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COMMERCIAL TEST REPORT
(1st Batch Test)

L k [; k / No. : **T-1269/1796/2019**
ekg / Month : **October, 2019**

(यह परीक्षण रिपोर्ट 31/10/2024 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/10/2024)



**MAHINDRA, 595 DI SUPER TURBO
(BRAND NAME: SARPANCH) TRACTOR**



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GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(Deptt. of Agricultural, Cooperation & Farmer's Welfare, Mechanization & Technology Division)

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T-1269/1796/2019	MAHINDRA, 595 DI SUPER TURBO (BRAND NAME :SARPANCH) TRACTOR – COMMERCIAL (1 ST BATCH TEST)
	THIS TEST REPORT IS VALID UPTO: 31/10/2024

Manufacturer : M/s. Mahindra & Mahindra Limited
(Farm Equipment Sector)
Akurli Road, Kandivli (East)
MUMBAI – 400 101

Month: October	Test Report No. T-1269/1796/2019	Year: 2019
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T-1269/1796/2019	MAHINDRA, 595 DI SUPER TURBO (BRAND NAME :SARPANCH) TRACTOR – COMMERCIAL (1 ST BATCH TEST)
	THIS TEST REPORT IS VALID UPTO: 31/10/2024

Type of Test : **COMMERCIAL (First Batch Test)**
Test code/Procedure : IS: 5994-1998 (Reaffirmed in 2014)
and IS: 12207-2014
Period of Test : January, 2019 to June, 2019
Test Report No. : **T-1269/1796/2019**
Month/Year : **October, 2019**

- 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 selected randomly from production line by the testing authority 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 should be read in conjunction with the Test Report of base model i.e. “Mahindra 595 DI Super Turbo (Brand name: Sarpanch)” Tractor bearing report no. T- 908/1423/2014 released in February, 2014 and the technical extension report, Mahindra 595 DI Super Turbo (Brand name: Sarpanch)” Tractor bearing report no. T-1268/1795/2019 released in October, 2019

SELECTED CONVERSIONS

SELECTED CONVERSIONS		
Sl. No.	Units	Conversion Factor
1	Force:	
	1 kgf	9.80665 N
		2.20462 lbf
2	Power:	
	1 Mechanical horse power	1.01387 Metric horse power
		745.7 W
	1 Metric horse power	735.5 W
	1 kW	1.35962 Metric horse power
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
SIP	Seat Index Point

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The “Mahindra, 595 DI super Turbo (Brand Name: Sarpanch)” tractor had undergone “Initial Commercial Test” at this Institute and a test report No. T- 908/1423/2014 was released in **February, 2014**. Thereafter, the firm had made modification in the specification of the tractor and permanently incorporated and tested under supplementary test vide test report no. T-1268/1795/2019, released in **October, 2019**. The applicant has submitted an application vide letter No. Nil dated 28.02.2017 for Batch testing of “Mahindra, 595 DI super Turbo (Brand Name: Sarpanch)”.

All necessary tests as per table-1 of clause 6.0 of IS: 5994 - 1998 (Reaffirmed in: 2014) were carried out and test report released as under:

Manufacturer	: M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Akurli Road, Kandivali (E) MUMBAI – 400 101
Location of other manufacturing plants (apa)	: M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Hingna Road, Hingna MIDC, NAGPUR- 440 016 : M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Agri Business Development Centre, Khatima Panipat Highway, Udham Singh Nagar, Vil-Lalpur, Tehsil-Kichha, RUDRAPUR-263153 . : M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Agri Development Centre, Vil-Mehla Tehsil-Dudu Jaipur- Ajmer Road, JAIPUR-303 007 . : M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Near Bidar “T” Junction , Mahindra Nagar, Zaheerabad- 502 220. : M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Mahindra Research Valley-AFS, Mahindra World City, Plot No. 41/1, Anjur P.O., Chengalpattu – 603 004 Kanchipuram District .
Test requested by (applicant)	: M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Akurli Road, Kandivli (E) Mumbai – 400 101.
Selected for test by	: Testing Authority
Place of running-in	: At manufacturer’s works
Duration of said running-in, (h):	
- Engine	: 15
- Transmission	: 30
Method of Selection	: The test sample was selected randomly out of Five tractors from the production line by the representative of testing authority.

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1. SPECIFICATIONS

- 1.1 Tractor:**
- Make : Mahindra
Model : 595 DI Super Turbo
Brand name : Sarpanch
Variant, if any : None
Type : Four wheeled, Rear wheel drive unit construction, General purpose, Agricultural Tractor.
Year of manufacture : FJ (September, 2018)
Chassis number : MBNADAKALJNF01907
Country of origin : India
- 1.2 Engine:**
- Make : Mahindra
Model : MDI3000TC3A
Type : Four stroke, turbo charged, liquid cooled, direct injection, diesel engine.
Serial number : NJF2RHE0017
Country of origin : India
- 1.2.1 Engine speed (rpm), (Manufacturer's recommended production settings):**
- Maximum speed at no load : 2250 to 2350
- Low idle speed : 700 to 800
- Speed at maximum torque : 1200 to 1400
- Rated speed, (rpm):**
- For PTO use : 2100
- For drawbar use : 2100
- 1.3 Cylinder & Cylinder Head:**
- Number : Four
Disposition : Vertical, Inline
Bore/stroke, (mm) : 88.9/101.6 (apa)
Capacity as specified by the applicant, (cc) : 2523
Compression ratio : 18.75 : 1
Type of cylinder head : Monoblock
Type of cylinder liners : Wet, replaceable
Type of combustion chamber : Re-entrant bowl cavity on piston top
Arrangement of valves : Overhead, inline
- Valve clearance (cold/hot):**
- Inlet valve, (mm) : 0.30/0.40
- Exhaust valve, (mm) : 0.40/0.50
- 1.4 Fuel System:**
- Type of fuel feed system : Gravity and force feed
- 1.4.1 Fuel tank:**
- Capacity, (l) : 56.0
Location : Above clutch housing
Provision for draining of sediments/ water : Provided
Material of fuel tank : Metallic
- 1.4.2 Water separator : Not Provided**

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1.4.3 Fuel feed pump:

Make : Bosch, India
Type : Plunger type with hand primer
Model, Group combination number : FP/KSG22AD105
Location : On Fuel Injection pump.
Method of drive : Through camshaft of Fuel Injection pump

1.4.4 Fuel filters:

Make : Bosch, India
Model/Group combination No. : F 002H20117
Number : Two

Type of elements:

- Primary : Cloth
- Secondary : Paper
Capacity of final stage filter, (l) : 0.48

1.4.5 Fuel Injection pump:

Make : Bosch, India
Model/Group combination No. : F002A0Z874, PES4A85D320RS3593
Type : Inline, plunger
Serial number : 85635381
Method of drive : Through timing gears

1.4.6 Fuel injectors:

Make : Bosch, India
Model/Group combination No.:
- Holder Number : F002 C70007856
-Nozzle Number : DSLA144P949
Type : Multihole (Five holes)
Manufacturer's production pressure : 24.5 +0.78
setting, (MPa)
Injection timing : 3±1 Degree BTDC
Firing order : 1 – 3 – 4 – 2

1.4.7 Governor:

Make : Bosch, India
Model/Group combination No. : RSV350...1050A1C1432R
Type : Mechanical, centrifugal, variable speed
Rated engine speed, (rpm) : 700 to 2350
Governed range of engine speed, : 2100
(rpm)

1.5 Air intake system:

1.5.1 Pre-cleaner : Not Provided

1.5.2 Air cleaner:

Make : Donaldson
Type : Dry type
Location : Above the radiator, under the bonnet
Range of suction pressure at : 7.2 to 8.3
maximum power, (kPa)

Details of elements: (Same as : Secondary element | Primary element previous)

- Size (OD/ID), (mm)	: 72/63	127.5/84.5
- Length, (mm)	: 296.5	310
- Type	: Paper	Felt
- No. of elements	: Two	

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Air flow restriction indicator : Provided on dash board
Dust unloading valve : Provided
Maintenance schedule : Cleaning of primary element if required in arduous condition or at every 250 hours of operation. Replace primary element at every 750 hours of operation or 2 cleaning of primary filter element. Replace Secondary element at every 2250hrs or 3rd replacement of primary filter element.

1.6 Exhaust System:

Type of silencer : Updraft, Cylindrical.
Position of silencer outlet with respect to SIP, (mm):
- Vertical : 775
- Longitudinal : 1250
- Lateral : 225 (on RHS)
Range of exhaust gas pressure at maximum power, (kPa) : 70.8 to 72.0
Provision of spark arresting device : **None**
Provision against entry of rain water : A bend is provided at the top of silencer

1.6.1 Turbocharger:

Make : Holset
Model : HX 20 (apa)
Type : Non Waste gate Turbo
Boost Pressure Ratio : 1.55 (apa)
Speed at rated engine speed, (rpm) : 160000 (apa)
Method of lubrication : Force feed lubrication from main oil gallery of engine.
Location : Above engine, under the bonnet

1.6.2 Exhaust Gas Recirculation system : Not Provided

1.7 Lubricating system:

Type : Forced feed-cum-splash
Oil sump capacity,(l) : 8.2
Total lub oil capacity, (l) : 9.0
Oil change period : First change after 50 hours and subsequently after every 250 hours of operation.
Type of cooling device, (if any) : Plate type oil cooler provided, having five numbers of plates. The cooler is connected with water pump outlet & engine water jackets.

1.7.1 Filters:

Make : Elofic
Type : Full flow, spin on, throw away paper element
Number : One
Capacity, (l) : 0.80

1.7.2 Pump:

Type : Gear
Method of drive : Through timing gears
Pressure release setting, (kPa) : 206 to 241
Minimum permissible pressure, (kPa) : 200

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- 1.8 Cooling system:**
Type : Forced circulation of coolant & water
Brand name of the coolant : Mobile coolz coolant additive
Coolant water ratio : 0.05:1 (apa)
- 1.8.1 Details of Pump** : Centrifugal, semi open impeller having seven vanes of 82.5 mm diameter and driven through crankshaft pulley by a cogged “V” belt.
- 1.8.2 Details of fan** : Suction type, having six metallic blades of 400 mm diameter and mounted on water pump.
- Means of temperature control : Thermostat
Bare radiator capacity, (l) : 2.80
Coolant expansion tank capacity,(l) : 0.85
Total coolant capacity, (l) : 7.65
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 and model : EXIDE & 95D31LMF
Type : Lead Acid
Capacity and rating : 12V, 88 Ah at 20 hour discharge rating
Location : RHS of clutch housing in a separate metallic box.
- 1.10.2 Starter:**
Make : Auto Lek
Model : NA
Type : Pre-engaging solenoid operated
Power rating : 12V, 2.2 kW (apa)
Serial number : NA
- 1.10.3 Generator:**
Make : Autolek
Model : ALT 4005 H
Type : Alternator
Serial number : N.A
Output rating : 12V, 35 Amp
Method of drive : Through water pump pulley by a cogged “V” belt.
- 1.10.4 Voltage regulator** : In-built with alternator

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1.10.5 Details of lights:

