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 on the efficient use and long life of this quality product.

As this instruction book covers all COMMANDER Classic SPB models and all COMMANDER Classic SPC models, please pay attention to the paragraphs dealing with precisely your model.

This book is to be read in conjunction with the „Spray Technique“ book.

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 INTERNATIONAL A/S 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 INTERNATIONAL A/S is without any obligation in relation to implements purchased before or after such changes.

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

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

Published and printed by HARDI INTERNATIONAL A/S
Table of Contents

Declaration of Conformity ................................................................. 4
Operator safety .................................................................................. 5
COMMANDER Classic ........................................................................ 6
Sprayer use ....................................................................................... 8
Unloading the sprayer from the truck .................................................. 8
Before putting the sprayer into operation ........................................... 8
Connecting the sprayer ..................................................................... 9
Drawbars .......................................................................................... 9
Fixed drawbar .................................................................................. 10
STEERING drawbar ........................................................................ 10
SELF TRACK for COMMANDER 2200/2800 .................................. 10
AUTO TRACK ................................................................................ 10
Transmission shaft .......................................................................... 11
Operator safety ................................................................................ 11
Installation of transmission shaft ....................................................... 11
Track gauge .................................................................................... 13
Altering the track gauge ................................................................. 13
Adjustment ranges - track width ..................................................... 14
Turning-arm and rim plate ............................................................... 16
Permitted rim positions .................................................................... 16
Extension kit for centre section ....................................................... 17
Mounting procedure for extension kit ............................................. 17
Hydraulic systems ............................................................................ 18
Indirect Acting Hydraulic system (I.A.H.) ....................................... 18
Hydraulics - joystick handle (type Z only) ....................................... 18
Installation of handle ........................................................................ 18
Installation of control box ............................................................... 19
Control box - EVC operating unit ................................................... 19
Brakes .............................................................................................. 20
Emergency and parking brake (if fitted) .......................................... 20
Hydraulic activated brakes (if fitted) ............................................... 20
Air activated brakes (if fitted) ........................................................ 20
Single-line brakes (if fitted) .......................................................... 21
Double-line brakes (if fitted) ........................................................ 21
Counter weight (TRACKER models only) ....................................... 22
Transport ......................................................................................... 23
Roadworthiness .............................................................................. 23
Rear lights (if fitted) .......................................................................... 23
Stop worklights (if fitted) ............................................................... 23
Transport brackets, height setting .................................................. 23
Transport lock ................................................................................ 24
Adjusting boom transport position ............................................... 24
Driving Technique .......................................................................... 25
STEER TRACK and SELF TRACK ................................................ 25
STEER TRACK (certain models only) .............................................. 25
SELF TRACK ............................................................................... 26
AUTO TRACK ............................................................................... 26
Equipment - Standard and Additional ............................................ 27
Ladder ............................................................................................. 27
Platform .......................................................................................... 27
Tank level indicator ......................................................................... 27
Crop protection Kit (if fitted) .......................................................... 27
Mudguards (if fitted) ......................................................................... 28
Disconnecting the sprayer ............................................................... 29
Operating the boom ........................................................................ 30
Speed regulation of the hydraulic boom movements ...................... 30
Unfolding and folding the SPB-Y and SPC-Y boom ......................... 30
Unfolding and folding the SPB-Z and SPC-Z boom ......................... 31
Folding one side only ........................................................................ 31
Hydraulic slanting control for both SPB-Y/SPB-Z and SPC-Y/SPC-Z (optional equipment) ......................................................... 31
Operating the liquid system ............................................................ 32
SMART VALVE SYSTEM .................................................................. 32
Use of MANIFOLD valve system .................................................... 33
Filling with Suction Filling Device (if fitted) ..................................... 34
Filling with Fast Filling Device (if fitted) .......................................... 34
Filling device and Fast filling device used simultaneously (if fitted) .... 35
Use of Quick coupler for external filling ......................................... 35
Filling of chemicals ......................................................................... 36
Filling through tank lid ..................................................................... 36
Filling by HARDI FILLER chemical inductor ............................... 36
Spraying ......................................................................................... 38
Use of Adjustable Agitation Valve .................................................. 38
Use of rinsing tank and rinsing nozzles (if fitted) ............................... 39
Safety precautions .......................................................................... 39
Personal protection ......................................................................... 39
MANIFOLD Quick Reference ......................................................... 40
Maintenance - rules of thumb ......................................................... 41
Cleaning the sprayer ........................................................................ 41
Cleaning the tank ........................................................................... 41
Cleaning and maintenance of filters ............................................. 42
Lubrication ....................................................................................... 43
About lubricants .............................................................................. 43
Lubrication & oiling plan ............................................................... 44
Service and Maintenance intervals ................................................. 49
10 hours service ............................................................................. 49
50 hours service ............................................................................ 49
100 hours service .......................................................................... 49
250 hours service .......................................................................... 49
1000 hours service or yearly, whichever comes first ....................... 49
Occasional maintenance ............................................................... 50
Readjustment of the boom ........................................................... 56
Off-season storage .......................................................................... 69
Preparing the sprayer for use after storage .................................... 69
Operational problems ...................................................................... 70
TRACKER damping system ........................................................... 70
Liquid system ................................................................................ 71
Hydraulic system ........................................................................... 72
Mechanical problems ..................................................................... 73
EC operating unit . .......................................................................... 74
Technical specifications ................................................................. 75
Overall dimensions ......................................................................... 75
Weight ............................................................................................ 75
Pump capacity ................................................................................. 78
Filters and nozzles ........................................................................... 79
Temperature and pressure ranges ................................................ 79
Brakes ............................................................................................ 79
Materials and recycling ................................................................... 79
Disposal of the sprayer ................................................................. 79
Conversion factors, SI to Imperial units ........................................ 79
Electrical connections ..................................................................... 79
Electrical connections for EVC operating unit ............................... 80
Electrical chart (EVC) ...................................................................... 81
Boom hydraulic SPB-Y, SPC-Y ....................................................... 82
Boom hydraulic SPB-Z, SPC-Z ....................................................... 82
Subject Index .................................................................................. 83
CE Declaration

Declaration of Conformity

Manufacturer,

HARDI INTERNATIONAL A/S
Helgeshej Allé 38
DK 2630 Taastrup
DENMARK

Importer,

Taastrup, September 2003

Lars Bentsen
Product Development Manager
HARDI INTERNATIONAL A/S

declare that the following product;

A) is in conformity with the provisions in the COUNCIL DIRECTIVE of 1998 on mutual approximation of the laws of the Member States on the safety of machines (98/37/EC) as well as other directives (89/336/CEE, 73/23/CEE, 87/404/CEE and 97/23/EC).

B) is in conformity with the current harmonised standards as well as other relevant national technical standards and specifications.

Adhere extra shipping package labels in the Product Identification Certificate.
Operator safety

Watch for this symbol. It means WARNING, CAUTION, NOTE. Your safety is involved so be alert!

Note the following recommended precautions and safe operating practices.

- Read and understand this instruction book before using the equipment. It is equally important that other operators of this equipment read and understand this book.
- Local law may demand that the operator is certified to use spray equipment. Adhere to the law.
- Pressure test with clean water prior to filling with chemicals.
- Wear protective clothing.
- Rinse and wash equipment after use and before servicing.
- Depressurize equipment after use and before servicing.
- Never service or repair the equipment while it is operating.
- Disconnect electrical power before servicing.
- Always replace all safety devices or shields immediately after servicing.
- If an arc welder is used on the equipment or anything connected to the equipment, disconnect power leads before welding. Remove all inflammable or explosive material from the area.
- Do not eat, drink or smoke while spraying or working with contaminated equipment.
- Wash and change clothes after spraying.
- Wash tools if they have become contaminated.
- In case of poisoning, immediately seek medical advice. Remember to identify chemicals used.

Keep children away from the equipment.
Do not attempt to enter the tank.
Do not go under any part of the sprayer unless it is secured. The boom is secure when placed in the transport brackets.

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

COMMANDER Classic
The COMMANDER plus is divided into three zones: a Clean zone, a Working zone and an Application zone, referring to the level of possible pesticide contamination.

CLEAN ZONE
- Locker for protective gear
- Clean water tank
- Tap for hand washing
- Support leg
- Pump
- P.T.O. shaft

WORKING ZONE
- Tank level indicator
- MANIFOLD valves
- Couplers for fast filling
- Working platform with ladder
- Hydraulic and electric components
- Boom and Work lights
- PARALIFT boom lift system
- Boom
- Nozzles
- Mudguards
- Suspension
- Crop Protection Kit

APPLICATION ZONE
- HARDI FILLER
- Lockers for pesticide containers and equipment

Please note that some of the features are optional equipment.
Description

**Frame**
Strong and compact frame with several options of drawbars and wheel sizes. The frame has a strong chemical and weather resistant electrostatic lacquer coat. Screws, nuts, etc. have been DELTA-MAGNI treated to be resistant to corrosion.

**Tank**
UV-resistant Polyethylene in a suitable design with no sharp corners for easy agitation, emptying and cleaning. Nominal contents 2200, 2800, 3200 or 4200 l.

**Pump**
Diaphragm pump with 6 diaphragms, model 363 or 463, depending on boom width, with easily accessible valves and diaphragms. Standard = 540 r.p.m. (6 splines)
Optional = 1000 r.p.m. (21 splines).

**MANIFOLD SYSTEM**
All functions of the spray circuits are operated via the centrally situated MANIFOLD valves with colour coded plates and pictorial symbols for easy operation.

**Operating unit**
The system is based on EVC - Electrical Valve Control. The on/off is linked to the section valves, which is resulting in a very quick response to on/off.

The operating unit is constructed of modules and is electrically controlled via a remote control box.

The built-in HARDI-MATIC ensures a constant volume per hectare of the liquid (l/ha) at varying forward speed within the same gear when the number of P.T.O. revolutions are between 300-600 r.p.m. (pump 540 r.p.m) or 650-1100 r.p.m. (pump 1000 r.p.m.).

**Filters**
With the self-cleaning filter the impurities that exist in the spray liquid will bypass the filter and be recirculated back to the tank via the return flow. Also suction filter and nozzle filters are standard. In-line pressure filters can be fitted as option.

**Boom**
The SPB boom is available in 15, 18, 20 and 21 m working width.
The SPC boom is available in 24, 27, 28 and 30 m working width.

Outer sections incorporate spring loaded breakaway.

Both the SPB boom and the SPC boom are available in two different hydraulic system versions – both equipped with I.A.H. (Indirect Acting Hydraulics) and named:

1. SPB-Y & SPC-Y
These type of booms are operated via the tractor hydraulics. These models feature hydraulic lift cylinder for boom height adjustment and two cylinders for simultaneous boom wing fold and unfold.

2. SPB-Z & SPC-Z
These type of booms have the same features as the above mentioned Y-models, but are provided with more advanced hydraulics. SPB-Z and SPC-Z also have two boom wing tilt cylinders that give the ability to obtain individual boom wing tilt as well as individual boom wing fold.

The hydraulics on the SPB-Z and SPC-Z are controlled via a joystick or via a hydraulic control box.

**Identification plates**
An identification plate fitted on the frame indicates producer name, model, own weight, max. weight, max. pressure of the hydraulic system, and max. pressure of the spray liquid system. Frame, boom centre frame, and inner/outer sections also have identification plates indicating boom type and part number of spare parts. If ordering spare parts, inform your dealer of these, so the right model and version are described.

---

(Certain countries only)
Description

Sprayer use
The HARDI COMMANDER sprayer is for the application of crop protection chemicals and liquid fertilisers.

The equipment must only be used for this purpose. It is not allowable to use the sprayer for other purposes.

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

Unloading the sprayer from the truck
For the unloading of the sprayer a crane or a fork lift is needed. When loading with a crane please observe the lifting points as shown on the illustration, and make sure that the straps or belts used for lifting are strong enough.

Before putting the sprayer into operation
Although the sprayer has been applied with a strong and protective surface treatment on steel parts, bolts etc. in the factories, it is recommended to apply a film of anticorrosion oil (e.g. CASTROL RUSTILLO or SHELL ENSIS FLUID) on all metal parts in order to avoid chemicals and fertilisers discolouring the enamel.

If this is done before the sprayer is put into operation for the first time, it will always be easy to clean the sprayer and keep the enamel shiny for many years.

This treatment should be carried out every time the protection film is washed off.
Connecting the sprayer

**Drawbars**
Mounted on the chassis in a centre pivot, the drawbar can be either standard fixed or optionally steered. Steering can be hydraulically operated or it can be automatically controlled (AUTO TRACK).

**Overview - Drawbar systems**

<table>
<thead>
<tr>
<th>COMMANDER</th>
<th>FIXED DRAWBAR</th>
<th>STEERING DRAWBAR</th>
<th>AUTO TRACK</th>
<th>SELF TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200/2800</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Following drawbar extensions are available. The drawbar extensions are available - steering or fixed - for both high and low tractor hitch points. Each drawbar is available in a long or a short version.

