FTZ FORCE Boom

Instruction book

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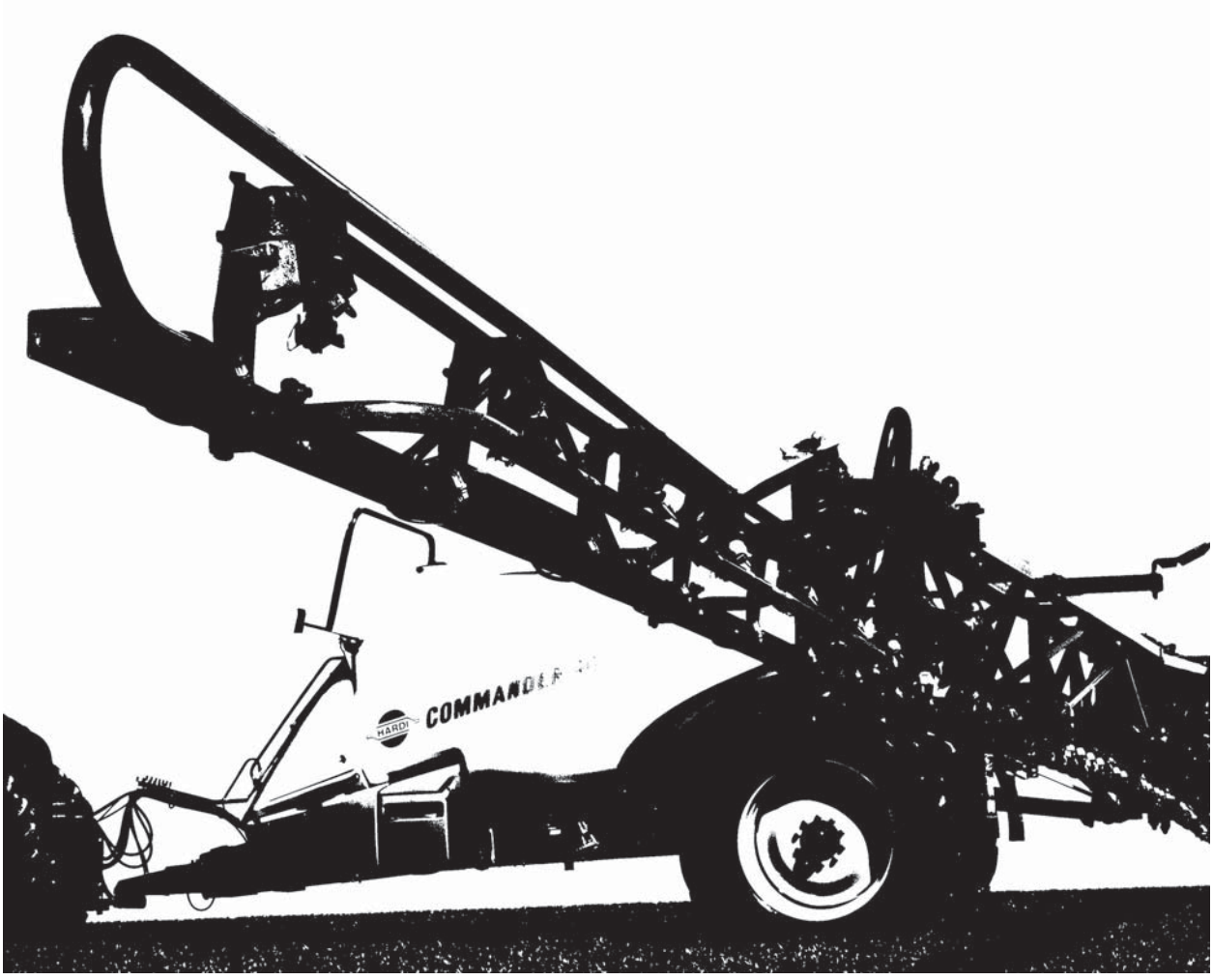

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We congratulate you for choosing a HARDI plant protection product. The reliability and efficiency of this product depend upon your care. The first step is to carefully read and pay attention to this instruction book. It contains essential information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

This book covers FTZ FORCE BOOM AND CENTRE

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

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

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

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

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

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Obligations and Liability

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 instructions 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.

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 applies to the employer or the supervisor of the sprayer operators.

Workplace Assessment

This must be completed to start with. Check your national 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 according to European Directive 2009/104/EC – Use of Work Equipment. Amendments to the directive, as well as subsequent directive versions are to be followed when applicable.

In this directive, the "minimum safety and health requirements for the use of work equipment by workers at work" are described in full. To guide you in this matter, the issues concerning your work with the sprayer are listed below. However, HARDI do not accept liability that the issues listed cover the requirements in the directive fully. This responsibility lies with the owner of the sprayer.

From European Directive 2009/104/EC:

CHAPTER I

GENERAL PROVISIONS

Article 1

Subject matter

1. This Directive, which is the second individual directive within the meaning of Article 16(1) of Directive 89/391/EEC, lays down minimum safety and health requirements for the use of work equipment by workers at work, as defined in Article 2.
2. The provisions of Directive 89/391/EEC are fully applicable to the whole scope referred to in paragraph 1, without prejudice to more stringent or specific provisions contained in this Directive.

Article 2

Definitions

For the purposes of this Directive, the following terms shall have the following meanings:

(a) 'work equipment': any machine, apparatus, tool or installation used at work;

(b) 'use of work equipment': any activity involving work equipment such as starting or stopping the equipment, its use, transport, repair, modification, maintenance and servicing, including, in particular, cleaning;

(c) 'danger zone': any zone within or around work equipment in which an exposed worker is subject to a risk to his health or safety;

(d) 'exposed worker': any worker wholly or partially in a danger zone;

(e) 'operator': the worker or workers given the task of using work equipment.

CHAPTER II

EMPLOYERS' OBLIGATIONS

Article 3

General obligations

1. The employer shall take the measures necessary to ensure that the work equipment made available to workers in the undertaking or establishment is suitable for the work to be carried out or properly adapted for that purpose and may be used by workers without impairment to their safety or health.

   In selecting the work equipment which he proposes to use, the employer shall pay attention to the specific working conditions and characteristics and to the hazards which exist in the undertaking or establishment, in particular at the workplace, for the safety and health of the workers, and any additional hazards posed by the use of the work equipment in question.

2. Where it is not possible in this way fully to ensure that work equipment can be used by workers without risk to their safety or health, the employer shall take appropriate measures to minimize the risks.

Article 5

Inspection of work equipment

1. The employer shall ensure that where the safety of work equipment depends on the installation conditions, it shall be subject to an initial inspection (after installation and before first being put into service) and an inspection after assembly at a new site or in a new location by competent persons within the meaning of national laws and/or practices, to ensure that the work equipment has been installed correctly and is operating properly.
2. In order to ensure that health and safety conditions are maintained and that deterioration liable to result in dangerous situations can be detected and remedied in good time, the employer shall ensure that work equipment exposed to conditions causing such deterioration is subject to:

   (a) periodic inspections and, where appropriate, testing by competent persons within the meaning of national laws and/or practices;

   (b) special inspections by competent persons within the meaning of national laws and/or practices each time that exceptional circumstances which are liable to jeopardize the safety of the work equipment have occurred, such as modification work, accidents, natural phenomena or prolonged periods of inactivity.

3. The results of inspections shall be recorded and kept at the disposal of the authorities concerned. They must be kept for a suitable period of time.

   When work equipment is used outside the undertaking it shall be accompanied by physical evidence that the last inspection has been carried out.

4. Member States shall determine the conditions under which such inspections are made.

Article 6

Work equipment involving specific risks

When the use of work equipment is likely to involve a specific risk to the safety or health of workers, the employer shall take the measures necessary to ensure that:

(a) the use of work equipment is restricted to those persons given the task of using it;

(b) in the case of repairs, modifications, maintenance or servicing, the workers concerned are specifically designated to carry out such work.

Article 8

Informing workers

1. Without prejudice to Article 10 of Directive 89/391/EEC, the employer shall take the measures necessary to ensure that workers have at their disposal adequate information and, where appropriate, written instructions on the work equipment used at work.
2. The information and the written instructions shall contain at least adequate safety and health information concerning:

   (a) the conditions of use of work equipment;

   (b) foreseeable abnormal situations;

   (c) the conclusions to be drawn from experience, where appropriate, in using work equipment.

   Workers shall be made aware of dangers relevant to them, work equipment present in the work area or site, and any changes affecting them, inasmuch as they affect work equipment situated in their immediate work area or site, even if they do not use such equipment directly.
3. The information and the written instructions shall be comprehensible to the workers concerned.

Article 9

Training of workers

Without prejudice to Article 12 of Directive 89/391/EEC, the employer shall take the measures necessary to ensure that:

(a) workers given the task of using work equipment receive adequate training, including training on any risks which such use may entail;

(b) workers referred to in Article 6(b) receive adequate specific training.

2 - General Safety Instructions

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 national Machinery Directive 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.

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 instructions 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.

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.

Guarantee 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 accept no liability for such incidents caused by the use of non-approved spare parts, wear parts or aids.
- Disasters through the impact of foreign bodies, natural disasters or force majeure.

2 - General Safety Instructions

Organizational Measures

This Instruction Book

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

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

Representation of Safety Symbols

Explanation of Symbols

Safety symbols are used in the following chapters throughout this Instruction Book to designate, where the reader has to pay extra attention.

The signal word (DANGER, WARNING, ATTENTION or NOTE) describes the severity of the risk.

The 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 indicates handling tips and particularly useful information. This instruction will help you to use all the functions of your sprayer in the best way possible for a better, easier and more safe operation.

2 - General Safety Instructions

Warning Signs On The Sprayer

Explanation of Labels

The labels on the sprayer are designating potential dangerous areas on the machine. Operators, or anyone in close range of the sprayer, must respect these warnings!

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

Note that not all labels shown hereafter will apply to your sprayer - this depends on the sprayer model which labels apply.

978437 Chemical handling!

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

978436 Service!

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

97802100 Risk of death!

Do not attempt to enter tank.

978444 Risk of injury!

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

978448 Risk of injury!

Keep sufficient distance away from electrical power lines.

978443 Service!

Carefully read the Instruction Book before handling the machine. Observe instructions and safety rules when operating.

978440 Service!

Tighten to the torque according to instruction book.

978447 Risk of burn!

Stay clear of hot surfaces.

978586 Risk of injury!

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

978435 Risk of injury!

Keep hands away.

978441 Risk of squeezing!

Stay clear of raised and unsecured loads.

