

व्यावसायिक परीक्षण रिपोर्ट (प्रथम बैच परीक्षण)
COMMERCIAL TEST REPORT (First Batch Test)

संख्या/No. : T-1536/2064/2021
माह/Month : May, 2021

(यह परीक्षण रिपोर्ट 31/05/2026 तक वैध है।/ THIS TEST REPORT IS VALID UPTO
31/05/2026)



TAFE, MF 241 DI TRACTOR



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग,
मशीनीकरण एवं प्रौद्योगिकी प्रभाग

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE
DEPARTMENT OF AGRICULTURE, COOPERATION & FARMERS WELFARE,
MECHANIZATION & TECHNOLOGY DIVISION

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) 466 445

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO 9001: 2015 Certified Institute)

TRACTOR NAGAR, BUDNI (M.P.) 466445

E-mail: fmti-mp@nic.in
Telephone: 07564-234729

Web site: <http://www.fmttibudni.gov.in>
FAX: 07564-234743

T-1536/2064/2021	TAFE, MF 241 DI TRACTOR - COMMERCIAL- (FIRST BATCH TEST)
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Manufacturer : M/s. Tractors and Farm Equipment Limited,
P.O. Box No.3302, (New 77)
35, Mahatma Gandhi Road,
Nungambakkam, Chennai- 600 034

Applicant : M/s. Tractors and Farm Equipment Limited,
P.O. Box No.3302, (New 77),
35, Mahatma Gandhi Road,
Nungambakkam, Chennai- 600 034

Month: May	Test Report No. T -1536/2064/2021	Year: 2021
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GOVERNMENT OF INDIA
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA
E-mail: fnti-mp@nic.in
Web site: fnttibudni.gov.in

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Telephone: 07564-234729, Fax: -234743

Type of Test : **COMMERCIAL - (FIRST BATCH TEST)**
 Test code/Procedure : IS: 5994-1998, IS: 9253-2013 and IS:12207-2019.
 Period of Test : October, 2020 to April, 2021
 Test Report No. : T- 1536/2064/2021
 Month/Year : May, 2021

-
- 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 was submitted by 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 the first batch test report and therefore, should be read in conjunction with the Initial commercial test report of "TAFE LTD., MF 241 DI" Tractor bearing report no. **T- 1024/1548/2016** released on April, 2016.
-

SELECTED CONVERSIONS

Sl. No	Units	Conversion Factor	A B B R E V I A T I O N S	
1.	Force:		Apa	As per applicant
	1 kgf	9.80665 N	TDC	Top Dead Centre
		2.20462 lbf	IS	Indian Standard
2.	Power:		LHS/RHS	Left Hand Side/ Right Hand Side
	1 Mechanical power	1.01387metric horse power	Hg	Mercury
		745.7 W	Temp.	Temperature
	1 Metric horse power	735.5 W	N.R.	Not recorded
1 kW	1.35962 Metric horse power	Rpm	Revolutions per minute	
3.	Pressure:		O.D/I.D	Outer diameter/ Inner diameter
	1 psi	6.895 kPa	N.A.	Not available/ Not applicable
	1 kgf/cm ²	98.067 kPa = 735.56 mm of Hg	PTO	Power take-off
	1 bar	100 kPa = 10 N/cm ²	R.H.	Relative Humidity
	1 mm of Hg	1.3332 m-bar		

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The “**TAFE LTD., MF 241 DI**” tractor had undergone “**Initial Commercial Test**” at this Institute and a test report No. **T- 1024/1548/2016** released on **April, 2016**. Now the applicant has submitted application vide letter No. Nil dated 06.06.2019 & revised application No. Nil dated 07.07.2020 for Batch testing of application for Batch testing of “**TAFE LTD., MF 241 DI**” tractor.

All necessary tests as per Table-1 of clause 6.0 of **IS: 5994 - 1998** (Reaffirmed in January, 2019) were carried out and test report released as under.

Manufacturer	:	M/s. Tractors and Farm Equipment Limited, P.O. Box No.3302, (New 77) 35, Mahatma Gandhi Road, Nungambakkam, Chennai- 600 034
Location of other manufacturing plants (apa)	:	M/s. Tractors and Farm Equipment Limited, Kalladipatti Plant, 10/205, Kalladipatti (P.O.), Pin code - 624 201Dindigul Dist., Tamilnadu.
	:	M/s. Tractors and Farm Equipment Limited, Doddaballapur Plant, Plot No. 1, Kiadb Industrial Estate, Doddaballapur, Bangalore - 561 203
Test requested by (applicant)	:	The Manufacturer
Selected for test by	:	The Applicant
Place of running-in	:	At Applicant's works
Duration of said running-in (h):		
- Engine	:	12
-Transmission	:	24
Method of Selection	:	Due to Covid-19 pandemic, it was not possible to conduct the random selection. Nor was it possible for applicant to facilitate the random selection. As a last resort, applicant requested to allow the direct submission of test sample which was allowed.

1. SPECIFICATION

1.1 Tractor:	
Make	: TAFE
Model	: MF 241 DI
Type	: Four wheeled, Rear-wheel driven, General Purpose, Unit construction, Agricultural Tractor.
Variant: if any	: Yes

Sr. no.	Variant model	Variant features
1.	MF 245 DI	Change nominal speed & Max PTO power (Vide test report no. T-1203/1730/2018, (December, 2018).
2.	MF 241 DI PP 4WD	4WD, change nominal speed, oil immersed disc brake system (Vide test report no. T-1264/1791/2019, (August, 2019).
3.	MF 241 DI Planetary Plus V1	Change nominal speed & Oil immersed disc brake system (Vide test report no. T-1537/2065/2021 (May,2021).

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	Year of manufacture	:	09 20
	Chassis number	:	MEA8D061JL2310730
	Country of origin	:	India
1.2	Engine:		
	Make	:	SIMPSON & Co. Limited
	Model	:	T III A S325.1 –F2
	Type	:	Four stroke, naturally aspirated, liquid (water) cooled, direct injection, diesel engine.
	Serial number	:	S325.1L07303
	Engine speed (Manufacturer's recommended production setting), (rpm):		
	- Maximum speed at no load	:	2100 to 2200
	- Low idle speed	:	600 to 800
	- Speed at maximum torque	:	1200 to 1400
	Rated speed, (rpm):		
	- For PTO use	:	2000
	- For drawbar use	:	2000
1.3	Cylinder & Cylinder Head:		
	Number	:	Three
	Disposition	:	Vertical, Inline
	Bore/stroke, (mm)	:	91.4/127 (apa)
	Capacity as specified by the applicant, (cc)	:	2500 (apa)
	Compression ratio, (apa)	:	18.5: 1
	Type of cylinder head	:	Monoblock
	Type of cylinder liners	:	Dry, replaceable
	Type of combustion chamber	:	Re-entrant cavity on piston crown
	Arrangement of valves	:	Overhead, inline
	Valve clearance (cold):		
	- Inlet valve, (mm)	:	0.30 / 0.25
	- Exhaust valve, (mm)	:	0.30 / 0.25
1.4	Fuel System:		
	Type of fuel feed system	:	Gravity and force feed
1.4.1	Fuel tank:		
	Capacity, (l)	:	45.0
	Location	:	Above the engine, under the bonnet
	Provision for draining of sediments/ water	:	Not provided, however a water separator is provided
	Make & Material of fuel tank	:	Sheet Metal
1.4.2	Water Separator:		
	Make	:	Hilux
	Type	:	Inverted funnel, gravity separation.
	Location	:	Between fuel tank & fuel feed pump
	Capacity (l)	:	0.50
1.4.3	Fuel feed pump:		
	Make	:	Bosch
	Type	:	Plunger
	Model/Group combination No.	:	FP/KSG22AD 104, F002 A50 038
	Provision of sediment bowl	:	Not provided
	Method of drive	:	Through camshaft of fuel injection pump
1.4.4	Fuel filters:		
	Make	:	Bosch, India
	Model/Group combination No.	:	F002 H20 151

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Number	: Two
Type of elements	: Full flow, spin-on, paper element
Capacity, (l)	: 0.45 (with element)
1.4.5 Injection pump:	
Make	: Bosch, Made in India
Model/Group combination No.	: F002 A0Z 778, PES3A80D320RS2000
Type	: Inline, plunger
Serial number	: 076112834
Firing order	: 1-2-3 (apa)
Method of drive	: Through timing gears
1.4.6 Fuel injectors:	
Make	: Bosch, Made in India
Holder Number	: F002 C70 018
Nozzle Number	: DLLA 146P 5514
Type	: Multi hole (Five holes)
Manufacturer's production pressure setting, (MPa)	: 25.0 to 25.8
Injection timing	: 14 + 0/-2 degree before TDC
1.4.7 Governor:	
Make	: Bosch, made in India
Model/Group combination No.	: RSV375...1000 A4C 1617R
Type	: Mechanical, centrifugal, variable speed
Rated engine speed, (rpm)	: 2000
Governed range of engine speed (rpm)	: 600 to 2200
1.5 Air Intake system:	
1.5.1 Pre-cleaner:	
Make	: TAFE (apa)
Type	: Centrifugal with transparent dust collector.
Location	: Above main air cleaner inlet tube.
1.5.2 Air cleaner:	
Make	: TAFE (apa)
Type	: Oil Bath
Location	: On RHS of the tractor, under the bonnet
Range of suction pressure at maximum power, (kPa)	: 3.3 to 3.5
Oil capacity, (l)	: 0.50
Oil change period	: After every 100 hours of operation in both normal condition and dusty condition.
1.6 Exhaust system:	
Make	: TAFE Ltd. (Apa)
Type of silencer	: Updraft (cylindrical)
Position of silencer outlet with respect to SIP, (mm):	
- Forward	: 1140
- Transverse	: 360 (on LHS)
- Upward	: 985
Range of exhaust gas pressure at maximum power, (kPa)	: 2.1 to 2.7
Provision of spark arresting device	: None
Provision against entry of rain water	: A bend is provided at the top of silencer
1.7 Lubricating system:	
Type	: Forced feed-cum-splash
Oil sump capacity, (l)	: 6.80

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	Total lub. oil capacity, (l)	:	7.30
	Oil change period	:	First change after 100 hours and subsequently after every 300 hours of operation.
1.7.2	Filters:		
	Make	:	TAFE LTD. (apa)
	Type	:	Full flow, spin-on throw away, paper element.
	Number	:	One
1.7.3	Pump:		
	Type	:	Rotary Lobe
	Method of drive	:	Through cam shaft
	Pressure release setting, (kPa)	:	343 to 448
	Minimum permissible pressure, (kPa)	:	88
1.8	Cooling system:		
	Type	:	Force circulation of water.
	Name & brand of coolant	:	Not Available
	Coolant water ratio	:	Not Available
1.8.1	Details of pump	:	Centrifugal, semi-open impeller of 69.5 mm diameter, having six number of vanes and driven through crankshaft pulley by a 'V'-belt common to alternator.
1.8.2	Details of fan	:	Suction type, having seven numbers of polypropylene blades of 390 mm diameter and mounted on water pump shaft.
	Means of temperature control	:	Thermostat
	Bare radiator capacity, (l)	:	2.5
	Coolant expansion tank capacity, (l)	:	0.9
	Total coolant (water) capacity, (l)	:	7.9
	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	:	AMCO
	Model	:	95D31RMF
	Type	:	Lead acid
	Capacity and rating	:	12V, 80 Ah at 20 hours discharge rate
	Location	:	Above clutch housing, under the bonnet.
1.10.2	Starter:		
	Make	:	Auto-lek
	Model	:	NA
	Type	:	Pre-engaging, solenoid operated
	Capacity and rating	:	12V, 2.2 kW
	Serial number	:	Not available
1.10.3	Generator:		
	Make	:	Lucas TVS
	Model	:	Not available
	Type	:	Alternator
	Output rating	:	12 V, 38 Amp
	Serial number	:	Not available

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Method of drive : Through crankshaft pulley by a cogged 'V' belt common to water pump.

1.10.4 Voltage regulator : In-built in 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)
Front Lights:				
- Head lights	2, 12V, 60/55W	1020	120 ϕ	695
- Parking lights	2, 12V,5W	1330	58 x 48	220
- Turn indicators -cum-hazard warning lights	2, 12V, 21W	1330	110 x 48	140
Rear lights:				
-Stop/Tail light	2, 12V, 21/5W	1340	90 x 75	240
- Turn indicators -cum-hazard warning lights	2, 12V, 21W	1340	90 x 75	145
Plough light (on RHS mudguard)	1, 12V, 55W	1500	125 X 70	350
Reflectors (Red)	2	1340	45 x 52	190
Registration plate light	1,12V,5W	1060	85 x15	850
Part of rear combination assembly				

1.10.6 Main switch : Key turn type, having three position viz: OFF, ON & START

1.10.7 Light switch : Combination switch with multifunction.
i) OFF
ii) Parking lights + Dash board light
iii) Head lights (short beam) + (ii)
iv) Head lights (long beam) + (ii)
v) Turn indicator
vi) Horn push button

1.10.8 Horn:
Make : Addon
Type : 2B, Electromagnetically Vibrated diaphragm
Location : In front of radiator, under the bonnet

1.10.9 Fuse box : Contains 05 numbers of fuses of following capacity:

Capacity	25 A	15 A	10 A
No. of fuse	01	03	01

1.10.10 Details of other electrical accessories:

1.10.10.1 Starting safety switch : Starter will not operate unless the main high- low range shifting lever is in neutral position.