**Overview - Drawbar extensions**

<table>
<thead>
<tr>
<th>Drawbar extensions</th>
<th>COMMANDER 2200/2800</th>
<th>COMMANDER 3200/4200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swivel type Ø33</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Swivel type Ø36</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hitch Ø50 (ISO 5692)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>High hitch</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

All drawbars are available in a long and a short version, except High hitch.

**Mounting the drawbar extension**
The extension piece is inserted into the opening of the drawbar, fastened by two main bolts through the two holes A and secured by two linch pins.

**Support leg**
The support leg is stored in the bracket on the sprayer’s right side when the sprayer is attached to the tractor.

To remove the support leg: Lift the leg, remove the linch pin and pull out the support leg.

The support leg can then be mounted to the drawbar extension and secured by linch pin.
Sprayer setup

Fixed drawbar
Make sure the drawbar points straight ahead from its position on the trailer. If not, the two turnbuckles A can be adjusted till the drawbar is centred.

![Fixed drawbar](image)

STEERING drawbar
*Transport lock (if fitted)*
The transport lock is a safeguard that will keep the drawbar in a centred position in case of hydraulic leakage during transport on public roads.

The transport lock is fixed by linch pins.

If necessary, the transport lock can be adjusted by turning the turnbuckle.

![STEERING drawbar](image)

NOTE! If possible, lock the tractor hydraulic lever when the lift arms are in the correct position to avoid the sprayer weight resting on the stabiliser chains.

3. Tighten the lift arm stabiliser chains.

![NOTE!](image)

WARNING! Do not stand in the area around the drawbar during manoeuvring.

![WARNING!](image)

AUTO TRACK
Please refer to separate instruction book.

![AUTO TRACK](image)

SELF TRACK for COMMANDER 2200/2800
SELF TRACK is connected as follows:

1. Attach the tractor lower links in the two mountings of the SELF TRACK. Adjust the length of the drawbar if necessary - to obtain the best tracking, choose the setting where the distance X is equal to distance Y. Secure with linch pins.

![SELF TRACK](image)

2. Attach safety chains to top link clevis. The chain will prevent the transmission shaft from being damaged if the lift arms are lowered too far. Adjust the chain length so the chains are tight when the tractor P.T.O. and pump shaft are in a horizontal line.

![Hose package support](image)

Hose package support
To prevent hoses and wiring from being damaged by the tractor wheels, all hoses, cables and wires are held by the hose bracket A fitted to the drawbar.

Check that the length of the hoses and cables are sufficient by tight turns.
Sprayer setup

Transmission shaft
Operator safety
To avoid accidents and personal injuries, note the following recommended precautions and safe operation practices.

1. Always STOP ENGINE before attaching the transmission shaft to tractor P.T.O. - most tractor P.T.O. shafts can be rotated by hand to facilitate spline alignment, when engine is stopped.

2. When attaching the shaft, make sure that the snap lock is FULLY ENGAGED - push and pull shaft until it locks.

**WARNING!** ROTATING TRANSMISSION SHAFTS WITHOUT PROTECTION GUARDS ARE FATAL.

3. Always keep protection guards and chains intact and make sure that it covers all rotating parts, including CV-joints at each end of the shaft. Do not use without protection guard.

4. Do not touch or stand on the transmission shaft when it is rotating - safety distance: 1.5 meter.

5. Prevent protection guards from rotating by attaching the chains allowing sufficient slack for turns.

6. Make sure that protection guards around tractor P.T.O. and implement shaft are intact.

7. Always STOP ENGINE and remove the ignition key before carrying out maintenance or repairs to the transmission shaft or implement.

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

1. Attach sprayer to tractor and set sprayer height in the position with shortest distance between the tractor and sprayer pump P.T.O. shafts.

2. Stop engine and remove ignition key.

3. If transmission shaft must be shortened, the shaft is pulled apart.

   Fit the two shaft parts at tractor and sprayer pump and measure how much it is necessary to shorten the shaft.

   Mark the protection guards.

4. The two parts are shortened equally. Use a saw, and file the profiles afterwards to remove burrs.

5. Grease the profiles and assemble male and female parts again.

6. Fit the shaft to tractor P.T.O. and sprayer pump shaft.

**NOTE!** Female part marked with a tractor towards tractor!
Sprayer setup

7. Fit the chains to prevent the protection guards from rotating with the shaft.

8. To ensure long life of the transmission shaft, try to avoid working angles greater than 15°.
**Sprayer setup**

**Track gauge**  
**Altering the track gauge**  
The track gauge of the COMMANDER can be altered stepless as follows,

1. Measure the current track gauge (centre RH tyre to centre LH tyre). Each side must be extended or retracted half the desired alteration.
2. Attach the sprayer to tractor and engage tractor parking brake.
   
3. Place stop wedges in front of and behind RH wheel. Jack up LH wheel, support and secure sprayer body.
4. Loosen clamp bolts for LH wheel axle.
5. Loosen the nut B on the brake operating arm. Extend/retract this arm according to the adjustment of the axle.

**COMMANDER without suspension**

6. Extend or retract the axle. A sack barrow and a rod will facilitate the operation.

7. If the rim position must be changed (described later in this chapter) do this first and fine adjust by extending or retracting the axles. Remember to tighten the wheel nuts to the specified torque:

   - Rim plate to rim: 280 + 30 Nm (207 + 22 lbft)
   - Rim plate to hub: 490 Nm (288 lbft)

8. Tighten the clamp bolts to a torque of:

   - 280 Nm (207 lbft) for 2200/2800
   - 390 Nm (289 lbft) for 3200/4200.

9. Tighten nut B again.

**IMPORTANT!** Place the jack under the axle and lift the wheel to remove load from the clamps before tightening the clamp bolts to the specified torque.

10. Repeat the procedure on RH wheel.
11. Check the distance from centre tyre to centre of tank frame is equal at RH and LH.
12. Retighten clamp bolts and wheel bolts to specified torque after 8 hours of work.
Sprayer setup

Adjustment ranges - track width

The maximum track width for all models is 2250 mm.

The minimum track width depends on the parameters in the charts beneath and whether the sprayer is equipped with suspended axle - or not. Please refer to the following charts (all figures in mm).

See example for explanation on how to read the charts.

Track width - Sprayers without suspension

<table>
<thead>
<tr>
<th>CM plus 2200</th>
<th>Tyre size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprayer with:</td>
<td>9.5 x 44&quot;</td>
</tr>
<tr>
<td>Flange hub</td>
<td>1500</td>
</tr>
<tr>
<td>Mudguards</td>
<td>1500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CM plus 2800</th>
<th>Tyre size</th>
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</thead>
<tbody>
<tr>
<td>Sprayer with:</td>
<td>9.5 x 44&quot;</td>
</tr>
<tr>
<td>Flange hub</td>
<td>1500</td>
</tr>
<tr>
<td>Mudguards</td>
<td>1500</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>CM plus 3200</th>
<th>Tyre size</th>
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<tr>
<td>Sprayer with:</td>
<td>9.5 x 44&quot;</td>
</tr>
<tr>
<td>Flange hub</td>
<td>1820</td>
</tr>
<tr>
<td>Mudguards</td>
<td>1820</td>
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</table>

Alternative (by shortened axles):

| Mudguards    | 1570 | 2250 | 1590 | 2250 | 1590 | 2250 | 1780 | 2250 | 1780 | 2250 |

<table>
<thead>
<tr>
<th>CM plus 4200</th>
<th>Tyre size</th>
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<tbody>
<tr>
<td>Sprayer with:</td>
<td>9.5 x 44&quot;</td>
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<tr>
<td>Flange hub</td>
<td>1820</td>
</tr>
<tr>
<td>Mudguards</td>
<td>1820</td>
</tr>
</tbody>
</table>

Alternative (by shortened axles):

| Flange hub   | 1540 | 2000 | 1680 | 2000 | 1730 | 2000 |

It is not permitted to fit dual wheels!

IMPORTANT! On TRACKER models a minimum track width of 1800 mm is strongly recommended to ensure stability and to avoid the sprayer from tipping over.

NOTE! The wider the track width is, the better is the stability of the sprayer and boom.
Sprayer setup

### Track width - Sprayers with suspension

<table>
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<th>Sprayer with:</th>
<th>CM plus 2200</th>
<th>Tyre size</th>
<th>9.5 x 44&quot;</th>
<th>9.5 x 48&quot;</th>
<th>11.2 x 44&quot;</th>
<th>11.2 x 48&quot;</th>
<th>12.4 x 46&quot;</th>
<th>18.4 x 38&quot;</th>
<th>20.8 x 38&quot;</th>
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<thead>
<tr>
<th>Sprayer with:</th>
<th>CM plus 4200</th>
<th>Tyre size</th>
<th>9.5 x 44&quot;</th>
<th>9.5 x 48&quot;</th>
<th>11.2 x 44&quot;</th>
<th>11.2 x 48&quot;</th>
<th>12.4 x 46&quot;</th>
<th>18.4 x 38&quot;</th>
<th>20.8 x 38&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flange hub</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mudguards</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
<td>1800 2250</td>
</tr>
</tbody>
</table>

*Hydraulic suspension in combination with 11.2 and 12.4 tyres is not recommended for boom sizes larger than 24 m.

It is not permitted to fit dual wheels!

**IMPORTANT!** On models with hydraulic suspended axles a minimum track width of 1800 mm is strongly recommended to ensure stability and to avoid the sprayer from tipping over.

**IMPORTANT!** On TRACKER models a minimum track width of 1800 mm is strongly recommended to ensure stability and to avoid the sprayer from tipping over.

**NOTE!** The wider the track width is, the better is the stability of the sprayer and boom.
Sprayer setup

**Turning rim and rim plate**
Track gauge can be altered by turning rim and rim plate, positions referred to as ‘+’ or ‘-’ position.

![Diagram of rim and rim plate positions]

**Permitted rim positions**

**WARNING!** When altering track gauge by turning rims and rim plates the maximum permitted offset between centre wheel and hub flange must be observed:

Max offset, hub flange and centre rim:

<table>
<thead>
<tr>
<th>COMMANDER model</th>
<th>Min. rim offset</th>
<th>Max. rim offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200/2800</td>
<td>-45</td>
<td>+55</td>
</tr>
<tr>
<td>3200/4200</td>
<td>-33</td>
<td>+55</td>
</tr>
</tbody>
</table>

**Overview**

![Overview diagram]

**IMPORTANT!** Tyre sizes 18.4 x 38” and 20.8 x 38” are not permitted in any “+ position”, only use the “- positions”.

---

16 GB 05 04 04
**Extension kit for centre section**

If the sprayer is fit with large-size tyres, the boom centre section may be in lack of sufficient space in unfolded position.

To obtain sufficient space, an extension kit can be mounted between boom centre section and the paralift. Thereby, the space between centre section and paralift can be increased by approx. 30 cm.

*Mounting procedure for extension kit*

1. Unfold the boom
2. Secure boom (centre section) by means of a crane.
3. Loosen the 4 bolts which join the paralift and the centre section.
4. Fit the extension bracket A by means of the 4 bolts to centre section and paralift.

**Suspension (SPC only)**

The SPC boom features adjustable suspension for 24-28 m booms and 30 m booms.

The spring A has two assembly positions as shown on the illustration below. Position 1 is meant for 24-28 m booms and position 2 is meant for 30 m booms.

Please control that the setup of the suspension corresponds to the actual boom width of your sprayer.
Sprayer setup

Hydraulic systems

Indirect Acting Hydraulic system (I.A.H.)

Connection requirements for SPB-Y and SPB-Z are:

- One single acting outlet for the lift function of the spray boom
- One double acting outlet for the folding function

Ensure that snap couplers are clean before connection!

NOTE! The hydraulic system requires a minimum oil pressure of 130 bar, max. oil pressure of 210 bar and an oil capacity of approx. 5 litres. After having operated the boom and the system has been filled with oil, check tractor’s hydraulic oil level and top up if necessary.

IMPORTANT! Due to the variation in tractor hydraulic systems and capacities, care should be exercised when initially operating the sprayer hydraulic cylinders. It is advisable to adjust the hydraulic flow control down to the minimum rate before operating the system. Adjust/increase the flow control after the system is bled of any air, if necessary.

Hydraulics - joystick handle (type Z only)

Installation of handle

1. Attach the control handle/joystick A to the hydraulic lever that operates the double acting outlet to be used. The universal mounting bracket B is very flexible and a number of different mounting positions can be used.

2. Connect the plug C to the tractor’s 12V power system. Try to hook-up the handle as close as possible to the battery power supply. HARDI recommends using an electric distribution box (ref. no. 817925) to ensure a good power supply to various 12V attachments.

Note! Check with your dealer or tractor operator’s manual for the best location to hook up the 12V system.

Note polarity:
- BROWN wire = Positive (+)
- BLUE wire = Negative (-)

3. Connect electric plug D from sprayer’s hydraulics to plug E on handle.
Sprayer setup

Hydraulics - control box (type Z only)

Installation of control box
1. Connect the plug A to the tractor’s 12V power system. Try to hook-up the handle as close as possible to the battery power supply. HARDI recommends using an electric distribution box (ref. no. 817925) to ensure a good power supply to various 12V attachments.

Note! Check with your dealer or tractor operator’s manual for the best location to hook up the 12V system.

