व्यावसायिक परीक्षण रिपोर्ट (प्रथम बैच परीक्षण) संख्या / No. : Comb-65/2054/2021

COMMERCIAL TEST REPORT (1st Batch Test) माह / Month : April, 2021

(यह परीक्षण रिपोर्ट 30/04/2028 तक वैध है। / THIS TEST REPORT IS VALID UP TO : 30/04/2028)

ACE, ACT 60 SELF PROPELLED, COMBINE HARVESTER (TRACK TYPE)

सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय

कृषि, सहकारिता एवं किसान कल्याण विभाग

मशीनीकरण एवं प्रौद्योगिकी प्रभाग

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(Department of Agriculture, Cooperation & Farmers Welfare, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001 - 2015 Certified Institute)

Tractor Nagar, Budni (M.P.) 466 445

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Telephone : 07564 - 234729, 234743

Manufacturer	:	**M/s Action Construction Equipment Ltd. Jajru Road, 25th Mile stone, Mathura Road, Ballabgarh, Faridabad, (Haryana) 121004.**
Location of manufacturing plant (apa)	:	M/s Action Construction Equipment Ltd. Dudhola link road, Dudhola, Palwal (Haryana) 121102
Test requested by (applicant)	:	The manufacturer
Selected for test by	:	The manufacturer

1.SCOPE OF TEST

The combine Harvester was tested in accordance with IS: 8122 (Part-I)-1994 (Reaffirmed in Oct. 2016), IS: 8122 (Part-II)-2000 (Reaffirmed in Oct. 2016) and IS: 15806-2018. The scope of the test was to check and assess the following.

1.1 Lab Test

1.1.1 Specification checking and other data furnished by the applicant.
1.1.2 Engine performance test.
1.1.3 Header lifting test.
1.1.4 Mechanical vibration at various assemblies / sub assemblies.
1.1.5 Noise Measurement
1.1.6 Brake test

1.2 Field Test

1.2.1 Field performance and suitability of the machine for harvesting paddy crop with regard to:
i) Quality of work
ii) Rate of work
iii) Fuel consumption
1.2.2 Ease of adjustments and handling.
1.2.3 Operator's comfort and safety.

1.3 Investigation after field test

1.3.1 Nature of breakdowns and repairs; and
1.3.2 Wear of various critical components.

2. METHOD OF SELECTION

The machine was submitted directly by the applicant for test. Hence method of selection is unknown.

3. SPECIFICATIONS

3.1 Combine Harvester:

Make	:	ACE
Model	:	ACT 60
Serial Number/Chassis No.	:	8000688
Type	:	Self propelled track type
Year of manufacture	:	10 , 2020

15.13 Category of breakdowns / defects:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 15806-2018, ANNEX A, B & C	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 breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or (1 major + 4 minor) or 5 minor breakdowns.	**None**	Yes

16. SUMMARY OF OBSERVATIONS. COMMENTS AND RECOMMENDATIONS

16.1 Engine performance Test:

Sl.No.	Engine Brake Power, (KW)	Crankshaft Torque, (Nm)	Engine Speed (rpm)	Hourly Fuel Consumption kg/h, (l/h)	Specific Fuel Consumption (kg/kwh)	Specific Energy (kwh/l)
I)	**Maximum Power- 2 hours test:**					
	42.9	141.1	2900	10.62 (12.70)	0.248	3.38
II)	**Power at rated engine speed test (2800 RPM):**					
	42.4	144.5	2800	10.32 (12.34)	0.243	3.44
	40.3	137.5	2800	10.08 (12.06)	0.250	3.34*
III)	**Maximum torque :**					
	27.5	164.3	1597	6.09 (7.28)	0.221	3.78
	25.5	152.1	1600	5.72 (6.84)	0.224	3.73*
IV)	**Five hour rating test**					
	a) Engine loaded to 90% of maximum power :					
	37.2	122.0	2912	9.43 (11.28)	0.254	3.30*
	b) Maximum power :					
	40.5	133.5	2900	10.24 (12.25)	0.253	3.31*

