TE

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Initial)

संख्या / No. : T-1116/1642/2017
माह / Month : November, 2017

ESCORTS LIMITED, FARMTRAC 6060 UM TRACTOR
(BRAND NAME : FARMTRAC)

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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Manufacturer : **M/s. Escorts Limited,**
Plot No. 2 & 3, Sector – 13
FARIDABAD – 121 007
HARYANA

Month: November	Test Report No. T-1116/1642/2017	Year: 2017

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GOVERNMENT OF INDIA
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Type of Test	:	**COMMERCIAL (Initial)**
Test code/Procedure	:	IS: 5994-1998 (Reaffirmed in 2009), IS: 9253-2001(Reaffirmed in 2012) and IS: 12207-2014
Period of Test	:	October, 2016 to October, 2017
Test Report No	:	**T-1116 / 1642 / 2017**
Month/Year	:	**November, 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 tests.

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.).

SELECTED CONVERSIONS

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

ABBREVIATIONS

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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CONTENTS

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 manufacturer'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. SPECIFICATIONS

1.1 Tractor:

Make	:	Escorts Limited
Model	:	FARMTRAC 6060 UM
Brand name	:	FARMTRAC
Variants, if any	:	None
Type	:	Four Wheeled, Four Wheel Driven, General Purpose Agricultural Tractor.
Year of manufacture	:	January, 2015 (KD)
Chassis number	:	T052332879KD
Country of Origin	:	INDIA

1.2 Engine:

Make	:	Escorts Limited
Model	:	AE.4286H-3A
Type	:	Four stroke, liquid cooled, turbocharged, direct injection, diesel engine.
Serial number	:	E2335319
Engine speed (Manufacturer's recommended production setting), (rpm) :		
- Maximum speed at no load,(rpm)	:	2275 to 2325
- Low idle speed, (rpm)	:	700 to 800
- Speed at max. torque, (rpm)	:	1300 to 1400
Rated speed, (rpm):		
- For PTO use	:	2000
- For drawbar use	:	2000

1.3 Cylinder & Cylinder Head:

Numbers	:	Four
Disposition	:	Vertical, Inline
Bore/stroke, (mm)	:	91/110
Capacity as specified by the applicant, (cc)	:	2860
Compression ratio, (apa)	:	17.5±0.5% : 1
Type of cylinder head	:	Mono block

	Type of cylinder liners	:	Wet, replaceable
	Type of combustion chamber	:	Cavity on piston crown
	Arrangement of valves	:	Over head, Inline
	Valve clearance (cold):		
	- Inlet valve, (mm)	:	0.30
	- Exhaust valve, (mm)	:	0.40
1.4	**Fuel System:**		
	Type of fuel system	:	Gravity and force feed
1.4.1	**Fuel tank:**		
	Capacity, (l)	:	60.0
	Location	:	Above clutch housing
	Provision for draining of sediments/water	:	Not provided
	Material of fuel tank	:	Metallic
1.4.2	**Water separator:**		
	Make	:	Hilux
	Type	:	Gravity, inverted funnel type
	Location	:	Between fuel tank and primary feed pump
	Capacity, (l)	:	0.45
1.4.3	**Fuel feed pump:**		
	Type	:	Plunger
	Make	:	BOSCH, India
	Model/Group combination No.	:	FP/KSG22AD105, F002A50040
	Provision of sediment bowl	:	Provided
	Method of drive	:	Through camshaft of fuel injection pump.
1.4.4	**Fuel filters:**		
	Make	:	Bosch, India
	Model/Group combination No.	:	9 450 030 120
	Numbers	:	Two
	Type of elements:		
	- Primary	:	Cloth
	-Secondary	:	Paper
	Capacity of final stage filter, (l)	:	0.35
1.4.5	**Fuel Injection pump:**		
	Make	:	Bosch, India
	Model/Group combination No.	:	F 002 A3Z 018 PES 4A 90D 410RS 3500
	Type	:	Inline, plungers
	Serial number	:	55417004
	Method of drive	:	Through timing gears
1.4.6	**Fuel injectors:**		
	Make	:	Bosch, India
	Model/Group combination No.:		
	Nozzle holder number	:	F002 C70 023
	Nozzle number	:	DSLA 146P 5509
	Type	:	Multi hole (04 holes)
	Manufacturer's production pressure setting, (MPa)	:	24.5 to 25.3
	Injection timing	:	4 ±1° before TDC (apa)

1.4.7 **Governor:**

Make	:	BOSCH (apa)
Model/Group combination No.	:	RSV 375...1000 A4C1782L
Type	:	Mechanical, centrifugal, variable speed.
Rated engine speed, (rpm)	:	2000
Governed range of engine speed, (rpm)	:	700 – 2325

1.5 **Air Intake System:**

1.5.1 **Pre-cleaner** : **Not provided**

1.5.2 **Air cleaner:**

Make	:	Fleet guard	
Type	:	Dry type	
Location	:	In front of radiator, under the bonnet	
Range of suction pressure at maximum power, (kPa)	:	4.5 to 4.7	
Details of elements:		**Primary element**	**Secondary element**
- Size (OD/ID), (mm)	:	155.0/93.3	87.6/71.4
- Length, (mm)	:	260.0	215.4
- Type	:	Paper	Paper
Air flow restriction indicator	:	Provided	
Dust unloading valve	:	Provided	
Maintenance schedule	:	Clean the element every day and replace after 500 hours working hours.	

1.6 **Exhaust System:**

Type of silencer	:	Up-draught (cylindrical)
Position of silencer outlet with respect to SIP, (mm):		
- Upward	:	805
- Longitudinal	:	1620
- Lateral	:	430 (on LHS)
Range of exhaust gas pressure at maximum power, (kPa)	:	143.1 to 146.0
Provision of spark arresting device	:	None
Provision against entry of rain water	:	A bend is provided on the outlet of silencer.

1.6.1 **Turbocharger:**

Make	:	Holset
Model	:	HX20 TD03L 6T/4 (apa)
Type	:	Without Waste gate
Boost Pressure Ratio	:	1.93 (apa)
Speed at rated engine speed, (rpm)	:	1,50,000 (apa)
Method of lubrication	:	Force feed lubrication from main oil gallery of engine.
Location	:	In between silencer and exhaust manifold.

1.6.2 **EGR Details:**

Make	:	Padmini
Model	:	Not visible
Type /Function	:	Electronically operated
Location	:	On the top of cylinder head connected between exhaust & inlet manifold.

1.7 **Lubricating system:**

Type	:	Force feed cum splash
Oil sump capacity, (l)	:	7.50
Total lub oil capacity, (l)	:	8.12
Oil change period	:	First change after 100 hours and subsequently after every 300 hours.
Cooling device, (if any)	:	None

Filters:

Make	:	Farmtrac
Type	:	Full flow, spin-on, throwaway type
Number (s)	:	One (01)

Pump:

Type	:	Gear
Method of drive	:	Through timing gears
Minimum permissible pressure,(kPa)	:	300±10 (apa)

1.8 **Cooling system:**

Type	:	Forced circulation of liquid
Name & brand name of coolant	:	Veedol
Coolant water ratio	:	1:25 (apa)
Details of pump	:	Centrifugal, semi-open type impeller of diameter 75 mm having eight numbers of vanes and driven through crankshaft pulley by a cogged 'V'-belt common to alternator.
Details of fan	:	Suction type fan having seven polypropylene blades of 455 mm diameter and mounted on water pump shaft.
Means of temperature control	:	Thermostat
Bare radiator capacity, (l)	:	7.91
Capacity of expansion tank, (l)	:	0.71
Total coolant capacity, (l)	:	12.0
Radiator cap pressure, (kPa)	:	88

1.9 **Starting System:**

Type	:	12V, DC, Electrical
Aid for cold starting	:	None
Any other device provided for easy starting.	:	None

1.10 **Electrical System:**

1.10.1 **Battery:**

Make & Model	:	Exide Express, MHD 880
Type	:	Lead acid
Capacity and rating	:	12 V, 88 Ah at 20 hours discharge rate
Location	:	On RHS clutch housing fitted in a separate box.

1.10.2 **Starter:**

Make	:	Lucas TVS (apa)
Model	:	M 127
Type	:	Pre engaging, solenoid operated
Capacity and rating	:	12V, 2.6 kW
Serial Number	:	Not available

1.10.3 Generator:

Make	:	Lucas TVS (apa)
Model	:	A115
Type	:	Alternator
Output rating	:	12V, 35 ampere
Serial number	:	Not available
Method of drive	:	Through crankshaft pulley

1.10.4 Voltage regulator: : In-built with alternator

1.10.5 Details of lights:

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)
1	2	3	4	5
Front lights:				
- Head lights long beam	2, 12V, 60W	925	60Ø	805
- Head lights short beam	2, 12V, 60W	1030	60Ø	785
- Parking lights	2, 12V, 5W	1425	85 x 85	235
- Turn Indicators-cum- hazard light	2, 12V, 21W	1425	85 x 85	120
- Reflectors (white)	2	1425	45 x 72	180
Rear lights:				
- Stop/tail light	2, 12V, 21/5W	1410	85 x 85	245
- Turn Indicators-cum- hazard light	2, 12V, 21W	1410	85 x 85	130
- Plough light	1, 12 V, 55W	1470	130Ø	380
- Registration plate Light	01, 12V, 5W	1340	35Ø	200
- Reflectors (Red)	2	1410	45 x 72	190

1.10.6 Main switch : Key turn type having three positions viz. OFF; Circuit ON & START

1.10.7 Light switch : Rotary type having four positions viz.
i) OFF
ii) Parking + dash board light
iii) Head light (short beam) + (ii)
iv) Head light (long beam) + (ii)

1.10.8 Horn:

Make	:	Minda
Type	:	12 V, 2B, electromagnetically vibrated diaphragm type
Location	:	In front of radiator, under the bonnet

1.10.9 Fuse box : Contains six numbers of fuses of following capacity.

Capacity	10 A	15 A
Numbers	02	04

1.10.10 Flasher Unit:

Make	:	Interface
Capacity:		12 V
-Turn signal	:	21W x 2 + 2W x 1
- Hazard signal	:	21W x 4 + 2W x 2
Flashes/Min.	:	85

1.10.10.1	**Seven pin trailer socket**	:	Provided
1.10.10.2	**Slow moving triangle**	:	Provided
1.10.10.3	**Safety switch**	:	Provided in high/low range shifting lever

1.11 Instrument panel details:

i) Engine rpm cum digital cumulative run hour meter (0 – 25 x 100)
ii) Lubrication oil pressure gauge with colour zone (red – green)
iii) Water temperature gauge (with colour zones)
iv) Fuel level gauge (with coloured zones)
v) Battery volt meter (with colour zones)
vi) Battery charging warning indicator
vii) Air cleaner clogging indicator
viii) Oil pressure indicator
ix) Parking brake light indicator
x) Four wheel engage indicator
xi) Turn/hazard light indicator
xii) Head light long beam ON indicator
xiii) Hazard light switch
xiv) Turn indicator light switch
xv) Horn push button
xvi) Mobile charging socket
xvii) Hand accelerator lever
xviii) Rear view mirror
xix) Steering control wheel
xx) Engine stop knob (fuel-shut-off knob)

1.12 Transmission System:

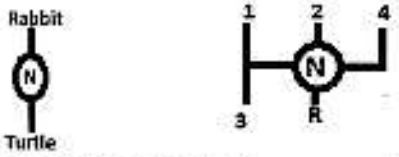
1.12.1 Clutch:

Make	:	LUK India
Type	:	Mechanical, double, dry friction plates
-Transmission	:	Dry friction pads
- PTO	:	Dry friction plate
No. of friction plate(s)	:	Two
Material:		
-Main transmission clutch	:	Cerametallic (apa)
-PTO clutch	:	Organic molded (apa)
Size, [OD/ID (mm)] :		
-Main transmission clutch	:	277.93/167.91 Φ and 24.4 cm^2 contact area of each pad having six pads.
-PTO clutch	:	277.73/165.89 Φ
Method of operation:		
-Main transmission clutch	:	By pressing LHS foot pedal
-PTO clutch	:	By LHS hand operated lever

1.12.2 Gear box:

Make	:	Farmtrac, Escorts
Model	:	Not available
Type	:	Mechanical, Constant mesh
No. of speeds:		
Forward	:	08
Reverse	:	02

Gear shifting pattern:



Range selection lever **Main gear shift lever**

Location of gear shifting levers	:	Side shift arrangement (i) Main gear shift lever on RHS of operator's seat (ii) Range selector lever on LHS of operator's seat.
Oil capacity, (l)	:	11.20
Oil changing period	:	Change after every 1200 hours of operation.