Note polarity:
- BROWN wire = Positive (+)
- BLUE wire = Negative (-)

2. Route the cable, with the 7 pins, from the hydraulic mount plate to the tractor.
3. Mount the hydraulic control box B in a suitable location in the tractor cabin.
4. Connect the female 7 pin plug C from the switch box to the 7 pin male plug D from the sprayer.

Control box - EVC operating unit
The control boxes for EVC-operating unit is fitted in the tractor cabin at a convenient place. Tapping screws can be used for mounting.

Power requirement is 12V DC.

Note Polarity:
- BROWN wire = Positive (+)
- BLUE wire = Negative (-)

The wires must have a cross sectional area of at least 4.0 mm to ensure sufficient power supply. For the EVC-operating unit the tractor circuit should have an 8 Amp fuse.

Use the HARDI Electric distribution box (Ref. no. 817925) if the tractor has a doubtful power supply.
**Sprayer setup**

**Brakes**

**Emergency and parking brake (if fitted)**
The parking brake lever has two function modes, which are determined by the small pawl control clip (A).

To change between the two modes, turn the clip.

**Pos. 1:** The pawl control clip must point away from the pawl.

**Pos. 2:** The pawl control clip must rest against the pawl.

To disengage the parking brake:
1. Set pawl control clip in pos. 1.
2. Pull the lever a little forward to release the pawl from the ratchet and then push the lever fully backwards.

To engage the parking brake:
1. Set pawl control clip in pos. 2.
2. Pull the lever firmly forwards until parking brake is fully engaged.

**Emergency brake**

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

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

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

**Oil reservoir**

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

**IMPORTANT!** Max. oil pressure is 150 bar (2175 p.s.i.) in the brake line. Relieve parking brake before driving.

**Air activated brakes (if fitted)**

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

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

**NOTE!** If the air hose(s) are disconnected with air in the brake air tank, control pressure will be dumped and the brakes will engage fully. If the sprayer must be moved with air in the tank and without the air hose(s) connected to the tractor, the load apportioning valve must be set at “relieved” to disengage the brakes. Remember to reset the handle to brake position again afterwards. When parking the sprayer, always engage the parking brake, as the air brakes will only be engaged as long as there is air in the tank! Cover the couplings with the dust flaps when hoses are disconnected.
# Sprayer setup

**Single-line brakes (if fitted)**

Flip the snap coupler protection flap away and connect the brake system snap coupler to the tractor outlet (black) and let the compressor fill the sprayer's air reservoir.

Check brake circuit for leaks.

**Dual-line brakes (if fitted)**

Flip the snap coupler protection flaps away and connect the two snap couplers for supply and control to the tractor outlets, and check brake circuits for leaks.

The couplers are colour coded and secured against incorrect attachment:

- **Red** = Supply line (RH)
- **Yellow** = Control line (LH)

Relieve parking brake before driving
Sprayer setup

Counter weight (TRACKER models only)
To improve stability on TRACKER models, extra weight can be added by means of liquid-filled tyres.

The standard tyre valve is an universal air-water valve.

The tyres can be filled with liquid to max. 75% of their total volume. The table below indicates the 75% volume.

<table>
<thead>
<tr>
<th>Tyre size</th>
<th>Max. litres of liquid per tyre</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5 x 44”</td>
<td>101</td>
</tr>
<tr>
<td>9.5 x 48”</td>
<td>108</td>
</tr>
<tr>
<td>11.2 x 44”</td>
<td>133</td>
</tr>
<tr>
<td>11.2 x 48”</td>
<td>144</td>
</tr>
<tr>
<td>12.4 x 46”</td>
<td>178</td>
</tr>
<tr>
<td>16.9 x 38”</td>
<td>285</td>
</tr>
<tr>
<td>18.4 x 38”</td>
<td>390</td>
</tr>
<tr>
<td>20.8 x 38”</td>
<td>466</td>
</tr>
</tbody>
</table>

Use a mixture of water and CaCl₂ to avoid frost damage as described in table below:

<table>
<thead>
<tr>
<th>CaCl₂ per litre water</th>
<th>Protection to</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 g (7.1 oz)</td>
<td>-15°C (30.6°F)</td>
</tr>
<tr>
<td>300 g (10.6 oz)</td>
<td>-25°C (12.6°F)</td>
</tr>
<tr>
<td>435 g (15.4 oz)</td>
<td>-35°C (-5.4°F)</td>
</tr>
</tbody>
</table>

**WARNING!** It is very important that the CaCl₂ is added to the water and agitated until it is fully dissolved. Never pour water on to CaCl₂! If you get CaCl₂ in the eyes, flush instantly with cold water for at least 5 minutes and seek medical advice afterwards.

**IMPORTANT!** The tyres must be liquid filled to max. 75% of total tyre volume. Fill only the qty. of liquid necessary to obtain sufficient stability of the sprayer. Do not fill liquid and CaCl₂ mixture in tyres without tubes!

To fill the tyres:

1. Jack up the wheel and rotate wheel till the valve is positioned at “12 o’clock”.
2. Remove the valve body and fill liquid until it reaches the valve.
3. When surplus liquid is drained through the valve stem fit the valve body again.
4. Adjust tyre pressure and lower the wheel. (Please refer to table for correct tyre pressure).

**NOTE!** Disposal of CaCl₂ has to take place according to local legislation.

Recommended tyre pressure:

<table>
<thead>
<tr>
<th>Tyre size</th>
<th>Recommended inflation pressure in bar (p.s.i.)</th>
<th>Minimum Load Index A8/A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>230/95 R44</td>
<td>3.6 (52)</td>
<td>134/145</td>
</tr>
<tr>
<td>230/95 R48</td>
<td>3.6 (52)</td>
<td>136/147</td>
</tr>
<tr>
<td>270/95 R44</td>
<td>3.6 (52)</td>
<td>140/151</td>
</tr>
<tr>
<td>270/95 R48</td>
<td>3.6 (52)</td>
<td>142/153</td>
</tr>
<tr>
<td>300/95 R46</td>
<td>3.6 (52)</td>
<td>147/158</td>
</tr>
<tr>
<td>420/85 R38</td>
<td>1.6 (23)</td>
<td>141/152</td>
</tr>
<tr>
<td>520/70 R38</td>
<td>1.6 (23)</td>
<td>147/144</td>
</tr>
<tr>
<td>580/70 R38</td>
<td>1.2 (18)</td>
<td>154/151</td>
</tr>
</tbody>
</table>

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

To empty the tyres:

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

**NOTE!** Disposal of CaCl₂ has to take place according to local legislation.
Sprayer setup

Transport Roadworthiness
When driving on public roads and other areas where the highway code applies, or areas where there are special rules and regulations for marking and lights on implements, observe these and equip implements accordingly.

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

Rear lights (if fitted)
Connect plug for rear lights to the tractor’s 7-pin socket, and check function of rear lights, stop lights and direction indicators on both sides before driving.

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

Before transport on public roads the front warning boards with position lamps must be folded out (fitted in certain countries only).

Stop wedges (if fitted)

Transport brackets, height setting
The transport brackets can be set in different positions. Thereby it is possible to obtain different transport heights and suitable clearance above various tractor cabins.

When changing the setting of the transport brackets it is done as a combination of adjusting the transport brackets themselves (1) and adjusting the transport locks (2). Always choose a transport height as low as possible.

1. Transport brackets
The transport bracket can be set at three different positions A, B or C.
Loosen the bolt to change position and replace it according to new setting. The setting must be identical on both sides.

2. Transport lock
To change position:

1. Lift and unfold inner sections till lock is disengaged.
2. Loosen and remove the two bolts, which keep the parts A and B assembled.
3. Reassemble A and B according to desired hole combination.

NOTE! Always use both bolts to assemble the lock. The setting must be identical on both sides.

NOTE! The rear settings must correspond to the front settings so the boom is resting on the front as well as rear brackets.

WARNING! The max. transport height must never exceed 4.0 m (13.1 ft.). Always measure the actual total height and choose settings not exceeding 4.0 m.
Sprayer setup

**Transport lock**
When the boom is unfolded: Inspect the gap between the bolt A and the frame. Correct position = 1 mm gap.

If necessary, adjust the position of bolt A.

**Adjusting boom transport position**
If the boom wings do not rest accurately in the transport brackets, the wings can be adjusted as described below:

1. Lift the boom all the way to the top.
2. Fold the boom into transport position. With the fold cylinder pressurized, determine if the boom wings need to be adjusted inwards or outwards.
3. Relieve the pressure from the fold cylinder by unfolding the boom a few centimetres.
4. If the boom rests too far in on the transport brackets, loosen the nut B and adjust collar A in towards the cylinder housing.
5. If the boom rests too far out on the transport brackets, the collar A has to go out from the cylinder housing.
6. Secure jam nut B.
7. Pressurize the cylinder to see if the boom is properly adjusted. If not, repeat the above procedure until it is correctly adjusted.
Sprayer setup

Driving Technique

STEER TRACK and SELF TRACK
A trailer with articulating drawbar (Tracker) behaves differently than a normal trailer.

In tracking position the vehicle centre of gravity is displaced further more compared to the vehicle centre line of a normal trailer.

Compared to a conventional trailer a Tracker has decreased stability when turning, especially when turning on hillsides.

To avoid overbalancing, pay attention to these guidelines:

1. Avoid sudden, tight turns
2. Slow down before entering a curve or turning, and drive with a constant, low speed during the turn.
3. Never slow down too fast, never brake heavily and never stop suddenly in a curve, or when turning on a hillside, when the sprayer is articulated.
4. Be careful when turning on uneven ground
5. Set the track gauge as wide as possible
6. The proper function of the hydraulic damping is essential to obtain good stability
7. Keep stabiliser chains on the tractor’s liftarms tight
8. For safety reasons, the following limitations are set for Trackers (with unfolded booms):

| Speed by turning, max. | 4 km/h (2.5 m.p.h.) |
| Ground inclination by turning, max. | 8° |
| Track gauge, min. | Please see the part “Track gauge” |

NOTE! HARI cannot undertake any responsibility for any damages caused by the sprayer tipping over.

STEER TRACK (certain models only)
(If the sprayer is equipped with HARDI NOVA, please see separate instruction book).

The articulating drawbar on STEER TRACK is to be operated manually via the D.A.H.

The switch on the D.A.H. control box is pushed side-wards to articulate the drawbar.

This is used when turning or as track correction when driving on slopes.
Sprayer setup

SELF TRACK
The SELF TRACK is always in tracking mode.

The SELF TRACK drawbar will always articulate when the tractor is turning and follow the tractor rear wheels.

The SELF TRACK drawbar is hydraulically damped to obtain stable trailing.

WARNING! Always drive the SELF TRACK very carefully on public roads, and be aware of the sprayer’s behaviour. Slow down before turning, to avoid the vehicle from tipping over.

AUTO TRACK
Please see separate instruction book.
Sprayer setup

Equipment - Standard and Additional

Ladder

Down: Pull the handle (A) to disengage the locking device and tilt ladder down.

Up: Tilt the ladder up and it will lock automatically when it is fully unfolded.

NOTE! Always unfold the ladder before driving.

Platform
Access to the platform is possible via the ladder (A).

The platform gives access to the clean water tank lid, the main tank lid, the top mounted suction filter and the self-cleaning filter, which is situated on the backside of the MANIFOLD system.

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

NOTE! If extra high accuracy are needed HARDI FILLMETER can be fitted as optional equipment.

Crop protection Kit (If fitted)
The kit consists of sheet, straw dividers and wheel brake covers.

Sheet
The PVC sheet is fitted underneath the trailer and covers the undercarriage of the chassis.

The sheet is lead through guiding rails fastened on both sides of the trailer.
Sprayer setup

Each cutout in the shield is then fastened with a matching locking device, which are mounted along the lower part of the sprayer.

Drag the split, twist it 90° and drop the split again to lock it

Strawdividers
A strawdivider can be fitted on each trailer wheel.

Wheel brake covers
A wheel brake cover A can be mounted in order to cover the brake.

Mudguards (if fitted)
Mudguards can be fitted on the trailer wheels by means of a supporting frame which is bolted to a mounting on the wheel axle.

Mudguards are available for all wheel configurations.
Sprayer setup

Disconnecting the sprayer
Always clean the sprayer - inside and outside - before disconnecting and parking it.

Support leg
Before disconnecting from the tractor, make sure the support leg is properly fitted and secured by linch pin.

The support leg is stored in the bracket on the right side of the trailer when the sprayer is attached to the tractor.

To remove the support leg: Lift the leg, remove the linch pin and pull out the support leg.

WARNING! To prevent the sprayer from tipping over, do not disconnect the sprayer from the tractor with the booms unfolded unless the boom is supported!

Always engage the parking brake (if fitted).

If no parking brake is fitted, or if local regulations requires so, place stop wedges in front of and behind the wheels.

Remember to disconnect all hoses and cables from the tractor.

WARNING! If the sprayer is parked unattended avoid unauthorised persons, children and animals from having access to the sprayer.

Transmission shaft support
The transmission shaft rests on the bracket A when not in use (Low hitch models).

