



ESCORTS LIMITED, POWERTRAC - 425 TRACTOR



भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(DEPARTMENT OF AGRICULTURE & CO-OPERATION)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान
ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

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T-844/1354/2012

**ESCORTS LIMITED, POWERTRAC - 425 TRACTOR
- Commercial (Initial)**

Manufacturer : M/s. Escorts Limited,
Plot No. 2 & 3, Sector - 13,
FARIDABAD - 121 007
(Haryana)

Test requested by (applicant) : M/s. Escorts R & D Centre,
15/5, Mathura Road,
FARIDABAD - 121 003
(Haryana)

Selected for test by : Applicant
Place of running-in : At Applicant's works

Duration of said running-in (h):
- Engine : 20
- Transmission : 30

Method of Selection : The tractor was submitted directly by the
applicant for test. Hence, method of
selection is not known.

1. SPECIFICATION

1.1 Tractor:
Make : Escorts Limited
Model : Powertrac- 425

S. No.	Variant models*	Variant features
1.	Powertrac 425 AGMAXX	With Dual Clutch
2.	Powertrac 425 LOADMAXX	With Oil Immersed Brakes
3.	Powertrac 425 LOADMAXX 1	With Hub Reduction Final Drive (Final Drive Location Changed to Wheel Hub)
4.	Powertrac 425 LOADMAXX 2	Without Hydraulic Lift.

* The variant models have not been tested yet at this Institute.

Type : Four wheeled, Rear wheel driven,
Standard agricultural tractor

Year of manufacture : 11-L-10 (November, 2011)

Serial number : T-2160001

Chassis number : T-2160001

Country of Origin : India

1.2 Engine:
Make : Escorts Limited
Model : E2.156-3A
Type : Four stroke, naturally aspirated, water cooled, direct injection, diesel engine

Serial number : E-2150001

Engine speed (Manufacturer's recommended production setting), (rpm) :
- Maximum speed at no load : 2200 to 2300
- Low idle speed : 600 to 700
- Speed at maximum torque : 1200 to 1300



17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameters applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2008 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207- 2008	Values declared by the applicant (D) / Requirement (R)	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5	6	7
17.1.1 PTO Performance :						
a)	- Max. power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >35hp. -7.5/+10% for PTO power ≤ 35 hp.	17.0 (D)	17.8	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	17.0 (D)	17.6	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	234.6 (D)	239	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	96.4 (D)	97.2	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7 percent, min.(R)	15.2	Yes
f)	Maximum operating temperature (°C)					
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130 (D)	94	Yes
	2) Coolant (water)	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	110 (D)	105	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.39 Maximum (R)	0.78	Yes
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per meter (R)	0.06	Yes



1	2	3	4	5	6	7
17.1.2 Drawbar performance :						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	13.48 Minimum (R) 13.59 (D)	15.78	Yes
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast/ with standard ballast	11.38 Minimum (R) 11.48 (D)	12.61	Yes
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 17.1.1(a) of PTO performance	14.2 Minimum (R) 13.6 (D)	15.9	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company.	125 (D)	80	Yes
17.1.3 Power lift and hydraulic pump performance :						
a)	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Non Evaluative	[Tolerance of minus 10%]	12.75 (D)	12.13	Yes
	2) With the standard frame	Evaluative	The lift capacity should at least be 18 kg/PTO hp. And it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft.	4.21 Minimum (R) 7.84 (D)	7.29	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 minute, (mm)	Non Evaluative	[Tolerance of plus 5 mm]	50 (D)	46	Yes
17.1.4 Brake performance at 25 kmph:						
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with ballast* (m):					
	1) Cold brake	Evaluative	10	10 (R)	6.69	Yes
	2) Hot brake	Evaluative	10	10 (R)	7.33	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	338	Yes

*The manufacturer has not recommended ballasting for road test. Therefore, the brake test was conducted under un-ballasted condition only.



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1	2	3	4	5	6	7
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes / No	Yes (R)	Yes	Yes
17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	94	Yes
17.1.6	Amplitude of mechanical vibrations at :					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	180	No
	2) Right foot rest		100 (R)	120	No	
	3) Seat (with driver seated)		-do-	100 (R)	60	Yes
	4) Steering wheel		-do-	100 (R)	210	No
17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	3.5 (D)	3.5	Yes
	2) Four wheel	Evaluative	--	5.0 (D)	5.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	8.0 to 9.0 (D)	9.32	Yes
	2) Four wheel		--	8.0 to 9.0 (D)	7.88	No
c)	Fuel consumption (ml/km/tonne):					
	1) Two wheel	Non Evaluative	--	30 to 35 (D)	30.65	Yes
	2) Four wheel		--	30 to 35 (D)	25.39	No
17.1.8	Wetland cultivation :					
	Sealing for the following assemblies:	Evaluative	The identified assem-blies should essen-tially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the require-ments of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud	No ingress of mud and / or water was observed	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
17.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	As per CMVR	At present no requirements	---	---
b)	Lighting arrangement	Evaluative	As per CMVR	--	Provided	Yes



