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# **TWIN - LA**

## **Instruction book**

674967-GB-89/3



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



## Description

The HARDI TWIN 12, 15, 16 or 18 m models consist of a pump, frame with tank of 800, 1000 or 1200 l, EC operating unit, self-cleaning filter, hydraulic spray boom with blower unit, TRIPLET nozzles, hydraulic pump with oil tank and P.T.O. shaft.

The design of the HARDI model 361 diaphragm pump is simple, with easily accessible diaphragms and valves. The pump is equipped with a through-going shaft which by means of a gear box operates a hydraulic pump. All are mounted on a slide tray to facilitate accessibility.

The tank, made of impact-proof and chemical resistant polyethylene, is designed with no sharp corners for easy cleaning.

The EC (Electric Control) operating unit consists of: on/off control, pressure gauge, pressure regulating valve with built-in HARDI-MATIC and distribution valves with pressure equalization. HARDI-MATIC ensures the same spray liquid rate is applied despite varying speed in the same gear. This is so provided the range of revolutions on the P.T.O. are kept between 300 and 540 r/min.

With the self-cleaning filter the impurities that exist in the spray liquid will by-pass the operating unit and be recirculated back to the tank.

The spray boom is equipped with seven hydraulic cylinders for the folding / unfolding and elevating / lowering functions. This ensures an easy and effortless operation. All functions of the boom are operated direct from the control panel placed near the operator. The frame and boom are connected by a shock reducing trapeze suspension which minimizes the swing of the boom when driving on uneven ground. Furthermore, there is a function for tilting the whole boom in order to maintain the trapeze effect when working on sloping terrain and a slot angle function enabling you to control the direction of the air current and spray liquid.

The hydraulically operated axial blower is placed on the centre part of the boom. It generates the air for the slot which is located under the length of the boom. TRIPLET nozzles are placed beside the slot. The use of blower in dense crop increases the penetration of spray liquid and reduces wind drift.

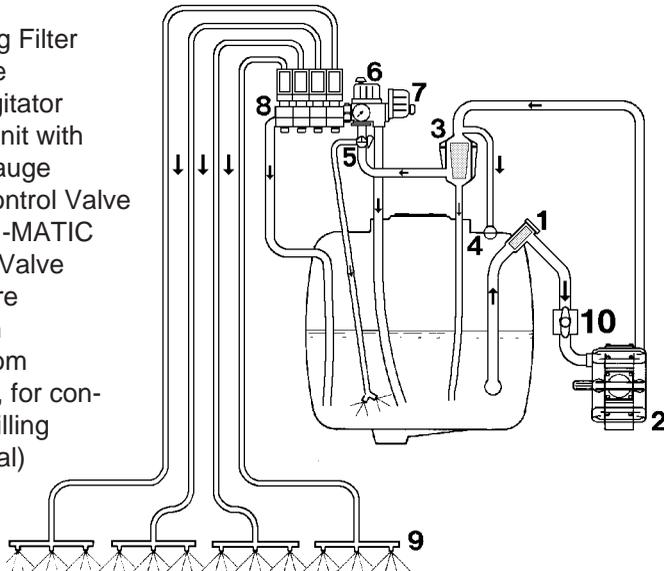
A boom break-away is fitted allowing the outer boom section to fold back if an object is hit. This minimizes damage to the boom, should the section strike an object.

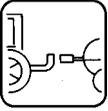
An identification plate fitted on the frame is to indicate model, year of production, serial number and country of origin.



## Operating Diagram for Spray Liquid

1. Suction Filter
2. Pump
3. Self-cleaning Filter
4. Safety Valve
5. Pressure Agitator
6. Operating Unit with Pressure Gauge
7. Pressure Control Valve with HARDI-MATIC
8. Distribution Valve with Pressure Equalization
9. Sprayer Boom
10. Filling valve, for connection of Filling filter (optional)





## Connecting the Sprayer

The sprayer is designed for Category II tractors and is fitted with 28mm pivots (Cat. II).

The sprayer also has the HARDI Quick Hitch System incorporated in the frame. If using the Quick Hitch System, fit the tractor part first. The distance from the top of the tractor part to the ground must be no more than 1 m when connecting the sprayer. If you use a hydraulic top bar, the hydraulic system needs a double outlet. (See paragraph on hydraulic connections).

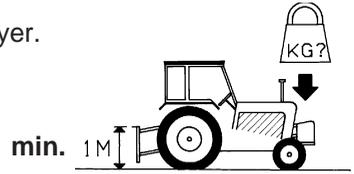


**WARNING:** Note the weight of the sprayer.

See Technical Specifications section.

Generally it is recommended to:

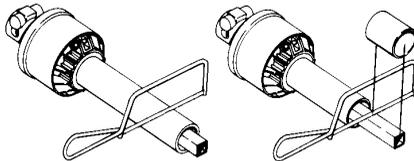
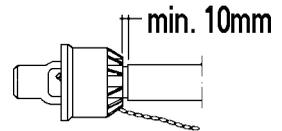
1. Use a tractor over 60kW (80hp).
2. Add ballast to front of tractor.
3. Increase tyre pressure  
(see tractor instruction book)
4. Travel at slower speeds when driving to the field with a full tank.



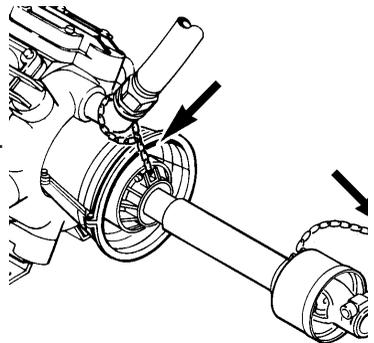
*Be careful when filling / lifting the sprayer for the first time.*



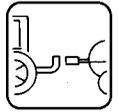
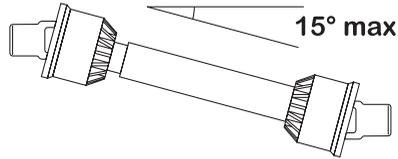
When connecting the sprayer to the tractor the length of the P.T.O. shaft should be checked and if necessary shortened. There should be at least 10mm free play between the male and female parts.



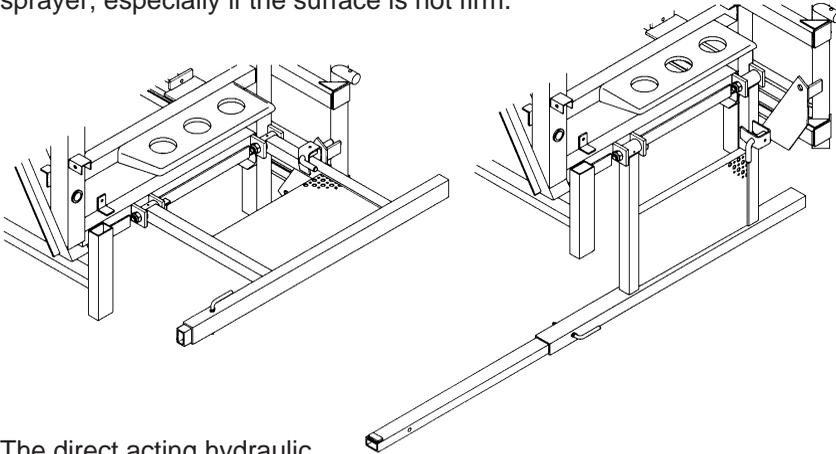
It is important for the personal safety of the operator that the P.T.O. shaft is intact. The protection guards must cover the whole shaft. This includes the universal-cross covers at each end of the shaft. The chains are connected so that the protection guards do not rotate with the shaft.



To ensure long life of the P.T.O. shaft, try and avoid working angles greater than 15°.



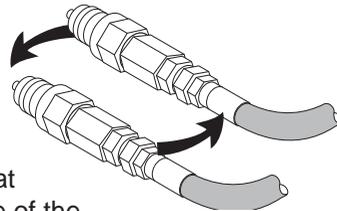
The sprayer can now be lifted and the leg extensions retracted. Fold the legs up. **REMEMBER** to use the extensions when parking the sprayer, especially if the surface is not firm.



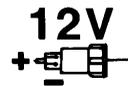
The direct acting hydraulic system requires a double acting outlet or a single acting outlet and a return for the functions of the spray boom. Note that the hydraulic system requires an oil capacity of approx. 5 litres and a minimum pressure of 130 bar. The hydraulic lever on the tractor can now be positioned so that the oil flows to the sprayer.

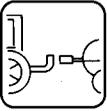


**NOTE:** If the boom rises (pressure in the system), the hydraulic hoses must be switched around or the hydraulic lever must be positioned in the opposite direction. Thereafter the hydraulic lever is locked in its working position. Take note that with some tractors, this prevents the usage of the hydraulics for the liftarms.



The remote control boxes for operating unit and boom, and blower control handle are placed in the tractor cabin. Connect the multiple plugs and the 12 V supply from the tractor. The supply wire must have a cross-sectional area of 4.00mm<sup>2</sup>.





Use the HARDI Electric Distribution Box (part no. 817925) if the tractor has a doubtful power supply. *Note the polarity of the plug.*

## Roadworthiness



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



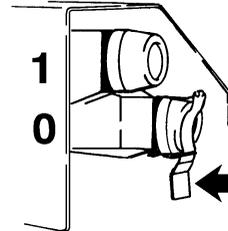
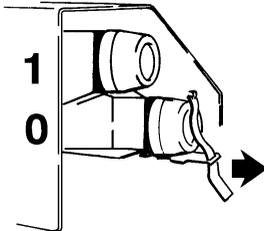
## Operating instructions

### Before operating the boom

The direct activated hydraulics system must be set to suit the tractor hydraulic. Locate solenoid valve block near the spray liquid pump.

If the tractor is equipped with open centre hydraulics, button (O) must be left out.

If the tractor is equipped with closed centre hydraulics, e.g. John Deere, button (O) must be pressed in.

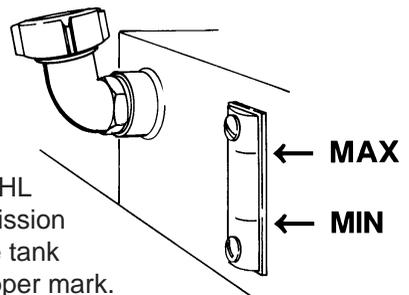


### Before operating the blower

If the hydraulic transmission has not been run before (no oil in the pump/tank) or the transmission has been disassembled, please read "Hydraulic Transmission" section first.

With the sprayer on even ground, check oil levels in the tank and gear box. It may be necessary to slide the pump tray out (see section on Changing Valves and Diaphragms).

**NOTE:** Use oils with DIN norm 51524 HL or 51525 HLP for the hydraulic transmission "DO NOT USE UNIVERSAL OIL". The tank holds approx. 30 l. Maintain level at upper mark.

