



## Operating Manual for danfoil AirBoss mounted sprayer

**danfoil**®



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# 1 Congratulations with your new danfoil field sprayer

Dear danfoil customer,

Congratulations with your new danfoil air sprayer. We are happy that you have chosen danfoil's unique spraying technology. Danfoil has always represented innovation within field sprayers, and with danfoil's technology you are ensured high capacity, low liquid consumption and better spray economy. As danfoils products must live up to our high expectations to quality we are confident that your new field sprayer will live up to your expectations and demands as well.

Our service team and resellers are at your disposal at all times in case you have any questions regarding your sprayer, want a service check or if you, against expectations, have any problems with your sprayer. We recommend that you at least every second year have a service check on your danfoil sprayer, so that it is always up-to-date and ready to be used.

In order for you to be able to capitalize on the advantages of your new danfoil sprayer from the beginning, it is important that you acquaint yourself with the construction of the sprayer, mode of operation, and settings.

Therefore we recommend you to read this instruction manual carefully before you start using the sprayer.

Also read the instruction manual applicable for the monitor, which is mounted on the sprayer

**Enjoy yourself**

## 2 EF declaration of conformity

### Manufacturer:

Company name: **danfoil a/s**  
Address: Jellingvej 14  
Postal address: 9230 Svenstrup J  
Country: Denmark  
Telephone: +45 98 67 42 33  
Fax: +45 98 67 34 88

Hereby declare that

### Machine:

Make: **danfoil**  
Type: EAB  
Serial number: EABXX/XXXX

Is in agreement with the regulations in RÅDETS DIREKTIV of 14. of June 1989 concerning mutual rapprochement of member states legislation about machines (89/392/EØF with later adjustments) with reference to the directives appendix I about significant security and health requirements regarding construction and production of machines.

Løgstør, the / 2011

**danfoil a/s**

Jesper S. Madsen  
Technical director

### 3 Machine data

#### 3.1 Machine Data of your new danfoil Sprayer

<b>Danfoil sprayer type</b>		<b>AirBoss</b>	
Maschine no.	<b>EABxx/0000</b>	Year of construction	<b>2011</b>
Matrix no.		E - number	
Working width:		<b>xx Meter</b>	
Number of sections:		<b>7</b>	
Suction filter typ	<b>Arag</b>	Width filter's meshes:	<b>0,500/Blue</b>
Pressure filter typ	<b>Arag</b>	Width filter's meshes:	<b>0,173/Red</b>
Tank filter typ	<b>Arag</b>	Width filter's meshes:	<b>0,980/Black</b>
Nozzle filter	<b>TeeJet</b>	Width filter's meshes:	<b>0,350/Red</b>
Technical residue:			
Pump typ/ output:		<b>Annovi/Reverberi AR 115</b>	
Sprayer computer type:		<b>danfoil PC-SprayController V1</b>	
Adjustment:		<b>Factory</b>	<b>Own</b>
Calibration number flow meter:			
Calibration number driving speed:			
Control speed:			

<b>Service weight</b>	<b>1.300 Kg</b>
<b>Weight total:</b>	<b>2.300 Kg</b>
<b>Authorized maximum speed</b>	<b>40 Km/H</b>

**Sound pressure level** on the driver's ear is far below the limiting value determined by the EN 1553 5.1 and D4. Thus, no ear protection is required.

### 3.2 Model Variants and Optional Extras of danfoil Field Sprayers:

5	4	3	2	1	Terms of component		
x	x	x	x	x	1,000 litre tank volume		Standard Equipment to AirBoss
x	x	x	x	x	1000 litre heated clean-water tank with boom flushing system		
x	x	x	x	x	15 litre clean water handbasin		
x	x	x	x	x	Rotary tank cleaner		
x	x	x	x	x	Secure filling		
x	x	x	x	x	Pressure and suction filter		
x	x	x	x	x	Overflow and backflow protection		
x	x	x	x	x	115 l/min. Diaphragm pump		
x	x	x	x	x	Hydraulic proportional driven fan		
					3 point linkage w. A-Frame quick coupler		
x	x	x	x	x	Pendulum boom suspension		
x	x	x	x	x	Boom tilt		
				x	5 numbers of section		
x	x	x	x		7 number of sections		
x	x	x	x	x	2 parted boom	Boom partition	
				x	15 Meter	Width of boom	
			x		18 Meter		
		x			20 Meter		
	x				21 Meter		
x					24 Meter		
x	x	x	x	x	Hydraulic height adjustment		
x	x	x	x	x	Hydraulic Folding/unfolding of boom		
x	x	x	x	x	Hydraulic Suspended parallel arms		
x	x	x	x	x	PC-SprayController v.1		
x	x	x	x	x	SC Joystick		
x	x	x	x	x	Hydr. pump station 70 l.	Optional Extras to AirBoss	
x	x	x	x	x	TrackControl – self tracking drawbar		
x	x	x	x	x	Flexible Extensions, Mechanic		
x	x	x	x	x	Flexible Extensions, Hydraulic		
x	x	x	x	x	Automativ levelling boom		
x	x	x	x	x	GPS Matrix 570G – and guidance computer		
x	x	x	x	x	High-pressure cleaner with hose reel		
x	x	x	x	x	Exterior washing equipment with hose reel		
x	x	x	x	x	Automatic filling equipment		
x	x	x	x	x	Working light, Hella LED		
x	x	x	x	x	Electronic windmeter		
x	x	x	x	x	Box for chemicals		
x	x	x	x	x	Hedgerow nozzle		
x	x	x	x	x	Equipment for liquid fertilizer		

### 3.3 Safety notes and warning signs



There must be no other personnel than the operator around the machine during operation



Risk of being wedged or pushed when staying under or next to the boom while folding in or out.



No folding of the boom while driving. Absolute caution to overhead power cables when folding the boom. Always maintain adequate distance



Danger of being wedged in. Never go over to the machine as long as the tractor engine is running.



Entering the tank is prohibited at any time. Poisonous vapours may cause intoxication



The machines must only be left on firm, sustainable surface and with an empty tank



Only dismantle the sprayer after Folding the telescopic outriggers out, both horizontal and vertically.



The sprayer must under no circumstances be lifted in points other than those designated.



Before operating the machinery the instruction manual must be read.



There is no requirement for hearing protection for the operator, as noise levels are far below the requirements in EN 1553 5.1 og D4.

### 3.4 Information plate

There is a CE identification plate mounted on the left side of the frame beside the stair. This state the producer, model, model number, year, and weight.



### 3.5 Transport on public road

When driving on public roads or other areas, where traffic law applies – or areas with specific rules and regulations regarding lights and markings on the vehicle, these rules must be complied and the vehicle must be equipped with lights etc. according to the rules.

### 3.6 Lifting points

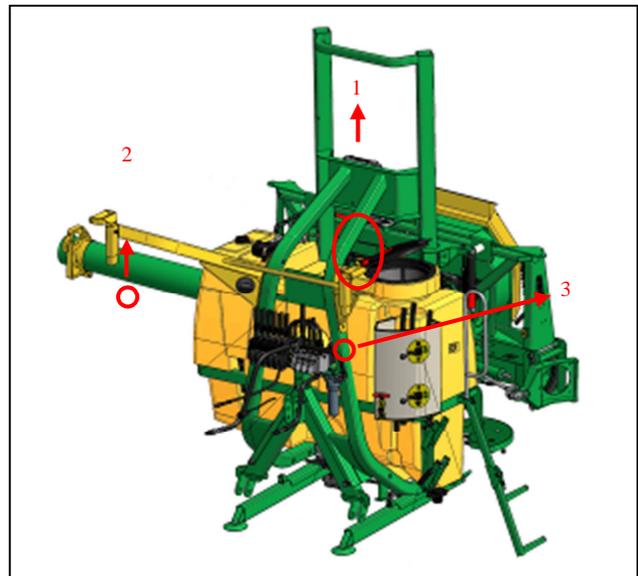
When lifting the sprayer with a crane the sprayer must be lifted in the designated lifting points as shown in the two pictures. Be aware that the sprayer must be lifted on both sides to give a homogeneous lift.

#### Lifting point 1:

Strap is attaches in tower between the two transverse chassis arms, as show in the picture to the right.

#### Lifting point 2 and 3:

The strap is attache don the right and left yellow boom support as show in the picture to the right.



**The sprayer must under no circumstances be lifted in points other than those designated.**

## 4 Connection procedures

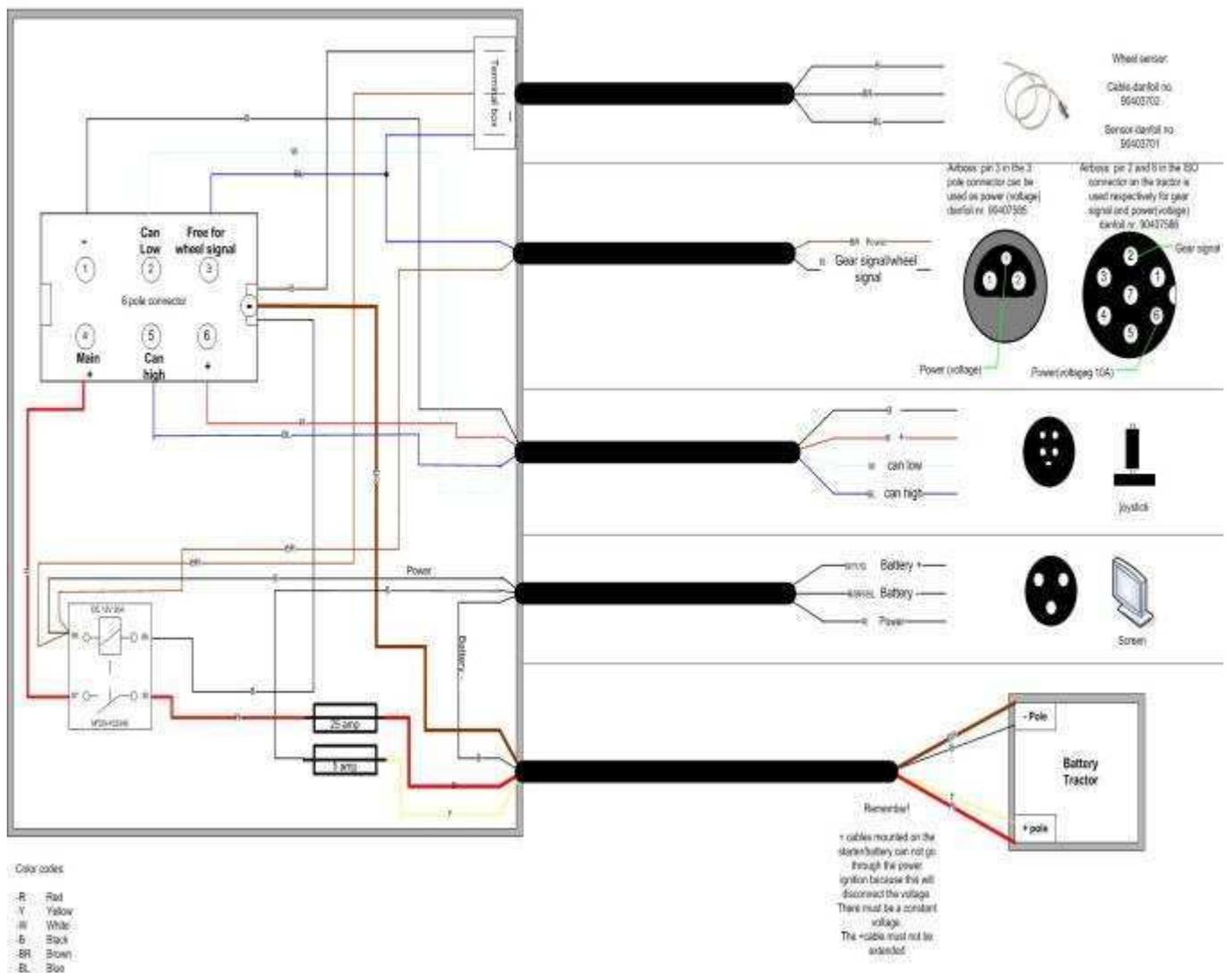


**BEFORE USING THE SPRAYER THIS CONNECTION PROCEDURE MUST BE GONE THROUGH. IF THE CONNECTION PROCEDURE IS NOT FOLLOWED THE WARRANTY IS INVALIDATED**

### 4.1 Connecting the power and control computer in the tractor

The table below shows the connection of power to the control computer and sensors in the tractor

Mounting kit tractor- standard



## 4.2 Connection of Load Sensing (LS)

A danfoil AirBoss Liftmounted sprayer is as standard equipped with LS proportional hydraulic which operates fan, pump, and all remote hydraulics.

### 4.2.1 AirBoss 15-24 meter 2-parted boom

The tractor must be supplied with a  $\frac{3}{4}$ " pressure free oil return flow directly in tank. For tractors with LS Load Sensing outlets this must be ready for use. The end-users tractor must be equipped with the following:

- LS Load Sensing hydraulic system
- $\frac{3}{4}$ " female return,  $\frac{1}{2}$ " female pressure
- $\frac{1}{4}$ " female LS signal
- All couplings must be of the same type as Farster NV

If the back-pressure exceeds 1 bar 1 unit of  $\frac{3}{8}$ " quick coupling type NV is installed for pressure free drain from the engine to the fan.

If the tractor cannot provide 80 ltr. oil/190 bars the sprayer must be equipped with a separate pump station. Danfoil a/s does not accept responsibility for altering the tractors hydraulic system

### 4.2.2 Tractors without LS-operation

If the tractor is not supplied with LS the system can be converted into an open center system, where an hydraulic oil cooler is installed subsequently. If the tractor cannot supply the needed amount of oil, see above, the sprayer can be delivered with a pump station, which is operated via the tractors PTO.

With back-pressure over one bar 1  $\frac{3}{8}$ " quick coupling type NV is installed subsequently for pressure free drain from the blower engine. Installation of the above mentioned equipment must be performed by danfoil a/s

## 4.3 Hydraulic hoses and couplings on sprayer

Danfoil AirBoss is as standard equipped with the following hoses and couplings:

1. LS signal cable  $\frac{1}{4}$ " quick coupling, male Type NV
2. Pressure P-cable  $\frac{1}{2}$ " quick coupling, male Type NV
3. Return T-cable  $\frac{3}{4}$ " quick coupling, male Type NV



## 4.4 Preparation of LS hydraulic on tractor

The tractor must be equipped with following hydraulic couplings:

1. LS signal cable ¼" quick coupling, female Type NV
2. Pressure P-cable ½" quick coupling, female Type NV
3. Retrunk T-cable ¾" quick coupling, female Type NV



**When dismantling and attaching hydraulic hoses the tractor's engine must be stopped**

### 4.4.1 Test of oil flow

At 190 bars the tractor must produce min. 70 litres per minute

### 4.4.2 Test of back-pressure

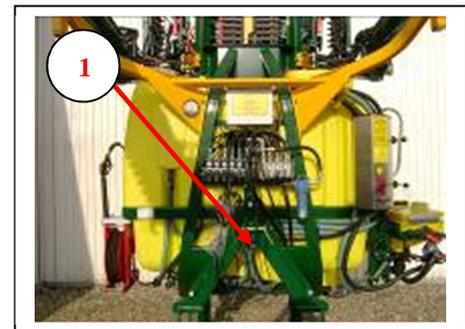
If the back-pressure exceeds 1 bar then 1 3/8" quick coupling type NV is installed subsequently for pressure free drain from the engine to the fan.

## 4.5 Mounting the sprayer on the tractor

The sprayer is mounted in the tractors three-point suspension, crossbar is placed in the top hole of the triangle and the A-frames (1) bottom hole. It must be adjusted so that the sprayer is hanging horizontally in working position – seen from behind and from the side. This ensure optimal displacement of lift.

