

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या/ No.: PS-485/2714/2021
माह/Month: July, 2021

THIS TEST REPORT VALID UP TO : 31st July, 2026



**HYMARK, HK-55, BATTERY CUM
HAND OPERATED KNAPSACK SPRAYER**



सत्यमेव जयते

भारत सरकार

Government of India

कृषि एवं किसान कल्याण मंत्रालय

Ministry of Agriculture and Farmers Welfare

कृषि, सहकारिता एवं किसान कल्याण विभाग

Department of Agriculture, Cooperation and Farmers Welfare

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

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3. Data recorded

Avg. Speed of Pump (rpm)	Working pressure (kg/cm ²)	Test No.	Delivery from the discharge line (ml/min)	Overflow (ml/min)	Average discharge from the discharge line (ml/min)	Discharge rate of pump (ml/min)
3868	2.0	1	2000	NIL	2007.5	2007.5
		2	2010			
		3	1990			
		4	2030			
3808	3.0	1	1740	NIL	1732.5	1732.5
		2	1710			
		3	1750			
		4	1730			
3789	3.5	1	1600	NIL	1625.0	1625.0
		2	1630			
		3	1650			
		4	1620			
3759	4.0	1	1350	NIL	1337.5	1337.5
		2	1330			
		3	1340			
		4	1330			
3500	5.0	1	950	NIL	932.5	932.5
		2	920			
		3	940			
		4	920			

Minimum discharge rate = 932.5 ml/min at 5 kg/cm²
Maximum discharge rate = 2007.5 ml/min at 2 kg/cm²
Discharge at rated pressure = 1625.0ml/min at 3.5 kg/cm²

6. TEST FOR VOLUMETRIC EFFICIENCY (Vide Clause 8.4 of IS: 11313 - 2007)

Date of test : 15.7.2021
Rated pressure, kg/cm² : 3.5
Avg. discharge of water at rated pressure, ml/min : 1625.0
Avg. discharge of water at no load, ml/min : 3417.5
Avg. pump speed at no load, rev/min : 4104
Avg. pump speed at rated pressure, rev/min : 3789
Volumetric efficiency of pump, % : 51.5 %

Remarks: - The volumetric efficiency does not conform to the requirement of IS: 11313-2007.



7. POWER REQUIREMENT (Vide Clause 8.5 of IS : 11313 : 2007)

- Date of test : 16.07.2021
The power requirement of DC motor fitted on sprayer was observed as following.
1. Motor operating voltage : 12 V
 2. Avg. current drawn by motor at no load : 1.30 A
 3. Avg. current drawn by motor at load : 1.56 A
 4. Avg. motor operating voltage : 12.59 V
 5. Avg. observed motor power requirement : 19.55 Watt
 6. Avg. motor speed at no load : 4104 rpm
 7. Avg. motor speed at load : 3789 rpm
 8. Avg. Time required for full discharge of battery : 7.8 to 8.3 hour
 9. Avg. No load rpm of motor after 6 hours of Operation : 3366 rpm
 10. Time required to fully charge the battery with AC charger was observed as : 7.8 to 8.9 hours
 11. The spraying operation time after full charging the battery was observed as : 7.0 to 8.2 hours

8. PRESSURE ADJUSTMENT TEST (Vide Clause 8.7.1 of IS : 11313-2007)

1. Date of test : 15.07.2021
2. Atmospheric conditions :
 - a. Temperature : 31.5 °C
 - b. Relative humidity : 67.5 %
 - c. Pressure : 98 kPa
3. Data recorded

S. No.	Working pressure (kg/cm ²)	Fluctuation range (kg/cm ²)	Pressure drop (kg/cm ²)	Ratio
1.	2.0	Nil	Nil	--
2.	3.0	Nil	Nil	--
3.	3.5	Nil	Nil	--
4.	4.0	Nil	Nil	--
	5.0	Nil	Nil	--

4. Resistance to different pressure: Yes

9. TEST FOR SPRAY LANCE (Vide Annex. D of IS: 3652-1995)

- Date of test : 14.07.2021
Type : Straight (Type-A)



10.4 MARKING ON CUT-OFF DEVICE

- a) Manufacturer's name or recognized trade mark : Hymark
 b) Batch or code number : C-1/9
 c) Type of cut-off device : Not marked

11. TEST FOR NOZZLE

(Vide Annex F of IS: 3652-1995)

- Date of test : 13.07.2021
 Type of Nozzle (apa) : Fixed type

11.1 TEST FOR DISCHARGE RATE OF NOZZLE

The discharge rate for fine cone spray pattern as 1200 ml/min at a pressure of 300 kPa was declared by the applicant. The discharge rate corresponding to 300 kPa pressure was observed as under:-

- For fine cone spray pattern : 1215.0 ml/min

11.2 TEST FOR SPRAY ANGLE OF NOZZLE

The spray angle of nozzle at a pressure of 300 kPa was declared by the applicant as 90 degree. The spray angle corresponding to 300 kPa pressure was observed as 88.9 degree.