1.12.3 Nominal Speed:

Movement	Gear No.	No of engine revolutions for one revolution of driving wheel	Nominal speed at rated engine speed when fitted with **16.9 - 28 size tyres of 670 mm radius index**, (kmph)
Forward	L1	164.31	3.08
	L2	131.70	3.84
	L3	75.00	6.72
	L4	55.11	9.17
	H1	45.99	10.97
	H2	36.86	13.70
	H3	21.00	24.08
	H4	15.43	32.74
Reverse	R1	150.07	3.36
	R2	42.02	12.02

Number of front wheel revolution for one revolution of rear wheel : 1.41

1.12.4 Rear differential unit:

Type	:	Crown wheel and bevel pinion with differential assembly accommodated inside the differential housing.
Reduction through crown wheel & pinion	:	2.818 : 1 (31/11 T)
Oil capacity of differential housing,(l)	:	27.00 (common with rear axle, hydraulic and brake systems)
Oil changing period	:	Change after every 1200 hours of operation.
Differential lock:		
Type	:	Dog clutch type
Method of operation	:	By pressing the pedal provided on RHS of operator's seat.

1.12.5 Rear axle & Rear final drive:

Type	:	Epicyclic reduction unit
Reduction through final drive	:	4.500 : 1 (ring-56T, sun-16T, planet-20T)
Oil capacity of final drive, (l)	:	27.0 (common with differential, hydraulic and brake systems)
Oil changing period	:	Change after every 1200 hours of operation.

1.12.6 Front differential unit:

Type	:	Crown wheel and bevel pinion with differential assembly accommodated inside the front axle housing.
Reduction through crown wheel & pinion	:	2.333 : 1 (28/12 T)
Oil capacity of differential housing,(l)	:	5.65
Oil changing period	:	Change after every 1200 hours of operation.
Differential lock:		**Not provided**

1.12.7 Front axle & Front final drive:

Type	:	Epicyclic reduction unit
Reduction through final drive	:	6.000 : 1 (ring-60T, sun-12T, planet-23T)
Oil capacity of final drive, (l)	:	0.55 (each side)
Oil changing period	:	Change after every 1200 hours of operation.

1.13 Power lift (Hydraulic System):

Make	:	Escorts
Type	:	Open centre, live, ADDC
No. and type of cylinder	:	One, single acting
Type of linkage lock for transport	:	The knob provided on distributor when fully closed acts as a transport lock.

1.13.1 Hydraulic pump:

- Make	:	Eaton
- Type	:	Gear (Tandem)
- Location & drive	:	On LHS of engine and driven through timing gears.
No. & type of filters	:	One, spin on type
Hydraulic oil capacity, (l)	:	27.0 (common with differential, rear axle and brake systems)
Oil change period	:	Change after every 1200 hours of operation.
Provision for external tapping	:	Provided
Details of control levers	:	i) Position control lever (yellow) ii) Draft control lever (red) iii) External circuit lever iv) A knob on distributor
Method of draft sensing	:	Through top link

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1.13.2 Three point linkage:

S. No.	Observations	As per IS: 4468-(Part-I) 1997 (Category I / II), (mm)	As measured (mm)	Remarks
1	2	3	4	5
I.	**Upper hitch points:**			
	a) Dia. of hitch pin hole	19.30 to 19.50/ 25.70 to 25.90	19.43/ 25.87	Conforms
	b) Width of ball	44.0 (max)/51.0 (max)	51.0	Conforms to Cat. II
II.	**Lower hitch points:**			
	a) Dia. of hitch pin hole	22.40 to 22.65/28.70 to 29.00	29.00	Conforms to Cat. II
	b) Width of ball	34.8 to 35.0/ 44.8 to 45.0	44.6	**Does not conform**
III.	Lateral distance from lower hitch point to centre line of tractor	359/435	364	**Does not conform**
IV.	Lateral movement of lower hitch points	100 (min)/125 (min)	170	Conforms
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	570	Conforms
VI.	Transport height	820 (min) /950 (min)	870	Conforms to Cat. I
VII.	Power range (without force)	560 (min)/ 650 (min)	620	Conforms to Cat. I
VIII.	Leveling adjustment	100 (min)/100 (min)	505	Conforms
IX.	Lower hitch point tyre clearance	100 (min)/100 (min)	110	Conforms
X.	Lower hitch point height	200 (max) /200 (max)	200	Conforms

1.13.3 Linkage geometry dimensions {Refer Fig.-1(a)}:
The following are dimensions observed, corresponding to **670 mm** as tyre dynamic radius index:

S. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1	2	3	4	5
1.	Length of lower link	A	820	820
2.	Length of lift arm	B	235	235
3.	Length of lift rods	C	690 to 775	720
4.	Length of top link	D	595 to 840	600
5.	Distance of lift rod connection point from pivot point of lower link	E	425	425
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	75, behind	75, behind
	-Vertically	G	205, below	205, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	305, 295 & 290 behind	295, behind
	-Vertically	J	255, 225 & 190 above	225, above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	295, forward	295, forward
	-Vertically	L	315, above	315, above

1	2	3	4	5
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	30 to 200	150, above
	- In low position	N	-630 to -395	470, below
10.	Height of lower link hitch points when locked in transport position	--	200, above	

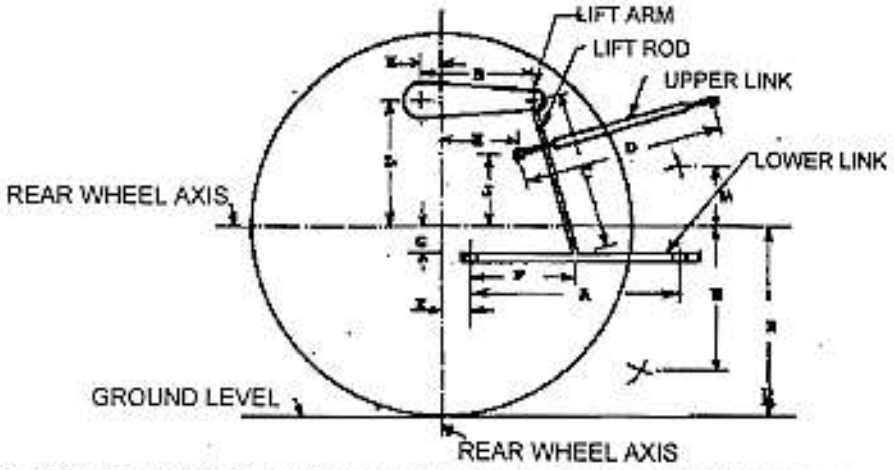


Fig.1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

1.13.4 Drawbar:

1.13.4.1 Linkage Drawbar [Refer Fig.1(b)]:

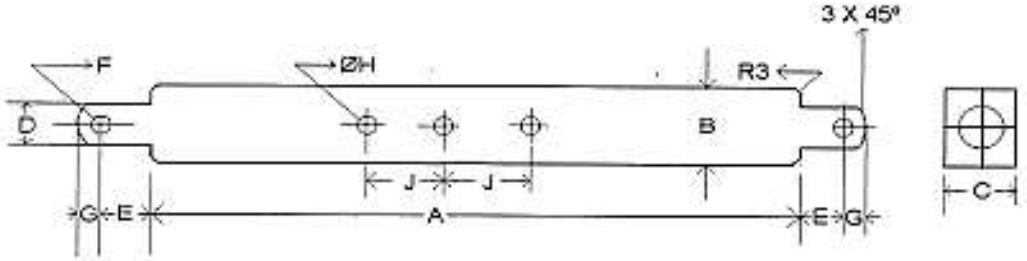


Fig. 1 (b): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

Notation	As per IS: 12953-1990 (Cat. I)/ (Cat. II), (mm)	As measured, (mm)	Remarks
A	683 ± 1.5/825 ± 1.5	684	Conforms to Cat. I
B	75 (min)/75 (min)	76	Conforms
C	30 (min) / 30 (min)	32	Conforms
DØ	21.79 to 22.0/27.79 to 28.0	27.97	Conforms to Cat. II
E	39.0 (min/)49.0 (min)	56.2	Conforms
FØ	12.0 (min)/12.0 (min)	11.6	**Does not conform**
G	15.0 (min)/15.0 (min)	15.1	Conforms
HØ	25 ± 1/25 ± 1	25	Conforms
J	80 ± 1.5/80 ± 1.5	80.5	Conforms
No. of holes	7/9	7	Conforms to Cat. I

1.13.4.2 Swinging drawbar: : **Not provided**

1.14 Power take-off shaft:

Type	:	Type-I, independent
Method of engaging	:	By a hand lever provided on LHS of operator's seat.
No. of shaft (s)	:	One
PTO speed corresponding to rated engine speed, (rpm)	:	596
Distance behind rear axle, (mm)	:	330
Engine to PTO speed ratio	:	3.353 : 1
Whether PTO Shaft is capable of transmitting the full power of engine	:	Yes
Other speeds, if any	:	Not provided

1.14.1 Specifications of Power Take-Off Shaft: -

Specification	As per IS:4931-1995 (Type-I)	As observed	Remarks
1	2	3	4
Nominal speed, (rpm)	540 ± 10	540 rpm of PTO corresponding to 1811 rpm of engine	Conforms
No. of splines	6	6	Conforms
Direction of rotation	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	Conforms
Dimensions (mm) [See Fig. 2 (a)]:			
DØ	34.79±0.06	34.74	Conforms
dØ	28.91 ± 0.05	28.72	**Does not conform**
BØ	29.4 ± 0.1	29.5	Conforms
AØ (Optional)	8.3 ± 0.1	8.4	Conforms
W	8.69 - 0.09 - 0.16	8.67	Conforms
a	7	7	Conforms
b (Optional)	25 ± 0.5	24.4	**Does not conform**
c	38	38	Conforms
x	30°	30°	Conforms
B	76 (min)	81	Conforms
h	450 to 675	545	Conforms

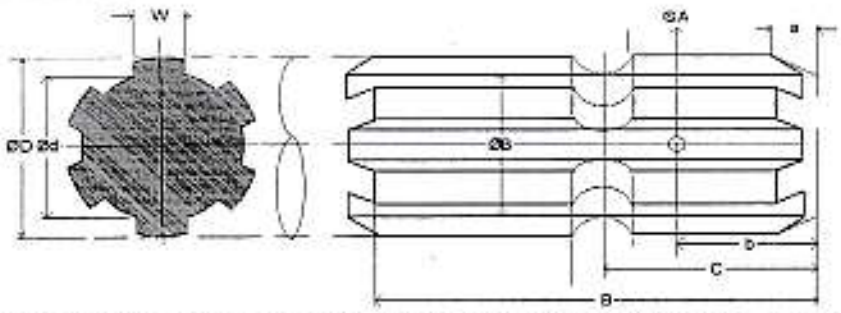


Fig. 2 (a): DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT

1.14.2 Master Shield of Power Take-Off Shaft:

Specification	As per IS 4931-1995 (mm)	As Observed	Remark
K	70(Min.)	70	Conforms
M	125 ± 5	130	Conforms
N	85 ± 5	110	**Does not conform**
P	285 ± 5	285	Conforms
r	76 (Max.)	18	Conforms

