



Biologische Bundesanstalt  
für Land- und Forstwirtschaft



# ENTAM - Test Report



Sprayer type:

Trade mark:

Model:

Trailed Field Crop Sprayer

John Deere

740

Manufacturer:

John Deere Fabriek Horst B.V.

Energiestraat 16

NL - 5961 PT HORST

Test report: D - 1759

May 2006

Assessment table
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No.	Contents	Assessment
1	Spray tank surface roughness	++
2	Spray tank over volume	+
3	Volume of total residual (here max. allowed 76 l)	++
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	++
10	Accuracy of flow meter	++
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)	+++
16	Pressure drop between manometer and nozzle	+
17	Deviation of single nozzle output from table	++

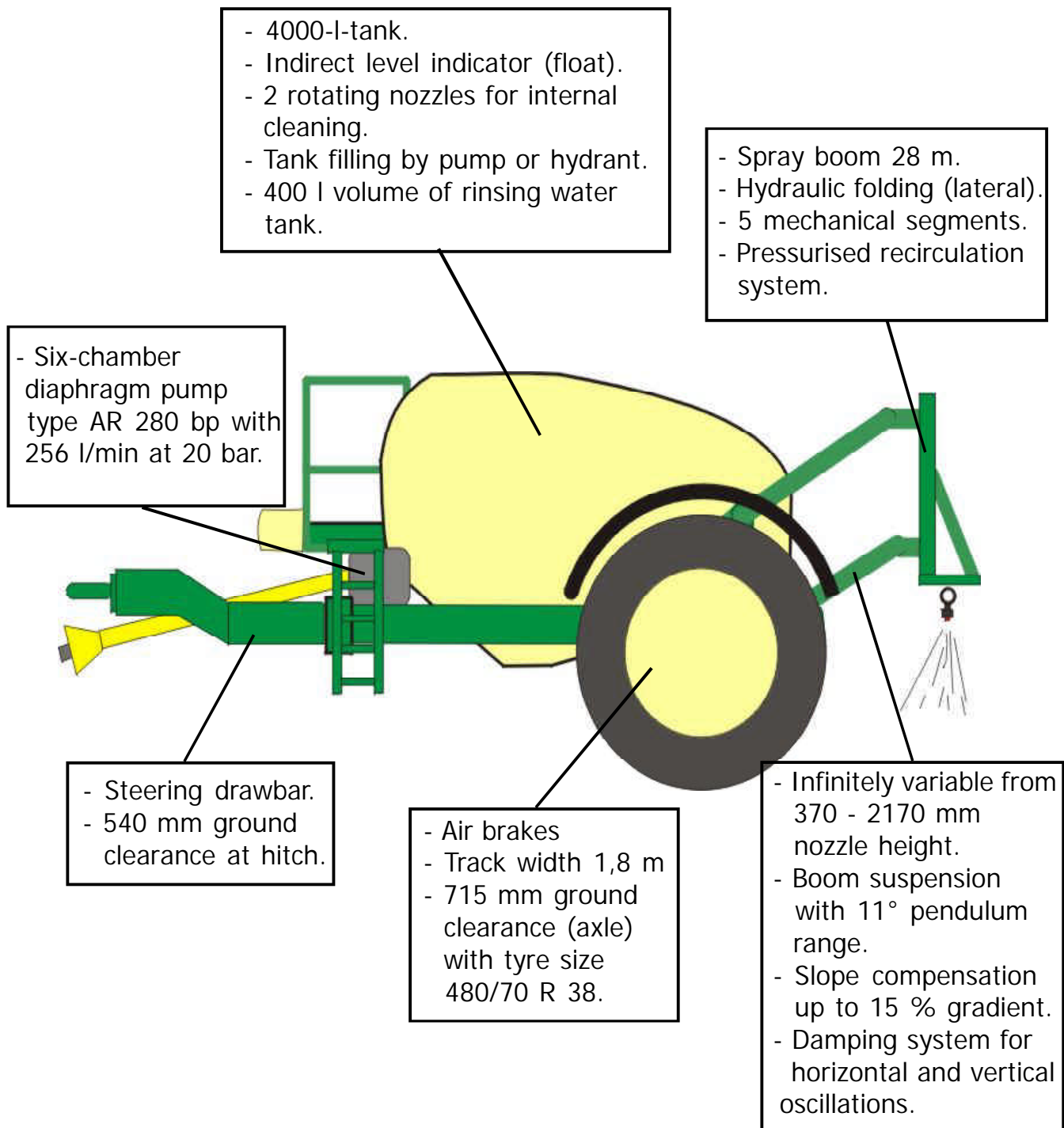
Table 1+2: assessment table and assessment keys of important test results.

