

ENTAM - Test Report



Sprayer type:
Trade mark:
Model:

Trailed Field crop sprayer
Danfoil
Eurofoil ConCorde 24/ECC

Manufacturer:
Danfoil production a/s
Sjællandsvej 8
9670 LOGSTOR
DENMARK
Sept. 2008

JKI-Report: D - 1796

Assessment table		
No.	Contents	Assessment
1	Spray tank surface roughness	+
2	Spray tank over volume	++
3	Volume of total residual	++
4	Spray tank contents gauge up to 20% Filling	+
5	Spray tank contents gauge from 20% Filling	++
6	Agitation system	+
7	Width of nozzle bar section	++
8	Boom height adjustment range	++
9	Accuracy of pressure gauge	diff. system
10	Accuracy of flow meter	diff. system
11	Regulation speed	++
12	Even transverse distribution	+
13	Rinsing water tank	+++
14	Deviation of volume/hectare adjustment device (spray computer) from desired value	+
15	Repeatability of volume/hectare adjustment device (spray computer)	++

Fig.1+2: Assessment table and assessment keys of important test results

Note: The assessment keys are listed below.

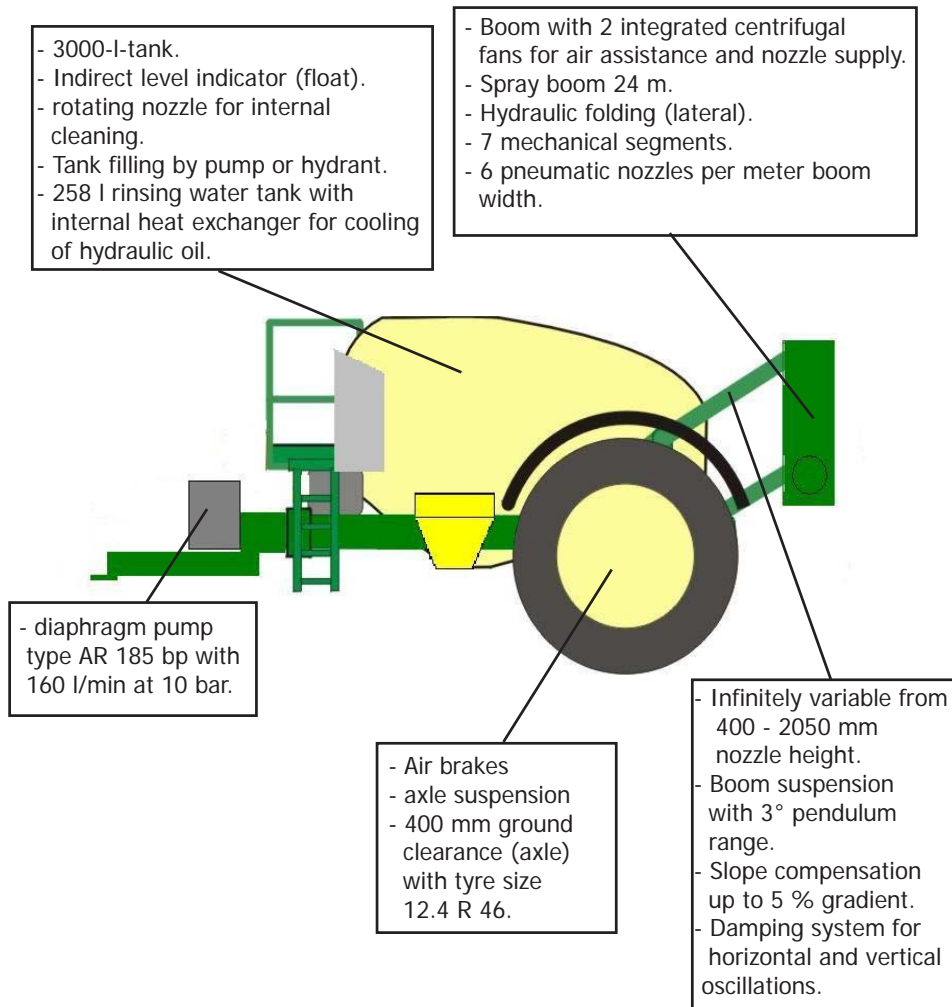
The detailed results are in the following test report.

