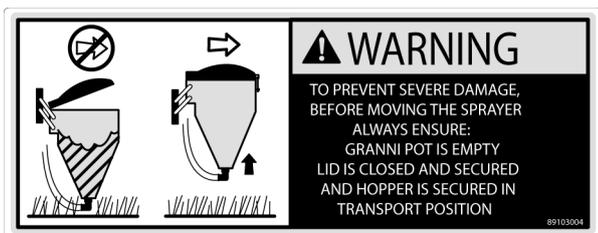


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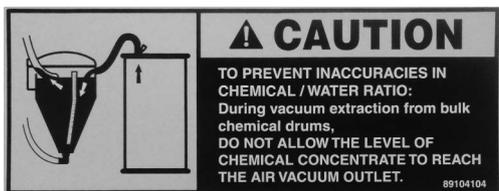




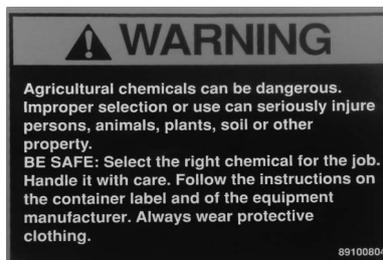
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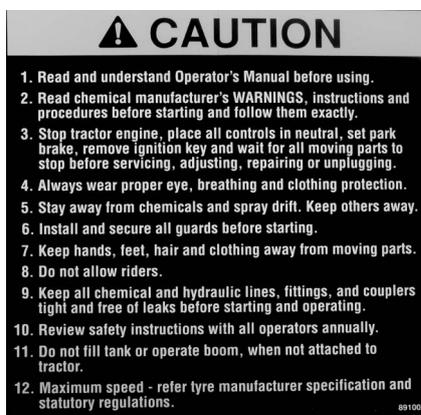
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## 2 - Safety notes

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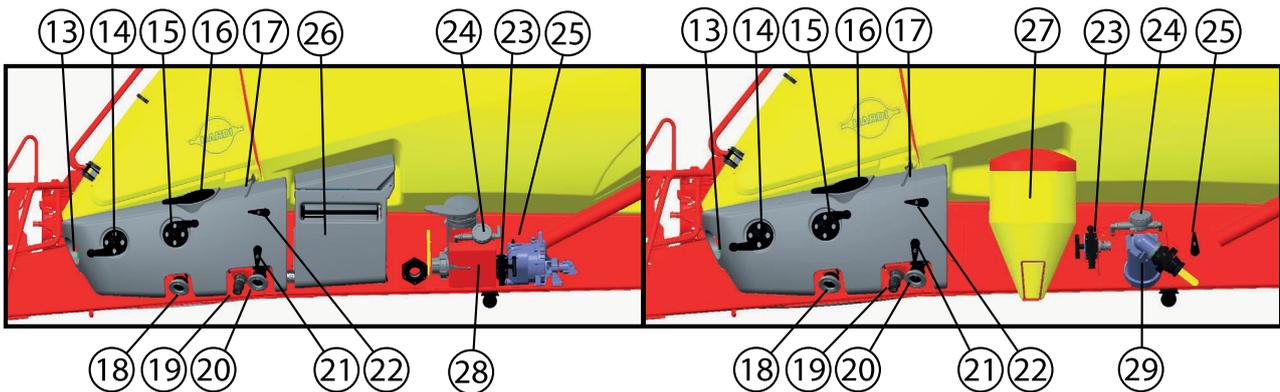
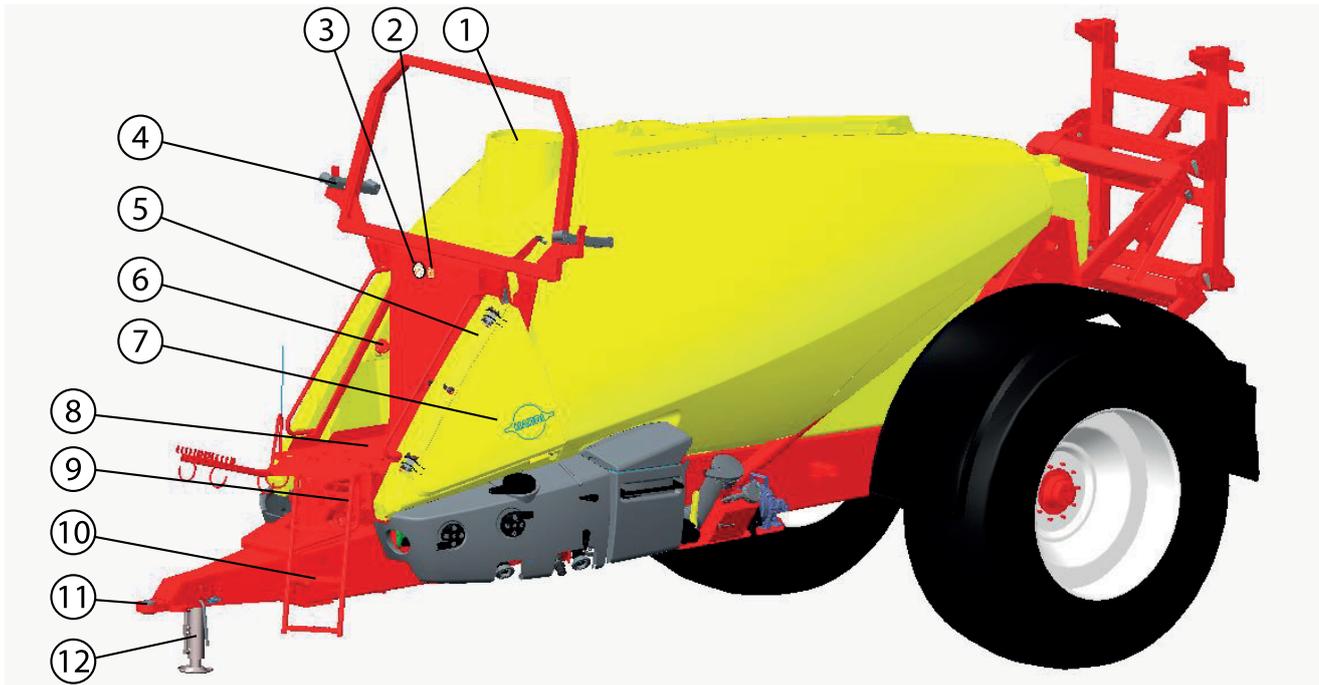
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## General info

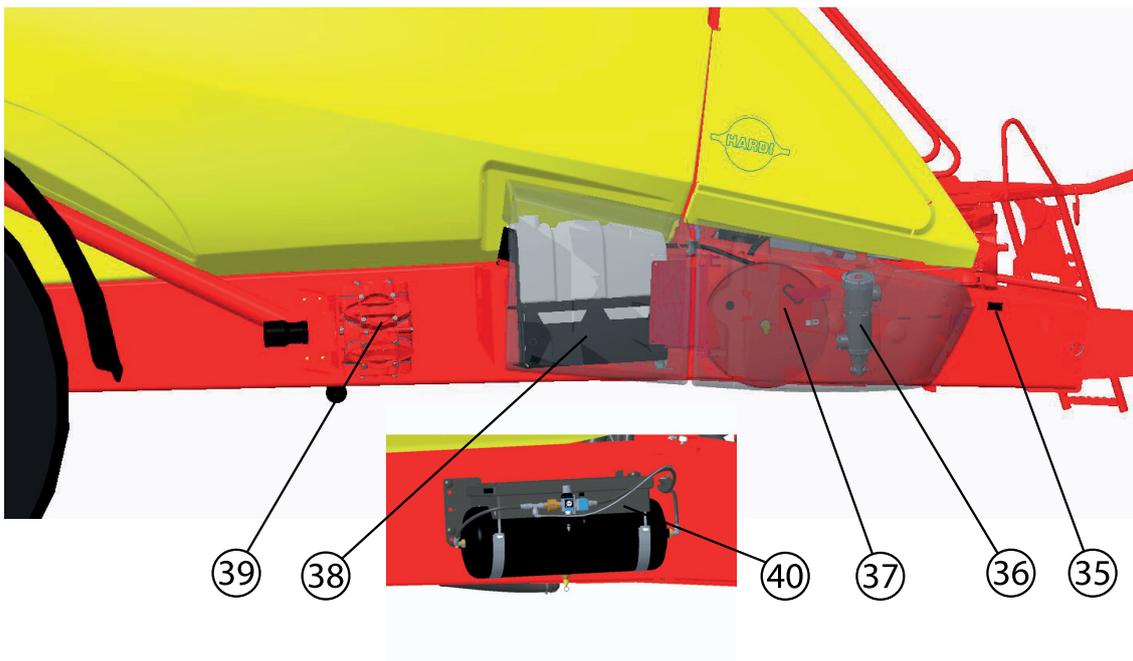
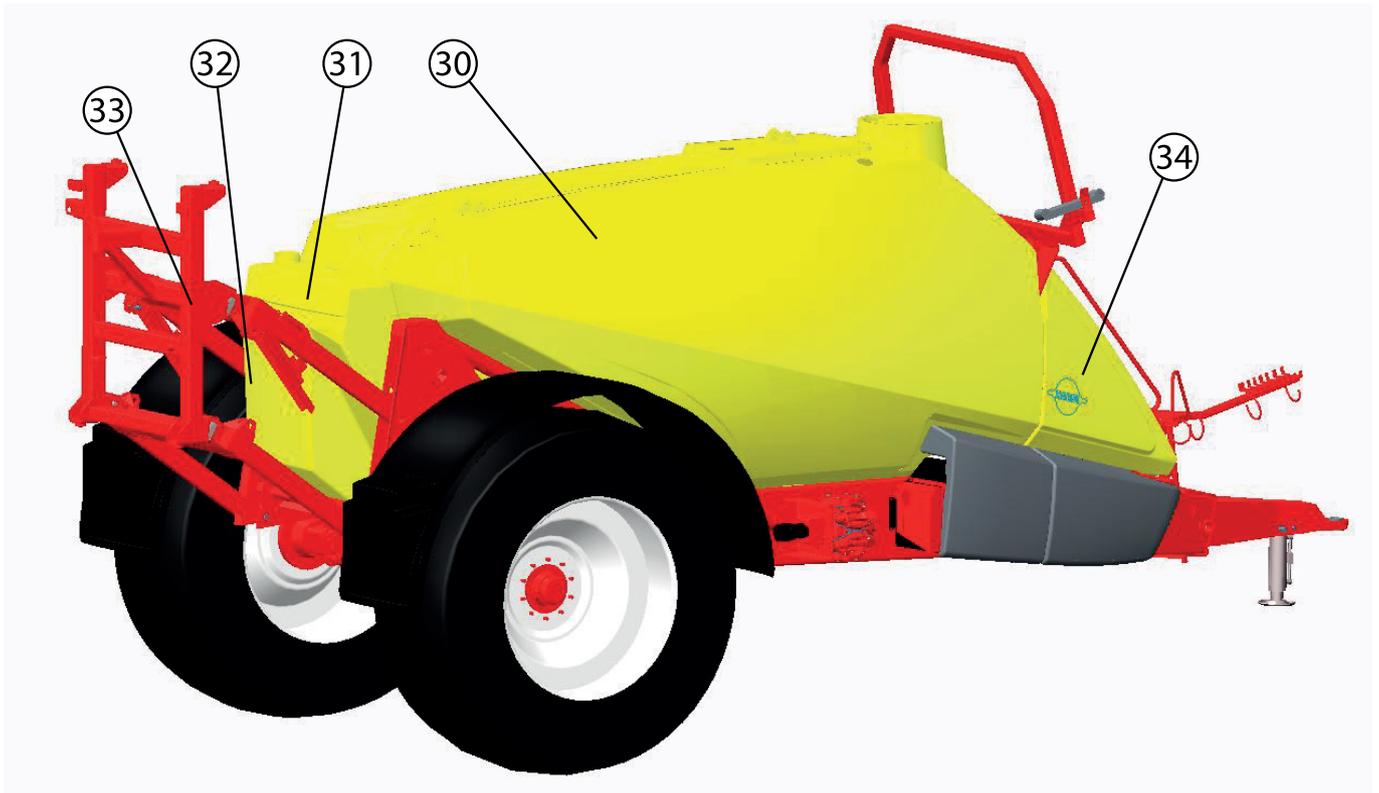
### View Front



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Main tank lid</li> <li>2. EasyClean clogging indicator</li> <li>3. Spray pressure gauge</li> <li>4. Boom rest</li> <li>5. Main tank level indicator</li> <li>6. Clean water tank lid</li> <li>7. SafetyLocker</li> <li>8. Platform</li> <li>9. Pump</li> <li>10. Ladder</li> <li>11. Drawbar hitch</li> <li>12. Support leg</li> </ul> | <ul style="list-style-type: none"> <li>13. Agitation/External Cleaning Device valve</li> <li>14. Suction SmartValve</li> <li>15. Pressure SmartValve</li> <li>16. EasyClean filter</li> <li>17. Clean water tap</li> <li>18. Rinsing tank coupler</li> <li>19. External Filling coupler</li> <li>20. Pressure empty coupler</li> <li>21. External Filling ON/OFF valve</li> <li>22. Chemical source valve</li> <li>23. (Optional) Chem Probe/ Flush valve</li> <li>24. (Optional) Chem meter</li> <li>25. Directional fill valve</li> <li>26. TurboFiller</li> <li>27. VACnMIX</li> <li>28. Banjo fast fill</li> <li>29. Filtered fill</li> </ul> |
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## 3 - Description

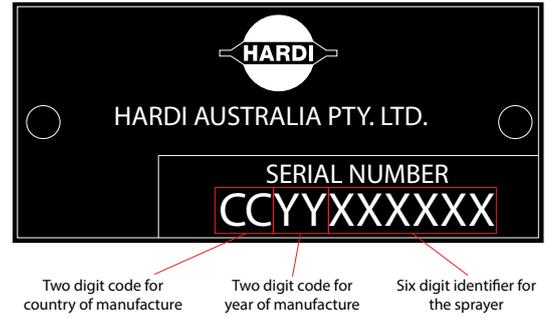
### View Back



- 30. Main tank
- 31. Rinse tank cap
- 32. Rinse tank
- 33. Paralift frame
- 34. Clean water tank
- 35. Chassis tie down point
- 36. CycloneFilter
- 37. (Not used)
- 38. Chem locker
- 39. FlexCapacity pump
- 40. Air receiver (Active air, TT12 and H-Select)

### Identification plates

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



## 3 - Description

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### Roadworthiness

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



ATTENTION! Maximum driving speed for sprayers with or without brakes is different. Maximum driving speed is 25 km/h for unbraked machines and 40 km/h for braked machines.

### **Sprayer Use**

The HARDI sprayer is for the application of crop protection chemicals and liquid fertilizers. 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 prevent unnecessary risk for persons and the environment, when carrying out your spray job.

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### **Steel Frame**

A very strong and compact steel frame / chassis with a strong chemically resistant and weatherproof electrostatic lacquer coat. Screws and bolts etc. are made of stainless steel, or they have been Delta/Magni-treated to resist corrosion.

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### **Tanks**

The tanks are made of impact-proof polyethylene, resistant to UV radiation and chemicals.

The main tank has a purposeful design with no sharp corners for easy cleaning.

The tank lid is placed so it can be accessed from the platform. This ensures an easy access for the filling and cleaning of the tank, etc. The sprayer may also be equipped with a TurboFiller, a RinseTank and a CleanWaterTank. A large, easy-to-read MainTank Level Indicator is placed beside the platform, where it is visible from the tractor cabin and in the work zone of the sprayer.

Nominal main tank content is 6500,8500 or 10000 litres.

# 3 - Description

## Liquid system

### Pump

Diaphragm pump with 6 diaphragms, model 464.

Standard speed = 540 RPM (6-spline shaft).

Optional speed = 1000 RPM (21-spline shaft).

The design of the diaphragm pump is simple, with accessible diaphragms and valves, which ensures that liquid does not contact the vital parts of the pump.

Pump model 464 is shown in the picture.



### FlexCapacity Pump (optional)

Some sprayers include a dual pump setup with an extra hydraulically driven pump of the same type as the main pump. It is placed on the sprayer's 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 too loose (= liquid leakage, the valve needs to be serviced. Please see "3-Way Valve Adjustment" on page 1 for further information.

### Pressure Valve (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 little steel knob above the handle.

The handle is turned so the desired symbol is just below the steel knob. If the handle is turned to a position without a symbol (unused function), the valve is closed.



Main tank



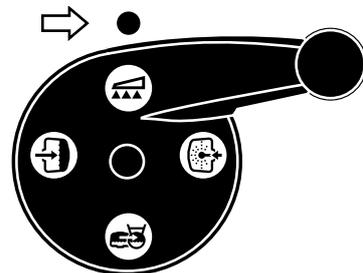
Spraying



Internal tank cleaning  
(Rinsing nozzles)



Pressure draining or  
TurboFiller



### Suction Valve (Blue symbols)

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

The handle is turned so the desired symbol is just below the steel knob.



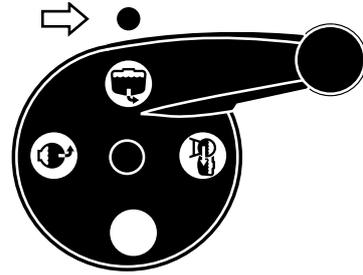
Main tank



Rinsing tank



Filling from external tank



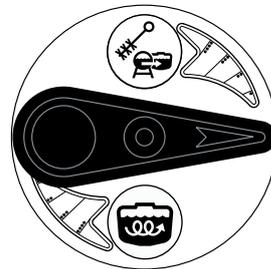
### Agitation Valve and Flushing Valve (Green symbols)

With the adjustable agitation valve it is possible to combine spraying with a high volume rate at high pressure with agitation at the same time. Flushing of the external filling equipment.

This is regulated by the valve: The valve is marked with an arrow on the disc which indicates the amount of liquid that passes through the valve.



Adjustable agitation



Choose your own valve setting, depending on the tank contents:

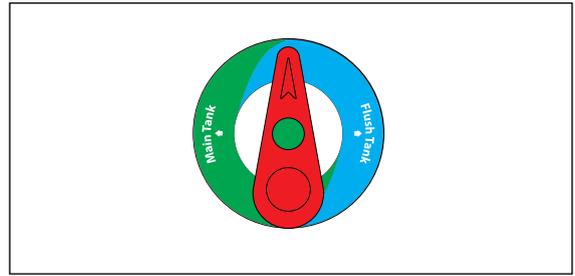
- The handle is turned to a position near the tip of the arrow: Only a small amount of liquid is allowed to pass the valve resulting in a lesser extent of agitation. This is recommended when using chemicals with a low density to prevent foaming in the tank.
- The handle is turned to a position in the wide end of the arrow: A large amount of liquid will pass the valve resulting in a large extent of agitation. This is recommended when using chemicals with a high density, which will tend to settle at the bottom of the tank.

# 3 - Description

## Directional fill valve

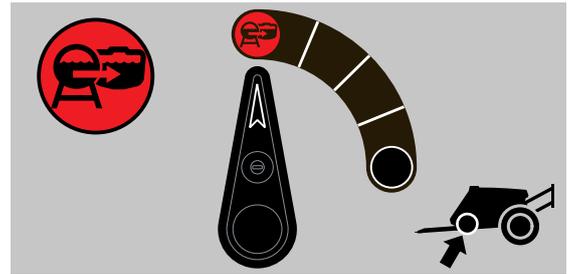
If the sprayer is equipped with Filtered Fill or a Banjo Fast fill System a directional fill valve is mounted on chassis left side.

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



## External Filling Device valve - Red labels (optional)

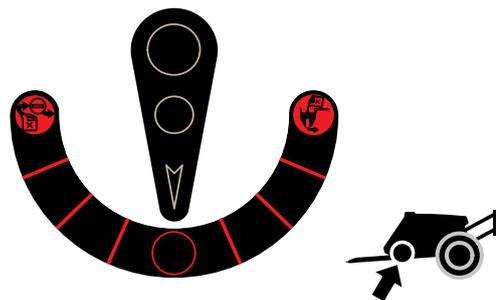
This valve is used to control filling from an external tank or reservoir. Note that the suction SmartValve should be positioned at "Suction from external source" and the pressure valve should be positioned at "Pressure to Main Tank" to activate the valve.



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

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

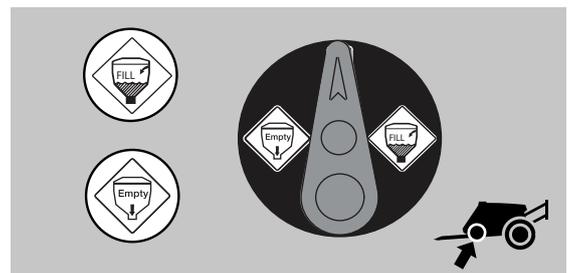
1. Centre position "OFF" (leave in this position unless transferring chemical).
2. TurboFiller (use this position to activate and empty the TurboFiller).
3. Chem Probe / Chem Meter...*if fitted* (use this position when transferring liquid chemical concentrate from an external drum or container).



## Vacuum Transfer Valve - (only if equipped with VACnMIX)

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

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

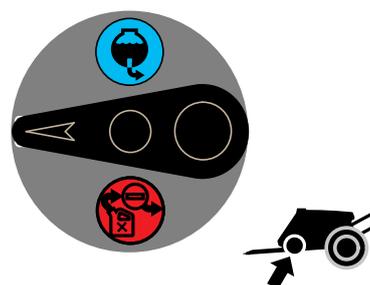


## ChemProbe / Flush valve

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

### Flushing the Chem Meter Circuit

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

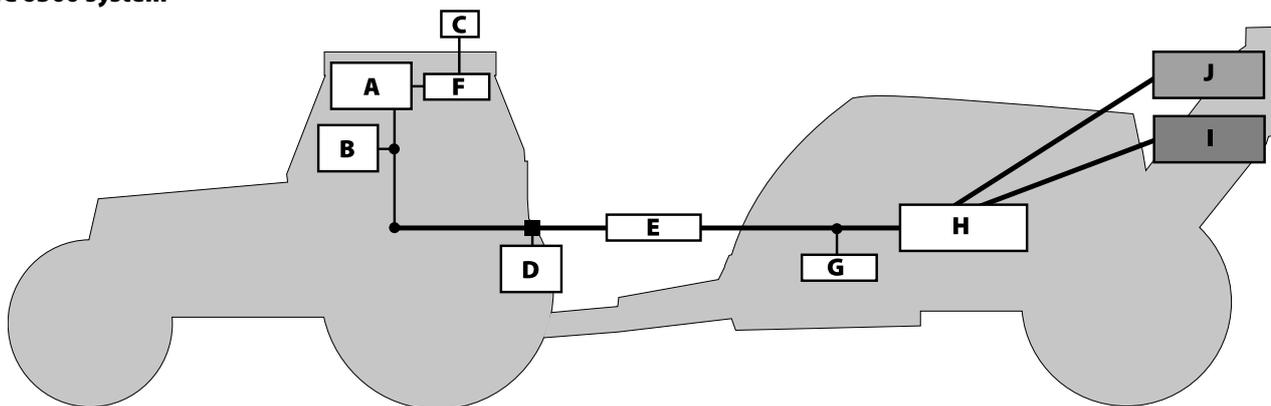


### Electronic Control units

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

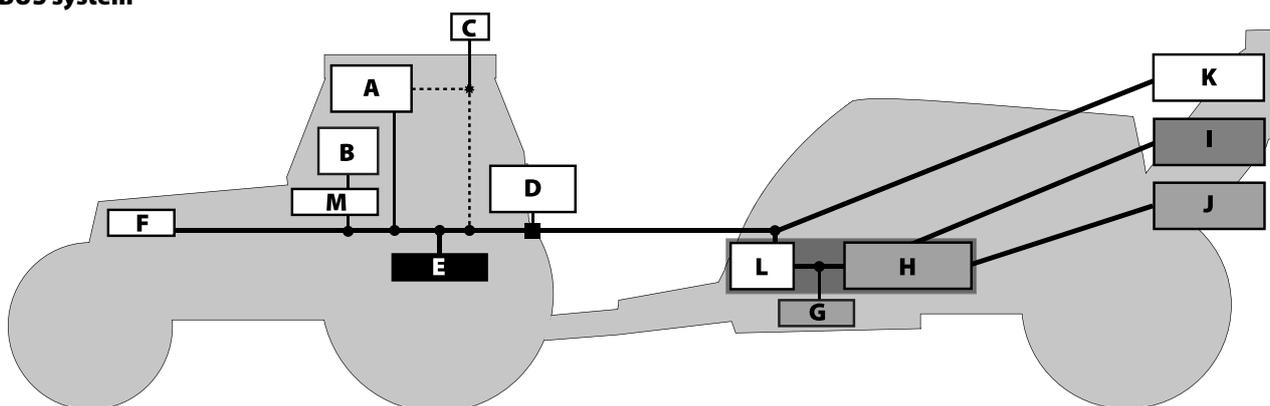
**i** NOTE! For information regarding installation of the control unit and how to operate it please refer to the: **67033200-100 Controller HC 6500 / Isobus VT** and **67032700-100 Controller HC 8500/9500** if equipped with a HC 8500/9500 controller

#### HC 6500 system



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

#### ISOBUS system



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

## 3 - Description

### DynamicFluid4 Pressure Regulation

Traditional fluid regulation starts, when the nozzles are opened. With DynamicFluid4 the regulation is a continuous process, even if the nozzles are closed.

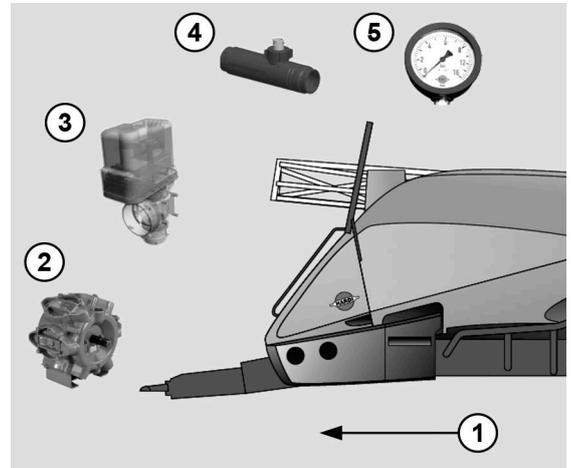
The DynamicFluid4 system is based on 5 sensors that the sprayer computer uses to calculate an optimal regulation. The sensors are also back-up for each other, ensuring that the system can continue regulation - even if one or more sensor signals fails.

The applied 5 sensors measure:

1. Driving speed.
2. Pump RPM.
3. Regulation valve opening angle.
4. Fluid flow.
5. Fluid pressure.

DynamicFluid4 uses the following parameters/variables to regulate:

- Driving Speed.
- Pump RPM.
- Active Sections.



Then DynamicFluid4 starts to move the regulation valve towards the calculated final position, immediately after the operator makes any changes.

During the spray job, there are two scenarios:

#### Nozzles ON

The sensor input to the regulation system is live.

#### Nozzles OFF

A simulation of the previous spray situation now is basis for the regulation. Called FeedForward and it foresees the correct opening of the regulation valve. Thereby it is extremely fast to obtain the correct application rate when opening the nozzles.

Even when closing all but one nozzle on a very wide boom, it is quick to achieve the correct and stable application rate. The benefit is more precise application rates immediately when spraying begins.

#### Features for DF4

- The pressure regulation, quick reaction and zero bypass is ensured by two ceramic discs.
- Very fast and accurate regulation when all sensors are active, controller configurations are correct, and pump, filters and valves are in good condition. The system measures and calculates 20 times per second.
- Quick reacting valve, when turning sections On/Off, and as speed changes.
- Optimized AutoSectionControl feature that predicts boom section openings and optimizes nozzle pressure.
- Optimized for different pump drive systems.
- Nozzle surveillance. No setup or tuning is required for nozzle change.
- Controller display can show the current nozzle output, which compares with the rated output. A significant difference in output is caused by failures occurring in the liquid system, such as:
  - Severe clogging of filters.
  - Large leakages on hoses and fittings.
- All functions work, though with degraded performance (limp-home modes), if:
  - Failures occur in the fluid system, e.g. pump defects, clogged filters or leaking valves.
  - Failures occur on the pressure sensor, flow sensor or pump sensor.
  - There is a wrong setup of sprayer data in the menus.

### Clean water tank

A clean water tank is integrated into the right side cover. It is accessed by entering the platform and is accessible on the right hand side. The ball valve (A) for water draining is located behind the grey side cover on the sprayer's left side.

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

Capacity: approximately 20 litres.



## 3 - Description

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### RinseTank

One RinseTank is rear of the sprayer behind the MainTank. The tank is made of impact-proof and chemical resistant polyethylene. It is used for rinsing and flushing of the MainTank and liquid system.

Filling is done via the 1½" CamLock fitting placed in the working area. The RinseTank level indicator is placed at the rear of the tank.

Capacity: approximately 700 litres.



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### Filters

Filters on your sprayer are there to protect components and prevent nozzle clogging.

- An EasyCleanFilter (suction) is fitted in the working zone.
- A CycloneFilter (pressure) is fitted on the sprayer's right side hidden behind the right front cover. It has a built-in self-cleaning function.
- InLine filters (pressure) can be fitted for each boom section.
- Nozzle filters are fitted at each nozzle.
- A coarse filter is located below the top cover for the MainTank.



ATTENTION! All the filters should be in use and their functionality must be checked regularly. Pay attention to the correct combination of filter and mesh size. For more information, see the chapter "Technical Specifications" in this book.



ATTENTION! Always operate your sprayer with clean filters to ensure proper functions and to protect the interior of the pump and valves.

#### EasyCleanFilter

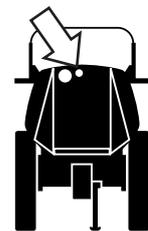
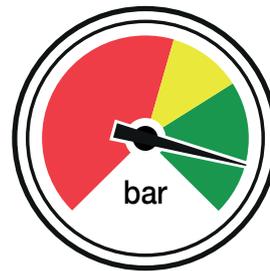
This filter collects impurities, when liquid is being sucked out of the main tank by the main pump.

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



Besides the spray pressure gauge a clogging indicator is installed. This works as a vacuum gauge for the filter during operation - the pointer moves from green towards red, if the filter starts clogging.

Clogging Indicator	Filter Condition
Green area	70 - 100 % capacity. No cleaning necessary.
Yellow area	55 - 70 % capacity It is possible to finish an ongoing spray job and then clean the filter afterwards.
Red area	0 - 55 % capacity Clean the filter immediately, as it is clogged too much for proper function.



## 3 - Description

### CycloneFilter

With the CycloneFilter, any impurities in the spray liquid will be cleaned out and returned to the MainTank via the return flow.

Function diagram:

1. Filter lid
2. Piping from pump
3. Piping to boom
4. Return to tank
5. Boost valve

The boost valve (5) has three positions marked with small dots on the lever:

- A. This position is marked with 1 dot:

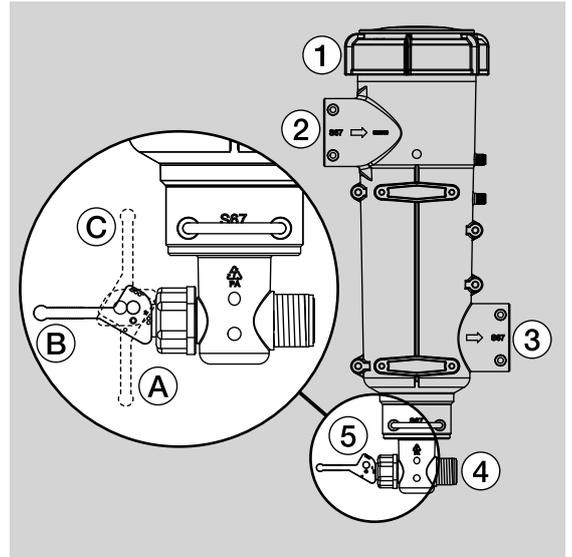
There is no return flow. This position is used when rinsing the boom, if there is spray liquid in the MainTank. Also used when high spraying volume is required.

- B. This position is marked with 2 dots:

Normal position when spraying. With return flow to prevent filter from clogging during spraying. This position is used when rinsing the boom, if the MainTank is empty.

- C. This position is marked with 3 dots:

Flushing position which is used if the filter is clogged. Lift and hold the lever to use this position, which largely increases the return flow and flushes the filter. The pressure SmartValve must be set for "Spraying".



