

ENTAM - Test Report



Sprayer type:
Trade mark:
Model:

Trailed field crop sprayer
Lemken
Vega 12 / 4000

Manufacturer:
Lemken GmbH & Co KG
Weseler Straße 5
46519 Alpen
Germany

Test report: D - 1952

May 2016

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	+
2	Spray tank over volume	++
3	Volume of total residual (here max. allowed 74 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	++

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

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 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	times amount of dilutable	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	CV	>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 test under: www.ENTAM.net
or www.julius-kuehn.de

Technical data of sprayer

- 16.9 l washhand Tank.

- 4000 l tank.
- Electronical contents indicator.
- Spray computer: CCI 200 MegaSpray
- 580 l rinsing water tank.

- 27 m working width.
- 11 hydraulic sections.
- Infinitely variable from 500mm—2750mm.
- Recirculation system for spray liquid.



- 2 pumps (spraying, mixing)
- type „Altek P260“ with 260 l/min at 10 bar and 450 l/min

- Air suspended axle.
- 2.25 m track width.
- Axle pivot steering.

Dimensions and weights :

total length:	7150 mm
height:	3870 mm
width:	2500 mm
unloaded weight:	5200 kg

Description of sprayer



Fig.4: View of the right sprayer side.

The framework is made of steel profiles, with the tank situated on the top. The suspended axle has a track width of 2.25 m and drawbar steering with a tracking function. The framework is designed for a maximum speed of 40 km/h. The pumps (main pump plus agitation/cleaning pump) are driven by power take-off shaft.

The spray boom is a framework construction made of steel and aluminium profiles. It is folded/unfolded at the back of the sprayer. The nozzles are completely enclosed in the aluminium profile, by what a good protection of the nozzles can be ensured. The height of the boom can be adjusted hydraulically and infinitely between 500 mm and 2750 mm. With special adjustments the boom can be lowered down to 250 mm. The pendulum device has a pendulum range of up to 12° relative to horizontal. The inspected equipment was also equipped with a slope compensation feature which can compensate gradients of up to 20%. Two ultrasonic distance sensors can regulate the height at which the boom is carried if required; the boom is raised and lowered automatically when it is taken from the track / placed back on the track on reaching the headland.

The operator can determine the distance between the nozzles and the target. The boom is divided mechanically into eleven segments. The boom segments comprise individual nozzles which have been grouped together (electric single nozzle control). The number of nozzles per section can be programmed by the user.

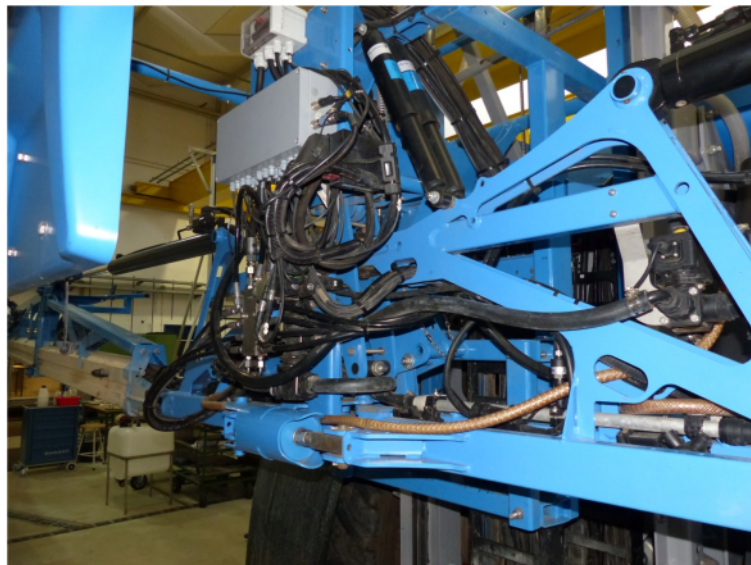


Fig.5: Central boom unit with slope compensation and damping system.

Description of sprayer



Fig.6: Left sprayer side with improved induction bowl and operating panel (above and left of induction bowl). With filling connections (left of the induction bowl).

The main tank is made of plastic and has a nominal volume of 4000 l. The spray level can be read using an electronic level indicator at the terminal in the driver's cab or at the main operating controls (scale graduation of 1 l) to the left side of the sprayer.

There is also a filling connection (KAM-LOCK) to the left of the sprayer for filling the tank. This allows a filling capacity of up to 500 l/min.

Apart from emptying by spraying, the tank can also be emptied using a drain valve to the right of the sprayer or using the pump and a pressure connection (KAM-LOCK) at the front left side of the sprayer.

The tank is cleaned by two rotating nozzles (plastic) which are positioned in the centre of the tank. The sprayer comprises a pressurised agitation system which consists of seven Venturi.

The agitator can be switched on and off from the driver's cab and its speed can be adjusted infinitely from zero to full power. The agitator is switched off automatically if the contents in the tank drop to under a defined value (value can be changed by the user). According to the requirements the sprayer has a separate water tank for the cleaning of the tank and machine.