Note: The assessment keys are listed below. 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	%	>7-10	>3-7	0-3
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	% of tank vol.	10-12	>12-14	>14
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					

Free download of the complete test report under: [www.ENTAM.com](http://www.ENTAM.com)  
or: [www.BBA.de](http://www.BBA.de)

## Technical data of sprayer



### Dimensions and weights:

total length:	6700 mm
height:	3770 mm
transportation width:	2520 mm
unloaded weight:	3434 kg
max. allowed weight:	7300 kg

Fig.1: diagram of the sprayer.

## Description of sprayer



Fig.2 and 3: view of the right side and the hitching device.



The sprayer features a chassis with an unsprung axle (axle suspension with polyurethane damper available as an extra) and a track width of 1.8 m. The maximum admissible speed is 40 km/h (also with a full tank). The steering drawbar is equipped with an automatic track following trailing system. Steering is via two hydraulic cylinders controlled by electro-hydraulic valves. Inductive proximity switches pass on the information concerning the positioning of the angle. For driving on roads, it is locked in position manually with a locking pin.

The coupling point (drawbar eye) can be adjusted both in height and length by using different screw positions.

The tank has no splash walls (baffles) and because of its round shape has little flat surface area at the bottom. This reduces spray deposits and improves the efficacy of the agitator and the cleaning system. The pressure agitator (four injector nozzles) can also be switched off, as well as the return flow of the pressure regulator into the tank can be redirected into the suction side of the pump, to keep residues in the tank to a minimum. The recirculation system enables that most of the residues in the tank (apart from the nozzle tubes) are dilutable. The system also guarantees that the correct concentration of spray fluid is available to the nozzles when put into spray mode (after cleaning). The circulation system opens when the nozzles are closed, which means that the liquid can travel to the section valves on the boom directly in front of the respective nozzle tubes.



Fig.4: multi-nozzle body on the boom pipe.



Fig.5: boom suspension with control valves.

Only the spray lines remain excluded from the circulation system. The flow meter or pressure sensor (alternatively) is situated directly on the boom. Together with the section valves which are directly in front of the spray lines (motorised valves), there is an even increase in pressure in the boom, with negligible pressure loss. The boom height is adjusted invariably and hydraulically by a parallelogram-shaped lifting frame with suspension system and slope compensation (hydraulic). The tested 28 m wide boom can also be used when only half is un-folded as a 14 m boom.

Slope compensation is electro-hydraulic using a potentiometer on the operator panel EL-4.

The volume/hectare adjustment device EL-4 with 7 sections (max. 9 sections) can either be driven by regulating via pressure, flow rate or combined pressure and flow rate (depending on the sensors). The pipe system has a primary pressure regulator which is delivered with preset pressure and assures even primary pressure for the functions „Clean“, „Induct plant protection product“ and „Clean container in induction bowl“. The secondary pressure regulator for spray pressure is driven by an electromotive adjustment butterfly regulating valve.



Fig.6: section valve directly in front of the respective section.

Fig.7: Spray computer EL-4 with hydraulic operator part EHB-2.







Fig. 8: induction bowl with circular rinsing pipe and container cleaning device.

The main control is via a main valve with simultaneous activation of the circulation system (pressure circulation).

The control system is modular and consists of the spray computer EL-4 including liquid crystal display, function buttons (foil keyboard) and section switches (rocker switches), and hydraulic operator panel EHB-2 (all hydraulic functions controlled by rocker switch).

Both operating elements are assembled using the brackets included, within sight and reach of the driver. All hydraulic functions are controlled electrically. The tractor only requires a double-action control valve for supplying the hydraulic circulation or a pressure connection with free return flow.

The tractor is supplied with electrical power using cable directly to the tractor battery and ignition switch.

The central controls for the sprayer are positioned centrally on the left hand side of the sprayer. All valves and connections for filling and cleaning the sprayer are situated at the central controls.

The suction and pressure side are each equipped with a preselection control valve.

Next to this are the connections for filling and emptying. Emptying is also possible using the pump (e.g. for pumping back liquid fertiliser). The standard induction bowl has a circular rinsing pipe and a container rinsing nozzle (rotating nozzle) with a spring-loaded valve.



Fig.9: central controls on the left side of the sprayer and easily accessible induction bowl.

#### Alternative accessories

Alternatively to the version tested here, the sprayer can also be equipped with tank sizes of 2400 l or 3200 l and with operating widths of 18 m - 28 m. In addition to the standard axle, an axle with a track width of up to 2.25 m can also be used. Either a steering or a rigid drawbar are possible. The sprayer can also be equipped with an additional electronic tank display.

