

व्यावसायिक परीक्षण रिपोर्ट  
COMMERCIAL TEST REPORT

संख्या/ No.: COMB-286/2931/2022  
माह/Month: October, 2022

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



**MAHINDRA SWARAJ 8200  
SELF PROPELLED COMBINE HARVESTER**



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

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**20. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS**

<b>20.1 Acceptance criteria for performance characteristics as per clause 4.1 of IS 15806:2018</b>						
<b>Sr. No</b>	<b>Characteristics</b>	<b>Category (Evaluative/ Non evaluative)</b>	<b>Requirement (R)/ Declaration (D)</b>	<b>Tolerance</b>	<b>Observed</b>	<b>Remarks</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>I.</b>	<b>Prime mover performance</b>					
	a) Max. power (absolute) Average max. power observed during 2 hrs. max. power test in natural ambient condition, kW	Evaluative	74 (D)	±5% of declared value	74.8	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	60 (D)	±5% of declared value	59.8	Conforms
	c) Power at rated engine speed, kW (under natural ambient condition)	Evaluative	74 (D)	±5% of declared value	73.5	Conforms
	d) Specific fuel consumption corresponding to average maximum power under 2h maximum power test, g/kWh.	Evaluative	255 (D)	±5% of declared value	251.4	Conforms
	e) Max. smoke density at 80% load between the speed at max. power & 55% of speed at max. power 1000 rpm whichever is higher	Evaluative	As pre CMV rules. Maximum smoke density light absorption coefficient 5.2 units (R)	Nil	0.88	Conforms

1	2	3	4	5	6	7
	<b>f)</b> Max. crank shaft torque, (N–m) observed during the test after no load engine speed is adjusted as per manufacturer’s recommendation for field work	Evaluative	395. <b>(D)</b>	±8% of declared value	394	Conforms
	<b>g)</b> Back up torque, % (Natural ambient)	Evaluative	7 % min. <b>(R)</b>	Nil	23.48	Conforms
	<b>h)</b> Max. operating temperature, ° C i) Engine oil ii) Coolant	Evaluative	110 <b>(D)</b> 105 <b>(D)</b>	Should not exceed the declared value	102.6 96.0	Conforms Conforms
	<b>i)</b> Lubrication oil consumption, g/kWh	Evaluative	1 % of SFC at maximum power (high ambient) <b>(R)</b>	Nil	0.637	Conforms

**II. Brake performance**

	<b>i)</b> 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 <b>(R)</b>	Nil	Cold: 3.9 Hot: 3.8	Conforms
	<b>b)</b> Max. force exerted on brake pedal to achieve deceleration of 2.5 m/sec <sup>2</sup> (N)	Evaluative	≤ 600 N <b>(R)</b>	--	Cold 494	Conforms
	<b>i)</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 <b>(R)</b>	Nil	Yes	Conforms

**III. Mechanical vibration**

	<b>i)</b> Operator’s platform	Non evaluative	120 µm max. <b>(R)</b>	Nil	698	<b>Does not conform</b>
	<b>ii)</b> Steering wheel	Non evaluative	150 µm max <b>(R).</b>	Nil	539	<b>Does not conform</b>
	<b>iii)</b> Seat with driver seated	Non evaluative	120 µm max. <b>(R)</b>	Nil	242	<b>Does not conform</b>