It is important to place the sprayer so high in transportation position, that the wires are free of the tractors roof and the tower is horizontal (2). In order to avoid the wires being lowered over the driver's cab, the tractor must never be stopped when in transportation width.

On some older tractors it may be necessary to install safety chains from the crossbar to the lift arm. This is to prevent accidental lowering of the sprayer.



**It is important to ensure that the mandatory distribution of weight on the tractors is complied with (e.g. by installing front weights). The sprayer is designed with the centre of gravity placed as close to the tractor as possible. This makes the space when connecting and disconnecting a little cramped, why extra vigilance is required in connection with these procedures.**

#### 4.5.1 Adjustment of tailpipe and exhaust

Tailpipe (1) on the exhaust must always be adjusted so that the exhaust does not hit the boom. **Failure to comply may result in severe damage to the boom.**



#### 4.5.2 Procedure for boom in transportation position

When danfoil AirBoss is mounted on the tractor, the following three steps must be followed in order prepare the boom for transportation.

##### Step 1 – Fold in the outer boom



##### Step 2 – Fold in the inner boom



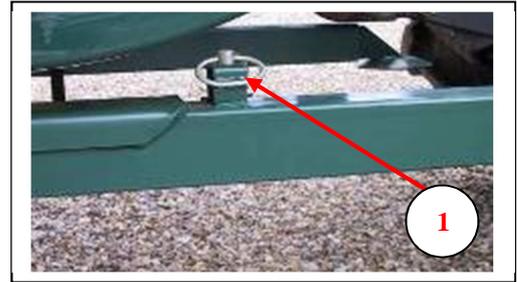
##### Step 3 – Fold in the boom until the towers are in a vertical position in order to ensure minimum transportation height



## 4.6 Dismounting the sprayer

Only dismantle the sprayer on solid and even ground.  
Fold the telescopic outriggers out, both horizontal and vertically until they reach the last hole. Then, lock the safety bolt **(1)** completely by plugging it in as far as possible

Fold in the boom until the towers are in a vertical position.  
This gives the most space possible for egress



**Remember to only leave the machine on solid and sustainable ground.**

**Do not leave the machine with liquid in the tank**

**Remember to fold the outriggers out when leaving the machine**

## 5 Description of the sprayer

### 5.1 Application

The danfoil sprayers are developed especially for spraying agricultural and horticultural crops. The sprayer is also suitable for forestry, garden centres and other crops.



**Other use of the field sprayer will invalidate the warranty**

The danfoil sprayer is designed to disperse all commonly used pesticides at an incredibly low water consumption (usually 30 to 60 l/ha compared with traditionally 150 to 400 l/ha). At normal driving speed the application rate does not exceed approximately 120 l/ha. For a number of spraying tasks the quantity of pesticides being used is noticeably decreased, when comparing to traditional sprayers, and still achieve the same effect. Spraying with a danfoil sprayer is described in detail in **chapter 10 and 11**, including directions for dosage, volume of water, and speed.

### 5.2 Description of danfoil spray technology

#### 5.2.1 Innovation

The danfoil sprayer, with the patented atomizer technology, represents innovation within the area of field sprayers. The principle was introduced in 1984 and has been developed subsequently. The danfoil sprayer is an air spray, that is, it uses air as a medium to create fine droplets, unlike the traditional hydraulic sprayer and air-assisted sprayer. The danfoil system is, because of the special patented principle, very environmentally friendly thanks to a reduced consumption of chemicals. Additionally, the operating economy is significantly improved compared to conventional sprayers. The reason for this is partly because water consumption is reduced (increased capacity per tank full), partly because the chemical consumption is reduced, and partly because the atomizers are not changed as with conventional sprayers, where these wear out or the spray tasks are changing.

#### 5.2.2 Operation

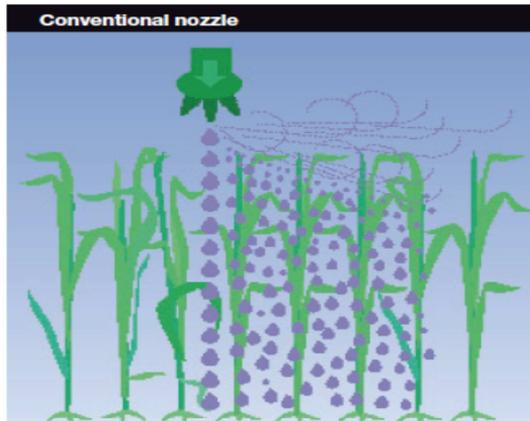
The first hydraulic field sprayers in Europe saw the light more than 100 years ago and the basic components of the conventional field sprayers have not changed over the last several decades. They all have tank, pump, hoses, pipes, and nozzles. The conventional sprayer's mode of operation is that hydraulic pressure is used to press liquid through a small hole in the nozzle, whereby the liquid is atomized and spread.

The Danish produced danfoil sprayer, which is an air-sprayer, represents with the patented atomizer principle innovation with the area. Similar to the conventional sprayer, the danfoil sprayer have a tank, pump, and pipes, but no nozzles. Instead of nozzles, which are available in numerous sizes and shapes for conventional sprayers, there is only one atomizer for a danfoil sprayer. The task of the atomizer is to distribute the liquid. Immediately before the atomizer, the liquid is throttled and thereby controlled. The spray liquid is atomized by pressing air over the foil and droplet are created from the lower edge of this. The sprayer is therefore an air blower, which through a glass fiber/aluminum pipe creates and overpressure in the atomizer.

#### 5.2.3 Deposit of liquid at top and bottom

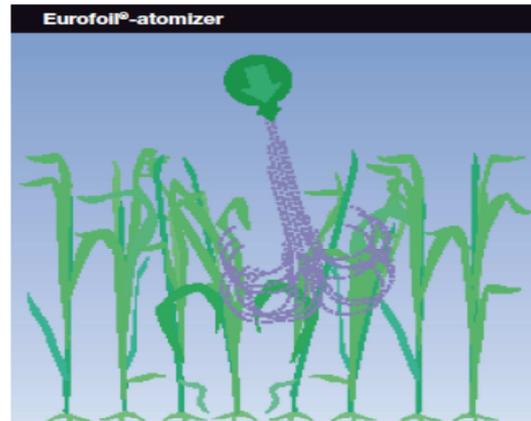
When spraying on open field, with little or no crops, air ensures that the droplets reach the soil and spread through horizontal air movement. In a larger crop the air, which create turbulence around the plants, ensures that liquid deposits in both the top as well as the bottom of the crop. In contrast, conventional sprayers deposit the majority of the liquid on the top of the crop, on the upper side of the leaves. The deposit of liquid on the underside of the leaves makes it easier for pesticides to penetrate and thereby be effective.

### Difference between danfoil Eurofoil® atomizer and the conventional nozzle:



Very small droplets can be difficult to manage. They linger in the air like a mist, which, in calm weather, will stretch like a long tail after the field sprayer. Even very little wind can lead such fine droplets astray.

Drift is greater over low, open crops than over high, dense crops, which can better grab hold of the droplets.



The Danfoil field sprayer mix liquid and air in the atomizer. An air stream tears the spray liquid into tiny droplets and carries them down into the crop. The airflow, which determines the droplet size, can be adjusted.

Thanks to the high speed of the droplets, drift is reduced and the crops are hit more accurately.

#### 5.2.4 Reduced consumption of chemicals

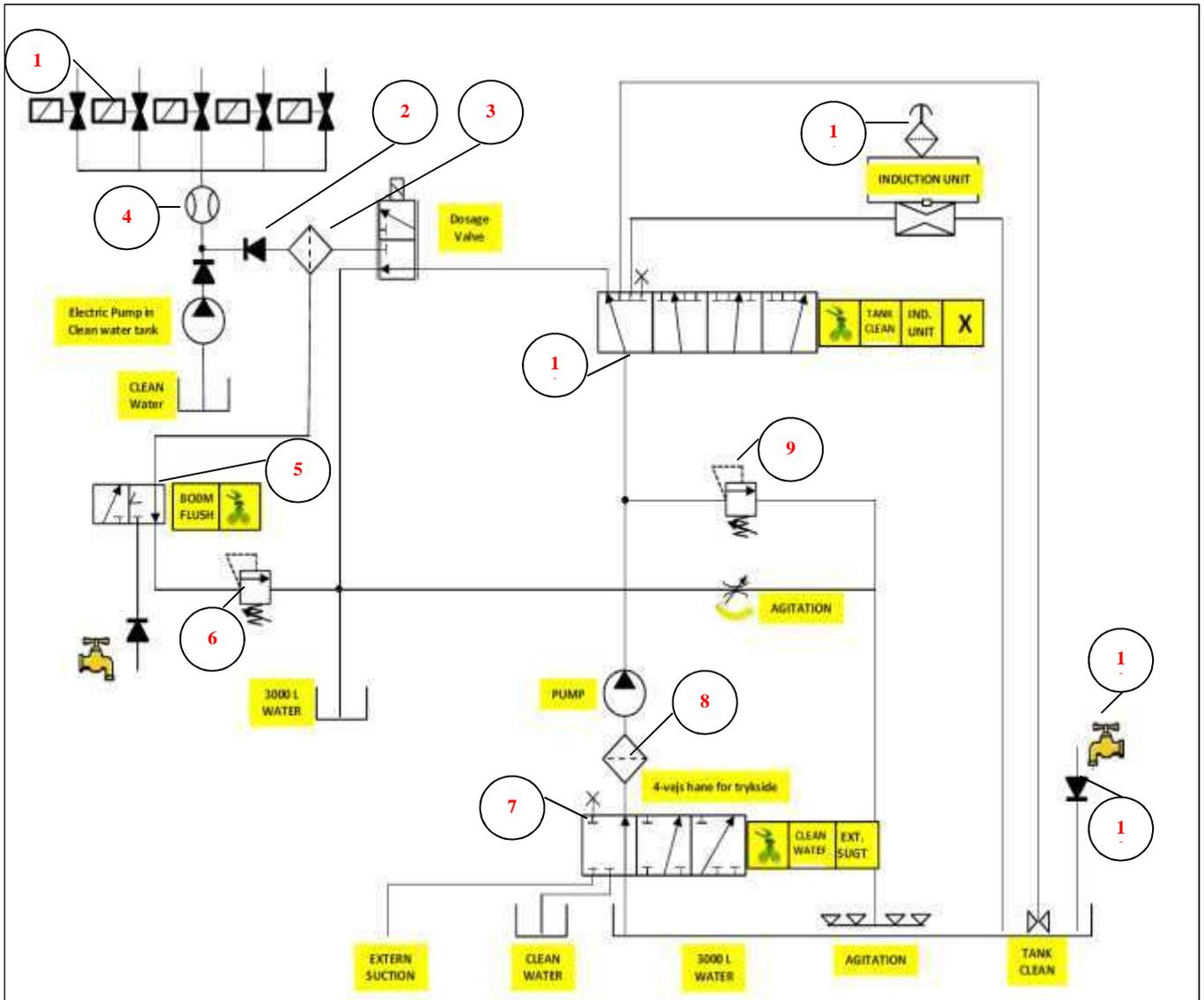
Using the danfoil system ensures an effective spraying and large capacity. It is for a variety of spray tasks possible to reduce consumption of chemicals compared to the amount used with a conventional sprayer. See **chapter 10** for a detailed description of the possibilities for reductions with you danfoil sprayer.

This can be done by choosing lower dosages or by selecting the same dosage, where possible, and reduce treatment frequency. The good use of the spray liquid is achieved by a low water consumption of 30 to 60 l/ha, compared to 150 to 400 l/ha for conventional sprayers. Thus the danfoil sprayer provides savings in time, chemicals, and water – to the benefit of both the user and the environment.

## 6 The sprayers liquid and valve system

Diagram 1 shows the danfoil sprayers liquid and valve system and the relationship between the individual functions on the sprayer. All the liquid systems functions are operated via an operating unit on the sprayer and its valve system. It is supplied with pictograms for simple and easy operation. The diagram is for you as a user to create an overview of the sprayer's functions and possible troubleshooting

**Diagram 1: The sprayers functions**

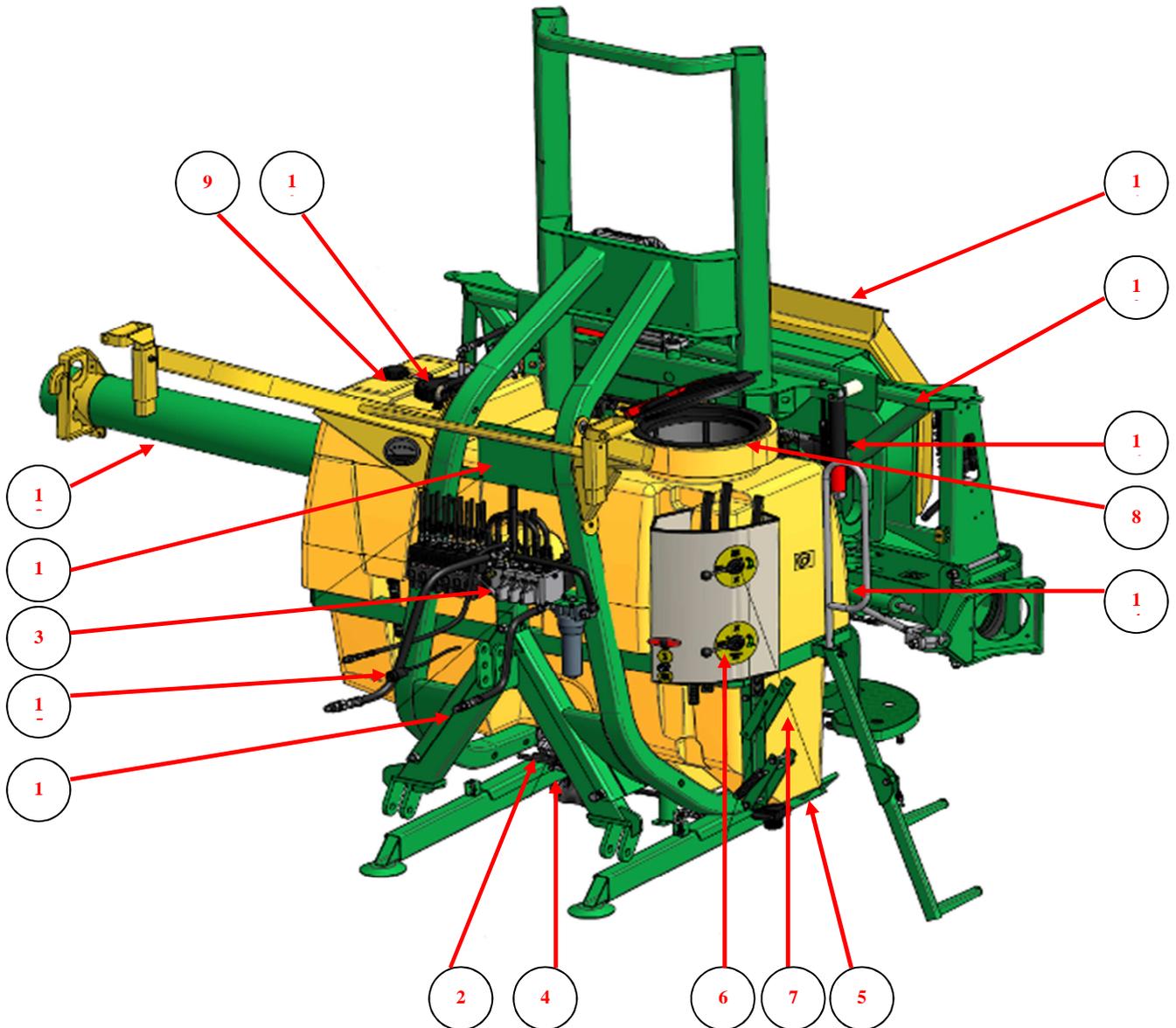


- |  |  |
|--|--|
| 1. Section valves                          | 8. Suction filter                            |
| 2. Check valve                             | 9. Safety valve                              |
| 3. Pressure filter                         | 10. 4-way valve for pressure (Control panel) |
| 4. Flow meter                              | 11. Hose for chemical canisters              |
| 5. 2-way valve (Control fitting)           | 12. Filling                                  |
| 6. Relief valve                            | 13. Check valve                              |
| 7. 4-way valve for suction (Control panel) |  |

## 7 Description of the danfoil sprayers functions

Overview 1 shows the most central functions on a danfoil AirBoss Liftmounted fieldsprayer. In this chapter these functions are gone through in a chronological order.

