

# USER MANUAL

## HAWK

13-15 M Hydraulic Boom  
Mounted Type Sprayer



**SWIFT**



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## INTRODUCTION

This booklet contains the usage rules and maintenance information of "SWIFT HAWK SERIES MODEL".

This book is also a part of the machine and provides information and a resource you can consult for safe and efficient use throughout its entire life cycle. Therefore, it should always be kept carefully in a safe place.

Plant protection activities against diseases and pests are an essential matter in the plant production cycle. These activities, which are also referred to as agricultural struggle, affect the whole society and the environment directly or indirectly. Since a complete alternative has not been revealed yet, the importance of product plant protection continues to a great extent.

Product products used in the most important part of product plant protection works and the machines used in their application constitute. The improvements in the efficiency and application doses of the plant protection products, the awareness about environmental and human health have also led to significant improvements in the machines used in the applications made with this method.

In the face of the rapidly increasing world population, the increase in agricultural products is not at the same rate. It is known by researchers that product loss has reached 35% due to insufficient plant protection measures in the world. Choosing the right medicine, the right equipment and the right method is of great importance for a successful agricultural struggle.

Since the tanks used in the sprayers are made of polyethylene or reinforced fiberglass, they are resistant and lightweight against corrosion caused by product and external conditions. With the support we receive from you, our continuous development policy, the importance we attach to R&D and our services will continue.



The user must carefully read and apply for safety and protection from possible accident rules specified for their own safety. Therefore, under all circumstances, it should be used by experts who have sufficient knowledge, who completely and carefully read the technical information and accident precautions contained in this book.

It should not be forgotten that it is the user's responsibility to monitor and control that the machine is used under the most appropriate conditions for human and environmental health and safety.

### DISCLAIMER:

While additional model information is available in the manual, current machine availability for the Australia/NZ region is available via [swiftagriculture.com.au](http://swiftagriculture.com.au)



## 1.1 MACHINE DESCRIPTION

HAWK SERIES is the most innovative machine among the models. Thanks to years of experience, HAWK SERIES models will provide you impressive returns.

Field sprayers are used in the production of field crops to reduce the effects of diseases and pests and to kill weeds. They are agricultural control machines that deliver the effective substance of the product in the form of drops in a liquid carrier to the target plant surfaces. Modern field sprayers are generally mounted or trailed on the tractor and are driven from the tractor tail shaft. As well, there are also self-propelled field sprayers.

It is especially important to prevent product losses caused by diseases, pests and weeds in obtaining more and higher quality products per unit area. The main purpose of agricultural spraying is to protect the plant product from the effects of diseases, pests and weeds in economic measures, to minimize product losses and to increase quality. Various agricultural methods are applied as the most effective and fastest solution against diseases and pests, which are the main factors that limit the yield of agricultural products. These methods can be listed as cultural, physical, biological quarantine and product methods. Although, in modern plant protection, the methods mentioned above are applied together in a balanced and conscious manner with the view of integrated control. The basis of product methods is the application of pesticides. Generally, herbicides are used as pesticides, fungicides for weeds, insecticides for bacteria and fungi.

We can examine the field sprayer operating with the pressure energy provided by the pump in two ways as main and auxiliary parts. We can show the main part as chassis, tank, pump, regulator, spraying boom, auxiliary part strainer, filter pipes, hoses, nozzles, and spray guns.



## 1.2 TECHNICAL INFORMATION

### MAIN PARTS

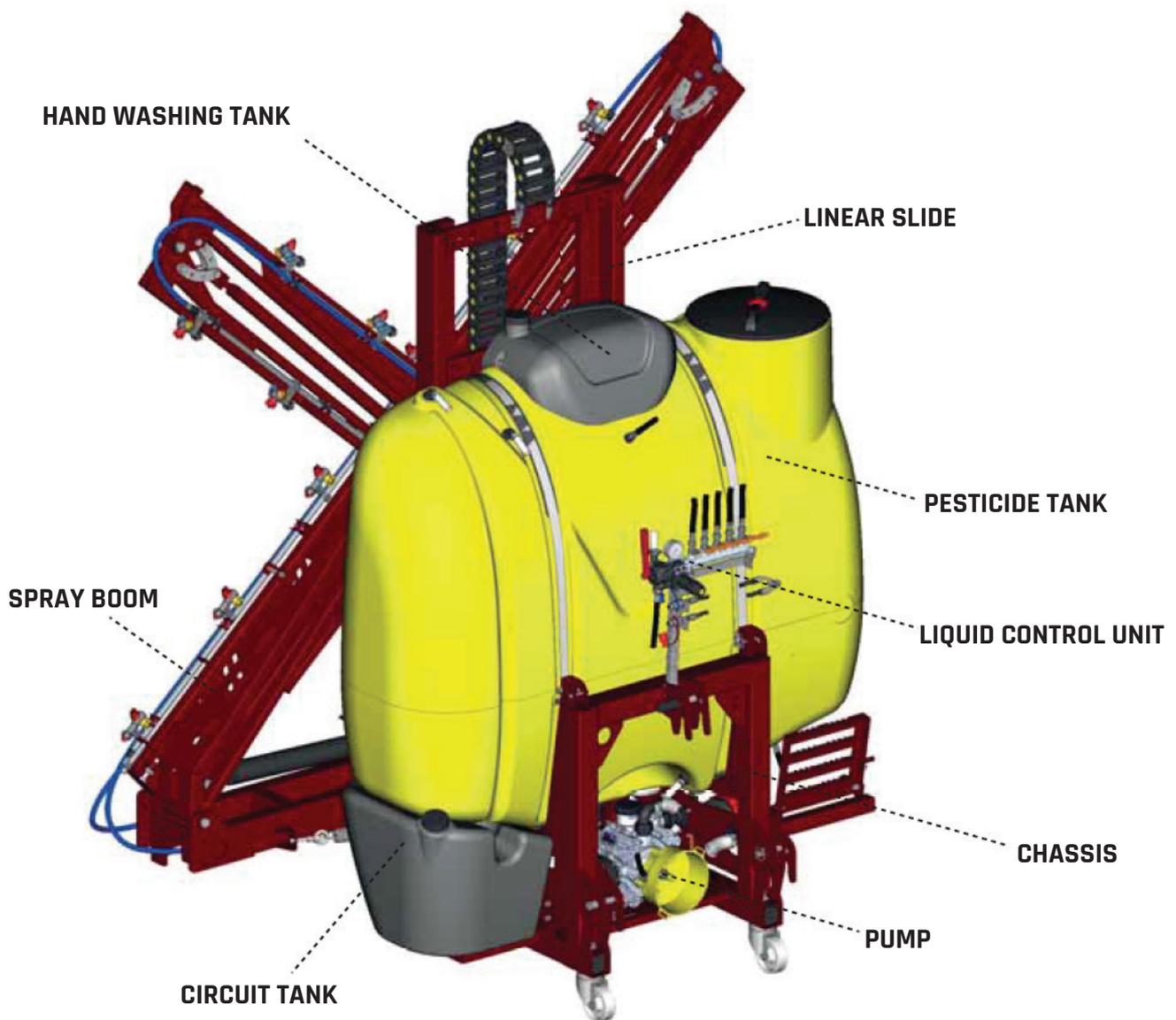


Figure 1



Dimensions change according to the tank capacity.

The indicated nominal volume is at least 5% less than the actual volume.

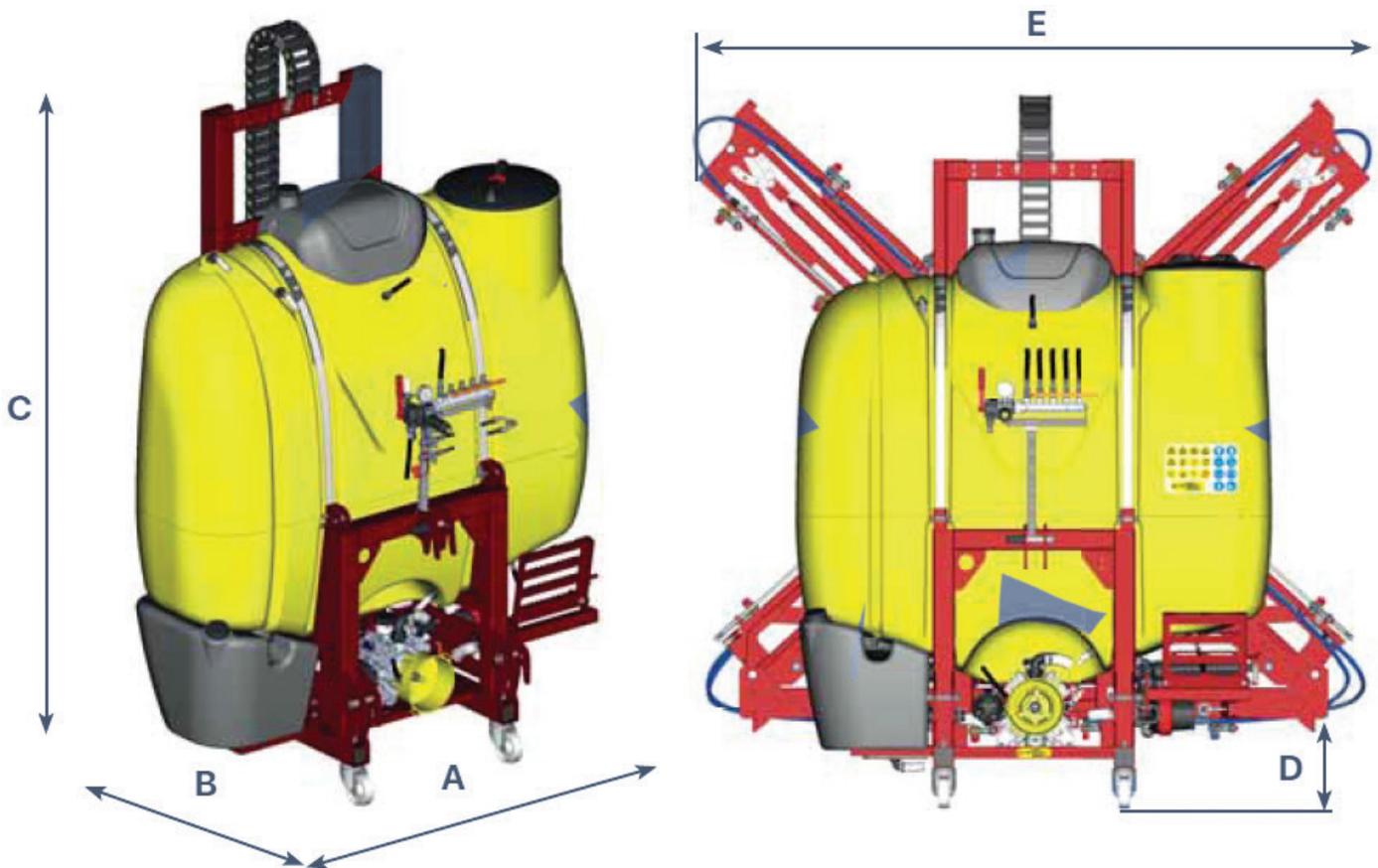
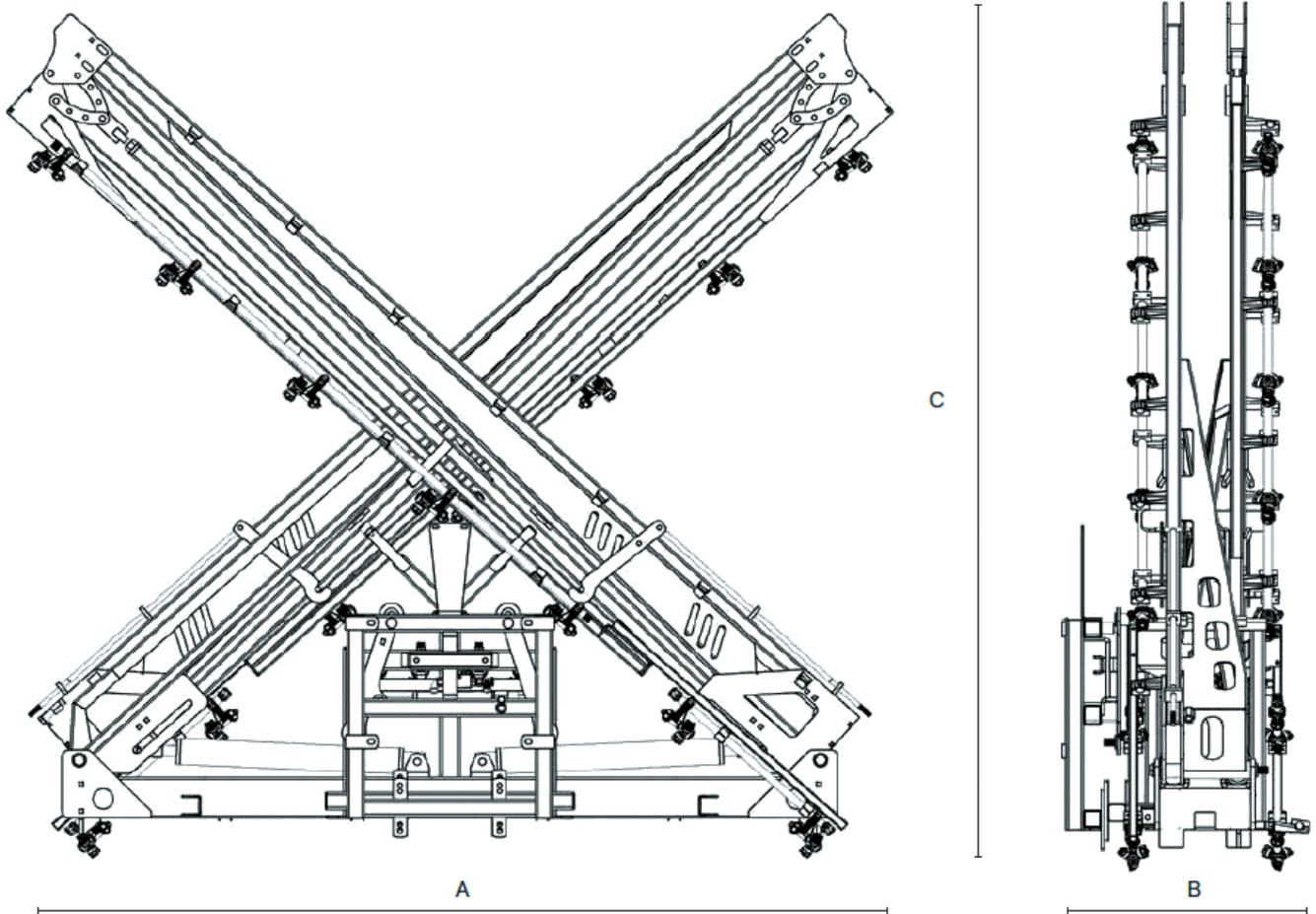


Figure 2

Model	Capacity (L)	Size (MM)			D	E	Weight (KG)
		A	B	C			
HAWK 10-13	1000L	1410	750	1195			128
HAWK 13-13	1300L	1410	750	1395			138
HAWK 10-15	1000L	1775	750	1395			150
HAWK 13-15	1300L	1775	750	1640			160



Model	Size (MM)			Weight (KG)
	A	B	C	
12 m "X" Tip	2585	740	2470	334
15 m "X" Tip	2585	580	2455	340



### 1.3 MACHINE INTRODUCTION LABEL

Each machine has an identification label on it (Figure 3).

- 1) Type of machine
- 2) Machine model
- 3) Machine license date and number
- 4) Machine serial number
- 5) Machine manufactured year
- 6) CE emblem

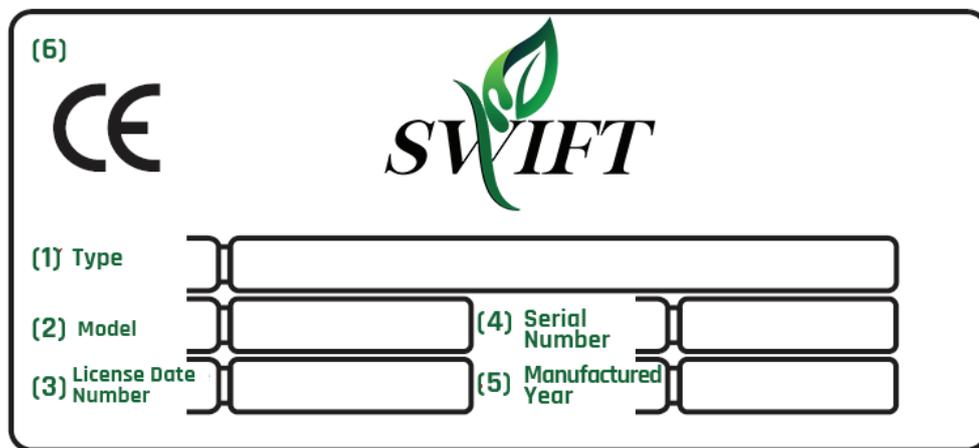


Figure 3



## 1.4 HAWK SERIES MODELS

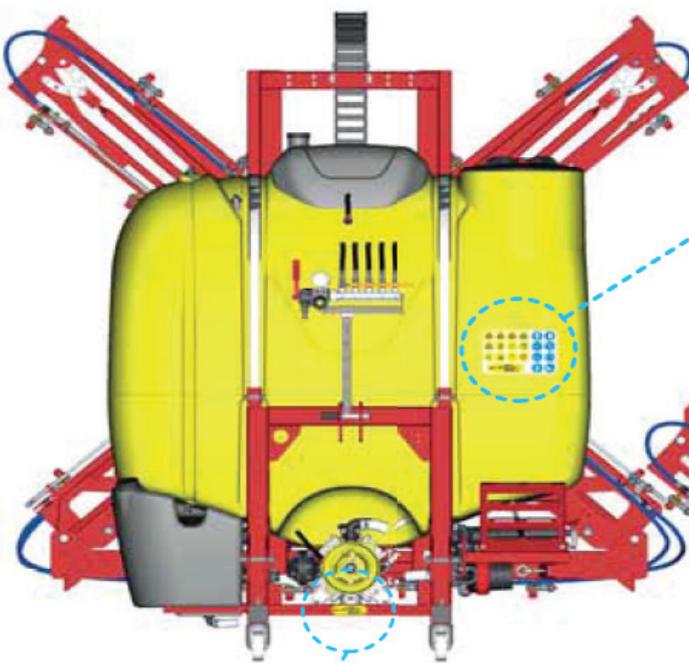
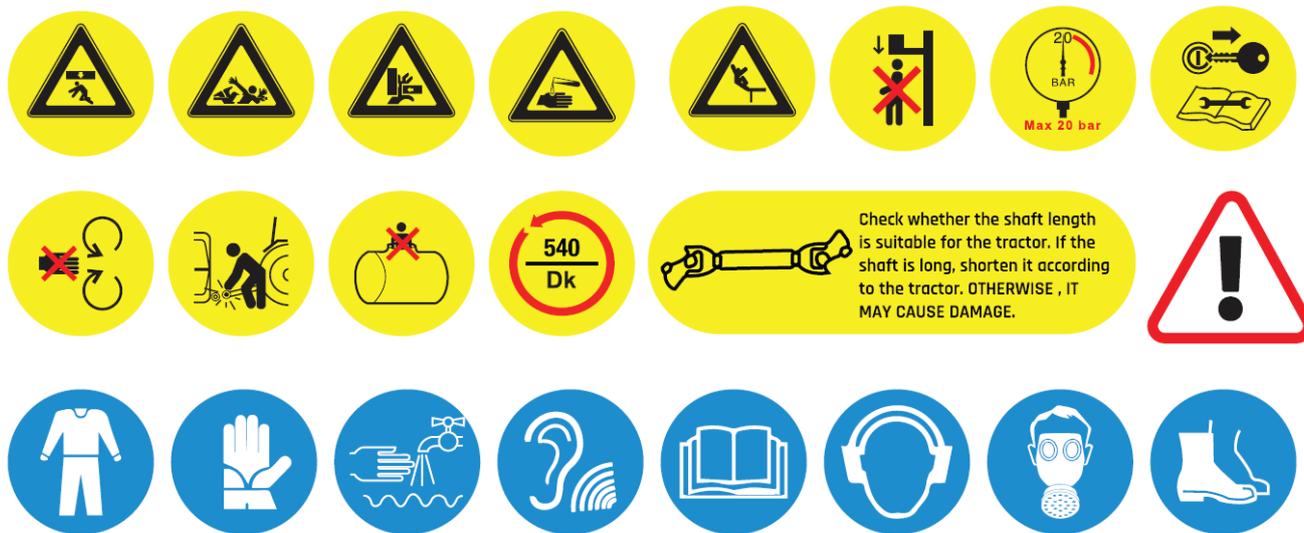




## 1.5 SAFETY WARNING LABELS

The location of all warning labels is shown in Figure 4. Always keep these labels clean. Replace unreadable or worn labels with new ones. Read the descriptions carefully and memorize what each label means.