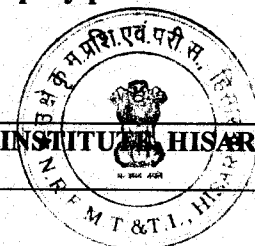
11.3 ENDURANCE TEST OF NOZZLE

- i) Date : 15.06.2021 to 23.06.2021
 ii) Total running time (h) : 48
 iii) Quantity of liquid collected and spray angle observed during endurance test.

Sr. No.	No. of collection	Avg. Discharge rate at fine cone spray pattern, ml/min	Spray angle, degree
a)	First collection	1215.0	87.9
b)	Second collection	1212.5	88.7
c)	Third collection	1217.5	88.1
d)	Fourth collection	1212.5	88.9
e)	Fifth collection	1205.5	88.4
f)	Sixth collection	1202.5	87.3
g)	Seventh collection	1192.5	87.9
h)	Eighth collection	1195.0	88.4

Remark: i) Percentage variation in discharge rate for fine cone spray pattern from first to last collection is 1.65 %.

ii) The variation in spray angle for fine cone spray pattern from first to last collection is 0.5 degree.



11.4 SPRAY DISTRIBUTION PATTERN OF NOZZLE

The liquid discharge from nozzle at 300 kPa pressure was collected in glass tubes of patternator. The spray pattern as per the quantity of liquid collected is represented in tabular form and in Fig. 1.

11.5 NOZZLE DESIGNATION : AN C90 1200

Provision for strainer in nozzle : Not provided

11.6 MARKING OF NOZZLE

Manufacturer's name or recognized trade mark : Hymark

Batch or code number : C-1/9

12. ENDURANCE TEST OF SPRAYER
(Vide clause 8.8 of IS:11313-2007)

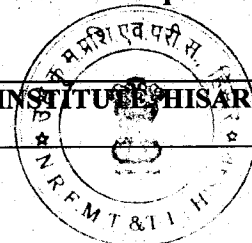
1. Date of test :- 07.06.2021 to 14.06.2021
2. Total running time (h)-50
3. Quantity of liquid collected during endurance:-
Avg. discharge (ml/min)
 - a) First Collection - 1717.5
 - b) Second Collection - 1635.0
 - c) Third Collection - 1632.0
 - d) Fourth collection - 1625.0
 - e) Fifth Collection - 1662.5
 - f) Sixth Collection - 1602.5
 - g) Seventh Collection - 1680.0
4. Percentage variation of discharge from first to last collection is 2.18 %

13. TEST FOR PUMP CHAMBER
(Vide Clause 7.1 of IS:10134-1994)

Date of test : 13.07.2021

Sr. No.	Details	Condition
1	Test Condition	Outlet end closed
2	Pressure applied -Hydraulic pressure	Motor stopped beyond 5.7 kg/cm ² pressure against the pressure requirement of 8.75 kg/cm ²
	-Pneumatic pressure	5.25 kg/cm ²
3	Duration	1 minutes each
4	Result	No leakage, crack deformation or breakage observed in pump chamber during the test.

Remarks : Tendency of stalling of motor was observed beyond 5.7 kg/cm² hydraulic pressure and therefore test could not be taken up to the required pressure of 8.75 kg/cm² and therefore sprayer does not conform to the requirement laid down in clause 7.1 of IS: 10134-1994.



14. TEST FOR HOSE AND HOSE CONNECTION.
(Vide Clause 5.14.3 of IS: 11313-2007 & Clause 7.2 of IS: 10134-1994)

Date of test : 13.07.2021

Sr. No.	Details	Condition
1	Test condition	Outlet end closed
2	Hydraulic pressure applied	1.5 MPa
3	Duration	1 minute
4	Result	No leakage, crack or breakage observed in hose and hose connection during the test.

