



**ESCORTS LIMITED, 439 E1
(BRAND NAME - POWERTRAC) TRACTOR**



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि, सहकारिता एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

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T- 1084/1609/2017	ESCORTS LIMITED , 439 E1 (BRAND NAME: POWERTRAC) TRACTOR - Commercial (Variant)
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Manufacturer : M/s. Escorts Limited,
Plot No. 2 & 3, Sector – 13
FARIDABAD – 121 007
HARYANA

Month: April	Test Report No.T- Draft	Year : 2017
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Type of Test : **COMMERCIAL (Variant)**

Test code/Procedure : IS: 5994-1998 (Reaffirmed in March 2009),
IS:9253 (Reaffirmed in September ,2013),
and IS: 12207-2014

Period of Test : March to April, 2017

Test Report No. : **Draft/2017**

Month/Year : **April,2017**

-
- i) The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.
- ii) The data given in this report pertain to the particular machine submitted by the applicant for test.
- iii) The results presented in this report do not in any way attribute to the durability of the machine.
- iv) This report should not be reproduced in part or full without prior permission of the Director, Central Farm Machinery Training and Testing Institute, Budni (M.P.).
- v) **This is a Variant test report should be read in conjunction with the 1st Batch Test Report of base model i.e. "Escorts, Powertrac 439 Tractor" bearing No. T-793/1301, 2011 (September) and report No. T-1009/1533/2016 (Supplementary on "Escorts, Powertrac 439 Tractor")**
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Sl. No	Units	Conversion Factor
1.	Force:	
	1 kgf	9.80665 N 2.20462 lbf
2.	Power:	
	1 hp	1.01387metric hp (Ps) 745.7 W
	1 Ps	735.5 W
	1 kW	1.35962 Ps
3.	Pressure:	
	1 psi	6.895 kPa
	1 kgf/cm ²	98.067 kPa = 735.56 mm of Hg
	1 bar	100 kPa = 10 N/cm ²
	1 mm of Hg	1.3332 m-bar

A B B R E V I A T I O N S	
Apa	As per applicant
TDC	Top Dead Centre
IS	Indian Standard
LHS/RHS	Left Hand Side/ Right Hand Side
Hg	Mercury
Temp.	Temperature
N.R.	Not recorded
Rpm	Revolutions per minute
O.D/I.D	Outer diameter/ Inner diameter
N.A.	Not available/ Not applicable
PTO	Power take-off
R.H.	Relative Humidity

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Manufacturer	: M/s. Escorts Limited, Plot No. 2 & 3, Sector – 13 FARIDABAD – 121 007 HARYANA
Test requested by (applicant)	: The manufacturer
Place of running-in & carried out	: At manufacturer work place
Duration of said running-in (h):	
- Engine	: 20
- Transmission	: 30
Method of Selection	: The tractor was directly submitted by the manufacturer for test. Hence method of selection is not known.

1. SCOPE OF TEST

The “Escorts, Powertrac 439 Tractor” had undergone Initial Commercial Test at this Institute and a Test Report Number **T-541/1030/2006** was released in January, 2006. Subsequently the batch test on **Powertrac-439** tractor undergone and test report released vide test report No. **T-793/1301/2011** in September, 2011. Thereafter to comply additional special characteristics features including optional features the applicant submitted the tractor under supplementary test on base model i.e. “Escorts, Powertrac 439 Tractor” and supplementary test report released vide test report No. **T- 1009/1533/2016; March, 2016**.

The applicant having enclosed a list of following differences in the technical specifications between “Escorts, Powertrac 439 Tractor” Tractor and “Escorts Ltd., 439 E1 (Brand Name: POWERTRAC)Tractor” Tractor and requested to test the “Escorts Ltd., 439 E1 (Brand Name: POWERTRAC)Tractor” as a variant of “Escorts, Powertrac 439 Tractor”.

The major features of Base model and Variant model are listed below:

S. No.	Parameters	Base Model	Variant Model
1.	Make	Escorts limited	Escorts limited
2.	Model	Powertrac 439	439 E1 (Brand name :Powertrac)
3.	Engine Model	E3.215D-3A	E3.234-3A
4.	Compression ratio, (apa)	18.0 ± 5% : 1	17.5 ± 5% : 1
5.	Capacity as specified by the applicant, (cc)	2146	2339
6.	Make & model of fuel filter	Bosch, India & 9 450 030 120	Bosch, India & F 002 H20 187
7.	Numbers of fuel filter	Two	One
8.	Make & model of fuel feed pump	FP/KSG22AD108, F002 A60 040	9 440 030 029
9.	Make & model of fuel Injection pump	F002 A0Z 939, PES3A90D410RS2000	F002 A2Z A08, PES3A90D410RS2000
10.	Make & model of fuel Injectors	Bosch, India & F 002 C70 023 459	Bosch, India & F 002 C70 023 (Holder no.), DSLA 144P 5586 (Nozzle no.)
11.	Injection timing	15 °±1 before TDC	10 °±1 before TDC
12.	Bare radiator capacity ,(l)	3.5	2.7
13.	Total coolant capacity,(l)	7.5	6.1
14.	Method of draft sensing	Through lower link	Through top link

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1	2	3	4
15.	Rear differential & Final Reduction unit:		
	Speed reduction through crown wheel & bevel pinion	4.444:1 (40/9T)	3.727:1 (41/11T)
	Speed reduction through rear final drive	3.750:1 (60/16T)	4.428:1 (62/14T)
16.	Location of brakes system	On rear half axle before final reduction unit.	On rear half axle after final reduction unit.
17.	Type of PTO shaft	Type-II, Not Independent	Type-I, Not Independent
18.	PTO speed corresponding to rated engine speed, rpm	1023 @ 2200 rpm	660@2200 rpm
19.	Engine to PTO speed ratio	2.151:1	3.333:1
20.	Max PTO power ,(Kw)	25.0	27.8
21.	Rear Tyres:		
	Size & ply rating	12.4-28,12PR & 13.6-28,12PR (Optional fitment)	13.6-28,12PR
	Size of wheel rim	W 11 x 28	W 11 x 28
22.	Wheel base ,mm	2045	2020
23.	Overall dimension ,Length, Width & height),mm	3500,1700 & 2165	3290,1725 & 2170

1. Scope of Test

Subsequent to the examination of the case in light of Indian Standard **IS 12207-2014**, the following tests were considered to be carried out:

- Specification checking
- Nominal speed test
- PTO performance test
- Field test (Dry land operation)

2. FUEL AND LUBRICANTS

2.1 Fuel : The High-speed diesel oil supplied by M/s Indian Oil Corporation Limited having density of 0.836 g/cc at 15°C was used.

2.2 Lubricants:

S. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine and Air cleaner oil	SURAKSHA API CF-4 15W40	Oil originally filled in the tractor was not changed
2.	Transmission and hydraulic oil	SURAKSHA API CC SAE- 20W-40	Oil originally filled in the tractor was not changed
3.	Steering housing oil	--do--	--do--
4.	Grease	Ball bearing AP3 Grease	Servo Grease MP

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3. ESSENTIAL TESTS

3.1. SPECIFICATIONS

3.1.1 Tractor:	<u>Base model</u>	<u>Variant model</u>
Make	: Escorts limited	Escorts limited
Model	: Powertrac 439	439 E1
Brand name	: Powertrac	Powertrac
Type	: Four wheel, Rear-wheel drive, Agricultural Tractor	drive, General Purpose,
Year of manufacture	: 15-B-1 (1 st February,2015)	BE (May,2016)
Chassis Serial number	: B-3139664 & T05-3263648	T053299953BE
Country of Origin	: India	India
3.1.2 Engine:		
Make	: Escorts Limited	Escorts Limited
Model	: E3.215D-3A	E3.234-3A
Type	: Four stroke, naturally aspirated, water, cooled, direct injection, diesel engine.	
Serial number	: E -3154587 & E-3292514	E-3335009
Engine speed (Manufacturer's recommended production setting)(rpm) :		
- Maximum speed at no load	: 2475 to 2525	2475 to 2525
- Low idle speed	: 600 to 650	600 to 650
- Speed at maximum torque	: 1200 to 1300	1200 to 1300
Rated speed, (rpm):		
- For PTO use	: 2200	2200
- For drawbar use	: 2200	2200
3.1.3 Cylinder & Cylinder Head:		
Number	: Three	Three
Disposition	: Vertical, Inline	Vertical, Inline
Bore/stroke, (mm)	: 91.0/110.0	95.0/110.0
Capacity as specified by the applicant, (cc)	: 2146	2339
Compression ratio, (apa)	: 18.0 ± 5% : 1	17.5 ± 5% : 1
Type of cylinder head	: Monoblock	Monoblock
Type of cylinder liners	: Wet, replaceable	Wet, replaceable
Type of combustion chamber	: Direct injection, open chamber in piston crown.	
Arrangement of valves	: Overhead, inline	Overhead, inline
Valve clearance (cold/hot):		
- Inlet valve, (mm)	: 0.3 / 0.4	0.3 / 0.4
- Exhaust valve, (mm)	: 0.3 / 0.4	0.3 / 0.4
3.1.4 Fuel System:		
Type of fuel feed system	: Gravity and forced feed	Gravity and forced feed
3.1.4.1 Fuel tank:		
Capacity, (l)	: 45.6	44.0
Location	: Above clutch housing	Above clutch housing
Provision for draining of sediments/ water	: Not provided, however water separator is provided.	Not provided, however water separator is provided.
Material of fuel tank	: Steel sheet	Steel sheet