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1	2	3	4	5	6	7
17.1.10	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Escorts Limited	Yes
	2) Model	Evaluative		--	Powertrac - 425	Yes
	3) Year of manufacture	Evaluative		--	11-L-10	Yes
	4) Engine number	Evaluative		--	E - 2150001	Yes
	5) Chassis number	Evaluative		--	B - 2160001	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	17.0	Yes
17.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer-	95.30	95.03 to 95.05	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		When the ring groove clearance exceeds discard limit	0.177 to 0.185	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	2.0	0.55 to 0.60	Yes
	- 2 nd comp. ring.		-do-	2.0	1.00	Yes
	- Oil ring.		-do-	2.0	0.55	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	0.20	0.102 to 0.104	Yes
	- 2 nd comp. ring.		-do-	0.20	0.062 to 0.065	Yes
	- Oil ring.		-do-	0.15	0.072 to 0.073	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.40	0.097 to 0.115	Yes
	- Crankshaft end float	Evaluative		0.67	0.30	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.40	0.101 to 0.116	Yes
	- Axial	Evaluative	-do-	0.65	0.35	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.40	0.11 to 0.12	Yes
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	0.40	0.11	Yes



17.1.12 CATEGORY OF BREAKDOWNS / DEFECTS :					
Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No.)
1	Critical	Evaluative	There should be no 'critical breakdown' during its validation after all tests including Repeat / Supplementary tests.	None	Yes
2.	Major	Evaluative	There should not be more than two 'major breakdowns' and neither of them is of repetitive nature.	None	Yes
3.	Minor	Evaluative	There should not be more than five 'minor defects' during the test 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 5 minor breakdowns.	None	Yes

17.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2008:				
S. No.	Characteristic	Requirements as per IS: 12207-2008	As observed	Remarks
1.	Air cleaner oil pull over, max. oil pull over (%)	0.25% (max.)	0.15	Yes
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Does not meet the requirement	No
3.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	No
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	--
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	Does not meet the requirement	No
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meet the requirement	No
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meets the requirements	Yes
	Specifications of swinging drawbar	Should meet the requirements of IS:12362 Part 3-1994.	Not provided	--
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes



17.3 Conformity with following IS:

- i) Guidelines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed in March, 2009)] : Conforms
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed in March, 2009)] : Does not Conform
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in March, 2007) / ISO 730-1:1994] : Does not Conform
- iv) Drawbar for agricultural tractors - Link type [IS 12953:1990 (Reaffirmed March, 2007)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement [IS: 12343 -1998 (First revision) (Reaffirmed in March, 2009)] : Does not conform
- vi) Guide for safety & comport of operator of agricultural tractors: Part 1 General requirements (first revision): [IS: 12239 (Part-1) 1996 (Reaffirmed in March, 2007) / ISO 4254-1:1989] : Does not conform
- vii) Tractors and machinery for agriculture and forestry - Technical means for ensuring safety Part 2: Tractors (first revision) (IS: 12239 (Part-2) 1999) (Reaffirmed in March, 2009)] : Does not conform
- viii) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed in March, 2009)] : Does not conform
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays [IS: 6283 (Part-1) - 2006 (Reaffirmed in March, 2009) and IS: 6283 (Part-2)-2007 (Reaffirmed in March, 2009)] : Conforms
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in March, 2009)] : Conforms

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO Performance:

- i) The backup torque is observed as 15.2%.
- ii) The specific fuel consumption corresponding to maximum power was observed as 239 g/kWh against the declaration of 234.6 g/kWh, which meet the requirement of IS: 12207-2008 with regard to tolerance.
- iii) During PTO performance test at natural ambient condition, the governor hunting was observed at an engine speed of 2002, 1550 and 1200 rpm. This should be looked into for necessary corrective action.



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17.4.1.2 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-9 of this test report is on higher side especially at steering control wheel, left foot rest and right foot rest. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.3 Three point linkage:

- i) The lateral distance from lower hitch point to centre line of tractor does not meet the requirements of IS: 4468 (Part-I)-1997. This should be looked into for necessary corrective action.
- ii) Some of the parameters of three point linkage conform to Cat.I and some of them conform to Cat.II. In view of the spirit of standardization, the necessary improvement may be incorporated.

17.4.1.4 Linkage drawbar:

Some of the parameters of linkage drawbar conform to Cat.I and some of them conform to Cat.II. In view of the spirit of standardization, necessary improvement may be incorporated.

