

# **ALPHA TWIN FORCE**

## **Instruction book**

670709-GB-99/01



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## EC Declaration of Conformity

### Manufacturer,

HARDI-EVRARD  
301, Rue du 21 Mai 1940  
F - 62990 BEURAINVILLE

### Importer,

declare that the following product,

SPRAYER Model ALPHA TWIN FORCE 2000 and  
ALPHA TWIN FORCE 2500

**A.** was manufactured in conformity with the provisions  
in the COUNCIL DIRECTIVE on mutual approximation  
of the laws of the Member States on the safety of ma-  
chines, 89/392/CE, 91/368/CE og 93/368/CE

**B.** was manufactured in conformity with special refer-  
ence to the Directive on essential safety and health re-  
quirements taking into account the following standards:  
EN 292-1  
EN 292-2

Furthermore, the owner of the material must keep this  
manual as long as the machine is in his possession,  
and when passing it on to a possible new owner he  
must also pass on the manual.

Beaurainville, January 1999

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G. Leprince  
Managing director  
HARDI-EVRARD S.A.

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 all models, features or equipment, please pay attention to paragraphs dealing with precisely your model.

Published and printed by HARDI INTERNATIONAL A/S



## Foreword

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

As the instruction book covers all ALPHA models, please pay attention to the paragraphs dealing with precisely your model.

All instructions related to service and maintenance of the machine is described in this instruction book. If you do not feel absolutely confident carrying out these jobs please contact your HARDI dealer. He has trained service personnel, workshop facilities, spare parts, tools and instruments that are required to supply the best service.

If there are several operators of the machine please ensure that all operators have read this instruction book before using the machine. If selling the machine, please let this book follow the machine to the new owner.

## Use of the sprayer

This agricultural sprayer is designed for application of plant protection chemicals and liquid fertilizers at agricultural crops. The sprayer must be used for this purpose only. It is not allowed to use the sprayer for any other purposes.

Please observe rules regarding driver's license for driving on public roads.


If no local rules of holding a sprayer operator license, it is strongly recommended to be educated in correct plant protection and safe handling of plant protection chemicals in order to carry out spraying jobs without unnecessary risk for persons and environment.







## Safety precautions

Before using your ALPHA sprayer, note the following safety precautions and recommended safe operating practices.

### General



















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

-  Read and pay attention to the instruction book before starting and operating the sprayer. It is equally important that other operators of this equipment read and understand this book.
-  If any portion of this instruction book remains unclear after reading it, contact your HARDI dealer for further explanation before using the equipment.
-  Use the handholds and steps when getting on and off the machine to prevent falls. Keep steps and platform clear of mud etc.
















-  Do not permit passengers to ride on the machine. There are no safe places for others than the driver.





-  Keep children away from the sprayer.

### Driving the machine.








-  Make sure that nobody is carrying out service or maintenance jobs on the sprayer *before* starting the engine.
  -  Make sure, that parking brake is activated, and the pilot lever is in neutral before starting the engine.
  -  Ensure that the on/off valve on the spraying circuit is switched off before starting the engine.
  -  The hydrostatic transmission control lever has a safety start switch. Do not by-pass this switch. If out of order, get the switch repaired instantly.
  -  Do not start the engine or operate control levers standing outside the cab. Always sit in the driver seat when starting and operating the levers.
  -  Be careful not to accidentally operate the hydrostatic transmission control lever. This will result in unexpected movements of the machine.
  -  Do not leave the driver seat while the machine is moving.
  -  Apply the parking brake, and switch off the engine before getting off the machine.
  -  Do not let the engine run in closed buildings unless an exhaust gas aspirator is connected to the exhaust pipe. Exhaust gases in closed rooms are lethal.
  -  If the steering malfunctions, stop the machine instantly.
- ### Diesel fuel
-  Do not remove the fuel tank cap when the engine is running or hot.
  -  Do not smoke or use open fire when refuelling the machine.
  -  Avoid spilling of fuel. Do not leave the machine when refuelling. Wipe up spilled fuel instantly.
  -  Do not fill the fuel tank to the edge. Allow a little room for expansion.
  -  Tighten the fuel cap properly.
  -  Use only the genuine HARDI fuel cap. If the original cap is lost, replace instantly with a new genuine HARDI fuel tank cap. **Do not** use a non-approved cap. **Never** plug with a piece of cloth or similar.
  -  Use only pure diesel fuel of approved quality. **Do not** mix diesel fuel with petrol or alcohol. These mixtures can be explosive and will cause severe injury and damage.
  -  Keep fuel lines in order. Repair possible leaks immediately.

## Operating the spraying equipment







-  Do not eat, drink or smoke whilst spraying or working with contaminated equipment.
-  Do not enter the sprayer tank.
-  Do not drive the machine near open water reservoirs (rivers, lakes etc.). Spilled chemicals can stream into the water causing serious contamination of environment.
-  Do not fill the sprayer from open water reservoirs. Malfunctioning or faulty operated filling process can siphon chemicals back into the water. Fill from closed reservoir (e.g. mobile water trailer, overhead tank) instead.
-  Do not let the filling hose enter the tank. Keep the end of the hose at least 10 cm. above the tank filling hole to avoid risk of tank content being siphoned back, contaminating water supply lines and well.
-  Do not fill chemicals nearby the well. Any overflow can contaminate the well.
-  Do not store chemicals nearby the well. Store chemicals behind locked doors to avoid unauthorized persons and children to access the chemicals.
-  If the sprayer is filled with chemicals at the same place every time, establish a filling place with concrete surface which is able to retain possible spillage.
-  Keep the cab door closed during spraying. The cab has built-in active carbon filters, which to some extent protects against chemicals.
-  Always read the chemical label prior to use and follow instructions given on the label.
-  Wear personal protection as stated on the chemical label. As a minimum always gloves, overalls, rubber boots, and face protection shield.
-  Chemicals will penetrate gloves, rubber boots etc. after a certain period of contact. This period will vary from a few hours to several days depending on rubber material and chemical used. Be familiarized with the quality of your protection equipment, and renew them according to the instructions.
-  Wash your gloves before taking them off. Do not touch the contaminated outer side of the gloves with bare hands when taking them off.
-  Keep the cab clean inside. Take off contaminated clothes and wash hands before entering the cab. Do not touch steering wheel, controls and instruments with contaminated hands or gloves. Wear gloves when touching any part of the machine outside cab.
-  If chemicals are splashed over you, remove soaked clothing instantly and wash with soap and water instantly. Plant protection chemicals will penetrate the skin, and affect your health. Consult chemical label regarding precautions to be taken against poisoning.








-  Watch out for overhead electrical conductors when operating the boom. A boom wing hitting a high voltage conductor is lethal!
-  If you need to check anything during spraying, e.g. nozzle clogging, close the main on/off valve and drive a few metres forward before stepping out. This to avoid walking in the crop just sprayed.
-  Wash and change clothes after spraying jobs.
-  In case of poisoning, seek medical advice or call an ambulance. Bring chemical label or container for identification of chemical.

## Cleaning the machine

-  Never wash the machine where washing water can flow into lakes, rivers etc. causing contamination of the environment.
-  Wash the machine on concrete surfaces where washing water can be retained and drained into a reservoir for controlled spreading on the field or proper disposal.
-  If no washing spot with concrete surface is available, avoid accumulation of pesticide residues in the soil. Do not wash the machine on the same spot every time. Huge accumulations will result in pesticides seeping down in the ground water.
-  Wear protective clothing when washing the equipment.
-  Wash the entire machine inside and outside to remove all chemicals as much as possible.
-  Do not enter the spraying tank for washing.
-  Wash and change clothes after spraying and washing spraying equipment.

## Servicing the machine

-  Rinse and wash equipment after use and before servicing.
-  Depressurize equipment after use and before servicing.
-  The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while the system is hot. Always loosen the cap slowly and allow the pressure to escape before removing the cap completely.
-  Do not smoke or use open fire when refuelling the machine.
-  Do not smoke or use open fire nearby the battery or cold weather starting aids. Use battery charger or jumper cables according to instructions.
-  Escaping hydraulic fluid or diesel fuel under pressure can penetrate the skin causing serious injury. **Do not** use your hands to check for leaks. Use a piece of paper or card board to search for leaks. If fluid is accidentally injected through the skin gangrene may result. Seek medical advice immediately.

-  Do not service the air conditioning system. It contains refrigerant under pressure. Escaping refrigerant is flammable, toxic and will cause severe frostbite if in contact with skin. If the air conditioning system need service, contact your HARDI dealer.
-  Continuous long term contact with used engine oil may cause skin cancer. Avoid prolonged contact with used engine oil. Use protective hand cream and wash skin promptly with soap and water.
-  The fuel injection system operates under high pressure. Unqualified persons should not carry out service or maintenance on any part of the fuel injection system. Faulty assembly or adjustment can lead to serious injury.
-  Do not rely on a jack alone. Support the machine with axle stands or similar if changing wheels or carrying out maintenance jobs where the machine need to be lifted off the ground.
-  Make sure the cab is correctly secured again after having been tilted for service and maintenance.
-  The main chassis is made of high tensile steel. **Do not** weld or drill holes in this frame as the material will completely change character. All warranty will be lost if this is violated.
-  If you do not feel totally confident in certain maintenance jobs described in this manual, leave the job for your HARDI dealer.

**Roadworthiness**

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

Please be aware of the machine's overall dimensions before driving on public roads.

**Plant protection chemicals**

The safety in use of plant protection chemicals depends on the user who must observe the legislative rules and instruction given by the manufacturer of each individual plant protection product.

Certain plant protection products cannot be mixed with each other - always follow the manufacturer's recommendations and instruction on the chemical label.

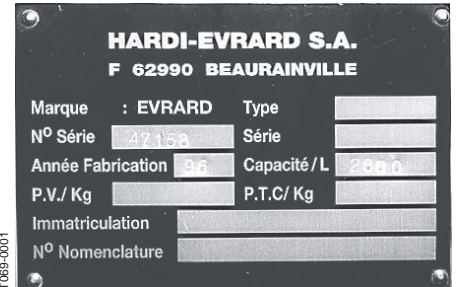
Clean the sprayer thoroughly after each spray job to avoid chemicals to react with the sprayer components.

Observe local legislation regarding chemical residues and mandatory decontamination methods. If in doubt contact the authorities e.g. Department of Agriculture.

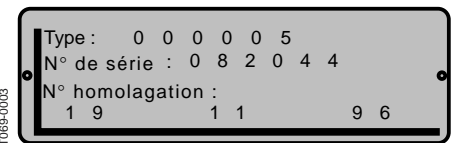
**Identification plates**

An identification plate is fitted to the sprayer's chassis at front right hand side. Pump, boom parts have ID-plates placed as shown. Please write the information given at these plates in this instruction book.

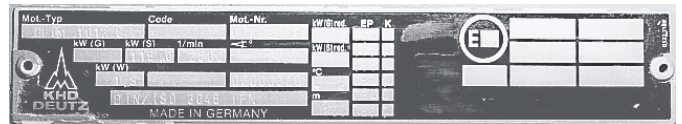
**IMPORTANT!**  
When ordering parts for the sprayer inform your dealer of these, so the correct model and version is described.



T069-0001



T069-0003









T069-0002

The machine chassis No. is stamped into the frame near the ID-plate.

**Warranty**

The delivery report supplied with the machine must be filled in, signed by the dealer and owner and returned to HARDI. This document puts the machine warranty into force. Please read the warranty conditions printed on the delivery report.

**International Pictorial Symbols**

-  T232-0001 Horn
-  T232-0002 Battery charging condition
-  T232-0003 Hourmeter
-  T232-0004 Fast
-  T232-0005 Slow
-  **STOP** Engine stop

- T232-0008  Electrical preheat
- T232-0009  Fuel
- T232-0010  Headlights - Main beam
- T232-0011  Headlights - Dipped beam
- T232-0012  Work lights
- T232-0013  Hazard warning lights
- T232-0014  Warning beacon
- T232-0015  Clearance/position lights
- T232-0016  Turn signals
- T232-0017  Windscreen wiper
- T232-0018  Windscreen washer
- T232-0019  Ventilating/air circulating fan

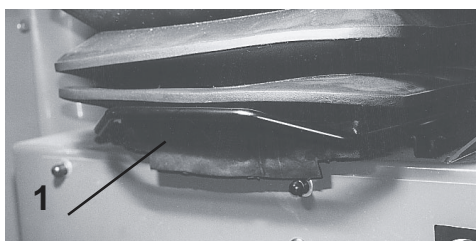
**Cabin, overview**

**Driver's seat**

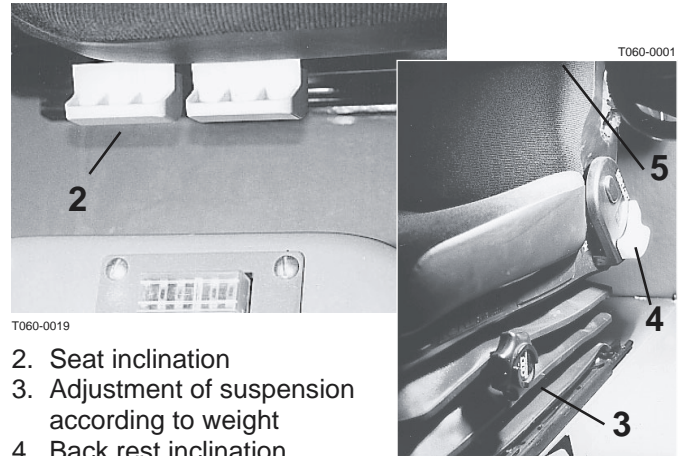
The driver's seat can be adjusted in several ways and can be fitted either with or without air suspension

***Driver's seat without air suspension***

1. Longitudinal adjustment



T060-0020



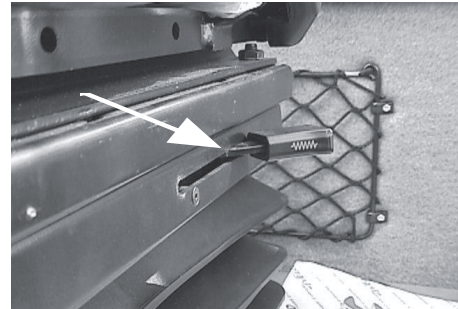
T060-0019

2. Seat inclination
3. Adjustment of suspension according to weight
4. Back rest inclination
5. Arm rest adjustments

T060-0001

***Driver's seat with air suspension***

1. Lock/unlock - longitudinal direction



T060-0049

2. Back rest adjustment



T060-0050

3. Arm rest adjustment



T060-0051



4. Adjustment of air suspension. (Please also see no. 5)



T060-0047

5. Indicator panel. Note the color in the panel for correct setting of air suspension.

- Yellow: Increase level of air suspension (+)
- Green: Correct setting
- Red: Lower level of air suspension (-)

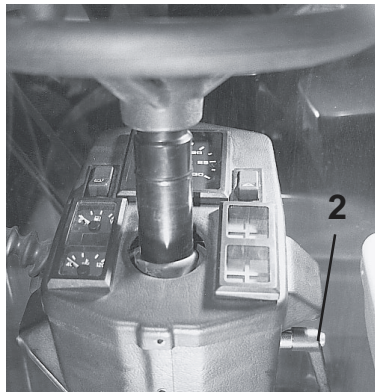


T060-0048

**Steering column**

The steering column height and angle can be adjusted.

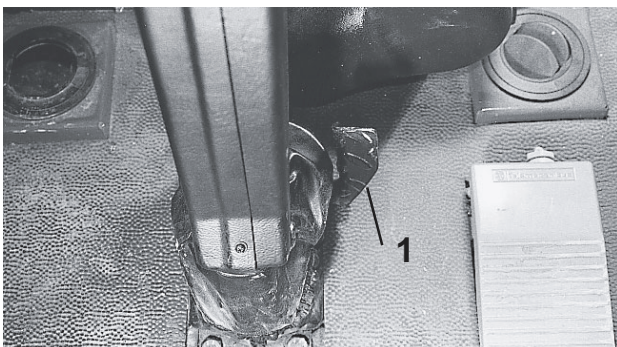
- 1. Inclination lever
- 2. Height adjustment lever



T064-0006

The inclination of the steering column is adjusted by depressing the pedal 1.

The height of the steering wheel is adjusted by loosening the lever 2 anticlockwise.



T064-0007

**Door lock**

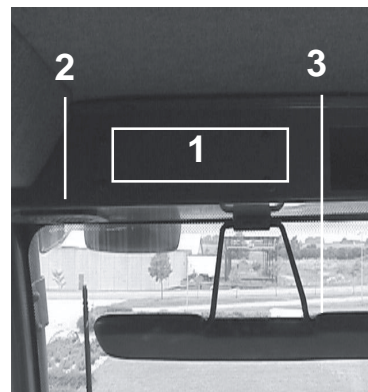
The door can be locked from the inside by the locking device, placed just above the door handle.



T060-0057

**Upper front panel**

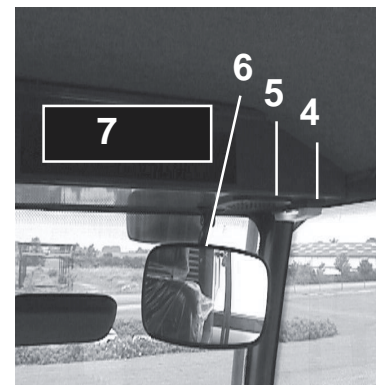
(left hand side)



T060-0055

- 1. Radio compartment
- 2. Loudspeaker
- 3. Adjustable sun visor

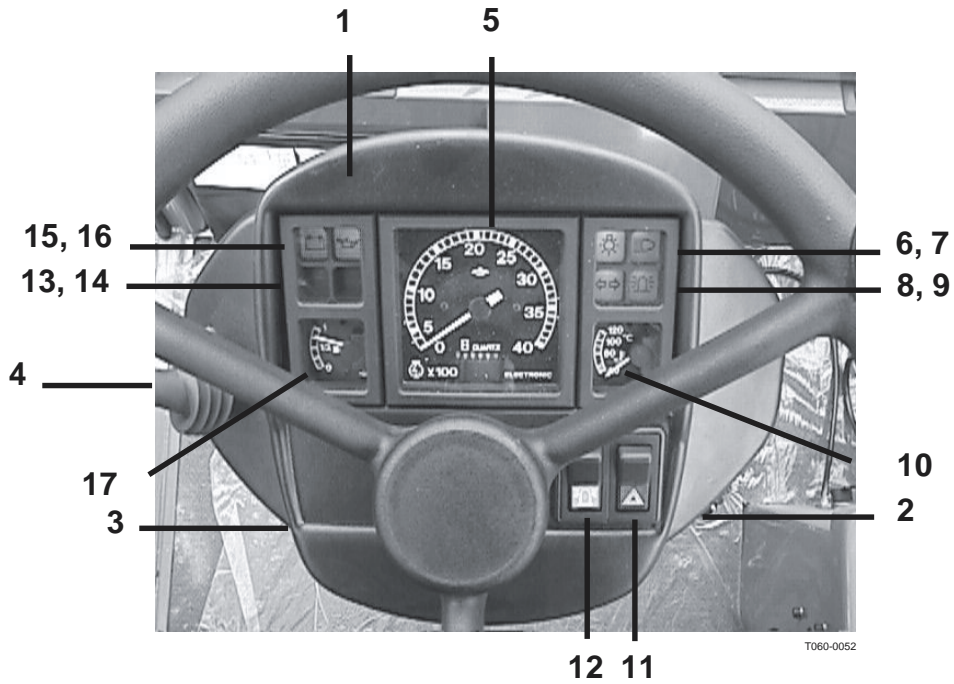
(right hand side)



T060-0056

- 4. Cab interior lamp with on/off switch
- 5. Loud speaker
- 6. Rear view mirror
- 7. Compartment

**Controls and switches, steering column**



- |  |                                  |
|--|----------------------------------|
| 1. Console                                 | 10. Engine coolant thermometer   |
| 2. Start key                               | 11. Hazard warning signal switch |
| 3. Fuse box                                | 12. Beacon switch                |
| 4. Multi functional control stalk          | 13. Not used                     |
| 5. Revolution counter and hour meter       | 14. Parking brake signal lamp    |
| 6. Position lamps                          | 15. Battery charge (alternator)  |
| 7. Main beam                               | 16. Engine oil pressure          |
| 8. Directional indicators (hazard warning) | 17. Fuel level gauge             |
| 9. Beacon control lamp                     |                                  |

**Start key**

- 0 = Off
- 1 = Power at all electric circuits, warning lamps and pre-heating on.
- 2 = Engine start position

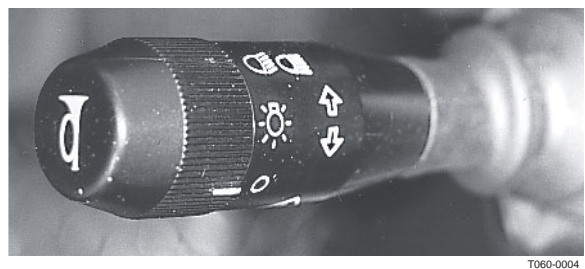
**Fuse box**

Regarding fuse diagram - see "Electrical system maintenance"

**Multi functional control stalk**

- The position lamps' and head lamps' dipped beam are switched on by turning the multi-functional lever and is indicated by the pilot lamp
- The main beam is activated by pressing the lever downwards and is indicated by the pilot lamp.
- To flash the main beam pull the lever upwards.
- The directional indicators are operated by pushing the lever forward (right) or backward (left) and indicated by the pilot lamp.
- The horn is activated by depressing the stalk end.

**Multi functional control stalk**



T060-0004

**Revolution counter and hour meter**

Count engine revolutions and working hours. All service and maintenance intervals are based on hour meter readings.

**Head lamps, main beam**

Indicates main beam is on.

**Position lamps or dipped beam, control lamp**

Indicates the head lamps and / or position lamps are on.

**Directional indicator control lamp**

(right and left side). If a bulb is defective, the frequency will increase or the control lamp will not flash.

**Rotating warning beacon control lamp**

Indicates when the rotating beacon is switched on.

**Engine coolant thermometer**

The engine coolant temperature should be 80-100 °C when the machine has reached normal operating temperature. If the temperature exceeds 110°C the engine is overheating, which can occur from the following reasons:

- Overload of engine - reduce driving speed
- Clogged cooler radiator fins - clean the radiator
- Coolant level low - refill with hot coolant to correct level
- Engine oil level low - refill to correct level.

If none of the above is solving the problem, call the engine service agent.

**Hazard warning signal device**

Depress knob to switch on and off hazard warning signals. Note local traffic regulations regarding use of this device.

**Rotating amber warning beacon switch**

Is recommended to be used when driving on public roads. Note local regulations regarding use of rotating warning beacon.

**Alternator charging control lamp**

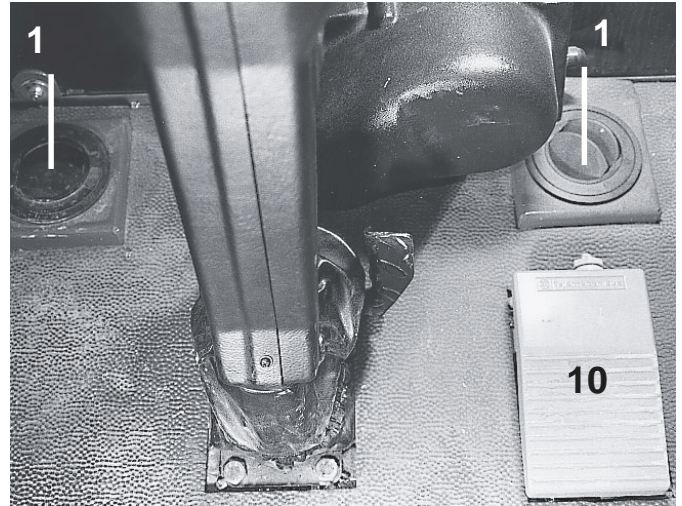
This should be off immediately after start of engine. If this lights up during working, the battery is not being charged. Get alternator and electric wiring inspected a.s.a.p.

**Engine oil pressure control lamp**

This lamp must be off immediately after engine starts. If this lamp is not off or lights on when engine works, STOP ENGINE IMMEDIATELY and check engine oil level - refill if necessary. If oil level is OK it is advised not to restart engine before it has been inspected by the engine service agent.

**Controls and switches, dash board**

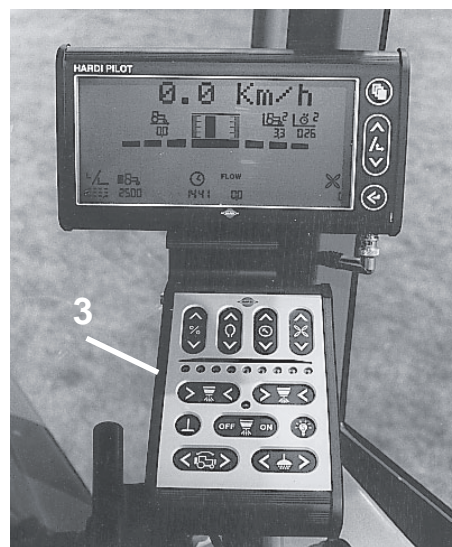
1. Adjustable air flow louvres
2. Adjustable air flow louvres at the windscreen (x 2)
  - 2a. Angling of air
  - 2b. Regulation/ON-OFF
3. Console for HARDI PILOT



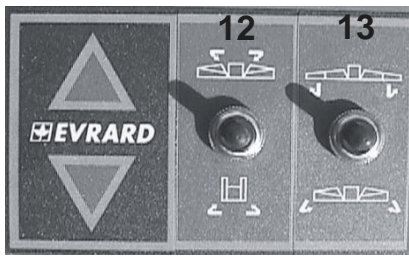
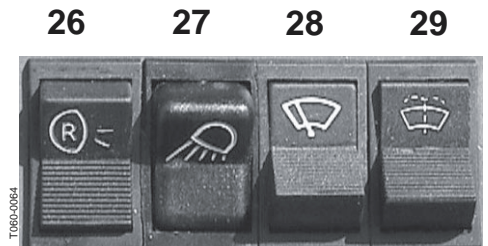
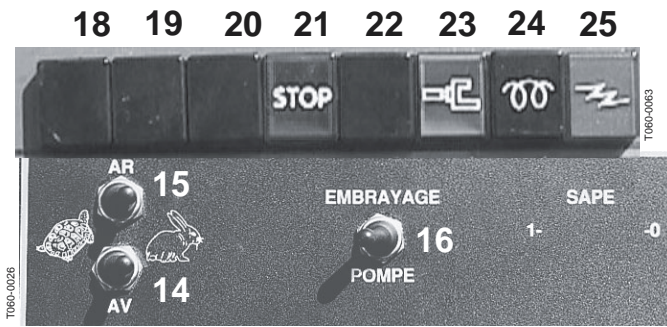
T064-0007



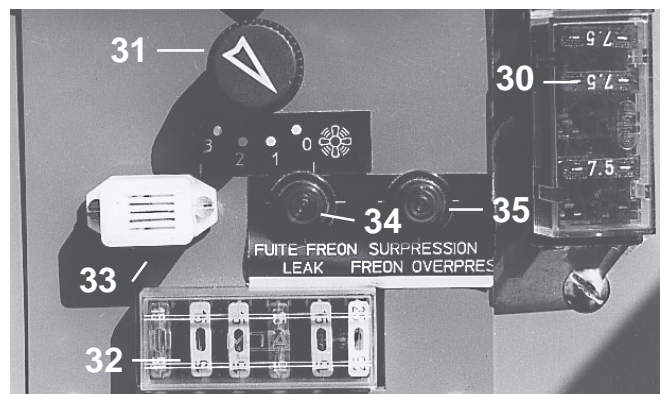
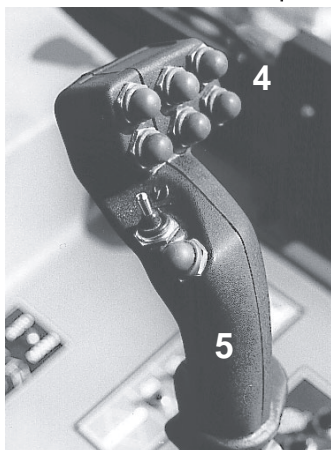
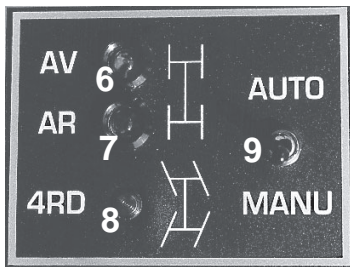
T060-0054




T060-0021

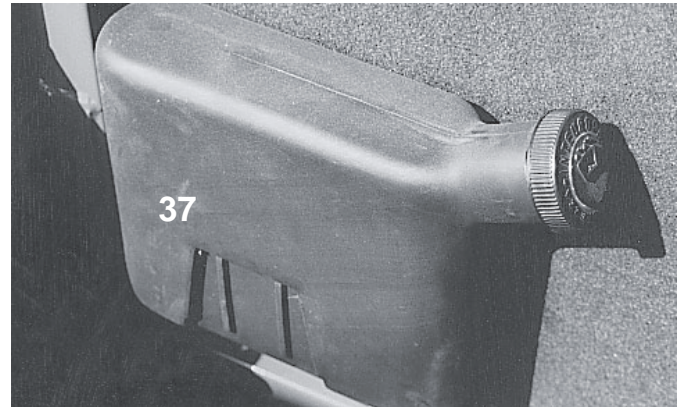


## Controls and switches, lateral control board



4. Engine throttle lever
5. Hydrostatic transmission control lever
6. Control lamp, realignment of front wheels (4-wheel steering)
7. Control lamp, realignment of rear wheels (4-wheel steering)
8. Control lamp, 4-wheel steering
9. 4-wheel steering AUTO/MANUAL switch
10. Pedal, 4-wheel steering (please see page 11)
11. ON/OFF switch for HARDI PILOT
12. Unfolding/folding of inner sections
13. Unfolding/folding of outer sections
14. Hydrostatic front wheel motors Fast/Slow switch
15. Do. Rear
16. Spraying pump switch
17. Not used
18. Control lamp, oil pressure for emergency brake system (only on certain models)
19. Not used
20. Not used
21. Engine STOP warning lamp
22. Not used
23. Spraying pump control lamp
24. Engine pre-heating control lamp
25. Battery isolator switch control lamp
26. Auxiliary lights switch (not used)
27. Working lamp switch
28. Windscreen wiper switch
29. Wind screen washer switch
30. Fuse box
31. Fan control 3-speed switch
32. Fuse box, cabin
33. Air conditioning warning buzzer
34. Air conditioning "over pressure" control lamp
35. Air conditioning "low pressure" control lamp
36. Boom sections switches (an open/close switch for each boom section. The switches are placed on top of the joy-stick)
  
37. Screen wash reservoir
38. Parking brake lever (only on certain models)
39. Parking brake/emergency brake lever (only on certain models)
40. Air conditioning temperature control
41. Cab heater/defroster
42. Cab air flow louvres

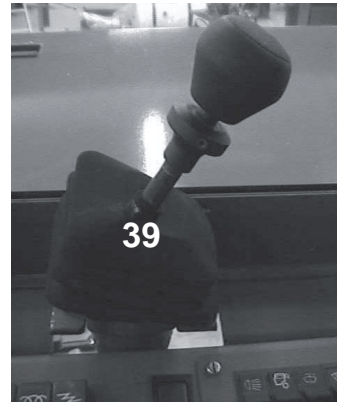
 **IMPORTANT:** Always stop the machine before folding or unfolding the boom (functions 12 & 13)



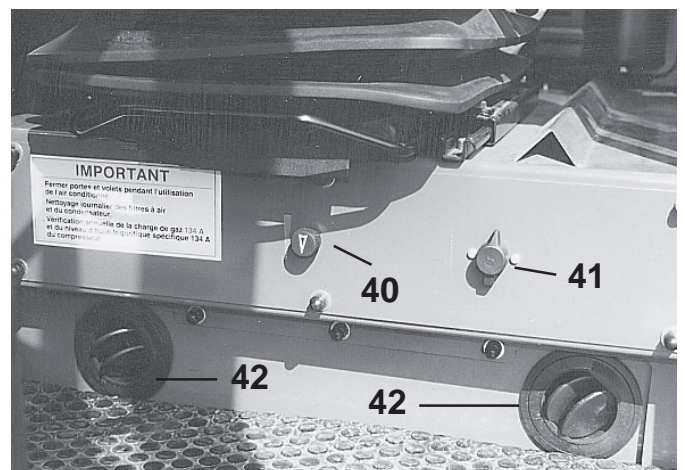
T060-0027



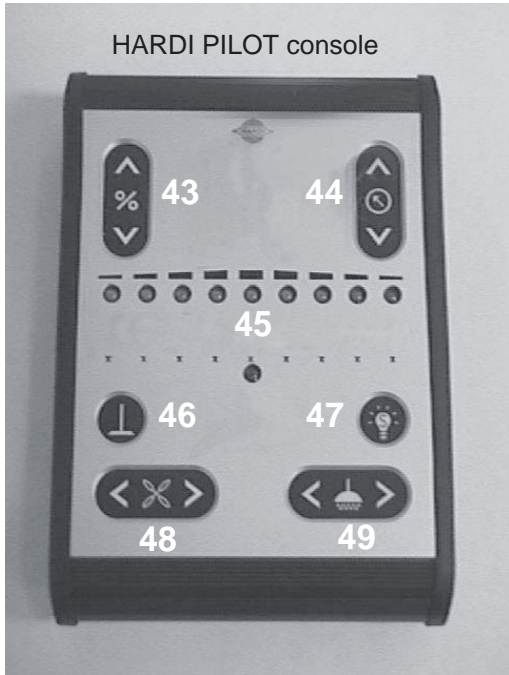
T060-0032



T060-0068



T060-0022



- 43. Spot dosage
- 44. Pressure regulation
- 45. Status LED (a diode for each boom section)
- 46. Tank agitation
- 47. LED brightness (for display)
- 48. TWIN fan revolutions
- 49. Foam marker

For further details - see HARDI PILOT instructions.

