

व्यावसायिक परीक्षण रिपोर्ट  
COMMERCIAL TEST REPORT

संख्या / No. : Comb – 130/1639/2014  
माह / Month: August, 2014



**SELF PROPELLED COMBINE HARVESTER  
'CLAAS DOMINATOR 40 TERRA TRAC (TRACK TYPE)'**



सत्यमेव जयते

भारत सरकार  
कृषि मंत्रालय  
कृषि एवं सहकारिता विभाग)

**GOVERNMENT OF INDIA  
MINISTRY OF AGRICULTURE  
(DEPARTMENT OF AGRICULTURE & COOPERATION)**

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4.	160.6	160.0	0.38
5.	163.1	162.2	0.56
6.	160.4	159.6	0.50
7.	161.6	160.7	0.56
8.	160.5	159.7	0.50

## 17 SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

### 17.1 Engine Performance Test:

Engine Brake power, kW (Ps)	Crankshaft torque, Nm(kgf-m)	Engine speed (rpm)	Hourly fuel consumption kg/h (l/h)	Specific fuel consumption kg/kWh (kg/hph)	Specific energy, kWh/l (hph/l)
<b>i) Maximum power - 2 hours test:</b>					
55.6(75.6)	250.2(25.5)	2225	14.65(17.61)	0.263(0.194)	3.160(4.296)
<b>ii) Power at rated engine speed (2200 rpm)</b>					
56.7(77.1)	257.9(26.3)	2200	14.79(17.80)	0.260(0.192)	3.185(4.331)
53.9(73.3)	245.0(25.0)	2200	14.25(17.29)	0.264(0.194)	3.117(4.239)*
<b>iii) Maximum torque:</b>					
43.7(59.4)	306.4(31.2)	1425	10.44(12.58)	0.239(0.176)	3.474(4.722)
41.9(56.9)	289.4(29.5)	1450	10.77(12.33)	0.243(0.179)	3.398(4.615)*
<b>iv) Five hour rating test:</b>					
<b>a) Engine loaded to 90% of maximum power:</b>					
49.7(67.6)	218.8(22.3)	2274	13.58(16.52)	0.273(0.206)	3.012(4.092)
<b>b) maximum power:</b>					
51.7(70.2)	234.8(23.9)	2200	13.96(16.97)	0.270(0.198)	3.044(4.139)

\* Under high ambient condition.

#### Remarks:

- i) The maximum power output of the engine was observed as 55.6 kW (75.6 Ps) at 2225 rpm of engine at full throttle which is also the setting recommend for field operation.
- ii) The specific fuel consumption corresponding to maximum power at full throttle setting which is also the setting recommended for field operation was measured as 0.263 Kg/kwh (0.194 kg/hph).
- iii) The back-up torque of the engine was measured as 19.97 % under natural ambient condition at full throttle.
- iv) The maximum smoke density was recorded as 0.16 (Bosch No.).
- v) The maximum temperature of engine oil, coolant (water) and exhaust gas were observed as 106, 96.0 and 477°C respectively under high ambient condition.

- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.394 g/kWh (0.290 g/hph) and 0.682 % of total coolant capacity respectively.

**17.2 Turning ability:**

The radius of turning circle at LHS and RHS was observed satisfactory.



**17.3 Visibility:**

The visibility around the cutter bar from operator's seat in normal sitting position is satisfactory.

**17.4 Braking Performance:**

Machine having no any service and parking brakes provision, hence this test should not be applicable for this machine.

**17.5 Mechanical Vibration:**

The amplitude of mechanical vibration of components is given in chapter 13 of this report are 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.

**17.6 Noise measurement:**

- i) The ambient noise emitted by the machine was measured as 87.9dB (A) which is normal against the limit of 88 dB(A).
- ii) The noise at driver's ear level was measured as 96.7 dB (A) which is normal against the limit of 98 dB (A).

**17.7 Field Test:**

**17.7.1 Summary of field tests:**

The results of the field test for paddy harvesting are summarized below:

S. No.	Observation	Range of observations	Average of observations
1.	Speed of operation, kmph	2.02 to 3.18	2.53
2.	Area covered (ha/h)	0.349 to 0.604	0.437
3.	Fuel consumption: - (l/h) - (l/hā)	5.555 to 7.847 9.195 to 19.833	7.022 15.584
4.	Crop throughput (t/h)	4.52 to 10.51	7.18
5.	Grain breakage in main grain outlet(%)	0.001 to 0.003	0.002
6.	Header losses(%)	0.089 to 0.372	0.284
7.	Total non-collectable losses(%)	0.250 to 0.531	0.399
8.	Total collectable losses(%)	0.005 to 1.240	0.853
9.	Total processing losses(%)	0.071 to 1.526	0.969
10.	Threshing efficiency(%)	98.73 to 99.64	99.21
11.	Cleaning efficiency(%)	97.06 to 99.0	97.22

**17.7.1.1 Paddy Harvesting**

- i) The grain breakage ranged from 0.001 to 0.003%
- ii) The total non-collectable losses ranged from 0.250 to 0.531%
- iii) The total processing losses ranged from 0.071 to 1.526%.
- iv) The threshing efficiency ranged from 98.73 to 99.64%.
- v) The cleaning efficiency ranged from 97.06 to 99.0%

**17.7.2 Break down and repairs:**

No any breakdown was observed during entire 57.04h running hour, during entire field test.