ATTENTION! Use of position C is no guarantee for a clean filter. Always do a visual inspection and cleaning of the filter. For more about cleaning, see the section "10 Hours Service - CycloneFilter" on page 1.



DANGER! Never open the CycloneFilter unless the pressure SmartValve is set to "MainTank". Otherwise spraying liquid may hit you, when opening the filter, and this will also drain the MainTank!

### TurboFiller

The TurboFiller is where you add the chemicals to be mixed with water in the MainTank.

Capacity: approximately 35 litres.

By operating the levers (A) on the side of the TurboFiller (B), you can do the following:

- Stir up the added chemicals with water from the sprayer.
- Transfer the mix to the main tank.
- Clean your chemical container or the TurboFiller (B) inside by using the flushing nozzle.
- A spray gun (C) is also available for further cleaning.

#### Before Use

- Pull the handle to unlock.
- Grab the handle to pull the TurboFiller down, until it click into locked position.

#### After Use

- Pull the handle to unlock.
- Push the TurboFiller back in storing position, until it locks.

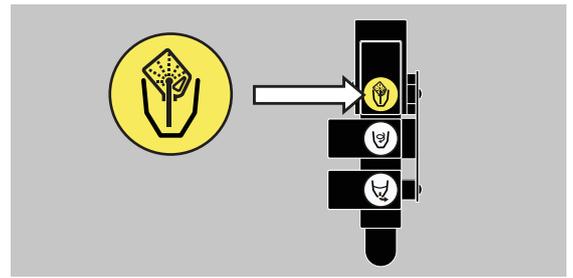


WARNING! Before releasing the lock, always keep a hand on the grip to avoid abrupt movement of the TurboFiller!

### Rinsing of Chemical Containers

The upper lever is used for two purposes.

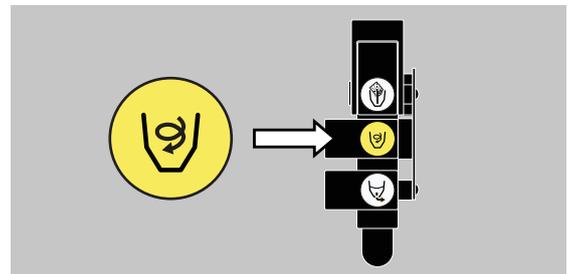
1. When the TurboFiller lid is open:  
For rinsing empty containers. Place the container over the rotating flushing nozzle in the middle of the TurboFiller to rinse the inside of the container.
2. When the TurboFiller lid is closed:  
Use the lever to rinse the hopper, when the filling of chemicals is completed.



**DANGER!** Do not activate this lever, unless the multi-hole nozzle is covered by a container, as spray liquid may otherwise hit the operator! Risk of injuries and spillage on the ground.

### 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.



### HARDI®VACnMIX (optional equipment)

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

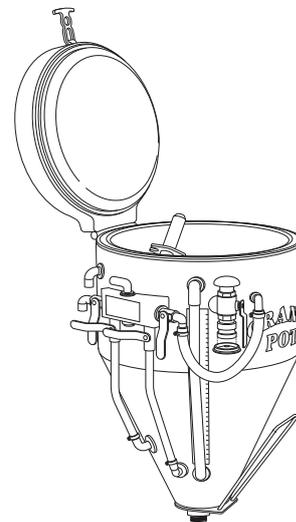
Your Vacuum VACnMIX™ uses the latest design and technology to provide fast, safe and accurate transfer of liquids, powder or granules.

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

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

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

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

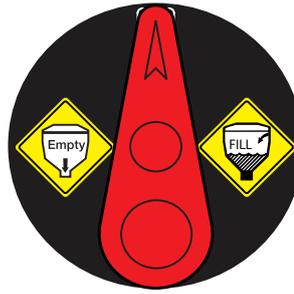


### 3 - Description

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#### **Vacuum / Transfer Valve (only if equipped with VACnMIX)**

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



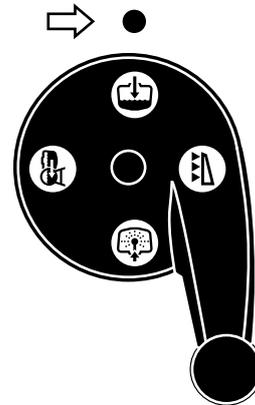
## Control Manifold VACnMIX



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

### Fast Fill valve/Vortex Control valve

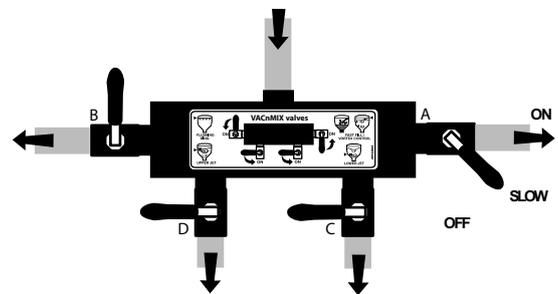
ATTENTION! The pressure Smartvalve must be set to Pressure to Main Tank to activate VACnMIX.



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



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



### Vortex Generation

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

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

### Hopper Rinsing Ring valve

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

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



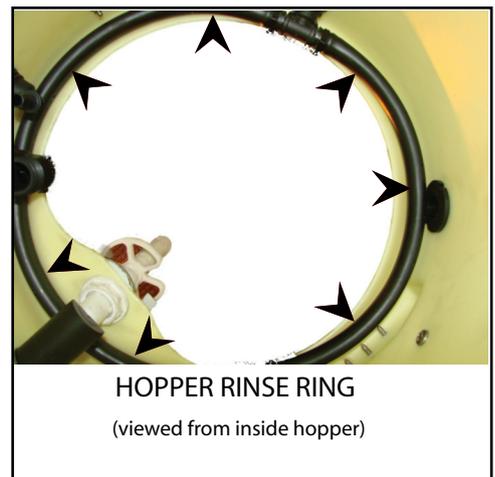
DANGER! Do not activate the rinse ring unless the hopper lid is closed to avoid spray liquid hitting the operator.



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



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



## 3 - Description

### Chemical Container Rinsing Device

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

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

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

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



### Chem Meter (optional)

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

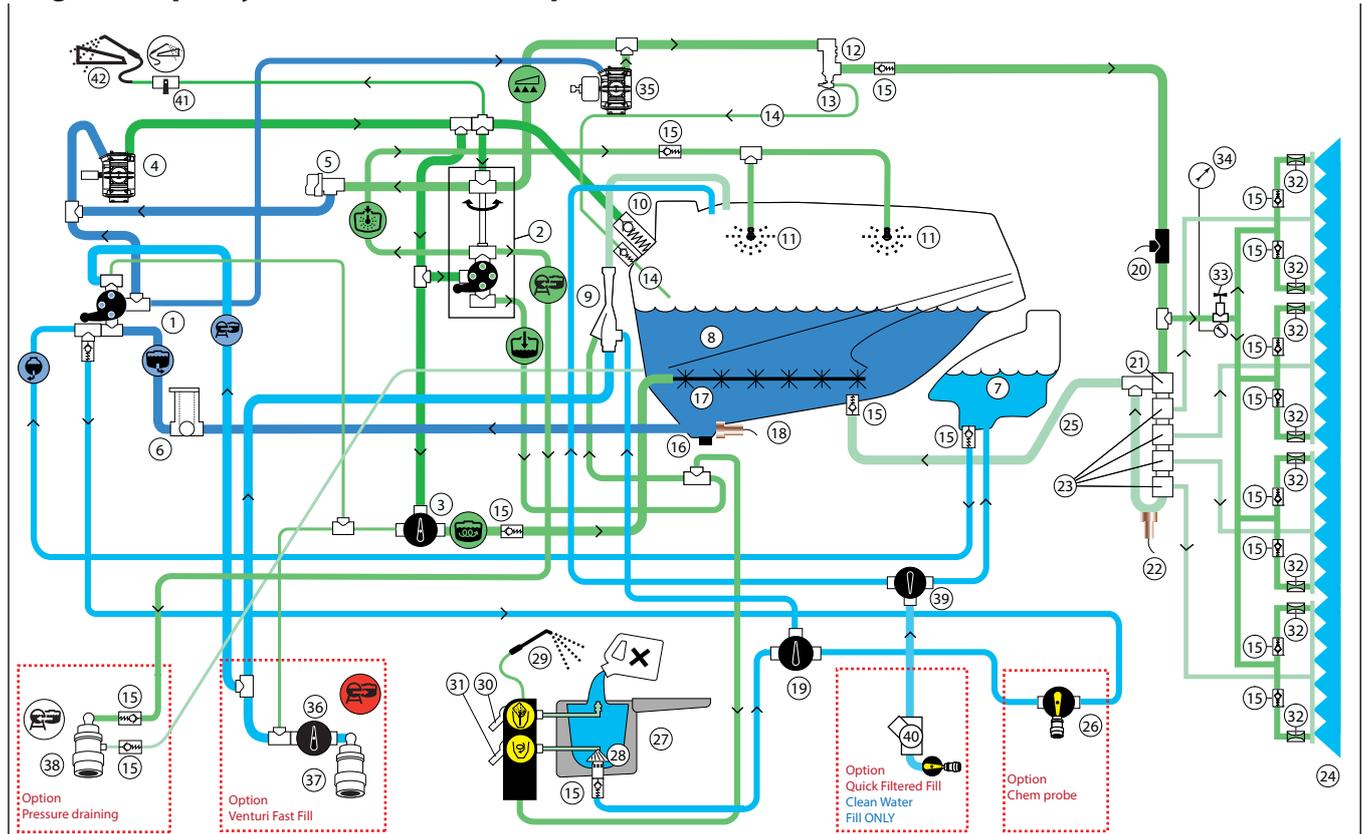
Basic instructions for the chem meter are provided in the "Operation Section" of this manual, however for more detailed information, see "Adding liquid chemical from a drum (Optional)" on page 4. or the manufacturers instruction sheet (supplied with your sprayer).





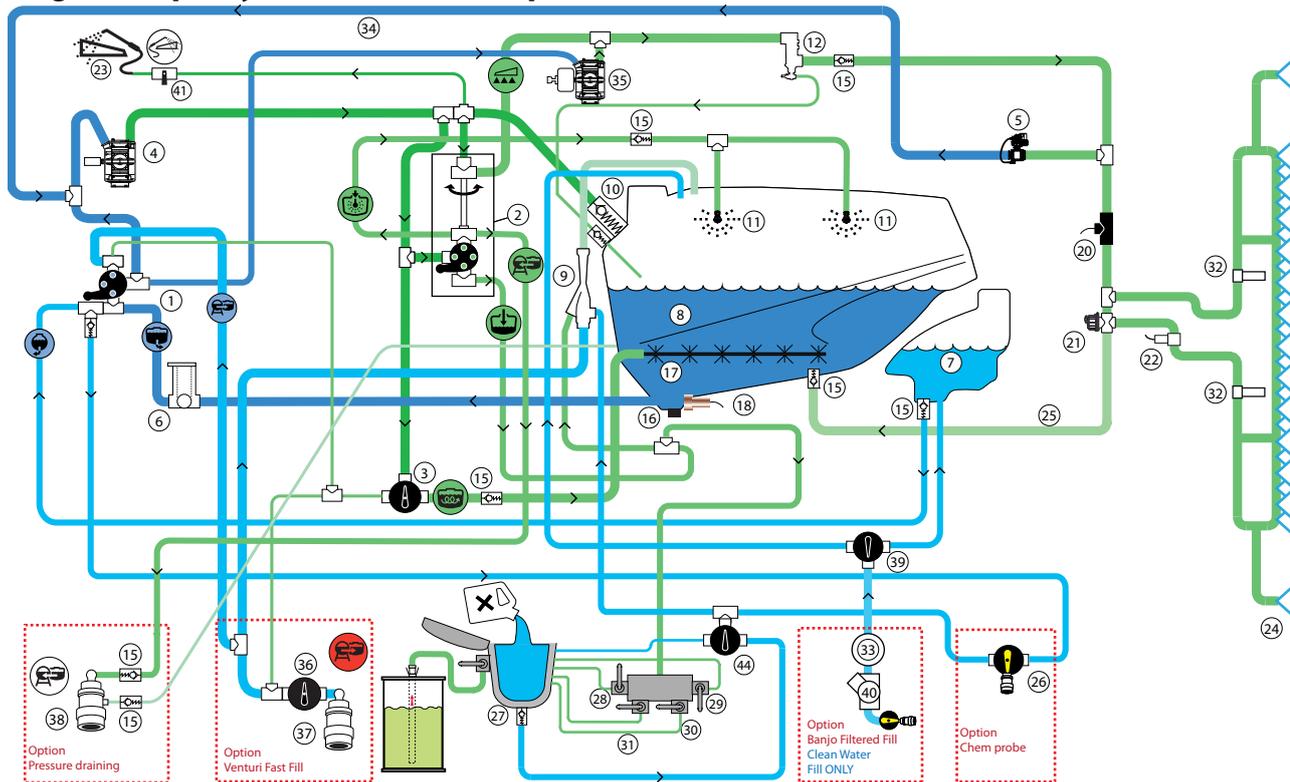
# 3 - Description

**Diagram - Liquid system TurboFiller with optional extras**



- |                                 |   |
|---------------------------------|---|
| 1. Suction SmartValve           | 23. Section valves                                |
| 2. Pressure SmartValve          | 24. Sprayer boom                                  |
| 3. Agitation valve              | 25. Return from section valves                    |
| 4. Main pump                    | 26. (Optional) Chem probe suction                 |
| 5. Pressure regulation valve    | 27. TurboFiller                                   |
| 6. EasyClean filter             | 28. TurboDeflector                                |
| 7. RinseTank                    | 29. Lance for cleaning TurboFiller                |
| 8. Main tank                    | 30. Drum rinse valve                              |
| 9. Venturi                      | 31. TurboDeflector valve                          |
| 10. Safety valve                | 32. (Optional) Boom prime restrictor              |
| 11. Internal tank rinse nozzles | 33. (Optional) Boom prime pressure control valve  |
| 12. CycloneFilter               | 34. (Optional) Boom prime pressure gauge          |
| 13. Boost valve                 | 35. (Optional) FlexCapacity pump                  |
| 14. Boost valve return line     | 36. (Optional) External fast filling ON/OFF valve |
| 15. One-way valve               | 37. (Optional) Fast fill coupler                  |
| 16. Main tank drain valve       | 38. (Optional) Pressure empty coupler             |
| 17. Agitation tube              | 39. Directional fill valve                        |
| 18. Main tank gauge sensor      | 40. (Optional) Filtered fill                      |
| 19. Chemical source valve       | 41. (Not used)                                    |
| 20. Flowmeter                   | 42. (Not used)                                    |
| 21. Bypass valve                | 43. (Not used)                                    |
| 22. Pressure sensor             | 44. (Not used)                                    |

**Diagram - Liquid system VACnMIX with optional extras**



- |                                 |   |
|---------------------------------|---|
| 1. Suction SmartValve           | 23. (Not used)                                    |
| 2. Pressure SmartValve          | 24. Sprayer boom                                  |
| 3. Agitation valve              | 25. Bypass return line                            |
| 4. Main pump                    | 26. (Optional) Chem probe suction                 |
| 5. Regulation valve             | 27. VACnMIX                                       |
| 6. EasyClean filter             | 28. Flushing ring valve                           |
| 7. Rinse tank                   | 29. Fast fill valve                               |
| 8. Main tank                    |   |
| 9. Venturi                      | <b>Options</b>                                    |
| 10. Safety valve                | 30. Upper jet valve                               |
| 11. Internal tank rinse nozzles | 31. Lower jet valve                               |
| 12. CycloneFilter               | 32. Boom fluid isolation valves                   |
| 13. Boost valve                 | 33. (Optional) Banjo fast fill pump               |
| 14. (Not used)                  | 34.   |
| 15. One-way valve               | 35.   |
| 16. Main tank drain valve       | 36. (Optional) External fast filling ON/OFF valve |
| 17. Agitation tube              | 37. (Optional) Fast fill coupler                  |
| 18. Main tank gauge sensor      | 38. (Optional) Pressure empty coupler             |
| 19. (Not used)                  | 39. Directional fill valve                        |
| 20. Flow meter                  | 40. (Optional) Filtered fill                      |
| 21. Bypass valve                | 41. (Not used)                                    |
| 22. Pressure sensor             | 42.   |
|                                 | 43.   |
|                                 | 44. Vacuum transfer valve                         |

## 3 - Description

### Boom

#### Boom and terminology

The COMMANDER range is available with a choice of boom configurations and widths. For this reason a separate “Boom operators and maintenance manual” is supplied with your sprayer and contains detailed information on boom safety, set-up, operation, maintenance and spare parts for the specific boom configuration.

The TERRA FORCE and B3 booms are a pendulum suspended, fully hydraulically operated Z-version with all functions controlled via the Direct Hydraulic System (D.H.).

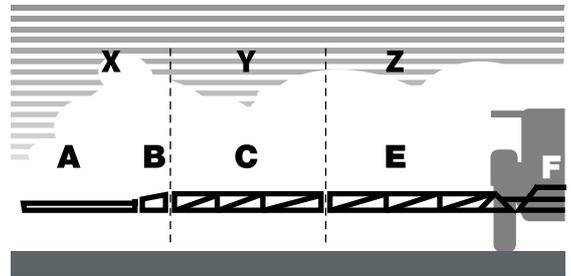
The TERRA FORCE boom is suspended in a parallelogram with nitrogen dampers and is available in 36 and 42m working widths. The B3 boom is suspended in a parallelogram with nitrogen dampers and is available in 36.5, 42.5 and 48.5m working widths. All booms are 3-folded.

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



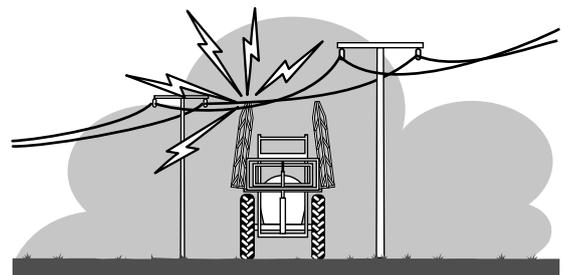
**i** NOTE! When controlling the boom at the SetBox, the folding sections are:

- X. 2nd outer wing
- Y. 1st outer wing
- Z. Inner wing

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

Unintended boom movements may cause contact with overhead power lines.

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



### 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.



## 3 - Description

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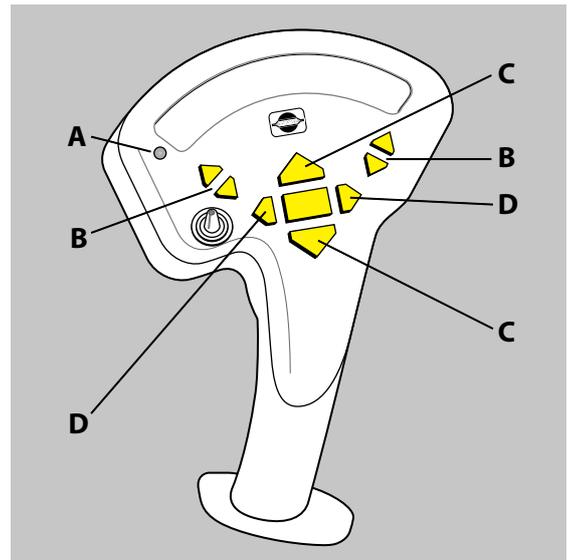
### Grip Controls

The grip controls the following:

- A. Status light (LED)
- B. Boom tilt
- C. Boom height
- D. Boom slant



NOTE! Grip controls are not available for HARDI Controller 5500 (HC 5500).





## 3 - Description

### Hydraulic systems

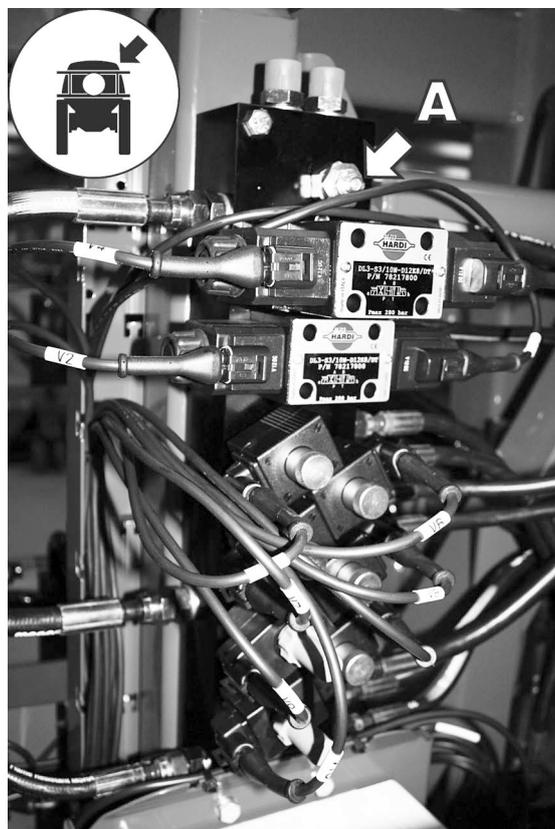
#### Hydraulic Blocks

Hydraulic blocks fitted to the sprayer are described below.

##### Spray Boom

The main hydraulic block which distributes hydraulic fluid for the boom controls.

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



##### ParaLift

This hydraulic block distributes hydraulic fluid for the ParaLift.

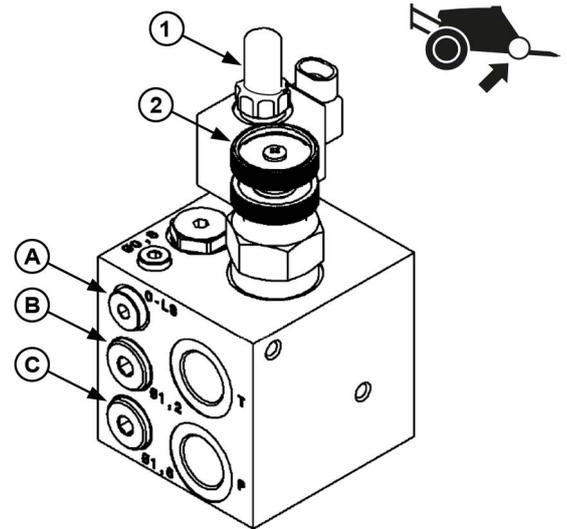


### Open Centre Hydraulics

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

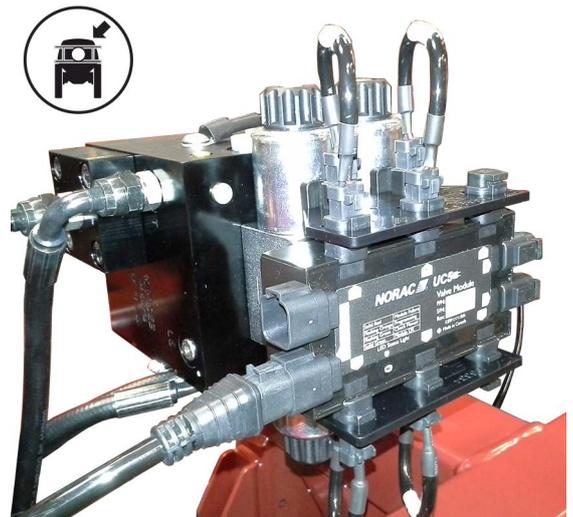
For adjustment, see "Open Centre Hydraulics" on page 1.

If in doubt what your tractor is using, see the tractor's instruction book or ask your tractor dealer.



### AutoHeight / AutoTerrain

On sprayers with the AutoHeight function, this hydraulic block distributes hydraulic fluid for the automatic boom height control functions.



## 3 - Description

### Equipment

#### 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 you can access:

- Lid for main tank at the top of the sprayer.
- On the left side of the platform (as shown in the picture):  
Integrated clean water tank.
- Above the platform:  
Pressure gauge and EasyClean filter clogging indicator.
- Lift and remove the platform floor (A) to get access to hydraulic and manifold components.
- Remove the cover plate (B) to access electronics and venturi.



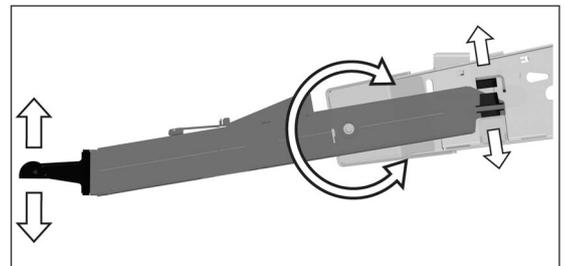
ATTENTION! Always fold the ladder up before driving off.



#### Suspended drawbar

For the COMMANDER models the drawbar is fully suspended.

The full vertical load from the sprayer to the tractor is transferred through neoprene dampers, which are built into the chassis.



### Tank Level Indicator

#### Main tank

The actual liquid level in the main tank can be observed on the main tank level indicator (A), where a plug (B) inside the tube follows the liquid level, as it is connected to a float inside the tank.

The scale is displayed in litres - multiply by 100 for the reading.

Example: The plug floats at 10 on the scale; this means 1000 litres left in the tank.



**ATTENTION!** The level indicator is only a guidance for the liquid level in the tank.

For the most accurate reading, park the sprayer on level ground with the sprayer chassis in a horizontal position.

The total deviation of accuracy for the level for each scale mark or readout value is:

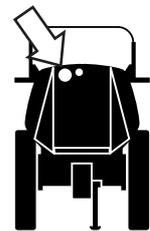
- $\pm 15\%$  for volumes up to 10% of the nominal tank volume.
- $\pm 7.5\%$  for volumes between 10 and 20% of the nominal tank volume.
- $\pm 5\%$  for volumes above 20% of the nominal tank volume.



### Nozzle Pressure Gauge

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

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



### SafetyLocker

This locker is integrated to the front right hand side just above the SmartValves. The SafetyLocker is for storage of safety gear such as non-contaminated protective gear, soap for hand washing etc. The locker is split in two compartments for the separation of clean clothes and contaminated equipment.



**WARNING!** Although this locker is meant for the storing of non-contaminated items, it must never be used for the storing of food, beverages or other items meant for human consumption.



## 3 - Description

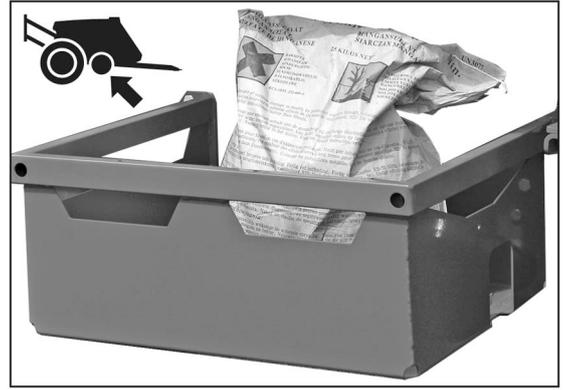
### ChemLocker (optional)

A ChemLocker for storage of chemical containers or bags is mounted on the sprayer's right side.

The ChemLocker can also be used for storage of wheel chocks.

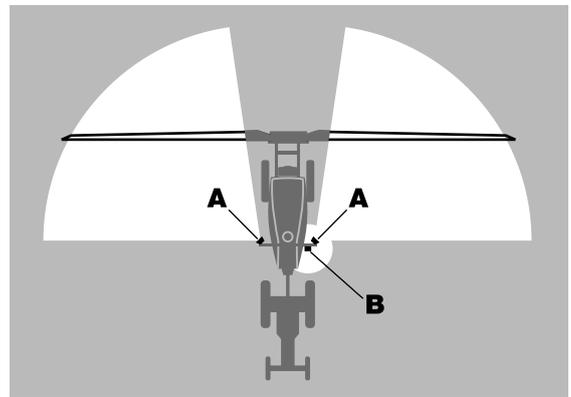


ATTENTION! Maximum load is 100 kg or 100 litres.



### Night Spraying Lights (optional equipment)

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



### Work Light

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



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



## Optional Filling Systems

### Optional Filling systems and equipment

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

### Venturi Fast Fill System

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

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



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

### Quick Filtered Fill System

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

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



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



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

### Cam Lock coupling sizes:

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

### Banjo Fast Fill System

The Banjo Fast Fill system employs a high capacity centrifugal pump (**P**) driven by a hydraulic drive motor (**M**). The motor is powered by the tractor's auxiliary hydraulic system and is protected from over speeding by a hydraulic relief valve.

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

By using the "Directional Fill" valve the "Banjo Fast Fill" system can be used to fill either "Main Tank" or "Rinse Tank".

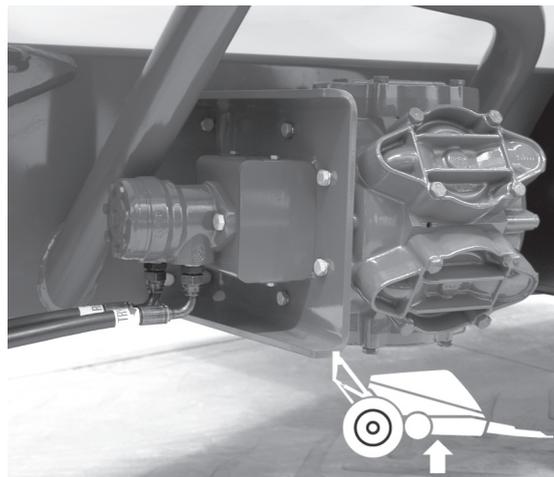


## 3 - Description

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### **FlexCapacity pump (optional)**

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



### General info

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#### Before Putting the Sprayer Into Operation

Although the sprayer has been supplied with a strong and protective surface treatment on steel parts, bolts etc., it is recommended that a film of anti-corrosion oil (e.g. CASTROL RUSTILO or SHELL ENSIS FLUID) is applied to all metal parts to avoid chemicals and fertilizers discolouring the paint or surface-treated parts.

If this treatment is applied before the sprayer is put into operation for the first time, it will always be easy to clean the sprayer and keep the paint or surface-treated parts clean for many years. This treatment should be reapplied every time the protection film has been washed off.

## 4 - Sprayer setup

### Support leg (6500 model)

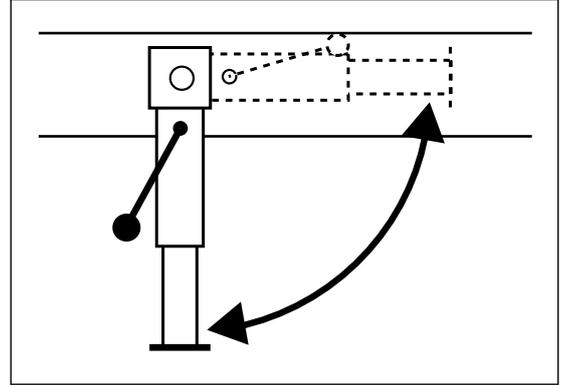


NOTE! The support leg and jack is only sufficient to carry the drawbar weight with an empty tank on level ground.

The support leg is stored in retracted horizontal position and secured by the lock pin, when the sprayer is attached to the tractor.

How to place the sprayer on the support leg:

1. Pull the spring loaded locating pin out and swing down the support leg.
2. Ensure that the locating pin "snaps" into place.
3. Turn the crank handle to lower or raise the support leg as required.
4. Reverse the above operations to return the support leg to the transport position.



DANGER! Never leave the sprayer standing on an unlocked support leg. Always check that the lever is in the locked position before allowing the support leg to take the weight of the sprayer.

### Hydraulic support leg (8500 and 10000 model)

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



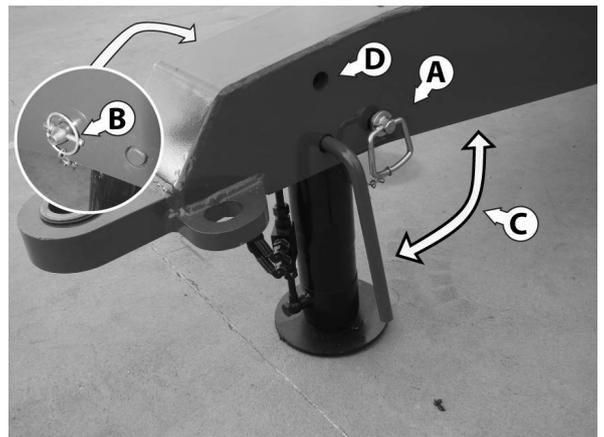
DANGER! Never leave the sprayer standing on an unlocked support leg. Always check that the lever is in locked position before allowing the support leg to take the weight of the sprayer.



