CAPTAIN 250 DI TRACTOR

सत्यमेव जयते

भारत सरकार
कृषि एवं किसान कल्याण मंत्रालय
(कृषि, सहकारिता एवं किसान कल्याण विभाग)
GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)
केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान
ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
(An ISO : 9001 - 2008 Certified Institute)
Tractor Nagar, Budni (M.P.) 466 445

E-mail fmti-mp@gov.in Website : http://www.fmttibudni.gov.in
Telephone : 07564 - 234729 Fax : 07564 - 234743

Name of the Manufacturer : **M/s. Captain Tractors Pvt. Ltd.**
Address : Padavala Road, Veraval (Shapar)-360 024,
Tal: Kotda Sanagani, Distt. Rajkot, Gujarat

Month: April	Test Report No. T-1081/1606 /2017	Year: 2017

GOVERNMENT OF INDIA
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA
Email: fmti-mp@gov.in
Web site: fmttibudni.gov.in

Telephone: 07564-234729 FAX: 07564-234743

Type of Test	:	**COMMERCIAL (INITIAL)**
Test code/Procedure	:	IS: 5994 -1998 (Reaffirmed in 2009), IS: 9253-2001 (Reaffirmed in 2012) and IS: 12207-2014
Period of Test	:	March, 2016 to February, 2017
Test Report No	:	**T-1081/1606 /2017**
Month/Year	:	April, 2017

i) The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.

ii) The data given in this report pertains to the particular machine submitted by the applicant for tests.

iii) The results presented in this report do not in any way attribute to the durability of the machine.

iv) This report should not be reproduced in part or full without prior permission of the Director, Central Farm Machinery Training and Testing Institute, Budni (M.P.)

S E L E C T E D C O N V E R S I O N S

Sl. No	Units	Conversion Factor
1	Force:	
	1 kgf	9.80665 N
		2.20462 lbf
2	Power:	
	1 hp	1.01387metric hp (Ps)
		745.7 W
	1 Ps	735.5 W
	1 kW	1.35962 Ps
3	Pressure:	
	1 psi	6.895 kPa
	1 kgf/cm^2	98.067 kPa = 735.56 mm of Hg
	1 bar	100 kPa = 10 N/cm^2
	1 mm of Hg	1.3332 m-bar

A B B R E V I A T I O N S

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

C O N T E N T S

Name of the manufacturer	:	**M/s. Captain Tractors Pvt. Ltd.**
Address	:	Padavala Road, Veraval (Shapar)-360024 Tal: Kotda Sanagani, Distt. Rajkot (Gujarat)
Test requested by (applicant)	:	The manufacturer
Selected for test by	:	The manufacturer
Place of running-in	:	At manufacturer's works
Duration of said running-in (h)		
- Engine	:	18
- Transmission	:	08
Method of Selection	:	The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

1.1 **Tractor:**

Make	:	CAPTAIN
Model	:	250 DI

Variants, if any

S No.	Variant Model*	Brand name, if any	Variant Feature
1	250 DI 4WD+	CAPTAIN	Four Wheel drive, Nominal speed change,

***The variant models have not been tested at this Institute yet.**

Type	:	Four wheeled, rear wheel driven, general purpose, Agricultural Tractor.
Year of manufacture	:	2016
Chassis number	:	D216010513
Country of Origin	:	India

1.2 Engine:

Make	:	Simpson & Co. Ltd. Chennai
Model	:	Simpsons TIII A SC213-F20
Type	:	Four stroke, water cooled, naturally aspirated, direct injection, diesel engine
Serial number	:	SC21304397

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

- Maximum speed at no load,	:	2300 to 2400
- Low idle speed	:	700 to 800
- Speed at maximum torque	:	1200 to 1300

Rated speed, (rpm):

- For PTO use	:	2200
- For drawbar use	:	2200

1.3 Cylinder & Cylinder Head:

Number	:	Two
Disposition	:	Vertical, Inline
Bore/stroke, (mm)	:	95 / 91
Capacity as specified by the applicant, (cc)	:	1290
Compression ratio	:	18.3 ± (0.3) : 1
Type of cylinder head	:	Integral
Type of cylinder liners	:	Wet, Non-replaceable
Type of combustion chamber	:	Re-entrant, Cavity on piston crown
Arrangement of valves	:	Over-head, Inline

Valve clearance (cold/hot):

- Inlet valve, (mm)	:	0.25 / 0.25
- Exhaust valve, (mm)	:	0.30 / 0.30

1.4 Fuel System:

Type of fuel feed system	:	Gravity and forced feed

1.4.1 Fuel tank

Capacity, (l)	:	20.2
Location	:	Above clutch housing
Provision for draining of sediments/ water	:	Provided
Material of fuel tank	:	Sheet metal

1.4.2 Water Separator : Not provided

1.4.3 Fuel feed pump:

Make	:	Bosch, India
Type	:	Plunger
Model/Group combination number	:	FP/KS22AD62, 9 440 030 029
Provision of sediment bowl	:	Provided (metallic)
Method of drive	:	Through camshaft of fuel injection pump
Location	:	Integrated with fuel injection pump

1.4.4 Fuel filters:

Make	:	Bosch, India
Model/Group combination No.	:	F002 H20 151
Number	:	Two
Type of elements		
- Primary	:	Cloth
- secondary	:	Paper
Capacity of final stage filter, (l)	:	0.38

1.4.5 Fuel Injection pump:

Make	:	Bosch, India
Model/Group combination No.	:	F002 A4Z 001
Type	:	Inline, Plunger
Serial number	:	51935045
Method of drive	:	Through timing gears

1.4.6 Fuel injectors:

Make	:	Bosch, India
Nozzle holder number	:	F002 C8 0015 453
Nozzle number	:	DSLA 144 P5624
Type	:	Multi hole (Five holes)
Manufacturer's production pressure setting, (MPa)	:	26 ± 0.8
Injection timing	:	10 ± 1º before TDC
Firing order	:	1-2