Result table
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tested assembly			result (measured)	
spray tank	over volume		7.55	* min. 5 %
	contents gauge	graduation marks	100	* max. 100 l
		deviation	-5.98%	* max. 7.5 % up to 800 l filling
			2.81%	* max. 5 % between 800 and 4000 l
	surface roughness		0.059 mm	* max 0.1 mm
rinsing tank	volume		400 l corresponding to 10 % of nominal volume	* min. 10 % of nominal contents
	rinsing and dilution possible?		yes	
can rinsing equipment	rinsing efficiency		< 0.001 % residual	* max. 0.01 % of can contents
manometer	graduation marks		0.2 bar	* max. 0.2 bar
	deviation		0.05 bar	* max. 0.2 bar
agitation system	deviation from even concentration		-13.25%	*max. 15 %
residual in l	dilutable		46.96 l	* max. 70 l
	non delutable		7.65 l	
spray boom	height adjustment range from - to		370 mm - 2170 mm	
	nozzle ground contact protection		yes	
	pressure loss between manometer and nozzle at 3 bar pressure		7.4 % (with XR 110 05 VP)	* max. 10 %
	nozzle dripping after switch off		0 ml	* max. 2 ml
	single nozzle flow rate			
	type of nozzle: Lechler IDN 120 025 POM			
	pressure (bar)	flow rate (l/min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
	2.0	0.820	-4.58	-4.69
	5.0	1.281	-3.71	-3.75
	8.0	1.612	-3.77	-3.31
transverse distribution				
type of nozzle: Lechler IDN 120 025 POM				
pressure (bar)		distance (cm)	coefficient of variation (%) *(max. 9 %)	
2.0		50	4.80	
5.0		50	3.45	
8.0		50	3.29	
volume/hectare adjustment device				
displayed (l/min)		real (l/min)	deviation in % from real *(max. 5 %)	
17.4		16.8	3.70	
33.6		33.0	1.85	
47.4		48.0	-1.23	
62.4		63.6	-1.87	
77.4		79.2	-2.22	
94.8		96.0	-1.23	
109.7		111.6	-1.56	
127.2		128.4	-0.93	

Table.3: test results, Part 1

Result table		
volume/hectare adjustment device		
repeatability of adjustment		
adjusted flow rate in l/ha	deviation from adjusted value % * (max. 6 %)	CV * (< 3 %)
210	-3.86	0.57
300	-3.01	0.71
390	-2.51	0.67
procedure		regulation time (s) with deviation > 10 % to adjusted value
switching on / off		1.5 * max. 7 s
switching of single sections		2.0 * max. 7 s
change of driving speed by changing gears		
1.5 m/s to 2.0 m/s		2.4 * max. 7 s
2.0 m/s to 2.5 m/s		1.8 * max. 7 s
2.5 m/s to 2.0 m/s		3.5 * max. 7 s
2.0 m/s to 1.5 m/s		2.9 * max. 7 s

Table.4: test results, Part 2.

### Assessment

The equipment fulfils all ENTAM testing requirements. The type of hitching used allows automatic track following through the steering drawbar. The filling hole is easily accessible from the platform at the front of the chassis. The swivelling induction bowl on the side of the sprayer can be used for filling the tank with plant protection products. The induction bowl is equipped with a ringline and a cleaning nozzle (rotating) and can be used to clean the PPP containers after filling.

#### Tank

The filling hole and the filter insert are sufficient in size. The tank can be filled easily via the pump by using the filling connection.

However, the liquid is prevented from flowing back through the pipes. In addition it is possible to connect to a hydrant. A recirculation valve in the hose prevents return flow. The container lid seals satisfactorily. The height of the spray tank contents is easy to read using the contents scale. The volume scale is sufficiently accurate. The container has an oversize of 7.6 % and therefore enough spare volume for any foam which may result. The efficiency of the agitator is adequate.

The agitator can be switched off to reduce the amount of technical residues. Due to the clean water tank which is integrated into the right of the sprayer, and which can hold 400 l, water can be drawn for



diluting technical residues, cleaning the inside of the tank and rinsing the liquid-conducting parts.

The sprayer is equipped with two rotating tank cleaning nozzles for cleaning the inside. It is possible to pre-clean the tank whilst diluting the residues.

The easily accessible filling connection and the induction bowl are also situated on the left side of the sprayer.

### Controls

The operator panel on the left of the sprayer makes filling, spraying and cleaning easier. Adjustments for the suction and pressure sides are made simple by the use of pictograms.

The control system EL-4 offers the operator further advantages apart from automatic speed-dependent spray rate control.

For example, the fictive spray pressure is calculated and displayed by the flow distribution meter. Significant deviations between this calculated pressure and the pressure shown by the pressure gauge are an early sign of problems such as a blocked filter.