**Description of the ALPHA functions:**

**Adjustable air flow louvres**

Can be adjusted to obtain optimal air circulation in the cab.

**Console for HARDI PILOT**

Please see separate manual for operating instructions for the HARDI PILOT.

**Boom function switches**

For operation, see section “operating the boom”.

**4-wheel steering switch**

For operation see section “driving”.

**Engine throttle lever**

To be used for maintaining the correct engine revolutions and forward speed during filling and spraying. A second throttle lever is situated on the left hand side of the machine under the platform, and can be used during filling of water and chemicals.

**Emergency brake control lamp**

If the oil pressure control lamp lights up, the oil pressure is too low for the brakes to be disengaged. Stand by and keep the engine on till sufficient oil pressure has been generated. The control lamp will then turn off and the machine can be operated again.

**Engine STOP warning lamp**

This lamp indicates a malfunction:

- Engine coolant temperature too high
- Engine oil pressure too low
- Hydraulic oil level too low

If the STOP lamp should light, stop the machine and engine instantly and sort out the cause to the failure.

**Spraying pump control lamp**

Lights when diaphragm spraying pump is engaged. A second lamp is situated at the machine left hand-side at the throttle and pump controls.

**Engine pre-heating control lamp**

The engine pre-heating device is functioning automatically. Start the engine when the pre-heating control lamp switches off.

**Battery isolator switch control lamp**

This lamp indicates that battery isolator switch is on, and 12V is present in the electrical circuit.

**Windscreen wiper switch**

The windscreen wiper has three positions:

- Off
- Normal
- Fast

**Working lamps switch**

Controls front fitted working lamps. The lamps can only be switched on when at least the position lamps are switched on. The working lamps must be switched off on public roads.

**Wind screen washer switch**

Controls the windscreen washer. Use plenty of screen wash before starting the wiper to avoid scratches in the windscreen.

**Auxiliary lights switch**

Switch to be used if extra working lamps are to be fitted.

**Windscreen washer reservoir**

To be filled with clean water or an approved screen wash. In freezing conditions use frost proof screen wash. Do not use engine antifreeze.

**Fuse box (dash board)**

For details see section “Electrical system maintenance”.

**On/off switch HARDI PILOT**

For switching on and off the HARDI PILOT. This switch by-passes the start key.

**Cab interior lamp**

The cab interior light switch is situated at the frame of the lens.

**Fan control 3-speed switch**

Controls the cab fan speed.

- 0 Off
- 1 Low
- 2 Normal
- 3 Full

The air conditioning can only be operated when the fan is set at pos. 1-3.

**Fuse box**

For details see section "Electrical system maintenance"

**Air conditioning warning buzzer**

Will buzz simultaneously with control lamp for "Air conditioning overpressure" See paragraph "Air conditioning"

**Air conditioning control lamp "overpressure"**

If the refrigerant pressure in the air conditioning circuit becomes too high, this warning lamp will light. See paragraph "Air conditioning"

**Air conditioning control lamp "low pressure"**

If the refrigerant level or pressure in the air conditioning circuit is too low, this lamp will light. See paragraph "Air conditioning"

**Parking brake lever**

The parking brake is working on all four wheels.

Up = Engaged

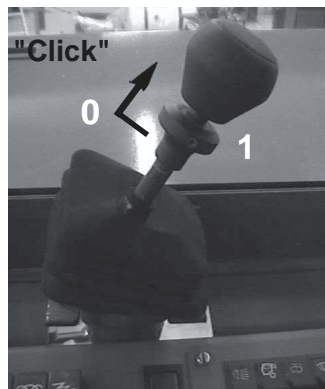
Down = Disengaged

In case of loss of hydraulic pressure the parking brake will engage automatically.

On some models, the sprayer is fitted with a combined emergency & parking brake.

If the lever is lead backwards to last position 1 = the parking brake is engaged.

If the lever is lead forwards to front position 0 = the parking brake is disengaged.



T060-0068

**Air conditioning temperature control**

This switches on the air conditioning and adjusts the temperature in the cab. The air conditioning does only work when fan switch is switched on as well. See paragraph "Air conditioning"

**Cab heater / defroster**

Controls the in-cab temperature.

**Cab air flow louvres**

Adjustable in all directions.

**Spraying pump switch**

Engages and disengages the diaphragm spraying pump. A second switch is located on the left hand side of the sprayer under the platform.

**Hydrostatic transmission control lever**

To start the engine, the lever must be in neutral position. Move the lever forward to drive forward and move backwards to reverse.

**Front wheel motors fast / slow switch**

Controls the front wheel motors speed and torque mode. See section "Driving".

**Rear wheel motors fast / slow switch**

Controls the rear wheel motors speed and torque mode. Se section "Driving".

**Control lamp, realignment of front wheels (4-wheel steering only)**

When the front wheels are aligned with the chassis this lamp lights.

**Control lamp, realignment of rear wheels (4-wheel steering only)**

When the rear wheels are aligned with the chassis this lamp lights.

**Control lamp, 4-wheel steering**

When the 4-wheel steering is set in automatic mode this lamp lights.

**Pedal, 4-wheel steering**

When this pedal is depressed the 4-wheel steering is active and front and rear wheels will steer when the steering wheel is turned.

## Use of cab heating

The cab is heated by means of the engine coolant. The warm air is distributed via the adjustable air flow louvres placed in the floor of the cab and will ensure effective heating of the cab and defrosting of the windscreen.

- Adjust the air volume by turning the 3-speed fan control
- Open and adjust the air flow louvres
- Adjust the temperature on the heater temperature control

## Use of air conditioning (if fitted)

The air conditioning evaporator unit is placed in the compartment under the seat and conditioned air is let into the cab via the air flow louvres.

Use of the air conditioning:

- Set the heater temperature control to minimum
- Adjust the air conditioning temperature control to the desired temperature
- Adjust the air volume by turning the fan speed control
- Adjust the air flow louvres to obtain comfortable air circulation in the cab
- Do not cool the cab air too much below outside temperature. A huge temperature difference will affect your physical well-being.

**IMPORTANT!** Always keep the cab door closed when the air conditioning is switched on.

To demist the windows rapidly, the air conditioning and heater can be operated simultaneously to lower cab air humidity.

**IMPORTANT!** To keep the air conditioning properly working, it must be operated at least once a month for minimum 10 min. Circulation of the refrigerant will lubricate all seals and prevent escape of the refrigerant.

Consult with your HARDI dealer if the problem continues, and have the system inspected by a specialist in air conditioning systems. AC refrigerant is not environmental friendly. Have leakages mended instantly.

## Windscreen wiper/washer

Depress the 2-speed wiper switch to operate the wiper. To wash the windscreen, press the button using screen wash from the reservoir

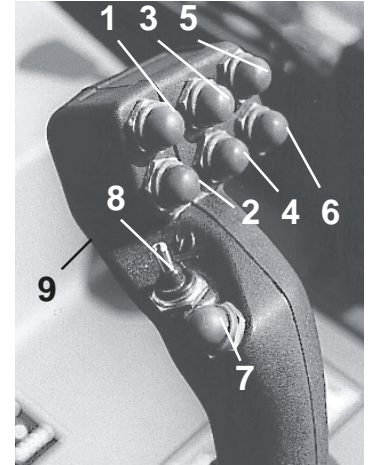
## Pilot lever

The pilot lever controls driving forward and reverse:

- Driving forward by moving the lever forward
- Reversing by moving the lever backwards
- Neutral position is midway in the notch

Following functions can be operated via switches on the pilot handle:

1. Raising of the boom
2. Lowering of the boom
3. LEFT hand side boom tilt UP
4. LEFT hand side boom tilt DOWN
5. RIGHT hand side boom tilt UP
6. RIGHT hand side boom tilt DOWN
7. EC operating unit ON / OFF
8. Slanting of the boom
9. Angling of air slot



T060-0006

## Boom section switches

On top of the pilot lever is situated a small board with an ON/OFF switch for each boom section.

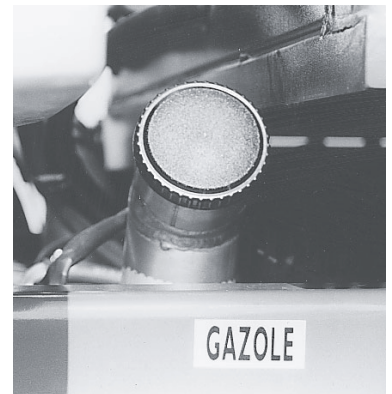


T060-0067

## Fuel tank

The filling cap on the fuel tank is located on the machine right hand side. Always clean the area around the fuel cap before unscrewing it for refilling.

It is recommended always to refuel the machine at the end of the day to avoid condensation of water in the fuel tank overnight.



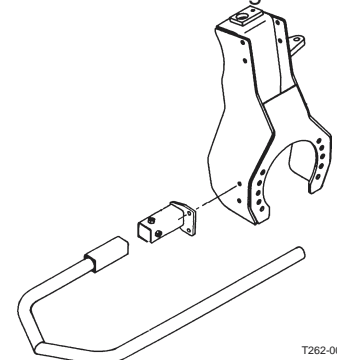
T060-0030

## Straw dividers (optional extra)

The machine can be fitted with straw dividers on all four wheels in order to reduce crop damage during spraying.

The straw dividers can be fitted on the following tyre sizes:

- 11.2 R 32"
- 14.9 R 24"
- 16.9 R 24"

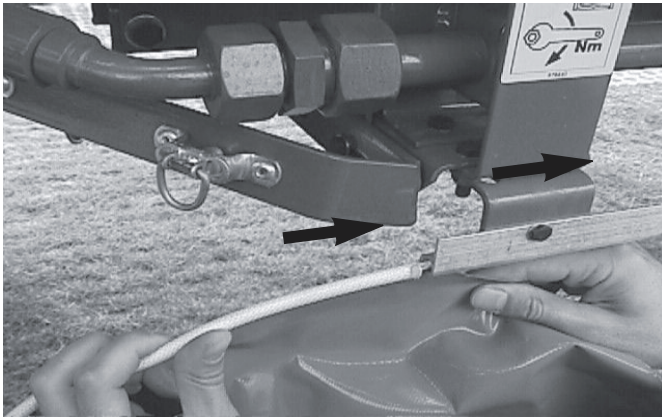


T262-0004



**Crop protective shield**

To protect high crop from being damaged by the under body of the sprayer, a protective shield can be fitted underneath the ALPHA TWIN FORCE.



T066-0073

1. Lead the rope of the protective shield the whole way through the guiding rail on the side of the sprayer. Repeat this procedure at the opposite side.

Each cutout in the protective shield must now be fastened with a matching locking device. The locking devices are situated on two metal profiles underneath the ALPHA TWIN FORCE.



T066-0074

2. Lead the locking device through the cutout in the shield.
3. Drag the split, twist it 90° and drop the split again to lock it.

**Optional tyre mountings**

The machine should normally only be fitted with the optional rims and tyres supplied as original equipment or rims with similar specifications and load capacities.

The maximum rim off-set is **-130 to +72 mm**.



**WARNING!** Failure to keep this maximum off-set may result in broken wheel motor shafts and can lead to serious accidents and personal injury!

**Track width**

The track width is factory set at 1800, 2000 or 2250 mm measured by standard wheel mountings. Change of wheel sizes will alter the actual track width.

Alteration of the track width requires the front and rear axles to be replaced.

**NOTE:** Track width 1500 is only available for 800 mm ground clearance.

Tyre size	Actual track width in mm (+/-10 mm):			
	Base track width (Mounting face distance)			
11.2 R 32"	1500 (1801)	1800 (1977)	2000 (2177)	2250 (2427)
14.9 R 24"	1500	1800	2000	2250
16.9 R 24"	1620	1800	2000	2250
16.9 R 24"	1720	2000	2200	2450
540/65 R 24"	1820	2000	2200	2450

Actual track width at base track width with different tyre sizes

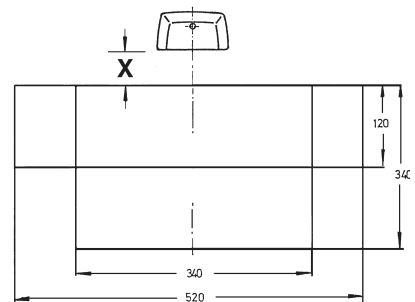
**Number plate(s)**

If the machine is required to be fitted with a number plate, this must be placed correctly under the lamp.

Number plate size	distance "X"
340 x 240 mm	45-65 mm
520 x 120 mm	65-100 mm

Rear number plate

The front number plate, if required, is fitted on the engine bonnet under the screen. Do not fit in the screen as it will reduce the cooling air flow.



T174-0002

## Driving

### Before starting the engine

Before starting the engine, always ensure that:

- All oil and fluid levels are correct
- Nobody is carrying out service or repair jobs on the machine
- All protection guards are properly fitted
- Parking brake is activated
- Pilot lever is in neutral position
- Main on/off valve at operating unit is switched off.

### Starting the engine

1. Switch on the battery isolator switch.
2. Ensure pilot lever is in neutral and parking brake is activated. A safety start switch will disable the starter motor when the pilot lever is not in neutral.
3. Set throttle at 1/4 of full speed.
4. Switch on key to pos. 1 and check warning lamps.
5. Check that the spraying pump and on/off valve at EC-operating unit is switched off.
6. When the preheating control lamp is off, turn the key to start position.
7. Set throttle to 1000 r.p.m. and let the engine warm up for 3 min. to ensure good lubrication before driving.

### To stop the engine

1. Set the pilot lever in neutral position and apply parking brake.
2. Let the engine run idle (800-1000 r.p.m.) for 5 min. to cool turbo and engine before stopping.
3. Stop engine by turning key to position 0.
4. Switch off the battery isolator switch.



**WARNING!** When parking, always ensure that the sprayer is out of reach of children or others, who can get contaminated and injured by chemical residues left at, or in the sprayer!

### Propulsion

The sprayer is equipped with hydrostatic transmission with full time 4-wheel-drive.

The speed can be varied stepless forward and reverse with the pilot lever.

The transmission has two different speed ranges which can be set independently on the front and the rear axle:

1. Low speed / high torque range. 0 - 12.5 km/h
2. High speed / low torque. 0 to 25 km/h.
3. Different setting on front and rear axles. 0-16 km/h.

**Range 1** is used for spraying in the field and when working speed and full traction power is required.

**Range 2** is used for road transport when the full speed and less traction power is required.

**Range 3** is used when driving uphill in slippery conditions where change in weight distribution will cause spinning front wheels.

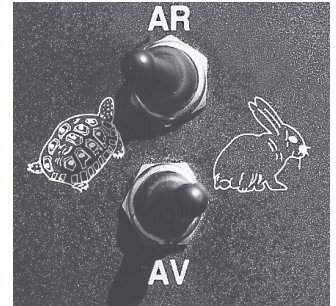
**IMPORTANT!** Range 3 should not be used for continuous driving. When conditions are back to normal, switch to range 1 again. NEVER change range when machine is moving.

To select speed range:

- Stop driving by moving the pilot lever to neutral
- Set the speed selector switches *forward* for slow speed range
- Set the switches *backwards* for fast speed range

- 1: Switch front wheels
- 2: Switch rear wheels

Slow range: 0 - 12.5 km/h  
 Fast range: 0 - 25 km/h  
 Medium range: 0 - 16 km/h



T060-0007

To avoid wheels spinning:

- Set the speed selector on “High” speed (Hare) on the axle with spinning wheels
- Set the speed selector on “Low” speed (Tortoise) on the axle with non-spinning wheels
- As soon as the conditions are back to normal, set both selectors to “low” again

**IMPORTANT!** The engine r.p.m. must always be **minimum 1800-2000 r.p.m.** to ensure full traction and braking power of the transmission. Driving with too low engine r.p.m. can cause braking failure and transmission damage!

### Service brakes

The ALPHA has no actual service brake system. The hydrostatic transmission works as propulsion and service brake system in one.

To stop the machine, the pilot lever is moved towards neutral “0”.

### Parking brake

The parking brake is placed on the side of the lateral switch board/console.

The brake is engaged when the handle is pushed upwards.

**IMPORTANT! Never activate the parking brake when the self-propelled sprayer is moving!**



T060-0032

### Emergency brake (certain countries only)

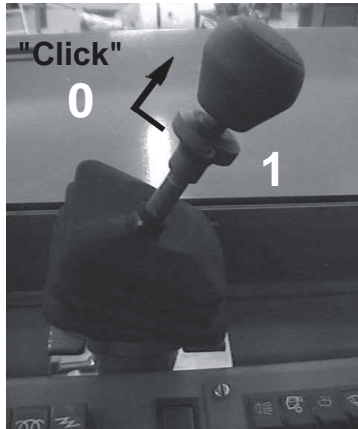
On some models, the sprayer is fitted with a combined emergency and parking brake, which can be variable proportioned. On this model, the operating lever is placed to the right of the pilot, on top of the lateral switch board.

This operating lever has two positions and is operated as follows:

*Engage the parking brake:*

Lift the lever actuator ring and lead the lever backwards to last position **1**.

This manoeuvre can also be proportioned in order to apportion the use of brake power in an emergency situation (= no sudden total engagement of the brakes).



*Driving position:*

Lead the lever forward to front position **0** and make sure the handle is engaged ("Click").

(If the engine should stop, the parking brake system still has sufficient brake power to perform the activation of the brakes approximately 9 times)

**IMPORTANT:** If the oil pressure control lamp on the lateral switch board comes on red, the oil pressure is too low for the brakes to be activated. Stand by and keep the engine on till sufficient oil pressure has been generated. The control lamp will then turn off and the ALPHA TWIN FORCE can be operated again.

## Steering

The steering on the ALPHA can be set in two different modes:

*Front wheel steering* - to be used on the road and during spraying

*Four wheel steering* - to be used during turning at the end of the tram lines



**WARNING!** Do not use 4-wheel-steering on public roads, and fast driving. Always disengage the 4-wheel steering before entering public roads.

In case of failure in the hydrostatic steering circuit the steering orbitrol permits an operation of the steering in a closed circuit.

## Front Wheel Steering

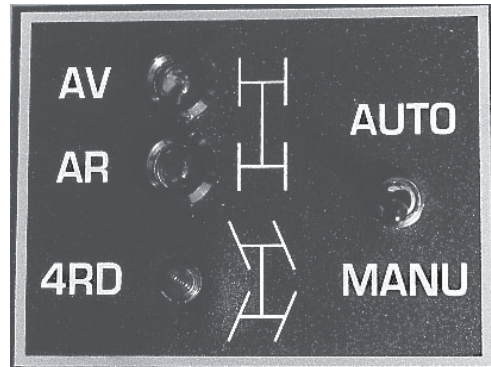
In this mode, only the front wheels can turn, the rear wheels stay in straight position.

To select Front Wheel Steering mode:

- Set the switch on 'AUTO'
- Turn the steering wheel so that the rear wheels are placed in right position; the signal **AR** is activated.

## Four Wheel Steering

In this mode, the front and rear wheels are steering opposite each other simultaneously.



To engage 4-wheel-steering mode:

- Set switch to "AUTO"
- Turn the steering wheel until both alignment lamps, **AV** and **AR**, lights
- Step on the 4-wheel-steering pedal on the floor
- Keep the pedal depressed as long as 4-wheel-steering is required

To disengage 4-wheel-steering mode:

- Step off the 4-wheel-steering pedal
- Turn the steering wheel until the lamp **AR** lights

The steering is now back to 2-wheel-steering.

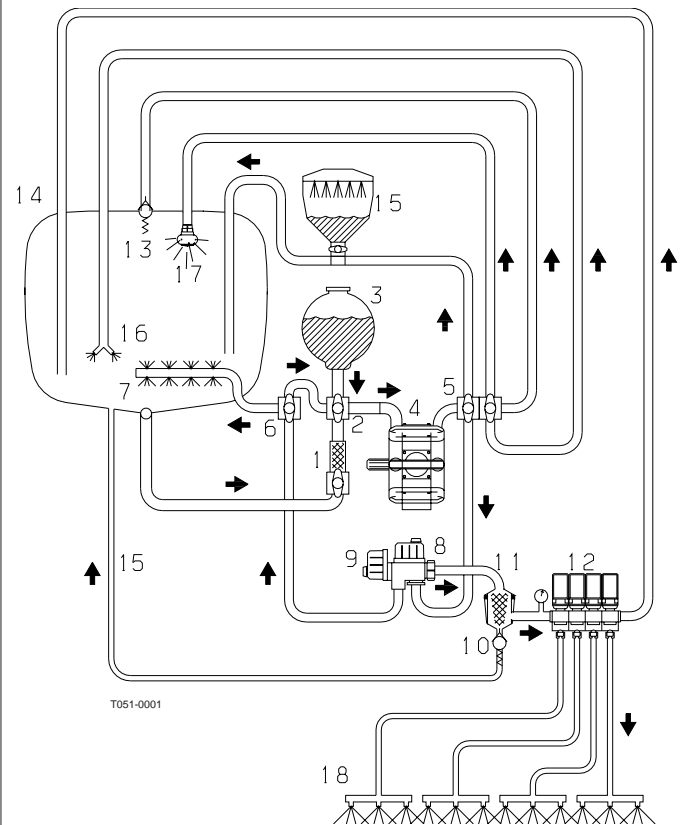
**NOTE!** If the AUTO/MAN switch is set in MAN mode, the wheel alignment must be done manually. The diodes indicate the wheels are aligned. In MAN mode an adapted crab steering can be done by using the steering wheel and pedal.

## Spraying

### Before taking 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 anti-corrosion oil (e.g. CASTROL RUSTILLO or SHELL ENSIS FLUID) on all metal parts in order to avoid chemicals and fertilizers to discolourate the enamel. Avoid to apply oil on windows, lamps, markings and rubber parts.

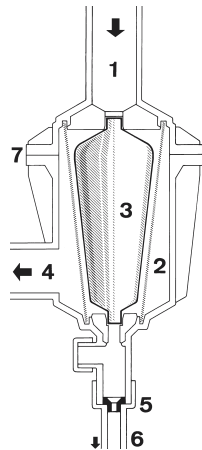
### Spraying circuit operating diagram



1. Suction filter
2. Suction manifold
3. Rinsing tank
4. Pump
5. Pressure manifold
6. Return valve
7. Return agitation
8. Operating unit on/off
9. HARDI MATIC pressure adjustment
10. Check valve
11. Self-cleaning filter
12. Distribution valves
13. Safety valve (operating pressure is 12 bar)
14. Return hose, constant pressure device
15. HARDI FILLER chemical filling device
16. Pressure agitation
17. Tank rinsing nozzle
18. Spray boom

**Self-cleaning filter  
Operating Diagram**

1. From pump
2. Double filter screen
3. Guide cone
4. To operating unit
5. Replaceable restrictor
6. Return to tank
7. Nut



**Choice of restrictor**

It is important to have a large flow through the filter. This is achieved by choosing the restrictor size in relation to the liquid consumption of the spray boom.

4 restrictors are supplied. Use the green one (largest orifice first).

The hose **N** is demounted at the self-cleaning filter, the restrictor is put in the hose and the hose is mounted again.

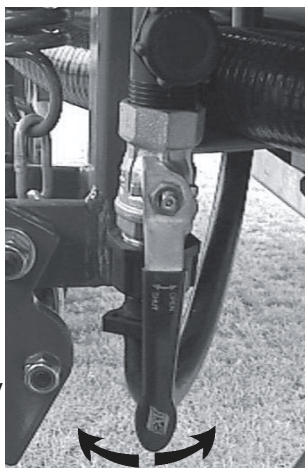
If the required working pressure cannot be obtained, the restrictor is too large. Choose a smaller restrictor. Start with a black one, then a white and finally a red one.

When cleaning the filter remove hose **N** and the hose at the safety valve, and check there are no residues.

Standard filter size is 80 mesh. Sizes of 50 and 100 mesh are available and can be changed by opening the filter top and replace the strainer. Check the O-rings before reassembling the filter and replace if damaged.

**IMPORTANT!** The ball valve underneath the self-cleaning filter should normally be open, but must be closed in the following cases:

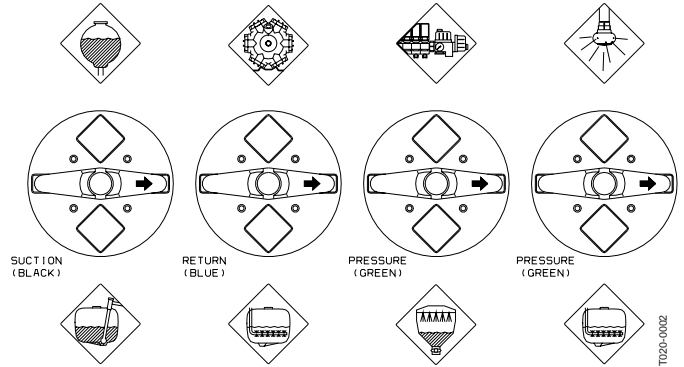
1. If rinsing with water from the rinsing tank and a quantity of spray liquid still remains in the main tank (otherwise the spray liquid will be diluted).
2. If opening the self-cleaning filter and a quantity of spray liquid still remains in the main tank (otherwise there is a risk that spray liquid will flow out).