DANGER! Only use the support leg when the tank is empty.

#### Support leg operation

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



#### Returning the Support leg to the transport position

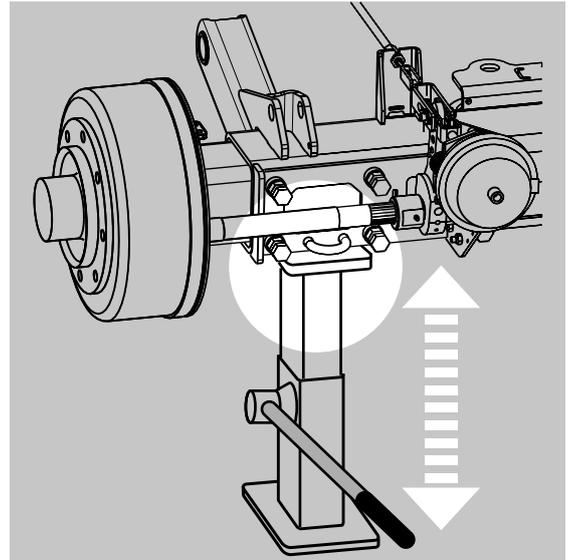
5. Remove the pins (B) then (A). Use the handle (C) to swing the support leg up into the transport position.
6. Secure the support leg in the transport position by fitting the retaining pin (A) into the second hole position (D) and secure with pin (B).

### Jack Up the Sprayer

When the sprayer needs wheel mounting or changing of wheels, wheel bearings or brakes, jack up the sprayer under the axle as shown.

Notice the axle load (kg) in "Tyre Pressure" on page 1, and use a suitable jack and two axle stands for the task.

-  DANGER! Be sure to place sprayer at level and firm ground to prevent the sprayer from falling off the jack.
-  DANGER! The sprayer should be connected to the tractor. The tractor should be in park with the hand brake engaged and the key removed.
-  DANGER! Axle position is high. Correct jack stability is important.
-  DANGER! No personnel should position themselves under the sprayer when it is only supported by a jack. Ensure that axle stands are in place before personnel are allowed under the machine.



## 4 - Sprayer setup

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### Safety chain (optional)

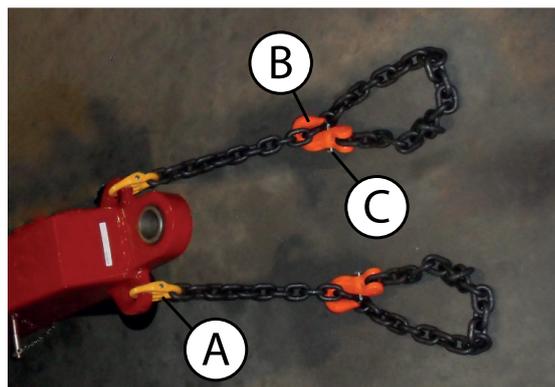
Safety chains can be used between the drawbar and the towbar on the tractor as an extra safety device. Fit the chain through the hole(s) on the side of the drawbar as pictured, then around the towbar on the tractor.



**WARNING!** If the Hammerlocks (A) are disassembled, a new pin and retainer are required before reassembly. Failure to do so may result in the failure of the Hammerlock.



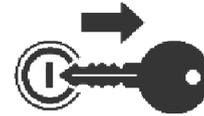
**ATTENTION!** Place the hook (B) over the chain as shown. Ensure that the spring retainer pin (C) prevents the chain from coming out of contact with the hook.



### Transmission shaft (optional)

#### Operator Safety

1. Always read the manufacturer's instruction book before applying any changes to the transmission shaft!
2. Always STOP THE ENGINE and remove the ignition key, before carrying out maintenance or repairs to the transmission shaft or implement.
3. Always STOP THE ENGINE before attaching the transmission shaft to the tractor power take-off (PTO) - most tractor PTO shafts can be rotated by hand to facilitate spline alignment, when the engine is stopped.
4. When attaching the shaft, make sure that the snap lock is FULLY ENGAGED - push and pull the shaft until it locks.
5. Always keep the 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.
6. Do NOT! touch or stand on the transmission shaft, when it is rotating - keep your safety distance at 1.5 meter. NEVER cross over a rotating PTO shaft to reach the other side of the sprayer.
7. Prevent protection guards from rotating by attaching the chains allowing sufficient slack for turns.
8. Make sure that protection guards around the tractor PTO and the implement shaft are intact.



**DANGER!** A ROTATING TRANSMISSION SHAFT WITHOUT PROTECTION GUARDS IS FATAL!

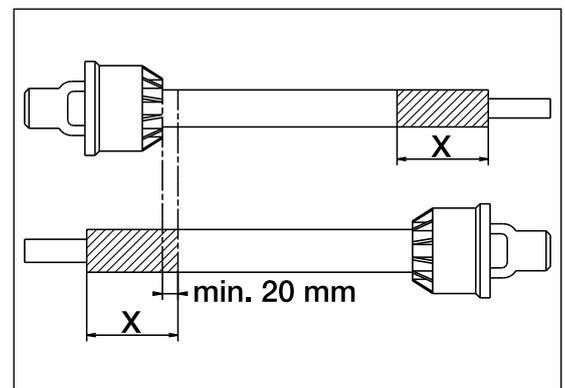
#### PTO Installation

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

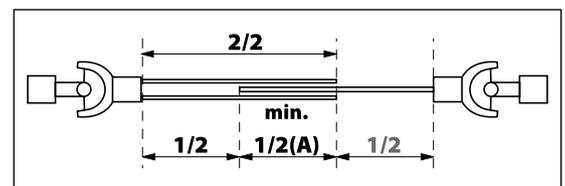
1. Attach the sprayer to the tractor and set the sprayer height in the position with the shortest distance between the tractor and the sprayer pump PTO shafts.
2. Stop the engine and remove the ignition key.
3. If the transmission shaft needs to be shortened, pull the shaft apart. Fit the two shaft parts 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.



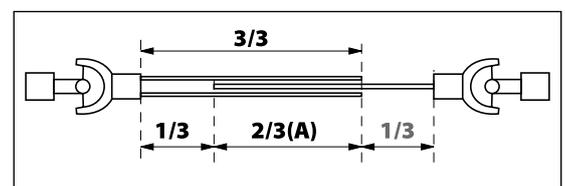
**WARNING!** Only shorten the shaft if it is absolutely necessary!



When cut, the shaft must always have minimum overlap (A) of 1/2 of the shaft length.



The recommended overlap (A) is 2/3 of the shaft length.



## 4 - Sprayer setup

### Mechanical connections

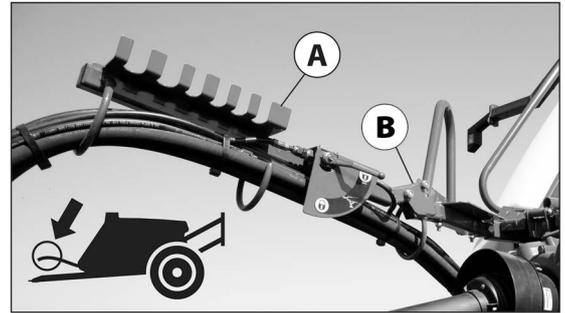
#### Hose Package Support

To prevent hoses and wiring from being damaged by the tractor wheels or the PTO shaft, 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.

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

 ATTENTION! Electrical connections should not be left exposed. If storing the sprayer outside, it is recommended to cover the connections and then clean them before use.



### Hydraulic systems

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#### General Info

Ensure that the snap couplers are clean before connection! Failure to do so will cause premature wear to the hydraulic system.

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.

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#### Requirements - tractor

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 main pump hydraulic drive (optional).
- 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.

## 4 - Sprayer setup

### Open Centre Hydraulics

This hydraulic block is necessary, if the tractor uses open centre hydraulics and/or power beyond.

The valves (pos.1 and 2) are factory set for open centre hydraulics, but if closed centre hydraulics is used (also in combination with load sensing), screw in the valves (clockwise).

 **WARNING!** Always be sure to fully open or close the selection valves for open/closed centre hydraulics.

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 to the tractor.

### Connection to tractor

Optional restrictors inside the hydraulic block have different orifices depending on the oil flow returned to the tractor's oil pump.

- A. Orifice is  $\varnothing 0.8$  mm
- B. Orifice is  $\varnothing 1.2$  mm
- C. Orifice is  $\varnothing 1.6$  mm

All three connection ports are size G1/4".

Start with connecting to port A.

Check the hydraulic flow by activating a hydraulic lever in the tractor. If the reaction time for the hydraulic function is relatively short, continue your work with this restrictor installed.

If the reaction time seems too long before the hydraulic function is enabled, change to port B allow more oil flow to pass through. If the reaction time is still too long, change to port C.

Ask your HARDI dealer for correct setup and correct connection, if in doubt.

 **WARNING!** It is essential that connectors on the sensing line are kept totally clean, so that impurities do not enter the pump. Failure to comply may cause damage to vital pump parts.

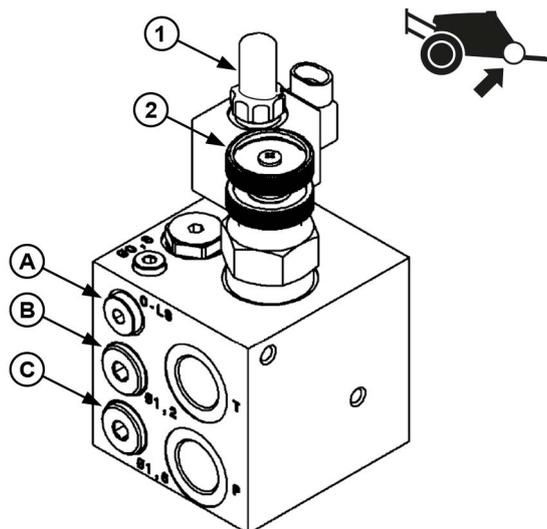
 **WARNING!** Before operating the hydraulics, the valve should be set according to the specific tractor model. If you are unsure of the type of hydraulic system in your tractor, please contact your tractor dealer.

Combinations of settings for flow element and circuit value:

Application	Valve 1	Valve 2	LS port: A, B or C
Open centre	Out	Out	Not connected
Closed centre	In	In	Not connected
Load sensing (LS)	In	Out*	Connected

\*If the tractor requires pressure relief, contact your tractor dealer for further advice.

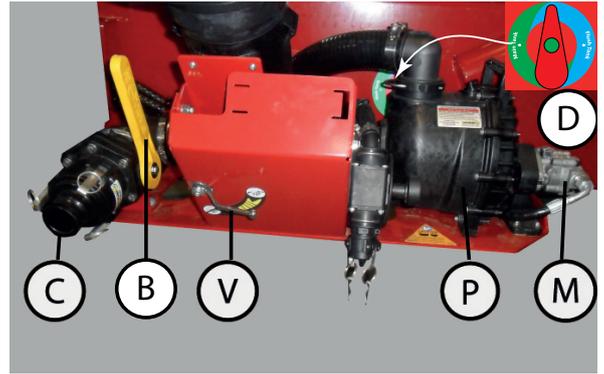
 **NOTE!** A spare part kit for connecting the hydraulic block to the tractor can be supplied by HARDI.



### Banjo Fast Fill (optional)

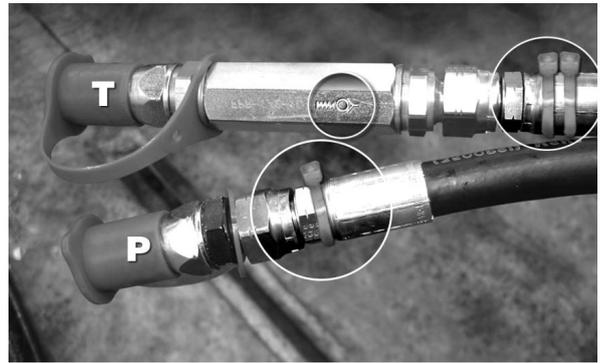
The Banjo Fast Fill system uses a high capacity centrifugal pump, driven by a hydraulic powered motor (C). A suction hose (from the water source) is fitted to the Cam-lock coupling (A) and the pump speed can be controlled by an adjustable hydraulic by-pass valve (B). The fill rate can also be adjusted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

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



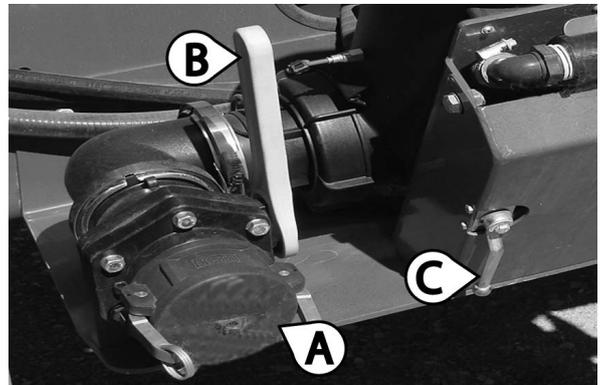
### Set-up

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



### Start-up & speed adjustment

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

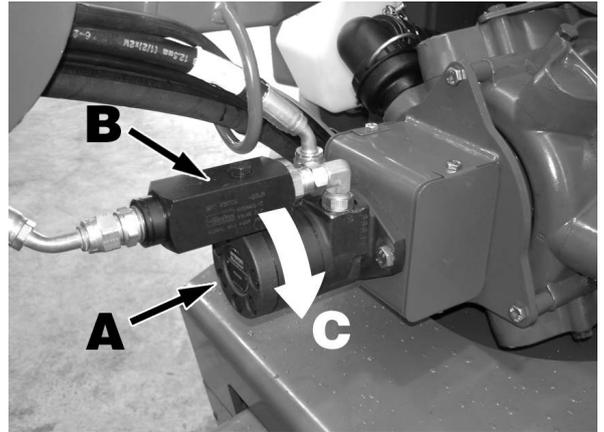


## 4 - Sprayer setup

### Hydraulic drive for Main pump (optional)

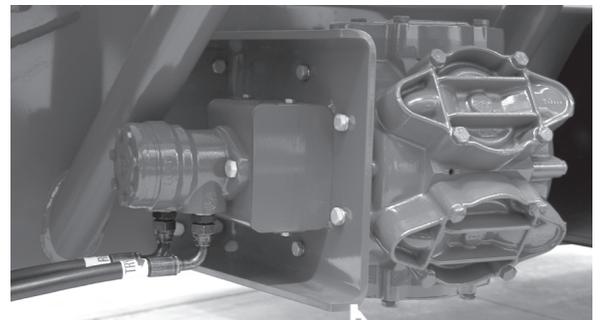
The optional hydraulic drive motor (A) mounts via an adaptor plate directly onto the front of 540 rpm 464 positive displacement pumps. The system is fitted with a speed limiting valve (B) to control the pump speed.

Note the correct direction of rotation (C) is clock-wise when viewing the motor with your back to the tractor.



### FlexCapacity pump (optional)

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



#### Set-up

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



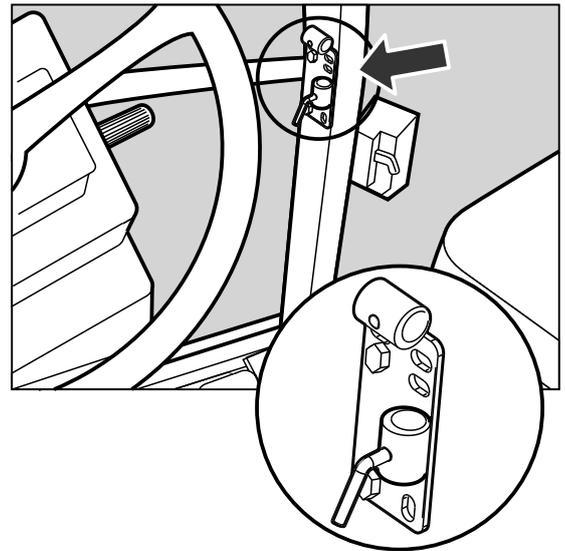
Run the pump motor briefly and check for hydraulic leaks and correct operation.

### Electrical connections

#### Installation of Control Unit Brackets

Find a suitable place in the tractor cabin to fit the control units.

Best recommended position is to the right of the driver seat.

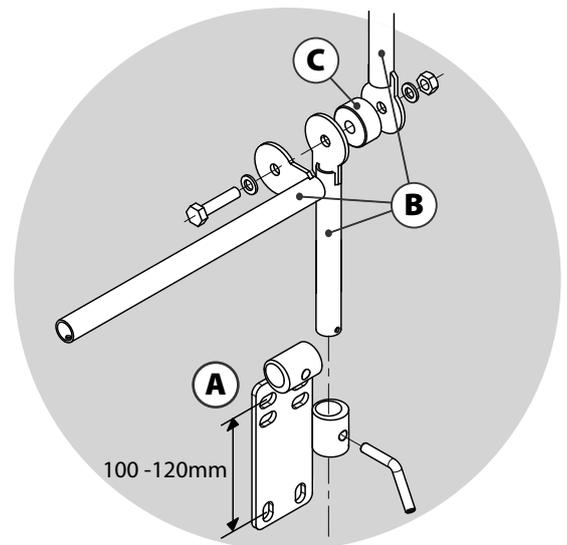


The supplied tractor pillar bracket (A) has a hole spacing of 100 and 120 mm, which fits most tractors. Threaded holes for fitting may be hidden behind the front corner cover. Check the tractor's instruction book for information regarding attachment points.

Supplied are three tubes (B) for fitting. 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.

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

 **ATTENTION!** See the controller's instruction book for further details of fitting the controller equipment.



#### Road Safety Kit

If rear lights are installed, 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 AS 4177.5-2004. See the chapter "Technical Specifications" in this Instruction Book.

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

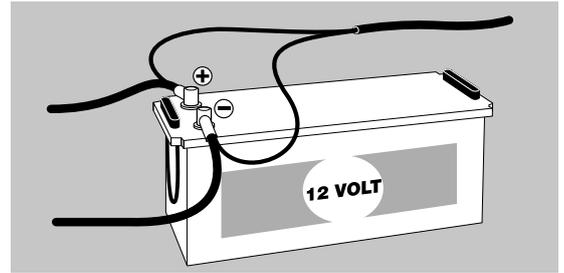


## 4 - Sprayer setup

### Power Supply

The power requirement is 12 V DC. Always note the polarity!

For proper function of the electric equipment for the sprayer, the tractor must have the following sizes of electric wires and fuses installed.



 <p><b>SprayBox Connector, 1-pin Plug</b></p> <p>The unit requires: Wire 2.5 mm<sup>2</sup>. Fuse 10 amps.</p> <p>Hydraulic control unit requires: Wire 4.0 mm<sup>2</sup>. Fuse 16 amps.</p> <p>Tractor must follow ISO 4165.</p>	 <p><b>Traffic Light Connector, 7-pin Plug</b></p> <p>The unit requires: Wire 6x 1.5 mm<sup>2</sup> + 1x 2.5 mm<sup>2</sup>.</p> <p>The cable is custom made and must not be changed to another type.</p> <p>Tractor must follow AS 4177.5-2004.</p>
 <p><b>ISOBUS Connector, 9-pin Plug</b></p> <p>The unit requires: Wire 2x 10 mm<sup>2</sup> + 2x 2.5 mm<sup>2</sup> + 2x (2x 0.5 mm<sup>2</sup>)</p> <p>The cable is custom made and must not be changed to another type.</p> <p>Tractor must follow ISO 11783-2.</p> <p>Cabin connector for Grip control and SetBox: HARDI item no. 26031500</p>	

**i** NOTE! The delivered power connectors follow the standard of most modern tractors. If you have a tractor with another power connector, it is necessary to disassemble the connector and fit it to the actual sprayer connector. Contact your HARDI dealer.

**i** NOTE! The delivered connectors may vary on the sprayer, depending on its equipment and scope of supply.

### Speed Sensor for Sprayer

The speed sensor and speed ring are located at the inside of the sprayer's right wheel. The sensor is an inductive type that requires a metallic protrusion like the 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 rotation of the wheel in the forward driving direction.
2. Check that the sensor lines up in the middle of the air gaps in the speed ring when looking in vertical direction.
3. Adjustment of the air gap begins with the sensor directly opposite one of the bolts holding the speed ring.

Loosen the bracket to move the sensor in or out of the red tube. Retighten the bracket when finished.

4. Adjust the air gap (B) between sensor and speed ring to 4 mm.

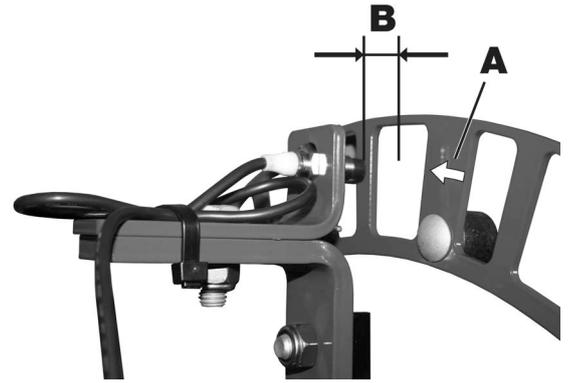
Use a feeler gauge or similar tool.

5. After adjustment, spin up the wheel.

The air gap variation must be less than  $\pm 0.5$  mm for the sensor to function correctly.

Check this at the entire circumference of the wheel.

6. Verify the speed on the controller.



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

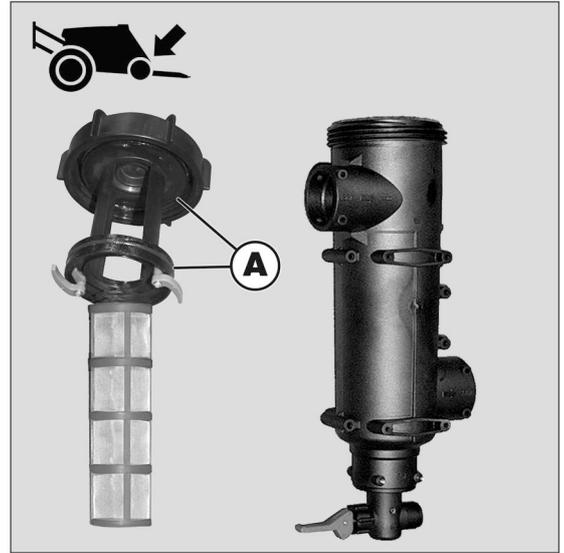
## 4 - Sprayer setup

### Liquid system

#### CycloneFilter

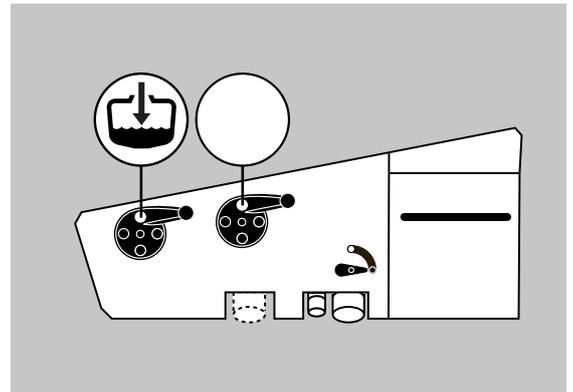
The standard filter size is 80 mesh and can be changed by opening the filter top.

Check condition of O-rings and lubricate if necessary, or replace them if damaged, before reassembly.



**DANGER!** Never open the CycloneFilter unless the suction SmartValve is turned to the unused position, and the pressure SmartValve is set to "MainTank".

Otherwise spraying liquid may hit you, when opening the filter and thereby draining the MainTank!



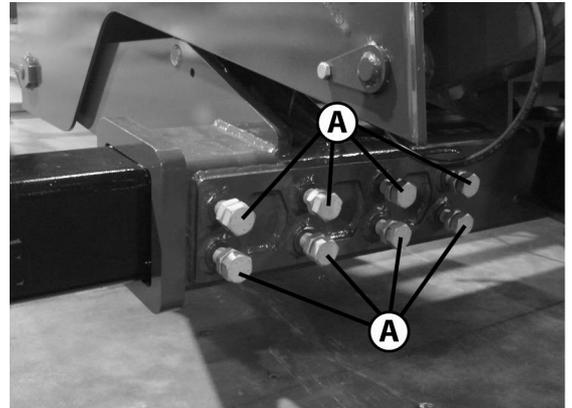
### Track gauge, axles and wheels

#### 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 conenut at the bolts (A) and the bolts (A) for LH wheel axle.
5. Extend or retract the axle.
6. Lower down the LH wheel.
7. Tighten the clamp bolts (A) to a torque of 640 Nm and lock the bolts with the conenuts.
8. Repeat the procedure on RH wheel.
9. Check if the distance from centre tyre to centre of rear frame is equal at RH and LH.
10. Retighten bolts and wheel bolts to specified torque after 8 hours of work.



**WARNING!** Bolts must always be locked and must always have contact. Never widen the axle beyond the securing bolt locations (A).



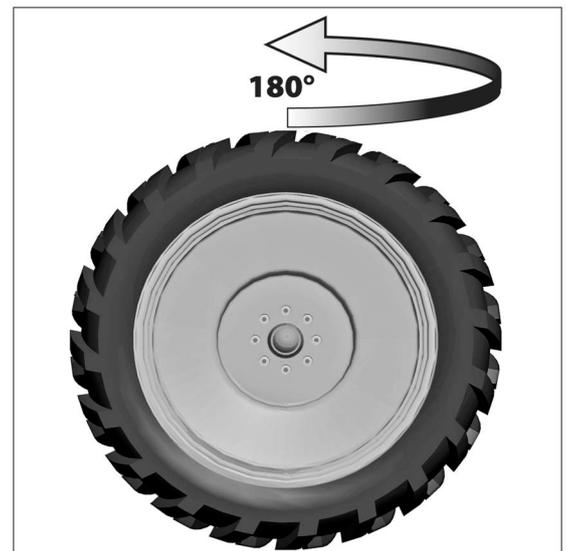
**ATTENTION!** The wider the track width, the better the stability of the sprayer. HARDI recommends to work with widest possible track width.

#### Turning the Wheel Rim

The track width can be altered by turning the rim, this will change the offset of the rim.



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



## 4 - Sprayer setup

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### Brakes

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#### Hydraulically Activated Brakes (optional)

This requires a special trailer brake valve connected to the tractor's hydraulics 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.

Ask your tractor dealer if in doubt.



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



WARNING! Maximum oil pressure is 150 bar in the brake line.

### General info

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#### Sprayer Use

The HARDI sprayer is for application of crop protection chemicals and liquid fertilizers. The equipment must only be used for this purpose.

If the sprayer is to be used for purposes other than the ones described in this instruction book, a new risk assessment and a workplace assessment must be completed for this use. This obligation lies with the owner and operator - see "Before First Use of the Sprayer" on page 1.

Improper use of the sprayer results in risks to your safety, health, and even a risk of death.

If no local law demands that the operator must be certified to use spray equipment, it is strongly advised to be trained in correct plant protection and in safe handling of plant protection chemicals to prevent unnecessary risk for persons and the environment, when carrying out your spray job.

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#### Environmental Info

For environmental info, please refer to the following parts in the Spray Technique Manual (Pn: 674953):

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

## 5 - Operation

### Symbols for Valves

The following symbols are shown on labels on the sprayer, where the operator can set a valve to stop or start a function.

The labels must be readable when operating the sprayer. Damaged or unreadable labels must be replaced.

The symbols are explained here.

Symbol	Symbol Description	Label Colour	HARDI Item Number
	Suction from the MainTank	Black / Blue	97809900
	Suction from the RinseTank	Black / Blue	97810000
	Filling of the MainTank from an external tank	Black / Blue	97810100
	Filling of the MainTank	Black / Green	97810300
	Spraying / Pressurized nozzles	Black / Green	97810400
	Cleaning the inside of the MainTank	Black / Green	97810500
	Agitation in the MainTank	Black / Green	97810900
	Pressure emptying	Black / Green	97825500
	Cleaning of empty chemical containers	Black / Yellow	97821600
	TurboDeflector operation in the TurboFiller	Black / Yellow	97821500
	External chemical filling	Black / Yellow	89109704
	Filling of the MainTank from an external tank (FastFiller)	Black / Red	97812400

### Boom

#### Safety Info

Keep the spray boom in folded position while driving outside the field. Park the sprayer and tractor on level ground before using the folding/unfolding functions.

Failure to comply will damage the boom and cause dangerous situations to people and the surroundings.



**DANGER!** Before unfolding the boom it is important to connect the sprayer to the tractor's hitch point to prevent overbalancing of the sprayer. Activate the tractor's handbrake.



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

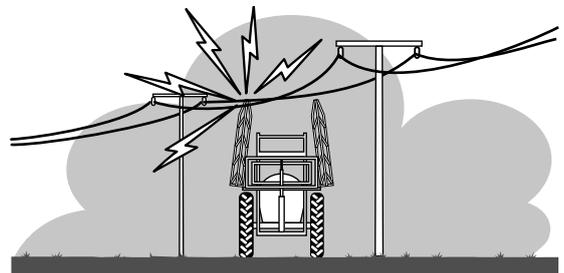


**DANGER!** Always follow the guidelines listed below when driving in areas with overhead power lines:

Keep from using the folding/unfolding functions in areas with overhead power lines. Unintended boom movements may cause contact with overhead power lines, causing a risk of fatal accidents.



**ATTENTION!** A label (HARDI item no. 978448) is fitted to the sprayer. This label must be placed in an easily visible position.



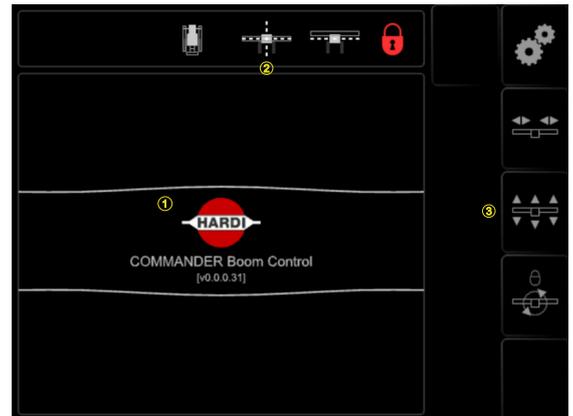
# 5 - Operation

## HCH-508 Overview

### Main screen

The main screen of the HCH-508 ISOBUS hydraulic control system is displayed on the right. There are 3 elements to this screen.

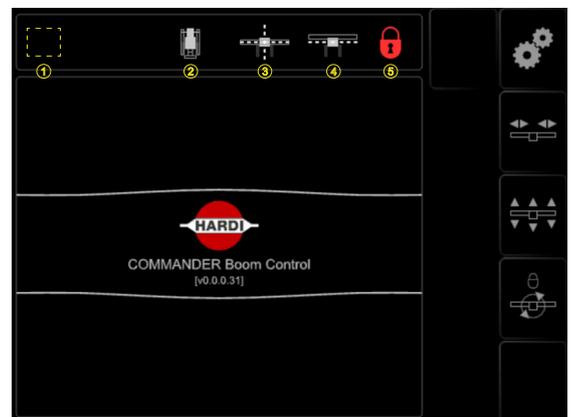
1. Profile description and firmware version.
2. Top row display showing basic boom conditions.
3. RH column soft keys to access further operational pages.



### Top row iconography

The top row of the HCH-508 ISOBUS hydraulic control system is always shown at the top of the VT screen. There are 5 elements that may be seen from this part of the display.

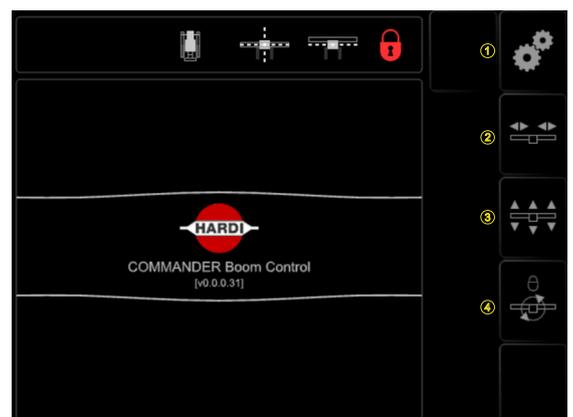
1. Active error symbol and error code (only when an error exists).
2. Inner boom fold condition.
3. Boom centre slant condition.
4. Boom height position.
5. Pendulum lock condition.



### RH column soft keys

The RH soft keys allow access to different pages of the HCH-508 ISOBUS hydraulic control system. The soft keys may change depending on the page that is displayed. The following pages are available from the main screen:.