1. Never operate your machine without reading and understanding the machine's manual.
2. Please also read the pump manual of the machine.
3. Do not operate the machine indoors.
4. Take necessary safety precautions against accidents during operation.
5. Do not neglect to use a protective mask or glasses while setting the machine before starting the operation.
6. When maintenance and repair are required, wear protective clothing.
7. Never leave near the machine while it is working.
8. Do not remove any part on your machine.
9. Do not keep the pump pressure above the maximum pressure specified in the instruction.
10. Do not use the machine tank for the transportation and pulverization of flammable and explosive materials.
11. Do not operate the pump without oil by checking the oil level.
12. Do not use the machine on an unsuitable steep and sloping field.
13. Do not change the original parts of the machine. Do not have it repaired by persons other than authorized service. Otherwise, all problems arising from the use of sub-industrial parts and out-of-service repairs, under the user's responsibility.
14. Do not operate your machine when the tank is empty. the pump will take in air.
15. In starting and stopping the machine, adjust the pump pressure to zero with the regulator or turn off the driving shaft.
16. Do not remove the safety valve on the pump. This valve is activated when the maximum pressure of the pump is exceeded by 20 and sends the excess liquid back to the tank by the bypass, thus preventing the machine and pump from being damaged. In this way, it acts as a pump fuse.
17. Do not use the machine in windy weather due to the spraying mechanism. It will be harmful in terms of health and economy.
18. The optional hand washing tank in the machine is for hand cleaning. It should not be drunk or used for other purposes.
19. The provisions of the current legislation regarding the transportation, use, and disposal of pesticides should be learned and should be followed.
20. The information on the product label and the application instructions should be read carefully and should be followed.
21. Nothing should be eaten or drunk during the preparation and application stages of spraying.
22. The product should not be transported in a container other than its own packaging, especially with food and beverage containers.
23. This machine is used as a spraying machine in line with the definitions and safety instructions stated in the manual. We, SWIFT AGRICULTURE, is not responsible for any damages that may arise from other uses. the responsibility belongs entirely to the user.



 Check whether the shaft length is suitable for the tractor. If the shaft is long, shorten it according to the tractor. OTHERWISE , IT MAY CAUSE DAMAGE.

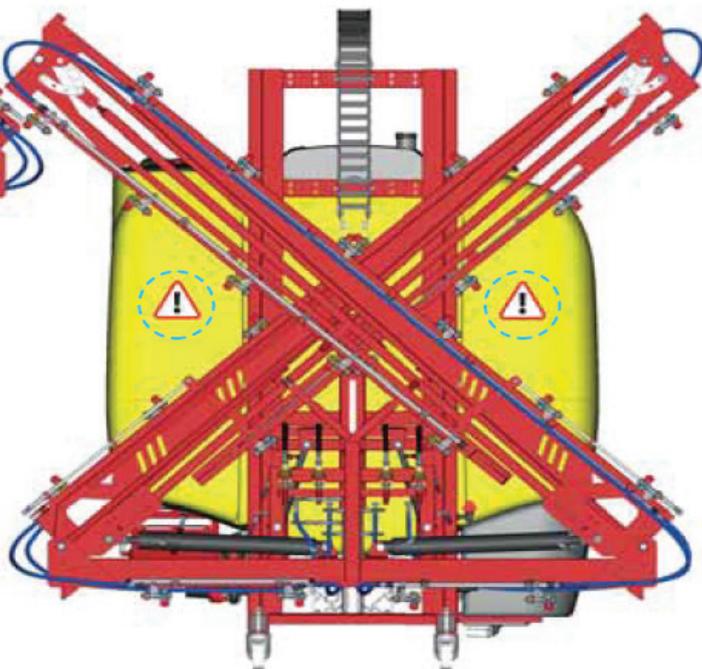


Figure 4



## 2.0 SAFETY INSTRUCTIONS AND ACCIDENT PRECAUTIONS

Pay attention to the signs indicated by the yellow symbol in the book.

There are 3 different levels of danger.



### **DANGER :**

This sign warns that if the specified procedures are not followed and applied correctly, it will cause serious injuries, death and long-term health risks.



### **ATTENTION :**

This sign warns that the specified procedures may cause serious injuries, death and long-term health risks if the procedures are not followed and applied correctly.



### **WARNING :**

This sign shows a warning that serious injuries, death, and long-term health risks may occur if the specified procedures are not followed and applied correctly.

**Read all instructions carefully before using the machine. If you have uncertainty at any point, contact the technicians of our dealer. The manufacturer does not accept any responsibility for the consequences that may arise from failure to comply with the following safety and accident precautions and rules.**

## GENERAL RULES

- 1) Close attention should be paid to danger labels on the machine and in this manual.
- 2) The instruction sticking on the machine. Safety labels are essential recommendations to prevent accidents.
- 3) Safety and accident prevention rules should be carefully studied with the help of instructions.

- 4) Please, do not touch mobile parts with any form or any purpose.
- 5) In order to make any operation or adjustment on the machine, the engine must be turned off and the tractor must be in a fixed position.
- 6) Do not transport under any circumstances people or animals on the machine.
- 7) It is strictly forbidden to use or let the tractor be used by an unqualified, non-expert, or compromised person while the equipment is mounted.
- 8) Before starting the tractor and equipment, make sure that all transport and handling equipment is working without missing parts.
- 9) Before operating the equipment, make sure that there are no obstacles, especially people, children or animals, and that you have a clear view.
- 10) Wear appropriate clothing for your job. Avoid wearing loose or loose clothing that could be caught in the moving parts of the tractor or equipment.
- 11) Be sure to check all control devices before starting work.
- 12) Do not start working with the equipment until you are sure that all guards are in good condition, in place, intact and safe.
- 13) Do not stay inside the working area where the machine has moving parts.
- 14) The use of equipment without tank covers and guards is strictly prohibited.
- 15) The driver's seat should never be left while the tractor is running.
- 16) Before operating the equipment, make sure that all parts are correctly assembled, adjusted, and in good working condition.
- 17) Do not load to the tank beyond its capacity.



## TRACTOR LINKAGE

18) Mount the equipment to the tractor with sufficient power, hydraulic lifting capacity, and connections that comply with the standards.

19) Equipment tips must be in the same category as tractor hydraulic lift tips.

20) Remember that the working area of the hydraulic lifting arms during the landing and taking off of the equipment is the danger zone.

21) Be extremely careful when connecting and disconnecting equipment to the tractor.

22) It should be remembered that there are moving parts between the equipment and the tractor, and it is strictly forbidden to stay in this area. (Figure 5)

23) It is strictly forbidden to stand in the area between the tractor and the implement while the engine is running and the cardan shaft is connected. (Figure 5) It is only possible to work in this area after the handbrake is pulled, the wheels are chocked and all the equipment and tractor parts are blocked.

24) The equipment to be connected to the tractor changes the load distribution of the axles. Check whether the load brought by the machine to the 3-point suspension system is suitable for the tractor load capacity. It is recommended to add appropriate weights to the front of the tractor to balance the load on the axles.

25) Consider the Maximum transportable capacity for axles, total load distribution, transport instructions and rules.

26) Do not connect any equipment behind the machine. (Figure 6)

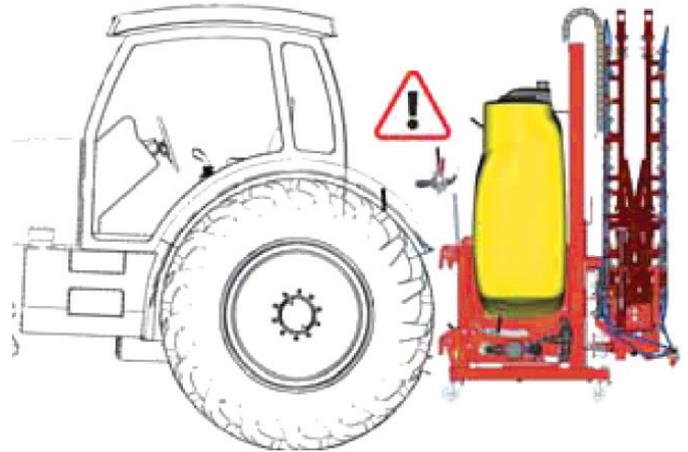


Figure 5

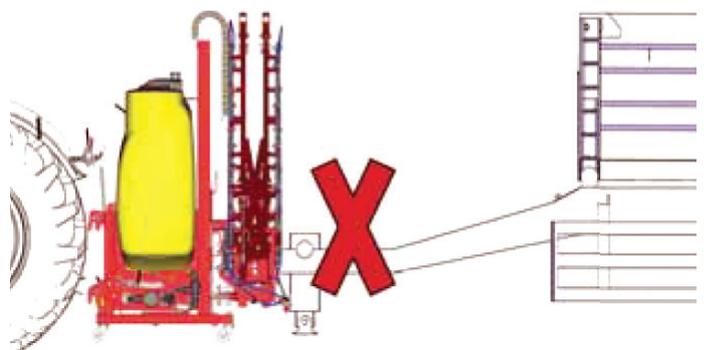


Figure 6



27) The machine can be mounted to any tractor of suitable power with a 3-point suspension system. Bring the lower hydraulic lifting arms of your tractor by maneuvering in a way that they will approach the lower connecting pins of the machine. Get off the tractor and attach the safety pins by connecting the lifting arms on the right and left to the pins. **(Figure 7)**



28) Attach the adjustable upper arm of the tractor to the appropriate level of the upper suspension points on the machine chassis and attach the safety pin. **(Figure 8)**



Figure 7



Check that the connection and safety pins are connected in the correct position.



Connecting the machine to the tractor is a step that requires extreme attention. For this, you should pay close attention to all the following points and make sure that no person comes near the machine.

Restrict the swinging of the lower arms with the help of the adjustment lever (Figure 8), and at the same time make sure that the ground heights are equal.

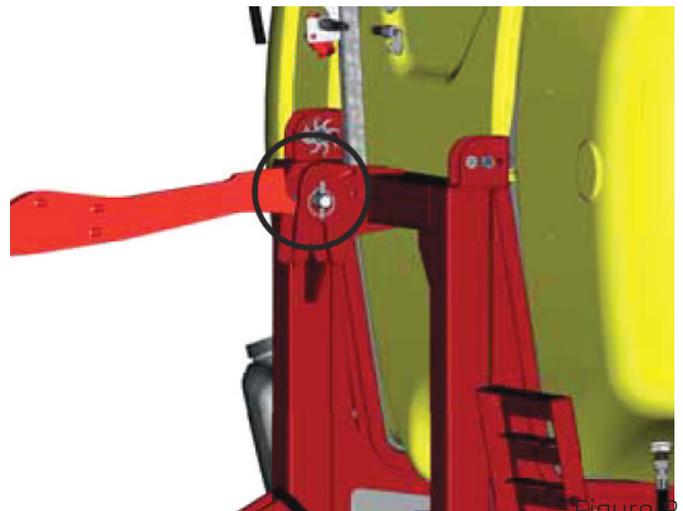


Figure 8

Bring the machine to the same axis with the tail shaft of the tractor with the hydraulic arms of the tractor, and mount the P T O shaft in this position.

Our company is not responsible for problems arising from such malfunctions.

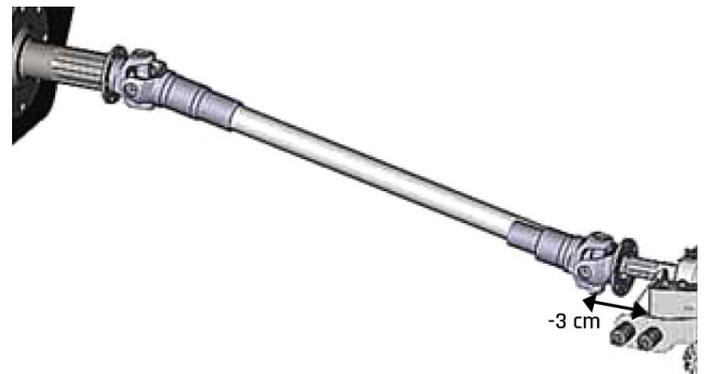


Figure 9



## P.T.O. SHAFT (ARTICULATED SHAFT)

Connect the transmission shaft properly between the tractor PTO shaft and the pump crankshaft.



Pay attention to the following points while connecting the shaft.

While A-the shaft mounted, make sure that the guards fixed to the tractor and the machine for all working angles, horizontal and vertical, are long enough to cover all rotating parts.

B-Check that the guards, rotating parts are fully covered when the shaft is at the maximum working angle.

C-Make sure that the joint heads of the shaft are correctly fixed to the tractor and the machine, taking care to attach the side of the tractor mark on the shaft guard to the tractor tail axle.

D-Fasten the casing of the shaft to the tractor and the machine with a suitable chain preventing rotation. (Figure 10)

E-Never under any circumstances use the shaft without a guard and fastening with chains. When the angle of the joint exceeds 35 degrees, stop the tractor. (Figure 11)

F-When not in use, do not leave the shaft uncovered or protect it in a closed place against weather influences.

G-Check all parts are working properly and lubricate joints before use.

H-Shaft spindle has 6 keyways. The suitable operating speed is 540 rpm. (Figure 12)

30) Start your tractor and lift the equipment using the lower hydraulic lift arms.

31) Adjust the length of your tractor's upper link arm until the implement stands parallel to the ground.

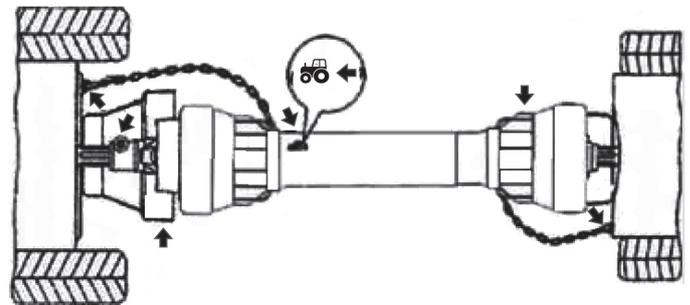


Figure 10

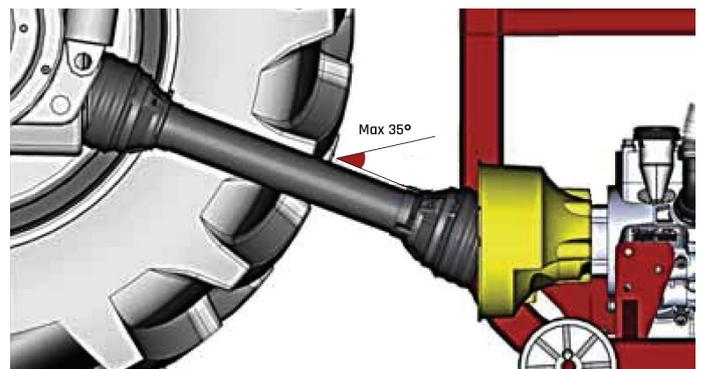


Figure 11



Figure 12



32) The equipment should only be used with a P.T.O shaft with the necessary safety equipment and protections connected with suitable chains against overloads.

33) Only the P.T.O shaft supplied by the manufacturer should be used.

34) When inserting or removing the P.T.O Shaft from the tractor, the engine must be turned off.

35) Pay attention to the correct mounting and safety of the P.T.O shaft.

36) Pay attention to the movable universal connection points.

37) Clean and grease the P.T.O shaft only when the P.T.O shaft is disabled, the engine is turned off, the handbrake is on, and the key is removed.

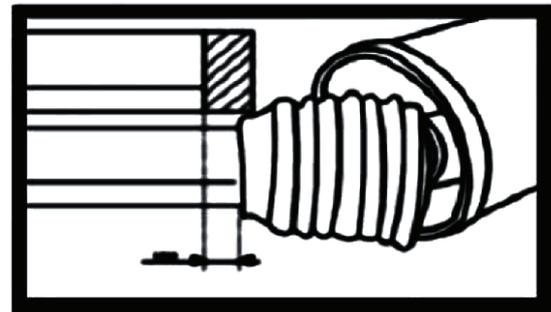
38) Put the P.T.O shaft protection cover again after removing the P.T.O shaft.

39) If you are going to use your machine on a different tractor, check the length of the P.T.O shaft.

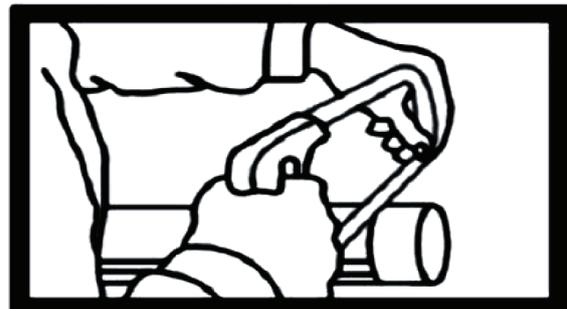
### THE ADJUSTMENT OF P.T.O. SHAFT

40) The P.T.O shaft supplied with the machine has standard dimensions. Therefore, it may be necessary to adapt the P.T.O shaft to the tractor or machine. In this case, consult the manufacturer for the necessary adjustment before doing anything.

