

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या/ No.: COMB-201/2345/2019

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



**SWARAJ-8100 HEX, SELF PROPELLED
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

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b)	Peg teeth of concave		
1	203.6	202.1	0.74
2	214.1	212.3	0.84
3	202.2	200.4	0.89
4	217.0	215.2	0.83
5	204.5	201.8	1.32

18. SUMMARY OF OBSERVATIONS

18.1 ENGINE PERFORMANCE TEST

Table-1 : ENGINE PERFORMANCE TEST (NATURAL AMBIENT)

Brake Power kW	Engine speed (rpm)	Fuel consumption			Specific energy, kWh/l
		l/h	kg/h	Specific, kg/ kWh	
(1)	(2)	(3)	(4)	(5)	(6)
a) Maximum power – 2 hours test					
73.8	2299	21.87	18.05	0.245	3.37
68.8	1549	18.30	15.17	0.220	3.76*
b) Power at rated engine speed: (2200 rpm)					
73.1	2199	21.87	18.04	0.247	3.34

*High idle at no load was 1650 rpm recommended for field operation.

Table-2 : ENGINE TEST (HIGH AMBIENT)

Brake power (kW)	Engine speed (rpm)	Fuel consumption			Specific energy, kWh/l
		l/h	kg/h	Specific, kg/kWh	
(1)	(2)	(3)	(4)	(5)	(6)
a) Maximum power -					
71.6	2299	21.92	17.93	0.250	3.27
b) Power at rated engine speed (2200 rpm)					
71.2	2199	21.51	17.62	0.247	3.31

18.2 Field test

18.2.1 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)	3.21 to 3.54	3.11 to 3.19
2.	Range of average area covered (ha/h)	0.948 to 1.015	0.804 to 0.898
3.	Maximum average fuel consumption:		
	- (l/h)	6.30 to 8.76	6.97 to 8.07
	- (l/ha)	6.11 to 9.24	8.24 to 9.21
4.	Range of average crop throughput (tonne/h)	5.80 to 11.28	12.11 to 14.29

5.	Reported average grain breakage in main grain outlet (%)	2.03	1.33
6.	Reported average header losses (%)	1.25	0.17
7.	Reported average total non-collectable losses (%)	1.6	0.6
8.	Reported average total collectable losses (%) (un threshed + broken from main outlet)	2.6	1.9
9.	Reported average total processing losses (%)	2.8	2.2
10.	Reported average threshing efficiency (%)	99.4	98.9
11.	Reported average cleaning efficiency (%)	96.3	97.3
Performance of straw chopper cum spreader			
12	Average percent of coefficient of variation for uniformity of spreading %	--	17.3
13	Average weighted chop size , cm	--	11.1

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 I & Part II)-2007(Reaffirmed 2014)- : **Conforms**
Tractors and machinery for agriculture and forestry-
symbol for operator controls and other displays.
- (v) IS: 8133-1983 (Reaffirmed 2014)-Guidelines for : **Does not meet the requirements in toto**
location & operation of operator controls on agricultural
tractors and machinery.
- (vi) IS: 15806-2018 (Combine Harvester recommendation : **Does not conform in toto**
on selected performance and other characteristics



1	2	3	4	5	6	7
g)	Back up torque, %	Evaluative	7 % min.	Nil	42.3	Conforms
h)	Max. Operating temperature, C° i) Engine oil ii) Coolant	Evaluative	i) 125 ii) 105	Should not exceed the declared value	i) 115 ii) 93	Conforms
i)	Lubrication oil consumption, g/kWh	Evaluative	Not exceeding 1 % of SFC at maximum power (high ambient)	Nil	0.387	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	--	Cold: 7.40 Hot: 7.50	Conforms
b)	Max. Force exert on brake pedal to achieve declaration of 2.5 m/sec ² (N)	Evaluative	As per requirement of CMVR	--	Cold: 503 Hot: 547	Conforms
c)	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	--	Effective	Conforms

III. Mechanical vibration

a)	Operator's platform	Non evaluative	120 µm max.	Nil	2300	Does not conform
b)	Steering control wheel	Non evaluative	150 µm max.	Nil	5100	Does not conform
c)	Seat with driver seated	Non evaluative	120 µm max.	Nil	3900	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	0.20max.	Nil	Dry type air cleaner provided hence test is not applicable	--
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V. Noise measurement

a)	Max. ambient noise emitted by combine at bystanders position dB (A)	Evaluative	88 dB (A) as per CMVR	Nil	84	Conforms
b)	Max. noise at operator's ear level dB (A)	Evaluative	98 dB (A) as per CMVR	Nil	94	Conforms