15. ASSESSMENT OF CONSTRUCTIONAL REQUIREMENTS

15.1 GENERAL REQUIREMENTS			
Ref. Cl. No.	Specified requirements as per Indian Standard IS: 3906-1995	Observation	Remarks
Cl. 6.1 Tank	The tank capacity shall be 10,13 or 16 litres with a tolerance of ± 0.5 litres	The tank capacity is 16 Litres.	Conforms
Cl.6.1.1	The thickness of sheet used in manufacture of brass tank shall be minimum of $0.63 \text{ mm} \pm 0.03 \text{ mm}$.	Not applicable, as the tank is made of plastic.	--
Cl. 6.1.2	The tank, when filled up to its neck level with water, shall not show any sign of leakage and shall not buckle.	No sign of leakage & buckling in tank is noticed, when filled up to the neck level with water.	Conforms
Cl.6.2 Skirt/Stand	The tank shall be provided with a skirt/stand which shall project a minimum of 6mm beyond the lowest portion of the bottom of the tank.	The tank is provided with a stand which is projected 6 mm beyond the lowest portion of the bottom of the tank.	Conforms
Cl.6.3 Strap	Two straps of not less than 800 mm when adjusted to maximum possible length and 38 mm in width shall be provided in order to help carriage of sprayer Provision for adjustment of the length of each strap shall also be provided.	Two straps provided of 1195 mm length and 38 mm width. Provision made for adjustment of the strap length.	Conforms
Cl.6.3.1	The straps and their assembly shall withstand the test prescribed in 7.3 of IS: 10134-1994.	Does not withstand the test (Refer Chapter No. 23 of this test report)	Does not conform
Cl.6.4 Filling hole	A filling hole of 90 mm minimum diameter if circular or in minor axis if oval, shall be provided on the top of the tank.	Circular filling hole of 112 mm diameter is provided on the top of tank.	Conforms
Cl.6.4.1	The hole shall be covered with a tightly fitted cap or lid it shall withstand the test given under 6.4.1.1.	Hole is covered with threaded lid.	Conforms

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18. TEST FOR VOLUMETRIC EFFICIENCY
(Vide Clause 6.2 of IS: 10134-1994)

Sl. No.	Date of test	:	12.07.2021
Sl. No.	Details	:	Observation
1.	Discharge of water in 10 successive stroke	:	362.5 ml
2.	No of cycle	:	10
3.	Actual volume of water in one cycle	:	36.25 ml
4.	Inner diameter of pump cylinder	:	45.0 mm
5.	Stroke length at 300 kPa pressure	:	32.0 mm
6.	Piston displacement	:	50.87 cc
7.	Theoretical volume of water in one cycle	:	50.87 ml
8.	Volumetric efficiency, %	:	71.3 %

Remark:- The volumetric efficiency does not conform to the requirement of IS: 10134-1994

19. TEST FOR PRESSURE CHAMBER
(Vide Clause 7.1 of IS: 10134-1994)

Date of test : 12.07.2021

Sr. No	Details	Condition
1	Test Condition	Outlet end closed
2	Pressure applied -Hydraulic pressure -Pneumatic pressure	8.75 kg/cm ² 5.25 kg/cm ²
3	Duration	1 minute each
4	Result	No leakage, crack, deformation or breakage observed in pressure chamber during the test.

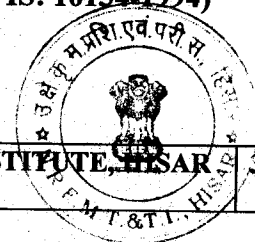
20. TEST FOR OPERATING LEVER, HANDLE & PISTON ROD
(Vide clause 7.6 of IS: 10134-1994)

Date of test : 13.07.2021

Sr. No	Details	Condition
1	Test Condition	Discharge outlet closed
2	Preassure applied	8.75 kg/cm ²
3	Result	No distortion, crackage or breakage was observed in handle, operating lever and piston.

21. TEST FOR HOSE AND HOSE CONNECTION
(Vide Clause 5.14.3 of IS:11313-2007 & Clause 7.2 of IS: 10134-1994)

Refer Chapter 14 of this report.



22. ENDURANCE TEST OF SPRAYER (Vide clause 8.1 of IS:10134-1994)

1. Date: 03.07.2021 to 12.07.2021
2. Total running time (h) - 48
3. Quantity of liquid collected during endurance:-
Avg. discharge (ml/min)
 - a) First Collection - 547.5
 - b) Second Collection - 562.5
 - c) Third Collection - 570.0
 - d) Fourth collection - 547.5
 - e) Fifth Collection - 582.5
 - f) Sixth Collection - 587.5
 - g) Seventh Collection - 560.0
 - h) Eighth Collection - 585.0

Remark: Percentage variation of discharge from first to last collection is 1.29 %.