Description	No. & capacity of bulb	Height of the centre of beam above ground level, (mm)	Size, (mm)	Distance between centre of the beam and outside edge of tractor at standard rear track setting, (mm)
Front Lights:				
- Head lights	2, 12V, 55/60W	1210	170 x 95	760
- Parking lights	2, 12V, 5W	1330	35 x 65	255
- Turn cum hazard light	2, 12V, 21W	1330	75 x 65	200
Rear lights:				
- Parking-cum-brake light	2, 12V, 5 / 21W	1320	45 x 65	240
- Turn Indicators-cum-hazard indicators	2, 12V, 21W	1320	35 x 65	165
- Plough light (On RHS mudguard)	1, 12V, 55W	1415	110 Φ	400
- Reflector(s) (Red)	2	1320	35 x 55	205
- Registration plate light	Part of rear light assembly			

- 1.10.6 Main switch** : Key turn type, having three position viz:
i) OFF
ii) 'Circuit' ON
iii) START
- 1.10.7 Light switch** : Rotary type having six positions viz.
i) OFF
ii) Parking lights + Dash board lights 'ON'
iii) Head lights (short beam) + (ii)
iv) Head lights (long beam) + (ii)
v) Horn push button
vi) Turn indicator light switch
vii) Hazard light switch
viii) Plough light switch
- 1.10.8 Horn:**
Make : Minda
Type : 12 V, 2B, Electromagnetically vibrated diaphragm
Location : In front of radiator under the bonnet
- 1.10.9 Fuse box** : Contains nine number of fuses of following capacity:
- | Capacity | 20 A | 15 A | 10 A |
|-------------|------|------|------|
| No. of fuse | 02 | 01 | 06 |
- 1.10.10 Details of other electrical accessories:**
- 1.10.10.1 Starting safety switch** : **Not provided**
- 1.10.10.2 Flasher Unit:**
Make : Interface
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

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3.1.11	Instrument panel details:	
	i) Engine speed-cum-cumulative digital run-hour-meter (0 to 30) x 100 rpm	Provided
	ii) Coolant temperature gauge (with colour zones).	Provided
	iii) Fuel level gauge (with colour zones).	Provided
	iv) Lub.oil pressure indicator light	Provided
	v) Main switch (key-turn type)	Provided
	vi) Light switch (Rotary type)	Provided
	vii) Plough Light switch	Provided
	viii) Hazard warning light switch	Provided
	ix) Turn-cum-hazard indicator lights (Tell-tale)	Provided
	x) Battery charging indicator light	Provided
	xi) Head lamp (high beam) 'ON' indicator light	Provided
	xii) Parking brake indicator light	Provided
	xiii) Air cleaner clogging warning indicator light	Provided
	xiv) Horn push button	Provided
	xv) Hand accelerator lever	Provided
	xvi) Steering control wheel	Provided
	xvii) Rear view mirror.	Provided
	xviii) Engine stop knob.	Provided
	xix) Plough light indicator	Provided

1.12 Transmission System:

1.12.1 Clutch:

Make	:	Valeo (apa)
Type	:	Single, Dry friction plate
No. of friction plate, (s)	:	One
Size, (mm)	:	280.0 /170.3 Φ
Method of operation	:	By pressing clutch pedal fully provided on LHS of operator's seat.

1.12.2 Gear box:

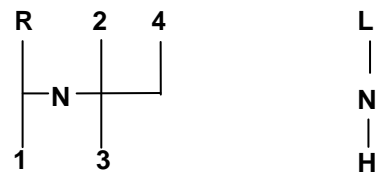
Make	:	Mahindra
Type	:	Mechanical, Combination of Sliding & Constant mesh gears

No. of speeds:

- Forward	:	8
- Reverse	:	2

Location of gear shifting levers:

-Main gear shift lever	:	In front of Operator's seat
-Range selection cum reverse lever	:	In front of Operator's seat



Gear shift lever Range shift lever

Oil capacity, (l)	:	44.5 (common with differential, rear axle & final drive, steering, brake & hydraulic system).
Oil changing period	:	First change after 1300 hours and subsequently after every 1300 hours of operation.

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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 14.9-28 size tyres of 640 mm radius index, (kmph)
Forward	L1	163.92	3.09
	L2	99.74	5.09
	L3	66.35	7.63
	L4	45.33	11.18
	H1	55.75	9.07
	H2	34.00	14.88
	H3	22.66	22.39
	H4	15.45	32.78
Reverse	LR	117.83	4.30
	HR	40.17	12.63

1.12.4 Differential :

Type : Crown wheel & pinion with differential unit accommodated inside the differential housing.

Reduction through crown wheel & bevel pinion : 4.182 : 1 (46/11 T)

Oil capacity, (l) : 44.5 (common with gearbox, rear axle & final drive, steering, brake & hydraulic system).

Oil changing period : First change after 1300 hours and subsequently after every 1300 hours of operation.

Differential lock:

Type : Dog clutch

Location : On RHS of operator's seat

Method of operation : By pressing a pedal provided at RHS of operator's seat

1.12.5 Rear axle & final drive:

Make : Mahindra (apa)

Type : Bull gear and pinion type reduction unit accommodated inside differential housing

Reduction through final drive : 3.692 : 1 (48/13 T)

Oil capacity of final drive, (l) : 44.5 (common with gearbox, differential, steering, brake & hydraulic system).

Oil changing period : First change after 1300 hours and subsequently after every 1300 hours of operation.

1.13 Power lift (Hydraulic system):

- Make : Mahindra

- Type : Open centre, live & ADDC

- No. and type of ram cylinder : One, single acting

- Type of linkage lock for transport : Hydraulic, isolating valve in fully closed position act as transport lock.

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1.13.1 Hydraulic pump:

- Make : Dynamics (apa)
- Type : Gear
- Location & drive : On RHS of engine & through timing gears.
- No. & Type of filter : Three
 - (i) One strainer at suction
 - (ii) Full flow spin on paper element type
 - (iii) Orifice filter on distributor
- Hydraulic oil capacity, (l) : 44.5 (common with transmission & brake system).
- Oil change period : First change after 1300 hours and subsequently after every 1300 hours of operation.
- Provision for external tapping : Provided
- Details of control :**
 - i) Position control lever
 - ii) Draft control lever
 - iii) Isolating valve knob on distributor
- Method of draft sensing : Through top link

1.13.2 Three point linkage:

S. No.	Observations	As per IS: 4468- (Part-1) -1997 (Reaffirmed in Oct., 2017) (Cat.I / Cat.II), (mm)	As measured (mm)	Remarks
I.	Upper hitch points:			
a)	Dia of hitch pin hole	19.30 to 19.50 / 25.70 to 25.90	25.86	Conforms to Cat. II
b)	Width of ball	44.0 (max.)/ 51.0 (max)	50.9	-do-
II.	Lower hitch points:			
a)	Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	29.0	Conforms to Cat. II
b)	Width of ball	34.8 to 35.0 / 44.8 to 45.0	38.0	Does not conform
III.	Lateral distance from lower hitch point to centre line of tractor	359 / 435	432	Does not conform
IV.	Lateral movement of lower hitch points	100 (min) / 125 (min)	158	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	565	-do-
VI.	Transport height	820 (min)/ 950 (min)	1000	-do-
VII.	Power range (Without force)	560 (min)/ 650 (min)	640	Conforms to Cat. I
VIII.	Leveling adjustment	100 (min)/ 100 (min)	415	Conforms to Cat. I & II
IX.	Lower hitch point tyre clearance	100 (min)/ 100 (min)	225	-do-
X.	Lower hitch point height	200 (max)/ 200 (max)	200	-do-

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

The following are dimensions observed, corresponding to **640 mm** as tyre dynamic radius index:

Sl. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1.	Length of lower link	A	750	750
2.	Length of lift arm	B	255	255
3.	Length of lift rods	C	525 to 695	620
4.	Length of top link	D	565 to 775	685
5.	Distance of lift rod connection point from pivot point of lower link.	E	385	385
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	160, behind	160, behind
	-Vertically	G	125, below	125, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	250, behind	250, behind
	-Vertically	J	295, above	295, above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	25, behind	25, behind
	-Vertically	L	400, above	400, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	55 to 360	200, above
	- In low position	N	-595 to -190	440, below
1	2	3	4	5
10.	Height of lower link hitch points when locked in transport position	--	200	

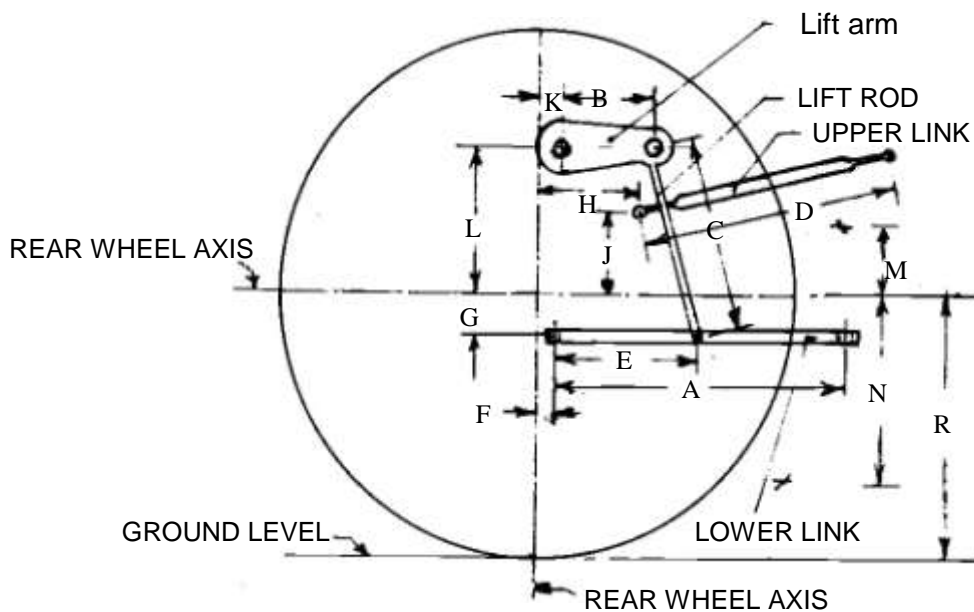


Fig.1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

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1.13.4 Drawbar:

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

Notation	As per IS: 12953-1990 (Reaffirmed in Oct.,2017), (Cat.I) / (Cat.II), (mm)	As measured, (mm)	Remarks
A	683 ± 1.5 / 825 ± 1.5	826	Conforms to Cat. II
B	75 (min) / 75 (min)	75.5	Conforms to Cat. -I & II
C	30 (min) / 30 (min)	32.0	Conforms to Cat. -I & II
D \varnothing	21.79 to 22.0 / 27.79 to 28.00	28.0	Conforms to Cat. - II
E	39.0 (min) / 49.0 (min)	50.9	Conforms to Cat. -I & II
F \varnothing	12.0 (min) / 12.0 (min)	12.2	Conforms to Cat. -I & II
G	15.0 (min) / 15.0 (min)	17.8	Conforms to Cat. -I & II
H \varnothing	25 ± 1 / 25 ± 1	24.5	Conforms to Cat. -I & II
J	80 ± 1.5 / 80 ± 1.5	80.5	Conforms to Cat. -I & II
No. of holes	7 / 9	09	Conforms to Cat. -II