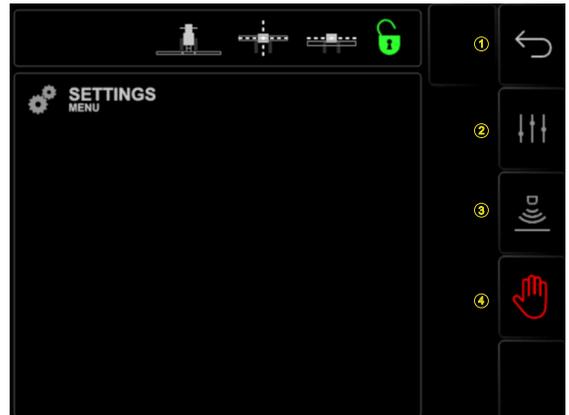
1. Settings.
2. Boom fold control.
3. Boom height control.
4. Slant and pendulum lock control.



## Settings screen keys

The settings screen allows the user access to further menus for setup, diagnosis or emergency operation. The following pages are available from the settings screen:

1. Return to the main screen.
2. Control setup screen.
3. Sensor information screen.
4. EMERGENCY MODE!



## Control setup screen

The control setup screen allows the user to select various options:

1. Return to the settings screen.
2. Allow grip functionality.

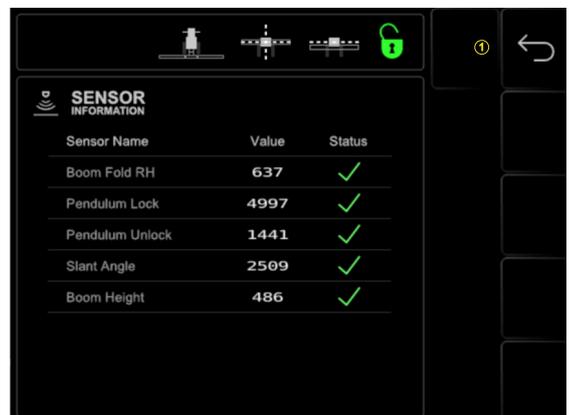
When the check-box is checked, the Hardi grip can be used to control some hydraulic functions. If the grip is unavailable or faulty, this check-box can be unchecked to prevent fault codes from being raised in relation to the Hardi grip.



## Sensor information screen

The sensor information screen allows the user to view the output of sensors fitted to the machine. It also shows whether the sensor is within the normal operating range with a green tick, or out of range with a red cross. There are no actions available from this screen other than:

1. Return to the settings screen.



# 5 - Operation

## Emergency mode screen

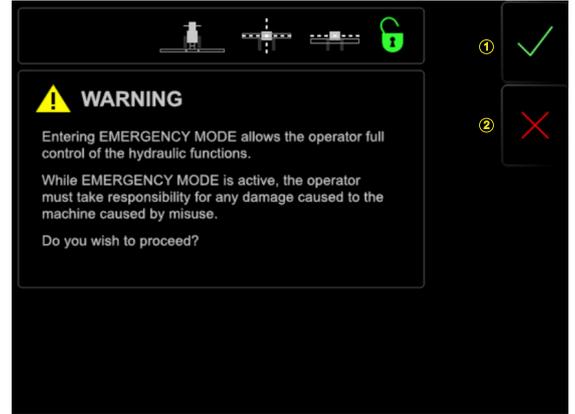
Access to the emergency mode is restricted, and the following must be acknowledged by the operator before proceeding:

“Entering EMERGENCY MODE allows the operator full control of the hydraulic functions.”

“While EMERGENCY MODE is active, the operator must take responsibility for any damage caused to the machine caused by misuse.”

“Do you wish to proceed?”

1. Pressing the tick will enter emergency mode.
2. Pressing the cross will return the user to the settings screen.



**i** NOTE! The HCH-508 retains a permanent record of every time the emergency operations screen is accessed.

The emergency mode screen allows all hydraulic functions regardless of sensor signals or boom fold logic. The following is a list of reasons when emergency mode may be required:

1. To allow folding or unfolding of the boom when normal operations have been interrupted.
2. To allow unfolding of the boom so that critical spraying operations may be completed, or to affect repairs to damaged sensors.
3. To allow folding of the boom for safe transport of the machine.

 WARNING! Serious damage to the machine may occur when operating in this mode. Only use EMERGENCY MODE when necessary.

 ATTENTION! Contact your local HARDI dealer as soon as practicable if repairs to the machine are required to bring it back into a normal state of readiness.

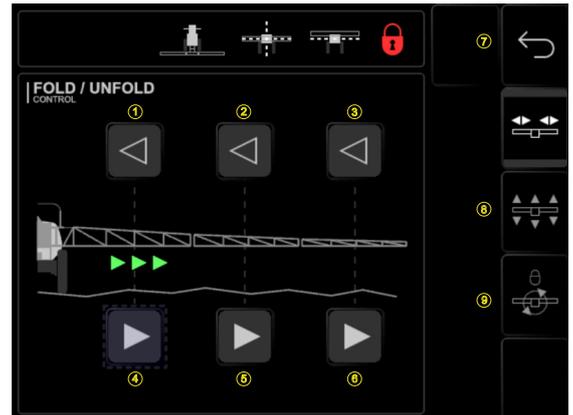


## Boom fold control screen

The boom fold control screen of the HCH-508 ISOBUS hydraulic control system allows for the folding or unfolding of the boom when the machine is stationary. Access to all other boom functions are available whilst in this screen.

The available functions are:

1. Inner boom fold.
2. 1st outer boom fold.
3. 2nd outer boom fold.
4. Inner boom unfold.
5. 1st outer boom unfold.
6. 2nd outer boom unfold.
7. Return to the main screen.
8. Boom height control.
9. Slant and pendulum lock control.



All boom functions have visual feedback on the relative screen as shown by '10'. This feedback is activated from the VT screen soft keys and from the Hardi grip.



ATTENTION! If the vehicle speed is above 1.5km/h a warning message will popup. STOP the machine before unfolding or folding.



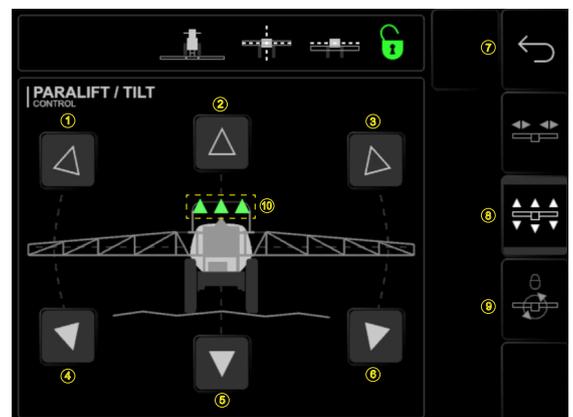
ATTENTION! The boom must be raised above a certain set point before it can be folded or unfolded. The set point is indicated by the boom height position icon on the top row.

## Boom height control screen

The boom height control screen of the HCH-508 ISOBUS hydraulic control system allows for lifting and lowering of the boom and wings at anytime. Access to all other boom functions are available whilst in this screen.

The available functions are:

1. LH boom wing tilt up.
2. Raise boom centre.
3. RH boom wing tilt up.
4. LH boom wing tilt down.
5. Lower boom centre.
6. RH boom wing tilt down.
7. Return to the main screen.
8. Boom fold control.
9. Slant and pendulum lock control.



All boom functions have visual feedback on the relative screen as shown by '10'. This feedback is activated from the VT screen soft keys and from the Hardi grip.



NOTE! All of these functions are available from the Hardi grip if it is installed.

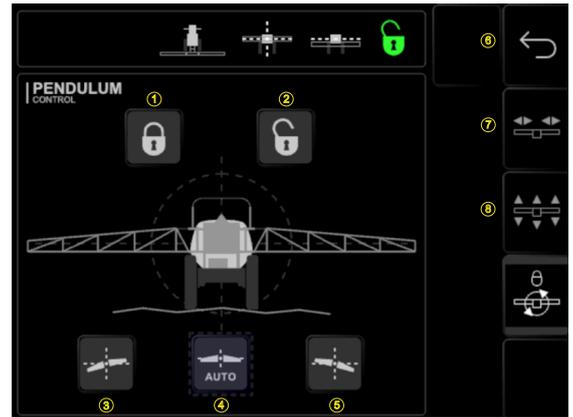
## 5 - Operation

### Slant and pendulum lock control screen

The slant and pendulum lock control screen of the HCH-508 ISOBUS hydraulic control system allows for the folding or unfolding of the boom when the machine is stationary. Access to all other boom functions is available whilst in this screen.

The available functions are:

1. Lock the boom centre pendulum.
2. Unlock the boom centre pendulum.
3. Slant boom centre CCW.
4. Auto-level the boom centre.
5. Slant the boom centre clockwise.
6. Return to the main screen.
7. Boom fold control.
8. Boom height control.



**WARNING!** IF auto-height is installed, the boom centre pendulum must be unlocked before engaging the auto-height control. Failure to do so will result in erratic boom movement and damage to the machine.

## Operating the boom - AutoTerrain with HCH-508



WARNING! The pendulum lock automatically activates when pressing one of the boom fold buttons. Boom folding is not possible if the pendulum is unlocked. A manual override of the pendulum lock is possible through the slant and pendulum lock control screen.



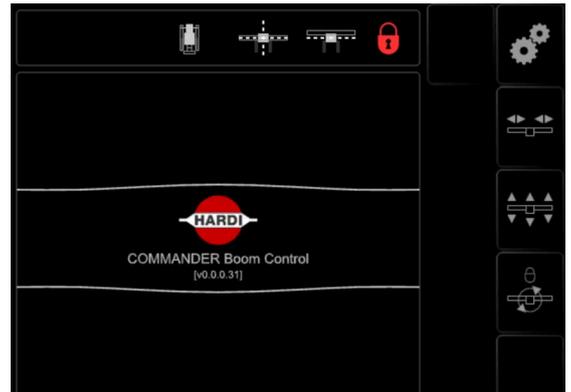
WARNING! Only operate the folding functions when the sprayer is stationary! Failure to do so may damage the boom. The pendulum lock automatically opens at speeds exceeding 1.5 km/h!



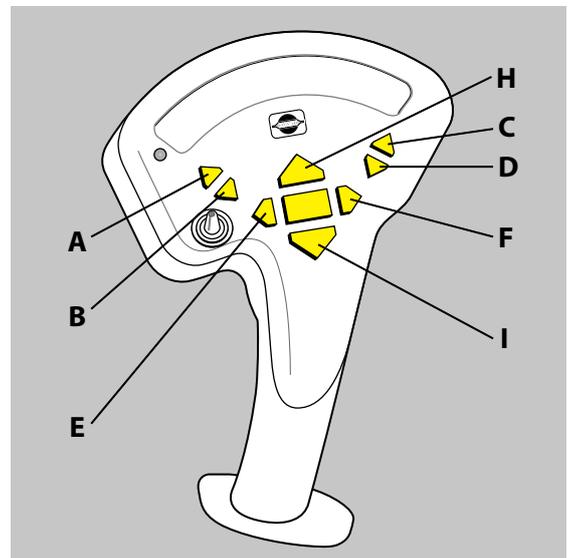
ATTENTION! If a folding or unfolding sequence is not completed, a warning message will ask you to complete this sequence before starting next sequence.

### To unfold the boom

1. Ensure that the tractor hydraulics are engaged.
2. Ensure that the HCH-508 VT screen is available.
3. Press buttons 'A' and 'C' to lift the booms wings from the transport frames.
4. Press the button 'H' to lift the boom from the paralift locks.
5. Press the soft key to enter the boom fold control screen.
6. Unfold the inner booms. Wait until the inner booms have stopped moving before releasing the soft key.
7. Press buttons 'B' and 'D' to lower the booms wings until the booms are level.
8. Unfold the 1st outer booms. Wait until the 1st outer booms stop moving before releasing the soft key.
9. Unfold the 2nd outer booms. Wait until the 2nd outer booms stop moving before releasing the soft key.
10. Press the 'I' button to lower the boom to working height.
11. Unlock the pendulum lock before commencement of spraying operations.



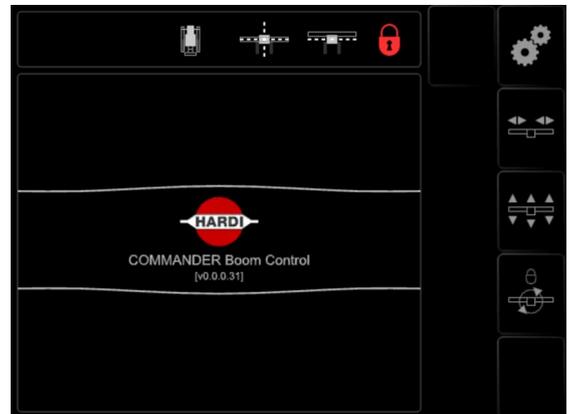
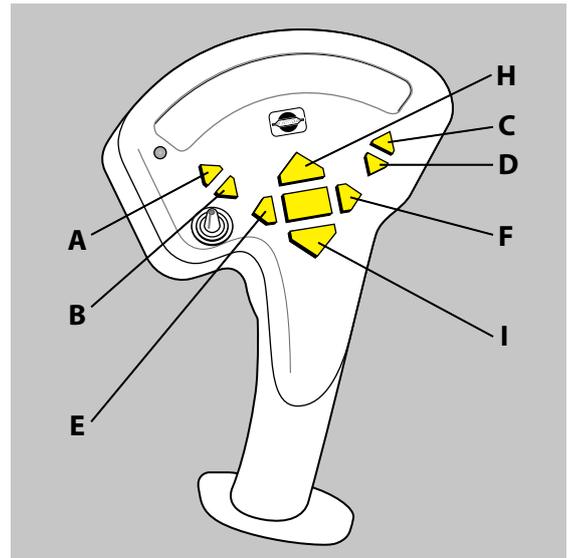
NOTE! All grip functions may be replaced by the relevant boom height control screen function.



## 5 - Operation

### To fold the boom

1. Press auto level soft key to return the boom centre to a level position. Alternatively, you may press the 'E' and 'F' buttons to manually level the boom centre. This is indicated by the boom centre slant condition icon at the top of the display.
2. Press the 'A', 'B', 'C', or 'D' buttons to level the boom wings as required.
3. Press the 'H' button to lift the boom to its highest position.
4. Fold the 2nd outer wings. The  symbol appears in display until the pendulum is locked. This takes approximately 10 seconds.
5. Fold the 1st outer wings.
6. Press buttons 'A' and 'C' to tilt boom wings up.
7. Fold the inner wings until they touch the transport frame uprights.
8. Press and hold the boom lower button (I) to lower the boom until it rests in the paralift locks. Continue holding this button for 10 seconds to drain the paralift accumulators.
9. Press and hold the 'B' and 'D' buttons to lower boom wings until they rest in the transport brackets. Continue to hold these buttons for 10 seconds to drain the tilt accumulators.



## Liquid system

### Filling/Washing Location Requirements

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

#### Dedicated Filling Site

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

Any spillage or cleaning water should be retained and diluted in order to be distributed in a larger area. This is 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 can be used. Filling location must be no 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.
3. 50 metres from surface water (watercourses, lakes and coastal waters) and from nature reserves.

#### In the Field

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



ATTENTION! Always follow local legislation.



ATTENTION! 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!



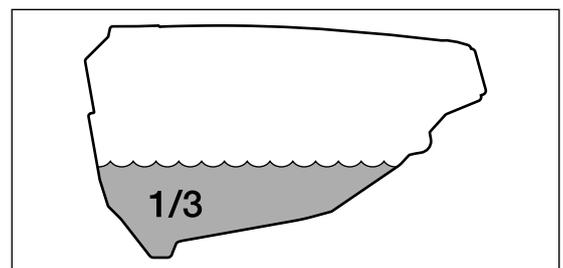
WARNING! If the sprayer is put aside with liquid in the MainTank, all manifold valves must be closed.



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



WARNING! Do not disconnect the sprayer from the tractor if there is liquid in either the main or the flush tank.



# 5 - Operation

## Filling the RinseTank - Base machine

The RinseTank is filled via the 1½" cam-lock connection (A):

1. Remove the filler cap, and then fit the external water hose to the threaded connection piece.
2. Start filling with clean water.
3. Keep an eye on the level indicator in order not to overfill the tank.
4. Stop filling and refit the cap.

Volume: approximately 700 litres.

-  **ATTENTION!** Only fill the RinseTank with clean water! To avoid algae developing in the tanks. Always drain the RinseTank, if the sprayer is not in use for a longer period.
-  **ATTENTION!** For cleaning and inspection purpose, the RinseTank is accessible via the tank lid on top of the tank.



## Filling the clean water tank

To fill the clean water tank:

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

For use of water:

- Turn the lever to open the ball valve. The ball valve (A) is located on the left side of the sprayer next to the EasyCleanFilter.

The water from this tank is for hand washing, cleaning of clogged nozzles etc.

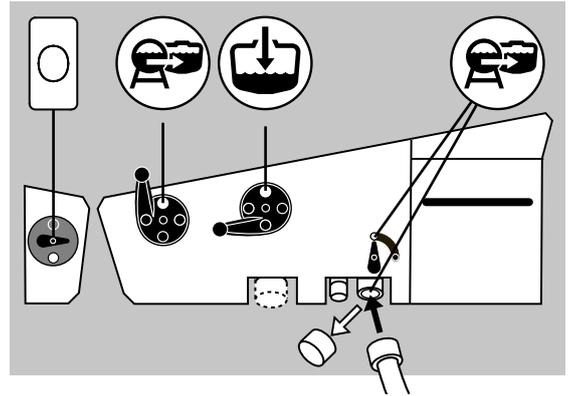
-  **WARNING!** Although the clean water tank is only filled with clean water, this water must NOT be used for drinking.
-  **ATTENTION!** Only fill the clean water tank with clean water! To avoid algae developing in the tank. Always drain the clean water tank, if the sprayer is not in use for a longer period of time.



### Venturi fast fill (optional)

The venturi fast fill (if installed) is operated as follows:

1. Remove the cap and connect a suction hose to the suction manifold.
2. Turn the pressure SmartValve to MainTank.
3. Turn the suction SmartValve to "External Filling Device".
4. Activate agitation valve.
5. Open the venturi fast fill valve.
6. Engage the pump and set PTO revolutions at max. 540 RPM or 1000 RPM depending on pump model.
7. The tank is now filling with water. Keep an eye on the liquid level indicator.
8. Turn the handle on the suction manifold from "External Filling Device" to "Main Tank" to discontinue the filling process. Now disengage the pump.
9. Disconnect the suction hose and replace the cap.



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



**WARNING!** Do not leave the sprayer while filling the tank, and keep an eye on the level indicator. **DO NOT** 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 the water source when filling!



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

## 5 - Operation

### Filtered Fill System (Optional)

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



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

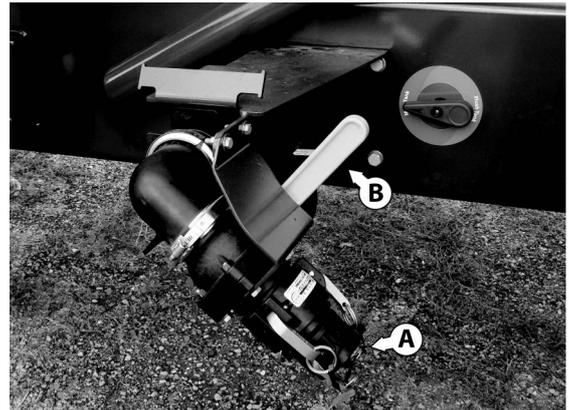


**WARNING!** Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator. **DO NOT** overfill the tank.



**ATTENTION!** The filtered fill system should only be used with clean water, and the filter should be cleaned regularly.

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



### Banjo Fast Fill System (optional)

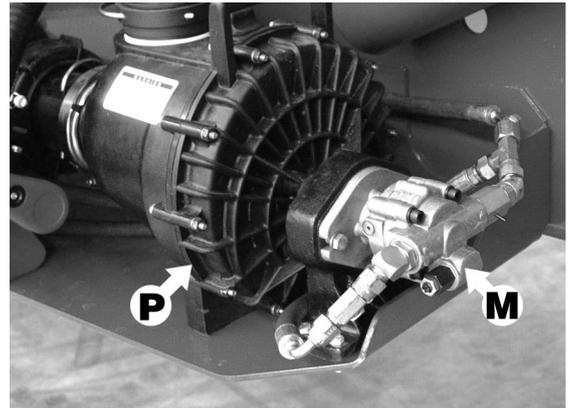
The Banjo fast fill system employs a high capacity centrifugal pump (P) driven by a hydraulic motor (M). The motor is powered by the tractor's hydraulics and speed limited by a hydraulic relief valve. The operator can control the flow rate of the pump by use of a variable speed control valve (D) located on a panel just forward of the pump.



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

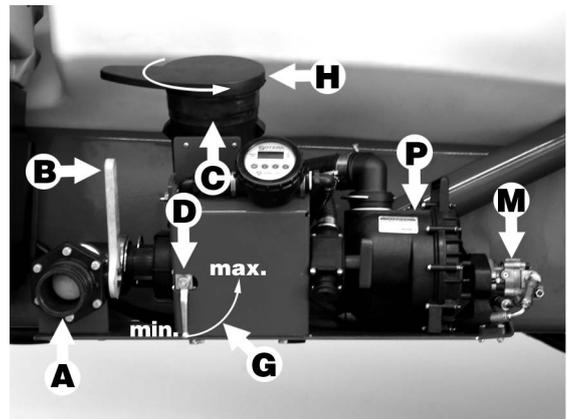


**WARNING!** This is a centrifugal pump. Always ensure that housing contains water otherwise seal damage will occur.



To fill the sprayer using the Banjo fast fill system:

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



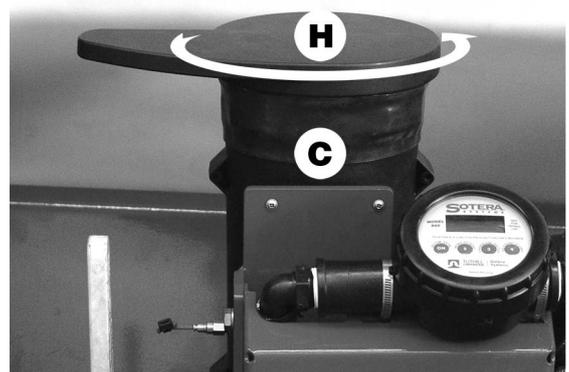
**WARNING!** Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator. DO NOT overfill the tank.

### Banjo Fast Fill Filter

A high capacity HARDI Easy-Clean 3" filter is used (C) for the fast fill circuit.

To clean the filter:

1. Close the hydraulic speed control valve.
2. Shut down the sprayer and the tractor's auxiliary hydraulics. Close the fast fill cam-lock coupling ball valve.
3. Turn the filter casing lid (H) anti-clockwise to separate the lid and filter screen from the casing (C). Note: a built in isolation valve automatically closes when the filter lid and screen are removed.
4. Clean the filter screen and re-assemble.



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



**ATTENTION!** Continual periodic inspection of filter is advised.



**ATTENTION!** Never leave the sprayer unattended while filling. Always watch the main tank sight gauge to avoid over filling the tank.

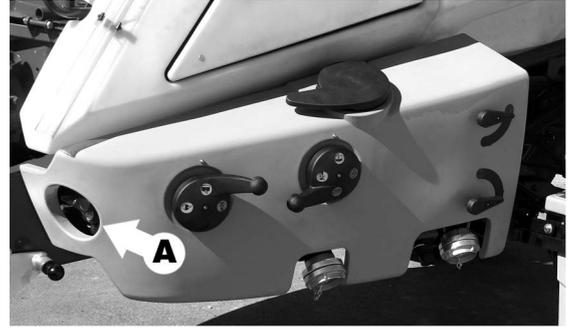


**ATTENTION!** It is recommended the filter be cleaned and serviced thoroughly after each spray job, before storage and at any time flow rate slows down due to debris causing a blockage. Wear appropriate safety gear.

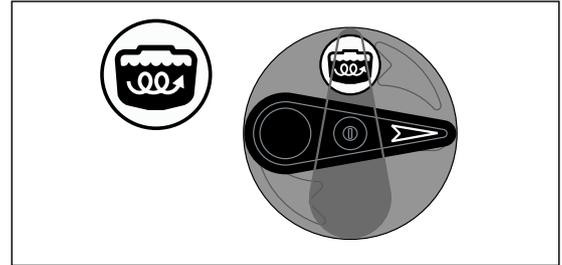
## 5 - Operation

### Agitation control valve

The agitation valve is a variable control valve, located at the front of the operator station (A). Some level of agitation is always present in the main tank unless the valve is closed completely by the operator. The level of agitation required during spraying is controlled by the valve position.



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



### Safety Precautions - Crop Protection Chemicals

Always be careful when working with crop protection chemicals!



WARNING! Always wear proper protective clothing before handling chemicals!

#### Personal Protection

Depending on the chemical type, protective gear/equipment should be worn to avoid contact with the chemicals, such as:

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



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 chemical.



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



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



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

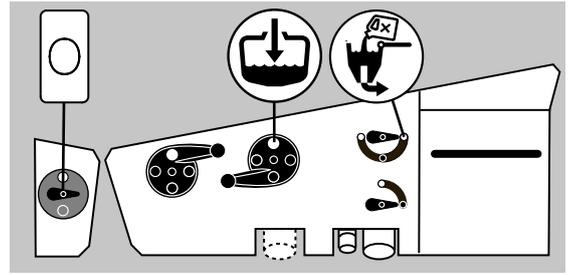
## 5 - Operation

### Filling liquid chemicals using the 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 SmartValve towards "Main tank".
3. Turn the pressure SmartValve towards "Main tank".
4. Partially close the agitation valve.

**i** NOTE! If filling from an external source, this can continue while performing the following steps.

5. Engage the pump and set PTO speed at max. 540 RPM or 1000 RPM (depending on pump model).
6. Open the TurboFiller lid. Pour the correct quantity of chemical into the hopper.



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

**h** 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 improved accuracy.

7. Engage suction to the TurboFiller by turning the chemical source valve to the TurboFiller position. Chemical will be transferred to the main tank. The chemical source valve must be open for at least 20 seconds after the chemical is no longer visible in the hopper, in order to empty the transfer hoses completely.

**!** DANGER! If the TurboFiller and the transfer hoses are not completely emptied, there is a risk of chemicals flowing back into the hopper!

8. 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 press down on the nozzle to activate container cleaning.

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

**h** ATTENTION! The rinsing device uses spray liquid to rinse containers for concentrated chemicals. Before disposal, always rinse the chemical containers with clean water several times, until they are clean.

9. Flush the TurboFiller with clean water by shifting to suction from the rinse tank or from an external 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 empty the transfer hoses completely.

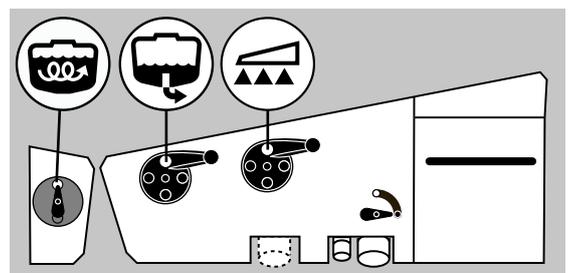
**h** ATTENTION! If the suction SmartValve is not moved to suction from a clean water supply, the hopper rinse will use spray liquid for rinsing the hopper! Cleaning of the TurboFiller must always be done, when the spray job is finished, together with cleaning the entire sprayer. Cleaning after the last filling, and before spraying, does not ensure a clean TurboFiller!

10. Close the TurboFiller suction valve, when the hopper has been rinsed. Close the lid.

11. Turn the agitation valve to increase agitation.

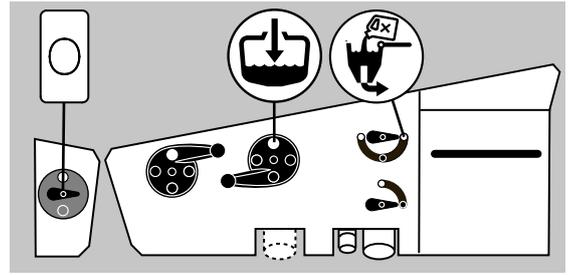
**h** ATTENTION! If foaming is a problem, reduce the agitation.

12. When the spray liquid is well agitated, turn the handle for the pressure SmartValve to the "spray" position. Continue agitation during transport and spraying of the crop.

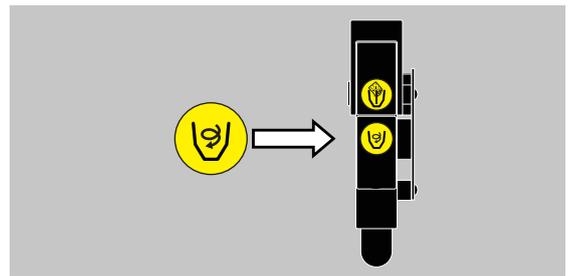


## Filling powder chemicals using the HARDI TurboFiller

1. Fill the main tank at least 1/2 with water (unless otherwise stated on the chemical container label).
2. Turn the handle of the suction SmartValve towards "Main tank".
3. Turn the pressure SmartValve towards "Main tank".
4. Turn the agitation valve towards "agitation" as required:
  - A fully open agitation valve will result in very little suction from the TurboFiller.
  - A fully closed agitation valve will result in no agitation, while the powder is being transferred into the tank, resulting in poor mixing.
5. Engage the pump and set PTO speed at max. 540 RPM or 1000 RPM (depending on pump model).



6. Open the TurboFiller lid. Turn the chemical source valve to the TurboFiller position and open the TurboDeflector valve.

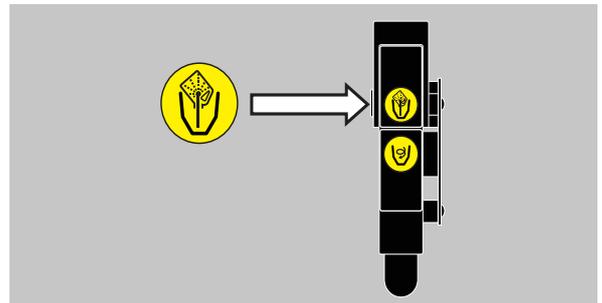


**!** DANGER! Always wear face shield and other appropriate personal safety equipment, when filling chemicals.

7. Pour the powder into the TurboFiller at a steady rate. The chemical source valve must be open for at least 20 seconds after the chemical is no longer visible in the hopper, in order to empty the transfer hoses completely.

**!** DANGER! If the TurboFiller and the transfer hoses are not completely emptied, there is a risk of chemicals flowing back into the hopper!

8. 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 press down on the nozzle to activate container cleaning.



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

**!** ATTENTION! The rinsing device uses spray liquid to rinse containers for concentrated chemicals. Before disposal, always rinse the chemical containers with clean water several times, until they are clean.

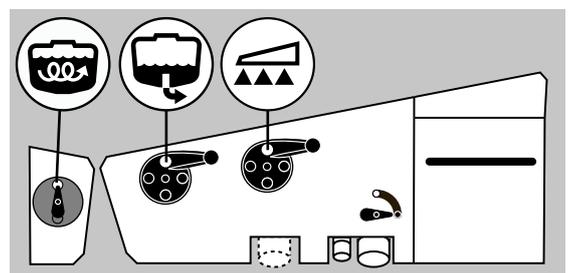
9. Flush the TurboFiller with clean water by shifting to suction from the rinse tank or from an external tank. The TurboFiller suction valve must be open for at least 20 seconds after the rinse water is no longer visible in the hopper, in order to empty the transfer hoses completely.

**!** ATTENTION! If the suction SmartValve is not moved to suction from a clean water supply, the hopper rinse will use spray liquid for rinsing the hopper! Cleaning of the TurboFiller must always be done, when the spray job is finished, together with cleaning the entire sprayer. Cleaning after the last filling, and before spraying, does not ensure a clean TurboFiller!

10. Close the chemical source valve when the hopper has been rinsed. Close the lid.
11. Turn the agitation valve to increase agitation.

**!** ATTENTION! If foaming is a problem, reduce the agitation.

12. When the spray liquid is well agitated, turn the handle for the pressure SmartValve to the "spray" position. Continue agitation during transport and spraying of the crop.