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	<u>Base model</u>	<u>Variant model</u>
3.1.4.2 Water separator	: Provided	Provided
Make	: Hilux	Hilux
Type	: Inverted funnel, gravity separation.	Inverted funnel, gravity separation.
Capacity, (l)	: 0.50	0.50
Location	: On RHS, In between fuel tank and fuel filter.	On RHS, In between fuel tank and fuel filter.
3.1.4.3 Fuel feed pump:		
Make	: Bosch, India	Bosch, India
Type	: Plunger	Plunger
Model/Group combination No.	: FP/KSG22AD108, F002 A60 040	9 440 030 029
Provision of sediment bowl	: Provided (metallic)	Provided (metallic)
Method of drive	: Through timing gears	
3.1.4.4 Fuel filters:		
Make	: Bosch, India	Bosch, India
Model/Group combination No.	: 9 450 030 120	F002 H20 187
Number	: Two	One
Type of elements	:	
-Primary	: Paper	Paper
-Secondary	: Cloth	Not applicable
Capacity of final stage filter, (l)	: 0.50	0.50
3.1.4.5 Fuel Injection pump:		
Make	: Bosch, India	Bosch, India
Model/Group combination No.	: F 002 A0Z 939 PES3A90D410RS2000	F 002 A2Z A08 PES3A90D410RS2000
Type	: Inline, Plunger	Inline, Plunger
Serial number	: 46040459	62080665
Method of drive	: Through timing gears	Through timing gears
3.1.4.6 Fuel injectors:		
Make	: Bosch, India	Bosch, India
Model/Group combination No.	: F002 C70 023 459	F 002 C70 023 Nozzle no., DSLA 144P 5586 (Holder no)
Type	: Multi hole (five holes)	Multi hole (five holes)
Manufacturer's production pressure setting, (MPa)	: 24.5 to 25.30	24.5 to 25.30
Injection timing	: 15 °±1 before TDC	10 °±1 before TDC
Firing order	: 1 – 2--3	1-2-3
3.1.4.7 Governor:		
Make	: Bosch, India	Bosch, India
Model/Group combination No.	: RSV325...1100A4C172 5L	RSV325...1100A4C1725 L
Type	: Mechanical, centrifugal, variable speed	
Rated engine speed, (rpm)	: 2200	2200
Governed range of engine speed (rpm)	: 600 to 2525	600 to 2525

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3.1.5	Air Intake system:	<u>Base model</u>	<u>Variant model</u>
3.1.5.1	Pre-cleaner	:	:
	Make	: Not Provided	Not Provided
	Type	: Centrifugal with transparent dust collector.	
	Location	: Above main air cleaner inlet tube, outside the bonnet.	
3.1.5.2	Air cleaner:		
	Make	: Escorts(apa)	Escorts
	Type	: Oil bath	Oil bath
	Location	: In the front of the radiator , under the bonnet	
	Range of suction pressure at maximum power, (kPa)	: 1.5 to 1.6	4.4 to 4.5
	Oil change period	: After every 50 hours of operation during normal working condition and after every 10 hours of operation in dusty condition.	
3.1.6	Exhaust System:		
	Type of silencer	: Updraft (cylindrical)	Updraft (cylindrical)
	Position of silencer outlet with respect to SIP, (mm):		
	- Vertical	: 840	855
	- Longitudinal	: 1570	1455
	- Lateral	: 385 (on LHS)	350 (on LHS)
	Range of exhaust gas pressure at maximum power , (kPa)	: 5.1 to 5.33	5.9 to 6.0
	Provision of spark arrestor	None	
	Provision against entry of rain water	A bend is provided at the top of silencer.	
3.1.7	Lubricating system:		
	Type	: Force feed and splash	Force feed and splash
	Oil sump capacity, (l)	: 5.0	4.8
	Total lub oil capacity, (l)	: 6.5	5.9
	Oil change period	: First change after 50 hours and subsequently after every 300 hours of operation.	
	Cooling device, (if any)	: None	
	Filters:		
	Type	: Full flow, spin on throw away, paper element.	
	Number	: One	One
	Pump:		
	Type	: Gear	
	Method of drive	: Through a gear mounted on crank shaft.	
	Pressure release setting, (kPa)	: 275 to 314	275 to 314
	Minimum permissible pressure, (kPa)	: 98	98
3.1.8	Cooling system:		
	Type	: Forced circulation of coolant	
	Coolant as recommended	: Not provided	Not provided
	Details of pump	: Centrifugal, semi open impeller of 75.0 mm diameter having eight vanes, and driven through crankshaft pulley by a 'V'-belt common to alternator.	
	Details of fan	: Suction type having six polypropylene blades of 378 mm diameter, and mounted on water pump shaft.	

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		<u>Base model</u>	<u>Variant model</u>
	Means of temperature control	: Thermostat	Thermostat
	Bare radiator capacity, (l)	: 3.50	2.7
	Capacity of expansion flask, (l)	: 0.75	0.75
	Total coolant capacity, (l)	: 8.15	6.10
	Radiator cap pressure,(kPa)	: 49	49
3.1.9	Starting System:		
	Type	: 12V, DC, Electrical	12V, DC, Electrical
	Aid for cold starting	: None	None
	Any other device provided for easy starting.	: None	None
3.1.10	Electrical System:		
3.1.10.1	Battery:		
	Make & Model	: Amaron & TRA 500 R	Amaron & TRA 500 R
	Type	: Lead acid	Lead acid
	Capacity and rating	: 12V, 75 Ah at 20 hours discharge rate	
	Location	: On LHS of clutch housing in separate metallic box.	
3.1.10.2	Starter:		
	Make	: Panalfa	Panalfa
	Model	: 155-0704	155-0704
	Type	: Pre-engaging solenoid operated	
	Capacity and rating	: 12V, 2.2 kW	12 V,2.2 kW
	Serial Number	: 26024035A	Not available
3.1.10.3	Generator:		
	Make	: Autolek	Autolek
	Model	: ALT4009H	ALT4009H
	Type	: Alternator	Alternator
	Serial number	: Not available	Not available
	Output rating	: 12V, 35 A	12 V,35 ampere
	Method of drive	: Through a cogged V-belt common to water pump from crank shaft pulley.	
3.1.10.4	Voltage regulator	: In built in alternator	In built in alternator

Description	No. & capacity of bulbs		Height of the centre of beam above ground level, (mm)		Size of beam, (mm)		Distance between centre of the beam and outside edge of tractor at standard rear track setting, (mm)	
	<u>Base model</u>	<u>Variant model</u>	<u>Base model</u>	<u>Variant model</u>	<u>Base model</u>	<u>Variant model</u>	<u>Base model</u>	<u>Variant model</u>
1	2	3	4	5	6	7	8	9
Front Lights:								
- Head lights	2,12V,4 5/40W	2,12V,35/ 35 W	960	990	125 Ø	125 Ø	439	535
- Parking lights	2, 12V, 5W	2, 12V, 5W	1255	1240	60 X 65	65X 75	208	155
- Turn Indicators- cum-Hazard lights	2, 12V,21 W	2, 12V,21W	1255	1240	70 X 65	65X 70	95	90
- Reflectors (white)	2	2	1255	1240	30 X 55	40X60	155	200

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1	2	3	4	5	6	7	8
Rear lights:							
-Tail light-cum-brake light	2, 12V, 21/5W	1290	1250	60 x 65	65X75	208	155
- Turn Indicators-cum-Hazard lights	2,12V, 21W	1290	1250	70 x 65	65X65	95	90
- Plough light (on RHS mudguard)	1, 12V, 35W	1400	1420	120 Ø	120 Ø	355	320
- Reflectors (Red)	2 (Red)	1290	1250	40 x 60	40x65	153	200
Registration plate Light (RHS)	--	Part of rear combination assembly					

3.1.11 Instrument panel details:-

	<u>Base model</u>	<u>Variant model</u>
i) Engine speed meter {analog type (0-25) x 100 rpm}	Provided	Provided
ii) Digital cumulative run hour meter	Provided	Provided
iii) Coolant temperature gauge (with colour zones)	Provided	Provided
iv) Fuel level gauge (with colour zones).	Provided	Provided
v) Lubricating oil pressure indicator	Provided	Provided
vi) Main switch (key-turn type)	Provided	Provided
vii) Light switch (Rotary type)	Provided	Provided
viii) Two way switch for turn indicators	Provided	Provided
ix) Hazard light switch	Provided	Provided
x) Turn-cum-hazard indicator lights tell-tale	Provided	Provided
xi) Battery charging warning indicator light	Provided	Provided
xii) Head lamp (Long beam) 'ON' indicator light	Provided	Provided
xiii) Horn push button	Provided	Provided
xiv) Hand accelerator lever	Provided	Provided
xv) Steering control wheel	Provided	Provided
xvi) Engine stop knob	Provided	Provided
xvii) Rear view mirror.	Provided	Provided