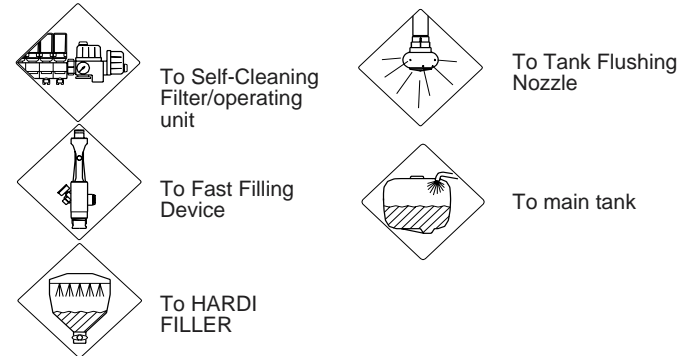
**Use of MANIFOLD valve system**

The following pictograms and colours are used for the visualizing of the function of the MANIFOLD valves:

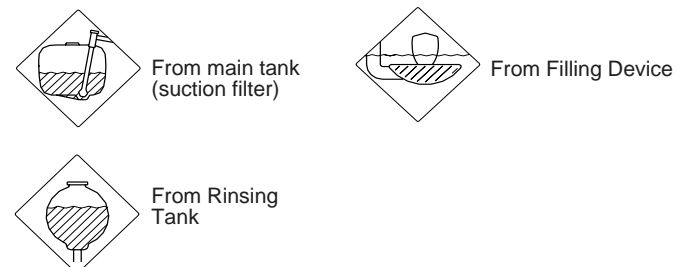
- Green disc: Pressure valve**
- Black disc: Suction valve**
- Blue disc: Return valve**



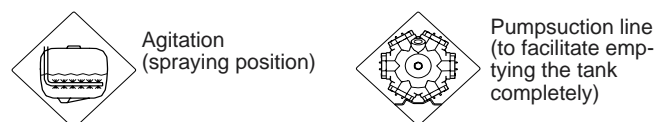
**Green disc = Pressure valve**



**Black disc = Suction valve**



**Blue disc = Return valve**



## To operate the spraying functions:

- Turn the handle on a green pressure valve towards the function desired
- Turn the handle on a black suction valve towards the desired function
- Turn the handle on the blue return valve towards the desired direction of return flow
- Close all remaining valves by setting the handle(s) on "O"

**IMPORTANT!** The valves and functions may vary from machine to machine depending on optional equipment fitted. Only the functions to be used must be open - Always close remaining valves.

## Spraying preparations

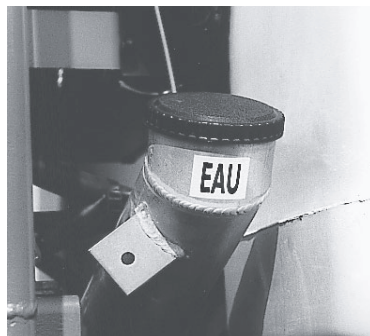
Before starting to spray always make necessary preparations:

- Chemical recommendations - read the label thoroughly
- Choice of nozzle type - Please see "Spray Technique"
- Working pressure - Please see "Spray Technique"
- Calibration of the nozzle output and speed. Please see "Spray Technique" and "HARDI PILOT 3880 DPE" manuals

## Filling of rinsing tank

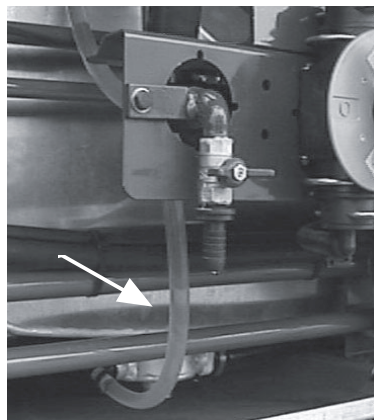
The rinsing tank filling tube is placed on the left hand side and has to be filled with clean water only through the filling cap. This tank is for rinsing of the spraying circuit and diluting of spray liquid residues prior to cleaning.

Capacity: 185 l.



T060-0010

The water level in the rinsing tank can be observed via the liquid indicator tube, situated on the side of the ALPHA. TWIN FORCE



T060-0058

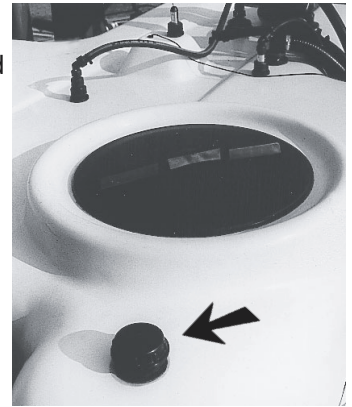
**IMPORTANT!** The ball valve underneath the self-cleaning filter should normally be open, but must be closed if rinsing with water from the rinsing tank and a quantity of spray liquid still remains in the main tank (otherwise the spray liquid will be diluted).

## Filling of clean water tank

The tank is incorporated at the left hand side front of main tank. It has to be filled with clean water from the tap only. It is used for washing of hands, cleaning of clogged nozzles etc.

Never put any chemical products in this tank and take care that it is always filled with clean water during work.

Capacity: 30 l.



T060-0012

## Filling of main tank

It is recommended to add the chemical products into the tank according to the manufacturer's instructions. During the filling process, please check continuously the liquid level in the tank in order to avoid pollution due to spillage. The chemical products can be added by suction or filled directly into the tank.

## Filling

Water can be filled into the main tank in the following ways:

1. Filled through tank lid on top of the sprayer tank.
2. Filled by diaphragm pump through suction side fitted filling device (optional extra) by normal pump capacity.
3. Filled by diaphragm pump through pressure side fitted injector/venturi type fast filling device (optional extra) by up to 3 times normal pump capacity.
4. Combination of 2. and 3.

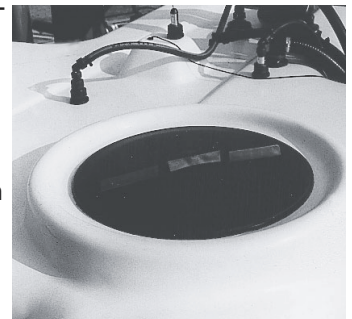
The tank should normally be filled  $\frac{2}{3}$  with water before adding the chemicals - always read instruction at chemical container!

## Filling through tank lid

Remove tank lid and fill water through strainer to prevent rust or other particles to enter the tank.

An overhead tank can be used in order to obtain high filling capacity.

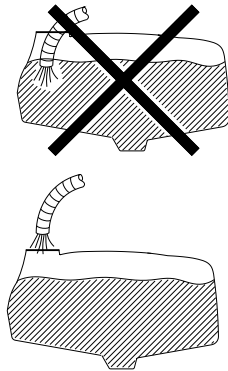
It is recommended to use as clean water as possible for spraying purposes.



T060-0012



**WARNING!** Never let the filling hose etc. enter the tank. Keep it outside the tank pointing towards the filling hole.



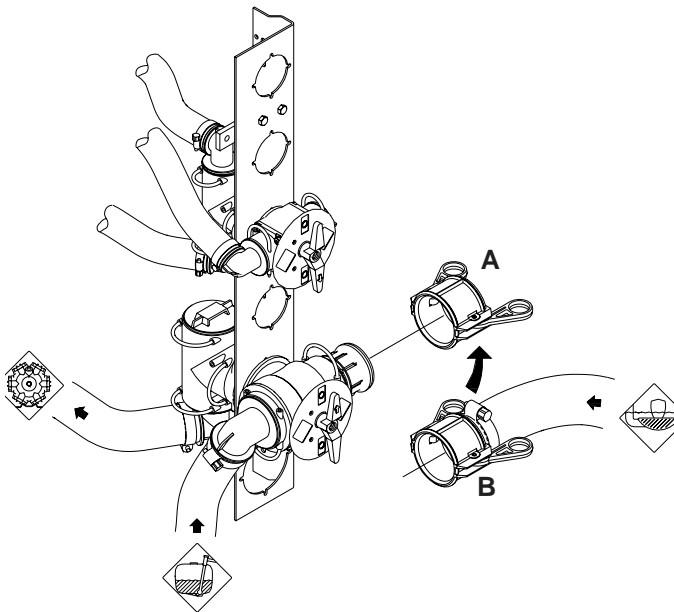
If the hose is lead to the bottom of the tank and the water pump at the water supply plant stops, chemicals can be siphoned back and contaminate water supply lines and well.

### Suction Filling Device.

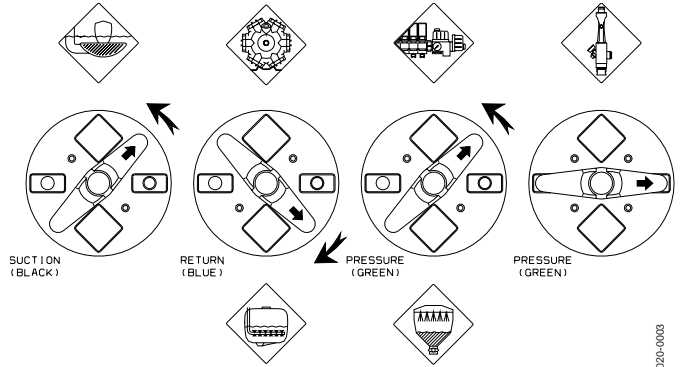


**WARNING!** Avoid contamination or personal injury. Do not open suction valve towards Suction Filling Device unless pump is running and filling hose is connected. If this valve is opened without pump running, liquid will stream out of the MANIFOLD.

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 engine revolutions at 2200 r/min. Turn handle on Suction Manifold towards Filling Device.
3. The tank is now filled with water. Keep an eye on liquid level indicator.
4. Turn handle on Suction Manifold away from Filling Device to discontinue filling process. Then disengage pump.
5. Disconnect suction tube **B** and replace cover.



T020-0003

**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.

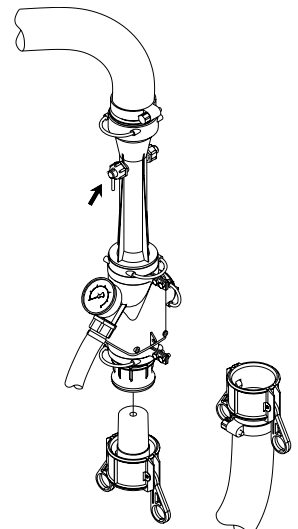


**WARNING!** If suction hose/filter is carried on the sprayer during spraying, it can be contaminated by spray drift which will be transferred to lake/river when filling!

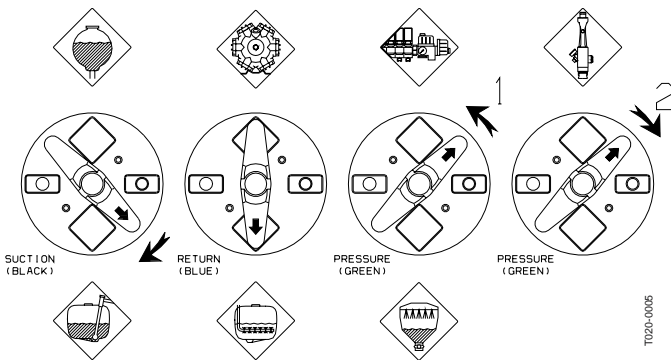
### Fast Filling Device.

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 engine at 2200 r/min, the pressure gauge should indicate about 10 bar.
4. If water is not seen in transfer tube, prime by turning valve **(C)**.
5. Keep eye on liquid level indicator.
6. Turn handle on Pressure Manifold away from Fast Filler to discontinue filling process.

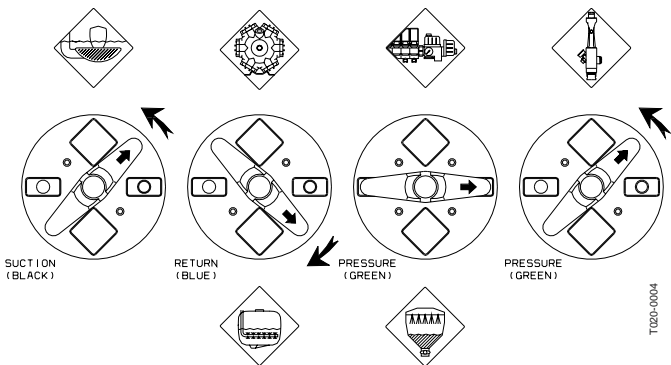


**NOTE:** Turn handle towards EC-operating unit **before** turning away from Fast Filler in order to avoid peak pressure blowing the safety valve!



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

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

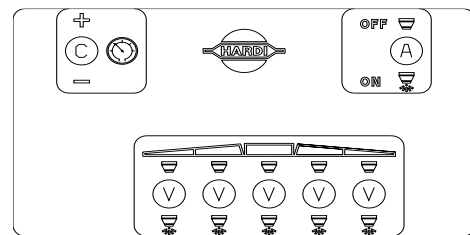
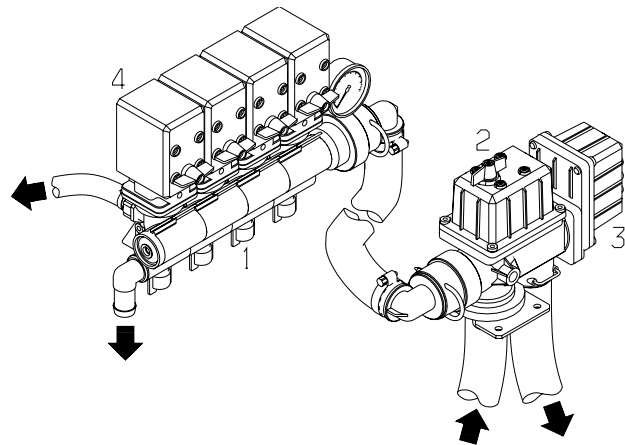


**WARNING:** Do not leave the sprayer whilst re-filling the tank, and keep an eye on the level gauge in order **NOT** to overfill the tank!

**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!

Adjustment of operating unit



**NOTE!** On models with HARDI PILOT the EC operating unit is controlled via the HARDI PILOT - See separate instruction book.

1. Choose the right nozzle size by turning the nozzle bodies to a suitable nozzle for the spray purpose. Make sure that all nozzles are the same type and size.
2. Open or close pressure agitation. (Remember pressure agitation takes 5% to 10% of pump output).
3. Open main on/off valve **2** by pushing switch towards green - spraying position **A**.
4. Open all distribution valves **4** by pushing switches **V** to position Green. A green indicator appears under the EC-motor when valve is in spray position.
5. Open pressure adjustment valve by activating switch **C** until green finger screw **3** stops rotating.
6. Put the machine in neutral and set the engine revolutions and thereby the number of revolutions of the pump corresponding to the intended travelling speed. Adjust the pressure adjustment valve **3** so that the pressure gauge indicates the recommended pressure.

ADJUST THE PRESSURE EQUALIZATION SECTIONS AS FOLLOWS:

8. Note the pressure and place the first of the distribution valves **4** to position "off" (opposite "Green" position).
9. Turn the corresponding adjusting screw **1** until the pressure gauge again shows the same pressure (turn the screw clockwise for higher pressure, anticlockwise for lower pressure).
10. Place the next distribution valve to position "off", and adjust this one in the same way - one by one.



**NOTE!** HEREAFTER ADJUSTMENT OF PRESSURE EQUALIZATION WILL ONLY BE NEEDED IF YOU CHANGE TO NOZZLES WITH OTHER CAPACITIES.

**OPERATING THE CONTROL UNIT WHILE DRIVING:**

11. To close the entire boom, operate switch **A**. This takes the pressure from the pump. The liquid will then return to the tank via the return system and serve as agitation. The diaphragm anti-drip valves ensure instantaneous closing of all nozzles. In order to close part of the boom, activate one of the distribution valves by the switch **V** of the section or sections to be closed. The pressure equalisation device ensures that the pressure does not rise in the sections which remain open.

**Remote pressure gauge (if fitted)**

The remote pressure gauge measures the working pressure in the boom tubes as close to the nozzles as possible. This pressure reading will always be slightly lower than the reading at the operating unit pressure gauge.

The outputs stated in the nozzle charts are always based on the pressure measured at the nozzle.

Always adjust pressure when calibrating and spraying according to readings at the remote pressure gauge.

**Filling of chemicals.**

Chemicals can be filled in the tank in 2 ways:

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

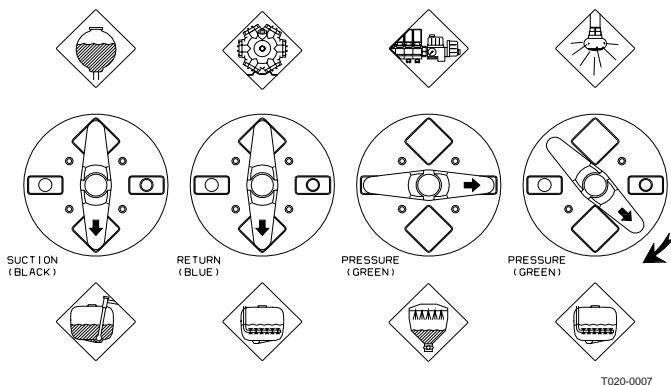
**Filling through tank lid**

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!

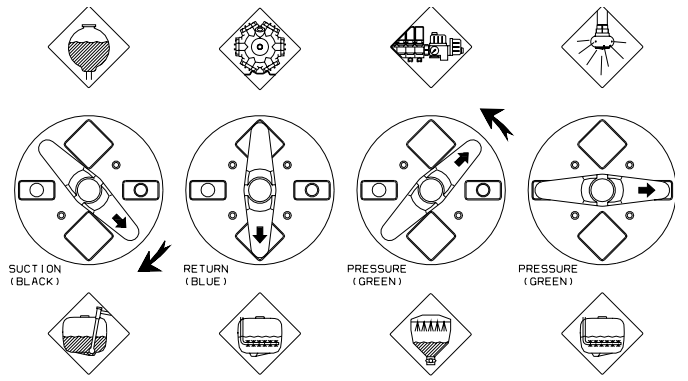
1. Make sure the EC on/off valve is switched off.
2. Set the MANIFOLD valves to correct position. Black valve "Suction from main tank", green valve towards "Agitation" and Blue valve towards "Agitation".



T020-0007

3. Engage the pump and set engine revs. to 2200 r.p.m.
4. Add the chemicals through the main tank hole.
5. When the spray liquid is well mixed, turn handle on the Pressure Manifold towards "Spraying" position.

Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

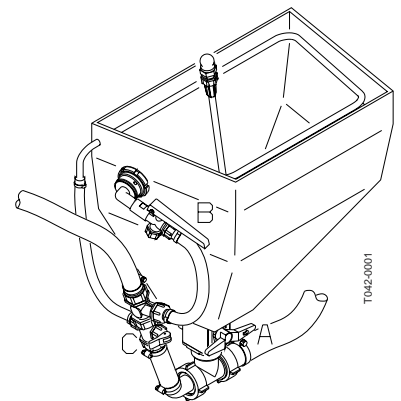


T020-0012

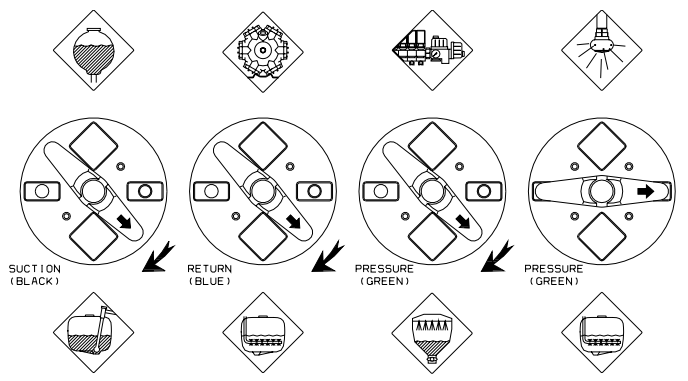
**Filling by HARDI FILLER chemical inductor**

**Liquid chemicals:**

1. Fill the main tank at least 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" and turn blue return valve towards "Agitation". Close remaining valves.
3. Turn the handle at the Pressure Manifold towards "HARDI FILLER". Close remaining valves. Check that bottom valve **A** at the FILLER is closed.
4. Engage the pump and set engine speed at 2200 r.p.m.



T042-0001




T020-0006

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.

- Open the bottom valve **A** and the chemical is transferred to the main tank.
- 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**.

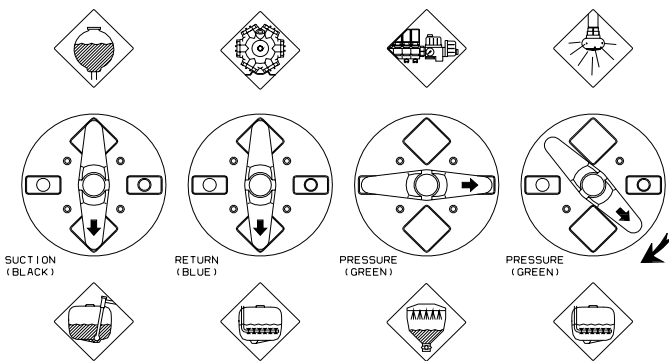
 **WARNING!** Do not press lever **B** unless the multi-hole nozzle is covered by a container to avoid spray liquid hitting the operator.

**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.

- Engage the hopper rinsing device by opening valve **C**.
- Close valve **C** again when the hopper is rinsed.

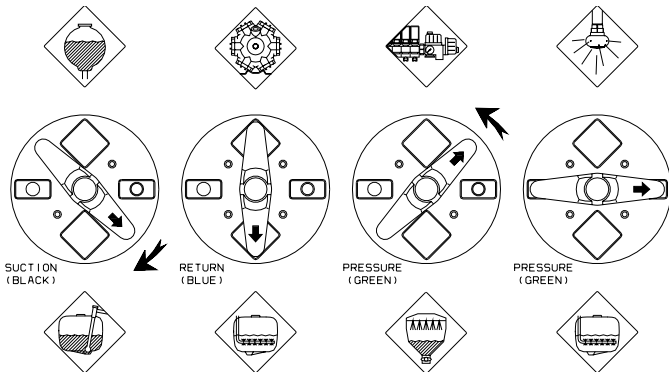
**IMPORTANT!** The hopper rinsing device is using spray liquid for rinsing the hopper for concentrated chemical! The FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

- Close valve **A** and the FILLER lid again.
- Turn handle at the Pressure Manifold towards "Intensive Agitation" and close remaining valves.



- When the spray liquid is well mixed, turn handle on the Pressure Manifold towards "Spraying" position.

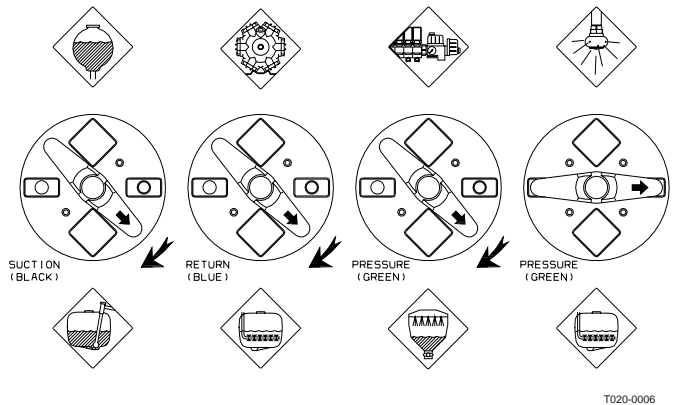
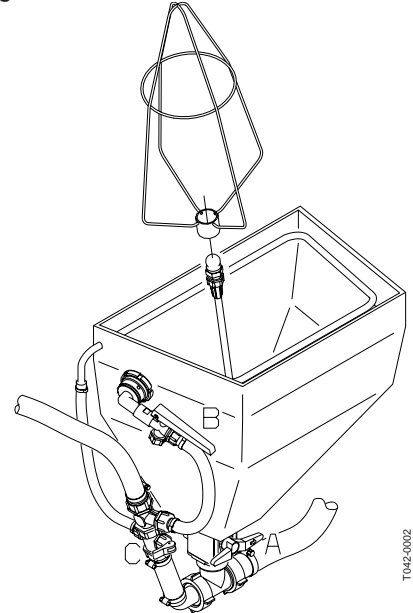
Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop




## Powder chemicals

Filling of powder chemicals is done as follows:

- 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".
- Turn the handle at the Suction Manifold towards "Main tank" and turn blue return valve towards "Agitation". Close remaining valves.
- Turn the handle at the Pressure Manifold towards "HARDI FILLER". Close remaining valves.



- Engage the pump and increase engine speed to 2200 r.p.m.
- Open the bottom valve **A** at the FILLER. Open FILLER lid.
- Engage the hopper rinsing device by opening valve **C**.
- Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the rinsing device can flush it down.
- 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**.

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

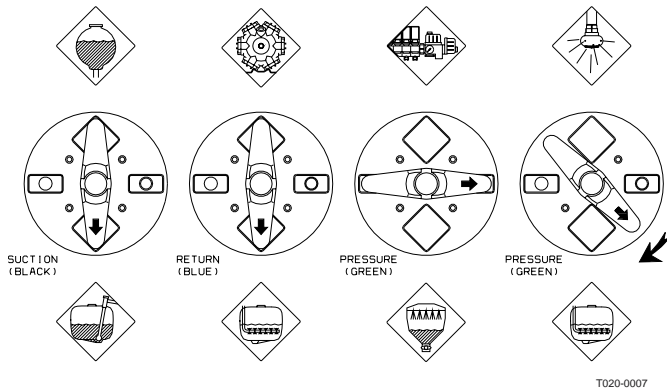
**IMPORTANT!** Rinsing device uses spray liquid to rinse containers for concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

9. Close valve **C** again when the hopper is rinsed.



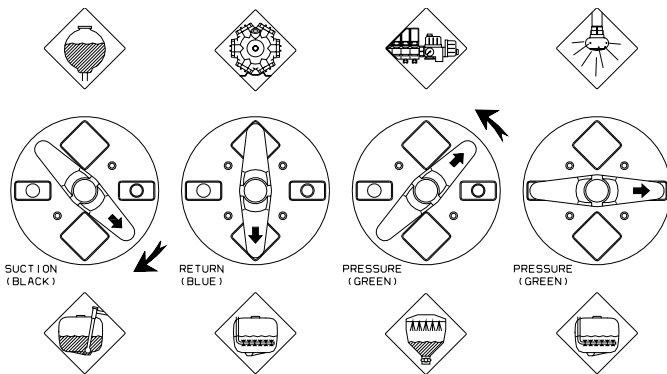
**IMPORTANT!** The hopper rinsing device is using spray liquid to rinse the hopper for concentrated chemical. The FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

10. Close valve **A** and the FILLER lid again.  
 11. Turn handle at the Pressure Manifold towards "Intensive Agitation" and close remaining valves to mix the spray liquid.



T020-0007

12. When the spray liquid is well mixed, turn handle on the Pressure Manifold towards "Spraying" position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.



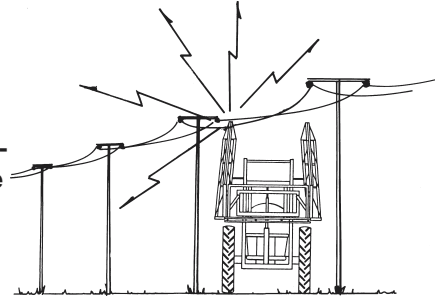
T020-0012

## Operating the boom

**Safety first!** Before operating the boom, be sure that no objects are found near the sprayer (poles, persons, etc.).

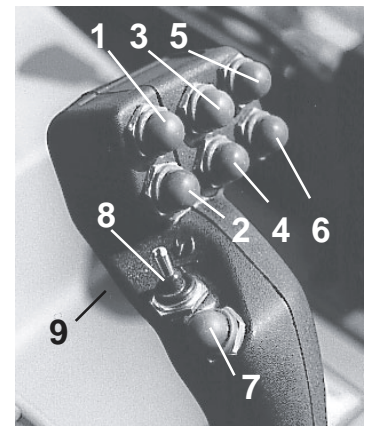


**DANGER!** When folding and unfolding the boom, be sure that no persons or objects are in the operating area of the boom and that the boom cannot touch any electrical conductors!

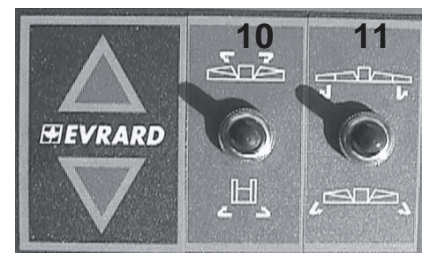


T029-0010

1. Raising of the boom
2. Lowering of the boom
3. LEFT hand side boom tilt UP
4. LEFT hand side boom tilt DOWN
5. RIGHT hand side boom tilt UP
6. RIGHT hand side boom tilt DOWN
7. EC operating unit ON/OFF
8. Slanting of the boom
9. Angling of air slot



T060-0006



T060-0065

10. Unfolding/folding of inner sections
11. Unfolding/folding of outer sections

## Unfolding the boom

**NOTE!** Ensure that the transport safety chains are removed and the booms are clear from the transport brackets before unfolding.

1. Push switch **1** to lift the boom clear of the transport brackets.
2. Push switch **10** upwards to unfold the inner sections. Rear transport hooks disengage automatically.

3. Push switches **4** and **6** downwards to lower individual tilt rams.
4. Push switch **11** upwards to unfold outer sections.
5. Push switch **8** to correct slant angle.
6. Push switch **2** to lower the boom to correct height above crop or ground level.
7. In order to reduce wind drift and/or increase penetration of spray liquid in the crop, the slot angle can be changed backwards and forwards by switch **9**.

**NOTE:** The ALPHA TWIN FORCE must be in parking position when folding and unfolding the boom (functions 10 and 11) Failure to do so may cause serious damages to the boom!