At High hitch models the transmission shaft is placed in the hook underneath the drawbar when not in use.
Operation

Operating the boom

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

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

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

- Never use the folding functions in areas with overhead power lines.
- Unintended boom movements can cause contact with overhead power lines.

**NOTE!** A label (ref. no. 978448) follows the sprayer. This label must placed in the cabin at a place visible from the operator’s seat.

Unfolding and folding the SPB-Y and SPC-Y boom

**WARNING!** Ensure that pendulum is locked in order to prevent abrupt boom movements.

1. Raise the boom to release it from the transport brackets.
2. Activate the double acting hydraulics outlet to unfold the boom. Both wings will now unfold simultaneously.
3. When the boom is completely unfolded, it can be raised or lowered to the desired spray height by activating the single acting hydraulic outlet.
4. Before attempting to fold the boom back into transport position, it should be raised all the way to the top by activating the single acting outlet.
5. The boom is folded by activating the double acting outlet in the opposite direction that was used to unfold the boom. The boom can now be lowered into the transport brackets.

Speed regulation of the hydraulic boom movements

**WARNING!** Test of the hydraulic system should be done very cautiously. There may be air in the system, which can cause violent movements of the boom. Therefore, take care that no persons are hurt, or objects damaged, in the process of testing.

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

Adjustable restrictors for the regulation of boom folding and unfolding are located on the hydraulic distribution block (fitted to the centre section).

It is important to adjust the valves to ensure that the boom operates smoothly and at correct folding/unfolding speed.

Unfold and fold the boom several times in order to heat the oil and remove air from the system and then adjust screws til the boom runs with the desired speed.
**Operation**

Unfolding and folding the SPB-Z and SPC-Z boom

**WARNING!** Always put the boom wings in the horizontal position prior to folding. Never attempt to fold the boom to transport position when the boom wings are tilted - unexpected boom movements may occur, if the wings are tilted when folding.

**A. Boom equipped with hydraulic joystick**

Switch **A** operates: Left hand fold cylinder
Switch **B** operates: Right hand fold cylinder
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder

1. Raise the boom to release it from the transport brackets
2. Depress switches **A** and **B** and move the joystick forward or rearward to activate oil flow.
   (Switch positions of the hoses in the double acting remote outlet, if you do not like the direction required to activate the boom).
3. ‘One side folding’ is achieved by following the above procedure - except that only one of the switches is depressed (See section ‘Folding one side only’).

**B. Hydraulic control box**

Switch **A** operates: Left hand fold cylinder
Switch **B** operates: Right hand fold cylinder
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder

1. Raise the boom to release it from the transport brackets.
2. Activate switch **A** upwards and hold it to unfold left hand boom wing. (Holding the switch in the ‘down’ position will fold the boom wing).
3. Activate switch **B** upwards and hold it to unfold right hand boom wing. (Holding the switch in the ‘down’ position will fold the boom wing).
4. ‘One side folding’ is achieved by following the above procedure - except that only one of the switches is activated. (See section ‘Folding one side only’).

**Folding one side only**

If only one side of the boom is to be unfolded, first unfold the boom completely and then turn switches off. Then flip the switch for the side that is to be folded and activate the double acting outlet to fold that side into transport position.

**Note!** It is not advisable to go directly from transport position to spraying position with one side only. Therefore, first unfold both boom wings completely.

**Hydraulic slanting control for both SPB-Y/SPB-Z and SPC-Y/SPC-Z**

(optional equipment)

A hydraulic slanting control kit can be mounted on the centre section.

This enables slanting of the entire boom in order to match the local topography. This is advantageous when spraying along hillsides.

**Note!** Always reset position to neutral before folding the boom.
Operating the liquid system
SMART VALVE SYSTEM
The SMART VALVE SYSTEM is located at the left side of the sprayer and permits operation of the liquid system from one position. Below is a principal sketch of the liquid system.

Conventional liquid system
Function diagram
1. Suction filter
2. Suction manifold
3. Pump
4. Pressure manifold
5. Agitation/Rinsing valve
6. Agitation tube
7. Safety valve
8. HARDI-MATIC
9. Self-cleaning filter return
10. Self-cleaning filter
11. Check valve
12. Boom section valves
13. Boom
14. Boom pressure gauge
15. Flush tank
16. HARDI chemical inductor
17. Tank rinse nozzles
18. Pressure equalization return
19. Boom Tube Pressure relief
20. Options
21. Ball valve
Operation

Use of MANIFOLD valve system
The following pictograms and colours are used for visualizing the functions of the MANIFOLD valves:
- Green disc (A) = Pressure Smart Valve
- Black disc (B) = Suction Smart Valve
- Upper green disc (C) = Agitation/Rinsing valve

Same colour references are used at the MANIFOLD Quick Reference (D)

On the Agitation/Rinsing valve a function is activated/opened by turning the handle towards the desired function.

On the Smart Valve a function is activated/opened by turning the handle towards the desired function. If the lever points at an unused position, then the Smart Valve will be closed.

To operate the spraying functions:

- Turn the handle on a green pressure valve towards the desired function
- Turn the handle on a black suction valve towards the desired function

NOTE! If a MANIFOLD valve is too tight to operate - or if it is too loose (= liquid leakage), the valve needs to be serviced. Please see the part “Occasional maintenance - Adjustment of 3-way-valve” for further information. Correct setting is when the valve can be operated smoothly by one hand.

Electric operated MANIFOLD valves (if fitted)
One or more MANIFOLD valve(s) can be electrically operated via a control box in the tractor cab. These can only be operated manually when the power to the valve motor is disconnected first.

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

*Agitation
Normally, Agitation should be on but please refer to the following rules of thumb:

1. Close agitation if a high level of effervescence occurs in order to reduce the amount of foam.
2. Choose “Agitation” when using powder chemicals in order to avoid sedimentation.
3. Close the valve if spraying with a high volume and it is impossible to achieve sufficient pressure or if a high level of effervescence occurs in order to reduce the amount of foam.

The valves and functions may vary from machine to machine depending on optional equipment fitted.
Operation

Filling with Suction Filling Device (if fitted)

Grip positions:

Agitation/Rinsing  |  Pressure  |  Suction

The Suction Filling Device is operated as follows:

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

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

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

Filling with Fast Filling Device (if fitted)

Grip positions:

Agitation/Rinsing  |  Pressure  |  Suction

The Fast Filling Device is operated as follows:

1. Ensure spray liquid tank contains at least 50 litres of water.
2. Remove cover (A) and connect suction hose (B).
3. Turn handle on Pressure Manifold towards Fast Filler. With the P.T.O. at 540 r/min or 1000 r/min (depending on pump model), the pressure gauge should indicate about 10 bar.
4. If water is not seen in the transfer tube, prime by turning valve (C).
5. Keep an eye on the liquid level indicator.
6. Turn handle on Pressure Manifold away from Fast Filler to discontinue filling process.

NOTE! Turn handle towards -operating unit before turning away from Fast Filler in order to avoid peak pressure blowing the safety valve!

7. Disconnect suction tube (B) and replace cover.
**Operation**

**Filling device and Fast filling device used simultaneously (if fitted)**

**Grip positions:**

- Agitation/Rinsing
- Pressure
- Suction

The Filling Device and the Fast Filling Device can be used simultaneously - this gives even bigger filling capacity.

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

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

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

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**Use of Quick coupler for external filling**

**Grip positions:**

- Agitation/Rinsing
- Pressure
- Suction

The quick coupler is operated as follows:

1. Fit the external water hose to the quick coupler on the trailer.
3. Turn handle on Pressure Manifold towards Main tank.
4. Turn handle on Suction Manifold towards Filling device.
5. Depending on the chemical in question, the Pressure Manifold can be set on “Agitation”. If no agitation is needed, this valve must be closed.
6. Engage the P.T.O. and start the pump.

**WARNING!** Do not leave the sprayer whilst refilling the tank, and keep an eye on the level gauge in order **NOT** to overfill the tank!
**Filling of chemicals**
Chemicals can be filled in the tank in two ways:

1. Through tank lid.
2. By means of HARDI FILLER chemical filling device.

**1. Filling through tank lid**
The chemicals are filled through the tank lid - Note instructions on the chemical container!

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

1. Make sure the EVC is switched off.
2. Set the MANIFOLD valves to correct position. Black valve “Suction from main tank”, upper green valve towards “Agitation”.
3. Engage the pump and set P.T.O. revolutions to 540 r/min or 1000 r/min (depending on pump model).
4. Add the chemicals through the main tank hole.
5. When the spray liquid is well mixed, turn handle on the Smart Valve towards “Spraying” position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

**Filling by HARDI FILLER chemical inductor**

**Grip positions:**

**Agitation/Rinsing**

**Pressure**

**Suction**

To get access to the HARDI FILLER, grab the handle and drag the HARDI FILLER the whole way down. Due to the spring loaded suspension, it will stay in this position. After use, it is pushed the whole way up again.

**Filling of Liquid chemicals**

1. Fill the main tank at least \( \frac{1}{3} \) with water (unless something else is stated on the chemical container label). See section “Filling of water”.
2. Turn the handle at the Suction Manifold towards “Main tank”. Turn green Smart Valve towards “HARDI FILLER and the upper green valve towards agitation. Close remaining valves.
3. Check that bottom valve A at the FILLER is closed.
4. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
5. Open FILLER lid.
6. Measure the correct quantity of chemical and fill it into the hopper.

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

7. Open the bottom valve A and the chemical is transferred to the main tank.
8. If the chemical container is empty it can be rinsed by the container rinsing device (if fitted). Place the container over the multi-hole nozzle and press the lever B.

**WARNING!** Do not press lever B unless the multi-hole nozzle is covered by a container to avoid spray liquid hitting the operator.

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

9. Engage the hopper rinsing device by opening valve C.
10. Close valve C again when the hopper is rinsed.

**IMPORTANT!** The hopper rinsing device is using spray liquid for rinsing the hopper for concentrated chemical! The FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

10. When the spray liquid is well mixed, turn handle on the Pressure Smart Valve towards “Spraying” position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

**Filling of Powder chemicals**
1. Fill the main tank at least \( \frac{1}{2} \) with water (unless something else is stated on the chemical container label). See section “Filling of water”.
2. Turn the handle at the Suction Manifold towards “Main tank” and upper green valve towards “Agitation”. Turn the handle at the Smart Valve towards “HARDI FILLER”. Close remaining valves.
3. Engage the pump and increase P.T.O. speed to 540 r/min or 1000 r/min (depending on pump model).
4. Open the bottom valve A at the FILLER. Open FILLER lid.
5. Engage the hopper rinsing device by opening valve C.
6. Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the rinsing device can flush it down.
7. If the chemical container is empty it can be rinsed by the container rinsing device (if fitted). Fit the bag bracket and place the powder bag over the multi-hole nozzle and press the lever B.
Operation

Spraying
Grip positions while spraying with agitation:

Use Adjustable Agitation to adjust the needed amount of agitation related to selected spraying volume.

Grip positions while spraying without agitation:

Spray Technique - see separate book

Use of Adjustable Agitation Valve
The valve is marked with arrows on the green disc that indicates the amount of liquid that passes through the valve. If handle is turned to a position near the tip of the arrow, then only a small amount of liquid is allowed to pass the valve. Otherwise, if handle is turned to a position in the wide end of the arrow, it means that a larger amount is passing the valve. This gives the possibility to continuously adjust how large amount of fluid from the pump is used for agitation in the tank and for spraying.

Examples on handle positions at different agitation quantities:

1. Handle is in same position as (open) agitation position at the original valve. Agitation quantity is 100%.

2. Handle is positioned at the middle of the arrow (in agitation side of the disk). Agitation quantity is 50%.

3. Handle is positioned in closed position. Agitation quantity is 0%.
Use of rinsing tank and rinsing nozzles (if fitted)

Grip positions:

The incorporated rinsing tank can be used for two different purposes.

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

1. Empty the sprayer as much as possible. Close the upper green pressure valve (no agitation) and spray till air comes out of all nozzles.
2. Turn black suction valve towards “Rinsing tank”.
3. Turn upper green pressure valve towards “Rinsing nozzle” (if fitted).
4. Engage and set the pump at approximately 300 r.p.m.
5. When rinsing water corresponding to approximately 1/3 of rinsing tank content is used, turn black suction valve towards “Suction from main tank” and operate all valves, so all hoses and components are rinsed.
6. Turn green Smart Valve back to “Operating unit” and spray liquid in the field you have just sprayed.
7. Repeat point 3-7 until the rinsing tank is empty.

B. Rinsing the pump, operating unit, spray lines, etc. in case of stop in spraying before main tank is empty (e.g. beginning rain etc.).

1. Close Self-cleaning filter (Ballofix).
2. Turn black suction valve towards “Rinsing tank”.
3. Close upper green pressure valve (no agitation).
4. Engage the pump and spray water from rinsing tank in the field until all nozzle tubes/nozzles are flushed with clean water.
5. Disengage pump again.
6. Open Self-cleaning filter again.

WARNING! The rinsing nozzles cannot always guarantee a 100% cleaning of the tank. Always clean manually with a brush afterwards, especially if crops sensitive to the chemical just sprayed are going to be sprayed afterwards!

Safety precautions

Always be careful when working with crop protection chemicals!