1	2	3	4	5	6	7
<b>IV. Air cleaner oil pull over</b>						
	<b>a)</b> Air cleaner oil pull over in % when tested in accordance with IS 8122 part (II) 2000	Evaluative	0.20 max. <b>(R)</b>	Nil	Dry type air cleaner provided hence test is not applicable	Not applicable
<b>V. Noise measurement</b>						
	<b>i)</b> Max. ambient noise emitted by combine at by-sanders position, dB(A)	Evaluative	88 dB(A) as per CMVR <b>(R)</b>	Nil	81.5	Conforms
	<b>ii)</b> Max. noise at operator's ear level, dB(A)	Evaluative	98 dB(A) as per CMVR <b>(R)</b>	Nil	95.0	Conforms
<b>VI. Header lifting Test</b>						
	<b>i)</b> Satisfactory completion of header lifting test	Evaluative	-	Nil	Satisfactorily completed	Conforms
<b>VII. Discard limit</b>						
	<b>a)</b> Cylinder bore diameter, mm	Evaluative	96.522 <b>(D)</b>	Should not exceed the values declared by the manufacturer	96.03	Conforms
	<b>b)</b> Piston diameter, mm	Evaluative	95.60 <b>(D)</b>	-do-	95.19	Conforms
	<b>c)</b> Piston to cylinder liner clearance at skirt	Evaluative	0.50 <b>(D)</b>	-do-	0.07	Conforms
	<b>d)</b> Ring end gap, mm	Evaluative	2.5 <b>(D)</b>	-do-	0.50	Conforms
	i) Top compression ring		2.5 <b>(D)</b>		1.30	Conforms
	ii) 2 <sup>nd</sup> compression ring		2.5 <b>(D)</b>		0.50	Conforms
	iii) Oil ring					
	<b>e)</b> Ring groove clearance, mm	Evaluative	--	-do-	Tapered	--
	1. Top compression ring		0.30 <b>(D)</b>		0.09	Conforms
	2. 2 <sup>nd</sup> compression ring		0.35 <b>(D)</b>		0.06	Conforms
	3. Oil ring					

1	2	3	4	5	6	7
	<b>f)</b> Diametrical and axial clearance of big end bearing, mm Diametrical Axial	Evaluative	0.35 (D) 1.5 (D)	-do-	0.19 0.30	Conforms Conforms
	<b>g)</b> Diametrical and axial clearance of main bearings, mm Diametrical Axial/crank shaft end float	Evaluative	0.35 (D) 1.6 (D)	-do-	0.09 0.40	Conforms Conforms
	<b>h)</b> Thickness of brake lining	Evaluative	Up to rivet head (D)	-do-	1.9 to 2.2 mm above rivet head	Conforms
	<b>i)</b> Thickness of clutch plate	Evaluative	Up to rivet head (D)	-do-	1.8 to 2.1 mm above rivet head	Conforms

**VIII. Field performance**

	<b>a)</b> Suitability for crops	Evaluative	Wheat & paddy (Wheel type) Paddy (Track type)	Nil	Wheat and paddy	Conforms
	<b>b)</b> Average processing losses (%)	Evaluative Wheat Rice/ Paddy	Max. (of average) 3% 4% (R)	Nil	Wheat Max. 2.75 %, Paddy Max. 1.93 %	Conforms Conforms
	<b>c)</b> Threshing efficiency (%)	Evaluative	≥98 percent for wheat & Paddy (R)	Nil	Min. 99.0 % for Wheat, Min. 99.1 % for Paddy	Conforms
	<b>d)</b> Cleaning efficiency (%)	Evaluative	≥96 percent for wheat & Paddy (R)	Nil	Min. 97.3 % for Wheat, Min. 97.7 % for Paddy	Conforms
	<b>e)</b> Grain breakage in main grain tank (%)	Evaluative	≤ 2.5 percent (R)	Nil	Max. 1.93 % for wheat, Max. 0.89 % for Paddy	Conforms
	<b>f)</b> Non collectable losses (%)	Evaluative	≤ 2.5 percent for wheat & Paddy & grain ≤ 4.0 percent for Soybean (R)	Nil	Max. 1.51 % for wheat, Max. 0.65 % for Paddy	Conforms

