



ESCORTS LIMITED, POWERTRAC 434 DS PLUS TRACTOR



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)
Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

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T-895/1410/2013

ESCORTS LIMITED, POWERTRAC 434 DS PLUS 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- 434 DS PLUS

Type : Four wheeled, Rear wheel driven, general
purpose agricultural tractor

Year of manufacture : 13-A-30 (January,2013)

Serial number : T 3189771

Chassis number : B 3189310

Country of Origin : India

1.2 **Engine:**

Make : Escorts Limited (apa)

Model : E3.215D-3A

Type : Four stroke, naturally aspirated, water
cooled, direct injection, diesel engine

Serial number : E 3210141

Engine speed (Manufacturer's recommended production setting), (rpm) :

- Maximum speed at no load : 2475 to 2525

- Low idle speed : 600 to 700

- Speed at maximum torque : 1200 to 1300

Rated speed, (rpm):

- For PTO use : 2200

- For drawbar use : 2200

1.3 **Cylinder & Cylinder Head:**

Number : Three

Disposition : Vertical, inline

Bore/stroke, (mm) : 91/110

Capacity as specified by the applicant, (cc) : 2146



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Compression ratio, (apa) : 17.5 (± 5%) : 1

Type of cylinder head : Monoblock

Type of cylinder liners : Wet, replaceable

Type of combustion chamber : Direct injection, open chamber in piston
crown.

Arrangement of valves : Overhead, inline

Valve clearance (cold):

- Inlet valve, (mm) : 0.30

- Exhaust valve, (mm) : 0.40

1.4 **Fuel System:**

Type of fuel feed system : Gravity and force feed

1.4.1 **Fuel tank:**

Capacity, (l) : 46

Location : Above flywheel housing, inside the bonnet

Provision for draining of sediments/
water : Side bowl with screw at lower left side of
tank

Material of fuel tank : Metallic

1.4.2 **Water Separator:**

Make : Hilux

Type : Sedimentation type with swirling motion

Location : In between fuel tank & fuel filters, on RHS
of engine.

Capacity (l) : 0.50

1.4.3 **Fuel feed pump:**

Type : Plunger with hand primer

Make : Bosch, India

Model/Group combination No. : FP/KS 22 AD 62, 9 440 030 029

Provision of sediment bowl : Provided (metallic)

Method of drive : Through timing gear

Location : RHS of engine

1.4.4 **Fuel filters:**

Make : Bosch, India

Model/Group combination No. : 9 450 030 120

Number : Two

Type of elements:

- Primary : Cloth

- Secondary : Paper

Capacity of final stage filter, (l) : 0.50

1.4.5 **Injection pump:**

Make : Bosch, India

Model/Group combination No. : F002 A0Z 939

Type : Inline, Plunger

Serial number : 112002

Method of drive : Through timing gears

1.4.6 **Fuel injectors:**

Make : Bosch, India

Holder Number : B 433 379 932



16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

| S. No. | Adjustments/Defects/Breakdowns and Repairs | Tractor run hours |
|--------|--|-------------------|
| 1. | During partial dismantling after water proof test the ingress of water was observed in RHS of king pin assembly. | -- |

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. | 25.0 (D) | 24.7 | Yes |
| b) | Power at rated engine speed, (kW) | Non Evaluative | -do- | 25.0 (D) | 24.7 | Yes |
| c) | Specific fuel consumption corresponding to maximum power, (g/kWh) | Non Evaluative | ± 5% | 238 (D) | 247 | Yes |
| d) | Maximum equivalent crankshaft torque, (Nm) | Non Evaluative | ± 8% | 140 (D) | 130.1 | Yes |
| e) | Back-up torque, percent | Non Evaluative | 7 percent, min. | 7 percent, min.(R) | 21.7 | 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. | 125 (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 |



| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|----------------|---|-------------------------------|---------|----------------|
| g) | Engine oil consumption, (g/kWh) | Evaluative | Not exceeding 1% of SFC at max. power under High ambient conditions | 2.49 Maximum (R) | 0.36 | 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) | 0.17 | Yes |
| 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 | 14.68 Minimum (R) 13.8 (D) | 19.03 | 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 | 12.26 Minimum (R) 11.5 (D) | 16.14 | Yes |
| c) | Maximum drawbar power without ballast, (kW). | Evaluative | Min. 80% of PTO power as referred in 17.1.1(a) of PTO performance | 19.76 Minimum (R) 20.0 (D) | 23.0 | Yes |
| d) | Maximum transmission oil temperature (°C) | Non Evaluative | The declared value should not exceed the maximum value specified by oil company. | 125 (D) | 83 | 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) | 14.14 | 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. | 5.96 Minimum (R) 7.8 (D) | 8.35 | 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) | 10 | 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) | 7.70 Yes |
| 2) | Hot brake | Evaluative | | 10 | 10 (R) | 7.74 Yes |
| b) | Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N) | Evaluative | | 600 | 600 (R) | 294 to 449 Yes |
| *The manufacturer has not recommended ballasting for road test. Therefore, the brake test was conducted under un-ballasted condition only. | | | | | | |