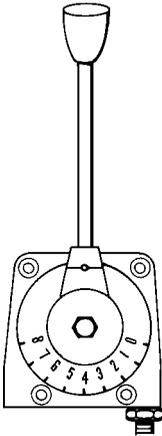
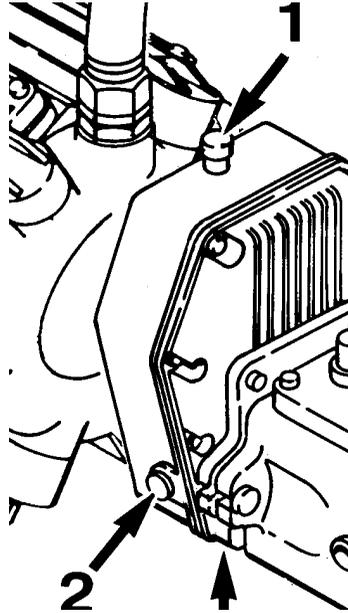


Oils meeting these requirements include;

Shell	Tellus 68	Q8	Harden 68
Texaco	Rando HD 68	Mobil	Mobil DTE 26
Castrol	ARS 68	BP	Bartran HV 68

Use gear oil SAE 90 EP (SAE J306a) for the gear box. Capacity is 500ml.

1. Filling hole
2. Level
3. Drain



Before starting the transmission, set the control handle for blower on "0".





## Operating of the Boom

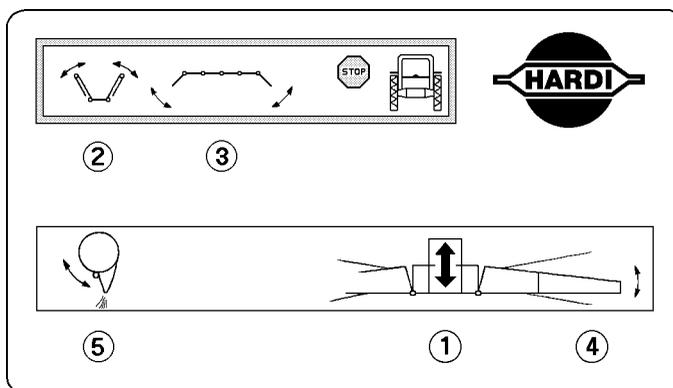
BEFORE UNFOLDING THE BOOM IT IS IMPORTANT TO HAVE THE TRACTOR CONNECTED TO PREVENT OVERBALANCING OF THE SPRAYER.



### WARNING

TESTING OF THE HYDRAULIC SYSTEM SHOULD BE DONE VERY CAUTIOUSLY; THERE MAY BE A LITTLE AIR IN THE SYSTEM AND THIS MAY CAUSE VIOLENT MOVEMENTS OF THE BOOM. THEREFORE, TAKE CARE THAT NO PERSONS OR OBJECTS ARE HURT OR DAMAGED IN THE PROCESS OF TESTING.

Remote control box for the hydraulic functions.



UNFOLDING AND FOLDING (FUNCTIONS ② + ③ IN THE RED BOX WITH STOP SIGN) ARE TO BE USED ONLY WHEN THE TRACTOR IS STATIONARY.



- Raising / lowering of the boom ①
- Unfold / folding of inner section ②
- Unfold / folding of outer section ③
- Tilting function of the boom ✓
- Angling function of the slot ⑤

To unfold the boom, it is first necessary to raise it clear of the transport supports. The inner/outer sections are then unfolded, followed by the outer sections and then the boom is lowered.

1. Raise the boom by pushing switch 1 up. The boom transport brackets must be clear of the transport supports. Do not raise the boom so high so as the bottom part of the supports touch the boom.

2. Unfold from transport position by activating switch 2. Be cautious that both sides clear the transport supports.

3. Now unfold the outer sections by activating switch 3.

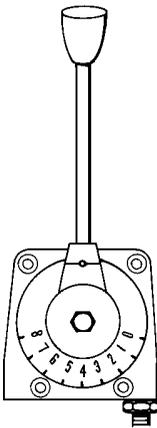
4. When the boom is completely unfolded, it can now be lowered.

Switch 4 is used during spray work on sloping terrain. Tilting the boom, thereby maintaining it as parallel as possible to the terrain, permits an equal nozzle to target distance along the length of the boom. The trapeze function is still maintained whilst the tilt function is used.

In order to reduce wind drift and/or increase penetration of spray liquid in the crop, the slot angle can be changed by using switch 5. It is possible to angle the slot backwards and forwards.

Before folding the boom, set the tilt function in neutral position first. This permits the boom to rest evenly on the transport brackets. Folding procedure is a reverse of the unfolding procedure.

## Operating the blower



The blower is activated by pushing the control lever forward.



THE TRACTOR P.T.O.  
MUST NOT EXCEED  
MORE THAN 540 r/min.

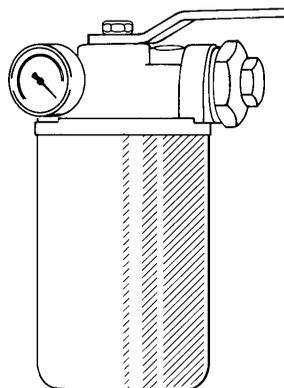




### Starting up of blower

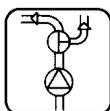
Check pressure gauge on oil filter. When the oil has reached operating temperature, the filter indicator should be in the green or yellow zone (not red) at 540 r/min and with the blower set at max. revolutions.

NOTE: Oil filter should be replaced after the first 25 hours of operation. See Lubrication.



### Calibration

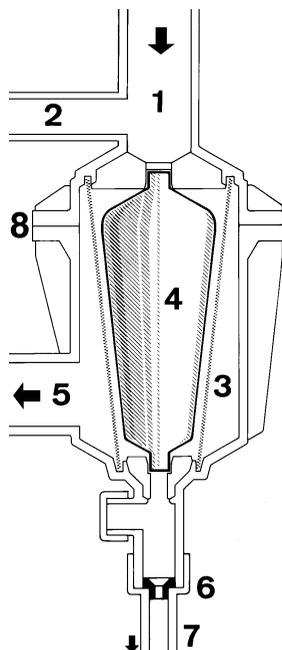
Adjustment and operation of operation unit and distribution valves is done with **CLEAN** water.



### Self cleaning filter

#### Operating diagram

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



## Choice of restrictor

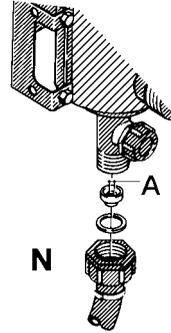
It is important to have a large flow through the filter. This is achieved by choosing the restrictor size in relation to the liquid consumption of the spray boom.

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.

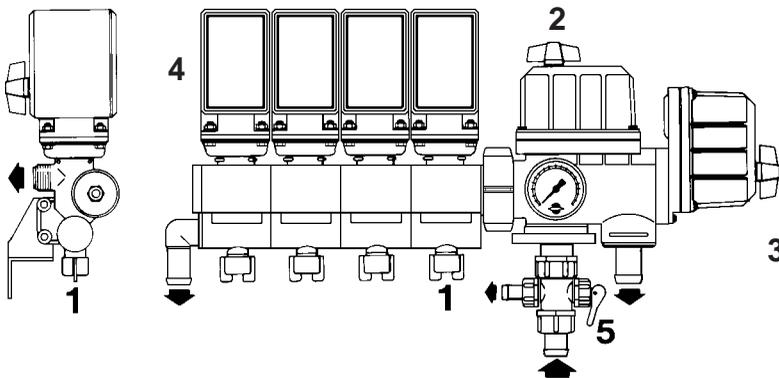
In the required working pressure can not be obtained, the restrictor is too large. Choose a smaller restrictor. Start with a black one, then a white and finally a red one.

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



## Adjustment of operating unit

### EC operating unit

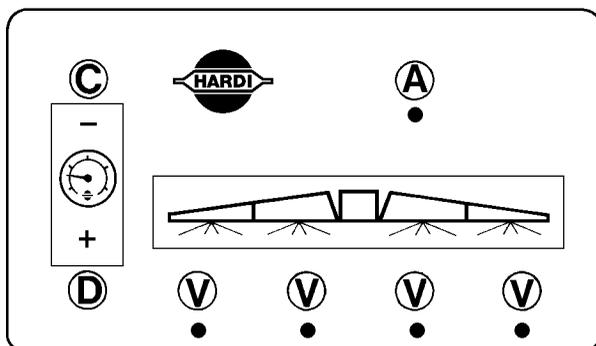


1. Adjusting screw for pressure compensation
2. On / off valve
3. Pressure regulation valve
4. Distribution valve
5. Pressure agitation valve





## EC Control box



- A. Operating switch for on-off valve
- V. Operating switch for distribution valves
- C. Pressure regulating switch (-)
- D. Pressure regulating switch (+)

1. Valve (5) for pressure agitation is opened or closed agitation on or off. REMEMBER that pressure agitation uses 5-10% of the pump capacity.
2. On-off switch A is activated towards green dot.
3. All distribution valve switches V are activated towards green dots.
4. Pressure regulating switch C is activated until emergency knob on pressure regulation valve (3), stops rotating (minimum pressure).
5. Put the tractor in neutral and adjust the P.T.O. and thereby the number of revolutions of the pump corresponding to the intended travelling speed. Remember the number of revolutions on the P.T.O. must be kept between 300-540 r/min.
6. Pressure regulating switch D is activated until the recommended pressure is shown on the pressure gauge.

ADJUST THE DISTRIBUTION PRESSURE COMPENSATION IN SECTIONS AS FOLLOWS:

7. Close the first distribution valve switch V.

8. Turn the adjusting screw (1) until the pressure gauge again shows the same pressure (turn the screw clockwise for higher pressure, anti- clockwise for lower pressure).

9. Adjust the other sections of the distribution valve in the same way.

NB: HEREAFTER ADJUSTMENT OF PRESSURE COMPENSATION WILL ONLY BE NEEDED IF YOU CHANGE TO NOZZLES WITH OTHER CAPACITIES.

#### 10. OPERATING THE CONTROL UNIT WHILE DRIVING:

In order to close the entire boom activate on-off switch **A**. This returns all the pumps' output to the tank through the return system.

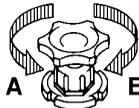
In order to close one or more sections of the boom switch the relevant distribution valve **V** to off position. The pressure compensation ensures that the pressure does not rise in the sections which are to remain open.

In case of power failure it is possible to emergency activate all functions of the operating unit manually. First disconnect the multiple plug from the EC operating unit. It is now possible to manually turn the emergency control knobs.

### Operating the Drain Valve on Tank

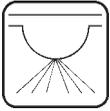
To open : Turn to the left

To close : Turn to the right



### Spray Technique - see separate book.



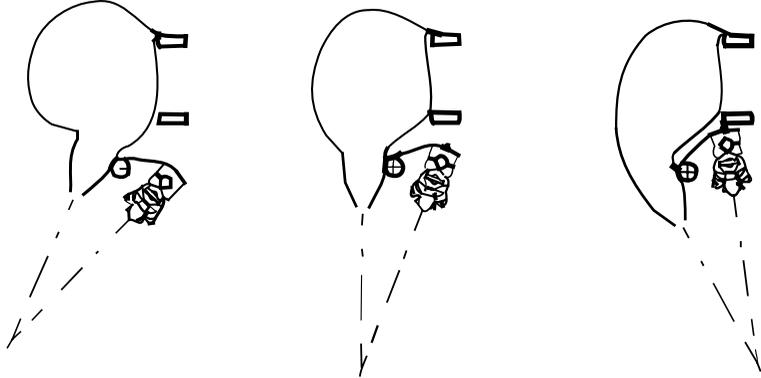


## Air Technique

The function of the air slot is to add energy to the spray droplets.