3.1.12 Transmission System

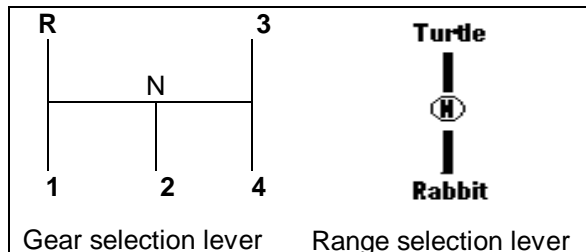
3.1.12.1 Clutch:

	<u>Base model</u>	<u>Variant model</u>
Make	Clutch Auto	Clutch Auto
Type	Single , dry friction plate type	Single , dry friction plate type
No. of friction plate, (s)	One	One
Size, (mm)	280 Φ/ 165 Φ	280 Φ/ 165 Φ
Method of operation	By pressing the foot pedal provided on LHS of operator's seat	

3.1.12.2 Gear box:

Make	Escorts (apa)	Escorts (apa)
Model	Not specified	
Type	Mechanical, constant mesh gears	

Gear shifting pattern (In case of base & variant model)



Location of gear shifting levers : Centre shifting, main & range selector lever provided in front of operator's seat.

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3.1.12.3 No. of speeds:	<u>Base model</u>	<u>Variant model</u>
- Forward	: 08	08
- Reverse	: 02	02
Oil capacity, (l)	: 27.0 (Common with differential, rear axle hydraulic and Brake systems)	35.75 (Common with differential, rear axle hydraulic and Brake systems)
Oil changing period	: First change after 150 hours subsequently after every 600 hours of operation	
3.1.12.4 Differential unit:		
Type	: Crown wheel & pinion with differential unit accommodated inside the differential housing.	
Reduction through crown wheel and bevel pinion	: 4.444 : 1 (40/9 T)	3.727 : 1 (41/11T)
Differential lock:	: Not Provided	Not Provided
3.1.12.5 Rear axle & final drive:		
Type	: Bull gear and pinion accommodated inside the portal housing.	Bull gear and pinion accommodated inside the rear axle housing.
Reduction through final drive	: 3.750 : 1 (60/16 T)	4.428:1 (62/14T)
Oil capacity of final drive, (l)	1.0 (on each side)	35.75 (Common with differential, hydraulic and Brake systems)
Oil changing period	: First change after 150 hours subsequently after every 600 hours of operation.	
3.1.13 Power lift:		
Make	: Not specified	Escorts (apa)
Type	: Open centre, Live, ADDC	
No. and type of cylinder	: One, single acting	
Type of linkage lock for transport	: Not provided	
3.1.13.1 Hydraulic pump:		
- Make	: Rexorth	EATON (apa)
- Type	: Gear	Gear
- Location & drive	: On LHS of engine, through timing gears.	
No. & type of filters	: One, full flow, spin-on paper element.	
Hydraulic oil capacity, (l)	: 27.0 (Common with gear box, differential, rear axle and brake system).	35.75 (Common with gear box, differential, rear axle and brake system).
Oil change period	: First change after 150 hours subsequent change after every 600 hours of operation	
Provision for external tapping	: Provided	Provided
Details of control levers	: i) Main control lever (Yellow) ii) Selection lever (Black) iii) External circuit lever (Red)	
Method of draft sensing	: Through lower link	Through top link

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3.1.13.2 Three point linkage:

S. No.	Observations	As per IS: 4468- (Part-1) -1997, (Cat.I / Cat.II), (mm)	As measured (mm)		Remarks in case of Variant model	
			Base model	Variant model		
1	2	3	4	5	6	
I.	Upper hitch points:					
	a)	Dia of hitch pin hole	19.30 to 19.50 / 25.70 to 25.90	25.8	19.48	Conforms to Cat.I
	b)	Width of ball	44.0 (max.) / 51.0 (max.)	51.0	50.95	Conforms to Cat.II
II.	Lower hitch points:					
	a)	Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	29.0	28.8	Conforms to Cat.II
	b)	Width of ball	34.8 to 35.0 / 44.8 to 45.0	45.0	44.97	Conforms to Cat.II
III.	Lateral distance from lower hitch point to centre line of tractor.		359 / 435	364	364	Does not conform
IV.	Lateral movement of lower hitch points		100 (min) / 125 (min)	160	170	Conforms to Cat.I&II
V.	Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)		450 to 575 / 550 to 625	655	530	Conforms to Cat.I
VI.	Transport height		820 (min)/ 950 (min)	855	855	Conforms to Cat.I&II
VII.	Power range (without force)		560(min)/ 650 (min)	560	630	Conforms to Cat.I
VIII.	Leveling adjustment		100 (min)/ 100 (min)	330	235	Conforms to Cat.I&II
IX.	Lower hitch point clearance		100 (min)/ 100 (min)	160	150	Conforms to Cat.I&II
X.	Lower hitch point height		200 (max)/ 200 (max)	200	200	Conforms to Cat.I&II

1.13.3 Linkage geometry dimensions [Refer Fig.-1(a)] (Variant Model):				
The following are dimensions observed, corresponding to 610 mm as tyre dynamic radius index:				
Sl. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
(1)	(2)	(3)	(4)	(5)
1.	Length of lower link	A	745	745
2.	Length of lift arm	B	245	245
3.	Length of lift rods	C	545 to 625	555
4.	Length of top link	D	550 to 700	525
5.	Distance of lift rod connection point from pivot point of lower link.	E	430	410
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	105, behind	105, behind
	-Vertically	G	115, below	115, below

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(1)	(2)	(3)	(4)	(5)
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	325, behind	325, behind
	-Vertically	J	275, above	275, above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	115, forward	115, forward
	-Vertically	L	350, above	350, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	80 to 375	220 above
	- In low position	N	-560 to -245	410, below
10.	Height of lower link hitch points when locked in transport position		245, above	

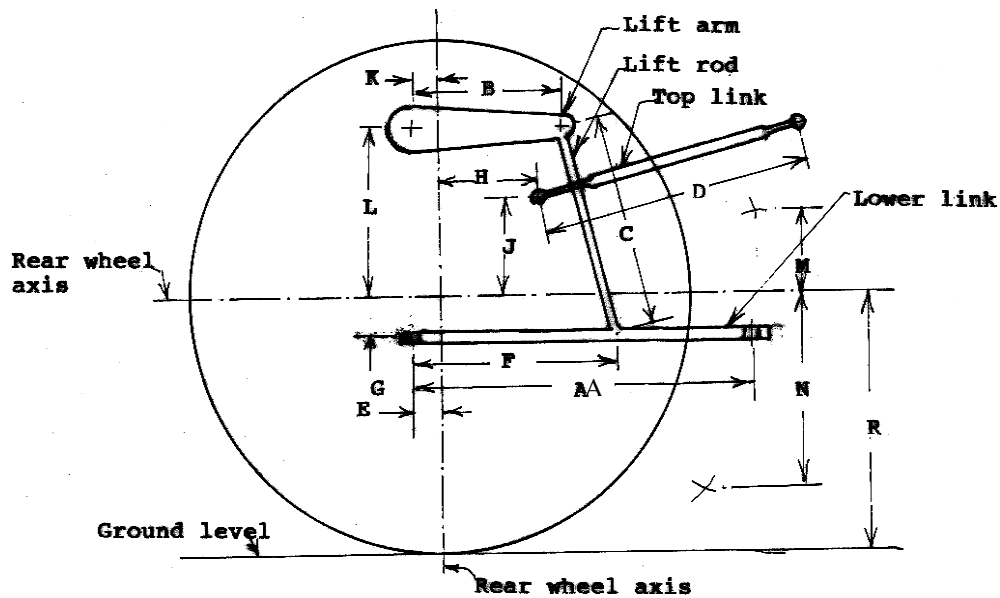


Fig. 1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY VARIANT MODEL

3.1.13.3 Drawbar:				
3.1.13.3.1 Linkage Drawbar [Refer Fig.1 (b)] :				
Notation	As per IS: 12953-1990, (Cat.I) / (Cat.II), (mm)	As measured, (mm)		Remarks in case of variant model
		Base model	Variant model	
A	683 ± 1.5 / 825 ± 1.5	684	683	Conforms to cat-I
B	75 (min) / 75 (min)	76.32	75.20	-- do --
C	30 (min) / 30 (min)	32.34	30.34	-- do --
D \varnothing	21.79 to 22.00 / 27.79 to 28.00	27.91	27.98	Conforms to cat-II
E	39.0 (min) / 49.0 (min)	56.0	57.20	-- do --
F \varnothing	12.0 (min) / 12.0 (min)	12.0	12.0	-- do --
G	15.0 (min) / 15.0 (min)	15.7	15.0	-- do --
H \varnothing	25 ± 1 / 25 ± 1	25.0	24.4	-- do --
J	80 ± 1.5 / 80 ± 1.5	80.0	79.7	-- do --
No. of holes	7 / 9	07	07	-- do --