1.10.10.2 Flasher Unit:

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

1.10.10.3 Seven pin trailer socket : Provided

1.11 Instrument panel details:

- i) Engine rpm cum- cumulative digital run hour meter (0 to 30 x100 rpm)
- ii) Battery volt meter with coloured zone

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- iii) Lubricant Oil pressure gauge with coloured zone
- iv) Water temperature gauge with coloured zone
- v) Fuel level gauge
- vi) Battery charging warning indicator
- vii) Turn/hazard indicator
- viii) Head light long beam ON indicator
- ix) Hazard light switch
- x) Mobile charging socket
- xi) Hand accelerator lever
- xii) Steering control wheel
- xiii) Horn push button
- xv) Rear view mirror

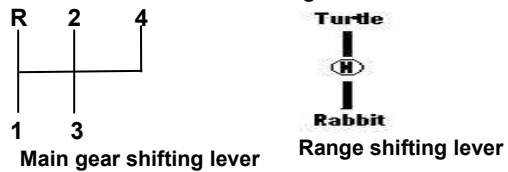
1.12 Transmission System:

1.12.1 Clutch:

- Make : AMREP
- Type : Dual, dry friction plate
- No. of friction plate, (s) : Two
- Size, (OD/ID) (mm):**
- Transmission : 302 ϕ / 197 ϕ
- PTO : 254 ϕ / 172 ϕ
- Method of operation :
- Transmission : By pressing half clutch pedal half way
- PTO : By pressing same clutch pedal fully

1.12.2 Gear box:

- Make : TAFE (apa)
- Model /identification mark : Not available
- Type : Mechanical sliding mesh with epicyclic gear reduction unit for Hi-low gear selection unit.
- Location of gear shifting levers : In center in front of driving seat
- Gear shifting pattern :



- Location of gear shifting levers : In center, In-front of driving seat
- Number of speeds:**
- Forward : 08
- Reverse : 02
- Oil capacity, (l) : 25.0, Common with differential, rear final drive and hydraulic system.
- Oil changing period : First change after 300 hours and subsequently after every 900 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 13.6-28 size tyres of 610 mm radius index, (kmph)
Forward	L1	200.04	2.30
	L2	136.44	3.37
	L3	74.41	6.18
	L4	60.60	7.59
	H1	49.97	9.19
	H2	34.08	13.50

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	H3	18.57	24.77
	H4	15.15	30.36
Reverse	LR	146.78	3.13
	HR	36.78	12.49

1.12.4 Differential unit:

- Type : Crown wheel & pinion with differential unit accommodated inside the differential housing.
- Reduction through crown wheel & bevel pinion : 5.571:1 (39/7 T)
- Oil capacity (l) : 25.0 (Common with transmission, rear final drive and hydraulic system).
- Oil changing period : First change after 300 hours and subsequently after every 900 hours of operation.
- Differential lock : Not provided**

1.12.5 Rear axle & final drive:

- Type : Bevel pinion type
- Reduction through final drive : Reduction through crown and bevel pinion, No separated final reduction is provided.
- Oil capacity of final drive, (l) : 25.0 (Common with transmission, differential and hydraulic system).
- Oil changing period : First change after 300 hours and subsequently after every 900 hours of operation.

1.13 Power lift (Hydraulic system):

- Make : TAFE
- Type : Open center, non-live, ADDC
- No. and type of cylinder : One, single acting
- Type of linkage lock for transport : Hydraulic response control knob in fully closed position acts as a transport lock.

1.13.1 Hydraulic pump:

- Make : TAFE
- Type : Scotch yoke (Radial piston pump), Mark-1A
- Location : Inside the transmission housing
- Method of Drive : Driven through the counter shaft of gearbox
- No. & type of filters : One wire mesh strainer inside transmission housing.
- Hydraulic oil capacity, (l) : 25.0 (Common with transmission, differential and rear final drive).
- Oil change period : First change after 300 hours and subsequently after every 900 hours of operation.
- Provision for external tapping : Provided
- Details of control levers : i) Position control lever
ii) Draft control lever
- Method of draft sensing : Through top link

1.13.2 Three-point linkage:				
S.No.	Observations	As per IS:4468-1997 (Part-I) (Reaffirmed in October, 2017), (Cat.I / Cat.II), (mm)	As measured, (mm)	Remarks
1	2	3	4	5

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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	19.40/25.82	Conforms to Cat. I & II
b)	Width of ball	44.0 (max.) / 51.0 (max.)	42.8/43.8	Conforms to Cat. I & II
II	Lower hitch points:			
a)	Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.0	22.62/29.00	Conforms to Cat-I & II
b)	Width of ball	34.8 to 35.0 / 44.8 to 45.0	44.8	Conforms to Cat-II
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)	200	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	505	Conforms to Cat. I
VI	Transport height	820 (min) / 950 (min)	870	Conforms to Cat. I & II
VII	Power range (without force)	560(min) / 650 (min)	700	Conforms to Cat. I & II
VIII	Leveling adjustment	100 (min) / 100 (min)	335	Conforms to Cat. I & II
IX	Lower hitch point tyre clearance	100 (min) / 100 (min)	185	Conforms to Cat. I & II
X	Lower hitch point height	200 (max) / 200 (max)	170	Conforms to Cat. I & II

1.13.3 Linkage geometry dimensions [Refer Fig.-1(a)]:

The following are dimensions observed, corresponding to **610 mm** as tyre dynamic radius index:

S.No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1	Length of lower link	A	845	845
2	Length of lift arm	B	280	280
3	Length of lift rods	C	560	560
4	Length of top link	D	585 to 805	695
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	45, forward	45, forward
	-Vertically	G	120, below	120, below
7	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	135, behind	135, behind
	-Vertically	J	270, above	270, above
8	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	200, forward	200, forward
	-Vertically	L	230, above	230, above
9	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	260	260, above
	- In low position	N	440	440, below

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10	Height of lower link hitch points when locked in transport position	Any height within the lift range.
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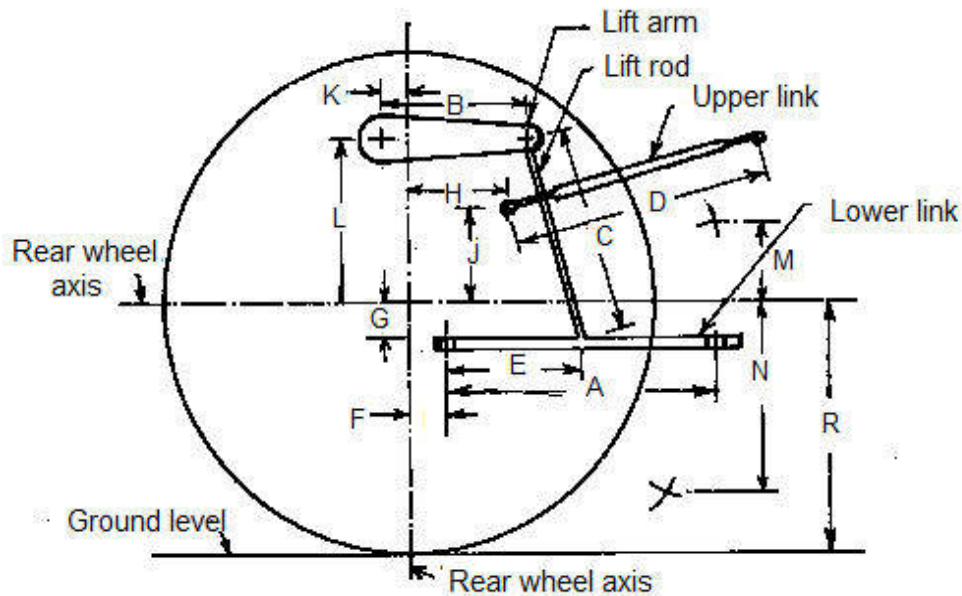
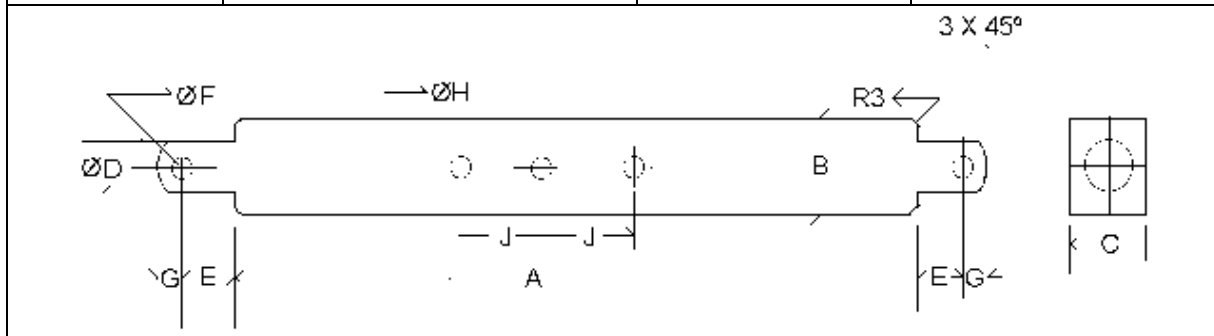


Fig. 1(a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

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

Notation	As per IS: 12953-1995 (Reaffirmed in October, 2017), (Cat. I / Cat. II) (mm)	As measured, (mm)	Remarks
A	683 ± 1.5 / 825 ± 1.5	684.0	Conforms to Cat. I
B	75 (min) / 75 (min)	81.0	Conforms to Cat. I & II
C	30 (min) / 30 (min)	30.9	Conforms to Cat. I & II
D \emptyset	21.79 to 22.0 / 27.79 to 28.0	22.0	Conforms to Cat. I
E	39.0 (min) / 49.0 (min)	52.0	Conforms to Cat. I & II
F \emptyset	12.0 (min) / 12.0 (min)	12.8	Conforms to Cat. I & II
G	15.0 (min) / 15.0 (min)	16.4	Conforms to Cat. I & II
H \emptyset	25 ± 1 / 25 ± 1	25.1	Conforms to Cat. I & II
J	80 ± 1.5 / 80 ± 1.5	80.2	Conforms to Cat. I & II
No. of holes	7 / 9	07	Conforms to Cat. I



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Fig. 1(b): DIMENSIONAL NOTATION OF LINKAGE DRAWBAR

1.13.4.2 Swinging drawbar : Not provided

1.14 Power take-off shaft:

Type : Type-I, Semi -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) : 720
Distance behind rear axle, (mm) : 295
Engine to PTO speed ratio : 2.778:1
Whether PTO Shaft is capable of transmitting the full power of engine : Yes

1.14.1 Specifications of Power Take-off shaft:

Specification	As per IS:4931-1995 (Type-I) (Reaffirmed in January, 2019)	As observed	Remarks
Nominal speed, (rpm)	540 ± 10	540 rpm of PTO corresponds to 1500 rpm of engine	Conforms
No. of splines	06	06	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	Centrally located	Conforms
Dimensions, (mm) [See Fig. 2(a)]:			
D∅	34.79 ± 0.06	34.78	Conforms
d∅	28.91 ± 0.05	28.88	Conforms
B∅	29.4 ± 0.1	29.5	Conforms
A∅ (optional)	8.3 ± 0.1	Not available	Not applicable
W	8.69 – 0.09 - 0.16	8.53	Conforms
a	7	7	Conforms
b(optional)	25 ± 0.5	Not available	Not applicable
c	38	38	Conforms
X	30°	30	Conforms
B	76 (min)	81	Conforms
h	450 to 675	480	Conforms

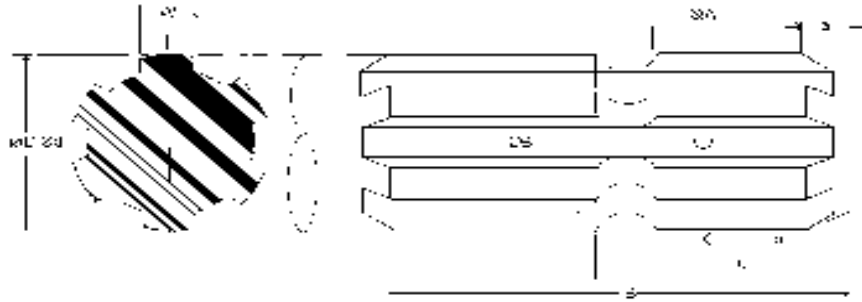


Fig.2. (a): DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT

- 1.14.2 Power Take-off Master Shield (Type I & II): Not provided**
- 1.15 Towing hitch:**
- 1.15.1 Front:**
- Type : Clevis
 - Location : At front bumper
 - Height above ground level, (mm) : 435 & 650
 - Type of adjustment : Fixed
 - Width of clevis, (mm) : 51 / 55
 - Dia of pin hole, (mm) : 34 / 32
- 1.15.2 Rear:**
- Type : Clevis
 - Location : At the rear of differential housing
 - Height above ground level, (mm):**
 - Maximum : 695
 - Minimum : 480
 - No. of position : 06
 - Type of adjustment : By changing the position of hitch on its mounting bracket and by reversing the hitch
 - Distance of hitch point, (mm):**
 - From rear axle centre : 420
 - From power take-off shaft end : 125
 - Dia of pin hole, (mm) : 31
 - Width of clevis, (mm) : 70
- 1.16 Steering:**
- Make : Rane
 - Type : Mechanical, Re-circulating ball and nut type
 - Location : Above the gear box housing
 - Method of operation : Manual, by steering control wheel
 - Diameter of steering control wheel, (mm) : 450
 - Lubricant capacity of system (l) : 0.70
 - Lubricant change period : First change after 100 hours and 500 hours of operation (if applicable).
- 1.17.1 Service Brake:**
- Make : TVS Girling
 - Type : Mechanical, dry disc brakes
 - Location : At the end of rear axle shaft
 - No. of disc(s) : Two (on each wheel side)
 - Area of liners, (cm²) : 909.2 (on each wheel side)
 - Material of liners : TVS AF 3456 (apa)

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	Method of operation	:	Individual or combined pedal operation by right foot.
1.17.2	Parking Brake:		
	Type	:	Pawl and ratchet arrangement for locking service brakes in position.
	Location & Method of operation	:	Service brake when locked in position by a hand lever provided on LHS of operator's seat acts as a parking brake.
1.18	Wheel Equipment:		
1.18.1	Steered Wheel:		
	Make	:	MRF Shakti life
	Number	:	Two
	Type of tyre	:	Pneumatic, ribbed
	Size	:	6.00-16
	Ply rating	:	8 PR
	Maximum permissible loading capacity of each tyre at 230 kPa pressure for road work, (kgf)	:	410 as per ITTAC manual
	Recommended inflation pressure, (kPa) :		
	- For field work	:	200
	- For transport	:	230
	Track width, (mm)	:	1315 (std.) & 1505
	Method of changing track width	:	By reversing the wheel.
	Make & size of wheel rim	:	WIL & 4.5E X 16
1.18.2	Drive wheel:		
	Make	:	MRF Shakti life
	Number	:	Two
	Type of tyre	:	Pneumatic, traction
	Size	:	13.6 - 28
	Ply rating	:	12
	Maximum permissible loading capacity of each tyre at 110 kPa pressure for road work, (kgf)	:	1230 as per ITTAC manual.
	Recommended inflation pressure, (kPa):		
	- For field work	:	98
	- For transport	:	110
	Track width, (mm)	:	1340 (std.),1440,1540,1580,1670,1780 &1900.
	Method of changing track width	:	By changing the position of discs on rim lugs and reversing the wheels
	Make & size of wheel rim	:	WIL & W11 x 28
1.18.3	Wheel base, (mm)	:	1765 (standard) & 1935 (Optional with power steering fitment)
	Method of changing wheel base, if any, and range	:	None
1.19	Operator's seat:		
	Make	:	Harita seating system Ltd.
	Type	:	Cushioned
	Type of suspension	:	Two helical springs
	Type of Dampening	:	Hydraulic shock absorber
	Range of adjustment, (mm):		
	Vertical	:	Nil

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Lateral : Nil
Longitudinal : ± 25

1.20 Provision for safety and comfort of operator:

1.20.1 Conformity with IS: 12343-1998:

Operator's seat meets the minimum requirements of IS: 12343-1998, (Re-affirmed in January, 2019) **except the following:**

i) Vertical distance of SIP to foot rest.