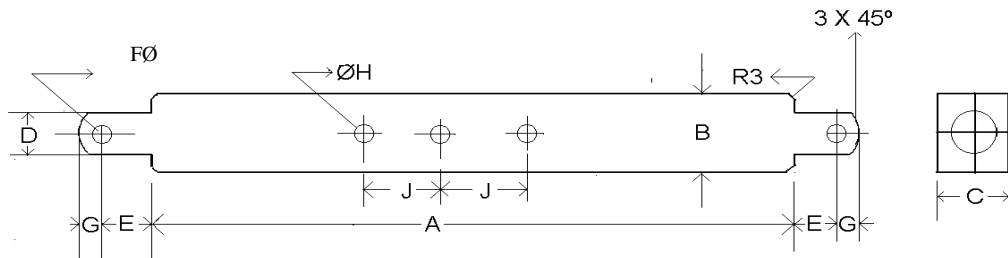


Fig. 1 (b): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

1.13.4.2 Swinging drawbar	: Not provided
1.14 Power take-off shaft:	
Type	: Type-I, Not 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 of 2100 (rpm)	: 572 - In low speed range selection & 1680 – In high speed range selection
Distance behind rear axle, (mm)	: 350
Engine to PTO speed ratio	: 3.671 : 1 – In low speed range selection 1.250 : 1 – In high speed range selection
Whether the PTO shaft is capable of transmitting the full power of engine	: Yes
Other speeds corresponding to rated engine speed	: None

1.14.1 Specifications of Power Take-Off Shaft: [Refer Fig. 2]

Specification	As per IS:4931-1995 (Type-I) (Reaffirmed in 2014)	As observed	Remarks
1	2	3	4
Nominal speed (rpm)	540 ± 10	540 rpm of PTO corresponds to 1982 rpm of engine.	Conforms
No. of splines	6	6	Conforms

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1	2	3	4
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) (Refer Fig. 2(a)):			
D \emptyset	34.79 \pm 0.06	34.73	Conforms
d \emptyset	28.91 \pm 0.05	28.92	Conforms
B \emptyset	29.4 \pm 0.1	29.40	Conforms
A \emptyset (Optional)	8.3 \pm 0.1	8.3	Conforms
W	8.69 – 0.09 – 0.16	8.61	Conforms
a	7	7	Conforms
b (Optional)	25 \pm 0.5	25.5	Conforms
c	38	38	Conforms
X	30 $^{\circ}$	30 $^{\circ}$	Conforms
B	76 (min)	90	Conforms
h*	450 to 675	625	Conforms

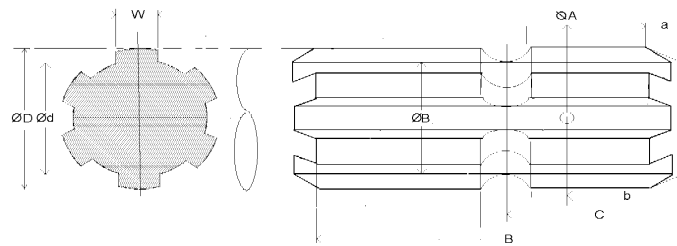


Fig. 2(a): DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT
1.14.2 Power Take-off Master Shield:
Dimensions of Power take-Off Shaft, [See Fig. 2(b)]:

Specification	As per IS: 4931-1995 (Reaffirmed in 2014)	As Observed, (mm)	Remarks
k	70 (Min.)	73	Conforms
m	125 \pm 5	120	Conforms
n	85 \pm 5	63	Does not conform
p	285 \pm 5	280	Conforms
r	76 (Max.)	0	Conforms

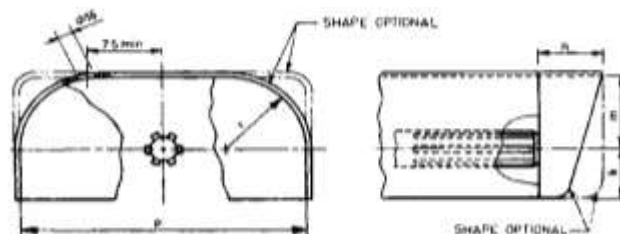


Fig. 2(b): DIMENSIONAL NOTATION FOR PTO SHAFT MASTER SHIELD

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1.15	Towing hitch:	
1.15.1	Front:	: Not Provided
1.15.2	Rear:	
	Type	: Clevis
	Location	: At rear of differential housing
	Height above ground level, (mm):	
	- Maximum	: 683
	- Minimum	: 488
	No. of position	: Five
	- Type of adjustment	: By changing the position of hitch on its mounting bracket.
	Distance of hitch point,(mm):	
	- From rear axle centre	: 455
	- From power take-off shaft end	: 105
	Dia of pin hole, (mm)	: 30.9
	Width of clevis, (mm)	: 86
1.16	Steering:	
	Make	: Danfoss
	Type	: Hydrostatic
	Location of control wheel	: Above bell housing
	Method of operation	: Manual, by steering control wheel
	Diameter of steering control wheel, (mm)	: 420
	Steering oil capacity, (l)	: 44.5 (common with transmission, brake & hydraulic system).
	Lubricant change period	: First change after 1300 hours and subsequently after every 1300 hours of operation.
1.17	Brakes:	
1.17.1	Service Brake:	
	Make	: Brakes India (apa)
	Type	: Mechanical, Oil immersed multi discs brake.
	Location	: On bull pinion shaft
	No. of discs	: Four (on each wheel side)
	Area of liners, (cm ²)	: 874.3 (on each wheel side)
	Material of liners	: Paper base (apa)
	Method of operation	: Individual or combined pedal operation by right foot of operator
1.17.2	Parking Brake:	
	Type	: Toggle link locking mechanism
	Method of operation	: Service brake act as parking brake when locked in position by a hand lever provided on RHS of the operator's seat.
1.18	Wheel Equipment:	
1.18.1	Steered Wheel(s):	
	Make	: CEAT
	Number	: Two
	Type of tyre	: Pneumatic, ribbed
	Size	: 6.00 -16
	Ply rating	: 8
	Maximum permissible loading capacity of each tyre recommended for road work, (kgf)	: 410

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Recommended inflation pressure, kPa :

- for field work	: 167
- for transport	: 196
Track width, (mm)	: 1265 (std.) & 1455
Method of changing track width	: By reversing the wheel disc
Make & size of rim	: WILP & 4.50E x 16

1.18.2 Driving wheel:

Make	: MRF Shakti life
Number	: Two
Type of tyre	: Pneumatic, traction
Size	: 14.9-28
Ply rating	: 12
Maximum permissible loading capacity of each tyre at 157 kPa pressure, (kgf)	: 1600

Recommended inflation pressure, (kPa)

- for field work	: 118
- for transport	: 137
Track width, (mm)	: 1420 (std.), 1445, 1535, 1625, 1705, 1725, 1815
Method of changing track width	: By reversing the wheel disc & changing the position of wheel disc on off-set rim lugs.

1.18.3 Wheel base, (mm)

Make & size of rim	: WILP, W13 x 28
Method of changing wheel base,if any	: 1975
	: None

1.19 Operator's seat:

Make	: Polar
Type	: Cushioned seat with back rest
Type of suspension	: Helical coil springs
Type of damping	: Hydraulic shock absorber

Range of adjustment,(mm):

- Vertical	: Nil
- Lateral	: Nil
- Longitudinal	: ± 130

1.20 Provision for safety and comfort of operator:

1.20.1 Operator's Seat:

Meets the minimum requirements of IS: 12343-1998, (Re-affirmed in 2014) **except the following:**

- i) Longitudinal distance from SIP to the center of steering control wheel.

1.20.2 Conformity with IS: 6283 (Part 1 & 2)-1998 (Re-affirmed in 2014) :

Controls and displays are identifiable with symbols meets the requirements as per IS: 6283 (Part 1&2) – 1998

1.20.3 Conformity with IS: 8133-1983 (Re-affirmed in 2014) :

Location and movement of various controls meets the requirement of IS: 8133-1983; **except the following:**

- i) Provision for safety switch against accidental start is not been provided
- ii) The fuel shut-off knob does not remain in stop position

1.20.4 Conformity with IS: 12239 (Part-1)-1996 (Re-affirmed in 2014):

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

- i) The spark arrester is not been provided in the exhaust system.

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1.20.5 Conformity with IS:12239 (Part-2)-1999 (Re-affirmed in 2014) :

Meets the requirements of IS: 12239 (Part-2)-1999; **except the following:**

- i) Working clearance around the position control lever is less than the minimum requirement

1.20.6 Conformity with IS: 14683 – 1999 (Re-affirmed in 2014) :

Lighting requirements conform to IS: 14683-1999.

1.20.7 Rear view mirror:

Rear view mirror is provided

1.20.8 Slow moving emblem : Provided

1.21 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in 2014):

Location of labelling plate:- It is riveted on LHS of outside fender and provides the following information:

Name of Manufacturer	M/s. Mahindra & Mahindra Limited, Farm Equipment Sector, India
Make	Mahindra
Model	595 DI Super Turbo
Year of manufacture	FJ (i.e September, 2018)
Chassis Serial Number	MBNADAKALJNF01907
Engine Serial Number	NJF2RHE0017
Maximum P.T.O Power, kW (hp)	32.5 (43.6)
Specific fuel consumption, g/kWh (g/hph)	251 (187)

1.22 Ballast Mass (kg):

Particular		As used during drawbar test	As used during haulage test
Front	C.I. weight	80	80
	Water	Nil	Nil
Rear	C.I. weight	450	370
	Water	270	Nil
Additional weight, if any		Nil	Nil

1.22.1 Standard ballast if any:

Front	51 (C.I. weight)
Rear	Nil

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	780	1250	2030
ii)	With ballast as used during drawbar performance test	855	1985	2840
iii)	With ballast as used during haulage test	855	1660	2515

1.24 Overall dimensions:

Condition	Length, (mm)	Width, (mm)	Height, (mm)		Ground Clearance, (mm)
			With exhaust pipe	Without exhaust pipe	
With standard ballast	3530	1830	2175	1695 (at steering control wheel)	317 (Below standard ballast at front axle)

1.25 Number of external lubricating points:

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

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- 1.26 **Colour of tractor:**
Chassis : Dark grey
Sheet metal:
Bonnet & fender : Red
Wheel Rim & Disc : Silver
- 1.27 **Optional features** : 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/cc at 15°C was used.

