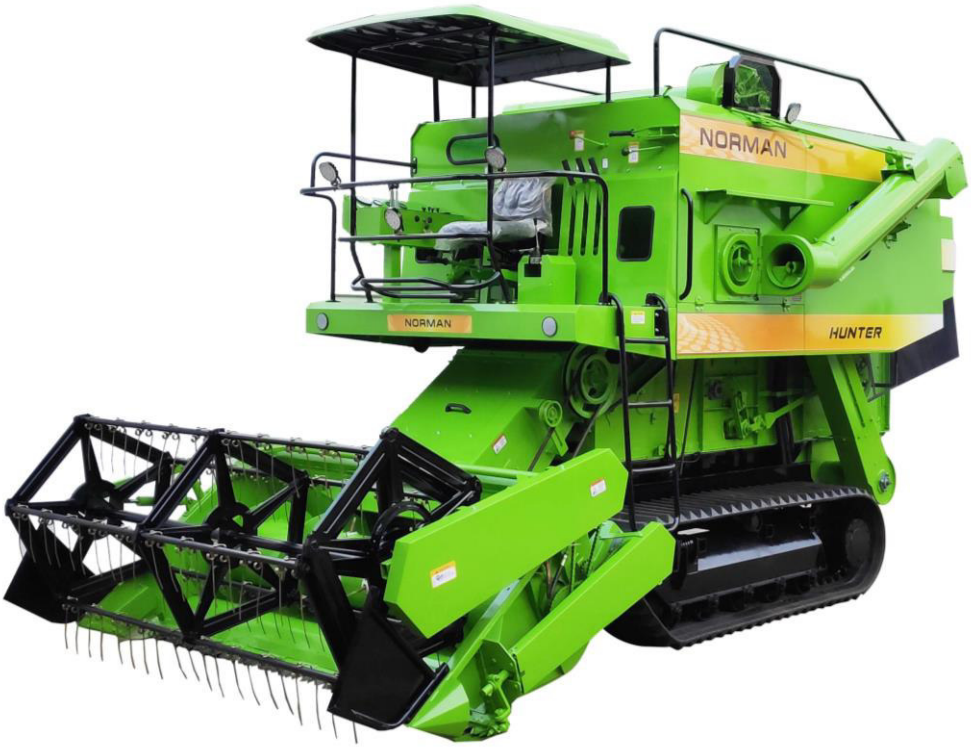
व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT

संख्या/ **No.: Comb- 290/2935/2022**

माह/**Month: October, 2022**

THIS TEST REPORT VALID UP TO : 31st October, 2029



NORMAN HUNTER
SELF PROPELLED COMBINE HARVESTER (TRACK TYPE)

सत्यमेव जयते

भारत सरकार

Government of India

कृषि एवं किसान कल्याण मंत्रालय

Ministry of Agriculture and Farmers Welfare

कृषि एवं किसान कल्याण विभाग

Department of Agriculture and Farmers Welfare

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

Northern Region Farm Machinery Training and Testing Institute

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16. FIELD TEST

16.1 The combine harvester was operated in field for 50.87 hours (excluding run in 2.09 h) for paddy harvesting. 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**

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

Crop Parameters

Sl. No.	Parameters		Observations
			Paddy
1.	Plant height, cm	:	103 to 119
2.	Number of tillers/m^2	:	279 to 406
3.	Length of ear head, cm	:	22 to 29
4.	Straw/grain ratio	:	16.1 to 29.1
5.	Moisture, %:		
	- Grain	:	16.5 to 18.0
	- Straw	:	60.0 to 64.0

The summary of losses and efficiencies observed during field performance test with paddy crop is summarised in Table 4 and presented in detail in **Appendix – III**

TABLE-4: SUMMARY OF LOSSES & EFFICIENCIES OBSERVED IN 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 (Max) (%)	Forward speed (kmph)	Area covered (ha/h)	Fuel consumption (l/h)	Fuel consumption (l/ha)	Grain out put (kg/h)	Crop through-put (t/h)
Rajendra Masuri	1.55	1.97	2.42	98.9	96.9	0.15 to 0.62	2.22 to 2.75	0.346 to 0.463	6.51 to 7.10	14.56 to 20.26	2370 to 3441	8.35 to 10.62

16.2 Unloading of grains

The time to unload the grain tank ranged from 80 to 135 seconds in paddy operation.

16.3 Time required for daily maintenance

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

16.4 Harvesting of any other crop

Not done, as not recommended.

17. DEFECTS, ADJUSTMENTS, BREAKDOWNS AND REPAIRS

No noticeable defect or breakdown was observed during the test.

20. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS

20.1	Acceptance criteria for performance characteristics as per clause 4.1 of IS 15806:2018					
S. No	Characteristics	Category (Evaluative/ Non evaluative)	Requirement (R) / Declaration (D)	Tolerance	Observed	Remarks
1	2	3	4	5	6	7
I.	**Prime mover performance**					
	a) Max. power (absolute) - Average max. power observed during 2 h. max. power test in natural ambient condition, kW	Evaluative	55 **(D)**	±5% of declared value	53.4	Conforms
	b) Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW	Evaluative	55 **(D)**	±5% of declared value	NA	Conforms
	c) Power at rated engine speed, kW (under natural ambient condition)	Non-evaluative	55 **(D)**	±5% of declared value	52.1	**Does not conform**
	d) Specific fuel consumption corresponding to average maximum power under 2 h maximum power test, g/kWh.	Evaluative	245 **(D)**	+5% of declared value	246.5	Conforms
	e) Max. Smoke density (Bosch no.) at 80% load between the speed at max. Power & 55% of speed at max. power or 1000 rpm whichever is higher	Evaluative	As per central motor vehicles rules (CMV) rules **(R)**	Nil	0.87 m^{-1}	Conforms

	f)	Max. crank shaft torque, (Nm) observed during the test after no load engine speed is adjusted as per manufacturer's recommendation for field work	Evaluative	350 **(D)**	±8% of declared value	NA	Conforms
	g)	Back up torque, %	Evaluative	7 % min**.** **(R)**	Nil	10.2	Conforms
	h)	Max. operating temperature, °C i) Engine oil ii) Coolant	Evaluative	 i) 120 **(D)** ii) 108 **(D)**	Should not exceed the declared value	 i) 111 ii) 85	Conforms
	i)	Lubrication oil consumption, g/kWh	Evaluative	1 % of SFC at maximum power (high ambient) **(R)**	Nil	0.35	Conforms
II. Brake performance at 24 km/h or maximum speed whichever is less							
	a)	Max. stopping distance at a force equal to or less than 600 N on brake pedal (m)- (cold brake and hot brake)	Evaluative	As per requirement of CMVR **(R)**	--	Not applicable as hydrostatic transmission does not require any separate/ regular conventional brake system.	--
	b)	Effectiveness of parking brake at a force of 600 N at foot pedal or 400 N at hand lever	Evaluative	As per requirement of CMVR **(R)**	--	Not applicable as no separate parking brake pedal/ lever is provided.	--
III. Mechanical vibration							
	a)	Operator's platform	Non evaluative	120 µm max. **(R)**	Nil	142	**Does not conform**
	b)	Steering control wheel	Non evaluative	150 µm max **(R)**.	Nil	NA	**--**
	c)	Seat with driver seated	Non evaluative	120 µm max. **(R)**	Nil	182	**Does not conform**

IV. Air cleaner oil pull over							
	a)	Air cleaner oil pull over in % when tested in accordance with IS 8122 part (II) 2000	Evaluative	0.20 max. **(R)**	Nil	Dry type air cleaner is provided hence test is not applicable	Not applicable
V. Noise measurement							
	a)	Max. ambient noise emitted by combine at by-standers position, dB (A)	Evaluative	88 As per CMV rules **(R)**	Nil	83.2	Conforms
	b)	Max. noise at operator's ear level, dB (A)	Evaluative	98 As per CMV rules **(R)**	Nil	92.2	Conforms
VI. Header lifting Test							
	a)	Satisfactory completion of header lifting test	Evaluative	-	Nil	Satisfactorily completed	Conforms
VII. Discard limit							
	a)	Cylinder bore diameter, mm	Evaluative	104.15 **(D)**	Should not exceed the values declared by the manufacturer	104.03	Conforms
	b)	Piston diameter, mm	Evaluative	103.755 **(D)**	-do-	103.96	Conforms
	c)	Piston to cylinder liner clearance at skirt, mm	Evaluative	0.140 to 0.172 **(D)**	-do-	0.13	Conforms
	d)	Ring end gap, mm i) Top compression ring ii) 2nd compression ring iii) Oil ring	Evaluative	 i) 1.20 **(D)** ii) 1.20 **(D)** iii) 1.20 **(D)**	-do-	 i) 0.45 ii) 0.45 ii) 0.45	Conforms

	e)	Ring groove clearance, mm 1.Top compression ring 2. 2nd compression ring 3. Oil ring	Evaluative	i) 0.70 **(D)** ii) 0.20 **(D)** iii) 0.10 **(D)**	-do-	i) Tapered ii) 0.046 ii) 0.041	Conforms
	f)	Diametrical and axial clearance of big end bearing, mm Diametrical Axial	Evaluative	0.12**(D)** 0.25**(D)**	-do-	0.30 0.40	Conforms
	g)	Diametrical and axial clearance of main bearings, mm Diametrical Crank shaft end float	Evaluative	0.13**(D)** 0.40**(D)**	-do-	0.11 0.17	Conforms
	h)	Thickness of brake lining, mm	Evaluative	--	-do-	**Not applicable**	--
	i)	Thickness of clutch plate, mm	Evaluative	--	-do-	**Not applicable**	--
VIII. Field performance							
	a)	Suitability for crops	Evaluative	Wheat & paddy (Wheel type) Paddy (Track type)	Nil	Applicant recommended to test in paddy crop only	Conforms
	b)	Average processing losses, %	Evaluative Rice	Average 4% **(R)**	Nil	2.42 % (Max.)	Conforms
	c)	Threshing efficiency, %	Evaluative	≥ 98 percent **(R)**	Nil	98.9 % (Min.)	Conforms
	d)	Cleaning efficiency, %	Evaluative	≥ 96 percent **(R)**	Nil	96.9 % (Min.)	Conforms
	e)	Grain breakage in main grain tank, %	Evaluative	≤ 2.5 percent **(R)**	Nil	0.62 % (Max.)	Conforms