### The principles

The angle between nozzles and air slot is fixed. The system can be angled hydraulically ranging from 30° forwards to 30° backwards.



Adjustment of the air slot.

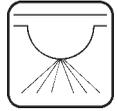
The fan speed is infinitely variable from 0 - 30 m/s (measured at the air slot).

	POSITION BLOWER								
	0	1	2	3	4	5	6	7	8
 r/min	0-50	600	1000	1500	1800	2200	2500	2800	3000
 m/s	0	6	10	15	18	22	25	28	30

Tractor P.T.O. shaft at 540 r/min

The correct use of these two adjustment possibilities depends on the following:

- Crop density and height
- Location of the target
- Wind velocity and direction
- Forward speed
- Spray volume rate (degree of atomisation)



## **Crop density and height**

Generally speaking the air velocity should be increased in proportion to the density and the height of the crop.

Normally, the slot should be angled backwards when spraying low crops. High air speeds should be avoided to reduce dust being blown about and covering the target plants. When spraying higher crops the air slot can be adjusted as per the other conditions mentioned.

## **Location of spray target**

If the target is at the bottom of the crop, the air velocity should be increased. If the target is at the top of the crop, the air velocity should be reduced.

Angling of the air slot is decisive for penetration.

When spraying easily accessible infestations, it is often an advantage with a backward angling.

If the target is at the bottom of the crop a forward/ vertical angling is used depending of the forward speed.

Wind direction will have an influence on the above procedure.

The air assistance also makes it possible to use less liquid even in windy conditions.

Note that this is only valid for treatment of crops which are able to “trap” the droplets.

High fan speed in sparsely populated crops will give too much reflection.

When treating bare soil or very light crops, high fan speed should not be used. Therefore, wind sensitivity with reduced volume rate will be higher than when treating a dense crop.

**m/s**

### **Wind velocity and direction**

Generally speaking, the stronger the wind, the higher the fan speed  
*(Note: there must be no reflection of the sprayliquid).*

In side-wind, the air slot can be set according to the crop and tractor speed.

In head-wind and down-wind it may be an advantage to angle the air slot against the wind (i.e. backwards in down-wind and forwards in head-wind).

**km/h**

### **Forward speed**

In broadacre crops the speed should not exceed 8 km/h and in row crops not exceed 6 km/h.

The faster the speed, the poorer the penetration. Therefore, fan speed should be increased with the forward speed, if the spray work necessitates deep penetration.

The air slot can also be adapted to a certain forward speed. A high speed can be considered as head-wind, and the air slot should therefore be angled more forward with a higher speed.

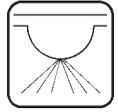
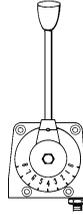
### **Spray volume rate (degree of atomisation)**

The smaller the spray volume rate or the higher degree of atomisation, the higher fan speed. The reason is that the small droplets, which are prevailing, should be given more energy in order to reach the target.

When using high spray volume rates and large nozzles, it is often sufficient to use reduced air velocity (0-4). Maximum penetration is obtained with high spray volume rate and high fan speed. Note: This combination, however, will often result in more deposits on the soil.

# Air adjustment

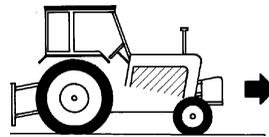
Steps 1-8 is regulated with the Control lever.



1										
2										
3										
4										
5										
6										
7										
8										
	0	1-3	4-6	7-8	9-10	10.1-11				

Growth stage (feekes)

- = Insecticide
- = Herbicide
- = Fungicide
- = Growth regulator
- = Backwards
- = Vertical
- = Forwards



Driving direction

Air slot

General adjustment proposals in cereal crops. The conditions described above may necessitate a readjustment.



## Maintenance

### Nozzles

It is a good rule to renew all nozzles once a year as some wear and tear is unavoidable. Otherwise it is strongly recommended to change nozzles when the flow rate exceeds 10% of the original flow rate. The operator should always have extra nozzles in store so that waste of time may be avoided when spraying time and weather conditions are ideal.

Check and carefully clean all nozzles. Are they all the same type and number?

Damaged nozzles apply chemicals incorrectly and should be changed immediately.

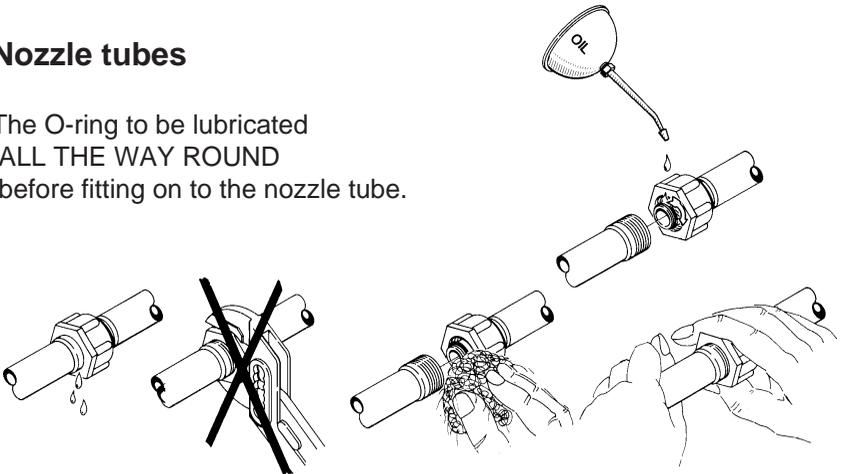
### Filters

Remember that cleaning also entails the cleaning of all filters. Clean the filters thoroughly on both suction and pressure side. Renew them if necessary.

When cleaning the Self-cleaning filter remove the by-pass hose and rinse with clean water by activating the pump. This should be done after each working day.

### Nozzle tubes

The O-ring to be lubricated  
**ALL THE WAY ROUND**  
before fitting on to the nozzle tube.



In case of leaks: **DO NOT** overtighten, disassemble, clean and reassemble as shown.

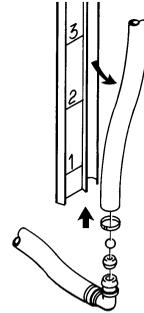
## Air tunnel

Air loss through holes or rips reduces the efficiency of the sprayer. It is therefore wise to periodically check the air tunnel. A rip can be repaired by glueing on a piece of P.V.C..

Use contact glue. Remember that the surface must be completely clean.

## Level indicator

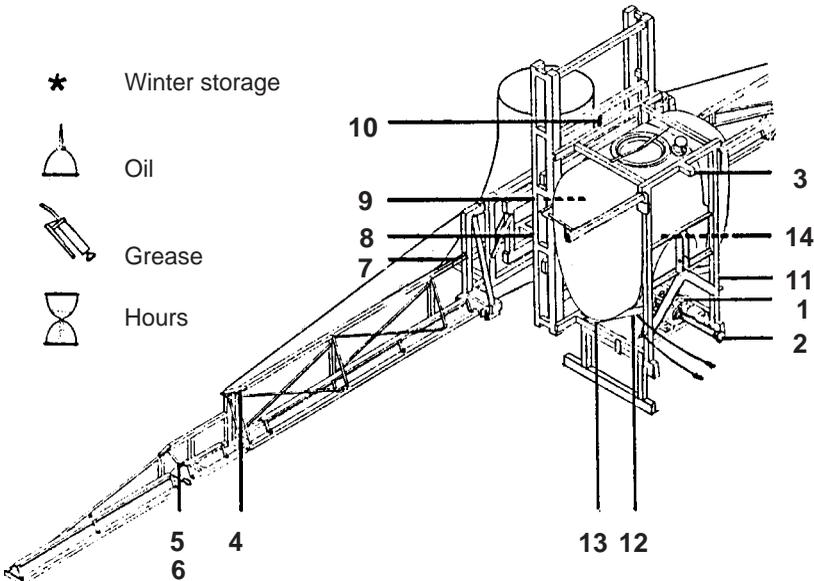
Depending on products used, it can become difficult to see the red sphere inside the level indicator tube. Note that the tube can be replaced when necessary.

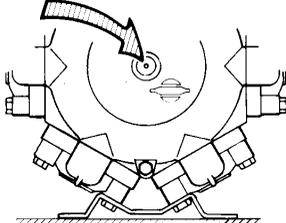
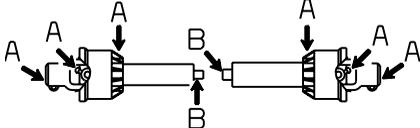
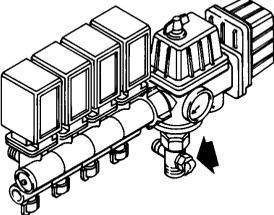
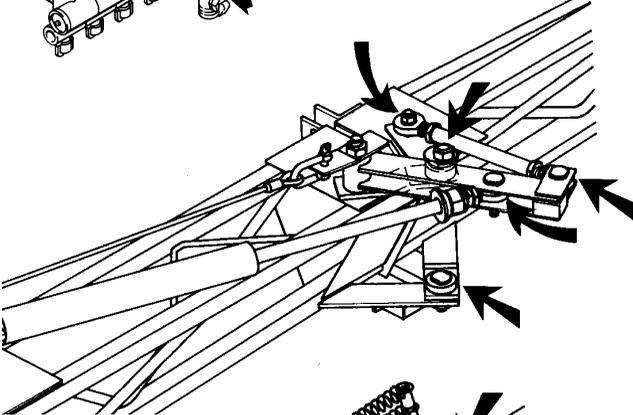
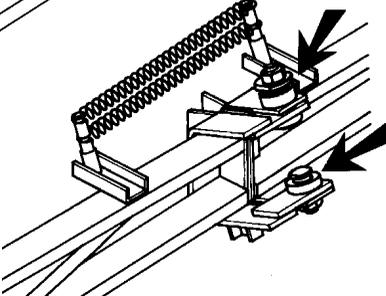


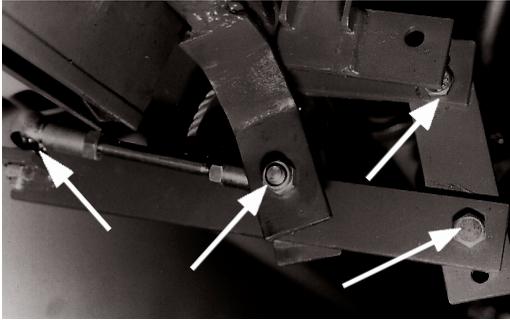
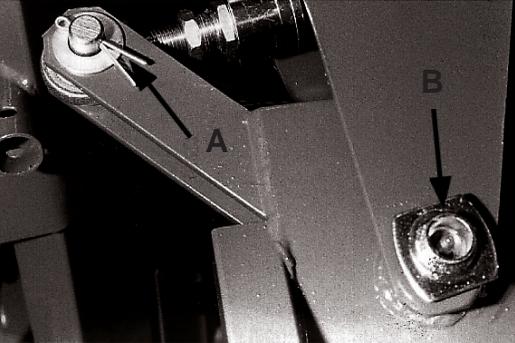
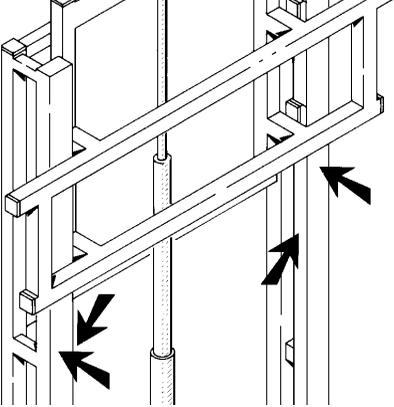
## Lubrication