## 5 - Operation

### TurboFiller Rinsing

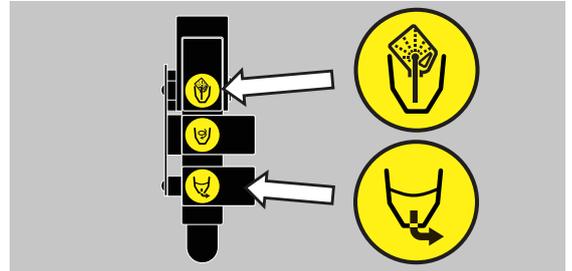


NOTE! It is important to suck from the RinseTank or an external tank with clean water.

Rinse the TurboFiller and chemical containers 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. Open the Turbo Deflector Valve  for 1 minute to get plenty of clean water through the hoses.
4. 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.
5. Rinse the hopper for 30-40 seconds.
6. 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.
7. 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. This is to ensure that it is clean, before spraying other crops that may be sensitive to the chemicals just used. See the section "Cleaning" on page 1 for details.

## Chemical Filling by VACnMIX (optional)

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

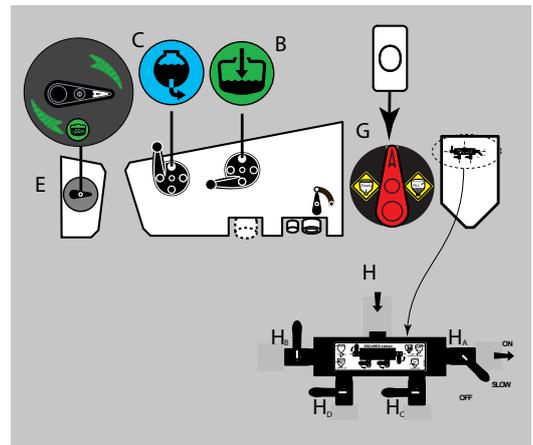
1. Induction of Dry Granules, Powders or Flowables by adding product to VACnMIX hopper.
2. Induction of Liquids by adding product to VACnMIX Hopper.
3. Using the optional Vacuum Feature to add Liquid Chemicals from Envirodrums and other containers.

## Filling the VACnMIX with water



Note! The VACnMIX can be filled with water from the main tank or the rinse tank. It is recommend to use water from rinse tank. In the event of a or burst or a leak from one of the pressure hoses, only claeen water will come out. Follow the instructions below to fill the VACnMIX from the rinse tank

1. Fill the rinse tank with clean water.
2. Turn the handle of the suction SmartValve towards "suction from rinse tank".
3. Set the Vacuum Transfer valve to Off position
4. To activate the Venturi and VACnMIX turn pressure SmartValve towards "Pressure to main tank".
5. Engage the pump. Set at 540 or 1000 rpm, relevant to equipped pump.
6. On the VACnMIX controls, turn Fast Fill handle on, to fill hopper. Watch the level of water. Fill to the 25 Litre level, which will be just above the upper jet. (NOTE: Sight gauge is a guide only to fluid volume in hopper).
7. When sufficient water is in the hopper turn fast fill handle off.



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



WARNING! Do not use faulty equipment.

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



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



ALWAYS follow label instructions! Always where

## 5 - Operation

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

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

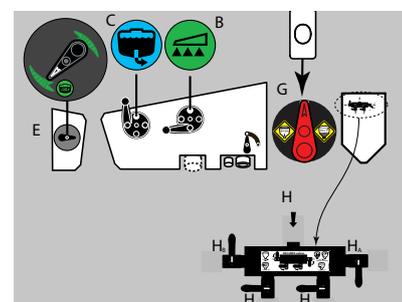
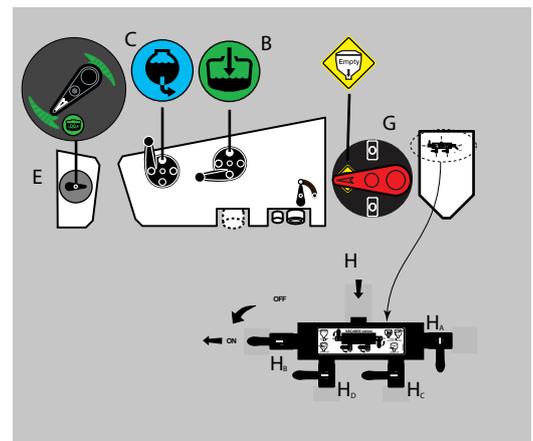
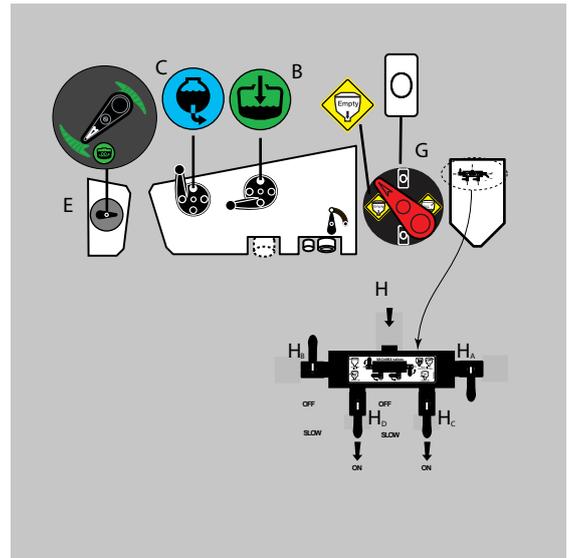
- i** NOTE! Large unmixed chemical will be held by centrifugal force to the outside wall of the hopper. Continue mixing in the hopper until chemical is fully integrated into water.

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

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

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

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



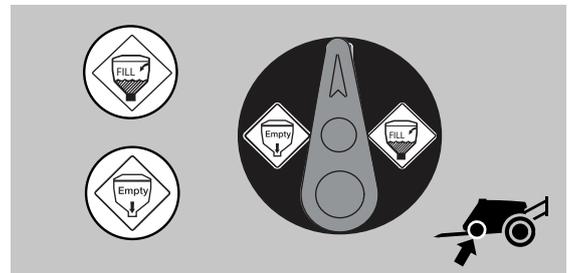
## Filling chemicals by VACnMIX Chem Probe (optional equipment)

**i** NOTE! Before adding any chemicals, fill hopper with water, to test functions see "Filling the VACnMIX with water" on page 1.

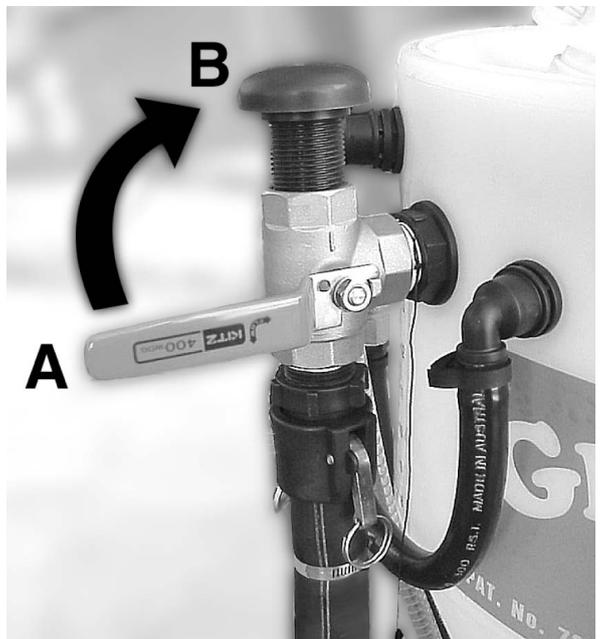
1. Connect Chem Probe suction hose to the camlock fittings on the ball valve on the hopper and the other end to the drum coupling.



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



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



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

### To empty the ChemProbe hose with liquid:

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

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

**h** ATTENTION! All components of the VACnMIX must be thoroughly cleaned and decontaminated, using recommended appropriate cleaning and / or neutralizing agents, before storage or using any different chemical concentrates. See "VACnMIX Rinsing" on page 110

## 5 - Operation

### VACnMIX Rinsing



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



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



The entire sprayer, chemical handling equipment and the boom should be cleaned together see page "Cleaning" on page 1. Please read below for an overview of cleaning

### Cleaning empty containers - VACnMIX lid open

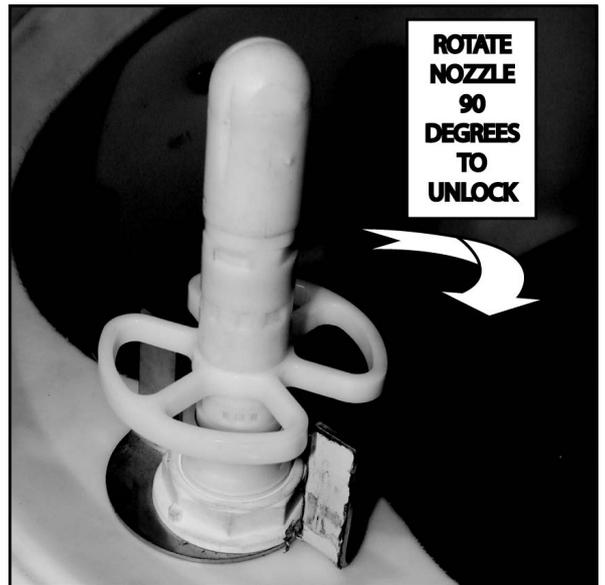


DANGER! Do not press the nozzle unless it is covered by a container to avoid spray liquid hitting the operator.

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



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

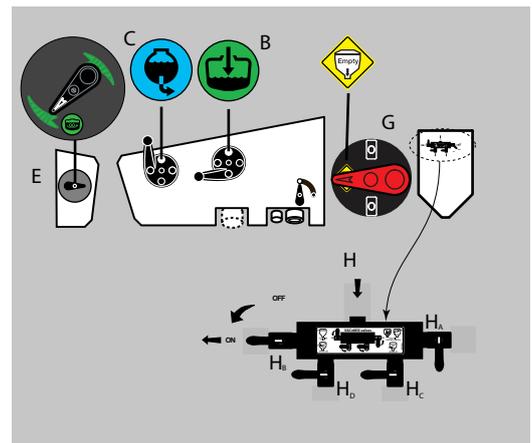


### VACnMIX rinsing - VACnMIX lid is closed

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



ATTENTION! The VACnMIX hopper needs to be cleaned thoroughly after spraying. This is to ensure that it is clean, before spraying other crops that may be sensitive to the chemicals just used. See section "Cleaning" on page 1 for details.



### Adding liquid chemical from a drum (Optional)

#### Operation of the SOTERA function keys are as follows:

- A. Power On / Displays the "Accumulated Total" when held on.
- B. Resets "Total" to zero when held for 1 second / Resets the meter to normal function from "Cal" or "FLSH" mode.
- C. Changes the "Calibration factor" (see instructions this section)
- D. Changes to "FLSH" (flush) mode when held for 3 seconds (meter will not add to the Total or the Accumulated total when in this mode).
- E. Turn the meter "ON" by pressing button (A).



#### Calibration of the Sotera Volumetric Flow Meter

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

#### Changing the "Calibration Factor"

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



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



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



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



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



ATTENTION! The HARDI 464 diaphragm pump must be run at 500RPM or more to ensure the HARDI venturi produces maximum vacuum of - 0.85 bar. If uncertain of performance, fit a vacuum gauge and test actual vacuum produced.



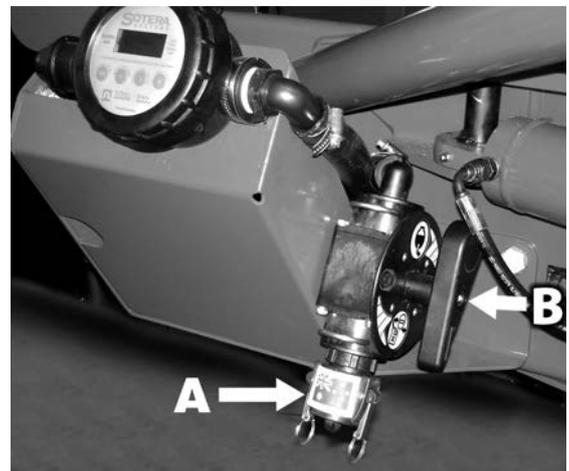
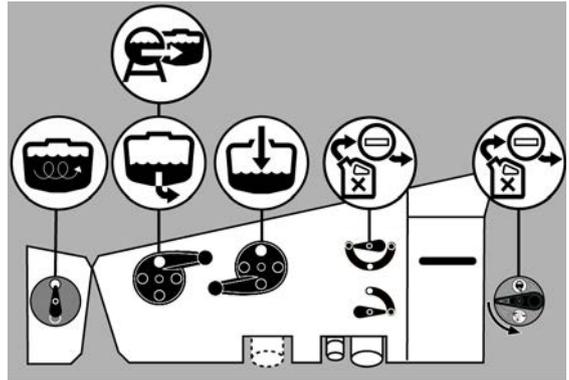
WARNING! A well functioning HARDI venturi system creates a very powerful vacuum. It is therefore important to note that the internal flow mechanism will be irreparably damaged if it is left to suck high speed air. See correct operational procedure above.

## 5 - Operation

### Operate the Chem Meter - Sotera Volumetric Flow Meter

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

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



### Flushing the Chem-meter circuit

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

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

### Chem-meter Specifications

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



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



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



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

### 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 a closed reservoir, the sprayer should be rinsed before returning to refill.

Dilute the residues of the spraying circuit, and spray it on the crop. Depending on the weather conditions, it could also be necessary to clean the sprayer on the outside now while in the field, before returning to the farm.

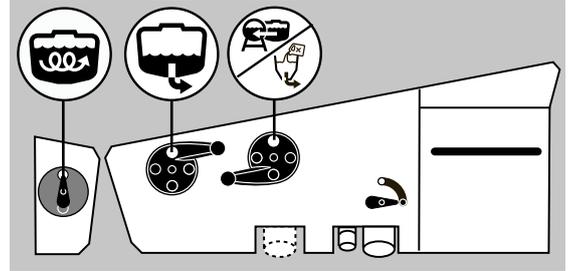


WARNING! Always follow local legislation in force at any time.

### 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".
2. Turn the pressure SmartValve towards "Pressure draining/TurboFiller".
3. Turn the agitation valve towards "Agitation". Close the remaining valves.



DANGER! Before turning the pressure SmartValve to "Pressure draining/TurboFiller" it is very important to be sure that the quick coupler lid is correct and completely fitted 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 fit the lid completely, lubricate the rubber seal and the grip hooks.

4. Engage the pump and set PTO speed to max. 540 RPM or 1000 RPM (depending on pump model).
5. Agitation has started and should be continued for at least 10 minutes.
6. The spray job can now be resumed. Turn pressure SmartValve towards "Spraying" and start spraying.

### Parking the Sprayer

To avoid spot contamination, the sprayer should always be parked at either the washing/filling location or under cover.

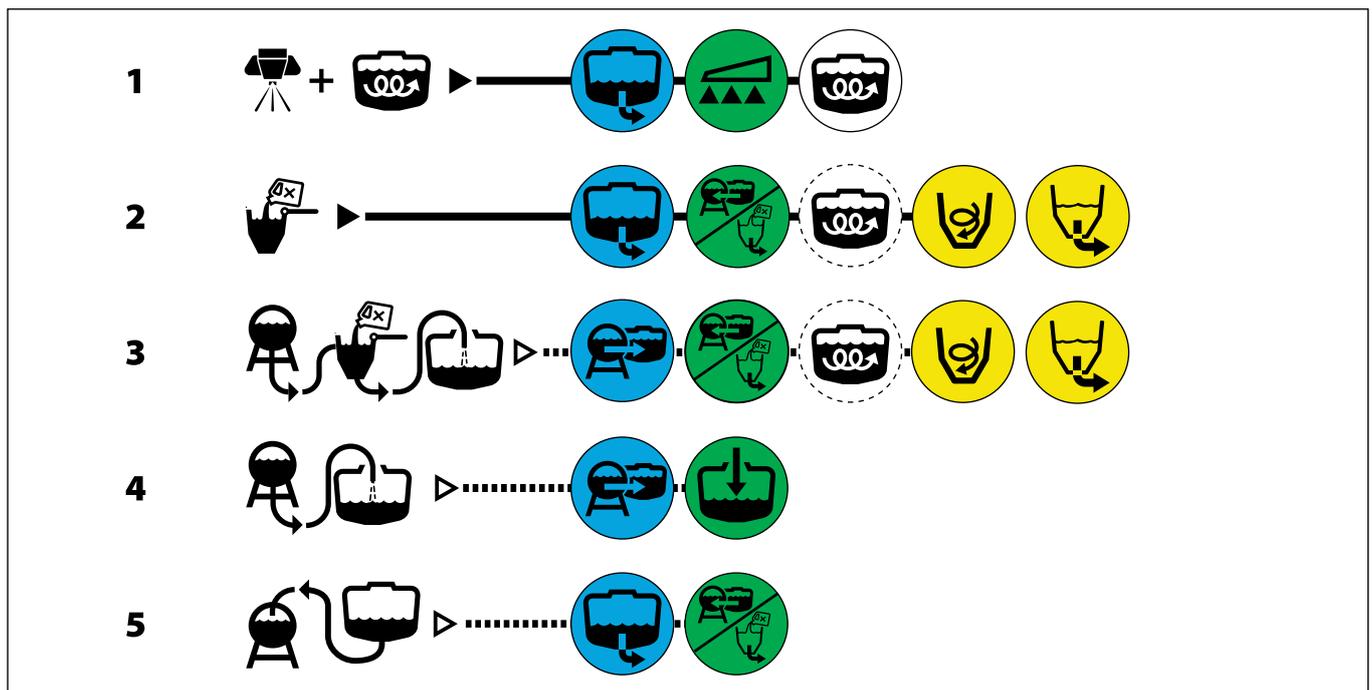
This prevents rainfall from washing down chemical residue from the sprayer's surfaces.

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

## 5 - Operation

### Quick Reference - Operation

In the following diagram, the handle positions for different options are illustrated.



**i** NOTE! Dashed lines and valve symbols, indicates optional equipment and functions.

1. Spraying with suction from the MainTank and using agitation in the MainTank.
2. Filling chemicals using the TurboFiller with suction from the MainTank. Using agitation is optional.
3. Filling chemicals using the TurboFiller, with suction from the external filling device. Using agitation is optional.
4. Filling of the MainTank, with suction from the external filling device.
5. Draining the MainTank to an external tank.

### Cleaning

Follow the following cleaning and maintenance program, in order to derive full benefit from the sprayer for many years.



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



ATTENTION! A clean sprayer:

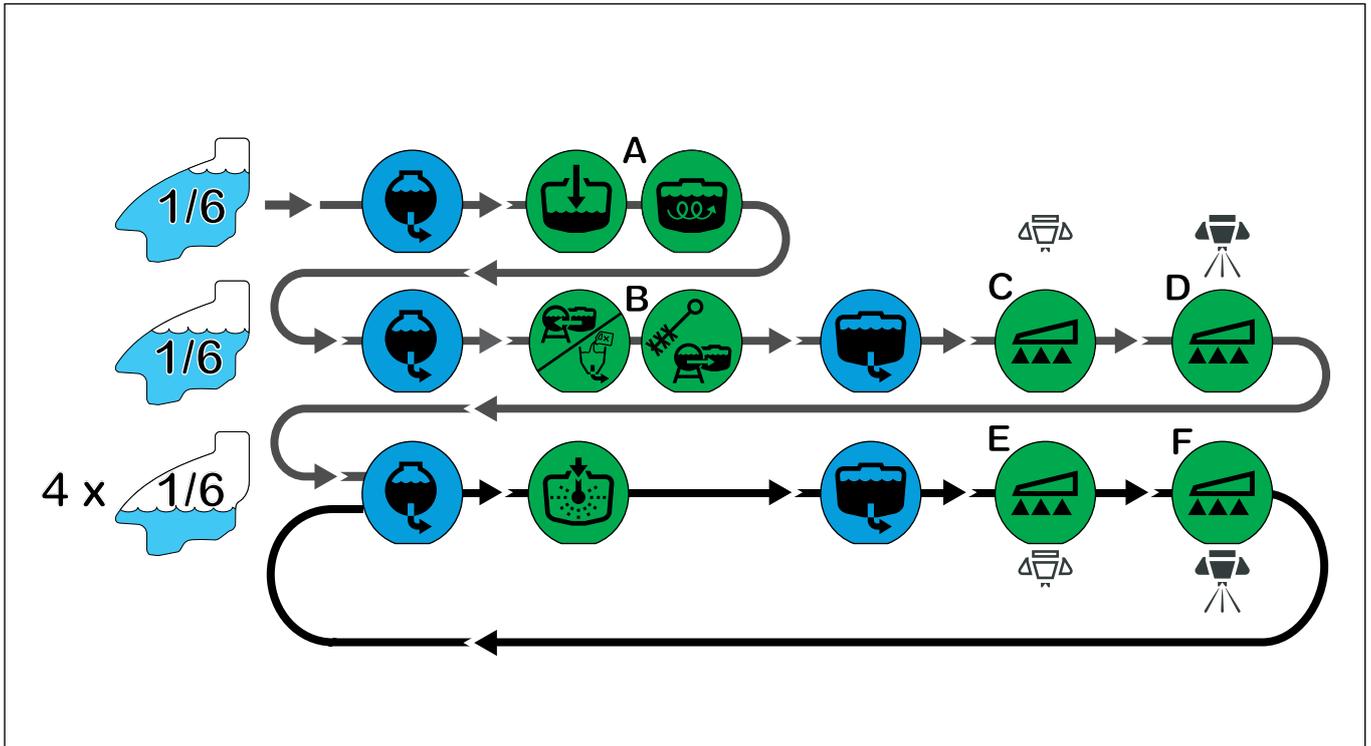
- Is a safe sprayer.
- Is ready for action.
- Does not take any damage from crop protection residue.

### Guidelines

- Read the complete 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.
- Be familiar with local legislation regarding disposal of pesticides washings, mandatory decontamination methods, etc. If in doubt, contact the appropriate authority.
- Usually the pesticide washings 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, watercourses, ditches, wells, springs, etc. The washings from the cleaning area must not enter sewers. Alternatively, retain the washings in an appropriate receptacle, diluted and distributed over a larger cultivated area - also see "Filling/Washing Location Requirements" on page 1.
- Cleaning starts with the calibration, as a well-calibrated sprayer will ensure the minimal amount of remaining spray liquid.
- Good practice is 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. Strongly advised is to perform an internal cleaning of the sprayer, when high concentrations of acids or chloride are present in the active ingredients, or if the spray liquid is corrosive. For the best result, use a cleaning agent recommended by HARDI, e.g. AllClearExtra.
- Sometimes it is 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, children and animals must not have access to the sprayer under these circumstances.
- Recommended is to coat all metal parts of the sprayer before and after use with a suitable rust inhibitor, if the product applied is corrosive.
- Always park the sprayer under roof to avoid rain-washing off pesticides as well as build-up of spot contamination in the soil. If parked outside, park the sprayer on the filling/washing location in order to retain possible pesticides.

## 5 - Operation

### Quick Reference - Cleaning



ATTENTION! Pump speed 250-280 rpm.

- A. Full agitation.
- B. Wait 3 seconds before changing valve position.
- C. Minimum 45 seconds with nozzles Off.
- D. Spray until air comes out of nozzles. Engage FlexCapacity pump.

When the pressure drops, close the regulation valve by pressing the pressure increase button for 10 seconds.

When the boom is completely empty, press the pressure decrease button for a few seconds to avoid a pressure spike.

- E. Minimum 45 seconds with nozzles OFF.
- F. Spray until air comes out of nozzles.

### Cleaning and Maintenance of Filters

Clean filters ensure:

- None hindering or damage during operation on sprayer components such as valves, diaphragms and operating units.
- Nozzle clogging 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.



NOTE! For cleaning procedure, refer to:

- "10 Hours Service - EasyCleanFilter" on page 1.
- "10 Hours Service - CycloneFilter" on page 1.
- "10 Hours Service - Nozzle Filters" on page 1.

## 5 - Operation

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### Use of Rinsing Tank and Rinsing Nozzles

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

- A. Full internal rinsing or cleaning. In-field diluting before cleaning.
- B. Rinsing the liquid system without diluting main tank content. Rinsing when main tank is not empty.
- C. External cleaning of the sprayer (can only be carried out on completion of "A.").



**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 already cleaned, please do this before attempting the cleaning procedures below - see "TurboFiller Rinsing" on page 1.

Note that cleaning the TurboFiller will then use water from the rinsing tank thus reducing the available quantity for cleaning procedures below.



**ATTENTION!** Do NOT fill any cleaning agents into the rinsing tank. If cleaning agents are to be used, they should be filled into the main tank, e. g. via the TurboFiller.

#### A. Full Internal Rinsing or Cleaning.

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 1.



**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 injuries for the operator or persons in proximity of the machine!

This rinsing procedure will rinse the liquid system 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 has stopped coming out of the nozzles 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 litres) of the rinsing tank content at this valve setting.
5. Now 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 pipes and nozzles - this may take several minutes after the spray fan has collapsed.
11. Shut off all nozzles by the main ON/OFF button.
12. Now 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 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 pipes and 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: Rinsing When Main Tank Is Not Empty**

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

Cleaning of the liquid system:

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



NOTE! The main ON/OFF function 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. Turn on the pump and spray water from the rinsing tank into the field, until all boom pipes and nozzles are flushed with clean water.
5. Turn off the pump when rinsing is finished.



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



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

## 5 - Operation

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### Full Internal Cleaning (Soak Wash)



ATTENTION! This cleaning procedure is always used when one or more of these situations occur:

- A. The next crop to be sprayed is at risk of being damaged by the chemical just used.
- B. The sprayer is not going to be used right away for the same chemical or crop.
- C. Before any repair or maintenance job is going to be carried out on the sprayer.



ATTENTION! Wash the sprayer between jobs with incompatible crops. This must be done according to the directions from the chemical manufacturer. Use a commonly used cleaning agent, or a cleaning agent and/or procedure as directed by the chemical manufacturer.

### Procedure for Washing with a Cleaning Agent

1. Rinse the sprayer in the field (see the section "Use of Rinsing Tank and Rinsing Nozzles" on page 1).
2. Drive to the filling location.
3. Prepare sprayer for cleaning. Fill water in the MainTank to 10% of its capacity. Fill the RinseTank completely.
4. Add the cleaning agent to the MainTank by using the TurboFiller. Follow instructions on the label of the cleaning agent.
5. Set suction SmartValve for "MainTank" and pressure SmartValve for "MainTank". Set agitation valve for "Full agitation".
6. Engage and set the pump speed at approximately 300 RPM. Engage auxiliary pump (FlexCapacity pump).
7. Allow the liquid to circulate the system for 3 minutes.
8. Set the pressure SmartValve for "main tank" for minimum 10 seconds in order to open and flush the safety valve.
9. Open the TurboFiller transfer valve and the deflector valve. Allow the liquid to circulate for 3 minutes.
10. Close the lid and activate the container rinsing valve to clean the hopper inside.
11. Shut all three valves on the TurboFiller again.
12. Set the SmartValve for "Flushing of external filling line" for 3 minutes to clean the FastFiller lines.
13. Verify that all nozzles are shut on the main valve ON/OFF switch on the grip.
14. Set the pressure SmartValve for "Spraying".
15. Allow the liquid in the MainTank to circulate for minimum 3 minutes with the nozzles shut.
16. Set the pressure SmartValve for "Tank cleaning nozzles". Allow the liquid to circulate for 3 minutes.
17. Spray out water with cleaning agent and chemical residue.  
Set the spray pressure at 3-5 bar.



Note! The wash water still contains active chemical. Choose an appropriate area to spray this out. Alternatively, the washings can be dumped at the filling/washing location and retained in an appropriate receptacle (e.g. slurry tank or similar). Spot contamination and accumulation must be prevented.

Continue to spray until all liquid has exited from the boom pipes and nozzles.

18. Shut all nozzles with the main ON/OFF button.
19. Rinse the sprayer again with clean water to rinse out all remains of the cleaning agent.
20. Include rinsing of the TurboFiller in step 18. Operate all 3 valves during this process.
21. Disassemble all filters (suction, pressure, in-line and nozzle filters) and clean the filter screens using clean water and detergent and a brush.



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



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

### Use of Cleaning Agents

Recommended is to use an appropriate cleaning agent suitable for cleaning agricultural sprayers.

- Recommended is cleaning agents containing a suitable lube or conditioner.
- If for some reasons not available, and instead using triple ammonia water, it is important to rinse the liquid system immediately after, and add some lubricant to the rinsing water to prevent ball valves etc. seizing up.
- Use of automotive antifreeze/radiator coolant (ethylene glycol) will protect valves and seals from drying or seizing up.

### Technical Residue

An amount of spray liquid will inevitably remain in the system. As the pump takes in air when the tank is just about empty, spraying the crop properly is not possible.

This technical residue is defined as the remaining amount of liquid in the system, when the first clear pressure drop appears on the pressure gauge.

The residual dilutable volume is approx. 47 litres. See the section "Technical Specifications" for more details.

Immediately dilute the residue in the tank in a ratio of 1:10 with clean water. Afterwards spray out on the crop just sprayed with increased driving speed.

In addition, separately rinse pump, linkage and armature with water from the rinsing tank.



**ATTENTION!** Liquid in the spray lines is undiluted residue. There should be an untreated paddock area available to spray this liquid out.

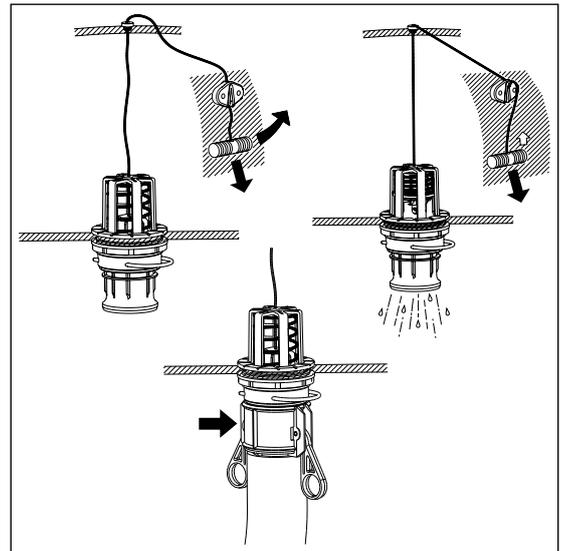
Follow national regulations when disposing of chemical residues.

### Using the Drain Valve

The drain valve is operated from side of the sprayer and is located just behind 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 is safely drained.



## 5 - Operation

### Pressure empty

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 quick coupler on the sprayer.



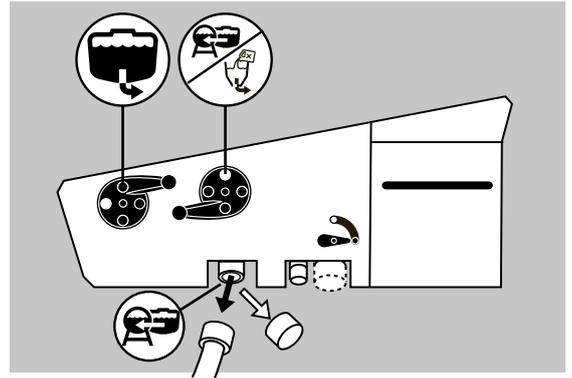
**DANGER!** Before setting pressure SmartValve to , it is very important to ensure that the quick coupler lid is correctly and completely fitted to the filling stud in its locked position. Failure to do so causes a risk of contamination and injury from quick coupler lid being "shot" off when pressurized! If it is not possible to fit the lid completely, lubricate the rubber seal and the grip hooks.