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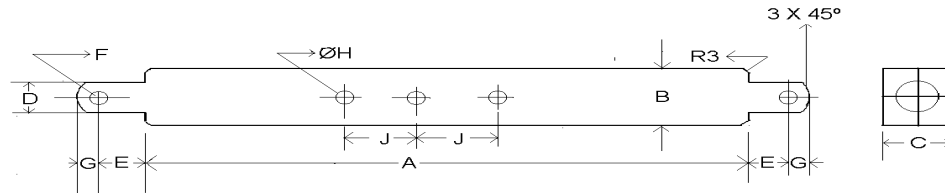


Fig. 1(b): DIMENSIONAL NOTATIONS FOR LINKAGE TYPE DRAWBAR

3.1.13.3.2	Swinging drawbar	:	Not provided
3.1.14	Power take-off shaft:		
	Type	:	<u>Base model</u> <u>Variant model</u> Type-II, Not Independent Type-I, Not Independent
	Method of engaging	:	By a hand lever provided on LHS of operator's seat.
	No. of shaft,(s)	:	One One
	PTO speed corresponding to rated engine speed, (rpm):	:	1023 660
	Distance behind rear axle, (mm)	:	155 315
	Engine to PTO speed ratio	:	2.151 : 1 3.333 : 1

3.1.14.1 Specifications of Power Take-Off Shaft:

Specification	As per IS: 4931-1995 (Type-I & II)		As observed		Remarks in case of variant model
			<u>Base model</u>	<u>Variant model</u>	
1	2	3	4	5	6
Nominal speed, (rpm)	540 ± 10	1000 ± 25/	1000 rpm of PTO corresponds to 2151 rpm of engine.	540 rpm of PTO corresponds to 1801 rpm of engine.	Conforms
No. of splines	6	21	21	6	Conforms
Direction of rotation	Clockwise	Clockwise	Clockwise	Clockwise	Conforms
Location	The position of the centre of the end of pto shaft shall be within 50mm to right or left of the centre line of the tractor.		In the centre line of the tractor	In the centre line of the tractor	Conforms
Dimensions, (mm) [See Fig.2(a):					
DØ	34.79 ± 0.06	34.67 ± 0.20	34.67	34.63	Conforms
dØ	28.91 ± 0.05	31.1 (min)	31.42	28.95	Conforms
BØ	29.4 ± 0.1	29.35 ± 0.05	29.35	29.5	Conforms
AØ (optional)	8.3 ± 0.1	N.A.	N.A	8.2	Conforms
W	8.69 - 0.09/ - 0.16	2.494 - 0.125 - 0.188	2.38	8.6	Conforms
a	7	5	5	7	Conforms
b (optional)	25 ± 0.5	N.A.	N.A	25.06	Conforms
c	38	25.5	25.5	38	Conforms
X	30°	30°	30°	30°	Conforms
B	76 (min)	64 (min)	72	85	Conforms
h	450 to 675	550 to 775	532	545	Conforms

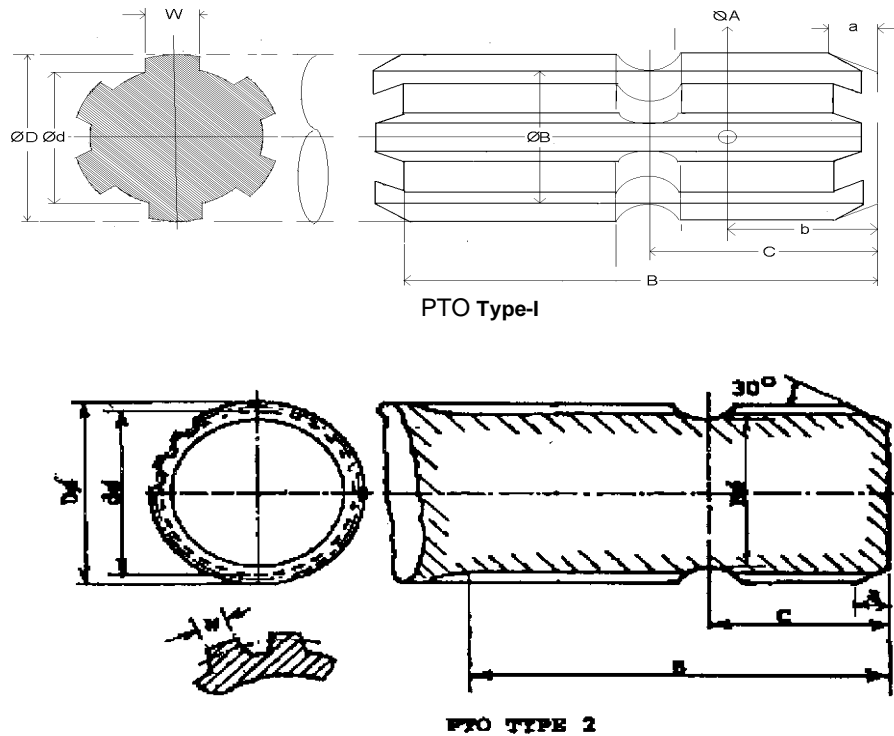


Fig.2 (a): DIMENSIONAL NOTATIONS FOR TYPE-I & II POWER TAKE-OFF SHAFT

		<u>Base model</u>	<u>Variant model</u>
1.14.2	Master Shield of Power Take-Off Shaft:	Provided	Not provided
3.1.15	Towing hitch:		
3.1.15.1	Front		
	Type	Clevis	Clevis
	Location	At front of engine support.	
	Height above ground level, (mm)	635	660
	Type of adjustment	Fixed	Fixed
	Dia of pin hole, (mm)	59.3	59.8
	Width of clevis, (mm)	35.3	35.3
3.1.15.2	Rear		
	Type	Clevis	Clevis
	Location	At rear of transmission housing	
	Height above ground level, (mm):		
	- Maximum	695	705
	- Minimum	440	495
	- No. of positions	8	8
	- Type of adjustment	By changing the position of hitch & reversing hitch on its mounting bracket.	
	Distance of hitch point, (mm):		
	-From rear wheel centre	275	450
	-From power take-off shaft end	120	130
	Dia of pin hole, (mm)	72.82	74.0
	Width of clevis, (mm)	35.70	32.3

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3.1.16	Steering:	<u>Base model</u>	<u>Variant model</u>
	Make	: ZF, India	: RANE
	Type	: Mechanical, re-circulating balls & nut with single drop arm.	
	Location of control wheel	: Above gear box housing.	
	Method of operation	: Manual, by steering control wheel	
	Diameter of steering control wheel, (mm)	: 430	: 430
	Steering oil capacity, (l)	: 0.6	: 0.6
	Lubricant change period	: First change after 150 hours subsequently after every 850 hours of operation.	
3.1.17	Brakes:		
3.1.17.1	Service Brake:		
	Make	: JMI	: JMI
	Type	: Mechanical, oil immersed brake.	
	Location	: On rear half axle before final reduction unit.	: On rear half axle after final reduction unit.
	No. of disc(s)	: Four (each wheel side)	
	Area of liners, (cm ²)	: 928.82 (each wheel side)	: 931.50 (each wheel side)
	Material of liners	: Non asbestos	
	Method of operation	: Manual, individual/combined operation by RHS foot pedal.	
3.1.17.2	Parking Brake:		
	Type	: Pawl and ratchet arrangement	
	Location & Method of operation	: Service brake acts as parking brake when locked in position by a hand lever provided on RHS of operator seat.	
3.1.18	Wheel Equipment:-		
3.1.18.1	Steering Wheel(s):		
	Make	: Good Year	: Good Year
	Number(s)	: Two	: Two
	Type of tyre	: Pneumatic, ribbed	: Pneumatic, ribbed
	Size	: 6.00 -16	: 6.00 -16
	Ply rating	: 8	: 8
	Maximum permissible loading capacity of each tyre at 196 kPa pressure, (kgf)	: 406	: 406
	Recommended inflation pressure, kPa :		
	- for field work	: 196	: 196
	- for transport	: 196	: 196
	Track width, (mm)	: 1345 (Std) & 1545	: 1360 (Std) & 1560
	Method of changing track width	: By reversing the wheel discs.	
	Make & size of rims	: SSWL & 4.50 E x 16	: SSWL & 4.50 E x 16
3.1.18.2	Drive wheel (s) :		
	Make	: Good Year	: Good Year
	Number	: Two	: Two
	Type of tyre	: Pneumatic, traction	: Pneumatic, traction
	Size	: 12.4-28 (Standard fitment),13.6-28 (Optional fitment)	: 13.6-28
	Ply rating	: 12 PR	: 12 PR
	Maximum permissible loading capacity of each tyre at 108 kPa pressure, (kgf)	: 996	: 996