***Under high ambient condition**

Remarks:

i) The maximum power output of the engine was observed as **42.9 kW** at **2900 rpm** of engine at full throttle against the declaration of **42.7 kW**, which is within the permissible limit.

ii) The power output of the engine at rated rpm was observed as **42.4 kW** (i.e. 2800 rpm) of engine at full throttle against the declaration of **42.7 kW**, which is within the permissible limit.

iii) The specific fuel consumption corresponding to maximum power at full throttle setting measured as **248** g/kwh against the declaration of **250 g/kWh**, which is within the permissible limit.

iv) The back-up torque of the engine was measured as **13.7 %** under natural ambient condition at full throttle**.**

v) The maximum smoke density was recorded as 0.18 m^{-1}**.**

16.2 Braking Performance:

No specific brake mechanism is provided. The combine stop by bringing the control levers of LHS and RHS driving roller/track to the neutral position.

16.3 Mechanical Vibration:

The amplitude of mechanical vibration of components are given in the chapter 8 of this report. The observation reading marked (*) for various assemblies were on higher side, thus suitable arrangement should be provided to dampen the vibration for the operator's comfort.

16.4 Noise Measurement:

The ambient noise emitted by the machine was measured as 83 dB(A).

The noise at drivers ear level was measured as 97 dB(A) which is within limit when compared to warning levels of 98 dB(A).

16.5 Field Test:

16.5.1 Summary of field test:

The result of the field test for the paddy harvesting is summarized below.

Sl. No.	Observation	Range of observation	Average of observation
1.	Speed of operations, kmph	2.71 to 4.03	-
2.	Area covered (ha/h)	0.443 to 0.649	-
3.	Fuel consumption: -(l/h) -(l/ha)	 8.00 to 10.67 13.98 to 21.41	-
4.	Crop throughput (tonne/ha)	3.985 to 7.620	-
5.	Grain breakage in main grain outlet (%)	0.370 to 1.506	0.814
6.	Header losses (%)	0.109 to 0.194	0.151
7.	Total non-collectable losses (%)	0.427 to 0.965	0.638
8.	Total collectable losses (%)	0.194 to 1.574	0.751
9.	Total processing losses (%)	1.129 to 3.153	2.066
10.	Threshing efficiency (%)	98.42 to 99.79	99.23
11.	Cleaning efficiency (%)	96.75 to 99.06	97.79

16.5.2 Paddy Harvesting

i) The grain breakage range from 0.370 to 1.506 % which is considered to be normal.

ii) The total non-collectable losses ranged from 0.427 to 0.965 % which is considered to be normal.

iii) The total processing losses ranged from 1.129 to 3.153 % which is within the limit against maximum limit of 4.0 % as per IS: 15806-2018.

iv) The threshing efficiency ranged from 98.42 to 99.79 % which is considered to be normal.

v) The cleaning efficiency ranged from 96.75 to 99.06 % which is considered to be normal.

16.5.3 Harvesting of any other crops:

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

16.5.4 Operation in Wet Soil:

The operation of combine harvester was found satisfactory in dry as well as wet fields.

16.5.5 Ease of operation and safety provision:

i) The control provided around the operator is within easy reach.

ii) Slip clutch/ safety devices in knife drive, crop auger and threshing drum drive are considered essential from safety point of view which needs to be provided.

iii) The provision for adjusting the reel speed is not provided, which needs to be provided.

iv) Mechanical lock for reel in raised position needs to be provided to ensure safety while working on cutter bar.

16.5.6 Assessment of Wear:

i) The wear of engine components i.e. cylinder liners, piston, piston rings, valves, valve guides, springs, big-end bearing were observed within the permissible limit.

ii) The transmission gears and components wear found in normal working condition.

iii) The timing gears, clutch lining, release bearing were found in normal working condition.

iv) The condition of the component 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 component of starter motor and alternator were found in normal working condition.

vii) The rate of wear of peg teeth bar of threshing cylinder & cylinder concave were observed to be normal.