978434 Risk of squeezing!

Keep hands away, when parts is moving.

978446 Risk of sprayer tipping over!

Be aware when disconnecting the sprayer.

97802200 Not for drinking!

This water must never be used for drinking.

97829000 Lifting point!

97831500 Load index!

Max. permitted load rating is 164 at 40 km/h or 5000 kg.

978445 Risk of squeezing

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

978442 Risk of falling off!

Do not ride on platform or ladder.

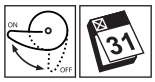
978438 Grapping area!

Manual handling of the boom etc.

97802300 Not for drinking!

This water must never be used for drinking.

978439 Lifting point!



97827000 EasyClean filter service!

Open and clean filter monthly.

2 - General Safety Instructions

Safety and Protection Equipment

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.

Faulty Safety Equipment

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

Informal Safety Measures

Additional Safety Instructions

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

A. Accident prevention

B. Environmental protection

C. 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 demands 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

Authorized 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.

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

Safety Measures in Normal Operation

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

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

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

Service and Maintenance Work

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.

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 to relieve oil pressure
- turn off the tractor and remove the ignition key
- dismount the hydraulic hoses connected from the tractor to the sprayer.

Electric system

- turn off the tractor and remove the ignition key
- dismount 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

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.

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 the 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.

Cleaning and Disposal

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.

Workstation

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.

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 loosing his concentration and focus on operating the vehicle correctly
- risk of the operator loosing 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.

If the Safety Information is Ignored

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 fluid or spray fluid to the environment
- can lead to the loss of all warranty claims.

2 - General Safety Instructions

Safety Information For Operators

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 in 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 damages to your skin or face, immediately seek medical advice. Remember to identify the chemicals used.

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.

Before connecting the sprayer to or disconnecting the sprayer from the tractor's three-point linkage, secure the operating lever of the tractor hydraulic system, so that unintentional raising or lowering is prevented.

When coupling and uncoupling sprayers, move the support equipment (if available) to the appropriate position (check stability and strength of the support).

When actuating the support equipment, there is a risk of injury from crushing and cutting points.

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 actuating 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 stable.

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, or
- fold the spray boom into the transport position
- turnoff the tractor engine
- remove the ignition key.

When use of the TurboFiller has ended, make sure that all manifold handles are closed / deactivated.

If parking or stopping the tractor with the sprayer pump running, always keep the sprayer under supervision.

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 and fatalities!

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.

Checking the vehicle

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

1. Spray boom is folded and resting in transport brackets with the intended locks engaged.
2. Engage transport locks on the steering cylinders.
3. Supply lines for hydraulic, electric and pneumatic systems (if installed) are correctly connected.
4. Parking brake is completely disengaged. Safety line is secured (if applicable).
5. Hydraulic pressure from tractor to sprayer is turned off.
6. PTO drive is turned off.
7. Hitch bolt(s) between tractor and sprayer must be secured with a linchpin or other appropriate means.
8. If the sprayer is coupled onto a lift link drawbar, the lower link should be laterally fixed.
9. Traffic lights and reflectors are in good working order, clean and free from damages.
10. Signs or markings on the vehicle regarding road transport are correctly placed and visible.
11. Brakes are in good working order and free from visible damages.
12. Tyre pressure is correct according to the load.
13. No cables or other parts must be strained or caught in the tractors wheels when cornering.
14. Crop residues and dirt are removed.
15. All moveable or loose equipment are securely latched or stowed away in the designated compartments.

Ensure that the tractor has sufficient steering and braking power. If necessary, use front weights to the tractor in a 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 brake delay for the loaded vehicle combination (tractor plus connected sprayer).

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.

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.

Check that the transport equipment, e.g. lighting, warning equipment and protective equipment, is correctly mounted on the sprayer.

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

Adjust your driving speed to the prevailing conditions.

Before driving downhill, switch to a low gear.

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

Do not use the sprayer as a means of transportation of people or goods.

No one is allowed outside the tractor cabin during road transport, as this can lead to fatalities.

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

Hydraulic System

The hydraulic system is operating under a high pressure.

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 calender 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 calender 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 infection and serious injuries.

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

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

Electrical System

When working on the electrical system, 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
- Ensure that the retrofitted electrical and electronic components comply with the EMC directive 2004/108/EC in the appropriate version and bear the CE mark.

Universal Joint Shaft

A rotating shaft can catch clothes, tools or aids, if touching or getting in contact with each other. Risk of severe damages and injuries 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 your 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 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.

After the universal joint shaft is switched off, there is a danger of injury from the continued rotation of freewheeling sprayer parts. Keep distance to the sprayer during this time. You may work on the sprayer only after all 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 decoupling 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 universal joint shaft speed depends on the drive speed of the vehicle, and that the direction of rotation reverses, when you drive in reverse.

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. Follow the local law. 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.

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 overfilling, some sprayer functions may be disabled. However, the main tank 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.

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 main tank. The rated volume inside the main tank is stated with large printed numbers on the outside of the tank. If overfilling, 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 is preferable 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 chocks in front of and behind the wheels to prevent 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.

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 main tank, climbing into this tank is very hazardous. Cleaning should only be done from the outside.
- Refrain from entering the main tank.
- Refrain from inspecting any of the tanks with the liquid pump running.

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

Service and Maintenance

Always reassemble all safety devices or shields immediately after servicing.

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

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

Do not attempt to enter the tank.

Access to the rinsing tank 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 retighten them as necessary.

If electrical welding is used on the tractor and on the attached sprayer, disconnect the cable to the tractor's generator 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.

Refrain from dismounting hoses, pipes, or any equipment, if the sprayer is in operation.

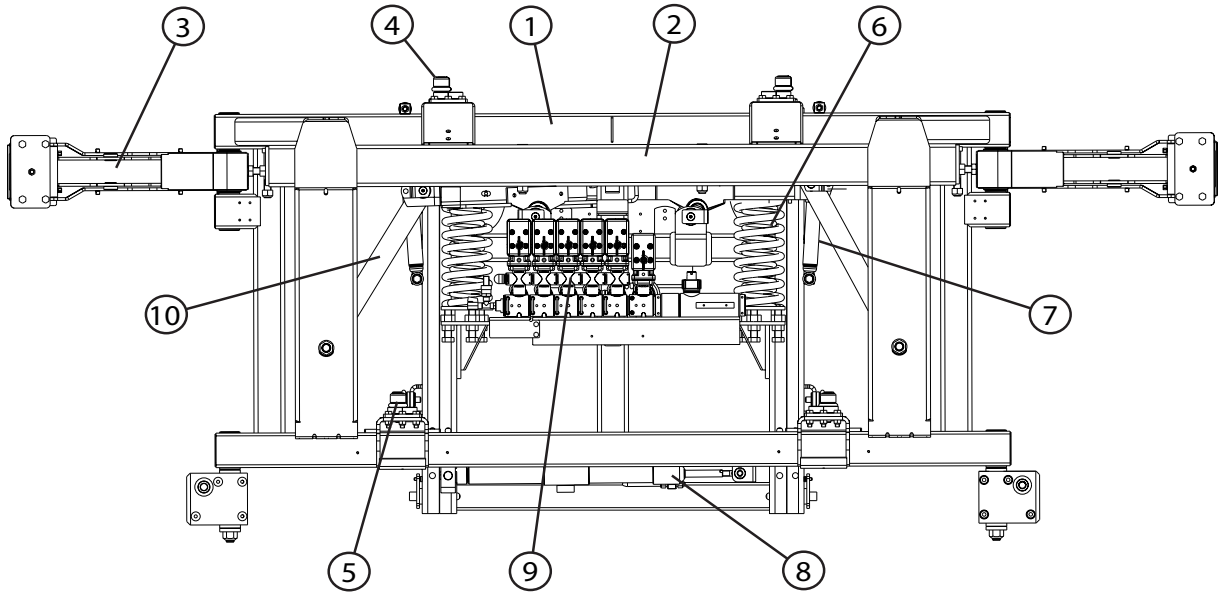
Stay below the maximum speed (rpm) suitable for the PTO shaft.

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.

Overview

FTZ force boom centre



1. Lift frame
2. Centre frame
3. Hinge
4. Top link arm
5. Bottom link arm
6. Suspension
7. Shock absorber
8. Damping cylinder/Lock
9. Distribution valve
10. Trapeze link arm

Boom

Boom and terminology

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

The FORCE (FTZ) boom is suspended on a strong, stable parallelogram boom lift and is available in 30, 32, 33 and 36 m working width. The booms are 3-folded.

Boom features:

- Hydraulic centre lock.
- Outer sections incorporate spring-loaded breakaway.
- Individual wing tilt control
- Outer wing sections fold independently of the inner wing sections
- The boom can be used half folded however there is no breakaway in this mode

Boom widths:

Full working width	1/2 folded	2/3 folded
30 metres	12 metres	23 metres
32 metres	14 metres	25 metres
33 metres	14 metres	25 metres
36 metres	14 metres	27 metres

For 3-folded booms the terminology is as follows:

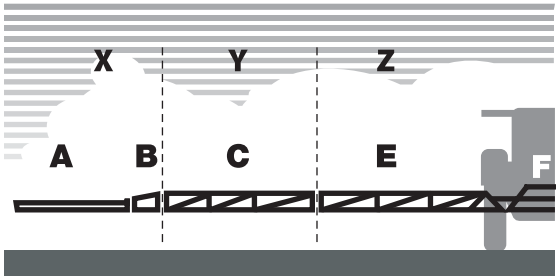
A. Breakaway section

B. 2nd outer wing

C. 1st outer wing

E. Inner wing

F. Centre section



NOTE! When controlling the 3-fold boom at the SetBox, it will fold the 1st outer wing and 2nd outer wing consecutively.

Folding terminology is as follows:

X. 2nd outer wing

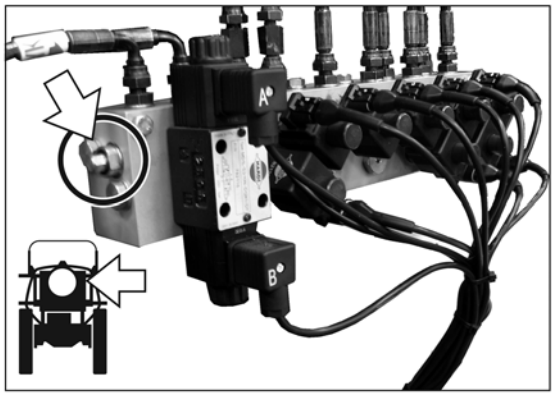
Y. 1st outer wing

Z. Inner wing

Hydraulic system

Boom folding speed adjustment

The restrictor for adjusting the boom folding speed is in the main hydraulics block
The throttle valve can adjust the folding speed of the boom.
Adjusting inwards = slower boom.