2. Turn the pressure SmartValve towards .
3. Turn the suction SmartValve towards .
4. Engage the PTO to start the pump.



**ATTENTION!** Set pump RPM so that the pressure the connected hose can handle is not exceeded.

5. When the tank is drained, then turn off the PTO again.
6. Disconnect the hose and fit the cap for the quick coupler.







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### Preparation

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#### Introduction

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

#### Safety



DANGER: Maintenance procedures involve:

- Reading and interpreting technical information and illustrations
- Lifting the sprayer's axle off the ground
- Cleaning of filters
- Brake adjustments
- Servicing hydraulic components
- Testing and servicing of fluid systems
- Servicing PTO shaft safety shields
- Lubrication

#### Before you get started...

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



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

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

# 6 - Maintenance

## Lubrication

### General Info

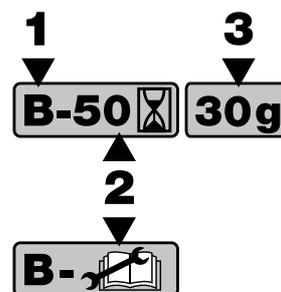
Always store lubricants clean, dry and cool - preferably at a constant temperature - to avoid contamination from dirt and condensed water. Keep oil filling jugs, hoppers and grease guns clean, and clean the lubricating points thoroughly before lubricating. Avoid skin contact with oil products for longer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

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

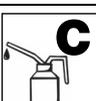
### Pictograms in Lubrication & Oiling Plans

1. Lubricant to be used (see "Suitable lubricants" below).
2. Recommended intervals. Shown in hours or with a symbol for occasional maintenance.
3. Quantity to use. Only shown if specifying a quantity.

 ATTENTION! Recommended is lubrication of the entire machine, if cleaning the sprayer with a high-pressure washer.



### Recommended Lubricants

	What to Lubricate?	Lubricant Type	Factory Use	Suitable Alternatives
	BALL BEARINGS and PUMP	Lithium based grease Consistency NLGI grade 2 Viscosity (@40°C) > 460 cSt	SHELL Gadus S3 V460 2 Hardi pump grease cartridge (400g): Item no. 96200604	MOBIL grease XHP 462 TOTAL Multis Complex SHD 460
	SLIDE BEARINGS	Lithium based grease Consistency NLGI grade 1/2 Viscosity (@40°C) > 200 cSt	MOBIL XHP 222	SHELL Gadus S3 V220C 2 TOTAL Multis Complex SHD 220
	OIL LUBRICATION POINTS	Engine or gear oil Viscosity 20W-50 or 80W-90	OK Tractor UTTO GL 4 80W	SHELL Spirax S4 TXM CASTROL ACT EVO 4T MOBIL Mobilube HD 80W/90
	BOLTS	Anti-corrosive wax	PAVA PV 700	TECTYL 506 WD
	VALVES and SEALS (O-RINGS)	NSF 51, NSF 61 silicone compound	ROCOL SAPPHIRE Aqua-Sil	DOW CORNING MOLYKOTE 111 Compound
	HYDROSTATIC FAN TRANSMISSION	Hydraulic oil, type ISO VG 46,	CASTROL HYSPIIN AWS 46	
	GEARBOX	Gear oil, type ISO VG 220 Fully synthetic	MOBIL SHC 630	
	HYDRAULICS, HYDRAULIC SUSPENSION	Hydraulic oil type ISO HVL Wide temperature range DIN 51524-3	CASTROL HYSPIIN AWS 46	

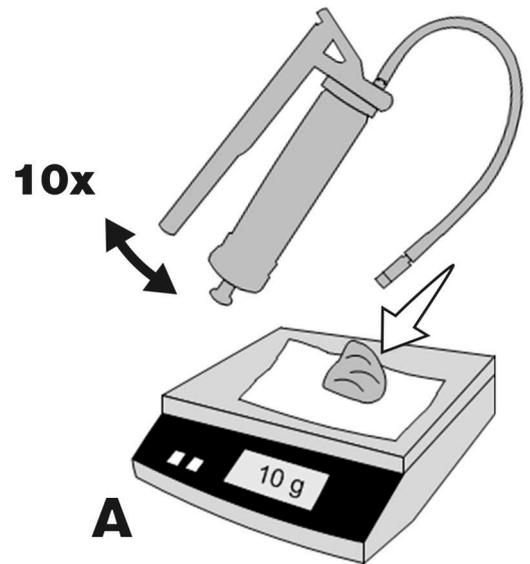
### Grease Gun Calibration

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

#### Calibration Example

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

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



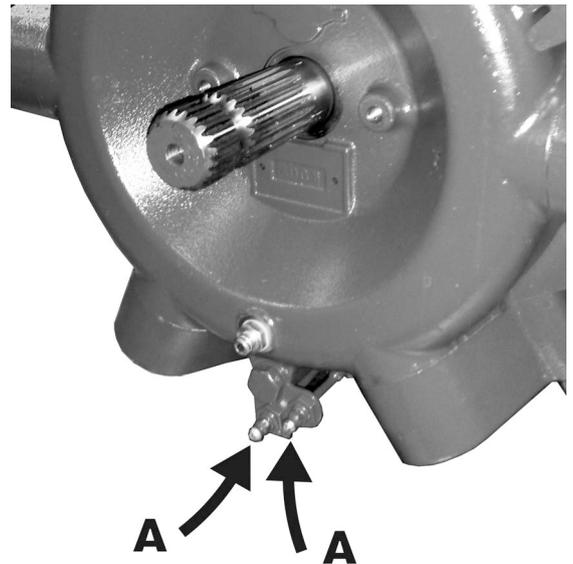
### Greasing the Pump

Grease the pump as follows:

- Factory greased:  
300 grams of grease into each lubrication point (A).
- Normal operation:  
Greasing every 50 hours with 30 grams (approximately 50 strokes,) of grease into each lubrication point (A). Also refer to "50 Hours Service - Greasing the Pump" on page 1.
- After disassembling the pump (diaphragm renewal, etc.):  
Greasing with 200 grams of grease into each lubrication point (A).

 **ATTENTION!** In order to prevent excessive wear, it is important to use a recommended lubricant! See the section "Recommended Lubricants" in this book.

 **ATTENTION!** When greasing the pump **MUST** be stopped!



# 6 - Maintenance

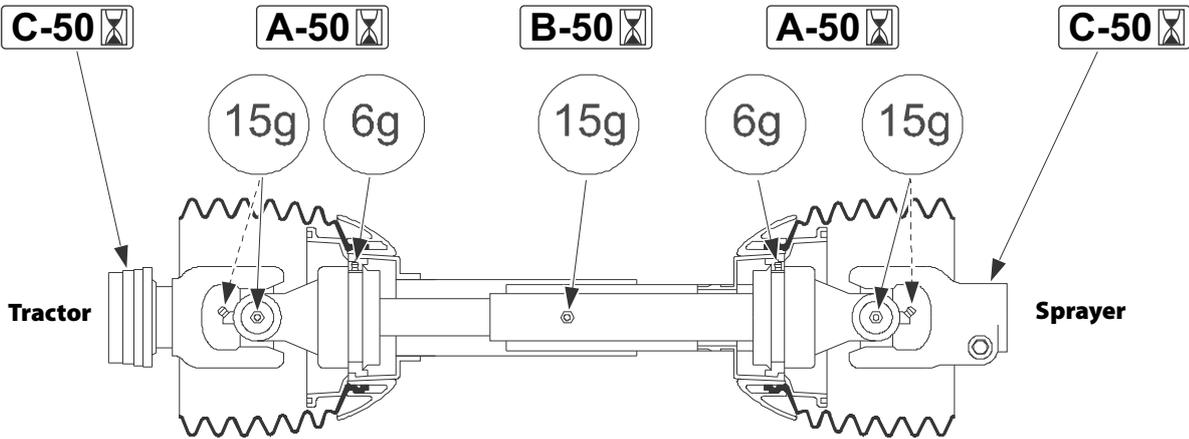
## Lubrication and Oiling Plan - PTO

The amount of grease to be applied is mentioned in grams (g). Test your grease gun to see how many grams it supply, for example after 10 strokes.

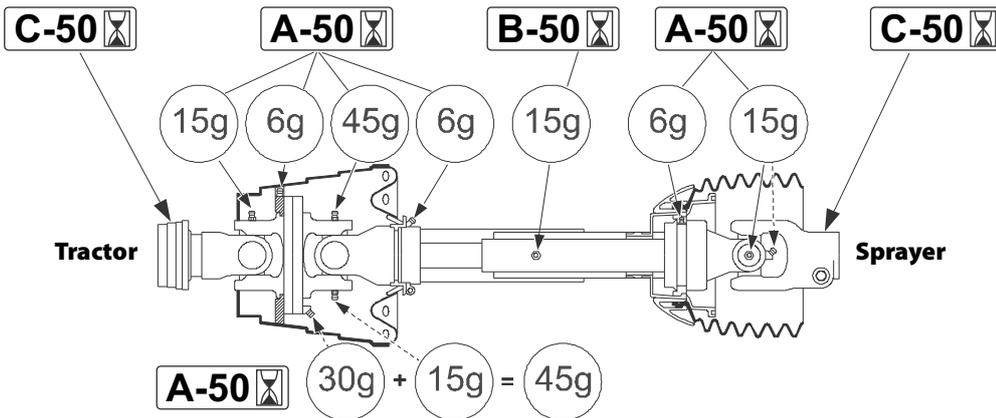
**ATTENTION!** It is important to apply the correct amount of grease at the intervals. Too little or too much grease will shorten the lifetime of the PTO.

The grease points and amount of grease to apply shown in the pictures below together with the intervals.

### Standard PTO for Tractor and Sprayer

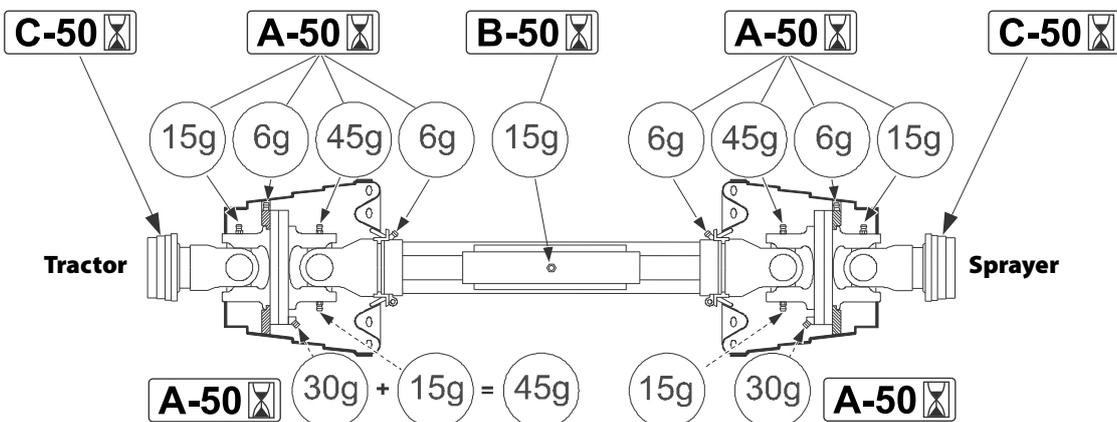


### Wide Angle PTO for Tractor, Standard PTO for Sprayer



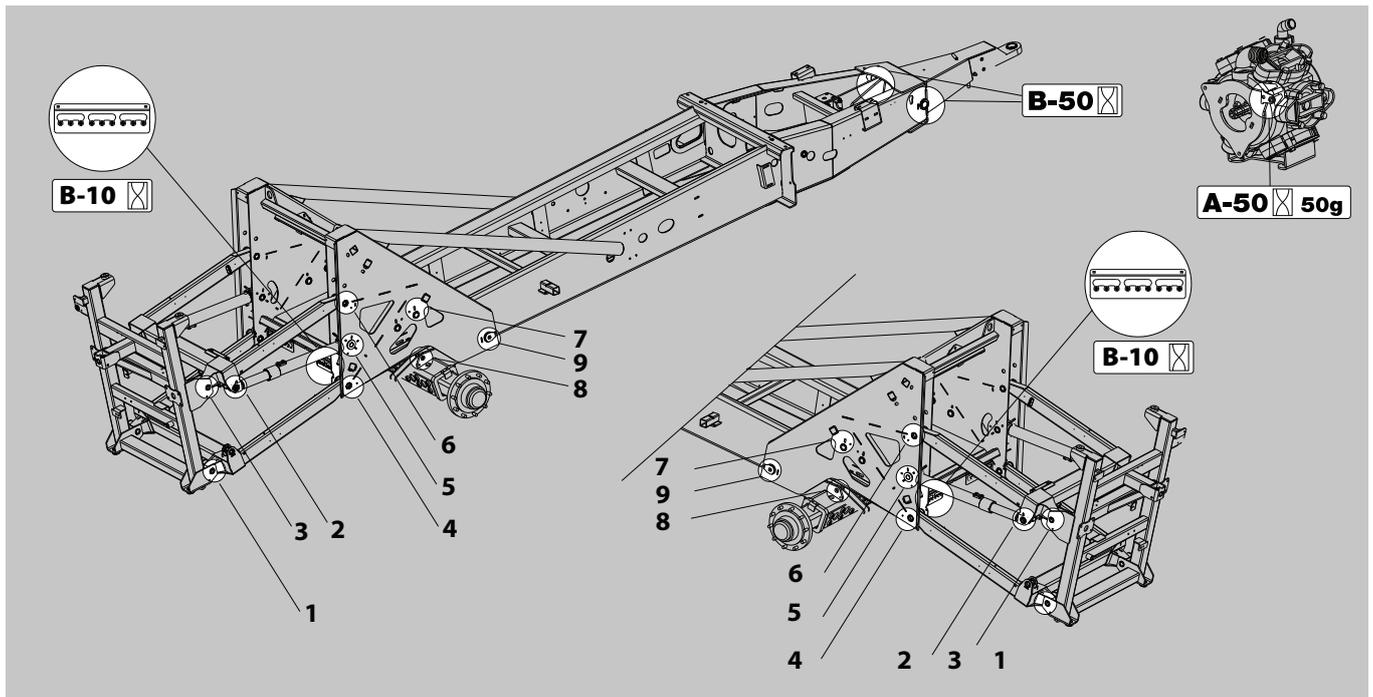
**ATTENTION!** If your sprayer has the TWIN air assistance included, **A-50** (hourglass icon) is changed to **A-30** (hourglass icon).

### Wide Angle PTO for both Tractor and Sprayer



**ATTENTION!** If your sprayer has the TWIN air assistance included, **A-50** (hourglass icon) is changed to **A-30** (hourglass icon).

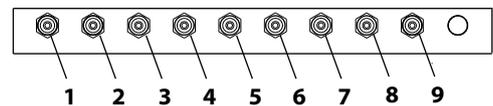
## Trailer/ParaLift lubrication & oiling plan



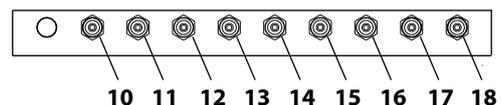
### Central lubrication

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

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



**LEFT HAND SIDE**



**RIGHT HAND SIDE**

# 6 - Maintenance

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## Service and maintenance intervals

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### General Info

National or regional laws may require periodic inspection of the sprayers in use. See the following section for more details.

The user may carry out the subsequent periodic service and maintenance work. Contact your HARDI dealer if in doubt. If this work completed correctly, the sprayer will run efficiently and it will prolong its lifetime.

When mentioning a number of hours in this chapter, this means hours of spraying, unless otherwise explained. Read the operation hours in the controller in the tractor (see the instruction book for the controller).

### Tightening Bolts and Nuts

When tightening bolts and nuts as a part of periodic service or due to replacement of spare parts, it is important to apply the correct torque. This will prevent accidents and prolong the lifetime of the parts included in the bolted joints.

If not stated otherwise in this book, tighten bolts and nuts using the following torques.

Material: Surface Treated Steel		
Bolt Size (metric)	Recommended Torque (Nm)	Maximum Torque (Nm)*
M4	2.4	3
M5	5	6
M6	8	10
M8	20	25
M10	39	50
M12	70	85
M14	112	140
M16	180	215
M18	240	305
M20	350	435
M22	490	590
M24	600	750
M27	976	1100
M30	1300	1495

Material: Stainless Steel		
Bolt Size (metric)	Recommended Torque (Nm)	Maximum Torque (Nm)*
M4	1.7	2.1
M5	3.5	4.2
M6	5.6	7.0
M8	14	17.5
M10	27	35
M12	49	60
M14	78	98
M16	126	151
M18	168	214
M20	245	305
M22	343	413
M24	420	525
M27	683	770
M30	910	1047

\*Exceeding this value results in a great risk of deforming the bolt.



WARNING! Applying too little torque will result in these risks:

- Bolted joints will rattle and thus fail under fatigue.
- Bolts worn out quickly and thus will not fulfil their design purpose.
- Bolted joints will come loose.
- Accidents caused by assembled parts coming apart due to bolts or nuts failing or falling off.



WARNING! Exceeding the maximum torque will result in these risks:

- Damaging or stripping the threads and deforming the bolt.
- Bolt heads will be broken.
- Bolted joints will come loose.
- Accidents caused by assembled parts coming apart due to bolts breaking.

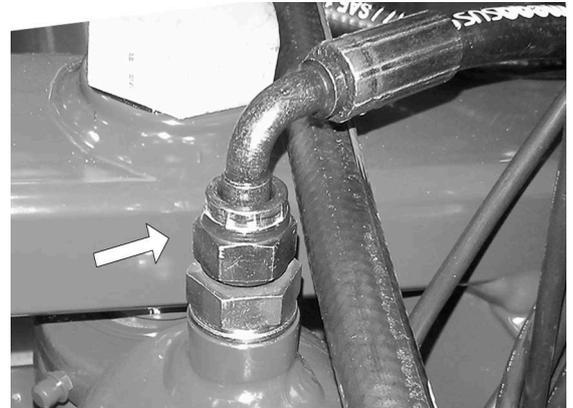
## 6 - Maintenance

### Tightening Hydraulic Hoses

When tightening hydraulic hoses as a part of periodic service or due to replacement of spare parts, it is important to apply the correct torque. This will prevent accidents and prolong the lifetime of the parts connected with the hoses.

If not stated otherwise in this book, please tighten hydraulic hoses using the following torques:

Hose Size	Thread Size	Spanner Size	Recommended Torque
1/4"	9/16"	19 mm	28 Nm
3/8"	11/16"	22 mm	44 Nm
1/2"	13/16"	24 mm	62 Nm
3/4"	1.3/16"	36 mm	130 Nm
1"	1.7/16"	41 mm	170 Nm



**DANGER!** A hydraulic hose or joint leaking or coming apart with the oil under pressure can cause severe injuries to persons standing nearby! The oil can be very hot, around 80 °C, and the oil streaming out can penetrate human skin. Risk of burns on the skin, internal injuries and facial injuries and even death.



**WARNING!** Applying too little torque will result in these risks:

- Hydraulic joints will leak due to the high oil pressure.
- Hydraulic joints will rattle and thus fail under fatigue.
- Hydraulic joints worn out quickly and thus will not fulfil their design purpose.
- Accidents caused by sudden loss of oil pressure due to hydraulic parts coming apart.



**WARNING!** Applying too much torque will result in these risks:

- Damaging or stripping the threads and deforming the hydraulic joints.
- Fittings will be broken.
- Hydraulic joints will leak.
- Accidents caused by assembled parts coming apart due to bolts breaking.



**WARNING!** Often a hydraulic joint turned when assembling to make it fit between other components on the sprayer. Remember to finish off by applying the correct torque.



**NOTE!** The sealing system for hoses and fittings is ORFS type (O-Ring Face Seal). This ensures a high level of sealing and good vibration resistance. The fittings use the O-ring compression mechanism to seal.

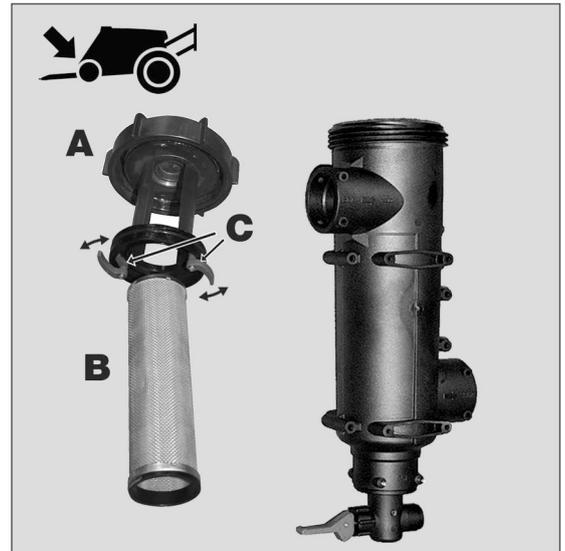
### 10 Hours Service - CycloneFilter

#### Servicing the Filter

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

#### To Reassemble

1. Grease the two O-rings on the lid/filter guide. Due to small space at the lid, use a paintbrush to apply the grease.
2. Fit the filter onto the recess (do not grease the recess) in the lid/filter guide.
3. Turn the two locks (C) inwards to lock the filter into position.
4. Place the filter/filter lid into the housing and screw the lid, until it hits the stop.



**WARNING!** Always wear protective clothing and gloves, before servicing the filter!



**DANGER!** The pressure SmartValve must always be turned to the unused function or to "tank cleaning nozzles" before opening the CycloneFilter!

In addition, turn the boost valve (D) to the closed position.

Otherwise, spraying liquid may hit you when opening the filter and this will also drain the MainTank!

## 6 - Maintenance

### 10 Hours Service - EasyCleanFilter

This filter has a clogging indicator, but even if this indicator does not show clogging, the filter mostly needs cleaning every 10 hours.

#### Servicing the Filter

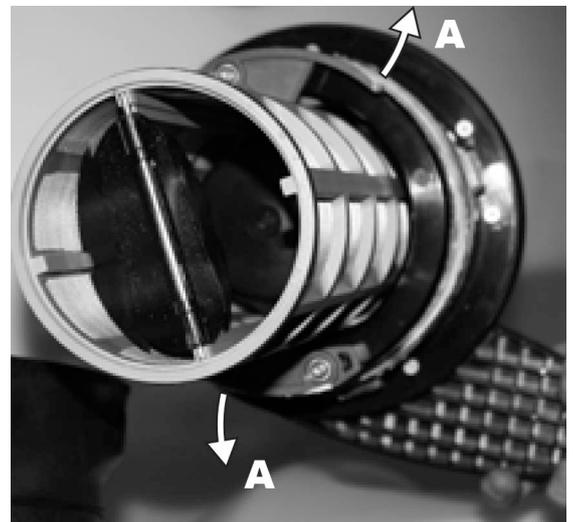
1. Turn the filter lid counter-clockwise to open it.
2. Remove lid and filter from the filter housing.



3. Separate filter element from lid/filter guide by turning locks (A) outwards.
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 the filter guide/lid. Make sure that it has caught the guide. Locks (A) are turned inwards.
3. Reassemble filter/filter lid into the housing. Make sure that it has caught the guide in the bottom of the housing.
4. Turn the filter lid clockwise to close it.



**WARNING!** Always wear protective clothing and gloves before servicing the filter!



**ATTENTION!** If you have difficulties with opening the filter, there is another way to operate it. See "Emergency Operation - EasyClean Filter" on page 1.

### 10 Hours Service - In-Line Filter

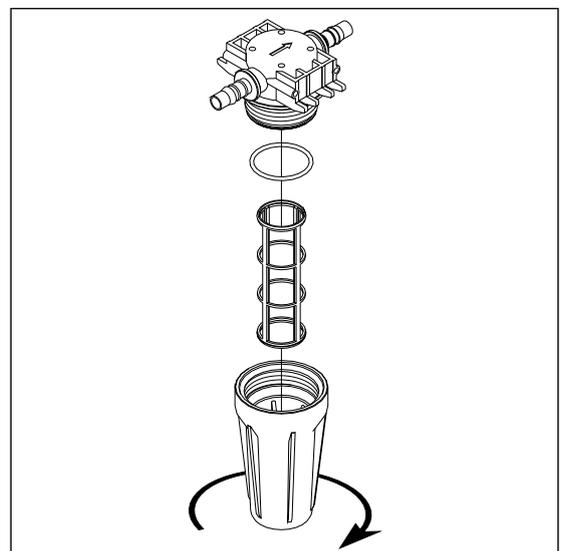
If the boom is equipped with In-Line filters, unscrew the filter bowl to inspect and clean the filter. When reassembling, the O-ring should be greased.

Alternative filter meshes are available. See the section "Filters" on page 1.



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

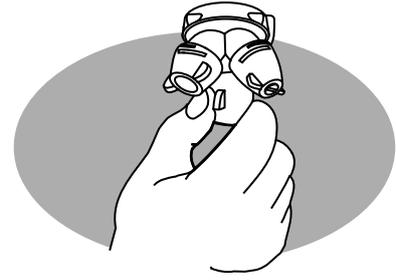
Always wear protective clothing and gloves, before servicing the filter!



### 10 Hours Service - Nozzle Filters

The filters are located in the nozzle holder.

Check the filter condition and clean the filter.



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### 10 Hours Service - Spraying Circuit

Fill with clean water and operate all functions.

Check for leaks by regulating the spray pressure up to 10 Bar.

Check nozzle spray patterns visually using clean water.

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### 10 Hours Service - Brakes

Apply the brake pedal and check the function of the trailer brakes.

## 6 - Maintenance

### 50 Hours Service - Transmission Shaft (PTO)

1. Check function and condition of the transmission shaft protection guard. Replace any damaged parts.
2. Lubrication. See "Lubrication and Oiling Plan - PTO" on page 1.



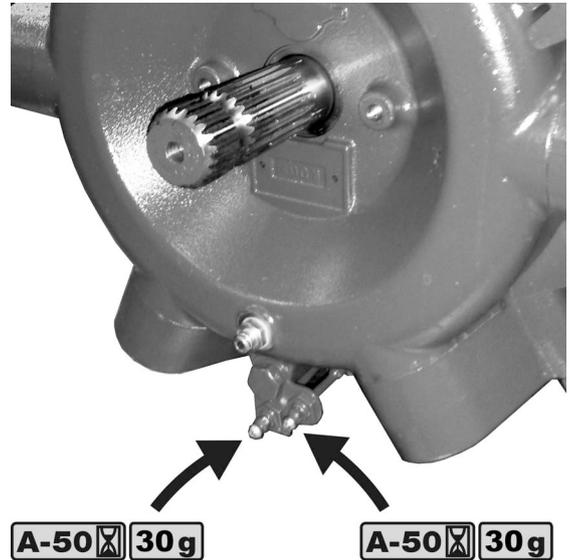
### 50 Hours Service - Greasing the Pump

Grease is necessary every 50 hours with 30 grams (approximately 50 strokes,) of grease into each lubrication point, when operating the pump.

Also refer to "Greasing the Pump" on page 1.

 **ATTENTION!** In order to avoid excessive wear, it is important to use a recommended lubricant! Refer to "Recommended Lubricants" on page 1 for more information.

 **ATTENTION!** When greasing the pump **MUST** be stopped!



### 50 Hours Service - Wheel Nuts

Tighten wheel nuts as follows.

Mounting wheel hub to rim plate: Torque 490 Nm.

Tightening sequence for wheel nuts: See illustration and tighten in the numbered order.

 **ATTENTION!** Always refit the plastic nut covers on the nuts after the wheels have been mounted or re-tightened.



### 50 Hours Service - Tyre Pressure

Check the tyre pressure according to the table in "Tyre Pressure" on page 1.

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

 **WARNING!** If renewing tyres, always use tyres with minimum load index as specified. See "Tyre Pressure" on page 1.



### 250 Hours Service - Readjustment of the Boom

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



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

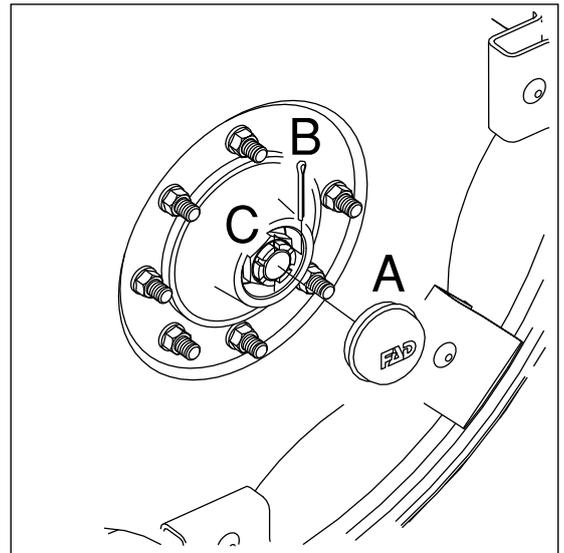


**WARNING!** Nobody is permitted to be under the boom whilst adjustment is being carried out. Never walk under the boom unless it is safely folded and stowed on the transport brackets.

### 250 Hours Service - Wheel Bearings

Check for play in the wheel bearings:

1. Place chocks in front of and behind the left wheel and jack up the right wheel.
2. Support the trailer with axle stands.
3. Rock the right wheel to discover possible play in the bearings.
4. If any play, support the wheel axle to prevent the trailer from falling down from the jack.
5. Remove hub cap (A) and cotter pin (B). Turn the wheel and tighten the castle nut (C), until feeling a slight resistance in the wheel rotation is felt.
6. Loosen the castellated nut until the first notch aligns with the cotter pin hole in the shaft.
7. Fit a new cotter pin and bend it to keep it in place.
8. Refit the hub cap to the hub.
9. Repeat the procedure for the left wheel.



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

### 250 Hours Service - Hydraulic Circuit

Check the hydraulic circuit for leaks. Repair if needed.

Refill following nitrogen accumulators:

- ParaLift suspension (if fitted)
- Wheel axle suspension (if fitted)
- Yaw suspension (if fitted)



**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. Replace damaged hoses or tubes.

In general, always replace a hose or tube if:

- It is leaking.
- Reinforcement material inside the hose is visible due to cracks in the outer layers.

## 6 - Maintenance

### 250 Hours Service - Adjustment of Wheel Brakes

1. Jack up the rear of the sprayer from the ground and support with axle stands placed under the wheel axle.

Make sure the sprayer is stable and secured before carrying out any adjustments.

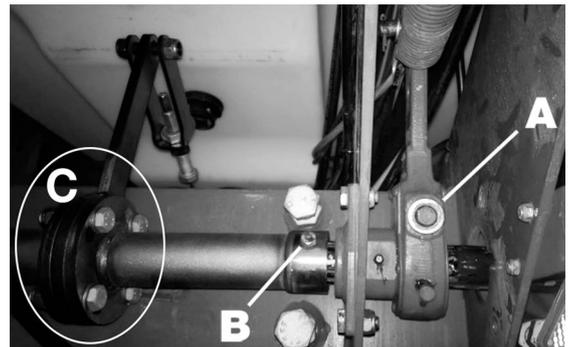
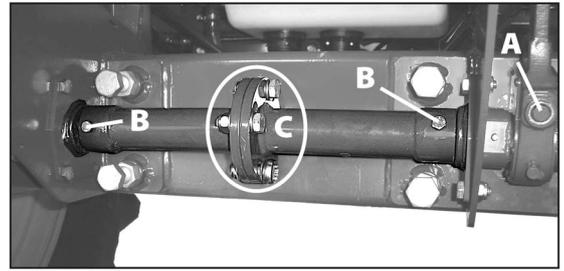


ATTENTION! There are two versions of the parking brake system available, one of the pictures should show your system at hand.

2. Loosen the hand brake cable at the rigging screw below the sprayer.
3. Loosen the 4 bolts at the brake connector (C) between the brake arms. Also loosen the screw (B) in each end of the brake connector.
4. Adjust the nut (A) counter-clockwise. This moves the brake arm backwards. Turn the nut 60° (1/6 turn) at a time - alternate between left and right brake.

Continue the adjustment, until resistance occurs when rotating the hub/wheel by hand (difficult to turn the wheel by hand).

5. Turn the nut 60° (1/6 turn) clockwise to loosen brake. Hub/wheel should rotate freely now.
6. Tighten the brake connector (C) bolts again.
7. Adjust the parking brake cable again (see separate section).



### 250 Hours Service - Hydraulic Brakes

Apply brakes to full pressure and inspect brake lines for damage or leaks. Replace damaged components.

If the hydraulic brake lines have been dismantled, the hydraulic circuit must be bled afterwards:

1. Have an assistant to apply the brakes.
2. Loosen the brake hose at the left brake cylinder.
3. The assistant continues applying the brakes, until brake fluid without air bubbles comes out.
4. Tighten the brake hose, before releasing the brakes.
5. Repeat step 1-4 to bleed the right brake cylinder.



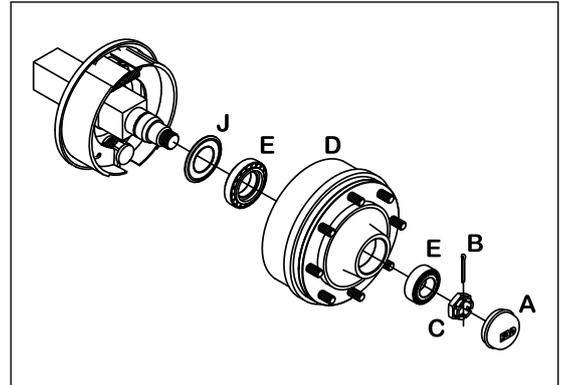
**WARNING!** Always bleed the circuit if the hydraulic brake lines have been dismantled.