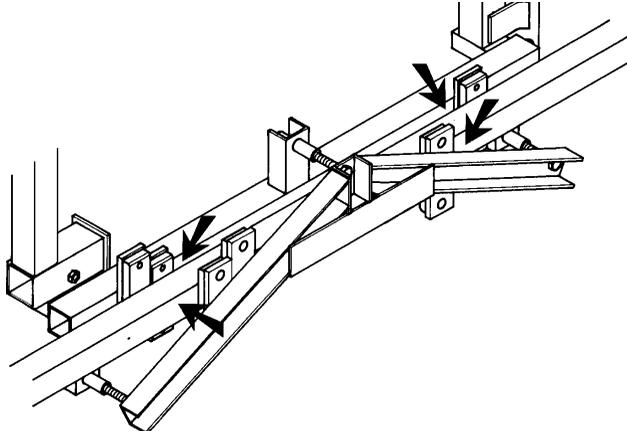
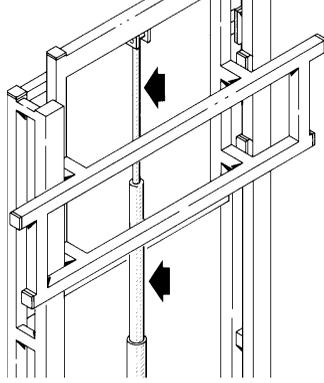
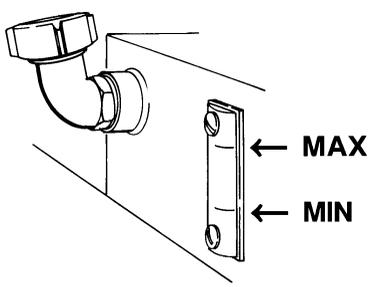
Recommended lubrication is shown in following tables.

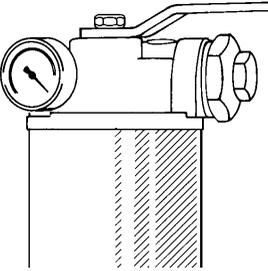
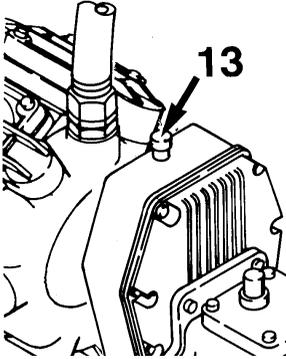
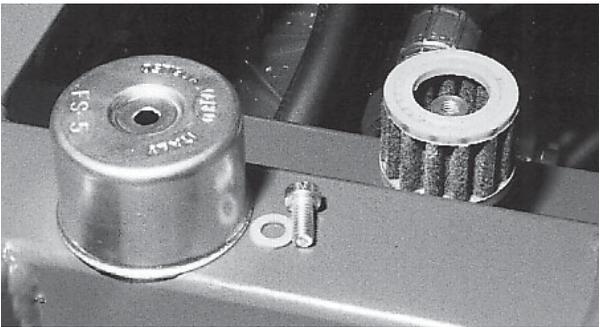
**NOTE:** If the sprayers is cleaned with a high pressure cleaner or fertilizer has been used, we recommend lubrication of all sections.



POS.					
1		x	40		
2A B		x x	12 40		
3	x		20		
4	x		40		
5	x		40		

POS.					
6	x	x	40		
7	x	x	40		
8		x	40		

POS.					
9		x	20		
10	x				
11	x		2000	 <p data-bbox="347 1332 985 1396">Shell Tellus 68 or equivalent. 30 litres. (upper mark). 2000 hours or every year.</p>	7

POS.					
12			(25) 200	 <p>To be changed after the first 25 working hours.</p> <p>Then every 200 hours or if the filter indicator is in the red area.</p> <p>Oil filter -10 micron HARDI No. 284025.</p>	10
13	x		(100) 1500	 <p>13</p> <p>500 ml gear oil SAE 90 EP. Change after the first 100 working hours, then every 1500 hours or at least once a year.</p>	7
14			1500	 <p>Clean air filter at least every 1500 hours.</p>	



## Adjustment of the boom

Every 50 hours or so, check and if necessary readjust the spray boom. A short description of the components is given so that a better understanding of the adjustment procedure is achieved.

### NOTE:

When adjusting the boom and the trapeze, spray boom must be in working position (open) with the tractor on level ground and the boom tilt in neutral position.

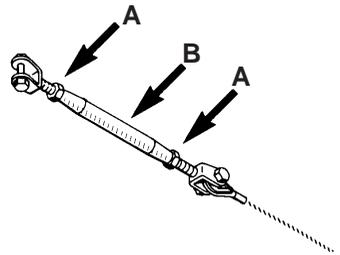
Figures noted in brackets in the following section are spanner sizes. Forward/back/left/right are reference directions when the operator is seated in the tractor seat facing forward.

### Inner section

The function of the cables is to support the boom wings. The inner folding cylinders maintain the boom firmly in place when opened. They determine the forward and back position of the boom wings. Adjustment is thus achieved by first adjusting the cable screws and then adjusting the folding cylinders.

#### Cable adjustment

1. Loosen nuts **A** (22mm).
2. Turn cable screw **B** until the slack in the cable is taken up.
3. Now turn cable screw **B** two full turns so that the cable is taught.
4. Tighten nuts **A**.



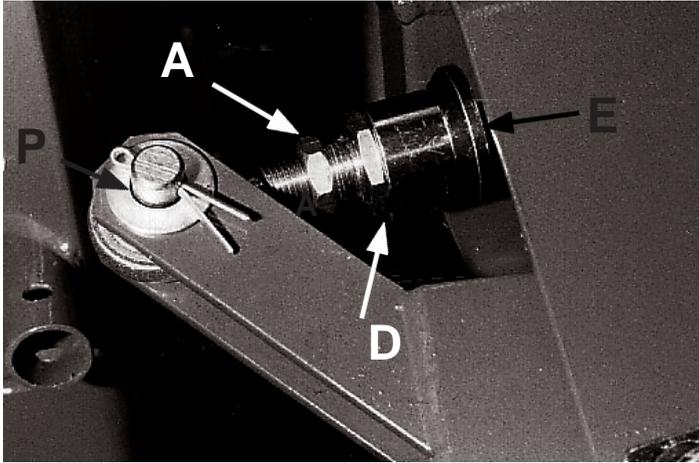
#### Forward/back adjustment

1. Remove bolt **P** (19mm)
2. Loosen cylinder lock nut **A** (24mm).
3. Ensure the cylinder is fully extended.
4. By turning the cylinder eye, the forward/back position of the boom will be altered. Replace bolt **P** and retighten lock nut **A**.

IN = Boom forward

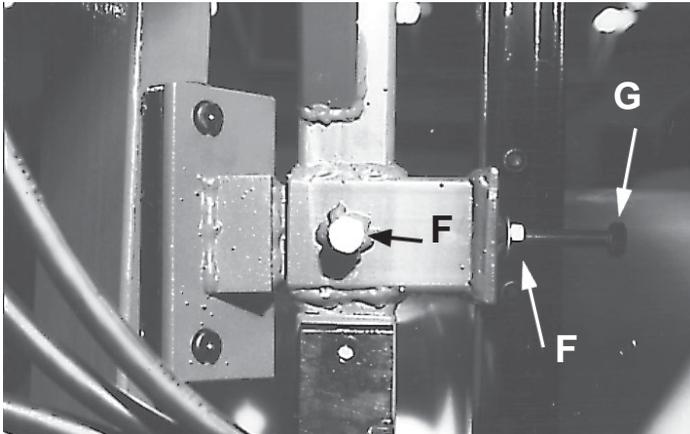
OUT = Boom back

Note it is the cylinder eye that is turned and not the transport stop **D** and **E**.



## Boom lift

The two adjustable assemblies on the left-hand side of boom-lift hold the boom lift (and thereby boom) firmly in place.

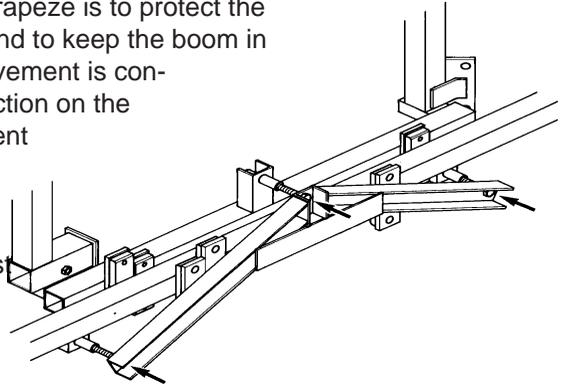


1. Loosen lock nuts **F** (19mm).
2. Adjust assembly position by turning bolt **G** (19mm).  
Adjust the upper and lower assembly equally so that the boom-lift frame remains parallel to the tank frame uprights.  
Do not overtighten as this will hinder lowering the boom.
3. Retighten lock nuts **F**.



## Trapeze

The two functions of the trapeze is to protect the boom from sudden jolts and to keep the boom in a horizontal position. Movement is controlled by adjusting the friction on the sliding surfaces. Adjustment points (three spring-tensioned bolts) are located under the blower housing. The trapeze must be lubricated before undertaking any adjustments.



1. Loosen lock nuts **H** (19mm).
2. Adjust bolts until the desired movement is obtained.

The trapeze must be able to work unhindered but without being too loose. Minor in-field adjustments may be necessary.

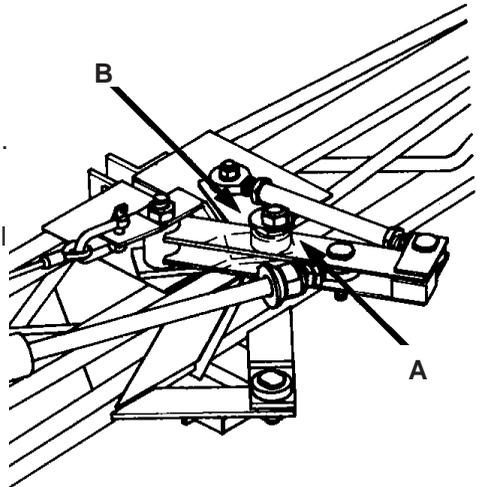
3. Retighten lock nuts **H**.

## Outer section

The outer sections of the boom can be adjusted both up and down and forward and back. The spring-loaded breakaway on 15, 16 and 18 meter booms can also be adjusted in a similar manner. A stop on the outer section folding cylinders determine the final position of the outer sections when folded.

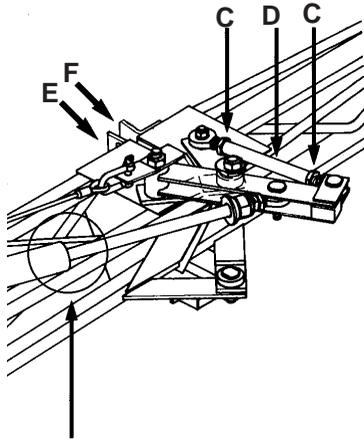
### Up/down adjustment

1. Loosen Allen screw **A** (4mm) on the side of the eccentric **B**.
2. Ensure the outer section is fully open.
3. Turn eccentric **B** (40mm) until the boom is straight.
4. Retighten Allen screw **A**.



