

व्यावसायिक परीक्षण रिपोर्ट  
COMMERCIAL TEST REPORT

संख्या/ No.: COMB-207/2466/2020

माह/Month: April, 2020

**THIS TEST REPORT VALID UP TO : 30<sup>th</sup> APRIL, 2027**



**STANDARD S-390  
TRACTOR MOUNTED COMBINE HARVESTER**



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

Northern Region Farm Machinery Training and Testing Institute

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[ISO 9001:2015 CERTIFIED]

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Height of microphone above ground level, m : 1.2  
 Distance of microphone from line of travel, m : 7.5  
**Atmospheric conditions:**  
 Temperature, (°C) : 18.5  
 Pressure, (kPa) : 99.4  
 Relative humidity, (%) : 57.6  
 Wind velocity, (m/s) : 0.9 to 1.5

**TEST DATA:**

S. No.	Gear Used	Travelling Speed before acceleration (kmph)	Noise level, dB (A)	
			Silencer facing microphone	Silencer facing away from microphone
1.	L1	0.99	84	84
2.	L2	1.32	84	84
3.	L3	1.93	85	84
4.	L4	2.82	84	84
5.	M1	2.46	84	83
6.	M2	3.69	84	84
7.	M3	5.42	84	84
8.	M4	7.86	85	84
9.	H1	9.29	85	84
10.	H2	11.04	85	84
11.	H3	14.01	86	85
12.	H4	20.38	86	85

**14.2 Noise at operator's ear level**

Date of test : 16.12.2019  
 Type of track : Ground  
 Background noise level, dB(A) : 54.2  
 Height of microphone from the foot board, mm : 1090

**Atmospheric conditions:**

Temperature, (°C) : 19.7  
 Pressure, (kPa) : 99.7  
 Relative humidity, (%) : 57.2  
 Wind velocity, (m/s) : 1.1 to 1.5

**TEST DATA:**

Maximum noise level observed dB(A) : 96

**14. FIELD TEST**

**14.1** Combine harvester was operated in field for 27.73 and 25.73 hours for wheat and paddy harvesting respectively. During the test, available varieties of crop were harvested to assess the field performance of combine with regard to quality of work, rate of work, fuel consumption, safety and soundness of construction etc. The crop and atmospheric conditions during field test are given in Appendix - II & IV respectively.

The crop parameters recorded during the test for all crops are as under:-

**Crop Parameters**

Sl. No.	Parameters		Observations	
			Wheat	Paddy
1.	Average plant height, cm	:	78 to 110	69 to 108
2.	Average number of tillers/m <sup>2</sup>	:	368 to 510	260 to 410
3.	Average length of ear head, cm	:	7 to 11	22 to 28
4.	Average straw/grain ratio	:	0.8 to 1.1	1.8 to 2.2
5.	Average moisture, %			
	- Grain	:	9.5 to 11.5	13.5 to 17.0
	- Straw	:	9.6 to 10.4	60.7 to 70.2

The results of field performance test of wheat and paddy crops harvesting are summarised in Table - 5 and presented in detail in **Appendix – II to V.**

**Table- 5: SUMMARY OF LOSSES & EFFICIENCIES OBSERVED DURING FIELD PERFORMANCE TEST.**

Crop variety	Collectable losses (%) (Max.)	Non-collectable losses (%) (Max.)	Total processing losses (%) (Max.)	Threshing efficiency (%) (Min.)	Cleaning efficiency (%) (Min.)	Grain breakage in main tank (%)	Forward speed (kmp h)	Area covered (ha/h)	Fuel consumption		Grain output (kg/h)	Crop throughput (t/h)
									(l/h)	(l/ha)		
1	2	3	4	5	6	7	8	9	10	11	12	13
<b>WHEAT</b>												
HD 2967	1.8	1.7	2.6	99.7	97.7	1.33 to 1.67	2.73 to 2.80	0.621 to 0.695	4.48 to 5.40	7.20 to 7.78	3839.92 to 3963.69	7.48 to 8.03
PBW 723	2.0	1.6	2.6	99.7	97.3	1.03 to 1.65	2.81 to 2.83	0.750 to 0.756	4.86 to 4.96	6.43 to 6.65	3254.91 to 3992.88	6.51 to 7.29
<b>PADDY</b>												
Rajendra Masuri	0.9	0.6	1.1	99.8	98.3	0.19 to 0.76	1.34 to 1.37	0.290 to 0.320	4.23 to 5.25	14.38 to 16.41	1992.34 to 2251.14	6.16 to 6.33
IR 64	1.8	0.9	2.0	99.1	97.1	0.91	1.31	0.333	5.09	15.30	1620.58	5.15
PUSA 1121	2.0	1.3	2.8	99.1	96.7	1.89	1.39	0.342	5.34	15.63	1195.20	3.41