1.20.2 Conformity with IS: 6283 (Part-1) – 2006 & IS: 6283 (Part-2) – 2007:

i) Oil lubricant, type & frequency symbol should be provided.

1.20.3 Conformity with IS:8133-1983, except the following:

Location and movement of various controls meets the requirement of IS: 8133- 1983: (Re-affirmed in January, 2019).

1.20.4 Conformity with IS: 12239 (Part-1)-2018.

Meets the requirements of IS: 12239(Part-1)-2018, **except the following:**

i) Vertical retainness should be provided at both side of clutch pedal.

ii) Provision of spark arrester in the exhaust system.

1.20.5 Conformity with IS:12239 (Part-2)-1999:

i) Provision of master shield has not been provided.

1.20.6 Conformity with IS: 14683 – 1999:

Lighting meets the requirements of IS: 14683 – 1999.

1.20.7 Rear view mirror:

Rear view mirror is provided.

1.21 Labelling of tractor as per IS: 10273:1987:

The Labeling plate riveted on RHS of below dashboard the following information:

Name of Manufacturer	:	Tractors and Farm Equipment Limited, Chennai, Tamil Nadu.
Make	:	TAFE
Model	:	MF 241 DI
Month & year of Manufacture	:	09 20
Chassis Serial Number	:	MEA8D061JL2310730
Engine Serial Number	:	S325.1L07303
Maximum PTO Power, kW (hp)	:	27.2
Specific fuel consumption, g/kWh	:	265

1.22 Ballast Mass, (kg):

Particulars		As used during drawbar test	As recommended for field test		As used during Haulage test
			Dry land	Puddling	
Front	C.I. weight	100	50	Full cage wheels	50
	Water	Nil	Nil		Nil
Rear	C.I. weight	540	270		270
	Water	230	230		230
	Additional weight, if any	Nil	Nil	Nil	Nil

1.22.1 Standard ballast if any:

Particulars	Front	Rear
C.I. Weights, (kg)	60	35
Location	Front bumper act as standard ballast	Rear wheel rim on each side

1.23 Masses:

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Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	With standard ballast as used during drawbar performance test.	730	1120	1850
ii)	With ballast as used during drawbar performance test.	875	1865	2740
iii)	As used during haulage test with trailer hitch, canopy and drawbar.	795	1615	2410

1.24 Overall dimensions (mm):

Condition	Length	Width	Height		Ground Clearance, (mm)
			With exhaust pipe	Without exhaust pipe	
Without Ballast	3320	1700	2195	1705	340 (below bell housing)

1.25 Number of external lubricating points:

- Oiling : Nil
- Grease cups : 02
- Grease nipples : 17

1.26 Colour of tractor:

Chassis and engine : Charcoal grey

Sheet metal:

Bonnet & mudguard : MF Red

Rims & discs : Silver

1.27 Optional features:

1.27.1 Steering system:

- Make : Danfoss
- Type : Hydrostatic, power steering
- Location : Above clutch housing
- Method of operation : Manually by steering control wheel
- Diameter of steering control wheel, (mm) : 450
- Make & type of pump : Danfoss (apa) & Gear
- Location & method of drive : Behind the front axle & On RHS of engine driven through timing gear.
- Make, number, type & location of hydraulic cylinder : TAL & two, double acting single connecting & on LHS & RHS of front axle.
- Steering oil capacity, (l) : 1.8
- Lubricant change period : Change after every 1200 hours of operation.

1.27.2 Bonnet style & Binnacle : Refer annexure -II & III

1.27.3 Front axle : Refer annexure-IV

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

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1.	Air Cleaner Oil	SAE 20W40/ TAFE genuine oil /TAFE engine oil (TEO)	As recommended
2.	Engine oil		As recommended
3.	Gearbox, differential, rear axle, final drive and hydraulic system oil	Servo Transmission T-20	Oil originally filled in the tractor was not changed
4.	Steering gear box oil		
5.	Grease	Servo grease MP	Servo Grease MP

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3. PTO PERFORMANCE TEST

Date(s) of test : 13.11.2020, 16.11.2020 & 17.11.2020

Tractor run at the Institute prior to start of : 7.4

PTO test (h)

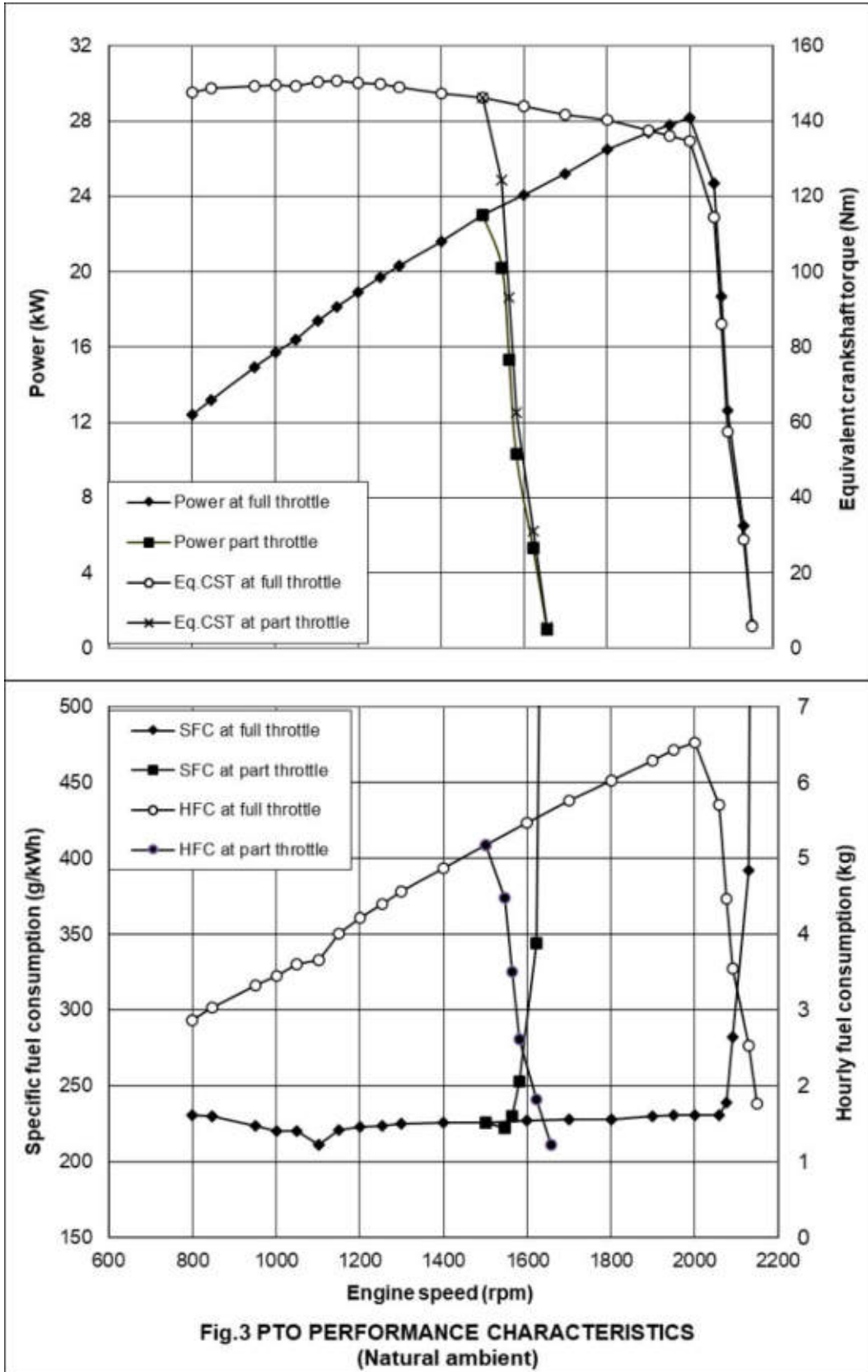
Type of dynamometer bench used : Fuchino ESF 1000 S Eddy Current

- 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)	
a) Maximum power - 2 hours test:						
28.2	720	2000	7.80	6.52	0.231	3.62
27.3	720	2000	7.55	6.31	0.231	3.62*
b) Power at rated engine speed (2000 rpm):						
28.2	720	2000	7.80	6.52	0.231	3.62
27.3	720	2000	7.55	6.31	0.231	3.62*
c) Power at standard power take-off speed (540 ± 10 rpm):						
23.0	540	1500	6.20	5.18	0.225	3.71
21.9	540	1500	5.94	4.97	0.227	3.69*
d) Varying loads at rated engine speed (2000 rpm):						
i) Torque corresponding to maximum power available at rated engine speed:						
28.2	720	2000	7.80	6.52	0.231	3.62
ii) 85% of the torque obtained in (i):						
24.7	741	2058	6.83	5.71	0.231	3.62
iii) 75% of the torque obtained in (ii):						
18.7	747	2075	5.33	4.46	0.239	3.51
iv) 50% of the torque obtained in (ii):						
12.6	753	2092	4.25	3.55	0.282	2.96
v) 25% of the torque obtained in (ii):						
6.5	766	2128	3.03	2.53	0.389	2.15
vi) Unloaded:						
1.3	774	2150	2.11	1.76	1.354	0.62
e) Varying loads at standard PTO speed:						
i) Torque corresponding to maximum power available at standard PTO speed (540 ± 10 rpm):						
23.0	540	1500	6.20	5.18	0.225	3.71
ii) 85% of the torque in (i):						
20.2	557	1547	5.36	4.48	0.222	3.77
iii) 75% of the torque obtained in (ii):						
15.3	563	1564	4.20	3.51	0.229	3.64
iv) 50% of the torque obtained in (ii):						
10.3	569	1581	3.13	2.62	0.254	3.26
v) 25% of the torque obtained in (ii):						
5.3	584	1622	2.18	1.82	0.343	2.43
vi) Unloaded:						
1.0	596	1656	1.46	1.22	1.220	0.68