## Folding the boom

1. Check that the slanting function is midway (**8**)
2. Set slot angle at midway (**9**)
3. Raise boom (**1**) to upper position.
4. Push switch **11** downwards to fold outer sections
5. Push switches **3** and **5** for individual boom tilt
6. Push switch **10** downwards to fold inner sections  
Rear transport hooks engage automatically.
7. Lower boom (**2**) until boom rests on transport brackets.

**NOTE:** During transportation of the folded boom, the boom must be correctly placed in the transport brackets. Failure to do so will damage the boom!

## Hydraulic slanting control

The hydraulic slanting control **8** enables slanting of the entire boom hydraulically. This is advantageous when spraying across hillsides.

Reset position to neutral (midway) before folding the boom.

## Boom tilt function

The boom tilt function control **3, 4, 5** and **6** enables you to adjust the boom height individually in right and left-hand side.

## Air slot angling

The air slot and nozzle assembly (**9**) can be angled approx. 40° forwards and 30° backwards compared to vertical position. Regarding adjustments - see section on "Air technique".

## Electric fan speed adjustment (HARDI PILOT)

The max. Revolutions for the fan is 3100 r.p.m., which will give full air speed of approx. 40 m/sec (90 mph).

The fan speed is indicated by the transmission working pressure by means of a pressure gauge.

Conversion table between pressure and fan speed - see section "Air Technique"  
Please refer to separate instruction book for HARDI PILOT for further information.

**IMPORTANT!** To avoid shock starting the fans always set fan speed to 0 before engaging the P.T.O.

## Boom support wheels

The boom is equipped with two support wheels. When spraying with low boom heights on bare ground or plants in the first growth stage it is recommended to fold down the support wheels. In later growth stages the wheels should remain folded up.

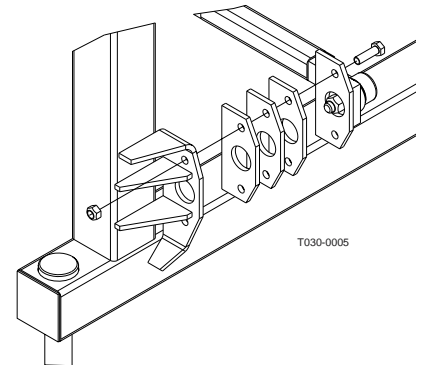
**IMPORTANT!** When driving on public roads the support wheels should be folded up and secured in order to keep the machine overall width according to the regulations!

## Boom suspension sensitivity

The boom suspension would normally suit most conditions and would not require any adjustment. The suspension will keep the boom parallel to the ground and compensate for uneven ground.

However special conditions or situations can require the suspension to react less or more slowly.

When the RH and LH guide rods are parallel to each other (factory setting) the boom suspension will react immediately, and the boom will move independently of the machine.

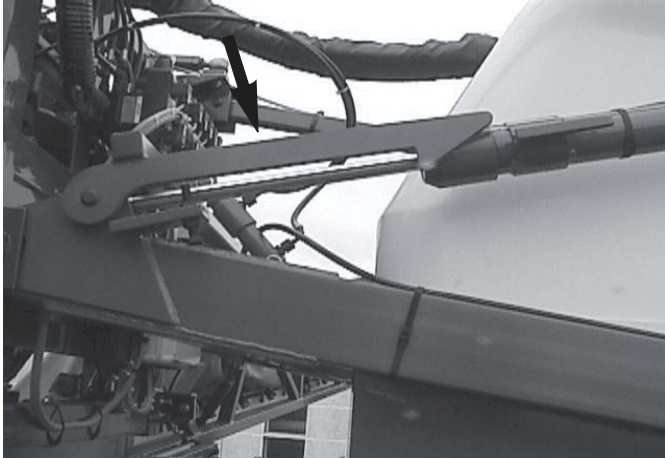


If the boom should follow the movements or inclinations of the ALPHA, the guide rods should be inclined towards each other at the rear.

Add 1-4 pcs. of 10 mm spacers as shown at each rod until the desired function is reached.

**Transport lock**

The transport locks (one on both right and left hand side) is situated on the side of the ALPHA TWIN FORCE just behind the tank.

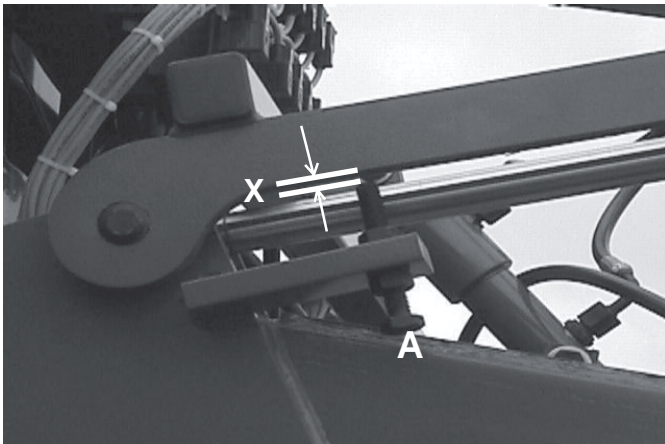


T060-0062

The bolt **A** on the transport lock must be adjusted if necessary. Correct position = 1 mm gap between the bolt and the transport lock when the boom is unfolded.

The bolt **A** is adjusted as follows:

1. Loosen the two nuts
2. Adjust the position of bolt **A** until correct distance between the bolt and the transport lock is obtained.
3. Fasten the two nuts again



T060-0060

X = 1 mm

**Spray Technique - see separate book.**

**Air technique**

With TWIN air assistance energy is added to the spray droplets to improve control with the spray liquid . This way TWIN makes it possible to:

- carry the spray droplets safely to the target and increase plant deposit
- minimize off-target deposit due to wind drift or loss on the ground
- open the crop and obtain good penetration even with a low volume rate
- ensure a high coverage.

**Air speed / Air volume**

The fan speed is infinitely variable and can produce from 0 to 35 m/s (78 mph) air speed at the air outlet. This equals from 0 to 2000 m<sup>3</sup> air/m boom/hour (3.872 CFM/A boom/hour).

The air speed must be adjusted to the spray job. The tables below give a rough guide line.

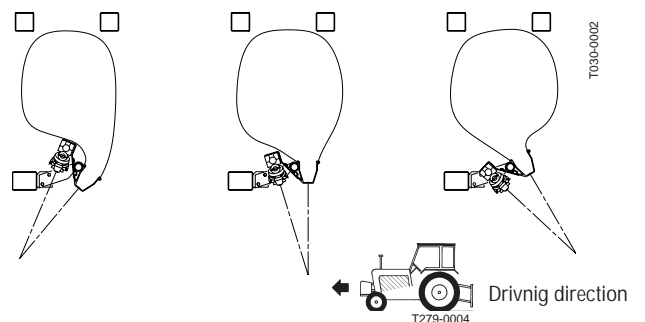
	Air assistance			
	Low (L)	Medium (M)	High (H)	Very high (VH)
Air speed (m/s.)	5-10	10-20	20-30	30-35
Fan r.p.m.	400-1000	1000-1900	1900-2700	2700-3100
	Oil press (bar)			
Boom 18 m	20-40	40-75	75-125	125-180
Boom 20-21 m	25-50	50-90	90-150	150-200
Boom 24-28 m	30-70	70-140	140-190	190-240

Spray job	Air assistance
Bare ground/low vegetation/early stage row crop	low/medium
Spraying only the top of a crop i.e. ear spraying in wheat*	low
Penetration in open crop*	medium/high
Penetration in dense crop*	high/very high

\*Can be checked with water sensitive paper

**Angling of air and liquid.**

The main purpose of the TWIN angling system is to counteract for the negative influence which wind direction and driving speed have on the quality of the spray job. Further the "co-angling" of air and liquid can help "opening" dense crops for better penetration. The TWIN FORCE air system can be set at any angle from 40° forward to 30° back (defined by the air stream).



**Adjusting the air assistance**

The air speed and angling must always be adjusted individually for each spray job and the given weather conditions.

It is always a good idea to get used to a new sprayer out in a field with only water in the tank, on this occasion the following routine for air adjustment should be practised:

1. Start with the air vertical
2. Set the air speed ..... **A**
3. Find the best angling ... **B**
4. Readjust the air ..... **A**

**IMPORTANT!** Fine turning of air speed and angling will often be necessary all through the spraying job.

It is easiest to find the best air setting to reduce drift when the sun is low and behind the boom (backlight). These conditions make the drift more visible.

**A** Setting of air speed, rules of thumb

**Step 1:** Find the range of air speeds that can control drift:

1. Start with the air setting at zero and keep increasing the air speed just to the point where you can see that the drift cloud is minimised - note minimum setting.
2. Then increase the air speed until you see drift again - note maximum setting.
3. Now you know the range of air speeds that can be used with minimum drift.

**Bare ground / low crop**

The range of air speeds is usually very small.

**Taller crop**

The taller the crop the wider the range of air speeds that can reduce drift.

**At higher wind speeds**

More air is needed on the sprayer and it is advisable to drive more slowly and use minimum boom height (40 cm)/(16 in).

**NOTE!** Too high air speed over bare ground/low crop can cause reflection of the spray liquid and leave dust on the leaves, which can again reduce the effect of the plant protection product.

**Step 2.:** Set the optimal air speed within possible the range mentions above.

Conditions	Air speed recommendations
Bare ground / low crop:	Use maximum air within the possible range
Taller crop:	Deeper crop penetration requires more air on the sprayer (if you are in doubt check with water sensitive paper).

Forward speed:	Higher forward speeds require more air on the sprayer.
Volume rate:	Lower volume rates require more air assistance to avoid drift.

**B** Angling of air and liquid, rules of thumb

To control wind drift the influence of wind speed and wind direction as well as the horizontal air current around the boom due to forward speed must be minimised. Because it is a sum of two forces with variable direction and size that we have to counteract for, the following can only be very rough guidelines.

**NOTE!** Often it will be necessary to drive with two different anglings, so the angling is changed when changing driving direction after turning at the headland.

Wind direction	Angle / air speed
Head wind:	Angle forward
Down wind:	Angle back (if the forward speed is higher than the wind speed: angle forward)
Side wind / No wind:	Angle vertical or back. Only high forward speeds may require forward angling.

Crop condition	Angle / air speed
Bare ground/ low vegetation:	Low air speed and angling back will often be the best setting to avoid reflection of spray liquid.
Dense crop:	The angling feature is ideal to help opening the canopy and improve penetration. If you follow the crop movement as you are varying the angling you will find that at certain settings the crop will open more for penetration.

If wind speed, wind direction or for some reason forward speed changes during spraying the optimum angling is likely to change too. Be aware that with certain combinations of air speed and angling you can “close” or flatten the crop and make penetration impossible - follow the crop movement intensively especially when setting the air assistance and keep an eye on the crop all through the application.**NOTE!**

- It is most important that the sprayer operator is familiar with the above rules of thumb before using the TWIN sprayer
- All volume rates, pressures and air adjustments stated in the following tables are, of course, guiding. Special conditions regarding climate, crop quality, spraying time and applied chemical can change the procedure. The tables are showing practice in northern Europe, and conditions may be very different in other countries. If you want some local advice you are very welcome to contact the TWIN application expert at the HARDI importer or daughter company in your country.

- The volume rate can generally be reduced to half of what is applied with a conventional sprayer, but with a minimum of 50-60 l/ha at 7-8 km/h (5.5-6.5 GPA at 4.5-5 mph. Exceptions are of course liquid fertiliser and herbicides whose selectivity is based large droplets that will only stick to the weeds.
- Low drift nozzles can also be fitted on a TWIN sprayer and help reduce drift even further.
- If there is a detailed spraying instruction on the chemical label regarding drop size, spray pressure, spray volume rate etc. this should be followed. Enclose 1 bag of water sensitive paper and instruction of how to use with all TWIN sprayers.

### **Water sensitive paper**

USE WATER SENSITIVE PAPER TO HELP FIND THE BEST AIR SETTING. Some time spent in different types of crops with clean water in the tank and some water sensitive paper will be valuable experience for the future work with your TWIN sprayer. The paper can be cut into smaller pieces (to simulate the target) and fixed with double sided tape at relevant places in the crop. Then spray with pure water and check the blue spots (droplets) on the paper. This way you can test different spraying techniques. Water sensitive paper is available at your local HARDI dealer, part No. 893211

**Winter Rape - Tractor speed 8 km/h**

Spray task	Growth Stage Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb. spraying	Pre-drilling	75	F-015-110	2.1	L
Herb. spraying	Post-drilling	100	F-015-110	3.6	L*
Volunteer cereal	Pre-emergence	100	F-015-110	3.6	L
Pests	At emergence	75	F-015-110	2.1	L/M*
Volunteer cereal	4 leaf stage	100	F-015-110	3.6	M
Pests	2-3 beetles/ plant when in bud	75	F-015-110	2.1	M
Pests; brassica pod midge and cabbage seed weevil	Beginning of flowering	100	F-015-110	3.6	M/H
Pests	Full flowering	100	F-015-110	3.6	H
Fungicide	Full flowering and until ceasing	100	F-015-110	3.6	H/VH
Herb. spraying, Couch grass + desiccation	2 weeks before harvest	100	F-02-110	2.1	H/VH

**Rye - Tractor speed 8 km/h**

Spray task	Growth Stage Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb. spraying, residual type	0	75	F-015-110	2.1	L
Herb. spraying, post-emergence	1-2	100	F-015-110	3.6	L/M*
Autumn fungicide	2-3	75	F-015-110	2.1	M
Herb. spraying, spring	4	75	F-015-110	2.1	M
Growth regulation	5-6	100	F-015-110	3.6	M
Fungicide, Eyespot	5-6	100	F-015-110	3.6	M/H
Fungicide, leaf disease	7-8	100	F-015-110	3.6	M/H
Growth regulation	8-9	75	F-015-110	2.1	M
Insecticide spraying	10-10.5	75	F-015-110	2.1	M
Herb. spraying,	At the latest				
Couch grass	10 days before harvest	75	F-015-110	2.1	M/H

**Peas (yellow) - Tractor speed 8 km/h**

Spray task	Growth Stage Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb. spraying	Pre-emergence	75	F-015-110	2.1	L
Pests (pea and bean weevil + thrips)	Post-emergence	100	F-02-110	2.1	L
Herb. spraying	2-5 cm high	100	F-02-110	2.1	M
Fungicide spraying (grey mould + leaf and stem pod spot and pea weevil)	Prior to flowering	100	F-02-110	2.1	M/H
Fungicide spraying (grey mould + pea weevil)	14 days later	100	F-02-110	2.1	H
Aphids spraying	At flowering until ceasing	100	F-02-110	2.1	M
Herb. spraying, Couch grass + desiccation by systemic herbicide	2-4 weeks before harvest	100	F-015-110	3.6	H
Withering by contact herbicide	2-4 weeks before harvest	150	F-02-110	4.6	H

**Spring Rape - Tractor speed 8 km/h**

Spray task	Growth Stage Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb. spraying	Pre-drilling	75	F-015-110	2.1	L
Herb. spraying	Post-drilling	75	F-015-110	2.1	L
Pests	At emergence	75	F-015-110	2.1	L*
Herb. spraying broad-leaf-species	3-4 true leaves	100♦	F-02-110	2.1	L/M
Herb. spraying monocotyledonous species	4 true leaves	100	F-015-110	3.6	M
Pests; blossom beetle	1 beetle/plant when in bud	75	F-015-110	2.1	M
Pests; brassica pod midge and cabbage seed weevil	Beginning flowering	75	F-015-110	2.1	M/H
Pests; brassica pod midge and cabbage seed weevil	At full flowering	75	F-015-110	3.6	H
Fungicide	At end of flowering	100	F-015-110	3.6	H/VH
Herb. spraying, Couch grass + desiccation	2 weeks before harvest	100	F-015-110	3.6	H/VH

♦ If applying full dose rate Benasalox (Benazolin - ethyl + Clopyralid) and Bladex (Cyanazin) in a tank mix, use water rate 150 l/ha.

NOTE! All volume rates, pressures and air suggestions indicated in these tables are only guiding. Special conditions regarding climate, quality of the crop, spraying time and chemicals applied (burning) may partially change the procedure.

\* NOTE! If dust is deposited on leaves the air speed must be reduced.



**Potatoes - Tractor Speed 6 Km/h**

Spray task	Growth stage	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb.spraying	Pre-emergence	75	F-01-110	2.7	L
Herb.spraying	Post-emergence	75	F-01-110	2.7	L/M*
Herb.spraying	Haulm 15 cm high	75	F-01-110	2.7	M
Diseases (potato blight)	1. spraying latest July 1	150	F-02-110	2.6	H/(VH)
Same treatment to be repeated with 10 days' interval until 2 weeks before harvest.					
Desiccation	When the tubers have the size required	200	F-03-110	2.1	H/(VH)

**Winter Wheat - Tractor Speed 8 Km/h**

Spray task	Growth Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb. spraying pre-emergence	0	75	F-015-110	2.1	L
Herb. spraying post-emergence	1-2	100	F-015-110	3.6	L/M*
Fungicide autumn	2-3	75	F-015-110	2.1	M
Herb. spraying spring	4	75	F-015-110	2.1	M
Growth regulation	4	75	F-015-110	2.1	M
Eyespot	5-6	75	F-015-110	2.1	M
1.Fungicide, leaf disease	7	75	F-015-110	2.1	M
Growth regulation	8-9	75	F-015-110	2.1	M/H
1. Aphids spraying	8-9	75	F-015-110	2.1	M/H
2.Fungicide, leaf disease	9-10	75	F-015-110	2.1	M/H
2. Aphids spraying	10-10.5	50	F-01-110	2.1	L
Fungicide, Ear diseases	10-11	50	F-01-110	2.1	L
Herb.spraying Couch grass	Latest 10 days before harvest	50	F-01-110	2.1	M/H

**Spring Barley - Tractor speed 8 Km/h**

Spray task	Growth stage Feekes scale	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb.spraying	2-4	75	F-015-110	2.1	L/M
Wild oat spraying	3-5	100	F-015-110	3.6	M
1. Fungicide spraying	5-7	50	F-01-110	2.1	M
Aphids spraying	7-10.1	100	F-015-110	3.6	H
Growth regulation	8-10.1	50	F-01-110	2.1	H
2. Fungicide spraying	9-10.1	100	F-015-110	3.6	H
Herb.spraying Couch grass	Latest 10 days before harvest	50	F-01-110	2.1	M/H

**Sugar Beets - Tractor Speed 6 Km/h**

Spray task	Growth stage	Volume rate l/ha	Nozzle ISO	Pressure bar	Air setting
Herb.spraying residual type	Pre-drilling	75	F-01-110	2.7	L
Pests	Seed-leaf stage	100	F-015-110	2.1	L/M*
1. Herb.spraying	Cotyledon + 2 true leaves of same size	100	F-015-110	2.1	L/M
Pests	Between 1. and	100	F-015-110	2.1	L/M
2. Herb.spraying	7-10 days later than 1. herb. spraying	100	F-015-110	2.1	L/M
1. Herb.spraying Couch grass	Couch grass has 3-4 leaves	75	F-01-110	2.7	M/H
2. Herb.spraying Couch grass	3-4 weeks later than 1. couch grass spraying	75	F-01-110	2.7	M/H
Pests (aphids)	Months of June	150	F-02-110	2.6	H
Fungicide (mildew)	Beginning of August	100	F-015-110	2.1	H

NOTE! All volume rates, pressures and air suggestions indicated in these tables are only guiding. Special conditions regarding climate, quality of the crop, spraying time and chemicals applied (burning) may partially change the procedure.

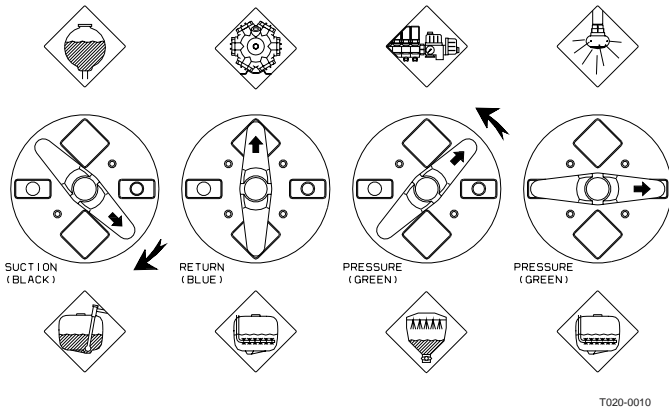
\* NOTE! If dust is deposited on leaves the air speed must be reduced.

## Use of rinsing tank and rinsing nozzles

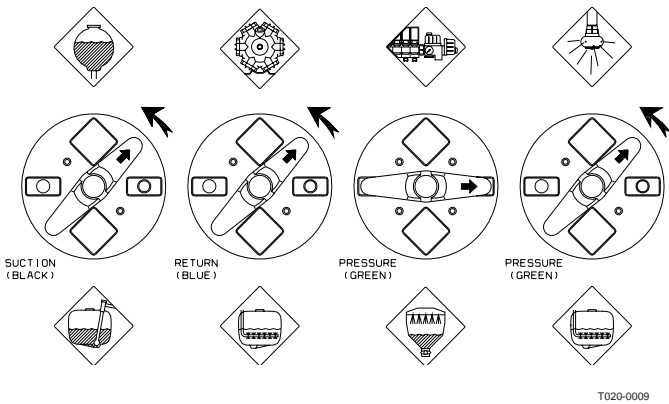
The incorporated 185 l rinsing tank can be used for two different purposes

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

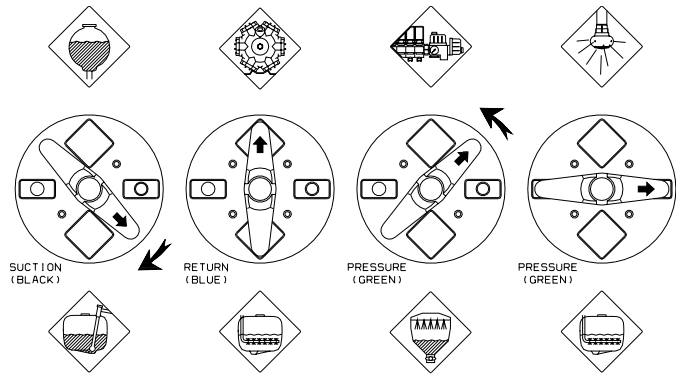
1. Empty the sprayer as much as possible. Turn the agitation off and spray till air comes out of all nozzles.



2. Remove the tank filter basket.
3. Turn suction valve towards rinsing tank.
4. Turn pressure valves towards rinsing nozzle.

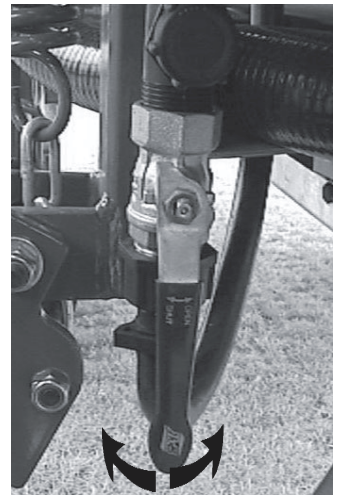


5. Engage the pump and set the engine at approx. 1500 r.p.m.
6. When rinsing water corresponding to approx. 10 times the spray liquid residue (see paragraph "Technical Residue") is used, turn back suction valve towards suction from main tank and operate all valves, so that all hoses and components are rinsed.
7. Turn pressure valve back to EC operating unit and spray liquid in the field you have just sprayed.
8. Repeat point 3-7 until the rinsing tank is empty.

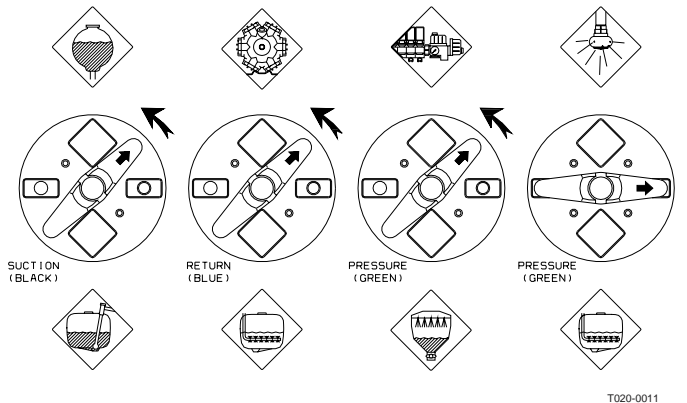


**B.** Rinsing the pump, operating unit, spray lines etc in case you stop spraying before main tank is empty (e.g. beginning rain etc.).

1. Close ball valve underneath the self-cleaning filter.



2. Turn suction valve towards rinsing tank.
3. Turn blue Return valve (if fitted) towards pump suction line.
4. Engage the pump and spray water from rinsing tank on the field till all nozzle tubes/nozzles are flushed with clean water.
5. Disengage pump again.
6. Open ball valve 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!

**Technical Residue**

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

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

Total residue**)	Dilutable residue*)
30-55 litre	19-34 litre

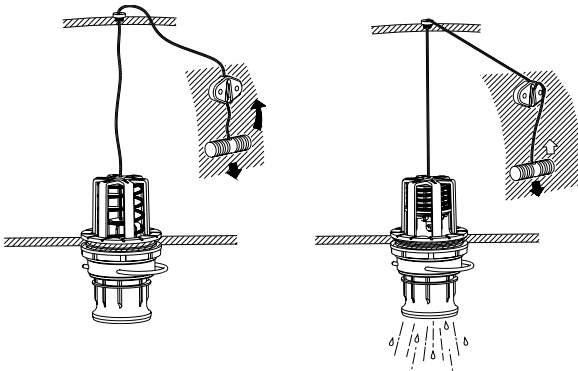
\*) Residue in main tank etc. Possible to dilute with water from rinsing tank.

\*\*\*) Total residue in tank and spraying circuit on standard sprayer. Variations due to difference in ground inclination, hose length etc.

The dilutable residue must be diluted 10 times with clean water and sprayed to the crop just sprayed before cleaning the sprayer - See paragraph "Cleaning".

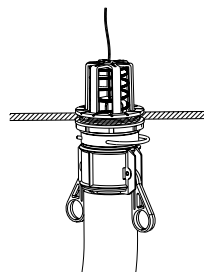
**Operation of the tank drain valve**

Pull the string at left hand side of the tank to open the drain valve. The valve is spring-loaded but can be kept open by pulling the string out and upwards in the V-shaped slit.



To release and close the drain valve again pull the string downwards and the valve will close automatically.


If draining a residue, e.g. liquid fertilizers into a reservoir, a snap coupler with hose can rapidly be connected to the drain valve and let out the liquid safely.



**Rinsing tank, draining**



To avoid algae developing in the rinsing tank always drain the rinsing tank when the sprayer is not in use for a long period. Remove the clip from the hose fitting, and pull out the hose to drain the tank. Operation of the tank drain valve  
Pull the string at left hand side of the tank to open the drain valve. The valve is spring-loaded but can be kept open by pulling the string out and upwards in the V-shaped slit.

 **WARNING!** Note local legislation regarding dumping of residues and rinsing water.

## Maintenance

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 regarding service/maintenance jobs carefully through before starting on the job. If any portion remains unclear or require facilities which are not available, then for safety reasons please leave the job to your HARDI dealers workshop.

### Cleaning the sprayer

#### Guidelines

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.

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

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 run-off of residues 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.

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

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

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.

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

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. For S4110 nozzles, pres-

sure may be reduced 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  $\frac{1}{5}$  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 by-pass 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 pump run dry. Rinse inside of 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 now. Check also 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.

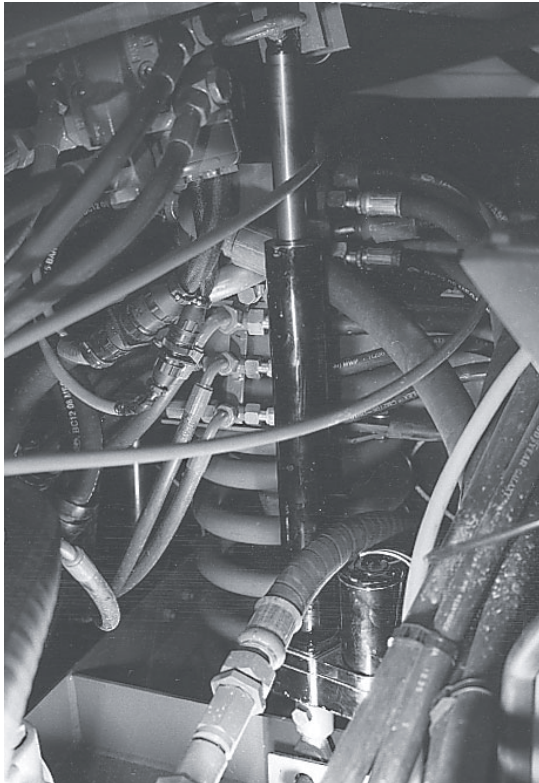
The main filter protecting sprayer components is the suction filter at the top of the tank. Check it regularly.

### Tilting of the cab

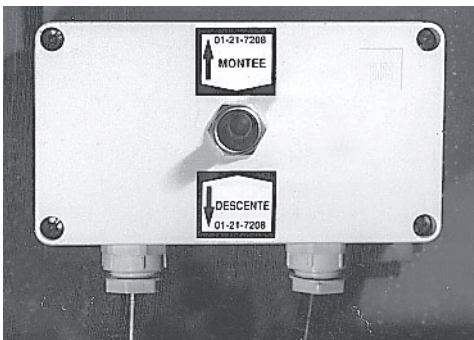
The cab can be tilted for easy access during maintenance jobs. An electric ram is available for this purpose.

1. Unfold the boom inner sections to improve access.
2. Fit the electric ram under the cab and secure with lynch pins.
3. Connect the plugs between control box and the ram.
4. Connect the terminal clips to battery: Red to pos. (+) and black to neg. (-).
5. Remove the two bolts in left hand-side front and back of the cab.
6. Remove the transport bracket cross sectional bar (only on OLH booms with Air conditioning).
7. The cab is now tilted.
8. The cab is lowered in reverse order.