No.	unit	+	++	+++	No.	unit	+	++	+++
1	µm	>70-100	30-70	<30	10	%	4-5	2-4	0-<2
2	%	5-8	>8-12	>12	11	s	> 4.7	2.3 - 4.7	< 2.3
3	of allow.value	>2/3-3/3	1/3-2/3	<1/3	12	CV	>7-9	4-7	<4
4	%	7.5-5.0	5.0-2.5	<2.5	13	* dilutable residue	10 - 12times	>12 - 14times	>14times
5	%	5.0-4.0	<4.0-2.0	<2.0	14	%	>4-6	2-4	<2
6	%	>10-15	5-10	<5	15	%	>2-3	1-2	<1
7	m	4.5-6	>3-4.5	3 or less	16	%	>7-10	3-7	<3
8	m	1-1.5	>1.5-2.0	>2.0	17	%	>7-10	3-7	<3
9	bar	>0.10-0.20	>0.05-0.10	0.00-0.05					

*) The rinsing water tank capacity was assessed according to the requirement of 10 times the dilutable residual of the main tank, measured according ISO 13440 with the sprayer in horizontal position.

Free download of the test under: www.ENTAM.net
or www.jki.bund.de

Technical data of sprayer



Dimensions and weights:

total length:	7050 mm
height:	3780 mm
transportation width:	2700 mm
unloaded weight:	2900 kg (acc. type plate)
max. allowed weight:	6600 kg

Fig.3: Diagram of sprayer

Description of sprayer

Framework / chassis:

Framework made of steel profiles, axle with brake (dual circuit compressed air system), rigid drawbar (optional hydraulic steering drawbar) for lower clevis hitch or piton fix hitch. The trailed sprayer has a hydraulically spring-mounted chassis and a dual circuit-brake system and is thus authorised for speeds of up to 40 km/h. The locking brake is operated mechanically. The stand is operated hydraulically.

Tank:

3000 l spray tank made of polyethylene with a level indicator using a float attached to a wire at the front on the right (scale gradations of 50 l). The tank is emptied using a spring-loaded valve below the tank. It is operated by a cable winch from the operator platform. There is a rotating cleaning nozzle in the middle tank area for

cleaning the inside of the tank. The pressurised agitator, which can be switched off, consists of a stainless steel pipe which lies directly above the ground, with a total of 12 injector nozzles. Separate rinsing water tank made of polyethylene for diluting the technical residues,



Fig.4: Front side with draw bar, pump, suction filter and front tank contents indicator

Description of sprayer

cleaning the inside of the tank and rinsing the fluid-conducting sprayer parts when the sprayer is not in constant use. In addition, the rinsing water tank (Volume: 258 l) has an integrated heat



Fig.5: Axial fan with 800 mm rotor

exchanger for cooling the hydraulic oil of the fan drive.

Spray boom with 7 segments and fans:

The spray boom consists of a middle part (painted sheet steel) and two side parts made of pipes of glass fibre reinforced plastic, on the one hand for guiding the air and on the other hand as a supporting structure. The middle part has two hydraulically driven radial fans (air flow rate can be adjusted). Nozzles with pneumatic drop atomisation (Danfoil patent) with 6 atomisers for each m working width are situated on the boom air exits. The atomisers consist of a rubber form with an inserted distributor lip made of plastic and one dosing plate each.

The liquid flows to the nozzles at low pressure (0.5 to 1.3 bar), is carried by the air and driven to the distribution lip. At the same time, the air which escapes supports the transport of the drops to the target area. The height of the boom can be adjusted hydraulically and infinitely using a lifting frame between 400 and 2050 mm.



