

THIS TEST REPORT VALID UP TO : 30th June, 2028



**HIRA-567 A
STRAW REAPER COMBINE**



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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6. LABOTATORY TESTS

Material analysis: The hardness and chemical analysis with respect to critical components are given in Table-3 & 4 respectively.

Table-3 : Hardness of critical parts :-

S. No.	Component	Material	Average Hardness observed (HRC)	
			Hardened zone	Remainder zone
1	Cutter bar blade	High carbon steel	56.6	32.6
2	Knife guard	High carbon steel	183.7 (HB)	
3	Knife back	Mild carbon steel	23.5	
4	Chopping cylinder blade	High carbon steel	58.0	33.0
5	Concave blade	High carbon steel	56.7	20.1

Table-4 : Chemical analysis of critical components

S. No.	Component	Primary element (%) by weight				
		Carbon	Manganese	Silicon	Phosphorous	Sulphur
1	Knife blade	0.500	0.972	0.375	0.008	0.042
2	Knife guard	0.210	1.184	0.315	0.035	0.055
3	Knife back	0.333	0.950	0.366	0.025	0.063
4	Chopping cylinder blade	0.309	1.156	0.379	0.009	0.055
5	Concave blade	0.427	0.749	0.416	0.006	0.047

7. FIELD TEST

The straw reaper combine was operated with John Deere 5310 V2 tractor at engine throttle setting corresponding to 540 rpm of PTO and tested in the field for 37.67 (including running-in 1.00) hours for reaping of left over straw & stubbles after wheat harvesting by grain combine harvester. During tests field performance of straw reaper combine was assessed with regard to quality of work, rate of work, fuel consumption, safety and soundness of construction etc. The crop parameters, atmospheric conditions and performance parameters as observed during field tests are also given in Annexure-I & II and summarized in Table-5 & 6.

Table-5 : Summary of field crop conditions

S. No.	Parameters	Range of parameters
1.	No. of tillers per m ²	210 to 410
2.	Manually recovered straw, before straw reaping (loose + stubble), g/m ²	449.90 to 657.67
3.	Moisture content of straw, %	7.0 to 11.0
4.	Manually recovered after straw reaping	88.33 to 106.67
5.	Height of stubbles before harvesting, mm	200 to 460
6.	Height of stubbles after harvesting, mm	50 to 140
7.	Straw recovery	t/ha t/h
		3.83 to 4.68 1.00 to 1.86

Table -6 : Summary of field performance test

S. No.	Observations	Range of observations
1.	Speed of operation, kmph.	1.78 to 1.82
2.	Width of cut, m	2.01 to 2.05
3.	Overlap, %	1.91 to 3.83
4.	Rate of work, ha/h	0.269 to 0.319
5.	Fuel consumption	
	l/h	6.20 to 6.65
	l/ha	19.74 to 23.44
	l/t	3.59 to 6.25
6.	Average length of straw, mm	16.16 to 20.70
7.	Straw split, %	92.60 to 94.60
8.	Straw recovery, %	79.55 to 85.04
9.	Grain recovery, %	63.00 to 80.92

7.1 Ease of operation

No noticeable problem was observed during operation of straw reaper.

7.2 Quality of wheat straw: Satisfactory for animal feed.**7.3 Labour requirements**

One man hour was required for daily maintenance of tractor and straw reaper. One skilled operator is needed to operate tractor with straw reaper. Extra labourers are required for transportation and handling of bhusa collected

8. WEAR OF CRITICAL COMPONENTS

The wear of serrated blades of cutter bar, chopping cylinder and concave was measured after completion of 37.67 hours of wheat straw harvesting.

Percentage wear on mass basis were computed and the results are given below in Table - 7

Table-7: Wear assessment of blades on mass basis

7.1 Concave blade

Sr. No.	Concave		
	Mass before test (g)	Mass after test (g)	Wear (%)
1	90.46	90.05	0.45
2	91.58	91.05	0.57
3	91.25	90.95	0.32
4	90.84	90.52	0.35

7.2 Chopping cylinder

Sr. No.	Chopping cylinder		
	Mass before test (g)	Mass after test (g)	Wear (%)
1	70.37	70.21	0.23
2	69.19	69.00	0.27
3	67.13	66.95	0.27
4	68.88	68.45	0.63
5	68.21	68.05	0.23

SR. Comb-149/2707/2021	HIRA-567 A, STRAW REAPER COMBINE (COMMERCIAL)
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6	65.75	65.52	0.35
7	68.36	68.22	0.20
8	64.74	64.65	0.14
9	63.47	63.41	0.09
10	69.51	61.45	0.08
11	67.40	67.33	0.10
12	69.25	68.88	0.53
13	65.69	65.52	0.26
14	67.00	66.89	0.16
15	69.08	68.83	0.36
16	70.44	70.19	0.35

Wear of concave & chopping cylinder blade on mass basis has ranged from 0.32 to 0.57 % and 0.08 to 0.63 % respectively.