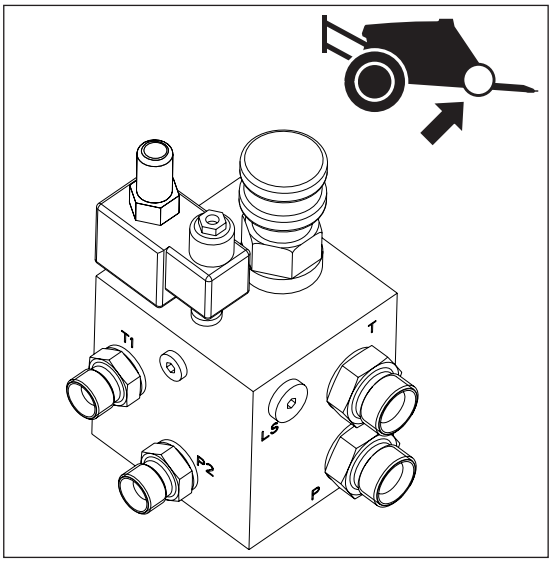


ParaLift

This hydraulic block manages the direct activation of the paralift boom height control.

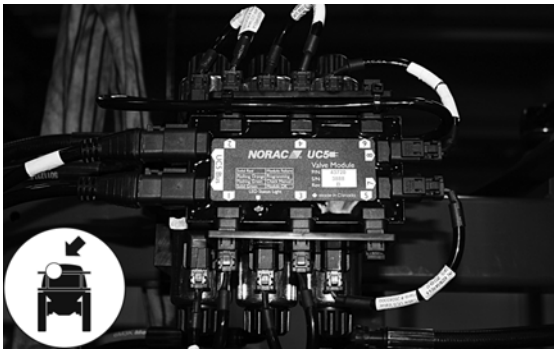
Open/Close centre hydraulics

The open centre hydraulics block is necessary to select between tractors with open centre hydraulics and/or load sensing. For adjustment see "Open/Close Centre Hydraulics" on page 41.



AutoHeight control UC5

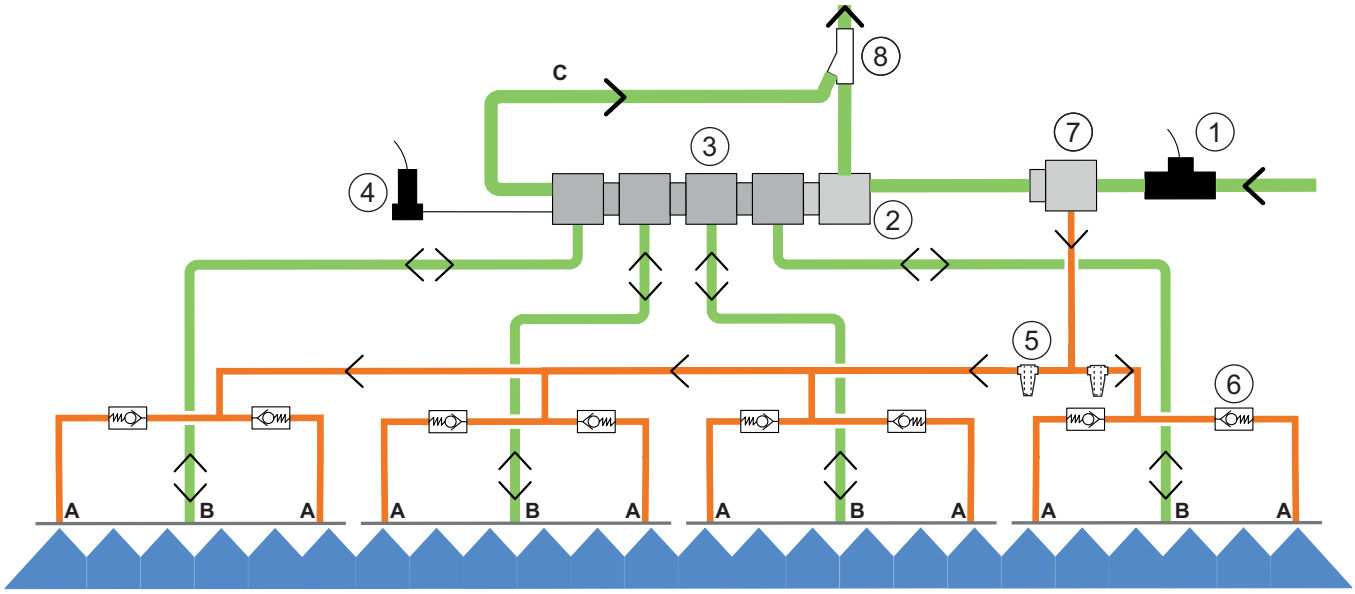
On sprayers with AutoHeight this hydraulic block manages hydraulic pressure for the automatic boom height control functions.



Note! For more information on the AutoHeight control please refer to the AutoHeight control manual.

BoomPrime (optional)

BoomPrime is a low pressure circulation system, which primes the spray boom tubes prior to spraying, ensuring a homogenous fluid in the boom tubes and in the main tank. Below the illustration shows the BoomPrime circuit for the boom.



1. Flow meter
2. Bypass valve
3. Distribution Valves
4. Pressure sensor
5. In-Line filter for boom prime
6. One-Way Valve for boom prime
7. Boom prime valve
8. Venturi

- The BoomPrime circuit is attached to each end or one end of a boom section (A).

Liquid for BoomPrime is taken from the boom prime valve (7) just after the flowmeter. This valve operates in opposite phase:

Operating state	Section valves	Bypass valve	Boom prime valve
Spraying	Open	Closed	Closed
Not spraying	All Closed	Open	Open

When priming, the direction of liquid flow will be reversed. The liquid will be fed into the nozzle tubes from each end, and is returned back to the main tank through the EFC section valves dump line (C).

Hydraulic systems

General Info

Ensure that the snap couplers are clean before connection!

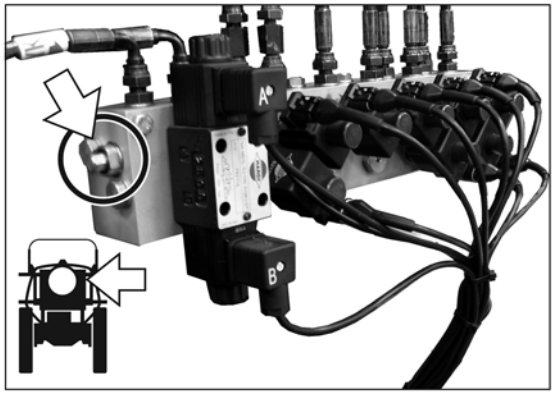
After having operated the boom and the system has been filled with oil, check the tractor's hydraulic oil level and top up, if necessary.

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

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

Boom folding speed adjustment

The restrictor for adjusting the boom folding speed is in the main hydraulics block
The throttle valve can adjust the folding speed of the boom.
Adjusting inwards = slower boom.

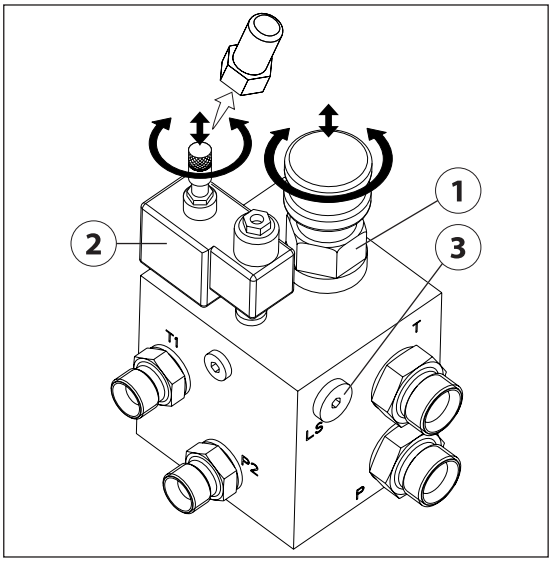


Open/Close Centre Hydraulics

The open/close centre hydraulics block is used to select tractors fitted with open centre hydraulics and/or load sensing.

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

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



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

Combinations of settings for flow element and circuit value:

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

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

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

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

Auto-steer

Auto Steering system and warnings

WARNING!

- Failure to take note of this warnings will damage the boom.
- Auto steer should never be engaged before the tractor is brought on the line. The combined aggression of the auto steering system snapping to the line and continued uncontrolled auto steer oscillation is a major cause of boom yaw movement and fatigue.

ATTENTION!

- Auto-steering is a GPS controlled system that control or allows the tractor to acquire and stay on a predetermined heading. Auto-steer is user friendly however a poorly setup system or worn tractor can result in very aggressive boom behaviour.
- Auto-steer systems can contribute to uncontrolled boom yaw movements and therefore must be considered when trying to control yaw movement.
- Auto steer re-tuning is highly recommended to minimise tractor oscillation and boom Yaw movement. Contact your guidance system provider for the latest firmware available that should provide the most up-to-date line acquisition settings and performance.
- Recalibrated the dead-zone & gain settings to minimise oscillation (chasing the line) and line acquisition aggression.
- Ask your dealer service technicians to help evaluate your auto-steer aggressiveness.

General info

Environmental info

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

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

Boom

Safety info

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

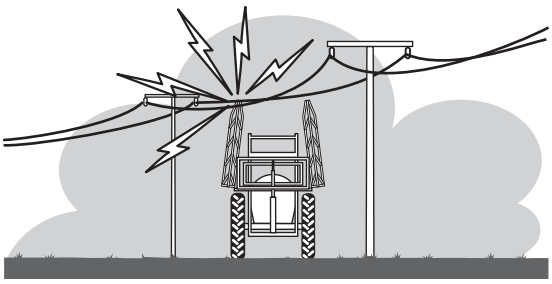
DANGER! Before unfolding the boom it is important to connect the sprayer to the tractor to prevent overbalancing of the sprayer.

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

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

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

Unintended boom movements may cause contact with overhead power lines.