### Overview 1: danfoil AirBoss field sprayer



- |                                |   |
|--------------------------------|---|
| 1. Load Sensing (LS)           | 11. Air manifold                          |
| 2. Liquid pump                 | 12. Boom suspension and boom construction |
| 3. PVG-valve for liquid pump   | 13. Eurofoil®-atomizer and anti-drip      |
| 4. Suction filter              | 14. Flowmeter                             |
| 5. Pressure filter             | 15. Wheel sensor                          |
| 6. Control fitting             | 16. Suspension on sprayer                 |
| 7. Pesticide Induction Unit    | 17. Control panel electronic              |
| 8. Spray tank 1.000 litres     |   |
| 9. Clean water tank 100 litres |   |
| 10. Basin tank 15 litre        |   |

## 7.1 Load Sensing (LS)



See chapter 4.2. Connections Procedures for connection of Load Sensing

A danfoil AirBoss Liftmounted sprayer is as standard equipped with LS proportional hydraulic which operates fan, pump, and all remote hydraulics.

### 7.1.1 AirBoss 15-24 meter 2-parted boom

The tractor must be supplied with a  $\frac{3}{4}$ " pressure free oil return flow directly in tank. For tractors with LS Load Sensing outlets this must be ready for use. The end-users tractor must be equipped with the following:

- LS Load Sensing hydraulic system
- $\frac{3}{4}$ " female return,  $\frac{1}{2}$ " female pressure
- $\frac{1}{4}$ " female LS signal
- All couplings must be of the same type as Farster NV

If the back-pressure exceeds 1 bar then 1  $\frac{3}{8}$ " quick coupling type NV is installed subsequently for pressure free drain from the engine to the fan.

If the tractor cannot provide 80 litres oil at 190 bars the sprayer must be equipped with a separate pump station. Danfoil a/s does not accept responsibility for altering the tractors hydraulic system.

### 7.1.2 Tractors without LS-operation

If the tractor is not supplied with LS the system can be converted into an open center system, where a hydraulic oil cooler is installed.

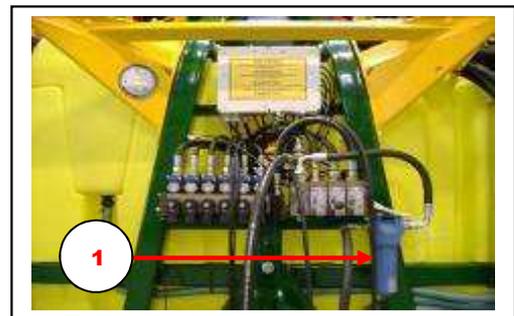
If the tractor cannot supply the needed amount of oil, see above, the sprayer can be delivered with a pump station, which is operated via the tractors PTO

With return flow over one bar 1  $\frac{3}{8}$ " quick coupling type NV is installed subsequently for pressure free drain from the blower engine. Installation of the above mentioned equipment must be performed by danfoil a/s

### 7.1.3 Oil filter

Behind the liquid motor, an oil filter (1) is installed where the tractors hydraulic oil runs through. The oil filter ensures that any impurities in the tractors hydraulic is caught and thus not enter the sprayer's hydraulic system.

It is **IMPORTANT** to check and possibly replace the oil filter regularly.



**Service Interval:**  
Oil filter is changed after first spray season and afterwards every second year

## 7.2 Liquid pump

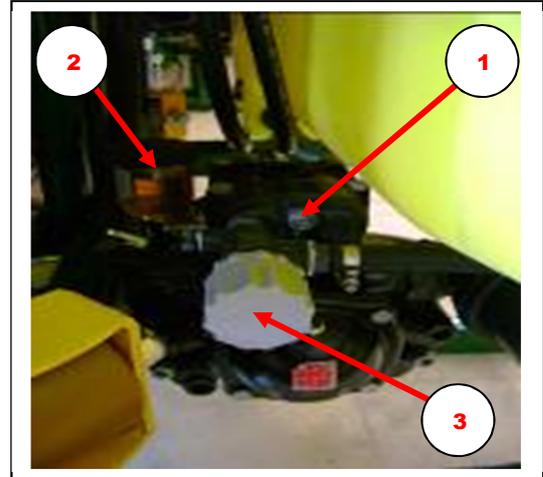
### 7.2.1 The liquid pump (1)

The liquid pump is a Annovi diaphragm pump with 3 chambers – model AR 115 bp, 550 R.P.M. All parts of the pump which have contact with spray liquid is produced in plastic coated aluminium or stainless steel. From the pump the spray liquid is guided through filter and flowmeter to 7 section valves, which supply the Eurofoil® atomizers. The liquid pump is driven by the hydraulic Load Sensing System

### 7.2.2 Oil level glass (2)

The liquid pump is equipped with an oil level glass. It is IMPORTANT that the oil level in the glass is always above the minimum level.

Furthermore it is IMPORTANT to check the colour of the oil, if this is gray/whitsh the liquid pumps diaphragm, must be checked.



### 7.2.3 Safety valve (3)

The liquid pump is equipped with a pressure control valve which is a safety valve against a defective valve or blockage in the liquid system. The safety valve is preset from danfoil and should NOT be adjusted during operation of the sprayer.

### 7.3 PVG-valve for liquid pump

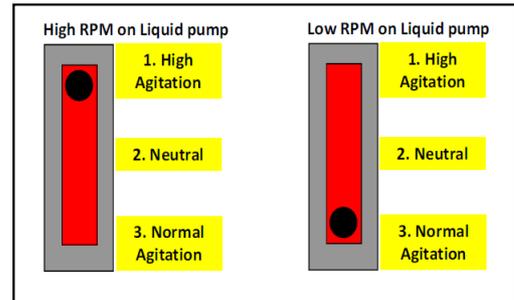
The PVG-valve has 3 settings:

1. High speed
2. Neutral (OFF)
3. Low speed

The desired speed is set using the PVG valves gear stick **(1)**, the three settings are shown in the diagram and the picture to the right.

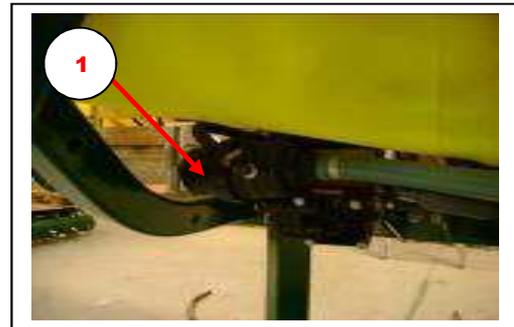
If setting 1 or 3 is selected this have influence on the agitation in the spray tank and how powerful the nozzle in the pesticide induction unit rinse. If position 2 is selected the liquid system is in neutral and hence is OFF.

This can be used with advantage during transport and/or empty tank, as well as during cleaning of boom with water from the clean water tank where the electric pump in the clean water tank is used.



### 7.4 Suction filter

A suction filter **(1)** is installed on the left side of the liquid pump. The type is a Arag suction filter with Mesh on 0,500 **Blue**. The filter must be checked regularly for impurities and cleansed. The O-ring in the filter are checked for leakage and may need replacing



**One can overcome wastage of chemicals by setting the 4-way valve on the suction side of the control fitting, see [chapter 7.6.1](#)**

**When cleaning the suction filter the liquid pump MUST be turned off so there is no pressure in the liquid system**

## 7.5 Pressure filter

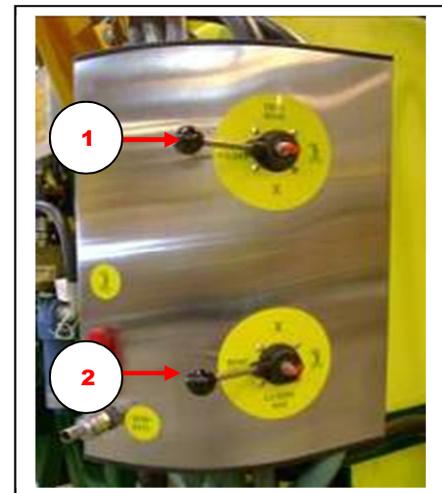
A pressure filter (1) is installed under the control panel on the left side of the sprayer. The type of the pressure filter is an Arag pressure filter with Mesh 0,173 Red. The filter must be checked regularly for impurities and cleansed. The O-ring in the filter must be checked for leakage and may need replacing



When cleaning the pressure filter the liquid pump **MUST** be turned off so that there is no pressure in the fluid system

## 7.6 Control fitting

The danfoil sprayer's liquid functions are operated via the control fitting on the sprayer. The valves and valve system are identified by coloured pictograms on the label. The symbols refer to every possible function and are installed on the turntable for easier identification and operation. A function is activated by turning the lever to the desired function. The fitting is divided into a suction side (1) and a pressure side (2), as illustrated on the picture to the right

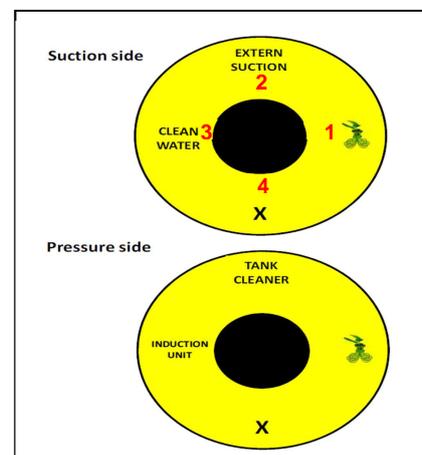


### 7.6.1 Suction side

On the suction side a 4-way valve is installed, which has 4 functions:

1. Liquid from the spray tank to the spray line
2. External suction
3. Clean water.
4. The last feature is marked with an X, which means that the valve is closed

With this valve you chose whether you want suction from the spray tank or water tank. Or if you want to suck water from external sources, e.g. front tank.

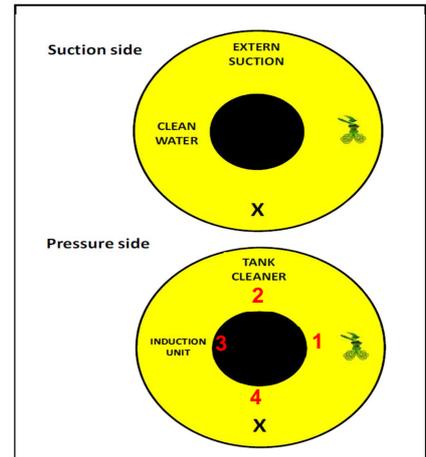


### 7.6.2 Pressure side

On the pressure side a 4-way valve is installed, which has 3 functions:

1. Liquid to spray line
2. Pesticide induction unit
3. Tank cleaner.
4. The last function is marked with an X and is only active when connecting equipment for fluid fertilizer,

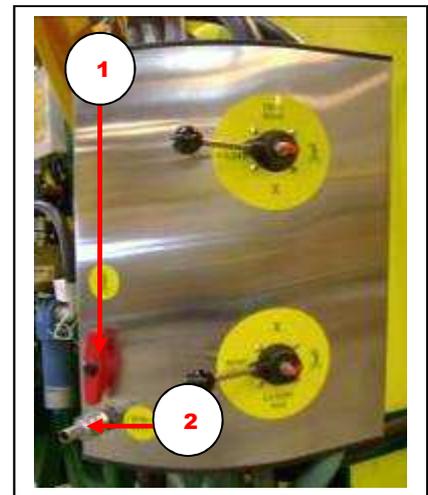
With this valve you choose if you want to spray, use chemical equipment or clean the tank or chemical equipment.



### 7.6.3 External boom flush

For external bomskyl a 2-way valve (1) is installed with the following functions: Liquid for spray line or external boom flush of spray line.

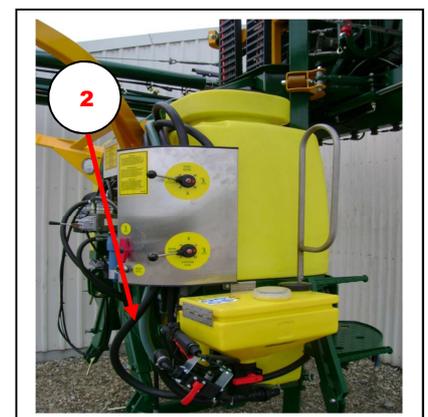
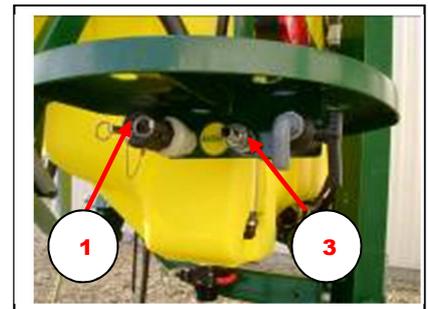
When using external boom flush the external water supply is connected to the 3/4" pipe branch (2).



### 7.6.4 External coupling for filling water

On the fitting there are three external coupling options:

- The first coupling option is filling via waterworks with pressure. It is coupled via 1 1/2" pipe branch (1)
- The second is external suction, where the sprayers pump is used as suction from external water tank or reservoir. It is coupled via a 1 1/2" pipe branch (2).
- The third option is "Filling via clean water tank". It is coupled via 1" pipe branch (3).





Remember that when the pesticide induction unit is in use, the hydraulic gear for the liquid pump is set a high speed to ensure optimal use, see [chapter 7.3, 7.6.8 and 7.6.9](#)

### 7.6.5 Settings on the suction and pressure valve

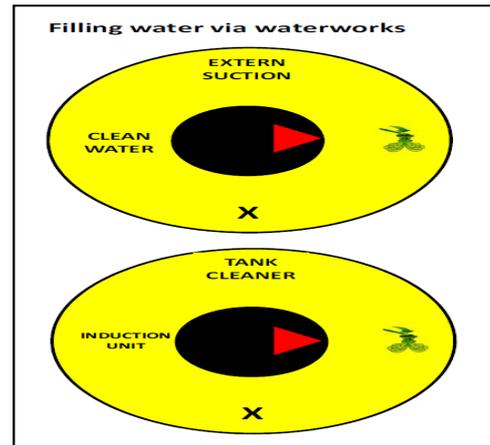
The settings on the control fitting are reviewed in this section. The red arrow marks the valves settings

### 7.6.6 Filling water via the waterworks

When filling water from the waterworks through the filling pipe or directly into the spray tank, both valves remain in position “spraying”

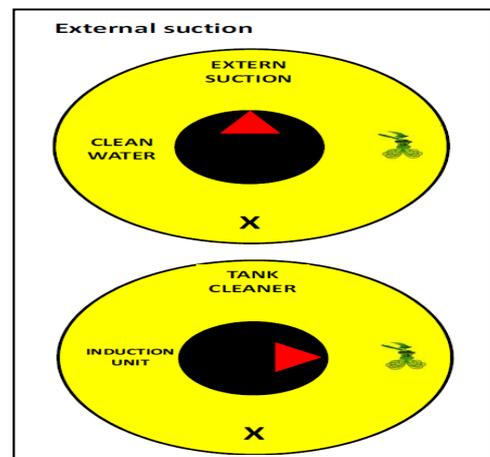
If you want to pour water through the filling pipe the external water supply is connected to the 1” pipe branch

**Remember** that if the filler pipe is used the mandatory filling valve and check valve is also active and secures you against undue overflow or backflow of water from the tank.