*Under High ambient conditions



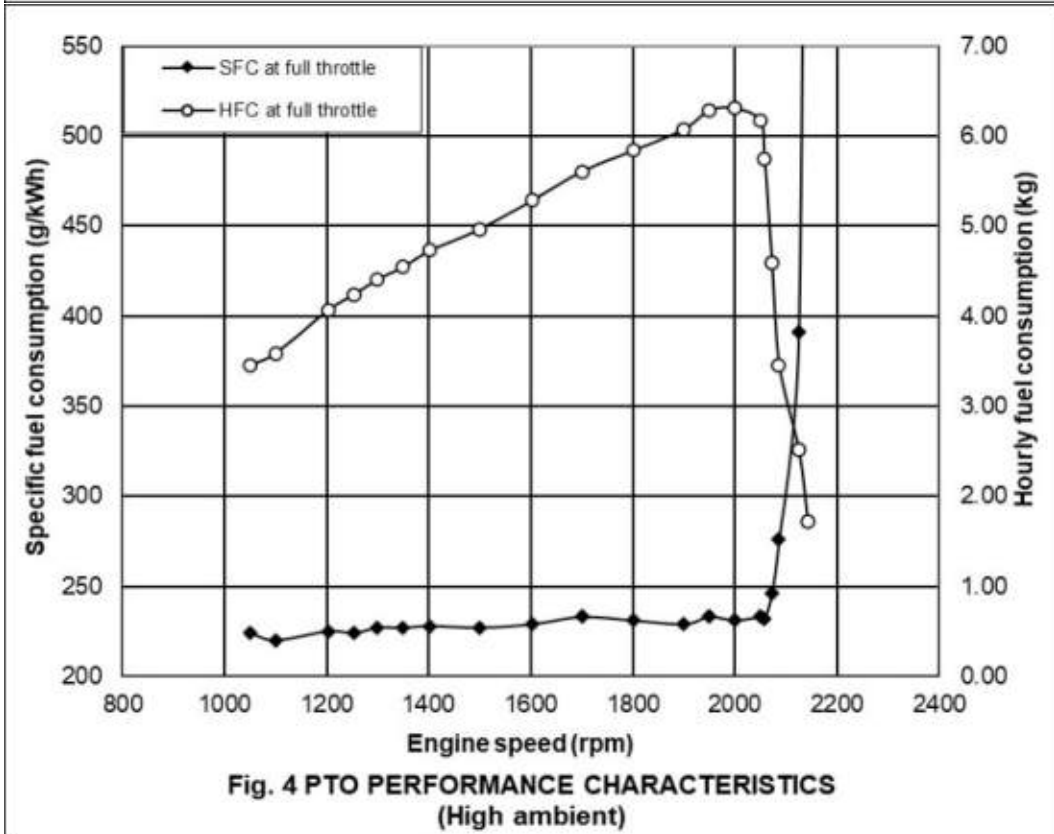
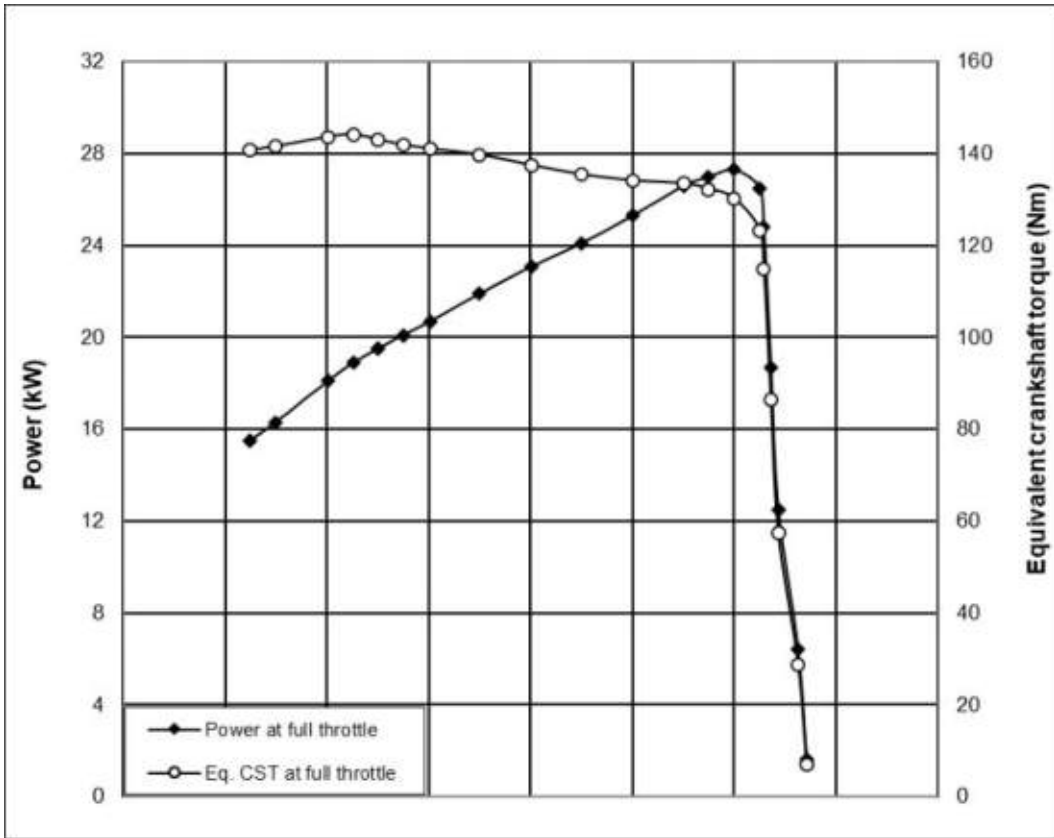
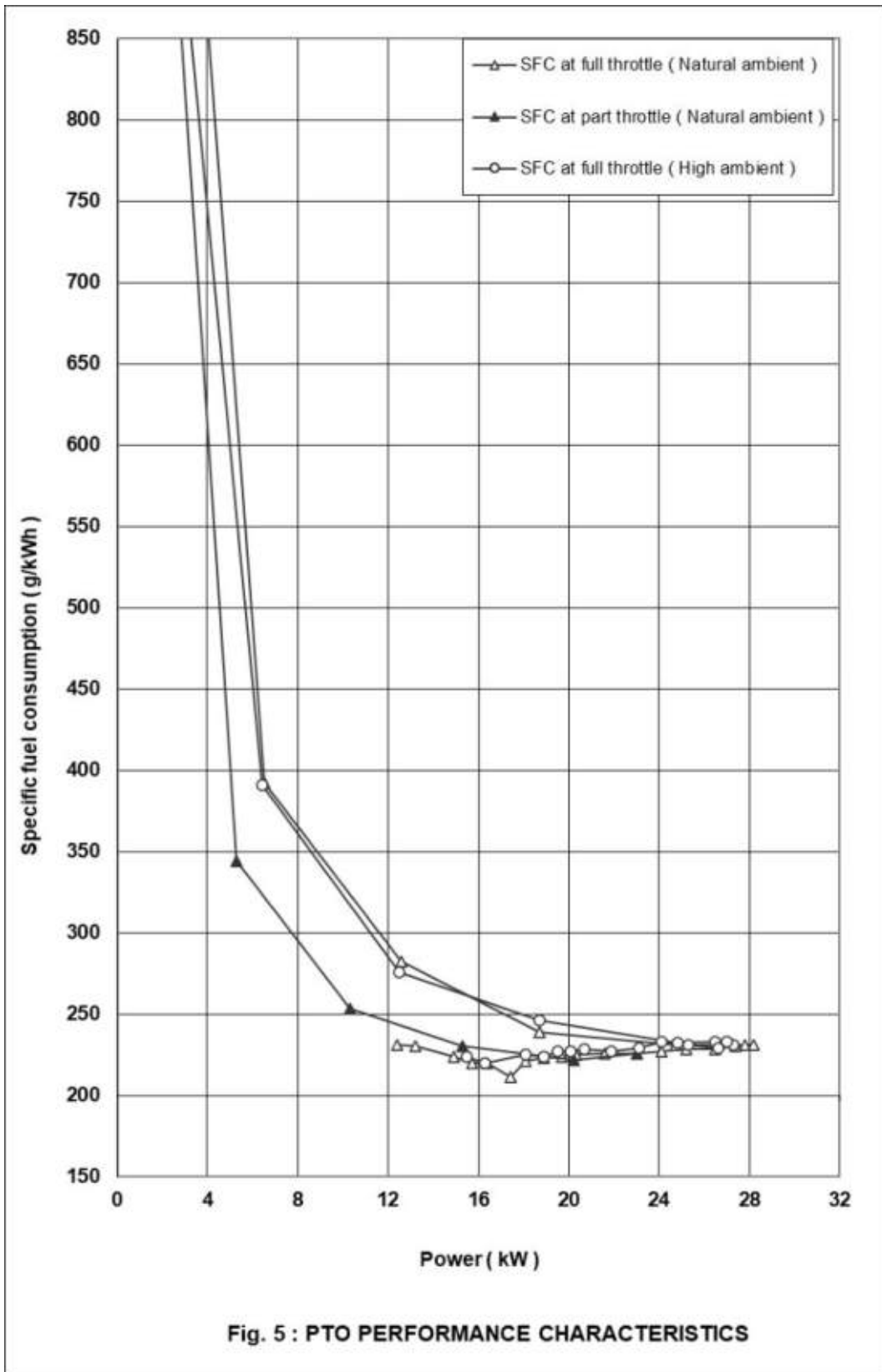


Fig. 4 PTO PERFORMANCE CHARACTERISTICS
(High ambient)



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	<u>Natural ambient</u>	<u>High ambient</u>
i) -No load maximum engine speed, (rpm) :	2150	2142
ii) -Equivalent crankshaft torque at maximum power, (Nm) :	134.6	130.2
iii) -Equivalent crankshaft torque at rated engine speed, (Nm) :	134.6	130.2
iv) -Maximum equivalent crankshaft torque, (Nm) :	150.6	144.2
v) - Engine speed at maximum equivalent crankshaft torque, (rpm) :	1200	1253
vi) - Backup torque (%) :	11.9≈12	10.8
vii) Smoke level , maximum light absorption coefficient, (per meter) :	0.16	--
viii) Range of atmospheric conditions:		
- Temperature, (°C) :	25 to 27	42 to 45
- Pressure, (kPa) :	98.8 to 99.4	99.6 to 100.1
- Relative humidity, (%) :	43 to 50	20 to 24
ix) Maximum temperatures (°C):		
- Engine oil :	114	125
- Coolant (water) :	93	110
- Fuel :	49	65
- Air intake :	38	53
- Exhaust gas :	443	435
x) Pressure at maximum power:		
- Intake air, (kPa) :	3.3 to 3.5	3.5
- Exhaust gas, (kPa) :	2.1 to 2.7	24.3 to 26.5
xi) Consumptions:		
- Lub oil, (g/kWh) :	--	0.33
- Coolant (water), (% of total coolant capacity) :	--	0.64

4. DRAWBAR PERFORMANCE TEST

Date(s) of test : 06.01.2021, 08.01.2021 & 11.01.2021

Tractor run at the Institute prior to start of drawbar performance test, (h) : 26.3

Type of track : Concrete

Height of drawbar, (mm):

- Without ballast : 580

- With ballast : 500

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

Table - 2

DRAWBAR PERFORMANCE TEST

C o n d i t i o n	Travel Speed (km/h)	Draw bar power (kW)	Draw bar pull (kN)	Engine Speed (rpm)	Wheel Slip (%)	Fuel consumption		Specific Energy (MJ/kWh)	Atmospheric conditions			Temperature (°C)				Max. fuel consump- tion (l/h)
						(kg/ kWh)	(l/h)		Temp (°C)	Pre- sSURE (kPa)	R.H. (%)	Fuel	Trans oil	Cool- ant (water)	Eng- oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor Standard Ballasted):																
L1	2.13	9.3	15.77	2091	15.0	0.400	4.45	2.09	29	98.8	50	34	80	79	98	16.22
L2	3.08	13.3	15.47	2077	15.0	0.348	5.54	2.40	28	98.9	51	34	80	80	100	16.12
L3	5.81	21.8	13.52	2001	8.6	0.305	7.85	2.74	27	99.0	53	34	77	84	102	15.37
L4	7.37	24.1	11.75	2000	6.5	0.278	8.01	3.00	26	99.1	58	32	61	84	99	12.64
H1	9.07	24.4	9.66	2004	5.2	0.274	8.00	3.05	25	99.2	61	31	55	84	97	11.07
ii) Maximum power test (Tractor Ballasted):																
L1	2.08	13.4	23.31	2080	15.0	0.361	5.79	2.32	27	98.7	57	32	77	80	98	24.21
L2	3.03	19.7	23.32	2058	14.9	0.315	7.42	2.65	27	98.8	56	32	77	81	102	24.01
L3	5.96	24.3	14.69	1998	5.7	0.276	8.02	3.03	27	98.9	56	32	61	83	102	16.70
L4	7.43	24.1	11.88	1899	4.3	0.278	7.86	3.03	28	98.9	58	32	58	84	101	13.58
H1	9.12	24.7	9.74	2000	3.0	0.279	8.24	3.00	25	98.9	58	30	50	82	95	11.11

Contd.. Table-2

G r a d	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- pull, (kN)
						(kg/ kWh)	(l/h)		Humid- ity, (%)	Baro- metric P (kPa)	Ambient Temp (°C)	Fuel	Trans- oil	Coolant (water)	Eng oil		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
ii) Five hours test at 75 percent of pull obtained at max. Power (ballasted wheeled tractor):																	
L3	6.26	19.2	11.03	2068	5.0	0.320	7.35	2.61	20	98.3	62	25	50	80	95		
iv) Five hours test at 15 percent wheel slip (ballasted wheeled tractor):																	
L2	3.02	19.8	23.34	2059	15.4	0.310	7.41	2.64	25	98.9	56	31	81	78	99		
									29	98.2	65	33	83	82	103		

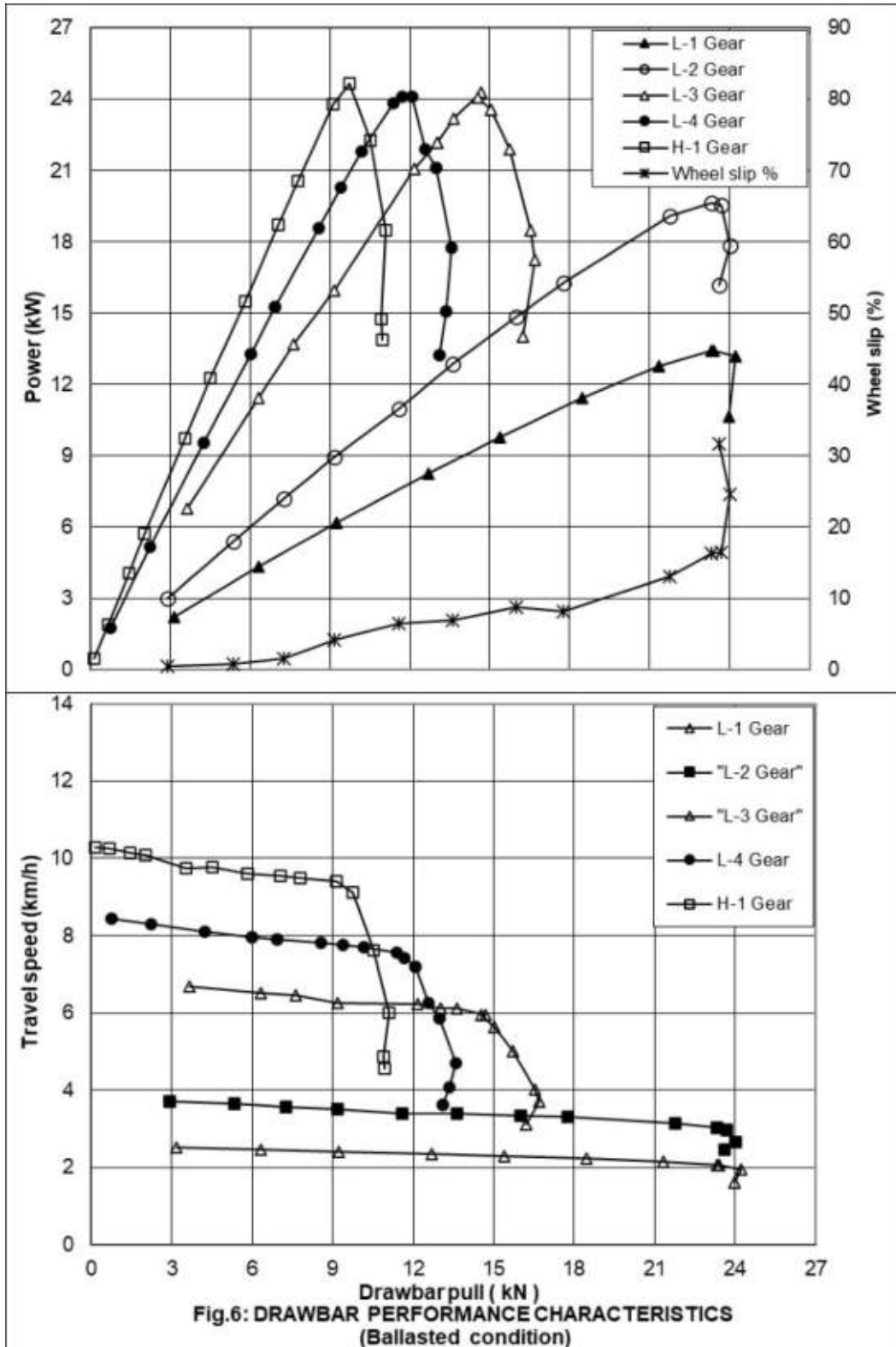
i) The coolant (water) and lub. oil consumption during 10 hours test were observed as 4.92 ml/h and **Nil** respectively.

ii) Tyre Creeping, (mm):

