

ENTAM - Test Report



Sprayer type:
Trade mark:
Model:

Mounted field crop sprayer
Hardi
MEGA

Manufacturer:
HARDI GmbH
Schaumburger Str. 17
D-30900 Wedemark

Test report: D - 2131

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	+++
2	Spray tank over volume	++
3	Volume of total residual (here max. allowed 65 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	% or s	>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 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	%	>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

- 2200 l tank.
- Electrical and mechanical contents indicator.
- 252 l rinsing water tank.

- 27 m working width.
- 9 spray sections.
- 10 mechanical sections.
- Pendulum range up to 13 °.
- Slope compensation 12 %.
- Boom height adjustment range: 1730 mm.



Fig.1: Overview.

- Diaphragm positive displacement spray pump, type: Hardi 464/10 with 227 l/min at 6 bar.
- Suspended lower linkage connections.

Dimensions and weights :

total length:	2600 mm
height:	2450 mm
width:	3400 mm
unloaded weight:	2008 kg

Description of sprayer



Fig.2: Rear view of the sprayer with boom package and the boom lift.

Chassis and boom are framework constructions made of steel profiles. For shock absorbing the linkage points of the lower arms of the 3-point linkage are equipped with an air bellow damping system. The spray tank, with a nominal volume of 2200 l is made from PE. The tank keeps an over volume of 9.8 % to hold back foam. The tank can be filled via the opening at the top or by the filling connection placed on the left sprayer side. For the inner tank cleaning two rotating nozzles are mounted in the centre of the tank. The pressure agitation system is realized by a set of injection nozzles situated in the tank. The intensity of the agitation can be adjusted continuously or switched on and off by the spray computer control board in the drivers cabin. The introduction of plant protection product and the rinsing of empty plant product cans can be done via a retractable induction bowl on the left sprayer side. This is equipped with a rotating cleaning nozzle for the rinsing of product cans and the cleaning of the bowl. Additional nozzles are mounted near to the outlet, aim of these nozzles is to produce a vortex in the outlet area to support the flush out of the plant protection liquid.

The clean water tank for rinsing and diluting holds a volume of 252 l. It is also made of polyethylene.

Description of sprayer



Fig.3: Damping system at the connections for the lower linkage arms.

On the front side of the spray tank mechanical gauges show the spray pressure, the hydraulic pressure, the spray tank and the clean water tank contents. The contents of the spray tank is also shown on the electronic terminal in the driver's cabin.

The spray liquid pressure system is based on a six diaphragms positive displacement radial spray pump, type: Hardi 464/10, driven via the PTO-shaft.

The 27 m boom is made from welded steel profiles with the outer 2.5 m elements including an obstacle give away function. The spray liquid is delivered to 9 spray sections. Return pipes are mounted at the end of the spray section lines, so all liquid in the pipes can flow back to the tank to enable the full spray concentration at all nozzles right from the start and to avoid non dilutable spray liquid in case of diluting the spray liquid residuals (recirculation system).

The boom lift can be adjusted indefinitely, the boom can be lifted about 1730 mm. The pendulum range of the boom is +/- 13 ° and slopes can be compensated up to 12 %. Ultrasonic sensors make an automatic controlled boom height adjustment possible.

Thanks to the design of the lower boom profiles, the nozzles are well protected against ground contact. The functions for filling, agitation and inner tank cleaning can be operated at the control centre on the left sprayer side as well as from the terminal (HC 8600) in the driver's cabin. All functions for spraying and boom movement can also be controlled by this terminal and the switch box (SetBox). Optionally the joystick can be used for switching and controlling the



Fig.4/5: Left sprayer side with control centre and induction bowl.

Description of sprayer

spray nozzle sections and the spray pressure.

With the “SetBox” the hydraulic functions can be switched and adjusted. In case of trailed sprayers the “SetBox” also manages the “Safe Track” function. In this concept all important functions and information are monitored on one display. The presentation on the display can be changed between 2D and 3D view.



Fig.6/7/8: Terminal „HC 8600“ and switch box „SetBox“ or joystick mounted in the driver's cabin for displaying and controlling the sprayer functions.



Result table

tested assembly				result (measured)	
spray tank	over volume			9.8 %	* min. 5 %
	contents gauge		graduation marks	electronical display	* max. 100 l
			deviation	3.71 %	* max. 7.5 % between 220 l and 440 l
				3.05 %	* max. 5 % between 440 l and 2200 l
surface roughness			0.020 mm***	* max 0.1 mm	
rinsing tank	volume			252 l	* 10 % of spray tank volume
	rinsing and dilution possible?			yes	
	Cleaning performance (main tank) (reduction factor, concentration after cleaning)			1711	Min.factor 400 of concentration before cleaning
can rinsing equipment		rinsing efficiency		0.0052 %	* 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			-7.68 %	*max. 15 %
residual in l		dilutable		30.02 l	* max. 65 l
		non dilutable		-	
spray boom	height adjustment range			1730 mm	
	nozzle ground contact protection			yes	
	pressure loss between manometer and nozzle at 2 bar pressure			10 % (with Hardi MD110 04)	* max. 10 %
	nozzle dripping after switch off			0 ml	* max. 2 ml
	single nozzle flow rate				
	type of nozzle: Hardi MD 110 04				
		pres- sure (bar)	flow rate (l/ min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
		3.0	1.54	- 8.8	- 5
	transverse distribution				
	type of nozzle: Hardi MD 110 04				
	pres- sure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)		
	2.0	50	4.3		
	3.0	40	4.6		
	6.0	50	6.0		

Tab.3: Result table 1.

* limit
*** outer surface

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	
	210	2.63	3.79
	300	1.40	0.94
390	1.79	2.01	
procedure		regulation time: time until deviation < 10 % to adjusted value	
switching on / off		5.2 s***	max. 7 s
switching of single sections		2.4 s***	max.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		3.7 s	< 10 %
2.0 m/s to 2.5 m/s		2.8 s	< 10 %
2.5 m/s to 2.0 m/s		2.8 s	< 10 %
2.0 m/s to 1.5 m/s		3.1 s	< 10 %

Tab.4: Result table 2.

** limit: max. 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)

001/19



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

EPH 01/19



ENAMA Ente Nazionale per la Meccanizzazione
 Agricola
 (Italy)

ENTAM „Rapporto di
 prova prestazionale“
 01/2019



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

D-177/2019



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

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PIMR - Przemysłowy Instytut Maszyn
 Rolniczych Industrial Institute of Agricultural
 Engineering
 (Poland)

PIMR-192/ENTAM/19