### 7.6.7 Filling via external suction

When filling water from external water tank or reservoir the valve for suction side is set to “external suction” and the valve for pressure side on “spraying”. If you want to fill water via external suction this must be connected to the 1½” pipe branch.

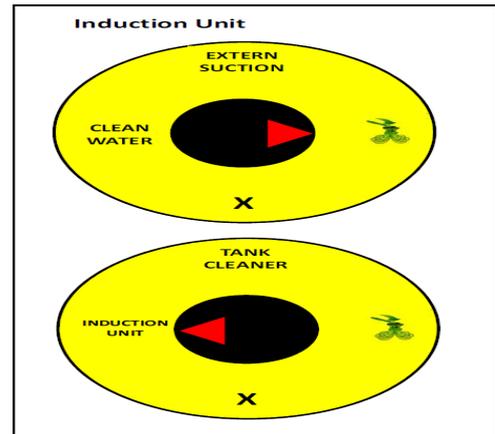


### 7.6.8 Filling chemicals

When filling chemicals into the pesticide induction unit the valve for suction side must be set to "**spraying**" and the valve for pressure side to "**pesticide induction unit**". See **chapter 7.7** for the use of the pesticide induction units functions.

**Remember** to fill the water into the spray tank before using the pesticide induction unit to avoid that the pesticide induction unit "draws air". It is recommended to fill 1/3 of the tank with water before adding chemicals.

**Remember** that the PVG valve must be set on high speed for maximum pressure, see **chapter 7.3**

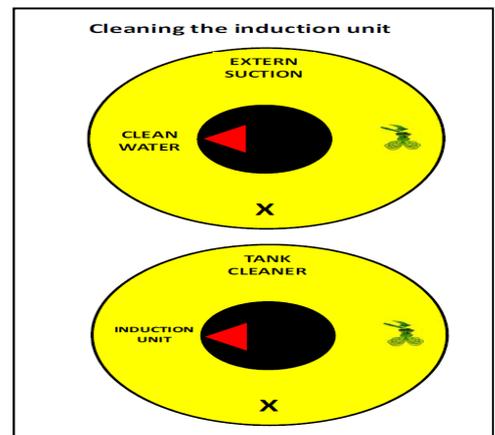


### 7.6.9 Cleaning the induction unit

When cleaning the pesticide induction unit and flushing the chemical boxes the valve for suction side must be set to "**Clean water**" and the valve for pressure side to "**pesticide induction unit**". When activating "clean water", clean water is sucked from the clean water tank.

**Remember** that the PVG valve must be set on high speed for maximum pressure, see **chapter 7.3**

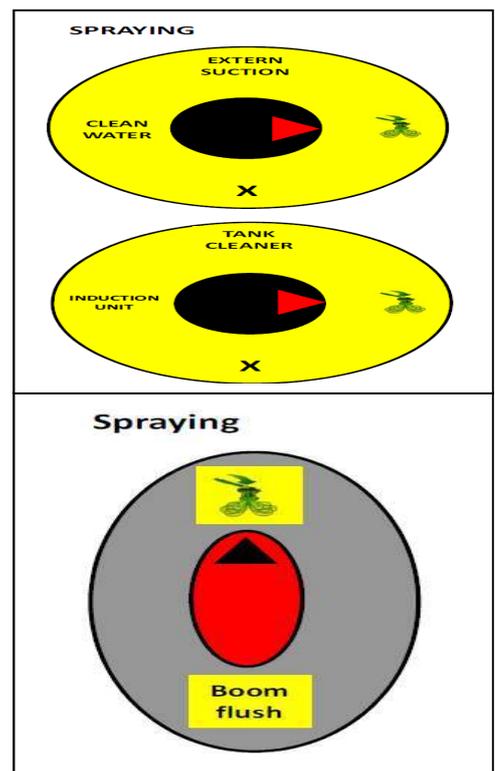
**Remember** to be aware, when cleaning the pesticide induction unit with clean water from the clean water tank, the water is subsequently sucked into the spray tank. Therefore it is important to take the extra amount of water into account when deciding on the concentration



### 7.6.10 Spraying

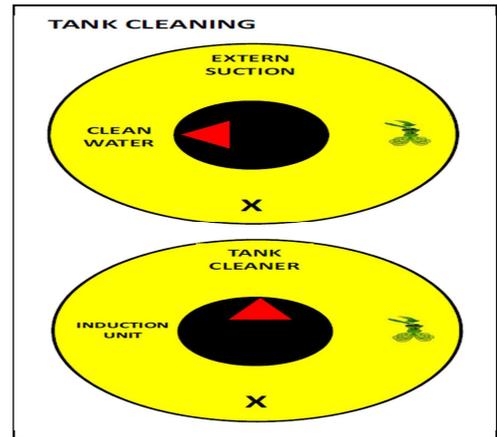
At the beginning of spraying, the spray line is activated by setting both valves to "**spraying**"

**Remember** that the 2-way valve for boom flush MUST be set to "**Spraying**"



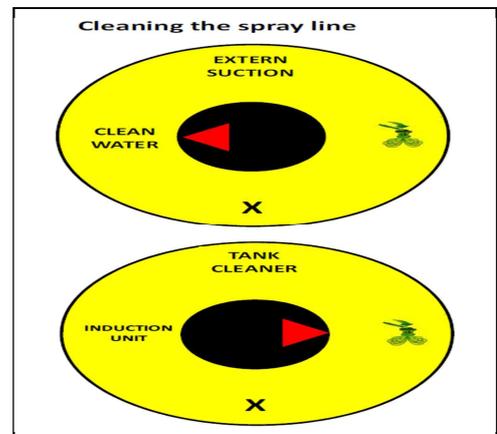
### 7.6.11 Tank cleaning (cleaning of the spray tank)

When cleaning the spray tank the valve on the suction side is set to "**clean water**" and valve on pressure side on "**tank clean**". Thus, clean water is sucked from the clean water tank and the wash down nozzles in the spray tank is activated..



### 7.6.12 Cleaning the spray line

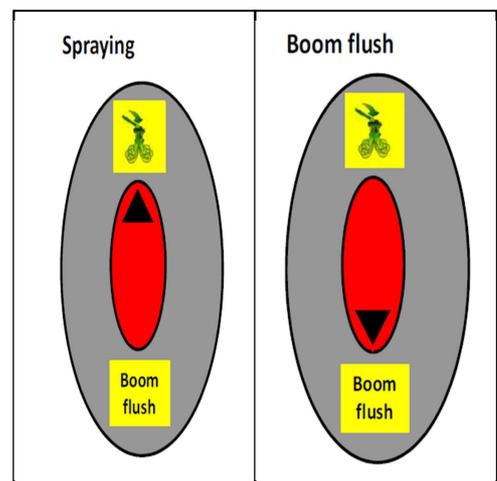
When cleaning the spray line the valve on the suction side is set to "**clean water**" and the valve on the pressure side to "**spraying**". Clean water from the clean water tank is sucked out into the spray line and thereby ensures an effective cleaning of the spray line.



### 7.6.13 External boom flush

For external boom flush a 2-way valve is installed with the ability to set the valve to "**spraying**" or "**external boom flush**". If you want to rinse the spraying line from external water tank this must be connected to the  $\frac{3}{4}$ " connection pipe on the fitting

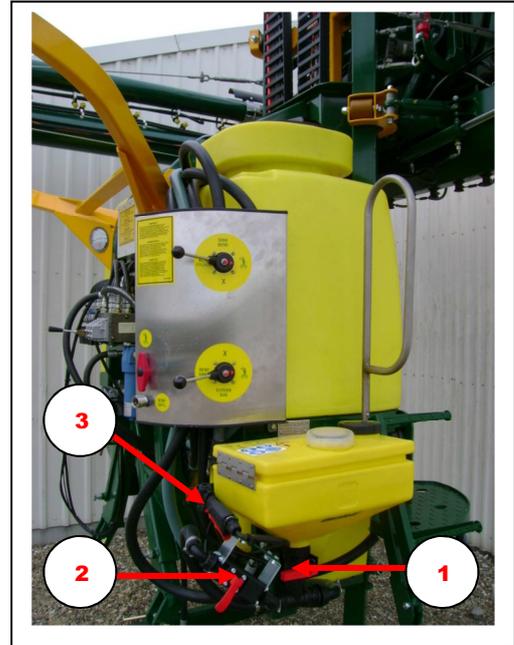
Remember that the 2-way valve must **only** be set to "**external boom flush**" when this maneuver is performed. In all other cases the valve **MUST** be set to "**spraying**"



## 7.7 Pesticide induction unit

To facilitate and make the process of filling chemicals more safe the pesticide induction unit should be used.. The pesticide is poured into the container, after which it is pumped into the tank. The following procedures apply when using the pesticide induction unit.

- The pesticide induction unit is operated by turning the 4-way valve on the control panel for pesticide induction unit, **see chapter 7.6.8 and 7.6.9.**
- Valve for pesticide induction unit **(1)** is opened, so there is access to the spray tank.
- Valve for rinse nozzle is opened and is used to rinse the pesticide induction unit after filling pesticides.
- To rinse the chemical container the pistol grip **(3)** on the left side of the pesticide induction unit is used.
- When the pesticide is filled the valve for the rinse nozzle **(2)** is closed
- Finally, close the valve for the pesticide induction unit **(1)**. Wait to close the valve until it “pulls air” as this ensures that the pesticide has flowed through the hose and into the spray tank



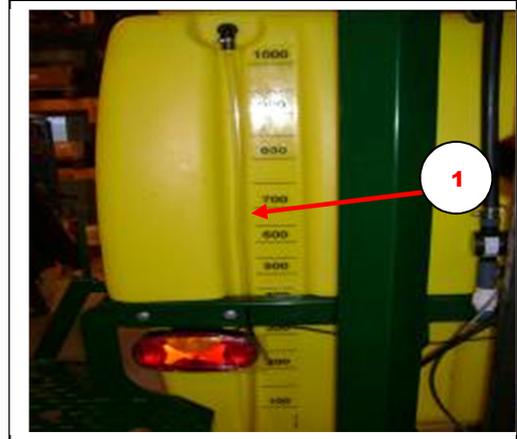
**Remember to clean the pesticide induction unit along with the rest of the sprayer**

**Note that all water-soluble granules MUST be mixed in the pesticide induction unit**

**Remember , when the pesticide induction unit is in use the hydraulic gear to the liquid pump MUST be set to high speed to ensure optimal use, see chapter 7.3.**

## 7.8 Spray tank 1.000 liter

Danfoil AirBoss liftmounted sprayer comes with a 1,000 liter spray tank made of shock-proof polyethylene. The tank has a streamlined design with easy access to the filler cap. The clean water tank and basin tank is build into the spray tank which provides a solid and compact design. The design also bear the mark of that there are no sharp edges, which ensures an optimum cleaning of the tank. At the left side of the spray tank a fuel gauge (1) is installed, which show the level of liquid contained in the tank.



### 7.8.1 Agitation in tank

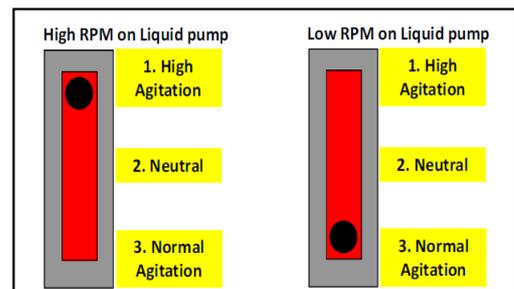
All danfoil sprayers are equipped with stirrer in the spray tank, which ensures optimal stirring of your spray liquid.

On danfoil sprayers, there are three options for agitation:

1. Heavy agitation
2. No agitation
3. Normal agitation

Stirring is adjusted on the hydraulics PVG valve (1), which determines the speed of the liquid pump. The three options are shown in the diagram and picture to the right, in addition see **chapter 7.3**.

Following the high concentration of the spray liquid and effective agitation, occasionally foaming in the tank occurs. This foaming can be reduced by using an anti-foam remedy, which can be purchased from the pesticide supplier.



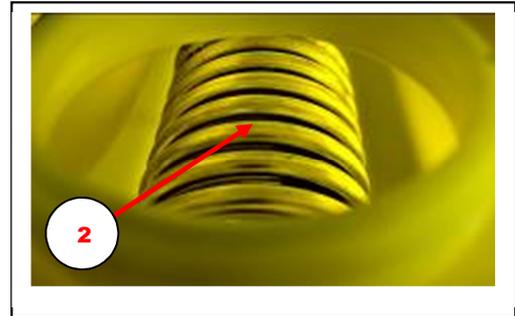
## 7.9 Clean water tank

Danfoil AirBoss is installed with a 100 liter clean water tank (1), which is built into the spray tank. There is access to filling from above and from under the footboard. The clean water tank is filled when the spray tank is filled and it is important to ensure that the clean water tank is always full. The water from the tank is pumped through the liquid system via an electric pump installed in the clean water tank. A check valve ensures that there are no back flow of spray liquid to the clean water tank. The clean water tank is installed with a filter mounted on the control fitting. The filter ensures that no impurities from the water are distributed around in the liquid system.



### The clean water tank has three purposes

1. The tank enables you to clean the sprayer according to the European requirements for cleaning. This is done by adjusting the control panel to clean water, see **chapter 7.6.11 and 7.6.12**
2. The clean water tank ensures that the sprayers hydraulic oil is not overheated. This occurs by allowing hydraulic fluid to flow through a spiral (2) in the clean water tank. This also means that the water in the tank is heated.
3. The heated water ensures an optimal cleaning of the spray line, since hot water has a significantly better cleaning effect than cold water.



**The clean water tank MUST always be full in order to ensure the cooling of the hydraulic oil.**

**Remember to continuously clean the filter for the clean water tank**

## 7.10 Tank for basin

A 15 liters tank for handbasin (1) is built into the spray tank. The water in the tank is intended for wahsing hands, protective equipment, filters and the like. Remember to only fill clean water into the tank.



**The water in the tank must not be used for drinking water**

## 7.11 Air manifold

The air pressure to the Eurofoil ® atomizers is created through an air manifold (1), which is placed alongside the boom suspension at the rear of the sprayer. The air manifold is mounted with two fans controlled by two hydraulic engines. The speed of the hydraulic engines controls the air pressure in the boom, also known as cm vandsøjle. In the boom a lufttransduser is positioned, which measure the air pressure. When the operator wishes to regulate the air pressure the speed of the hydraulic engines is adjusted. It is important to regularly check the air manifold for any objects that may prevent free air intake.



## 7.12 Boom suspension and boom construction



**It is important to continuously check the pipes on the boom for ingress of foreign bodies that may restrict air pressure and thereby create an uneven atomization in the Eurofoil ® atomizers**

Danfoil AirBoss liftmounted sprayer boom construction is suspended in a very stable pendulum. The air box itself is installed on the vertical lift construction, which are hydraulically operated and suspended. All raising and lowering, folding and tilting is hydraulically controlled and operated via the sprayer computer and joystick in the tractor.

The lift construction partly have the function of raising and lowering the boom via the hydraulic pistons on the lift. In addition, the lift construction has the function of suspending the boom, so that it is always stable and in the right height over the crop.

The pendulum suspended boom construction ensures that the boom is adapted to the terrain and is installed with shock absorbers and limiters, which ensures a steady boom. It is possible to lock the pendulum in a fixed position. It is also possible to tilt the entire boom. Both functions are hydraulically operated via the tilt cylinder and can be operated via the spray computer and joystick.