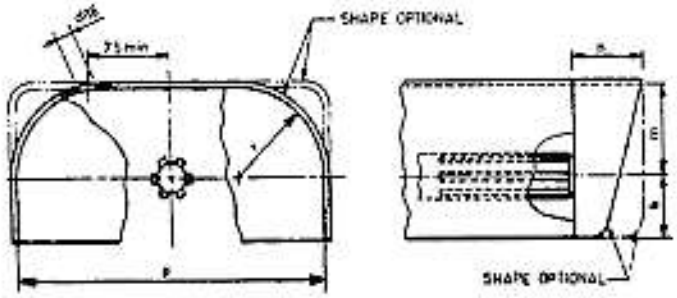


Fig. 2(b): DIMENSIONAL NOTATIONS FOR PTO SHAFT MASTER SHIELD

1.15 Towing hitch:

1.15.1 Front:

Type	:	Clevis
Location	:	At front of tractor on standard ballasting weight
Height above ground level, (mm)	:	650 (Fixed)
Dia of pin hole, (mm)	:	34.2
Width of clevis, (mm)	:	53.7

1.15.2 Rear:

Type	:	Clevis
Location	:	At the rear of differential housing
Height above ground level, (mm):		
Maximum	:	800
Minimum	:	490
Number of positions	:	08
- Type of adjustment	:	By changing hitch position on its mounting bracket and reversing the hitch.
Distance of hitch point, (mm):		
- From rear wheel centre	:	450
- From power take-off shaft end	:	120
Dia. of pin hole, (mm)	:	30.0
Width of clevis, (mm)	:	71.7

1.16 Steering:

Make	:	Farmtrac
Type	:	Hydrostatic, power steering
Location	:	Above flywheel housing
Diameter of steering control wheel,(mm)	:	425

Make & type of pump	:	Eaton & gear (tandem)
Location & drive	:	LHS of engine, through timing gears.
Method of operation	:	Manually, through steering control wheel
Make, type & number of hydraulic ram cylinder	:	Rane Madras Limited (apa), double acting, one
Location of ram cylinder	:	Mounted centrally on top of front axle towards rear side.
Oil capacity of steering system, (l)	:	3.0
Oil change period	:	First change after 200 hours and subsequently change after every 1200 hour.

1.17 Brakes:

1.17.1 Service Brake:

Make	:	Escorts (apa)
Type	:	Mechanically operated, oil immersed disc brakes
Location	:	On half axle shaft before final drive.
No. of disc(s)	:	Three on each side
Area of liners, (cm^2)	:	892.9 (on each wheel side)
Material of liners	:	Non-asbestos (apa)
Method of operation	:	By depressing RHS foot pedal independently or combined.
Oil capacity, (l)	:	27.0 (common with differential, rear axle and hydraulic system)
Oil change period	:	Change after every 1200 hours of operation.

1.17.2 Parking Brake:

Type	:	Paul & Ratchet arrangement
Location & Method operation of operation	:	Service brake acts as parking brake when locked in position by a hand lever provided on LHS of operator's seat.

1.18 Wheel Equipment:

1.18.1 Steered Wheel(s):

Make	:	MRF Shakti life
Numbers	:	Two
Type of tyre	:	Pneumatic, traction
Size	:	9.50-24
Ply rating	:	12
Maximum permissible loading capacity of each tyre at 450 kPa pressure, (kgf)	:	1150
Recommended inflation pressure, (kPa) :		
- For field work	:	210
- For transport	:	210
Track width, (mm)	:	1335,1395, 1485, 1525 (std.), 1555, 1595, 1675 & 1735
Method of changing track width	:	By reversing wheel disc and changing the position of disc on offset rim lugs
Make & size of rim	:	SSWL, W8 x 24

1.18.2	**Drive wheel(s):**		
	Make	:	MRF Shakti life
	Numbers	:	Two
	Type of tyre	:	Pneumatic, traction
	Size	:	16.9-28
	Ply rating	:	12
	Maximum permissible loading capacity of each tyre at 130 kPa pressure, (kgf)	:	1850
	Recommended inflation pressure, (kPa):		
	- For field work	:	110
	- For transport	:	130
	Track width, (mm)	:	1445 (std.), 1555,1615, 1735, 1855 & 1965
	Method of changing track width	:	By reversing wheel disc and changing the position of disc on offset rim lugs
	Make & size of rim	:	SSWL, W15 x 28
1.18.3	**Wheel base, (mm)**	:	2255
	Method of changing wheel base, if any, and range	:	None
1.19	**Operator's seat:**		
	Make	:	Not available
	Type	:	Cushioned seat with back rest
	Type of suspension	:	Two helical coil springs
	Type of dampening	:	Hydraulic shock absorber
	Range of adjustment, (mm):		
	Vertical	:	Nil
	Lateral	:	Nil
	Longitudinal	:	± 65

1.20 **Provision for safety and comfort of operator:**

1.20.1 **Conformity with IS: 12343-1998 (Reaffirmed in March, 2009)**

All parameters meets the minimum requirements of IS: 12343-1998, (Re-affirmed in March, 2009), **except the following:**

i) Width of seat.

ii) Longitudinal distance from seat index point to the centre of differential lock pedal.

iii) Vertical distance from seat index point to the centre of steering control wheel.

iv) Vertical distance from seat index point to the foot rest.

vi) Lateral distance from seat index point to the centre of foot accelerator.

1.20.2 **Conformity with IS: 6283 (Part 1)-2006**

All the controls are identifiable with symbols as per IS: 6283(Part 1) -2006

1.20.3 **Conformity with IS: 6283 (Part 2)-2007**

All the displays are identifiable with colour codes as per IS: 6283(Part 2) -2007

1.20.4 **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:**

Stop knob does not remain in stop position

1.20.5 **Conformity with IS:12239 (Part-1)-1996 (Re-affirmed in February, 2012) :**

Meets the requirements of IS: 12239 (Part-1) – 1996, **except the following:**

Provision of spark arresting device in the exhaust system.

1.20.6 Conformity with IS:12239 (Part-2)-1999 (Re-affirmed in March, 2009):
Meets the requirements of IS: 12239 (Part-2)-1999, **except the following:**
The working clearance between draft control lever and mud guard is not provided as per minimum requirement.

1.20.7 Conformity with IS: 14683 – 1999 (Re-affirmed in March, 2009) :
Lighting meets the requirements of IS: 14683 – 1999.

1.20.8 Rear view mirror:
Rear view mirror has been provided.

1.21 Labeling of tractor as per IS: 10273-1987 (Reaffirmed in March, 2009):
Location : The labeling plate is riveted on the inner side of LHS mudguard at its rear end which provides the following information:

Name of Manufacturer	**ESCORTS LIMITED-AGRI MACHINERY FARIDABAD**
Make	ESCORTS LIMITED
Model	FARMTRAC 6060 UM
Year of manufacturer	KD (January, 2015)
Engine Serial Number	E2335319
Chassis Serial Number	T052332879KD
Maximum PTO Power, kW	37.5
Specific fuel consumption, g/kWh	258

1.22 Ballast Conditions:

Particulars		Ballast mass as used, (kg)			
		Front		Rear	
		Water	C.I.weight	Water	C.I.weight
i)	As used during drawbar performance test	Nil	Nil	420	145
ii)	As used during field test, except rotavator	Nil	Nil	Nil	Nil
iii)	As used during haulage test	Nil	Nil	Nil	Nil
iv)	As use during wet land operation (with roto puddler and puddling special tyres)	Nil	Nil	Nil	Nil

1.22.1 Standard ballast, if any:

Particulars	Front	Rear
C. I. weight, (kg)	208	Nil
Location	On front engine support	--

1.23 **Masses:**

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	With standard ballast without canopy	1365	1565	2930
ii)	With ballast as used during drawbar performance test without canopy.	1390	2105	3495
iii)	With ballast as used during dry land operation with canopy (other than rotavator operation)	1385	1580	2965
iv)	Without ballast as used during wet land operation with puddling special tyre	1250	1580	2830
v)	As used during the haulage test with trailer hitch, canopy and drawbar.	1385	1605	2990

1.24 **Overall dimensions:**

Condition	Length, (mm)	Width, (mm)	Height, (mm)	Ground Clearance, (mm)
Without ballast	3975	1890	2180 (with exhaust pipe)	300 (below 4WD engaging housing)

1.25 **Number of external lubricating Points:**

- Oiling : Nil
- Greasing cups : Nil
- Greasing nipples : 13

1.26 **Color of tractor:**

Chassis & engine : Blue

Sheet metal:

Bonnet : Blue
Mudguard : Smoke grey
Wheel rims & discs : Smoke grey

1.27 **Optional features, if any** : None

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/cm³** at 15°C was used.

2.2 **Lubricants:**

Sl. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine oil	SAE 15 W 40	As recommended
2.	Transmission, hydraulic, differential, rear final drive and brakes.	UTTO (Tract ELFSF-3I)	Oil originally filled in the tractor was not changed
3.	Steering system	SAE 80 W 90	--do--
4.	Grease	Servo grease MP	Servo grease MP

3. PTO PERFORMANCE TEST

Date(s) of test : 19.12.2016 & 20.12.2016
Tractor run at the Institute prior to start of PTO test (h) : 8.04
Type of dynamometer bench : ESF 1000 S Eddy current

3. 1 The results of power take-off performance are tabulated in **Table-1** and graphically represented in **Fig. 3, 4** and **5**.

Table – 1

Power (kW)	Speed, (rpm)		Fuel consumption			Specific energy, (kWh/l)
	P.T.O.	Engine	l/h	kg/h	Specific, (kg/ kWh)	
1	2	3	4	5	6	7
a) Maximum power - 2 hours test:						
38.5	596	1998	11.00	9.20	0.239	3.50
37.3	596	1998	10.78	9.01	0.242	3.46*
b) Power at rated engine speed (2000 rpm):						
38.5	596	1998	11.00	9.20	0.239	3.50
37.3	596	1998	10.78	9.01	0.242	3.46*
c) Power at standard power take-off speed (540 ± 10 rpm):						
37.6	540	1811	10.35	8.65	0.230	3.63
36.2	540	1811	10.23	8.55	0.236	3.54*
d) Varying loads at rated engine speed:						
i) Torque corresponding to maximum power available at rated engine speed:						
38.6	596	1998	11.02	9.21	0.239	3.50
ii) 85% of the torque obtained in (i):						
36.3	660	2213	11.16	9.33	0.257	3.25
iii) 75% of the torque obtained in (ii):						
27.4	663	2223	9.11	7.62	0.278	3.01
Iv) 50% of the torque obtained in (ii) :						
18.4	667	2236	7.05	5.89	0.320	2.61
v) 25% of the torque obtained in (ii):						
9.3	675	2263	5.14	4.30	0.462	1.81
vi) Unloaded:						
1.6	680	2280	3.68	3.08	1.925	0.43
e) Varying loads at standard PTO speed (540 ± 10 rpm):						
i) Torque corresponding to maximum power available at standard PTO speed						
37.6	540	1811	10.35	8.65	0.230	3.63
ii) 85% of the torque obtained in (i) :						
34.5	583	1955	9.92	8.29	0.240	3.48
iii) 75% of the torque obtained in (ii) :						
26.0	586	1965	8.06	6.74	0.259	3.23
Iv) 50% of the torque obtained in (II) :						
17.5	591	1982	6.11	5.11	0.292	2.86
v) 25% of the torque obtained in (ii):						
8.8	597	2002	4.34	3.63	0.413	2.03
vi) Unloaded:						
1.4	601	2015	2.95	2.47	1.764	0.47