Personal protection
Dependant on which type of chemical used, the following protective clothing/equipment should be used:

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

This equipment should be worn to avoid contact with the chemicals.

Protective clothing/equipment should be used when preparing the spray liquid, during the spraying work and when cleaning the sprayer. Also follow the recommendations on the chemical label.

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

Always clean the sprayer carefully and immediately after use.

Do not mix different chemicals in the tank.

Always clean the sprayer before changing to another chemical.
Water filling

Chemical filling

Spraying

Cleaning
Aspirate 1/3 of rinsing tank content

Operate all functions

Repeat 3 times

Spray out all the diluted tank content
Maintenance

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

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

Cleaning the sprayer
Guidelines
1. Read the whole chemical label. Take note of any particular instructions regarding recommended protective clothing, deactivating agents, etc. Read the detergent and deactivating agent labels. If cleaning procedures are given, follow them closely.

2. Be familiar with local legislation regarding disposal of pesticides washings, mandatory decontamination methods, etc. Contact the appropriate department, e.g. Dept. of Agriculture.

3. Pesticide washings can usually be sprayed out on a soakaway. This is an area of ground that is not used for cropping. You must avoid seepage or runoff of residue into streams, water courses, ditches, wells, springs, etc. The washings from the cleaning area must not enter sewers. Drainage must lead to an approved soakaway.

4. Cleaning starts with the calibration, as a well calibrated sprayer will ensure the minimal amount of remaining spray liquid.

5. It is good practice to clean the sprayer immediately after use and thereby rendering the sprayer safe and ready for the next pesticide application. This also prolongs the life of the components.

6. It is sometimes necessary to leave spray liquid in the tank for short periods, e.g. overnight, or until the weather becomes suitable for spraying again. Unauthorised persons and animals must not have access to the sprayer under these circumstances.

7. If the product applied is corrosive, it is recommended to coat all metal parts of the sprayer before and after use with a suitable rust inhibitor.

Remember:

- Clean sprayers are safe sprayers.
- Clean sprayers are ready for action.
- Clean sprayers cannot be damaged by pesticides and their solvents.

Cleaning the tank
1. Dilute remaining spray liquid in the tank with at least 10 parts of water and spray the liquid out in the field you have just sprayed - See paragraph "Use of rinsing tank and rinsing nozzles".

NOTE! It is advisable to increase the forward speed (double if possible) and reduce the pressure to 1.5 bar (20 psi).

2. Select and use the appropriate protective clothing. Select detergent suitable for cleaning and suitable deactivating agents if necessary.

3. Rinse and clean sprayer and tractor externally. Use detergent if necessary.

4. Remove tank and suction filters and clean. Be careful not to damage the mesh. Replace suction filter top. Replace filters when the sprayer is completely clean.

5. With the pump running, rinse the inside of the tank. Remember the tank roof. Rinse and operate all components and any equipment that has been in contact with the chemical.

Before opening the distribution valves and spraying the liquid out, decide whether this should be done in the field again or on the soakaway.

6. After spraying the liquid out, stop the pump and fill at least 1/6 of the tank with clean water. Note that some chemicals require the tank to be completely filled. Add appropriate detergent and/or deactivating agent, e.g. washing soda or Triple ammonia.

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

7. Start the pump and operate all controls enabling the liquid to come in contact with all the components. Leave the distribution valves until last. Some detergents and deactivating agents work best if left in the tank for a short period. Check the label. The Self-Cleaning Filter can be flushed by removing the bypass hose from the bottom of the filter. Stop the pump and remove the hose. Start the pump for a few seconds to flush filter. Be careful not to lose the restrictor nozzle.

8. Drain the tank and let the pump run dry. Rinse inside of the tank, again letting the pump run dry.

9. Stop the pump. If the pesticides used have a tendency to block nozzles and filters, remove and clean them immediately. Also check for sediment on the pressure side of the safety valve for the Self-Cleaning Filter.
10. Replace all the filters and nozzles and store the sprayer. If, from previous experiences, it is noted that the solvents in the pesticide are particularly aggressive, store the sprayer with the tank lid open.

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

**Cleaning and maintenance of filters**

Clean filters ensure:

- Sprayer components such as valves, diaphragms and operating unit are not hindered or damaged during operation.
- Nozzle blockages do not occur whilst spraying.
- Long life of the pump. A blocked suction filter will result in pump cavitation.

The main filter protecting sprayer components is the suction filter at the top of the tank. Check it regularly.
**Maintenance**

**Lubrication**

**About lubricants**

- 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.

- **NOTE!** If the sprayer is cleaned with a high pressure cleaner or fertiliser has been used, lubrication of all sections is recommended.

**Recommended lubricants**

<table>
<thead>
<tr>
<th>Lubricating points</th>
<th>Lubricant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball bearings</td>
<td><strong>A</strong> Universal Lithium grease, NLGI No. 2 SHELL RETINAX EP2 CASTROL LMX GREASE</td>
</tr>
<tr>
<td>Slide bearings</td>
<td><strong>B</strong> Lithium grease with Molybdenum disulphide or graphite SHELL RETINAX HD M2 CASTROL MOLYMAX</td>
</tr>
<tr>
<td>Oil lubricating points</td>
<td><strong>C</strong> TOTAL Transmission TM SAE 80W/90 CASTROL EPX 80W/90 SHELL SPIRAX 80W/90 MOBIL MOBILUBE 80W/90</td>
</tr>
</tbody>
</table>

*) **Guidelines - greasing**

- Follow the shown direction concerning recommended quantity.

- If no recommended quantity is given, feed lubricator till new grease becomes visible.
Maintenance

Lubrication & oiling plan

Use this quantity of grease (in gram)
Operating hours
Type of lubricant

Position on the sprayer

---

Trailer

Boom
**Maintenance**

1. A - 50h - 40g/50g*

2. A - 10h

3. All models

4. A - 200h

5. B - 50h

* Pump model 363 = 40g
Pump model 463 = 50g
**Maintenance**

6 *Without suspension*

6 *With suspension*
Maintenance

9 SPC only

10 SPB only

11 (If fitted)

C - 500h

B - 50h

T212-0021

T219-0003

B - 50h

B - 50h

B - 50h

B - 50h

B - 50h

SPC only

SPC only

SPC only

SPB only
Service and Maintenance intervals

10 hours service

1. Suction filter, clean
2. Self-cleaning filter, check and clean gauze if necessary
3. In-line filters, clean
4. Nozzle filters, clean
5. Spraying circuit, check for leaks
6. Brakes Air tank, drain
7. Brakes, check

50 hours service

Do all previous mentioned +

1. Wheel bolts and nuts, tighten
2. Air brakes, check
3. Expansion bottle (SELF TRACK only), check air pressure
4. Tyre pressure, check
5. Transmission shaft, check

100 hours service

Do all previous mentioned +

1. Fixed drawbar, check/adjust
2. Retighten bolts

250 hours service

Do all previous mentioned +

1. Wheel bearings, check
2. Parking brake, inspect
3. Wheel brake, adjust
4. Air brake filters, clean
5. Hydraulic brakes, inspect
6. Hydraulic circuit, check
7. Expansion bottle (SELF TRACK only), check oil level
8. Hoses and tubes, check
9. Readjustment of the boom

1000 hours service or yearly, whichever comes first

Do all previous mentioned +

1. Wheel bearings and brakes, check
2. Transmission shaft, change parts
3. Change of bearings - centre and inner section
Occasional maintenance

Pump valves and diaphragms renewal
Cone check/renewal, EVC operating unit
Cone check/renewal, EVC distribution valve
Wear bush renewal, boom lift
Wear bush renewal, drawbar
Venting the hydraulic damping system (SELF TRACK)
TRACKER damper pressure setting (SELF TRACK)
Shock absorbers, inspect
Level indicator adjustment
Cord renewal, level indicator
Seal renewal, drain valve
Wear bush renewal, drawbar
Wear bush renewal, boom lift
Venting the hydraulic damping system (SELF TRACK)
TRACKER damper pressure setting (SELF TRACK)
Shock absorbers, inspect
Level indicator adjustment
Cord renewal, level indicator
Seal renewal, drain valve
Nozzle tubes and fittings
Replacement of transmission shaft protection guards
Replacement of transmission shaft cross journals
Adjustment of 3-way-valve
Change of bulbs
Adjustment of slanting control indicator cable
Change of tyres
Adjustment of breakaway device
Yaw dampers
Rubber dampers

⚠️ Always check that all lock nuts are tight after adjustment

Glossary

The text in the following part refers to adjustments performed in the folds between the different boom sections. An overview of the names of the sections is shown here:

A: Centre section
B: Inner section
C: Outer section
D: Breakaway section
10 hours service

1. Suction filter
To service the suction filter:
1. Pull out the steel clip A.
2. Lift the suction hose fitting B from housing.
3. Filter guide and filter C can now be removed.

To reassemble:
4. Press the guide onto filter end.
5. Place the filter into housing with guide facing up.
6. Ensure the O-ring D on the hose fitting is in good condition and lubricated.
7. Refit the suction hose B and steel clip A.

2. Self-Cleaning Filter
1. Unscrew nut A and open filter.
2. Check filter gauze B, clean if necessary
3. Lubricate O-ring C
4. Assemble filter again.

3. In-Line filter (if fitted)
If the boom is equipped with In-Line Filters unscrew the filter bowl to inspect and clean filter.

Alternative filters are available. See section Technical specifications - Filters and nozzles.

4. Nozzle filters
Check and clean.

5. 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.

6. Brakes Air tank
Drain the air tank for condensed water at the drain valve.

7. Brakes
Apply brake pedal and check function of trailer brakes.

8. Retighten bolts (suspension only)
Check that these 9 bolts - on each side of the COMMANDER - are tight. Retighten if necessary. Tightening torque:

Bolt 1 = 24 Nm (retain nut on the backside of the mounting by a spanner while adjusting bolt 1).
Bolt 2-9: 280 Nm

Bolt 8 and 9 are situated behind the spring.
50 hours service

1. Wheel bolts and nuts
Tighten wheel bolts and nuts as follows with following torque wrench settings:

Wheel hub to rim plate: 490 Nm (362 lbf ft)
Rim plate to rim: 280 + 30 Nm (207 + 22 lbf ft)

Tightening sequence:
See illustration (1-8).

2. Air brakes
The air brakes are checked for leaks by following procedure:

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

3. Expansion bottle (SELF TRACK only)
Check air pressure in the expansion tank for the hydraulic damping at the pressure gauge.

Fill through valve A if necessary.
Air pressure: 5 bar (73 p.s.i.)

4. Transmission shaft
Check function and condition of the transmission shaft protection guards. Replace possible damaged parts.

5. Tyre pressure
Check the tyre pressure according to the table below.

<table>
<thead>
<tr>
<th>Tyre size RC 95</th>
<th>Recommended inflation pressure in bar (p.s.i.)</th>
<th>Minimum Load Index A8/A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>230/95 R44</td>
<td>3.6 (52)</td>
<td>134/145</td>
</tr>
<tr>
<td>230/95 R48</td>
<td>3.6 (52)</td>
<td>136/147</td>
</tr>
<tr>
<td>270/95 R44</td>
<td>3.6 (52)</td>
<td>140/151</td>
</tr>
<tr>
<td>270/95 R48</td>
<td>3.6 (52)</td>
<td>142/153</td>
</tr>
<tr>
<td>300/95 R46</td>
<td>3.6 (52)</td>
<td>147/158</td>
</tr>
<tr>
<td>420/85 R38</td>
<td>1.6 (23)</td>
<td>141/152</td>
</tr>
<tr>
<td>520/70 R38</td>
<td>1.6 (23)</td>
<td>147/144</td>
</tr>
<tr>
<td>580/70 R38</td>
<td>1.2 (18)</td>
<td>154/151</td>
</tr>
</tbody>
</table>

IMPORTANT! If renewing tyres always use tyres with min. load index as specified in the table.

WARNING! Never inflate tyres more than to the pressure specified in the table. Over-inflated tyres can explode and cause severe personal injuries! See the part Occasional Maintenance - Change of tyre.
100 hours service

1. Check/adjust drawbar (Fixed drawbar only)
   If too much play is found in the lateral movements of the drawbar it must be adjusted.

   Regulate on the turnbuckles A on each side in order to adjust and centre the drawbar.
**250 hours service**

1. **Wheel bearings**
   Check for play in the wheel bearings:

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

2. **Inspect parking brake**
   Inspect the following:

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

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

   Correct length: When the brake is relieved the cable must be tight and yet not stretched.

   Lengthening/shortening of the parking brake cable is carried out by adjusting the nut A.

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

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

   1. Place the handbrake in the first jag. (Please refer to illustration).

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

   2. Loosen nut B, lift and flip the small lock plate aside.
   3. Adjust the nut A clockwise. Turn the nut 90° (1/4 turn) at a time - alternately on both LH and RH brake.

   **After each 1/4 turn:**
   Check the hub by rotating it. Continue adjustment till resistance occurs. This adjustment is completed, when each hub is strained.
4. **Air brake filters (if fitted)**

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

5. **Hydraulic brakes**

Apply brakes to full pressure and inspect brake lines for damages or leaks. Replace damaged parts.