The boom is produced in fiberglass and aluminum. All danfoil sprayers are delivered with an inner boom in aluminum and outer-boom in fiberglass. Fiberglass and aluminum ensures an easy and stable boom. The 2 parted sprayer can be adjusted to 12 meter working width

The boom is sustained by a wire installed on the boom suspension and in towers installed after the inner-section. For adjustment of the boom see **chapter 9.2.8.**



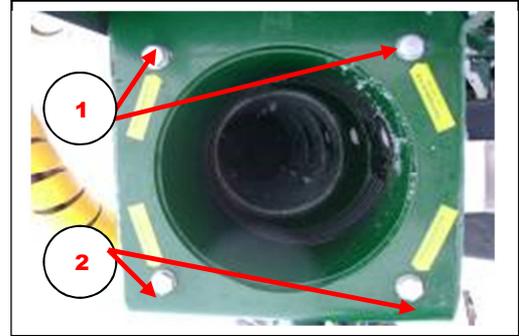
The pipes on the boom also have the function that air is transported to the Eurofoil atomizers through these pipes. When the boom is down the pipes are therefore tight to maintain air pressure. The same is true with reduced working width, e.g. 12 meter, where flaps are installed at the inner boom..

Unfolding and folding of the boom is done via the sprayers hydraulic and is operated via the joystick in the tractor, see chapter 6.5. The boom can be installed with self-leveling boom, see chapter 6 Optional Equipment.

### 7.12.1 Security bolts

Four security bolts are installed on either side of the inner boom, which snaps in the case of collision. This ensures that no unnecessary damage is done to the boom, blow box and boom suspension. When replacing the security bolts, the following new security bolts is installed, as shown on the picture to the right:

1. 2 pcs. security bolts type **4,6** in the top
2. 2 pcs. security bolts type **8.8** in the bottom



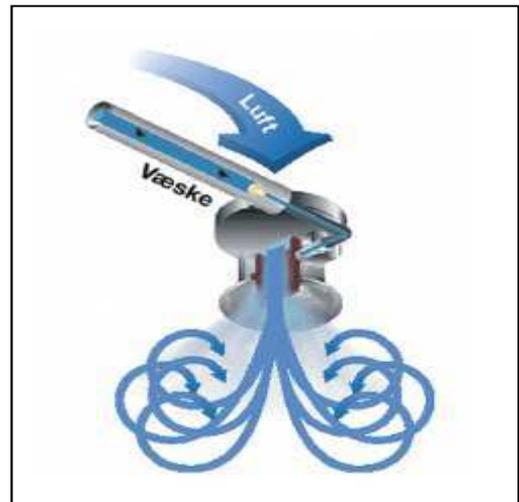
**When replacing the security bolts similar security bolts MUST be installed, as shown above. Failure to do so will invalidate the warranty and the risk of damaging the boom increases considerably**

### 7.13 Eurofoil atomizer and Anti-drip

The task of the atomizer is to distribute the liquid. Immediately before the atomizer the liquid flow is throttled, and the liquid flow is therefore controlled

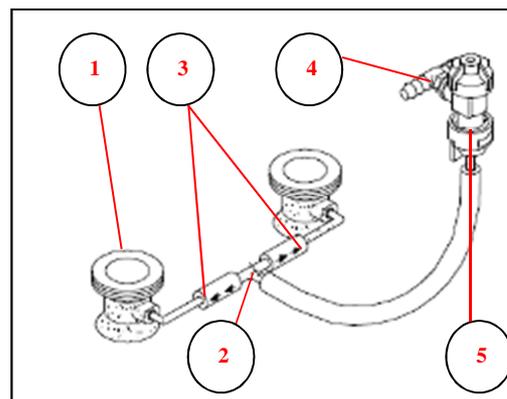
When spraying on an open field, with little or no crops, the air ensures that the droplets reach the soil and is distributed through horizontal air movements.. In a larger crop, the air, which creates turbulence around the crops, ensures that the spray liquid is deposited at the top as well as the bottom of the crop, as well as the top side and underside of the leaves.

With the danfoil system an effective spraying and large capacity of between 30 to 60 litres per hectare is ensured.



### 7.13.1 Construction of Eurofoil atomizer

1. Eurofoil Atomizer
2. T-piecestykke with 0,7 throttle
3. 2 stk. distributor with 0,5 throttle
4. Anti-drip
5. Filter for anti-drip, Mesh 0,350 **Rød**



The Eurofoil atomizer is made of durable plastic and the foil is made of a mixture of plastic and fibreglass. In front of the atomizer an angle piece and T-piece is installed, see the picture above. A brass throttle is installed in the angle piece and T-piece. The throttle in the T-piece is a 0.7 and the two throttles in the angle pieces are 0.5. This ensures an optimal liquid pressure. The throttle must be checked continuously to ensure that they are not clogged. This is done by checking the liquid flow through the atomizer.

Before the T-piece an anti-drip is installed to ensure that residues in the spray line do not run out. The anti-drip is installed with a nozzle filter type TeeJet Mesh 0,350 **Rød**. The nozzle filter ensures that no impurities clog the throttle.



**The brass throttles must be checked continuously for blockages. If the angle piece and T-piece is cleaned with air, this MUST be in the liquid flow direction otherwise you risk that the throttles fall out and create an uneven liquid flow.**

**The nozzle filter in the anti-drip must be checked regularly for dirt and may need cleaning. Thus ensures an optimal liquid flow.**

### 7.14 Flowmeter

The sprayer's flowmeter ensures that the correct amount of spray liquid is distributed to the Eurofoil atomizer. The flowmeter is calibrated at the factory. However, the flowmeter ought to be calibrated before each spray season. **See computer manual chapter 11.**

## 7.15 Wheel sensor

The wheel sensor measures the velocity and is essential for delivery and computation of liter per hectare. If the tractor has its own wheel sensor signal this is used. If the tractor cannot deliver the signal, an inductive wheel sensor is installed on the tractor. **See chapter 4.1**



See **chapter 10** in the spray computer manual for adjusting the wheel sensor.

Be aware of ruptures on the wire for the sensor or a defect in the sensor.

## 7.16 Suspension

Danfoil AirBoss liftmounted sprayer is installed with hydraulic suspension on the boom. The hydraulic suspension ensures a stable boom during spraying. When driving on road the tractors suspensions is essential for safe driving, especially when driving on bumpy road with full tank.

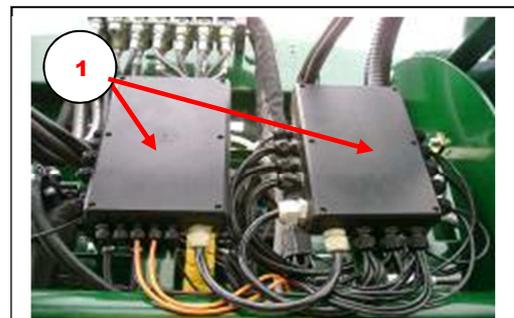
## 7.17 Control box for electronics

The control box (1) to control electronics are located on the sprayers boom suspension. The control box controls the sprayers hydraulic functions and valves. Via a CAN-BUS signal between the control box and computer/joystick in the tractor, all function are controlled and regulated.

### 7.17.1 danfoil PC-SprayController V.1

The PC-SprayController V.1 (2) gathers all functions of the sprayer on one display with high graphic freedom. Danfoil PC-SprayController V.1 is developed with PC technology and the web server is based on Linux operating system. The spray computer is based on CAN-BUS communication between the job computers, control units, and the PC-supported display to keep wiring to a minimum.

All functions are controlled from one touch screen. The integrated spray control handles all the functions of the sprayer, including regulation of air pressure, liquid control, all hydraulic control, boom regulating, section control, individual boom lift, GPS, and general control of other optional equipment.



Danfoil PC SprayController V1 is reviewed in the user manual for the spray computer.



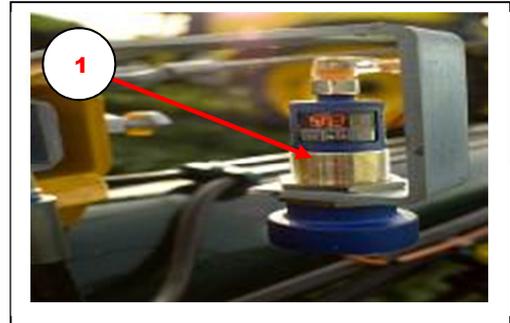
The box for controlling electronics **MUST** be tight in order to prevent ingress of liquid.

## 8 Extras

Danfoil AirBoss liftmounted sprayer is available with a number of extras. These are listed in **chapter 1.2**.

### 8.1 Self-levelling boom

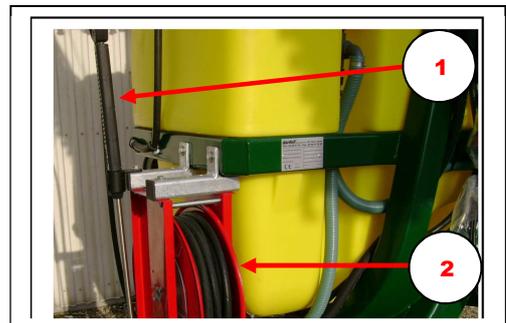
The self-levelling boom ensures that the desired boom height is always maintained regardless of differences in the terrain. This allows the operator to concentrate on spraying and not focus on continuously adjusting the boom height and tilt. Two inductive sensors (1) on the boom and a height sensor on the lift read off the height of the crops continuously and adjusts the boom height and tilt relative to the operators desired setting. The system is controlled via the hydraulic function on parallel arms and tilt cylinder.



**Be aware that using the self-leveling boom in thick crops or crops with large holes the self-leveling boom cannot maintain altitude and the system can advantageously be turned off in these extreme cases in order to avoid the boom go down.**

### 8.2 High pressure cleaner

The high pressure cleaner (1) with hose reel (2) is for use when cleaning the exterior of the sprayer in the field with clean water. The cleaner uses hot water from the clean water tank, thereby ensuring an efficient cleaning. The pump for the high pressure cleaner is placed to the right of the liquid pump and the high pressure cleaner itself is placed on the backside of the sprayer. The high pressure cleaner is activated via the spray computer. Remember to set the valve on the control panel to "clean water".



**Avoid air to occur in the liquid hose to the high pressure cleaner since the pressure will fall. This can happen if the water tank runs out of water. If there is air in the hose the valve on the pump for the high pressure cleaner is opened.**

### 8.3 Auto filling equipment

The auto filling equipment eases the filling process for the operator. The auto filling equipment measures the liquid volume, why the operator can enter the desired volume he want to fill into the tank, e.g. 800 litres. The auto filling equipment closes for inflow when the desired volume is reached. The auto filling equipment is located at the control fitting.



## 8.4 Mechanical flexible extension

The mechanical extension link (1) is installed on the outer boom and ensures that the boom does not fall to pieces if the outer part of the outer boom is impacted. The flexible extension link is installed with springs as shown in the picture and may extend in both directions; the link returns to the starting position itself.



## 8.5 Matrix GPS section control

With automatic boom section control you achieve optimal screening thereby avoiding any overlap of the field, allowing you to concentrate on spraying. The Matrix GPS section control is mounted together with the danfoil PC SprayController.



For further information about the Matrix GPS setting, please see chapter 10 in the Manual for the Spray computer.

## 9 Preparation and maintenance of the sprayer

### 9.1 Preparation and inspection of the sprayer

Preparation of the sprayer is important in correlation to durability and in correlation to optimal spraying every time. This chapter examines the adjustment of the boom before starting, lubrication procedures and general inspection before starting the sprayer.



**No personnel other than the operator must be around the machine during operation**

**During inspection, lubrication, and maintenance the sprayers must support on a solid surface and the tractor engine must be stopped and the key removed from the ignition switch.**

**It is important to ensure that all coverings are in place and intact before starting the sprayer.**

---

### 9.2 Before spraying

#### 9.2.1 General inspection of the sprayer

Check air pressure in the tires and tighten wheel bolts after 2-4 hours of driving and the retighten them on a weekly basis.

Check oil level in the liquid pump through the oil level glass on the liquid pump. Refill if necessary with normal motor oil. Check out all the hydraulic functions on the sprayer, folding/unfolding, raise/lower and tilt of the boom.

Important: the boom must be unfolded with the sprayer standing on flat ground and in horizontal position and tilt standing in neutral position.

#### 9.2.2 Filling water

Water is filled through the filling aperture on the top of the tank. At times of high air temperature the water in the clean water tank must be changed at each filling in order to obtain the cooling effect for the hydraulic oil/system.



**If filling directly from water line this must be equipped with a check valve.**

**Remember to fill at least 1/3 water into the tank before filling with chemicals**

**It is recommended to only use tap water, using water from the buffer tank it is recommended to install a filter on the water supply**

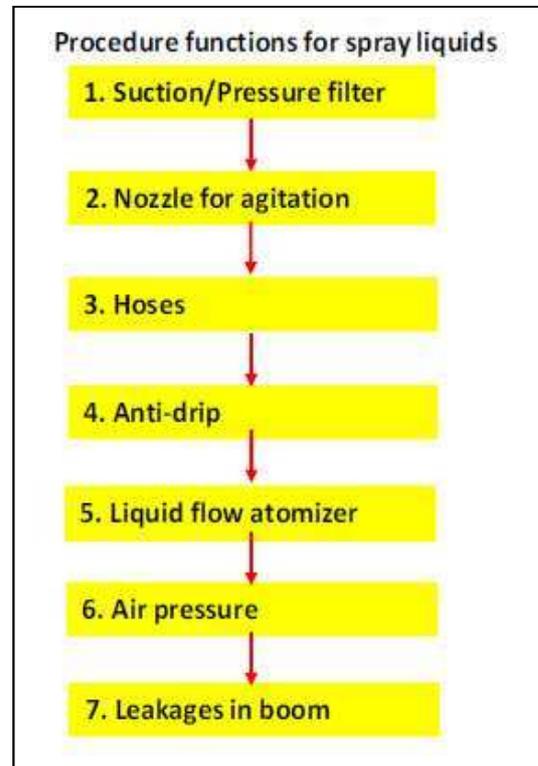
### 9.2.3 Inspection of functions for spraying liquids



All functions of the sprayer must be controlled and checked for leakages after water has been filled in the tank, however before filling up with plant protection products.

#### 9.2.3.1 Procedure for inspection of functions for spray liquids

1. Suction and pressure filter have to be cleaned and tested. Tighten bolt only manually. If couplings are not sealed well enough check if the gaskets are in good condition, otherwise lubricate the gaskets.
2. Check if the nozzle for agitation at the bottom of the tank is working.
3. Hoses are inspected for leakages.
4. Anti-drip is inspected
5. Check the liquid flow from the atomizers and control at least once a year if every atomizer is dispersing the same amount of spray liquid. The little nozzle, which is located on the side of the atomizer, must be in the right position – the little hole must face away from the atomizer.
6. Add air and check atomizing. Check that the blower produce the needed air pressure, this is checked by providing the maximum and minimum air pressure (from 30 cm/V to 5 cm/V). Check that no impurities, paper, or leaves are stuck in the atomizer.
7. Check for leakages in boom pipe, especially at boom link



#### 9.2.4 Calibration of flow gauge (liquid gauge)

Before operating the sprayer, the flow gauge must be calibrated to ensure that the litres of pesticides are read correctly. Calibration is usually carried out only once a year before a new spraying season starts. For calibration only use clean water and turn off the tractor. The sprayer has to stand firmly and secured (on outriggers or permanent foundation) during the process of calibration in order to guarantee an exact reading of the tank level indicator



For further information about the process of validation, see chapter 11 in the spray computers users manual.

#### 9.2.5 Proportioning the amount of spray liquid (fine tuning)

For procedure regarding proportioning the amount of spray liquids please see the section about setting the monitor.

#### 9.2.6 Test run in the field

It is recommended to run a test drive with clean water in the field to ensure that everything is operating as it should. During this test run, all the functions and setting possibilities of the sprayer should be tested and practiced.

### 9.2.7 Choice of working width

It is possible to choose between full working width and a 12 meters working width. When spraying at a working width of 12 the outer boom is not folded out. Automatic flaps are mounted at the end of the inner boom and the motor-operated valves for the outer boom sections are shut.