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

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

Operating the boom (Z-version) with HC 6500

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

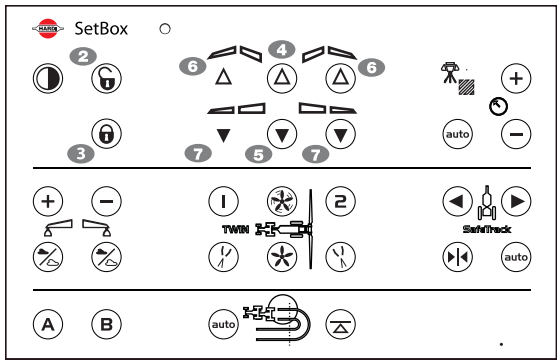
WARNING! The centre lock doesn't automatically lock when start folding. Always lock the centre before start folding the boom.

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

WARNING! Ensure that the boom is clear from transport brackets before unfolding the boom.

To unfold the boom

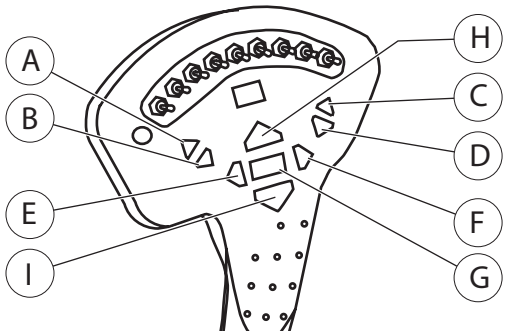
1. Turn on the hydraulic pressure if it is not already on.
2. Switch on the SetBox and controller
3. Check that the centre locked symbol is visible in the display. If not press button (**3**) to lock the centre.
4. Press button (**A**) and (**C**) on the grip to tilt boom up to clear the transport.
5.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



10. Press button (**2**) to unlocked the centre. The symbol appears in display until centre is unlocked. This takes approximately 10 seconds.

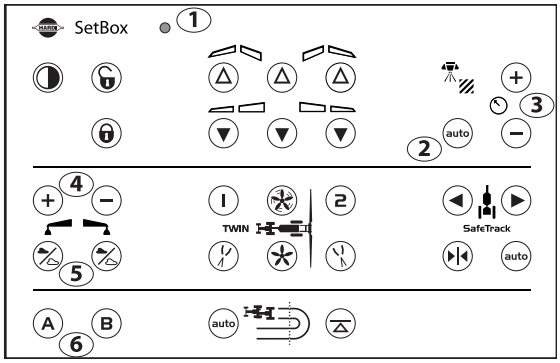
To fold the boom

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



Operating the (Z-version) with HC 6500 while spraying

The SetBox and Grip control the following spray functions:



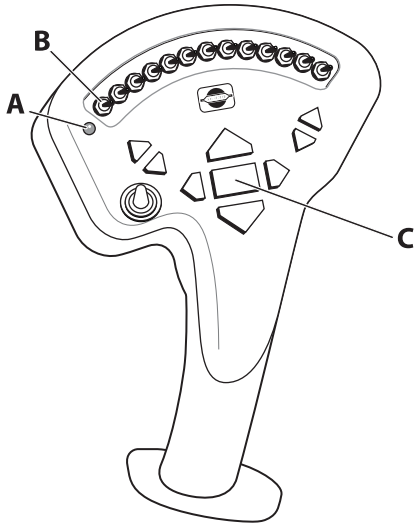
1. Power ON/OFF/status LED. LED must be ON.
2. Automatic spray pressure regulation.

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

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

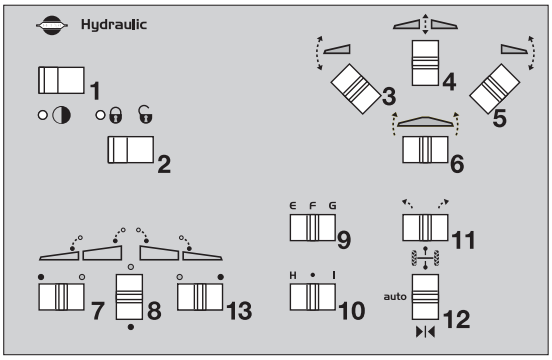
B. Section valves. Turns single sections on or off. Lever up is OFF and down is ON.

C. Main valve ON/OFF.



Operating the boom (Z-version) with HC 5500

The switches on the hydraulic control box control the following functions:



1. Power ON/OFF
2. Pendulum lock
3. Boom tilt left
4. Boom lift raise/lower
5. Boom tilt right
6. Boom slanting (if applicable)
7. Boom outer folding left
8. Boom inner folding (both sides)
9. Optional function
10. Optional function
11. Manual track control (left/right) (optional)
12. Track control auto (manual/auto/lock) (optional)
13. Boom outer folding right

WARNING! Ensure that the centre lock is locked before using the fold functions.

WARNING! Ensure that the boom is clear from transport brackets before unfolding the boom.

WARNING! The folding functions must only be operated when the sprayer is stationary! Failure to do so will damage the boom.

To unfolding the boom

1. Check that centre (**2**) is locked.
2. Push switch (**3**) and (**5**) upwards clear the boom of the front transport brackets.
3. Push switch (**4**) upwards to raise the boom to highest possible position.
4. Push switch (**8**) downwards to unfold the inner sections. Rear transport hooks disengage automatically.
5. Push switches (**3**) and (**5**) downwards to lower the individual tilt rams.
6. Push switch (**7**) to the left and (**13**) to the right to unfold outer sections.
7. Push switch (**6**) to correct slant angle. (if applicable)
8. Push switch (**4**) downwards to lower the boom to correct height above crop or ground level.
9. Unlock centre (**2**).

To fold the boom

1. Check that centre (**2**) is locked.
2. Push switch (**4**) upwards to raise the boom to highest possible position.
3. Push switch (**7**) to the right and (**13**) to the left to fold outer sections.
4. Push switches (**3**) and (**5**) upwards to raise the individual tilt rams.
5. Push switch (**8**) upwards to fold the inner sections. Make sure to fold the inner sections against the vertical slide pads. Push switch (**4**) downwards to lower the boom until the rear transport hooks are firmly engaged.
6. Push switches (**3**) and (**5**) downwards to lower the individual tilt rams until they rest on the front transport brackets.

Operating the Control Unit While Spraying - Spray Box III

EVC operating unit only

The switches of the spray control unit (Spray Box) control the following functions:

1. Spray Box power on or off.
2. Regulating the main spray pressure.
3. Spray ON/OFF. Turns all sections valve on or off. (Lever up is OFF and down is ON).
4. Optional function (A/OFF/B). If extra equipment is added, it can be controlled from here. (Middle position is OFF).
5. End nozzle (Left/OFF/Right). If end nozzles are fitted, they can be turned on for each side. (Middle position is OFF).
6. Foam marker blob interval.
7. Foam marker (Left/OFF/Right).
8. Section valves. Turns individual spray sections on or off. (Lever up is OFF, and lever down is ON).

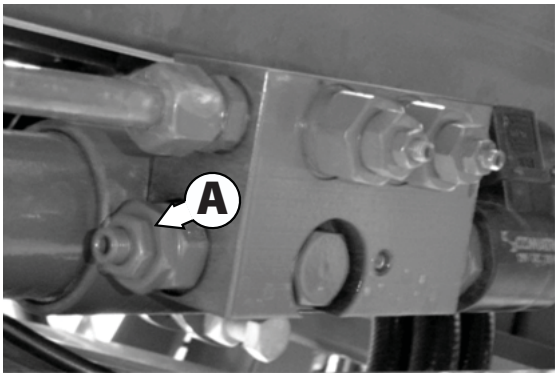
- In order to close the entire boom, switch main ON/OFF (**3**) to OFF position. This returns the pump output to the tank through the return system. The diaphragm non-drip valves ensure instantaneous closing of all nozzles.
- In order to close one or more sections of the boom, switch the relevant distribution valve (**7**) to off position (upwards).

Damping adjustment (infield)

Fine tuning of the boom suspension is possible by adjusting the throttle valve screw on the damping cylinder at the bottom of the boom centre. To achieve the factory setting, Back off the lock nut and screw the throttle valve (A) all the way in and then out three full turns.

To obtain more damping: Throttle valve (A) must be screwed inward.

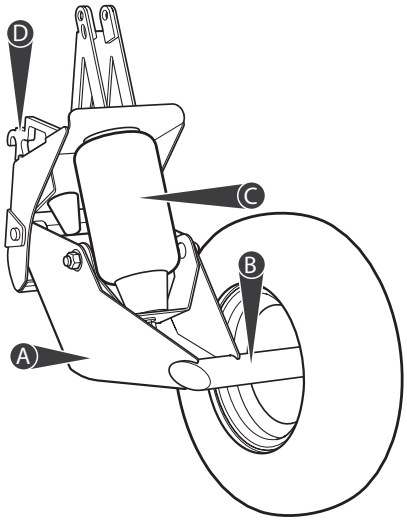
To obtain less damping: Throttle valve (A) must be screwed outward.



Note: For Damping Cylinder service procedure please see the maintenance section of this publication.

Boom wheels - air bag suspended (optional)

An optional heavy duty boom wheel has been developed which features robust steel construction (A), tapered roller bearing hubs (B), and pneumatic / air bag suspension (C). The optional wheel also features an easy release mounting system (D) and transport bracket assembly.



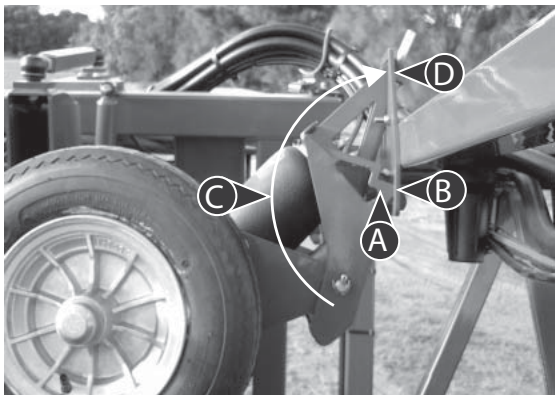
Warning: The boom wheels are not intended for constant ground engagement! Running them continuously on the ground will damage the boom and boom wheel.

Warning: When driving on public roads the support wheels must be secured in their transport position. Check with your local authorities for details of laws regarding moving implements on public roads.

Note: For maximum service life the boom wheel must be regularly maintained, including wheel bearing lubrication, adjustment and tyre and air bag inflation pressures. Please see maintenance section for service details.

Optional boom wheel transport position

In order to transport the sprayer without exceeding maximum width limitations for implements on public roads, the boom wheels must be stowed in their transport position as shown in the illustration. The transport bracket is located on the forward side of the inner boom wing and stores the wheels on the inboard side of the boom when folded.