-LHS : 15
-RHS : 05

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

Engine oil : 103
Coolant (water) : 89
Transmission oil : 83
Fuel : 36



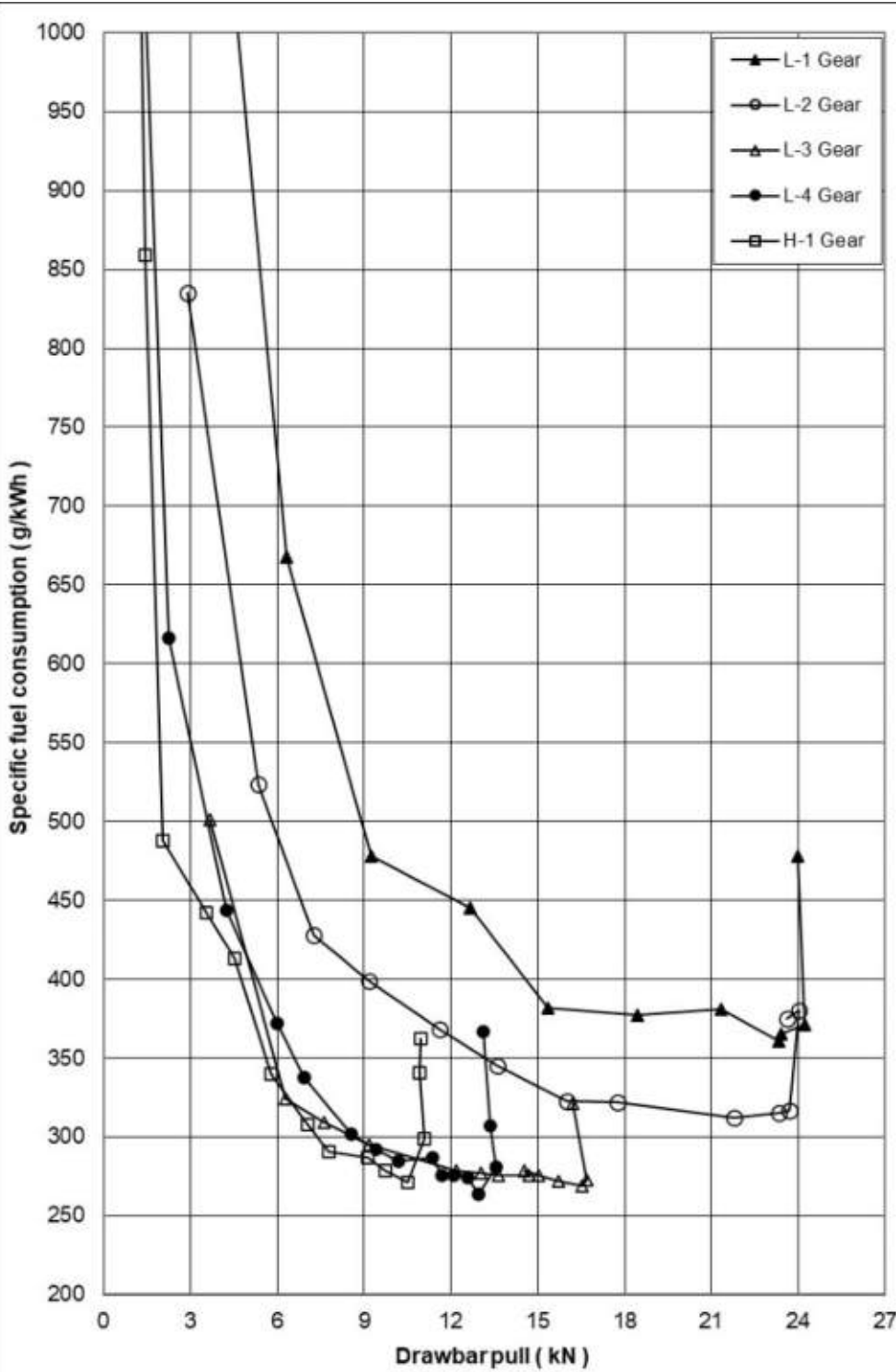


Fig.7 : DRAWBAR PERFORMANCE CHARACTERISTICS
(Ballasted condition)

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5. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE TEST

5.1 Date(s) of test : 16.12.2020
 Tractor run at the Institute prior to start of hydraulic test, (h) : 21.4
 Pump speed at rated engine speed, (rpm) : 2000

5.1.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed (l/min) : 18.10
 Maximum hydraulic power, (kW) : 4.8
 Pump delivery rate at maximum hydraulic power, (l/min) : 17.09
 Pressure at maximum hydraulic power, (MPa) : 17.0
 Sustained pressure of the open relief valve, (MPa) : 20.0

Tapping point:

a) Relief valve test : External circuit
 b) Pump performance test : Pump outlet
 Temperature of hydraulic fluid, (°C) : 60 to 63

5.1.2 Lifting capacity test:

Test	Height of lower hitch point above ground in down position, (mm)	Vertical Movement with lifting force, (mm)	Maximum corrected force exerted through full range, (kN)	Corresponding pressure (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (degrees)
At hitch points	200	610	14.29	18.0	11.43	--
On the standard frame	200	605	11.87	18.0	16.74	19

5.1.3 Maintenance of lift load:

Force applied at the frame, (kN) : 10.68
 Temperature of hydraulic fluid at the start of test, (°C) : 60

Test data:

Elapsed Time, (minute)	5	10	15	20	25	30
Cumulative drop in height of lift, (mm)	10	15	20	25	30	35

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6. BRAKE TEST

- 6.1 Service brake:**
Date of test(s) : 16.10.2020 & 21.10.2020
Type of track : Concrete
Maximum attainable speed, (kmph):
- Standard ballasted tractor : 33.4
- With Ballasted (Road work) : 33.4

6.1.1 Cold brake test:

		At maximum attainable speed			
Standard ballasted Tractor	Braking device control force, (N)	536	493	449	405
	Mean deceleration, (m/sec ²)	3.29	2.93	2.76	2.50
	Stopping distance, (m)	13.43	14.68	15.59	17.19
Ballasted Tractor (Road work)	Braking device control force, (N)	566	520	473	427
	Mean deceleration, (m/sec ²)	3.11	2.82	2.72	2.50
	Stopping distance, (m)	13.58	15.26	15.79	17.19
		At 25 kmph travel speed			
Standard ballasted Tractor	Braking device control force, (N)	559	508	457	406
	Mean deceleration, (m/sec ²)	3.013	2.88	2.63	2.50
	Stopping distance, (m)	7.94	8.37	9.16	9.65
Ballasted Tractor (Road work)	Braking device control force, (N)	587	535	483	431
	Mean deceleration, (m/sec ²)	3.12	2.90	2.59	2.50
	Stopping distance, (m)	7.95	8.33	9.31	9.65

6.1.2 Brake fade test:

		At maximum attainable speed			
Road ballasted Tractor	Braking device control force, (N)	576	539	503	466
	Mean deceleration, (m/sec ²)	3.03	2.73	2.61	2.50
	Stopping distance, (m)	13.77	15.76	16.46	17.19
		At 25 kmph travel speed			
Road ballasted Tractor	Braking device control force, (N)	593	557	520	484
	Mean deceleration, (m/sec ²)	2.96	2.68	2.55	2.50
	Stopping distance, (m)	8.23	9.00	9.47	9.65

- Maximum 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 1.82 tones	
	Facing up	Facing down	Facing up	Facing down
Braking device control force, (N)	280	289	270	323
Efficacy of parking brake	----- Effective -----			

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7. Noise Measurement

7.1 Noise at bystander's position:

Date of test : 13.10.2020
 Type of track : Concrete
 Background noise level, dB (A) : 46
Atmospheric conditions:
 Temperature, (°C) : 32
 Pressure, (kPa) : 96.5
 Relative humidity, (%) : 62
 Wind velocity, (m/s) : 1.4

Test data:

Sr. No.	G e a r	Travelling speed before acceleration, (kmph)	Noise level, dB (A)
1	L1	1.92	79
2	L2	2.78	79
3	L3	5.14	79
4	L4	6.33	78
5	H1	7.66	78
6	H2	11.18	78
7	H3	20.58	78
8	H4	25.12	80

7.2 Noise at operator's ear level:

Date of test : 06.01.2021
 Type of track : Concrete
 Background noise level, dB (A) : 54
Atmospheric conditions:
 Temperature, (°C) : 30
 Pressure, (kPa) : 98.6
 Relative humidity, (%) : 46
 Wind velocity, (m/s) : 1.3

Test data:

Gear	Drawbar pull at which the tractor develops the max. noise level, (kN)	Corresponding travelling speed, (kmph)	Noise level dB (A)
L1	15.25 to 15.50	2.17 to 2.10	90
L2	7.54 to 15.30	3.53 to 3.08	90
L3	11.94 to 13.46	6.10 to 5.79	92
*L4	8.31 to 11.72	7.82 to 7.34	92
H1	7.51 to 9.53	9.51 to 9.07	92

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

8. AIR CLEANER OIL PULL-OVER TEST

Date(s) of test : 27.10.2020
Atmospheric conditions:
 - Temperature, (°C) : 32 to 38
 - Pressure, (kPa) : 97.3 to 97.6
 - Relative humidity, (%) : 33 to 45
 Mass of oil before test, (g) : 432.3

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S. No.	Position of tractor	Loss of oil (g)	Oil pull-over (%)	Engine oil pressure
i)	Tractor parked on level ground	0.3	0.07	Normal
ii)	Tractor tilted 15° laterally on RHS	0.2	0.05	Normal
iii)	Tractor tilted 15° laterally on LHS	0.5	0.12	Normal
iv)	Tractor tilted 15° longitudinally with front end up	0.4	0.09	Normal
v)	Tractor tilted 15° longitudinally with front end down	0.1	0.02	Normal

Remarks: 1. Engine oil pressure was not measured separately.

9. MECHANICAL VIBRATION MEASUREMENT

Date of test : 29.12.2020

Type of test surface : Concrete

S.No.	Measuring points		Vibration, microns			
			At no load		At load corresponding to 85 % of max. PTO power	
			VD	HD	VD	HD
i)	Foot rest	Left	70	82	92	114*
		Right	67	85	82	148
ii)	Steering wheel		55	32	64	48
iii)	Seat	Back	27	23	32	36
		Bottom	36	21	44	47
iv)	Mudguard	Left	55	115*	66	142*
		Right	56	158*	63	195*
v)	Head light	Left	52	51	57	63
		Right	39	50	44	51
vi)	Battery base, centre		39	47	42	57
vii)	Tail light	Left	90	121*	95	130*
		Right	42	104*	59	113*
viii)	Plough light		144*	201*	197*	276*
ix)	Gear shifting lever		65	44	102*	59
x)	Accelerator lever	Hand	46	51	73	71
		Foot	42	79	47	97
xi)	Brake pedal	Left	43	53	52	68
		Right	40	60	53	78
xii)	Clutch pedal		36	64	40	96
xiii)	Main hydraulic control lever		35	26	44	33
xiv)	PTO engaging lever		49	36	51	43
xv)	Differential lock lever		NA	NA	NA	NA

10.0 TURNING ABILITY

10.1.1 With Standard Fitment:

Characteristics	Minimum turning diameter, (m)		Minimum clearance diameter, (m)	
	LHS	RHS	LHS	RHS
Brakes released	6.22	6.14	6.86	6.79
Brake applied	5.59	5.46	6.32	6.19

10.1.2 With Optional fitment (Power steering) :

Brakes released	7.24	7.27	7.74	7.77
Brake applied	6.37	6.39	6.87	6.89

10.1.2 Steering Effort (N):

Steering type	Clock wise, (Avg.)	Anti-Clockwise, (Avg.)
Mechanical steering	71	77
Hydrostatic, power steering	79	86

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11. HAULAGE TEST

Type of trailer:	<u>Two wheel (Single axle)</u>	<u>Four wheel (Double axle)</u>
Gross mass of trailer, (tonnes) :	5.0	5.0
Height of trailer hitch above ground level, (mm) :	0.58	0.60
Gear used during the test for negotiating slopes upto 8% :	H-4	H-4
Average travel speed, (kmph) :	31.82	32.31
Average fuel consumption:		
- (l/h) :	4.81	4.77 to 5.00
- (ml/km/tonne) :	30.22	29.50 to 30.95
Average distance traveled per litre of fuel consumption, (km) :	6.62	6.46 to 6.78
General observations:		
Effectiveness of brakes :	Effective	Effective
Maneuverability of tractor-trailer combination :	Satisfactory	Satisfactory

12. FIELD TEST

- 12.1** The major breakdowns were not observed in the field test during initial commercial testing of this tractor model having test report No. **T- 1024/1548/2016** released on **April, 2016**). So, as per the provision as laid down in clause 7.2 of IS: 12207- 2019, the field test during the batch testing of this tractor model was not conducted.

13. COMPONENTS / ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **86.5** hours of tractor operation at this Institute.

