

ENTAM - Test Report



Sprayer type:
Trade mark:
Model:

Trailed field crop sprayer
Horsch Leeb
4 AX

Manufacturer:
Horsch Maschinen GmbH
Sitzenhof 1
92421 Schwandorf
Germany

Test report: D - 2136

March 2019

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	++
2	Spray tank over volume	++
3	Volume of total residual (here max. allowed 67 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	see no.14
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	++

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

*) changed requirement

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	%	>7-7.5	>3-7	0-3
3	of al-low.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 nominal tank volume	10-12	>12-14	>14
5	%	5.0-4.0	<4.0-2.0	<2.0	14	s	>4-7	2-4	<2
6	%	>10-15	5-10	<5	15	deviation %	>4-6	2-4	<2
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 test under: www.ENTAM.net
or www.julius-kuehn.de

Technical data of sprayer

- 24 m working width.
- 7 hydraulic sections.
- Pendulum range up to 11 °.
- Slope compensation up to 15 %.
- Infinitely variable from 550 mm - 2000 mm.

- 18 l hand wash tank.

- 3800 l polyethylene tank.
- Contents indicator by float gauge at left-front.
- Horsch (Müller) Touch 800.



Fig.1: Overview.

- Piston diaphragm pump with 233 l/min at 5 bar, mechanically driven.
- Steering drawbar.

- 1.5 m—2.25 m track width.
- 40 km/h allowed road speed.

Dimensions and weights :

total length:	7000 mm
height:	3870 mm
width:	2500 mm
unloaded weight:	4250 kg
total weight:	8000 kg

Description of sprayer



Fig.2: View of the right sprayer side with folded boom, storage compartment and wash water tank (over drawbar).

The framework of the sprayer is made of steel profiles with a polyethylene tank situated on the top. The sprayer is equipped with a steering drawbar. The track width is adjustable from 1.5 m to 2.25 m. It is designed for a road speed of 40 km/h.

The spray tank has a nominal volume of 3800 l and an over volume of 8 % for holding back foam. The fluid system is supplied by a mechanically —via PTO shaft — driven piston diaphragm pump, situated in the drawbar. The pressure agitation system is build by 3 injector nozzles in the central section of the tank.



Fig.3: Outer boom section with well protected nozzles and obstacle give away function.

Description of sprayer



Fig.4: Steering drawbar with piston diaphragm pump. Blocking of steering function by bolt (right).

The wash water tank (polyethylene) holds a volume of 431 l and the hand wash tank holds 18 l.

The 24 m boom is made from welded steel tubes and consists of 7 segments with the outer elements in a box frame design with obstacle give away function. It can be adjusted in height indefinitely between 550 mm and 2000 mm with a vertical lift system. The pendulum range of the boom is $\pm 11^\circ$ and the slope compensation can compensate between $\pm 15\%$. The boom is

equipped with nozzle stations every 50 cm. The 7 fluid sections of the boom are connected with a recirculation line. The off centre nozzles at the end of the boom can be switched separately. The tested sprayer was equipped with ultrasonic sensors for an automatic height guiding of the boom, which includes the automatic lifting and lowering of the boom at the beginning and end of a track.

On the left sprayer side a control centre and an induction bowl (made of polyethylene) is present. From the control centre all functions concerning tank filling, agitation, tank cleaning and tank draining can be handled. In the driver's cabin the sprayer can be controlled in the main spraying functions by a terminal with touch screen type Müller "Touch 800".



Fig.5: Left sprayer side with induction bowl, control center with filling connections and hand wash tank.

Description of sprayer



Fig.6: Polyethylene induction bowl with wall nozzles and rotating nozzle.

In addition to the terminal, it is also possible to operate the main spray functions using the multi-function joystick, which can be assembled near to the driver armrest in the cabin. Functions like complete and individual spray sections, pressure adjustment, lifting and lowering of the boom, slope compensation feature and manual steering of the drawbar can be controlled by the multi-function joystick.