1.4.7 Governor:

Make	:	Bosch, India
Model / Group combination No.	:	RSV 425**...** 1100A2C1762R
Type	:	Mechanical, centrifugal, variable speed
Rated engine speed, (rpm)	:	2200
Governed range of engine speed, (rpm)	:	700 to 2400

1.5 Air Intake system:

1.5.1 Pre-cleaner:

Make	:	Not available
Type	:	Centrifugal with transparent dust collector
Location	:	LHS of engine above the air cleaner inlet tube

1.5.2 Air cleaner:

Make	:	Not available
Type	:	Oil bath
Location	:	On LHS of engine outside the bonnet
Range of suction pressure at maximum power, (kPa)	:	1.9 to 2.1
Oil capacity, (l)	:	0.3
Oil change period	:	After every 50 hours of operation

1.6 Exhaust system :

Type of Silencer	:	Updraft (Cylindrical)
Position of Silencer outlet with respect to SIP,(mm)	:	
-Vertical	:	550
-Longitudinal	:	1055
-Lateral	:	250, (RHS)
Range of exhaust gas pressure at maximum power (kPa)	:	9.2 to 13.0
Provision of spark arresting device	:	Not provided
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)	:	3.80
Total lub. oil capacity, (l)	:	4.10
Oil change period (h)	:	First after 50 hours and subsequently after every 250 hours of operation
Cooling device, (if any)	:	Not provided
Minimum permissible lubricating oil pressure, (kPa)	:	147 (apa)

1.7.1 Filters:

Make	:	Not available
Type	:	Full flow, spin on, throw away type
Number(s)	:	One

1.7.2 Pump:

Make	:	Not available
Type	:	Rotary lobe type
Method of drive	:	Through crank shaft
Pressure release setting of relief valve (KPa)	:	500
Minimum permissible pressure, (kgf/cm^2)	:	2.0

1.8 Cooling system:

Type	:	Forced circulation of coolant and water
Coolant as recommended	:	Castrol
Coolant water ratio	:	1:1

1.8.1 Details of pump:

Make and type of pump	:	Make not available, type centrifugal
Type of impeller	:	Semi open
Impeller dia (mm)	:	66.58
Number of vanes in impeller	:	06
Method of drive	:	Driven through crank shaft pulley by a cogged V belt common to alternator

1.8.2 Details of cooling fan:

Type	:	Suction
Dia (mm)	:	292
Number of vanes/blades	:	06
Method of drive	:	Mounted on common shaft of water pump

1.8.3 Radiator :

Radiator cap pressure, (kg/cm^2)	:	0.90
Bare radiator capacity, (l)	:	2.12
Total coolant capacity, (l)	:	4.60
Means of temperature control	:	Thermostat valve

1.9 Starting System:

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

1.10 Electrical System:

1.10.1 Battery:

Make & model	:	Exide, 65D 26RMF
Number	:	One
Type	:	Lead acid
Capacity and rating	:	12V, 65 Ah at 20 hours discharge rating.
Ground polarity	:	Negative
Location	:	On RHS of clutch housing in a separate box

1.10.2 Starter:

Make	:	Lucas TVS
Model	:	M70 GRS
Type	:	Pre-engaging, solenoid operated
Capacity and rating	:	12V, 1.2 kW
Serial number	:	Not available

1.10.3 Generator (Alternator / Dynamo) :

Make	:	Auto Lek
Model	:	ALM 4005
Type	:	Alternator
Output rating	:	12V, 35 Amp
Serial number	:	Not available
Method of drive	:	Through crankshaft pulley by a cogged V-belt.

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)
1	**2**	**3**	**4**	**5**
Front Lights				
Head lights	2, 12V, 35/35W	935	140 x 90	417
Parking lights	2, 12V, 5W	915	40 x 60	165
Turn / Hazard lights	2, 12V, 21W	915	75 x 60	90
Rear lights				
Stop lights	2, 12V, 21 W	885	40 x 65	162
Turn / Hazard lights	2, 12V, 21W	885	40 x 65	80
Reflectors (Red)	2	885	35 x 65	120
Plough light	1, 12V, 55W	1045	110 Ø	210
Registration plate lights	Part of rear tail light assembly			
Tail light	1, 12V, 5W	885	40 x 65	120

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

1.10.7 Light switch : Rotary type having six positions viz.
i) Off
ii) Parking lights + dashboard lights-'P'
iii) Head lights (short beam) + (ii)
iv) Head lights (long beam) + (ii)
v) Turn indicator switch
vi) Horn push button

1.10.8 Horn

Make : Mitutoyo
Type : 2B, Electromagnetically vibrated diaphragm
Location : On RHS, fitted in engine timing cover

1.10.9 Fuse box : Contains six numbers of fuses having following capacities:

Capacity	15A	20A
Number	03	03

1.10.10 Details of other electrical accessories:

1.10.10.1 Flasher unit:

Make : Wesco
Capacity:
- Turn signal : 12V, 21W x 2 + 2W x 1
- Hazard signal : 12V, 21W x 4 + 2W x 2

Flashes/Min : 85

1.10.10.2 Starting safety switch : Starter will operate only when clutch pedal is in fully depressed position.

1.10..10.3 Seven pin trailer socket : Provided

1.11 Instrument panel details :

i) Engine speed-cum-cumulative digital run hour meter (0 – 30 x 100)

ii) Water temperature gauge with colour zone

iii) Fuel level gauge with colour zone

iv) Lubricating oil pressure indicator

v) Battery charging warning indicator

vi) Head light long beam on indicator

vii) Turn / hazard indicator light

viii) Hazard light switch

ix) Mobile charging socket

x) Hand accelerator lever

xi) Steering control wheel

xii) Rear view mirror

xiii) Fuel shut-off knob

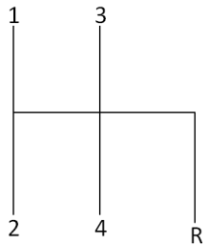
1.12 Transmission System:

1.12.1 Clutch:

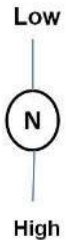
Make	:	Luk, India
Type	:	Single plate, dry, diaphragm type, friction clutch
No. of friction plate(s)	:	One
Size (mm):		
- Transmission (OD/ID)	:	211.55 / 140.47
Material of clutch lining	:	Non asbestos
Method of operation	:	By pressing clutch pedal provided on LHS

1.12.2 Gear box:

Make	:	Captain
Model	:	Not specified
Type	:	Mechanical, Sliding cum synchromesh
No. of speeds:		
- Forward	:	8
- Reverse	:	2
Gear shifting pattern		



Gear Selection lever



Range selection lever

Location of main gear shifting lever	:	In front of operator's seat
Location of high-low gear shifting lever	:	On LHS of operator's seat
Oil capacity, (l)	:	3.5
Oil changing period	:	After every 500 hours of operation

1.12.3 Nominal Speed :

Movement	Gear No.	No of engine revolutions for one revolution of driving wheel with		Nominal speed at rated engine speed when fitted with **8.00-18** size tyres of **395** mm radius index, (kmph)	Nominal speed at rated engine speed when fitted with **8.3 – 20 size tyres of 420 mm radius index**, (kmph)
		With 8.00-18 size tyres	With 8.3-20 size tyres		
Forward	L1	108.57	108.45	3.02	3.21
	L2	64.39	64.27	5.09	5.42
	L3	39.95	39.91	8.20	8.72
	L4	27.21	27.21	12.04	12.80
	H1	56.89	56.88	5.76	6.12
	H2	33.72	33.84	9.72	10.29
	H3	20.96	21.00	15.63	16.58
	H4	14.23	14.23	23.03	24.47
Reverse	LR	144.46	144.60	2.27	2.41
	HR	75.74	75.87	4.33	4.59

1.12.4 Differential :

Type : Crown wheel and pinion with differential unit, accommodated inside differential housing.

Reduction through crown wheel & pinion : 4.273**:**1 (47 / 11T)

Oil capacity, (l) : 16.5 (common with final drive and hydraulic system)

Oil changing period : After every 500 hours of operation

Differential lock : Not provided

1.12.5 Rear axle and final drive :

Type : Bull and pinion gear reduction unit, accommodated outside differential housing on both sides

Reduction through final drive : 5.0:1 (70 / 14T)

Oil capacity of final drive, (l) : 16.5 (common with differential housing and hydraulic system)

Oil changing period : After every 500 hours of operation

1.13 Power lift (hydraulic system) :

Make : Captain

Type : Live, ADDC, open centre

No. and type of cylinder : One, single acting

Type of linkage lock for transport : Hydraulic, response control valve in fully closed position acts as a transport lock

1.13.1 Hydraulic pump :

- Make : Not available
- Type : External gear
- Location : In front of engine, below radiator
- Method of drive : Driven through crankshaft

No. & type of filters : Two, one strainer at suction and one full flow spin on throw away type filter at LHS of hydraulic housing

Hydraulic oil capacity, (l) : 16.5 (common with differential housing and final drive)

Oil change period : After every 500 hours of operation

Provision for external tapping : Provided
Details of control levers : (i) Position control lever (Black)
(ii) Draft control lever (Red)
(iii) Mode selector valve
Method of draft sensing : Through top link

1.13.2 Three point linkage:

S. No.	Observations	As per IS: 4468 – (Part-2) -1993 (Cat. 1N Narrow Hitch), (mm)	As measured, (mm)	Remarks
1	**2**	**3**	**4**	**5**
I.	**Upper hitch points:**			
	a) Dia. Of hitch pin hole	19.30 to 19.50	20.54	**Does not conform**
	b) Width of ball	44.0 (max.)	37.50	Conforms
II.	**Lower hitch points:**			
	a) Dia. Of hitch pin hole	22.40 to 22.73	22.54	Conforms
	b) Width of ball	34.8 to 35.0	35.00	--do--
III.	Lateral distance from lower hitch point to centre line of tractor	218 (min.)	218	--do--
IV.	Lateral movement of lower hitch points	50 (min)	70	--do--
V.	Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)	300 to 375	345	--do--
VI.	Transport height	600 (min)	695	-do-
VII.	Power range (without force)	420 (min)	435	-do-
VIII.	Leveling adjustment	75 (min)	250	--do--
IX.	Lower hitch point tyre clearance	100 (min)	255	--do--
X.	Lower hitch point height	200 (max)	200	--do--

1.13.3 Linkage geometry dimensions [Refer Fig.-1(a)]:
The following are dimensions observed, corresponding to **395 mm** as tyre dynamic radius index:

S .No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
(1)	**(2)**	**(3)**	**(4)**	**(5)**
1.	Length of lower link	A	445	445
2.	Length of lift arm	B	235	235
3.	Length of lift rods	C	390 to 510	425
4.	Length of top link	D	385 to 580	425
5.	Distance of lift rod connection point from pivot point of lower link.	E	230	230
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	180 behind	180 behind
	-Vertically	G	60 below	60 below

(1)	(2)	(3)	(4)	(5)
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	245,220 behind	245,220 behind
	-Vertically	J	230,280 above	230,280 above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	55 behind	55 behind
	-Vertically	L	340 above	340 above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	105 to 300	240
	- In low position	N	-360 to -110	195
10.	Height of lower link hitch points when locked in transport position	240 above		

