

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या/ No.: COMB-268/2846/2022
माह/Month: April, 2022

THIS TEST REPORT VALID UP TO : 30th April, 2029



**SURINDERA, SURINDERA FALCON,
SELF PROPELLED COMBINE HARVESTER
(TRACK TYPE)**



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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7.	220.0	217.1	1.32
8.	214.0	211.5	1.17

18. SUMMARY OF OBSERVATIONS

18.1 Engine Performance Test:

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)
i) Maximum power – Two hour test:					
54.8	2050	16.02	13.28	0.242	3.42
ii) Power at rated engine speed: (2200 rpm)					
53.2	2200	16.85	13.90	0.261	3.16

Table2- : 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-					
52.6	2050	15.51	12.70	0.241	3.39
b) Power at rated engine speed: (2200 rpm)					
49.8	2200	16.24	13.30	0.267	3.06

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
		Paddy harvesting
1.	Speed of operation (kmph)	1.80 to 2.14
2.	Area covered (ha/h)	0.279 to 0.320
3.	Fuel consumption:	
	- (l/h)	8.48 to 9.38
	- (l/ha)	27.86 to 31.74
4.	Crop throughput (t/h)	5.16 to 7.44
5.	Grain breakage in main grain outlet (%)	0.66 to 1.67
6.	Header losses (%)	0.14 to 0.47
7.	Total non-collectable losses (%)	0.9 to 1.7
8.	Total collectable losses (%) (unthreshed + broken from main outlet)	1.9 to 2.3
9.	Total processing losses (%)	2.8 to 3.8
10.	Threshing efficiency (%)	98.3 to 99.3
11.	Cleaning efficiency (%)	96.2 to 97.6

18.3 Conformity to Indian Standard

- (i) IS: 6025-1982–Specification for knife section for harvesting machine. : **Does not conform in toto**
- (ii) IS: 6024-1983– Specification for guards for harvesting machines. : **Not applicable as guards are not provided.**
- (iii) IS:10378-1982–Specification of knife back for harvesting machine. : **Does not conform in toto**
- (iv) IS: 6283 (Part-I)–2006 & IS: 6283 (Part-II)-Tractor and machinery for agriculture and forestry, powered lawn and garden equipment-symbol for operator controls and other displays. : **Conforms**
- (v) IS: 8133-1983–Guidelines for location & operation of operator controls on agricultural tractors and machinery. : **Does not conform in toto**
- (vi) IS: 15806-2018–Combine Harvester- Recommendations on Selected Performance and Other Characteristics : **Conforms**

19. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS

19.1 Acceptance criteria for performance characteristics as per clause 4.1 of IS 15806:2018						
Sr. 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	54.8	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	55 (D)	±5% of declared value	54.8	Conforms

	c)	Power at rated engine speed, kW (under natural ambient condition)	Non-evaluative	55 (D)	±5% of declared value	53.2	Conforms
	d)	Specific fuel consumption corresponding to average maximum power under 2 h maximum power test, g/kWh.	Evaluative	245 (D)	+5% of declared value	242.2	Conforms
	e)	Max. smoke density (Bosch no.) at 80% load between the speed at max. Power & 55% of speed at max. or 1000 rpm whichever is higher	Evaluative	As per central motor vehicles rules (CMV) rules (R)	Nil	1.68 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	338	Conforms
	g)	Back up torque, %	Evaluative	7 % min. (R)	Nil	32.29	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) 99.4 ii) 98.3	Conforms
	i)	Lubrication oil consumption, g/kWh	Evaluative	1 % of SFC at maximum power (high ambient) (R) (Max.2.422)	Nil	0.174	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	232	Does not conform
	b)	Steering control wheel	Non evaluative	150 µm max (R).	Nil	222	Does not conform
	c)	Seat with driver seated	Non evaluative	120 µm max. (R)	Nil	234	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	84.9	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	104.00	Conforms
	b)	Piston diameter, mm	Evaluative	103.755 (D)	-do-	103.884	Conforms
	c)	Piston to cylinder liner clearance at skirt, mm	Evaluative	0.140 to 0.172 (D)	-do-	0.12	Conforms
	d)	Ring end gap, mm i) Top compression ring ii) 2 nd compression ring iii) Oil ring	Evaluative	i) 1.20 (D) ii) 1.20 (D) iii) 1.20 (D)	-do-	i) 0.40 ii) 0.45 iii) 0.45	Conforms
	e)	Ring groove clearance, mm 1. Top compression ring 2. 2 nd compression ring 3. Oil ring	Evaluative	i) 0.70 (D) ii) 0.20 (D) iii) 0.10 (D)	-do-	i) Tapered ii) 0.050 iii) 0.047	Conforms
	f)	Diametrical and axial clearance of big end bearing, mm Diametrical Axial	Evaluative	0.12(D) 0.25(D)	-do-	0.078 0.25	Conforms
	g)	Diametrical and axial clearance of main bearings, mm Diametrical Crank shaft end float	Evaluative	0.13(D) 0.40(D)	-do-	0.043 0.19	Conforms
	h)	Thickness of brake lining, mm	Evaluative	--	-do-	Not applicable	--