## 6 - Maintenance

### 1000 Hours Service - Wheel Bearings and Brakes

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

1. Place brake chocks in front of and behind the left wheel. To service, jack up the right wheel.
2. Support the trailer with axle stands.
3. Remove the wheel.
4. Unscrew the 6 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 the brake drum (D) for brake dust, or rinse it with water.



**⚠ DANGER!** Brake dust can cause severe health injuries! Avoid inhalation of brake dust! Wear a dust mask when servicing the brakes. Do not clean brakes with compressed air! Use a vacuum cleaner or rinse with water to avoid blowing brake dust around.

7. Rinse the remaining parts on the brake carrier plate with water and wipe them off.
8. Remove roller bearings (E), clean all parts with a degrease detergent and wipe them.
9. Check the brake drum diameter (K) and lining thickness (L). Replace if worn.

Max. wear rates on brake components:

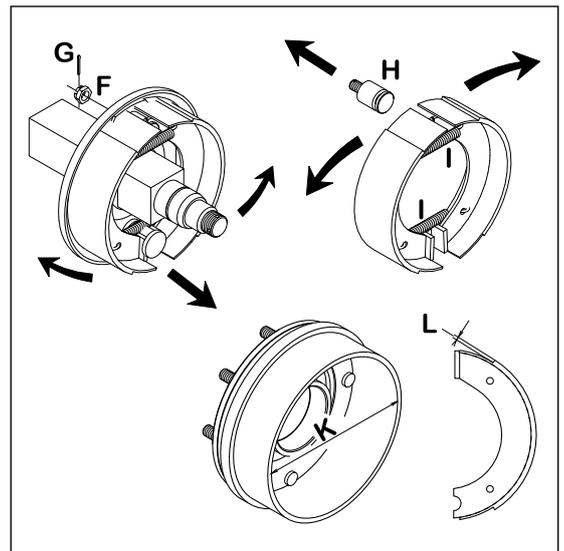
- Max. drum diameter (K): 402 mm (Large drums)
- Min. lining thickness (L): 2.0 mm

**⚠ WARNING!** Never exceed the specified minimum lining thickness (L) is the absolute minimum. Replace the parts, if they would reach the above dimensions before the next service inspection.

**⚠ WARNING!** It is necessary to renew brake linings or brake drums for both sides at the same time.

**⚠ ATTENTION!** If removing the brake drum 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 the brake cam lever.
11. Remove the cotter pin (G), castle nut (F) and 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). If the linings are worn, replace the brake shoes.
12. Apply a small amount of copper paste on moving parts, reassemble the brake shoes, and shoe return springs (I).



**⚠ 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. Replace if worn or damaged.
15. Assemble drum (D) and bearings (E) using a new sealing ring (J).
16. Fill the hub and bearings with new grease, before fitting them to the wheel axle.

**⚠ 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 feeling a slight rotation resistance.
18. Loosen the castle nut (C) again, until the first notch aligns with the cotter pin hole in the axle.



ATTENTION! The shaft has a vertical and a 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 to keep it in place.
20. Fit the hub cap (A) to the hub. Slightly tighten the 6 bolts.
21. Adjust the brakes as described in "250 Hours Service - Adjustment of Wheel Brakes" on page 1.
22. Fit the wheel again and tighten the wheel nuts. See "Tightening Bolts and Nuts" on page 1 regarding torque wrench setting. Tighten all bolts to half the specified torque at first, and then tighten to the specified torque.
23. Tighten again after 10 hours of work. Check the torque every day, until it is stabilised.
24. Repeat the steps for servicing the left wheel. Remember to place chocks on both sides of the right wheel.

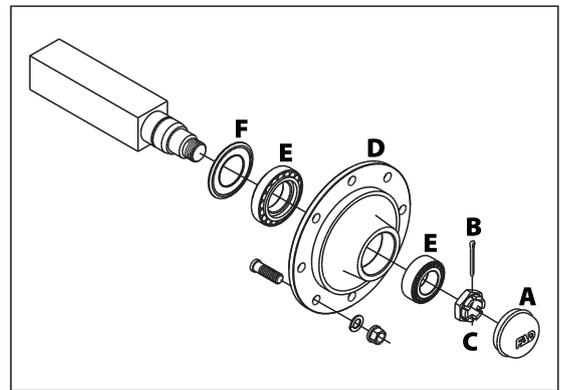


WARNING! If you do not feel very confident changing wheel bearings or brakes, then contact your HARDI dealer's workshop.

### 1000 Hours Service - Wheel Bearings (No Brakes)

Check the condition of the bearings in the following way:

1. Place stop wedges in front of and behind the left wheel and jack up the right wheel.
2. Support the trailer with axle stands.
3. Remove the wheel.
4. Unscrew the 6 bolts and remove the hub cap (A), cotter pin (B) and castle nut (C).
5. Pull off the wheel hub (D). Use a wheel puller if necessary.
6. Remove roller bearings (E). Clean all parts with a degreasing detergent and wipe them.
7. Check roller bearings (E) for discolouration and wear. Replace if worn or damaged.
8. Assemble the hub (D) and bearings (E) using a new sealing ring (F).
9. Fill the hub (D) and pack the bearings (E) with new grease, before fitting them to the wheel axle.
10. Fit the castle nut (C). Rotate the hub (D) and tighten the castle nut (C), until a slight resistance in the rotation is felt.
11. Loosen the castle nut (C) again, until the first notch is aligned with the cotter pin hole in the axle.
12. Fit a new cotter pin (B) and bend it to keep it in place.
13. Fit the hub cap (A) to the hub (D). Slightly tighten the 6 bolts.
14. Fit the wheel again and tighten the wheel nuts. See section "50 hours service" regarding torque wrench setting. Tighten all bolts to half the specified torque at first, then tighten to the full specified torque.
15. Tighten again after 10 hours of work. Check the torque every day, until it is stabilised.



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



WARNING! If you do not feel totally confident changing wheel bearings, then contact your HARDI dealer.

## 6 - Maintenance

### Occasional maintenance

#### General Info

The maintenance and service intervals for the following components will depend very much on the operating conditions, and therefore it is almost impossible to specify the intervals beforehand.

The operator must select appropriate intervals for the occasional maintenance.

If in doubt, contact your local HARDI dealer.

#### 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).



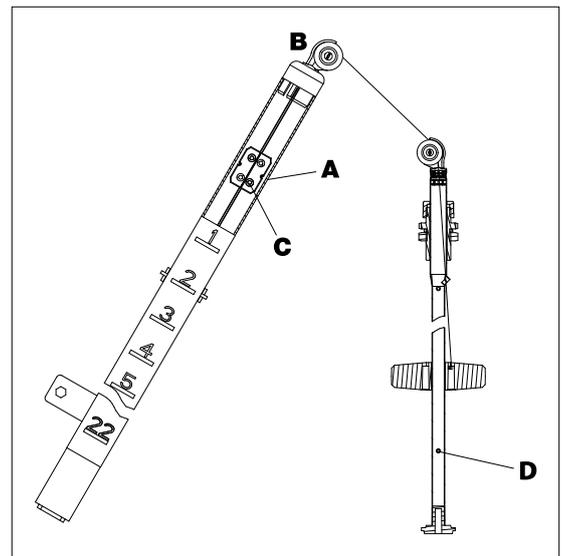
**ATTENTION!** The wire guide wheels should be directed so they follow the direction of the wire.

If any deviation is found, do the following:

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



**NOTE!** To obtain the best accuracy, the adjustment shall be done with the sprayer attached to the tractor normally used.



#### Level Indicator Cord Renewal

If the cord on the level indicator has to be changed, the float guide pole is removed.

1. Remove the tank drain valve (see the following section "Drain Valve Seal Replacement") and loosen the fitting holding the pole in position.
2. Pull the pole down through the drain valve hole, until 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 tank inside - the parts can be changed from the outside of the tank!

### 3-Way Valve Adjustment

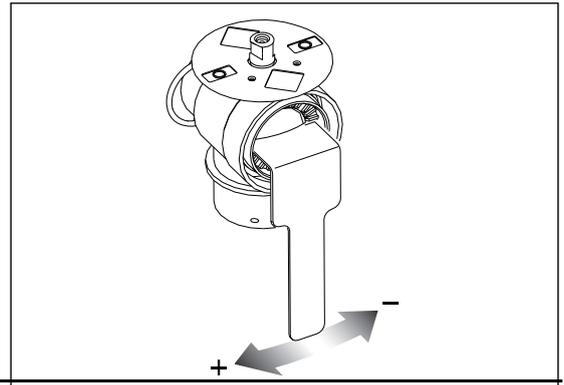
The large ball valve used for SmartValves and valves for filling equipment (type s93) can be adjusted, if it is too tight to operate - or if it is too loose (= liquid leakage).

- Correct setting is when possible to operate the valve smoothly by one hand.

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



**ATTENTION!** Adjustment not possible for the small ball valves (type s67).



### Lifting and Removing the Pump

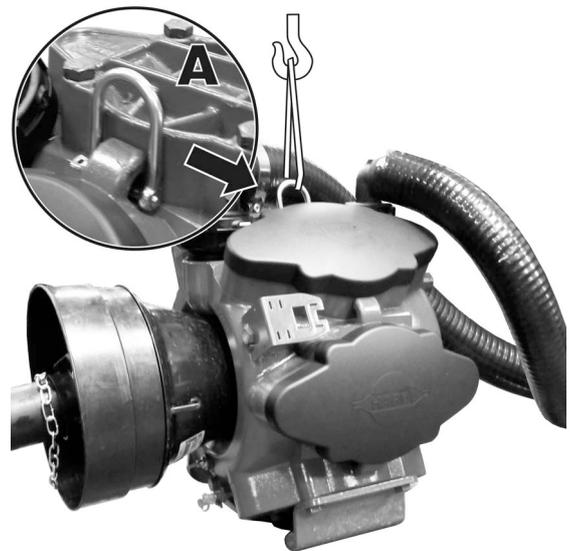
When lifting and removing the pump, use a shackle fitted to the built-in lifting eye located between the heads (A).



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



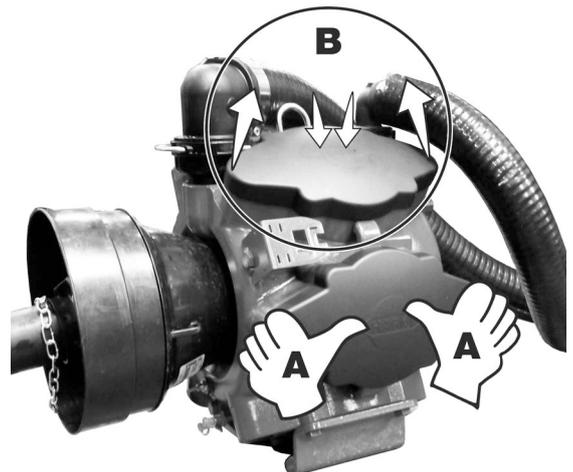
**NOTE!** Pump weight is approximately 75 kg.



### Pump Valves and Diaphragms Renewal

Pump model: 464.

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



## 6 - Maintenance

### Valves

2. Loosen the 4 head bolts (1).
3. Remove the head (2).
4. Change the valves (3) - note their orientation, in order to replace them correctly!



ATTENTION! Recommended is to use new seals (4), when changing or checking the valves.

### Diaphragms

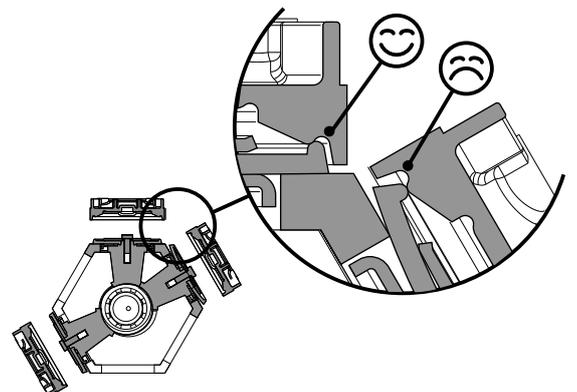
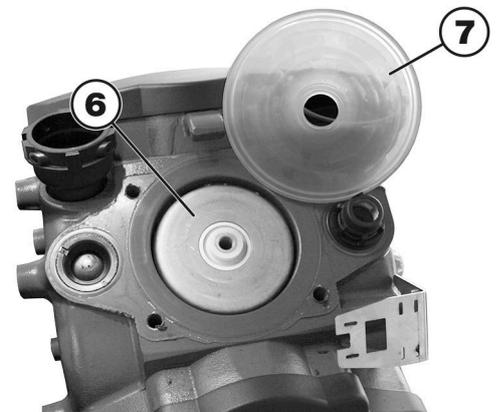
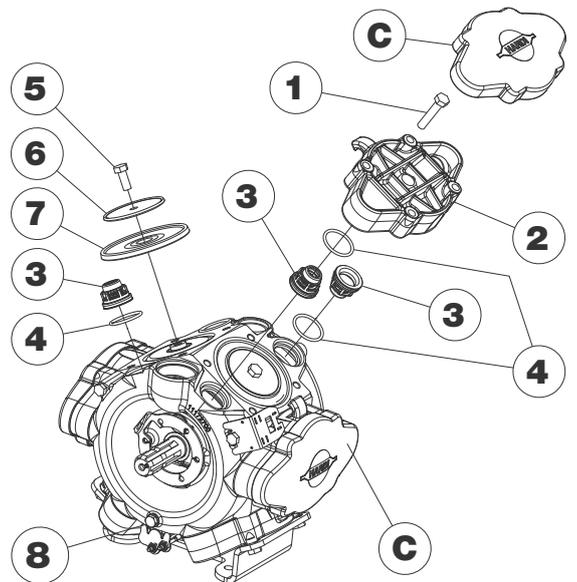
5. Loosen the diaphragm bolt (5).
6. Remove the diaphragm washer (6).
7. The diaphragm (7) may then be changed.
8. Check that the drain hole (8) at the bottom of the pump is not blocked.
9. Apply a small amount of pump grease on the surface between diaphragm washer (6) and diaphragm (7).
10. Reassemble the pump with the following torque setting.
  - Diaphragm head bolts (1): 90 Nm.
  - Diaphragm bolt (5): 90 Nm.
11. Refit the plastic covers (C).



NOTE! The diaphragm bolt on 1000 RPM pumps must be secured with a locking compound.



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



### Lubrication after Assembly

After disassembling the pump for diaphragm renewal, etc., you MUST lubricated with 200 g grease into each lubrication point.

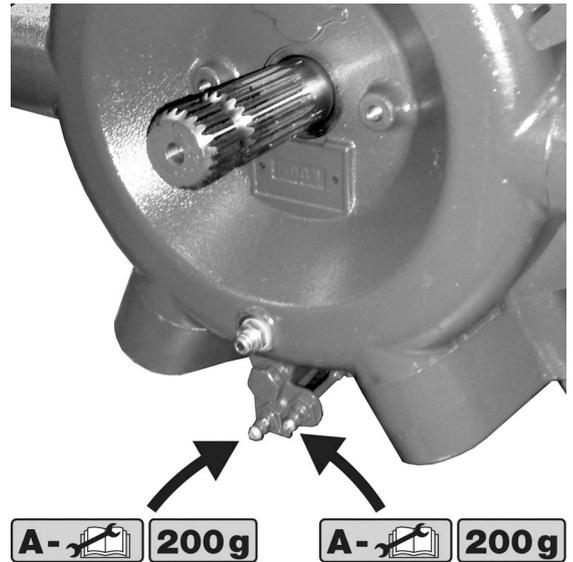
HARDI pump grease cartridge (400g): HARDI item no. 96200604

### Overhaul Kit

Pump model: 464.

It is possible to order an overhaul kit for the diaphragm pump (valves, seals, diaphragms etc.). Detect the pump model - order the overhaul kit at the local dealer.

Model 464: HARDI item no. 75586000.



### Speed Transducer for the Pump

The speed transducer that measures rotations per minute (RPM), is located at the inner side of the PTO or drive coupler shield.

The sensor is an inductive type, which requires metallic protrusions to pass by it to trigger a signal.

If exchanging the sensor, it must installed accurately to function properly.

### Adjustment

1. Adjust the air gap (A) between sensor tip and the protruding pump part by turning the counter nuts at the support bracket for the sensor.

The air gap (A) must be set to 1 mm (+0.3/-0.0 mm).

Use a feeler gauge or similar tool to verify.

2. Verify transducer function on the controller:

- HC 5500:

Correct fitting is indicated by continuous flashing from transducer, when the shaft is rotating.

- HCM3:

Monitor the speed on the front screen.



## 6 - Maintenance

### Drain Valve Seal Replacement

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

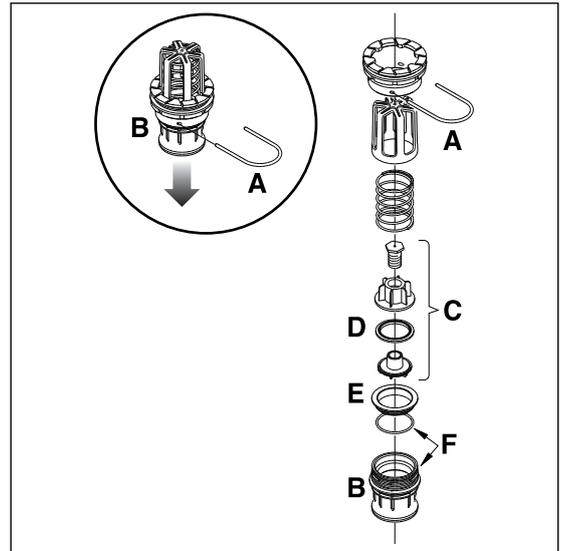


**DANGER!** Do not enter the inside of the tank - the parts can be changed from the outside of the tank!



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

1. Make sure that the tank is empty and clean.
2. The valve must be closed and the string must be loose.
3. Pull out the clip (A) and pull down the 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 reassemble.
5. Reassemble the valve using a new valve seat (E). Lubricate O-rings (F) before assembly.
6. Fit clip (A) again.



**ATTENTION!** Check the valve function using clean water, before filling the tank with chemical.

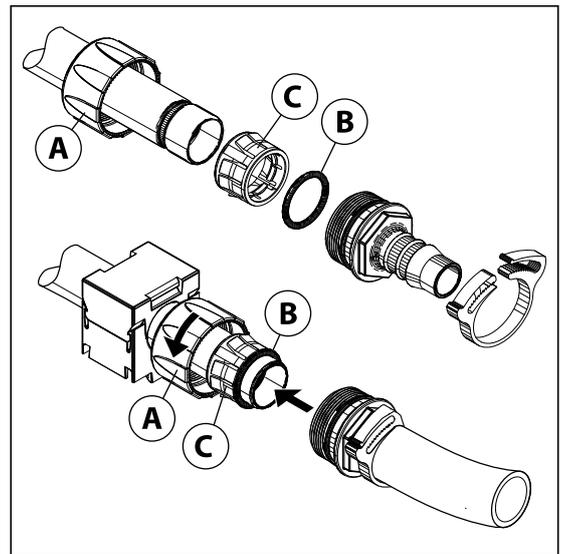
### Feed Pipe Snap-Lock Assembly

#### Disassembly

1. Unscrew the union nut (A) completely.
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.

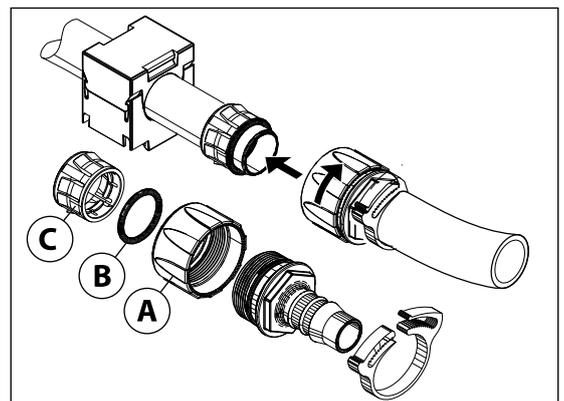


### Initial Assembly of Fittings



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

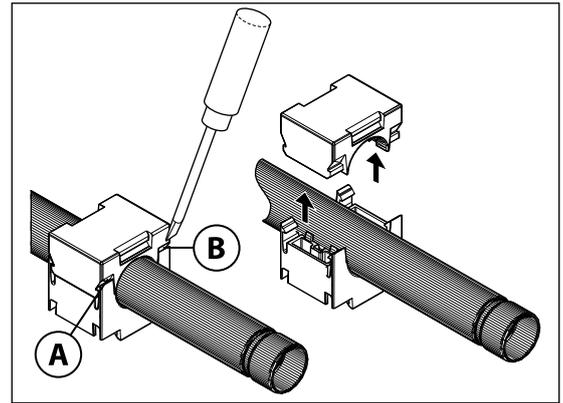
1. Fit the barbed lock ring (C) to the feed pipe with barb pointing away from pipe opening.
2. Fit the oiled O-ring (B) on top of the lock ring.
3. Screw the union nut (A) on the hose barb.
4. Press the feed pipe and hose barb together.
5. Tighten the union nut (A) by hand if needed.



### Feed Pipe Clamp Assembly

Remove a feed pipe 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.

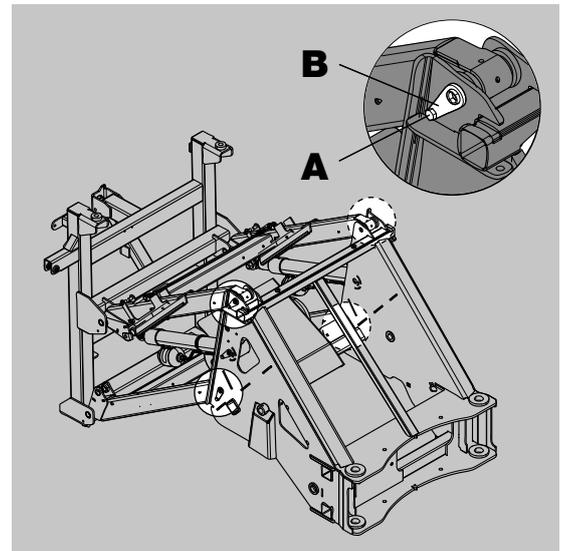
### Wear Bushing Replacement on ParaLift

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

1. Connect the trailer to a tractor and unfold the boom 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 screw (A), and pull out the pin (B) at one end of the upper parallelogram arms.

Disconnect the pins in both sides simultaneously.

4. Replace the wear bushes.
5. Refit the arm.
6. Repeat this on the other end of the upper arm.
7. Disconnect the lower arms simultaneously, when changing wear bushes. Repeat procedure on the lower arm.
8. Apply grease into all grease nipples.
9. Remove the lifting gear.



### Replacement of the Transmission Shaft Shield

- See the manufacturer's instruction book.

### Replacement of Transmission Shaft Cross Journals

- See the manufacturer's instruction book.

## 6 - Maintenance

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### Safety Valve Activation

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

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



**DANGER!** Before turning pressure the SmartValve to "Pressure draining", it is very important to ensure correct fitment of the quick coupler cap to the filling coupler. Failure to do so causes a risk of contamination and injury from the quick coupler lid becoming a projectile when pressurized. If the lid is unable to be fitted completely, lubricate the rubber seals and the grip hooks.

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### Shock absorbers

If the shock absorbers lose their efficiency or start leaking oil, they should be replaced.

### Tyre Change



**DANGER!** If it is time to change tyres, it is recommended to leave this job to a specialist and follow the rules below. Some mounting instructions are usually printed on the tyre itself.

Failure to understand the mounting instructions will result in a bad seating of the tyre on the rim, and it could cause the tyre to burst leading to serious injury or death!

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

### Mounting Instructions

- Always clean and inspect the rim before mounting a new tyre.
- Always check that the rim diameter corresponds exactly to the rim diameter moulded on the tyre.
- Always inspect the tyre inside 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.
- Always inspect the inside of the tyre for dirt or foreign objects. Remove this before installing a new tyre tube.
- Always use new tubes of recommended size. When fitting new tyres, always fit new tubes. Do not use tubes for tubeless tyres.
- Before mounting, always lubricate both tyre beads and rim flange with approved lubricating agent or equivalent anti-corrosion lubricant. Never use petroleum based greases and oils, because they may damage the tyre. Using the appropriate lubricant will prevent the tyre from slipping on the rim.
- Always use specialised tools for mounting the tyres as recommended by the tyre supplier.
- Make sure that the tyre is centred, and that the beads are perfectly seated on the rim - otherwise tearing of the bead wire may occur.
- Inflate the tyre to 1-1.3 bar (14.5-19 psi), then check whether both beads 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 1-1.3 bar (14.5-19 psi), inflate the tyre to a maximum of 2.5 bar (36 psi), until they seat perfectly on the rim.
- Never exceed the maximum mounting pressure moulded on the tyre!
- After mounting the tyres, adjust the inflation pressure to the operation pressure as recommended.

# 6 - Maintenance

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## Off-season storage

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### General Info

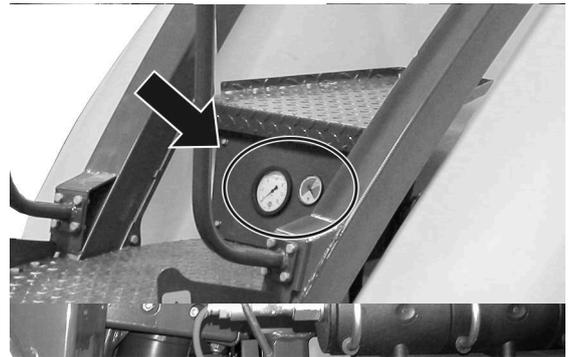
To preserve the sprayer condition and to protect its components, carry out following off-season storage program.

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### 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 long periods, it may reduce the life of individual components.

1. Clean the sprayer completely both inside and outside as described under "Cleaning" on page 1. Make sure there is no chemical residue left in the sprayer by cleaning all valves, hoses and auxiliary equipment with a cleaning agent and flushing with clean water afterwards.
2. Replace any damaged seals and repair any leaks.
3. Completely empty the sprayer, and let the pump work for a few minutes. Operate all valves and handles to drain as much water out off the liquid system as possible. Let the pump run, until air comes out of all nozzles. Also, drain the rinsing tank.
4. Lubricate all lubricating points according to the lubricating schemes - regardless of intervals stated.
5. When the sprayer is dry, remove rust from scratches or damage in the paint, if any, and touch up the paint.
6. Apply a thin layer of anti-corrosion oil (e.g. SHELL ENSIS FLUID, CASTROL RUSTILO or similar) on all metal parts. Avoid oil on TWIN air bags, rubber parts, hoses and tyres.
7. Fold the boom into transport position and relieve the pressure from all hydraulic functions.
8. All unplugged electric plugs and sockets are to be stored in a dry plastic bag to protect them against moisture, dirt and corrosion.
9. Remove the control boxes and computer display from the tractor. Store them dry and clean (indoor) in a non-condensing environment.
10. Wipe hydraulic snap couplers clean and fit the dust caps.
11. Apply grease to all hydraulic cylinder rods that are not fully retracted in the barrel to protect against corrosion.
12. Place the wheel axle on jack stands to prevent moisture damage and deformation of the tyres. Apply tyre black to the tyre walls to preserve the rubber.
13. Drain the air tank for condensed water.
14. Cover the sprayer with a tarpaulin to protect against dust. 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 tarpaulin.
2. Remove the jack stands from the wheel axle, and adjust the tyre pressure.
3. Wipe off the grease from the hydraulic ram piston rods.
4. Connect the sprayer to the tractor, including hydraulic, electric and electronic connections. Check that the hoses and cables are free to move along when driving with the sprayer. No rubbing or stretching of cables and hoses.
5. Check the hydraulic hoses for damage and correct connection to the tractor (see flow directions marked on the hoses).
6. Check for correct connection between the PTO shaft and the tractor, and protection guards are in good working order. See the PTO instruction manual delivered for more about correct installation.
7. Fill with clean water and check all functions. Do a liquid test:
  - Fill a small amount of water into the MainTank and circulate it around the liquid system.
  - Manually set spray pressure to 5 bar.
  - Check for leaks and repair if any.
  - Check spray patterns and water jets from the nozzles.
8. Rinse the entire sprayer liquid system with clean water.
9. Check that the MainTank is clean inside and check the function of the drain valve.
10. Check that hydraulic brake hoses are intact and correctly connected to the tractor, and without damage.
11. Check the working order of the brakes. Please note reduced brake power, until the rust worn off the drums. Always brake lightly until the drums are clean.
12. Check that the electric cables to the tractor are intact and correctly connected. Also, check that:
  - Cable sheaths are without damage due to wear, stretching or rubbing.
  - Electric plugs are without copper corrosion and damage.
  - Electric boxes are without cracks.
13. Check trailer lights are visible and in good working order. Check the protection glass is clean and without damage.
14. Check the speed sensor and other sensors are in good condition and free of dirt.
15. Check that the spray boom folds correctly. Make adjustments if needed and repair oil leaks if any.
16. Check that the boom hydraulic hoses and electric cables are in place, and follow the folding movements without being damaged.



### Operational problems

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#### General Info



DANGER! Trained personnel should be involved in fault finding, as this is hazardous work! It may be necessary to have the sprayer operating to complete the fault finding.

Operational incidents are often due to the same reasons:

- A suction leak reduces the pump pressure and may interrupt suction completely. It can also cause pulsation in the pressure hoses.
- A clogged suction filter may reduce suction or interrupt and prevent the pump from running normally.
- A clogged pressure filter increases pressure in the fluid system in front of the pressure filter. This may open the safety valve.
- Clogged in-line filters or nozzle filters increase pressure in the pressure gauge, but it decreases pressure at the nozzles.
- Impurities sucked in by the pump may prevent the valves from closing correctly, thus reducing the pump flow.
- A poor reassembly of the pump elements, especially the diaphragm covers, can cause air intakes or leaks and reduces the pump flow.
- Rusted or dirty hydraulic components cause bad connections and premature wear.
- A poorly charged or faulty battery causes failure and faults in the electrical system.

#### Therefore ALWAYS check

- Suction and pressure filters, as well as nozzles, are clean.
- Hoses are free of leaks, cracks, and kinks, especially on suction hoses.
- Gaskets and O-rings are present and in good condition.
- Pressure gauges are in good working order. Application rate accuracy depends on it.
- Operating unit functions properly. Use clean water to check.
- Hydraulic components are clean.
- The tractor battery and its connectors are in good condition.

## 7 - Fault finding

### Liquid System

FAULT	PROBABLE CAUSE	CONTROL / REMEDY
No spray from boom when turned on.	SmartValve valve position is incorrect.	Set correct valve position for spraying.
	Suction/pressure filters are clogged.	Clean suction and pressure filters.
	No suction from tank.	See if suction fitting in main tank sump is free of sedimentation. Clean if needed.
Lack of pressure.	Incorrect assembly.	Boost valve has a defect (it is located at the bottom of the cyclone filter). The valve seat is worn or missing.
	Air in system.	Fill suction hose with water for initial priming.
	Too much agitation.	Close the agitation valve.
	Pump valves are clogged or worn.	Check for obstructions and wear.
	Clogged filters.	Clean all filters.
	Defective pressure gauge.	Check for dirt at inlet of pressure gauge.
Pressure dropping.	Filters are clogging.	Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.
	Nozzles are worn.	Check nozzle output. Replace nozzles, if the deviation in output exceeds 10%.
	Sucking air towards end of tank load.	Reduce pump rpm.
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 rpm.
		Check safety valve is tight.
		Ensure returns inside the tank are present.
Operating unit is not functioning, or it is having a malfunction.	Blown fuse(s).	Check mechanical function of micro switches. Use cleaning/lubricating agent if the switch does not operate freely.
		Check motor current, max. 450-500 mA. If over, change the motor.
	Wrong polarity.	Brown to positive (+). Blue to negative (-).
	Valves not closing properly.	Check valve seals for obstructions.
		Check micro switch plate position. Loosen the screws holding the plate a 1/2 turn.
	No power.	Wrong polarity. Check that brown is positive (+), blue is negative (-).
		Check print plate for dry solder joints or loose connections.
		Check fuse holder is tight around fuse.