13.1 Engine:

13.1.1 Cylinder bore:

Cylinder No.	Cylinder bore diameter, (mm)						Max. permissible wear limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Thrust side	Non-thrust side	
1.	91.496	91.494	91.484	91.489	91.488	91.487	91.86
2.	91.501	91.494	91.500	91.493	91.492	91.495	
3.	91.493	91.487	91.484	91.485	91.494	91.486	

13.1.2 Piston:

Piston No.	Piston diameter, (mm)				Max. permissible wear limit of piston diameter at skirt, (mm)	Clearance between piston to cylinder liner at the skirt, (mm)	
	Top (above top compression ring)		At skirt			As measured	Max. permissible wear limit, (mm)
	Thrust side	Non-thrust side	Thrust side	Non-thrust side			
1	90.767	90.632	91.341	91.058	Piston to be discarded when ring groove clearance exceed 0.25 mm with new ring	0.155	0.25
2	90.773	90.640	91.345	91.064		0.156	
3.	90.770	90.630	91.340	91.051		0.153	

** Not measured due to piston design features.

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13.1.3 Ring end gap:

Rings	Ring end gap, (mm)									Maximum Permissible wear limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No. 3			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1 st Comp. ring	0.45	0.45	0.45	0.35	0.35	0.35	0.40	0.40	0.40	1.5
2 nd Comp. ring	0.95	0.95	0.95	0.95	0.95	0.95	0.90	0.90	0.90	1.5
Oil ring	0.40	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	2.0

13.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)			Max. Permissible clearance limit, (mm)
	Piston-I	Piston-II	Piston-III	
1 st Compression ring	--Tapered--			0.25
2 nd Compression ring	0.058	0.057	0.055	0.25
Oil ring	0.052	0.054	0.050	0.25

13.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. Permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.084 to 0.086	0.25	0.25	0.75
2.	0.090 to 0.099			
3.	0.098 to 0.105			
4.	0.081 to 0.083			

13.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. Permissible clearance limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.086 to 0.103	0.25	0.50	0.75
2.	0.092 to 0.085	0.30		
3.	0.088 to 0.102	0.25		

13.1.7 Valve, guides and timing gears:

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 : 12.18 to 13.45 | Against the discard limit of 9.81 N/mm

Exhaust valve spring : 12.03 to 13.13

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

Intake valve : 0.075 to 0.088 | Against the discard limit of

Exhaust valve : 0.082 to 0.086 | 0.17 mm

13.2 Clutch:

Any marked wear on clutch friction plate(s) : None

Condition of clutch release bearing : Normal

Condition of pilot bearing : Normal

Condition of springs and release levers : Normal

Presence of oil in clutch housing : None

Any marks on fly wheel/pressure plate : None

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Overall thickness of clutch plate, (mm):

-Transmission : 9.61 to 9.79
-PTO : 8.01 to 8.08

Height of lining over rivet head, (mm):

-Transmission : 1.63 to 1.79
-PTO : 1.50 to 1.68

Against discard limit of wear up to rivet head

13.3 Transmission gears:

Any visual damage, pitting & chipping : None
of any transmission gear teeth

Backlash between crown wheel and Pinion, (mm) : 0.21

Against discard limit of 0.50 mm

13.4 Brakes:				
Description	Initial specified thickness of brake lining, (mm)	Measured thickness of brake lining after test, (mm)	Measured height of brake lining over rivet head, (mm)	Minimum permissible depth of oil groove of brake lining, (mm)
Left	6.30	12.32 to 12.49	1.34 to 1.72	Wear up to rivet head
Right	6.30	12.32 to 12.56	1.30 to 1.62	

13.5 Front axle:

Observations

Any marked wear of king pins : None
Any marked wear of king pin bushes : None
Clearance between king pin and bushes, (mm) : 0.133 to 0.168
Condition of bearings for stub axles : Normal
Condition of king pin bearings : Normal
Condition of seals for stub axles and king pins : Normal
Clearance between centre pin and bushes, (mm) : 0.078 to 0.092

Against the discard limit of 0.50 mm

Against the discard limit of 1.25 mm

13.6 Steering system:

Visual condition of the components of complete steering assembly : Normal

13.7 Starter motor & Alternator:

Presence of soil/oil in housing : None
Condition of bearings and other Components : Normal

14. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustments/Defects/Breakdowns and Repairs	Tractor run hours
-None-		

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15. COMPARISON OF SPECIFICATION AND PERFORMANCE CHARACTERISTICS OF PREVIOUS SAMPLE (TEST REPORT No. T- 1024/1548/2016) released on April, 2016 AND PRESENT SAMPLE

15.1	Specification:	<u>Previous sample</u>	<u>Present sample</u>
15.1.1	Tractor:		
	Make	:	TAFE
	Model	:	MF 241 DI
15.1.2	Engine:		
	Make	:	SIMPSON & Co. Limited
	Model	:	T III A S325.1 –F2
	Bore/Stroke, (mm)	:	91.4/127
	Specified cubic capacity, (cc) (apa)	:	2500
	Rated engine speed, (rpm)	:	2000
15.1.2.1	Fuel system:		
	Make & model of fuel feed pump	:	Bosch, India & FP/KSG22AD45 / 2 9440 030 030 Bosch, India & FP/KSG22AD104 / F002 A50 038
	Make & model of fuel filters	:	Bosch, Made in India & F 002 H20 151
	Make and model of fuel injection pump	:	Bosch, India & F 002 A0Z 778
	Make & model of fuel injectors	:	Bosch, Made in India & F 002 C7 0018, DSL A 146 P 5514
	Type of injector	:	Multi holes (five holes)
	Manufacturer's production pressure setting, (MPa)	:	25.0 to 25.8
	Injection timing	:	14 + 0/-2 degree before TDC
	Make & model of governor	:	Bosch & RSV375...1000 A4C 1617R
15.1.2.2	Lubricating system:		
	Total lubricating oil capacity, (l)	:	6.70 7.30
15.1.3	Transmission:		
15.1.3.1	Clutch:		
	Type of clutch plate	:	Dual, dry friction clutch plate
	Size, OD/ID, (mm): -Transmission	:	302 / 195 ϕ 302 ϕ / 197 ϕ
	-PTO	:	254 / 172 ϕ 254 ϕ / 172 ϕ
15.1.3.2	Gear Box:		
	No. of speeds:		
	- Forward	:	08 08
	- Reverse	:	02 02
	Range of speed, (kmph) :		
	- Forward	:	2.29 to 29.95 2.30 to 30.38
	- Reverse	:	3.08 to 12.27 3.13 to 12.49
15.1.4	Service Brake		
	Make	:	TVS Girling
	Type	:	Mechanical, dry disc brakes
	No. of friction disc	:	Two (on each wheel side)
	Area of liners, (cm ²)	:	916.9 (on each wheel side) 909.2 (on each wheel side)

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15.1.5 Wheel equipment:		<u>Previous sample</u>	<u>Present sample</u>
Make & Size of tyres:			
- Front	:	Good Year & 6.00 -16, 8PR	MRF Shakti life & 6.00-16, 8PR
- Rear	:	Good Year & 13.6-28,12 PR	MRF, shakti & 13.6-28-12PR
Standard Track width, (mm):			
- Front	:	1330	1315
- Rear	:	1335	1340
15.1.5.1	Wheel base, (mm)	:	1765
15.1.6	Overall dimensions, (mm):		
- Length	:	3320	3320
- Width	:	1700	1700
-Height	:	2190	2195
- Ground clearance, (mm)	:	335 (below gears box housing)	340 (below gears box housing)
15.1.7	Operational mass of tractor (kg), standard ballast:		
- Front	:	730	730
- Rear	:	1120	1120
- Total	:	1850	1850
15.1.8	Conformity with following IS:	<u>Previous sample</u>	<u>Present sample</u>
i)	Guide lines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in January,2019)].	: Conformed	Conforms
ii)	Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS: 4931-1995 (Reaffirmed in January,2019)].	: Conformed	Conforms
iii)	Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/ISO 730-1:1994 (Reaffirmed in Oct.,2017)].	: Did not conform	Does not conform
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in Oct.,2017)].	: Conformed	Conforms
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed in January,2019)].	: Did not conform	Does not conform
vi)	Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision): [IS 12239 (PT-1) 2018/ISO 4254-1:2013.	: Did not conform	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 & Part-2) –2006 & 2007. (Reaffirmed in January,2019)]/ ISO 3767-2:1991]].	: Did not conform	Does not conform
viii)	Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed in January,2019)].	: Did not conform	Does not conform
ix)	Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in January,2019)].	: Conformed	Conforms
x)	Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in January,2019)].	: Did not conform	Conforms

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15.2 Performance Characteristics:		<u>Previous sample</u>		<u>Present sample</u>	
15.2.1 PTO Performance:					
Maximum Power, (kW)	:	28.3		28.2	
Power at Rated engine speed, (kW)	:	28.3		28.2	
Specific fuel consumption corresponding to maximum power, (g/kWh)	:	241		231	
Maximum equivalent crankshaft torque, (Nm)	:	154.1		153	
Back up torque, (%)	:	14.2		12.0	
Maximum temperatures (degree):					
Engine oil	:	128		125	
Coolant	:	108		110	
Lub oil consumption, (g/kWh)	:	0.30		0.33	
15.2.2 Drawbar performance:					
Maximum power with standard ballasted tractor, (kW)	:	25.6		24.4	
Maximum pull with standard ballasted Tractor, (kN)	:	15.74		15.77	
Maximum transmission oil temperature (°C)	:	89		83	
15.2.3 Hydraulic performance:					
Hydraulic pump discharge at minimum pressure and rated engine speed (l/min.)	:	18.0		18.1	
Maximum hydraulic power, (kW)	:	4.0		4.8	
Sustained pressure of the open relief valve, (MPa)	:	19.5		20.0	
Maximum lifting capacity, (kN):					
- At the hitch point	:	13.78		14.29	
- At the standard frame	:	10.46		11.87	
Total drop in height of lift during load maintenance test, (mm)	:	22		35	
15.2.4 Brake performance test at 25 kmph speed (max).					
With rear wheel brake system in engaged condition:					
Parameters		Cold	Hot	Cold	Hot
Maximum Stopping distance, (m)		6.53	7.13	7.95	8.23
Maximum force exerted on the brake Pedal effort required to achieve deceleration of 2.5 m/sq sec, (N)	:	251 to 353		431 to 484	
Weather parking brake is effective at a force of 600N at foot pedal (s) or 400 N at hand lever	:	Effective		Effective	
15.2.5 Noise measurement:					
- Maximum noise at bystanders' position, dB(A)	:	82		80	
- Maximum noise at operator's ear level dB(A)	:	94		92	
15.2.6 Mechanical vibration:					
Maximum amplitude of vibration at (microns):					
- Foot rest – LHS & RHS	:	180 & 190		114 & 148	
- Steering wheel	:	120		64	
-Driver's seat, (driver in seat):	:	30		47	
15.2.7 Haulage Test:					
		2-wheel trailer	4-wheel trailer	2-wheel trailer	4-wheel trailer
-Gross mass of trailer, (ton)	:	5.0	5.0	5.0	5.0
- Average speed, (kmph)	:	26.51 to 27.75	27.57 to 27.75	30.22	29.50 to 30.95
-Average distance traveled per litre of fuel consumed, (km)	:	6.46 to 7.52	6.90 to 7.38	6.62	6.46 to 6.78
- Average fuel consumption, (cc/km/ton)	:	26.60 to 30.94	27.07 to 29.01	30.22	29.50 to 30.95

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15.3 Qualifying performance (comparable limit) for batch model in comparison to ICT model (please refer Clause 7.6 of IS: 12207-2019):

S. No.	Characteristic	Requirements as per IS: 12207-2019		As observed		Whether meets the requirement (Yes/No)
		Column 4 of Table-1	Clause 7.6	Previous sample	Present sample	
1	2	3	4	5	6	7
15.3.1	Drawbar performance:					
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Minimum 70% of static mass with ballast	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	23.51	23.32	Yes
b)	Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN)	Minimum 70% of static mass of tractor without ballast		15.74	15.77	Yes
c)	Maximum drawbar power with standard ballast, (kW).	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having ≤1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.		25.6	24.4	Yes
d)	Maximum transmission oil temperature (°C)	The declared value should not exceed the maximum value specified by oil company		89	83	Yes
15.3.2	Hydraulic performance:					
a)	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Tolerance of ± 10%	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	13.78	14.29	Yes
	2) With the standard frame	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		10.46	11.87	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)	The observed value should not exceed 50 mm		22	35	Yes

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15.4 Salient Observations:

15.4.1 Laboratory test:

Previous Sample

Present Sample

15.4.1.1 PTO Performance Test:

- i) The maximum power was observed as **28.3 kW** against the declaration of **27.2 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was measured as **241 g/kWh** against the declaration of **265 g/kWh**, which was considered on lower side as per declaration. Which is not within the tolerance limit of IS: 12207-2014.
- iii) The maximum equivalent crankshaft torque was recorded as **154.1 Nm** against the declaration of **155 Nm**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- iv) The backup torque was recorded as **14.2 %**.

- i) The maximum power was observed as **28.2 kW** against the declaration of **27.2 kW**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power in was recorded as **231 g/kWh** against the declaration of **265 g/kWh**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iii) The maximum equivalent crankshaft torque was recorded as **150.6 Nm** against the declaration of **155 Nm**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iv) The backup torque is **12.0%**.

15.4.1.2 Drawbar Performance Test:

- i) Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN) was recorded as **15.74 kN** against the minimum requirement of **11.79 kN**, which meet the minimum requirement of IS: 12207-2014.
- ii) Maximum drawbar power with standard ballast was recorded as **25.6 kW** against the minimum requirement of **22.6 kW**, which meets the minimum requirement of IS: 12207-2014.
- iii) During 10-hour drawbar test, creeping of LHS and RHS rear tyre over the rims was observed as 75 & 90 mm respectively, which was considered on higher side. This should be looked into for necessary corrective action.

- i) Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN) was recorded as **15.77 kN** against the minimum requirement of **12.7 kN**, which meet the minimum requirement of IS: 12207-2019.
- ii) Maximum drawbar power with standard ballast was recorded as **24.4 kW** against the minimum requirement of **22.6 kW**, which meets the minimum requirement of IS: 12207-2019.
- iii) During ten hours drawbar performance test under ballasted condition, creeping of LHS & RHS tyre over the rim were observed as **15 mm & 05 mm**. this should be looked into for necessary corrective action.

15.4.1.3 Hydraulic Performance Test:

- i) Maximum lifting capacity throughout the range of lift at hitch point and standard frame was recorded as **13.78 kN & 10.46 kN** respectively against the declaration of **14.0 kN & 14.5 kN** respectively, which meets the evaluative requirement of IS: 12207-2014.

- i) Maximum lifting capacity throughout the range of lift at hitch point and standard frame was recorded as **14.29 kN & 11.87 kN** respectively against the re-declaration of **14.0 kN & 14.5 kN** respectively, which meets the evaluative requirement of IS: 12207-2019.

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15.5 Adequacy of literature:

Following literatures has been supplied with the tractor for reference during the test.