Fig.6: Result table

Description of sprayer



Fig.7: Manually operated control valves

The pendulum suspension has a central pendulum with a pendulum range up to 3° and hydraulic slope compensation up to 5 %. The boom is divided mechanically into 7 segments of which the

outer segment (1.65 m) is flexible and can evade obstacles at the front and the back. Vertical and horizontal vibrations of the boom are compensated for by shock absorbers. It is possible to fold/unfold the outer boom element on one side only. Boom widths of 15, 18, 21, 27 and 28 m are also available on request. The radial fans are driven hydraulically. The amount of air is regulated on the suction side by an electromotive regulating flap. The settings for the fan can be checked using the air pressure indicator in the manifold and regulated by the operator. A pressure gauge for fluid pressure is not required. The noise level when driving past at a distance of 7 m to the sprayer is 83 dB(A). Pipe/hose system: suction hose system. The spray fluid is taken from the spray tank using a suction hose and the control valve. If required, the fluid can also be drawn from the rinsing tank or the external suction connection by means of the control valve. Thanks to its position, the suction filter can easily be removed and cleaned when the tank is full.

Result table

Pressurised pipe system: the fluid runs from the pump via a control valve with the settings ,spray', ,clean tank' and ,draw PPP' to the pressure control valve (control ball valve - controls the flow to the spray section valves). Fluid which is not required either flows without pressure back to the spray tank via a pressure control valve or is used for agitating in the tank via an adjustable pressurised agitator. After passing through the pressure regulation device, the fluid flows directly via the pressure filter to the spray section valves (7 in total) on the boom support and from there to the nozzles.

Induction bowl: funnel-shaped tank made of polyethylene, no rinsing pipe inside the induction bowl but a rebound nozzle above the vent and a container rinsing device to the left on the sprayer frame (practical working height of 850 mm when swivelled out). The entire rinsing bowl can be cleaned easily by closing the lid and activating the container rinsing nozzle. The induction bowl has not been inspected by ENTAM.

Control valves: the control valves consist of the control element AgroJoy 2001 and the terminal AgroMaster III XL, manufactured by V-technik. The AgroJoy 2001 control element controls the hydraulic functions (lifting, lowering, folding together, unfolding, incline adjustment), the fan output adjustment and the central switch or the spray section switch. Special functions through accessories such as foam marking and drawbar steering are controlled via the operator interface. The controls can be situated either directly on the tractor seat arm or within the operator's reach. They are connected with the terminal by a cable. The terminal enables the operator to regulate application depending on the driving speed and the target value set.

It is possible to operate the sprayer by hand and with manual pressure adjustment. The terminal menu is divided into ,operate', ,info', ,filling' and ,setups'. In ,operate' mode, the current speed and application in l/ha is shown. The system has a special feature for use when standing: for control purposes, for example, an internal speed of 3.5 k/h is simulated so that it is possible to measure distribution and to inspect dosing accuracy when standing. 'Info' mode provides the usual summary of measured values for the ongoing application and the total litres and total area since setting up the system.

Design: decentralised control valves with pressure regulation valve at the front of the sprayer and spray section valves on the boom support. AgroMaster and AgroJoy within sight and reach of the operator. Shut-off valves:



Fig.8: Result table

Switched off centrally by activating all the spray section valves at the same time; by using the electromotive valves without a pressure equaliser system, the pressure pipes can be shut off individually. Pressure adjustment valve: flow distribution regulator with fixed settings for cross-section; infinitely adjustable via an electric motor (flow distribution regulation for spray section valves and agitator/return flow). Pressure relief by using the central switch and closing the spray section valves.

