Julius Kühn-Institut
Federal Research Centre for Cultivated Plants

ENTAM

ENTAM - Test Report

Sprayer type: Trailed field crop sprayer
Trade mark: DUBEX
Model: Mentor 4000 l

Manufacturer:
DUBEX B.V.
Ohmweg 16
NL - 9503 GW Stadskanaal
Netherlands

Test report: D - 2096

January 2018

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	++

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 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	Times amount of dilutable **	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					

**) only in horizontal position = +

Free download of the test under: *www.ENTAM.net*
or *www.julius-kuehn.de*

Technical data of sprayer

- 27 m working width.
- 11 spray sections.
- Pendulum range up to 11 °.
- Slope compensation up to 15 %.
- Infinitely variable from 500 mm - 2500 mm.

- 4000 l tank.
- Electronic contents gauge (control centre + cabin).
- Spraycomputer Müller Touch ME 1200.

- 16.4 l hand wash tank.

Fig.1: Overview.

- 2 pumps Bertolini „Poly 2210 VD“ with 202 l/min at 6 bar (each).
- Rigid drawbar.

- 2.0 m track width.
- 580 mm ground clearance (axle) and 700 mm (drawbar) with 460/85 R 38 tyres.
- Air-suspended axle.

Dimensions and weights :

total length:	6300 mm
height:	3300 mm
width:	2700 mm
unloaded weight:	3250 kg

Description of sprayer

Fig.2: View of the right sprayer side with equipment box.

The framework of the sprayer is made of steel profiles with the tank situated on the top. The suspended axle has a track width of 2.0 m. It is designed for a road speed of 40 km/h.
The spray tank with a nominal volume of 4000 l is made of polythene. He keeps an over volume of 8.7 % to hold back foam. The pressure agitation system has his own pump (Bertolini „Poly 2210 VD“) and is designed as a back-flow system. The clean water tank for rinsing and diluting holds a volume of 393 l. The hand wash tank for the operator has a volume of 16.4 l.
The boom is made from welded steel tubes. It can be adjusted in height indefinitely between 500 mm and 2500 mm with a vertical lift system. The pendulum range of the boom is +/- 11 ° and the slope compensation can compensate between +/- 15 %. The outer 3 m segment of the boom works as obstacle give away.

Fig.3: Sprayer underside with axle.

Description of sprayer

Fig.4: Rear view with boom and boom lift for the lateral folding boom.

The outer 4.5 m boom segments are equipped with additional bars to protect the nozzles in case of ground contact of the boom. The boom can be equipped with ultrasonic sensors for detecting and automatically keeping the adjusted boom height over ground. In the tested version the boom was outfitted with spotlights to make the spray visible for controlling.

Via pneumatic single nozzle switching the nozzles can be grouped together to individual spray sections (before delivery), controlled by the spray computer. With the used spray computer (Müller Touch ME1200) it is possible to adjust and control all important spraying and boom movement functions from the driver`s place. All necessary controls and connections for filling, agitation and inner tank cleaning are centralized on the left sprayer side.
In case of blockage, the central suction filter is easy to reach. The central pressure filter will be flushed automatically.

Fig.5: Ccontrol center on the left sprayer side.

Description of sprayer

The stainless steel induction bowl (left sprayer side) offers a circular manifold under the rim for flushing in chemicals. For the inner cleaning of empty chemical containers an additional rotating nozzle is present in the bowl. It is switched on by pushing an empty can over the rotating nozzle. The opening of the bowl is round about 90 cm above ground and therefore easy to reach.

Fig.6: Stainless steel induction bowl with contents indicator and rotating nozzle for can rinsing.

Result table

tested assembly				result (measured)	
spray tank	over volume			8.7 %	* min. 5 %
	contents gauge		graduation marks	electronical display	* max. 100 l
			deviation	-2.2 % 1.8 %	* max. 7.5 % between 400l and 800 l. * max. 5 % between 800 l and 4000 l
	surface roughness			0.039 mm	* max 0.1 mm
rinsing tank	volume			393 l	*10 times dilutable volume, in horiz. position
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (concentration after cleaning)			2791	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			-12,5 %	*max. 15 %
residual in l			dilutable	68.8 l	* max. 74 l
			non dilutable	1 l	
spray boom	height adjustment range from - to			500 mm - 2500 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 4 bar pressure			-10 %	* 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	1.95	-4.1	4.2
	transverse distribution				
	pressure (bar)		distance (cm)	coefficient of variation (%) *(max. 9 %)	
		1.5	50	2.7	
		3.0	40	3.5	
		4.0	50	2.2	
	Measured with :			Lechler IDKT 120-05	

Tab.3: Result table * limit

Result table

volume/hectare adjustment device			
repeatability of adjustment			
	adjusted flow rate in l/ha	deviation from desired value % ** ascending application rate	deviation from desired value % ** descending application rate
	238	-0.5	-0.2
	340	-0.9	-0.9
	442	-1.3	-1
procedure		regulation speed: deviation to adjusted value after 7 s	
	switching on / off	1.8 s***	after 7 s
	switching of single sections	1.6 s***	after 7 s
procedure		reaching steady state after varing conditions (s)	
	change of driving speed by changing gears		steady state mean deviation
	1.5 m/s to 2.0 m/s	5.1 s	*
	2.0 m/s to 2.5 m/s	6.4 s	*
	2.5 m/s to 2.0 m/s	5.5 s	*
	2.0 m/s to 1.5 m/s	6.9 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 **BLT** Wieselburg (Austria)	002/2018
CMA Generalitat de Catalunya Centre de Mecanització Agrària (CMA) (Spain)	EPH 02/18
ENAMA Ente Nazionale per la Meccanizzazione (Italy)	ENTAM „Rapporto di Agricola prova prestazionale“ 02/2018
HIAE (MGI) Hungarian Institute of Agricultural Engineering (Hungary)	D-168/2018
IRSTEA - National Research Institute of Sience and Technology for Enviroment and Agriculture (France) (formerly CEMAGREF)	IRSTEA/CEMAGREF/ENTAM/ 18/002
PIMR - Przemyslowy Instytut Maszyn Rolniczych Industrial Institute of Agricultural Engineering (Poland)	PIMR-183/ENTAM/18

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