**IMPORTANT!** Always remember to fit and tighten the two securing bolts again. Never drive with the electric ram connected, as it will disable the cab rubber suspension.






T060-0033



T060-0034

### Lubrication table

Component	Capacity	Lubricant
DEUTZ engine: 6 cyl.	15,5 litres	TOTAL Rubia XT Castrol Powermax Shell Myrina M Mobil® Delvac®
Hydrostatic transmission		
Hydraulic system	60 litres	TOTAL Equivis 46 Castrol Hyspin AWH 46 Shell Tellus T46 Mobil® DTE® 15 M
Hydrostatic steering		
Diaphragm pump	-	Lithium based ball bearing (grease nipple) grease, NLGI No. 2-2.5: TOTAL Multis EP 2 CASTROL LMX Grease Shell Retinax EP 2 Mobil® Mobilux EP 2 NC
<b>A</b> 		
Chassis and boom	-	Lithium based grease with grease nipples molybdenumdisulfide and graphite: Castrol Molymax Shell Retinax HDM 2 Mobil® Mobilgrease Special
<b>B</b> 		
Oil lubrication points	-	TOTAL Transmission TM SAE 80W/90 Castrol EPX 80/W90 Shell Spirax 80W/90 Mobil® Mobilube® 80W/90
<b>C</b> 		
Engine cooling system: 6 cyl.	15 litres	Deutz coolant anti-freeze, 45% Castrol anti-freeze 50% Glycoshell, 50% Mobil, 50%

### Fuel and lubricants storage

Always store fuel and lubricants clean, dry and cool - preferably by constant temperature - to avoid contamination by dirt and condensed water.

When having refilled the fuel storage tank, allow sedimentation of possible dirt, condensed water and sludge - wait 24 hours before refilling the sprayer fuel tank. Drain water and sludge from storage tank once a year, if possible.

Keep oil filling jugs and hoppers clean.

## Maintenance during the running-in period

During the running-in period some maintenance jobs must be done with shorter intervals than usual, allowing all parts to bed in correctly. Follow instructions closely:

### After 1 hour

Tightening of wheel bolts

### After 2 hours

Tightening of wheel bolts

### After 10 hours

Tightening of wheel bolts  
Check tightness of hydraulic circuit

### After 50 hours

Check tightness of engine (\*)  
Change engine oil (\*)  
Replace engine oil filter (\*)  
Replace fuel filter (\*)  
Check belts (\*)  
Replace hydraulic filters

### After 100 hours

Check tightness of hydraulic circuit

### After 250 hours

Check air conditioning circuit  
Change hydraulic oil

(\*) Follow instructions given in the engine instruction book

## Regular, preventive maintenance

Service jobs and intervals:

### Every 10 hours or daily (whichever comes first)

Engine oil, check level \*)  
Fuel tank, fill up  
Engine air filter, check/clean (\*)  
Hydraulic oil, check level  
Spraying circuit/filters, check/clean  
Air condition condenser, check/clean

### Every 50 hours or weekly (whichever comes first)

Boom, check bolt tightness  
Wheel bolts, re-tighten  
Tyre pressure, check/adjust  
Battery electrolyte level, check/refill  
Lubrication, frame and boom

### Every 100 hours

Cooler radiator, check/clean (\*)  
Battery connections, check/tighten (\*)  
Check tightness of wheel bolts

### Every 250 hours

Boom readjustment  
Hydraulic filters, renew

Cab carbon filter, renew

### Every 500 hours

Engine oil, change(\*)  
Engine V-belts, check/ tighten (\*)  
Air conditioning compressor V-belts, check / tighten  
Air condition refrigerant level, check/refill  
Engine mountings, retighten  
Coolant concentration, check/adjust

### Every 1000 hours (or annual)

Fuel tank, drain for condensed water  
Fuel line suction strainer (in tank), clean  
Fuel pre-filter, clean  
Fuel filter, renew (\*)  
Hydraulic oil, change  
Engine glow plugs, check/renew (\*)  
Engine air intake, check for leakage (\*)  
Engine air filter, renew filter cartridge (\*)  
Wheel suspension, check shock absorbers

### Every 1500 hours

Engine valve clearance, check/adjust (\*)

### Every 2000 hours (or every 2 years)

Engine air filter, renew safety cartridge (\*)  
Coolant; drain, flush, renew (\*)  
Adjustment of steering gear

(\*) Follow the engine instruction manual

### General maintenance with flexible intervals

Charge of battery  
Repair of polyester tank  
Chassis  
Adjustment of head lamps  
Pump valves and diaphragms renewal  
Ball seat check/renewal  
Cone check/renewal  
Wear bush, boom lift, renewal  
Shock absorbers  
Level indicator adjustment  
Cord renewal  
Seal renewal, drain valve  
Adjustment of steering gear  
Wheel suspension, wear bushes  
Steering axle, wear bushes  
Fan transmission priming  
Fan transmission pressure adjustment

**Electrical system maintenance** - please see page 51

10 hours service (or daily)

**Engine oil.**

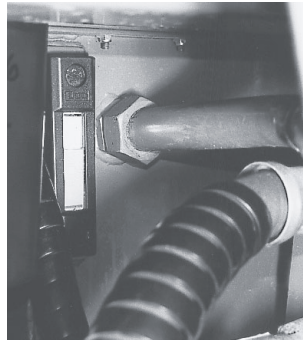
Check oil level is between the marks on the dip stick. Fill with fresh, clean engine oil if necessary.

Engine air filter

Please follow instructions given in the engine instruction book attached to this manual.

**Hydraulic oil**

Check the oil level to be in the upper part of the sight gauge on the hydraulic reservoir. Fill with fresh, clean oil if necessary.

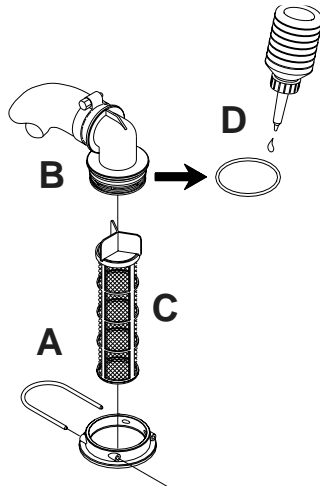


T068-0001

**Suction filter**

To service the suction filter:

1. Close the valve.
2. Pull the steel clip **A** out.
3. Lift the suction hose fitting **B** from housing.
4. Filter guide and filter **C** can now be removed.



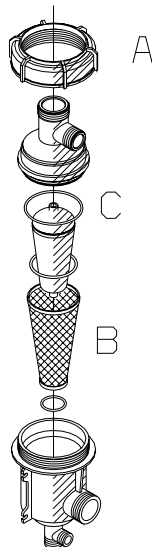
To reassemble:

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

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

**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.



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

**IMPORTANT!** The ball valve underneath the self-cleaning filter must be closed if the main tank contains spray liquid when opening the self-cleaning filter (otherwise there is risk of spray liquid flowing out).

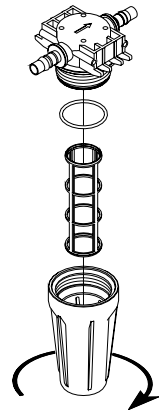


T068-0046

**In-Line filter (if fitted)**

If the boom is equipped with In-Line Filters unscrew the filter bowl to inspect and clean the filter.

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



**Nozzle filters**

Check / clean the nozzle filters. Alternative filters are available. See section on Technical specifications - Filters and nozzles.



**Spraying circuit**

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

**Engine air filter**

Check cartridge for damage to filter paper (by introducing lighted lamp), and check seals. Renew if necessary. After having serviced the filter cartridge 5 times, the safety cartridge must be renewed.

Please refer to separate book "Operation Manual for DEUTZ Diesel Engines" and the part concerning *Engine air filter* in the section "General maintenance with flexible intervals" in this instruction book.

### Air conditioning condenser

Check / Clean the air condition condenser for dust. Use compressed air or rinse with water. Be careful not to damage the fins when cleaning.

### Fuel tank

Fill up the fuel tank

50 hours service (or weekly)

### Boom

Check / retighten vital bolts on the boom.

### Wheel bolts

Tighten wheel bolts with a torque wrench. If the bolts are replaced, grease the threads slightly.

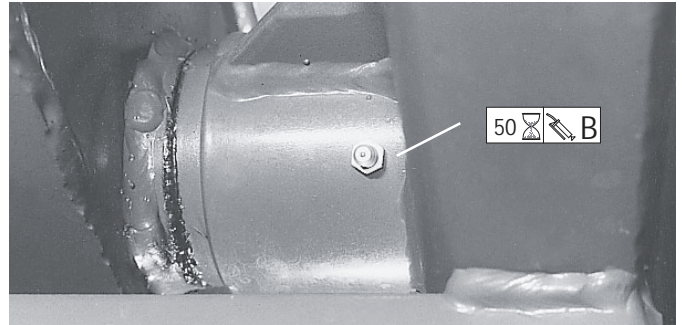
1. Rim plate to flange: 32.0 daNm
2. Rim to rim plate,
  - Ø14 24.5 daNm
  - Ø16 35.0 daNm



T068-0002

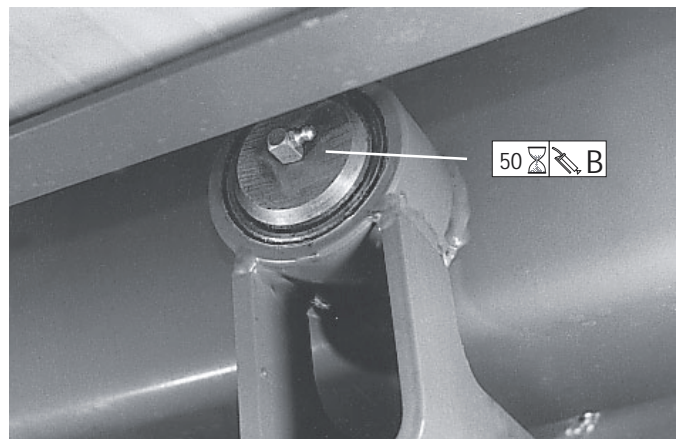
### Lubrication, frame and boom

Lubricate all grease nipples in wheel suspension, paralift and boom. Regarding lubricant see section "Lubricant table".



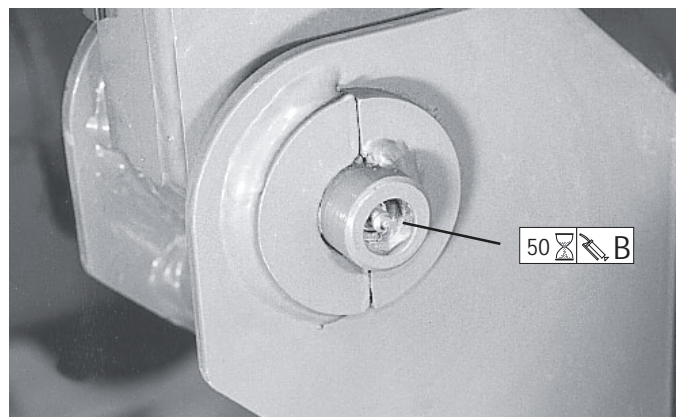
Front axle centre pin

T062-0005



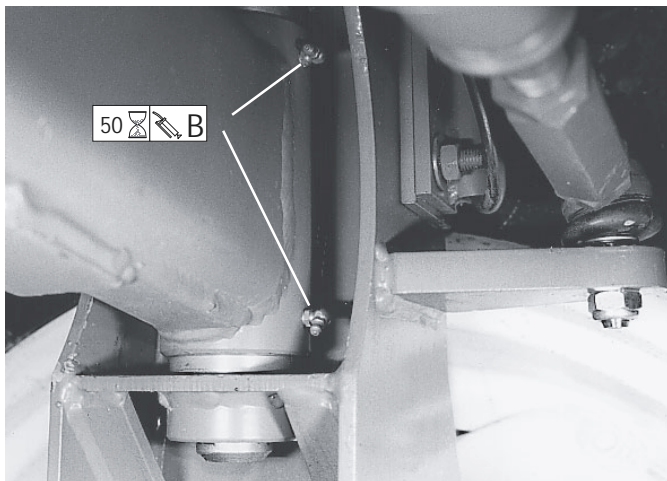
Front axle centre pin

T062-0002



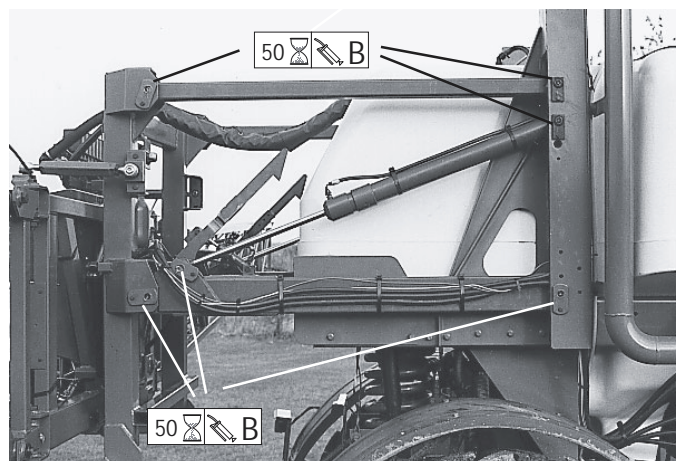
Front/rear axle suspension bearings

T062-0003



Front/rear axle spindles

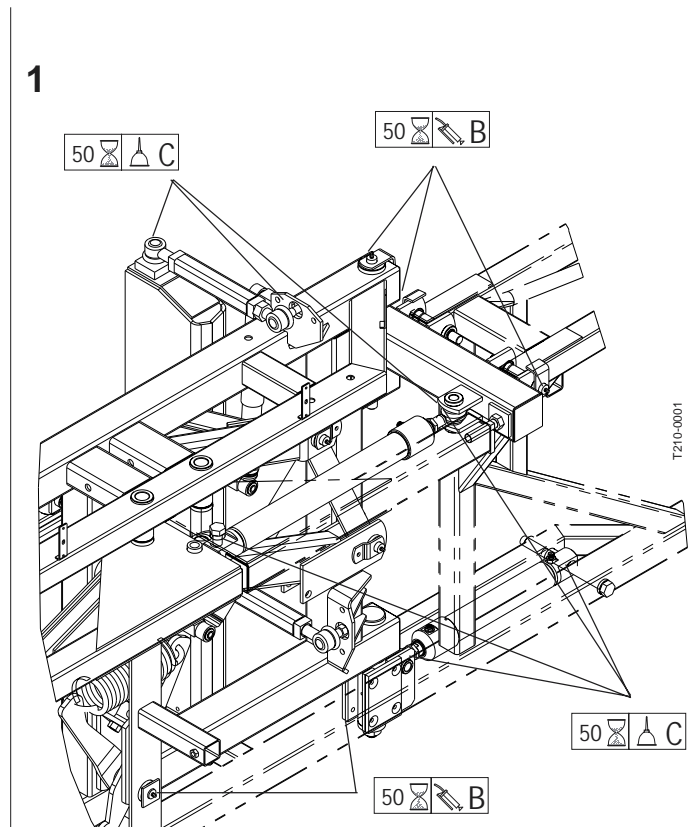
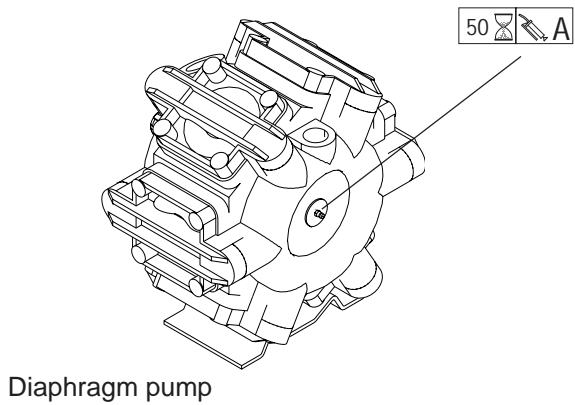
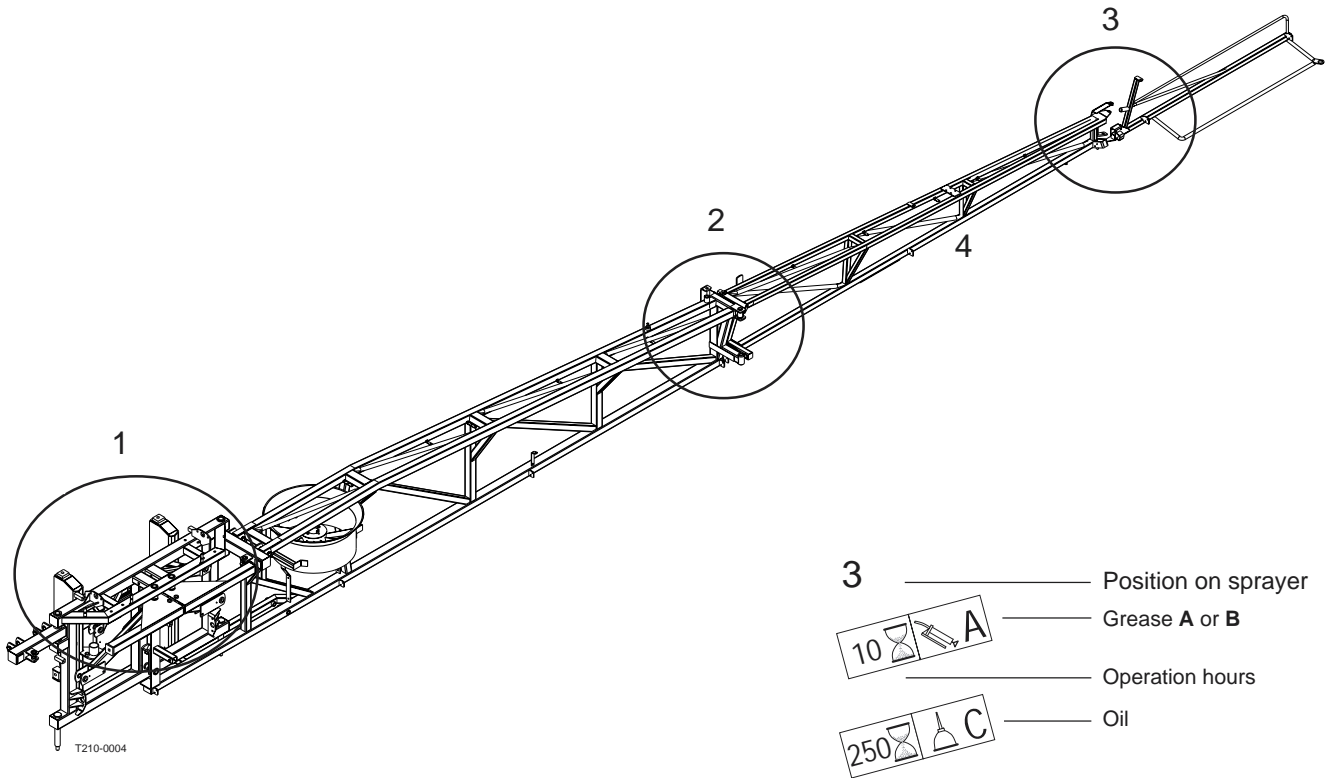
T062-0001

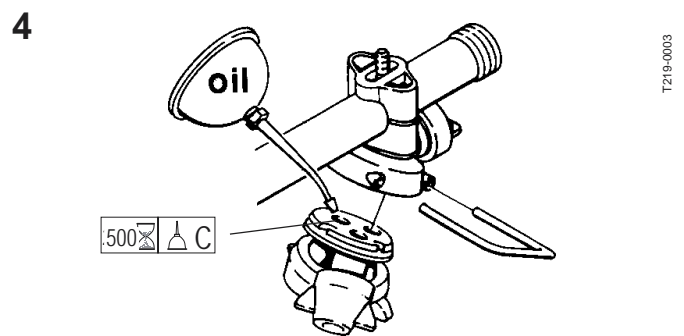
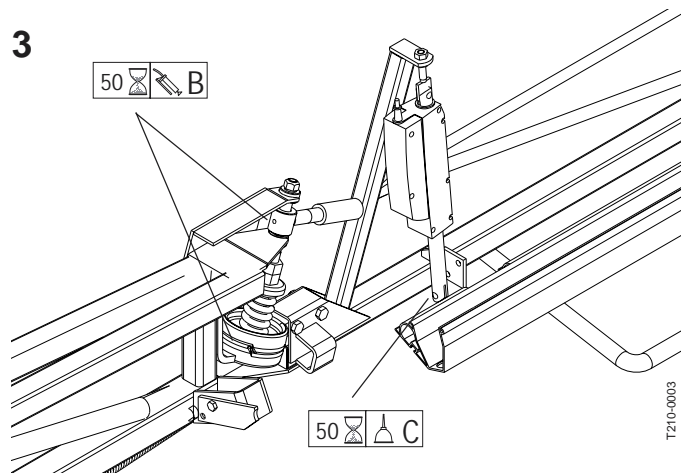
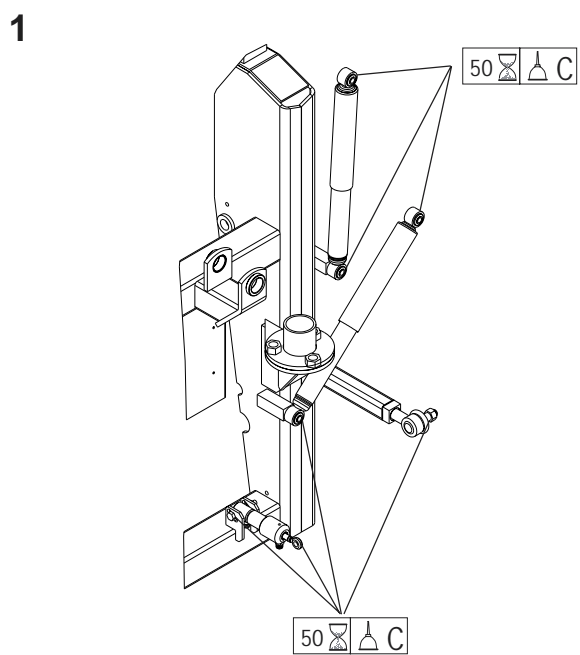
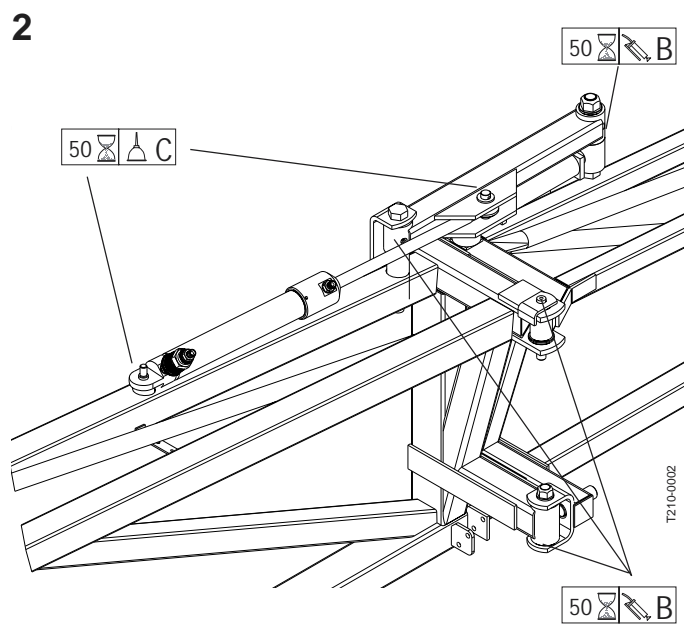
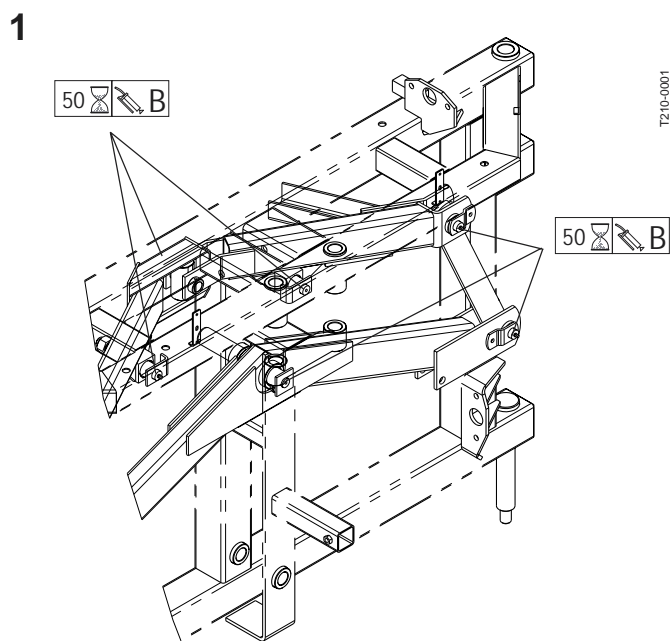


Parallelogram lift

T062-0006







**Battery**

Check the electrolyte level on the battery.

1. Remove the battery cover and retaining buckle.
2. Pull the battery sideways out of the tray.
3. Clean the area around the cell caps.
4. Remove the cell caps and check the electrolyte level to be 10 mm above the cells. If low, fill demineralized water to correct level.



**WARNING!** Do not smoke or use open fire when working with batteries. Highly explosive hydrogen gases can be generated from batteries and cause serious injuries from fire or acid. Use rubber gloves and goggles.

**Tyre pressure**

Check the tyre pressure which should be in accordance with the below table:

	2000 l	2500 l
KLEBER 11.2R32****	4.0 bar	4.0 bar
KLEBER 14.9R24*	1.6 bar	2.4 bar
KLEBER 16.9R24**	1.6 bar	2.4 bar
MICHELIN 540/54R24	1.3 bar	1.3 bar
GOOD YEAR 480x25.00-20 super TERRA GRIP	1.4 bar	1.4 bar

**100 hours service**

**Cooler radiators**

Please follow instructions given in the engine instruction book attached to this manual.

**Battery terminals**

Clean the battery terminals. Check the connectors to be tightened on terminals and on the starter motor. Apply acid free grease to the terminals.

**Wheel bolts**

Check tightness of wheel bolts. Retighten if necessary.

**250 hours service**

**Boom readjustment**

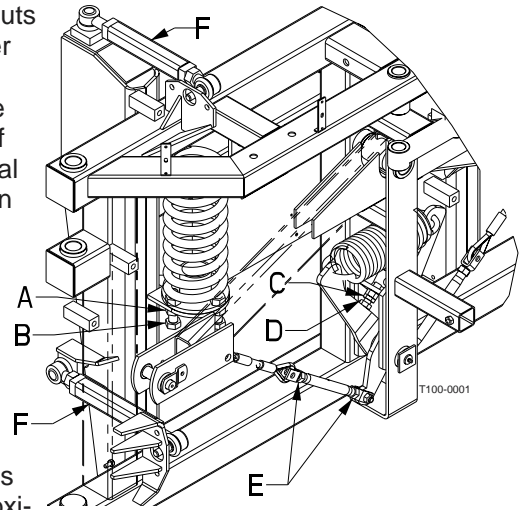
1. Park the sprayer on a level surface
2. Unfold the boom completely
3. Lower tilt rams completely
4. Set the slanting control midway (piston rod length is 60 mm)

Following adjustments can now be carried out:

**Boom center section**

**Suspension spring tension**

1. Loosen the counter nuts **A** in either side and adjust the tension of the vertical springs on the bolts **B** to suit the boom weight. The adjustment is correct when the guide rods **F** are approximately level.



2. Tighten the counter nuts again.

**Pendulum return spring and cables**

1. Ensure that the slanting ram is set midway
2. Loosen the counter nuts **C** and adjust the stop screws **D** until the V-shaped mechanism is in symmetry.
3. Allow max. 1 mm play between stop screw and arm.
4. Loosen the counter nuts **E** on the rigging screws, and adjust the length of the rigging screws until the boom is level. The correct adjustment is reached when the spring opens 1 mm between the threads
5. Tighten the counter nuts again.

**Guide rods length adjustment**

The guide rods length should normally not be necessary to adjust. If the suspension has been dismantled, the length must be checked or adjusted if necessary.

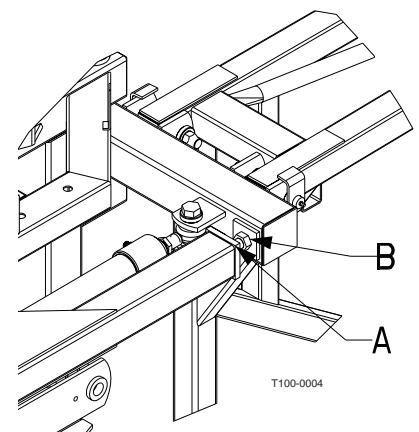
The trapeze and pendulum must hang freely. Adjust the length of the rods **F** accordingly.

Loosen the counter nuts and adjust the rods.