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	<u>Base model</u>	<u>Variant model</u>
Recommended inflation pressure, (kPa):		
- For field work	: 100	100
- For transport	: 108	108
Track width, (mm)	: 1345 (std.),1435, 1565, 1615, 1775, 1835 and 1955	1250,1360(std),1450,1 560,1710 ,1770 &1890
Make & size of wheel rim	: SSWL & W 11 x 28	
3.1.18.3 Wheel base, (mm)	: 2045	2020
Method of changing wheel base, if any, and range	: None	None
3.1.19 Operator's seat:		
Make	: HILTA	SIETZ
Type	: Cushioned with back rest	
Type of Suspension	: Two helical coil springs	
Type of Damping	: Hydraulic shock absorber	
Range of adjustment, (mm):		
Vertical	: Nil	(Three fixed height at 30 mm spacing
Lateral	: Nil	Nil
Longitudinal	: ±30	±30
3.1.20 Provision for safety and comfort of operator:		
3.1.20.1 Operator's Seat:		
Meets the minimum requirements of IS: 12343-1998, (Re-affirmed in March, 2009) except the following:		
	<u>Base model</u>	<u>Variant model</u>
i)	Meets the minimum requirements	i) Meets the minimum requirements
3.1.20.2 Conformity with IS: 6283 (Part 1 & 2)-1998 (Re-affirmed in March, 2009) :		
Controls and displays are identifiable with symbols meets the requirements as per IS : 6283 (Part 1&2) – 1998		
	<u>Base model</u>	<u>Variant model</u>
i)	Meets the minimum requirements	i) Meets the minimum requirements
3.1.20.3 Conformity with IS : 8133-1983 (Re-affirmed in March, 2009) :		
Location and movement of various controls meets the requirement of IS : 8133-1983, except the following:		
	<u>Base model</u>	<u>Variant model</u>
i)	Provision of safety against accidental start of engine has not been provided.	i) Provision of safety against accidental start of engine has not been provided.
ii)	The fuel shut-off lever does not remain in stop position	ii) The fuel shut-off lever does not remain in stop position
3.1.20.4 Conformity with IS:12239 (Part-1)-1996 (Re-affirmed in March,2007) :		
Meets the requirements of IS: 12239 (Part-1) – 1996, except the following:		
	<u>Base model</u>	<u>Variant model</u>
i)	The spark arrester has not been provided in the exhaust system.	i) The spark arrester has not been provided in the exhaust system.
ii)	Provision of vertical retainers at both sides of clutch pedal	ii) Width of step does not meet the requirement.
3.1.20.5 Conformity with IS:12239 (Part-2)-1999 (Re-affirmed in March,2009) :		
Meets the requirements of IS:12239 (Part-2)-1999, except the following:		
	<u>Base model</u>	<u>Variant model</u>
i)	Meets the minimum requirements	Meets the minimum requirements
3.1.20.6 Conformity with IS: 14683 – 1999 (Re-affirmed in March, 2009) :		
Lightings provided on the tractor meets the requirements and conform to IS: 14683-1999.		

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3.1.21	Mass of tractor, (kg):	Unballasted	Unballasted
	- Front	: 760	780
	- Rear	: 1110	1120
	- Total	: 1880	1900

3.1.22	Over all dimensions:		
	- Length	: 3500	3290
	- Width	: 1700	1725
	- Height (with exhaust pipe)	: 2165	2170
	Minimum ground clearance, (mm)	: 340 (below transmission housing)	

3.1.23 Labelling of tractor:

The labelling plate riveted on LHS of the fender provides the following information:

Name of Manufacturer	:	M/s.ESCORTS LIMITED (AGRI MACHINERY GROUP) FARIDABAD
Make	:	ESCORTS LIMITED
Model	:	439 E1
Brand name	:	Powertrac
Year of manufacture	:	BE (i.e. May,2016)
Engine Serial Number	:	E3335009
Chassis Serial Number	:	T053299953BE
Maximum PTO Power, kW (hp)	:	27.8 (37.2)
Specific fuel consumption, gm/kWh(g/hph)	:	234 (174)

3.1.24	Number of external lubricating points:		
	- Oiling	: Nil	Nil
	- Grease cups	: 02	02
	- Grease nipples	: 14	17

3.1.25	Colour of tractor:		
	Chassis & engine	: Black	Black
	Sheet metal:	: Blue	Blue
	Mudguard & Rim	: Off white	Off white

3.2 NOMINAL SPEED TEST

Movement	Gear No.	No. of engine revolutions for one revolution of driving wheel		Nominal speed at rated engine speed when fitted with 12.4-28 size tyres 590 mm radius index, (kmph).		Variation in nominal speed (%)
		Base model	Variant model	Base model	Variant model	
Forward	L1	184.16	187.2	2.66	2.70	1.5
	L2	131.26	119.5	3.73	4.23	13.4
	L3	82.67	77.7	5.92	6.51	10.0
	L4	51.74	51.3	9.46	9.85	4.1
	H1	59.26	60.8	8.26	8.31	0.6
	H2	42.31	38.3	11.57	13.21	14.2
	H3	26.62	24.9	18.38	20.28	10.3
	H4	16.70	16.5	29.30	30.63	4.5
Reverse	RL	140.77	154.5	3.48	3.27	-6.0
	RH	45.31	49.9	10.80	10.13	-6.2

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3.3 PTO PERFORMANCE TEST

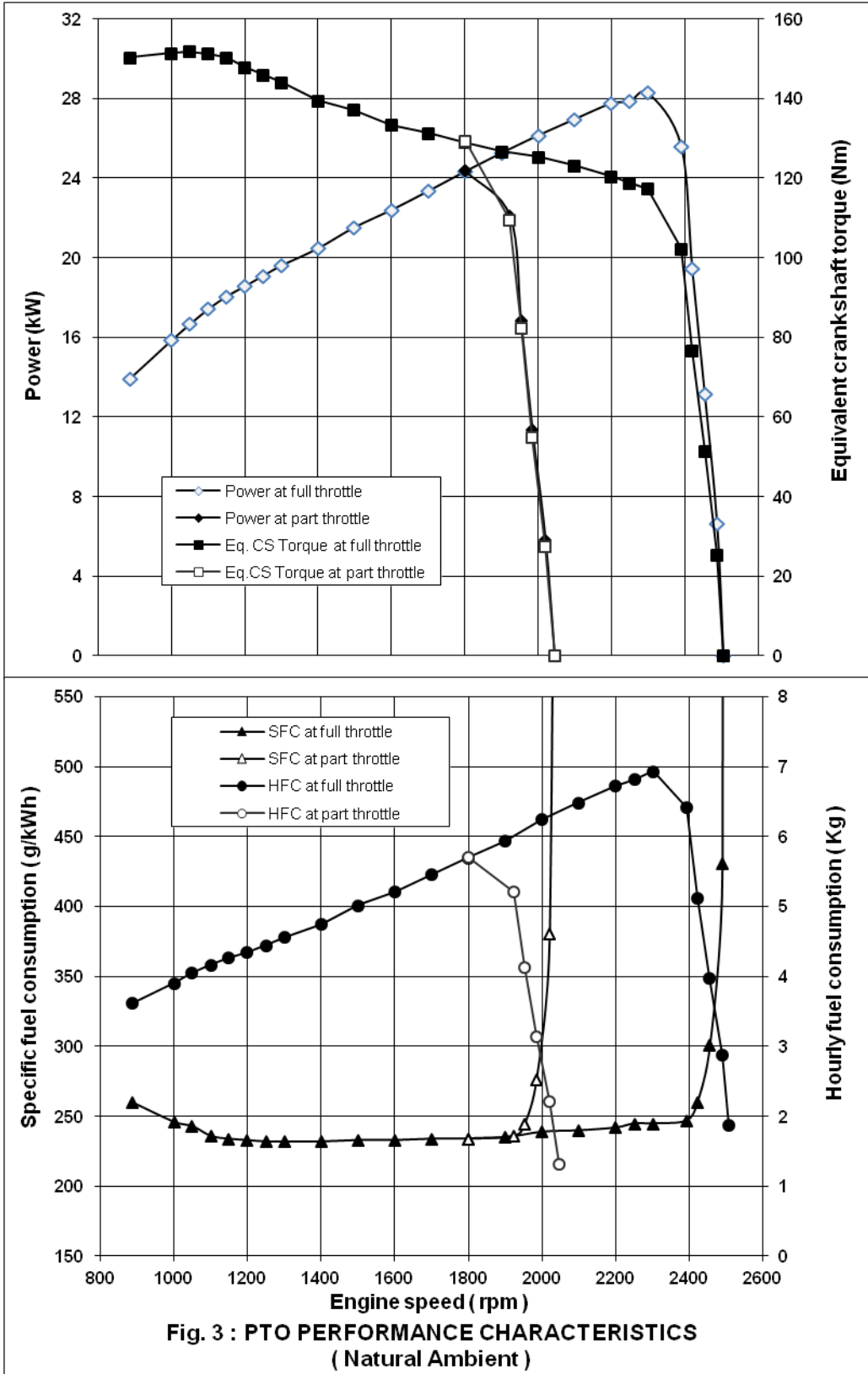
S. No.	Particulars	Base model	Variant model
1	Date(s) of test	22.02.2016 & 23.02.2016	25.03.2017 & 26.03.2017
2	Tractor run at this Institute prior to start of PTO test, (h)	0.25	----
3	Dynamometer test bench used	SAJ-AG 250 Eddy current.	SAJ-AG 400 Eddy current.