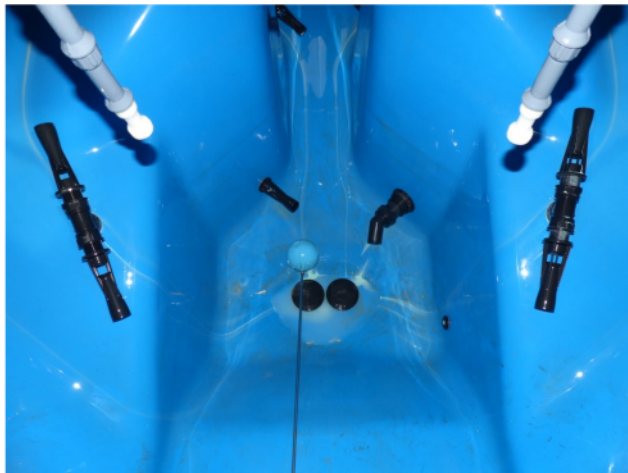


Fig.7: Tank bottom section with cleaning and agitation devices.

Description of sprayer

A circulation valve on the tank opens when the nozzle valves are closed, ensuring circulation in the boom. The swivelling induction bowl made of plastic is equipped with a rotating nozzle for cleaning containers and four rinsing nozzles fixed to the side as well as one nozzle in the area of the vent. The nozzles positioned on the sides of the tank wall are arranged so that the liquid is rotated during operation.

The control unit including a job calculator type CCI 200 MegaSpray for regulating spray application depending on the speed of the sprayer with a tracking



Fig.8: View of tank top section.

assistant and automatic spray section control (DGPS sensor). The central and individual spray sections, pressure adjustment, lifting and lowering of the boom, slope compensation feature and manual drawbar steering can be controlled by the terminal.

Folding/unfolding of the boom, nozzle selection, steering drawbar, agitator can also be activated using the terminal. All the necessary parameters can be entered by using the terminals touch-screen, the function keys and a rotary knob with press button. The touch-screen liquid crystal graphic

display can still be read adequately in direct sunlight. During operation the display shows: application in l/ha, driving speed, active spray sections, spray pressure, selected nozzles, manual or automatic mode, as well as agitator on/off, for example. It can also show the liquid level in the tank or information about the spray boom like: height, automatic or manual mode and angle of pendulum device.



Fig.9: Lemken CCI 200 terminal in the driver's cab.

Result table

tested assembly				result (measured)	
spray tank	over volume			10.4 %	* min. 5 %
	contents gauge		graduation marks	electronical display	* max. 100 l
			deviation	2.8%	* max. 7.5 % between 400l and 800 l
				2.0%	* max. 5 % between 800 l and 4000 l
surface roughness			0.088 mm	* max 0.1 mm	
rinsing tank	volume			580 l	* 10 times delutable residual on flat ground
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (concentration after cleaning)			0.01 %	max. 2 % of original concentration
can rinsing equipment		rinsing efficiency		0.0048 %	* max. 0.01 % of can contents
manometer	graduation marks			0.1 bar	* max. 0.2 bar
	deviation			0.2 bar	* max. 0.2 bar
agitation system	deviation from even concentration			10 %	*max. 15 %
residual in l		dilutable		43 l	* max. 74 l
		non dilutable		Non, recirculation system	
spray boom	height adjustment range from - to			500 mm - 2750 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 3 bar pressure			8.30 % (with Agrotop AirMix 110- 04)	* max. 10 %
	nozzle dripping after switch off			0 ml	* max. 2 ml
	single nozzle flow rate				
	type of nozzle: Agrotop AirMix 110-04				
		pressure (bar)	flow rate (l/ min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
		3.0	1.64	5.0	4.2
	transverse distribution				
	type of nozzle: Agrotop AirMix 110-04				
	pressure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)		
	1.5	50	6.3		
	3.0	50	4.2		
	6.0	50	4.2		

Fig.10: Result table

Result table		
volume/hectare adjustment device		
repeatability of adjustment		
adjusted flow rate in l/ha	deviation from desired value % CV (max. 3 % CV)	deviation from desired value % CV (max. 3 % CV)
	ascending application rate	Descending application rate
160	2.14	1.37
240	1.74	1.51
320	0.46	0.71
procedure	regulation speed: deviation to adjusted value after 7 s	
switching on / off	4.1 %	after 7 s
switching of single sections	4.1 %	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	1.4 s	< 10 %
2.0 m/s to 2.5 m/s	0.7 s	< 10 %
2.5 m/s to 2.0 m/s	0.9 s	< 10 %
2.0 m/s to 1.5 m/s	1.3 s	< 10 %

Fig.11: Result table 2.

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:



BLT- Francisco Josephinum, Wieselburg - 012/16
 Biomass, Logistics, Technology (Austria)



CMA Generalitat de Catalunya 01/16
 Centre de Mecanització Agrària (CMA) (Spain)



ENAMA Ente Nazionale per la Meccanizzazione Agricola (Italy) ENTAM „Rapporto di prova prestazionale“:03/2016



HIAE Hungarian Institute of Agricultural Engineering (Hungary) D-120/2016



IRSTEA - National Research Institute of Science and Technology for Environment and Agriculture (France) (formerly CEMAGREF) IRSTEA/CEMAGREF/ENTAM/16/006



PIMR - Przemyslowy Instytut Maszyn Rolniczych Industrial Institute of Agricultural Engineering (Poland) PIMR-135/ENTAM/16