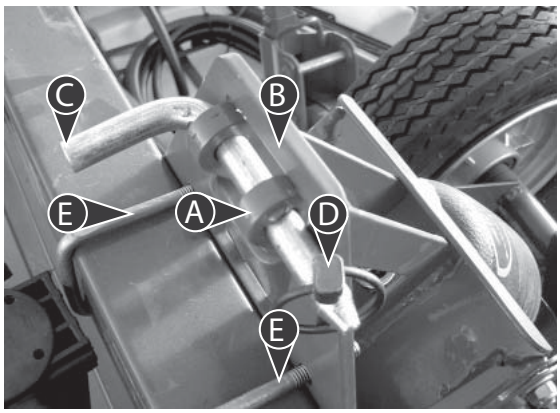


Storage

To store the boom wheel for transport, insert the hooks on the boom wheel frame assembly (A) into the base of the transport bracket (B) and swing it upwards (C) until the eyelets pass through the slot cut in the top of the transport bracket (D).

Securing the boom wheel for transport

With the eyelets on the boom wheel frame (A) passed through the matching slot cut in the transport bracket (B) secure the assembly by passing the lynch pin (C) through the eyelets and lock it in place with the spring loaded clevis pin (D). If mounting the transport bracket for the fi rst time, pass the two 'U' bolts (E) over the upper forward member of the inner boom section (800mm outboard of the inner fold). Secure with nuts and washers (see spare parts section for detailed drawings).

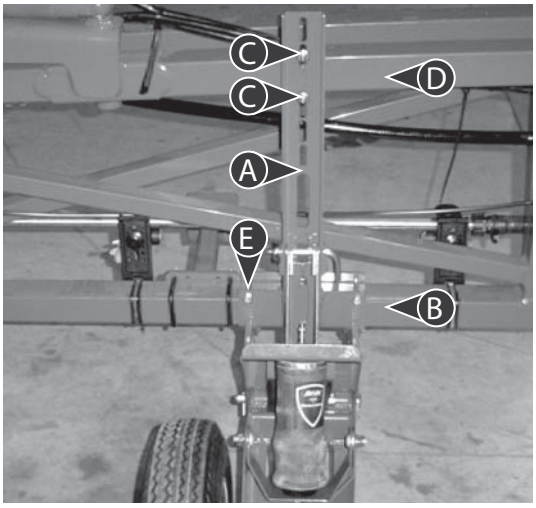


Warning! The spring loaded clevis pin (D) is a safety precaution and prevents the lynch pin from working loose. Do not operate the sprayer without it.

Boom wheel operation

When in use, the wheel is mounted to the boom wing inboard of the outer section fold as illustrated (right hand side shown). To fit the wheel for spraying, remove it from the transport position, and using the same lynch and clevis pins, mount the wheel to the operating bracket in a similar way as previously described for transport, being sure to secure it with the lynch and clevis pins.

If fitting the boom wheel kit for the first time, hook the bracket (**A**) under the lower wing member (**B**) and loosely assemble the 'U' bolt (**C**) around the upper forward member of the outer boom section (**D**). Pass the two bolts supplied (**E**) through the holes in the lower part of the bracket assembly, and clamp it to the lower boom wing member by tensioning the nuts accordingly.



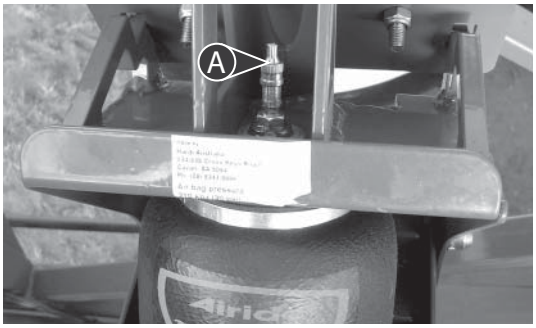
Air bag inflation

The boom wheel air bag is a pneumatic suspension device, designed to reduce impact and vibration stress being transferred to the boom, whilst maintaining individual boom wing support. To inflate or check the air bag pressure, remove the valve cap (A) and use a conventional automotive type tyre pressure device.

Air bag pressure:.....206kpa (30psi)

Tyre pressure:.....220kpa (32psi)

Note! See maintenance section for service details and schedule.



Lubrication

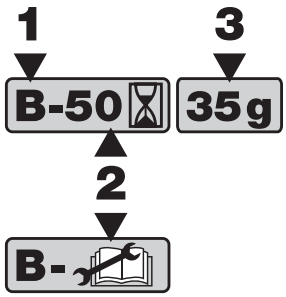
General Info

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

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

Pictograms in Lubrication & Oiling Plans Designate:

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



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

Suitable Lubricants

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

Grease Nipple

When lubricating the sprayer, please use a greasing gun which fits the dimensions of the grease nipple.

Nipple head type:	DIN 71412
Nipple head size (A):	6.5 mm

ATTENTION! If grease is leaking from the nipple near its threaded part, when grease is being applied, please tighten the nipple by using a spanner or similar. Replace the nipple, if it is damaged or bent out of shape.

ATTENTION! If applying grease into the nipple seems difficult, unscrew the nipple. Check if the nipple is blocked inside, or if the spring-loaded ball is stuck. Clean or repair as needed.

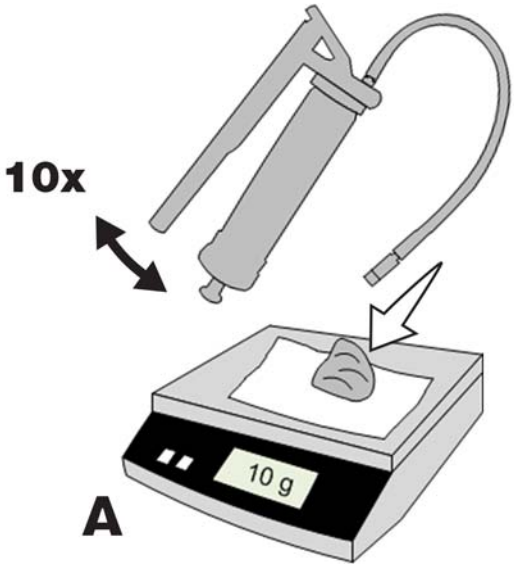
Grease Gun Calibration

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

Calibration example

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

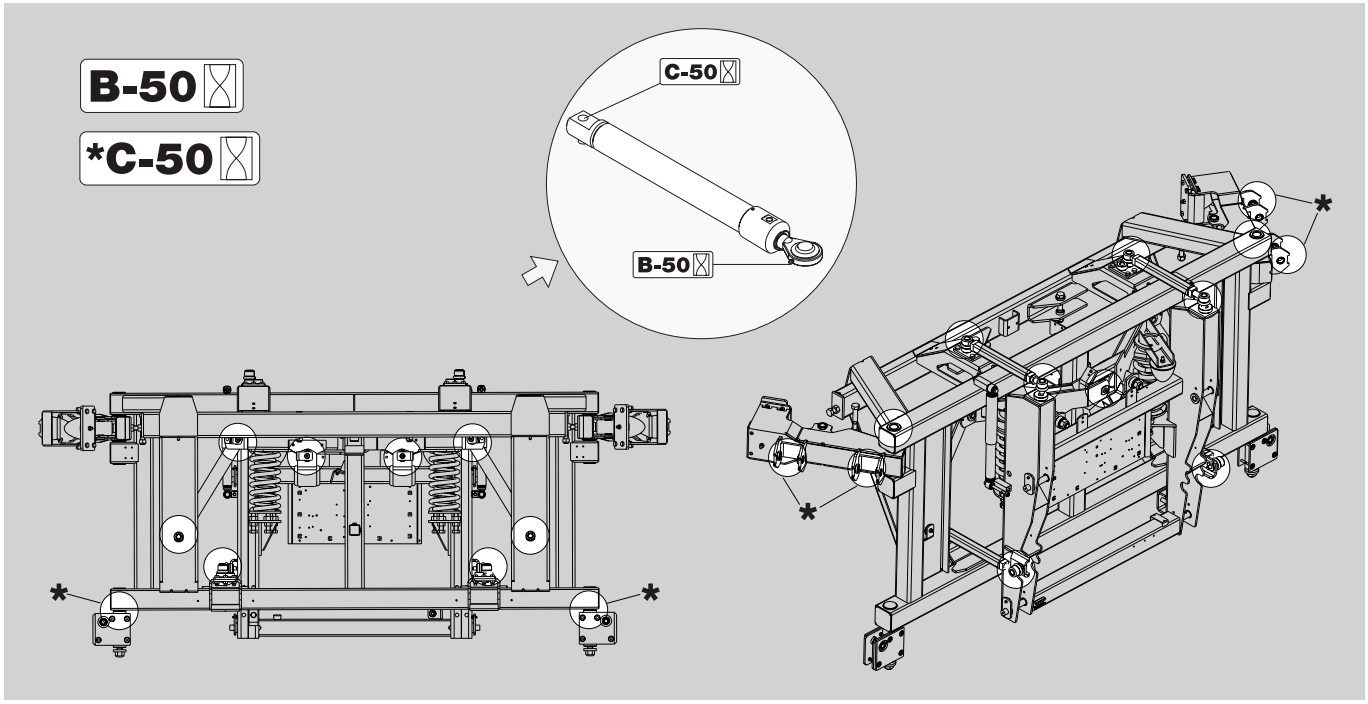
When calibrated, you can count how many strokes to complete, when lubricating the different grease points on the sprayer according to the specifications.



