Julius Kühn-Institut
Federal Research Centre for Cultivated Plants

ENTAM

ENTAM - Test Report

Sprayer type: Trailed field crop sprayer
Trade mark: Kverneland
Model: iXtrack C50

Manufacturer:
Kverneland Group Nieuw-Vennep B.V.
Hoofdweg 1278
NL-2153 Nieuw-Vennep

Test report: D - 2072

July 2017

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	+++
2	Spray tank over volume	+
3	Volume of total residual (here max. allowed 81 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.

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	% or s	>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	% of tank volume	10-12	>12-14	>14
5	%	5.0-4.0	<4.0-2.0	<2.0	14	s	>4	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

- 5000 l tank.
- Electronical contents indicator displayed on terminal and control centre.
- Spray computer: ISO Match Tellus Pro.
- 573 l rinsing water tank.

- 28 m working width.
- 4 m max. hydraulic section width.
- 9 hydraulic sections.
- Pendulum range up to 11.5 °.
- Slope compensation up to 20 %.
- Boom height adjustment: 500 mm-2800 mm, continuously.

Fig.1: Overview.

- 2 Diaphragm pumps type: Altek P260 with 2 * 260 l/min at 10 bar.
- 100 mm pressure gauge at sprayer front.

- 1.8 m track width.
- Axle pivot steering.
- 770 mm ground clearance (axle) and 680 mm (drawbar) with 520/85R38 tyres.

Dimensions and weights :

total length:	7400 mm
height:	3810 mm
width:	2650 mm
unloaded weight:	3985 kg

Description of sprayer

The framework of the sprayer is made of steel profiles with the tank situated on the top. The axle has a track width of 1.8 m. It is designed for a road speed of 40 km/h. The sprayer has a rigid drawbar which can be delivered with different mounting systems. Track following is realized by an axle pivot steering. The spray tank with a nominal volume of 5000 l is made of polyethylene and is constructed without splash walls. The tank keeps an over volume of 6 % to hold back foam. For the inner tank cleaning two rotating nozzles are placed in the centre section of the tank. The agitation system is realized by 8 injection nozzles and a runback line. The runback agitation can be activated by the spray computer control board in the drivers cabin. The pressure agitation system is only active while the filling of the sprayer.

Fig.2: Control centre on the left sprayer side.

The introduction of plant protection product and the rinsing of empty plant product cans can be done via the induction bowl on the left sprayer side. This is equipped with a rotating cleaning nozzle (for can rinsing), one nozzle in the outlet area and an annular piping under the rim.
The clean water tank for rinsing and diluting holds a volume of 573 l. It is also made of polyethylene and is placed in the rear of the sprayer. The spray liquid pressure system of the sprayer is based on two diaphragm pumps type „Altek P 260” which are driven via the PTO-shaft.

Fig.3: Open induction bowl on the left sprayer side.

Description of sprayer

If required, the tank can be filled with up to 520 l/min by the sprayer pumps and a Kamlock 3” connection to the water supply.
The lateral folded 28 m boom is made from welded steel profiles and can be adjusted indefinitely between 480 mm and 2800 mm nozzle height. The pendulum range of the boom is +/- 11.5 ° and the slope compensation can compensate between +/- 20 %.

Fig.4: Two Altek P260 pumps placed in the drawbar.

The boom (HRZ 28) is equipped with ultrasonic sensors for detecting and automatically keeping the adjusted boom height over ground. In this case the boom will be lifted and lowered automatically at the beginning and end of a spray track while the sprayer is turning.
Thanks to the design of the lower boom profiles, the nozzles are well protected against ground contact. The boom is divided mechanically in 7 boom parts with 3 m for the outer elements with the additional obstacle give away function. Because of the hydraulic steering, the boom arms can be bend to each other independently.

Fig.5/6: Independent bend of the boom arms. Ultrasonic sensor and hydraulic arm to swing ultrasonic sensor in parking position automatically whether the boom is folded.