*** Under High ambient conditions**

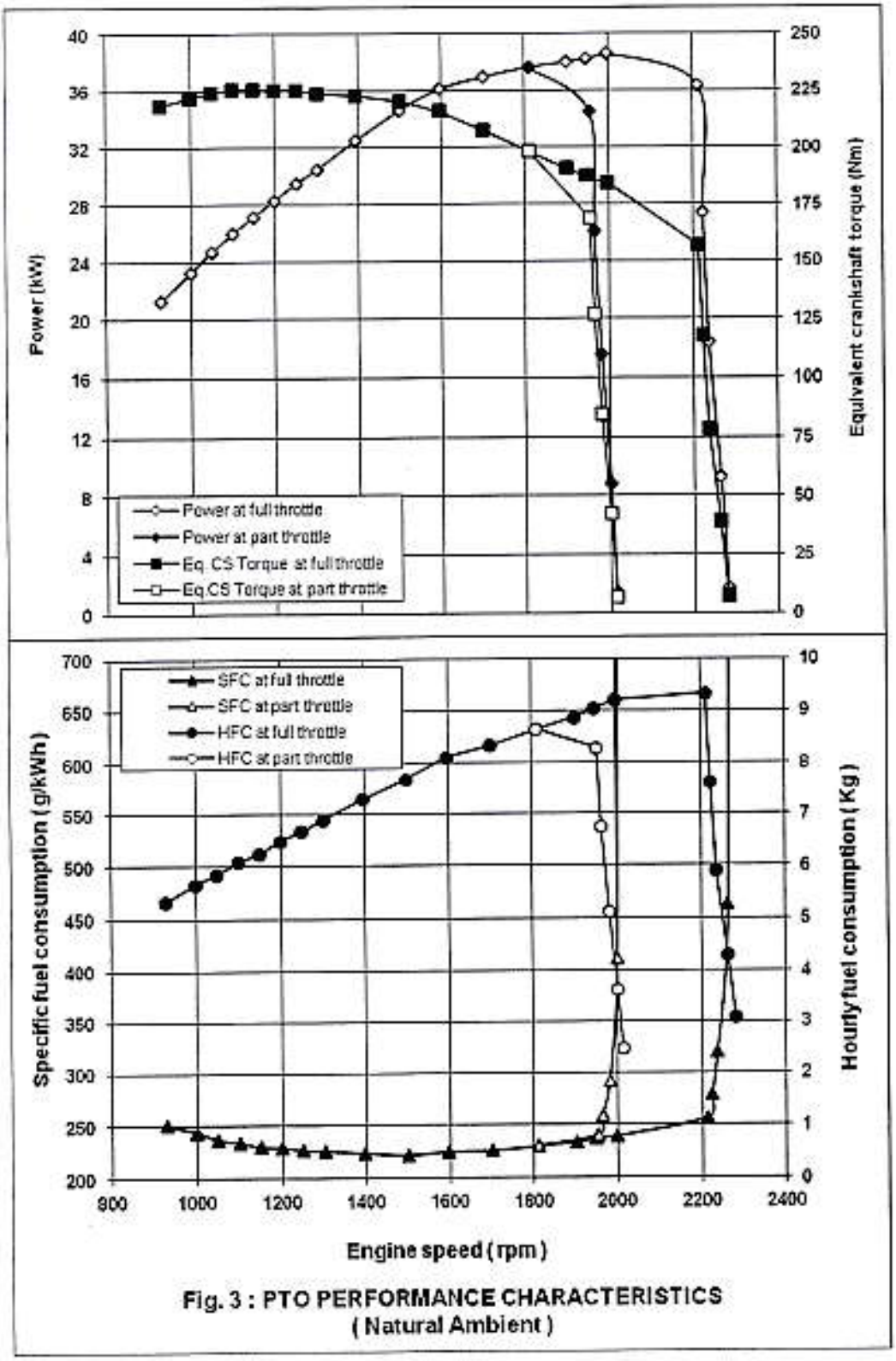


Fig. 3 : PTO PERFORMANCE CHARACTERISTICS
(Natural Ambient)

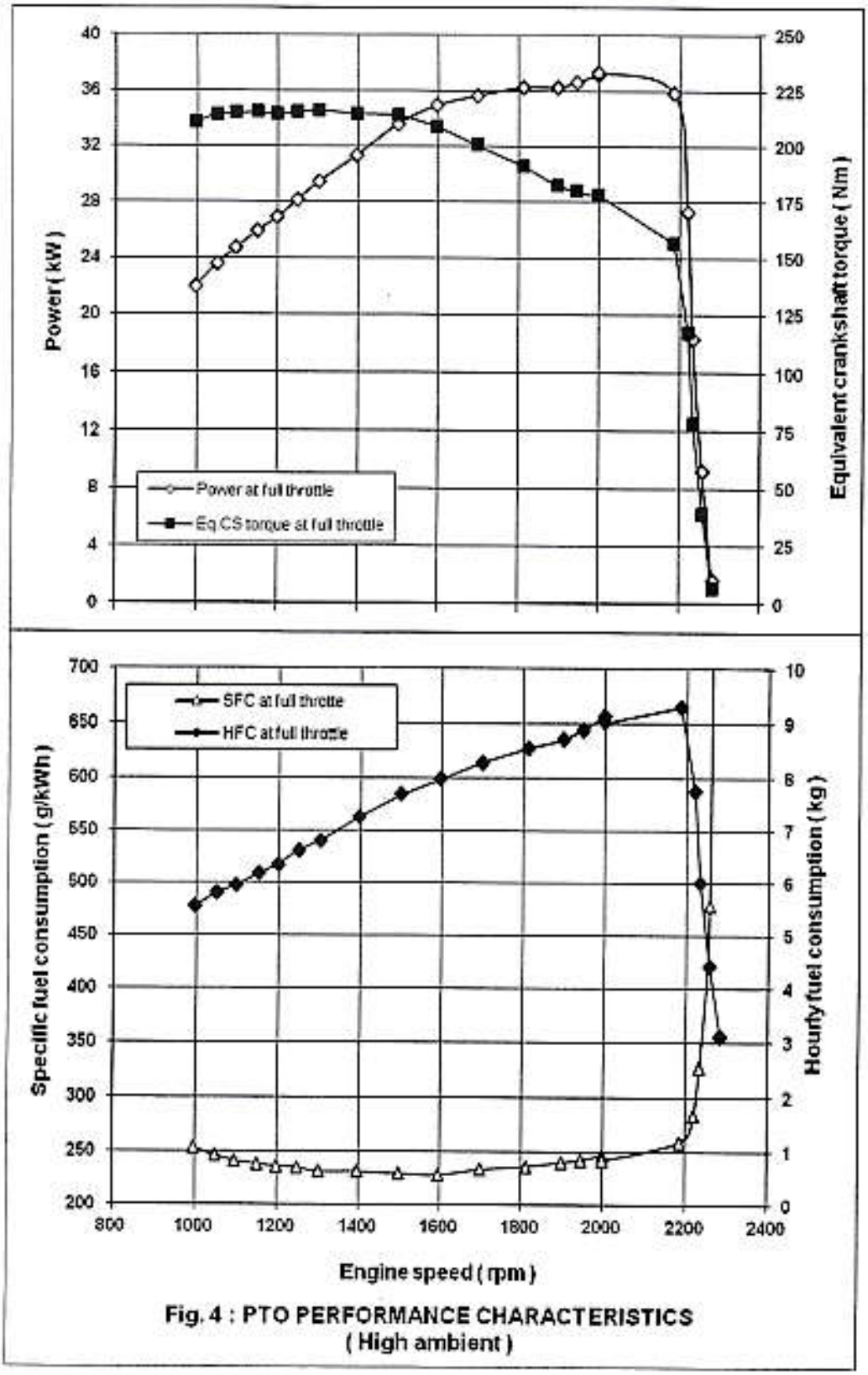


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS
(High ambient)

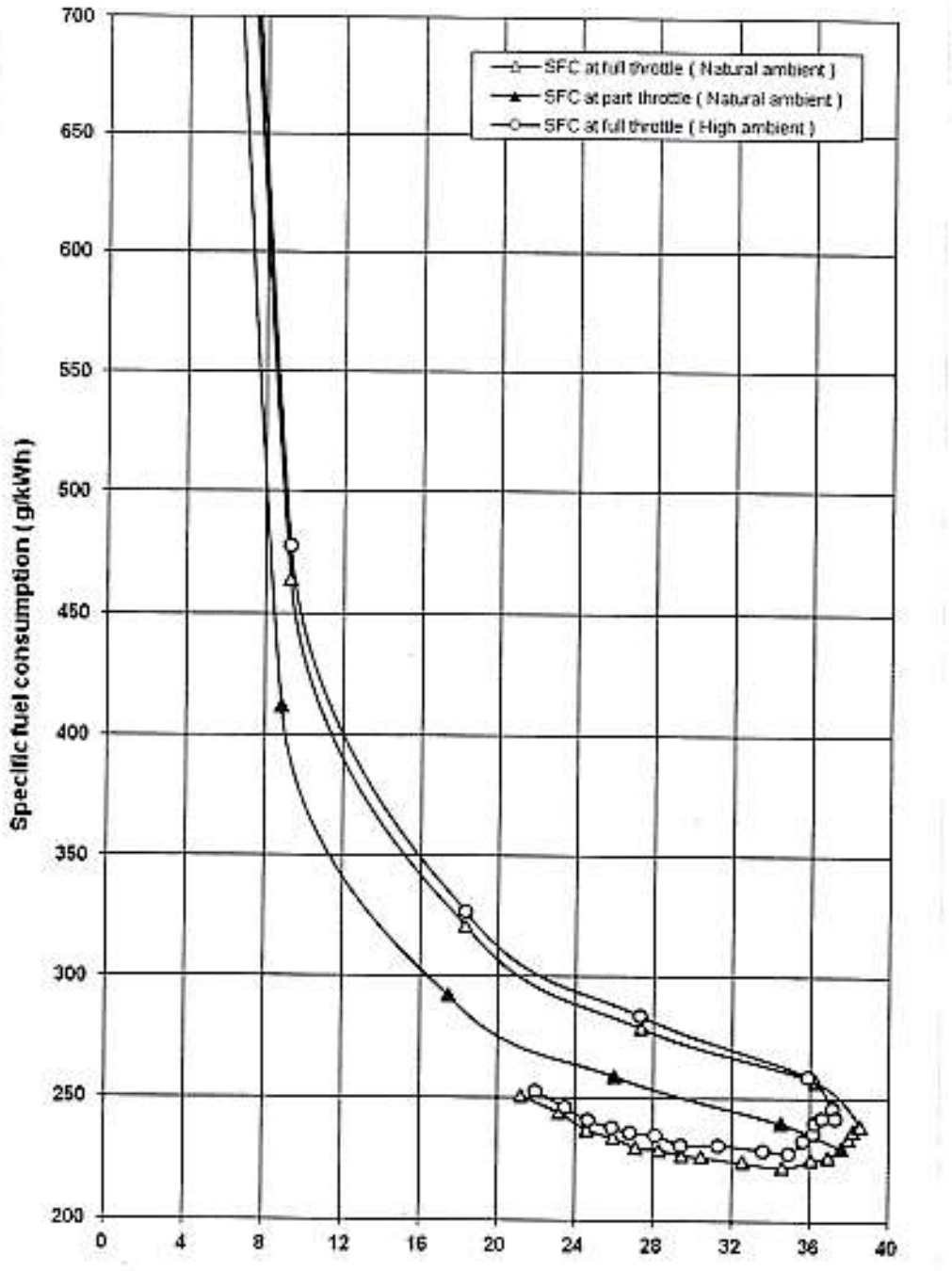


Fig. 5 : PTO PERFORMANCE CHARACTERISTICS

		Natural ambient	High ambient
- No load maximum engine speed, (rpm)	:	2280	2283
-Equivalent crankshaft torque at maximum power, (Nm)	:	184.1	178.2
- Maximum equivalent crankshaft torque, (Nm)	:	225.6	215.9
-Engine speed at maximum equivalent crankshaft torque, (rpm)	:	1100	1301
- Back-up torque, percent	:	22.54	21.16
- Smoke level, maximum light absorption coefficient (per meter)	:	0.41	–
- Range of atmospheric conditions:			
Temperature, (°C)	:	27 to 29	42 to 45
Pressure, (kPa)	:	99.3 to 99.8	100.4 to 101.1
Relative humidity, (%)	:	35 to 41	12 to 29
- Maximum temperatures (°C):			
Engine oil	:	102	111
Coolant (water)	:	82	93
Fuel	:	49	61
Air intake	:	43	57
Exhaust gas	:	591	593
- Pressure at maximum power:			
Intake air, (kPa)	:	4.5 to 4.7	4.7
Exhaust gas,(kPa)	:	143.1 to 146.0	128.7 to 130.3
- Consumptions:			
Lub. oil, (g/kWh)	:	--	0.27
Coolant (water), (% of total coolant capacity)	:	--	0.42