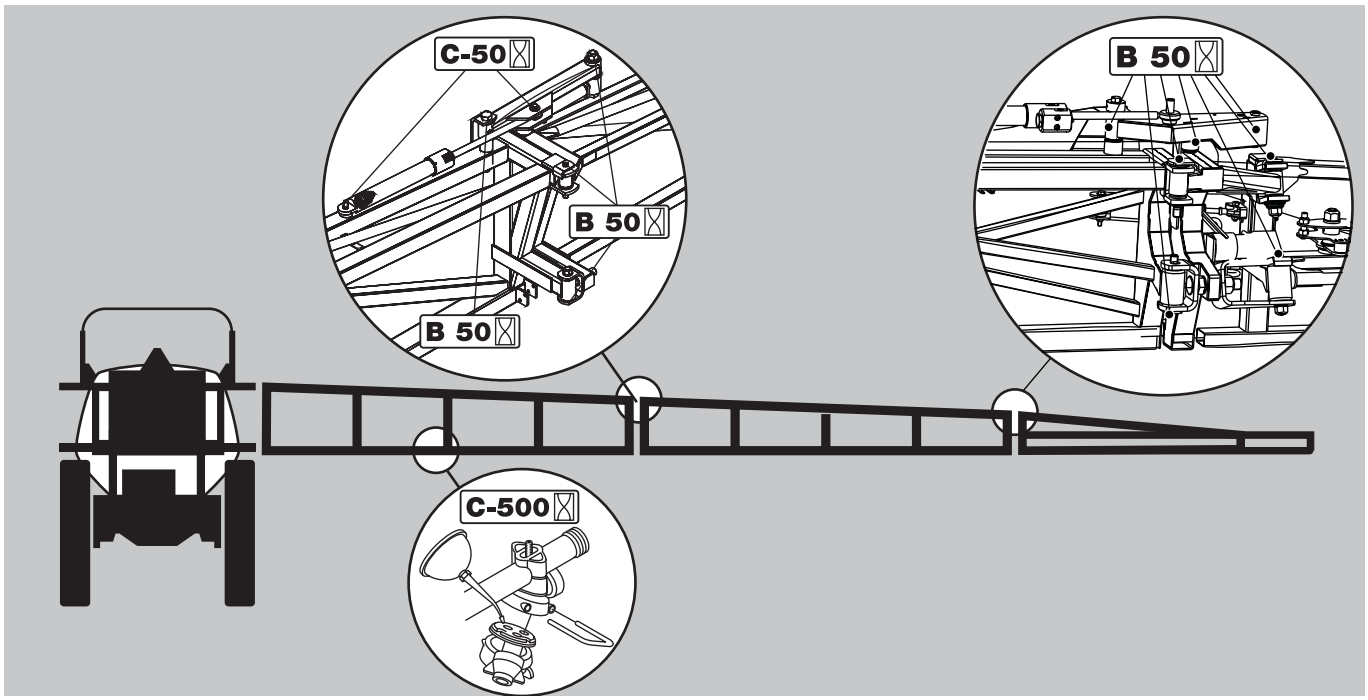
Alternative method

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

Centre Lubrication



Boom Lubrication



6 - Maintenance

Service and maintenance intervals

General Info

The periodic service and maintenance work may be carried out by the user. Contact your HARDI dealer if in doubt. If this work is completed correctly, the sprayer will run efficiently and its lifetime will be prolonged.

When a number of hours are mentioned in this chapter, this means hours of spraying, unless otherwise explained. Operation hours can be read in the controller in the tractor (see instruction book for 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 otherwise stated in this book, please tighten bolts and nuts using the following torques.

Bolt size	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

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

- bolted joints will rattle and thus fail under fatigue
- bolts are being worn 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 fastener
- bolt heads will be broken
- bolted joints will come loose
- accidents caused by assembled parts coming apart due to bolts breaking at a later time.

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 otherwise stated in this book, please tighten hydraulic hoses using the following torques:

Hose size (“)	Fitting thread size (“)	Spanner size (mm)	Recommended torque (Nm)
1/4	9/16	19	28
3/8	11/16	22	44
1/2	13/16	24	62
3/4	13/16	36	130

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.

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 are being worn 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 leaks.
- accidents caused by assembled parts coming apart due to bolts breaking at a later time.

WARNING! When assembling a hydraulic joint, this is often being twisted around in different directions 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.

6 - Maintenance

After first use - Bolts and nuts boom

- Check that all bolts and nuts are properly tighten and re-tighten if necessary using suitable tool.
- Tighten the nuts on the parallelograms anchor plates see page "Anchor plates" on page 67.

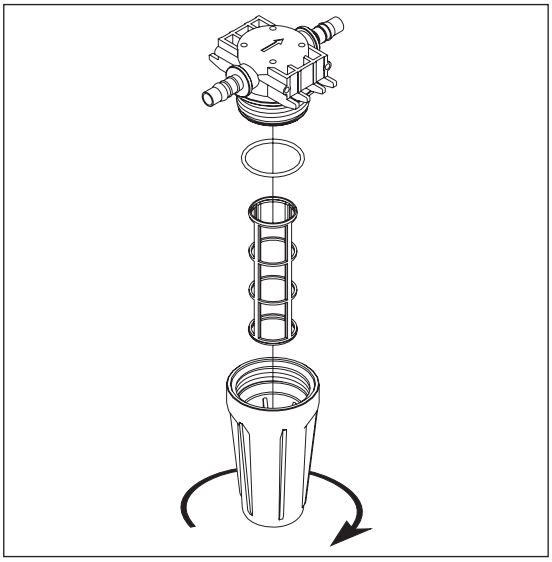
10 hours service - In-Line filter (not PrimeFlow)

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

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

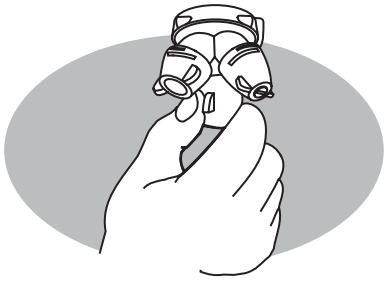
WARNING! Be careful not to splash out liquid when unscrewing the filter bowl.

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



10 hours service - Nozzle filters

Check and clean.



10 hours service - Spraying circuit

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

50 hours service - Lubricate boom and centre

Lubrication points on the boom and centre needs attention every 50 working hours to work correctly. see "Centre Lubrication" on page 55 and "Boom Lubrication" on page 55

50 hours service - Bolts and nuts boom

Check that all bolts and nuts are properly tighten and re-tighten if necessary using suitable tool. See page "Tightening Bolts and Nuts" on page 56 for correct torque settings.

50 hours service - Spring break away

Check the tension of the break-away spring see "Breakaway section adjustment" on page 63 and adjust if necessary.

250 hours service - Readjustment of the boom

See section “Readjustment boom - general info” on page 62.

6 - Maintenance

Occasional maintenance

General info

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

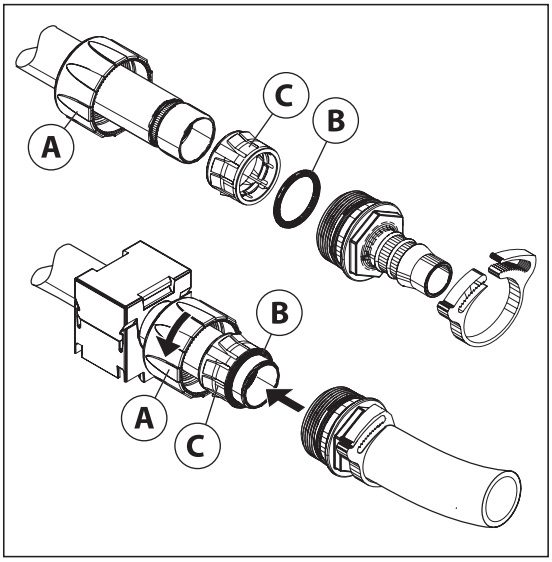
Feed pipe snap-lock assembly

Disassembly

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

Reassembly

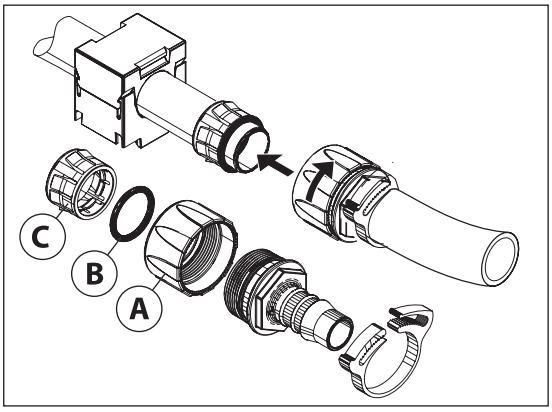
1. Check that the barbed lock ring (C) is fitted to the feed pipe with barb pointing away from pipe opening.
2. Fit the oiled O-ring (B) on top of the lock ring (C).
3. Push the feed pipe and hose barb together.
4. Screw the union nut (A) on the hose barb and tighten union nut (A) by hand.



Initial fitting of fittings

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

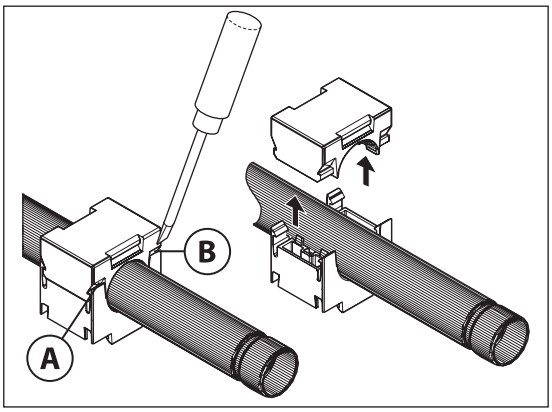
1. Fit the barbed lock ring (C) to the feed pipe with barb pointing away from pipe opening.
2. Fit the oiled O-ring (B) on top of the lock ring.
3. Screw the union nut (A) partly on the hose barb.
4. Press the feed pipe and hose barb together.
5. Tighten the union nut (A) by hand.



Feed pipe clamp assembly

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

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



Opening the cable trays

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

Disassembly

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

Assembly

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

Readjustment boom - general info

Before commencing adjustment jobs please go through this check list.

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

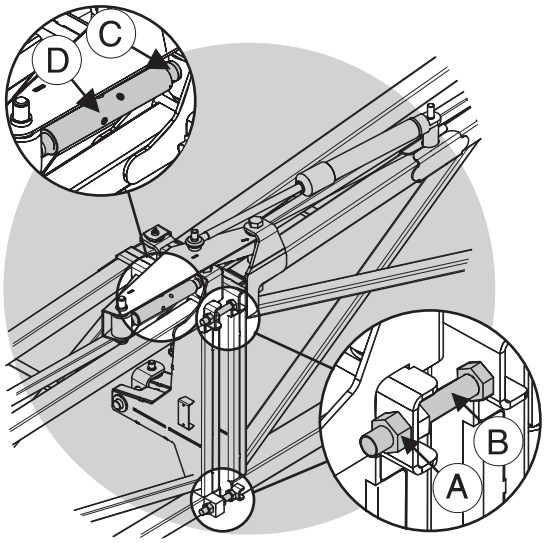
NOTE! Adjustment of hydraulic cylinders is to be carried out without pressure in the system.

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

Alignment of inner and 1st outer wings

The inner wing sections must be aligned with the 1st outer wing sections. If necessary adjust the inner wing sections as follows:

1. Depressurize the folding cylinders.
2. Loosen counter nuts (A) and (C).
3. Loosen the screws (B).
4. Adjust the rigging screw (D) until the correct setting is reached.
5. Adjust the stop screws (B) up against the inner section.
6. Tighten counter nuts again.
7. Check the alignment. If needed, redo the adjustment described above.