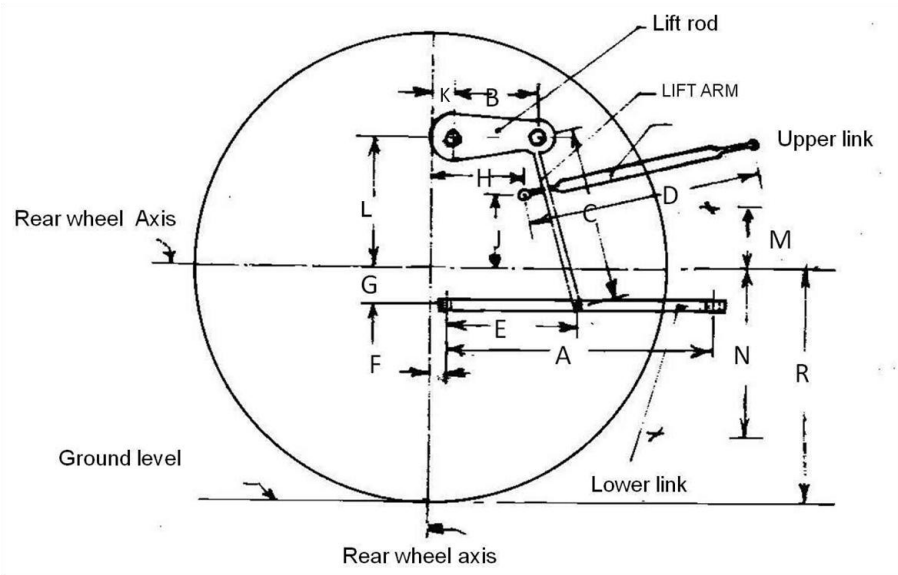


Fig. 1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

1.13.4 Drawbar:

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

Notation	As per IS: 12953-1990, (mm) (Cat. I N) / (Cat. II)	As measured, (mm)	Remarks
A	400 ± 1.5	400	Conforms to Cat.IN
B	75 (min) / 75 (min)	80.00	Conforms to Cat.IN
C	30 (min) / 30 (min)	32.10	Conforms to Cat.IN
D∅	21.79 to 22.0	22.00	Conforms to Cat.IN
E	39.0 (min)	39.00	Conforms to Cat.IN
F∅	12.0 (min) / 12.0 (min.)	12.00	Conforms to Cat.IN
G	15.0 (min) / 15.0 (min)	15.00	Conforms to Cat.IN
H∅	25 ± 1 / 25 ± 1	25.00	Conforms to Cat.IN
J	80 ± 1.5 / 80 ± 1.5	80.00	Conforms to Cat.IN
No. of holes	05	05	Conforms to Cat.IN

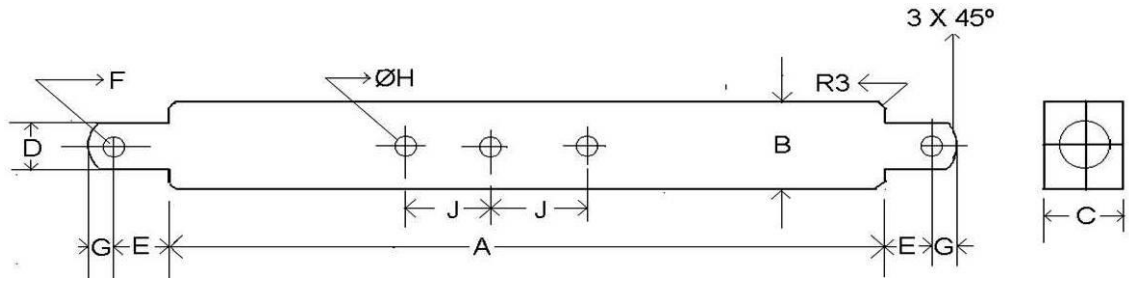


Fig. 1 (b): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

1.13.4.2 Swinging drawbar : Not provided

1.14 Power take-off shaft:

Type	:	Not independent, type – 1
Method of engaging	:	By a hand lever situated at RHS of operator's seat
Number of shaft(s)	:	One
PTO speed corresponding to rated engine speed (rpm)	:	551
Distance behind rear axle (mm)	:	280
Engine to PTO speed ratio	:	3.99 : 1
Whether the PTO shaft is capable of transmitting full power of the engine.	:	Yes
Other speeds, if any	:	None

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

specification	As per IS:4931-1995 (Type-1)	As observed	Remarks
1	2	3	4
Nominal speed (rpm)	540 ± 10	540	Conforms
No. of splines	6	6	-do-
Direction of rotation	Clockwise	Clockwise	-do-
Location	The position of the centre of the end of PTO shaft shall be within 50 mm to the right or left of the centre line of the tractor	In centre Line of tractor	-do-
DØ	34.79 ± 0.06	34.84	Conforms
dØ	28.91 ± 0.05	28.65	**Does not conform**
BØ	29.4 ± 0.1	29.30	Conforms
AØ (optional)	8.3 ± 0.1	8.30	Conforms
W	8.69 – 0.09 – 0.16	8.53	Conforms
a	7	7	Conforms
b (optional)	25 ± 0.5	25.0	Conforms
c	38	38	Conforms
X	30º	30º	Conforms
B	76 (min.)	82	Conforms
h	450 to 675	440	Conforms