**Inner section folding adjustment**

The boom tip must point slightly forward. If necessary adjust the inner section folding as follows:

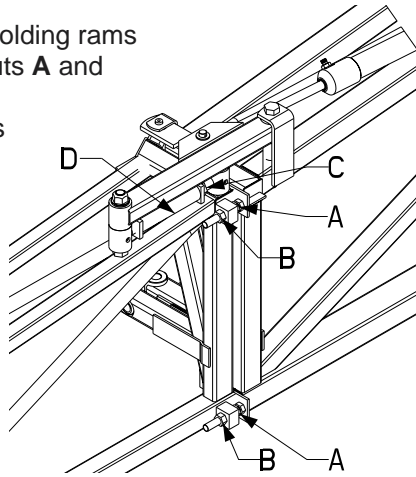
1. Depressurize the folding rams
2. Loosen counter nut **A**
3. Adjust stop screw **B** until the correct setting is reached.
4. Tighten counter nuts again



## Outer section folding adjustment

The outer sections must be aligned with the innersections. If necessary adjust the outer sections as follows:

1. Depressurize the folding rams
2. Loosen counter nuts **A** and **C**.
3. Loosen the screws **B**.
4. Pressurize the folding ram until it is fully extended
5. Adjust on the rigging screw **D** until the correct setting is reached.
6. Adjust the stop screws **B** up against the inner section.
7. Tighten counter nuts again

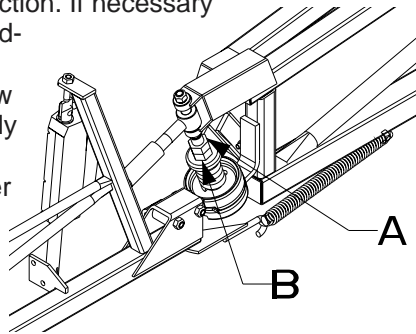


T100-0002

## Break-away section adjustment

The break-away section must release when a force of approximately 150 N (34 lb) is applied to the extremity of the break-away section. If necessary the release force is adjusted as follows:

1. Make sure the claw coupling is correctly lubricated.
2. Loosen the counter nut **A**.
3. Adjust the nut **B** until the break-away will release at a force of 150 N (34lb) applied at the extremity of the section.
4. Tighten the counter nut again

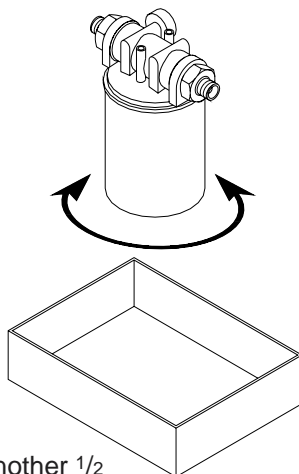


T100-0003

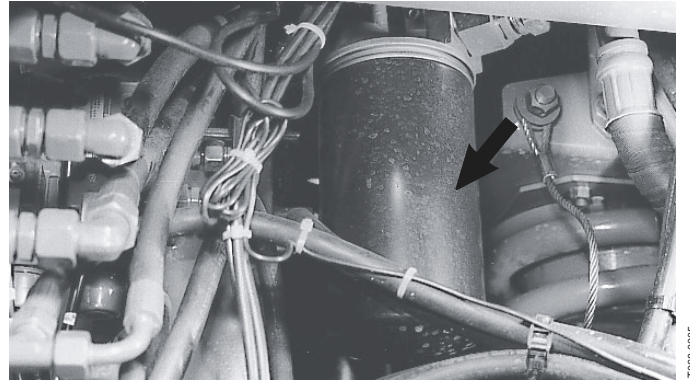
## Hydraulic filters

Procedure for changing hydraulic filters:

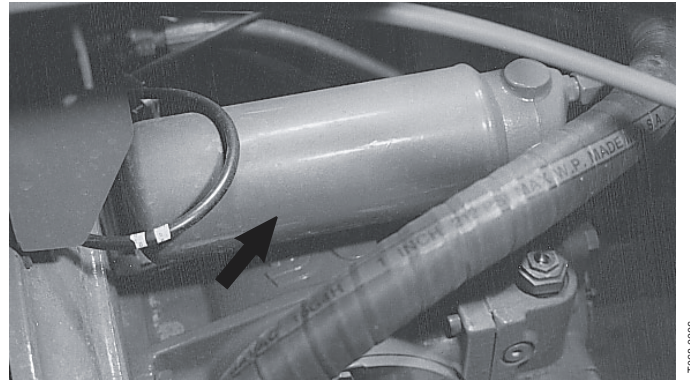
1. Clean the area around the filters thoroughly.
2. Place a tray under the filter to retain waste oil and unscrew the filter cartridge CCW.
3. Apply a thin oil film to the cartridge seal. If possible fill up the filter with fresh clean hydraulic oil.
4. Screw the filter cartridge on CW until the seal is lying against the flange.
5. Tighten the filter cartridge another 1/2 to 3/4 turn by hand



6. Check hydraulic oil level - top up with fresh, clean hydraulic oil if necessary.
7. Disposal of used hydraulic filters must take place according to local legislation.



T068-0005



T068-0006

**IMPORTANT!** Use only original filter cartridges!

Suction filters: Part No.: 786769  
Boost pump filter: Part No. CA75AA8002

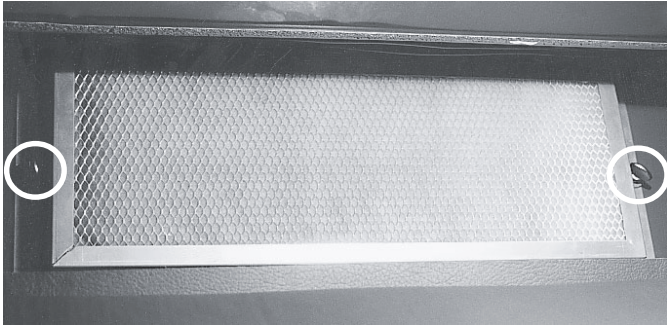
## Cab carbon filters

The chemicals will cause the carbon filters losing their efficiency. The renewal interval can vary depending on which chemicals are used. If chemicals are smelled through the cab ventilation systems the cab filter must be changed instantly.

1. Remove the 4 wing nuts in the cover located under the cab ceiling for access to the cab filter.



T068-0007



T068-0033

2. Remove the 2 retaining screws and renew the filter panel.
3. Fit the cover again.

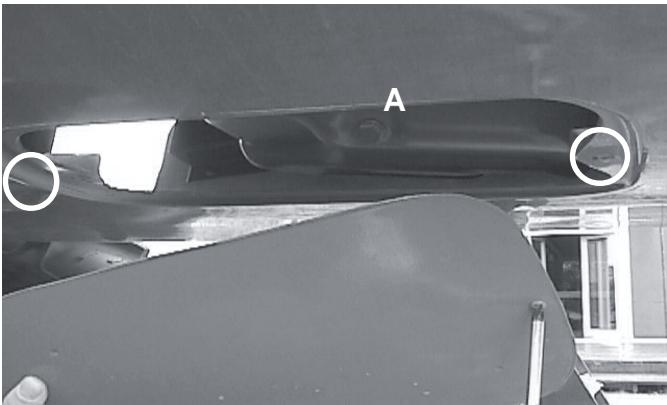
**500 hours service**

**Engine oil and filter**

Please follow instructions given in the engine instruction book attached to this manual.

Access to the drain plug **A** is possible via the access hatch underneath the ALPHA TWIN FORCE.

Loosen the two screws to remove the access hatch. Remember to fasten the access hatch again when the maintenance job has been carried out.



T062-0026

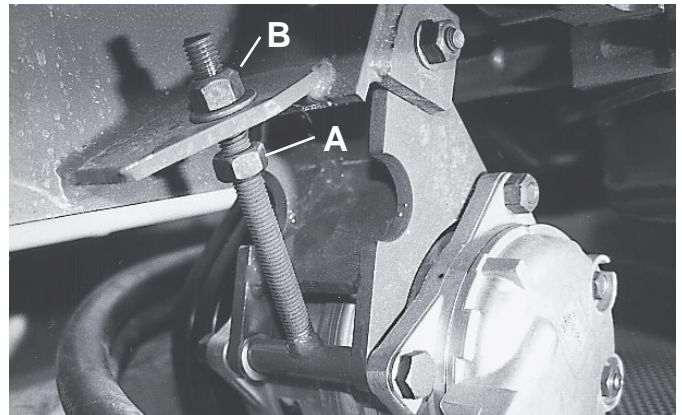
**Engine V-belts**

Please follow instructions given in the engine instruction book attached to this manual.

**Air conditioning V-belts**

1. Loosen the counter nut **A** and adjust the belt tension on nut **B**.

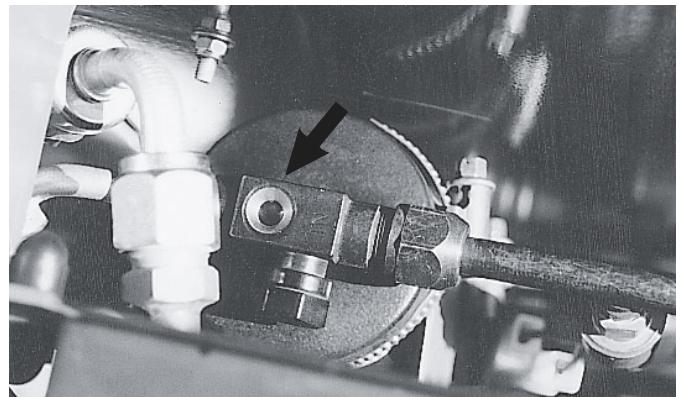
2. Belt tension must be 400 N for new belts and 250 after 15 min. operation.



T064-0009

**Air conditioning refrigerant level**

1. Start the engine, switch on the air conditioning and adjust to maximum cooling.
2. Air bubbles must disappear within app. 10 sec. from the sight glass on top of the dehydrator, and cooling must be evident.
3. If the air bubbles continue, the refrigerant level is too low. Have the air conditioning unit inspected for leaks and refilled by a specialist as soon as possible.



T068-0008



**WARNING! Do not dismantle any part of the AC circuit.** The circuit contains refrigerant R134A under pressure. Escaping refrigerant will cause severe injury (frostbite) if coming in contact with skin. First aid will be as for frostbite. Warm the area with warm water (30-40°C) and cover loosely with a bandage to protect against infection. Seek medical advice immediately after.

If the eyes have been in contact with refrigerant the eyes must be flushed immediately with clean *cold* water for at least 5 min. Seek medical advice immediately after.

## Engine mountings

Retighten engine mountings (if necessary) according to the instructions in the engine manual.

## Coolant concentration

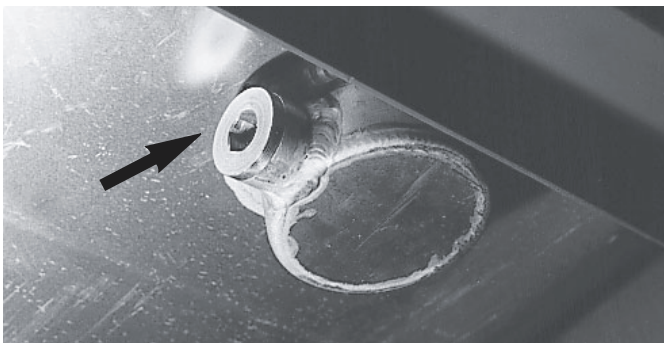
Check the coolant additive concentration according to instructions in the engine manual.

### 1000 hours service (or annual)

#### Fuel tank

The fuel tank is drained for condensate and sludge. This must be done when the fuel level is as low as possible, and when the machine has been stopped for some hours to allow the condensate and sludge to sediment (for example over night).

1. Clean the area around the fuel tank drain plug and place a container under the fuel tank.
2. Remove the drain plug and allow contaminated fuel, sludge and condensate to drain.
3. When clean fuel is streaming out, fit the drain plug again.



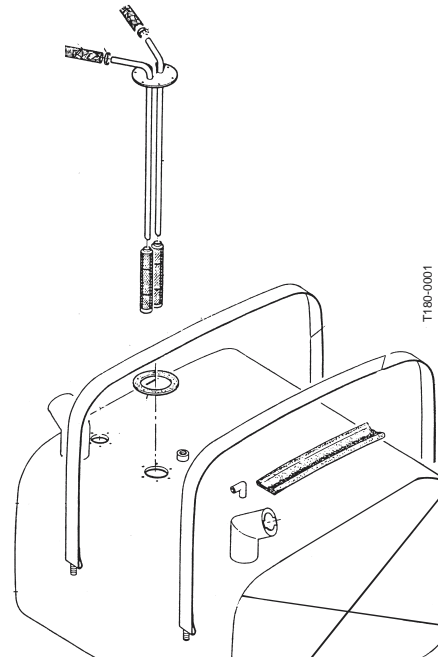
T068-0011

Disposal of waste fuel must take place according to local legislation.

#### Fuel suction tube strainer

The fuel suction strainer inside the fuel tank must be checked/cleaned as follows:

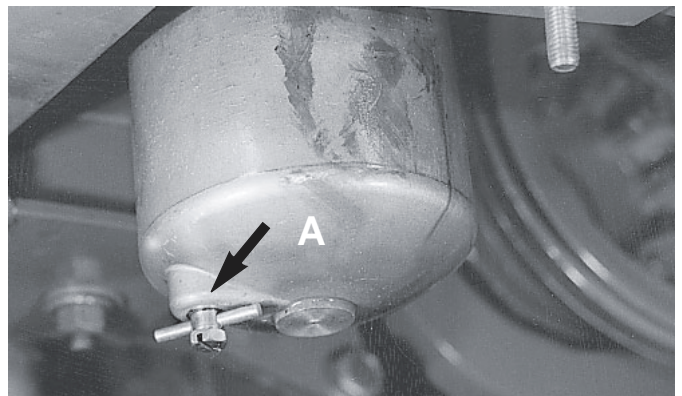
1. Unscrew the fuel suction tube retaining screws.
2. Remove the suction tube from the tank.
3. Clean the suction strainer in clean fuel.
4. Fit the suction tube in the tank again using a new gasket.
5. Check the fuel hose and clamp for proper attachment.



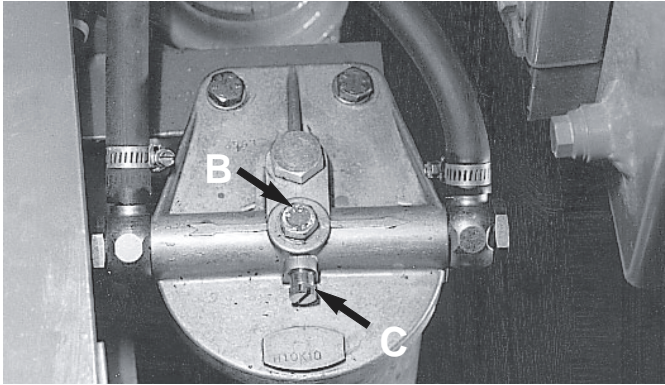
#### Fuel prefilter

The fuel filter must be dismantled and cleaned the following way:

1. Open the drain screw **A** and drain the filter bowl. Retain fuel in an appropriate container.
2. Unscrew the filter bowl retaining screw **B** and dismantle the filter assembly.
3. Clean the filter element and bowl in clean fuel.
4. Reassemble the filter unit again, and close the drain screw.
5. Open the bleed screw **C**.
6. If the fuel level is too low to flow to the prefilter, unscrew the fuel tank cap and press the fuel towards the prefilter using compressed air in the fuel tank.
7. When fuel free from air bubbles is streaming, close the bleed screw. Fit the fuel tank cap again and wipe up spilled fuel.
8. Start the engine and check the fuel lines for leaks.



T068-0013



T068-0014

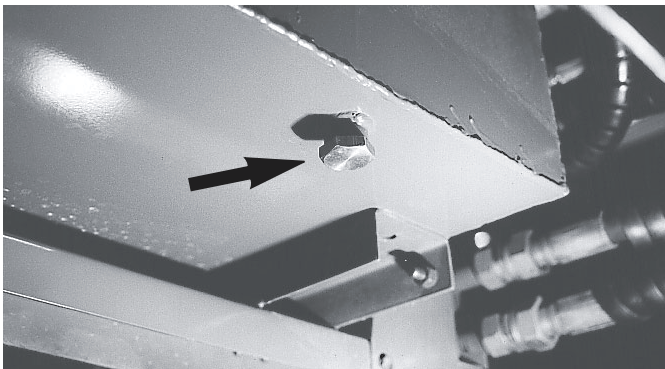
**Fuel filter**

Please follow instructions given in the engine instruction book attached to this manual.

**Hydraulic oil reservoir**

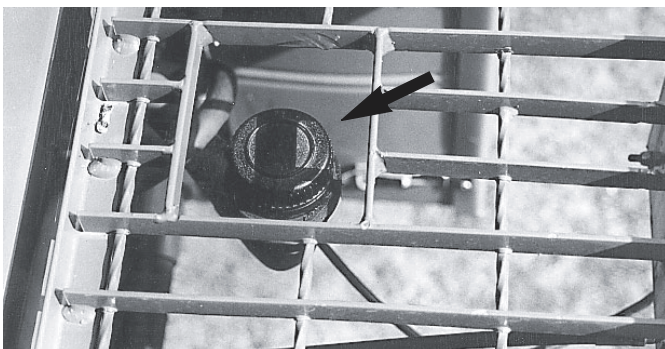
The hydraulic oil must be changed when the machine is at working temperature (has been working for at least one hour) and is placed on level ground. Change the hydraulic oil as follows:

1. Clean the area around the drain plug and filling cap.
2. Place a container under the hydraulic reservoir.
3. Unscrew the drain plug and drain the hydraulic oil.



T068-0015

4. Wipe possible metal particles off the drain plug magnet with a clean cloth.
5. When the oil is drained, fit the drain plug again using a new copper seal (Part No. JO10AC5459).
6. Turn the key switch to pos. 1 to check function of the hydraulic oil level alarm lamp and horn.



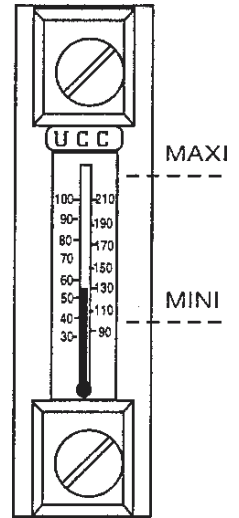
T060-0023

7. Fill the reservoir to correct level with fresh, **clean** hydraulic oil.

The reservoir can contain 60 litre of hydraulic oil.

**IMPORTANT!** The hydraulic oil purity is of vital importance to the transmission components. It is recommended to fill hydraulic oil through a filter unit to guarantee the purity. Filter rating: 10 micron absolute or better.

8. Fit the cap again.
9. Start the engine. Check oil level again after 10 minutes. The oil level can be observed via the level indicator. The oil level must be between the MINI and MAXI indicated on the indicator to the right



T276-0003

Disposal of used hydraulic oil must take place according to local legislation.

**Engine glow plugs**

Check/change the engine pre-heating glow plugs.

**Engine air intake**

Check the hoses and clamps on the engine air intake.

**Engine air filter**

Renew filter cartridge at every 1000 hours or after 5 cleanings or at least once a year - whichever comes first.

Always check cartridge for damage to filter paper (e.g. by introducing lighted lamp), and check seals. Renew if necessary.

For cleaning of filter cartridge, please refer to separate book "Operation Manual for DEUTZ Diesel Engines", part about Dry-type Air Cleaner, and read this part in combination with this instruction book. Follow the guidelines described in the above mentioned Manual regarding maintenance, service and safety. How to open and handle the air filter vary a little from the description in the DEUTZ Manual and is described on the following page.

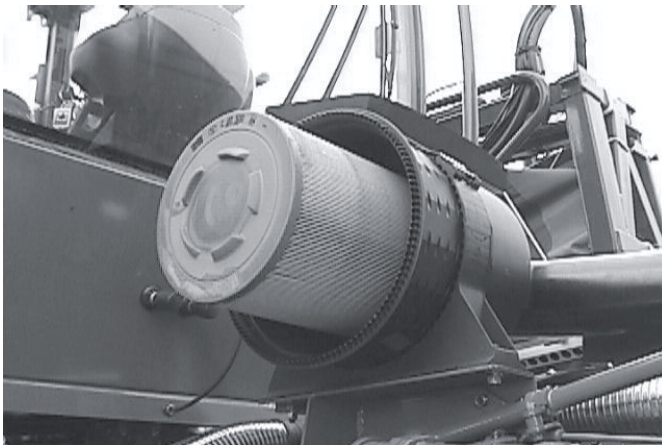
## Opening the filter hood:



T067-0005

1. Loosen the opening devices on both sides of the hood. Pull and remove the hood.

## Removal of filter cartridge:



T067-0004

1. Pull and remove the filter cartridge.

## Shock absorbers (wheel suspension)

Check the shock absorbers function. Renew if worn. Always renew absorbers in pairs.

### 1500 hours service

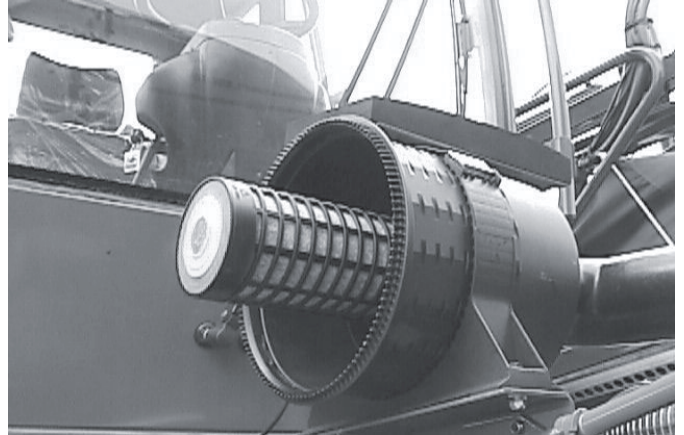
#### Valve clearance

Check/adjust valve clearance according to instructions in the engine manual.

### 2000 hours service (or every 2 years)

#### Engine air filter

After having serviced the filter cartridge five times, or after 2 years at the latest, renew the safety cartridge (never clean!)



T067-0003

Please refer to separate book "Operation Manual for DEUTZ Diesel Engines" for further information.

#### Coolant

Change the engine coolant fluid according to instructions in the engine manual.

**NOTE!** Set the cab heating on max. heating when draining, flushing and filling the coolant.

Always change every 2000 hours or every 2 years - whichever comes first.

#### Adjustment of steering gear

Carry out adjustments as described in the part "General maintenance with flexible intervals".

### General maintenance with flexible intervals

The intervals between following maintenance will vary depending on the conditions under which the machine is operated.

#### Charge of battery

To obtain a long life of the battery and ensure that the sprayer always is ready for use, the battery should be recharged regularly. Charge the battery every 2nd month during winter storage, and every 3rd month during season.



**WARNING!** Before, during and after the charge process, highly flammable and explosive hydrogen gases can be generated. If these gases are lighted, the battery can explode and cause severe personal injury by the explosion and battery acid! Follow instructions closely.



**Safety precautions:**

1. Service and maintenance jobs at batteries must always be carried out at good, ventilated areas, to prevent concentration of explosive gases.
2. Always wear rubber gloves and goggles when working with batteries.
3. Do not smoke or use open fire nearby batteries. Avoid sparks by short-cuts or when connecting/disconnecting battery terminals.
4. In case of getting battery acid in contact with eyes and skin, rinse immediately with clean water. Seek medical advice, if necessary.
5. Do not charge defective or frozen batteries.
6. Read instruction for battery charger before connecting it to the battery.

**Connecting of charger:**

1. Stop engine and switch off battery isolator switch.
2. Clean battery and loosen cell caps to allow gases to evaporate. (Not maintenance free batteries).
3. Check electrolyte level. Fill with demineralized water till level reaches 10 mm above cells, if levels are low.
4. Connect battery charger terminal clips to battery terminals - **Note!:** **Battery charger must be switched off and disconnected from power socket.** Make sure that + terminal is for +, and - terminal is for -. Positive is often red and negative is often black.
5. Check that battery charger is set for 12 V DC. Connect to power socket and switch on charger.
6. Do not overcharge maintenance free batteries. Charge with few Amps and stop when battery is fully charged.

**Disconnecting of charger.**

1. Switch off charger at power source and disconnect plug.
2. Ventilate around the battery to make possible gases disappear, and fit cell caps.
3. Disconnect charger terminal clips from battery terminals.

**Repair of polyester tank**

Minor damages on the main tank can be repaired with polyester tissue and a special glue. Contact your HARDI dealer.

**Chassis**

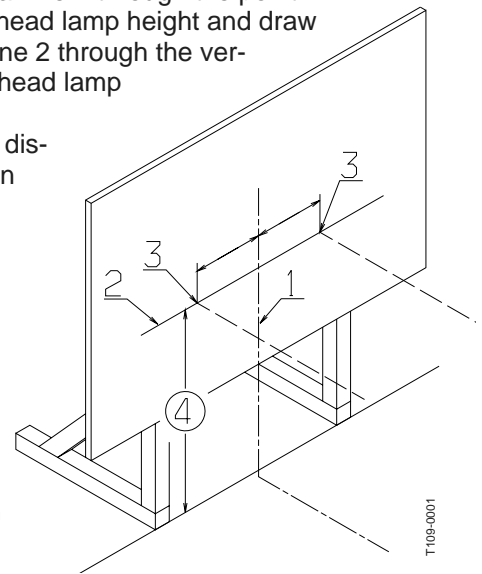
The chassis is made of High Tensile Steel. Never weld on the frame. Use only bolts or rivets if fitting additional equipment. If any doubt contact your HARDI dealer.

**Adjustment of head lamps**

Adjust the head lamps the following way:

1. Position the sprayer facing a wall or screen with a distance between wall and head lamps of 2 metres.
2. Mark a point on the wall or screen by sighting down the hood centre line.

3. Draw a vertical line 1 through the point.
4. Measure the head lamp height and draw a horizontal line 2 through the vertical line 1 at head lamp height 4



5. Measure the distance between centre of RH and LH head lamp. Mark two points 3 on the horizontal line with head lamp distance, placed with equal distance from the vertical line 1.
6. Switch on the main beam, and cover off LH head lamp.
7. Adjust RH head lamp so the point 3 is in the centre of the beam.
8. Cover RH head lamp and repeat point 7 on LH head lamp.

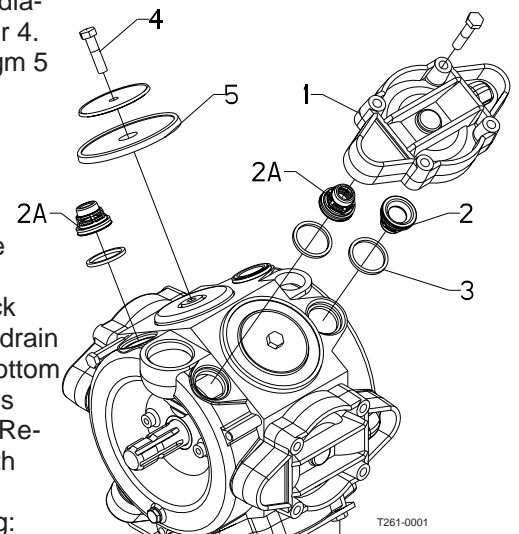
**Pump valves and diaphragms renewal**

**Valves**

Remove valve cover 1. Before changing the valves 2, note their orientation so they are replaced correctly. **NOTE:** One special valve with white flap 2A is used. It has to be placed in the valve opening shown. 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. Check also that the drain hole at the bottom of the pump is not blocked. Re-assemble with the following torque setting:



Pump Model	Diaphragm cover Nm	Diaphragm bolt Nm
463	90	90

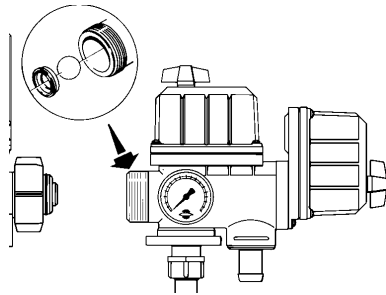
1 Nm = 0.74 lbf

### Ball seat check/renewal, EC on/off valve

If the main ON/OFF valve does not seal properly (dripping nozzles when main ON/OFF valve is closed), the ball and seat should be checked.

Remove the 2 bolts fixing the main ON/OFF pressure valve unit to the bracket, unscrew the union nut A and pull the valve away from the distribution valves.

Check the ball for sharp edges and scratches and check the ball seat for cracks and wear - replace if necessary.

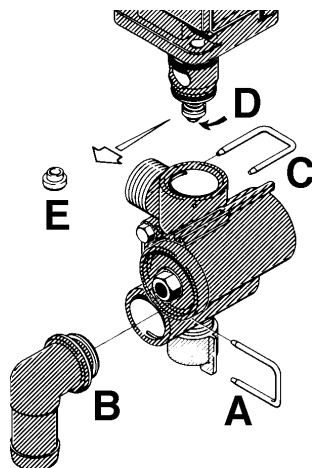


### Cone check/renewal, EC distribution valve

Periodically check the distribution valves for proper sealing. Do this by running the sprayer with clean water and open ON/OFF valve and all distribution valves.

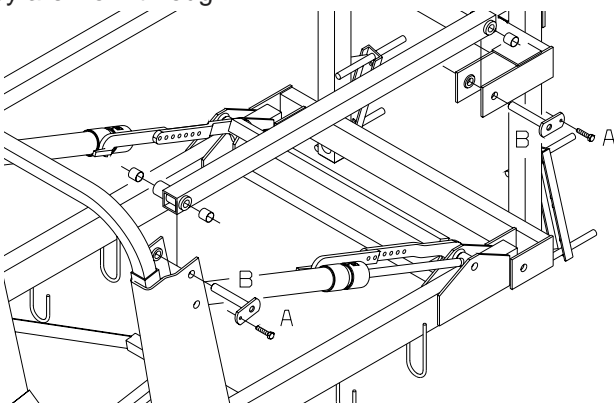
Cautiously remove the clip A and pull out the hose B for the pressure equalization device. When the housing is drained, there should be no liquid flow through the pressure equalization device. If there is any leakage, the valve cone E must be changed.

Remove the clip C and lift the EC-motor housing off the valve housing. Then unscrew the screw D and replace the valve cone E. Reassemble in opposite sequence.