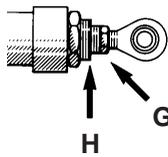
### Forward/back adjustment

1. Ensure outer section is fully open.
2. Loosen lock nuts **C** (24mm) on adjusting screw **D** and **E** (19mm) on stop bolt **F**.
3. Turn stop bolt **F** (19mm) in to minimum position.
4. Turn screw **D** to alter position for ward or back.
5. Adjust stop bolt **F** so that it touches the outer section of the boom.
6. Retighten lock nuts **C** and **E**.



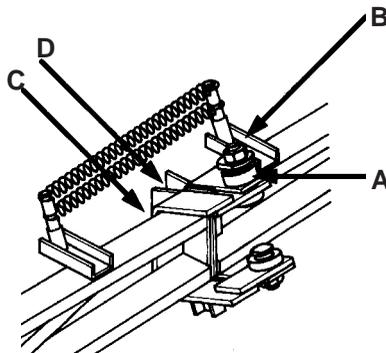
### Fold stop

1. Loosen lock nut **G** (32mm).
2. Fold outer section of boom cautiously.
3. Screw cylinder stop **H** (32mm) down on cylinder body when the boom skid at tip of boom is approx. 10mm from air tunnel at the inner section. The cylinder stop must prevent the boom tip from hitting the air tunnel.
4. Retighten lock nut **G**.



### Breakaway

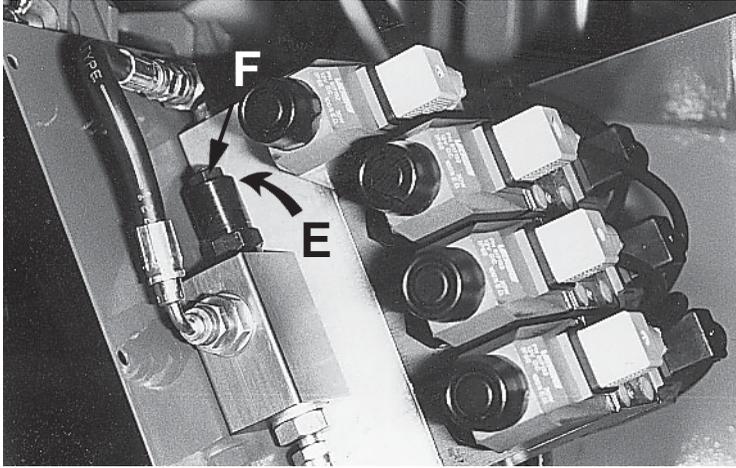
1. Loosen Allen screw **A** (4mm) on side of eccentric and lock nut **C** (19mm) on stop bolt **D**.
2. Turn eccentric **B** (40mm) until breakaway is straight.
3. Retighten Allen screw.
4. Turn stop bolt **D** (19mm) until the breakaway is parallel with the rest of the boom.
5. Retighten lock nut **C**.





## Breakaway 12 meter boom

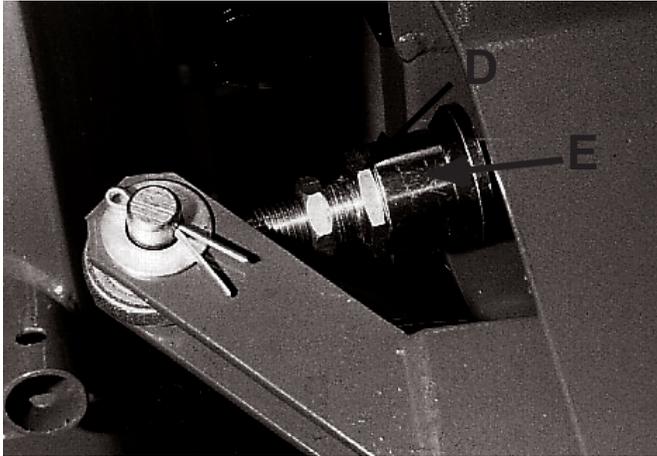
The breakaway function is incorporated in the hydraulics that fold the outer section of the boom. If the outer section strikes an object, a by-pass valve at the outer fold cylinder opens allowing the outer section to fold back. The pressure required to allow this to happen is adjustable.



1. Remove protection box for solenoids (10mm).
2. Loosen lock nut **E**.
3. Adjust allen screw **F** on by-pass valve. Factory setting is 1 turn from fully closed position. Check setting by applying force on the breakaway. Readjust if necessary.
4. Retighten lock nut and replace box.

## Transport position

When the boom is in transport position it must rest on the two transport brackets located on the tank frame uprights, the two transport brackets for the inner booms and the two transport brackets for the outer booms. The inner boom folding cylinders have a stop adjustment that determines how far in the boom comes when it is folded. The outer boom transport brackets also have an adjustment possibility as adjustments to other parts of the boom may alter the position of the outer boom sections.

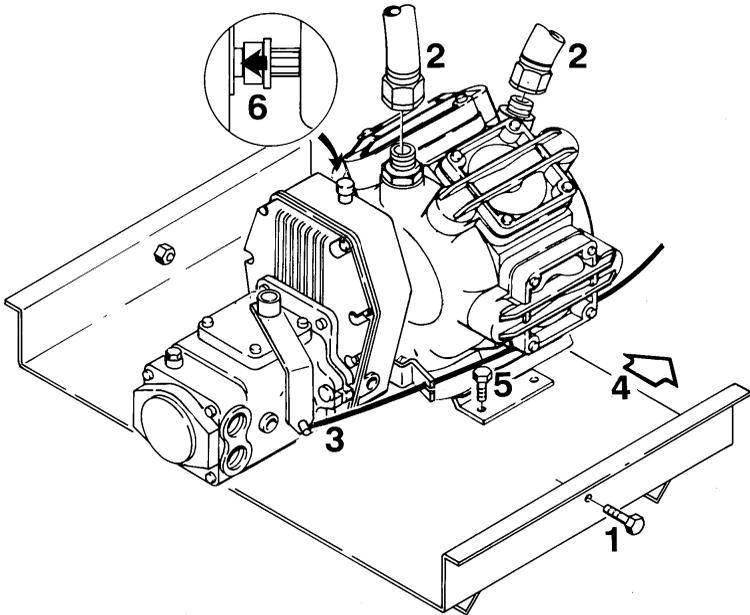


1. Loosen lock nut **D** (36mm) and screw cylinder stop **E** (36mm) away from the cylinder body.
2. Ensure the boom tilt is in neutral position.
3. Lift boom and fold, keeping an eye on both sides.  
Be wary as the boom nears the transport brackets. Further lowering of the boom may be necessary.
4. Complete the manouver until the inner and outer boom transport brackets pass over the transport supports.
5. Screw cylinder stop **E** down on to the cylinder body and retighten lock nut **D**.
6. Lower the boom. The outer boom transport brackets should touch the transport supports just before the inner boom transport brackets. Adjust the outer boom transport supports if necessary. The boom should now rest on all six points.



## Changing of valves and diaphragms

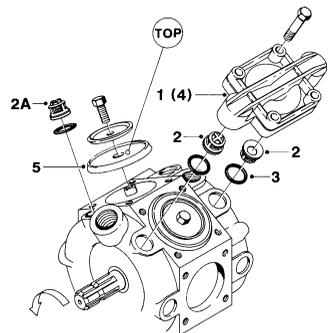
To facilitate service, it is best to slide the pump tray out.



1. Remove the 2 bolts that hold the tray **1**.
2. Disconnect suction / pressure hoses **2**.
3. Being cautious not to damage the hoses and cable **3** to hydraulic pump, the tray can now be pulled forward **4**.
5. After removing foot plate bolts **5**, the pump is removed by first pushing the lock ring **6** back.

### Valves

Dismantle valve covers (1). Before changing the valves (2) note the orientation of the valves so that they may be replaced correctly. It is recommended to use new o-rings (3) when changing or checking the valves.



### Diaphragms

Remove the diaphragm cover (4) after having dismantled the valve cover as indicated above. The diaphragm (5) may then be changed. If fluids have reached the crankcase it is strongly recommended to lubricate the pump.

## Winter storage

When the spraying season is over you should devote some extra time to the sprayer before it is put away for the winter.



### Hoses

Check that none of the hoses are caught or have sharp bends.

A leaky hose can give an annoying delay in the middle of the spraying job. Therefore check all the hoses and change if there is any doubt about the durability.

### Paint

Some chemicals are very rough on paints. It is therefore well advised to remove rust, if any, and then touch up the paint.

### Tank

Check that no chemical residues are left from the last spraying. Chemical residues must not be left in the tank for a long time. It will reduce the life of the tank. See Spray Technique book- Cleaning Field Sprayers

### P.T.O.

Check that the power take-off shaft fulfills its security purpose, e.g. that shields and protective tubes are intact.

### Anti-freeze precaution

If the sprayer is not stored in a frost-proof place you should take the following precautions: Put at least 10 litres of 33% anti-freeze mixture in the tank and let the pump run a few minutes so that the entire system including spray hose are filled. Remove the glycerine filled pressure gauge and store it frost free in vertical position.



## Operational problems

In cases where breakdowns have occurred 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 resulting in reduced or no capacity.
- Electrical and hydraulic components that are contaminated with dirt result in poor connections and rapid wear to the hydraulic system.

### Therefore ALWAYS check:

1. Suction, Self-cleaning, 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. Electrical and hydraulic components are maintained clean.



<b>Fault</b>	<b>Probable cause</b>	<b>Control / remedy</b>
No spray from boom when turned on.	Air leak on suction.	Check if red suction lid/O-ring are sealing. Check suction tube and fittings. Check tightness of pump diaphragm and valve covers.
	Air in system.	Fill suction hose with water for initial prime.
	Suction/pressure filters clogged.	Clean filters. Check yellow suction pipe is not obstructed
Lack of pressure.	Incorrect assembly.	Agitation nozzles not fitted. Restrictor nozzle in Self-cleaning filter not fitted. Safety valve spring for Self-cleaning filter not tight.
		Pump valves blocked or worn.
	Defect pressure gauge.	Check for dirt at inlet of gauge.
Pressure dropping.	Filters clogging.	Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.
		Nozzles worn.
	Tank is airtight.	Check vent is clear.
	Sucking air towards end of tank load.	Excessive agitation, turn off. Returns inside tank need relocation.
Pressure increasing	Pressure filters beginning to clog.	Clean all filters.
	Agitation nozzles clogged.	Check by turning agitation off/on.



Fault	Probable cause	Control / remedy
Formation of foam.	Air is being sucked into system.	Check tightness / gaskets / O-rings of all fittings on suction side.
	Excessive liquid agitation.	Turn agitation off. 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.
EC operating unit not functioning .	Blown fuse(s).	Check for short circuits and replace. See Emergency operation of the sprayer.
	Wrong polarity.	Brown - pos.(+) Blue - neg.(-)
No response from control box. No "clicking" at solenoid valves.	Blown fuse. Type	Check for short circuits and replace fuse.
	Wrong polarity.	White - pos.(+) Black - neg.(-)
	Insufficient power.	Ensure at least 10V is supplied.
No response from control box. "Clicking" heard at solenoids.	Oil not effecting action.	Hydraulic couplings on tractor restricting flow.
		Not enough oil in tractor reservoir.
		Tractor not supplying required pressure (min. 130bar).
	Bypass valve after tractor type set incorrectly.	Reset valve.