Result table			
tested assembly		result (measured)	
spray tank	over volume	8.23%	* min. 5 %
	contents gauge graduation marks	50	* max. 100 l
	deviation	5.4%	* max. 7.5 % up to 600 l filling
		2.6%	* max. 5 % between 600 and 3000 l
surface roughness	0.08mm	* max 0.1 mm	
rinsing tank	volume	258 l corresponding to 22.8**	* min. 10times the dilutable volume
	rinsing and dilution possible?	yes	
can rinsing equipment	rinsing efficiency	< 0.001%	* max. 0.01 % of can contents
agitation system	deviation from even concentration	14.08%	*max. 15 %
residual in l	dilutable	26.25	* max. 63 l
	non delutable	10,13	
spray boom	height adjustment range from - to	400 mm - 2050 mm	
	nozzle ground contact protection	yes	
	nozzle dripping after switch off	0 ml	* max. 2 ml
	type of nozzle: Danfoil Eurofoil (nozzle for pneumatic drop build up)		
transverse distribution with setting: 50 l/ha; 7.2 km/h			
air pressure in sprayboom (mbar)		boom height (cm)	coefficient of variation (%) *(max. 9 %)
10.0		60	7.07
8.0		60	5.41
6.0		60	4.16
volume/hectare adjustment device			
repeatability of adjustment			
adjusted flow rate in l/ha		deviation from adjusted value % *(max. 6 %)	CV *(< 3 %)
40		5.36	0.57
60		3.81	0.73
80		1.82	0.85
procedure		regulation time (s) with deviation > 10 % to adjusted	
switching of single sections		3.8	* max. 7 s
change of driving speed by			
1.5 m/s to 2.0 m/s		3.3	* max. 7 s
2.0 m/s to 2.5 m/s		2.7	* max. 7 s
2.5 m/s to 2.0 m/s		3.6	* max. 7 s
2.0 m/s to 1.5 m/s		2.7	* max. 7 s

**) measured with sprayer on level ground

Fig.9: Result table

Additional information

At the time of publishing this report the sprayer is listed in the drift reduction class 75 % of the German drift reduction system, depending on the regulations of use. For more information about the assessment of this sprayer relating to the German drift reduction system see: www.jki.bund.de

Safety Tests

The sprayer is equipped with safety pictograms (stickers) and operating instructions in the native language, which include further safety information. The sprayer carries a CE-mark and a vehicle identification plate.

The CE-mark shows that a product fulfills the requirements defined for the respective EC directives and that the supplier has carried out the appropriate procedures to achieve conformity. The CE-mark is placed on the equipment by the manufacturer. The manufacturer confirms by doing so that the sprayer was designed and built in accordance with harmonised EC Directive 98/37/EEC and that standard EN 907 has been complied with.

Explanation on testing:

Testing takes place according to the Technical Instructions for ENTAM-Tests of boom sprayers (release 3). This procedure was developed by the competent testing authorities of the European countries participating in ENTAM and is based on the CEN standard EN 12761 „Agricultural and forestry machinery – Plant protection equipment for the application of plant protection products and liquid fertilisers“. This test is only a technical performance test which takes place without an accompanying field test. The test results apply only to the tested appurtenances of the sprayer. Statements on the behaviour of the sprayer with different appurtenances cannot be derived from these results.

Responsibility and recognition



Performing competent authority:

Julius Kühn-Institute (Germany)
 Institute for Application Techniques in Plant Protection
 Messeweg 11-12
 D-38104 Braunschweig

This test is recognized by the ENTAM members:

	BLT - Francisco Josephinum, Wieselburg (Austria)	026/09
	AU/DAE - University of Aarhus - Department of Agricultural Engineering Sciences (Denmark)	AU/DAE/ENTAM 2009-10
	Cemagref - Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement (France)	CEMAGREF/ENT/09/020
	I.A.M.C. Institute of Agricultural Machinery and Constructions (Greece)	AE/118/01/ZZ
	HIAE Hungarian Institute of Agricultural Engineering (Hungary)	D-18/2009
	ENAMA Ente Nazionale per la Meccanizzazione Agricola (Italy)	ENTAM „Rapporto di prova prestazionale“ 13/2009
	PIMR - Przemyslowy Instytut Maszyn Rolniczych Industrial Institute of Agricultural Engineering (Poland)	PIMR - 32/ENTAM/09
	CMA Generalitat de Catalunya Centre de Mecanització Agrària (CMA) (Spain)	EPHP 003/09
	ART - Agroscope Reckenholz-Taenikon (Switzerland)	D-26.09