1	2	3	4	5	6	7
VI. Header lifting Test						
a)	Satisfactory completion of header lifting test	Evaluative	-	Nil	Satisfactor y completed	Conforms
VII. Discard limit						
a)	Cylinder bore diameter, mm	Evaluative	104.15	Should not exceed the values declared by the manufacture	104.03	Conforms
b)	Piston diameter, mm	Evaluative	103.745	-do-	103.89	Conforms
c)	Piston to cylinder liner clearance at skirt	Evaluative	0.2	-do-	0.12	Conforms
d)	Ring end gap, mm i) Top compression ring ii) 2 nd compression ring iii) Oil ring	Evaluative	i) 1.2 ii) 1.2 ii) 1.2	-do-	i) 0.40 ii) 0.45 ii) 0.35	Conforms
e)	Ring groove clearance, mm 1. Top compression ring 2. 2 nd compression ring 3. Oil ring	Evaluative	i) Tapered ii) 0.2 ii) 0.20	-do-	i) Tapered ii) 0.08 ii) 0.04	Conforms
f)	Diametrical and axial clearance of big end bearing, mm Diametrical Axial	Evaluative	0.25 0.60	-do-	0.09 0.40	Conforms
g)	Diametrical and axial clearance of main bearings, mm Diametrical Crank shaft end float	Evaluative	0.25 0.40	-do-	0.14 0.11	Conforms
h)	Thickness of brake lining, mm	Evaluative	Up to Rivet head	-do-	1.7 to 2.0 mm above rivet head	Conforms
i)	Thickness of clutch plate, mm	Evaluative	Up to Rivet head	-do-	1.6 to 2.0 mm above the rivet head	Conforms

1	2	3	4	5	6	7	
VIII. Field performance							
a)	Suitability for crops	Evaluative	Wheat & paddy (Wheel type) Paddy (Track type)		Nil	Wheat and paddy	Conforms
b)	Average processing losses (%)	Evaluative	Wheat : Max 3%	Barley : Max 4%	Nil	Wheat (max) 2.8%	Conforms
			Rice : Max 4%	Sorghum : Max 3%		Rice (max) 2.2 %	Conforms
			Maize : Max 5%	Oilseed, rape : Max 4%			
			Soya : Max 5%	Beans			
c)	Threshing efficiency	Evaluative	≥98 percent for wheat & Paddy		Nil	99.4% for Wheat 98.9% for Paddy	Conforms
d)	Cleaning efficiency	Evaluative	≥96 percent for wheat & Paddy		Nil	96.3% for Wheat 97.3% for Paddy	Conforms
e)	Grain breakage in main grain tank	Evaluative	≤ 2.5 percent		Nil	2.03% for Wheat 1.33% for Paddy	Conforms
f)	Non collectable losses	Evaluative	i) ≤ 2.5 percent for wheat & Paddy & grain ii) ≤ 4.0 percent for Soybean		Nil	1.6 % For Wheat 0.6 % For Paddy	Conforms
IX Field performance for straw management system (if fitted)							
a)	Uniformity of straw spread, C.V. (percent)	Evaluative		20, Max	--	17.3	Conforms
b)	Weighted mean size of chopped straw , cm	Evaluative		20, Max	--	11.1	Conforms
X. Safety requirement							
a)	Guards against all moving parts	Evaluative	Belt and chain drives, pulleys hydraulic pipes around operators work place	--	Provided	Conforms	

1	2	3	4	5	6	7
b)	Lighting arrangement	Evaluative	As per CMVR	-	Provided	Conforms
c)	Grain tank cover	Evaluative	Essential	-	Provided	Conforms
d)	Spark arrester in engine's exhaust in case naturally aspirated engine	Evaluative	Essential	-	Not provided as turbo charger in exhaust system	--
e)	Stone trap before concave bars	Evaluative	Essential	-	Provided	Conforms
f)	Rear view mirror	Evaluative	Essential	-	Provided	Conforms
g)	Fire extinguisher	Evaluative	Essential	-	Provided	Conforms
h)	Slip clutch at following drives –	Evaluative Non evaluative Non evaluative	Essential	-	Provided	Conforms
	i) Cutting platform auger		Essential		Provided	Conforms
	ii) Undershot conveyor drive		Essential		Not provided	Does not conform
	iii) Grain & tailing elevator					
i)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers.	Evaluative	Essential	-	Provided	Conforms
j)	Working clearance around the controls	Non evaluative	Essential 70mm,min	-	Provided	Conforms
k)	Labelling of control and gauges	Evaluative	Essential	-	Provided	Conforms