**IMPORTANT!** If the hydraulic brake lines have been dismantled the circuit must be primed afterwards:

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

6. **Hydraulic circuit**

Check the hydraulic circuit for leaks and repair if any.

7. **Expansion bottle (SELF TRACK only)**

Check the oil level:

1. Depressurize the expansion bottle through valve A first.
2. Remove the level plug B and check that the oil level is reaching the level hole. Add if the level is low.
3. Tighten the plug again and inflate the bottle to 5 bar air pressure.

8. **Hoses and tubes**

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

9. **Readjustment of the boom**

Please see next page.
Readjustment of the boom
Before adjusting the boom please go through this check list:

- Lubricate the sprayer (please see part about Lubrication)
- Tractor and sprayer must be placed on level ground
- The boom should be unfolded (unless specific guidelines are given)
- If boom is equipped with slanting control: Set slanting angle at midway

Adjustment of hydraulic cylinders is best done without pressure in the hydraulic system.

**WARNING! NO ADMITTANCE UNDER THE BOOM WHILE ADJUSTMENT IS CARRIED OUT!**

Checking and Adjusting sprocket timing (SPB only)
1. Unfold the boom and stand on its rear side.
2. Check that the pin connection A in the timing chain is aligned with the centre line B between the sprocket cap screws.
   
   \[ *A = 7\text{th pin connection} \]

3. To adjust timing, loosen turnbuckles on the front and rear cables until slack.
4. Line up the chain and sprocket as indicated in step 2 above.

Alignment of centre section and inner section
1. Unfold the boom and check alignment of the inner section with the centre section.
2. If adjustment is necessary, relieve pressure from the cylinder by folding the boom a few centimetres.
3. Disconnect cylinder rod eye A from the inner section.

**Note!** Some cylinder rods have a machined flat which can be used for adjustments. If using this one for adjustment, leave the rod eye pinned to the boom.

4. Loosen jam nut B and adjust the length of the rod eye A.
   
   \[ \begin{aligned} 
   \text{IN} &= \text{to move the boom forward} \\
   \text{OUT} &= \text{to move the boom rearward} 
   \end{aligned} \]

5. Tighten the jam nut B again. (Reattach the cylinder rod to the boom again, if it has been loosened).

6. Pressurize the cylinder to check boom alignment.

---

Right Wing Sprocket
Alignment of inner section and outer section

1. Unfold the boom and check that the boom wing is aligned. If adjustment is needed:
2. SPB type: Remove stop device A from the inner section. SPC type: Loosen stop device A.
3. Adjust the position of the adjusting bolt B on the inner section so that the cap of the bolt head B contacts top stop plate on outer section with inner and outer sections aligned. Tighten it in this position.
4. SPB type: Fit stop device A again. SPC type: Tighten stop device A again.

**SPB only:** Please note that the rubber stop (= stop device A) should be compressed 3-5 mm. Therefore, check that the distance between the tabs C is a little less than the length of the rubber stop itself. The rubber stop may need to be spaced out with 1 or more flat washers in order to obtain correct compression. Tighten nut to hold it in place.

Adjusting the front fold cable

The performance of the SPB/SPC boom while spraying depends very much on the front fold cable adjustment. A correctly adjusted cable will also control the movement of the outer section.

**WARNING!** The rear cable can snap and injure you or someone else if tensioned when the boom is unfolded. Always adjust the front cable first - with the boom unfolded and the rear cable last - with the boom folded in transport position.

1. Unfold the boom.
2. Check security of turnbuckle anchors to its hinges.
3. Slide a straight edge A down the underside of the inner section until it contacts the front cable = contact point (B).
4. Suspend a weight of 4.5 kg from the straight edge-to-cable contact point (B) and check deflection by measuring the distance from the straightedge to the cable. Cable should deflect 13-22 mm.

If adjustment is needed:
Adjusting the breakaway clutch
The function of the breakaway section is to prevent or reduce boom damage, should it strike an object or the ground.

Adjust the screw A until the breakaway will release at a force of 80 N at the extremity.

Please note that the clutch must be well greased before adjustment is commenced.

5. Loosen jam nuts C on the turnbuckle assembly and adjust turnbuckle D for proper cable deflection.
6. Tighten jam nuts C again and remove weight

IMPORTANT! Check boom alignment again. If front cable was tightened, the wing assembly will move a bit forward. If front cable was loosened, the wing assembly will move a bit rearward. Therefore, adjust fold cylinder, if necessary, as described in the section ‘Alignment of centre section and inner section’.

SPC type breakaway is shown here. Same principle applies for SPB type.

Adjusting boom level to ground
Unfold the boom and check that the boom sections are parallel to the centre frame and level to the ground. Adjust if necessary, as described below. Adjustment is carried out with the boom unfolded.

A. SPB-Y 18-21 m
1. Loosen jam nut A.
2. Adjust nut B - in or out - until boom wing is level to the ground.
3. Secure jam nut A again.

Same procedure applies to both sides.

B. SPC-Y 24-28 m
1. Loosen jam nuts A at both ends of rod B.
2. Adjust length of rod B until boom wing is level to the ground.

Note! If rod is removed to adjust length, the boom wing must be supported.
3. Secure jam nuts A again.

Same procedure applies to both sides.
C. SPB-Z & SPC-Z models

1. Ensure that cylinder is fully extended.
2. Loosen jam nut A.
3. Apply an adjustable wrench to the machined surface at B.
4. Turn the cylinder rod until boom is level to the ground.
5. Secure jam nut A again.

WARNING! Never adjust the centre cables without having folded the boom all the way into the transport position.

1. Fold the boom into transport position.
2. Check that the tilt cylinders are completely extended. Adjust if necessary (SPB-Z only).
3. Check that centre section cable A is routed over centre section nozzle bracket B.
4. Loosen jam nuts C on the bolt assembly D. This applies both boom wings.
5. Adjust the threaded bolt(s) E. Alternate from side-to-side while making adjustments.

IMPORTANT! Adjust both boom wings in one sequence. Adjust one cable a small amount at the time, and then the other cable, to equalize cable tension and maintain a level centre frame.

Adjusting rear cable

WARNING! The rear cable can snap and injure you or someone else if tensioned when the boom is unfolded. Always adjust the front cable first - with the boom unfolded and the rear cable last - with the boom folded in transport position.

1. Raise boom to its highest position. Fold it to transport position with tilt cylinders fully extended. Make sure that fold cylinders are pressurized and that the boom is folded all the way in.
2. Ensure the boom transport brackets are in contact with the outer wing. Adjust if necessary.
3. Loosen the jam nuts on the turnbuckle. Adjust the turnbuckle so that the outer section contacts the boom transport bracket.

If 18-21 m boom: Turn the turnbuckle another 4 complete turns and retighten the jam nuts.

If 24-28 m boom: Turn the turnbuckle another 3 complete turns and retighten the jam nuts.

Adjusting centre section cables

The centre section cables keep the centre frame in correct position during folding procedure or when spraying with one side raised and folded (SPB-Z only).

WARNING! Never adjust the centre cables without having folded the boom all the way into the transport position.

1. Fold the boom into transport position.
2. Check that the tilt cylinders are completely extended. Adjust if necessary (SPB-Z only).
3. Check that centre section cable A is routed over centre section nozzle bracket B.
4. Loosen jam nuts C on the bolt assembly D. This applies both boom wings.
5. Adjust the threaded bolt(s) E. Alternate from side-to-side while making adjustments.

If 18-21 m boom: Turn the turnbuckle another 4 complete turns and retighten the jam nuts.

If 24-28 m boom: Turn the turnbuckle another 3 complete turns and retighten the jam nuts.
As a guideline for adjustment, follow the distance shown at the bolt assembly below:

Properly adjusted cables will be very tight and only deflect a small amount (mm) when pulled by hand.

**Note!** Cables will be loose when the boom is unfolded.

6. Tighten jam nuts C again.
7. Unfold the boom and inspect that the centre frame is correctly centred.

**Jaw rubber dampers (SPC only)**
Inspect basic adjustment of the rubber jaw dampers. Basic adjustment = The compression of the jaw should correspond to a distance of 34 mm (+/- 0.5).

Measure and adjust the jaw if necessary by means of the two M12 bolts.

**Yaw damping**
Tighten/loosen bolt A to adjust slack at point B.

**Guideline:**
If boom does not work smoothly or if it works in ‘steps’:
Loosen bolt A

If boom works too loosely or swings uncontrollable:
Tighten bolt A

**Note!** Do not stress the bolt (A). Only tighten till contact is reached at point B.
**1000 hours service**

**1. Wheel bearings and brakes**
Check the condition of the bearings and brake wear parts in the following way:

1. Place stop wedges in front of and behind LH wheel and jack up RH wheel.
2. Support the trailer with axle stands.
3. Remove the wheel.
4. Remove the hub cap A, cotter pin B and castle nut C.
5. Pull off the wheel hub and brake drum assembly. Use a wheel puller if necessary.
6. Vacuum clean the brake drum D for brake dust or rinse with water.

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

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

**Max. wear rates on brake components, mm (in)**

<table>
<thead>
<tr>
<th>Model</th>
<th>2200/2800</th>
<th>3200/4200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. drum diameter</td>
<td>A 302 (11.8897)</td>
<td>402 (15.8388)</td>
</tr>
<tr>
<td>Min. lining thickness B</td>
<td>2.0 (0.07874)</td>
<td>4.0 (0.15748)</td>
</tr>
</tbody>
</table>

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

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

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

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

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

13. Fit the shoe assembly with the anchor bolt first. Then pull the shoes away from each other and slide them over the cam afterwards. Tighten the anchor bolt castellated nut again and fit a new cotter pin.
14. Check roller bearings for discoloration and wear - renew if worn or damaged.
15. Assemble the hub and bearings using a new sealing ring J.
16. Fill the hub and bearings with fresh grease before fitting it to the shaft.
17. Fit the castellated nut. Rotate the hub and tighten the castellated nut until a slight rotation resistance is felt.
18. Loosen the castellated nut again until the first notch is aligned with the cotter pin hole in the shaft.

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

19. Fit a new cotter pin and bend it.
20. Fill the hub cap with fresh grease and carefully press it on to the hub.
21. Adjust the brakes as described in “200 hours service”.
22. Fit the wheel again and tighten the wheel nuts. See section “50 hours service” regarding torque wrench setting. Tighten all bolts to half the specified torque first, then to the full specified torque.
23. Tighten again after 10 hours of work. Check the torque every day until it is stabilised.

**WARNING!** If you do not feel totally confident changing wheel bearings or brake shoes contact your HARDI dealers workshop.
2. Transmission shaft
Change the protection tube nylon bearings as described under “Replacement of transmission shaft protection tubes” in the part Occasional Maintenance.
Occasional maintenance

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

Pump valves and diaphragms renewal

Diaphragm pump overhaul kit (valves, seals, diaphragms etc.)

<table>
<thead>
<tr>
<th>Pump model</th>
<th>HARDI part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>363</td>
<td>750342</td>
</tr>
<tr>
<td>463</td>
<td>750343</td>
</tr>
</tbody>
</table>

Valves

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

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

Diaphragms

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

<table>
<thead>
<tr>
<th>Pump model</th>
<th>Diaphragm cover Nm</th>
<th>Diaphragm bolt Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>363</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>463</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

\( \text{Nm} = 0.74 \text{ lb ft} \)

**IMPORTANT!** Before tightening the 4 bolts for the diaphragm cover B the diaphragm must be positioned between centre and top to ensure correct sealing between diaphragm pumphousing and diaphragm cover. Turn crank shaft if necessary.

Cone check/renewal EVC operating unit

If it becomes difficult to build up sufficient pressure or if pressure fluctuations occur, it may be necessary to renew cone and cylinder. A HARDI kit is available for this purpose. Ref. no. 741293.

1. Remove 4 x screws A and remove the housing.
2. Remove 4 x screws B.
3. Replace cylinder C and O-ring D.
4. Loosen the nut E, remove and replace the cone F.
5. Reassemble in reverse order.
**Maintenance**

**Cone check/renewal, EVC distribution valve**
Periodically check the distribution valves for proper sealing. Do this by running the sprayer with clean water and open all distribution valves.

Cautiously remove the clip A and pull out the hose B for the pressure equalisation device. When the housing is drained, there should be no liquid flow through the pressure equalisation device. If there is any leakage, the valve cone E must be changed.

Remove the clip C and lift the motor housing off the valve housing. Then unscrew the screw D and replace the valve cone E. Reassemble in reverse order.

**Wear bushing renewal, boom lift**
The wear bushes are inspected and renewed before they are worn through.

1. Connect the trailer to a tractor and unfold the booms to working position.
2. Lift the boom centre frame with a lifting device and support it until the load is taken off the parallelogram arms.
3. Remove the screws A, and pull out the pins B at one of the upper parallelogram arms and renew the wear bushes.
4. Refit the arm.
5. Repeat this on the other upper arm.

**Wear bushing renewal, drawbar**
(all TRACKER models)
If too much play is found in the drawbar, the wear bushes must be renewed.