	i)	Thickness of clutch plate, mm	Evaluative	--	-do-	Not applicable	--
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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	3.6 %	Conforms
	c)	Threshing efficiency, %	Evaluative	≥ 98 percent (R)	Nil	98.3 %	Conforms
	d)	Cleaning efficiency, %	Evaluative	≥ 96 percent (R)	Nil	96.2 %	Conforms
	e)	Grain breakage in main grain tank, %	Evaluative	≤ 2.5 percent (R)	Nil	1.67 %	Conforms
	f)	Non collectable losses, %	Evaluative	≤ 2.5 percent (R)	Nil	1.7%	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	Evaluative	Essential (R)		Provided	Conforms
		ii) Undershot conveyor drive	Non evaluative	Optional	-	Provided	Conforms
		iii) Grain & tailing elevator	Non evaluative	Optional		Not Provided	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)	-	Not applicable as knife guards were not provided on machine.	--
	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= 0.56% Mn= 0.34%	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=0.21%	Does not conform
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19.2 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	Two, Mj45 (None of repetitive)	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 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.

20.2 Field performance test

- (i) The mechanism for oscillations of top and bottom sieve (sieve box) at LHS & RHS was broken. It **MUST** be looked into to improve the quality as it is major breakdown.
- (ii) Often chocking of reel was observed during field test. It **MUST** be looked into.

20.3 Ease of operation and safety provisions

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

	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=0.21%	Does not conform
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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

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20.4 Hardness and chemical composition

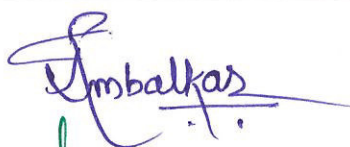
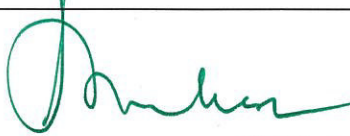
Hardness & chemical composition of knife blade and knife back are not within the limit specified in relevant standards. It should be looked into for corrective action at regular production level.

20.5 The clearance between valve guide and valve stem of inlet and exhaust valve is exceeding the discard limit provided. It must be looked into.

20.6 Literature supplied with the machine.

No literature is provided by applicant during testing. It must be provided.

TESTING AUTHORITY

G.R AMBALKAR AGRICULTURAL ENGINEER	
Dr. MUKESH JAIN DIRECTOR	 25.04.2022

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

21. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant comments
21.1	20.1	We will provide suitable dampening measures to reduce the mechanical vibration of the components where required at production level as advised.
21.2	20.2	(i) The quality of the mechanism of oscillation will be corrected at the production level in all models as advised. (ii) Often checking will be corrected at the production level.
21.3	20.3	(i) We will provide the slip clutch for grain and tailing elevator to our customer as advised. (ii) The provision for accidental start of engine will be looked into at the production level in all models as advised.
21.4	20.4	The hardness and chemical composition of knife guards will be corrected at the production level in all models as advised.
21.5	20.5	We will look into the clearance between valve guide and valve stem of inlet and exhaust valve at the production level as advised.
21.6	20.6	We will take corrective actions against the literature in future production.