17.4.1.5 Power take-off shaft:

The dimension "dØ" of the power take-off shaft does not meet the requirements of IS: 4931-1995. This should be looked into for necessary corrective action.

17.4.1.6 Operator's seat:

The longitudinal distance from SIP to steering control wheel does not meet the requirements of IS: 12343-1998. This should be looked into for necessary corrective action.

17.4.2 Field performance test:**17.4.2.1 Wetland cultivation (Puddling operation):**

No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is recommended as suitable for wetland operation (Puddling).

17.4.2.2 Haulage test:

- (i) The distance travelled per litre of fuel consumption with four wheel trailer was observed as 7.88 km/l against the declaration 8.0 to 9.0 km/l. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.
- (ii) The fuel consumption with four wheel trailer was observed as 25.39 ml/km/tonne against the declaration 30.0 to 35.0 ml/km/tonne. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.

17.5 Maintenance / Service Problems:

No noticeable maintenance or service problem was observed during the test.



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17.6 Recommendation with regard to safety on tractor:

The following requirements, inter-alia, may be considered for incorporation on the tractor:

- i) Provision of safety against accidental start of engine.
- ii) Provision of spark arresting device in exhaust system.
- iii) Provision of differential lock.
- iv) The fuel shut-off knob does not remain in "STOP" position.
- v) Transport lock in hydraulic system.
- vi) The working clearance between the position control, draft control & external circuit levers may be provided as per IS: 12239 (Part-2) – 1999.

17.7 Adequacy of Literature supplied with machine:


17.7.1 The following literature was supplied with the tractor for reference during the testing.

- i) Operator's Manual in respect of Powertrac - 425 tractor.
- ii) Spare parts catalogue in respect of Powertrac - 425 tractor.
- iii) Repair Manual in respect of Powertrac - 425 tractor.

17.7.3 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

TESTING AUTHORITY:


C.V.CHIMOTE
TEST ENGINEER


P.K.VERMA
SENIOR AGRICULTURAL ENGINEER


V.N. KALE
DIRECTOR

Test Report compiled by: **Shri Pramod Yadav**, Senior Technical Assistant.



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18.0 APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
18.1	1.20.1, 1.20.3, 1.20.4, 1.20.5, 17.1.7(b-2)(c-3), 17.2(2,3,4,5), 17.4.1.3, 17.4.1.4, 17.4.2.2, 17.6	These aspects are further being looked into & will try to eliminate these deviations soon wherever necessary.
18.2	1.13.2(III), 1.14.1, 16(1), 17.4.1.1(iii), 17.4.1.5, 17.4.1.6	These being studied and Corrective action would be taken in near future.
18.3	17.1.6(1,2,4), 17.4.1.2	We would be looking into possibility to reduce vibration levels further.

ANNEXURE- I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No	Item	Mould Board Plough	Rotavator	Puddler
1.	Make	Field king	Shaktimaan	Not available
2.	Type	Mounted	Mounted	Mounted
3.	No. of bottoms/blades	Two	24, in 8 flanges	12 (6 in each gang)
4.	Type of bottoms/blades	General purpose	Hatchet	Notched
5.	Size of bottoms/blades, (mm)	300	245 x 75 x 6	460
6.	Spacing of bottoms/flanges, (mm)	570	255	164
7.	Lower hitch point span, (mm)	712	820	680
8.	Mast height, (mm)	620	600 x 640	680
9.	Overall dimensions, (mm):			
	- Length	1400	840	1190
	- Width	980	1790	1810
	- Height	1165	1110	1330
10.	Gross mass, (kg)	230	440	240



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ANNEXURE- II

BRIEF SPECIFICATION OF HALF CAGE WHEEL

S. No.	Items	Specifications
1.	Type	Half cage wheel
2.	Dia, (mm)	1055
3.	Width, (mm)	350
4.	No. and types of lugs	16, straight lugs made up of MS-angle section welded to angle iron frame.
5.	Size of angle section, (mm)	50 x 50 x 5
6.	Length of lugs, (mm)	350
7.	Spacing of lugs, (mm)	210
8.	Weight of each cage wheels (kg)	70

ANNEXURE- III

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	11.9
3.	Power lift and hydraulic pump performance test	2.5
4.	Drawbar performance test	16.3
5.	Turning ability	0.3
6.	Location of centre of gravity	0.2
7.	Operator's field of vision	--
8.	Brake test	1.7
9.	Noise measurement	2.3
10.	Air cleaner oil-pull over test	3.5
11.	Mechanical vibration test	0.3
12.	Theoretical speed test	0.6
	B. FIELD TEST:	
1.	Mould board plough	10.8
2.	Rotavation	10.2
3.	Puddling (including five hours water proof test)	15.4
	C. HAULAGE TEST:	10.0
	D. Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	6.5
	TOTAL:	92.5