2.2 Lubricants:

S. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine oil	SAE 15W40	As recommended
2.	Steering housing	MTRAC 30	Oil originally filled in the tractor was not changed
3.	Transmission, Hydraulic, Steering housing, brake system, rear axle and final drive oil		
4.	Grease	MP3 lithium base	MP grease

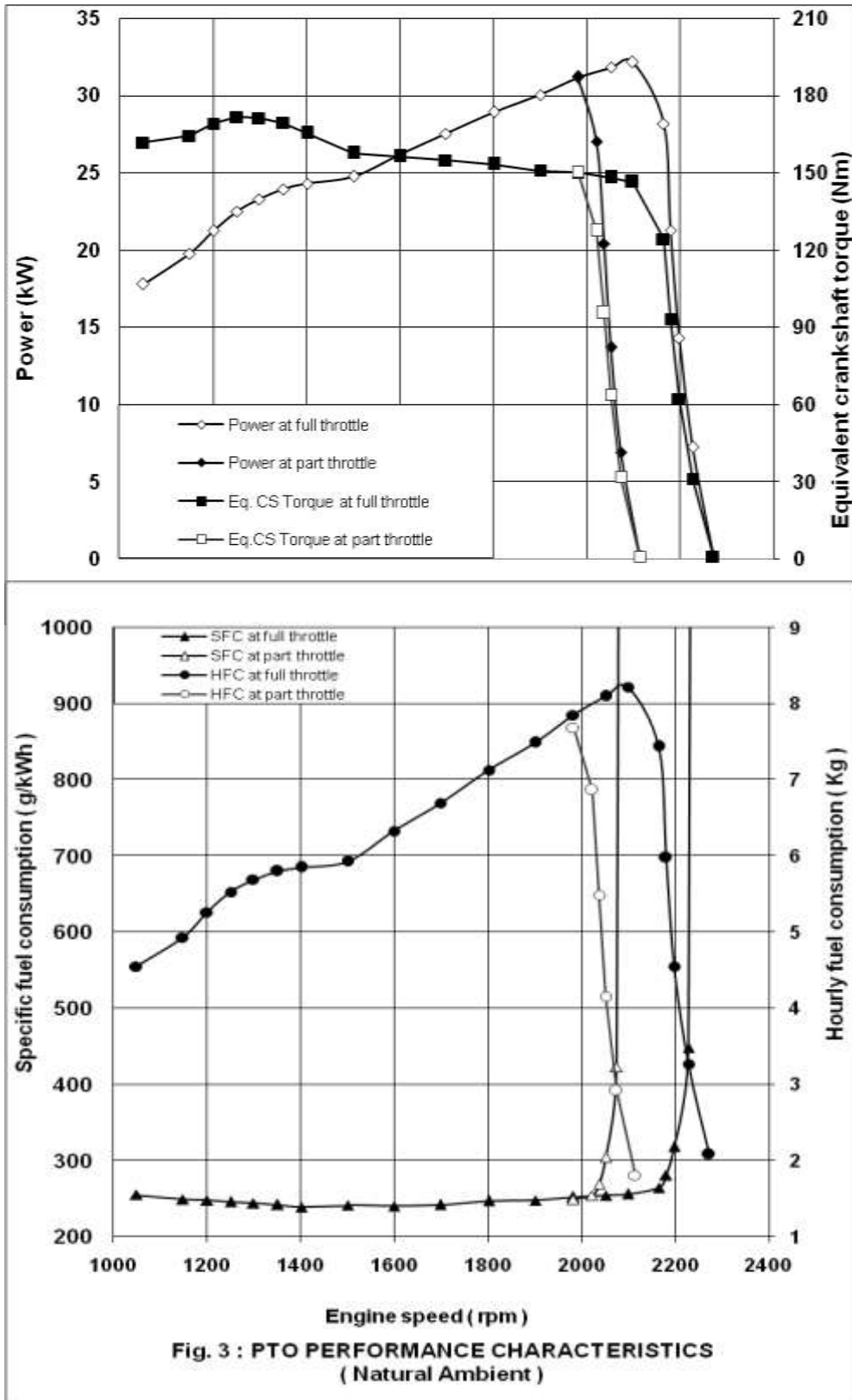
3. PTO PERFORMANCE TEST

- Date(s) of test : 04.02.2019 & 05.02.2019
Tractor run at the Institute prior to start of PTO test (h) : 2.45
Type of dynamometer bench used : SAJ-AG 250 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)
	PTO	Engine	(l/h)	(kg/h)	Specific, (kg/ kWh)	
1	2	3	4	5	6	7
a) Maximum power – 2 hours test:						
32.2	572	2099	9.83	8.22	0.256	3.28
30.0	572	2099	9.40	7.86	0.262	3.19*
b) Power at rated engine speed (2100 rpm):						
32.2	572	2099	9.83	8.22	0.256	3.28
30.0	572	2099	9.40	7.86	0.262	3.19*
c) Power at standard power take-off speed (540 ± 10 rpm):						
31.2	540	1982	9.20	7.69	0.246	3.39
29.6	540	1982	9.09	7.60	0.257	3.26*
d) Varying loads at rated engine speed:						
i) Torque corresponding to maximum power available at rated engine speed:						
32.2	572	2099	9.83	8.22	0.256	3.28
ii) 85% of the torque obtained in (i):						
28.2	590	2165	8.90	7.44	0.264	3.17
iii) 75% of the torque obtained in (ii) :						
21.3	594	2180	7.16	5.98	0.281	2.97
iv) 50% of the torque obtained in (ii) :						
14.3	599	2198	5.44	4.55	0.318	2.63



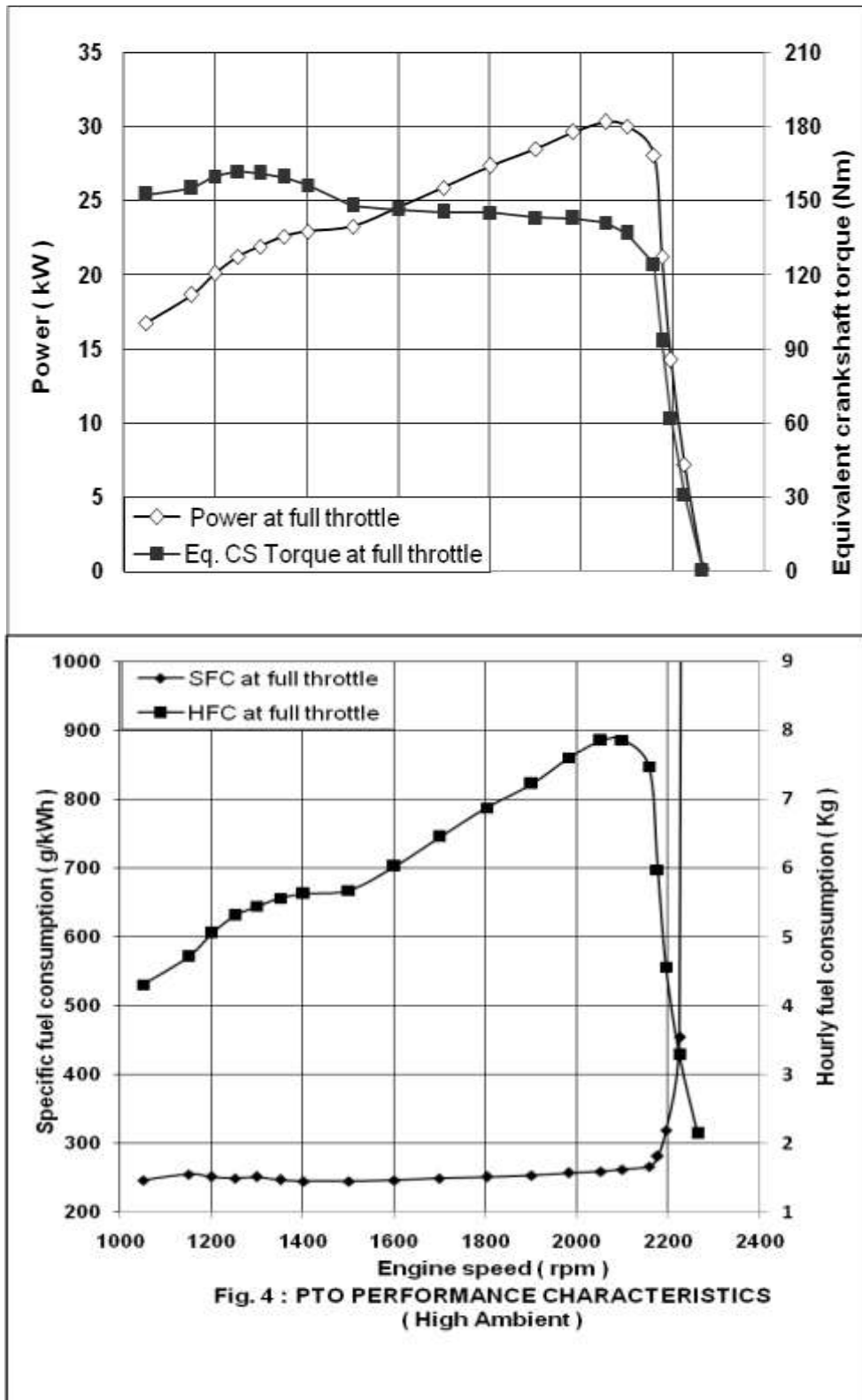
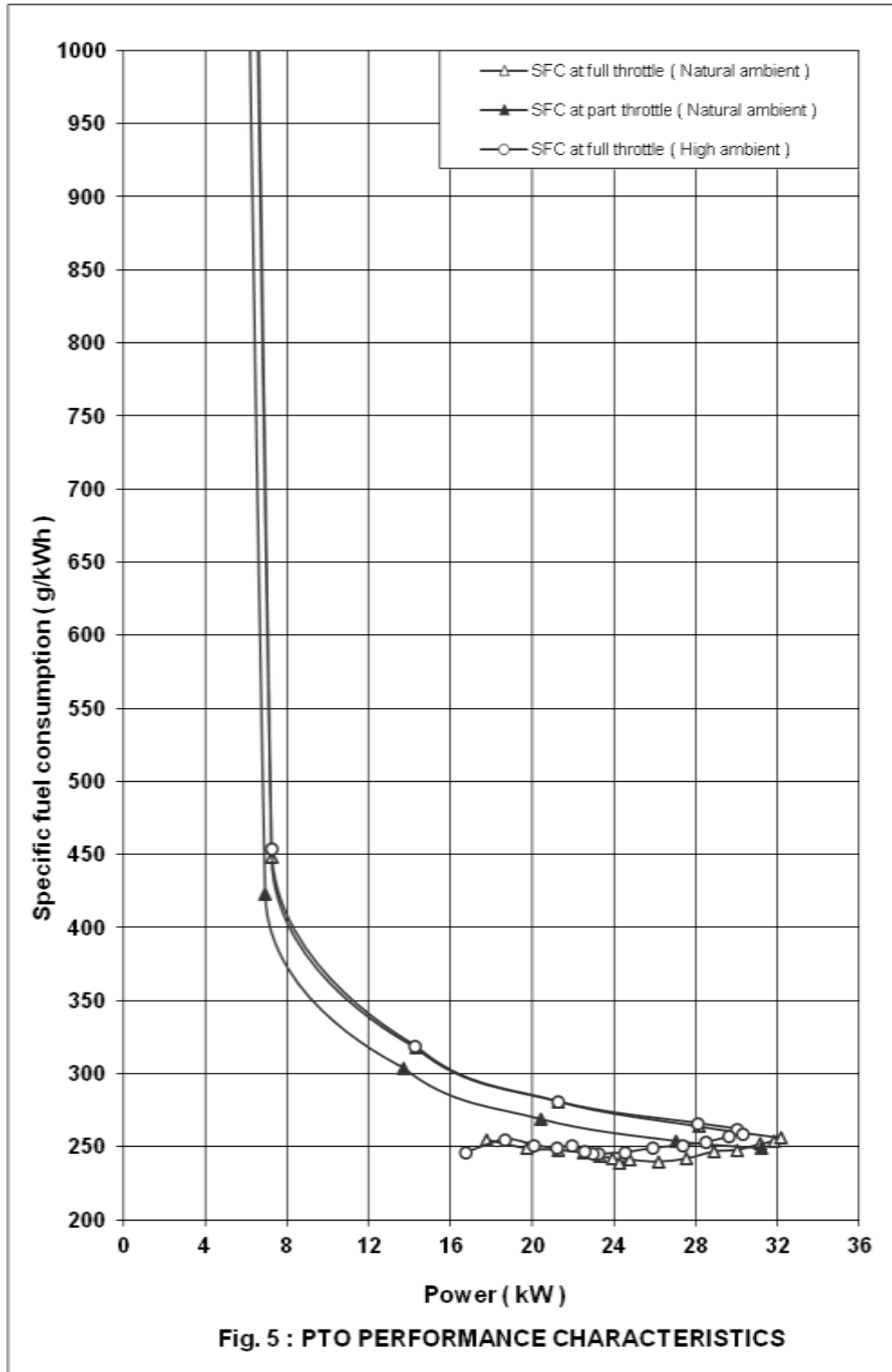