Folding/unfolding of the boom, agitator on/off or intensity and the steering drawbar can also be activated using the "Touch 800" terminal. All the necessary parameters are entered in the terminal using function keys. The liquid crystal graphic display can still be read adequately also in direct sunlight. During operation the display can show: application in l/ha, driving speed, active spray sections, spray pressure, selected nozzles, as well as 'pump on/off' and 'agitator on/off', for example. It can also show the liquid level in the tank if required.



Fig.7: Müller „Touch 800 Terminal“ to be placed in the driver´s cabin.

Result table

tested assembly				result (measured)	
spray tank	over volume contents gauge			8.05 %	* min. 5 %
			graduation marks	electronical display	* max. 100 l
			deviation	1.0 %	* max. 7.5 % between 380 l and 760 l.
		1.0 %		* max. 5 % between 760 l and 3800 l.	
surface roughness			0.054 mm	* max 0.1 mm	
rinsing tank	volume			430.6 l	*10 % of nominal tank volume.
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (concentration after cleaning)			2778	Min.factor 400 of concentration before cleaning
can rinsing equipment		rinsing efficiency		<0.01 %	* max. 0.01 % of can contents
manometer	graduation marks			0.1 bar	* max. 0.2 bar
	deviation			0.1 bar	* max. 0.2 bar
agitation system	deviation from even concentration			14.18 %	*max. 15 %
residual in l		dilutable		57.9 l	* max. 67 l
		non dilutable		Non, recirculation system	
spray boom	height adjustment range from - to			550 mm - 2000 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 5 bar pressure			4.6 %	* max. 10 %
	nozzle dripping after switch off			0 ml	* max. 2 ml
	single nozzle flow rate				
		pressure (bar)	flow rate (l/ min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
		3.0	1.53	- 5.1	3.7
	transverse distribution				
		pressure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)	
		2.0	50	4.72	
	3.0	60	3.14		
	5.0	50	3.77		
Measured with :			Lechler IDK 120-04		

Tab.3: Result table

* limit

Result table

volume/hectare adjustment device		
repeatability of adjustment		
adjusted flow rate in l/ha	deviation from desired value % **	deviation from desired value % **
	ascending application rate	descending application rate
196	- 2.82	- 0.78
280	1.02	1.25
364	0.90	0.87
procedure	regulation speed: deviation to adjusted value after 7 s	
switching on / off	3.6 s***	after 7 s
switching of single sections	3.0 s***	after 7 s
procedure	reaching steady state after varying conditions (s)	
change of driving speed by changing gears		steady state mean deviation
1.5 m/s to 2.0 m/s	3.8 s	*
2.0 m/s to 2.5 m/s	3.5 s	*
2.5 m/s to 2.0 m/s	4.2 s	*
2.0 m/s to 1.5 m/s	5.1 s	*

Tab.4: Result table 2.

* limit: < 10 % after 7 s
 ** limit: m,ax. 6 %
 ***steady state reached

Explanation on testing:

Testing takes place according to the Technical Instructions for ENTAM-Tests of Field Crop Sprayers (Rel.5). This procedure was developed by the competent testing authorities of the European countries participating in ENTAM and is based on the standard EN ISO 16119. 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:



HBLFA Francisco Josephinum
 Wieselburg

HBLFA Francisco Josephinum
BLT Wieselburg
 (Austria)

038/2019



CMA Generalitat de Catalunya
 Centre de Mecanització Agrària (CMA)
 (Spain)

EPH 16/19



ENAMA Ente Nazionale per la Meccanizzazione
 (Italy)

ENTAM „Rapporto di Agricola
 prova prestazionale“ 04/2019



HIAE (MGI) Hungarian Institute of Agricultural
 Engineering
 (Hungary)

D-217/2019



IRSTEA - National Research Institute of Science
 and Technology for Environment and Agriculture
 (France) (formerly CEMAGREF)

IRSTEA/CEMAGREF/ENTAM/
 19/032



ŁUKASIEWICZ-PIMR –
 Sieć Badawcza ŁUKASIEWICZ –
 Przemysłowy Instytut Maszyn Rolniczych
 (Poland)

PIMR-233/ENTAM/19