### Pump

FAULT	PROBABLE CAUSE	CONTROL / REMEDY
Liquid leaks from the bottom of the pump.	Damaged diaphragm.	Replace diaphragm.
Grease leaks from the bottom of the pump.	Grease used has too low viscosity.	Change to recommended grease type.
Grease leaks from the shaft grease seals.	Grease used has too low viscosity.	Change to recommended grease type.
	Bearings worn/too high friction.	Replace pump bearings and grease seals.
Lack of pressure.	Pump valves are clogged or defect.	Check for obstructions or, if needed, replace valves.
	Clogged filters in fluid system.	Clean filters.
Vibrations in system and unpleasant noise from the pump.	Pump valves are clogged or defect.	Check for obstructions or, if needed, replace valves.
	Air is being sucked into system.	Check for leaks, pinholes in suction hoses, tightness / gaskets / O-rings of all fittings on the suction side.
Lack of flow / capacity.	Internal wear on conrod and conrod ring.	Poor greasing. Replace parts as needed and observe proper grease quality and intervals.
	Pump valves are clogged or defect.	Check for obstructions or, if needed, replace valves.
Extreme internal erosion on diaphragm covers and housing.	Too high vacuum caused by clogged suction filter or excessive pump speed (rpm).	Replace affected pump parts. Clean suction filter and observe maximum pump rpm.
	Lack of internal cleaning.	Use recommended cleaning procedures and add extra cleaning agents (e.g. AllClearExtra or similar).
	Lack of conservation of the fluid system during storage.	Always use a proper mixture of antifreeze during storage.
Short lifetime for diaphragm.	Overspeeding of the pump.	Observe maximum pump rpm.
	Too high vacuum when filling from external source:	
	Hose dimension is too small.	Fit a larger hose to the External Filling Device.
	Too long filling hose.	Park sprayer closer to the external tank and use a shorter hose.
	Bad filling conditions, e.g. too high water column when transferring water from a buried tank.	Change external water supply to obtain a lower water column.

## 7 - Fault finding

### Hydraulic System, Z-version

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 15 - 80 l/min (depending on the equipment on the sprayer). Check tractor hydraulic oil level.
	The operator has interrupted the boom folding by releasing the folding button in the tractor. Built-in timers automatically inhibit boom movements that may damage the machine.	Unfold the boom completely. Start folding again without letting go of the activated folding buttons for more than 10 seconds at a time, until the folding is completed.
	Blown fuse(s).	Check / replace fuse on tractor harness.
	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.
	Defective 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 a 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 hydraulic cylinder does not move.	Clogged restrictor.	Dismantle and clean restrictor.

### HCH508 Controller fault codes

Below is a table that display a list of conditions that may be required for a fault to be detected.

CONDITION	DESCRIPTION
SC_HYD_BYPASS_LS_ON	Hydraulic Bypass low-side switch is ON
SC_HYD_BYPASS_LS_OFF	Hydraulic Bypass low-side switch is OFF
SC_FLOW_FWD_LS_ON	Flow Forward low-side switch is ON
SC_FLOW_FWD_LS_OFF	Flow Forward low-side switch is OFF
SC_FLOW_REV_LS_ON	Flow Reverse low-side switch is ON
SC_FLOW_REV_LS_OFF	Flow Reverse low-side switch is OFF
SC_PARA_RAISE_LS_ON	Paralift Raise low-side switch is ON
SC_PARA_RAISE_LS_OFF	Paralift Raise low-side switch is OFF
SC_PARA_LOWER_LS_ON	Paralift Lower low-side switch is ON
SC_PARA_LOWER_LS_OFF	Paralift Lower low-side switch is OFF
SC_PEND_LOCK_FX_INACTIVE	Pendulum locking functions are inactive
SC_NONE	SC_NONE
RELEASE CONDITION	DESCRIPTION
RC_VT_RESET_BTN	The operator has "pressed" the fault reset button on the screen.

Below is a table of alarms and warnings relevant for the hydraulic control unit which may occur in the terminal display. Cross reference the DTC (Diagnostic Trouble Code,) to the description.

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 1005		CPU core error - check source code and EMI		
SPN: 1006		Memory error		
SPN: 1007		Error during watchdog startup - check watchdog timing constraints		
SPN: 1013		Battery voltage fell below lower threshold		
SPN: 1014		Battery voltage exceeds upper threshold		
SPN: 1015		Temperature at lower threshold		
SPN: 1016		Temperature at upper threshold		
SPN: 9000		RH Boom Fold Proxy - Low		RC: RC_VT_RESET_BTN
SPN: 9001		RH Boom Fold Proxy - High voltage / short to power		RC: RC_VT_RESET_BTN
SPN: 9002		RH Boom Fold Proxy -Voltage out of valid range		RC: RC_VT_RESET_BTN
SPN: 9003		RH Boom Fold Proxy - SW parameter invalid		RC: RC_VT_RESET_BTN
SPN: 9004		RH Boom Fold Proxy - SW initialization error		RC: RC_VT_RESET_BTN
SPN: 9005		Pendulum Locked Proxy - Low voltage / short to ground		RC: RC_VT_RESET_BTN
SPN: 9006		Pendulum Locked Proxy - High voltage / short to power		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9007		Pendulum Locked Proxy - Voltage out of valid range		RC: RC_VT_RESET_BTN
SPN: 9008		Pendulum Locked Proxy - SW parameter invalid		RC: RC_VT_RESET_BTN
SPN: 9009		Pendulum Locked Proxy - SW initialization error		RC: RC_VT_RESET_BTN
SPN: 9010		Pendulum Unlocked Proxy - Low voltage / short to ground		RC: RC_VT_RESET_BTN
SPN: 9011		Pendulum Unlocked Proxy - High voltage / short to power		RC: RC_VT_RESET_BTN
SPN: 9012		Pendulum Unlocked Proxy - Voltage out of valid range		RC: RC_VT_RESET_BTN
SPN: 9013		Pendulum Unlocked Proxy - SW parameter invalid		RC: RC_VT_RESET_BTN
SPN: 9014		Pendulum Unlocked Proxy - SW initialization error		RC: RC_VT_RESET_BTN
SPN: 9015		Slant Angle Sensor - Short to power		RC: RC_VT_RESET_BTN
SPN: 9016		Slant Angle Sensor - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9017		Slant Angle Sensor - Invalid parameter		RC: RC_VT_RESET_BTN
SPN: 9018		Slant Angle Sensor - Unknown internal error		RC: RC_VT_RESET_BTN
SPN: 9019		Boom Height Sensor - Short to power		RC: RC_VT_RESET_BTN
SPN: 9020		Boom Height Sensor - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9021		Boom Height Sensor - Invalid parameter		RC: RC_VT_RESET_BTN
SPN: 9022		Boom Height Sensor - Unknown internal error		RC: RC_VT_RESET_BTN
SPN: 9038		Pendulum Lock & Unlock - Open load		RC: RC_VT_RESET_BTN
SPN: 9039		Pendulum Lock & Unlock - Short to power		RC: RC_VT_RESET_BTN
SPN: 9040		Pendulum Lock & Unlock - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9041		Pendulum Lock & Unlock - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9042		Yaw Fold Unlock - Open load		RC: RC_VT_RESET_BTN
SPN: 9043		Yaw Fold Unlock - Short to power		RC: RC_VT_RESET_BTN
SPN: 9044		Yaw Fold Unlock - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9045		Yaw Fold Unlock - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9046		Slant CW & CCW - Open load		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9047		Slant CW & CCW - Short to power		RC: RC_VT_RESET_BTN
SPN: 9048		Slant CW & CCW - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9049		Slant CW & CCW - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9050		Yaw Fold LH & RH - Open load		RC: RC_VT_RESET_BTN
SPN: 9051		Yaw Fold LH & RH - Short to power		RC: RC_VT_RESET_BTN
SPN: 9052		Yaw Fold LH & RH - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9053		Yaw Fold LH & RH - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9055		Override Slant CW - Short to power		RC: RC_VT_RESET_BTN
SPN: 9056		Override Slant CW - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9057		Override Slant CW - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9059		Override Slant CCW - Short to power		RC: RC_VT_RESET_BTN
SPN: 9060		Override Slant CCW - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9061		Override Slant CCW - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9062		Inner Fold LH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9063		Inner Fold LH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9064		Inner Fold LH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9065		Inner Fold LH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9066		Paralift Lock - Open load		RC: RC_VT_RESET_BTN
SPN: 9067		Paralift Lock - Short to power		RC: RC_VT_RESET_BTN
SPN: 9068		Paralift Lock - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9069		Paralift Lock - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9070		Outer 1 Fold LH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9071		Outer 1 Fold LH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9072		Outer 1 Fold LH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9073		Outer 1 Fold LH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9074		Outer 2 Fold LH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9075		Outer 2 Fold LH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9076		Outer 2 Fold LH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9077		Outer 2 Fold LH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9078		Hydraulic Bypass HS - Open load	SC_HYD_BYPASS_LS_ON	RC: RC_VT_RESET_BTN
SPN: 9079		Hydraulic Bypass HS - Short to power		RC: RC_VT_RESET_BTN
SPN: 9080		Hydraulic Bypass HS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9081		Hydraulic Bypass HS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9082		Paralift Raise HS - Open load	SC_PARA_RAISE_LS_ON	RC: RC_VT_RESET_BTN
SPN: 9083		Paralift Raise HS - Short to power		RC: RC_VT_RESET_BTN
SPN: 9084		Paralift Raise HS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9085		Paralift Raise HS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9086		Paralift Lower HS - Open load	SC_PARA_LOWER_LS_ON	RC: RC_VT_RESET_BTN
SPN: 9087		Paralift Lower HS - Short to power		RC: RC_VT_RESET_BTN
SPN: 9088		Paralift Lower HS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9089		Paralift Lower HS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9090		Flow Forward HS - Open load	SC_FLOW_FWD_LS_ON	RC: RC_VT_RESET_BTN
SPN: 9091		Flow Forward HS - Short to power		RC: RC_VT_RESET_BTN
SPN: 9092		Flow Forward HS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9093		Flow Forward HS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9094		Flow Reverse HS - Open load	SC_FLOW_REV_LS_ON	RC: RC_VT_RESET_BTN
SPN: 9095		Flow Reverse HS - Short to power		RC: RC_VT_RESET_BTN
SPN: 9096		Flow Reverse HS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9097		Flow Reverse HS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9098		Tilt LH - Open load		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9099		Tilt LH - Short to power		RC: RC_VT_RESET_BTN
SPN: 9100		Tilt LH - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9101		Tilt LH - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9102		Tilt RH - Open load		RC: RC_VT_RESET_BTN
SPN: 9103		Tilt RH - Short to power		RC: RC_VT_RESET_BTN
SPN: 9104		Tilt RH - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9105		Tilt RH - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9108		Hydraulic Bypass LS - Short to ground	SC_HYD_BYPASS_LS_OFF	RC: RC_VT_RESET_BTN
SPN: 9109		Hydraulic Bypass LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9112		Paralift Raise LS - Short to ground	SC_PARA_RAISE_LS_OFF	RC: RC_VT_RESET_BTN
SPN: 9113		Paralift Raise LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9116		Paralift Lower LS - Short to ground	SC_PARA_LOWER_LS_OFF	RC: RC_VT_RESET_BTN
SPN: 9117		Paralift Lower LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9120		Flow Forward LS - Short to ground	SC_FLOW_FWD_LS_OFF	RC: RC_VT_RESET_BTN
SPN: 9121		Flow Forward LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9124		Flow Reverse LS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9125		Flow Reverse LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9128		Sensor Supply Relay LS - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9129		Sensor Supply Relay LS - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9131		Override Tilt RH Up - Short to power		RC: RC_VT_RESET_BTN
SPN: 9132		Override Tilt RH Up - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9133		Override Tilt RH Up - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9135		Override Tilt RH Down - Short to power		RC: RC_VT_RESET_BTN
SPN: 9136		Override Tilt RH Down - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9137		Override Tilt RH Down - Internal driver error		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9139		Override Tilt LH Up - Short to power		RC: RC_VT_RESET_BTN
SPN: 9140		Override Tilt LH Up - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9141		Override Tilt LH Up - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9143		Override Tilt LH Down - Short to power		RC: RC_VT_RESET_BTN
SPN: 9144		Override Tilt LH Down - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9145		Override Tilt LH Down - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9147		Override Main Down - Short to power		RC: RC_VT_RESET_BTN
SPN: 9148		Override Main Down - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9149		Override Main Down - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9151		Override Main Up - Short to power		RC: RC_VT_RESET_BTN
SPN: 9152		Override Main Up - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9153		Override Main Up - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9154		Pendulum lock/unlock sensor disparity	SC_PEND_LOCK_FX_INAC	
SPN: 9155		Pendulum lock timeout		
SPN: 9156		Pendulum unlock timeout		
SPN: 9157		Auto centre failed due to timeout		
SPN: 9178	Type: Info	Emergency mode activated		
SPN: 9186		Inner Fold RH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9187		Inner Fold RH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9188		Inner Fold RH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9189		Inner Fold RH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9190		Outer 1 Fold RH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9191		Outer 1 Fold RH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9192		Outer 1 Fold RH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9193		Outer 1 Fold RH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN

## 7 - Fault finding

DTC	CATEGORY TYPE	DESCRIPTION	CONDITION	RELEASE BEHAVIOR
SPN: 9194		Outer 2 Fold RH #1/#2 - Open load		RC: RC_VT_RESET_BTN
SPN: 9195		Outer 2 Fold RH #1/#2 - Short to power		RC: RC_VT_RESET_BTN
SPN: 9196		Outer 2 Fold RH #1/#2 - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9197		Outer 2 Fold RH #1/#2 - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 1049		HARDI Grip - CAN Timeout		
SPN: 1058		ISOBUS Ground Speed - CAN Timeout		
SPN: 9198		Inner Fold - Open load		RC: RC_VT_RESET_BTN
SPN: 9199		Inner Fold - Short to power		RC: RC_VT_RESET_BTN
SPN: 9200		Inner Fold - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9201		Inner Fold - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9202		Inner Unfold - Open load		RC: RC_VT_RESET_BTN
SPN: 9203		Inner Unfold - Short to power		RC: RC_VT_RESET_BTN
SPN: 9204		Inner Unfold - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9205		Inner Unfold - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9206		Outer Fold - Open load		RC: RC_VT_RESET_BTN
SPN: 9207		Outer Fold - Short to power		RC: RC_VT_RESET_BTN
SPN: 9208		Outer Fold - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9209		Outer Fold - Internal driver error		RC: RC_VT_RESET_BTN
SPN: 9210		Outer Unfold - Open load		RC: RC_VT_RESET_BTN
SPN: 9211		Outer Unfold - Short to power		RC: RC_VT_RESET_BTN
SPN: 9212		Outer Unfold - Short to ground		RC: RC_VT_RESET_BTN
SPN: 9213		Outer Unfold - Internal driver error		RC: RC_VT_RESET_BTN

## 7 - Fault finding

---

### Mechanical problems

---

#### Emergency Operation - Liquid System

In case of a power failure, it is possible to operate all functions of the operating unit manually.

##### Controller HCM3 / ISOBUS

Disconnect the power supply to each valve.

Manually turn the control knobs on the distribution valves and the bypass valve.

##### EFC and SprayBox

First disconnect the multi-plug from the Spraybox. Then manually turn the emergency control handle on the distribution valve (1).

Turn the handle anticlockwise to close and clockwise to open.



**i** NOTE! The handle on the distribution valve has a peg that acts as a mechanical stop.

- The problem may be due to a blown fuse.
- Three fuses are placed inside the SprayBox. Fuse type: Thermo.
- When the fuse have cooled off, turn the SprayBox back on.

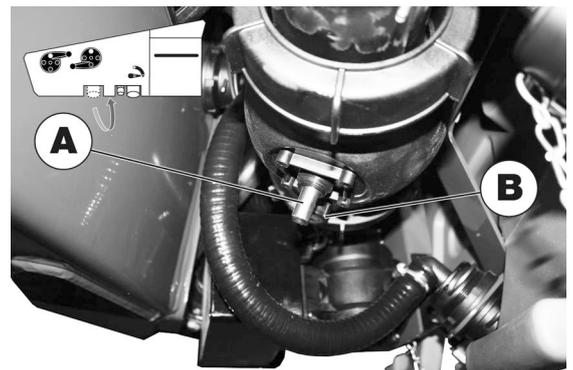
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#### Emergency Operation - EasyClean Filter

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) located at the bottom of the filter housing.

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!

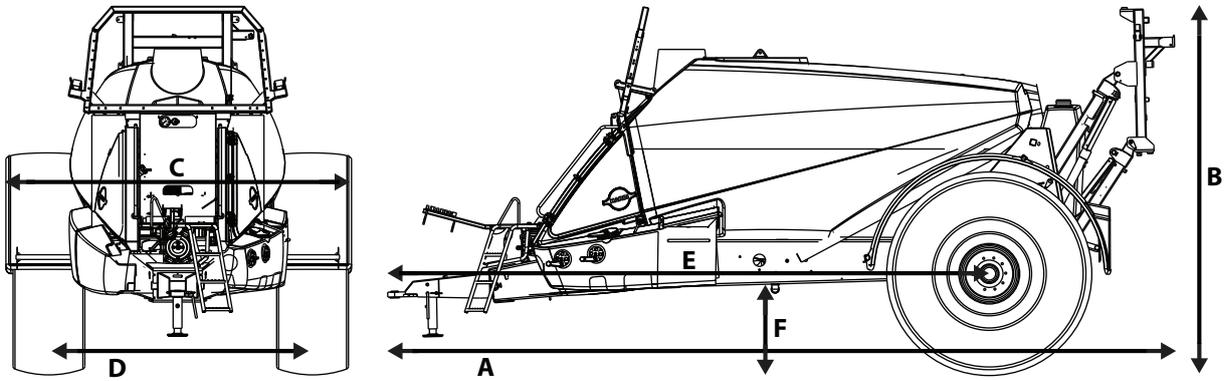


## Dimensions

### General Info

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

### Overall Dimensions



Tank size	Wheel size	Dimension					
		A	B	C	D	E	F
6500 litres	480/65R46	7.30 m	3.99 m	3.50 m	2.20 to 3.00 m	5.68 m	0.76 m
6500 litres	520/85R42	7.80 m	4.05 m	3.50 m	2.20 to 3.00 m	5.68 m	0.82 m
6500 litres	620/70R42	8.60 m	4.04 m	3.50 m	2.20 to 3.00 m	5.68 m	0.81 m
6500 litres	650/65R42	7.30 m	4.04 m	3.75 m	2.20 to 3.00 m	5.68 m	0.81 m
8500 litres	480/65R46	9.15 m	3.99 m	3.50 m	2.20 to 3.00m	6.05 m	0.65 m
8500 litres	520/85R42	9.15 m	4.05 m	3.50 m	2.20 to 3.00m	6.05 m	0.73 m
8500 Litres	620/70R42	9.15 m	4.04 m	3.50 m	2.20 to 3.00m	6.05 m	0.71 m
8500 litres	650/65R42	9.15 m	4.04 m	3.75 m	2.20 to 3.00m	6.05 m	0.72 m
10000 litres	480/65R46	9.15 m	3.99 m	3.50 m	2.40 to 3.00m	6.05 m	0.73 m
10000 litres	620/70R42	9.15 m	4.04 m	3.50 m	2.40 to 3.00m	6.05 m	0.71 m
10000 litres	650/65R42	9.15 m	4.04 m	3.75 m	2.40 to 3.00m	6.05 m	0.72 m
10000 litres	710/70R42	9.15 m	4.10 m	3.80 m	2.40 to 3.00m	6.05 m	0.78 m

8500 and 10000 fitted with a long draw bar: add 1.00m to 'A' and 'E'

## 8 - Technical specifications

### Specifications

#### Pump Model 464/5.5

<b>HARDI</b> HARDI INTERNATIONAL A/S HERTHADALVEJ 10, 4840 NØRRE ALSLEV, DENMARK			
No.			
Type 464/5.5	Max. 1100 rpm		
rpm	l/min	bar	kW
1000	293	0	3.1
1000	245	max. 15	8.7

97619300

#### Pump Model 464/6.5

<b>HARDI</b> HARDI INTERNATIONAL A/S HERTHADALVEJ 10, 4840 NØRRE ALSLEV, DENMARK			
No.			
Type 464/6.5	Max. 1100 rpm		
rpm	l/min	bar	kW
1000	349	0	3.2
1000	298	max. 15	10.3

97619400

#### Pump Model 464/10.0

<b>HARDI</b> HARDI INTERNATIONAL A/S HERTHADALVEJ 10, 4840 NØRRE ALSLEV, DENMARK			
No.			
Type 464/10	Max. 700 rpm		
rpm	l/min	bar	kW
540	280	0	1.8
540	259	max. 15	8.3

97619500

#### Pump Model 464/12.0

<b>HARDI</b> HARDI INTERNATIONAL A/S HERTHADALVEJ 10, 4840 NØRRE ALSLEV, DENMARK			
No.			
Type 464/12	Max. 600 rpm		
rpm	l/min	bar	kW
540	334	0	2.2
540	310	max. 15	9.7

97619600

### Pump Model FMCWS-650-HARDI-CD-RPM

#### High performance pump

- Maximum flow 681 LPM
- Maximum pressure 11 bar

#### WetSeal technology

- Prevents run dry failure
- Isolates seals from chemicals and fertiliser

#### Maximum reliability

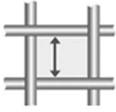
- Nominal 4400 rpm operating speed
- Stainless steel wet end



## 8 - Technical specifications

### Filters

The higher the number of mesh, the finer the filtration.

			Filter Name/Position					
			Mesh	Mesh Size	Colour	EasyCleanFilter	CycloneFilter	In-Line**
	18	1.00 mm	White	-	-	-	Yes	-
	30	0.58 mm	Green	Yes	-	-	-	-
	50	0.30 mm	Blue	Yes, standard	-	Yes*	-	Yes*
	80	0.18 mm	Red	Yes	Yes, standard	Yes*	-	Yes*
	100	0.15 mm	Yellow	-	-	Yes*	-	Yes*

\*depending on selected nozzles

### Power Consumption

Recommended tractor engine power output are as follows.

Main tank volume (litres)	Output (Hp)	Output (kW)
6500	130	97
8500	170	127
10000	200	150



ATTENTION! For sprayers with the TWIN air system, an additional 60 Hp (45kW) is required to be added to the above figures.



ATTENTION! The amount of power needed is also dependant on the terrain where the sprayer is operated.

### Brakes

Maximum wear rates on brake components:

Sprayer Volume	Drum Dimensions	Max. Drum Diameter	Min. Lining Thickness
6500 / 8500 / 10000 litres	412 x 160 mm	414 mm	5.5 mm

### Hydraulic brakes

Maximum hydraulic pressure is 150 bar (2176 p.s.i.)



DANGER! If the hydraulic pressure is exceeded, damage may occur to the sprayer. There is a risk of injury or fatality.

### 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 a fully loaded sprayer at maximum speed, when having narrow wheels mounted.



NOTE! Be aware of the specific data for your sprayer.

Tyre Size	Load Index	Tyre Pressure (bar)	Speed: 10 km/h	Speed: 25 km/h	Speed: 30 km/h	Speed: 40 km/h
			Max. Axle Load (kg)			
480/80 R46	176 A8	2.4	N/A	N/A	N/A	N/A
520/85 R42	162 A8	2.4	N/A	N/A	N/A	9500
620/70R42	173D	2.4	14810	N/A	12710	12110
650/65 R42	176 A8	2.4	15000	13080	12660	12000
710/70 R42	179 A8	1.6	15008	13776	N/A	13440

N/A: Data is not available from tyre supplier.



WARNING! Never inflate tyres to more than the pressure specified in the table. Over-inflated tyres can explode causing severe injuries! Always check the information about pressure on the tyre itself.



WARNING! If changing tyres, always use tyres with minimum load index as specified in the table.



WARNING! Liquid fertiliser is significantly heavier than all plant protection mixes. Due to the increase in the tyre / axle load, it is recommended that the transport and spray speed is decreased by 10km/h.



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



NOTE! The axle load is two times the tyre load for the sprayer. Be aware of the specific data for your sprayer.

## 8 - Technical specifications

### Data for Load Index

Load Index	Max. Wheel Load (kg)	Load Index	Max. Wheel Load (kg)
100	800	143	2725
101	825	144	2800
102	850	145	2900
103	875	146	3000
104	900	147	3075
105	925	148	3159
106	950	149	3250
107	975	150	3350
108	1000	151	3450
109	1030	152	3550
110	1060	153	3650
111	1090	154	3750
112	1120	155	3875
113	1150	156	4000
114	1180	157	4125
115	1215	158	4250
116	1250	159	4375
117	1285	160	4500
118	1320	161	4625
119	1360	162	4750
120	1400	163	4875
121	1450	164	5000
122	1500	165	5150
123	1550	166	5300
124	1600	167	5450
125	1650	168	5600
126	1700	169	5800
127	1750	170	6000
128	1800	171	6150
129	1850	172	6300
130	1900	173	6500
131	1950	174	6700
132	2000	175	6900
133	2060	176	7100
134	2120	177	7300
135	2180	178	7500
136	2240	179	7750
137	2300	180	8000
138	2360	181	8250
139	2430	182	8500
140	2500	183	8750
141	2575	184	9000
142	2650	185	9250

Symbol	Speed (km/h)
A1	5
A2	10
A3	15
A4	20
A5	25
A6	30
A7	35
A8	40
B	50
D	65
F	80
J	100

---

### Materials and recycling

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#### Disposal of the Sprayer

When the equipment has completed its working life, it must be thoroughly cleaned.

The tanks, hoses and synthetic fittings can be incinerated at an authorized disposal plant.

The metallic parts can be scrapped. Steel parts are made of various types of treated steel.

Always follow local legislation regarding disposal.

#### Materials Used

Parts	Materials
Tanks:	Plastic (HDPE)
Chassis:	Steel
Boom:	Steel, aluminium
Tyres:	Rubber
Mudguards:	Plastic (PE)
Grey side shields:	Plastic (PE)
Air blower housing:	Steel
Air impeller blades:	Glass reinforced plastic (PA)
Air guide on boom:	Aluminium
Bag for air guide:	Plastic (PVC)
Pump housing:	Grey cast iron (GG200)
Pump diaphragms:	Plastic (PUR)
Hoses (suction lines):	Plastic (PVC)
Hoses (pressure lines):	Rubber (EPDM)
Valves:	Glass reinforced plastic (PA)
Hose and pipe fittings:	Glass reinforced plastic (PA)
Filter housings:	Plastic (PP)
Nozzles:	Plastic (POM)

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#### Disposal of Cleaning Water

Protect the environment.

When cleaning the sprayer inside and outside, dispose of chemical residues in the liquid system and water containing cleaning agent according to local regulations.

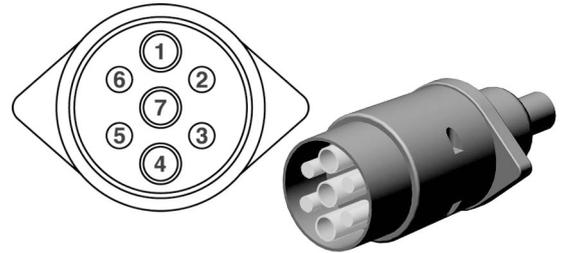
## 8 - Technical specifications

### Electrical connections

#### Rear Lights

The wiring is in accordance with AS 4177.5-2004.

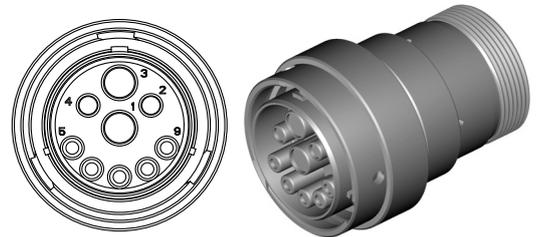
Position	Designation	Wire Colour
1	Left direction indicator	Yellow
2	Reverse	Blue
3	Ground	White
4	Right direction indicator	Green
5	Not used	Brown
6	Stop lamps	Red
7	Tail lamps	Black



#### ISO 11783 Plug

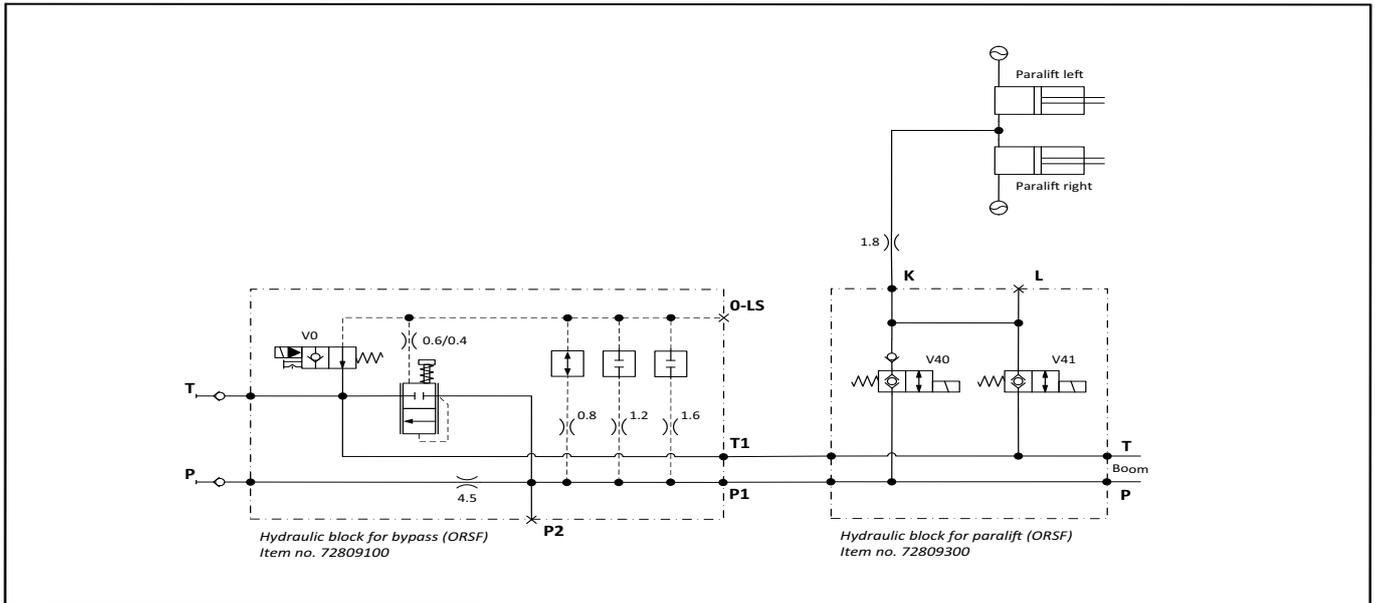
The wiring is in accordance with ISO 11783-2.

Pin no.	Name	Wire Colour	Comments
1	GND	Black	Connected separately from ECU_GND to the tractor's power source (battery) negative terminal. Connected to chassis ground on both tractor and implement. All major power loads (lights, motors, etc.) shall use this return path. Connection to chassis ground assures that there is no potential or static charge difference between the implement and tractor.
2	ECU_GND	Black	Circuit to be limited to providing electrical return for electronic control units mounted on tractors or implements. This pin shall further be electrically isolated from GND, and shall be connected to the tractor's power source (battery) negative terminal.
3	PWR	Red	Power for all lights, motors, etc. that normally require significant power and tend to generate transients on the supply line. On implements that are so equipped, lighting normally powered by the ISO 1724 connector may be powered by this pin.
4	ECU_PWR	Orange	Intended to provide a good source of clean positive battery power for ECUs mounted on implements.
5	TBC_DIS	N/R	Exists only within the connectors (i.e. not for external connections) to control relay for automatic terminating bias connection/removal. Connected to Pin 4 on implement connector plug.
6	TBC_PWR	Red	Power for the TBCs; shall not be used for any other purpose.
7	TBC_RTN	Black	Provides return path for TBCs; shall not be used for any other purpose.
8	CAN_H	Yellow	Data transmission line pulled toward higher voltage in dominant state.
9	CAN_L	Green	Data transmission line pulled toward lower voltage in dominant state.



## Charts

### Sprayer hydraulic





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**Spare parts**

To see updated spare part information the website [www.agroparts.com](http://www.agroparts.com) can be visited. Here all parts information can be accessed when free registration has been made.



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