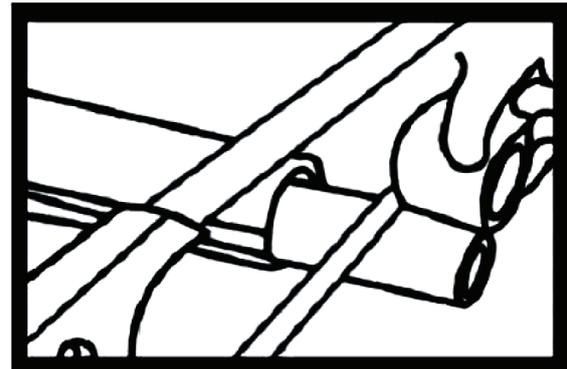
- First, bring the shaft to its shortest position and mark the cut size To adjust the length of the P.T.O shaft. (Figure 13).
- Cut the protectors of both male and female parts of the shaft to the same size. (Figure 13)
- Cut the shafts to be the same size as the guard. (Figure 13)
- Remove burrs D, Figure 13 and lubricate the shafts. (Figure 13)



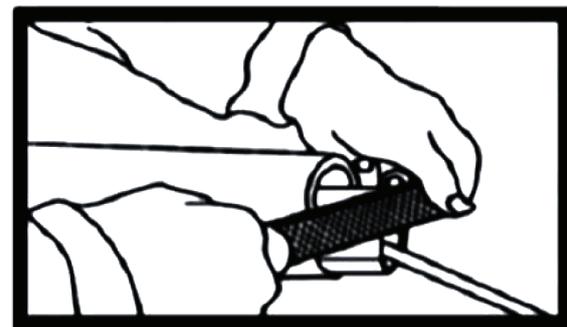
A



B



C



D

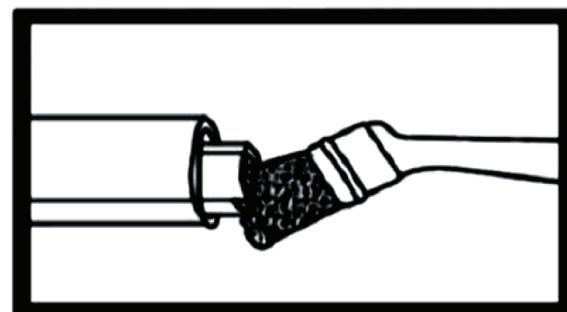
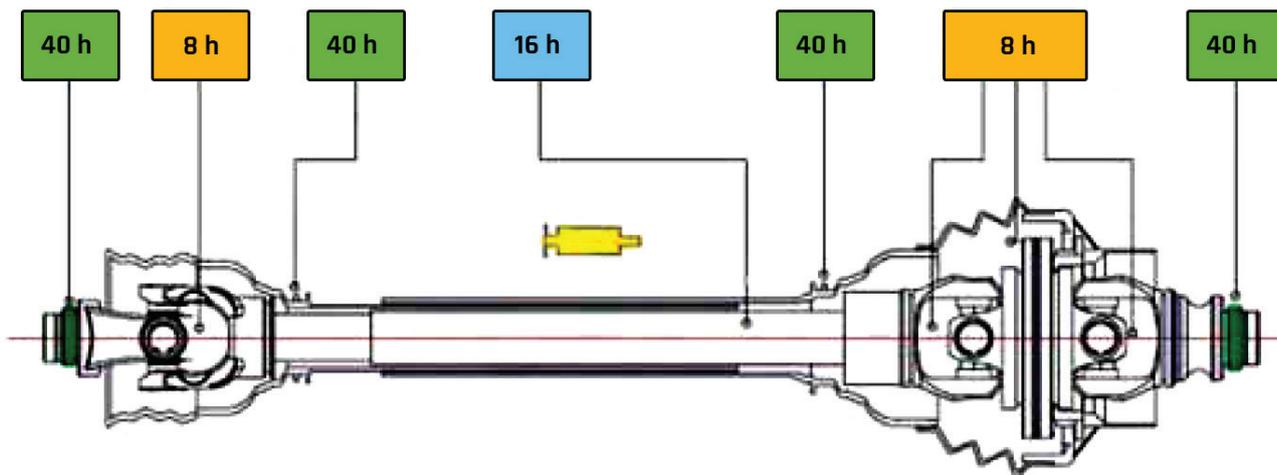


Figure 13



### POST-OPERATION MAINTENANCE OF P.T.O. SHAFT

- After the operation of the shaft, it is checked whether there is any breakage or deterioration in the housing and parts of the shaft. If a problem is observed, the shaft is not operated until the problem is solved.
- The shaft is lubricated within the hours indicated in the Figure shown below. (Figure 14)



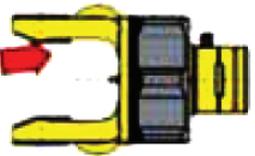
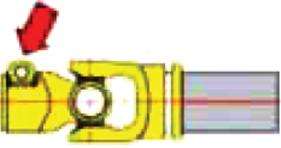
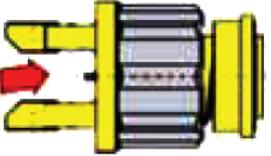
<b>8 h</b>		<b>8 h</b>	
	<b>Cross Kit</b>		<b>Overrunning Clutch</b>
<b>8 h</b>		<b>40 h</b>	
	<b>Overrunning Clutch</b>		<b>Push Pin</b>
<b>16 h</b>		<b>16 h</b>	
	<b>Ratchet Torque Limiter</b>		<b>Shield Cones</b>

Figure 14



## TRANSPORT ON THE ROAD

If the machine needs to be transferred, it should be carried out with a suitable lift of sufficient capacity after the specified connection points are connected with suitable hooks. Since accidents may occur if these procedures are not done properly, they must be done by authorized and trained people.

41) When transporting on public roads, follow the road and traffic rules of your region.

42) It should be kept in mind that the transported or trailed equipment has different load distribution in the road position, increases in braking and steering distances, and sometimes even lateral deviations may occur.

43) It is necessary to consider potholes and bends on the road. It is necessary to be very careful about the deviations in the center of gravity that the centrifugal force can cause. The same attention should be paid on rough roads and grounds, with or without equipment.

44) For transportation, the tension chains of the tractor's side drawbars must be tensioned, move the hydraulic control lever to the locked position.

45) If requested, the factory will be able to supply signaling devices to carry equipment.



## TRACTOR-MACHINE BALANCE DURING TRANSPORT

When the machine is attached to a tractor, it becomes a part of it. Due to imbalances, difficulties can be experienced on the road, while driving. In order to ensure a balanced weight distribution on the tractor, weight can be loaded at the front.

When the machine is attached to a tractor, it becomes a part of the overall machine weight. Due to imbalances, difficulties can be experienced on the road, while driving. In order to ensure a balanced weight distribution on the tractor, weight can be loaded at the front.

These factors are summarized with the formula below.

$$Z \geq [Mx(s1+s2)] - (0.2xTxi) / (d+i)$$

The symbols used in the formula can be seen in Figure 15.

M : (KG) Weight of the fully loaded machine

T : (KG) The weight of the tractor

Z : (KG) The front Weight

i : (M) Distance between wheel axes

d : (M) Distance between the center of The front Weight and the front wheel axis

s1 : (M) Distance between rear wheel axis and the point where the machine is mounted

s2 : (M) Distance between the center of gravity of the machine and the point where the machine is mounted

The result with the formula gives us the minimum value of the preload. Preload can be increased for better performance. For the maximum value of the preload, refer to your tractor's manual.

A negative value indicates that no preload is required. Check whether the wheels of your tractor are suitable for loading.

## During Transport

Prohibit climbing on the machine during transportation or operation.

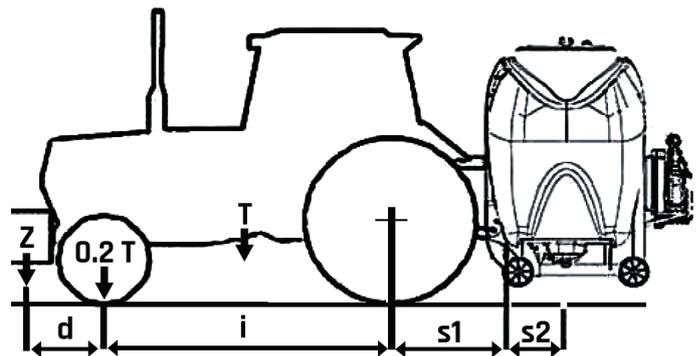


Figure 15

Take the PTO shaft in neutral while moving on the road position. Attach the "Heavy Load" warning sign. Please obey the traffic rules while on the road.

Carrying out the transportation of the machines with the help of wheels mounted on the chassis.

Carrying out the transportation of the machines with the help of wheels mounted on the chassis.

Carry the machine with the help of a hoist and crane by lifting the rope under the chassis.

Make sure that the pump and tank are not damaged during transportation.



## 2.1 LOADING PROCEDURE



Lifting and handling should be carried out while the tank is empty and using appropriate equipment by qualified personnel specialized in this type of operation.

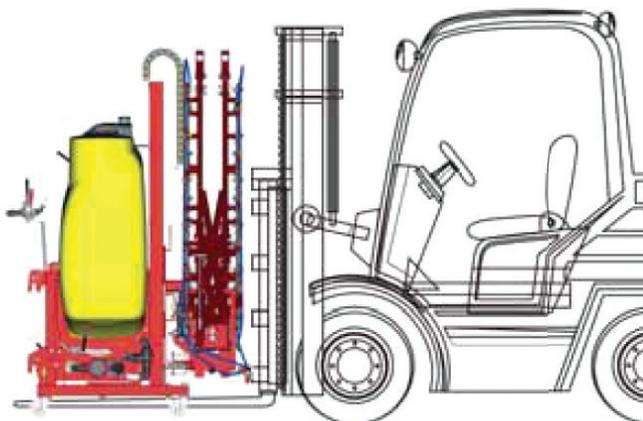


Figure 16

Place the forklift's forks under the machine.

## 3.0 OPERATING INSTRUCTIONS

To get the best performance from the equipment, carefully follow the instructions given below.



All maintenance, adjustment and preparation operations should be done while the PTO shaft is disabled, the tractor should not be running, the wheels should be blocked and the ignition should be turned off.



### 3.1 ISSUES TO BE CONSIDERED BEFORE STARTING WORK

1.) The level in the oil bottle should be between the lower and upper limit. **(Figure 17-A)**  
If the level is lower than the lower limit, add No 20W - 50 engine oil.

1.b) The pressure of the valve on the air tube  
Set the value to 40 psi. **(Figure 17-B)**

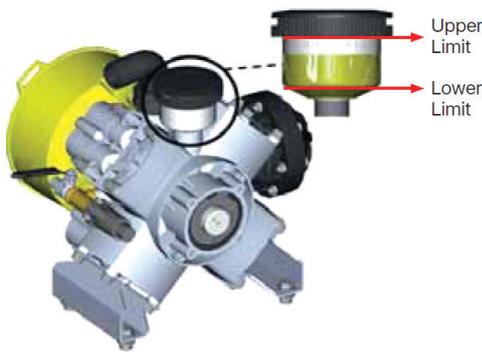


Figure 17-A



Figure 17-B

2.) There should be no air leakage in the suction circuit. Elbow nut. (Figure 18) hose clamps. (Figure 19) gaskets and o rings should be checked and tightened. Otherwise, the efficiency of the pump will decrease due to air leakage.



Figure 18



Figure 19

Open one of the taps by placing the regulator's by-pass handle to the pressure position and let all the air out by operating the pump at zero pressure for 1, 2 minutes. (On FPR regulators) **(Figure 20)**

3.a) Open one of the taps by placing the regulator's by-pass handle to the pressure position and let all the air out by operating the pump at zero pressure for 1, 2 minutes. (On FPR regulators) **(Figure 20A)**



Figure 20A

3b) In A machine with an FPR regulator connected, it is undesirable to increase the pressure in case one of the sections is closed during spraying when each section is open. In order to prevent this situation, a calibration adjustment is required so that the pressure does not change when a section is closed.

Calibration setting:

- While the machine is running, the regulator by-pass lever is placed in the pressure position. **(Figure 20b)**, when all sections are closed, the pressure is adjusted to around 8-10 Bar **(Figure 20d)** with the pressure adjustment knob **(Figure 20c)**.

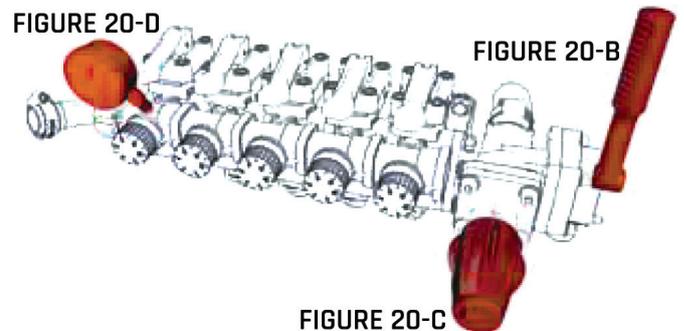


Figure 20 B-C-D



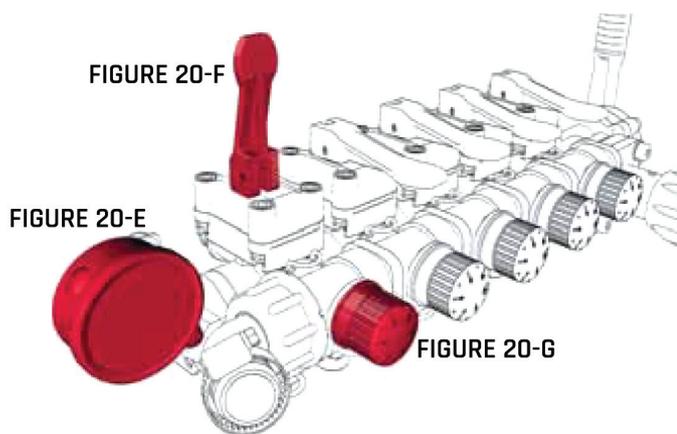
The first Section (**Figure 20f**) opens, (in this case some pressure drop is normal).By turning the calibration knob of the 1st section (**Figure 20g**), the pressure value seen on the manometer (**Figure 20e**) is fixed to the desired pressure (bar) value and the 1st section latch is closed.

The 2nd section is opened and the changing pressure (bar) value is fixed to the desired pressure value by turning the calibration knob again and the 2nd section is closed with the latch. These processes are repeated in the same way for the other sections, the purpose here is to ensure that the desired pressure value in the manometer does not change when any of the sections is closed while spraying.



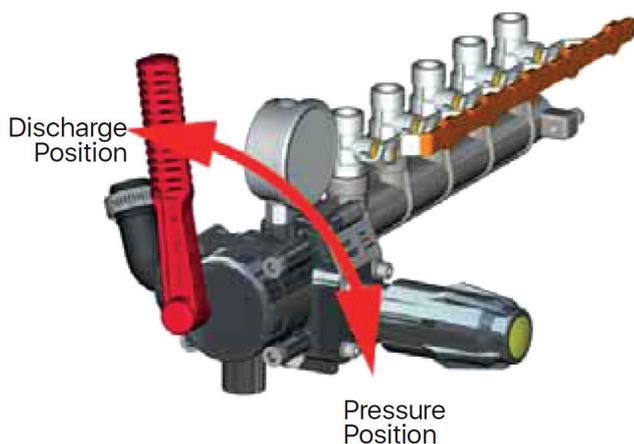
**The rotational speed of the pump should never exceed 540 rpm. In this period, the specific fuel consumption of the tractor is the lowest.**

**In addition, an increase in pressure and efficiency cannot be achieved above this cycle. There is only unnecessary wear and tear.**



**Figure 20 E-F-G**

4.b) Open one of the taps by taking the by-pass lever of the regulator to the pressure position, operate the pump at zero pressure for 1, 2 minutes and let all the air evacuate. **(In OSR Regulator) (Figure 21)**



### 3.2 PROHIBITED USES

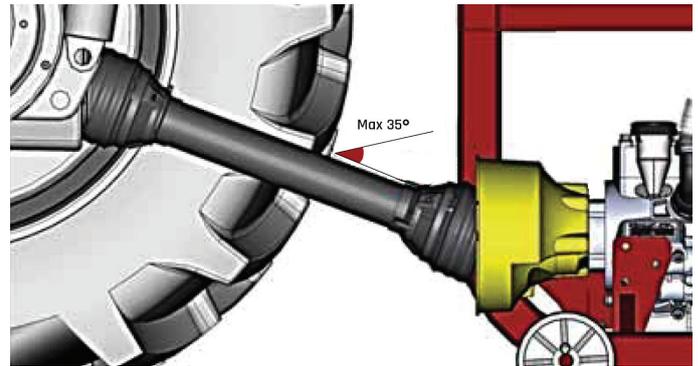
1. Do not operate without oil and under high pressure.
2. Do not damage the pump during transportation.
3. Do not perform the spraying process by connecting the boom to the front of the tractor.
4. Do not enter the tank under any circumstances.
5. Park the machine on level grounds that are not inclined.
6. Do not operate shaft without safety guard.
7. Do not stand between the tractor and the machine while working. Otherwise, serious injuries can be caused by the shaft



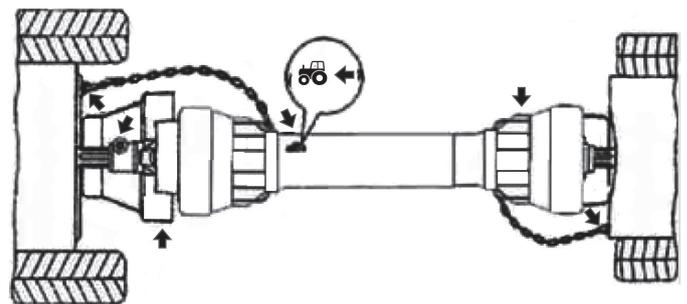
### 3.3 HAWK USAGE INFORMATION

You must comply with the following points to achieve success throughout the lifetime of the machine.

1. The efficiency and life of the agricultural machine depends on careful maintenance.
2. Select the product recommended by your agronomist.
3. Find out how much water will be mixed with the product you will use and how much it will be applied per hectare.
4. Determine the application time well, taking into account the climatic conditions, paying attention to rainy and windy days.
5. Any repair, maintenance and adjustment should be made after the machine has been stopped and never remove the safety devices.
6. Following down below points while connecting the sprayer to the tractor.
7. Connect the drive transmission shaft between the tractor PTO shaft and the pump shaft. The shaft should be in the same axis as the horizontal as possible. Whatever happens, it should not make an angle of more than 35 ° with the horizontal.
8. If the shaft length is long, it should be cut or adjusted as necessary. Do not increase the power take-off speed above 540 rpm.



**Figure : 22**  
**Connecting the Shaft Between the Tractor and the Machine and Its Angle.**



**Figure : 23**  
**Attaching the shaft chain to a fixed part of the tractor**



### **3.4 USE OF THE MACHINE**

#### **3.4.1 TANK FILLING**

##### **3.4.1.1 PRODUCT TANK FILLING**

The machine can be attached to any tractor of suitable power with a 3-point mounted system.

##### **3.4.1.1 (A) OSR CONTROLLED SYSTEM**

##### **3.4.1.1 (A:1) FILLING FROM THE TANK LID**

Fill the water required for filling from an external water source located higher than the tank cap.  
(Figure : 24)



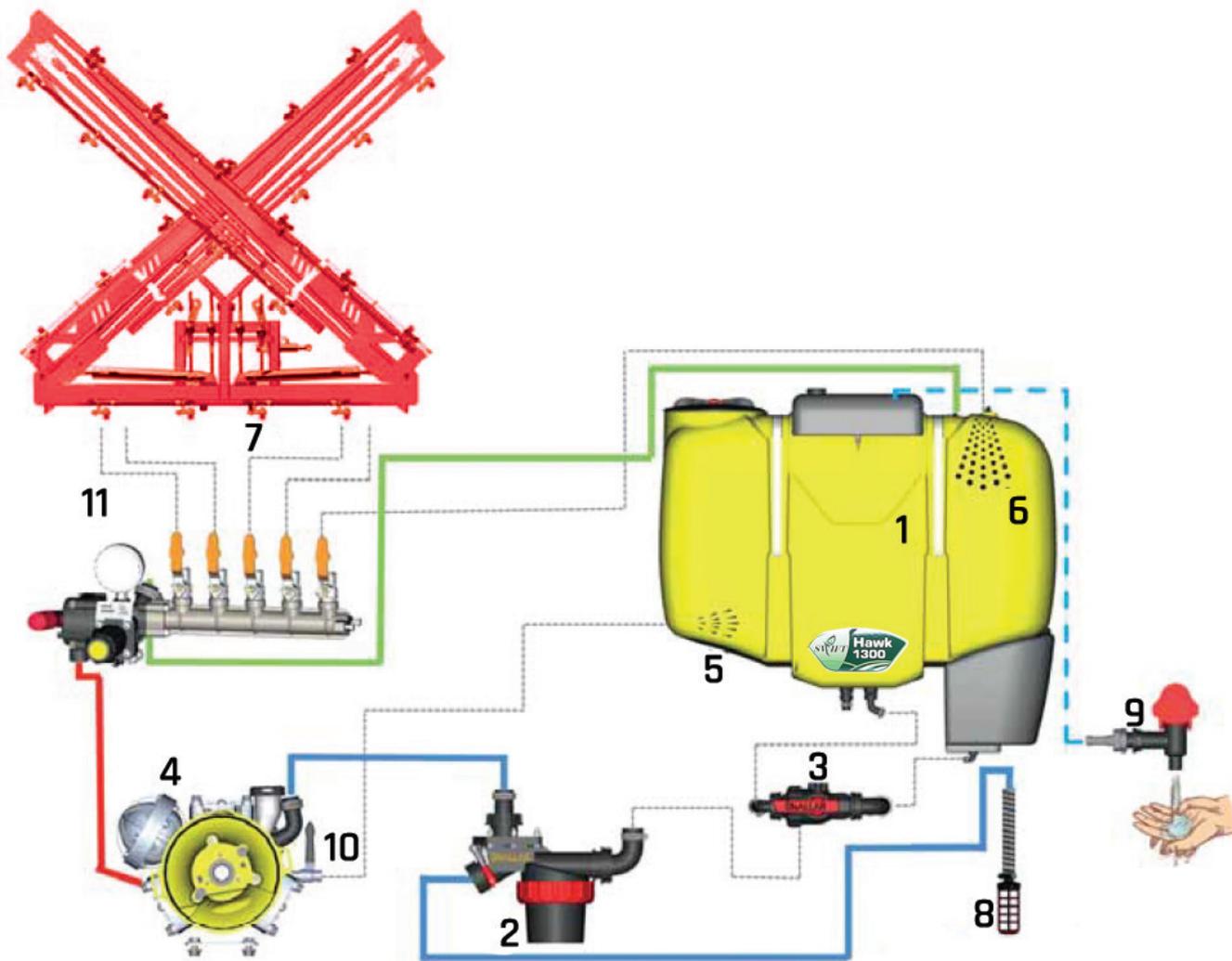
**The cap filter must be installed inside the tank cover during the filling process.**



Figure 24



**3.4.1.1 (A:2) FILLING WITH 3-WAY CHCEK VALVE SUCTION FILTER DIAGRAM:**



PRESSURE LINE  
 SUCTION LINE  
 RETURN LINE

NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Mixer Hydraulic
6	Cricut Tank
7	Boom
8	External Suction Hose
9	Hand washing
10	Filler
11	Regulator



### 3.4.1.1 (B) FPR OPERATED SYSTEM 3.4.1.1 (B.1) FILLING FROM THE TANK LID

Fill the water required for filling from an external water source located higher than the tank cap.