### Wear bush renewal, boom lift

The wear bushes are inspected and renewed before they are worn through.



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

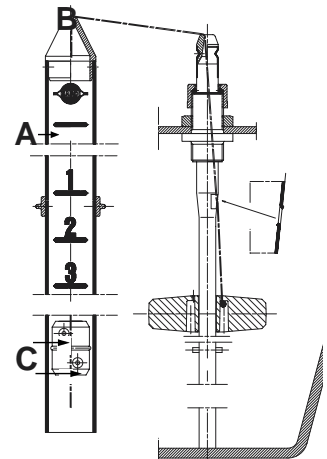
### Shock absorbers (boom)

If the shock absorbers loose their efficiency or start leaking oil, they need replacement.

### 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 of the level indicator has to be changed, the float guide pole is removed:

1. Remove the tank drain valve (see section "Main tank drain valve") and loosen the fitting holding the pole in position.
2. Pull down the pole 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.



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

### Seal renewal, drain valve

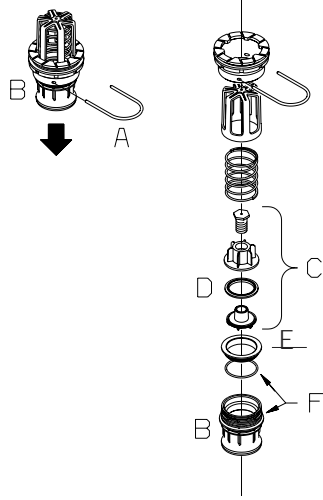
If the main tank drain valve leaks, the seal and seat can be changed the following way.

NOTE! 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.

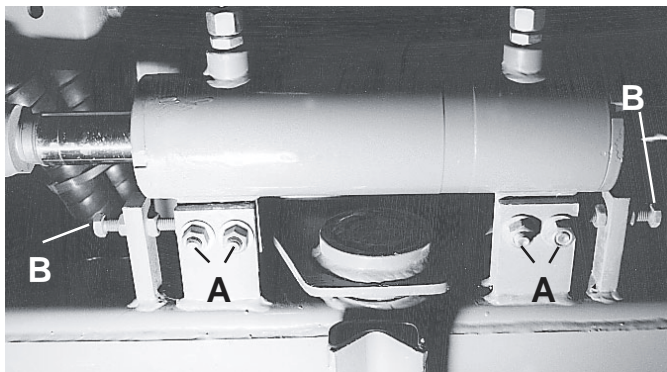


**NOTE!** Check function of valve with clean water before filling chemicals into the tank!

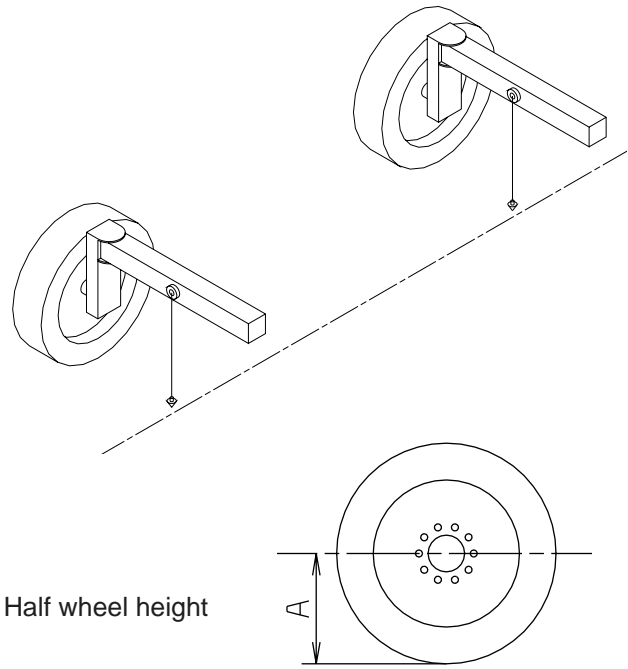
**Adjustment of steering gear (minimum every 2000 hours - or every 2 years)**

**Centre adjustment:**

1. Place the machine on level surface.
2. Turn the steering wheel until the steering ram is dead centre.
3. Loosen the 4 screws **A** and adjust the screws **B** until the steering ram barrel is centred to the front axle centre pin. Tighten the screws again.
4. Mark a point vertically down on the floor under the rear axle and front axle centre using plumb bob.
5. Draw a straight line through the two points. The machine centre line has now been found and projected to the ground.
6. Measure half wheel height **A** front and back, and mark with a piece of chalk.



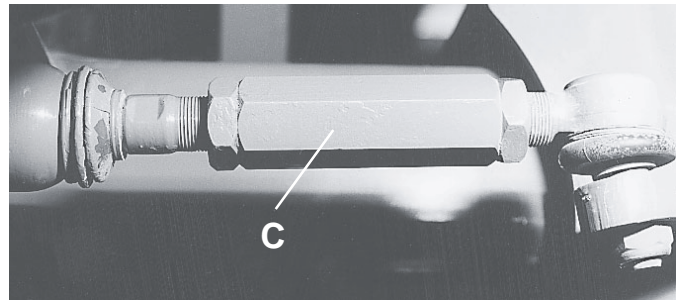
T064-0001



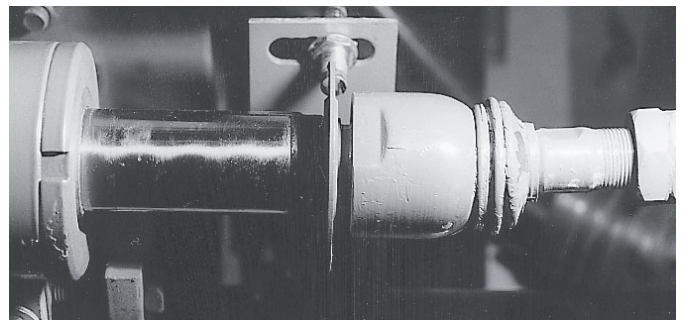
T109-0002

Half wheel height

7. The distance between the wheels front and rear should be equal on both axes.
8. Adjust length of connecting rods **C** at the steering ram if necessary to obtain correct steering.



T064-0002

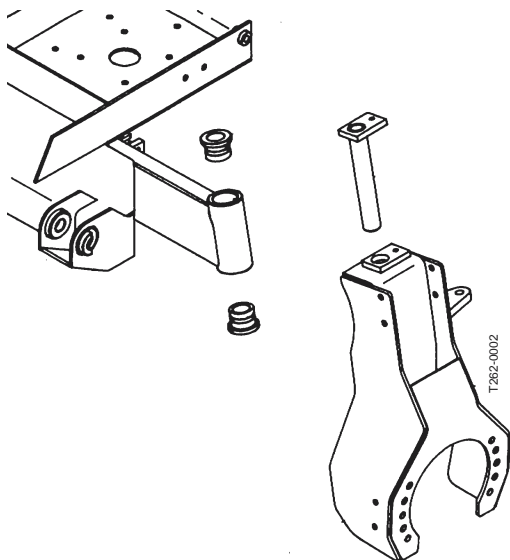
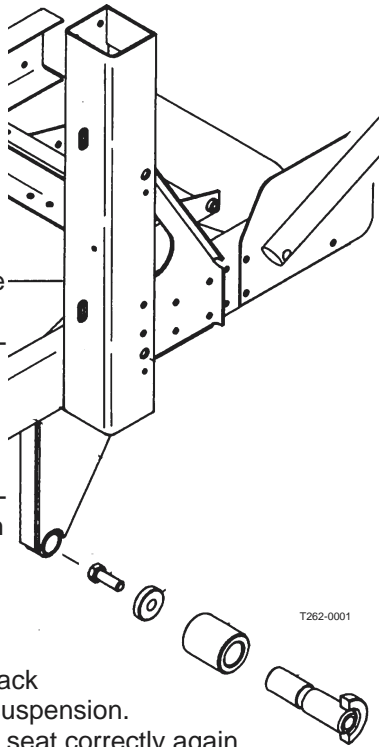


T064-0012

9. The half distance, front and back, between the wheels should be on the machine longitudinal centre line. Adjust equally on both the connecting rods until the wheels are aligned with the central line, and have correct toe-in.
10. Adjust the alignment sensors to be exactly over the discs and with a distance of 3 mm for front sensor and 1 mm for rear sensor.

**Wheel suspension wear bushes**

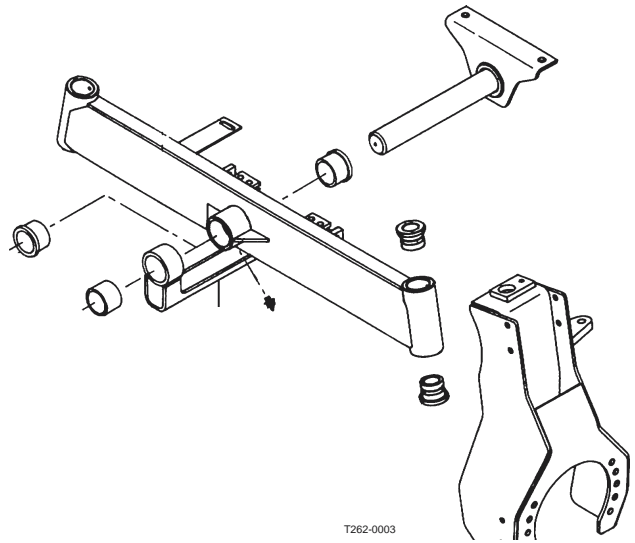
1. Remove the limitation cables from the wheel suspension.
2. Support and secure the wheel axle assembly with jacks and axle stands.
3. Remove the load on the wheel suspension with hydraulic jacks and support the chassis with axle stands.
4. Remove the suspension pins securing bolts.
5. Press out the pins.
6. Lift the chassis free of the wheel suspension and secure with the axle stands.
7. Press out the worn bushes and replace with new.
8. Lower the chassis back in position with the suspension. Ensure the spring to seat correctly again.
9. Fit the pins and securing screws.
10. Grease the pins.
11. Lower the chassis completely and check the suspension for correct assembly.
12. Fit the limitation cables again.



**Steering axle wear bushes**

- A. Lift and support the chassis and front axle independently.
- B. Remove the securing screws and push out the pins.
- C. Renew worn bushes.
- D. Assemble in reverse order.

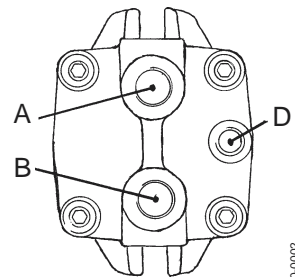
- E. Grease the grease nipples.
- F. Lower and remove jacks and axle stands again.



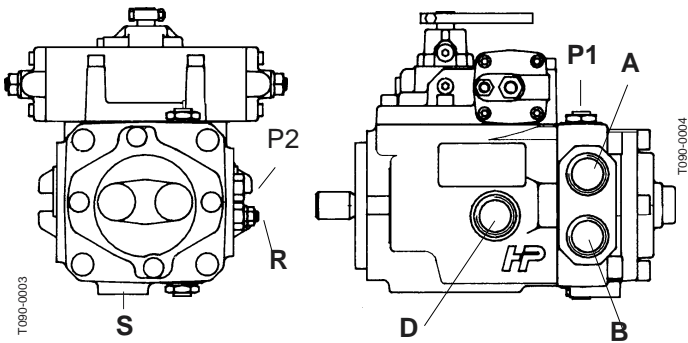
**Fan transmission priming**

If the hydraulic fan transmission has been dismantled, or pump or motor has been changed, the following priming procedure must be carried out before starting up the transmission:

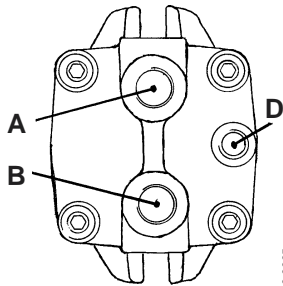
1. Fill the oil reservoir with fresh, clean oil to the top of the sight glass.
2. Fill the pump housing with oil through the drain pipe **D** which is dismantled at the tank connection. Reconnect and tighten.
3. Check the oil level in the gear box.
4. Remove the drain hose **D** from the motor outside the blower housing.
5. Set the fan r.p.m. at 0, engage the tractor P.T.O. with the engine running idle - wait a few minutes.
6. Set the fan speed at 200 r.p.m.
7. After a while the oil will start dripping constantly. Refit the drain hose and tighten.
8. With the tractor P.T.O. at 540 r.p.m. the fan should rotate at max. revolutions/min.
9. Recheck oil level at tank sight glass.
10. Check vacuummeter at the suction filter.
11. Retighten hose connections and check for leaks.
12. Check fan speed and feed pressure adjustments - see sections on "Fan speed adjustment" and "Fan transmission pressure adjustment".



**Fan transmission pressure adjustment**



- A = Pressure port
- B = Return port
- D = Drain port
- P1= Connector for working pressure measurement
- P2= Connector for feed pressure
- R = Adjustment Screw for feed pressure
- S = Suction port



The transmission feed and working pressure are checked as follows:

1. Connect a 40 bar (580 p.s.i.) pressure gauge to the feed pressure connector **P2**, and a 400 bar (5800 p.s.i.) pressure gauge at the working pressure connector **P1**.
2. Set the tractor P.T.O. at 540 r.p.m. - check with tachometer.
3. Set the blower at max. speed.
4. Check the feed and working pressure:

Feed pressure, **P2**            15-20 bar (218-290 p.s.i.)

Working pressure, **P1**, approx.

18 m	180 bar (2610 p.s.i.)
20 m	190 bar (2755 p.s.i.)
21 m	200 bar (2900 p.s.i.)
24 m	210 bar (3045 p.s.i.)
27 m	240 bar (3721 p.s.i.)
28 m	240 bar (3721 p.s.i.)

Adjust feed pressure if necessary.

Failure to reach feed and working pressure indicates that the transmission needs overhauling.

**Electrical system maintenance**

- Speed sensor, HARDI PILOT
- Head lamp bulb renewal
- Front position lamp and direction indicator bulb
- Side direction indicator bulb
- Number plate lamp bulb
- Working lamp bulb
- Rotating warning beacon bulb renewal
- Instrument cluster lamp bulbs
- Interior lamp bulb
- Dashboard control lamp bulbs
- Fuses

## Electrical system maintenance

### Speed sensor, HARDI PILOT

It is important that the distance between the speed sensor is correct:

- Adjust the sensor to be 2.5 mm ± 0.5 mm.
- Turn the wheel one turn in order to ensure, that the distance is within the tolerances on the full circumference.

### Head lamp bulb renewal

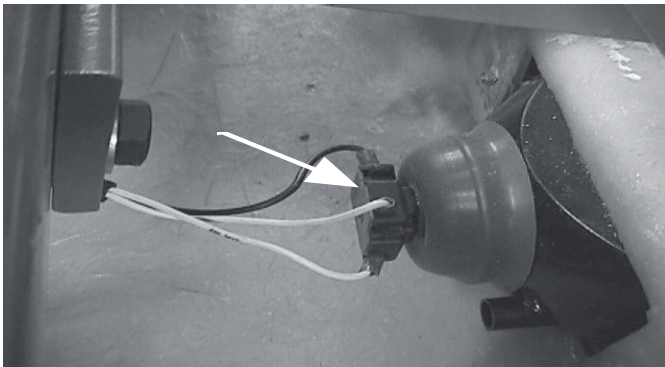
To get access to the head lamps:

1. Loosen the hinge on each side of the engine hood and open the hood fully.
2. Loosen and remove the two wing nuts on the front plate and remove the plate.



T067-0002

3. Remove the wire socket from the bulb terminals

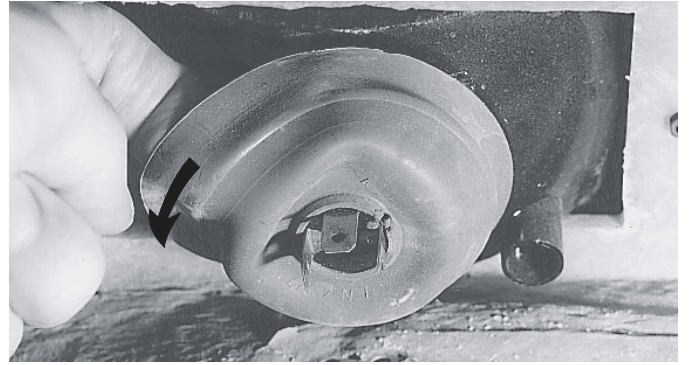


T067-0001

4. Remove the rubber boot from the bulb
5. Twist the bulb retaining ring CCW and remove it
6. Remove the bulb
7. Fit new bulb and assemble in reverse order

Bulb type: H4 12V 60/55W

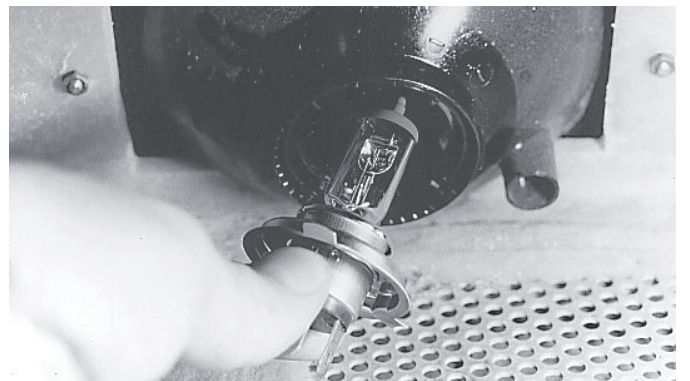
**IMPORTANT!** Do not touch the bulb glass. Hold on the base only.



T068-0016



T068-0027



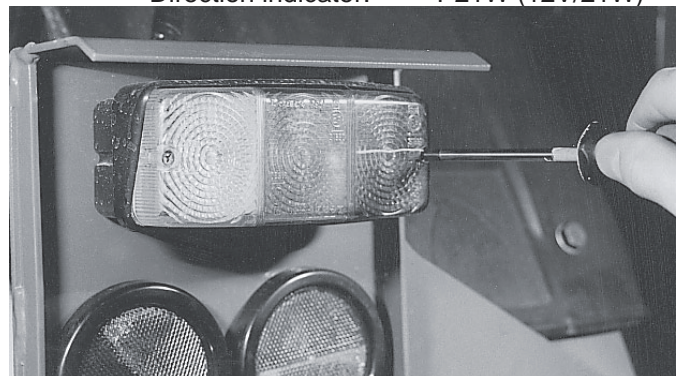
T086-0026

### Rear lamp and direction indicator bulb

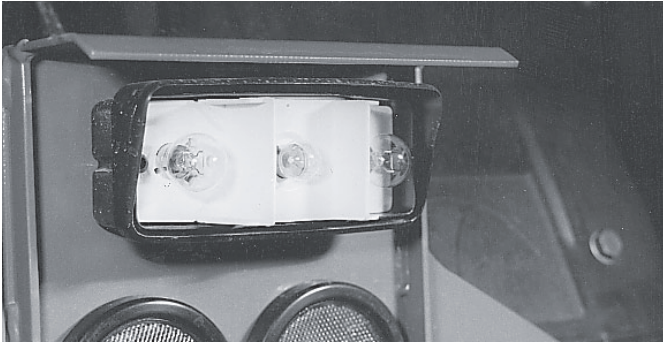
Unscrew the two screws and remove the lens

1. Press and twist the bulb
2. Remove the bulb

Bulb types: Rear lamp: R5W (12V/5W)  
 Direction indicator: P21W (12V/21W)



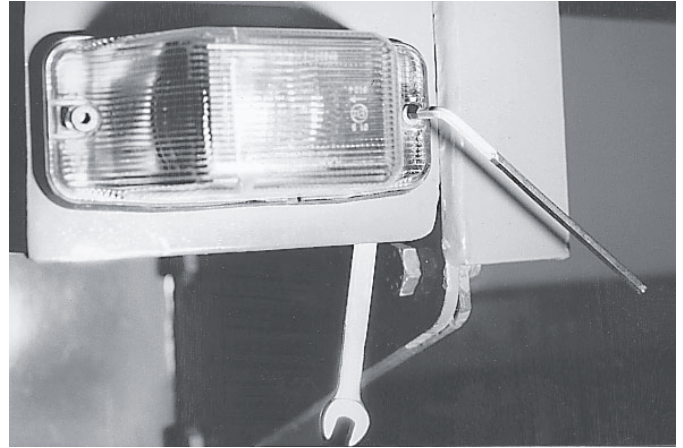
T068-0017



T068-0010

**Front position lamp and direction indicator bulb**

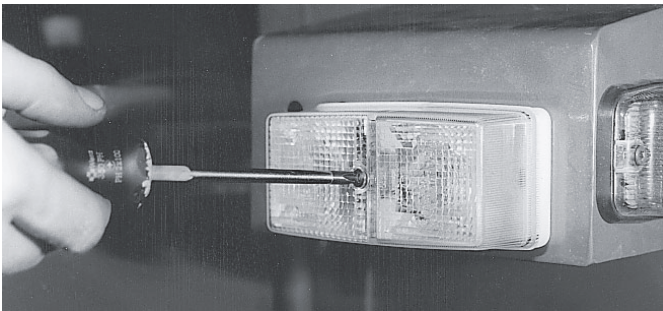
1. Unscrew the screw and remove the lens
  2. Remove and renew the bulb
- Bulb types : Position lamp: R5W (12V/5W)  
 : Direction indicator: P21W (12V/21W)



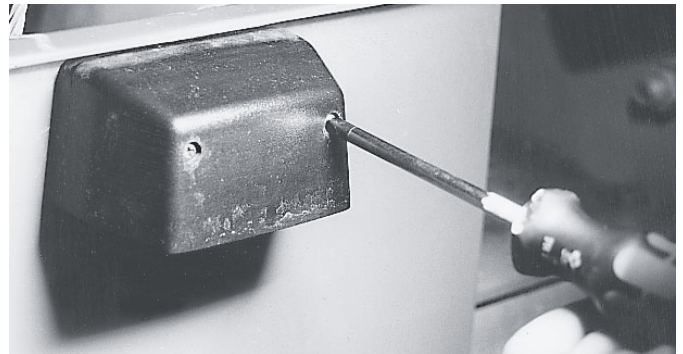
T068-0019

**Number plate lamp bulb**

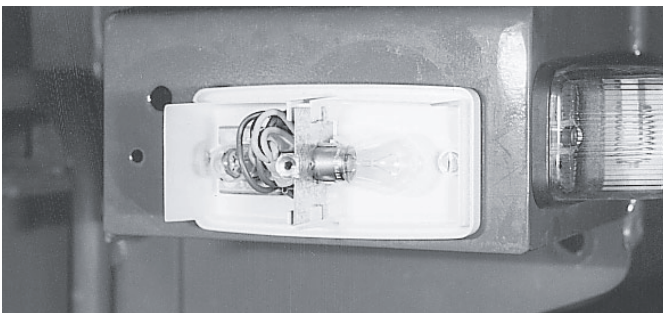
1. Unscrew the two screws and remove the housing / lens
  2. Press and twist the bulb
  3. Remove the bulb
- Bulb type: R10W (12V/10 W)



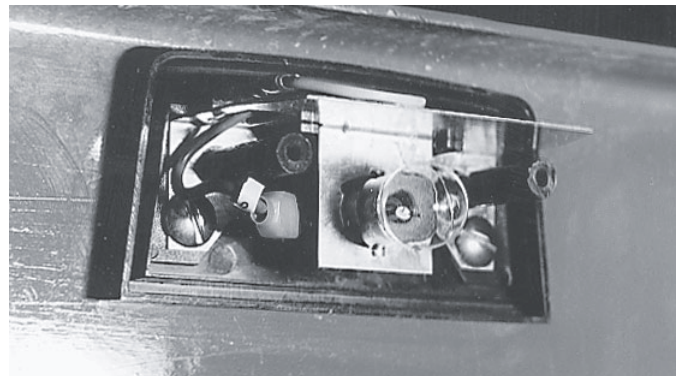
T068-0018



T068-0020



T068-0034



T068-0025

**Side direction indicator bulb**

1. Remove the 2 Allen screws
  2. Remove the lens
  3. Press down, twist and remove the bulb
  4. Renew the bulb and assemble in reverse order
- Bulb type: P21W (12V/21W)

**NOTE!** Lens must be positioned correctly. Arrow indicates driving direction.

## Working lamp bulb

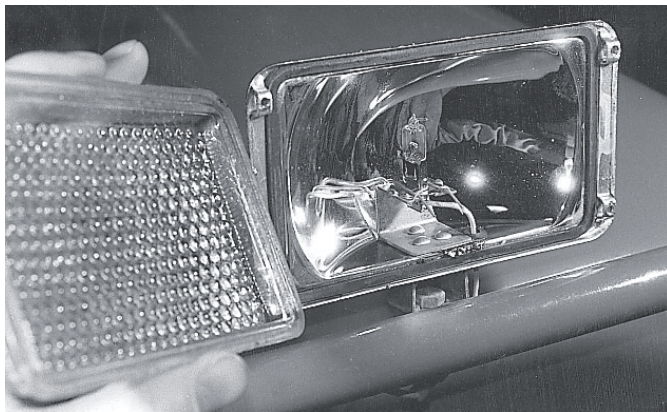
1. Unscrew the 4 screws
2. Remove the protection grid
3. Remove carefully the lens - mind the seal
4. Press the bulb retaining clamps and lift
5. Disconnect the bulb wire and remove the bulb
6. Fit new bulb and assemble in reverse order

Bulb type: H3 12V/55W

**IMPORTANT!** Do not touch the bulb glass. Hold on the base only.



T068-0035



T068-0036



T068-0021

## Rotating warning beacon bulb renewal

1. Remove the warning beacon from the bracket
2. Remove the amber lens by carefully prising it out of the rubber housing
3. Turn anti-clockwise the bulb-holder cap **A** and remove it
4. Pull up the bulb and insert the new bulb into the faston

5. Replace the bulb-holder cap **A** and press the bulb into place while turning clockwise the bulb-holder cap
6. Carefully replace the amber lens in the rubber housing
7. Replace the warning beacon in the bracket.

Bulb type: H1 12V/55W

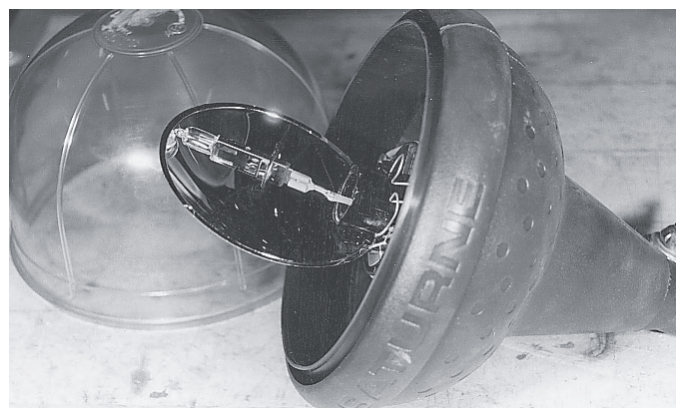
**IMPORTANT!** Do not touch the bulb glass. Hold on the bulb base only.



T068-0037



T068-0034



T068-0039

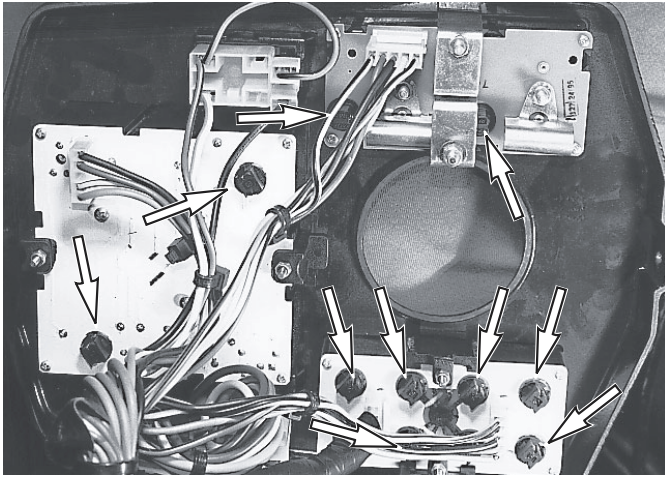
## Instrument cluster lamp bulbs

1. Remove the 4 panel retaining screws
2. Adjust the steering wheel to highest position
3. Pull up the instrument panel
4. Twist and remove the bulb and socket



- The switch control lamp bulb is pulled out of the switch
- Pull out the bulb from the socket and renew it

Bulb type: W5/1.2 (12V/1.2W)

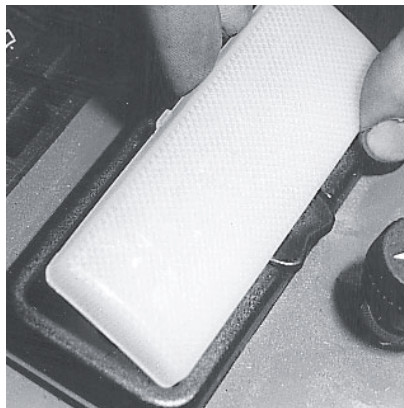


T068-0022

**Interior lamp bulb**

- Press carefully on top centre of the lens and remove it
- Remove and renew the bulb

Bulb type: C5W (12V/5W)

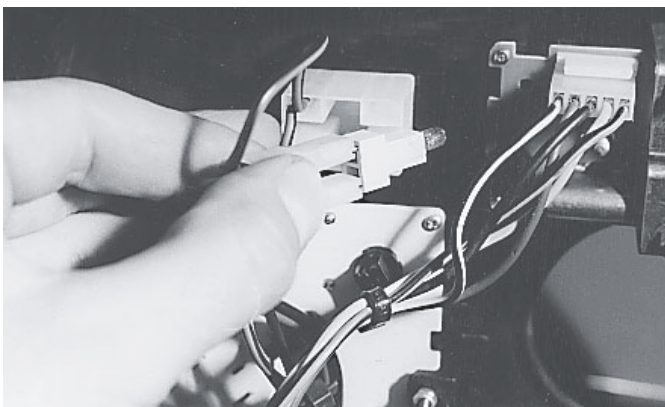


T068-0023

**Dashboard control lamp bulbs**

- Open the cab service door on RH side of the cab
- Pull the bulb socket out of the lamp
- Pull the bulb out from the socket and renew it
- Push the bulb socket in to the lamp again.