## Hydraulic transmission

### Start up

In case the hydraulic transmission has not been operated before or has been taken apart, the following has to be done:

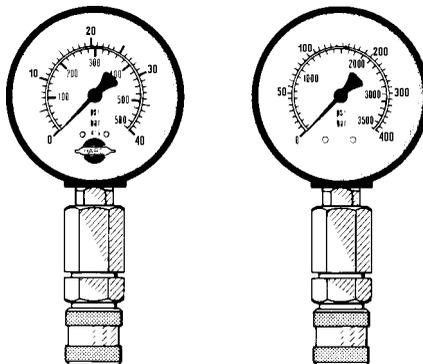


1. Fill the tank with oil (appr. 30 l) to the top of the indicator.
2. Fill the pump with oil through the drain hose D1 which is dismantled at the tank connection. Reconnect.
3. Check that the gear box is filled with oil.
4. Remove the drain hose D2 from the hydraulic motor outside the blower housing.
5. Set the control handle of the blower on 2, start the P.T.O. shaft with the tractor running idler. The oil filter gauge indicator must begin to move.
6. After a while (2-5 min) the oil will start dripping constantly. Fit the drain hose D2 again.
7. Set the control handle at maximum.
8. With 540 r/min on the P.T.O. shaft the fan should rotate at 3,000 r/min. If not, adjust the cable on the pump arm by loosening the cable screw on the cable holder and then adjust until the revolutions reach 3,000. Tighten the screw.
9. Check oil level in the tank. Fill with oil up to the upper mark.
10. Check that the oil filter gauge is not in the red zone.
11. Retighten hoses and check for leaks, also at the gear box.

### Adjusting feed pressure

**NOTE:** It is necessary to use a pressure gauge of 0 - 40 bar and another of 0 - 400 bar fitted with pressure line snap couplers.

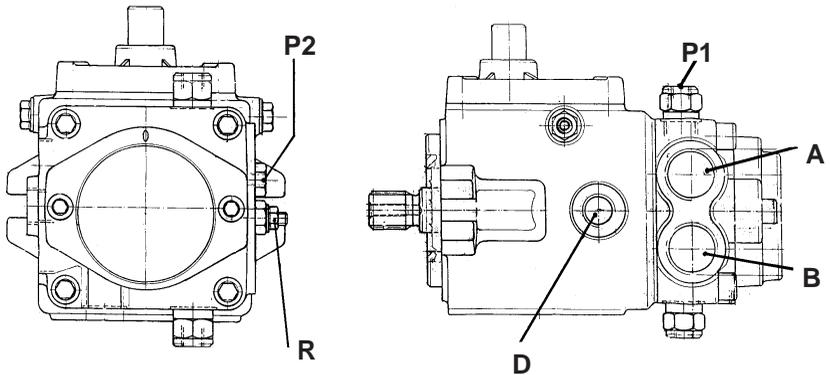
HARDI no. 726895 0- 40 bar  
HARDI no. 726896 0-400 bar





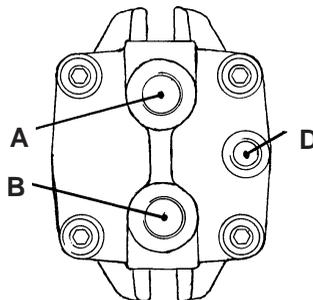
1. Connect the 0-40 bar gauge on P2 and the 0-400 bar gauge on P1.
2. Carry out "start up" procedure.
3. With 540 r/min on the P.T.O. shaft the fan should rotate at 3,000 r/min.
4. With the booms unfolded check that the working pressure is between 140-160 bar and the feed pressure between 8-13 bar. Adjust feed pressure R if necessary. Check that the oil filter gauge is not in the red zone.

#### Pump PV 43M



- A Pressure port
- B Return port
- D Drain port to tank
- P1 Connection for working pressure
- P2 Connection for feed pressure
- R Adjustment screw for feed pressure

#### Motor MF20



# Emergency operation of the Sprayer

## Boom

In case of power failure the boom can be operated manually by pressing the individual buttons on the solenoid valves. This is done by locking the by-pass valve, as is done when using tractors with closed-centre hydraulics.

Remove the protection box covering the solenoid valves at the blower.

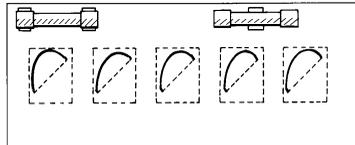
The operation can now be made by pressing the individual buttons on the solenoid valves. Take caution when manually operating the boom.

Block	Function
0	Pressed in for closed-centre hydraulics
1	Raising/lowering of the boom
2	Folding of outer section
3	Folding of inner section
4	Tilting the boom
5	Slot angle

Remember to reset the system to open-centre hydraulic, if the tractor has an open-centre hydraulic system.

The problem may be due to a blown fuse in the junction box. One spare fuse is in junction box.

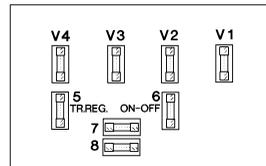
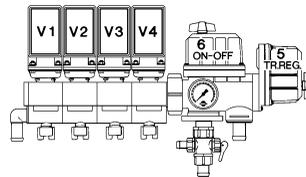
Fuse type T 10A 250V  
 HARDI no. 261272

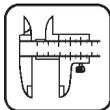


## EC Operating unit

In case of power failure it is possible to emergency activate all functions of the operating unit manually. First disconnect the multiple plug from the EC operating unit. Now manually turn the emergency control knobs. The problem may be due to a blown fuse. The fuses are placed in the remote control box and are marked according to functions. (7 and 8 are spare fuses).

Fuse type T 500mA  
 HARDI no. 261125



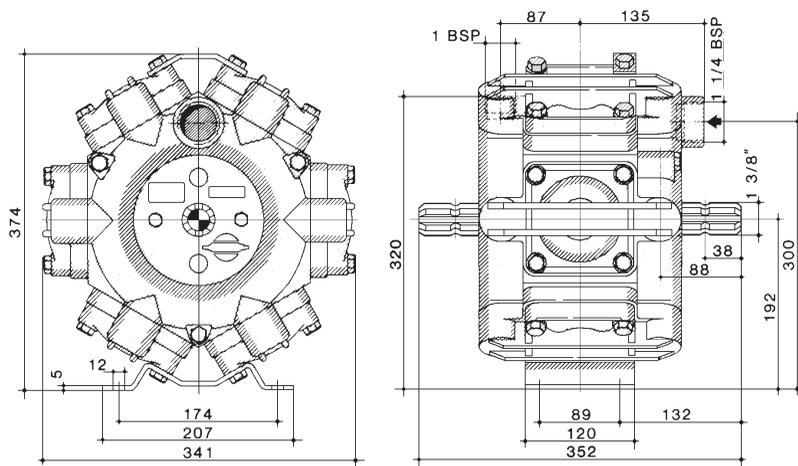


## Technical specifications

Tank Size l	Dimensions mm L x W x H	Weight * Kg
800 1000 1200	490 x 330 x 340	1220

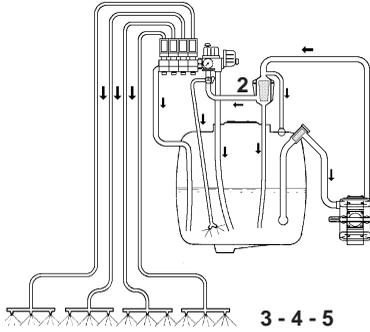
\* The weight is stated for an empty tank and with a 18 m boom.

### Pump Model 361

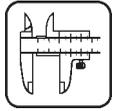


r/min		200		300		400		500		540	
		l/min	kW	l/min	kW	l/min	kW	l/min	kW	l/min	kW
bar	0,0	62,0	1,73	91,0	1,79	121	1,87	150	2,00	161	2,11
	2,5	559,0	1,83	88,0	1,97	117	2,10	146	2,25	157	2,33
	5,0	58,5	1,96	87,5	2,09	116	2,28	144	2,50	155	2,61
	7,5	58,0	2,05	86,5	2,25	115	2,54	143	2,78	153	2,93
	10,0	57,0	2,13	86,0	2,43	113	2,77	141	3,10	152	3,29
Rotation per min		r/min	Capacity			l/min	Suction height			0,0 m	
Output		kW		Max. pressure			15 bar	Weight			54,0 kg

## Filters and nozzles



Pos.	Mesh/ colour	Description
1.	30	suction filter
2.	80	Self-cleaning filter
3.	50 blue	nozzle 4110-18
4.	80 red	nozzle 4110-12
5.	80 red	nozzle 4095-08



## Fan

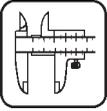
Control lever	Fan r/min x)	Air Velocity m/sec	Air Quantity Total m <sup>3</sup> /h/m
0	0-50	0	0
1	600	6	300
2	1000	10	500
3	1500	15	750
4	1800	18	900
5	2200	22	1100
6	2500	25	1250
7	2800	28	1400
8	3000	30	1500

x) Tractor P.T.O. at 540 r/min.

## Power Consumption

Boom Size	kW	Hp
12m	17	23
15m	19	26
16m	22	30
18m	25	34

The power consumption is stated at a working pressure of 10 bar.



### **Gear box**

Make	MINTOR ML 52 (1 - 3.0)
Oil type	SAE 90 EP (SAE J306 a)
Oil quantity	Up to level glass 500 ml
Operating temp. of oil	80° C