1	2	3	4	5	6	7	
<b>Field performance for straw management system (if fitted)</b>							
	a)	Uniformity of straw spread, CV (%)	Evaluative	20 (Max.) <b>(R)</b>	--	18.3	Conforms
	b)	Weighted mean size of chopped straw, cm	Evaluative	20 (Max.) <b>(R)</b>	--	6.9	Conforms
<b>IX. Safety requirement</b>							
	a)	Guards against all moving parts	Evaluative	Belt and chain drives, pulleys hydraulic pipes <b>(R)</b>	--	Provided	Conforms
	b)	Lighting arrangement	Evaluative	As per CMVR <b>(R)</b>	-	Provided	Conforms
	c)	Grain tank cover	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms
	d)	Spark arrester in engine's exhaust in case naturally aspirated engine	Evaluative	Essential <b>(R)</b>	-	Turbo charger fitted engine provided	--
	e)	Stone trap before concave	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms
	f)	Rear view mirror	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms
	g)	Fire extinguisher	Evaluative	Essential <b>(R)</b>	-	Provided	Provided
	h)	Slip clutch at following drives –			-		
		i) Cutting platform	Evaluative	Essential <b>(R)</b>		Provided	Conforms
		ii) Undershot conveyor drive	Non evaluative	Optional		Provided	Conforms
		iii) Grain & tailing elevator	Non evaluative	Optional		Provided	Conforms
	i)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers.	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms

1	2	3	4	5	6	7
	j) Working clearance around the controls	Non evaluative	Essential 70mm,min <b>(R)</b>	-	Provided	Conforms
	k) Labelling of control and gauges	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms
<b>X</b>	<b>Material of construction :</b>					
	i) Knife guard should conform to IS: 6024 -1983	Non evaluative	Should have maximum hardness 163 HB <b>(R)</b>	-	331.5 (Average)	<b>Does not conform</b>
	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% <b>(R)</b>	-	C= 0.69  Mn= 0.49	<b>Does not conform</b>  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 % <b>(R)</b>	-	0.18	<b>Does not conform</b>
	iv) Material of blades for straw management System (SMS)	Non evaluative	The flail and fixed blades shall be manufactured from steel having the following chemical composition or such other composition as shall be agreed to between the supplier and the purchaser. a) Carbon 0.70 to 0.1 percent. b) Manganese 0.6 to 0.97 percent. c) Chrome 0.1 percent. d) Nickel 0.1 percent	-	Flail blade C-0.70 Mn-0.70 Cr-0.05 Ni-2.56  Fixed blade C-0.60 Mn-0.76 Cr-0.03 Ni-2.70	As the code itself accommodate the variation in chemical composition, there is little scope for declaration of conformity or otherwise

1	2	3	4	5	6	7	
	v)	Bushes for flail blades	Non evaluative	Mild steel <b>(R)</b>	-	Not specified	<b>Does not conform</b>
	vi)	Hardness of flail blades for Straw management system (SMS)	Non evaluative	Bush section 20 to 35 HRC <b>(R)</b>	-	30 (Average)	Conforms
				Edge section (Hardened zone) : 48 to 58 HRC <b>(R)</b>	-	57.7 (Average)	Conforms
				Remainder zone : 20 to 35 HRC <b>(R)</b>	-	28.2 (Average)	Conforms
	vii)	Hardness of serrated blades for Straw Management System (SMS) :	Non evaluative	Bush section 20 to 35 HRC <b>(R)</b>	-	30 (Average)	Conforms
				Edge section (Hardened zone) : 48 to 58 HRC <b>(R)</b>	-	59.4 (Average)	Conforms
				Remainder zone : 20 to 35 HRC <b>(R)</b>	-	30.8 (Average)	Conforms
	viii)	<b>Safety Requirements for Straw Management system, (if fitted)</b>					
		a) Guards against all moving parts/ drives and hot parts	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms
		b) RPM indicator for rotor	Evaluative	<b>Desirable (as written in code)</b>	-	Provided	Conforms
		c) Overlapping of flail and fixed serrated blades	Evaluative	Essential <b>(R)</b>	-	Provided	Conforms



<b>20.2 Acceptance criteria in case of Breakdowns/Defects as per clause 4.2 of IS:15806-2018</b>					
<b>XI. Break down (critical, major &amp; minor)</b>					
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. CRITICAL TECHNICAL SPECIFICATIONS**  
(Vide Ministry's communication F. No 9-1/2019 M&T (I&P) dated 20.08.2019)