Bulb type: W3W (12V/3W)



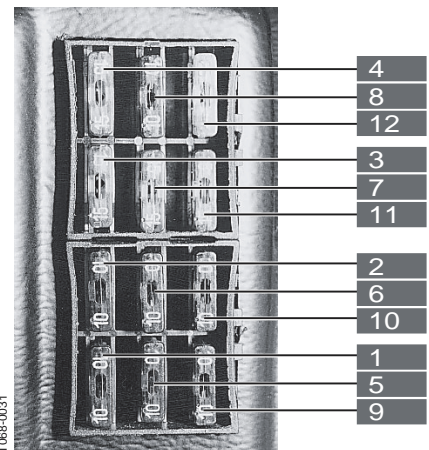
T068-0029

**Fuses**

Fuses in the electrical circuits are located several places:

**Fuse box, Steering console**

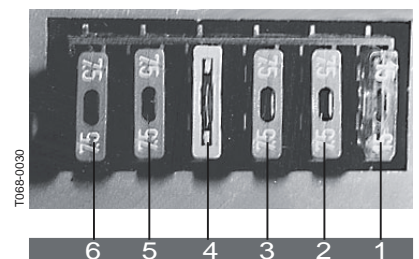
Fuse No.	Rating, Amp	Circuit
1		Not used
2	7,5	Hazard warning device and direction indicators
3	7,5	RH position lamps
4	7,5	LH position lamps
5	10	Main lamps
6	10	Head lamps
7	7,5	Horn
8	10	Electric engine stop device
9	10	Not used
10	7,5	Stop control lamp
11		Not used
12	10	Red Amber rotating warning beacon



T068-0031

**Fuse box, dashboard**

Fuse No.	Rating, Amp	Circuit
1	15	Windscreen washer & Working lamps
2		Not used
3	7,5	Cab interior lamp
4	20	Fan
5	7,5	Radio
6	7,5	Windscreen wiper



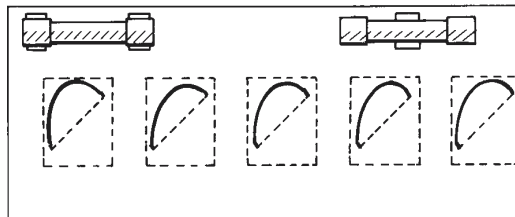
T068-0030

## Fuse box, dashboard

Fuse No.	Rating, Amp	Colour	Circuit
1	7.5		Engine pre-heating device
2	7.5		Control lamps, buzzer and brake lights
3	7.5		Spray pump
4	15		Boom hydraulics
5	7.5		4 wheel steering
6	7.5		Wheel motors high/low modes
7	7.5		Hydrostatic transmission control Reverse biiper
8	7.5		SAPE anti spin control
9	7.5		Aut. slanting control
10	7,5		Pneumatic seat
11			Not used
12			Not used

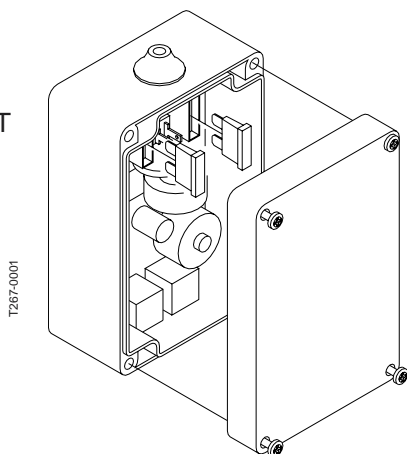
## Fuse, Electric junction box, D.A.H.

10 Amp slow blow, protects boom hydraulic functions (OLH).



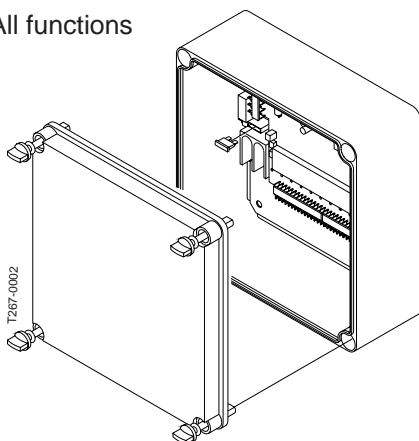
## Fuse, HARDI PILOT 3005 box

5 Amp, brown transparent. PILOT power supply



## Fuse, HARDI PILOT 3050 junction box

25 Amp., white. All functions operated via HARDI PILOT.



## Tyre safety

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

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



**WARNING!** Non observance of mounting instructions will lead to bad seating of the tyre on the rim and may make the tyre burst and thereby cause serious injury or death!

Never mount or use damaged tyres or rims!

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

## Off-season storage

When the spraying season is over you should devote some extra time to the sprayer.

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

To preserve the sprayer intact and protect the components, carry out the following off-season storage programme:

1. Clean the sprayer thoroughly - 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 residues are 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 approx. 100 litre anti-freeze mixture consisting of  $\frac{1}{3}$  automotive anti-freeze and  $\frac{2}{3}$  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. Change hydraulic oil and hydraulic oil filters as described in section on "Maintenance".
8. When the sprayer is dry, remove rust from possible scratches or damages in the paint and touch up the paint.
9. Remove the glycerine-filled pressure gauges and store them frost free in vertical position. Let anti-freeze mixture fill the hose for the pressure gauge.
10. Apply a thin layer of anti-corrosion oil (e.g. SHELL ENSIS FLUID, CASTROL RUSTILLO or similar) on all metal parts. Avoid oil on rubber parts, hoses, and tyres.
11. Fold the boom in transport position and relieve pressure from all hydraulic functions.
12. Remove the control boxes and the HARDI PILOT control box + display from the cab and store them dry and clean (in-house).
13. Apply grease on all hydraulic ram piston rods which are not fully retracted in the barrel to protect against corrosion.
14. 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.

15. Engine preservation is carried out as described in the engine manual.
16. To protect against dust the sprayer can be covered by a tarpaulin. Ensure ventilation to prevent condensation.

## Preparation after off-season 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. Prepare engine according to instructions in the engine manual.
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.

## Emergency operation of the sprayer

### The boom

In case of power failure the boom can be operated manually by pressing the individual buttons on the solenoid valves.

Remove the protection box of the solenoid valves at the boom. Lock the by-pass valve. The boom can now be operated by pressing the individual buttons on the solenoid valves.

The problem may be due to a blown fuse.

### EC operating unit

In case of power failure it is possible to operate all functions of the operating unit manually. First remove the fuse in the junction box. Now manually turn the emergency control knobs.

### Towing

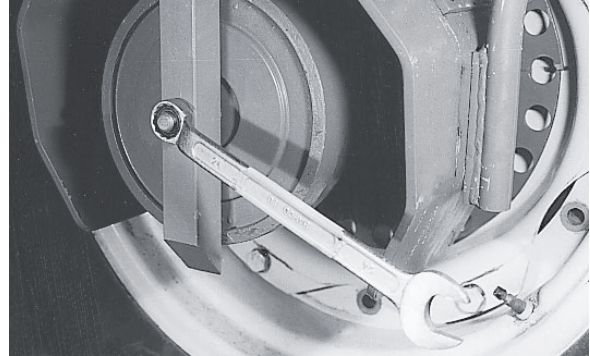
In emergency situations the machine can be towed a short distance. In case of a engine break-down on public road, and the machine must be pulled up on a truck.



**IMPORTANT!** Never attempt any towing unless the parking brakes in all 4 wheel motors are relieved mechanically and the high pressure relief valves on the hydrostatic pump are relieved! Failure to do so will damage the transmission.

### Hydraulic wheel motors

1. Remove the protection rubber dust plug
2. Fit the screw
3. Fit the yoke
4. Tighten the nut a few turns in order to relieve the spring pressure. Do this on all 4 motors.



T060-0017

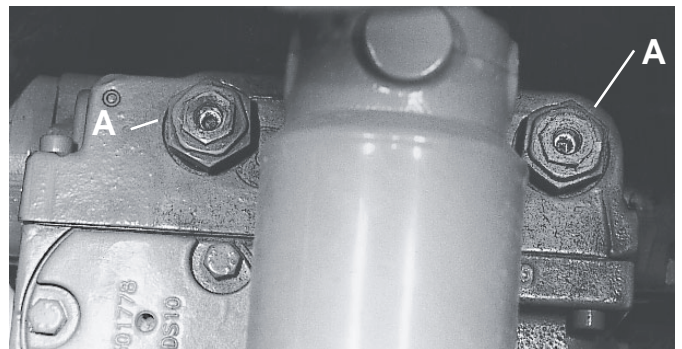
### Hydrostatic pump

1. Loosen the cartridge valve A 1,5-2 turns

**IMPORTANT!** Towing must only take place in emergency situations. Max. towing distance is **15-20 m**. Max. towing speed is **5 km/h**. Exceeding these limits can damage the transmission.

### When towing is completed:

1. Tighten the cartridge valves **A**.
2. Remove the yoke and the screw from wheel motors.
3. Fit the dust plug.
4. Release the parking brake and test transmission function.



T060-0018

### Stop wedges (if fitted)

A stop wedge can be fitted at the right hand-side of the sprayer. The wedge is recommended to be used when parking the sprayer at inclining grounds.

The wedges are removed from the brackets by pulling the handle upwards and lift up the wedges.

### Warning signal triangle

A reflecting warning triangle is placed in the cab behind the driver's seat.

In case of breakdown of the machine on public roads, the triangle should be unfolded and placed 100 - 250 m behind the machine to warn, if it is parked inconveniently or dangerously to the traffic.

### Starting aid by jumper cables

Be careful when using jumper cables to start vehicle with flat battery.

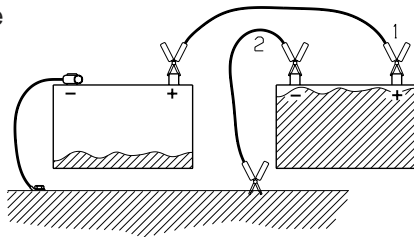
The risks are the same as described in section "Charge of battery" - see this section.



**WARNING:** Use goggles and gloves when working with batteries!

To avoid explosions it is important to connect jumper cables in the following order:

1. Connect first cable (red) to positive terminal at charged battery - then to positive terminal at discharged battery.
2. Connect second cable (black) to negative terminal at charged battery first.
3. Then connect second cable to FRAME (not negative terminal at battery!) at vehicle with discharged battery.



This to avoid sparks near the battery when connecting the last cable to terminal.

## Trouble shooting

### Operational problems, spraying equipment

In case of breakdowns, the same factors always seem to come into play:

- Minor leaks on the suction side of the pump will reduce the pump capacity or stop the suction completely.
- A clogged suction filter will hinder or prevent suction so that the pump does not operate satisfactorily.
- Clogged up pressure filters will result in increasing pressure at the pressure gauge but lower pressure at the nozzles.
- Foreign bodies stuck in the pump valves with the result that these cannot close tightly against the valve seat. This reduces pump efficiency.
- Poorly reassembled pumps, especially diaphragm covers, will allow the pump to suck air which will reduce capacity.
- Hydraulic components that are contaminated with dirt will lead to 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 functions properly. Use clean water to check.
6. Hydraulic components are maintained clean.

<b>Fault</b>	<b>Probable cause</b>	<b>Control / remedy</b>		
<b>Liquid system</b> No spray from boom when turned on.	Air leak on suction line.	Check if suction filter O-ring is sealing. Check suction tube and fittings. Check tightness of pump diaphragm and valve covers.		
	Suction/pressure filters clogged.	Clean filters. Check suction pipe is not obstructed or placed too near the tank bottom.		
	Lack of pressure.	Incorrect assembly.	Restrictor nozzle in Self-Cleaning Filter not fitted. Safety valve spring for Self-Cleaning Filter not tight.	
		Pump valves blocked or worn.	Check for obstructions and wear.	
Pressure dropping.	Defect pressure gauge.	Check for dirt at inlet of gauge.		
	Filters clogging.	Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.		
	Nozzles worn.	Check flow rate and replace nozzles if it exceeds 10%.		
	Tank is air tight.	Check vent is clear.		
Pressure increasing	Sucking air towards end of tank load.	Returns inside tank need relocation.		
	Pressure filters beginning to clog.	Clean all filters.		
Formation of foam.	Air is being sucked into system.	Check tightness / gaskets / O-rings of all fittings on suction side.		
	Excessive liquid agitation.	Reduce pump r/min. Check safety valve for Self-Cleaning Filter is tight. Ensure returns inside tank are present. Use foam damping additive.		
		Liquid leaks from bottom of pump.	Damaged diaphragm.	Replace. See Changing of valves and diaphragms.

Fault	Probable cause	Control / remedy
<b>EC Operating unit</b> Operating unit not functioning	Blown fuse(s).	Check mechanical function of microswitches. Use cleaning/lubricating agent if the switch does not operate freely.
		Check motor. 450-500 milli-Amperes max. Change motor, if over.
	Wrong polarity.	Brown - pos. (+). Blue - neg. (-).
	Valves not closing properly.	Check valve seals for obstructions.
		Check microswitch plate position. Loosen screws holding plate a 1/2 turn.
No power.	Wrong polarity. Check that brown is pos. (+), Blue is neg. (-).	
	Check print plate for dry solders or loose connections.	
<b>D.A.H. Hydraulic system</b> No boom movements when activated	Insufficient oil pressure	Check oil pressure - min. 130 bar, max. 150 bar.
		Check hydraulic oil level
	Insufficient oil supply.	Check hydraulic oil level.
	Blown fuse.	Check / replace fuse in junction box.
	Bad / corroded electrical connections	Check / clean connections, etc.
	Insufficient power supply.	Voltage on activated solenoid valve must be more than 8 Volts. Use wires of at least 4 mm <sup>2</sup> for power supply.
	Defect relay / diodes in junction box.	Check relays, diodes and soldering at PCB in junction box
Wrong polarity.	Check polarity. White pos. (+) Blue neg. (-).	
Individual ram does not move	Clogged restrictor	Dismantle and clean restrictor

<b>Problem</b>	<b>Probable cause</b>	<b>Control / remedy</b>
<b>Air conditioning</b>		
The overpressure warning lamp lights	Cold ambient temperature	Turn the AC thermostat knob off and back to desired setting again
The circuit leakage warning lamp lights	Leakage of refrigerant from the circuit	Clean as described in section "maintenance"
The cooling capacity is poor	Low air flow	Clean the evaporator
	Restricted evaporator	Clean or renew the cab filters
	Restricted condenser	Increase fan speed
No function at all	Fuse blown	Change fuse
	Thermo fuse disengaged	Press in the red button on condenser left hand side
<b>Four wheel steering sensor</b>		
No signal from sensor	Distance between sensor and disc is incorrect	Adjust sensor
	Sensor defective	Renew sensor
<b>Engine</b>		
Please see engine manual		
<b>Hydrostatic transmission</b>		
Machine will drive in neutral position	Neutral position on pilot handle linkage is faulty adjusted	Adjust the linkage till neutral is correct
	Neutral position on the pump is faulty adjusted	See your HARDI dealer for pump adjustment
Machine will not drive	Parking brake is engaged	Disengage parking brake
	Feed pressure is low	Check feed pressure (brakes engaged)
The machine is moving too slowly	On hilly terrain: High pressure valves set too low	Check high pressure valves setting
	Internal leakage in pump/motors excessive	Check internal leakages on pump, motors etc.



<b>Problem</b>	<b>Probable cause</b>	<b>Control/remedy</b>
<b>Hydraulic fan transmission</b>		
Max. revolutions cannot be obtained	Tractor P.T.O. speed is lower than 540 r.p.m. (reading failure on tractometer)	Check tractor's P.T.O. r.p.m. Check tractometer
	Feed pressure is too low	Adjust feed pressure to correct setting
	Max. fan r.p.m. is not adjusted correctly (models with bowden cable adjustment only)	Adjust the max. fan r.p.m.
	Pump/motor is worn	Get transmission checked by your HARDI dealer
Noisy fan transmission	Wrong oil quality (foam)	Change oil to correct quality
	Feed pressure too low	Adjust feed pressure
	Oil filter clogged (vacuummeter indicator in red area)	Change oil filter
Formation of foam in oil tank	Pump/motor is worn	Get the fan transmission checked by your HARDI dealer
	Wrong oil quality	Change the oil to correct quality
	Mixture of hydraulic oil and other quality (e.g. universal oil)	Change the oil to correct quality
	Oil change interval not kept	Change the oil to fresh, clean oil of correct quality
	Leak on the pump suction line	Check hydraulic pump suction line for leaks
Fan speed will not stay at adjusted level	No signal from speed sensor at the fan	Check the wire connection between sensor and actuator for damages
	Bad connections	Check the wire connection between sensor and actuator for damages
Fan r.p.m. control does not start up	Fuse blown	Check power supply and fuse
Oil leaks from pump/motor shaft seal (seal pressed out)	Drain hoses from motor/pump housing is blocked	Check the drain hose(s) for bendings, damages, and proper attachment
	Too much pressure in pump/motor housing (pump/motor worn)	Get the transmission checked by your HARDI dealer

**Technical specifications**  
**Specification**

Engine	Engine
Mark	DEUTZ
Model	BF6M 1012 C
No. of Cyl.	6

**Engine**

HP/kW at 2500 min <sup>-1</sup>	167/118
Max. torque Nm at 1500 min <sup>-1</sup>	564
Turbo charger	Yes
Intercooler	Yes

**Electrical system**

Alternator	14V, 90 Amp
Starter motor	12V, 3.1 kW
Battery	12V, 160 Ah

**Transmission**

Type	Hydrostatic
Pump make	Sauer series 90
Displacement	100 cm <sup>3</sup> /rotation
Feed pressure	28-30 bar
Working pressure, max.	420 bar
Loop flushing valve pressure	3 bar less than feed pressure
Motor make	Poclair
Model	MS08 or MS11
Motor displacement	780/390 cm <sup>3</sup> / rotation

**Brakes**

Parking brake	Multi disc on all wheels
Service brake	Hydrostatic transmission

**Steering**

Front-wheel-steering	Standard
4-wheel-steering	Standard
Turning radius at 1800 mm track gauge	5500 mm
Do. 4WS	4800 mm

**Suspension**

Type	Central Helicoid spring suspension, front and rear, with acting shock absorbers
Front axle	Oscillating
Rear axle	Fixed

**Cab**

Air filter	Active carbon cartridge
Noise level (working conditions, 2500 engine r.p.m.) at the driver's ear	78-80 dB (A)
Heating	Engine coolant
Air conditioning	Optional extra
Air conditioning refrigerant	R134 A

**Measure and weight**  
**Overall dimensions (mm)**

**A: Length**  
**B: Width**  
**C: Height**

**2000 I, HAZ**

Boom width, m	A	B	C
18	≤7580	≤3150	≤4000
20	≤7580	≤3150	≤4000
21	≤7580	≤3150	≤4000
24	≤7580	≤3150	≤4000
27	≤7580	≤3150	≤4000
28	≤7580	≤3150	≤4000

**2500 I, HAZ**

Boom width, m	A	B	C
18	≤7580	≤3150	≤4000
20	≤7580	≤3150	≤4000
21	≤7580	≤3150	≤4000
24	≤7580	≤3150	≤4000
27	≤7580	≤3150	≤4000
28	≤7580	≤3150	≤4000

All figures are in mm.

**Weights (kg)**

**2000 I**

Boom width, m	Empty			Full		
	Axle load front	Axle load rear	Total weight	Axle load front	Axle load rear	Total weight
18	-	-	-	-	-	-
20	-	-	-	-	-	-
21	-	-	-	-	-	-
24	-	-	-	-	-	-
27	-	-	-	-	-	-
28	3640	2640	6280	4400	4270	8670

**2500 I**

Boom width, m	Empty			Full		
	Axle load front	Axle load rear	Total weight	Axle load front	Axle load rear	Total weight
18	-	-	-	-	-	-
20	-	-	-	-	-	-
21	-	-	-	-	-	-
24	-	-	-	-	-	-
27	-	-	-	-	-	-
28	3650	2670	6320	4565	4670	9235

All weights are in kg.

The missing figures were not available when this book was printed.

### Capacities

Main tank	2000/2500 l + 5% oversize
Rinsing tank	185 l
Clean water tank	30 l
Fuel tank	185 l
Hydraulic reservoir	60 l
Screen wash bottle	2 l
Air conditioning circuit	1000 - 1100 gram R134 A

	BF4M 1012 C	BF6M 1012	BF6M 1012 C
Engine oil, incl. filter	10 l	15 l	15 l
Do. without filter	9.5 l	13.5 l	13.5 l
Coolant, incl. heater	11 l	14 l	14 l

### Conversion factors, SI to Imperial Units

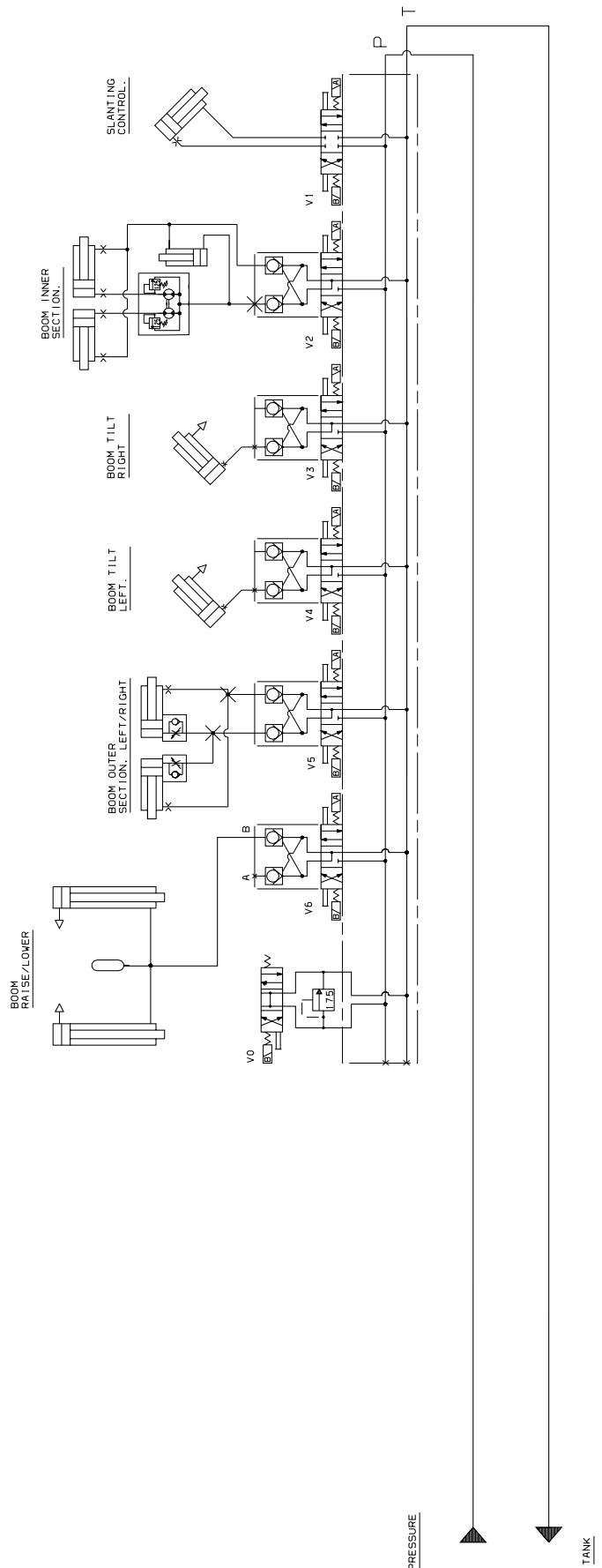
All units used in this manual are SI units. In some occasions Imperial units are used. Use following factors to convert SI units to Imperial units:

	SI unit	Imperial unit	Factor
Weight	kg	lb.	x 2.205
Surface area	ha	acres	x 2.471
Length	cm	in	x 0.394
	m	ft	x 3.281
	m	yd	x 1.094
Velocity	km/h	mile/h	x 0.621
	km/h	m/s	x 0.277
Quantities/area	l/ha	gal (Imp.)/acre	x 0.089
Volume	ml	fl.oz (Imp.)	x 0.0352
	l	Imp. pt.	x 0.568
	l	gal (Imp.)	x 0.22
Pressure	bar	lb./in <sup>2</sup> (p.s.i.)	x 14.504
Temperature	°C	°F	(°C x 1.8) + 32
Power	kW	hp	x 1.341
Torque	Nm	lbft	x 0.74

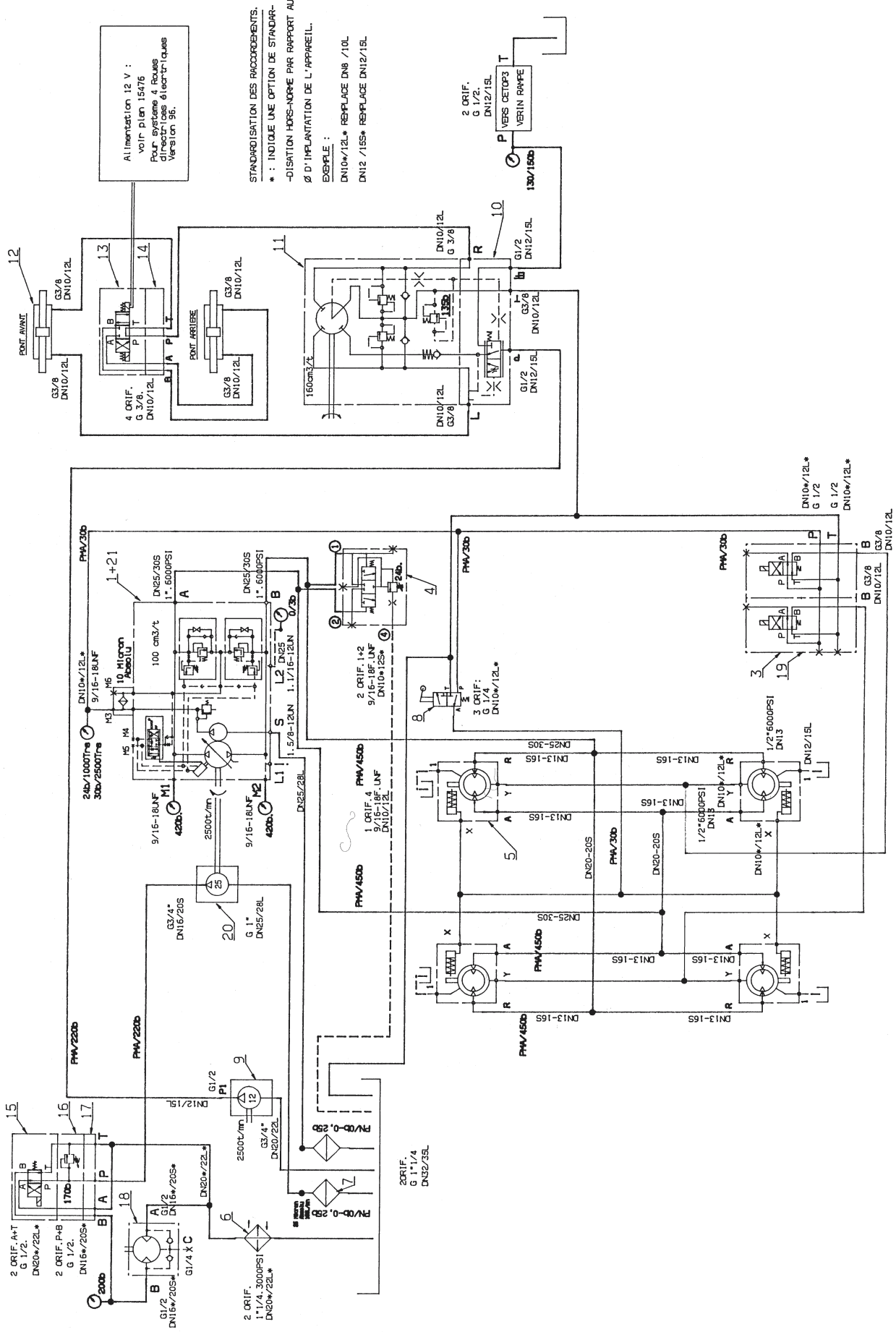
### Pump capacity

463/10.0	Rotation per min					
	200	300	400	500	540	600
bar	Capacity l/min					
0	109	156	207	257	276	305
2	103	152	202	252	270	299
4	101	149	198	246	265	295
6	99	146	195	242	263	289
10	94	142	192	236	256	282
15	91	136	184	230	248	276
Max. pressure: 15bar	Weight: 66.5 kg		Suction height: 0.0 m			

### Boom hydraulic, HAZ



## ALPHA transmission, steering and spray pump drive



Allimentation 12 V :  
voir plan 15476  
Pour système 4 Roues  
directrices électriques  
Version 96.

STANDARDISATION DES RACCORDEMENTS.  
\* : INDIQUE UNE OPTION DE STANDARDISATION.  
-DISATION HORS-NORME PAR RAPPORT AU Ø D'IMPLANTATION DE L'APPAREIL.  
EXEMPLE :  
DN10\*12L\* REPLACE DN8 /10L  
DN12 /15S\* REPLACE DN12/15L

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