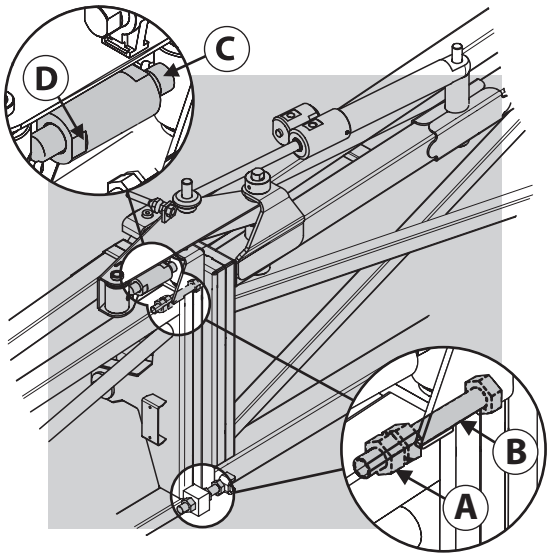


ATTENTION! The rigging screw (D) must be slightly over tightened/adjusted to insure a firm and fixed outer section.

Alignment of 1st outer and 2nd outer wings

The 2nd outer wings must be aligned with the 1st outer wings. If necessary adjust the 2nd outer wings as follows:

1. Depressurize the folding cylinders.
2. Loosen counter nuts (A) and (C).
3. Loosen the screws (B).
4. Adjust the rigging screw (D) until the correct setting is reached.
5. Adjust the stop screws (B) up against the inner section.
6. Tighten counter nuts again.
7. Check the alignment. If needed, redo the adjustment described above.

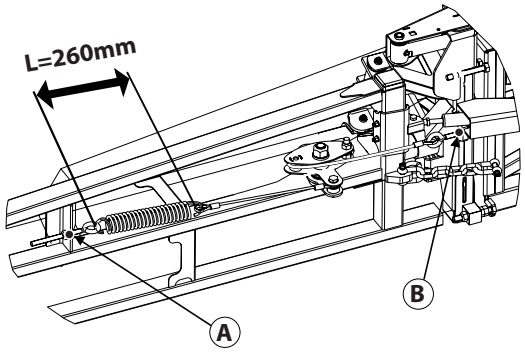


ATTENTION! The rigging screw (D) must be slightly over tightened/adjusted to insure a firm and fixed outer section.

Breakaway section adjustment

The breakaway section must release when a force of approximately 150 N is applied to the extremity of the breakaway section.

1. Adjust the spring tension by loosen or tighten eye-bolt (**B**) The spring should have the length of approximately 260mm when correctly adjusted. After adjusted check so nuts are tight on both eye-bolt (**A**) and (**B**)



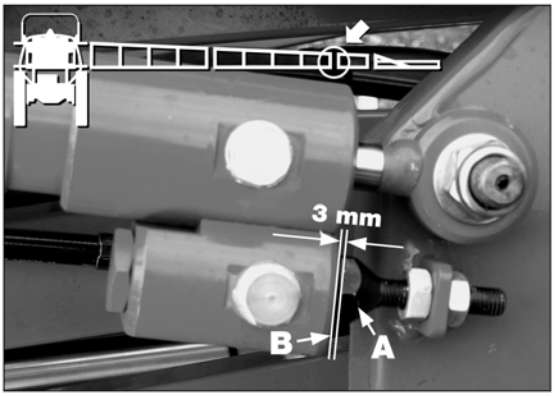
DANGER! Never place fingers into open breakaway clutch! You may be injured if clutch snap closed accidentally!

WARNING! Do not tighten the breakaway clutch more than what is necessary. Over tightening can cause damage to the boom.

End stroke valves

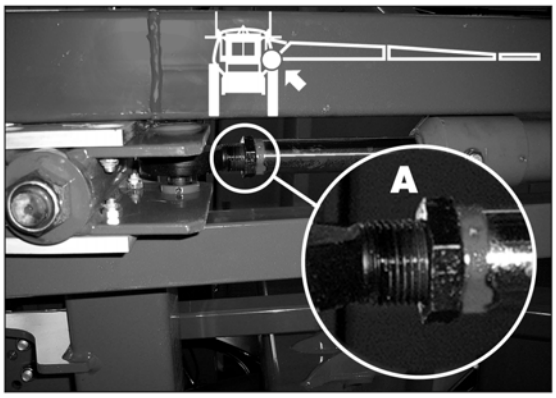
The end stroke valves is activated when the end stop is pressed in. Once activated it will bypass hydraulic to the next fold cylinder.

To inspect the end stop fold the wing and check the distance between the bolt head (A) and the surface (B) of the end stop is 3 mm. Adjust position of bolt (A) if necessary.



Wing tilt adjustment

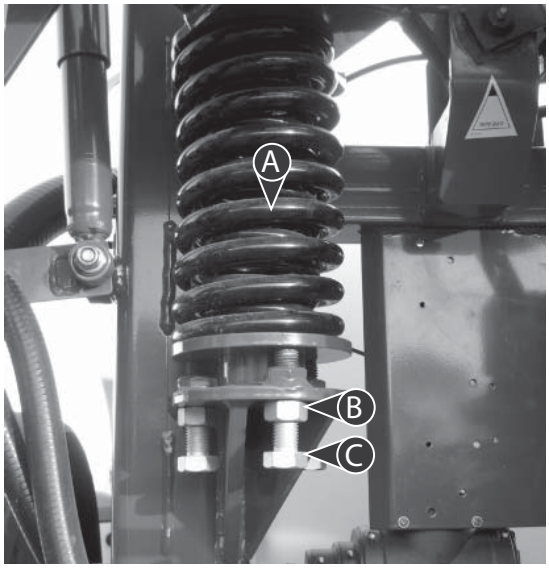
The horizontal adjustment of the inner wings is done with the tilt cylinder. The boom must be straight and horizontal. If not adjust the wing as follows:



1. Make sure the tilt cylinder is fully retracted
1. Support the boom to relieve the load from the hydraulic cylinder.
2. Loosen counter nut (A), which is positioned on the tilt cylinder's piston rod.
3. Adjust the wing level with a spanner (two flat spots on end of the ram) adjust the cylinder ram inwards or outwards to get the desired wing level.
4. Repeat steps for other side.

Suspension

The Force boom is suspended on coil springs (A). In order to obtain the best spray job, the boom wings must be parallel with the ground surface. If an abnormal condition exists the tension of the springs can be adjusted to improve the level of the boom.

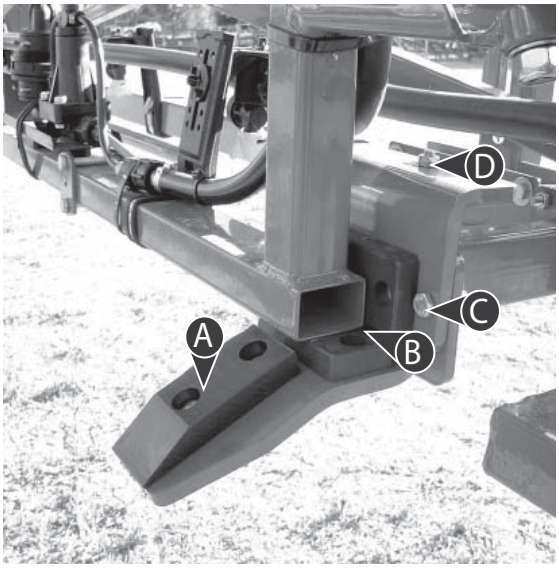


Tension adjustment

1. Loosen the three lock nuts (B).
2. Wind the three spring carrier bolts (C) in or out to tension or de-tension the springs as required.
3. Check to see the level of the boom wings has been improved, and re-tighten the lock nuts (B).

Note: When adjusting the coil springs, make sure the bolts are all adjusted evenly.

Section supports



In order to avoid stress to section components when the boom is folded for transport, adjustable section support brackets are provided (**A**). If the section supports are adjusted correctly, the outer wing sections will mount the bracket ramp and come to rest firmly in contact with the rubber pads on the bracket (**B**).

Adjustment

Inspection and adjustment should take place after the other section alignment procedures have been carried out. To check if the support brackets are adjusted correctly:

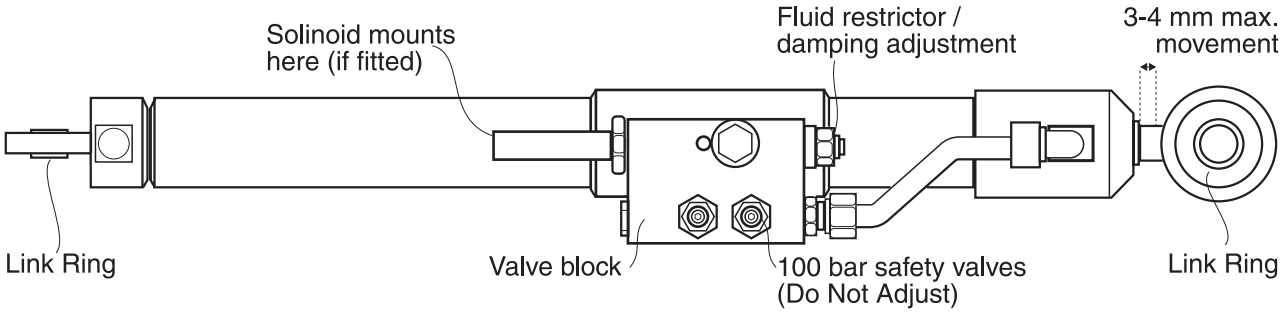
1.Fold the outer wing sections only and observe the level of contact between the wing and the rubber pads on the support bracket (**B**).

2.If the wing section is not contacting the support pads, loosen the two bolts (**C**) and adjust the hight screw (**D**) until the wing section is in firm contact with the pads.

3.Re-tension the two bolts (**C**) and operate to confirm your adjustment was successful.