4. DRAWBAR PERFORMANCE TEST

Date(s) of test	:	30.05.2017, 31.05.2017 & 01.06.2017
Tractor run at the Institute prior to start of drawbar performance test, (h)	:	30.23
Type of track	:	Concrete
Height of drawbar, (mm):		
- Without ballast	:	525
- With ballast	:	525

4.1 The results of drawbar performance test with 4WD engaged condition, consisting of maximum power and pull with standard ballast/with ballast and ten hours test are tabulated in **Table - 2**. The results of the tests with ballast are also represented graphically in **Fig. 6 & 7.**

Table - 2

DRAWBAR PERFORMANCE TEST

Gear	Travel Speed, (Km/h)	Draw-bar power, (kW)	Draw-bar pull, (kN)	Engine Speed (rpm)	Wheel Slip, (%)	Fuel consumption		Specific Energy, (kWh/l)	Atmospheric conditions			Temperature (°C)				Max. sust-ained pull, (kN)
						kg/ kWh	l/h		Temp (°C)	Pre-Ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Cool-ant (wa-ter)	En-gine oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor with standard ballast & 4WD in engaged condition):																
L1	2.97	21.6	26.14	2219	15.2	0.372	9.61	2.25	29	97.9	55	37	105	74	98	27.10
L2	3.68	26.2	25.61	2195	14.8	0.354	11.09	2.36	30	97.9	53	37	105	77	98	26.38
L3	6.53	30.0	16.51	1999	5.2	0.306	10.98	2.73	27	97.9	56	36	100	76	97	20.83
L4	9.11	29.4	11.60	2005	3.3	0.311	10.94	2.70	26	97.9	60	35	88	76	98	15.38
H1	10.98	32.3	10.59	2005	2.6	0.287	11.09	2.91	25	97.9	63	33	80	75	94	12.99
ii) Maximum power test (Tractor with ballasted & 4WD in engaged condition):																
L1	2.98	25.3	30.60	2219	14.5	0.346	10.47	2.42	31	97.8	51	38	106	76	99	32.53
L2	3.63	29.4	29.13	2104	11.9	0.315	11.08	2.65	30	97.9	57	37	106	78	101	31.68
L3	6.50	30.8	17.04	1997	5.0	0.295	10.87	2.83	28	97.9	58	36	89	77	98	21.18
L4	9.03	31.1	12.42	2003	3.6	0.294	10.94	2.84	28	97.9	59	35	83	76	93	15.72
H1	10.92	30.4	10.02	2005	2.7	0.305	11.09	2.74	26	97.8	63	34	80	75	93	12.82

Contd.. Table – 2

Table – 2 (Contd.)

Gear	Travel Speed, (Km/h)	Draw-bar power, (kW)	Draw-bar pull, (kN)	Engine Speed (rpm)	Wheel Slip, (%)	Fuel consumption		Specific Energy, (kWh/l)	Atmospheric conditions			Temperature (°C)				Max. sust-ained pull, (kN)
						kg/ kWh	l/h		Temp (°C)	Pre-ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Cool-ant (wa-ter)	En-gine oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
iii Five hours test at 75 percent of pull corresponding to max. power (ballasted wheeled tractor):																
L2	4.02	24.39	21.88	2212	7.2	0.340	9.97	2.45	27 to 32	97.9 to 98.1	48 to 61	36 to 39	81 to 114	74 to 76	91 to 101	--
iv) Five hours test at pull corresponding to 15 percent wheel slip (ballasted wheeled tractor):																
L1	2.97	24.79	30.05	2216	--	0.350	10.54	2.35	33 to 35	97.7 to 98.1	35 to 45	41 to 44	108 to 114	75 to 80	100 to 103	--

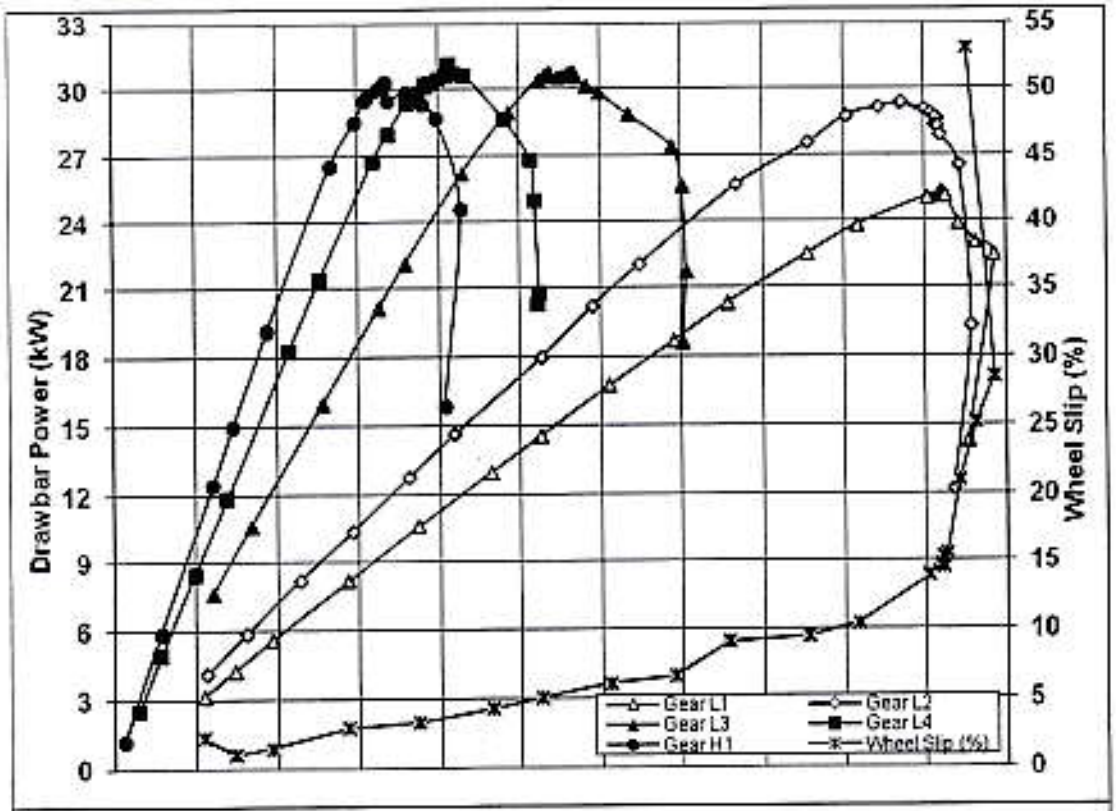
i) The coolant (water) and lub oil consumption during 10 hours test were observed as **9.83 ml/h** and **Nil** respectively.

ii) Creeping of rear tyres, (mm):

	Front wheel	Rear wheel
- LHS:	Nil	Nil
- RHS:	Nil	35

iii) Maximum temperatures during entire drawbar test, (°C)

Engine oil	:	103
Coolant (water)	:	86
Transmission oil	:	114
Fuel	:	44



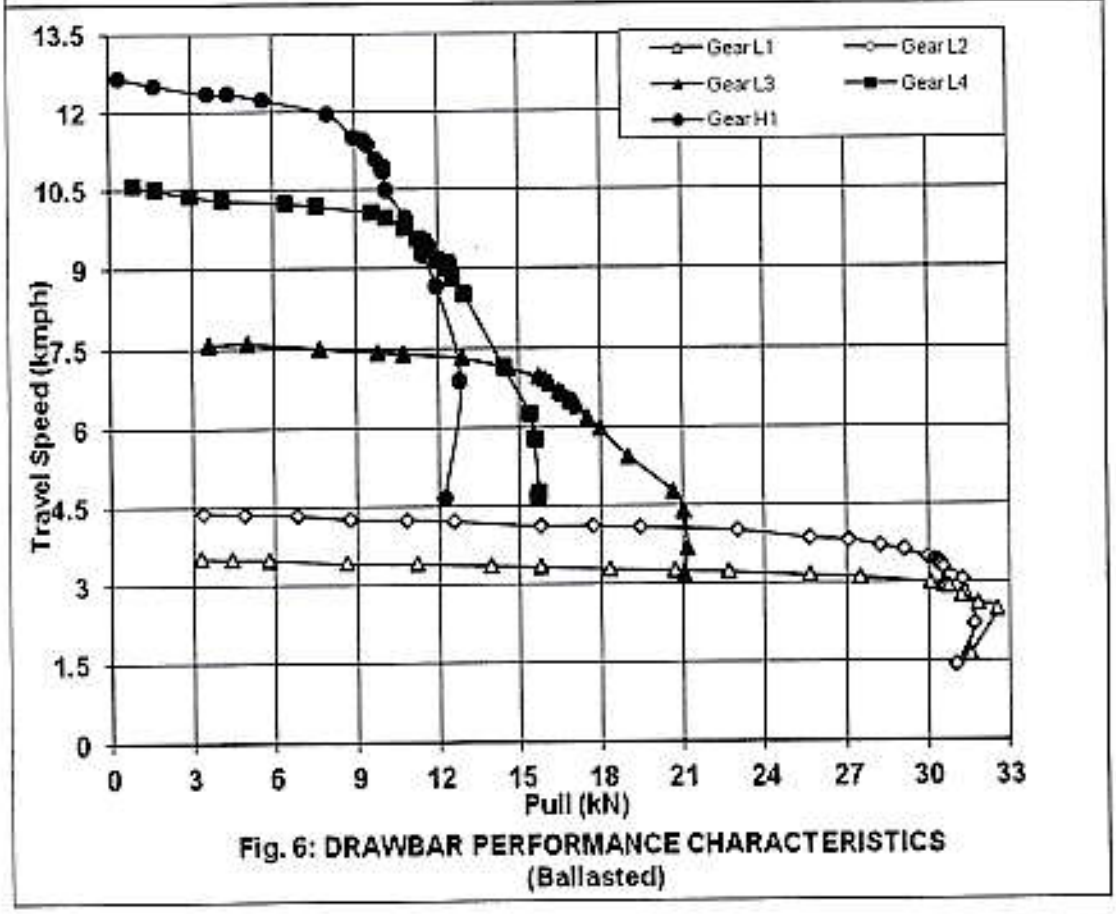


Fig. 6: DRAWBAR PERFORMANCE CHARACTERISTICS
(Ballasted)