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS
(High Ambient)



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1	2	3	4	5	6	7
iv) 50% of the torque obtained in (ii) :						
14.3	599	2198	5.44	4.55	0.318	2.63
v) 25% of the torque obtained in (ii) :						
7.3	607	2228	3.91	3.27	0.448	1.87
vi) Unloaded:						
0.2	619	2272	2.49	2.08	10.400	0.08
e) Varying loads at Standard PTO Speed:						
i) Torque corresponding to maximum power available at standard PTO speed: (540 ± 10 rpm):						
31.2	540	1982	9.20	7.69	0.246	3.39
ii) 85% of the torque obtained in (i) :						
27.0	551	2022	8.22	6.87	0.254	3.28
iii) 75% of the torque obtained in (ii) :						
20.4	555	2037	6.57	5.49	0.269	3.11
iv) 50% of the torque obtained in (ii):						
13.7	559	2052	4.98	4.16	0.304	2.75
v) 25% of the torque obtained in (ii) :						
6.9	565	2074	3.49	2.92	0.423	1.98
vi) Unloaded:						
0.2	567	2114	2.16	1.81	9.050	0.09

* Under high ambient conditions

Sl. No.	Parameters	Natural Ambient	High Ambient
i)	No load maximum speed, (rpm)	2272	2264
ii)	Equivalent crankshaft torque at maximum power, (Nm)	146.3	136.7
iii)	Maximum equivalent crank shaft torque, (Nm)	171.6	161.9
iv)	Engine speed at maximum equivalent crankshaft torque, (rpm)	1251	1251
v)	Backup torque, (%)	17.3	18.4
vi)	Smoke level, (m ⁻¹)	0.39	---
vii)	Range of atmospheric condition :		
	- Temperature, (°C)	26 to 30	41 to 46
	- Pressure, (kPa)	99.5 to 99.9	100.3 to 100.8
	- Relative humidity, (%)	46 to 50	23 to 25
viii)	Maximum Temperature, (°C):		
	- Engine oil	106	114
	- Coolant	92	104
	- Fuel	50	64
	- Air intake	56	71
	- Exhaust gas	600	608
ix)	Pressure at maximum power:		
	- Intake air, (kPa)	7.2 to 8.3	4.6 to 5.0
	- Exhaust gas, (kPa)	70.8 to 72.0	65.2 to 67.1
x)	Consumptions:		
	Lub. Oil, (g/kWh)	--	0.487
	-Coolant (% of total coolant capacity)	--	Nil

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4. DRAWBAR PERFORMANCE TEST

Date(s) of test : 20.05.2019, 22.05.2019, 23.05.2019 & 24.05.2019
 Tractor run at the Institute prior to start of drawbar performance test, (h) : 25.1
 Type of track : Concrete
Height of drawbar, (mm):
 - With standard ballast : 550

4.1 The results of drawbar performance test consisting of maximum power and pull without ballast and ten hours test are tabulated in **Table – 2** The results of the tests with unballast, are also represented graphically in **Fig. 6 & 7.**

5. POWER LIFT & HYDRULIC PUMP PERFORMANCE TEST

Date(s) of test : 18.02.2019 & 19.02.2019
 Tractor run at the Institute prior to start of hydraulic test, (h) : 17.46
 Pump speed at rated engine speed, (rpm) : 2665

5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (l/min) : 33.0
 Maximum hydraulic power, (kW) : 6.3
 Pump delivery rate at maximum hydraulic power, (l/min) : 27.1
 Pressure at maximum hydraulic power, (MPa) : 14.0
 Sustained pressure of the open relief valve, (MPa) : 20

Tapping point:

a) Relief valve test : External circuit
 b) Pump performance test : Pump outlet
 Temperature of hydraulic fluid, (°C) : 60 to 66

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)	Corresponding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (degrees)
At hitch points	200	630	16.28	20.0	14.81	--
On the standard frame	200	625	14.14	19.3	21.49	10

5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 12.73
 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	20	25	35	40	45

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. sustained pull, (kN)
						(kg/kWh)	(l/h)		Temp (°C)	Pressure (kPa)	R.H. (%)	Fuel	Trans. oil	Coolant (water)	Eng. line oil		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
i) Maximum power test (Tractor Std. ballasted condition):																	
L1	2.79	12.2	15.79	2181	15.4	0.392	5.27	2.13	34	98.6	24	47	78	87	111	16.61	
L2	4.56	19.9	15.68	2158	15.1	0.348	8.28	2.40	33	98.6	26	47	78	89	113	16.29	
L3	7.35	26.3	12.90	2099	6.2	0.304	9.64	2.75	30	98.6	29	47	64	90	113	15.33	
L4	11.32	27.4	8.71	2125	2.6	0.304	9.96	2.75	28	98.6	31	46	52	89	105	10.45	
H1	9.01	25.8	10.29	2107	3.6	0.311	9.60	2.69	30	98.6	30	47	61	89	112	12.83	
ii) Maximum power test (Tractor ballasted condition):																	
L1	2.76	17.7	23.00	2162	14.8	0.360	7.62	2.32	35	98.2	34	47	80	89	112	24.32	
L2	4.73	26.0	19.77	2100	8.6	0.312	9.70	2.68	31	98.2	43	45	78	90	114	22.66	
L3	7.42	26.7	12.96	2095	4.2	0.304	9.71	2.75	32	98.2	38	45	64	90	111	15.06	
L4	11.28	27.4	8.74	2119	1.7	0.302	9.90	2.77	31	98.2	37	43	53	90	106	10.10	
H1	9.02	25.7	10.27	2102	2.3	0.315	9.68	2.65	32	98.2	41	45	63	90	113	12.54	

Table-2 Contd..

Contd..Table-2

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. sustained pull, (kN)	
						(kg/kWh)	(l/h)		Temp (°C)	Pre-ssure (kPa)	R.H (%)	Fuel	Trans. oil	Coolant (water)		Eng-ine 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 obtained at max. Power (ballasted wheeled tractor):																
L2	5.04	20.78	14.83	2161	--	0.330	8.40	2.47	26 to 37	98.1 to 98.3	28 to 49	41 to 51	58 to 83	88 to 89	111 to 114	--
iv) Five hours test at pull corresponding to 15 percent wheel slip (ballasted wheeled tractor):																
L1	2.82	18.02	23.01	2164	13.8	0.376	7.88	2.29	26 to 35	98.2 to 98.4	31 to 45	41 to 49	58 to 81	87 to 89	110 to 114	--

i) The coolant (water) and lub. oil consumption during 10 hours test were observed as 50 ml and Nil respectively.

ii) Tyre Creeping, (mm):

- LHS : Nil
- RHS : Nil

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

Engine oil : 115
Coolant (water) : 93
Transmission oil : 83
Fuel : 75

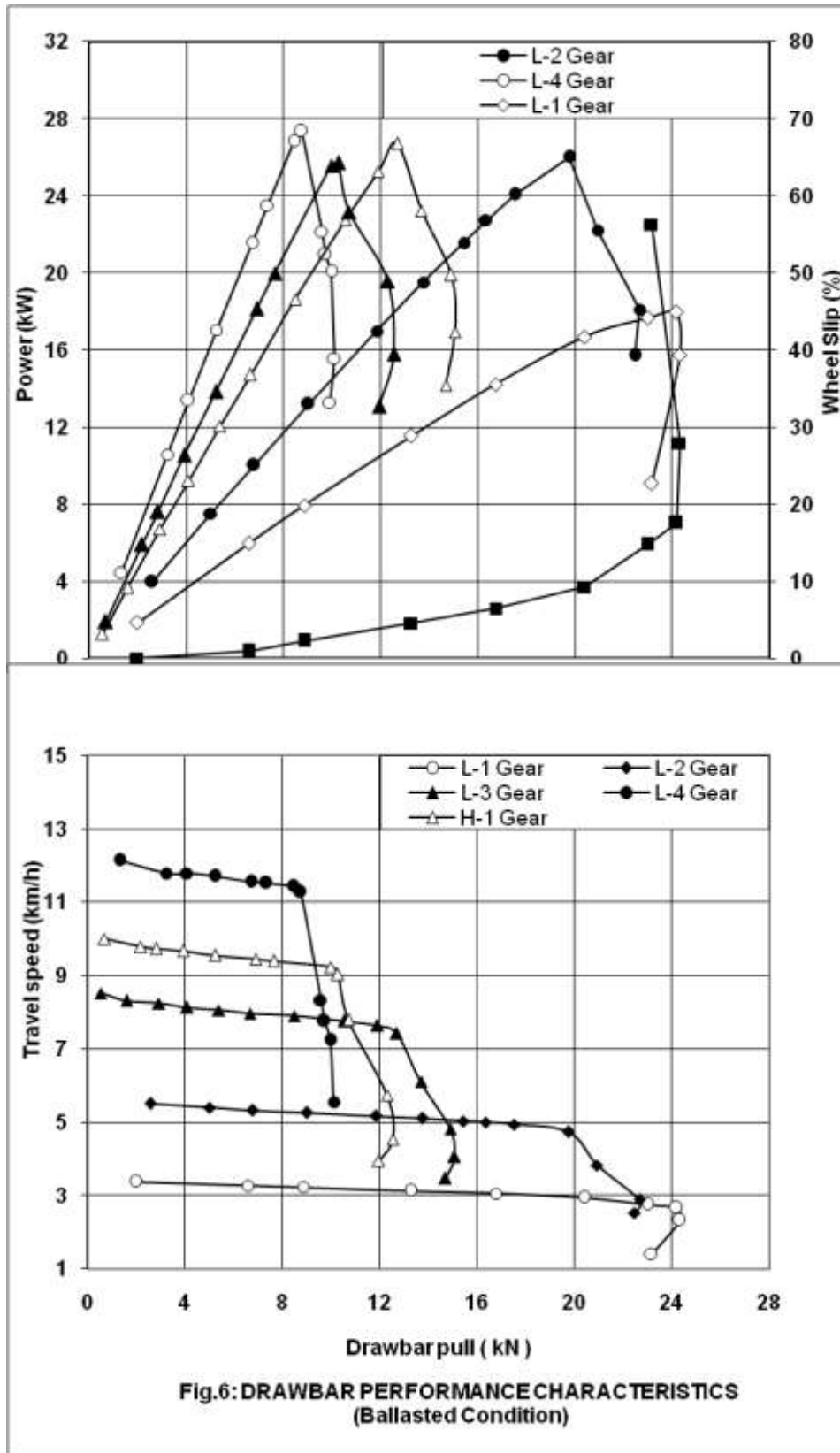
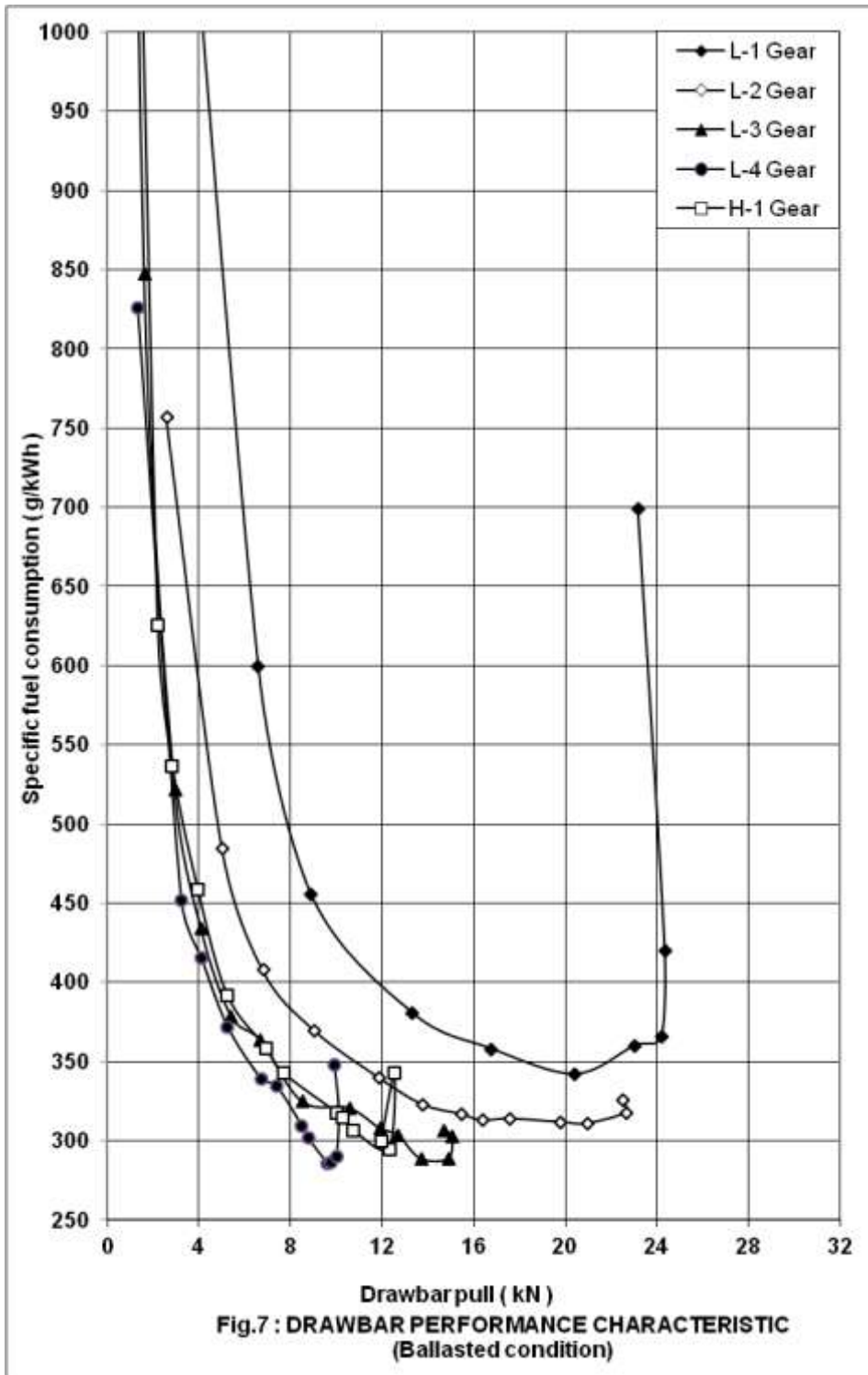