### **Hydraulic pump**

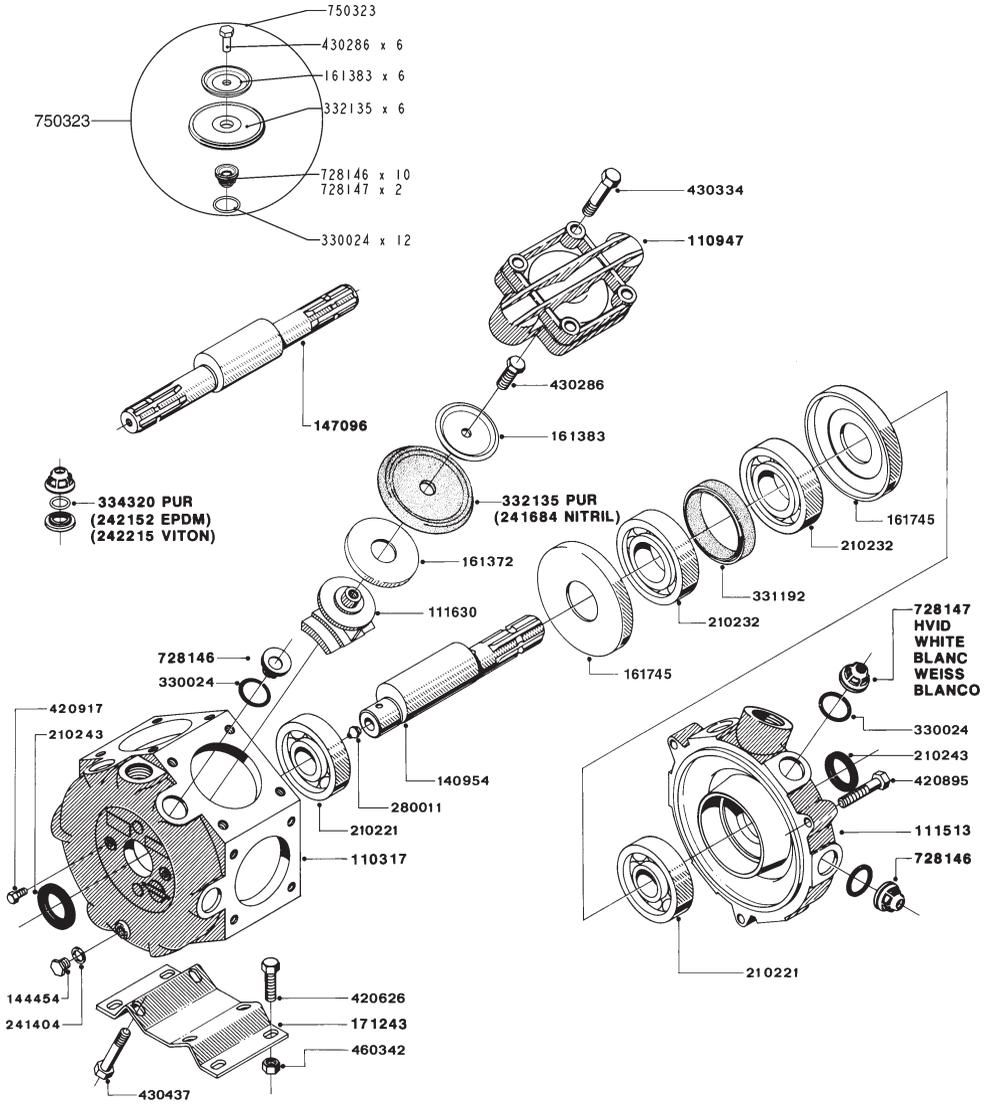
Make	HP hydraulic. Type PV43 M
Max. r/min	1620
Working pressure (max. r/min)	160 bar
Feed pressure max. r/min	8 - 13 bar
Oil type	SHELL TELLUS 68 or equivalent
Oil quantity (tank)	30 l
Operating temperature	55° C
Max. oil temperature	75° C
Filter type	10 micron
Air breather filter type	Ostiglia FS-5

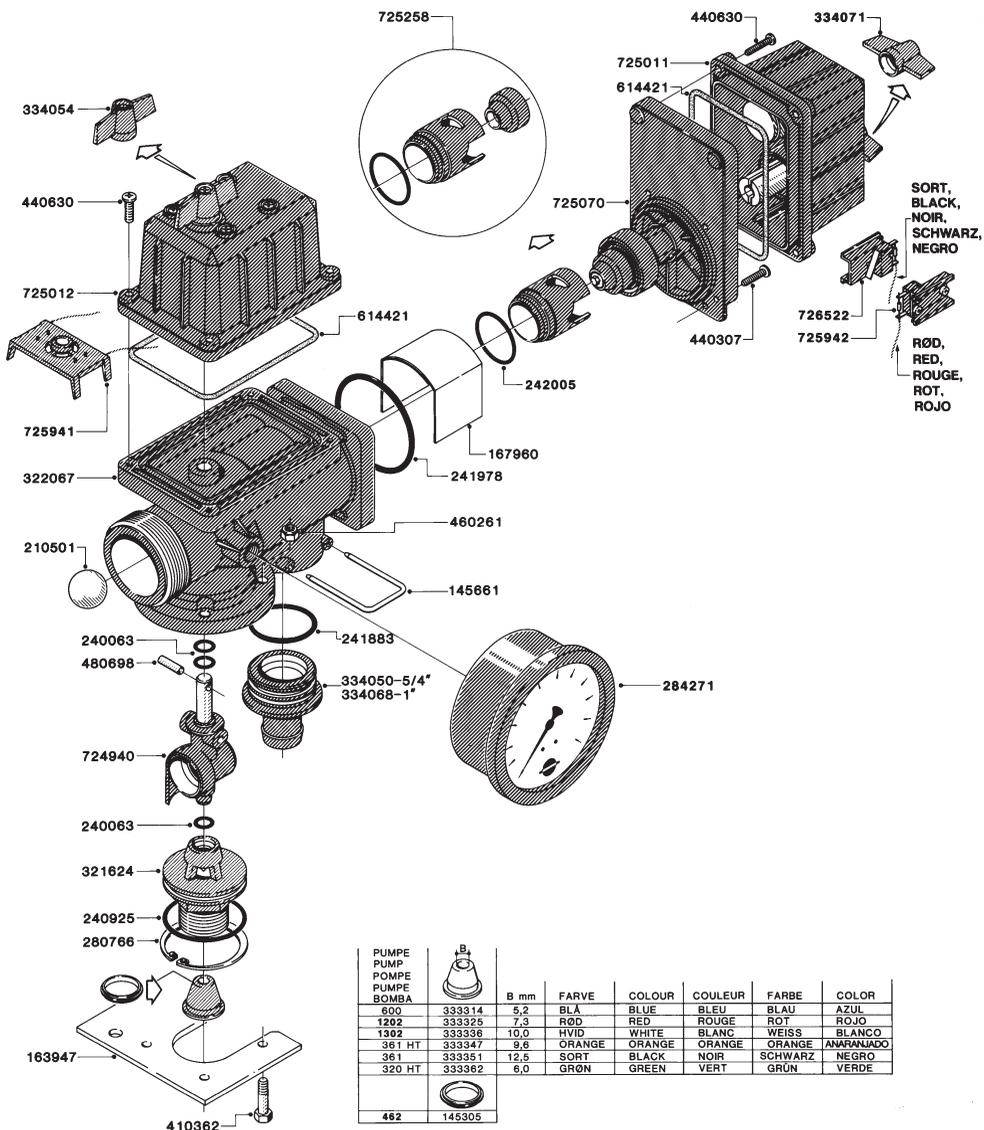
### **Hydraulic motor (Fan)**

Make	HP hydraulic. Type MF 20
Max. r/min	3000

### **Solenoid valves**

Make	Vickers Havant
By-pass valve	DG 4 V-3- OB
Slot cylinder	DG 4 V-3-2C EU-38
Other cylinder	DG 4 V-3-6C
Check valves	DGM PC3

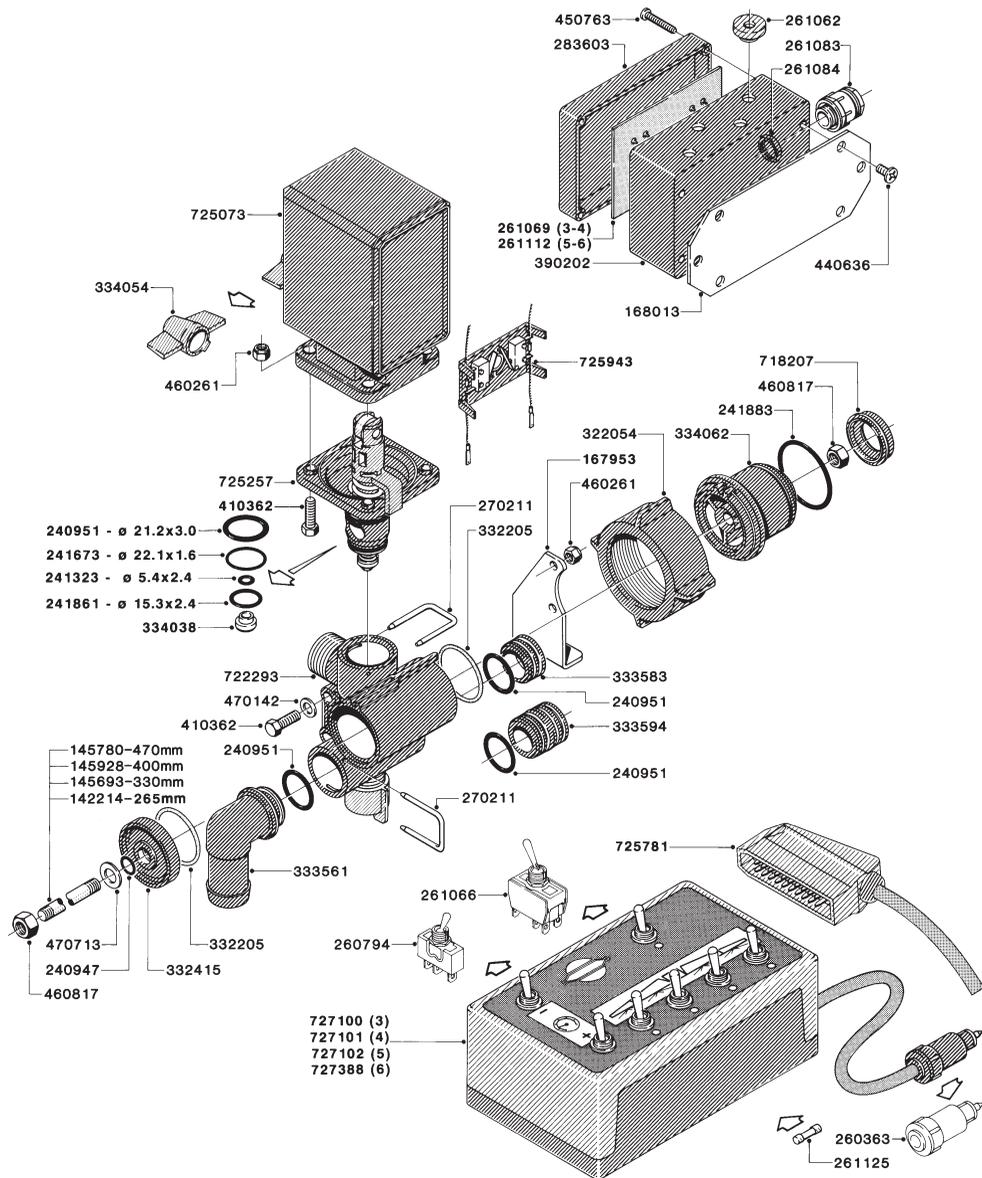




PUMPE PUMP POMPE PUMBA		B mm	FARVE	COLOUR	COULEUR	FARBE	COLOR
600	333314	5,2	BLÅ	BLUE	BLEU	BLAU	AZUL
1202	333325	7,3	RØD	RED	ROUGE	ROJO	ROJO
1302	333336	10,0	HVID	WHITE	BLANC	WEISS	BLANCO
361 HT	333347	9,6	ORANGE	ORANGE	ORANGE	ORANGE	ANARANJADO
361	333351	12,5	SORT	BLACK	NOIR	SCHWARZ	NEGRO
320 HT	333362	6,0	GRØN	GREEN	VERT	GRÜN	VERDE
462	145305						