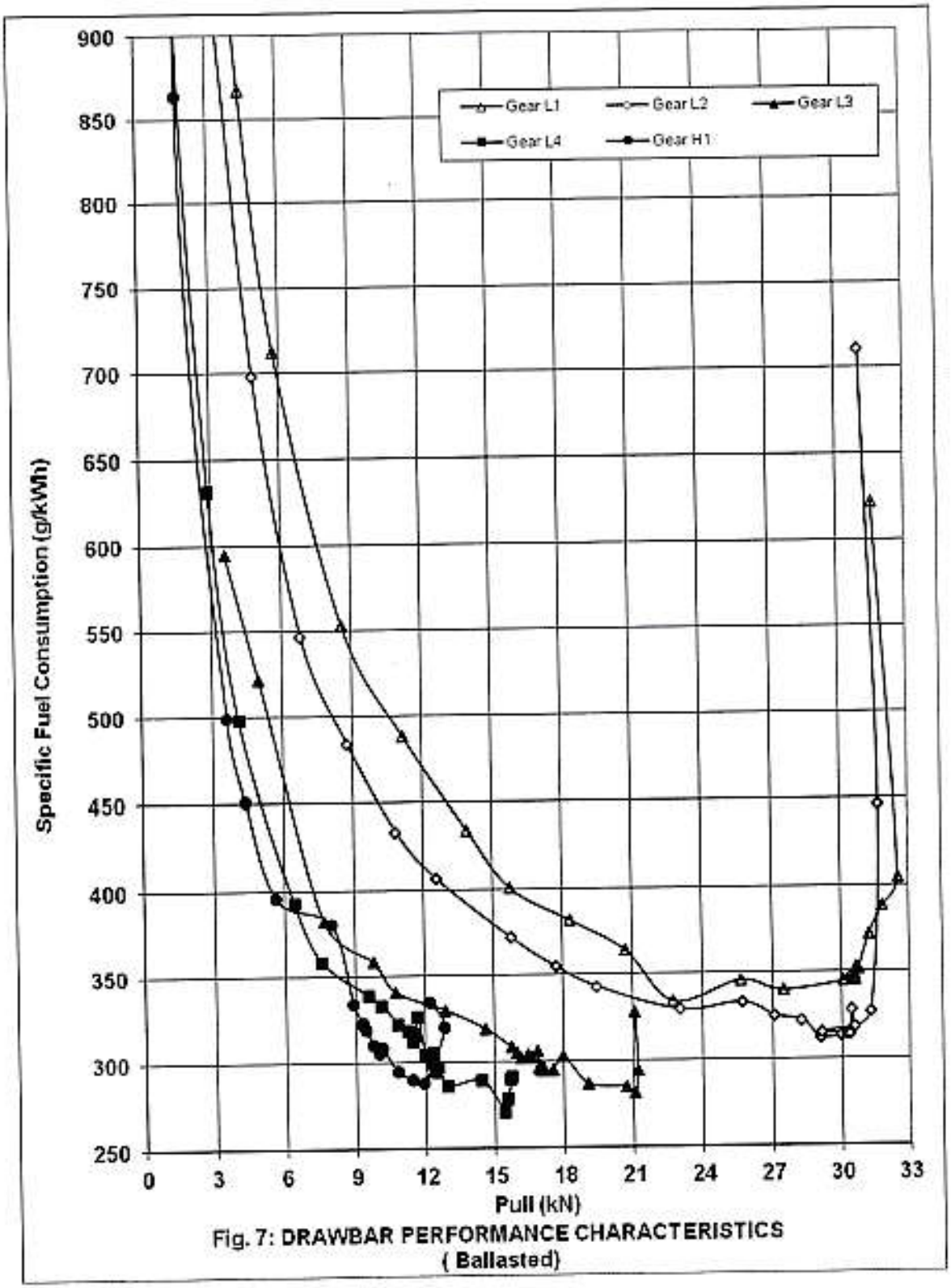


Fig. 7: DRAWBAR PERFORMANCE CHARACTERISTICS
(Ballasted)

5. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE TEST

Date(s) of test : 08.12.2016 & 09.12.2016
Tractor run at the Institute prior to start of hydraulic test, (h) : 3.63
Pump speed at rated engine speed,(rpm) : 2000 (apa)

5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed (l/min) : 35.22
Maximum hydraulic power,(kW) : 8.5
Pump delivery rate at maximum hydraulic power, (l/min) : 26.97
Pressure at maximum hydraulic power, (MPa) : 19.0
Sustained pressure of the open relief valve, (MPa) : 21.0

Tapping point:

a) Relief valve test : At external circuit
b) Pump performance test : At pump outlet
Temperature of hydraulic fluid, (°C) : 60 to 65

5.2 Lifting capacity test:

Test	Height of lower hitch point above ground in down position, (mm)	Vertical Movement with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corresp-onding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical , (degrees)
At hitch points	200	590	15.39	18.9	13.77	--
On the standard frame	200	570	13.97	18.9	21.02	16.7°

5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 12.57
Temperature of hydraulic fluid at the start of test, (°C) : 65

Test data:

Elapsed Time, (minute)	5	10	15	20	25	30
Cumulative drop in height of lift, (mm)	25	40	55	65	75	85

6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test : 02.12.2016
Type of track : Concrete
Maximum attainable speed (kmph):
-Standard ballast : 35.0
-With road ballast : 35.0

		At maximum attainable speed			
Std ballasted tractor	Braking device control force, (N)	482	385	287	190
	Mean deceleration, (m/sec. sq.)	3.52	3.33	3.10	2.50
	Stopping distance, (m)	13.56	14.20	15.27	18.90

		At 25 kmph travel speed			
Std ballasted tractor	Braking device control force, (N)	496	395	295	194
	Mean deceleration, (m/sec. sq.)	3.70	3.20	2.86	2.50
	Stopping distance, (m)	6.64	7.54	8.42	9.65

6.1.2 Brake fade test:

		At maximum attainable speed			
Std ballasted tractor	Braking device control force, (N)	509	407	304	201
	Mean deceleration, (m/sec. sq.)	3.51	3.28	3.12	2.50
	Stopping distance, (m)	13.64	14.41	15.12	18.90

		At 25 kmph travel speed			
Std ballasted tractor	Braking device control force, (N)	528	427	326	224
	Mean deceleration, (m/sec. sq.)	3.56	3.21	3.00	2.50
	Stopping distance, (m)	6.91	7.50	8.05	9.65

Max. deviation of tractor from its original course, (m) : None

Abnormal vibration : None

The brakes were heated by : Self braking

6.2 Parking brake test:

Particulars	Parked on 18 percent slope		Parked on 12 percent slope with trailer of 2.96 tonnes.	
	Facing up	Facing down	Facing Up	Facing Down
Braking device control force, (N)	256	271	227	237
Efficacy of parking brake	---------- Effective ----------			

7. NOISE MEASUREMENT

7.1 Noise at bystander's position:

Date of test	:	01.12.2016
Type of track	:	Concrete
Background noise level, dB (A)	:	57
Atmospheric conditions:		
Temperature, (°C)	:	30
Pressure, (kPa)	:	98.6
Relative humidity, (%)	:	42
Wind velocity, (m/s)	:	1.9

Test Data:

S. No.	Gear	Travelling speed before acceleration, (kmph)	Noise level, dB (A)
1.	L1	2.66	82
2.	L2	3.33	82
3.	L3	5.81	82
4.	L4	7.93	82
5.	H1	9.43	82
6.	H2	11.75	82
7.	H3	20.47	82
8.	H4	27.95	82

7.2 Noise at operator's ear level:

Date of test	:	30.05.2017
Type of track	:	Concrete
Background noise level, dB (A)	:	58
Atmospheric conditions:		
Temperature, (°C)	:	31
Pressure, (kPa)	:	97.8
Relative humidity, (%)	:	51
Wind velocity, (m/s)	:	3.1

Test Data:

Gear	Drawbar pull at which the tractor develops the max. noise level, (kN)	Corresponding travelling speed, (kmph)	Noise level dB (A)
L1	25.26	3.07	92
L2	23.51 to 25.61	3.94 to 3.68	93
*L3	11.72 to 16.12	7.34 to 6.71	93
L4	11.11 to 11.60	9.72 to 9.11	93
H1	10.11 to 10.29	11.46 to 11.26	93

* Gear corresponds to the nominal traveling speed nearest to 7.5 kmph.

8. MECHANICAL VIBRATION MEASUREMENT

Date of test : 29.12.2016
Type of test surface : Concrete

Sl. No.	Measuring points		Vibration, microns			
			At no load		At load corresponding to 85% of maximum PTO power	
			VD	HD	VD	HD
1	2		3	4	5	6
i)	Foot rest	Left	100	70	100	70
		Right	20	60	60	110*
ii)	Steering wheel		40	100	100	180*
iii)	Seat	Bottom	90	60	70	60
		Back	30	20	20	30
iv)	Mudguard	Left	30	40	60	70
		Right	30	30	70	90
v)	Head light	Left	40	40	30	30
		Right	60	40	40	30
vi)	Battery base, centre		30	30	120*	30
vii)	Tail light	Left	50	50	90	90
		Right	70	70	120*	100
viii)	Plough light		60	100	90	190*
ix)	Gear shifting lever		90	70	130*	160*
x)	Accelerator lever	Hand	60	100	100	110*
		Foot	70	40	60	80
xi)	Brake pedal	Left	90	100	170*	190*
		Right	100	140*	130*	150*
xii)	Clutch pedal		100	70	90	120*
xiii)	Main hydraulic control lever		30	60	90	90
xiv)	PTO engaging lever		50	20	40	30
xv)	Differential lock lever		20	20	20	60

*** The amplitude of mechanical vibration is on higher side.**

9. LOCATION OF CENTRE OF GRAVITY

Condition	Particulars	Coordinates
Tractor under standard ballasted condition but with all the liquid reservoirs full & the operator replaced by a 75 kg mass on the seat	Height above ground, (mm)	778
	Distance forward from the vertical plane containing the axis of rear wheels, (mm)	1046
	Distance from the median plane parallel to the longitudinal axis of tractor bisecting the track, (mm)	4.7 (towards RHS)

10. TURNING ABILITY

With 2WD engaged condition				
Characteristics	Minimum turning diameter,(m)		Minimum clearance diameter,(m)	
	RHS	LHS	RHS	LHS
Brake applied	7.81	7.91	8.11	8.17
Brakes released	8.74	8.70	9.04	8.96
With 4WD engaged condition				
Brake applied	7.63	7.78	7.93	8.10
Brakes released	9.73	9.65	10.05	9.89

11. OPERATOR'S FIELD OF VISION

The operator's field of vision to the front and rear from the operator's seat is represented in **Fig. 8.** The observations are as under:

i) The non visible space in front is **7500 mm** which is **3.33** times of wheel base (i.e. 2255 mm).

ii) The non-visible space on LHS and RHS is **2850 mm** which is **1.97** times of rear track width (i.e. 1445 mm).

iii) Silencer is creating masking effect.

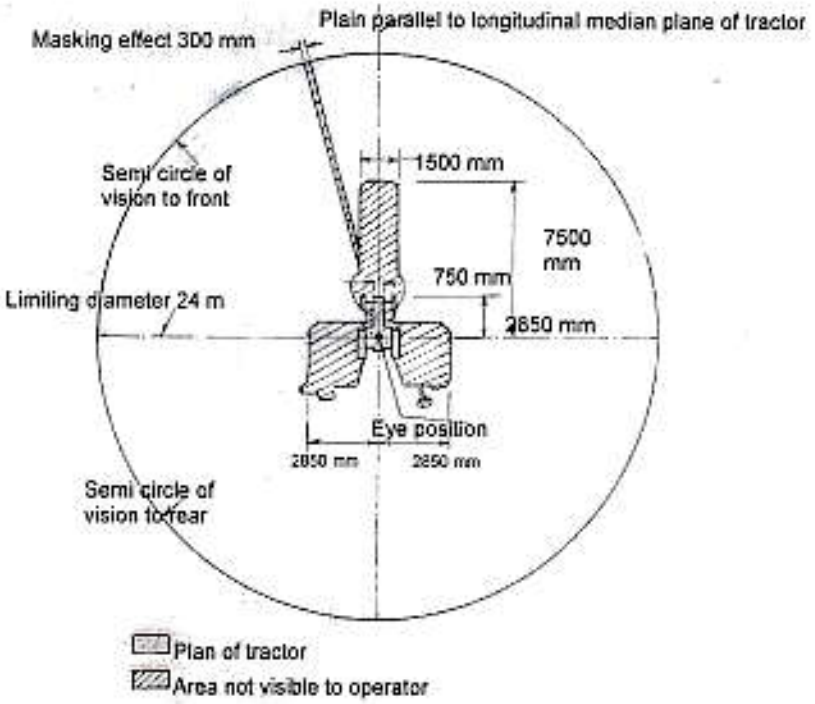


Fig. 8: OPERATOR'S FIELD OF VISION

12. FIELD TEST

12.1 The field tests comprising of Disc ploughing, Rotavation and Puddling (including water proof test for five hours) were conducted for **11.42, 11.08 and 15.89** hours respectively.