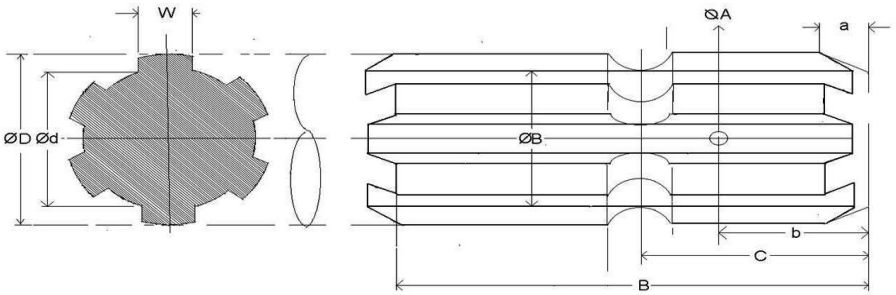


Fig. 2: DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT

1.14.2 Power Take-off Master Shield : Not Provided

1.15 Towing hitch:

1.15.1 Front : Not provided

1.15.2 Rear:

Type	:	Clevis
Location	:	At the rear of differential housing.
Height above ground level, (mm)	:	330 (fixed)
Type of adjustment	:	None
Distance of hitch point, (mm):		
- From rear axle centre	:	330
- From power take-off shaft end	:	50
Dia of pin hole, (mm)	:	27.75
Width of clevis, (mm)	:	76.40

1.16 Steering:

Make of distributor	:	Rane
Type	:	Mechanical, single drop arm
Type of steering gear box	:	Recirculating ball & nut type
Location	:	Above the clutch housing clutch housing
Method of operation	:	Manual, by steering control wheel
Diameter of steering control wheel (mm)	:	380
Steering oil capacity, (l)	:	0.400
Lubricant change period	:	After every 500 hours of operation

1.17 Brakes:

1.17.1 Service Brake:

Make	:	Not available
Type	:	Dry, Internal expending shoe type
Location of braking system	:	On rear axle shaft, outside the differential housing
Number of disc(s) shoe(s)	:	2 (on each wheel side)
Area of liners, (cm^2)	:	82.08 on each wheel side
Material of liners	:	Non asbestos (apa)
Method of operation	:	Independent / combined pedal operation by right foot.

1.17.2 Parking Brake:

Type	:	Mechanical arrangement for locking service brakes
Location & Method of operation	:	By locking the service brake pedals in position by a hand lever provided on RHS of operator's seat.

1.18 Wheel Equipment:

1.18.1 Steered Wheel(s) :

Make	:	Speed ways
Number(s)	:	Two
Type of tyre	:	Pneumatic, ribbed
Size	:	5.20 -14
Ply rating	:	08
Maximum permissible loading capacity of each tyre at 240 kPa inflation pressure recommended for road work, (kgf)	:	375
Recommended inflation pressure, (kPa) :		
- For field work	:	216
- For transport	:	245
Track width, (mm)	:	860 (standard), 960
Method of changing track width	:	By reversing the rim.
Make & size of wheel rim	:	SSWL 3.5J x 14

1.18.2 Drive wheel(s) :

Make	:	MRF
Number(s)	:	Two
Type of tyre	:	Pneumatic, traction
Size	:	8.00-18
Ply rating	:	4
Maximum permissible loading capacity of each tyre at 160 kPa pressure, (kgf)	:	515
Recommended inflation pressure, (kPa):		
- For field work	:	84
- For transport	:	157
Track width (mm)	:	830 (standard), 950
Method of changing track width	:	By reversing rim.
Make & size of wheel rim	:	CWPL,5.5 Fx18

1.18.3 Wheel base, (mm) : 1555

Method of changing wheel base, if any, and range : None

1.19 Operator's seat:

Make	:	Not available
Type	:	Cushioned with back rest
Type of suspension	:	Two helical coil springs
Type of Dampening	:	None
Range of adjustment (mm):		
-Vertical	:	Nil
-Lateral	:	Nil
-Longitudinal	:	± 45

1.20 Provision for safety and comfort of operator:

1.20.1 Conformity with IS: 12343-1998 (Re-affirmed in March, 2009):

The operator's seat meets the minimum requirements of IS: 12343-1998 (Re-affirmed in March, 2009), **except the following :**

i) Vertical distance from seat index point to the centre of **accelerator pedal and steering control wheel** does not meet the requirements of IS: 12343-1998 (Reaffirmed in March 2009)

ii) Vertical distance of seat index point from **foot rest** does not meet the minimum requirements of IS: 12343-1998 (Reaffirmed in March, 2009).

1.20.2 Conformity with IS: 6283 (Part 1) – 2006 (Re-affirmed in March, 2009) and IS: 6283 (Part 2)- 2007 (Re-affirmed in March, 2009):

Controls and displays are identifiable with symbols as per IS : 6283 (Part 1) – 2006 (Re-affirmed in March 2009)and IS: 6283 (Part 2)- 2007 meets the requirement, **except the following :**

i) The symbol for Pressurized, open & slowly.

ii) Grease lubricant frequency

1.20.3 Conformity with IS : 8133-1983 (Re-affirmed in March, 2009):

Location and movement of various controls meets the requirement of IS: 8133-1983 (Re-affirmed in March, 2009).

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

Meets the requirements of **IS: 12239 (Part-1)-1996 (Re-affirmed in February, 2012), except the following:**

i) Provision of hand holds for easy mounting and dismounting of the operator

ii) Provision of spark arresting device in the exhaust system.

1.20.5 Conformity with IS:12239 (Part-2)-1999 (Re-affirmed in March, 2009):

Meets the requirements of **IS: 12239 (Part-2)-1999 (Re-affirmed in March, 2009), except the following:**

i) The working clearance around hand control between the draft control and mudguard is less than 70 mm.

1.20.6 Conformity with IS:4468 (part – 1)1997

Meets the requirements of **IS:4468 (part – 1)1997, except the following:**

i) Dia. Of upper hitch pin hole.

1.20.7 Conformity with IS: 14683 – 1999 (Re-affirmed in March, 2009) :

Lighting meets the requirements of IS: 14683 -1999.

1.20.8 Rear view mirror:

Rear view mirror has been provided.

1.21 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in March, 2009):

Location of labelling plate: The labelling plate riveted on LHS fender of tractor.