- | | |
|---------------------------|---------------------------|
| a) Operator's manual | a) Operator's manual |
| b) Spare part's catalogue | b) Spare part's catalogue |
| c) Service manual | c) Service manual |

16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

16.1 On the basis of test conducted the performance results have been summarized as evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of **IS: 12207-2019** for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

Sl. No.	Characteristic	Category (Evaluative / Non-Evaluative)	Requirements as per IS: 12207-2019	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: $\pm 5\%$ for PTO power and or engine power > 26 kW. $\pm 10\%$ for PTO power and or engine ≤ 26 kW.	27.2 (D)	28.2	Yes
b)	Power at rated engine speed, (kW)	Non-Evaluative	-do-	27.2 (D)	28.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% max.	265 (D)	231	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non-Evaluative	$\pm 8\%$	155 (D)	150.6	Yes
e)	Back-up torque, percent	Evaluative	12 percent	12% (D) 12% (R) Minimum	12.0	Yes
f)	Maximum operating temperature, ($^{\circ}$ C)					
	1) Engine oil	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.	132 (D)	125	Yes
	2) Coolant	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.	112 (D)	110	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions.	1% of SFC 2.31 (R)	0.33	Yes
h)	Smoke level, m^{-1}	Evaluative	Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR).	3.25 per meter Maximum (R)	0.16 per meter	Yes

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1	2	3	4	5	6	7	
16.1.2	Drawbar performance:						
a)	Max. drawbar pull with ballasted corresponding to 15 percent wheel slip, (kN)	Non-Evaluative	Minimum 70% of static mass of tractor with ballast.	18.62 (D) 18.81 (R) Minimum	23.32	Yes	
b)	Max. drawbar pull with standard ballasted as the case may be corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 70% of static mass of tractor without ballast or with standard ballast, as the case may be.	13.00 (D) 12.70 (R) Minimum	15.77	Yes	
c)	Maximum drawbar power with standard ballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having ≤1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	22.0 (D) 22.6 (R) Minimum	24.4	Yes	
d)	Maximum transmission oil temperature (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	132 (D)	83	Yes	
16.1.3	Power lift and hydraulic pump performance:						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Evaluative	Tolerance of ± 10%	14.0 (D)	14.29	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.	14.5 (D) 6.64 (R) Minimum	11.87	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 Minutes, (mm)		Non-Evaluative	The observed value should not exceed 50 mm	50 (D) Maximum	35	Yes

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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 unballast, (m):						
	1)	Cold brake	Evaluative	10	10 (R)	7.95	Yes
	2)	Hot brake	Evaluative	10	10 (R)	8.23	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)		Evaluative	600	600 (R) Maximum	431 to 484	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal (s) or 400 N at hand lever, N		Evaluative	Yes / No	Yes	Yes	Yes
16.1.5	Noise measurement:						
a)	Maximum ambient noise emitted by the tractor dB(A)		Evaluative	As per CMVR	88 (R)	80	Yes
b)	Maximum noise at operator's ear level dB(A)		Evaluative	As per CMVR	96 (R)	92	Yes
16.1.6	Amplitude of mechanical vibrations at:						
1)	Left foot rest		Non Evaluative	100 microns (max)	100(R)	114	No
	Right foot rest					148	No
	Seat (with driver seated)					47	Yes
	Steering wheel					64	Yes
16.1.7	Air cleaner Oil Pull-Over: (*)						
	Maximum air cleaner oil pull over, (%)		Evaluative	0.25% (Maximum)	NA	0.12	Yes
16.1.8	Haulage requirements:						
a)	Gross mass of the trailers, (tones):						
	Two wheels		Non-	--	5.0 (D)	5.0	Yes
	Four wheels		Evaluative	--	5.0 (D)	5.0	Yes
b)	Distance travelled / liter of fuel consumption, (km/l):						
	Two wheels		Non-	--	4.8 to 6.5 (D)	6.62	No
	Four wheels		Evaluative	--	4.8 to 6.5 (D)	6.46 to 6.78	No
c)	Fuel consumption (ml/km/tonne):						
	Two wheels		Non-	--	25 to 30 (D)	30.22	Yes
	Four wheels		Evaluative	--	25 to 30 (D)	29.50 to 30.95	No

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 wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud (R)	No ingress of water and / or mud was observed during ICT test vide test report no. T-1024/1548/2016 (April,2016). So, as per the provision as laid down in clause 7.2 of IS: 12207-2019, test was not conducted.	Yes
1)	Clutch assembly	-do-				
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
4)	Engine oil	-do-				
5)	Transmission oil	-do-				

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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 (Part2))	Meets the requirement	Yes			
b)	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement	Yes			
c)	Seating requirements (Tractors having more than 1150 mm rear track width)	Non-Evaluative	Should meet the requirements of IS: 12343 (As amended from time to time)	Does not Meets the requirement	No			
d)	Technical requirements for PTO shaft	Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	Meets the requirement	Yes			
e)	Dimensions of three-point linkage	Non-Evaluative	Should meet the requirements of IS: 4468 (Part-I) (As amended from time to time)	Does not Meets the requirement	No			
f)	Specifications of linkage	Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement	Yes			
g)	Swinging drawbar (wherever fitted)	Evaluative	Should meet the requirement of IS: 12362 (Part 3) (As amended from time to time)	Not provided	Not applicable			
h)	1) Maximum travelling speed at rated engine speed in reverse gears, Kmph	Evaluative	Should not exceed 20 Kmph	12.49 kmph Meets the requirement	Yes			
	2) Audible warning signal on tractor	Evaluative	As soon as the travelling speed in reverse gear reaches to 20 kmph, an audible warning signal on tractor shall be activated. The safety aspects about the operation of shuttle technology shall be brought in operation and manufacturer /dealer shall ensure the training on this aspect to operator before the delivery of tractor.	Not provided	Not applicable			
16.1.11	Labelling of tractors (Provision of labelling plate):							
	1) Make	Evaluative	Should conform to the requirements of CMVR along with maximum PTO Power in kW and year of manufacture in numerical form. <table border="1" style="margin: 5px auto; width: 100px; height: 20px;"> <tr> <td>MM</td> <td>YY</td> </tr> </table> Digit 01 – 12 in box No.1 for MM will represent the months and next two digits in box No.2 for YY will represent the year of Manufacturing.	MM	YY	TAFE		Yes
MM	YY							
	2) Model	Evaluative		MF 241 DI		Yes		
	3) Month & Year of manufacture	Evaluative		09	20	Yes		
	4) Engine number	Evaluative		S325.1L07303		Yes		
	5) Chassis number	Evaluative		MEA8D061JL2310730		Yes		
	6) Maximum PTO power, (kW)	Evaluative		27.2		Yes		
	7) Specific fuel consumption, (g/kWh)	Evaluative	265		Yes			
16.1.12	Discard limit for:							
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	91.86 (D)	91.484 to 91.501	Yes		
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non-Evaluative		0.25 with new rings (D)	0.153 to 0.156	Yes		
(c)	Piston diameter at skirt, mm	Non-Evaluative		Piston is discarded when the ring groove clearance exceeds 0.25mm with new ring.	91.340 to 91.345	Yes		

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1	2	3	4	5	6	7	
(d)	Ring end gap (mm):						
	-	Top comp. ring.	Evaluative	-do-	1.50	0.35 to 0.45	Yes
	-	2 nd comp. ring.		-do-	1.50	0.90 to 0.95	Yes
-	Oil ring.	-do-		2.00	0.40 to 0.45	Yes	
(e)	Ring groove clearance (mm):						
	-	Top comp. ring.	Evaluative	-do-	0.25 (D)	Tapered	Yes
	-	2 nd comp. ring.		-do-	0.25 (D)	0.055 to 0.058	Yes
-	Oil ring.	-do-		0.25 (D)	0.050 to 0.054	Yes	
(f)	Clearance of main bearings (mm):						
	-	Diametrical clearance	Evaluative	-do-	0.25 (D)	0.081 to 0.105	Yes
-	Crankshaft end float	Evaluative	0.75 (D)		0.25	Yes	
(g)	Clearance of big end bearings, (mm):						
	-	Diametrical	Evaluative	-do-	0.50 (D)	0.085 to 0.103	Yes
	-	Axial	Evaluative	-do-	0.75 (D)	0.25 to 0.30	Yes
(h)	Clearance between king pin and bush, (mm)		Non-Evaluative	-do-	0.50 (D)	0.133 to 0.168	Yes
(i)	Clearance between centre pin and bush, (mm)		Non-Evaluative	-do-	1.25 (D)	0.078 to 0.092	Yes
16.1.13 Literature (Submission to test agency)							
(a)	Operator manual		Evaluative	Provided / Not Provided	Provided	Provided	Yes
(b)	Parts Catalogue		Evaluative		Provided	Provided	Yes
(c)	Workshop/ Service manual		Evaluative		Provided	Provided	Yes
16.1.14 Fitment of Roll Over Protective Structures (ROPS):							
	For tractor having more than 1150 mm rear track width		Evaluative	ROPS should meet the requirement of IS:1182 or OECD code or equivalent International Standard		Not fitted	Not applicable
16.1.15	Standard Accessories		Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor		Provided	Yes
16.1.16	Accessories (optional)		Non-Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR		Provided	Yes

16.2	CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2019):				
Sl. No.	Category of breakdowns	Category (Evaluative / Non-Evaluative)	Requirements as per IS: 12207-2019	As observed	Whether meets the Requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than one and neither of them should be repetitive in nature	None	Yes
3.	Minor	Evaluative	Not more than three 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 four, that is, (1 major + 3 minor) or 4 minor breakdowns.	None	Yes

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16.3 Salient Observations:

16.3.1 Laboratory tests:

16.3.1.1 PTO Performance Test:

- i) The maximum power in case of previous & present sample were observed as **28.3 & 28.2 kW** respectively, against the declaration of **27.2 kW**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power in case of previous & present sample was recorded as **241 & 231 g/kWh** against respectively the declaration of **265 g/kWh**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iii) The maximum equivalent crankshaft torque in case of previous & present sample were recorded as **154.1 & 150.6 Nm** against the declaration of **155 Nm**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iv) The backup torque was observed as **12.0 %** and meets the evaluative requirement of IS: 12207-2019.

16.3.1.2 Drawbar performance test:

- i) Maximum drawbar pull in case of previous & present sample with standard ballast corresponding to 15 percent wheel slip, (kN) was recorded as **15.74 kN & 15.77 kN** respectively against the minimum requirement of **12.70 kN**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) Maximum drawbar power in case of previous & present sample under standard ballasted condition was recorded as **25.6 kW & 24.4 kW** respectively against the minimum requirement of **22.6 kW** in case of present sample which meets the minimum requirement of IS: 12207-2019.

16.3.1.3 Hydraulic performance test:

- i) Maximum lifting capacity throughout the range of lift at hitch point and standard frame was recorded as **14.29 kN & 11.87 kN** respectively against the declaration of **14.0 kN & 14.5 kN** respectively, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.

16.3.1.4 Three-point linkage:

- i) 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 Maintenance / Service Problems:

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

16.5 Recommendation with regard to safety on tractor:

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

- i) Vertical distance of SIP from foot rest has not been provided as IS:12343-1998.
- ii) Vertical retainness in both side of clutch pedal has not been provided as IS :12239 (Part-I) 2018.
- iii) Provision for spark arresting device has not provided as IS :12239 (Part-I) 2018.
- iv) Provision of master shield has not been provided as IS: 12239 (Part-II).
- v) Working clearance in between position control and draft control lever is 45 mm not as per IS: 12239 (Part-II) .
- vi) Oil lubricant, type & frequency identifiable symbols should be provided as per IS:6283-1998.

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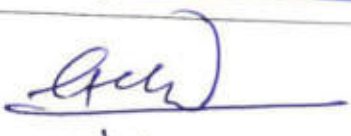

16.6 Adequacy of Literature supplied with machine:

16.6.1 The supplied literature was found adequate

- a) Operator Instruction book for MF 1035 DI V2, MF 241 DI, MF 241 DI PLANETARY PLUS V1, MF 5245 DI PLANETARY PLUS V1 Tractors models.
- b) Parts book for MF 241 DI tractor model.
- c) Workshop Service manual for MF 241 DI & MF 5245 DI PLANETARY PLUS 1 tractor model.

16.6.2 The literature should be brought out in national as well as other regional languages of India for guidance of users.

TESTING AUTHORITY:

C.V. CHIMOTE TEST ENGINEER	
Y.K. RAO SENIOR AGRICULTURAL ENGINEER	
P.K. PANDEY DIRECTOR	

Draft test report compiled by: **Sh. C.S. Raghuwanshi**, Agricultural Engineer.

17. APPLICANT'S COMMENTS

Para no.	Our reference	Applicant comments
17.1	16.3.1.4, 16.5 (i), (ii), (iii), (iv), (v), (vi), 16.6.1 & 16.6.2	We will study and take appropriate corrective actions.

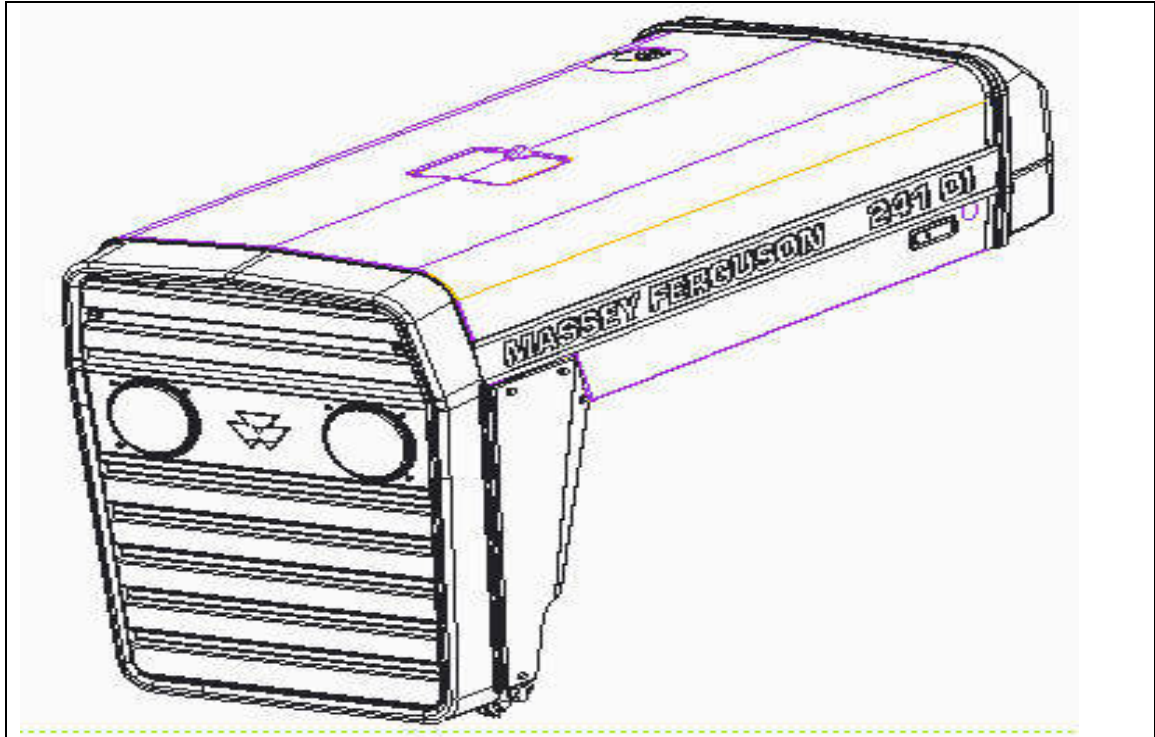
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ANNEXURE- I