All the field tests were conducted at the full accelerator settings, when the no load speed of the engine varied from **2430 to 2433** rpm.

12.2 The brief specifications of the implements used during field tests are given in **Annexure-** II.

12.3 The summary of field test observation with Disc plough; Rotavator and Puddling is given in **Table - 3.**

Table – 3

SUMMARY OF FIELD PERFORMANCE TEST

Sl. No.	Parameter/operation	Disc Ploughing	Rotavation	Puddling
i)	Type of soil (refer IS: 7926-1975)	Light	Light	Heavy
ii)	Av. soil moisture, (%)/Av. Depth of standing water, (mm)	7 to 8	6 to 8	6
iii)	Bulk density of soil, (g/cc)	1.80 to 1.95	1.80 to 2.0	--
iv)	Cone index, (kg/sq.cm)/ puddling index, (%)	6.81 to 8.17	6.81 to 8.17	90
v)	Gear used	L1	L1	L2
vi)	Av. speed of operation, (kmph)	2.97 to 3.25	3.50 to 3.54	4.16 to 4.17
vii)	Av. wheel slip, (%)/Av. Travel reduction, (%)	7.9 to 13.0	-2.9 to -0.9	8.1
viii)	Av. depth of cut, (cm)/ Av. depth of puddle, (cm)	26 to 31	7 to 8	23 to 29
ix)	Av. working width, (cm)	64 to 81	172 to 179	--
x)	Area covered, (ha/h)	0.171 to 0.201	0.515 to 0.587	--
xi)	**Fuel consumption:**			
	- (l/h)	3.72 to 4.40	5.63 to 7.05	6.22 to 6.78
	- (l/ha)	21.75 to 21.89	10.93 to 11.14	--
xii)	Av. draft of implement, (kN)	5.98 to 6.02	--	--

Remarks: The average lub oil and coolant (water) consumptions during the entire field tests were observed as **2.60 and 2.60** ml/h respectively.

12.4 Wet land cultivation (Puddling):

12.4.1 The tractor was fitted with roto puddler and puddling special tyres for carrying out the puddling operation. The brief specification of roto puddler given in **Annexure** –II.

12.4.2 After completion of puddling test and water proof test, the tractor was partially dismantled to check effectiveness of sealing provided against ingress of water and / or mud in various assemblies / components as per requirements of IS : 11082 – 1984 (Technical requirement of Agriculture tractors for wet land cultivation). The observations recorded were as under :

S. No.	Location	Whether ingress of mud and/or water	Remarks
1.	Front axle assemblies (contain front differential, front final drive, bevel pinion, wheel hub & centre pin)	No	None
2.	Clutch housing	No	
3.	Brake housing	No	
4.	Lubricating oil of engine sump, transmission, hydraulic, brake, rear differential, rear final drive & steering gearbox.	No	
5.	Starter motor	No	
6.	Alternator	No	

13. HAULAGE TEST

Type of trailer:		Two wheel (Single axle)	Four wheel (Double axle)
Gross mass of trailer, (tonnes)	:	5.0	6.5
Height of trailer hitch above ground Level, (mm)	:	540	605
Gear used during the test for negotiating slopes up to 8%	:	H4	H4
Average travel speed, (kmph)	:	29.97 to 30.64	29.54 to 30.19
Average fuel consumption:			
- (l/h)	:	7.04 to 7.36	7.21 to 7.30
- (ml/km/tonne)	:	46 to 49	37 to 38
Average distance traveled per litre of fuel consumption, (km)	:	4.07 to 4.35	4.1 to 4.14
General observations:			
Effectiveness of brakes	:	Effective	Effective
Maneuverability of tractor-trailer Combination	:	Satisfactory	Satisfactory

14. COMPONENTS / ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **87** hours of tractor operation at this Institute.

14.1 Engine:

14.1.1 Cylinder bore:

Cylinder No.	Cylinder bore dia. (mm)						Max. permissible limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Thrust side	Non-thrust side	
1.	91.016	91.005	91.015	91.008	91.013	91.014	91.3
2.	91.015	91.005	91.024	91.005	91.022	91.009	
3.	91.016	91.006	91.021	91.007	91.021	91.012	
4.	91.026	91.008	91.029	91.011	91.027	91.009	

14.1.2 Piston:

Piston No.	Piston dia., (mm)				Max. permissible wear limit of piston dia. (mm)	Clearance between piston and cylinder liner at the skirt of the piston, (mm)	
	Top (above top compression ring)		At skirt			As observed	Max. Permissible limit
	Thrust side	Non-thrust side	Thrust side	Non-thrust side			
1.	90.321	90.246	90.884	*	When the ring and groove clearance exceeds discard limit	0.132	0.45
2.	90.310	90.247	90.875	*		0.149	
3.	90.336	90.249	90.867	*		0.154	
4.	90.336	90.263	90.885	*		0.142	

* **Not measured due to piston design feature.**

14.1.3 Ring end gap:

Rings	Ring end gap, (mm)												Max. Permissible end gap limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No.3			Cylinder No.4			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1st comp ring	0.55	0.45	0.60	0.55	0.55	0.55	0.50	0.50	0.50	0.60	0.60	0.60	2.00
2nd comp ring	0.60	0.60	0.60	0.55	0.65	0.60	0.60	0.65	0.65	0.65	0.65	0.65	2.00
Oil ring	0.60	0.60	0.65	0.55	0.50	0.55	0.60	0.65	0.65	0.55	0.65	0.60	2.00

14.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)				Max. Permissible clearance Limit, (mm)
	Piston-I	Piston-II	Piston-III	Piston-IV	
1st Compression ring	0.142	0.140	0.139	0.137	0.20
2nd Compression ring	0.077	0.083	0.078	0.072	0.20
Oil ring	0.044	0.046	0.049	0.047	0.15

14.1.5 Main bearing:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. Permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1	0.036 to 0.041	0.32	0.40	0.67
2	0.041 to 0.043			
3	0.036 to 0.041			
4	0.039 to 0.051			
5	0.026 to 0.034			

14.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. Permissible clearance limit,(mm)	
	Diametrical	Axial	Diametrical	Axial
1	0.084 to 0.112	0.30	0.40	0.60
2	0.066 to 0.094	0.30		
3	0.067 to 0.076	0.30		
4	0.058 to 0.059	0.30		

14.1.7 Valve, guides and timing gears: **Observation**

Any marked sign of overheating of valves : None

Pitting of seat/faces of valves : None

Any visual damage to the teeth of timing gears : None

Spring Rate, (N/mm):

- Intake valve spring : 10.9 to 11.3 | Against discard limit of 8.83 N/mm
- Exhaust valve spring : 10.9 to 11.5

Clearance between valve guide and valve stem, (mm):

- Intake valve : 0.028 to 0.049 | Against discard limit of 0.25 mm
- Exhaust valve : 0.055 to 0.084

14.2 Clutch:

Any marked wear on clutch friction plate(s)	:	None	
Condition of clutch release bearing	:	Normal	
Condition of pilot bearing	:	Normal	
Condition of diaphragm and springs	:	Normal	
Presence of oil in clutch housing	:	None	
Any marks on fly wheel/ pressure plate	:	None	
Overall thickness of clutch plate,(mm):			
-Main transmission	:	10.30 to 10.37	7±0.4 (under load of 7000 N)
-PTO	:	7.63 to 7.69	6±0.3
Height of lining over rivet head, (mm):			
-Main transmission	:	1.02 to 1.26	Up to rivet head
-PTO	:	1.10 to 1.34	

14.3 Transmission gears:

Any visual damage, pitting & chipping of any transmission gear teeth.	:	None	
Backlash between crown wheel and Pinion, (mm)	:	0.49	0.5 (Re-shim to attain the desired backlash)

14.4 Brakes:

Description	Initial specified thickness of brake lining, (mm)	Measured thickness of brake lining after test, (mm)	Measured depth of oil groove of brake lining, (mm)	Minimum permissible thickness of brake lining, (mm)	Minimum permissible depth of oil groove of brake lining, (mm)
Left	4.63 to 4.90	4.63 to 4.84	0.33 to 0.46	3.53	0.3
Right	4.63 to 4.90	4.83 to 4.89	0.34 to 0.51		

14.5 Front axle : Front axle final drive reduction unit case is located near front wheel hub in a separate case. The differential unit is accommodated inside centre of the front axle housing. Bearing pins and bushes are provided at end of front axle and final drive.

Condition of front axle seals, bushes & bearing pins	:	Normal	
Any visual damage, pitting & chipping of front axle transmission gear teeth	:	None	
Any marked wear of bearing pins and bushes	:	None	
Clearance between bearing pins and bushes at top, mm	:	0.077 to 0.088	Against discard limit of 0.40 mm
Clearance between centre pin (journals) and bushes, mm	:	0.034 to 0.290	Against discard limit of 0.40 mm

14.6 Steering system:

Visual condition of the components of complete steering assembly : Normal

14.7 Starter motor & Alternator:

Presence of soil/oil in housing : None

Condition of bearings and other Components : Normal

15. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustments/Defects/Breakdowns and repairs	Category of breakdown	Tractor run hours
--	-None-	--	--

16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

16.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2014 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant(D)/ Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
16.1.1	**PTO Performance :**					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26kW. -7.5/+10% for PTO power ≤ 26kW	37.5 (D)	38.5	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	37.5 (D)	38.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	258 (D)	239	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	229.0 (D)	225.6	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10 percent, min (R)	22.5	Yes
f)	**Maximum operating temperature (^{0}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)	111	Yes

1	2		3	4	5	6	7
	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)	93	Yes
g)	Engine oil consumption, (g/kWh)		Evaluative	Not exceeding 1% of SFC at max. power under high ambient conditions	Max. 2.58 (D) 1% of SFC, max. (R)	0.27	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	0.41 per meter	Yes
16.1.2	**Drawbar performance :**						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN).		Non Evaluative	Minimum 65% of static mass of tractor with ballast	21.95 (D) 22.18 (R) Minimum	30.60	Yes
b)	Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN).		Evaluative	Minimum 65% of static mass of tractor with standard ballast	18.35 (D) 18.74 (R) Minimum	26.14	Yes
c)	Maximum drawbar power with standard ballast (kW).		Evaluative	Minimum 80% of PTO power as referred in Sl. No. i) a) of PTO performance in case of tractors having total static mass >1500 kg. Minimum 75% of PTO power as referred in Sl. No. i) a) of PTO performance in case of light weight tractors. Minimum 75% of the engine power as referred in Sl. No. i) a) of PTO performance in case of tractors which do not have a PTO shaft	30.0 (D) 30.6 (R) Minimum	32.3	Yes
d)	Maximum transmission oil temperature (°C)		Non Evaluative	The declared value should not exceed the maximum value specified by oil company.	125 (D)	114	Yes
16.1.3	**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%]	15.20 (D)	15.39	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft	10.79 (D) 9.06 (R) Minimum	13.97	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	The observed value should not exceed 50 mm	50 (D) 50 (R) Maximum	85	No