XI Material of construction :

i)	Knife guard should conform to IS: 6024 - 1983	Non evaluative	Should have maximum hardness 163HB	-	317 to 338	Does not conform
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1	2	3	4	5	6	7
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%	-	C=0.8541 Mn= 0.9440	Conforms Does not conform
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 %	--	C=0.2168	Does not conform
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 1.0 percent. b) Manganese 0.6 to 0.97 percent. c) Chrome 0.1 percent. d) Nickel 0.1 percent	--	Flail blade C-0.8338 Mn-0.9538 Cr-0.0910 Ni-1.17203 Fixed blade C-0.7839 Mn-0.9240 Cr-0.0582 Ni -1.4985	As the code itself accommodate the variation in chemical composition, there is little scope for declaration of conformity or otherwise
v)	Bushes for flail blades	Non evaluative	Mild steel	-	Mild steel	Conforms

1	2	3	4	5	6	7
vi)	Hardness of flail blades for Straw management system (SMS)	Evaluative	Bush section 20 to 35 HRC	-	18.1 to 20.3	Does not conform
			Edge section (Hardened zone).: 48 to 58 HRC	-	15.8 to 17.4	Does not conform
			Remainder zone : 20 to 35 HRC	-	15.8 to 17.4	Does not conform
vii)	Hardness of serrated blades for Straw Management System (SMS) :	Evaluative	Bush section 20 to 35 HRC	-	20.6 to 23.7	Conforms
			Edge section (Hardened zone) : 48 to 58 HRC	-	23.8 to 26.1	Does not conform
			Remainder zone : 20 to 35 HRC	-	23.8 to 26.1	Conforms
viii)	Safety Requirements for Straw Management system, (if Fitted) :					
	a) Guards against all moving parts/ drives and hot parts	Evaluative	Essential	-	Provided	Conforms
	b) RPM indicator for rotor	Evaluative	Essential	-	Provided	Conforms
	c) Overlapping of final and fixed serrated blades	Evaluative	Essential	-	Provided	Conforms

XVII. Break down (critical, major & minor)

Sr. No.	Category of breakdowns	Category (Evaluative/ Non evaluative)	Requirements as per IS 15806:2018	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

20. COMMENTS AND RECOMMENDATIONS

20.1 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.

20.2 Provision for varying oscillation of sieve is not provided. It should be provided.

20.3 There is no drive safety for grain unloading auger. It should be provided

20.4 Safety against the accidental start of engine is not provided on combine harvester. It **MUST** be provided.

20.5 The clearance between engine inlet valve and valve guide exceeds the discard limit. It should be looked into.

20.6 Field performance test

No noticeable defect observed during field test.

20.7 Ease of operation and safety provision

i) Slip clutch at Gain and tailing elevator drive is not provided. It **MUST** be provided as per the requirement of IS 15806 : 2018

ii) The first aid box is not provided on machine. It may be provided.

20.8 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.**

ii) **The harness of fixed & flail blade of SMS does not conforms to the requirement of IS 15806:2018. It **MUST** be looked into as it is evaluative requirement**

20.9 Literature supplied with the machine

The following literature was supplied by the applicant during the test

i) Operator's and service manual of combine harvester

ii) Combine harvester parts catalogue

iii) Operator manual for engine

The operator's manual should be updated as per IS: 8132-1999

TESTING AUTHORITY

R. K. NEMA SENIOR AGRICULTURAL ENGINEER	<i>Per</i>
P. K. PANDEY DIRECTOR	<i>U3n-1m584</i>

Draft test report compiled by : V.S. Shinde, Senior Technical Assistant

21. APPLICANT'S COMMENTS

Para No	Our reference	Applicant's comments
21.1	18.3(i), (ii), (iii), (v) and (vi)	We will take care in production machines.
21.2	19 (III)	Design will be upgraded to reduce the vibrations.
21.1	19 X (h) (iii)	The machine will be upgraded with this feature.