

ENTAM - Test Report



Sprayer type:
Trade mark:
Model:

Trailed field crop sprayer
LEMKEN
Primus 10/2500

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

Test report: D - 2094

November 2017

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	++
2	Spray tank over volume	+
3	Volume of total residual (here max. allowed 54 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

**) alternative criteria: > 10 % nominal volume = „+“

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	times amount of dilutable residual	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

- 21 m working width.
- 9 hydraulic sections.
- Pendulum range up to 10 °.
- Infinitely variable from 370 mm - 2300 mm.
- Nozzle spacing 500 mm.

- 16 l hand wash tank.

- 2400 l tank.
- Mechanical rope contents indicator.
- Spraycomputer CCI 50.
- 327 l rinsing water tank.



Fig.1: Overview.

- PTO driven pump „Altek P 260“ with 262 l/min at 4 bar.
- Rigid drawbar.

- 1.8 m track width.
- 590 mm ground clearance (720 mm below axle) with 13.6 R 48 tyres.

Dimensions and weights :

total length:	6000 mm
height:	3600 mm
width:	2350 mm
unloaded weight:	3380 kg

Description of sprayer



Fig.2: View of the right sprayer side.

The framework of the sprayer is made of steel profiles with the tank situated on the top. The tested sprayer has a rigid axle and a track width of 1.8 m. The tested sprayer was designed for export and without equipment (parking brake, fender) for road approval in EU. Road approved versions are also available.

The spray tank with a nominal volume of 2400 l is made of glass-fibre reinforced plastic. He keeps an over volume of 5.5 % to hold back foam. The pressure agitation system in the spray tank is indefinitely adjustable from 0 to maximum. The clean water tank for rinsing and diluting holds a volume of 327 l. The hand wash tank for the operator has a volume of round about 16 l.

The boom is made from welded steel tubes. It can be adjusted in height indefinitely between 370 mm and 2300 mm with a vertical lift system.



Fig.3: Steel boom with vertical lift.

Description of sprayer



The pendulum range of the boom is $\pm 10^\circ$. The outer 1.5 m segments of the boom have an additional function as obstacle give away.

The nozzles are grouped together in sections with 3 m and 1.5 m width. All important adjustments for spraying can be done from the driver's place. During work the most important information can be read on the display except the remaining tank volume. This is only shown by the indicator at the tank. All necessary controls and connections for filling, agitation and inner tank cleaning are centralized on the left sprayer side.

Fig.4/5: Left sprayer side with induction bowl, control center and filling connections. Terminal and switchboard in the driver's cab.



Fig.6: Rigid axle and flat tank bottom.

Description of sprayer



The swivelling induction bowl made of plastic is equipped with a rotating nozzle for cleaning containers. For flushing in plant protection products, 4 rinsing nozzles fixed to the side as well as one nozzle in the area of the vent can be used. A closed circular pipeline is supporting the cleaning of the inner walls of the induction bowl in case of adhesive powders.

Fig.7: Induction bowl with erected rotating nozzle for can cleaning.

Result table

tested assembly				result (measured)	
spray tank	over volume			5.5 %	* min. 5 %
	contents gauge		graduation marks	100 l	* max. 100 l
			deviation	-1.31 %	* max. 7.5 % between 240l and 480 l.
				3.6 %	* max. 5 % between 480 l and 2400 l
surface roughness			0.04 mm	* max 0.1 mm	
rinsing tank	volume			327 l	*10 % of nominal volume
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (concentration after cleaning)			2288	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			0.12 bar	* max. 0.2 bar
agitation system	deviation from even concentration			- 8.9 %**	*max. 15 %
residual in l		dilutable		39.7 l	* max. 54 l
		non dilutable		3.8 l	
spray boom	height adjustment range from - to			370 mm - 2300 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 4 bar pressure			1.5 %	* 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	1.58	-5.1	-2.3
	transverse distribution				
		pressure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)	
		2.0	50	8.4	
	3.0	60	6.6		
	5.0	50	6.3		
Measured with :			TeeJet AIXR 110 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
224	- 2	1.6
320	0.3	0.7
416	-0.3	0.7
procedure	regulation speed: deviation to adjusted value after 7 s	
<u>switching on / off</u>	1,5 s***	after 7 s
<u>switching of single sections</u>	1.5 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	2.4 s	*
2.0 m/s to 2.5 m/s	1.1 s	*
2.5 m/s to 2.0 m/s	1.0 s	*
2.0 m/s to 1.5 m/s	1.6 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 001/2018
BLT Wieselburg
 (Austria)



CMA Generalitat de Catalunya 01/18
 Centre de Mecanització Agrària (CMA)
 (Spain)



ENAMA Ente Nazionale per la Meccanizzazione 01/2018
 (Italy) ENTAM „Rapporto di Agricola prova prestazionale“



HIAE (MGI) Hungarian Institute of Agricultural 01/2018
 Engineering
 (Hungary)



IRSTEA - National Research Institute of Science 18/001
 and Technology for Environment and Agriculture
 (France) (formerly CEMAGREF)



PIMR - Przemyslowy Instytut Maszyn 182/ENTAM/18
 Rolniczych Industrial Institute of Agricultural
 Engineering
 (Poland)