1	2	3	4	5	6	7
16.1.4	**Brake performance at 25 kmph:**					
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with standard ballast*, (m):					
	1) Cold brake	Evaluative	10	10 (R)	6.64	Yes
	2) Hot brake	Evaluative	10	10 (R)	6.91	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2, (N)	Evaluative	600	600 (R)	194 to 224	Yes
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
	*** The manufacturer has not recommended ballasting for road test, therefore the brake test was conducted under standard ballast condition only.**					
16.1.5	**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	96 (R)	93	Yes
16.1.6	**Amplitude of mechanical vibrations at :**					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	100	Yes
	2) Right foot rest			100 (R)	110	No
	3) Seat (with driver seated)			100 (R)	90	Yes
	4) Steering wheel			100 (R)	180	No
16.1.7	**Air cleaner:**					
	Air cleaner oil pull over, (%)	Non Evaluative	0.25 % (maximum)	Dry type air cleaner	Not applicable	--
16.1.8	**Haulage requirements:**					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2) Four wheel		--	6.5 (D)	6.5	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	4.50 to 5.50 (D)	4.07 to 4.35	No
	2) Four wheel		--	4.50 to 5.50 (D)	4.10 to 4.14	No
c)	Fuel consumption, (ml/km/tonne):					
	1) Two wheel	Non Evaluative	-	35 to 40 (D)	46 to 49	No
	2) Four wheel		-	35 to 40 (D)	37 to 38	Yes
16.1.9	**Wetland cultivation (Puddling Operation):**					
	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 welland cultivation, it may be recommended for dry land operation only	There should be no ingress of water and/or mud	No ingress of water and/or mud was observed.	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine oil	-do-				
	5) Transmission oil	-do-				

1	2	3	4	5	6	7
16.1.10	**Safety features :**					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulic pipes (As per IS 12239 Part 2)	–	Meets the requirements	Yes
b)	Lighting arrangement	Evaluative	As per CMVR	–	Meets the requirements	Yes
c)	Seating requirements (Tractors having more than 1150 mm track width)	Non Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	--	**Does not meet the requirements**	**No**
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	**Does not meet the requirements**	**No**
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS 4468 (Part 1) (as amended from time to time)	--	**Does not meet the requirements**	**No**
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS 12953 (as amended from time to time)	--	**Does not meet the requirements**	**No**
	Specifications of swinging drawbar	Non Evaluative	Should meet the requirements of IS 12362 (Part 3) (as amended from time to time)	--	Not provided	NA
16.1.11	**Labeling of tractors (Provision of labeling plate):**					
	1) Make	Evaluative	Should conform to the requirements of CMVR	–	ESCORTS LIMITED	Yes
	2) Model	Evaluative		–	FARMTRAC 6060 UM	Yes
	3) Year of manufacture	Evaluative		–	KD (January, 2015)	Yes
	4) Engine serial number	Evaluative		--	E2335319	Yes
	5) Chassis number	Evaluative		--	T052332879KD	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	37.5	Yes
16.1.12	**Discard limit for:**					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by printed literature.	91.020 +0.010	91.005 to 91.029	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45	0.132 to 0.154	Yes
(c)	**Ring end gap (mm):**					
	- Top comp. ring.	Evaluative	-do-	2.00	0.45 to 0.60	Yes
	- 2nd comp. ring.		-do-	2.00	0.55 to 0.65	Yes
	- Oil ring.		-do-	2.00	0.50 to 0.65	Yes
(d)	**Ring groove clearance (mm):**					
	- Top comp. ring.	Evaluative	-do-	0.20	0.137 to 0.142	Yes
	- 2nd comp. ring.		-do-	0.20	0.072 to 0.083	Yes
	- Oil ring.		-do-	0.15	0.044 to 0.049	Yes

1	2	3	4	5	6	7
(e)	**Clearance of main bearings (mm):**					
	- Diametrical clearance	Evaluative	-do-	0.40	0.026 to 0.051	Yes
	- Crankshaft end float	Evaluative	-do-	0.67	0.32	Yes
(f)	**Clearance of big end bearings, (mm):**					
	- Diametrical	Evaluative	-do-	0.40	0.058 to 0.112	Yes
	- Axial	Evaluative	-do-	0.60	0.30	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.40	0.08 to 0.09	Yes
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	– do–	0.40	0.03 to 0.29	Yes
16.1.13	**Literature (Submission to test agency):**					
(a)	Operator manual	Evaluative	Provided/ Not provided	Provided	Provided	Yes
(b)	Parts Catalogue	Evaluative	Provided/ Not provided	Provided	Provided	Yes
(c)	Workshop/ Service manual	Evaluative	Provided/ Not provided	Provided	Provided	Yes

16.1.14	CATEGORY OF BREAKDOWNS / DEFECTS :				
S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown.	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature.	None	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns.	None	Yes

16.2	Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:			
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	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.	ROPS not fitted	Not applicable
2.	Accessories	Trailer hitch, front tow hook may be provided.	Trailer hitch provided Front tow hook provided	Yes

16.3 Conformity with following IS:

i) Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (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 - Three-point linkage: Part 1 Categories 1, 2, 3 & 4 (Fourth Revision) [IS 4468 (Part-1):1997/ ISO 730-1:1994 (Reaffirmed in March, 2009)]	:	**Does not conform**
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)]	:	**Does not conform**
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Re-affirmed in March, 2009)]	:	**Does not conform**
vi)	Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision): [IS 12239 (PT-1) 1996 (Reaffirmed in February, 2012)/ISO 4254-1:1989]	:	**Does not conform**
vii)	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)]/ISO 3767-2:1991]	:	Conforms
viii)	Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) [(IS 12239 (PT-2) 1999) (Re-affirmed in March, 2009)]	:	**Does not conform**
ix)	Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Re-affirmed in March, 2009)	:	**Does not conform**
x)	Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Re-affirmed in March, 2009)	:	Conforms

16.4 Salient Observations:

16.4.1 Laboratory tests:

16.4.1.1 PTO Performance:

i) The maximum PTO power was observed as **38.5 kW** against the declaration of **37.5 kW** which meets the requirement of IS: 12207-2014 with regard to tolerance limit.

ii) The specific fuel consumption corresponding to maximum power was recorded as **239 g/kWh** against the declaration of **258 g/kWh**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.

ii) The backup torque is **22.5 %.**

16.4.1.2 Drawbar performance:

The creeping of rear tyres over rim was recorded as 35 mm in RHS rear tyre during ten hours drawbar performance test. This should be looked into for necessary corrective action.

16.4.1.3 Hydraulic Performance:

During the hydraulic lift load maintenance test the drop in vertical height of the lower links was observed as **85 mm** against the maximum permissible limit of 50 mm. It indicates an internal leakage in the hydraulic system. This may be looked into for necessary corrective action.

16.4.1.4 Mechanical Vibration:
The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-8 of this test report is on very higher side, especially at the steering control wheel & right hand side foot rest. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

16.4.1.5 Haulage requirements:
The distance travelled per liter of fuel with two and four wheel trailer was recorded as **4.07 to 4.35 km/l and 4.10 to 4.14 km/l**, respectively against the declaration of 4.50 to 5.50 km/l & specific fuel consumption with two wheel trailer was recorded as **46 to 49 ml/km/tonne** against the declaration of 35 to 40 ml/km/tone. This should be looked into.

16.4.1.6 Operator's Seat:

The width of seat, the longitudinal distance from seat index point to the centre of lock pedal, the vertical distance from seat index point to the centre of steering control wheel, vertical distance from seat index point to the foot rest and lateral distance from seat index point to the centre of foot accelerator does not meet the requirement of IS: 12343-1998. This should be looked into for necessary corrective action.

16.4.1.7 Technical Requirements for Power Take Off Shaft:
Dimension "d∅" and "b" [Refer Fig.2(a)] of power take off shaft and dimensions of "N" [Refer Fig.2(b)] of master shield does not meet the requirement of IS: 4931-1995. This should be looked into for necessary corrective action.

16.4.1.8 Three Point Linkage:
The width of ball and the lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS: 4468 (Part-1) -1997. This should be looked into for necessary corrective action.

16.4.1.9 Dimensions of Linkage Drawbar:
Dimension "F∅" [Refer Fig.1(b)] of linkage drawbar does not meet the requirement of IS: 12953-1990. This should be looked into for necessary corrective action.

16.4.2 Field performance test:

16.4.2.1 Wet land cultivation (Puddling operation):
No ingress of water and or mud in various assemblies/components was noticed during wetland cultivation of tractor. Hence, it meets the requirements of IS: 11082-1984 (Technical Requirements of Agricultural Tractors for Wetland Operation). The tractor is found suitable for wetland operation (Puddling).

16.5 Maintenance / Service Problems:
No noticeable maintenance or service problem was observed during the test.

16.6 Recommendation with regard to safety on tractor:
The following requirements, inter-alia, may be considered for incorporation on the tractor:

i) Provision for spark arresting device in exhaust system.
ii) The longitudinal distance from seat index point to the centre of lock pedal, the vertical distance from seat index point to the centre of steering control wheel, vertical distance from seat index point to the foot rest and lateral distance from seat index point to the centre of foot accelerator should be within the limit for easy handling of tractor.
iii) Stop knob is provided but does not remain in stop position
iv) The working clearance between draft control lever and mudguard should be as per the minimum requirements of relevant Indian Standard for easy operating the lever.

16.7 **Adequacy of Literature supplied with machine:**

16.7.1 The following literature was supplied with the tractor for reference during the test:

i) Tractor Operator's Manual
ii) Parts Catalogue
iii) Service Manual

16.7.2 The printed literature supplied with the test sample is in English. The literature may be brought out as per IS: 8132-1999 (Reaffirmed in March, 2009) for the guidance of user and service personnel in national as well as other regional languages.

17. CITIZEN CHARTER

Time frame for Testing & Evaluation as per Citizen Charter	Duration of test	Whether the report is released within the time frame given in the Citizen Charter	Remark
10 Months	12 Months (October, 2016 to October, 2017)	No	Due to waiting in drawbar performance test and seasonal constraints.

TESTING AUTHORITY:

C. K. TIJARE
AGRICULTURAL ENGINEER

C. V. CHIMOTE
TEST ENGINEER

Y. K. RAO
SENIOR AGRICULTURAL ENGINEER

J.J.R. NARWARE
DIRECTOR

18. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
18.1	16.4.1.6,16.4.1.7,16.4.1.8,16.4.1.9, 16.6 & 16.7.2	These being studied & corrective action would be taken in near future.
18.2	16.4.1.2,16.4.1.3,16.4.1.4	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.

ANNEXURE – I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No.	Item	Disc Plough	Rotavator	Roto puddler
1.	Make	Field King	Maschio Itali	Escorts
2.	Type	Mounted	Mounted	Mounted
3.	No. of bottom / blades/discs	03	42 in 8 flanges	46
4.	Type of bottom / blades/blades	Concave	Hatchet	Hatchet
5.	Size of bottom / blade/disc, (mm)	335	245x75x6.0	255x45x6.6
6.	Spacing of bottom/flanges/bracket, (mm)	280	245	75
7.	Lower hitch point span, (mm)	785	735	755
8.	Mast height, (mm)	510	470 & 610	660
9.	**Overall dimensions, (mm):**			
	- Length	1920	1985	2045
	- Width	1040	1020	940
	- Height	1180	1045	1215
10.	Gross mass, (kg)	345	440	385

ANNEXURE-II

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	11.64
3.	Power lift and hydraulic pump performance test	4.41
4.	Drawbar performance test	16.63
5.	Turning ability	0.50
6.	Location of centre of gravity	0.15
7.	Operator's field of vision	--
8.	Brake test	1.5
9.	Noise measurement	1.83
10.	Mechanical vibration test	1.00
11.	Theoretical speed test	1.13
B.	**FIELD TEST:**	
1.	Disc ploughing	11.42
2.	Rotavation	11.08
3.	Wetland cultivation (including water proof)	15.89
C.	**HAULAGE TEST:**	8.17
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	1.55
	TOTAL:	**87.0**