The Labelling plate provides the following information:

Name of Manufacturer	**:**	CAPTAIN TRACTORS PVT. LTD. Padavala Road, Veraval (Shapar), Dist.Rajkot (Gujarat) India
Make	**:**	CAPTAIN
Model	**:**	250 DI
Year of manufacturer	**:**	2016
Engine Serial Number	**:**	SC21304397
Chassis Serial Number	**:**	D216010513
Maximum P.T.O Power, kW	**:**	14.5
Specific fuel consumption, g/kwh	**:**	259

1.22 Ballast Mass, (kg):

particular		Recommended for drawbar test	Recommended for field test	Recommended for road test
Front	C.I. Weight	NIL	NIL	NIL
	Water	NIL	NIL	NIL
Rear	C.I. Weight	NIL	NIL	NIL
	Water	NIL	NIL	NIL

1.22.1 Standard ballast, if any : None

1.23 Masses:

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	Without ballast	380	530	910
ii)	With ballast as used during drawbar performance test	380	530	910
iii)	With ballast as used during field test	380	530	910
iv)	With ballast as used during haulage test with trailer hitch and canopy	380	530	910

1.24 Overall dimensions (mm):

Condition	Length	Width	Height		Ground Clearance
			With exhaust pipe	Without exhaust pipe	
Unballasted tractor	2630	1075	1700	1270	230 (below differential housing drain plug)

1.25 Number of external lubricating points:

- Oiling : Nil
- Greasing cups : 02
- Greasing nipples : 07

1.26 Colour of tractor:

- Chassis & engine : chockolet gray

Sheet metal:

- Bonnet and mud guard : Red
- rims and discs : Silver

1.27 Optional features of Base model :

i) Rear tyre size 8.30 x 20 instead of 8.00 x 18

ii) Hydro power assisted steering

1.27.1 Details of optional features:

1.27.1.1 Driving wheel:

Make : MRF Shakti

Number : Two

Type : Pneumatic, traction

Size : 8.30 x 20

Ply rating : 6 PR

Maximum permissible loading capacity of each tyre at 240 k Pa inflation pressure recommended for road work (kgf) : 710

Recommended inflation pressure, (kPa):

- For field work : 120
- For road work : 240

Track width : 825 (standard), 950

Method of changing track width : By reversing the disc

Make and size of rim : CWPL W7 x 20

1.27.1.2 Steering:

Make of distributor & location	:	ZF & mounted on clutch housing
Type	:	Hydro power assisted, integral type power steering consisting of rotary type control valve.
Method of operation	:	Manual by steering control wheel
Diameter of steering control wheel (mm)	:	380
Make and type of pump	:	Dowty, gear (tandem pump)
Location of pump	:	In front of engine below radiator
Method of drive	:	Through crank shaft pulley
Steering housing & container oil capacity (l)	:	1.00
Oil change period	:	Every 500 hours of operation.

2. FUEL AND LUBRICANTS

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

2.2 Lubricants

S. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine & air cleaner oil	SAE 15W40	SAE 15W40
2.	Gear box, differential unit, front axle and final drive	SAE 90	Oil originally filled in the tractor was not changed
3.	Hydraulic system	SAE 90	-do-
4.	Steering housing	SAE 90	-do-
5.	Grease	MP 3	MP3

3. PTO PERFORMANCE TEST

Date(s) of test	:	18.08.2016 to 31.08.2016 & 14.12.2016 to 16.12.2016
Tractor run at the Institute prior to start of PTO test, (h)	:	12.81
Type of dynamometer bench used	:	Eddy current, SAJ AG-250

3.1	During PTO performance test under high ambient condition the following defects/non conformity were recorded and test was suspended: -	
	i)	The coolant temperature was recorded as 122 degree C at 1700 speed of engine, against the maximum declaration of 120 degree C and further test was suspended. The overheating tendency of the engine in the vicinity of maximum torque was observed and does not meet the evaluative requirement of IS: 12207-2014.
	ii)	The exhaust gas back pressure was recorded as 32.3 to 35.0 kPa against declaration of 6±1 kPa.
	To rectify the above problem of overheating tendency of engine the following checking/ adjustments were done.	
	a)	Cleaning of radiator was done by forced air.
	b)	Thermostat valve was checked for its proper functioning and found correct.
	c)	Calibration of coolant & oil temperature sensors was done and found correct.

3.1.1	Thereafter, again PTO performance test under high ambient condition was repeated as per clause 3.2.3 of IS:12207:2014, but no improvement in the performance of the engine was observed. The coolant temperature was recorded as 124 degree C at 1700 speed of engine, against the maximum declaration of 120 degree C and further test was suspended. The overheating tendency of the engine in the vicinity of maximum torque was persist as such and does not meet the evaluating requirement of IS: 12207-2014.	
	To rectify the problem of overheating tendency of engine the following replacements were done. The comparative specifications of existing & modified parts are tabulated in **Annexure-III.**	
	i)	Radiator (Pt. No. 001752.00) was replaced with modified radiator along with its {(Pt No. 002252 (SM-AR-580-0000)} mounting bracket.
	ii)	Exhaust silencer (Pt. No. 010036.00) having vertical flow was replaced with circular flow (Pt. No. 012313.00).
	iii)	While removing the coolant sensor from the engine, the thermostat water sensor mounting body got cracked and this water sensor mounting body is an integral part of cylinder head assembly. Thus it was replaced with new ones having same specifications. This breakdown was occurred due to miss operation/manual mistake.