Fig.6: DRAWBAR PERFORMANCE CHARACTERISTICS (Ballasted Condition)



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6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test(s) : 08.02.2019 & 13.02.2019
 Type of Track : Concrete
 Maximum attainable speed (kmph):
 -Without Ballast : 35

		At maximum attainable speed			
Unballasted tractor	Braking device control, force (N)	414	341	268	195
	Mean deceleration, (m/sec ²)	3.61	3.31	3.10	2.50
	Stopping distance, (m)	13.28	14.30	15.26	18.90
Road ballasted tractor	Braking device control, force (N)	437	374	312	249
	Mean deceleration, (m/sec ²)	3.50	3.29	3.08	2.50
	Stopping distance, (m)	13.81	14.35	15.35	18.90
		At 25 kmph travel speed			
Unballasted tractor	Braking device control, force(N)	304	271	238	206
	Mean deceleration, (m/ sec ²)	3.17	3.10	2.98	2.50
	Stopping distance, (m)	7.50	7.79	8.08	9.65
Road ballasted tractor	Braking device control, force (N)	340	305	269	234
	Mean deceleration, (m/sec ²)	3.24	3.02	2.79	2.50
	Stopping distance, (m)	7.57	7.99	8.65	9.65

6.1.1.2 Brake fade test:

		At maximum attainable speed			
Braking device control force (N)		448	384	320	256
Mean deceleration, (m/ sec ²)		3.41	3.23	3.07	2.50
Stopping distance, (m)		13.88	14.62	15.40	18.90
		At 25 kmph travel speed			
Braking device control force,(N)		378	353	328	303
Mean deceleration, (m/ sec ²)		3.19	2.90	2.6	2.50
Stopping distance, (m)		7.68	8.32	9.07	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	18 percent slope		12 percent slope with trailer of 2.01 tones.	
	Up	Down	Up	Down
Braking device control force, (N)	245	256	207	245
Efficacy of parking brake	-----Effective-----			

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7. TURNING ABILITY

Characteristics	Minimum turning diameter,(m)		Minimum clearance diameter,(m)	
	LHS	RHS	LHS	RHS
Brakes released	7.18	6.87	7.54	7.19
Brake applied	5.97	5.91	6.23	6.15

8. NOISE MEASUREMENT

8.1 Noise at bystander's position:

Date of test	: 16.01.2019
Type of track	: Concrete
Background noise level, dB (A)	: 52
Atmospheric conditions:	
Temperature, (°C)	: 25
Pressure, (kPa)	: 98.1
Relative humidity, (%)	: 22
Wind velocity, (m/s)	: 2.0

TEST DATA:-

S. No.	G e a r	Travelling speed before acceleration, (kmph)	Noise level, dB (A)
1.	L1	2.56	82
2.	L2	4.18	81
3.	L3	6.24	81
4.	L4	9.16	80
5.	H1	7.48	82
6.	H2	12.25	80
7.	H3	18.10	80
8.	H4	26.26	80

8.2 Noise at operator's ear level:

Date of test	: 20.05.2019
Type of track	: Concrete
Background noise level, dB(A)	: 55
Atmospheric conditions:	
Temperature, (°C)	: 34
Pressure, (kPa)	: 98.6
Relative humidity, (%)	: 20
Wind velocity, (m/s)	: 1.2

TEST DATA:

Gear	Drawbar pull at which the tractor develops the maximum noise level, (kN)	Corresponding travelling speed, (kmph)	Noise level dB (A)
L1	9.31 to 16.42	3.20 to 2.57	90
L2	5.61 to 15.36	5.41 to 4.57	90
L3*	8.61 to 12.90	7.89 to 7.35	91
L4	8.64 to 8.73	11.26 to 11.18	92
H1	10.28 to 10.29	8.98 to 8.96	92

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

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9. MECHANICAL VIBRATION MEASUREMENT

Date of test : 07.02.2019

Type of test surface : Concrete

Sl. No.	Measuring points		Vibration, microns			
			At no load		At load corresponding to 85% of maximum PTO power	
			HD	VD	HD	VD
i)	Foot rest	Left	120*	160*	100	260*
		Right	90	40	70	80
ii)	Steering control wheel		80	90	70	130*
iii)	Seat	Bottom	20	20	40	60
		Back	20	20	30	20
iv)	Mudguard	Left	40	120*	70	100
		Right	110*	80	90	100
v)	Head light	Left	50	30	30	60
		Right	70	50	50	40
vi)	Battery base, centre		60	60	60	130*
vii)	Tail light	Left	130*	140*	140*	150*
		Right	100	100	170*	160*
viii)	Plough light		100	100	160*	130*
ix)	Gear shifting lever		70	30	20	30
x)	Accelerator lever	Hand	70	70	70	130*
		Foot	90	120*	80	120*
xi)	Brake pedal	Left	140*	60	40	60
		Right	30	30	70	70
xii)	Clutch pedal		130*	40	190*	90
xiii)	Main hydraulic control lever		30	40	40	90
xiv)	PTO engaging lever		20	20	30	20
xv)	Differential lock lever		20	10	30	20

*The amplitude of mechanical vibration is on higher side.

10. FIELD TEST

- 10.1 The major breakdowns were not observed in the field test during Initial Commercial Test of this tractor model as tested vide test report No. T- 908/1423/2014 (February, 2014). So as per the provision as laid down in Clause 7.2 of IS: 12207 – 2014, the field test during the batch testing of this tractor model was not conducted.

11. HAULAGE TEST

Type of trailer:	Two wheel (Single axle)	Four wheel (Double axle)
Gross mass of trailer, (Ton) :	4.0	5.5
Height of trailer hitch above ground level, (mm) :	535	655
Gear used during the test for negotiating slopes upto 8% :	H-4	H-4
Average travel speed, (kmph) :	31.82 to 32.31	31.82 to 32.31
Average fuel consumption:		
- (l/h) :	5.61 to 5.65	6.02 to 6.15
- (ml/km/ton) :	43.40 to 44.43	33.85 to 35.17
Average distance traveled per litre of fuel consumption, (km) :	5.67 to 5.76	5.17 to 5.37
General observations:		
Effectiveness of brakes :	Effective	Effective
Maneuverability of tractor-trailer combination :	Satisfactory	Satisfactory

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12. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after 42.5 hours of tractor operation at this Institute.

12.1 Engine:

12.1.1 Cylinder bore:

Cylinder No.	Cylinder bore dia, (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.	88.910	88.905	88.916	88.905	88.916	88.902	0.13 over initial value
2.	88.905	88.888	88.913	88.892	88.917	88.984	
3.	88.917	88.892	88.919	88.895	88.918	88.898	
4.	88.910	88.894	88.919	88.898	88.918	88.896	

12.1.2 Piston:

Piston No.	Piston dia, (mm)				Piston to cylinder liner clearance at skirt (mm)	
	Top (above top compression ring)		At skirt		As observed	Max. permissible limit, (mm)
	Thrust Side	Non-thrust Side	Thrust side	Non-thrust side		
1.	88.326	88.230	88.820	***	0.096	0.20
2.	88.345	88.236	88.829	***	0.088	
3.	88.337	88.228	88.829	***	0.089	
4.	88.328	88.239	88.831	***	0.087	

Remark (***) :- Not measured due to piston design features.