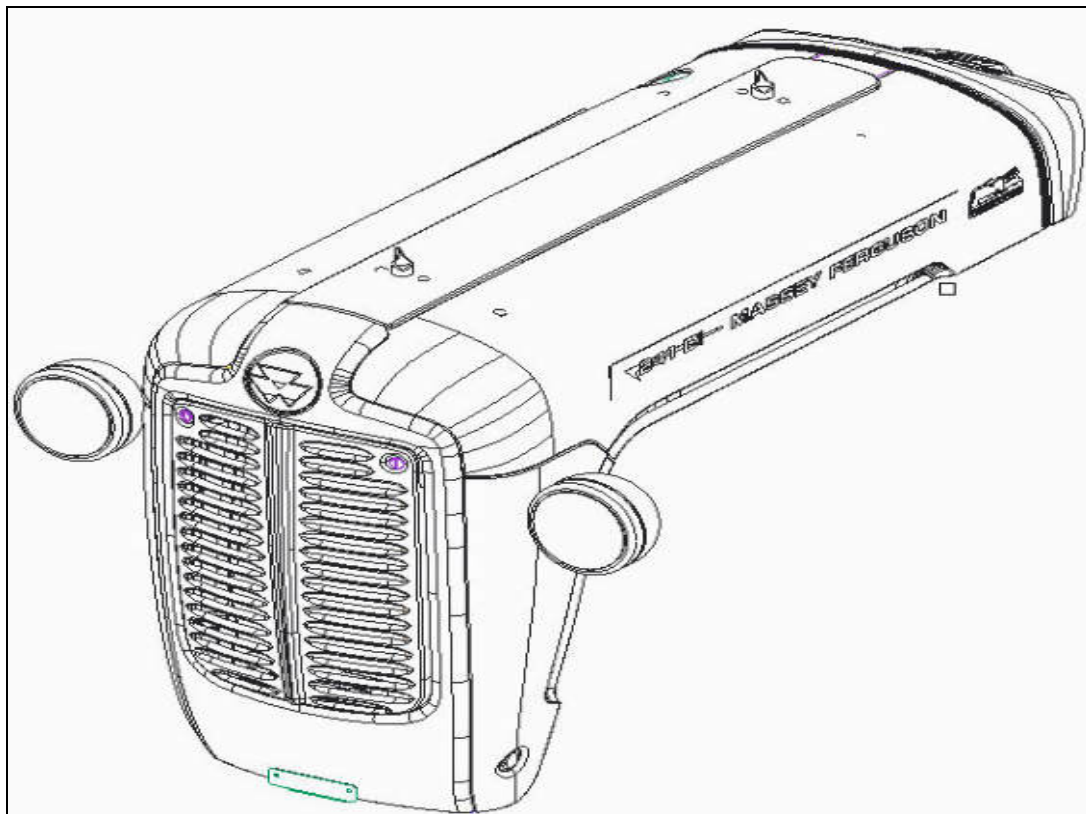
TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in (Engine -12 & Transmission -24 hours)	36.0
2.	PTO performance test	14.0
3.	Drawbar performance test	16.4
4.	Power lift and hydraulic pump performance test	1.5
5.	Brake test	1.8
6.	Noise measurement	0.8
7.	Air cleaner oil-pull over test	2.5
8.	Mechanical vibration test	1.0
9.	Theoretical speed test	1.1
B.	Haulage Test	5.2
C.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	6.2
	TOTAL:	86.5

ANNEXURE-II

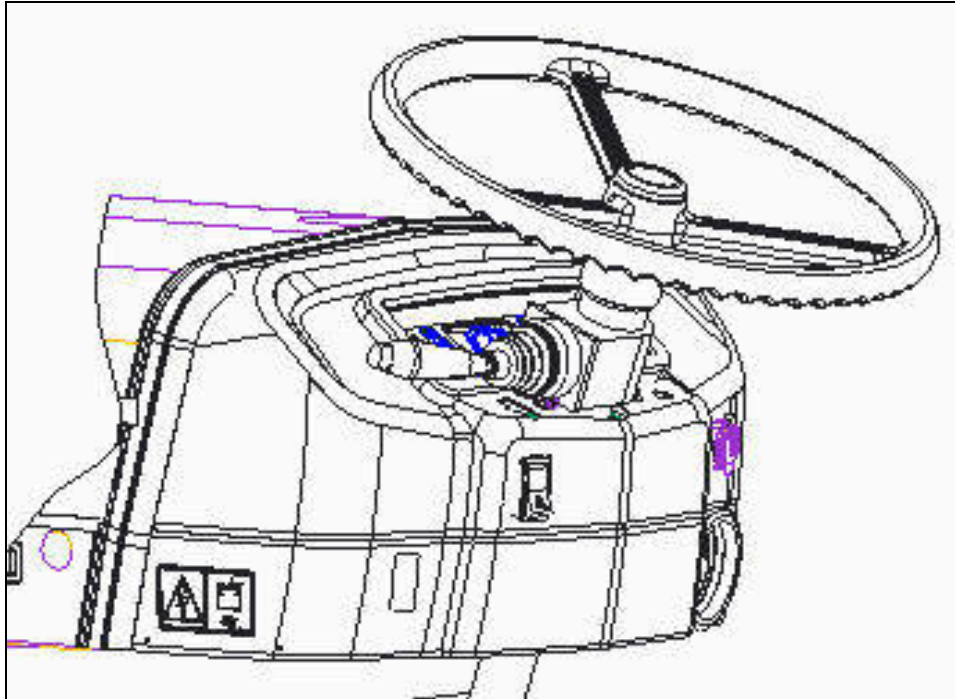


STANDRAD FITMENT BONNET SHEETMETAL

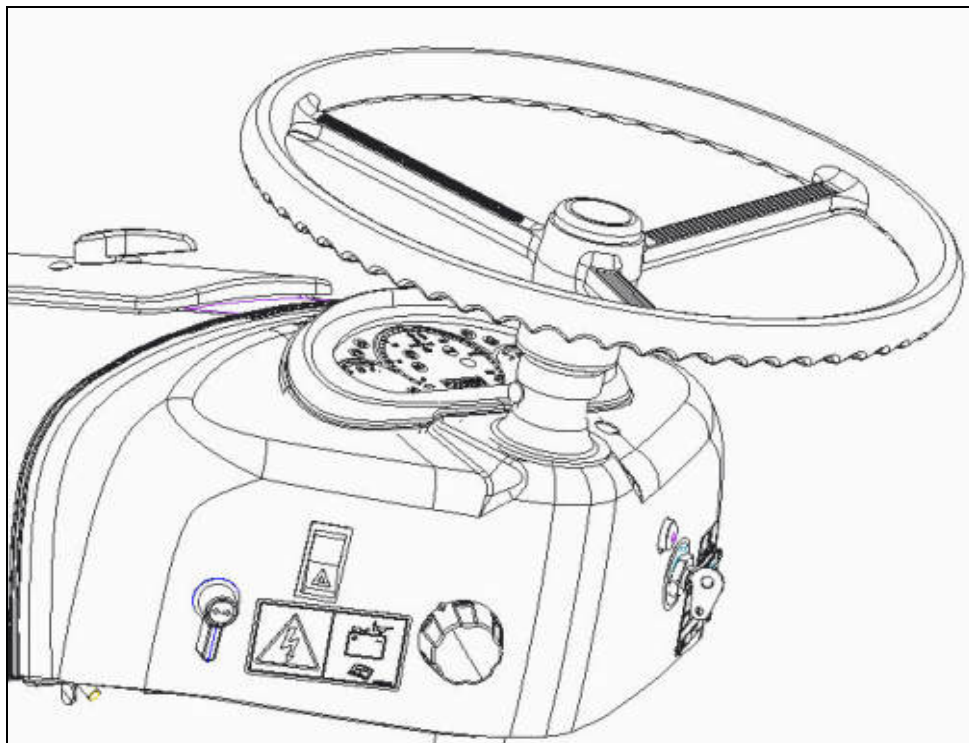


OPTIONAL FITMENT - BONNET SHEETMETAL

ANNEXURE-III



STANDRAD FITMENT -BINNACLE

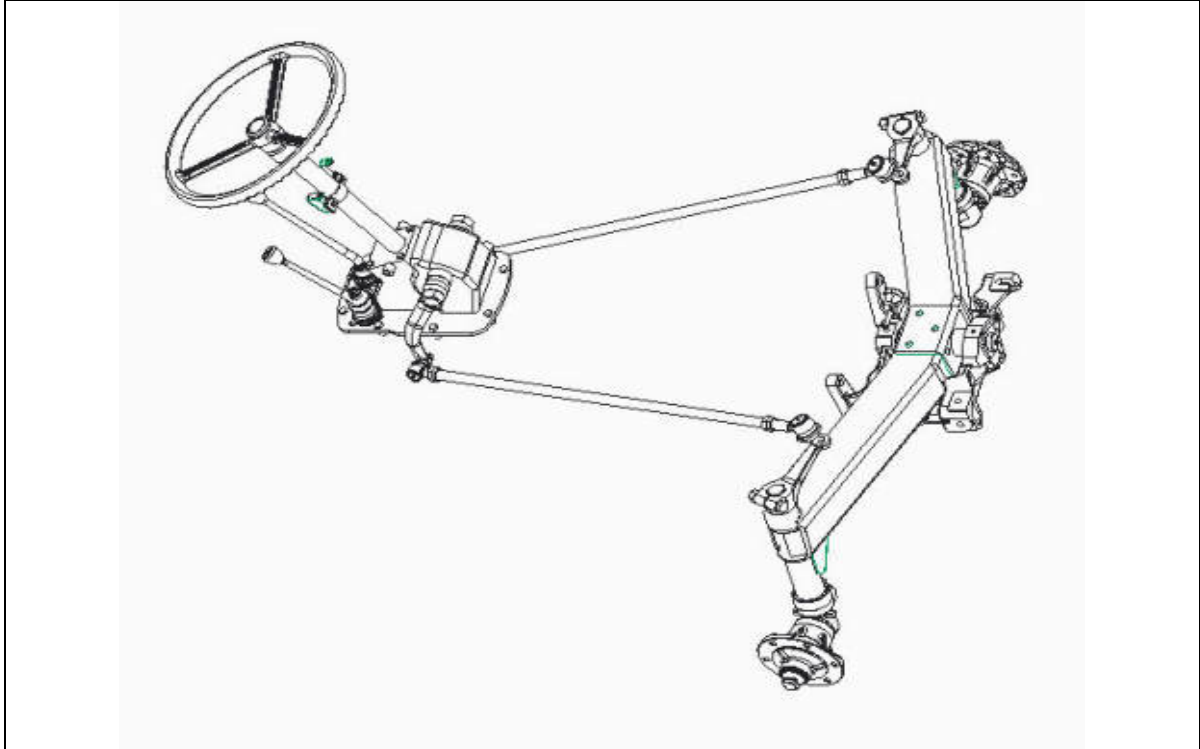


OPTIONAL FITMENT -BINNACLE

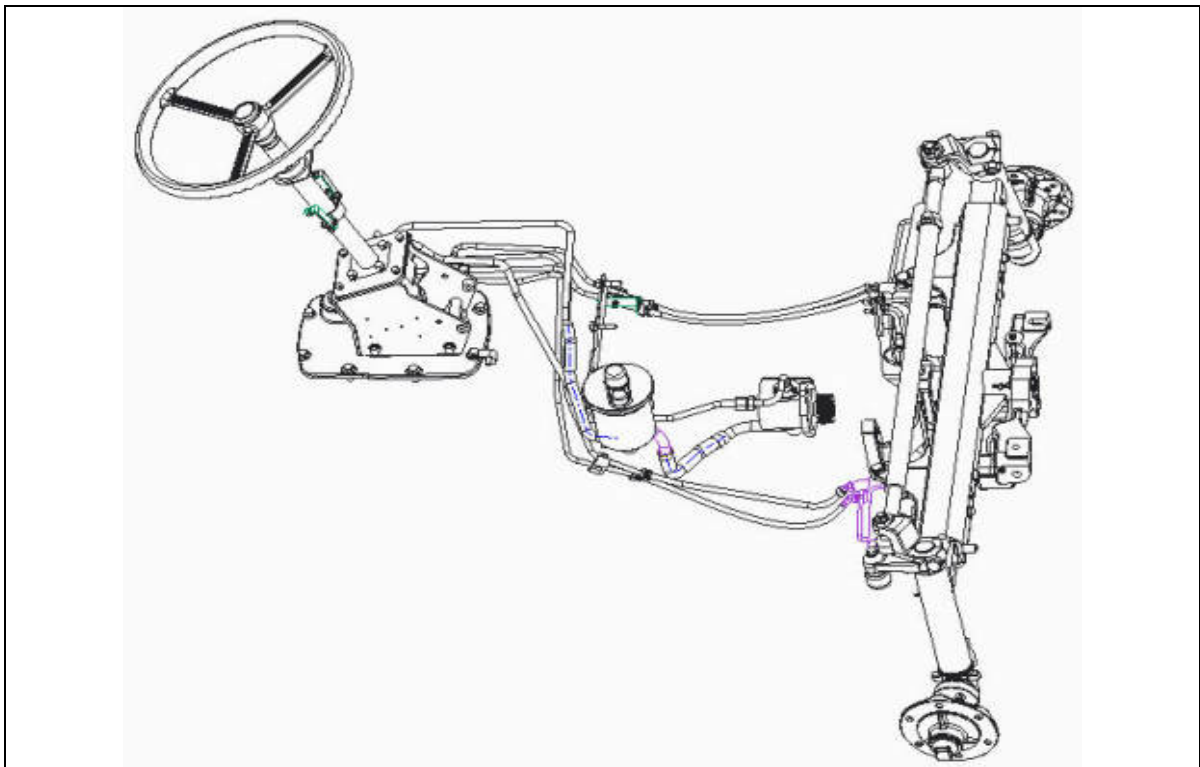
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ANNEXURE-IV



STANDARD FITMENT - SWEEP FIXED AXLE WITH MANUAL STEERING



OPTIONAL FITMENT - STRAIGHT ADJUSTABLE AXLE WITH POWER STEERING