	f)	Non collectable losses, %	Evaluative	≤ 2.5 percent **(R)**	Nil	1.97 % (Max.)	Conforms
IX. Safety requirement							
	a)	Guards against all moving parts/ drives and hot parts	Evaluative	Belt and chain drives, pulleys, hydraulic pipes (Around operators work place) **(R)**	--	Provided	Conforms
	b)	Lighting arrangement	Evaluative	As per CMVR **(R)**	-	Provided	Conforms
	c)	Grain tank cover	Evaluative	Essential **(R)**	-	Provided	Conforms
	d)	Spark arrester in engine's exhaust in case naturally aspirated engine	Evaluative	Essential **(R)**	-	Turbo charger is provided	**--**
	e)	Stone trap before concave bars	Evaluative	Essential **(R)**	-	Provided	Conforms
	f)	Rear view mirror	Evaluative	Essential **(R)**	-	Provided	Conforms
	g)	Fire extinguisher	Evaluative	Essential **(R)**	-	Provided	Conforms
	h)	Slip clutch at following drives – i) Cutting platform ii) Undershot conveyor drive iii) Grain & tailing elevator	 Evaluative Non evaluative Non evaluative	 Essential **(R)** Optional Optional	-	 Provided Provided **Not Provided**	 Conforms Conforms **Does not conform**
	i)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers.	Evaluative	Essential**(R)**	-	Provided	Conforms

	j)	Working clearance around the controls	Non evaluative	Essential 70 mm, min **(R)**	-	Provided	Conforms
	k)	Labelling of control and gauges	Evaluative	Essential **(R)**	-	Provided	Conforms
XI	**Material of construction**						
	i)	Knife guard should conform to IS: 6024 - 1983	Non evaluative	Should have maximum hardness 163 HB **(R)**	-	Knife guards were not provided on machine.	**Does not conform**
	ii)	Knife blade as per IS :6025 -1982	Non evaluative	It must have Chemical composition as C=0.70-0.95 % Mn= 0.30-0.50% **(R)**	-	C= 0.60% Mn= 0.48%	**Does not conform** Conforms
	iii)	Knife back should meet the requirement of IS:10378-1982	Non evaluative	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 % **(R)**	--	C=0.11%	**Does not conform**

20.2 Acceptance criteria in case of Breakdowns/Defects as per clause 4.2 of IS:15806-2018					
XVII. Break down (critical, major & minor)					
Sr. No.	Category of breakdowns	Category (Evaluative/ Non evaluative)	Requirements as per OM	As observed	Whether meets the requirements (Yes/No)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	None	Yes

3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two	None	Yes
4.	Total breakdown	Evaluative	In no case total no of (major + minor) breakdowns exceed five	None	Yes

21. COMMENTS AND RECOMMENDATIONS

21.1 Mechanical vibration

The amplitude of mechanical vibration of components marked as (*) in chapter 13 of this test report are observed to be 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.

21.2 Field performance test

No noticeable defect was observed during field operation.

21.3 Ease of operation and safety provisions

(i) No noticeable difficulties observed during operation of combine harvester.

(ii) Slip clutch for grain and tailing elevator is not provided. It must be provided.

(iii) Provision for accidental start of engine is not provided. It is not conforming to the serial no. (1) (i) (a) of IS:8133-1983. It should be looked into.

21.4 Hardness and chemical composition

Hardness & chemical composition of knife blade and knife back are not within the limit specified in relevant standards. It should be looked into for corrective action at regular production level.

21.5 The power at rated engine speed (non-evaluative parameter) does not meet the requirements of selected performance and other characteristics, acceptance criteria for performance characteristics as per clause 4.1 of IS:15806:2018. It should be looked into.

21.6 Literature supplied with the machine.

The following literatures are provided by the applicant during the test.

i) Operators manual

ii) Spare parts catalogue

However, operator manual needs to be updated as per IS: 8132-1999.

TESTING AUTHORITY

Er. SANJAY KUMAR AGRICULTURAL ENGINEER	
Dr. MUKESH JAIN **DIRECTOR**	31.10.2022

Draft test report compiled by: Er. E. Bhaskar, Senior Technician

22. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant Comments
22.1	21.1	The overall vibration of the machine can be reduced before starting commercial production and our R&D team is working on it.
22.2	21.3 (ii)	Our R&D team is working on the design of a slip clutch for the grain and tailing elevator and it can be provided in future
22.3	21.3 (iii)	Our R&D team is working on the provision for the accidental start of the engine to comply with IS:8133-1983.
22.4	21.4	Knife blades and knife back with hardness and chemical composition complying with IS:6025-1982 will be used for commercial production.
22.5	21.5	Actions will be taken in future to get sufficient power at the rated engine speed, complying with IS:15806-2018
22.6	21.6	The operator manual can be updated as per IS:8132-1999.