#### 14.2

##### Unloading of grain

The time to unload the grain tank ranged from 63 to 187 second in wheat operation & 92 to 123 seconds in Paddy operation.

#### 14.3

##### Time required for daily maintenance

The average labour required for daily maintenance was approximately two man hours.

#### 14.4

##### Harvesting of any other crop

Not done, as not recommended.



**15. DEFECTS, ADJUSTMENTS, BREAKDOWNS AND REPAIR**

After 27.73 h. of operation in the wheat, pitman shaft broke, which falls under major breakdown Mj-31. As the hours for wheat harvesting was completed, the applicant was allowed to replaced the broke pitman shaft with new one for paddy harvesting

**16. INSPECTION AND ASSESSMENT OF WEAR****16.1 Steering system**

Visual condition of the components : No noticeable defect observed.  
of complete steering assembly.

**16.2 Chains, sprockets and belts**

Visual condition of the components : No noticeable defect observed.  
of complete assembly

**16.3 Bearings**

Visual condition of the components : No noticeable defect observed.  
of complete assembly

**16.4 Wear of rasp bar**

Sr. No.	Mass of rasp bar before test (g)	Mass of rasp bar after 29.47 h test (g)	Wear (%) by weight
1	4911.3	4839.7	1.46
2	4986.9	4928.5	1.17
3	5008.7	4943.7	1.30
4	5023.8	4957.3	1.32

**16.5 Wear of the peg teeth**

The wear of the peg teeth of the threshing cylinder and concave was measured. The percentage wear on mass basis was computed and the results are given below:

Sl. No.	Original mass before test (g)	Mass after 26.18 h of test (g)	Percent wear by weight (%)
<b>a)</b>	<b>Peg teeth of threshing cylinder</b>		
1.	212.5	211.7	0.38
2.	219.1	218.5	0.27
3	221.1	220.3	0.36
4	216.3	215.5	0.37
5	221.0	220.4	0.27
6	211.3	210.6	0.33
7.	204.8	204.1	0.34
8.	214.7	214.0	0.33
<b>b)</b>	<b>Peg teeth of concave</b>		
1	211.0	210.2	0.38
2	217.6	216.9	0.32
3	217.8	217.1	0.32
4	214.8	214.2	0.28
5	215.5	214.6	0.42
6	211.3	210.4	0.43

## 17. SUMMARY OF OBSERVATIONS

17.1 Tractor P.T.O. Performance Test: (Refer tractor test report No T-1044/1569/2016, October 2016 issued by C.F.M.T & T.I Budni)

17.2 Field test

17.2.1 Summary of field tests

The results of the field test are summarized below:-

S. No	Parameters	Observed range	
		Wheat harvesting	Paddy harvesting
1.	Range of average speed of operation (kmph)	2.73 to 2.83	1.31 to 1.39
2.	Range of average area covered (ha/h)	0.621 to 0.756	0.290 to 0.342
3.	Maximum average fuel consumption: - (l/h) - (l/ha)	4.48 to 5.40 6.43 to 7.78	4.23 to 5.34 14.38 to 16.41
4.	Range of average crop throughput (tonne/h)	6.51 to 8.03	3.41 to 6.33
5.	Reported average grain breakage in main grain outlet (%)	1.03 to 1.67	0.19 to 1.89
6.	Reported average header losses (%)	0.41 to 1.00	0.24 to 0.75
7.	Reported average total non-collectable losses (%)	0.5 to 1.7	0.5 to 1.3
8.	Reported average total collectable losses (%) (un threshed + broken from main outlet)	1.1 to 2.2	0.3 to 2.0
9.	Reported average total processing losses (%)	1.4 to 2.6	0.5 to 2.8
10.	Reported average threshing efficiency (%)	99.7 to 99.9	99.1 to 99.9
11.	Reported average cleaning efficiency (%)	97.3 to 98.5	96.7 to 98.8