3.1.2 Supplementary Test:

After above replacement/repair work the supplementary PTO test as per clause 3.2.4 (a) of IS: 12207:2014 was conducted successfully. The results of power take-off performance tests are tabulated in Table – 1 and graphically represented in fig. 3, 4 and 5

Table – 1

Power (kW)	Speed, (rpm)		Fuel consumption			Specific energy, (kWh/l)
	P.T.O.	Engine	l/h	kg/h	Specific, (kg/ kWh)	
1	**2**	**3**	**4**	**5**	**6**	**7**
a) Maximum power – 2 hours test:						
14.5	551	2198	4.66	3.90	0.269	3.10
13.9	551	2198	4.45	3.72	0.267	3.13*****
b) Power at rated engine speed (2200 rpm):						
14.5	551	2198	4.66	3.90	0.269	3.10
13.9	551	2198	4.45	3.72	0.267	3.13*****
c) Power at standard power take-off speed (540±10 rpm):						
14.4	540	2155	4.64	3.88	0.271	3.10
13.9	540	2155	4.49	3.75	0.270	3.10*****
17. Varying load at rated engine speed:						
i) Torque corresponding to maximum power:						
14.5	551	2198	4.66	3.90	0.269	3.10
ii) 85% of the torque obtained at maximum power:						
12.8	572	2282	4.09	3.42	0.268	3.12
iii) 75% of the torque obtained in (ii):						
9.7	577	2302	3.28	2.74	0.284	2.95
iv) 50% of the torque obtained in (ii) :						
6.5	582	2322	2.56	2.14	0.328	2.55
v) 25% of the torque obtained in (ii):						
3.3	588	2346	1.87	1.56	0.480	1.74
vi) Unloaded:						
0.1	599	2390	1.32	1.10	11.000	0.08

1	2	3	4	5	6	7
e) Varying loads at Standard PTO speed:						
i) Torque corresponding to maximum power available at standard PTO speed (540 ± 10 rpm):						
14.4	540	2155	4.64	3.88	0.271	3.10
ii) 85% of the torque obtained in (I):						
12.5	555	2214	3.97	3.32	0.266	3.15
iii) 75% of the torque defined in (ii):						
9.4	559	2230	3.17	2.65	0.282	2.97
iv) 50% of the torque defined in (ii):						
6.4	564	2250	2.48	2.07	0.323	2.58
v) 25% of the torque defined in (ii):						
3.2	569	2270	1.81	1.52	0.475	2.11
vi) Unloaded:						
0.1	580	2314	1.22	1.02	10.200	0.10

*** Under High ambient conditions**

Parameters		**Natural ambient**	**High ambient**
-No load maximum engine speed, (rpm)	:	2390	2382
-Equivalent crankshaft torque at maximum power, (Nm)	:	62.9	60.5
-Maximum equivalent crankshaft torque, (Nm)	:	69.7	66.3
-Engine speed at maximum equivalent crankshaft torque, (rpm)	:	1301	1600
- Back up torque, (%)	:	10.8	9.6
-**Smoke level**, maximum light absorption coefficient, (per meter)	:	0.09	--
- Range of atmospheric conditions:			
Temperature, (^{o}C)	:	26 to 31	41 to 44
Pressure, (kPa)	:	98.9 to 99.6	100.0 to 100.4
Relative humidity, (%)	:	35 to 45	21 to 24
- Maximum temperatures, (^{o}C):			
Engine oil	:	81	106
Coolant	:	90	103
Fuel	:	53	67
Air intake	:	35	51
Exhaust gas	:	570	587
- Pressure at maximum power:			
Intake air, (kPa)	:	1.9 to 2.1	1.8 to 2.1
Exhaust gas, (kPa)	:	9.2 to 13.0	9.1 to 12.3
- Consumptions:			
Lub oil, (g/kwh)	:	--	0.37
Coolant (% of total coolant capacity)	:	--	2.17