All functions of the sprayer can be controlled by the terminal (Tellus Pro) with touch screen display and switch board (joystick optional) at the drivers place. Additionally all functions concerning filling and draining of the tank, inner tank cleaning or ON/OFF and regulation of the pump can be handled from the control centre at the left sprayer side.
All necessary information like for example manual or auto mode, current spray rate (l/ha), driving speed, active spray sections, flowrate, sprayed amount, sprayed area, remaining tank contents, remaining area or distance can be displayed on the touch screen. The display is also readable in direct sunlight.

Description of sprayer

Fig.7: ISO match „Tellus PRO" terminal (ISOBUS) with switch board.

The liquid level in the tank is also displayed on the ISO match spray computer "Tellus Pro" terminal and on the operators control board (left sprayer side).
The pressurized agitation system can be switched off via the computer to keep the residues in the tank to a minimum. The „Tellus Pro" can also control the steering of all hydraulic and spray functions and is able to save the data like area and sprayed volume for some data sets. It records the driving speed, application rate, remaining distance or remaining liquid volume in the tank.

For manual operations the switch board can be used. It provides the functions for: folding and unfolding of the boom, switching of single sections, spaying ON/OFF, spray pressure, adjustment of boom height or inclination of the boom.

Result table

tested assembly				result (measured)	
spray tank	over volume			5.8 %	* min. 5 %
	contents gauge		graduation marks	electronical display	* max. 100 l
			deviation	-0.8% 1.33 %	* max. 7.5 % between 500l and 1000 l * max. 5 % between 1000 l and 5000 l
	surface roughness			0.019 mm	* max 0.1 mm
rinsing tank	volume			573 l	* 10 % of spray tank volume
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (reduction factor, concentration after cleaning)			1537	Min.factor 400 of concentration before cleaning
can rinsing equipment		rinsing efficiency		0.0013 %	* 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			8.5 %	*max. 15 %
residual in l			dilutable	78 l	* max. 81 l
			non dilutable	0 l	
spray boom	height adjustment range			2300 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 3 bar pressure			-3.8 % (with Lechler IDK 120-04)	* max. 10 %
	nozzle dripping after switch off			0 ml	* max. 2 ml
	single nozzle flow rate				
		type of nozzle: Lechler IDKN 120-04			
		pressure (bar)	flow rate (l/min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
		3.0	1.58	3.4	-2.4
	transverse distribution				
		type of nozzle: Lechler IDKN 120-04			
		pressure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)	
		2.0	50	7.1	
		3.0	60	4.2	
		5.0	50	3.0	

Tab.3: Result table 1. * limit

Result table

volume/hectare adjustment device			
repeatability of adjustment			
	adjusted flow rate in l/ha	deviation from desired value % CV (max. 3 % CV) ascending application rate	deviation from desired value % CV (max. 3 % CV) descending application rate
	175	0.6	0.51
	250	0.46	0.30
	325	0.37	0.67
procedure		regulation time: time until deviation < 10 % to adjusted value	
	switching on / off	4.4 s***	max. 7 s
	switching of single sections	1.2 s***	max.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	3.0 s	< 10 %
	2.0 m/s to 2.5 m/s	3.2 s	< 10 %
	2.5 m/s to 2.0 m/s	4.1 s	< 10 %
	2.0 m/s to 1.5 m/s	3.3 s	< 10 %

Tab.4: Result table 2.

*** 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)	036/2017
CMA Generalitat de Catalunya Centre de Mecanització Agrària (CMA) (Spain)	EPH 09/17
ENAMA Ente Nazionale per la Meccanizzazione Agricola (Italy)	ENTAM „Rapporto di prova prestazionale" 11/2017
HIAE (MGI) Hungarian Institute of Agricultural Engineering (Hungary)	D-154/2017
IRSTEA - National Research Institute of Sience and Technology for Enviroment and Agriculture (France) (formerly CEMAGREF)	IRSTEA/CEMAGREF/ENTAM/ 17/028
PIMR - Przemyslowy Instytut Maszyn Rolniczych Industrial Institute of Agricultural Engineering (Poland)	PIMR-169/ENTAM/17

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