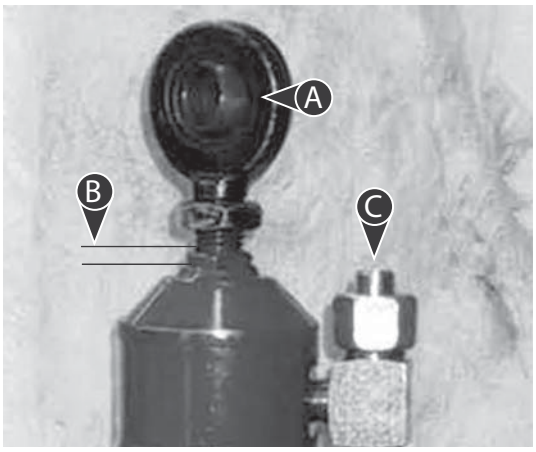
Servicing Damping Cylinder

The performance of the damping cylinder may be adversely affected by the presence of air space within the cylinder's internal hydraulic circuit. This condition may be improved by the following 'priming' procedure but note that the cause of the condition should be investigated and rectified if necessary. If the cylinder is found to have failed completely and no sign of significant oil leakage is present, internal by-pass may be suspected and overhaul/ replacement of the piston seal may be necessary. Note: If a solenoid controlled pendulum lock is fitted but not functioning, no power supply or a defective solenoid should also be investigated.



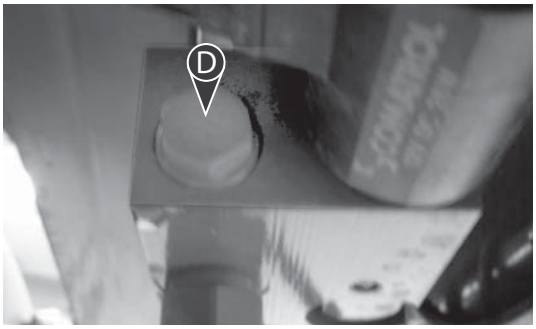
Priming procedure

1. Remove the damping cylinder from the sprayer and secure it vertically in a soft jawed vice as shown.
2. Close the damping adjustment screw by backing off the lock nut and winding the screw in until it seats.
3. Pass a screw driver through the link ring (A) at the end of the hydraulic shaft and operate by hand to determine the amount of free play (un-restricted movement) present (B). The maximum free-play allowable is 5.0 mm.
4. If required, continue by drawing the shaft up and down through it's full range of motion twice, resting at the bottom again.
5. Remove the end cap (C) and top up with a suitable grade oil such as Castrol Hi-spin AWH-M68 or equivalent.
6. Replace the end cap.
7. Repeat steps 4,5 & 6 until no more oil can be added.



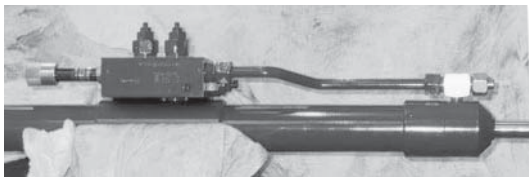
Priming continued

8. Next, turn the cylinder over in the vice 180 degrees and secure it again in the soft jaws.
9. Using a screw driver as before, operate the shaft twice through it's full range of movement, this time leaving it fully extended.
10. Remove the service port plug (D) and top up with oil as previously described (Castrol Hi-spin AWH-M68 or equivalent).
11. Replace the service plug (D).
12. Repeat steps 9 to 11 until no more oil can be added.
13. Reverse the cylinder one last time and repeat steps 4,5 & 6 until no more oil can be added.



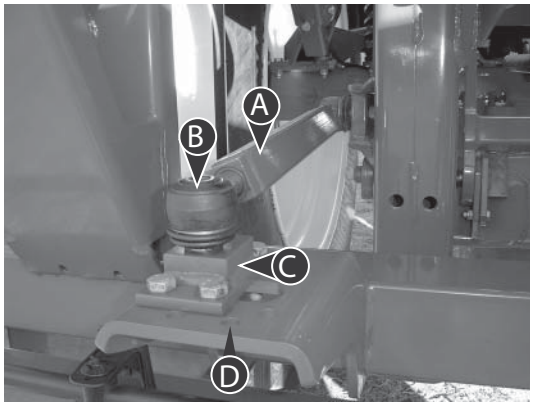
Priming continued

14. Finally turn the cylinder to the horizontal position and secure it in the vice.
15. Using a suitable tool, lock the piston manually and check the free play / stroke. It should be a maximum of 5mm.
16. Remember to reset the damping adjustment / throttle valve.



Boom response adjustment

The FTZ Force boom centre is mounted to the paralift frame via four link arms (**A**) with a ball joint on each end (**B**). The ball joints are mounted to the boom centre via anchor plates (**C**) which can be set in various positions (**D**) depending on the type of terrain to be encountered when spraying.



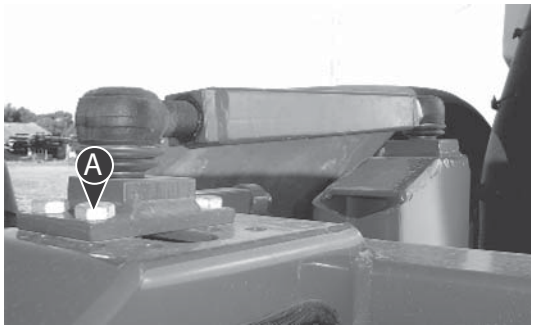
Rule of thumb

For high speed spraying on smooth terrain the ball joint anchor plates on the boom centre should be set further apart (as in the case of the sprayer shown in this photo) allowing less freedom of movement. This type of setting will cause the boom to respond more quickly to the movement of the trailer.

For slower speed spraying on rough terrain less response to the trailers movement is desirable so the ball joint anchor plates on the boom centre should be set closer together allowing the trailer to move more independently of the boom and therefore reducing the possibility of the boom striking the ground.

Anchor plates

As a part of your routine maintenance programme, make a point of checking the tension of the bolts which secure the anchor plates to the boom centre (**A**). This should be carried out after the first 10 hours of operation and every 25 hours thereafter.



Note: If servicing the ball joints / link arms etc, ensure you mark the position of the ball end anchor plates and ensure the link arms are the same length for either side when reassembled.

Operational problems

General info

Operational incidents are frequently due to the same reasons:

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

Therefore ALWAYS check

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

7 - Fault finding

Liquid system

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

Hydraulic system - Z model

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

7 - Fault finding

Boom width

Boom	Width	Inner wing unfolded	Inner + 1st outer unfolded
FTZ FORCE	30 m	12 m	23 m
	32 m	14 m	25 m
	33 m	14 m	25 m
	36 m	14 m	27 m

Boom wheel

	Pressure (bar)
Air bag pressure	2.06
Tyre pressure	2.2

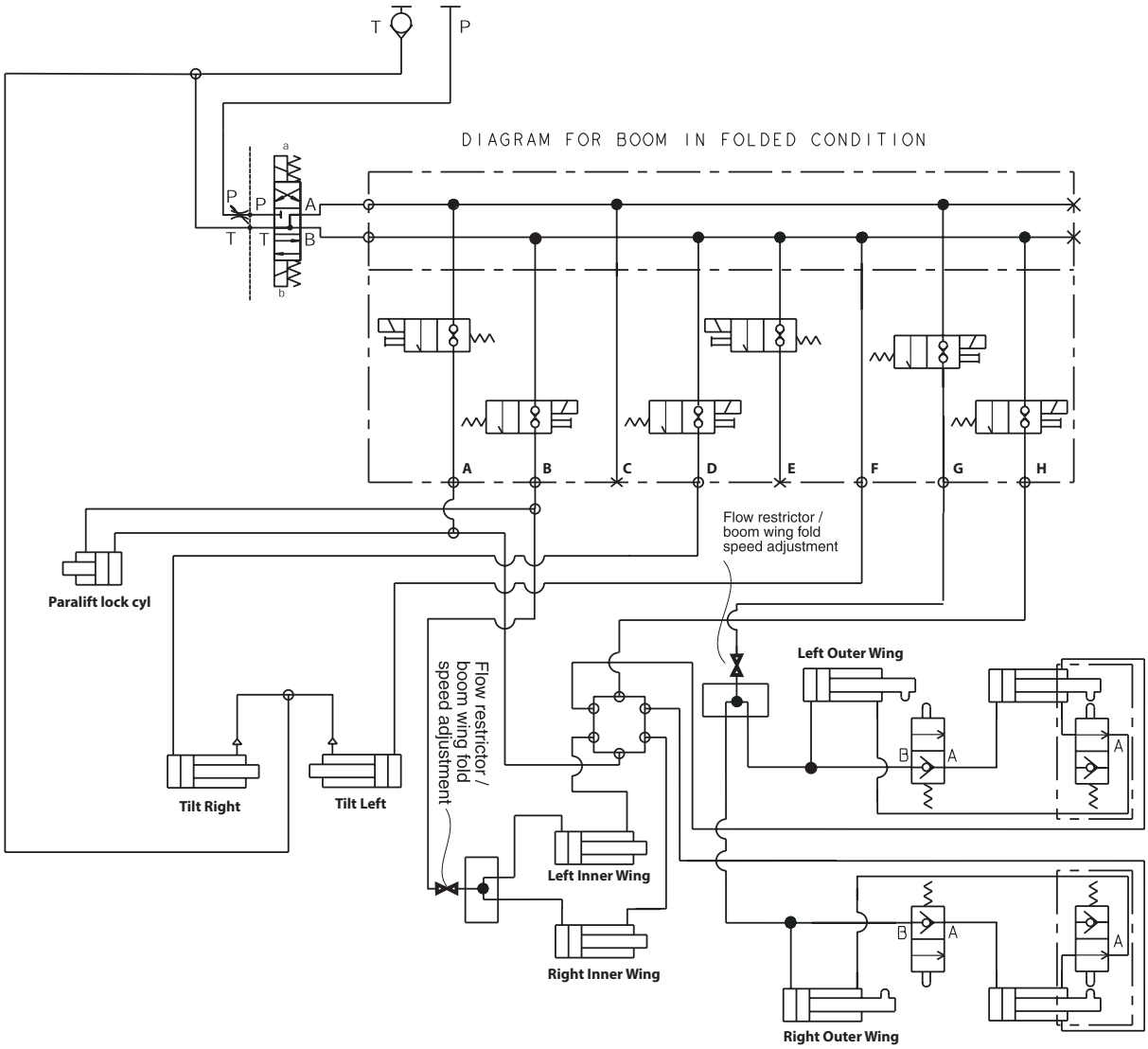
Materials and recycling Disposal of the boom

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

Materials used:

Boom Frame etc.:	Steel
Hoses (suction):	PVC
Hoses (pressure):	EPDM
Valves:	Glass reinforced PA
Filters:	PP
Nozzles:	Unfilled POM
Fittings:	Glass reinforced PA

Charts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B
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Paralift lock cyl
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Flow restrictor / boom wing fold speed adjustment
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Spare parts

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

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