16.6 Hardness and chemical composition:

The hardness of knife blade (fixed) in reminder zone & chemical composition of both reciprocating and fixed knife blade is not within the permissible limit of IS: 6025-1999.

16.7 Maintenance / service problems:

No noticeable maintenance / service problem was observed during the course of test at this institute however the following provisions needs to be provided in the machine

i) Provision of threshing drum speed variation to cater for varying crop conditions

16.8 Safety provisions

i) The slip clutch should be provided in all the drives to prevent the damage to the drive belts and fire hazard in case of choking of combine harvester during the crop harvesting.

ii) Grain unloading light should be provided for safe and ease parking of grain collecting vehicle.

iii) The provision for mechanical lock of cutting platform in raised position should be provided for safety during maintenance work.

16.9 Identification plate of combine:

The identification plate was provided on the combine harvester as required of CMVR along with engine power & SFC.

16.10 Literature supplied with the machine:

The following literature supplied in English were supplied with the machine for reference during testing and these where found adequate, however, it needs to be modified in Hindi and other regional language for the guidance of the users.

a) Operator manual of ACE Combine ACT 60 Harvester Combine.

b) Operator's Service book 4SP NA / TC BS-III Industrial Engine.

c) Spare Part's Catalogue of ACE Combine ACT 60 Harvester Combine.

d) Service manual of ACE Combine ACT 60 Harvester Combine.

17. Citizen charter

Test duration under citizen charter	Duration of Test	Whether the report released within time frame given in the citizen charter	Remark
10 Months	5 Months (November 2020 to March 2021)	Yes	--

TESTING AUTHORITY:

PRAMOD YADAV
AGRICULTURAL ENGINEER

C.V. CHIMOTE
TEST ENGINEER

MAHESH CHANDRA
DIRECTOR (I/C)

The report compiled by: **Shri Vithato Keyho**, Senior Technical Assistant.

18. APPLICANT'S COMMENTS

Para No	Our Reference	Applicant's comments
18.1	14.2.4, 15.3 & 16.3	In further manufacturing of Combine Harvester (Track type), we will provide suitable Anti Vibration Mount to dampen the vibration.

Combine Run Hours During Test

Annexure-I

A	Laboratory Tests:	Hours
1.	Running-in	13.2
2.	Engine Performance test	14.3
3.	Brake performance Test	0.8
4.	Noise measurement	0.5
5.	Mechanical vibration Test	0.5
6.	Header Lifting Test	3.0
B	**Field Test:**	
1	Paddy Harvesting	53.7
2	Miscellaneous test and other run hours including ideal run, transportation, trails and preparation for test	1.3
	TOTAL	**87.3**

Annexure-II

OBSERVATION SHEET FOR FIELD TESTING (PAADY HARVESTING)