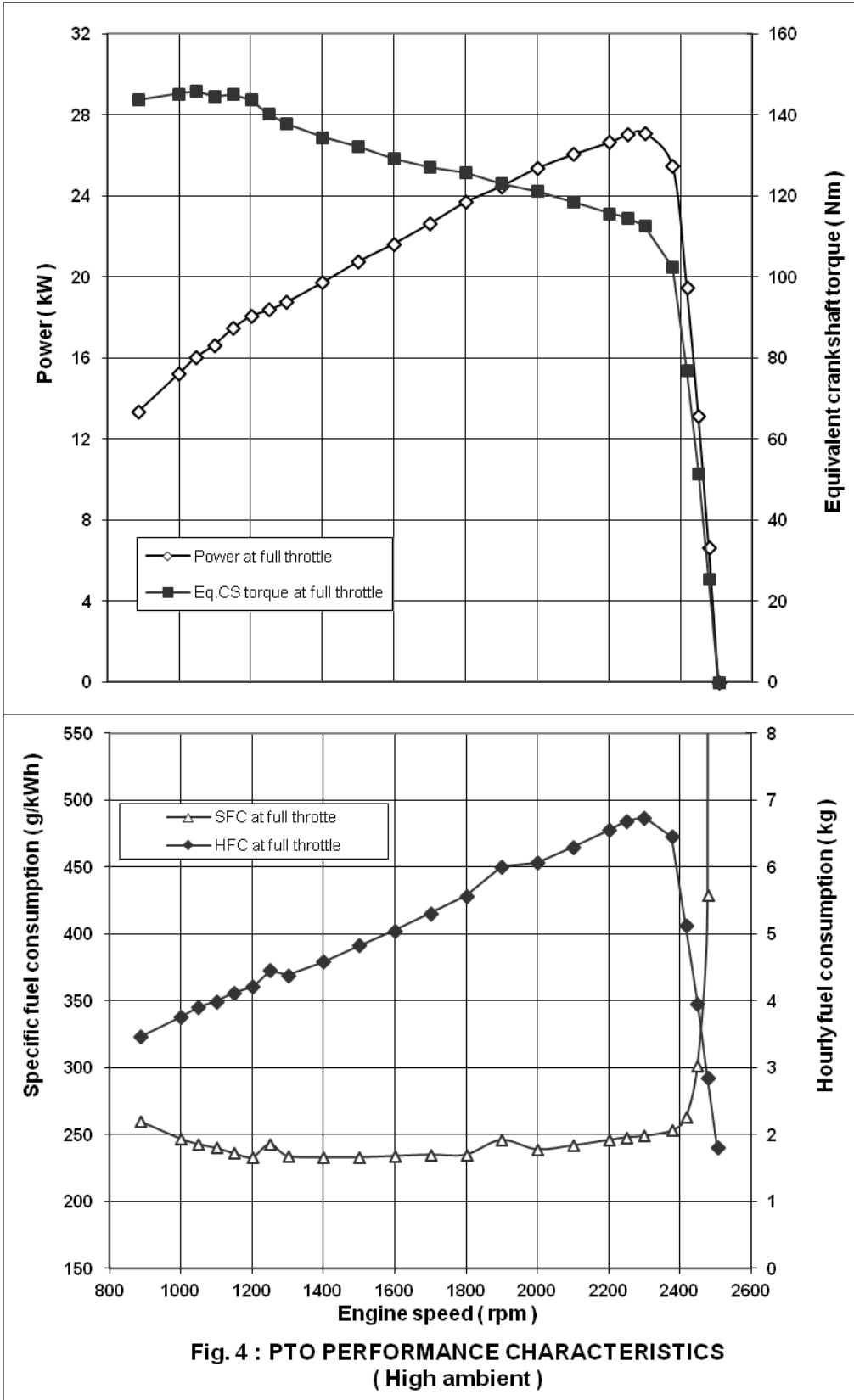
Maximum power two hours test under natural ambient condition test was conducted. The results of Power take-off performance test under natural ambient & high ambient of Base & Variant Model are tabulated in **Table-1**.

Table-1

	Power (kW)	Speed, (rpm)		Fuel Consumption			Specific energy, (kWh/l)
		PTO	Engine	(l/h)	(kg/h)	(kg/kWh)	
1	2	3	4	5	6	7	8
a) Maximum power – 2 hours test (under natural ambient condition):							
Base model supplementary test	26.2	1023	2200	7.28	6.09	0.232	3.60
Variant model	28.3	690	2300	8.30	6.94	0.245	3.41
	27.1	690	2300	8.06	6.74	0.250	3.36*
b) Power at rated engine speed (2200 rpm):							
Base model supplementary test	26.2	1023	2200	7.28	6.09	0.232	3.60
Variant model	27.8	660	2201	8.05	6.73	0.242	3.45
	26.6	660	2200	7.83	6.55	0.246	3.40*
c) Power at standard power take-off speed (540± 10 rpm):							
Variant model	24.4	540	1800	6.82	5.71	0.234	3.58
d) Varying loads at rated engine speed:							
i) Torque corresponding to maximum power available at rated engine speed:							
Variant model	27.8	660	2201	8.05	6.73	0.242	3.45
ii) 85% of the torque obtained in (i):							
Variant model	25.6	718	2391	7.68	6.42	0.251	3.34
iii) 75% of the torque obtained in (ii):							
Variant model	19.5	726	2421	6.13	5.13	0.263	3.17
iv) 50% of the torque obtained in (ii):							
Variant model	13.2	737	2455	4.75	3.98	0.301	2.77
v) 25% of the torque obtained in (ii):							
Variant model	6.6	747	2489	3.45	2.88	0.434	1.93
vi) Unloaded:							
Variant model	0.02	752	2506	2.24	1.87	93.500	0.009
f) Varying loads at standard PTO speed (540 ± 10 rpm):							
i) Torque corresponding to maximum power available at standard PTO speed:							
Variant model	24.4	540	1800	6.82	5.71	0.234	3.58
ii) 85% of the torque obtained in (i):							
Variant model	22.1	577	1923	6.23	5.21	0.236	3.55
iii) 75% of the torque obtained in (ii):							
Variant model	16.9	586	1953	4.95	4.14	0.245	3.41
iv) 50% of the torque obtained in (ii):							
Variant model	11.4	595	1984	3.77	3.15	0.276	3.03
v) 25% of the torque obtained in (ii):							
Variant model	5.8	606	2020	2.66	2.22	0.381	2.19
vi) Unloaded:							
Variant model	0.01	614	2045	1.58	1.32	13.200	0.006