Sr. No.	Parameters	Specification	Observation	Remarks
<b>Rotor</b>				
1.	Rotor diameter, mm	165-170	165	Conforms
2.	No. of lugs on rotor in row	6	6	Conforms
3.	No. of rows in periphery	4	4	Conforms
4.	Length of pivotal flail, mm	170-180	175	Conforms
5.	Width of flail, mm	50 ± 1	50	Conforms
6.	Thickness of flail, mm	5.0 (Min.)	5	Conforms
7.	No. of flails in one set	2	2	Conforms
8.	Spacing between flails of one set, mm	35 (Max.)	35	Conforms
9.	Distance between adjacent flails units, mm	200±10	205	Conforms
10.	No. of rows/bars of serrated blades	1	1	Conforms
11.	No. of serrated blades in row	20 (Min.)	24	Conforms
12.	Spacing between serrated blades, mm	50 (Max.)	50	Conforms
13.	Overlapping of pivotal blade on serrated blade, mm	60 (Min.)	104 (Adjustable)	Conforms
<b>Spreader</b>				
14.	Total no. of flaps	6 + 2 (side)	6+2	Conforms
15.	Length of flaps, cm	38 (Min.)	38.5	Conforms
16.	Distance between flaps (left to right)	Adjustable	Adjustable	Conforms

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17.	Spreader angle with horizontal, degree	Adjustable preferably downwards	Adjustable	Conforms
18.	Spreader angle with line of travel, degree	15 (Min.) (adjustable)	25 (Max.) (Adjustable)	Conforms
19.	Spreader sheet thickness, mm	2.5 to 3.0	3.0	Conforms
20.	SMS sheet thickness, mm	5.0 (Min.) for outer	5.5	Conforms
21.	Rotor balancing	Should be dynamically balanced	Balanced	Conforms
22.	Rotor rpm	Min. 1600	1920	Conforms
23.	Fitting of SMS on combine harvester	Rigidly fixed to the combine chassis	Rigidly fixed	Conforms
24.	Fitting of power transmission system on combine harvester	Rigidly fixed to the combine chassis	Rigidly fixed	Conforms
25.	Marking/labelling of machine	Labelling plate should be riveted on the body of machine having Name and address of manufacturer, Country of origin, Make and Model, Year of manufacture, Serial number, Type, Size required, size of prime mover (kW), Weight of the machine (kg)	Provided	Conforms
26.	Literature	Operator manual, Service manual and Parts catalogue should be provided	Provided	Conforms

Note:- The implementation of critical technical specifications has been deferred till 30.09.2022 vide Ministry's O.M No. 13-1/2021- M&T (I&P) dated 03.02.2022.

## 22. COMMENTS AND RECOMMENDATIONS

**22.1** The amplitude of mechanical vibration of components marked as (\*) in chapter 13 of this test 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.

### **22.2 Field performance test**

**22.2.1** No noticeable defect observed during field test.

### **22.3 Ease of operation and safety provision**

No noticeable difficulties observed during operation of combine harvester.

### **22.4 Hardness and chemical composition**

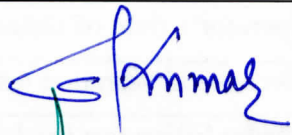

**22.4.1** Hardness & chemical composition of knife blade is not within the limits specified in IS:6025-1982. It should be looked into for corrective action at regular production level.

**22.4.2 Hardness of the knife guard does not conform to their relevant IS code. It should be looked into for improvement.**

**22.5 Literature supplied with the machine**  
The following literatures were supplied by the applicant

1. Operator's manual for combine harvester
2. Operator manual –Engine
3. Parts catalogue for combine harvester

**TESTING AUTHORITY**

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

The test report is compiled by Sh. Vikarm, Senior Technician

**23. APPLICANT'S COMMENTS**

No specific comments received from the applicant