23. TEST FOR STRAP AND ITS ASSEMBLY (Vide Clause 7.3 of IS: 10134-1994)

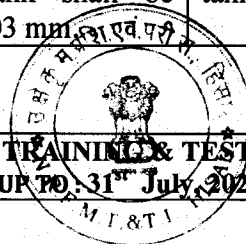
Date of test : 13.07.2021

The sprayer was filled with clean water to its specified capacity. The sprayer was hung from a solid support by its straps simulating its carriage on the shoulder of an operator. The tank was vertically raised to height of 300 mm and was allowed to drop freely and hung by straps.

Observation: At 3rd drop the buckle of strap assembly failed to hold the strap in its position.

24. ASSESSMENT OF CONSTRUCTIONAL REQUIREMENTS APPLICABLE FOR HAND OPERATED KNAPSACK SPRAYER

Ref. Cl. No.	Specified requirements as per Indian Standard IS: 3906-1995	Observation	Remarks
Cl.5.1 Discharge rate	When tested in accordance with the method given in 6.1.3 of IS:10134- 1994, the pump shall be capable of discharge a minimum of 500 ml of water per minute.	570.0 ml/min	Conforms
Cl.5.2 Volumetric efficiency	When tested in accordance with the method given in 6.2 of IS 10134 : 1994, the volumetric efficiency shall be not less than 85 percent.	71.3 %	Does not conform
Cl. 6.1 Tank	The tank capacity shall be 10, 13 or 16 liters with a tolerance of ± 0.5 litres.	The tank capacity is 16 litres.	Conforms
Cl.6.1.1	The thickness of sheet used in manufacture of brass tank shall be minimum of $0.63 \text{ mm} \pm 0.03 \text{ mm}$.	Not applicable, as the tank is made of plastic.	--



27. COMMENTS & RECOMMENDATIONS

- 27.1 During the strap drop test, the buckle/bracket of strap assembly failed to hold the strap in its position. It should be improved.
- 27.2 The strap cushion is not provided. It should be provided.
- 27.3 The aperture size of cut-off device strainer does not meet the requirement of Indian Standard. It **MUST** be looked into.
- 27.4 The type of cut-off device is not marked. It **MUST** be looked into.
- 27.5 The strainer in nozzle is not provided. It may be provided.
- 27.6 Agitator is not provided in sprayer. It may be provided.
- 27.7 During the hydraulic test of pump, the motor stopped beyond 5.7 kg/cm² pressure against the pressure requirement of 8.75 kg/cm² and the test could not be conducted. This **MUST** be looked into and improved.
- 27.8 The strainer area of cut-off device does not meet the requirement of Indian Standard. It **MUST** be looked into.
- 27.9 The volumetric efficiency of sprayer on battery operated and hand operated mode was observed as 51.5 % and 71.3 % respectively, which is not within the requirement of the relevant Indian Standard.
- 27.10 A suitable labeling plate (**Not Sticker**) needs to be provided with "Interalia" following information.
- i) Manufacturer's name
 - ii) Make
 - iii) Model
 - iv) Month & Year of manufacturer
 - v) Rated speed
 - vi) Rated pressure
 - vii) Discharge rate
 - viii) Power rating
 - ix) Country of Origin
- 27.11 **Safety provision/safety wear**
The safety instructions regarding handling poisonous agro chemical before, during and after spraying operation should be provided on sprayer.



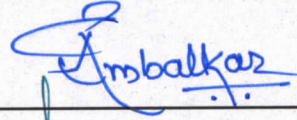
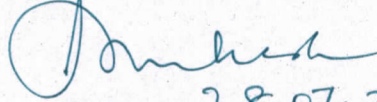
28. TECHNICAL LITERATURE

The following literature are provided with sprayer for guidance to the user.

- i. Operator's manual
- ii. Service manual
- iii. Part's catalogue

However, the manuals of sprayer should be updated as per IS:8132-1999.

TESTING AUTHORITY

Er. G.R. AMBALKAR AGRICULTURAL ENGINEER	
Dr. MUKESH JAIN DIRECTOR	 28-07-2021

The report compiled by Er. Maan Singh, Senior Technical Assistant

29. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant Comment's
29.1	27.1	Will be improved to hold the strap in its position.
29.2	27.2 & 27.5	Will be provided.
29.3	27.3 & 27.8	Will be looked into to meet the requirement of Indian Standard.
29.4	27.4	Will be marked.
29.5	27.6	Will also be provided.
29.6	27.7	We will check and improve.
29.7	27.9	Will be improved as per the requirement of the relevant Indian Standard.
29.8	27.10	Will be provided with required information.
29.9	27.11	Will be provide on sprayer.
29.10	28	Will be updated as per IS:8132-1999.