* Under high ambient conditions





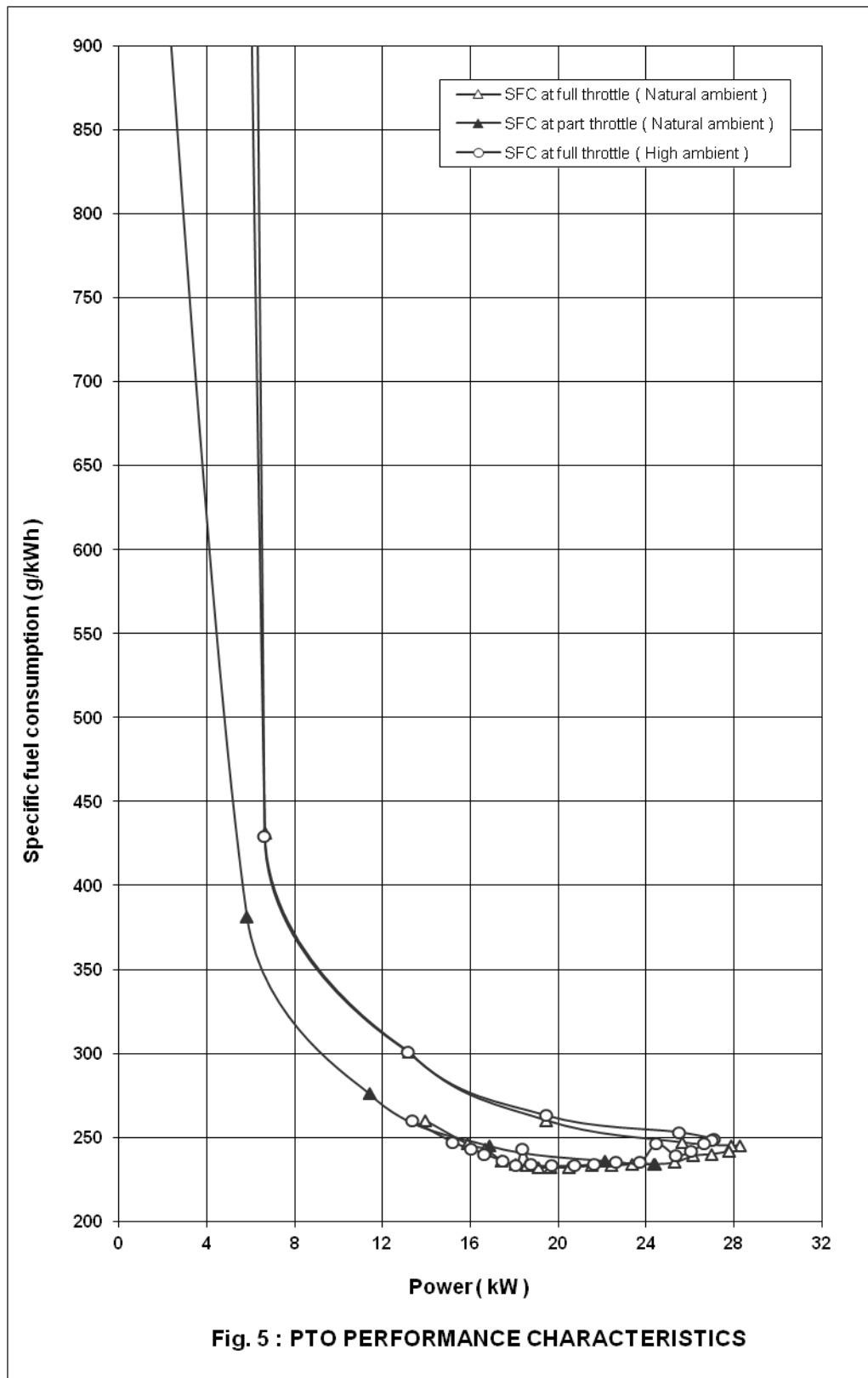


Fig. 5 : PTO PERFORMANCE CHARACTERISTICS

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Sl. No.	Parameters	Base model (T-793/1301/September/2011)		Variant model	
		Natural Ambient	High Ambient	Natural Ambient	High Ambient
1	2	3	4	5	6
i)	No load maximum speed, (rpm)	2482	2469	2506	2505
ii)	Equivalent crankshaft torque at maximum power (Nm)	110.3	106.1	117.5	112.5
iii)	Maximum equivalent crank shaft torque (Nm)	140.3	133.3	151.8	145.8
iv)	Engine speed at maximum equivalent crankshaft torque, (rpm)	1099	1099	1050	1048
v)	Backup torque (%)	27.2	25.6	29.2	29.6
v)	Range of atmospheric condition :				
	- Temperature, (°C)	26 to 28	41 to 44	27 to 30	42 to 44
	- Pressure, (kPa)	98.5 to 99	98.5 to 98.9	98.5 to 98.8	98.6 to 99.0
	- Relative humidity, (%)	24 to 27	NR	28 to 35	15 to 18
vi)	Maximum Temperature, (°C):				
	- Engine oil	93	105	94	102
	- Coolant	90	104	89	100
	- Fuel	46	57	39	60
	- Air intake	26	39	30	47
	- Exhaust gas	496	482	554	567
vii)	Pressure at maximum power:				
	- Intake air, (kPa)	1.2 to 1.3	1.8	4.4 to 4.5	5.9 to 6.1
	- Exhaust gas, (kPa)	6.1	15.6 to 16.4	5.9 to 6.0	7.5 to 7.7
viii)	Consumptions:				
	Lub. Oil (g/kWh)	--	0.20	--	0.35
	-Coolant (% of total coolant capacity)	--	2.67	--	Nil

4.0 OTHER APPLICABLE TESTS

4.1 FIELD TEST

- 4.1** The field tests comprising of MB ploughing and rotavation were conducted for 10.0 & 10.1 hours respectively.
All the field tests were conducted at the full accelerator settings, when the no load speed of the engine was varied from **2486 to 2506** rpm.
- 4.2** The brief specifications of the implements used during field tests are given in **Annexure-II**.
- 4.3** The summary of field test observation with Mould board plough & rotavator is given in **Table – 3**.

Table – 3

SUMMARY OF FIELD PERFORMANCE TEST

S. No.	Parameter/operation	MB Ploughing	Rotavation
1	2	3	4
i)	Type of soil	Light	Light
ii)	Av. Soil moisture, (%) / Av. Depth of standing water (cm)	10 to 11	11 to 12
iii)	Bulk density of soil, (g/cc)	1.0 to 1.1	1.3 to 1.4

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1	2	3	4
iv)	Cone index, (kgf/sq.cm) / Puddling index, (%)	5.1 to 5.8	4.8 to 5.9
v)	Gear used	L-2	L-2
vi)	Av. Speed of operation, (kmph)	4.15 to 4.54	4.16 to 4.33
vii)	Av. Wheel slip, (%) / Av. Travel reduction, (%)	7.0 to 10	-0.8 to -0.3
viii)	Av. Depth of cut, (cm) / Av. Depth of puddle, (cm)	18	8 to 11
ix)	Av. Working width, (cm)	73 to 76	158 to 175
x)	Area covered, (ha/h)	0.268 to 0.278	0.590 to 0.620
xi)	Fuel consumption:		
	- (l/h)	3.88 to 4.66	5.42 to 5.96
	- (l/ha)	13.94 to 17.51	9.19 to 9.60
xii)	Av. draft of implement, (kN)	5.95 to 6.19	--

Remarks: The average lub oil and coolant (water) consumptions during the entire field tests were observed to be **4.98 ml/h** and **19.9 ml/h** respectively.

5. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustment/Defect/Breakdown and Repairs	Tractor run hours
	None	

6. COMPARISON BETWEEN BASE MODEL AND VARIANT MODEL (Based on Table 3 & 4 of Indian Standard 12207: 2014)

Sl. No.	Clause No	Features	Observation on base model (T-793/1301/September , 2011 & T-1009/1523/March,2016)	Observation on variant model	Remarks	
1	2	3	4	5	6	
1.	i)	Clutch	Single, dry friction plate	Single, dry friction plate	No change	
2.	ii)	Air cleaner	Same configuration in base & variant models (refer para 3.1.5)		No change	
3.	iii)	Exhaust system	Same configuration in base & variant models (refer para 3.1.6)		No change	
4.	iv)	Gear Box:				
		- Type	Mechanical, Constant mesh gears	Mechanical, Constant mesh gears	No Change	
5.	v)	Reduction ratio of transmission:				
	Movement	Gear	Base model	Variant model	Variation (%)	Remark
	Forward	L1	183.71	187.2	1.9	Changed
		L2	131.0	119.5	-8.8	-do-
		L3	82.64	77.7	-6.0	-do-
		L4	51.82	51.3	-1.0	-do-
		H1	59.25	60.8	2.6	-do-
		H2	42.31	38.3	-9.5	-do-
		H3	26.6	24.9	-6.4	-do-
		H4	16.7	16.5	-1.2	-do-
		LR	140.82	154.5	9.7	-do-

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Reverse	HR	45.35	49.9	10.0	-do-
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1	2	3	4	5	6
6.	vi)	Range of speeds (kmph):			
		- Forward	2.66 to 29.29	2.70 to 30.63 (Variation of 1.5 to 14.2 %)	Changed
		- Reverse	3.47 to 10.79	3.27 to 10.13 (Variation of -6.1 to -6.6 %)	Changed
		Additional no. of speed	None	None	No change
7.	vii)	Fitment of accessories:			
		- Expansion tank	Provided	Provided	No change
		- Additional hydraulic pump	None	None	--do--
		- Air compressor	None	None	--do--
		- Radiator	Provided	Provided	--do--
		- Bare radiator capacity, (l)	3.50	2.70	Changed
		Total coolant capacity,(l)	8.15	6.10	Changed
		- Oil cooler	None	None	No Change
8.	viii)	Brake system:			
		Type	Oil immersed discs	Oil immersed discs	No Change
9.	ix)	Type of three point linkage:			
		Type	Cat.I/Cat.II	Cat.I/Cat.II	No change
		Rear/front mounted	Rear mounted	Rear mounted	No change
10.	x)	PTO shafts:			
		Location	Centrally located	Centrally located	No change
		Type	Type-II, Not independent	Type-I, Not independent	Changed
		No of splines	21	6	Changed
		Speed corresponding to rated engine speed (rpm)	1023 Clockwise rotation	660- Clockwise rotation	Changed
		- Anticlockwise rotation speed (rpm)	Not provided	Not provided	No change
11.	xi)	Type of drive:			
		2WD or 4WD	2WD	2WD	No change
12.	xii)	Hydraulic System:			
		Location & type of Hydraulic pump drive	Same configuration in base & variant models (refer para 3.1.13).		No change
13.	xiii)	Positioning of Hydraulic Sensing Mechanism			
		Lower link, top link, etc.	Through lower link	Through top link	Changed
14.	xiv)	Rear differential & Final Reduction unit:			
		Speed reduction through crown wheel & bevel pinion	4.444:1(40/9T)	3.727:1(41/11T)	Changed
		Speed reduction through rear final drive	3.750:1 (60/16T)	4.428:1(62/14T)	Changed
15.	xv)	Type of fuel Injection pump:			
		Inline/Rotary/Common rail	Inline plunger	Inline plunger	No change