### Spray boom

The parallelogram-shaped lifting frame has a large adjustment range. The boom height can be adjusted easily using the hydraulics.

The tyres used for the tested version allow an adjustable nozzle height starting from 40 cm. The multi-nozzles (five) on the stainless steel nozzle tube are protected well from ground contact by the way they are assembled. The pressure in the boom is extremely even due to large cross sections and short hose lengths. The hoses on the boom are positioned so as not to buckle. All joints and bearing points are made of rustproof metal. Mudguards protect the nozzles and the operator panel from dirt.

## 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 fulfils 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.

## Diagram of liquid system

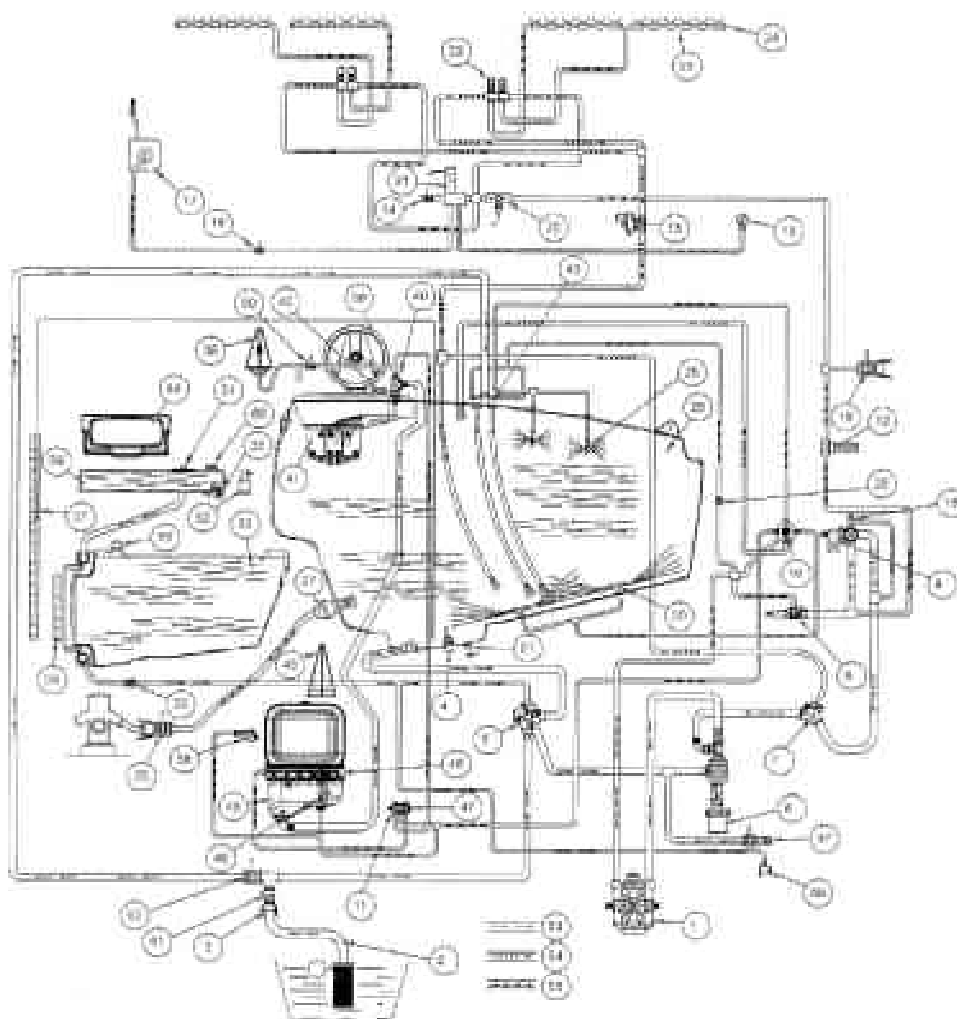


Fig.10: Diagram of the pipe/hose system.

### Explanation on testing:

Testing takes place according to the Technical Instructions for ENTAM-Tests of field crop sprayers. 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:  
Federal Biological Research Centre for  
Agriculture and Forestry (BBA) (Germany)  
Application Techniques Division; Messeweg 11-  
12; D-38104 Braunschweig

This test is recognized by the ENTAM members:



HBLuFA FRANCISCO JOSEPHINUM  
WIESELBURG (Austria)

BLT-Prot.-Nr. 028/06



NAGREF National Agricultural Research  
Foundation (Greece)

LE/69/01/ZZ



PIMR - Przemyslowy Instytut Maszyn Rolniczych  
(Poland)

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HIAE Hungarian Institute of Agricultural  
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DIAS recognition 957