The cap filter must be installed inside the tank cover during the filling process.

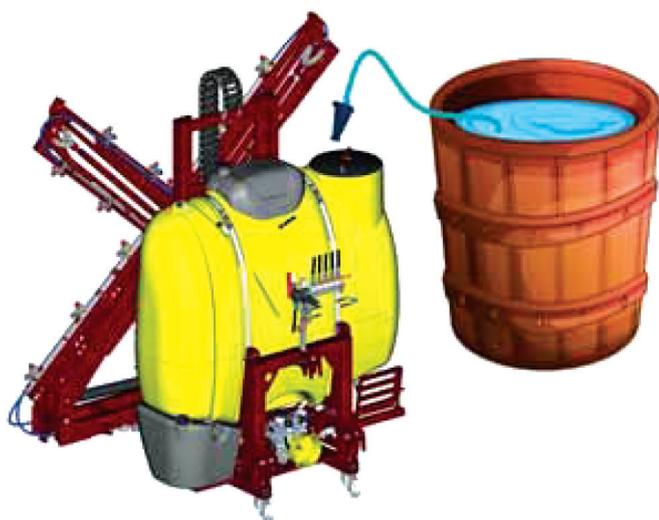


Figure 24

### 3.4.1.1 (B.2) FILLING WITH 3 WAY CHECK VALVE SUCTION FILTER IN FPR REGULATOR:

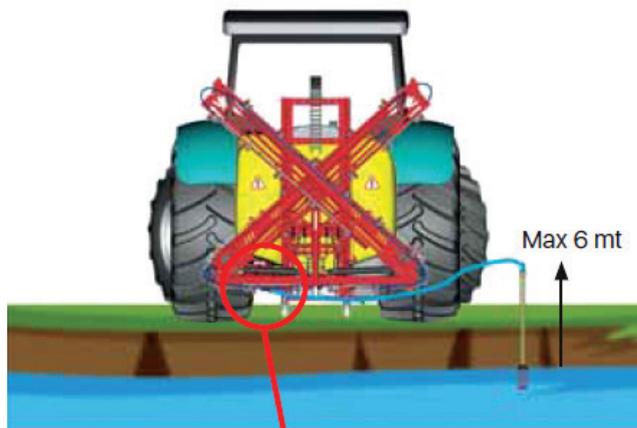


Figure 25

Connect the equipment and transmission shaft to the tractor as described in the manual.



Move the regulator by-pass handle to the tank return position.

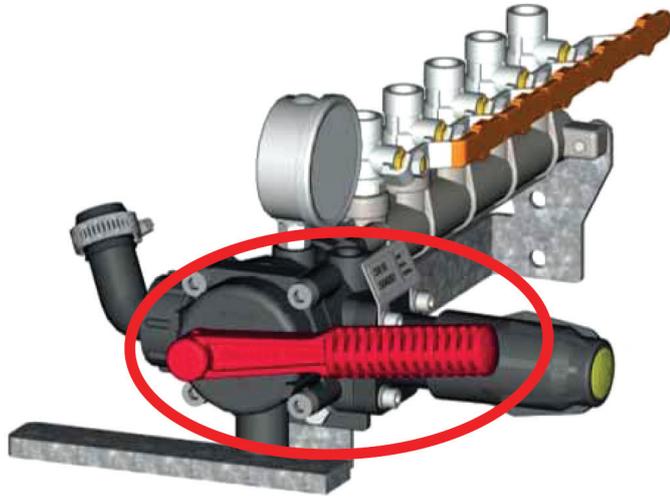


Figure 26 : OSR Regulator

When the tank filling is finished, lower the tractor gas(to idle position) and stop the PTO shaft.

Then remove the external suction hose (Figure 29) and replace the cover of the check valve filter. (Figure 30)

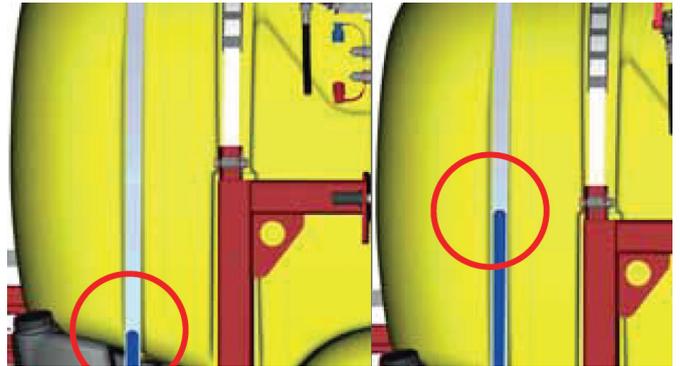


Figure 28



Figure 27 : FPR Regulator

Start your tractor and run the PTO.

Raise tractor gas until suction starts from the external suction hose and make sure that suction starts.

Thanks to this special system, the tank will be filled in a short time.

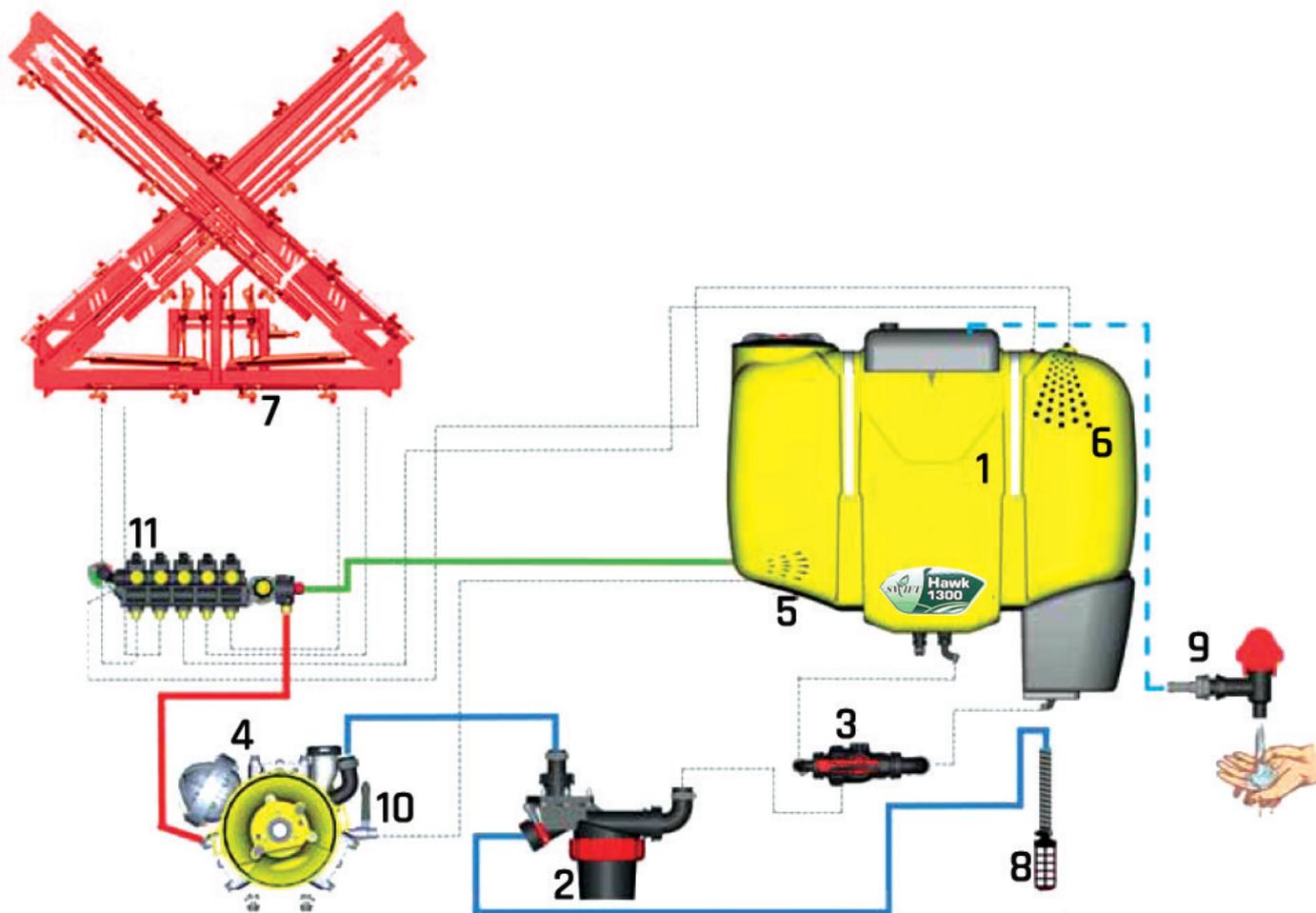
You can track how many liters of water are filled with the transparent hose, colored ball and embossed level markers on the tank. (Figure 28)



Figure 29



Figure 30



NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Mixer Hydraulic
6	Cicut Tank
7	Boom
8	External Suction Hose
9	Hand washing
10	Filler
11	Regulator



### 3.4.1.2 FILLING OF THE SYSTEM CRICUT TANK



Figure 31



#### Especially

- Wear protective clothing to avoid direct contact with body parts, especially in the presence of wounds.
- Wear personal protective equipment, rubber gloves, dust masks, goggles and helmets to protect your face, head and hands.
- Do not use protective equipment that is not in perfect condition, especially check the condition of the gas mask and cabin filters.
- Keep chemical products out of the reach of unauthorized persons (especially children and persons with disabilities).
- Arrange all the necessary equipment to handle the chemical product and mixture during preparation, filling, emptying and cleaning of the tank, as well as product distribution, adjustment, replacement or addition of plant protection products and maintenance operations.
- Calculate the exact amount of the product to be mixed according to the application surface according to the instructions given by the manufacturer. Do not mix different products.

### 3.4.1.3 FILLING THE HAND WASHING TANK

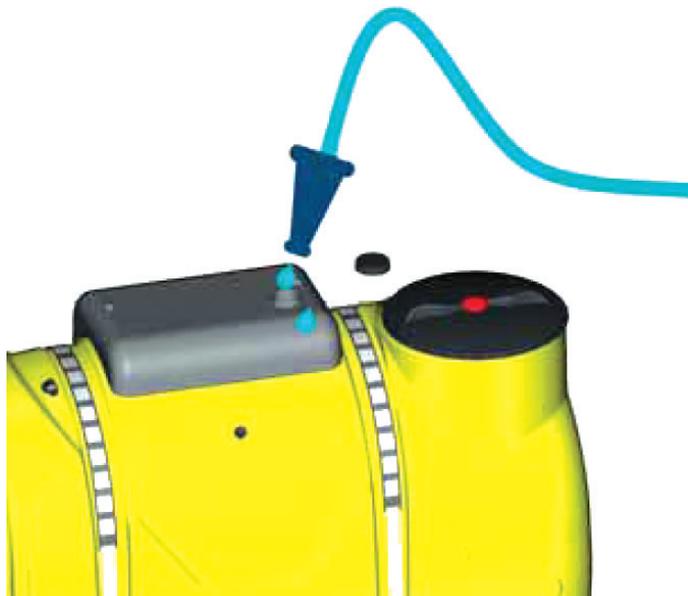


Figure 32

### 3.4.2 CHEMICAL PREPARATION AND MIXING



Before starting the preparation of the chemical product, take all necessary precautions to prevent contamination to humans, animals and the environment.



**Do not dispose of the product, mixture or other contaminating material into the environment. Disposal should be done in accordance with current waste regulations.**

**If the product or mixture accidentally comes into contact with the skin, wash your skin immediately with clean water. Seek emergency medical assistance in case of illness.**



### 3.4.2.1 HYDRAULIC AGITATION

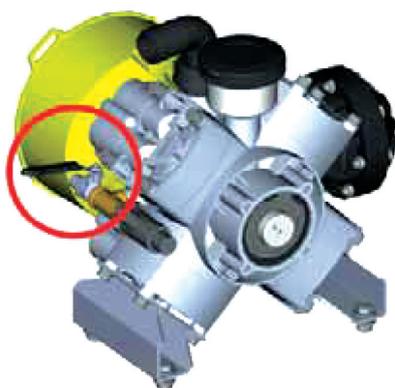
1. Attach the equipment and your transmission shaft to the tractor as specified in the manual. (Page 17).
2. Start your tractor and run the PTO shaft.
3. Add from the tank cover of the mixture you have prepared in the ratio specified by the manufacturer (Figure 33 ).

Figure 33

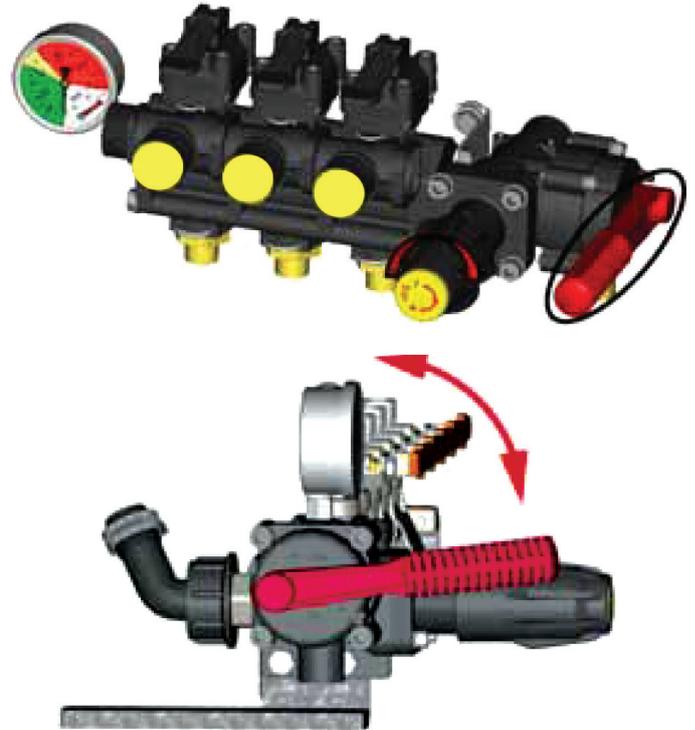


4. Switch on the hydraulic mixer valve on the pump (Figure 34).

During the product mixing process open the valve connected to the hydraulic agitator which is on the pump. Before opening the valves put the three 3-way valve of the suction line in the spraying tank position.



5. Make sure that the by-pass of regulator is in the regulator input lever position. (Figure 35 For Optional FPR Control).



6. To adjust the speed of the hydraulic mixer change the pressure setting of your regulator. (Figure 36).

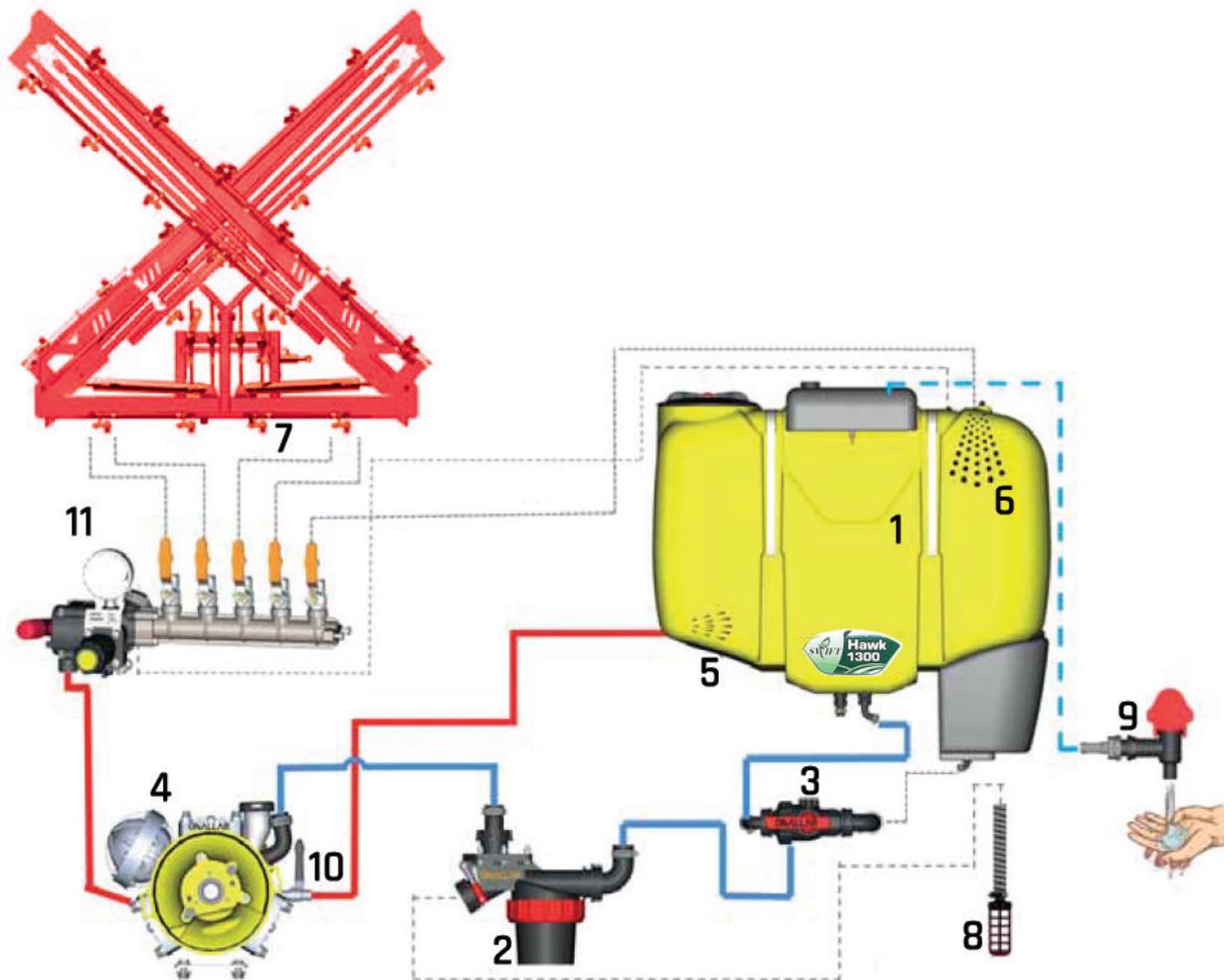


Figure 36 OSR Regulator



### 3.4.2.1 HYDRAULIC AGITATION

#### 3.4.2.1 (A) OSR CONTROLLED SYSTEM DIAGRAM



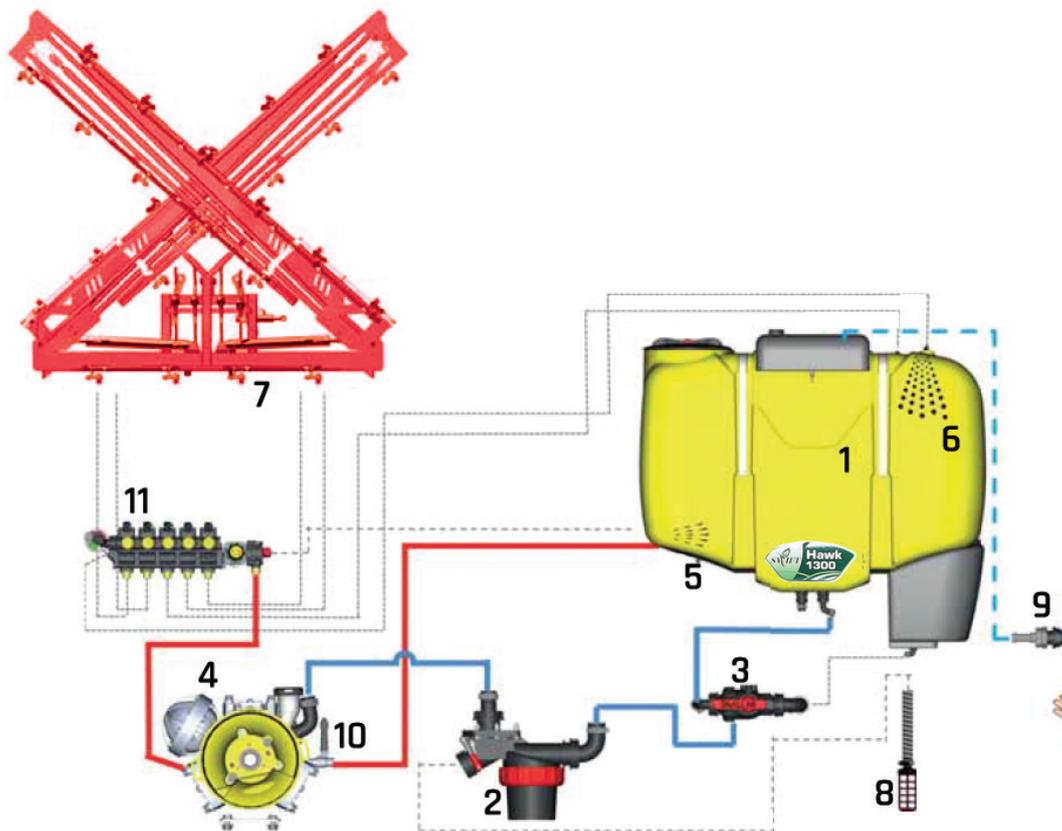
- PRESSURE LINE
- SUCTION LINE
- RETURN LINE

NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Hydraulic Mixer
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Filler
11	Regulator



### 3.4.2.1 HYDRAULIC AGITATION

#### 3.4.2.1 (B) FPR CONTROLLED SYSTEM DIAGRAM



 SUCTION LINE  
 PRESSURE LINE

NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Hydraulic Agitator
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Filler
11	Regulator



### 3.4.2.2 MIXING WITH WATER

1. When the spraying sections are closed, the pressure is adjusted to around 15-20 Bar.
2. The suction valve will be closed which is located under the mixer. **(Figure : 37)**

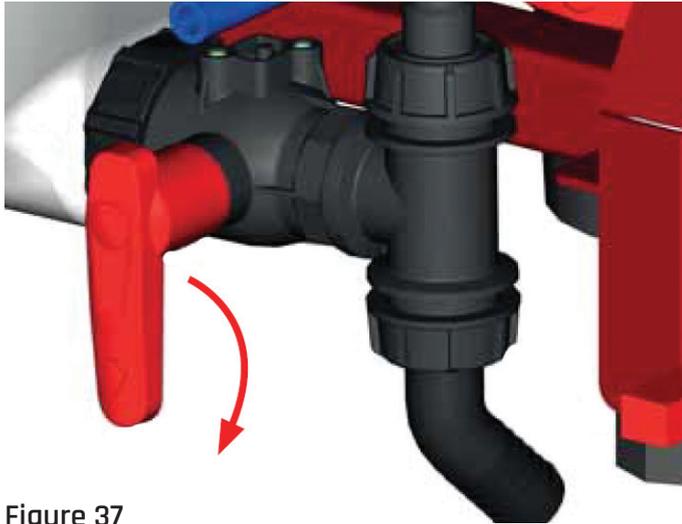


Figure 37

3. The valve on the pump to the mixer and the mixer valve on the control panel connected to it are opened. **(Figure : 38)**

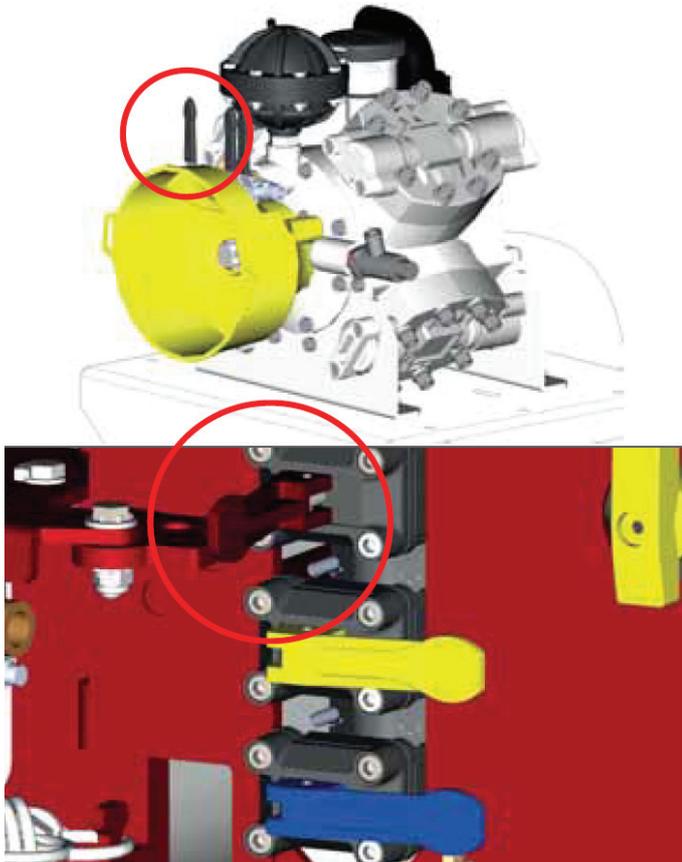


Figure 38

4. The chemical is poured into the mixer and after th washing valve of the drug canister on the mixer is opened to clean the empty drug canister, the drug canister is pressed on the sprinkler and the drug canister is cleaned. **(Figure : 39)**

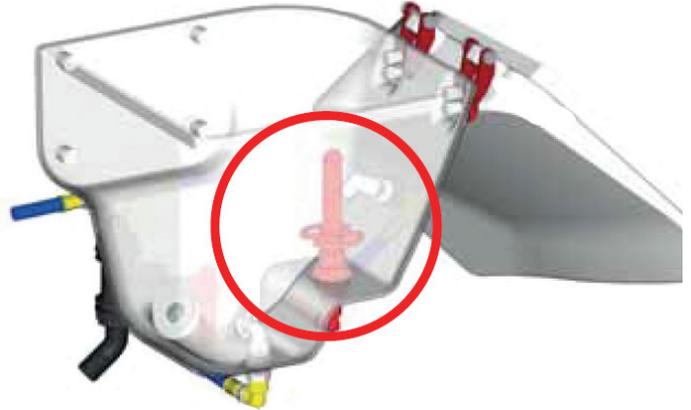


Figure 39

5. The filler blue valve and mixer valve (red valve) on the mixer are opened to get water into the mixer. When the water reaches a certain level, the blue filler valve is closed. **(Figure : 40)**

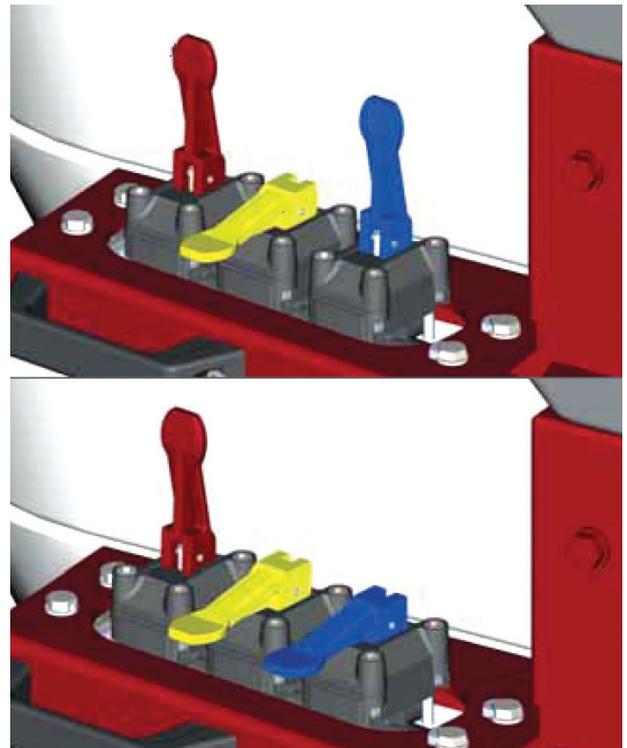


Figure 40



6. After the chemical-water is mixed, the suction valve under the mixer is opened to transfer it to the main tank and the mixture is transferred to the tank. **(Figure : 41)**

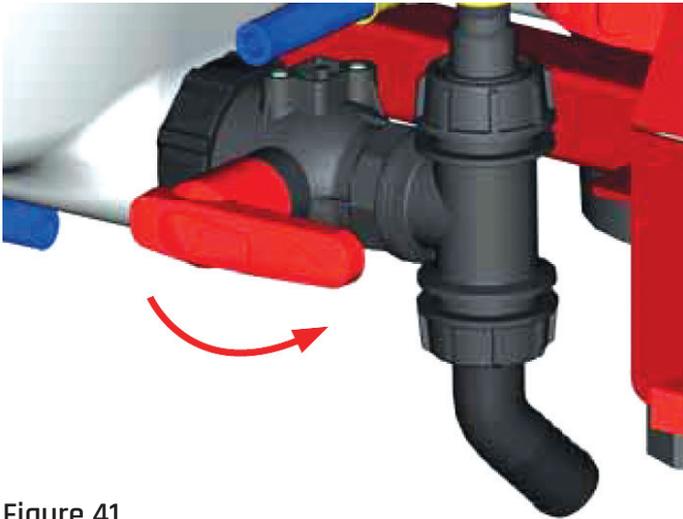


Figure 41

7. When the mixer is discharged, first the valve on the pump to the mixer is closed, then the mixer valve on the control panel is closed. **(Figure : 42)**

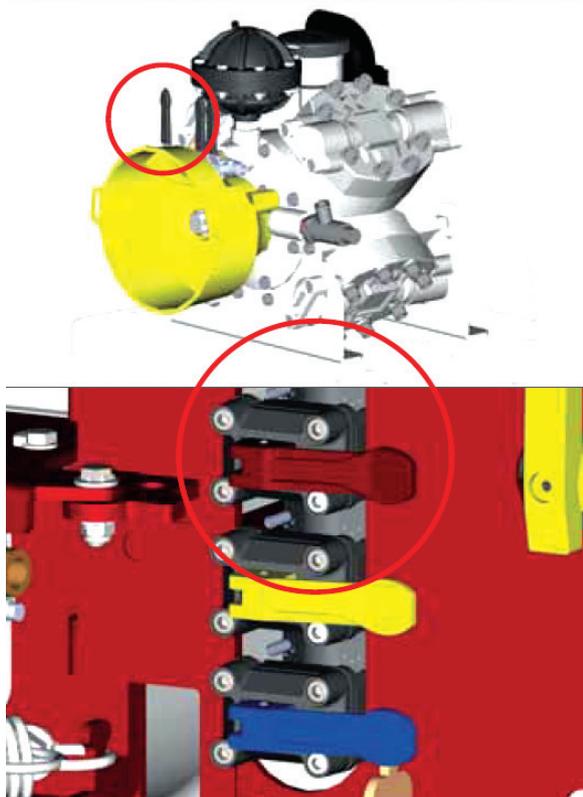


Figure 40



### 3.4.3 PULVERIZATION



Consider the following requirements.

- Check whether there is or no power lines and / or tree-like objects in the field and evaluate the contact risk with spraying bars.
- Check the slope of the land to evaluate the optimal conditions for a safe work. Always remember the maximum slopes allowed.
- When spraying while moving across the slope follow the instructions with the utmost care.
- To prevent the booms from swinging and to equalize the spray keep your speed max 8-10 km / h .
- Before you start spraying an area, check if there is enough product in the tank.
- While spraying being aware of the weather conditions it's important. Wind speed should not exceed 5 m/s.

- After filling the tank with water the concentrated spray liquid is adjusted by dilution based on the values of pesticide label. (on the product label is written how many liters it should be ).
- Then go to the field (field) to start spraying.
- From any point in the field the boom's road position lock is unlocked.
- Work begins after the arms are fully opened. (Figure 40)



Figure 43: Regulator spraying position and pressure adjustment.

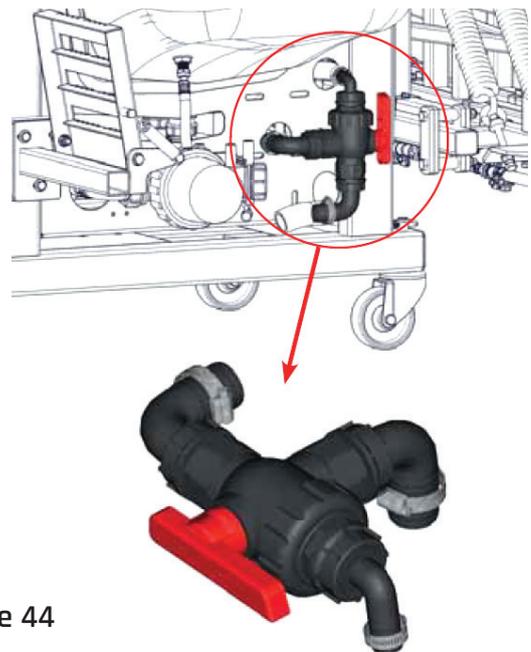


Figure 44

During the mixing process before opening the valves bring the 3-way valve found in suction line to the spraying tank position.



If it is windy, to avoid drifting keep your speed below the maximum 5 m / sec limit, keep the boom low and increase the size by dropping your pressure.



Prevent equipment from approaching outside people's work area while in use. If necessary, stop spraying immediately and drive away people from risk area.

Regulator must be in the spraying position and pressure adjustments must be made.

Pressure adjustment is made by turning regulator pressure adjustment knob. If desired to obtain the required flow and pressure the mixing valve can also be turned off.

The chemical to be spray norm is determined by looking at the nozzle feature from the chart and according to required tractor speed. (see spraying norm (flow rate) setting section).



Figure 45

### 3.4.3.1 FIELD SPRAYING BOOM

1. The spraying arm (**Figure 46**) is connected from the center in a balancing way and is tensioned by springs from the right and left sides.
2. End arms can be folded with hinged system. All these parts can practically be folded on each other and become a package, and they can easily take the transport position for road conditions. (**Figure 47**)
3. Also, when driving on the road, in suitability with the traffic and safety rules there is a Attention label on hanging type machine. (**Figure 43**)
4. Four connecting hoses which extending from the booms are connects to taps of the regulator. The spraying booms are equipped with PVC pipes and rubber hoses mounted on the folding points, and the liquid is never passed through the rustable parts. (**Figure 48**)

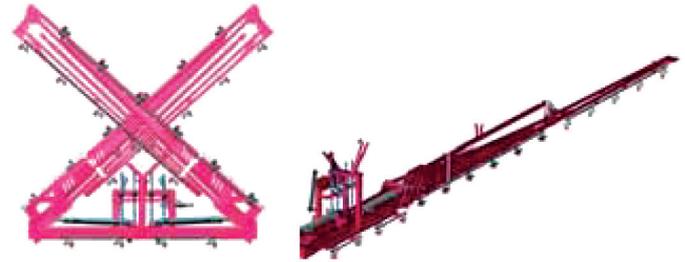


Figure 46

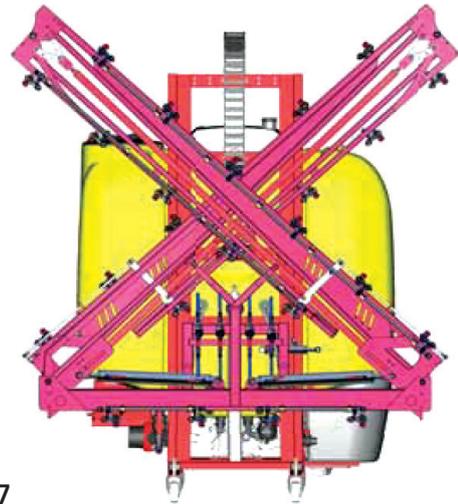


Figure 47



Figure 48



5. It can adjust the hardness of the springs from the shackle located under the springs
6. In Hawk machine it can adjustment boom position in height with hydraulic pistons (Figure 49). For adjustment boom height connect hoses to tractor correct way (Figure 50)

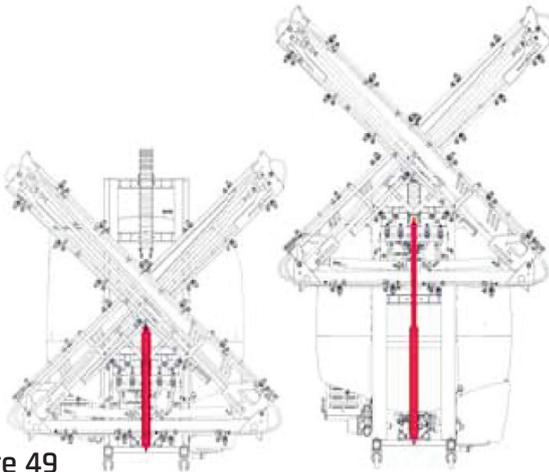


Figure 49



Pay attention that the locking system are active of the end booms when the booms are in the fully closed position, if the locks are not active, do not move the machine in any case without fixing the arms. (Figure 51) (c=lock system)

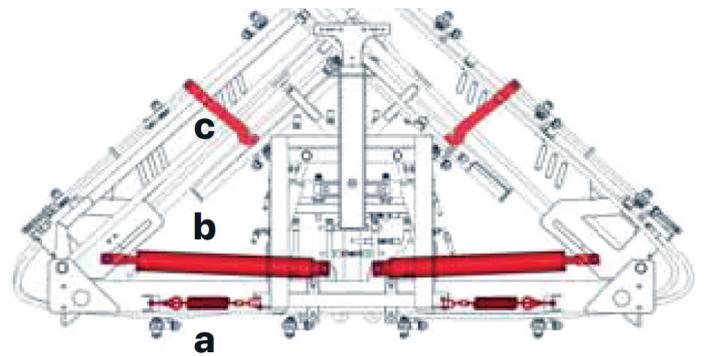


Figure 51



To adjust the boom height, connect the hoses to the tractor correctly. Make sure that the hoses are fully seated by pulling them back slightly.

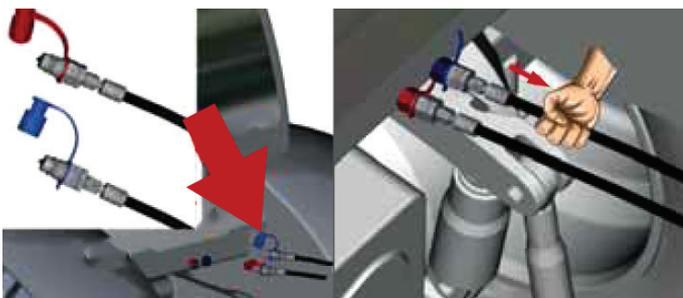


Figure 50

7. In HAWK Series machines, the spraying boom open-close system is controlled by hydraulic cylinders (Figure 51). Correctly connect the hoses which comes from the hydraulic cylinders to the tractor for open-close the boom (Figure 50). Completely closed booms has been shown in Figure 52A. Using the machine only when the booms are in fully open position ( Figure 52C). Do not use the machine when the booms are half-open position (Figure 52B).