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1	2	3	4	5	6
16.	Change related to statutory/ regulatory requirements (As per Table 4):				
a)	Engine operating principle (spark/ compression ignition, two/four stroke)	Compression Ignition, 4 stroke	Compression Ignition, 4 stroke	No change	
b)	Number & arrangement of cylinders	Three vertical inline	Three vertical inline	No change	
c)	Maximum declared PTO power, (kW)	25.0	27.8	Changed	
d)	Bore /stroke ,(mm)	91/110	95/110	Changed	
e)	Engine displacement (cc)	2146	2339	Changed	
f)	Rated engine speed (rpm)	2200	2200	No change	
g)	Naturally aspirated/turbo charged	Naturally aspirated	Naturally aspirated	-do-	
17.	Change related to ergonomics, safety comfort, statutory / regulatory requirements:				
a)	IS: 10273	Conformed	Conforms	No change	
b)	IS: 4931	Did not conform	Conforms	Changed	
c)	IS: 4468	Did not conform	Does not conform	No change	
d)	IS: 12953	Conformed	Conforms	-do-	
e)	IS:12343	Conformed	Does not conform	Changed	
f)	IS:12239 (Pt-I)	Did not conform	Does not conform	No change	
g)	IS:12239 (Pt-II)	Did not conform	Does not conform	No change	
h)	IS:8133	Conformed	Conforms	-do-	
i)	IS: 6283	Conformed	Conforms	-do-	
j)	IS:14683	Conformed	Conforms	-do-	
18.	Other changes:				
a)	Make of steering system	ZF	RANE	Changed	
b)	Overall length (mm)	3500	3290	-do-	
c)	Color of sheet metal	Blue & yellow	Blue	-do-	
d)	Number of fuel filters	Two	One	-do-	

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7. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

7.1 On the basis of test conducted the performance results have been summarized as evaluative (mandatory) and non – evaluative (not mandatory) parameters applicable for qualifying Minimum Performance Criteria as per clause-4 table-1 of Indian Standard **12207: 2014** for acceptance of tractor for the purpose of subsidies/NABARD financing for the applicable features for this tractor model.

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant/ requirement		As observed		Whether Variant model meets the requirements (Yes/ No.)
				Base model	Variant model	Base model	Variant model	
1	2	3	4	5 a	5 b	6 a	6 b	7
7.1.1	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 >26 kW. – 7.5/+10% for PTO power ≤ 26 kW or -5 / +10% for engine power >26 kW. – 7.5/+10% for engine power ≤ 26 kW	25.0 (D)	27.8 (D)	26.2	28.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	25.0 (D)	27.8 (D)	26.2	27.8	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	252 (D)	234 (D)	232	245	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	137	146 (D)	140.3	151.8	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10% min. (R)	10% min. (R)	27.2	29.2	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.	125 (D)	125 (D)	105	102	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)	110	104	102	Yes

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1	2	3	4	5 a	5 b	6 a	6 b	7
	g) Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.52 (R)	2.50 (R)	0.20	0.35	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)	3.25 per meter (R)	0.07	0.23	Yes
7.1.2	Safety features :							
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2))	At present no requirements	Provided	--		--
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR	Provided	Provided			Yes
c)	Seating requirement (Tractors having more than 1150 mm rear track width)	Non-Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	Meets the requirement	Meets the requirement			Yes
d)	Technical requirements for PTO shaft	Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	Did not meets the requirement	Meets the requirement			Yes
e)	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	Did not meets the requirement	Does not meets the requirement			No
f)	Specification of linkage and swinging drawbars	Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	Meets the requirement	Meets the requirement			Yes
7.1.3	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		--	439 E1 (Brand name : Powertrac)			Yes
	3) Year of manufacture	Evaluative		--	BE (i.e. May ,2016)			Yes
	4) Engine number	Evaluative		--	E3335009			Yes
	5) Chassis number	Evaluative		--	T053299953BE			Yes
	6) Declaration of PTO power, kW	Evaluative		--	27.8			Yes

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1	2	3	4	5 a	5 b	6 a	6 b	7
7.1.4	Literature (Submission to test agency)							
(a)	Operator manual	Evaluative	Provided/ Not Provided	As per relevant IS Code (IS 8132)		Provided		Yes
(b)	Parts Catalogue	Evaluative	Provided/No t Provided	As per relevant IS Code (IS 8132)		Provided		Yes
(c)	Workshop/ Service manual	Evaluative	Provided/No t Provided	As per relevant IS Code (IS 8132)		Provided		Yes

7.2 Salient Observations:

7.2.1 Laboratory tests:

7.2.1.1 PTO Performance:

- i) The maximum power in case of base & variant was observed as **26.2 & 28.3 kW** respectively against the declaration of **25.0 kW & 27.8 kW** respectively. Which is within the tolerance limit specified in **IS: 12207-2014**.
- ii) The specific fuel consumption in case of base and variant models corresponding to maximum power was observed as **232 & 245 g/kWh** against the declaration of **238 & 234 g/kWh** respectively, which is within the tolerance limit.
- iii The backup torque was observed as **29.2%**
)

7.2.1.2 Location and operation of operator's control:

- i) Provision of safety against accidental start of engine has not been provided.
- ii) The fuel shut-off lever does not remain in stop position
- iii Vertical distance from SIP to the centre of clutch pedal does not meet the
) requirement as per IS: 12343 -1998.

7.2.1.3 Three point linkage:

Lateral distance from lower hitch point to centre line of tractor does not meet the requirement as per IS: 4468 (part –I) 1997.

7.3 Maintenance / Service Problems:

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

7.4 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 for spark arresting device in exhaust system.
- iii) Provision of differential lock.
- iv) The fuel shut-off lever does not remain in stop position

7.5 Applicant submitted the Literature during test with machine:

- a) Operator's Manual for "Escorts ltd., 434DS, 439 E1 (Brand name: Powertrac)" tractor models.
- b) Spare Parts Catalogue for "Escorts ltd., 434DS, 439 E1 (Brand name: Powertrac)" tractor models.
- c) Service manual for "Escorts ltd., 434DS, 439 E1 (Brand name: Powertrac)" tractor models.

7.5.2 It is therefore, recommended that following literature may be brought out as per IS: 8132-1999 (Reaffirmed in March, 2009) for the guidance of users and service personnel in national as well as regional languages for this model of tractor.

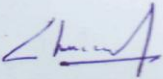
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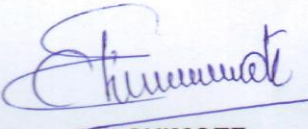
The results of the tests carried out on variant model "Escorts Ltd., 439 E1 (Brand name: Powertrac)" Tractor have been compared with those on base model "Escorts Ltd., Powertrac 439" Tractor and found within the limit, as specified in Indian Standard: 12207-2014.

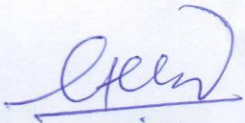
8. CITIZEN CHARTER

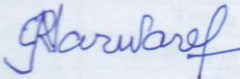
Duration of Test	Time frame for Testing & Evaluation as per Citizen Charter	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
March to April , 2017	10 Months	Yes	None

TESTING AUTHORITY:


C.S.RAGHUWANSHI
AGRICULTURAL ENGINEER


C.V.CHIMOTE
TEST ENGINEER


Y.K. RAO
SENIOR AGRICULTURAL
ENGINEER


J.J.R.NARWARE
DIRECTOR

9. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
9.1	7.2.1.2(i),(ii) & (iii),7.2.1.3 & 7.4	These being studied & corrective action would be taken in near future.
9.2	7.5.2	Your valuable comments & suggestions for improvement are well taken. Under our policy of continuous product improvement these aspects are future being looked into & will try to eliminate these deviation soon wherever necessary.

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ANNEXURE-I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	<u>HOURS</u>
1.	Running –in	--
2.	PTO Performance Test	10.6
3.	Theoretical speed test	0.50
4.	Field test (Dry land only)	20.1
B.	Miscellaneous test and other run hours, including idle run transportation, trial and preparation for test.	1.5
	Total	32.7

ANNEXURE-II

Sl. no	Item	Mould Board Plough	Rotavator
1.	Make	Field king	Maschio
2.	Type	Mounted	Mounted
3.	No. of bottoms /blades	Three	36 in 7 flange
4.	Types of bottoms / blades	General purpose	Hatchet
5.	Size of bottoms /blades(mm)	410	170x 70 x 10
6.	Spacing of bottoms flange, mm	355	200
7.	Lower hitch point span,(mm)	775	760
8.	Mast height,(mm)	575	550
9.	Overall dimensions:		
	-Length	2015	1560
	- Width	1095	860
	- Height	1100	950
10.	Gross mass, (kg)	335	120