## 18.3 Conformity to Indian Standard

- (i) IS: 6025-1982 (Reaffirmed 2014)-Specification for : **Does not conform in toto**  
knife section for harvesting machine.
- (ii) IS: 6024-1983 (Reaffirmed 2014)-Specification for : **Does not conform in toto**  
guards for harvesting machines.
- (iii) IS: 10378-1982 (Reaffirmed 2016)-Specification of : **Does not conform in toto**  
knife back for harvesting machine.
- (iv) IS: 6283 (Part II)-2007(Reaffirmed 2014)-Tractors and : **Conforms**  
machinery for agriculture and forestry-symbol for operator controls and other displays.
- (v) IS: 8133-1983 (Reaffirmed 2014)-Guidelines for : **Conforms**  
location & operation of operator controls on agricultural tractors and machinery.
- (vi) IS: 15806:2018 Recommendation on selected : **Does not conform in toto**  
performance and other characteristics



## 19. COMMENTS AND RECOMMENDATIONS

19.1 **Mechanical vibration**

The amplitude of mechanical vibration of components marked as (\*) in chapter 12 of this report are observed on higher side. This calls for providing suitable remedial measures to dampen the vibration in order to improve the operational comfort and service life of various components & sub-assemblies.

19.2 **Field performance test**

19.2.1 After 27.73 h. of operation in the wheat, pitman shaft broke, which falls under major breakdown Mj-31. As the hours for wheat harvesting was completed, the applicant was allowed to replaced the broke pitman shaft with new one for paddy harvesting

19.2.2 The paddy harvesting began, 25 numbers of flail blades broke. The applicant, then, requested to test the combine without SMS

19.3 **Ease of operation and safety provision**

- i) No noticeable difficulties observed during operation of combine harvester.
- ii) Slip clutches at undershot conveyer drive is not provided. It **MUST** be provided as per the requirement of IS 15806 : 2018

19.4 Cutter bar knife drive safety arrangement is not provided. It should be provided.

19.5 **Hardness and chemical composition**

- i) **Hardness & chemical composition of knife blade, knife guard and knife back is not within the limits specified in their respective IS: 6025-1982. It should be looked into for corrective action at regular production level.**

19.6 Engine oil and Gear box oil grade is not specified. It should be specified.

19.7 Grade of grease is not specified. It should be specified.



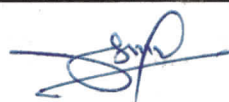

**19.8 Literature supplied with the machine**

The following literature provided during the test

- i) Operator manual for combine harvester
- ii) Parts catalogue

However, the Operator manual should be updated as per IS: 8132-1999.

**TESTING AUTHORITY**

ANSHUL PANDEY AGRICULTURAL ENGINEER (I)	
P. K. PANDEY DIRECTOR	

The test report compiled by C.Veeranjaneyulu, Senior Technician

**20. APPLICANT'S COMMENTS**

Para No	Our reference	Applicants comment's
20.1	19.1	Suitable measures will be taken in future commercial production machines to control the mechanical vibrations.
20.2	19.2.1	The pitman shaft will be observed and proper actions will be taken to rectify the error.
20.3	19.2.2	Reason for SMS filial blades broken shall be found and proper action will be taken.
20.4	19.3 (ii)	Slip clutch will be provided at undershot conveyer in the future commercial harvesters.
20.8	19.4	Cutter bar knife drive safety arrangement will be provided for future commercial harvesters.
20.9	19.5	Proper actions will be taken regarding hardness and chemical composition of knife blade, knife guard, and knife back with respect to IS: 6025-1982.
20.10	19.6	Engine oil and Gear box oil grade will be specified for future combine harvester.
20.11	19.7	Grade of grease will be specified in future.
20.12	19.8	Operator manual shell be provided as per IS: 8132-1999.