Test No.	Date of test	Variety of crop	Field soil condition Dry/Wet	Height of plants (cm)	Length of ear head (cm)	No. of grains per ear head	Plant Population		Straw grain ratio	Moisture (%)		Atmospheric conditions at the time of test	
							No of plant/m²	No of tillers/m²		Grain	Straw	R.H (%)	Press-ure, (Kpa)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	05.11.20	PB -1637	Dry	91 to 105	25 to 33	189 to 339	26 to 28	295 to 338	2.38	22.1	69.5	45 to 49	96.9 to 97.6
2	06.11.20	PB -1637	Dry	105 to 120	24 to 31	150 to 234	26 to 28	263 to 313	3.10	21.8	70.1	46 to 49	96.8 to 97.5
3	19.11.20	PB -1637	Dry	100 to 105	27 to 32	183 to 262	13 to 19	304 to 414	2.35	23.0	71.1	44 to 50	96.7 to 96.9
4	20.11.20	PB -1637	Dry	104 to 109	25 to 29	185 to 220	15 to 26	310 to 425	2.33	23.0	71.0	42 to 47	96.8 to 97.6
5	21.11.20	PB -1637	Dry	99 to 104	26 to 29	170 to 205	21 to 25	210 to 255	2.38	21.0	69.2	42 to 48	97.0 to 97.8
6	23.11.20	PB -1637	Wet & Muddy	90 to 100	27 to 29	165 to 201	19 to 29	265 to 288	2.30	18.0	68.3	40 to 47	96.8 to 97.5
7	24.11.20	PB -1637	Wet & Muddy	107 to 110	26 to 28	152 to 257	19 to 23	320 to 406	2.37	24.0	70.0	41 to 50	96.9 to 97.8
8	25.11.20	PB-5	Dry	100 to 104	26 to 28	134 to 152	14 to 18	250 to 325	2.38	24.0	70.0	41 to 48	96.8 to 97.8
9	26.11.20	PB.5	Dry	105 to 115	25 to 30	150 to 170	26 to 27	310 to 360	2.25	23.0	70.0	41 to 47	96.7 to 97.1
10	27.11.20	PB-5	Dry	102 to 110	26 to 28	170 to 201	19 to 29	265 to 288	2.29	24.0	70.0	38 to 50	97.1 to 97.9

Annexure-III

FELD TEST DATA ANALYSIS (PADDY HARVESTING)

Test No.	Date of test	Duration of test (hr.)	Speed of operation (kmph)	Width of cut (m)	Rate of work		Through put		Fuel consumption		Pre-harvest loss (kg/ha)	Crop straw/Grain ratio (SKH/GKH)	Crop through put (t/h)	Grain breakage in main outlet (%) (a)
					Area covered (ha/hr.)	Grain output (Kg/h.)	Clean Grain (kg/h) GKH	Straw (kg/h) SKH	(l/h)	(l/ha)				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	05.11.20	6.27	2.84	1.99	0.459	1171.258	1177.361	2807.690	9.36	20.40	3.10	2.385	3.985	1.039
2	06.11.20	4.66	2.71	1.99	0.443	1845.381	1856.397	5763.522	8.20	18.50	10.30	3.105	7.620	1.038
3	19.11.20	6.16	3.84	1.99	0.636	2056.700	2070.493	4867.703	9.25	14.52	1.20	2.351	6.938	0.379
4	20.11.20	6.33	4.01	1.99	0.649	2206.511	2216.752	5162.039	9.08	13.98	4.10	2.329	7.379	0.539
5	21.11.20	6.50	4.03	1.95	0.651	2028.369	2039.653	4852.221	9.05	13.94	5.70	2.379	6.892	0.370
6	23.11.20	5.66	3.40	1.98	0.566	2004.399	2015.696	4563.417	9.15	16.20	5.70	2.264	6.579	1.506
7	24.11.20	3.75	2.99	2.01	0.498	1902.796	1919.646	4557.951	10.67	21.41	8.40	2.374	6.478	0.975
8	25.11.20	4.17	3.01	2.00	0.499	1903.135	1917.185	4562.574	9.59	19.25	6.20	2.380	6.480	0.419
9	26.11.20	5.00	3.07	1.99	0.522	1982.887	1997.896	4493.583	8.00	15.36	8.50	2.249	6.491	0.872
10	27.11.20	5.17	3.02	2.00	0.502	1987.754	2001.968	4588.420	9.19	18.29	5.20	2.292	6.590	1.001
Total		53.67											Average	0.814

Annexure-IV

FIELD TEST DATA ANALYSIS (PADDY HARVESTING)