1. Place stop wedges in front of and behind both wheels.
2. Jack up the frame and support it properly.
3. If not a SELF TRACK model: Remove the drawbar extension to reduce the weight of the drawbar.
4. Loosen the two bolts A and support the bracket B in order to keep it in a level position (e.g. by a rope fastened to the platform railing).
5. Without dismantling the hydraulic system the hydraulic rams are removed from the drawbar by loosening the nuts C.
6. Support the drawbar and remove the two pin bolts D, the washer E and the pin F.
7. Move the drawbar to the side and support it.
8. Press out the worn bushes and fit new ones.
9. Assemble again in reverse order.
10. Grease through grease nipples.
11. Fit the extension piece in the drawbar again and place the sprayer on the support leg.
12. Remove jack and wedges.
Venting the hydraulic damping system (SELF TRACK only)
The following venting procedure requires a special venting kit, HARDI ref. no. 720725.

1. Place the trailer on the support leg so that the yoke goes free from the tractor and the rams can work freely.
2. Relieve the pressure in the expansion tank and remove the hydraulic hose.

NOTE! Plug the hose. If this is neglected, the pressure gauge may be damaged.

3. Fit the two test hoses in the pressure gauge outlets on the rams (at the rear of the track system).
4. Move the track system from one side to the other approx. 10 times (full swing).
5. Loosen the plug very carefully in order to leak the air out of the system.
6. Fit the hydraulic hose on the expansion tank.
7. Remove the level plug and using the tractor hydraulics, cautiously fill oil in the expansion tank until it reaches the level plug.
8. Fit the level plug and fill the expansion tank to an air pressure of 5 bar.
9. Fit the 0-400 bar pressure gauge on the pressure gauge outlet at the ram. Adjust the excess-pressure valve to approx. 40 bar.

On flat ground it is possible to work with a lower opening pressure. This gives a more sensible reaction but it also results in the fact that the trailer can swing when driving on hilly ground and when swinging at high speed.

TRACKER damping pressure setting (SELF TRACK only)
The hydraulic pressure relief valves in the TRACKER's damping system is factory set to open at 40 bar (580 p.s.i.) which is adequate for most conditions.

If the damping seems too “soft” or too “hard”, the settings can be adjusted.

Connect manometers to the Minimesh couplings and control if pressure is equal for both sides.

A = Adjusting screw
B = Self-locking nut

NOTE! Too low pressure will result in a swaying trailer. Too high pressure will influence on the ability to turn with the tractor.

Shock absorbers
If the shock absorbers loose their efficiency or start leaking oil, they should be replaced.

Level indicator adjustment
The level indicator reading should be checked regularly.

When the tank is empty, the float should lie on the stop pin, of the rod, and the O-ring on the indicator should be positioned at the top position line A.

If any deviation is found, pull out the plug B, loosen screws C, and adjust the length of the cord.

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

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

DANGER! Do not attempt to enter the tank - the float pole can be removed from outside the tank!

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

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

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

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

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

**Nozzle tubes and fittings**

Poor seals are usually caused by:

- Missing O-rings or gaskets
- Damaged or incorrectly seated O-rings
- Dry or deformed O-rings or gaskets
- Foreign bodies

In case of leaks:

**DO NOT overtighten.** Disassemble, check condition and position of O-ring or gasket. Clean, lubricate and reassemble.

The O-ring must be lubricated **ALL THE WAY ROUND** before fitting on to the nozzle tube. Use non-mineral lubricant.

For **RADIAL** connections only hand-tighten them.

For **AXIAL** connections, a little mechanical leverage may be used.

---

**Replacement of transmission shaft protection guards**

1. Remove bolt A, lock B and grease nipple C. Twist uni CV-joint cover 1/4 turn and pull it backwards.
2. Remove the synthetic bearings and protection tube.
2a. Remove inner bush from protection tube.
3. Assemble again in reverse order, using new parts where necessary. Remember to fit chains again.
4. Grease bearings.

**NOTE!** Only use genuine HARDI spare parts to service the transmission shaft.

---

**Replacement of transmission shaft cross journals.**

1. Remove protection guard as described previously.
2. Remove Seeger circlip rings
3. Press the cross journal sidewards - use hammer and mandrel if necessary.
4. Remove needle bearing cups and cross journal can now be removed.
5. Carefully remove needle bearing cups from new cross journal and install it in reverse order. Before fitting the needle bearing cups again, check that needles is placed correctly. Avoid dust and dirt in the new bearings.
**Adjustment of 3-way-valve**
The MANIFOLD valve can be adjusted if it is too tight to operate - or if it is too loose (= liquid leakage).

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

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

---

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

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

---

**Adjustment of slanting indicator (if fitted)**
If the position of the pointer on the indicator does not correspond to the actual boom position, the pointer A can be adjusted.

1. Loosen the small bolt B sufficiently to allow the wire C to be adjusted.
2. Place the pointer A in correct position and fasten bolt B against the wire C again.

---

**Change of bulbs**
**Overview of bulbs used.**

<table>
<thead>
<tr>
<th>Rear combi lamp, HELLA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Bulb type (DIN)</td>
</tr>
<tr>
<td>Rear lamp</td>
<td>R5W</td>
</tr>
<tr>
<td>Stop lamp</td>
<td>P21W</td>
</tr>
<tr>
<td>Direction indicator</td>
<td>P21W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rear combi lamp, GEKA (with warning boards)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Bulb type (DIN)</td>
</tr>
<tr>
<td>Rear lamp</td>
<td>R5W</td>
</tr>
<tr>
<td>Stop lamp</td>
<td>P21W</td>
</tr>
<tr>
<td>Direction indicator</td>
<td>P21W</td>
</tr>
<tr>
<td>Position lamp, front</td>
<td>(GEKA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boom and work lamps</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Bulb type (DIN)</td>
</tr>
<tr>
<td>Boom lamp</td>
<td>H3</td>
</tr>
<tr>
<td>Working lamp</td>
<td>124 98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number plate lamp, HELLA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Bulb type (DIN)</td>
</tr>
<tr>
<td>Number plate lamp</td>
<td>R10W</td>
</tr>
</tbody>
</table>

**Side marking combi lamp**

Prise out the lens carefully from the rubber housing to remove the bulb.

| Function                                      | Bulb type (DIN) | Volt / Watt |
|-----------------------------------------------|--|            |
| Side marking combi lamp white, red yellow     | R5W            | 12V / 5W    |
Maintenance

Change of tyre

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

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

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

WARNING! Never mount or use damaged tyres or rims!

Use of damaged, ruptured, distorted, welded or brazed rim is not allowed!
Maintenance

Off-season storage
When the spraying season is over, you should devote some extra time to the sprayer.

If chemical residue is left over in the sprayer for longer periods, it can reduce the life of the individual components.

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

1. Clean the sprayer completely - inside and outside - as described under “Cleaning of the sprayer”. Make sure that all valves, hoses and auxiliary equipment have been cleaned with detergent and flushed with clean water afterwards, so no chemical residue is left in the sprayer.

2. Renew possible damaged seals and repair possible leaks.

3. Empty the sprayer completely and let the pump work for a few minutes. Operate all valves and handles to drain as much water off the spraying circuit as possible. Let the pump run until air is coming out of all nozzles. Remember to drain the rinsing tank also.

4. Pour appr. 50 litre (11 Imp.gal) anti-freeze mixture consisting of 1/3 automotive anti-freeze and 2/3 water into the tank.

5. Engage the pump and operate all valves and functions on the MANIFOLD, operating unit, FILLER etc. allowing the anti-freeze mixture to be distributed around the entire circuit. Open the operating unit main on/off valve and distribution valves so the anti-freeze is sprayed through the nozzles as well. The anti-freeze will also prevent O-rings, seals, diaphragms etc. from drying out.

6. Lubricate all lubricating points according to the lubricating scheme - regardless of intervals stated.

7. When the sprayer is dry, remove rust from possible scratches or damages in the paint and touch up the paint.

8. Remove the glycerine-filled pressure gauges and store them frost free in vertical position.

9. Apply a thin layer of anti-corrosion oil (e.g. SHELL ENESIS FLUID, CASTROL RUSTILLO or similar) on all metal parts. Avoid oil on rubber parts, hoses and tyres.

10. Fold the boom in transport position and relieve pressure from all hydraulic functions.

11. All electric plugs and sockets are to be stored in a dry plastic bag to protect them against damp, dirt and corrosion.

12. Remove the control boxes and the HARDI PILOT control box + display from the tractor, and store them dry and clean (in-house).

13. Wipe hydraulic snap-couplers clean and fit the dust caps.

14. Apply grease on all hydraulic ram piston rods which are not fully retracted in the barrel to protect against corrosion.

15. Chock up the wheels, to prevent moisture damage and deformation of the tyres. Tyre blacking can be applied to the tyre walls to preserve the rubber.

16. Drain air brake tank for condensed water.

17. To protect against dust the sprayer can be covered by a tarpaulin. Ensure ventilation to prevent condensation.

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

1. Remove the cover

2. Remove the support from the wheel axle and adjust the tyre pressure.

3. Wipe off the grease from hydraulic ram piston rods.

4. Fit the pressure gauges again. Seal with Teflon tape.

5. Connect the sprayer to the tractor including hydraulics and electric’s.

6. Check all hydraulic and electric functions.

7. Empty the tank for remaining anti-freeze.

8. Rinse the entire liquid circuit on the sprayer with clean water.

9. Fill with clean water and check all functions.

10. Check function of brakes. Please note that brake power will be reduced until the rust are worn off the drums. Always brake lightly until the drums are clean.
Fault-finding

Operational problems
In cases where breakdowns have occurred, the same factors always seem to be in question:

1. Minor leaks on the suction side of the pump will reduce the pump capacity or stop the suction completely.
2. A clogged suction filter will hinder or prevent suction so that the pump does not operate satisfactorily.
3. Clogged up pressure filters will result in increasing pressure at the pressure gauge but lower pressure at the nozzles.
4. Foreign bodies stuck in the pump valves with the result that these cannot close tightly against the valve seat. This reduces pump efficiency.
5. Poorly reassembled pumps, especially diaphragm covers, will allow the pump to suck air resulting in reduced or no capacity.
6. Hydraulic components that are contaminated with dirt result in rapid wear to the hydraulic system.

Therefore ALWAYS check:

1. Suction, pressure and nozzle filters 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. Correct dosage depends on it.
5. Operating unit works properly. Use clean water to check.
6. Hydraulic components are maintained clean.

Tracker damping system

<table>
<thead>
<tr>
<th>FAULT</th>
<th>PROBABLE CAUSE</th>
<th>CONTROL/REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprayer trails unstable</td>
<td>Air pockets in the hydraulic circuit</td>
<td>Prime hydraulic circuit</td>
</tr>
<tr>
<td></td>
<td>Hydraulic circuit leaking</td>
<td>Repair leak, prime</td>
</tr>
<tr>
<td></td>
<td>Pressure relief valve(s) set too low</td>
<td>Adjust pressure relief valves</td>
</tr>
<tr>
<td>Rear hydraulic rams are too tight and vehicle</td>
<td>Insufficient counter weight on</td>
<td>Ad ballast on front of tractor</td>
</tr>
<tr>
<td>continues straight ahead when trying to turn</td>
<td>front of tractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure relief valve set too high</td>
<td>Adjust pressure relief valves</td>
</tr>
</tbody>
</table>
## Fault-finding

### Liquid system

<table>
<thead>
<tr>
<th>FAULT</th>
<th>PROBABLE CAUSE</th>
<th>CONTROL/REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>No spray from boom when turned on.</td>
<td>Air leak on suction line.</td>
<td>Check if suction filter O-ring is sealing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check suction tube and fittings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check tightness of pump diaphragm and valve covers.</td>
</tr>
<tr>
<td></td>
<td>Air in system.</td>
<td>Fill suction hose with water for initial prime.</td>
</tr>
<tr>
<td></td>
<td>Suction / pressure filters</td>
<td>Clean filters.</td>
</tr>
<tr>
<td></td>
<td>clogged.</td>
<td>Check yellow suction pipe is not obstructed or placed too near the tank bottom.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety valve spring for Self-Cleaning Filter not tight.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too little distance between yellow suction pipe and tank bottom.</td>
</tr>
<tr>
<td></td>
<td>Pump valves blocked or worn.</td>
<td>Check for obstructions and wear.</td>
</tr>
<tr>
<td></td>
<td>Defect pressure gauge.</td>
<td>Check for dirt at inlet of gauge.</td>
</tr>
<tr>
<td>Pressure dropping.</td>
<td>Filters clogging.</td>
<td>Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.</td>
</tr>
<tr>
<td></td>
<td>Nozzles worn.</td>
<td>Check flow rate and replace nozzles if it exceeds 10%.</td>
</tr>
<tr>
<td></td>
<td>Tank is air tight.</td>
<td>Check vent is clear.</td>
</tr>
<tr>
<td></td>
<td>Sucking air towards end of</td>
<td>Lower pump r.p.m.</td>
</tr>
<tr>
<td></td>
<td>tank load.</td>
<td></td>
</tr>
<tr>
<td>Pressure increasing</td>
<td>Pressure filters beginning to</td>
<td>Clean all filters.</td>
</tr>
<tr>
<td></td>
<td>clog.</td>
<td></td>
</tr>
<tr>
<td>Formation of foam.</td>
<td>Air is being sucked into system.</td>
<td>Check tightness / gaskets / O-rings of all fittings on suction side.</td>
</tr>
<tr>
<td></td>
<td>Excessive liquid agitation.</td>
<td>Reduce pump r/min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check safety valve for Self-Cleaning Filter is tight.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure returns inside tank are present.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use foam damping additive.</td>
</tr>
</tbody>
</table>
## Fault-finding