| 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) | 82 | Yes | |
| b) | Maximum noise at operator's ear level dB(A) | Evaluative | As per CMVR | 98 (R) | 95 | Yes | |
| 17.1.6 | Amplitude of mechanical vibrations at : | | | | | | |
| | 1) Left foot rest | Non Evaluative | 100 microns (max) | 100 (R) | 100 | Yes | |
| | 2) Right foot rest | | | 100 (R) | 170 | No | |
| | 3) Seat (with driver seated) | | | -do- | 100 (R) | 50 | Yes |
| | 4) Steering wheel | | | -do- | 100 (R) | 90 | Yes |
| 17.1.7 | Haulage requirements : | | | | | | |
| a) | Gross mass of the trailers, (tones): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 5.0 (D) | 5.0 | Yes | |
| | 2) Four wheel | | | | | | |
| b) | Distance travelled / litre of fuel consumption, (km/l): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 8.0 to 9.0 (D) | 5.96 to 6.02 | No | |
| | 2) Four wheel | | | 8.0 to 9.0 (D) | 5.42 to 5.38 | No | |
| c) | Fuel consumption (ml/km/tonne): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 30 to 35 (D) | 33.24 to 33.55 | Yes | |
| | 2) Four wheel | | | 30 to 35 (D) | 30.73 to 30.98 | Yes | |
| 17.1.8 | Wetland cultivation : | | | | | | |
| | Sealing for the following assemblies: | Evaluative | The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the requirements 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 | |



| 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 - 434 DS PLUS | Yes |
| | 3) Year of manufacture | Evaluative | | -- | 13-A-30 | Yes |
| | 4) Engine number | Evaluative | | -- | E - 3210141 | Yes |
| | 5) Chassis number | Evaluative | | -- | B - 3189310 | Yes |
| | 6) Declaration of PTO power, (kW) | Evaluative | | -- | 25.0 | Yes |
| 17.1.11 | Discard limit for: | | | | | |
| (a) | Cylinder bore diameter, (mm) | Evaluative | To be specified by the manufacturer- | 91.30 | 91.02 to 91.04 | Yes |
| (b) | Clearance between piston & cylinder liner at skirt, (mm) | Non Evaluative | | 0.45 | 0.179 to 0.199 | Yes |
| (c) | Ring end gap (mm): | | | | | |
| | - Top comp. ring. | Evaluative | -do- | 2.0 | 0.35 to 0.40 | Yes |
| | - 2 nd comp. ring. | | -do- | 2.0 | 1.20 to 1.25 | Yes |
| | - Oil ring. | | -do- | 2.0 | 0.60 | Yes |
| (d) | Ring groove clearance (mm): | | | | | |
| | - Top comp. ring. | Evaluative | -do- | 0.20 | 0.147 to 0.148 | Yes |
| | - 2 nd comp. ring. | | -do- | 0.20 | 0.128 to 0.129 | Yes |
| | - Oil ring. | | -do- | 0.20 | 0.045 to 0.047 | Yes |
| (e) | Clearance of main bearings (mm): | | | | | |
| | - Diametrical clearance | Evaluative | -do- | 0.40 | 0.076 to 0.099 | Yes |
| | - Crankshaft end float | Evaluative | | 0.67 | 0.40 | Yes |
| (f) | Clearance of big end bearings, (mm): | | | | | |
| | - Diametrical | Evaluative | -do- | 0.40 | 0.082 to 0.092 | Yes |
| | - Axial | Evaluative | -do- | 0.60 | 0.40 to 0.45 | Yes |
| (g) | Clearance between king pin and bush, (mm) | Non Evaluative | -do- | 0.40 | 0.16 to 0.18 | Yes |
| (h) | Clearance between center pin and bush, (mm) | Non Evaluative | -do- | 0.40 | 0.089 to 0.12 | 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.) | 0.19 | Yes |
| 2. | Seating requirements | Should meet the requirements of IS: 12343-1998 | meets the requirement | Yes |
| 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)] : Conforms
 - 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)] : Does not conform
 - 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 21.7%.
 - ii) The specific fuel consumption corresponding to maximum power was observed as 238 g/kWh against the declaration of 247 g/kWh, which meet the requirement of IS: 12207-2008 with regard to tolerance.
- 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.



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ESCORTS LIMITED, POWERTRAC 434 DS PLUS TRACTOR
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- 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 dimensions of the power take-off shaft Does not meet the requirements of IS: 4931-1995.

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):**

Ingress of mud and / or water was noticed in king pin assembly during puddling operation of the tractor and is not meets the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is not recommended as suitable for wetland operation (Puddling) but meets the MPS requirement.

17.5 Maintenance / Service Problems:

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

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:

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

- i) Operator's Manual in respect of Powertrac - 434 ds plus tractor.
- ii) Spare parts catalogue in respect of Powertrac - 434 ds plus tractor.
- iii) Repair Manual in respect of Powertrac - 434 ds plus 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.



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ESCORTS LIMITED, POWERTRAC 434 DS PLUS TRACTOR
- Commercial (Initial)**18. CITIZEN CHARTER**

| Time frame for Testing & Evaluation as per Citizen Charter | Duration of Test | Whether the Test Report is released within the time frame given in Citizen Charter | Remarks |
|--|--|--|---------|
| 10 Months | 7 Months (April, 2013 to October, 2013) | Yes | None |

TESTING AUTHORITY:

H.L. YADAV
SENIOR AGRICULTURAL ENGINEER

C.R. LOHI
DIRECTOR

Test Report compiled by: **Shri P.RISHI PRAKASH**, Senior Technical Assistant.

19. APPLICANT'S COMMENTS

| Para No. | Our Reference | Applicant's comments |
|----------|---|--|
| 19.1 | 17.6, 17.4.1.3, 17.4.1.4, 17.4.1.5 & 17.4.1.6 | Your valuable comments & suggestions for improvements are well taken. Under our policy of continuous product improvement these aspects are further being looked into & will try to eliminate these deviations soon wherever necessary. |
| 19.2 | 17.4.2.1 | These being studied & corrective action would be taken in near future. |
| 19.3 | 17.4.1.2 | We would be looking into possibility to reduce vibration levels further. However we will only follow IS & CMVR requirements wherever applicable as per IS 12207. |