### 9.2.8 Adjusting the sprayer boom

The entire boom is adjusted correctly by the manufacturer. Due to transportation this may alter. Therefore, it is essential to readjust the sprayer boom before using it. Please repeat re-adjustment the sprayer boom on a yearly basis to ensure that the boom is always in correct position both during spraying and transportation.

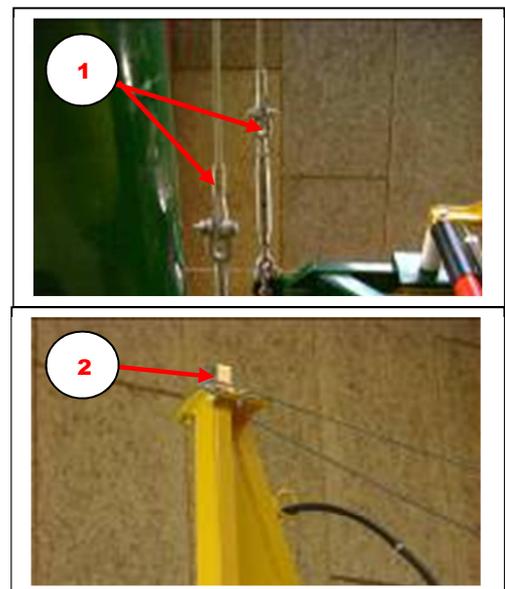
It can be tested continuously whether the boom is correctly adjusted by folding out the boom and visually check if all the atomizers are on a straight line and the boom is not swaying. If so, the wires, which carry the boom, must be tightened, so that all atomizers are on a straight line in working position.

#### 9.2.8.1 Procedure for adjusting the boom i spraying position:

1. Fold out boom completely (please note: the lifting cylinder must be swung out fully).
2. Tighten front bolt firmly and turn it one more full revolution
3. Then, tighten the lock nut
4. Fold in boom completely (please note: the lifting cylinder must be retracted fully).
5. Tighten rear bolt firmly and turn it one more full revolution.
6. Then, tighten the lock nut.

#### 9.2.8.2 Adjusting boom to transportation position

It is important that the boom is always in correct transportation position, as the boom is otherwise damaged. To adjust the boom to transportation position use the adjustable wire tightening device (1) and the adjustable pivotal point (2) on top of the tower.



### 9.2.8.3 Procedure for adjusting the boom in transportation position:

1. Fold in boom slowly. Please note that the outer boom must slip correctly into the appropriate fixture and snap into place.
2. If the boom is too high, shift the cable guide at the top of the tower backwards.
3. If the boom is too low, shift the cable guide at the top of the tower towards the front.
4. The inner boom must be placed in the fixture safely. Please be aware that the height of the fixture can be adjusted in order to change its height for transportation



**Wrong: boom must slip correctly into the fixture**



**RIGHT: boom is correctly placed into the fixture**

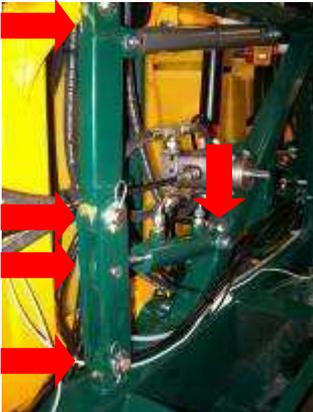
### 9.2.9 Lubrication and maintenance scheme:

		Daily	Weekly	Yearly
<b>Pump</b>	Check of oil level	X		
	Change of oil (norm and motor)			X
<b>Hydraulic system</b>	Change of oil filter			X
<b>Hydraulic hoses</b>	Check of hydraulic hoses		X	
	Exchange of hoses due to ageing			X (a)
<b>Air vessel</b>	Check of air pressure (approx. 1,0 kg/sq.cm)			X
<b>Fittings</b>	Cleaning and check of filter	X (b)		
	Calibration of flow gauge			X (springtime)
<b>Boom</b>	Check of atomizers (both air and liquid)	X (b)		
	Wire spraying position		X	
	Wire transportation position		X	X
<b>Lubrication</b>	Turning joint, connection link and cylinder		X	
	pendulum suspension, mech. Shock absorbers, cardan on turning joint	X	X	

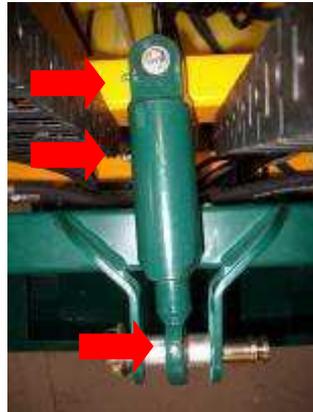
- a) Hydraulic hoses must be exchanged every 6 years, including storing time. For this, hoses are marked with a production date.
- b) According to necessity / when changing pesticides.

### 9.2.10 Important lubrication points

= lubrication point.



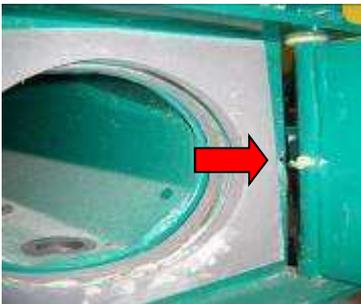
Pendulum for tilt cylinder



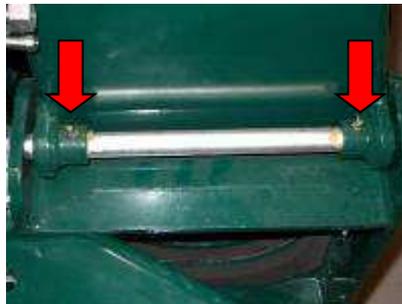
Mechanical shock absorbers



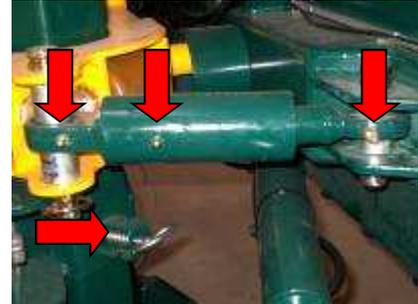
Wire wheel for sledge



Inner boom



Swing joint



Mechanical shock absorbers



Cylinder for inner boom



Cardan at turning point

## 10 Dosage and filling of plant protection products

### 10.1 How to read dosage instructions

The recommended water volume and pesticide dosages for the danfoil sprayer are mentioned in **chapter 10.2**

**Please note**, that all instructions for spraying stated in this manual are only recommendation. Different operating conditions or times for spraying might require changing the dosage according to the new circumstances.

**Please also note** that the dosage instructions on the packing of the different plant protection products are referring to the dosage one would have used with a traditional sprayer for the same spraying task



**Always take notice of the instructions given by the supplier of the different plant protection products. They inform about correct use, different possibilities for mixing and the right order of the components as well as about protective measures and adequate cleaning of the sprayer.**

If you are unsure about dosage and concentration please try and make a proportional mixing in a bucket

## 10.2 Dosage recommendations for the danfoil sprayer

*for pesticides used under normal spraying conditions.*

Recommended pesticide dosage is shown with a \* / \*\* / \*\*\* / \*\*\*\* as follows:

* : Approx. 100%	} of the dosage chosen for a conventional sprayer.
** : Approx. 80%	
*** : Approx. 65%	
**** : Approx. 50%	

### A) HERBICIDES

#### GRAIN:

- \* Soil herbicides: Boxer EC, Stomp SC, DFF
- Foliar herbicides:
- \* Hormone herbicides
- \* "Mini herbicides": Ally ST, Express ST, Harmony, Harmony Plus, Primus, Lexus 50 WG, Monitor, Hussar OD, Atlantis OD
- \*\* Contact herbicides: Oxitril, Briotril, Basagran 480, Fighter 480, Basagran M75
- \*\*\* Systemic herbicides: Roundup, Primera Super, Grasp 40 SC, Starane XL, Starane 180, Tomahawk 180EC, Metaxon
- \*\*\* Mixed herbicides: DFF + Oxitril/Briotril

#### RAPE:

- \* Soil herbicides: Command CS, Kerb 500 SC
- \*\* Foliar herbicides: Focus Ultra, Agil 100EC, Matrigon, Loncid, Cliophar

#### PEAS:

- \* Soil herbicides: Bladex
- \*\* Mixed herbicides: Stomp + Basagran

#### BEEETS:

- \* Soil herbicides:
- \*\* Foliar + mixed herbicides: Goltix, Betanal-products, Matrigon, Safari

#### CORN:

- \* Soil herbicides: Calaris, Laddok TE
- \*\* Foliar herbicides: CornTer, mix of CornTer with Starane 180-Tomahawk 180EC/Harmony

#### POTATOES:

- \* Soil herbicides: Fenix, Command CS, Boxer EC
- \*\* Foliar herbicides: Titus WSB, Agil
- \*\*\* Desiccation: Reglone

#### GRASS SEED:

- \*\* Foliar herbicides: Stomp SC, Boxer EC, DFF

#### CHRISTMAS TREES:

- \* Soil herbicides: Zeppelin, Boxer EC, Kerb 500 SC
- \*\* Foliar herbicides: Matrigon, Metaxon, Logo

### B) GROWTH REGULATORS

- \*\*\* (in tank-mixing)

### C) FUNGICIDES

- \*\*\*\* Grain and Peas
- \*\*\* Strobilurins
- \*\* Rape and Beets
- \* Potatoes
- \* Strawberry and Onion

### D) INSECTICIDES

- \*\* Pyrethroider, Dimethoat, Pirimor
- \* Other insecticides

### E) MANGANESE FERTILIZER

- \*\* Manganese chelate
- \*\* Manganese sulphate powder (of good quality)
- \*\* Manganese sulphate solutions (Liquid)

*Never mix manganese sulphate with hormone pesticides and only with one fungicide and one insecticide.*

**Manganese sulphate must only be 10% of application rate (max. 3 Kilo in 30 litres of water)**

**NB: All stated recommendations are only for guidance as many circumstances at time of spraying may indicate other spraying technique.**

*Always follow the label recommendations in relation to mixing procedure and mix ability.*

Oil, spread and adhesive is always added per each litre of water (not per ha). Otherwise, the concentration would be too high since danfoil field sprayers only require a small amount of water.

**Caution:** Effects and consequences of using plant protection products in combination with the above mentioned amount of water and dosage have not been tested by the BBA.

### 10.3 Filling of plant protection products

Always read the label on the container of the plant protection products. The plant protection products are filled into the tank through the filling aperture on the top of the tank or through the chemical filling device

Always use the filter insert, so that no impurities enters the tank. When filling the plant protection products through the filling aperture, it is recommended to establish a working platform on par with the sprayer's footboard or to decant chemicals into smaller containers as to avoid the risk of residues during ascent onto the footboard.

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### 10.4 Precautions

During spraying, cleaning, and especially when preparing the spraying liquid the operator must be careful. The various precautions, use of personal protective equipment, and rules for disposal of chemical residues and empty containers are extensively described in manuals and pamphlets from e.g. the working environment authority. **Read them!**



**The following protection equipment should be used:**

- Gloves
- Boots
- Headwear
- Respiratory protection
- Safety goggles
- Clothing that prevent chemical contact with skin

**You may not eat, drink, or smoke while working with plant protection products. Always have fresh water nearby. The content of the clean water tank can be drained from the tap at the bottom left of the footboard.**

## 11 Spraying in the field

### 11.1 In general

During spraying, the main task of the operator is to provide the proper air pressure and the proper boom height. See the following regarding spraying technique



**Always remember to clean hoses from residues of cleaning liquids before starting a new spraying task. For this, flush the hoses with clean water.**

**Always consider wind conditions. Adjust the sprayer according to wind conditions in order to prevent shelterbelts and neighboring crops from being damaged or destroyed. Make sure that no persons or animals are in the range of spray mist.**

Do not perform any spraying tasks in case of strong wind. An anemometer can help to decide whether or not to spray.



**Especially on rough and hilly terrain the tank always has to be filled with sufficient spray liquid so as to guarantee accurate dispersion. The spraying task must be stopped if the monitor of the spraying computer displays a decrease in litres/hectare. This occurs when the flowmeter is undersupplied.**

The deposition and penetration of the spray liquid on the crops can be examined and evaluated by placing small pieces of water susceptible paper on the plants

---

## 11.2 Setting of air pressure

### 11.2.1 General notes for air pressure

In the following, general directions for setting air pressure and boom height is described.

#### 11.2.1.1 On bare ground or in low crops (levelling pole 1-5):

Always spray with low air pressure (10-13 cm water column) in order to obtain larger droplets and to lower the risk of drift. The height of the boom is to be adjusted in a way that the spray liquid is slightly touching the ground (the crops or small parts of plants on the ground must be gently moved by the air). When there is a risk of drift the operator must be very attentive to air pressure and height of boom.

#### 11.2.1.2 Beets

Sprayed under the guidance above (bare ground or low crops)

#### 11.2.1.3 Corn

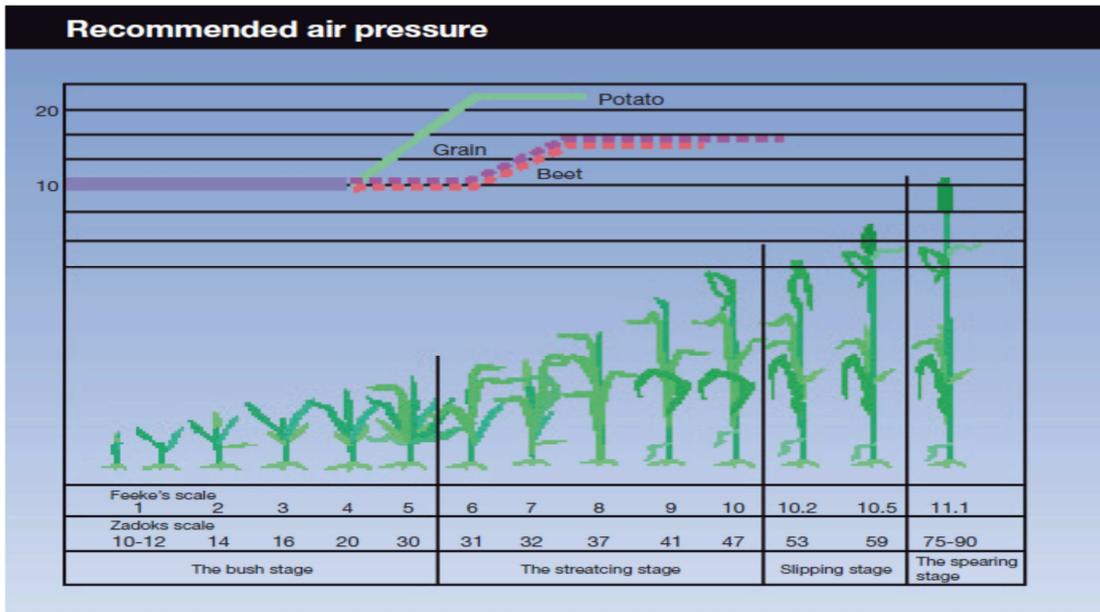
When combating weed and during the first spraying task with fungicides (levelling pole 1-5) spraying should be carried out with such a low air pressure that the plants are slightly moved by the air. Avoid too high air pressure since this can press down the crops. When crops grow the air pressure must be increased to ensure better deposition (levelling pole 6-10). Higher air pressure leads to smaller droplets and therefore guarantees a better deposition onto the plants. The final spraying task (levelling pole 10-11) must be carried out with an air pressure of approx. 22 cm water column

### 11.2.1.4 Potatoes

The first spraying task for potatoes is carried out with low air pressure. When the amount of crops to be sprayed is increasing, the air pressure is raised up to a level of 25 cm water column during the last 3 mildew spraying tasks and for weed control.

### 11.2.2 Recommended air pressure

The air pressure is adjusted according to the growth of the crop and according to the wind conditions. The illustration is considered as guideline. Different operating conditions or times for spraying might require changing the pressure according to the new circumstances.