**17.7.3 Harvesting of any other crops:**

The performance of combine to harvest paddy crop was evaluated as the same was recommended by the applicant.

**17.7.4 Ease of Operation and Safety Provision:**

- i) The controls provided around the operator are within easy reach, and labelled with symbols as per Indian standard IS:6283-1998.
- ii) The stone trap is provided for easy cleaning.
- iii) Spark arresting device is not provided in the engine exhaust system, however as per applicant the turbocharged engine eliminates the requirement for spark arrester.
- iv) Slip clutch provided for tailing auger, grain auger and under shout conveyer drive. The slip clutch is not provided for threshing drum drive, which needs to be provided.
- v) The mechanical arrangement for adjusting the reel speed is not provided, this needs to be added such that the same could be controlled from operators position.
- vi) Mechanical lock for reel in raised position needs to be provided to ensure safety while working on cutter bar.

**17.7.5 Assessment of Wear:**

- i) The wear of engine components i.e cylinder liners, piston, piston rings, valves, valve guides, springs, big-end bearings and main bearings were observed within the permissible limit.
- ii) The transmission gears and components were found in normal working condition.
- iii) The timing gears, clutch lining, release bearing were found in normal working condition.
- iv) The condition of the components of hydraulic system and steering system was observed to be normal.
- v) The condition of the bearing, chains, sprockets and belts was observed to be normal.
- vi) The components of starter motor and alternator were found in normal working condition.
- vii) The rate of wear of critical components of threshing cylinder & concave were observed to be normal.

**17.8 Hardness and Chemical composition:**

- i) The Hardness of knife blade at Hardened zone is higher than the prescribed limit of IS :6025-1999.
- ii) The manganese content of knife blade is higher than the prescribed limit of IS: 6025-1999.

**17.9 Maintenance/Service problems:**

No noticeable maintenance/service problem was observed during the course of test at this Institute.

**17.10 Identification plate of Combine Harvester:**

The identification plate is provided on the combine harvester as specified in IS:10273-1999.

**17.11 Literature supplied with the Machine:**

The following literature in English were supplied with the machine for reference during testing and these were found adequate, however, it needs to be provided in Hindi and other regional languages for the guidance of the users in accordance with IS:8132-1999.

1. Operator manual.
2. Service manual.
3. Part's catalogue

**18. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS AS PER IS: 15806-2008.**

S. No.	Characteristics	Requirement	Declared	Observed	Remark
1.	<b>Prime mover performance</b>				
i)	Max. Power (absolute) Average max. power observed during 2 hrs. max. power test in natural ambient condition kW(Ps)	It should not be less than 5% of the declared value.	56.0(76.1)	55.6(75.6)	Conforms
ii)	Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW (Ps)	Max. power observed must not be less than 5% of declared value.	56.0(76.1)	55.6(75.6)	Conforms
iii)	Power at rated engine speed, kW (Ps)	The observed value must not be less than 5% of the declared value by the applicant.	56.0(76.1)	56.7(77.1)	Conforms
iv)	Specific fuel consumption g/kWh.	The average observed value during 2 hr. max. power test must be within $\pm 5\%$ of the declared value by applicant/ manufacturer.	235 $\pm$ 15	263	Conforms on + side



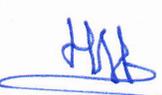
v)	Max. smoke density (bosch no.) at 80% load between the speed at max. power & 55% of speed at max. or 1000 rpm which ever is higher, should be observed as per CMVR rule	For tractor :- 5.2 bosch no. or 75 hartridge For engine :- Free deceleration or natural aspirated or turbo charges - 65 hartridge	5.2	2.53	Conforms
vi)	Max. crank shaft torque, (N-m) observed during the test after no load engine speed is adjusted as per manufacture's recommendation for field work	It must not be less than 8% of declare value by manufacturer.	Not specified	306.4	Conforms
vii)	Back up torque, %	7% min.	-	19.97	Conforms
viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	130°C	106	Conforms
		ii) Coolant	110°C	96.0	Conforms
ix)	Lubrication oil consumption, g/kWh	1% of SFC at max. power during high ambient condition			
2.	<b>Brake performance</b>				
i)	Max. stopping distance at a force equal to or less than 600 N on break pedal, m	10 m or $S \leq 0.15V + V^2/130$ V= speed corresponding to 80% of design max. speed, kmph	-	Not applicable for track type combine	--
ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec <sup>2</sup> .	$\leq 600N$ .	-	Not applicable for track type combine	--
iii)	Whether parking brake is effective at a force of 600 N at foot pedal or 400 N at Hand and lever	Yes or No	-	Not applicable for track type combine	--
3.	<b>Mechanical vibration</b>				
i)	Operator's platform	120 $\mu$ m max.	-	400	<b>Does not conform</b>
ii)	Steering wheel	150 $\mu$ m max.	-	NA	-
iii)	Seat with driver seated	120 $\mu$ m max.	-	300	<b>Does not conform</b>