12.1.3 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	Mid-dle	Bott-om	Top	Mid-dle	Bott-om	Top	Mid-dle	Bott-om	Top	Middle	Bottom	
1 st Comp. Ring	0.25	0.25	0.25	0.25	0.30	0.30	0.25	0.30	0.30	0.25	0.25	0.25	2.50
2 nd Comp. Ring	0.70	0.70	0.70	0.55	0.55	0.55	0.60	0.60	0.60	0.65	0.65	0.65	
Oil ring	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	2.00

12.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)				Max. Permissible clearance Limit, (mm)
	Piston-I	Piston-II	Piston-III	Piston-IV	
1 st Compression ring	--Tapered --				--
2 nd Compression ring	0.075	0.074	0.070	0.074	0.30
Oil ring	0.045	0.045	0.040	0.034	0.20

12.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Maximum permissible limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.050 to 0.079	0.10	0.20	0.60
2.	0.052 to 0.094			
3.	0.061 to 0.067			
4.	0.064 to 0.090			
5.	0.064 to 0.070			

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12.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Maximum permissible limit,(mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.079 to 0.100	0.25	0.20	0.75
2.	0.090 to 0.098	0.25		
3.	0.094 to 0.118	0.25		
4.	0.090 to 0.100	0.25		

12.1.7 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 : 19.32 to 19.51 | Against discard limit of 16.0 N/mm
- Exhaust valve spring: : 19.02 to 19.81

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

- Intake valve : 0.058 to 0.063 | Against discard limit of 0.20 mm
- Exhaust valve : 0.086 to 0.096

12.2 Clutch:

Any marked wear on clutch friction plates : None
Condition of clutch release bearing : Normal
Condition of springs and release levers : Normal
Condition of pilot bearing : Normal
Any marks on fly wheel/ pressure plate : None

Overall thickness of clutch plate, (mm): : 8.47 to 8.54 | Discard limit wear up 5.3 mm

Height of lining over rivet head, (mm) : 3.58 to 3.85 | Discard limit wear up to 0.1 mm each side

12.3 Transmission gears:

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

Backlash between crown wheel and pinion, (mm) : 0.32 | Readjusted if backlash increases beyond 0.7 mm

12.4 Brakes:

Description	Initial specified thickness of brake lining, (mm)	Measured overall thickness of brake disc after test, (mm)	Height of brake lining over oil groove, (mm)	Minimum permissible height of brake lining above oil groove, (mm)
Left	4.75	4.79 to 4.84	0.30 to 0.53	Discard limit wear up to 0.1 mm each side
Right	4.75	4.77 to 4.84	0.28 to 0.53	

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- 12.5 Front axle:**
Any marked wear of king pins : None
Any marked wear of king pin bushes : None
Clearance between king pin and bushes, (mm) : 0.06 to 0.19 | Against the discard limit of 0.30 mm.
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) : 0.07 to 0.08 | Against the discard limit of 0.30 mm.
- 12.6 Steering system:**
Visual condition of the components of complete steering assembly : Normal
- 12.7 Starter motor & Alternator:**
Presence of soil/oil in housing : None
Condition of bearings and other components : Normal

13. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments/Defects/Breakdowns and Repairs	Tractor run hours
(i)	During PTO test at full load varying speed under natural ambient condition governor hunting occurred at 1160 to 1250 of engine rpm.	7.9

14. COMPARISON OF SPECIFICATION AND PERFORMANCE CHARACTERISTICS OF PREVIOUS SAMPLE (TEST REPORT No. T- 908/1423/2014) released on February, 2014 and Supplementary test report No. T- 1268/1795/2019, released on October, 2019. and PRESENT SAMPLE

14.1	Specification:	Previous sample	Present sample
14.1.1	Tractor: Make : Mahindra Model : 595 DI Super turbo	Mahindra 595 DI Super turbo	Mahindra 595 DI Super turbo
14.1.2	Engine: Make : Mahindra Model : MDI 3000TC 3A Bore/Stroke, (mm) : 88.9/101.6 Specified cubic capacity, (cc) : 2523 (apa) Rated engine speed, (rpm) : 2100	Mahindra MDI3000TC3A 88.9/101.6 2523 2100	Mahindra MDI3000TC3A 88.9/101.6 2523 2100
14.1.2.1	Fuel system: Make & model of fuel feed pump : Bosch, India & FP/KS22AD62, 9440030029 Make & model of fuel filters : Bosch, India & F 002H20117 Make and model of fuel injection pump : Bosch, India & F002A0Z874, PES4A85D320RS35	Bosch, India & FP/KS22AD62, 9440030029 Bosch, India & F 002H20117 Bosch, India & F002A0Z874, PES4A85D320RS35	Bosch, India & FP/KSG22AD105 Bosch, India & F 002H20117 Bosch, India & F002A0Z874, PES4A85D320RS3593

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	<u>Previous sample</u>	<u>Present sample</u>
Make & model of fuel injectors	: Bosch, India & F002C70007111	Bosch, India & F002 C70007856
Type of injector	: Multihole (Five holes)	Multihole (Five holes)
Manufacturer's production pressure setting, (MPa)	: 24.5 +0.78	24.5 +0.78
Injection timing	: 3±1 Degree BTDC	3±1 Degree BTDC
Make & model of governor	: Bosch ,India& RSV350...1050A1C1 432R	Bosch, India & RSV350...1050A1C1 432R
14.1.2.2 Lubricating system:		
Total lubricating oil capacity, (l)	: 8.8	9.0
14.1.3 Transmission:		
14.1.3.1 Clutch:		
Type of clutch plate	: Single, Dry friction plate, diaphragm type.	Single, Dry friction plate, diaphragm type.
Size, OD/ID,(mm):	: 279.7/170 Φ	280.0 /170.3 Φ
14.1.3.2 Gear Box:		
No. of speeds:		
- Forward	: 8	8
- Reverse	: 2	2
Range of speed, (kmph) :		
- Forward	: 3.04 to 32.22	3.09 to 32.78
- Reverse	: 4.61 to 13.53	4.30 to 12.63
14.1.4 Service Brake:		
Make	: TVS Girling	Brakes India (apa)
Type	: Mechanical, dry disc brakes	Mechanical, Oil immersed multi discs brake.
No. of friction disc	: Two(on each wheel side)	Four (on each wheel side)
Area of liners, (cm ²)	: 880.5 (on each wheel side)	874.3 (on each wheel side)
14.1.5 Wheel equipment:		
Make & Size of tyres		
- Front	: MRF Shakti life & 6.00 -16	CEAT & 6.00 -16
- Rear	: MRF Shakti life & 13.6 -28	MRF Shakti life & 14.9-28
Standard Track width, (mm):		
- Front	: 1245	1265
- Rear	: 1395	1420
14.1.5.1 Wheel base, (mm)	: 1940	1975
14.1.6 Overall dimensions, (mm):		
- Length	: 3380	3530
- Width	: 1825	1830
-Height	: 2165	2175
- Ground clearance, (mm)	: 335 (Below front axle)	317 (Below standard ballast weight at front axle)

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14.1.7 Operational mass of tractor kg):

	<u>Unballast</u>	<u>Standard ballast</u>
- Front	: 760	780
- Rear	: 1250	1250
- Total	: 2010	2030

14.1.8 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 2014):]	: Conformed	Conforms
ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision)[IS: 4931-1995 (Reaffirmed in 2014)]	: Conformed	Does not conform
iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/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 2014)]	: Did not conform	Conforms
vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed in Oct.,2017)]	: 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 2014)]/ ISO 3767-2:1991]]	: Conforms	Conforms
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 2014)]	: Conforms	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 2014)]	: Did not conform	Does not conform
x) Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in 2014)]	: Conformed	Conforms

14.2 Performance Characteristics:

14.2.1 PTO Performance:

Maximum Power, (kW)	: 32.0	32.2
Power at Rated engine speed,(kW)	: 31.5	32.2
Specific fuel consumption corresponding to maximum power, (g/kWh)	: 237	256
Maximum equivalent crankshaft torque,(Nm)	: 170	171.6
Back up torque, (%)	: 18.9	18.4

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		Previous sample	Present sample	
Maximum temperatures (degree):				
Engine oil	:	115	114	
Coolant	:	98	104	
Lub oil consumption, (g/kWh)	:	0.528	0.487	
Remark (*) :- Data was taken from supplementary test report No. T-1268/1795/2019 (October,2019)				
14.2.2 Drawbar performance :				
Maximum power without ballasted /with standard ballasted tractor, (kW)	:	27.4 (without ballasted)	27.4 (with std. ballasted)	
Maximum pull without ballasted /with standard ballasted tractor, (kN)	:	15.53 (without ballasted)	15.79 (with std. ballasted)	
Maximum transmission oil temperature (°C)	:	78	80	
14.2.3 Hydraulic performance:				
Hydraulic pump discharge at minimum pressure and rated engine speed (l/min.)	:	30.53	33.0	
Maximum hydraulic power, (kW)	:	4.5	6.3	
Sustained pressure of the open relief valve, (MPa)	:	20.5	20.0	
Maximum lifting capacity, (kN):				
- At the hitch point	:	17.46	16.28	
- At the standard frame	:	11.05	14.14	
Total drop in height of lift during load maintenance test, (mm)	:	75	45	
14.2.4 Brake performance test at 25 kmph speed (max).				
Parameter	Previous Sample		Present Sample	
	Cold	Hot	Cold	Hot
Maximum Stopping distance, (m)	7.33	7.18	7.57	7.68
Maximum force exerted on the brake Pedal effort required to achieve deceleration of 2.5 m/sq sec, (N)	383 to 418		234 to 303	
Weather parking brake is effective at a force of 600N at foot pedal (s) or 400 N at hand lever	Effective		Effective	
14.2.5 Noise measurement:				
- Maximum noise at bystanders position, dB(A)	:	82	82	
- Maximum noise at operator's ear level dB(A)	:	91	92	
14.2.6 Mechanical vibration:				
Maximum amplitude of vibration at (microns):				
- Foot rest – LHS & RHS	:	370 & 300	160 & 90	
- Steering wheel	:	110	130	
-Driver's seat, (driver in seat):	:	90	60	
14.2.8 Haulage Test	2 wheel trailer	4 wheel trailer		
-Gross mass of trailer, (tonnes)	:	4.0	5.5	
- Average speed, (kmph)	:	25.85 to 27.35/	26.26 to 26.33/	
-Distance traveled per litre of fuel consumed, (km)	:	6.62 to 7.35/	5.91 to 6.02/	
- Average fuel consumption (cc/km/tonne)	:	34.0 to 37.78/	30.22 to 30.77/	

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14.3 Qualifying performance (comparable limit) for batch model in comparison to ICT model (please refer Clause 7.6 of IS: 12207-2014):

S. No.	Characteristic	Requirements as per IS: 12207-2014		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	
14.3.1 Drawbar performance:							
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Minimum 65% of static mass with ballast	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	21.55	23.00	Yes	
b)	Maximum drawbar pull without ballast / with standard ballasted corresponding to 15 percent wheel slip, (kN)	Minimum 65% of static mass of tractor without ballast		15.53 (without ballasted)	15.79 (with std. ballasted)	Yes	
c)	Maximum drawbar power without ballast / with standard ballasted, (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.		27.4 (without ballasted)	27.4 (with std. ballasted)	Yes	
d)	Maximum transmission oil temperature (°C)	The declared value should not exceed the maximum value specified by oil company		78	80	Yes	
14.3.2 Hydraulic performance:							
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	[Tolerance of minus 10%]	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	17.46	16.28	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		11.05	14.14	No
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	75	45	No	

14.4 Salient Observations:

14.4.1 Laboratory test:

Previous Sample

14.4.1.1 PTO Performance Test:

i) The backup torque was observed as **18.9%**.

Present Sample

i) The maximum PTO power was recorded as **32.2 kW** against the declaration of **32.5 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.