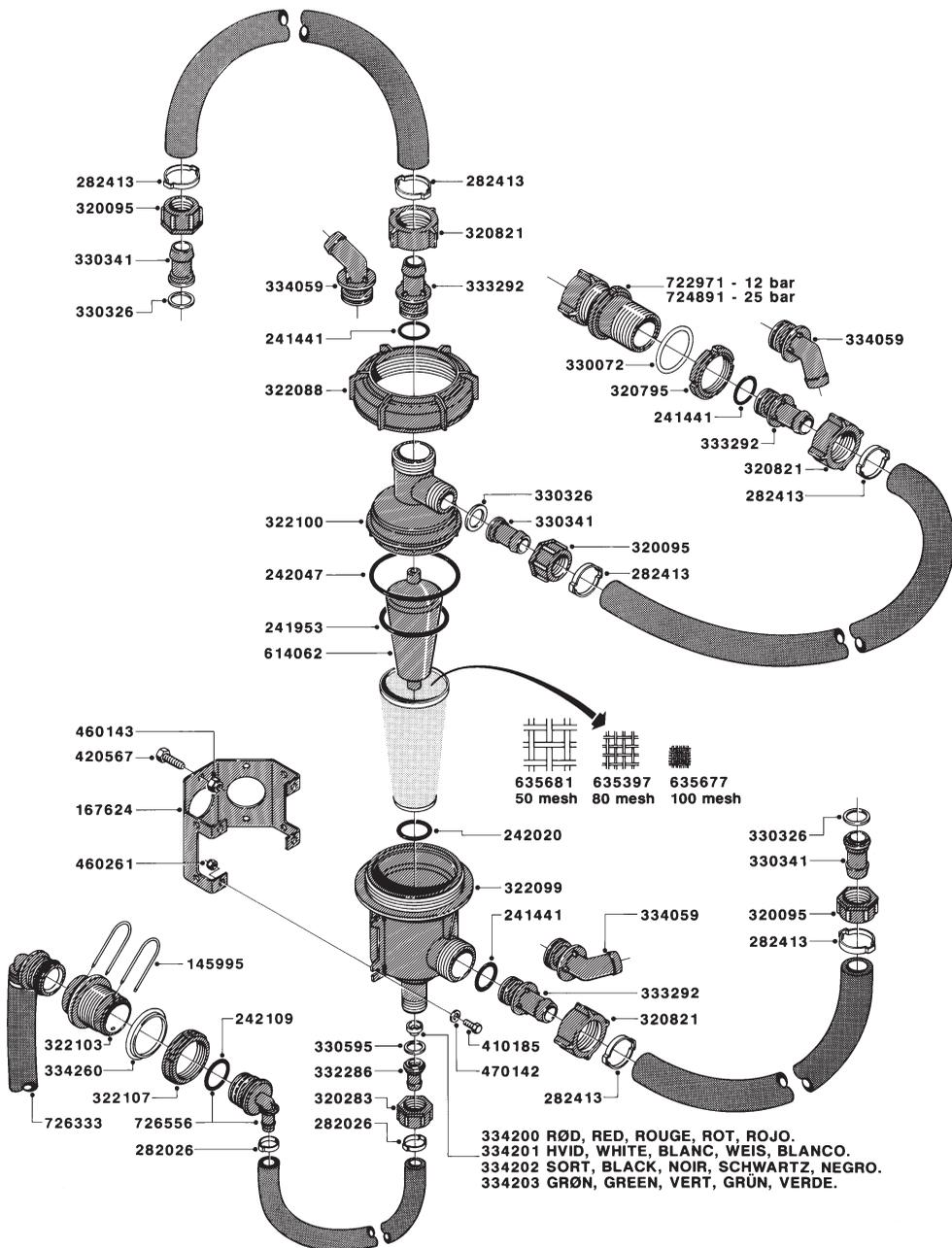
B102

Unit EC



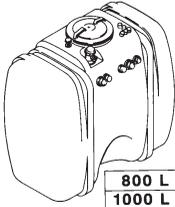
Distributor

B103

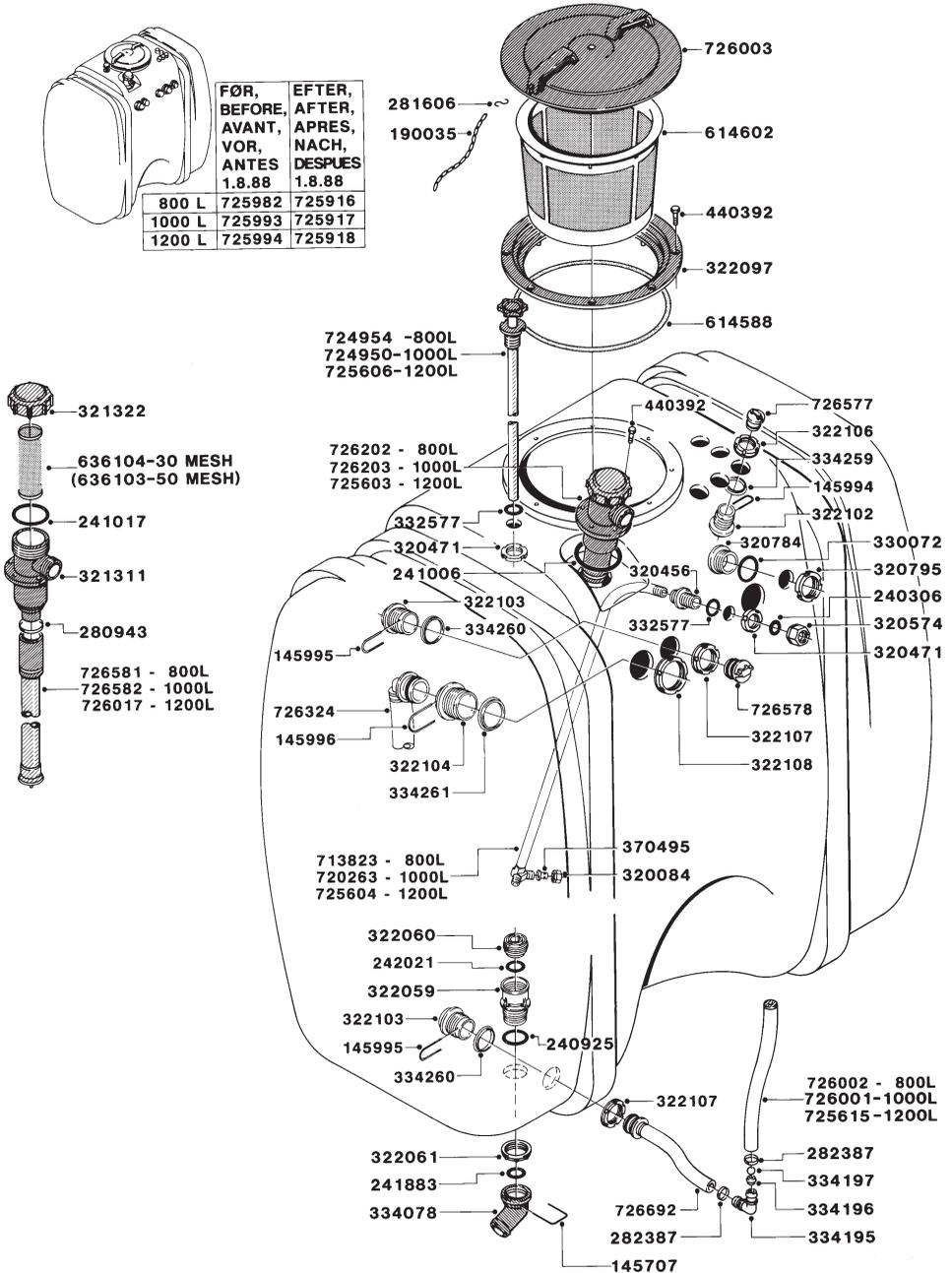


**B205**

Self-cleaning filter (87)

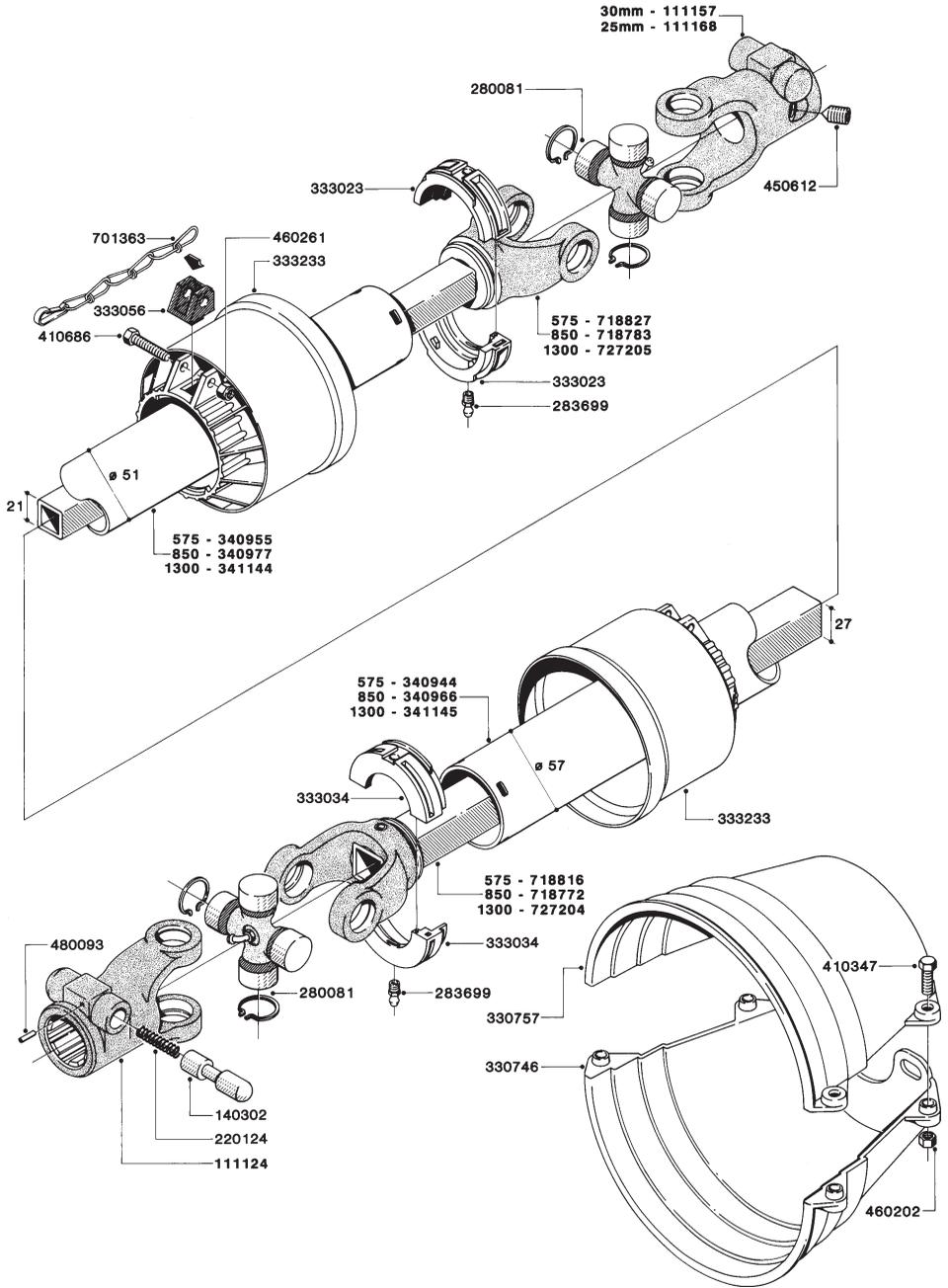


	FØR, BEFORE, AVANT, VOR, ANTES 1.8.88	EFTER, AFTER, APRES, NACH, DESPUES 1.8.88
800 L	725982	725916
1000 L	725993	725917
1200 L	725994	725918



LX 800/1000/1200

E9



**K602**

Shaft (81)