4.	<b>Air cleaner oil pull over</b>					
	i)	Max. oil pull over in % age when tested in accordance with IS: 8122 pt. (II)-2000	0.25% max.	-	Machine having dry type air cleaner. Hence, it is not applicable.	--
5.	<b>Noise measurement</b>					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	-	87.9	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	-	96.7	Conforms
6.	<b>Discard limit</b>					
	i)	Cylinder bore diameter	Should not exceed the values declared by the manufacture	97.135	97.02	Conforms
	ii)	Piston diameter	-do-	96.755	96.87	Conforms
	iii)	Ring end gap	-do-	1.50	0.55	Conforms
	iv)	Ring groove clearance	-do-	0.15	0.06	Conforms
	v)	Diametrical and axial clearance of big end bearing	-do-	Diametrical- 0.20 Axial-0.50	Diametrical- 0.09 Axial-0.35	Conforms
	vi)	Diametrical and axial clearance of main bearings	-do-	Diametrical- 0.20 Axial-0.50	Diametrical- 0.09 Axial-0.20	Conforms
	vii)	Thickness of brake lining	-do-	Not applicable	Not applicable	-
	viii)	Thickness of clutch plate	-do-	Not applicable	Not applicable	--
7.	<b>Field performance</b>					
	i)	Suitability for crops	Paddy	-	Recommended for paddy only	Conforms
	ii)	Grain breakage in grain tank	≤ 2.5 %	-	Paddy 0.001 to 0.003 (Avg. 0.002%)	Conforms
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	-	Paddy 0.250 to 0.531 (Avg. 0.399%)	Conforms
	iv)	Threshing efficiency	≥ 98% wheat & paddy	-	Paddy 98.73 to 99.64 (Avg. 99.21%)	Conforms
	v)	Cleaning efficiency	≥ 96 % wheat & paddy	-	Paddy 97.06 to 99.0 (Avg. 97.72%)	Conforms

8. Safety requirement						
i)	Guards against all moving per	Essential	-	Provided	Conforms	
ii)	Lighting arrangement a) Head light b) Parking light c) Indication d) Reverse gear e) Brake f) Number plate	Essential as per CMVR		CMVR is not applicable for track type combine, However lighting arrangement is provided as per 3.2.10.8 of the test report	-	
iii)	Grain tank cover	Essential	-	Provided	Conforms	
iv)	Spark arrester in engine's exhaust	Essential	-	Not provided, However the turbo charger fitted on engine arrests the sparks, as full quantity of smoke passes through turbocharger turbine.	--	
v)	Stone trap before concave	Essential	-	Provided	Conforms	
vi)	Rear view mirror	Essential	-	Provided	Conforms	
vii)	Slip clutch at following drives - a) Cutting platform b) under shout conveyor drive c) Grain & tailing elevator	Essential	-	Provided	Conforms	
viii)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers	Essential	-	Provided	Conforms	
ix)	Working clearance around the controls	Essential 70 mm, min.	-	Provided	Conforms	
x)	Labelling of control gauge	Essential	-	Provided	Conforms	

9. Material of construction						
i)	Guard should conform to IS: 6024 -1983	The guard (except ledger plate) shall be manufactured from malleable iron casting ( IS: 2108-1977), steel casting (IS: 1030-1974) or steel forging (IS: 2004-1978)	-	Knife guard is not provided in machine	-	
ii)	Knife blade As per IS :6025 -1982	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	-	C=0.76% Mn=0.60%	Conforms only for carbon	
iii)	Knife back Must meet the requirement of IS:10378-1982	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	-	C=0.10%	Does not conform	
10. Labelling of combine harvester						
	It should conform to IS: 10273-1987	Essential, It should mention make & model, Engine No. Chassis No., Year of manufacture, Power & SFC of engine	--	Provided	Conforms	
11. Break down (critical, major & minor)						
		Essential as per IS: 15806-2008 Annexure A <sub>1</sub> , A <sub>2</sub> , A <sub>3</sub>	--	None	Conforms	

**TESTING AUTHORITY**

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