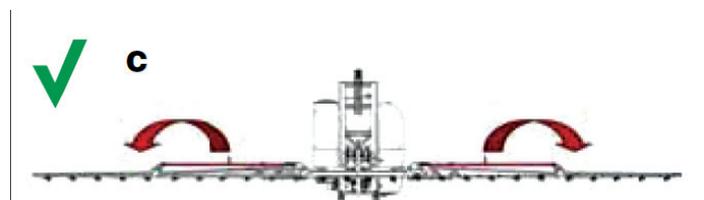
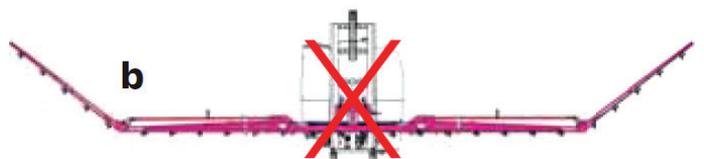
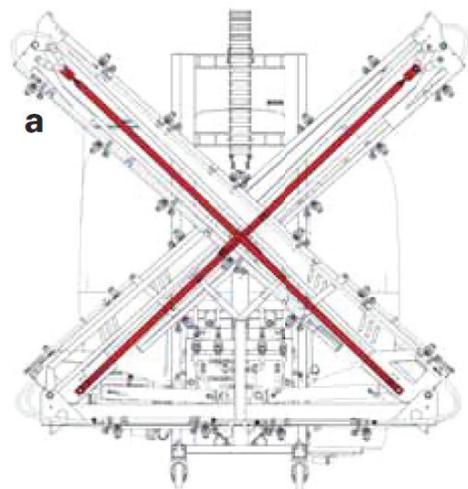


Figure 52



8. The spacing distance of the field spraying nozzle heads is 50 cm. The working width of the spraying arms is 12 or 15 meters. Nozzle fasteners are galvanized and the nozzle body is brass or plastic. While the brass nozzle is a conical nozzle tip, the plastic nozzle is a flat spray tips. Brass nozzle plate hole diameters are 1- 1.2- 1.5 mm. International standard (ISO) colors are used in standart flat spray nozzles, The number corresponding to each color is the flow rate in gallons given by that nozzle under 3 Bar pressure, for example, in a nozzle no 110-04 (red), the number 110 is the nozzle's throw angle, the number 04 is 0.4 gallons in 1 minute and at 3 Bar. that means it gives 1.52 liters of liquid. (See ISO nozzle table)

10. Open the sprayer boom.



Figure 54

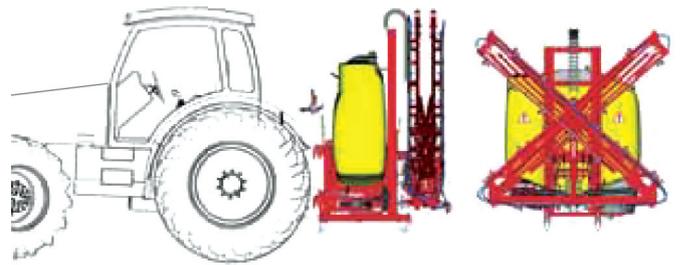


Figure 55

9. Push the oil control lever inside the tractor.



Figure 53

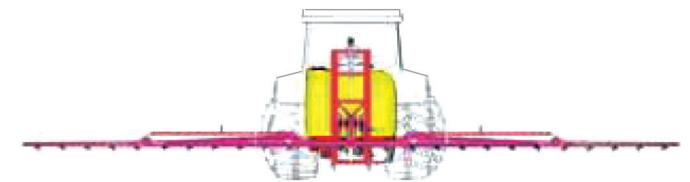


Figure 56



### 3.4.3.2 OPERATING SYSTEM

The spraying liquid passing from the tank outlet to the filter, comes to the pump by its suction hose.

The high pressure (0-40 bars) spraying liquid coming from the pump reaches the controller through the pump pressure hose.

From here, part of the regulated spraying liquid pressure goes into the tank by coming to the circulation hose flows and allows the chemical in the tank to mix.

The other part of the regulated spraying liquid is sprayed with high pressure by coming to the spraying arms and nozzle heads through the spraying hoses.

In the meantime, the excess spraying liquid coming into the regulator is being emptied to the tank with the return hose.

Tank water filling is made by the three-way filter mounted under the tank and the external suction hose from creeks, pools, etc. (Optional for FPR)

Pressure section of the pressurized spraying liquid supplied causes vacuum due to contraction and pressure drop. In this case suction is being done with the external suction hose.

#### 3.4.3.2 (A) SPRAYING SYSTEM WITH OSR REGULATOR

1. Connect the equipment and transmission shaft to the tractor as described in the manual.

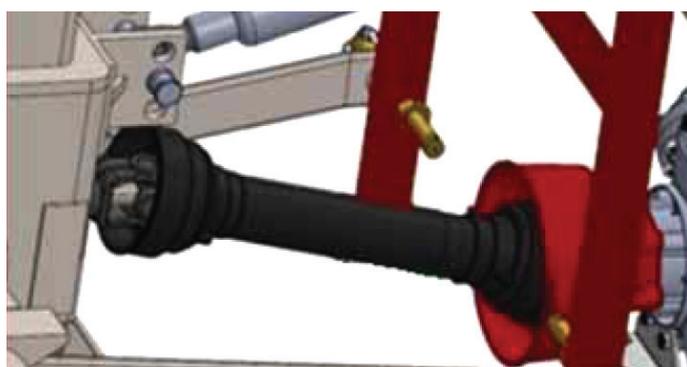


Figure 57

1. Push the oil control lever inside the tractor.



Figure 58

3. Open the sprayer boom.



Figure 59



- 4. Start your tractor as described in the manual and move the PTO.

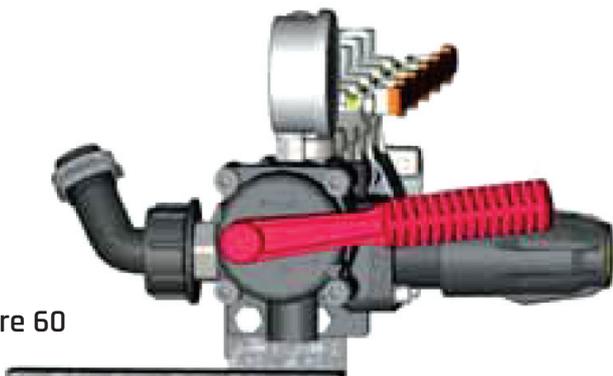


To immediately stop spraying, turn the regulator's bypass lever towards the tank.

- 6. To start the spraying process, open the valves from the regulator to the spraying boom.



Figure 60



To immediately stop spraying, turn the regulator's bypass lever towards the tank.

- 5. To change the pressure, change the pressure setting by turning the pressure knob on the regulator to the right and left.



In the spraying operation, keep the nozzle's flushing valve for the spraying system closed.

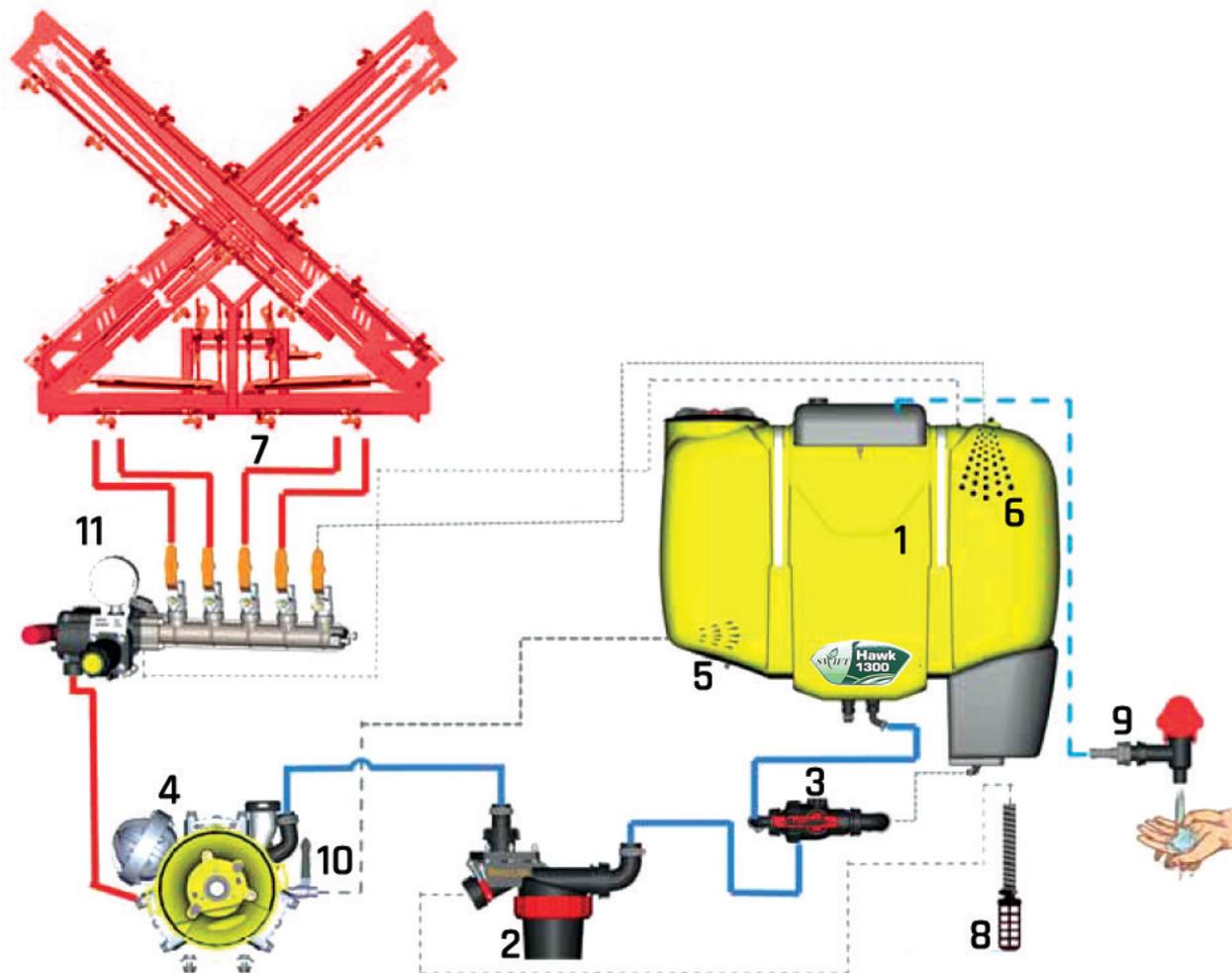


Before beginning the spraying procedure, perform the spraying norm calculations (calibration).

Figure 61



3.4.3.2 (A) OPERATING SYSTEM DIAGRAM



PRESSURE LINE  
 SUCTION LINE

NO	PART NAME
1	Tank
2	Filter Check Valve
3	3 Way Valve
4	Pump
5	Hydraulic Agitator
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Mixer Valve
11	Regulator



### 3.4.3.2 (B) SPRAYING SYSTEM WITH FPR REGULATOR

1. Connect the equipment and transmission shaft to the tractor as described in the manual.

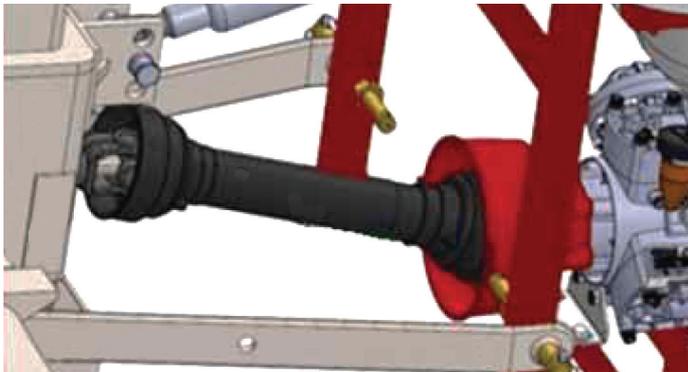


Figure 63

2. Open the sprayer boom.



Figure 64

3. Start the tractor as described in the manual and start the PTO.
4. Make sure that the by-pass of regulator is in the regulator input lever position. (Figure 65) (For optional FPR Control)

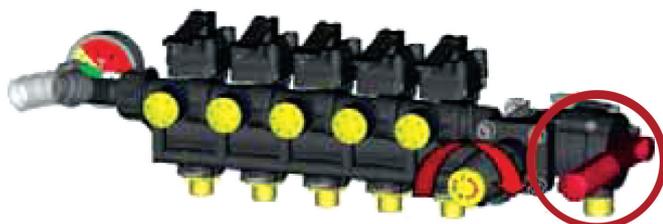


Figure 65

5. To adjust the pressure, turn the pressure knob on the regulator right or left to change the pressure setting.



Figure 66

6. Begin the spraying operation by opening the valves from the regulator to the spraying boom.



Figure 67



To avoid heterogenous solutions during spraying, keep the hydraulic mixer valve open.



In the spraying operation, keep the nozzle's flushing valve for the spraying system closed.



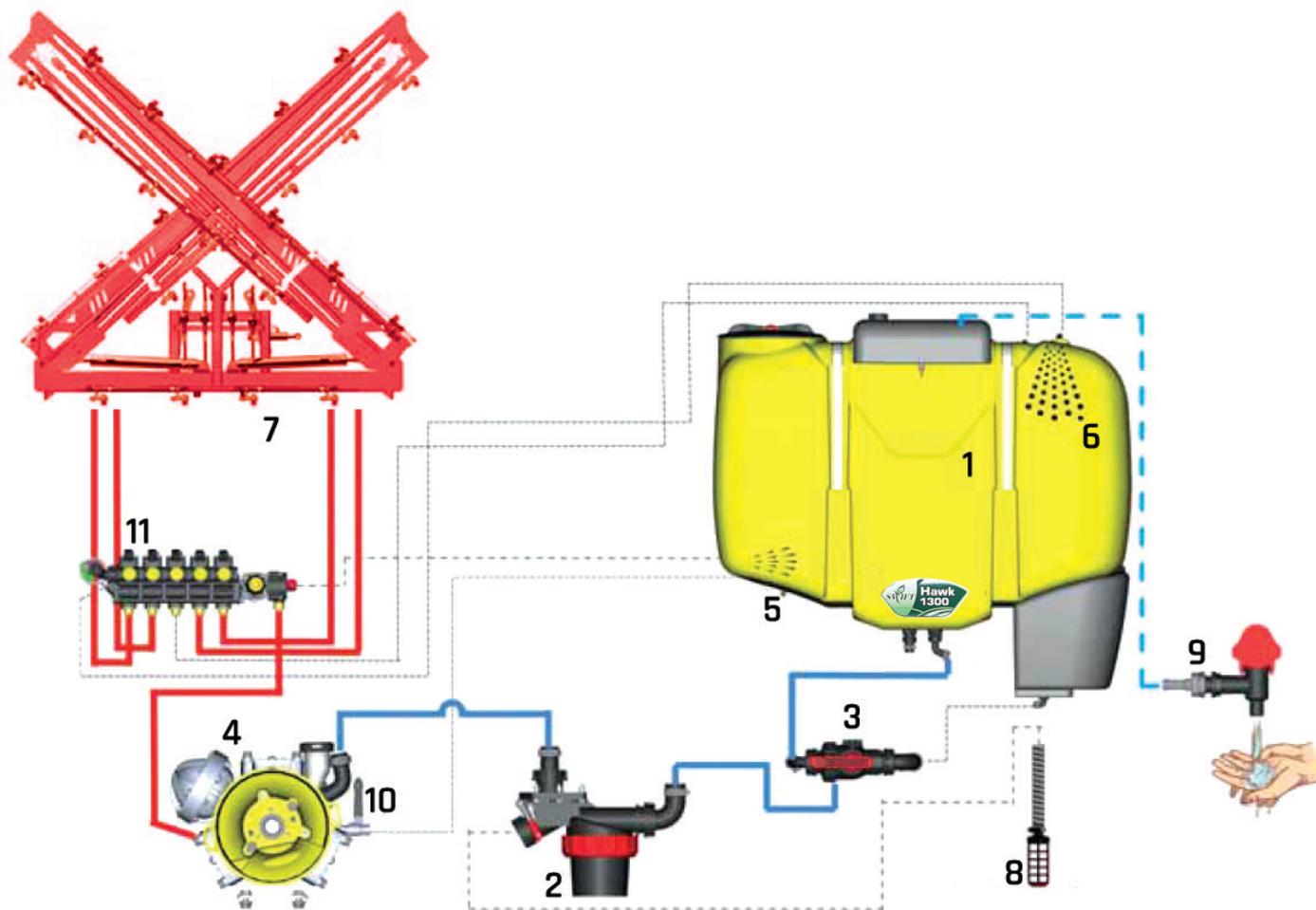
To immediately stop spraying, move the regulator's bypass lever to the tank return position.



Before beginning the spraying procedure, perform the spraying norm calculations (calibration).



### 3.4.3.2 (C) SPRAYING OPERATION WITH FPR CONTROL DIAGRAM



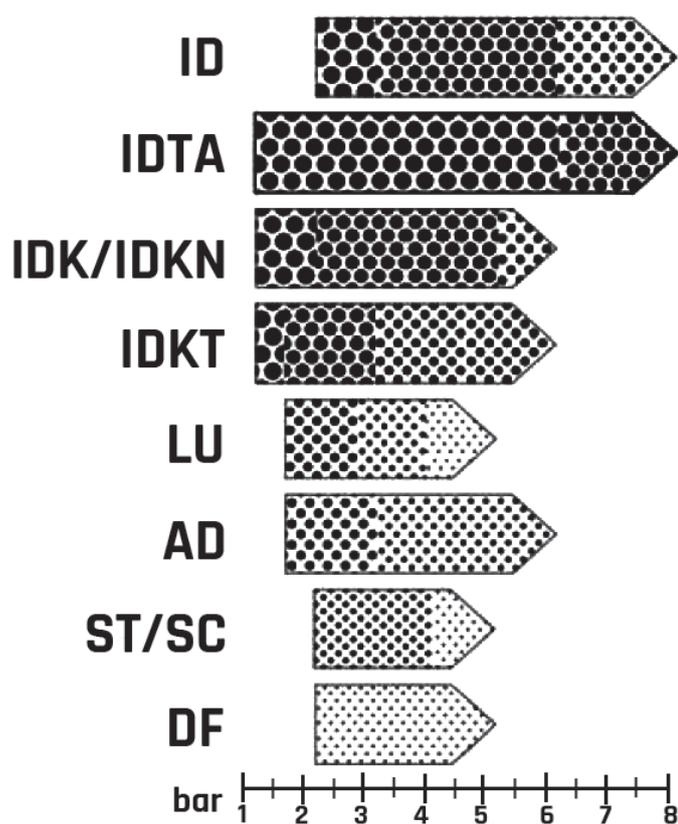
PRESSURE LINE  
 SUCTION LINE

NO	PART NAME
1	Tank
2	Filter Check Valve
3	3 Way Valve
4	Pump
5	Hydraulic Agitator
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Mixer Valve
11	Regulator

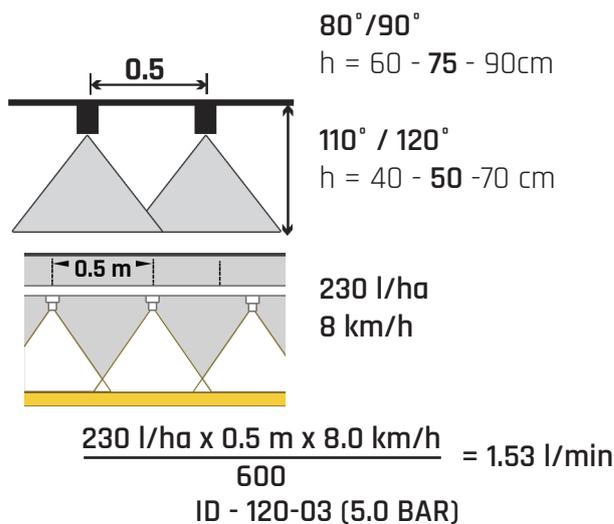


### 3.4.3.3 ADJUSTMENT OF SPRAYING NORM (FLOW)

Fan Beam Nozzle Norm Table



ID:	01-015:	3.0 - 4.0 - 8.0	bar
ID:	02-08:	2.0 - 4.0 - 8.0	bar
IDTA:	02-08:	1.0 - 4.0 - 8.0	bar
IDK:	01-03:	1.5 - 3.0 - 6.0	bar
IDK:	04-06:	1.0 - 3.0 - 6.0	bar
IDKN:	03-04:	1.0 - 3.0 - 6.0	bar
IDKT:	015-025	1.5 - 3.0 - 6.0	bar
IDKT:	03-06	1.0 - 3.0 - 6.0	bar
LU:		1.5 - 2.5 - 5.0	bar
AD:		1.5 - 3.0 - 6.0	bar
ST/SC/DF:		2.0 - 3.0 - 5.0	bar