### Hydraulic system

<table>
<thead>
<tr>
<th>FAULT</th>
<th>PROBABLE CAUSE</th>
<th>CONTROL/REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom slow/eradic.</td>
<td>Air in system</td>
<td>Loosen ram connection and activate hydraulics until oil flow has no air in it (not whitish).</td>
</tr>
<tr>
<td>Regulation valve incorrectly set</td>
<td></td>
<td>Open or close until desired speed is achieved (clockwise = less speed).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remember oil must be at operating temperature.</td>
</tr>
<tr>
<td>Insufficient hydraulic pressure</td>
<td></td>
<td>Check output pressure of tractor hydraulics. Minimum for sprayer is 130 bar.</td>
</tr>
<tr>
<td>Insufficient amount of oil in tractor reservoir</td>
<td></td>
<td>Check and top up if needed.</td>
</tr>
<tr>
<td>Ram not functioning.</td>
<td>Restrictor or regulation valve blocked</td>
<td>Secure boom with “S” hook. Dismantle and clean.</td>
</tr>
<tr>
<td>Hydraulic system fold/tilt functions will not operate</td>
<td>Power supply</td>
<td>Check for proper 12V power supply</td>
</tr>
<tr>
<td>One function (fold or tilt) will not operate</td>
<td>Various</td>
<td>Check for defective switch(s). Check continuity of cables. Check for operation of applicable solenoid (coil not activating or plunger stuck). Check for short circuit in wiring junction box at rear of sprayer. Dirt in the restrictor port of the cylinder.</td>
</tr>
<tr>
<td>Multiple hydraulic functions with one switch activated</td>
<td>Various</td>
<td>Check for correct solenoid electric/hydraulic hook-up. Check for short circuit in wiring in the junction box at rear of sprayer.</td>
</tr>
</tbody>
</table>
# Fault-finding

## EVC Operating unit

<table>
<thead>
<tr>
<th>FAULT</th>
<th>PROBABLE CAUSE</th>
<th>CONTROL/REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating unit not functioning</td>
<td>Blown fuse(s).</td>
<td>Check mechanical function of microswitches. Use cleaning/lubricating agent if the switch does not operate freely.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check motor. 450-500 milli-Amperes max. Change motor, if over.</td>
</tr>
<tr>
<td>Wrong polarity.</td>
<td>Brown - pos. (+). Blue - neg. (-).</td>
<td></td>
</tr>
<tr>
<td>Valves not closing properly.</td>
<td></td>
<td>Check valve seals for obstructions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check microswitch plate position. Loosen screws holding plate a 1/2 turn.</td>
</tr>
<tr>
<td>No power.</td>
<td>Wrong polarity.</td>
<td>Check that brown is pos. (+), Blue is neg. (-).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check print plate for dry solders or loose connections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check fuse holder are tight around fuse.</td>
</tr>
</tbody>
</table>

## Mechanical problems

<table>
<thead>
<tr>
<th>FAULT</th>
<th>PROBABLE CAUSE</th>
<th>CONTROL/REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom will not fold in or out</td>
<td>Cylinder</td>
<td>Adjust the fold cylinder</td>
</tr>
<tr>
<td>Boom will not fold completely</td>
<td>Cables</td>
<td>Check adjustment of centre cables</td>
</tr>
<tr>
<td>Boom not aligned</td>
<td>Cables</td>
<td>Adjust and grease complete boom cables and stops</td>
</tr>
<tr>
<td>Boom will not stay in spraying posi-</td>
<td>Various</td>
<td>Check for hydraulic leaks through solenoid block. Check for a solenoid that is stuck open.</td>
</tr>
<tr>
<td>reion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wing to be kept folded swings out</td>
<td>Various</td>
<td>Boom must be completely unfolded - then fold out the desired boom wing.</td>
</tr>
<tr>
<td>when unfolding other side of the bo-</td>
<td></td>
<td>Check for hydraulic leaks through solenoid block.</td>
</tr>
<tr>
<td>om</td>
<td></td>
<td>Check for a solenoid that is stuck open.</td>
</tr>
</tbody>
</table>
Emergency operation

**EC operating unit**

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

The problem may be due to a blown fuse. An extra fuse is placed inside the box.

Fuse type: 6.3 A
## Technical specifications

### Overall dimensions

![Diagram of CM Classic 2200/2800 SPB & SPC]

| CM Classic 2200/2800 SPB & SPC | Bo...
# Technical specifications

## Weight, SPB

### CM Classic 3200 SPB

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
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<td></td>
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<tr>
<td>21</td>
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</tbody>
</table>

Please refer to note 1

### CM Classic 4200 SPB

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
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<td>20</td>
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<td></td>
</tr>
<tr>
<td>21</td>
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<td></td>
</tr>
</tbody>
</table>

Please refer to note 1

## Weight, SPC

### CM Classic 2200 SPC

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
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<tr>
<td>28</td>
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<td></td>
</tr>
<tr>
<td>30</td>
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<td></td>
</tr>
</tbody>
</table>

Please refer to note 1

### CM Classic 2800 SPC

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
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<td>28</td>
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</tr>
<tr>
<td>30</td>
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</tbody>
</table>

Please refer to note 1
# Technical specifications

## Weight, SPC

### CM Classic 3200 SPC

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
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<tr>
<td>28</td>
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<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please refer to note 1

### CM Classic 4200 SPC

<table>
<thead>
<tr>
<th>Boom width (m)</th>
<th>Empty</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Axle load (kg)</td>
<td>Drawbar load (kg)</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please refer to note 1

**Note 1:**
All weights are approximate values and are based on machines equipped with rinsing tank, clean water tank, HARDI FILLER and suspended axle.

For **SELF TRACK** models the values in above tables must be increased:

+ 100 kg on Drawbar and Total weights

For **COMMANDER** models **without** suspended axle, subtract:

- COMMANDER 2200/2800: -220 kg (own weight)
- COMMANDER 3200/4200: -250 kg (own weight)

**Ground clearance (under axle):**

- COMMANDER 2200/2800: without suspension: appr. 700 mm  with suspension: appr. 600 mm
- COMMANDER 3200/4200: without suspension: appr. 700 mm  with suspension: appr. 750 mm
## Technical specifications

### Pump capacity

#### Pump 363/10.0 (540 r.p.m.)

<table>
<thead>
<tr>
<th>Rotation per min.</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>540</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>73</td>
<td>107</td>
<td>141</td>
<td>178</td>
<td>194</td>
<td>211</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>105</td>
<td>140</td>
<td>175</td>
<td>189</td>
<td>207</td>
</tr>
<tr>
<td>4</td>
<td>71</td>
<td>103</td>
<td>139</td>
<td>172</td>
<td>186</td>
<td>205</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>102</td>
<td>138</td>
<td>169</td>
<td>184</td>
<td>203</td>
</tr>
<tr>
<td>10</td>
<td>68</td>
<td>100</td>
<td>135</td>
<td>166</td>
<td>182</td>
<td>200</td>
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<tr>
<td>15</td>
<td>66</td>
<td>98</td>
<td>132</td>
<td>164</td>
<td>178</td>
<td>197</td>
</tr>
</tbody>
</table>

- Max. pressure: 15 bar
- Weight: 52.6 kg
- Suction height: 0.0 m

#### Pump 363/5.5 (1000 r.p.m.)

<table>
<thead>
<tr>
<th>Rotation per min.</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
<th>900</th>
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<tbody>
<tr>
<td>bar</td>
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</tr>
<tr>
<td>0</td>
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<td>61</td>
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<td>103</td>
<td>123</td>
<td>144</td>
<td>164</td>
<td>186</td>
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</tr>
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<td>179</td>
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<tr>
<td>4</td>
<td>-</td>
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<td>98</td>
<td>117</td>
<td>138</td>
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<td>-</td>
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<td>112</td>
<td>130</td>
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<td>174</td>
</tr>
</tbody>
</table>

- Max. pressure: 15 bar
- Weight: 52.6 kg
- Suction height: 0.0 m

### Pump 463/10.0 (540 r.p.m.)

<table>
<thead>
<tr>
<th>Rotation per min.</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>540</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar</td>
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<td>207</td>
<td>257</td>
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<tr>
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<td>103</td>
<td>152</td>
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<td>252</td>
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</tr>
<tr>
<td>4</td>
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<td>149</td>
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<td>195</td>
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<td>94</td>
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<tr>
<td>15</td>
<td>91</td>
<td>136</td>
<td>184</td>
<td>230</td>
<td>248</td>
<td>276</td>
</tr>
</tbody>
</table>

- Max. pressure: 15 bar
- Weight: 66.5 kg
- Suction height: 0.0 m

### Pump 463/5.5 (1000 r.p.m.)

<table>
<thead>
<tr>
<th>Rotation per min.</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
<th>900</th>
<th>1000</th>
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<tbody>
<tr>
<td>bar</td>
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<td></td>
</tr>
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<td>178</td>
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<td>197</td>
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<td>252</td>
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<tr>
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<td>54</td>
<td>82</td>
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<td>137</td>
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</tr>
<tr>
<td>6</td>
<td>52</td>
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<td>10</td>
<td>49</td>
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<td>171</td>
<td>195</td>
<td>219</td>
<td>246</td>
</tr>
</tbody>
</table>

- Max. pressure: 15 bar
- Weight: 66.5 kg
- Suction height: 0.0 m

### Pump 463/12.0 (540 r.p.m.)

<table>
<thead>
<tr>
<th>Rotation per min.</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>540</th>
<th>600</th>
<th>700</th>
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</thead>
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- Max. pressure: 15 bar
- Weight: 66.7 kg
- Suction height: 0.0 m

### Pump 463/6.5 (1000 r.p.m.)

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<td>280</td>
</tr>
</tbody>
</table>

- Max. pressure: 15 bar
- Weight: 66.7 kg
- Suction height: 0.0 m
Technical specifications

Filters and nozzles

Filter gauze width
- 30 mesh: 0.58 mm
- 50 mesh: 0.30 mm
- 80 mesh: 0.18 mm
- 100 mesh: 0.15 mm

Temperature and pressure ranges

Operating temperature range: 2°C to 40°C (36°F to 104°F)

Operating pressure for safety valve: 15 bar (220 psi)

Max. pressure on the pressure manifold: 20 bar (290 psi)

Max. pressure on the suction manifold: 7 bar (100 psi)

Brakes

Max. wear rates on brake components, mm (in):

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<th>3200/4200</th>
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<tr>
<td>Max. drum diameter A</td>
<td>302 (11.8997)</td>
<td>402 (15.8388)</td>
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<tr>
<td>Min. lining thickness B</td>
<td>2.0 (0.07874)</td>
<td>4.0 (0.15748)</td>
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</table>

Hydraulic brakes

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

Air brakes, single line:
- Air pressure, relieved brakes: 5.3 - 5.6 bar
- Air pressure drop to activate: 0.8 - 1.3 bar

Air brakes, dual line

Load apportioning valve pressure settings:
- Relieved: 0 bar
- Empty: 1.6 bar (23.2 p.s.i.)
- Half: 3.4 bar (49.3 p.s.i.)
- Full: Air tank pressure

Materials and recycling

Tank: HDPE
Hoses: PVC
Valves: mainly glass-filled PA.
Fittings: PA

Conversion factors, SI to Imperial units

All units used in this manual are SI units. In some occasions Imperial units are used. Use following factors to convert SI units to Imperial units:

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<th>SI unit</th>
<th>Imperial unit</th>
<th>Factor</th>
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<td>Surface area</td>
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<tr>
<td></td>
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<tr>
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<td>m/s</td>
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<tr>
<td>Quantities/area</td>
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<td>gal (Imp.)/acre</td>
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<td>fl. oz (Imp.)</td>
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<td>Torque</td>
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Electrical connections

Rear lights

Position
1. LH direction indicator - Yellow
2. Free
3. Frame
4. RH direction indicator
5. RH rear position lamp
6. Stop lamps
7. LH rear position lamp

Wire colour
- Yellow
- Blue
- White
- Green
- Brown
- Red
- Black

The wiring is in accordance with ISO 1724.

Disposal of the sprayer

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

Electrical connections for EVC operating unit

20 poled plug with cable

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G/Y = Green/Yellow

EVC

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G/Y = Green/Yellow

The EVC operating unit fulfils the EC noise reduction standards.
Technical specifications

Boom hydraulic SPB-Y, SPC-Y

Boom hydraulic SPB-Z, SPC-Z
# Subject Index

## Symbols

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## A

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<td>Drawbar</td>
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<td>Drawbar extension</td>
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## G

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<td>Hydraulic system</td>
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## N

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