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	<u>Previous Sample</u>	<u>Present Sample</u>
ii)	The specific fuel consumption corresponding to maximum power was measured as 237 g/kWh against the declaration of 251 g/kWh, which is within the tolerance limit of IS: 12207-2008.	ii) The specific fuel consumption corresponding to maximum power was recorded as 256 g/kWh against the declaration of 251 g/kWh , which is within the tolerance limit of IS: 12207-2014.
iii)		iii) The maximum equivalent crankshaft torque was recorded as 171.6 N-m against the declaration of 207.0 N-m , which is doesn't meet the requirement of IS: 12207-2014. This should be looked into for necessary corrective action.
		iv) The backup torque is 18.4 % .
		v) The drop of 6.8 % in max. PTO power was observed during natural & high ambient conditions. This should be looked into for necessary corrective action.
		vi) During PTO performance test at full load varying speed under natural ambient condition, hunting was observed at 1160 to 1250 of engine rpm. This is recommended to looked into for necessary corrective action.
14.4.1.2 Drawbar Performance Test:	During ten hours drawbar test, creeping of LHS & RHS rear tyre over the rims was observed as 10 mm & 60 mm respectively. This should be looked into for necessary corrective action.	i) No such abnormal observation was recorded
14.4.1.3 Hydraulic Performance Test:	--	i) The moment about rear axle at hitch point and standard frame was computed as 14.81 kN-m and 21.49 kN-m respectively. The moment about rear axle at standard frame is on higher side as compared to the moment about front axle i.e. 15.11 kN-m . It is therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or standard ballast mass at the front may be provided to avoid front lifting of the tractor.
14.5 Adequacy of literature:	Following literatures has been supplied with the tractor for reference during the test.	Following literatures has been supplied with the tractor for reference during the test.
	a) Operator's Manual 595 DI Super Turbo	a) Operator's manual of Mahindra 595 DI Super Turbo Tractor model
	b) Tractor's part's catalogue – Engine, Chassis and Seat metal, transmission and hydraulic.	b) Service manual of Mahindra 595 DI Super Turbo Tractor model
	c) Service Manual Mahindra tractors	c) Parts Catalogue of Mahindra 595 DI Super Turbo Tractor model

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15. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

15.1 Evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters 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:

Sl. 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
15.1.1	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 >26 kW. – 7.5/+10% for PTO power ≤ 26 kW or-5 / +10% for Engine power >26 kW. –7.5/+10% for Engine power ≤ 26 kW	32.5 (D)	32.2	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	32.5 (D)	32.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	251 (D)	256	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	207 (D)	171.6	No
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10 (D)	18.4	Yes
f)	Maximum operating temperature, (°C)					
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	129 (D)	114	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)	104	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.62 Maximum (R)	0.487	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 Maximum (R)	0.39	Yes

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1	2	3	4	5	6	7
15.1.2	Drawbar performance :					
a)	Max. drawbar pull with ballasted corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor with ballast or with standard ballast, as the case may be	17.92 (D) 18.11 (R) Minimum	23.00	Yes
b)	Max. drawbar pull with standard ballast correspond-ing to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast, as the case may be	12.82 (D) 12.94 (R) Minimum	15.79	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.	26.0 (D) 25.8 (R) Minimum	27.4	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	80	Yes
15.1.3	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%]	16.08 (D)	16.28	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	10.18 (D) 7.58 (R) Minimum	14.14	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	45	Yes
15.1.4	Brake performance at 25 kmph:					
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):					
	1) Cold brake	Evaluative	10	10 (R)	7.57 to 9.65	Yes
	2) Hot brake	Evaluative	10	10 (R)	7.68 to 9.65	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	234 to 303	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	256	Yes
15.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88(R)	82	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98(R)	92	Yes

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1	2	3	4	5	6	7
15.1.6	Amplitude of mechanical vibrations at:					
	1) Left foot rest	Non Evaluative	100 microns (max)	100(R)	160	No
	2) Right foot rest				90	Yes
	3) Seat (with driver seated)				60	Yes
	4) Steering wheel				130	No
15.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
	Two wheel	Non Evaluative	--	4.0 (D)	4.0 (D)	Yes
	Four wheel			5.5 (D)	5.5 (D)	Yes
b)	Distance travelled / liter of fuel consumption, (km/l):					
	Two wheel	Non Evaluative	--	6.62 to 7.35 (D)	5.63 to 5.76	No
	Four wheel			5.91(D)	5.17 to 5.37	No
c)	Fuel consumption (ml/km/tonne):					
	Two wheel	Non Evaluative	--	34.0 to 37.78 (D)	43.40 to 44.43	No
	Four wheel			30.22 to 30.77 (D)	33.85 to 35.17	No
15.1.8	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	Non 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	Non Evaluative	Should meet the requirements of IS 12953 and IS 12362 (Part 3) (As amended from time to time)	--	Meets the requirement	Yes
	Swinging drawbar			--	Not Provided	--
15.1.9	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO hp	--	Mahindra	Yes
	2) Model	Evaluative		--	595 DI Super Turbo	Yes
	3) Year of manufacture	Evaluative		-	FJ i.e. September, 2018	Yes
	4) Engine number	Evaluative		--	NJF2RHE0017	Yes
	5) Chassis number	Evaluative		--	MBNADAKALJNF0 1907	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	32.5	Yes

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1	2	3	4	5	6	7
15.1.10	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.13 over initial value (initial setting 88.90 / 88.93) (D)	88.888 to 88.919	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.20 (D)	0.087 to 0.096	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	2.50 (D)	0.25 to 0.30	Yes
	- 2 nd comp. ring.		-do-	2.50 (D)	0.55 to 0.70	Yes
	- Oil ring.		-do-	2.00 (D)	0.40	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	--Tapped--		--
	- 2 nd comp. ring.		-do-	0.30 (D)	0.070 to 0.075	Yes
	- Oil ring.		-do-	0.20 (D)	0.034 to 0.045	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.20 (D)	0.050 to 0.094	Yes
	- Crankshaft end float	Evaluative		0.60 (D)	0.10	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.20 (D)	0.079 to 0.118	Yes
	- Axial	Evaluative	-do-	0.75 (D)	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.30 (D)	0.064 to 0.191	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.30 (D)	0.071 to 0.079	Yes
15.1.11	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
15.1.12	CATEGORY OF BREAKDOWNS / DEFECTS :					
Sl. No.	Category of breakdowns	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

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15.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:				
S.No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Remarks
1.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	Not applicable
		If ROPS fitted it should meet the requirement of IS: 11821 (As amended from time to time) or equivalent International Standards	ROPS not provided	Not applicable
2.	Accessories	Trailer hitch, front tow hook, may be provided.	Provided	Yes

15.3 Salient Observations:

15.3.1 Laboratory tests:

15.3.1.1 PTO Performance Test:

- i) The maximum PTO power was recorded as **32.2 kW** against the declaration of **32.5 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 **256 g/kWh** against the declaration of **251 g/kWh**, which is within the tolerance limit of IS: 12207-2014.
- iii) The maximum equivalent crankshaft torque was recorded as **171.6 N-m** against the declaration of **207.0 N-m**, which is not within the permissible limit as specified in IS: 12207-2014. This should be looked into for necessary corrective action.
- iv) The backup torque is **18.4 %**.
- v) The drop of 6.3 % in max. PTO power was observed during natural & high ambient conditions. This should be looked into for necessary corrective action.
- vi) During PTO performance test at full load varying speed under natural ambient condition, governor hunting was observed at 1160 to 1250 of engine rpm. This is recommended to be looked into for necessary corrective action.

15.3.1.2 Drawbar performance test:

- i) Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN) was recorded as **15.79 kN** against the minimum requirement of 12.94 kN. Which meet the minimum requirement of IS: 12207-2014.
- ii) Maximum drawbar power with standard ballast was recorded as **27.4 kW** against the minimum requirement of 25.8 kW. Which meet the minimum requirement of IS: 12207-2014.

15.3.1.3 Hydraulic performance test:

- i) Maximum lifting capacity throughout the range of lift at hitch point and standard frame was recorded as **16.28 & 14.14 kN** respectively against the declaration of **16.08 & 10.18 kN** respectively. Which meet the requirement of IS: 12207-2014.
- ii) The moment about rear axle at hitch point and standard frame was computed as **14.81 kN-m** and **21.49 kN-m** respectively. The moment about rear axle at standard frame is on higher side as compared to the moment about front axle i.e. **15.11 kN-m**. It is therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or standard ballast mass at the front may be provided to avoid front lifting of the tractor.

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15.3.1.4 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter – 6 of this test report is on higher side. This calls for dampening down of vibrations especially on LHS foot rest and steering control wheel to improve the operational comfort and service life of components.

15.3.1.5 Haulage Test:

- i) Distance travelled / litre of fuel consumption (**km/l**) with two and four wheel trailer was recorded as **5.63 to 5.76 km/l** and **5.17 to 5.73 km/l** respectively, against the declaration of **6.62 to 7.35 km/l** in two and **5.91 km/l** in four wheel trailer. Which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into for necessary corrective action.
- ii) Specific fuel consumption (ml/km/ton) in two wheel trailer and four wheel trailer was recorded as **43.40 to 44.43 ml/km/tonne** and **33.85 to 35.17 ml/km/ton** respectively, against the declaration of **34.0 to 37.78 ml/km/tonne** in two wheel and **30.22 to 30.77 ml/km/t** in four wheel respectively. Which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into for necessary corrective action.

15.3.1.6 Operator's seat:

The longitudinal distance from Seat Index Point to centre of steering control wheel does not meet the requirement of IS: 12343-1998. This is recommended to looked into for necessary corrective action.

15.3.1.7 Three point linkage:

- i) The dimension of width of ball of lower hitch point and lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS: 4468 (Part I) – 1997. This is recommended to looked into for necessary corrective action.
- ii) Some of the parameters conform to Cat. I and some of them conform to Cat. II. Keeping in view the spirit of standardization, necessary improvement may be incorporated.

15.4 Maintenance / Service Problems:

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

15.5 Recommendation with regard to safety on tractor:

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

- i) There should be provision for spark arresting device in exhaust system.
- ii) There should be provision against accidental start or safety switch.
- iii) The working clearance between the draft control lever and position control lever should be provided as per IS: 12239 (Part-2) – 1999.
- iv) Fuel shut-off knob should remain in "STOP" position
- v) Width of foot step should be as per relevant standard.

15.6 Adequacy of Literature supplied with machine:

15.6.1 Literature was supplied with the tractor for reference during the test.

- a) Operator's manual of Mahindra 595 DI Super Turbo Tractor model
- b) Service manual of Mahindra 595 DI Super Turbo Tractor model
- c) Parts Catalogue of Mahindra 595 DI Super Turbo Tractor model

15.6.3 However, these literatures should be brought out in other vernacular languages of India for guidance of users

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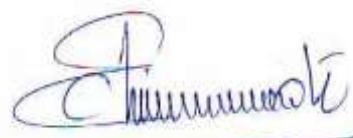
16. Citizen charter

Duration of Test	Time frame for testing & evaluation as per citizen charter	Whether the report released within time frame given in the citizen charter	Remark
6 Months (January, 2019 to June, 2019)	10 Months	Yes	None

TESTING AUTHORITY:



C.S. RAGHUWANSHI
AGRICULTURAL ENGINEER



C.V. CHIMOTE
TEST ENGINEER



J.J.R. NARWARE
DIRECTOR

The report compiled by: **Sh. Vithato Keyho**, Senior Technical Assistant.

17. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
17.1	15.3.1.1(iii, v & vi), 15.3.1.3 (ii), 15.1.1.4, 15.3.1.5 (i & ii), 15.3.1.6, 15.3.1.7, 15.3.1.8 (i & ii) & 15.5	Your valuable comments & suggestions for improvements well taken. Under our policy of continuous product improvement these aspects are further being looked into & will take appropriate actions to eliminate these deviations soon wherever necessary.

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ANNEXURE- I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running-in	--
2.	PTO performance test	12.1
3.	Drawbar performance test	14.6
4.	Power lift and hydraulic pump performance test	1.0
5.	Brake test	2.0
6.	Noise measurement	1.3
7.	Mechanical vibration test	0.5
8.	Nominal speed test	1.1
9.	Turning ability test	0.3
B.	HAULAGE TEST	5.1
C.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	4.5
TOTAL:		42.5