The level of air pressure is determining both the penetration and deposition of spray liquid onto the crops as well as the risk of drift.

## 11.3 Setting the height of the boom

### 11.3.1 Recommended height of the boom

Recommended height for the boom is 40-80 cm above the crop. Most of the spray liquid is dispersed in the lower third part of the atomizers' range. In this part the air has the greatest turbulent effect

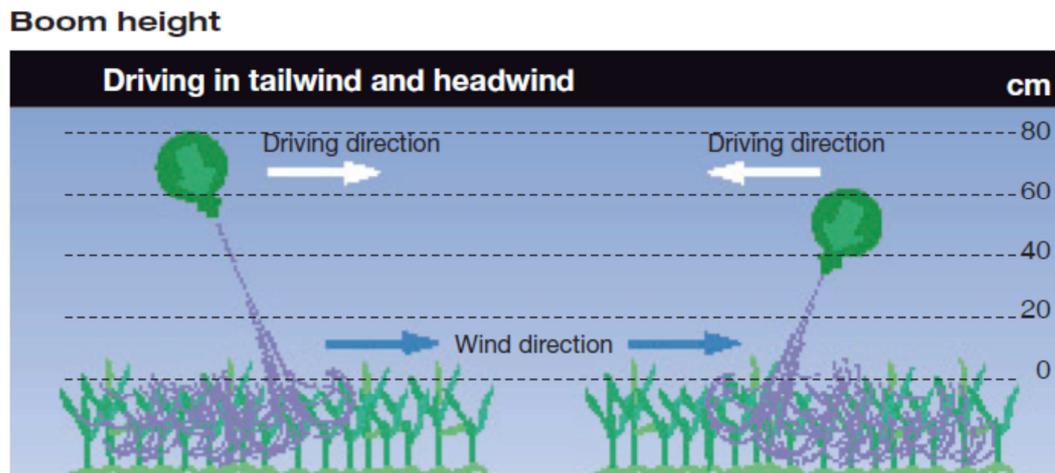
The theoretical working principle of the Danfoil-sprayer is that the airflow directs the spray liquid exactly to where an optimal effect is guaranteed



**At low air pressure the height of the boom must also be low and vice versa**

**If the height of the boom is too low the spray liquid will be dispersed unevenly (in stripes)**

### 11.3.2 Driving in down- and headwind



When using the Danfoil sprayer during windy weather conditions the driver must ensure that the atomizers' airflow is reduced in case of headwind. Therefore, the boom's height must be lower than its height when driving in downwind

If the wind is coming diagonally from the front then the boom on the wind-facing side must be lower than the boom in the lee of the tractor

Driving in tailwind and headwind		
	Tailwind	Headwind
Boom height	High boom	Low boom
Driving speed	High speed	Low speed

### 11.4 Recommended driving speed

Recommended driving speed is 6-7 km/h. An even lower driving speed is recommended when spraying densely standing crops as well as beets.

## 11.5 Recommended spraying techniques

The following spraying recommendations are only guidelines. Different operating conditions or times for spraying might require changing the spraying technique according to the new circumstances (air pressure-measurement on boom).

Crop - assignment		Levelling pole 9 Feekes scale	Liquid litres per hectare	Air pressure cm water column.	Speed km per hour	Recommended boom height cm
Grain	Weeds	0 - 5	40 - 50	12 - 13	6 - 8	60
	Fungal decease	1 - 5	35 - 50	12 - 15	6 - 8	60
	Fungal disease	6 - 10	35	14 - 18	6 - 7	60
	Infestation	6 - 10	35	15 - 18	6 - 7	60
	Growth regulator	4 - 10	35	15 - 20	6 - 7	70
	Wild oats	5 - 7	35	15 - 20	6 - 7	60
	Fungal decease/infestation	10 - 11	35	20	6 - 7	60
Rape	Weeds	1	40 - 60	12 - 15	6 - 8	60
Peas	Weeds	2	40 - 60	12 - 15	6 - 8	60
Beets	Weeds	4 - 5	35 - 50	12 - 14	6 - 7	60
	Infestation	6 - 9	35 - 50	14 - 18	5 - 6	60
Seed grass	Weeds	1 - 3	60 - 80	12 - 15	6 - 7	60
	Fungal decease/infestation	4 - 11	35 - 40	15 - 18	6 - 7	60
Potatoes	Mildew	2 - 3	35 - 40	12 - 16	6 - 8	60
	Mildew	4 - 7	35 - 40	14 - 18	5 - 7	60
	Die down	7	35	17 - 25	5 - 7	60
In general	Soil pesticides	0	35	12 - 15	6 - 8	60
	Manganese fertilizer	1 - 5	35 - 50	12	6 - 8	60
	Manganese fertilizer	6 - 8	35 - 50	12 - 14	6 - 7	60
	Liquid- / leaf fertilizer with N-22, kl. 16-21	8 - 9	35 - 100	approx. 8 - 12	6 - 7	60
	Quick grass before harvest in good growth	10 - 11	35	17 - 25	6 - 7	60
	Quick grass, after harvest	stubble	35	12	6 - 8	60

**Remarks:** The air pressure must always be adjusted according to wind conditions: Low air pressure at adverse wind and max. air pressure at favourable Wind conditions: When spraying on bare ground and under moderate wind conditions the height of the boom is recommended to be at 40 cm and the use of low air volume is advised.

## 12 Cleaning the sprayer

### 12.1 Cleaning instructions



**The sprayer must be kept clean constantly – do not clean it only occasionally!**

For this, never let residues from spraying or chemicals remain in the sprayer and dry up. Always pay close attention to the cleaning instructions written on the packaging of the plant protection product

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### 12.2 Advices for cleaning

Keeping the sprayer clean is facilitated when flushing the sprayer properly with clean water immediately after every spraying task. Additionally, empty and rinse filters after every cleaning procedure.



**Emptying, cleaning, and rinsing the sprayer should possibly be carried out on the field or on designated washing areas where the water can be collected.  
Legal regulations regarding environmental protection must absolutely be obeyed.**

#### 12.2.1 Section valves and the motor-operated valve

Section valves and the motor-operated valve should be operated several times during the cleaning procedure and as long as cleaning liquid is pumped through the entire system to ensure a good cleaning of these valves.

#### 12.2.2 Eurofoil atomizers

The atomizers are cleaned most effectively when the air supply is completely opened and the cleaning liquid is pumped through the boom system. . If the effect is not satisfying clean the atomizer with a brush and water as well as cleaning agent. Never use a high pressure cleaner directly for atomizers.

#### 12.2.3 Warm water

Warm water increases the positive effect of the cleaning agent and accelerates the cleaning process. Especially after spraying potatoes or similar plants the sprayer must be properly cleaned, since hardly soluble chemicals are used. Finally, remember to also clean both the tractor's and the sprayer's exterior surface

#### 12.2.4 Rinsing

After cleaning and rinsing, refrain from further spraying until the boom system has completely dried out and spray liquid has been replaced.

## 12.3 Cleaning the sprayer

### 12.3.1 Beginning of spraying season

At the beginning of the season clean the sprayer with warm water and an officially approved cleaning agent. Repeat this procedure several times. Check if the liquid supply in the boom is correct and well-functioning. The following checklist can be used to ensure that the sprayer is ready for the spraying season:

1. **Liquid pump:**
  - a. Oil change
  - b. Be aware that the oil is clean. If the oil is gray or whitish in color the diaphragm in the liquid pump must be changed.
  - c. Control wearing parts and possibly replace
2. **Fittings:**
  - a. Cleaning and inspection of filters
  - b. Calibration of flow gauge
3. **Hydraulic**
  - a. Inspect the hydraulic hoses
  - b. Change oil filter
4. **Boom and air box**
  - a. Check of air pressure (approx. 1,0 kg/sq.cm)
  - b. Check of atomizers (both air and liquid)
  - c. Check boom sections for foreign objects
  - d. Adjustment of boom
  - e. Lubrication of turning joint, cylinder and shock-absorbers
  - f. Cleaning or replacing of diaphragm in anti-drip.
5. **Sprayer**
  - a. It is recommended to lubricate the sprayer with thin oil before starting spraying, as this may ease future cleaning.

### 12.3.2 Remove residue from the sprayer

Remove residue from the sprayer with the help of the valve at the bottom of the tank. Please note that rests of spray liquid may remain in pump, filter, and hoses even after emptying it.

The residue of spray liquid can be channelled to the tank by using clean water from the clean water tank. For this, switch the button on the control panel to "clean water". Set the motor valve to maximum water volume and open completely. Then, empty and clean the filter. See **chapter 7.4**.

### 12.3.3 Procedure for cleaning tank

The following procedure is recommended for cleaning the tank:

1. When the tank is nearly empty, the agitator is turned off while you continue spraying until air comes out of the atomizers.
2. 1/3 of the rinse water is filled into the tank.
3. The sprayer is set to agitation, and all valves are operated so that all hoses are flushed.
4. The tank is briefly rinsed via the flush valve.
5. Rinse water is sprayed out through the atomizers while driving forward.
6. Continue spraying until air comes out of the atomizers.

This is repeated two more times until all the rinse water is used.

### 12.3.4 Rinsing boom system and flow gauge

Rinsing the boom system and the flow gauge should be carried out directly on the field with water from the clean water tank or by hooking a water hose to the control panel. Rinse with water from the clean water tank you need to switch a button on the control panel and turn off the spray pump.

Rinsing with water hose the following adjustment of levers is needed: Lever for flushing boom system is turned, section vents are opened, **see chapter 7.6**.

### 12.3.5 Daily cleaning

After spraying with easily soluble products: If easily soluble products do not leave any residues good cleaning results can be reached by well emptying and rinsing the tank with clean water. Then, empty and clean the filter. After spraying hardly soluble products: Because hardly soluble products may leave residues, the entire spray system must be properly cleaned with water and adequate cleaning agent. To clean the atomizers use brush, water, and cleaning agent. Empty and clean the filter. Then, flush the entire system with clean water. Cleaning the interior of the tank can be tremendously facilitated by installing an additional rotary tank cleaner. The rotary tank cleaner is supplied from the pump and flushes the tank with water and high pressure (and cleaning agent if necessary). Let the water circulate for approx. 15 minutes.. Then, follow the instructions as mentioned above. For this, turn the lever on the control panel. See **chapter 7.6**

### 12.3.6 Cleaning when changing plant protection product

Cleaning when changing plant protection products must be carried out very thoroughly. Remember to also clean the induction unit (if mounted). Note the packaging of the plant protection product for useful cleaning instructions. If those cleaning instructions are insufficient follow the cleaning procedures as described in **chapter 12.4**

### 12.3.7 Exterior cleaning

Cleaning of the exterior parts of the tractor as well as the sprayer can be done by using officially approved cleaning agent and a high pressure cleaner. Remember never use high pressure cleaner directly for atomizers.

### 12.3.8 End of spraying season:

Cleaning of the sprayer at the end of the season is to be completely carried out as described above, both internally as well as externally as described above. Additionally, the anti-drip valve has to be cleaned as follows: Demount the anti-drip valves and place them in a bucket with cleaning agent. After several hours take the anti-drip valves out, rinse them off and blow them with high air pressure before remounting. It is recommendable to check and exchange the section valves if necessary. If the sprayer is used very often it is recommendable to change the membranes in the pump once a year.

### 12.3.9 Frost protection

Frost protection of the sprayer before the winter by filling antifreeze in the tank and pump it with water through the sprayer and the boom (e.g. 40 litres of water + 15 litres of antifreeze). **Please remember to empty the filter from antifreeze**

1. We recommend using anti-freeze for frost protection (Ethyleneglycol)
2. Empty the sprayer as good as possible for residues
3. Clean the interior and exterior of the sprayer thoroughly.
4. Fill 20 liter water and add 5 liter anti-freeze. This mix protects the sprayer down to -13 degrees
5. Start the sprayer on agitation
6. When the liquid is mixed tank cleaning is started
7. Subsequently the chemical filling device is started. Remember the cleaning nozzles.
8. The boom is turned on and is closed when you see blue anti-freeze in the outer atomizers.
9. Residues are drained from the tank, as well as suction and pressure filters
10. Subsequently, residues can be used to frost protect the clean water tank as well as the rinse pump.
11. Possibly emptying the high pressure cleaner for water.
12. If any additional residues save these for next year.
13. Remember to keep these residues out of reach for children
14. Remember to empty filters

**12.3.10 Other winter preparation tips:**

1. Keep your danfoil control computer and joystick in a dry room to avoid humidity.
2. Check if the computer box on the sprayer is intact in order to avoid condensation in the box, as this can damage the circuit board.
3. Check that the electricity grid on the sprayer is intact, in order to avoid damage and short circuit at start-up.

## 12.4 Cleaning procedures

<p><b>DU PONT</b> recommends the following:</p> <p style="text-align: center;"><i><b>Cleaning of the sprayer after Ally 20 DF, Express &amp; Glean 20 DF.</b></i></p> <p><b>1.</b> Just after having finished the spraying task clean the sprayer thoroughly with clean water. Then, the water can also be sprayed on the crop. Remember also to clean the sprayer on the exterior surface.</p> <p>During the cleaning procedure all vents and taps should be activated to ensure that all hoses are cleaned. Additionally, the sprayer needs to be completely emptied between each flushing.</p> <p><b>2.</b> Fill up the sprayer with water mixed with 0,3 litres threefold ammonia solution per 100 litres water (see also other cleaning agents listed below*), rinse hoses and boom, refill the tank with water and leave it for at least 15 min. to be stirred by the rotary tank cleaner. Empty the sprayer through the boom/atomizers – flush tank and boom with clean water.</p> <p><b>3.</b> Atomizers and filters are cleaned separately with the same cleaning agent and concentration as used for the sprayer.</p> <p><b>4.</b> Repeat step 2.</p> <p><b>5.</b> Rinse tank/sprayer well for 5 min. Simultaneously, squirt out the rinsing water through boom/atomizers.</p> <p>Caution: Remember to only release water in areas where trees, crops, groundwater, river or other natural water resources could be negatively affected.</p> <p>* Other cleaning agent approved by <b>DU PONT</b></p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">Ordinary ammonia solution</td> <td style="padding: 2px;">1 litre / 100 litres water</td> </tr> <tr> <td style="padding: 2px;">PLK-Red sprayer cleaner</td> <td style="padding: 2px;">1 litre / 100 litres water</td> </tr> <tr> <td style="padding: 2px;">KVK sprayer cleaner</td> <td style="padding: 2px;">1 litre / 100 litres water</td> </tr> <tr> <td style="padding: 2px;">Red sprayer cleaner (Shell)</td> <td style="padding: 2px;">1 litre / 100 litres water</td> </tr> <tr> <td style="padding: 2px;">Clarén <b>CitriKleen</b> Eco</td> <td style="padding: 2px;">2-2½ litres / 100 litres water</td> </tr> <tr> <td style="padding: 2px;"><b>DU PONT</b> All Clear Extra</td> <td style="padding: 2px;">½-1 litre / 100 litres water</td> </tr> </table>	Ordinary ammonia solution	1 litre / 100 litres water	PLK-Red sprayer cleaner	1 litre / 100 litres water	KVK sprayer cleaner	1 litre / 100 litres water	Red sprayer cleaner (Shell)	1 litre / 100 litres water	Clarén <b>CitriKleen</b> Eco	2-2½ litres / 100 litres water	<b>DU PONT</b> All Clear Extra	½-1 litre / 100 litres water	<p><b>danfoil a/s</b> has experience with the following cleaning procedure:</p> <p><b>1. Empty</b> the sprayer, remember filters.</p> <p><b>2. Flush</b> with 30-60 litres clean water. Adjust to the highest amount of liquid possible to create an effect of high speed rinsing. <b>Empty</b> the whole sprayer</p> <p><b>3. Cleaning</b> 40-60 litres water + 1-3 kg caustic soda or approved cleaning agent e.g. <b>CitriKleen</b>.</p> <ul style="list-style-type: none"> <li>- <i>The mixture is sent through hoses and boom</i></li> <li>- <i>Activate all valves and taps</i></li> <li>- <i>The mixture remains in the system for 10-15min</i></li> <li>- <i>The inside of the tank is rinsed</i></li> <li>- <i>The atomizers are cleaned (brushed)</i></li> <li>- <i>The outside of the tractor &amp; sprayer is cleaned</i></li> <li>- <i>Emptying through the boom (with air)</i></li> <li>- <i>Filters are emptied and cleaned.</i></li> </ul> <p><b>4. Rinsing</b></p> <ul style="list-style-type: none"> <li>- <i>The system should be rinsed 2 times entirely</i></li> <li>- <i>Optionally, mix Lissapol into the water of the last rinsing procedure.</i></li> </ul> <p><i>After spraying with Ally, Express and Glean the following disinfection has to finish the cleaning procedure:</i></p> <ul style="list-style-type: none"> <li>- <i>The tank is completely filled up with water and additionally mixed with 1,0 litre ammonia water (3%) or 0,3 litre threefold ammonia water (9%) per 100 litres water</i></li> <li>- <i>The mixture is sent through hoses and boom</i></li> <li>- <i>The tank is refilled with water</i></li> <li>- <i>The mixture remains in the system for 10-15min</i></li> <li>- <i>The exterior surface of the tractor and the sprayer is cleaned</i></li> <li>- <i>Emptying of sprayer - (some part through the boom with air)</i></li> <li>- <i>Rinsing and emptying of filters</i></li> </ul>
Ordinary ammonia solution	1 litre / 100 litres water												
PLK-Red sprayer cleaner	1 litre / 100 litres water												
KVK sprayer cleaner	1 litre / 100 litres water												
Red sprayer cleaner (Shell)	1 litre / 100 litres water												
Clarén <b>CitriKleen</b> Eco	2-2½ litres / 100 litres water												
<b>DU PONT</b> All Clear Extra	½-1 litre / 100 litres water												