9. SOUNDNESS OF CONSTRUCTION

No noticeable breakdown was observed during 37.67 hours of field operation.

10. CRITICAL TECHNICAL SPECIFICATION

(Vide Ministry's communication No 13-9/2019 M & T (I & P) dated 26.04.2019)

Sl. No.	Parameters	Specifications	Observation	Remarks
1.	Towing hook type	Clevis/Circular	Clevis	Conforms
2.	Power input shaft connection to tractor PTO	Propeller shaft with universal joint	Provided	Conforms
3.	Cutting Width, mm	1500 to 2500	2240	Conforms
4.	Speed of chopping cylinder, rpm	800 to 1000	968	Conforms
5.	Chopping cylinder dia, mm	700 to 900	767	Conforms
6.	PTO drive shaft	Compliant with BIS code		
	- Safety against overload	Must be provided	Provided	Conforms
	- Guard in shaft	Must be provided	Provided	Conforms
7.	Safety cover in all drive	Must be provided	Provided	Conforms
8.	Chopping cylinder blade	Serrated	Provided	Conforms
9.	Material of blade and ledger plate	High carbon steel EN 42 J& EN 44	Not specified	Does not conform
10.	Hardness of blade and ledger plate, HRC	36 and 45 (Min.)	56.2 (Average)	Conforms
11.	Provision for concave clearance adjustment	Must be provided	Provided	Conforms



SR. Comb-149/2707/2021	HIRA-567A, STRAW REAPER COMBINE (COMMERCIAL)
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12.	Provision of grain recovery	Must be provided	Provided	Conforms
13.	Reel type	Pick up tine	Pick up tine	Conforms
14.	Diameter of tine bar, mm	20 (Min.)	26.6	Conforms
15.	Arrangement for forward & backward movement of reel	Must be provided	Provided	Conforms
16.	Labelling of lubricating points	Must be provided	Provided	Conforms
17.	Marking/labelling of machine	The labelling plate should be riveted on the body of machine having name & address of manufacturer, serial number, size, required size of prime mover (kW/HP)	Provided	Conforms
18.	Literature	Operator manual, service manual & parts catalogue should be provided	Provided	Conforms

11. COMMENTS & RECOMMENDATIONS

- 11.1 Safety guard in reel drive is not provided. It **MUST** be provided.
- 11.2 Safety drive device in feeding platform auger drive is not provided. It **MUST** be provided.
- 11.3 The construction of PIC and PIC shaft does not meet the requirement of IS:4931-1995. It **MUST** be looked into for corrective action.
- 11.4 Safety signs, symbols and hazard notices are not provided on machine. It **MUST** be provided in safety point of view.
- 11.5 **Visual observations and provision for adjustments**
- i) Marking on inlet and outlet is not provided. It should be provided.
 - ii) Marking of direction of rotation on chopping drum, blower unit, beater unit and reel unit is not provided. It should be provided.
 - iii) The provision for following adjustment on straw reaper is not provided. It should be provided.
 - a) Adjustment of speed of chopping cylinder, blower, reel & cutter bar.
 - b) Adjustment of air displacement.
 - iv) The operator & service manual is provided, however, adequate information regarding the machine maintenance, adjustment, operation, lubrication / maintenance schedule etc is not provided. It is recommended to take corrective action.



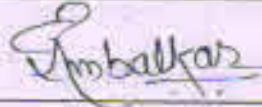


12. TECHNICAL LITERATURE

The following manuals were provided during the test:

- i) Operator cum service manual.
- ii) Parts catalogue

The operator cum service manual of machine should be updated as per IS: 8132-1999.

TESTING AUTHORITY

Er. G.R. AMBALKAR AGRICULTURAL ENGINEER	
Er. R.K. NEMA SENIOR AGRICULTURAL ENGINEER	
Dr. MUKESH JAIN DIRECTOR	 28.06.2021

Draft test report compiled by: Er. Dharmendra Kumar, Technical Assistant

13. APPLICANT'S COMMENTS

No specific comment is offered by the applicant.