60 SEC. = 6.0 KM/H  
45 SEC = 8.0 KM/H  
36 SEC = 10.0 KM/H



### NORM CALCULATION / CALIBRATION

Nozzle	Bar	l/min	480.5m la/h									
			5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	16.0 km/h	20.0 km/h	25.0 km/h	30.0 km/h
<b>-01 ID (60M) IDK LU ST (80M)</b>	1.5	0.28	67	56	48	42	34	28	21	17	13	11
	2.0	0.32	77	64	55	48	38	32	24	19	15	13
	2.5	0.36	86	72	62	54	43	36	27	22	17	14
	3.0	0.39	94	78	67	59	47	39	29	23	19	16
	3.5	0.42	101	84	72	63	50	42	32	25	20	17
	4.0	0.45	108	90	77	68	54	45	34	27	22	18
	4.5	0.48	115	96	82	72	58	48	36	29	23	19
	5.0	0.51	122	102	87	77	61	51	38	31	24	20
	6.0	0.55	132	110	94	83	66	55	41	33	26	22
	7.0	0.60	144	120	103	90	72	60	45	36	29	24
8.0	0.64	154	128	110	96	77	64	48	38	31	26	
<b>015 ID IDK (60M) IDKT LU AD ST (80M)</b>	1.5	0.42	101	84	72	63	50	42	32	25	20	17
	2.0	0.48	115	96	82	72	58	48	36	29	23	19
	2.5	0.54	130	108	93	81	65	54	41	32	26	22
	3.0	0.59	142	118	101	89	71	59	44	35	28	24
	3.5	0.63	151	126	108	95	76	63	47	38	30	25
	4.0	0.68	163	136	117	102	82	68	51	41	33	27
	4.5	0.72	173	144	123	108	86	72	54	43	35	29
	5.0	0.76	182	152	130	114	91	76	57	46	36	30
	6.0	0.83	199	166	142	125	100	83	62	50	40	33
	7.0	0.90	216	180	154	135	108	90	68	54	43	36
8.0	0.96	230	192	165	144	115	96	72	58	46	38	
<b>-02 ID IDK LU/AD ST (60M) IDKT IDTA DF (80M)</b>	1.0	0.46	110	92	79	69	55	46	38	25	22	18
	1.5	0.56	164	112	96	84	67	56	42	34	27	22
	2.0	0.65	156	130	111	98	78	65	49	39	31	26
	2.5	0.73	175	146	125	110	88	73	55	44	35	29
	3.0	0.80	192	160	137	120	96	80	60	48	38	32
	3.5	0.86	206	172	147	129	103	86	65	52	41	34
	4.0	0.92	221	184	158	138	110	92	69	55	44	37
	4.5	0.98	235	196	168	147	118	98	74	59	47	39
	5.0	1.03	247	206	177	155	124	103	77	62	49	41
	6.0	1.13	271	226	194	170	136	113	85	68	54	45
7.0	1.22	293	244	209	183	146	122	92	73	59	49	
8.0	1.30	312	260	223	195	156	130	98	78	62	52	
<b>-025 ID IDTA IDK IDKT LU SC (60M)</b>	1.0	0.57	137	114	98	86	68	57	43	34	27	23
	1.5	0.70	168	140	120	105	84	70	53	42	34	28
	2.0	0.81	194	162	139	122	97	81	61	49	39	32
	2.5	0.91	218	182	156	137	109	91	68	55	44	36
	3.0	0.99	238	198	170	149	119	99	74	59	48	40
	3.5	1.07	257	214	183	161	128	107	80	64	51	43
	4.0	1.15	276	230	197	173	138	115	86	69	55	46
	4.5	1.22	293	244	209	183	146	122	92	73	59	49
	5.0	1.28	307	256	219	192	154	128	96	77	61	51
	6.0	1.40	336	280	240	210	168	140	105	84	67	56
7.0	1.52	365	304	261	228	182	152	114	91	73	61	
8.0	1.62	389	324	278	243	194	162	122	97	78	65	

$$2 \times l/ha^{0.5M} = l/ha^{0.25}$$



### NORM CALCULATION / CALIBRATION

Nozzle	Bar	l/min	0.5 m la / h									
			5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	16.0 km/h	20.0 km/h	25.0 km/h	30.0 km/h
<b>-03 ID IDTA IDK/IDKN IDKT LU AD/ST SC (60M) DF (80M)</b>	1.0	0.69	166	138	118	104	83	69	52	41	33	28
	1.5	0.84	202	168	144	126	101	84	63	50	40	34
	2.0	0.97	233	194	166	145	116	97	73	58	47	39
	2.5	1.08	259	216	185	162	130	108	81	65	52	43
	3.0	1.19	286	238	204	179	143	119	89	71	57	48
	3.5	1.28	307	256	219	192	154	128	96	77	61	51
	4.0	1.37	329	274	235	206	164	137	103	82	66	55
	4.5	1.46	350	292	250	219	175	146	110	88	70	58
	5.0	1.53	367	306	262	230	184	153	115	92	73	61
	6.0	1.68	403	336	288	252	202	168	125	101	81	67
<b>-04 ID IDTA IDK/IDKN IDKT LU AD ST/SC DF (60M)</b>	1.0	0.91	218	182	156	137	109	91	68	55	44	36
	1.5	1.04	269	224	192	168	134	112	84	67	54	45
	2.0	1.29	310	258	221	194	155	129	97	77	62	52
	2.5	1.44	346	288	247	216	173	144	108	86	69	58
	3.0	1.58	379	316	271	237	190	158	119	95	76	63
	3.5	1.71	410	342	293	257	205	171	128	103	82	68
	4.0	1.82	437	364	312	273	218	182	137	109	87	73
	5.0	2.04	490	408	350	306	245	204	153	122	98	82
	6.0	2.23	535	446	382	335	268	223	167	134	107	89
	7.0	2.41	578	482	413	362	289	241	181	145	116	96
<b>-05 ID IDK LU ST/SC (25M) IDTA IDKT DF (60M)</b>	1.0	1.14	274	228	195	171	137	114	86	68	55	46
	1.5	1.39	334	278	238	209	167	139	104	83	67	56
	2.0	1.61	386	322	276	242	193	161	121	97	77	64
	2.5	1.80	432	360	309	270	216	180	135	108	86	72
	3.0	1.97	473	394	338	296	236	197	148	118	95	79
	3.5	2.13	511	426	365	320	256	213	160	128	102	85
	4.0	2.28	547	456	391	342	274	228	171	137	109	91
	5.0	2.55	612	510	437	383	306	255	191	153	122	102
	6.0	2.79	670	558	478	419	335	279	209	167	134	112
	7.0	3.01	722	602	516	452	361	301	226	181	144	120
<b>-05 ID IDK LU ST/SC (25M) IDTA IDKT DF (60M)</b>	1.0	1.36	326	272	233	204	163	136	102	82	65	54
	1.5	1.67	401	334	286	251	200	167	125	100	80	67
	2.0	1.93	463	386	331	290	232	193	145	116	93	77
	2.5	2.16	518	432	370	324	259	216	162	130	104	86
	3.0	2.36	566	472	405	354	283	236	177	142	113	94
	3.5	2.55	612	510	437	383	306	255	191	153	122	102
	4.0	2.73	655	546	468	410	328	273	205	164	131	109
	5.0	3.03	732	610	523	458	366	305	229	183	145	122
	6.0	3.34	802	668	573	501	401	334	251	200	160	134
	7.0	3.61	866	722	619	542	433	361	271	217	173	144
8.0	3.86	926	772	662	579	463	386	290	232	185	154	

$l/ha = -04 \times 2$



### NORM CALCULATION/CALIBRATION

Nozzle	Bar	l/min	0.5 m la / h									
			5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	16.0 km/h	20.0 km/h	25.0 km/h	30.0 km/h
-03 ID IDTA IDK/IDKN IDKT LU AD/ST SC (60M) DF (80M)	1.0	0.69	166	138	<b>118</b>	104	83	69	52	41	33	28
	1.5	0.84	202	168	<b>144</b>	126	101	84	63	50	40	34
	2.0	0.97	233	194	<b>166</b>	146	116	97	73	58	47	39
	2.5	1.08	259	216	<b>185</b>	162	130	108	81	65	52	43
	3.0	1.19	286	238	<b>204</b>	179	143	119	89	71	57	48
	3.5	1.28	307	256	<b>219</b>	192	154	128	96	77	61	51
	4.0	1.37	329	274	<b>235</b>	206	164	137	103	82	66	55
	<b>4.5</b>	<b>1.46</b>	<b>350</b>	<b>292</b>	<b>250</b>	219	175	146	110	88	70	58
	5.0	1.53	367	306	262	230	184	153	115	92	73	61
	6.0	1.68	403	336	288	252	202	168	126	101	81	67
	7.0	1.81	434	362	310	272	217	181	136	109	87	72
8.0	1.94	466	388	333	291	233	194	146	116	93	78	

**Example :**

In the table above if 250 liters of product will be sprayed on 1 hectare area with the blue nozzle number 03. The tractor would move with a constant speed of 7 km / h, the product solution pressure is adjusted to 4.5 bar, 250lt of product would be applied.

- Q = Total flow (l / min)
- N = Norm (l / ha)
- V = Tractor speed (km / h)
- B = Working width (m)
- q = 1 nozzle flow (l / min)

With our 10 m working width and 50 cm between 2 nozzles machine, we want to spray 250 lt of chemical solution to 1 hectare area , we will calculate the tractor advance speed.

Nozzle number :  
 working width / distance between nozzles =  
 10 / 0,5 = 20 nozzles.

Blue nozzle 03 at 4,5 bar sprays 1 46 l / min chemical solution (according to the table), let's first find the total flow rate :

Q= nozzle number x q = 20 x 1,46 = 29,2 l / dk

Formule : V = Q x 600 / N x B yani ;

Total advance speed = Flowx 600 /norm x working width

V= 29 ,2 x 600 /250 x 10

V= 17520/2500 = 7 km/h

(the same value as the value in the table is found)

**Example :**

Weed control will be made in cereals. The number of nozzles of the sprayer to be used is 20 and distance between two nozzles is 0.5 m. 400 liters per hectare (400 liters / hectare) chemical solution is to be given. In this case, what should be the working speed of the sprayer? (1 hectare = 10 decares)

**Solution :**

First of all, the working width of the machine is found by multiplying the number of nozzles by the distance between two nozzles .

**working width = number of nozzles x distance between two nozzles**

$$W = 20 \times 0.5 = 10 \text{ m}$$

The pressure of the nozzles is set to blow the chemical in a well-balanced and adequate way. By placing a measuring cup under the nozzles run the machine for one minute with the tractor PTO shaft to be 540 rev / min.

**Total flow = one nozzle's flow x nozzle number**

$$T.F = 2.4 \times 20 = 48 \text{ lt min}$$

The required speed is found as follows :

$$\begin{aligned} \text{Progress speed (km/h)} &= \frac{600 \text{ (fixed number)} \times \text{total flow rate (l/min)} / \text{product}}{\text{norm (litre / hectare)} \times \text{working width (m)}} \\ \text{Progress speed (km/h)} &= \frac{600 \times 48}{400 \times 10} \\ \text{Progress speed (km/h)} &= 7.2 \text{ km / h} \end{aligned}$$



## PRODUCT NORM TABLE FOR CONICAL BRASS NOZZLES

Plate Hole Diameter (mm) *	Working Speed (km/h)	Pressure (bar)	Average FLOW (lt / mim) **	Spraying Norm (lt / da)
1.2	5	4	0.44	19.44
1.2	6	4	0.44	16.2
1.2	7	4	0.44	13.89
1.2	8	4	0.44	12.15
1.2	10	4	0.44	9.72
1.2	14	4	0.44	6.94
1.2	16	4	0.44	6.08
1.2	18	4	0.44	5.4
1.2	5	6	0.93	22.32
1.2	6	6	0.93	18.6
1.2	7	6	0.93	15.94
1.2	8	6	0.93	13.95
1.2	10	6	0.93	11.16
1.2	12	6	0.93	9.3
1.2	14	6	0.93	7.97
1.2	16	6	0.93	6.98
1.2	18	6	0.93	6.2
1.2	5	8	1.1	26.4
1.2	6	8	1.1	22
1.2	7	8	1.1	18.56
1.2	8	8	1.1	16.5
1.2	10	8	1.1	13.2
1.2	12	8	1.1	11
1.2	14	8	1.1	9.43
1.2	16	8	1.1	8.25
1.2	18	8	1.1	7.33

\* It is the plate hole diameter for the nozzle used in standard booms.

\*\* It is the average flow rate measured approximatively from one nozzle.

**Example:**

$$N = Q \times 60 / V \times B$$

$$Q = q \times n$$

$$B = \text{distance between two nozzles} \times n$$

SYMBOL	EXPLANATION	UNIT
N	Chemical norm	Lt/da
Q	Total chemical disposed per unit time	Lt/min
n	Nozzle number	
B	Working width	m
q	Average flow of one nozzle	Lt/min
V	Tractor Speed	Km/h

**For example:**

16 nozzle at 10 bar nozzle pressure (not to be confused with regulator pressure) tractor speed rate 5.4 km/h, distance between nozzle 50cm = 0.5 m, with a conical beam of 1.2 mm hole diameter and 0.86 lt / flow rate be taken from the nozzle. According to the given let's find the norm of the spraying liquid to be applied per hectare.

$$q : 0.86 \text{ lt /min} \quad n: 16$$

$$Q = 0.86 \times 16 = 13.76 \text{ lt /min}$$

$$v: 5.4 \text{ km/h}$$

$$B: 16 \times 50 \text{cm} = 800 \text{cm} = 8 \text{ metre}$$

$$N = 13.76 \times 60 / 8 \times 5.4 \quad N = 19.10 \text{ lt /da}$$

As it can be understood from the formula above, 19,10 liters of liquid per hectare is applied by a machine with 16 nozzles and driven by a tractor at a speed of 5.4 km/h under a pressure of 10 atmospheres.

If you want to apply 60 liters of liquid per hectare, and not 19,10lt/da here's what to do. No need to change the pressure, nozzle number and working width, what we will do is adjust the tractor's speed.

$$V = Q \times 60 / N \times B$$

$$V = 13.76 \times 60 / 60 \times 8$$

$$V = 1.72 \text{ km/ h}$$

Note: Tractor speed is provided from the tractor's indicator.



By placing a measuring cup under the nozzles, run the machine for one minute under 10 Bar pressure with the tractor PTO shaft to be 540 rev / min. The average quantity of liquid expelled from each nozzle is measured and the above formula is applied.



### 3.4.4 TANK WASHING

#### 3.4.4 (A) WITH OSR CONTROLLER

1. Connect the equipment and transmission shaft to the tractor as described in the operator's manual.
2. Start your tractor and run the PTO.
3. Switch the 3-way valve in the suction line to the washing tank position. (Figure 68)
4. You can start system flushing process by turning on the valve to the system wash nozzle from your regulator. (Figure 69).



You can wash the nozzles and the spraying pipes by opening the valves from your regulator to the booms.



Figure 68

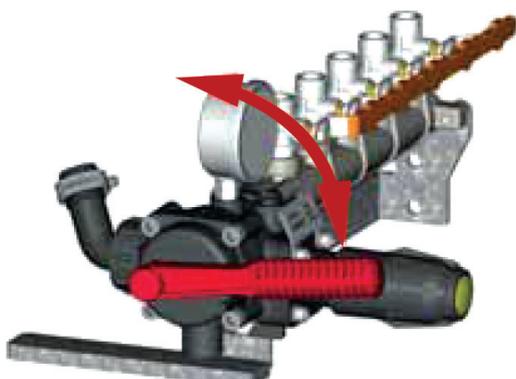


Figure 69

#### 3.4.4 (B) WITH FPR CONTROL

1. Connect the equipment and transmission shaft to the tractor as described in the operator's manual.
2. Start your tractor and run the PTO.
3. Switch the 3-way valve in the suction line to the washing tank position.
4. Make sure that the by-pass of regulator is in the regulator input lever position. (Figure 70)
5. You can start system flushing process by turning on the valve to the system wash nozzle from your regulator.



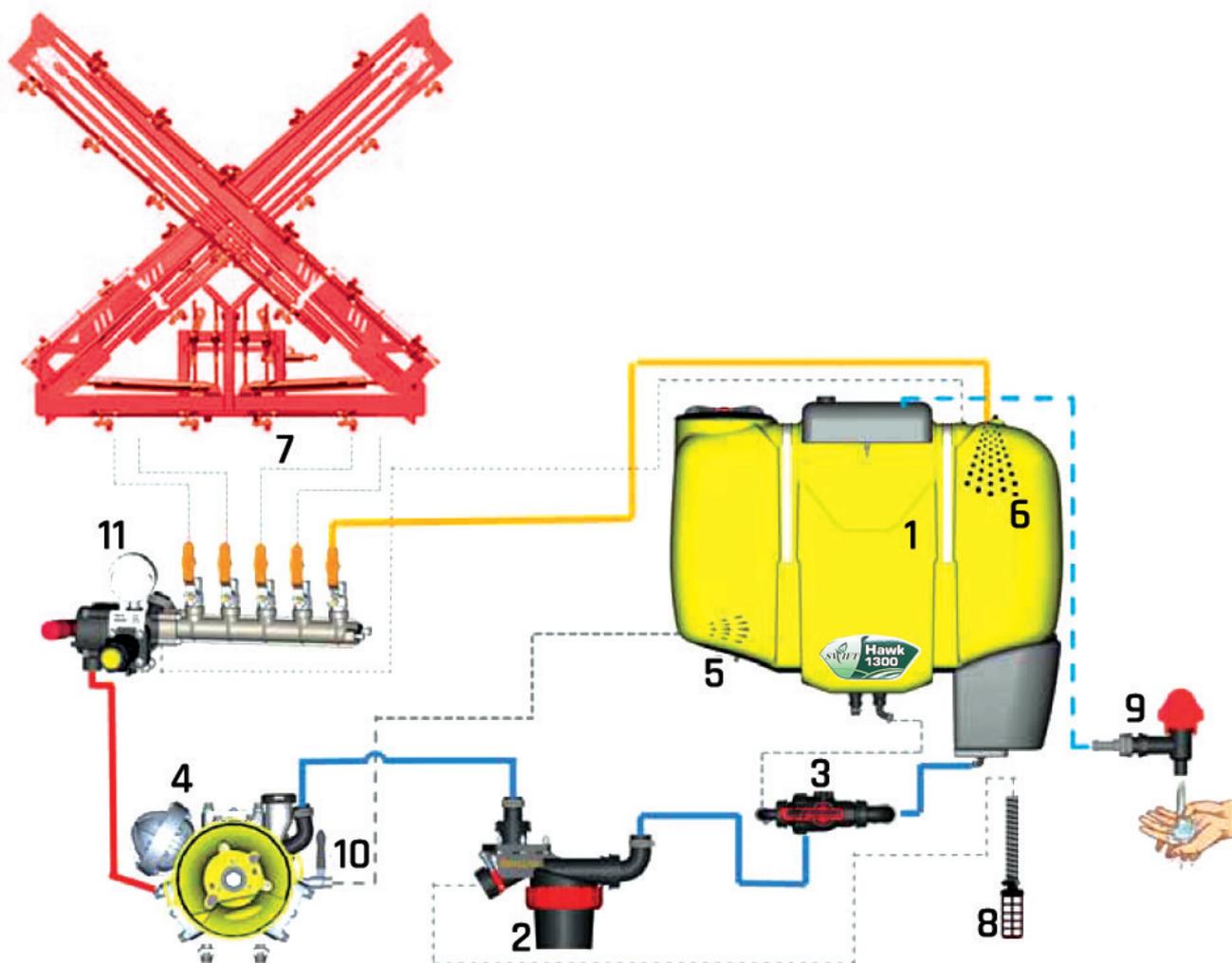
You can wash the nozzles and the spraying pipes by opening the valves from your regulator to the booms.