**After one spraying task the boom should immediately be rinsed with sufficient water. It prevents sedimentation. For this, use the hook for an external water hose. Water pressure should amount to 2 bars. Flush for 5–10 minutes, preferably with warm water.**

## 12.5 Good advise for cleaning



**After every rinsing and cleaning procedure empty and clean filters**

Insufficient cleaning can cause partly or completely clogging of the sprayer.. In this case, rinse immediately with warm water and apply cleaning agent.

Remember always to follow the instructions on the cleaning agent. The mixture is run through the system out to the atomizers. Empty the rest of the tank and filter. Allow the cleaning agent to work for a few hours, preferable overnight. Then follow the procedure from the table above to rinse. Mix a soap product into the last rinse water in order to prevent the hoses and gaskets from drying.



**Never leave spray or chemical residues sit in the sprayer and dry. Always read the instructions as listed on the individual plan protection products.**

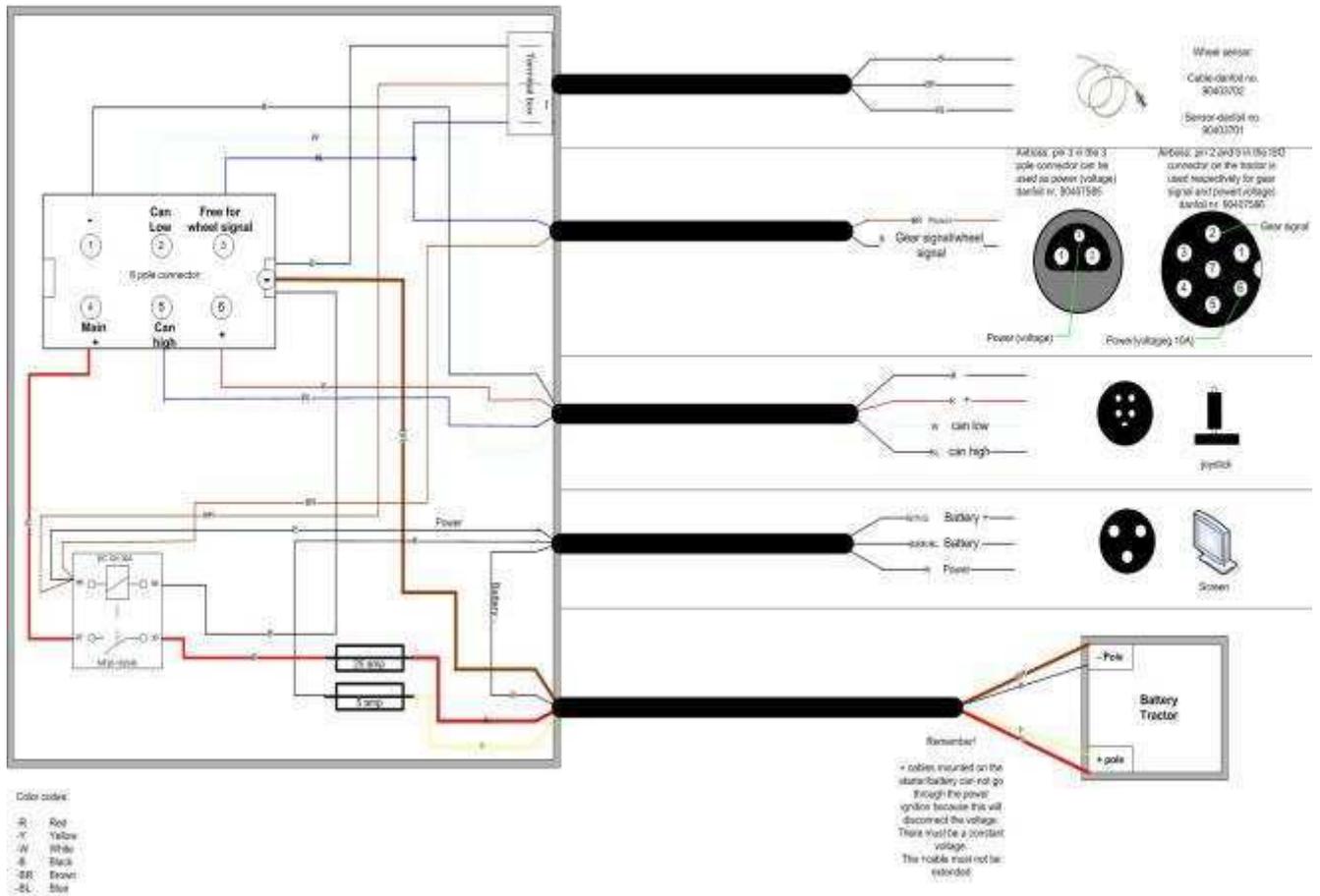
## 13 Troubleshooting

Problem	Cause	Solution
Frequent blockaging of atomizers	Filter cartridges leak	Replacement
	Impurities inside the system	Thorough cleaning
An atomizer applies too small amount/nothing	The throttle in the side of the atomizer is blocked	Cleaning
Two neighbouring atomizers apply too small amount	The anti-drip device is stuck	Cleaning
	The throttle on the hose is blocked	
Bad atomization	Impurities in the atomizer	Remove impurities
	The trailing edge is not sharp	Replacement
Max. output is too low	Filter is blocked	Cleaning
	The pressure valve needs adjustment	Contact dealer
The indication of the flow gauge varies	Poor cleaning of the system	Thorough cleaning
	Error indication in speed: Fault at the wheel sensor / magnet (magnets) is/are missing	Check the wheel sensor/magnets
<b>Hydraulics</b>		
No hydraulic functions	Loss of power on sprayer	Check plug in printed circuit board
		Check power supply (fuses, relays and cables)
Cylinders are not working	Impurities in the oil	The restrictor on the block of valves is cleaned
<b>Air</b>		
The indication of the manometer is unchanged	Manometer is defect	Must be changed
Descending air pressure	Motor speed is too low.	Accelerate the motor speed
	The boom leaks at the swivel	The boom is completely unfolded and the gaskets are replaced
<b>Electricity</b>		
Monitor will not start	Lack of power	1. Check 3 amp fuse
		2. Check signal cable
		3. Check plug in printed circuit board
<b>Spray liquid</b>		
No or too small amount of liquid to the boom	The main tap is closed	Open the main tap
	Filters are blocked	Cleaning
	Liquid hose is jammed/twisted	Release the liquid hose
	The section valves are not opening	Lack of power supply Check the fuses etc. Poor cleaning

# 14 Appendixes

## 14.1 Appendix 1 – Installation of power

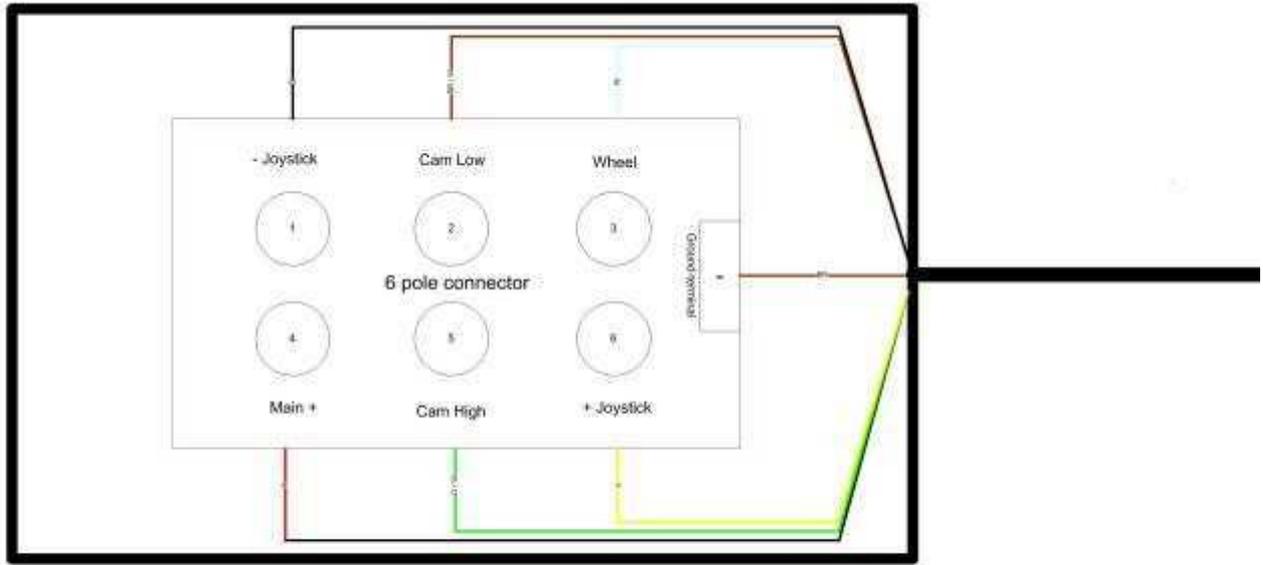
Mounting kit tractor- standard



Version 1.0  
Date: 02-03-2011

## 14.2 Appendix 2: Wire coupling for the 6 pole connector

### Wire Coupling for the 6 pole Connector

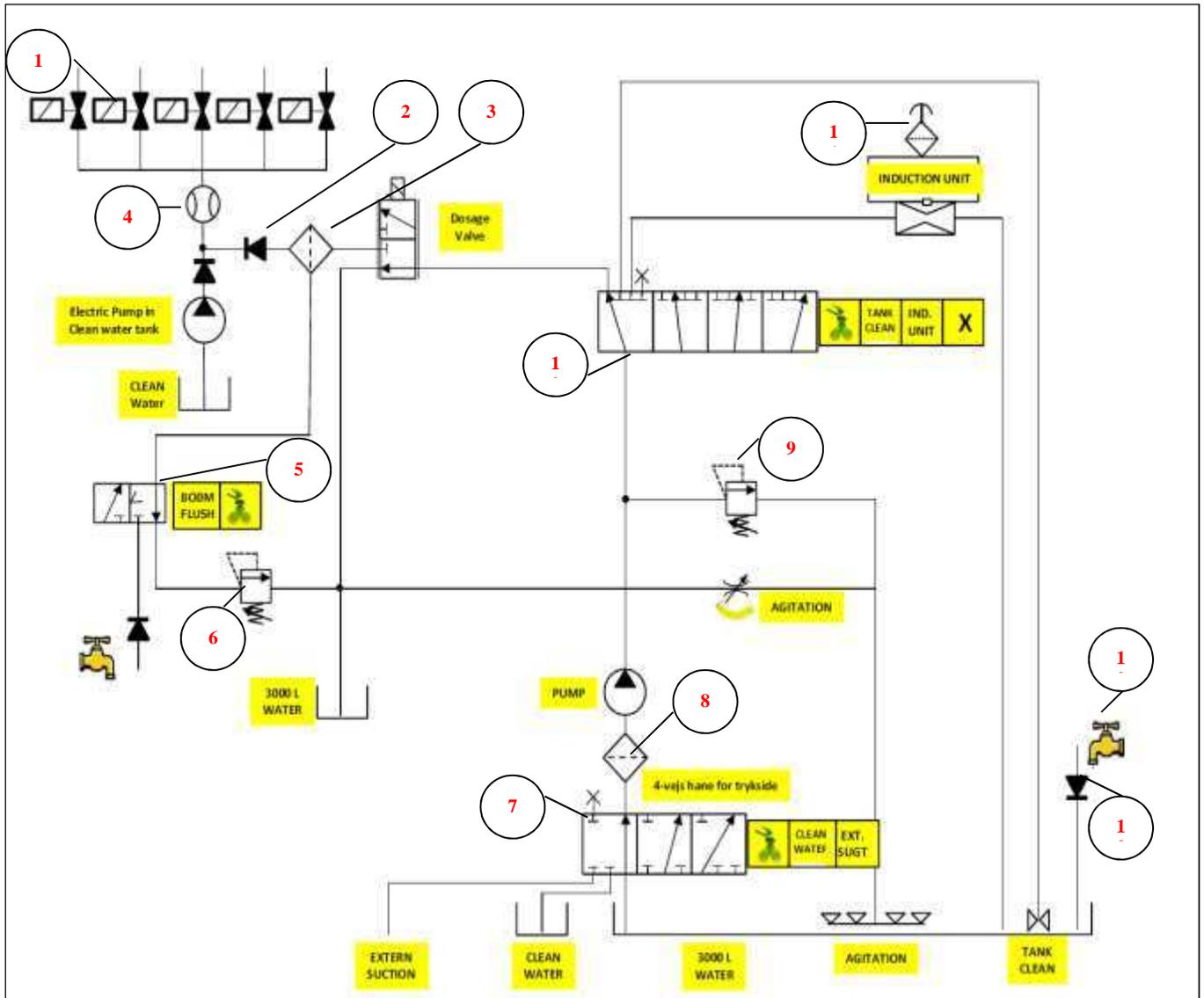


Color codes:

- R- Red
- Y- Yellow
- W- White
- B- Black
- G- Green
- BR- Brown

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### 14.3 Appendix 3 – The sprayers liquid and valve system



- |  |  |
|--|--|
| 1. Section valves                          | 8. Suction filter                            |
| 2. Check valve                             | 9. Safety valve                              |
| 3. Pressure filter                         | 10. 4-way valve for pressure (Control panel) |
| 4. Flow meter                              | 11. Hose for chemical canisters              |
| 5. 2-way valve (Control fitting)           | 12. Filling                                  |
| 6. Relief valve                            | 13. Check valve                              |
| 7. 4-way valve for suction (Control panel) |  |

**danfoil**<sup>®</sup>

Jellingvej 14 | DK-9230 Svenstrup |  
Tlf. +45 98 67 42 33  
[www.danfoil.dk](http://www.danfoil.dk) | [info@danfoil.dk](mailto:info@danfoil.dk)