Test No.	Total collectable losses Unthreshed from main outlet (%) (A)	Loss due to combine, percent by mass Non collectable losses (%) (c)									Header loss (c)	Total (B)	Total losses A+B	Threshing efficiency (%)	Cleaning efficiency (%)	Total processing losses (15+17+a+b)
		Straw outlet (Rake)				Sieve(Shoe)										
		Threshed	Unthreshed	Broken	Total (a)	Threshed	Unthreshed	Broken	Total (b)							
		(1)	(2)	(3)	(1+2+3)	(1)	(2)	(3)	(1+2+3)			(a+b+c)				
16	17	18	19	20	21	22	23	24	25		26	27	28	29	30	31
1	1.574	0.262	0.001	0.000	0.263	0.078	0.006	0.001	0.085		0.171	0.519	2.093	98.42	98.59	2.961
2	1.431	0.215	0.002	0.001	0.218	0.212	0.002	0.000	0.214		0.161	0.593	2.024	98.56	98.64	2.901
3	0.716	0.310	0.067	0.000	0.377	0.054	0.042	0.000	0.096		0.194	0.667	1.383	99.17	97.07	1.568
4	0.348	0.297	0.005	0.000	0.302	0.041	0.002	0.000	0.043		0.116	0.461	0.807	99.65	97.90	1.230
5	0.370	0.259	0.004	0.000	0.263	0.117	0.009	0.000	0.126		0.164	0.553	0.923	99.62	96.75	1.129
6	1.235	0.325	0.003	0.001	0.329	0.075	0.008	0.000	0.083		0.150	0.427	1.662	98.76	99.06	3.153
7	0.417	0.525	0.006	0.000	0.531	0.249	0.004	0.008	0.261		0.173	0.965	1.382	99.57	97.55	2.184
8	0.460	0.377	0.008	0.000	0.385	0.193	0.002	0.008	0.203		0.145	0.793	1.193	99.54	97.19	1.467
9	0.770	0.471	0.002	0.000	0.473	0.125	0.017	0.008	0.150		0.128	0.751	1.521	99.20	97.93	2.266
10	0.194	0.286	0.004	0.000	0.290	0.307	0.005	0.000	0.312		0.109	0.711	0.905	99.79	97.22	1.797
Avg.	0.751										0.151	0.638	1.389	99.23	97.79	2.066

Annexure-V

DETAILS OF GREASING & OILING POINTS

1)	Grease Nipples : to be greased after each working day	
S. No.	Location	No. of Grease Nipples
i)	Cutter bar drive	8
ii)	Reel drive shaft	3
iii)	Feeding unit drive shaft	2
iv)	Threshing drum bearing	2
v)	Tensioner pulley	4
vi)	Main drive pulley	1
vii)	Blower Bearing	2
	Total:	22
2)	Oiling Points	
i)	Reel	12
ii)	Undershot conveyor	2
iii)	Cutter bar blade joint & ball joint	2
	Total:	16

Annexure-VI

SYMBOLS AND ABBRIVIATION

SYMBOLS:

I. SYMBOLS ASSIGNED TO BASIC SI UNIT

S.N.	PHYSICAL QUANTITY	NAME OF SI UNIT	SYMBOL
1	Length	Meter	m
		Millimeter	mm
2	Mass	Kilogram	kg
		Gram	g
		Tonne	t
3	Time	Second	s

II SYMBOLS ASSIGNED TO SOME DERIVED UNIT

S.N.	PHYSICAL QUANTITY	NAME OF SI UNIT	SYMBOL
1.	Area	Square centimeter	cm^2
		Square meter	m^2
		Hectare	ha
2	Speed / velocity	Meter per second	m/s
		Kilometer per hour	kmph
3	Pressure	Newton per square millimeter	N/mm^2
4	Time	Minute	min
		Hour	h
5	Volume	Cubic centimeter	cm^3
		Milliliter	ml
		Litre	l

ABBREVIATIONS:

As per applicant	:	apa	Clause	:	Cl
Degree	:	deg	Figure	:	Fig
Indian standard	:	IS	Kilowatt	:	kW
Number	:	No.	Not available	:	N.A.
Not Recorded	:	N. R.	Percent	:	%
Reference	:	Ref.	Revolutions per minute	:	rpm