Figure 70



### 3.4.4 (D) TANK WASHING WITH OSR CONTROL DIAGRAM

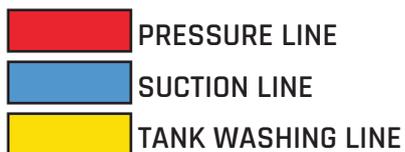
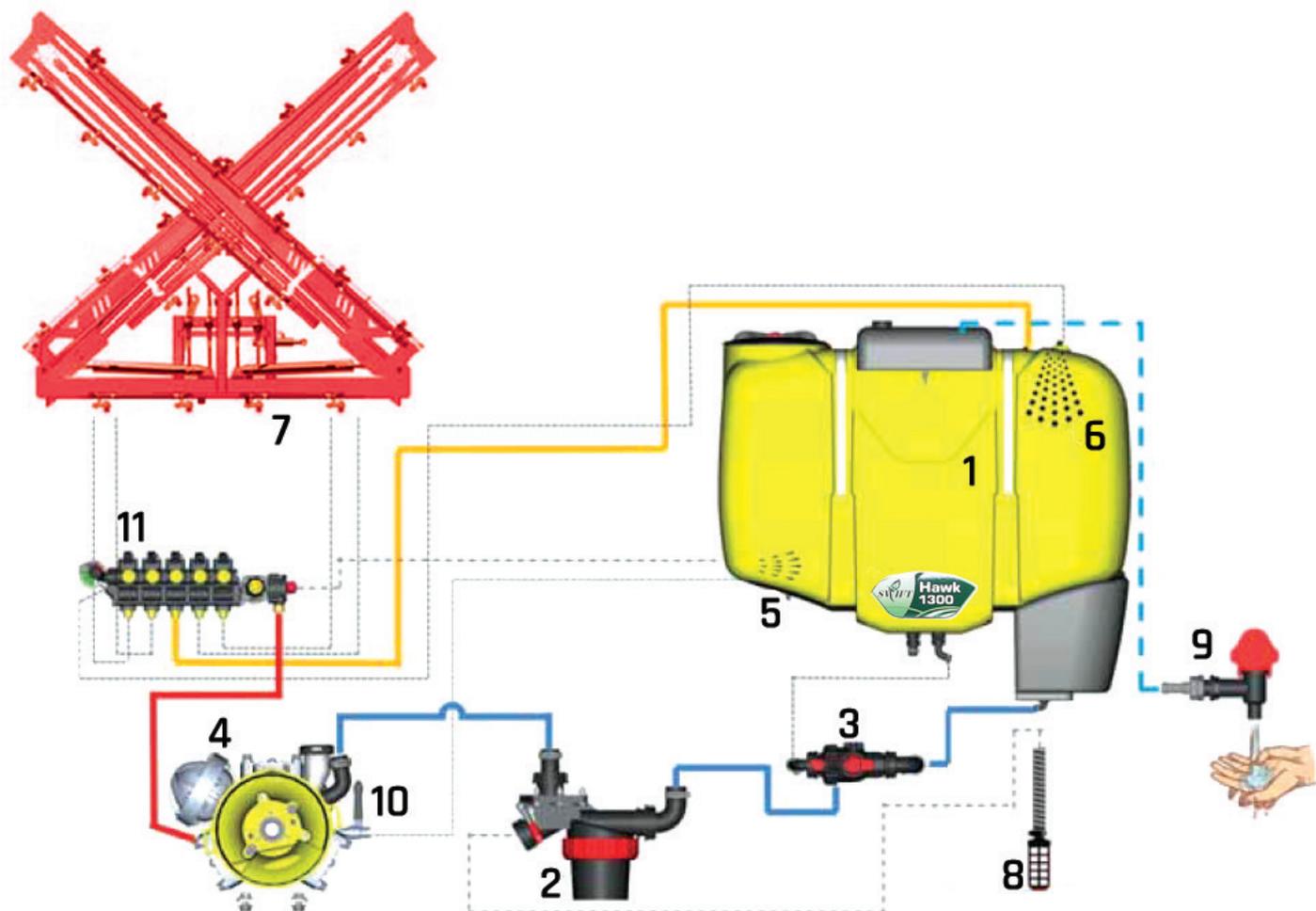


- PRESSURE LINE
- SUCTION LINE
- TANK WASHING LINE

NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Hydraulic Agitator
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Mixer Valve
11	Regulator



### 3.4.4 (E) TANK WASHING WITH FPR CONTROL DIAGRAM



NO	PART NAME
1	Tank
2	Filter
3	3 Way Valve
4	Pump
5	Hydraulic Agitator
6	Tank Washing
7	Boom
8	External Suction Hose
9	Hand washing
10	Mixer Valve
11	Regulator



### 3.4.5 TANK EMPTYING

Tank emptying can be done in 2 ways:

1. By adjusting the spraying process on the pressure line, you can empty the tank with the pump's pressure.
2. You can empty the remaining solution in the tank by opening the bottom plug or by opening the bottom valve.



Before starting the emptying of the product, take all necessary measure to prevent poisoning humans, animals and the environment.

Especially:

- To avoid direct contact with body parts, specially wounds, wear protective clothes.
- To protect your face, head and hands wear personal protective equipment, rubber gloves, dust proof mask, goggles, and a helmet.
- Do not use equipment that is not in perfect condition especially gas mask and check the condition of the cabin filters.



In case of accidental contact of the product or mixture with the skin, clean your skin immediately with clean water. Seek immediate medical assistance in case of illness.

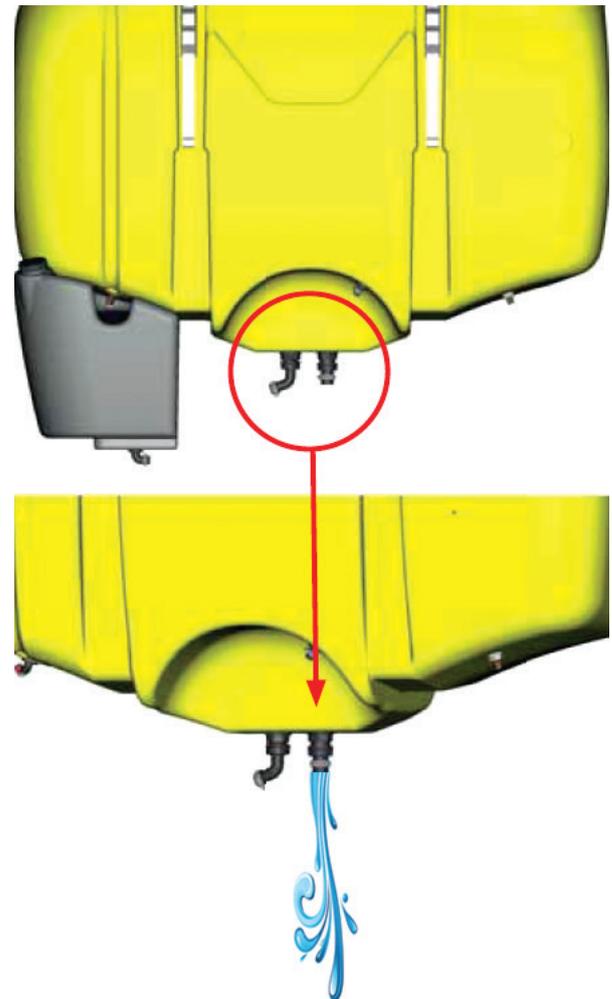


Figure 71



### 3.4.6 SEPARATING THE MACHINE FROM THE TRACTOR



Separation process of the machine from the tractor is very dangerous and caution is required. Carefully read and follow the instructions below.

The machine tank can be placed on the ground when empty. Choose a smooth and horizontal surface for a proper separation.

1. Move the machine slowly until it has fully reached the ground.
2. Detach the P.T.O shaft from the tractor and hang it on its hanger.
3. Disconnect the hydraulic hoses from the tractor and fit the covers of the couplings.
4. Loosen up the middle pin and disconnect the three-point hitch from connection points.



### 3.5 CLEANING AND MAINTENANCE

#### Safe Maintenance

While performing the maintenance operations, be sure to put on the following clothes.



Before starting maintenance and cleaning operations, first disable the PTO shaft, stop the engine's motor, pull the handbrake and place the correct size wedge or stone under the wheels.

To avoid danger, for your machine assembly, maintenance, cleaning, etc. when you lift it you must place some stand legs.

#### 3.5.1 DAILY MAINTENANCE

Before starting to work:

1. Check and clean your machine's filters.
2. Pump oil level should be checked. Oil is added if it is below the specified limit.
3. Bolt, nut, elbow and clamps must be checked.
4. Check the spraying nozzles (the number of nozzles, laxity, congestion etc...).
5. Lubricate the tractor shaft.

#### 3.5.2 INTERMEDIATE MAINTENANCE

1. If you are not going to use your machine for a while in spraying season, you should do these maintenance.
2. Check and clean your machine's filters.
3. Wash the inside of the tank. Fill the machine with a certain amount of water and run it, water will pass through the nozzles and clean so that no product residue remains in the tank and system.

#### 3.5.3 SPRAYING SEASON END AND WINTER MAINTENANCE

1. Wash the machine completely.
2. Fill the tank with water and run the machine to clean it in such a way that there is no product residue remained in the tank, the pump, the pipes, the nozzles and all the other parts of the machine.
3. To prevent freezing in winter water should not be left into the machine and the pump. before the freezing reaches the pump apply antifreeze fluid, otherwise the pump may be damaged.

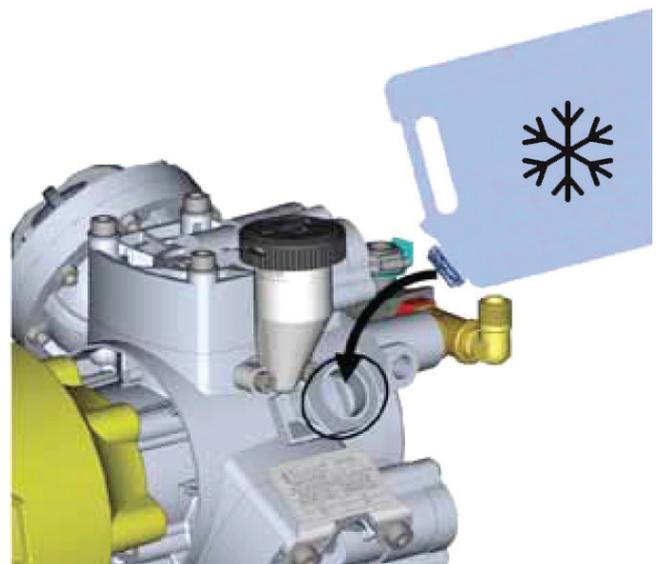


Figure 72  
Adding Antifreeze to the pump

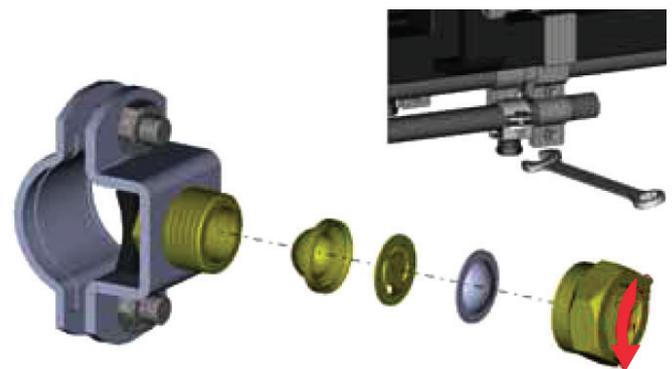


### 3.5.4 WORK END CLEANING

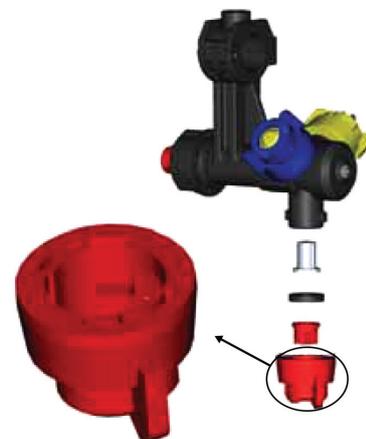
1. Do not run the machine when there is no water in the tank.
2. Wash all filters with clean water. Wash the filters by removing the nuts with the filter wrench provided with the machine.
3. Check the filter of the filling suction hose. By removing the nozzle filters on the spray arms, wash them in plenty of water. Nozzle filter is multi-valve, it does not drip. (For fan beam type).
4. Clean the joints of the transmission shaft and lubricate the grease points.
5. In order to keep the pump safe, water should not be left into it during winter. For this, turning the crankshaft would be is enough. Also, antifreeze should be added to avoid freezing.
6. It is very important to lubricate the pump. You have to change the pump's oil every 150 hours of work or at the end of every farming season. To drain the oil, remove the drain plug at the bottom of the pump. Open the cap of the oil bottle and turn the crank by hand until the oil is drained. Fill up the oil bottle with approx. 1 liter 20-50W engine oil. While doing this process, turn the crank left and right so that no air is trapped inside the pump. You should continue this process until you get bubble-free oil .
7. Since the parts of the pump that come into contact with the product are made of durable material , no need to disassemble or change parts except for simple maintenance.
8. Bolts, nuts, elbows, clamps on the machine and nozzles should be checked. If there is any of them missing or loose the necessary should be done. The inside of the tank should be washed. Fill the machine with a certain amount of water and run it, water will pass through the nozzles for a while and clean so that no product residue remains in the tank and system.



**Figure 70**  
Tank Outlet Filter Removal



**Figure 74**  
Conical jet nozzle removal and conical nozzle brass nozzle parts.



**Figure 75**  
Fan nozzle removal and cleaning



### 3.5.5 MACHINE STORAGE

- Check the connections on the machine, keep your machine in a suitable place covered by a protective cover.
- Never leave water into the pump during winter in order to protect it.
- To protect the pump from moisture and rust be careful that it does not touch the ground.
- After washing the pump with water, put antifreeze and run the pump to allow the antifreeze to flow into it.

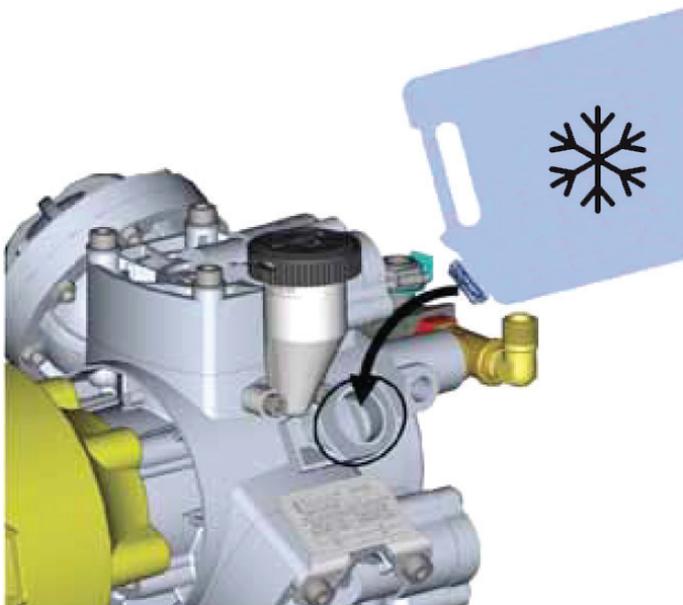


Figure 76  
Fill pump with anti-freeze



## 4.0 FAULT PROBLEMS AND SOLUTIONS

### PROBLEMS THAT MAY OCCUR DURING THE OPERATION OF THE SPRAYER, CAUSES AND RECOMMENDATIONS

PROBLEM/TROUBLE	CAUSES	RECOMMENDATIONS
The pump does not draw water or draws less water.	<ol style="list-style-type: none"> <li>1. Filler nozzle clogged.</li> <li>2. Filling hose filter clogged.</li> <li>3. Problem coming from the suction line.</li> <li>4. Filler valve closed.</li> <li>5. Filling suction hose worn</li> <li>6. Regulator pressure not set or may be low. (may vary by machine )</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean the filler nozzle</li> <li>2. Remove the filter at the end of the filling hose, clean and fix it again.</li> <li>3. Check the suction hose clamps, elbows and the o-rings, tighten the loose ones.</li> <li>4. Open the filler valve.</li> <li>5. Replace the filling suction hose or check the o-rings and clamps.</li> <li>6. Regulator pressure should be adjusted. Pressure should be raised if low.</li> </ol>
The pump is working noisily.	<ol style="list-style-type: none"> <li>1. Pump oil level too low</li> <li>2. Valve's o-rings are worn</li> <li>3. Loose bolt and nuts.</li> <li>4. The pump may be getting air from the inlet connections.</li> <li>5. Pump suction filter blocked.</li> <li>6. pump valves broken or dirty etc. material may have clogged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Oil filling must be done by looking at the mark level on the oil bottle.</li> <li>2. Valve o-rings should be changed.</li> <li>3. Check the bolts and nuts and tight the loosened ones or replace if they are broken.</li> <li>4. The filter should be cleaned by removing the filter cover.</li> <li>5. Open the valve cover and change the damaged valves, or clean the blocked ones and ....</li> </ol>
If the pump's oil is decreasing or if oily water comes out.	<ol style="list-style-type: none"> <li>1. Membrane ruptured.</li> <li>2. Oil gaskets burst or may leak</li> </ol>	<ol style="list-style-type: none"> <li>3. Drain the pump's oil and dismantle the covers, replace the ruptured membrane with a new one. It should be filled with 20-50W oil as much as it can take, go to the nearest service.</li> <li>4. Check the oil gaskets, if necessary, change them with new ones.</li> </ol>
Spraying arms nozzles don't spray, pressure is low or under the required.	<ol style="list-style-type: none"> <li>1. Nozzle filter or plate blocked.</li> <li>2. Filler or mixer tap open.</li> <li>3. Tank outlet filter blocked..</li> </ol>	<ol style="list-style-type: none"> <li>1. The nozzle cap, the filter and its plate. should be cleaned and replaced if necessary.</li> <li>2. Turn off the filler or mixer tap. (without sharing power from the pump, almost all the power should be given to the arms).</li> <li>3. Clean the tank outlet filter. (Note: The cleaning process should absolutely not be done by blowing with the mouth .It should be done by holding water or air).</li> </ol>



## 4.0 FAULT PROBLEMS AND SOLUTIONS

### PROBLEMS THAT MAY OCCUR DURING THE OPERATION OF THE SPRAYER, CAUSES AND RECOMMENDATIONS

PROBLEM/TROUBLE	CAUSES	RECOMMENDATIONS
Water leakage in the pressure hose connections.	<ol style="list-style-type: none"> <li>1. Hose seals worn.</li> <li>2. Loose joint.</li> </ol>	<ol style="list-style-type: none"> <li>1. Worn seals must be replaced</li> <li>2. Loose parts should be tightened</li> </ol>
Manometer shows a different pressure value from the initial value	<ol style="list-style-type: none"> <li>1. Manometer is defective.</li> <li>2. The suction strainer is dirty.</li> <li>3. Nozzle holes enlarged.</li> <li>4. Regulator pressure wedge worn.</li> </ol>	<ol style="list-style-type: none"> <li>1. The manometer should be changed</li> <li>2. The strainer must be cleaned.</li> <li>3. Check nozzles and replace as necessary</li> <li>4. Replace the wedge.</li> </ol>
Hydraulic lift system not working, arm can not be set at enough height level or moving slower than the way it should be.	<ol style="list-style-type: none"> <li>1. The hydraulic hoses from the machine to the tractor hydraulic output are not connected.</li> <li>2. Tractor hydraulic system oil level dropped.</li> <li>3. hydraulic hose joints loose, hose frayed</li> </ol>	<ol style="list-style-type: none"> <li>1. Machine hydraulic hoses must be connected to tractor hydraulic outputs.</li> <li>2. Tractor hydraulic system should be refilled with oil.</li> <li>3. Loosening deteriorating joints or hoses must be changed.</li> </ol>
Manometer shakes a lot.	<ol style="list-style-type: none"> <li>1. It is taking air from the suction circuit or the air has not been completely evacuated from the pump.</li> <li>2. It may be related to the pump valves.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the hose clamps and gaskets between the pump and filter.</li> <li>2. Check the valves.</li> </ol> <p>Note: When the machine is idling and the regulator is evacuating let the machine run for a moment so the air in the system can be evacuated.</p>
Water is pumped at low or no pressure.	<ol style="list-style-type: none"> <li>1. Regulator thrust block is worn.</li> <li>2. Manifold or another piece burst.</li> <li>3. Blockage in the pump suction line.</li> <li>4. Pump valves may be worn.</li> </ol>	<ol style="list-style-type: none"> <li>1. The pressure wedge should be changed.</li> <li>2. The parts that are cracked must be replaced.</li> <li>3. Filters must be cleaned.</li> <li>4. Replace worn valves.</li> </ol>









534 - 538 Cross Keys Rd., Cavan SA 5094  
email: [swiftmarketing@swiftagriculture.com](mailto:swiftmarketing@swiftagriculture.com)  
[www.swiftagriculture.com](http://www.swiftagriculture.com)