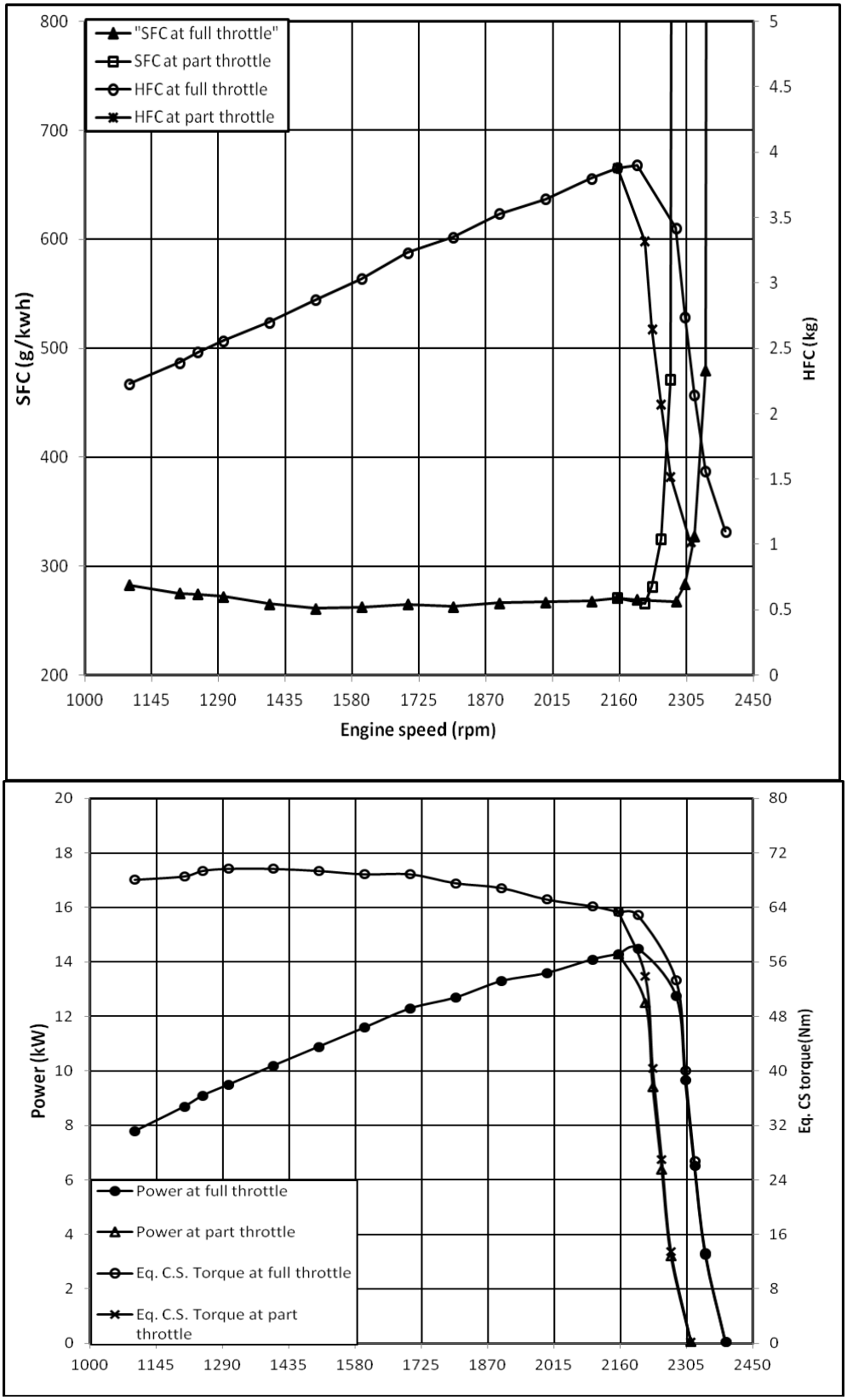


Fig. 3: PTO PERFORMANCE CHARACRERISTICS (NATURAL AMBIENT)

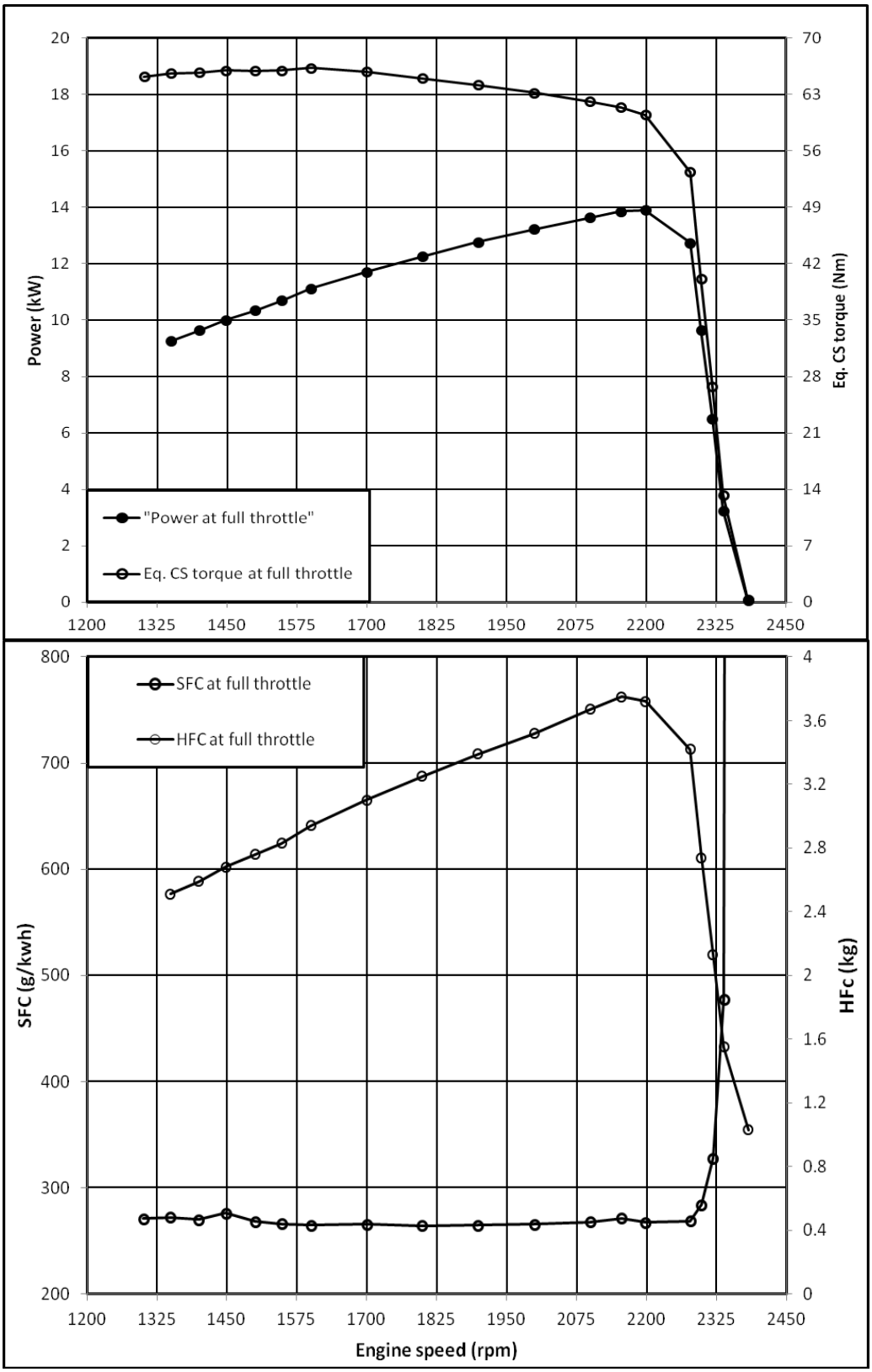


Fig. 4: PTO PERFORMANCE CHARACRERISTICS (HIGH AMBIENT)

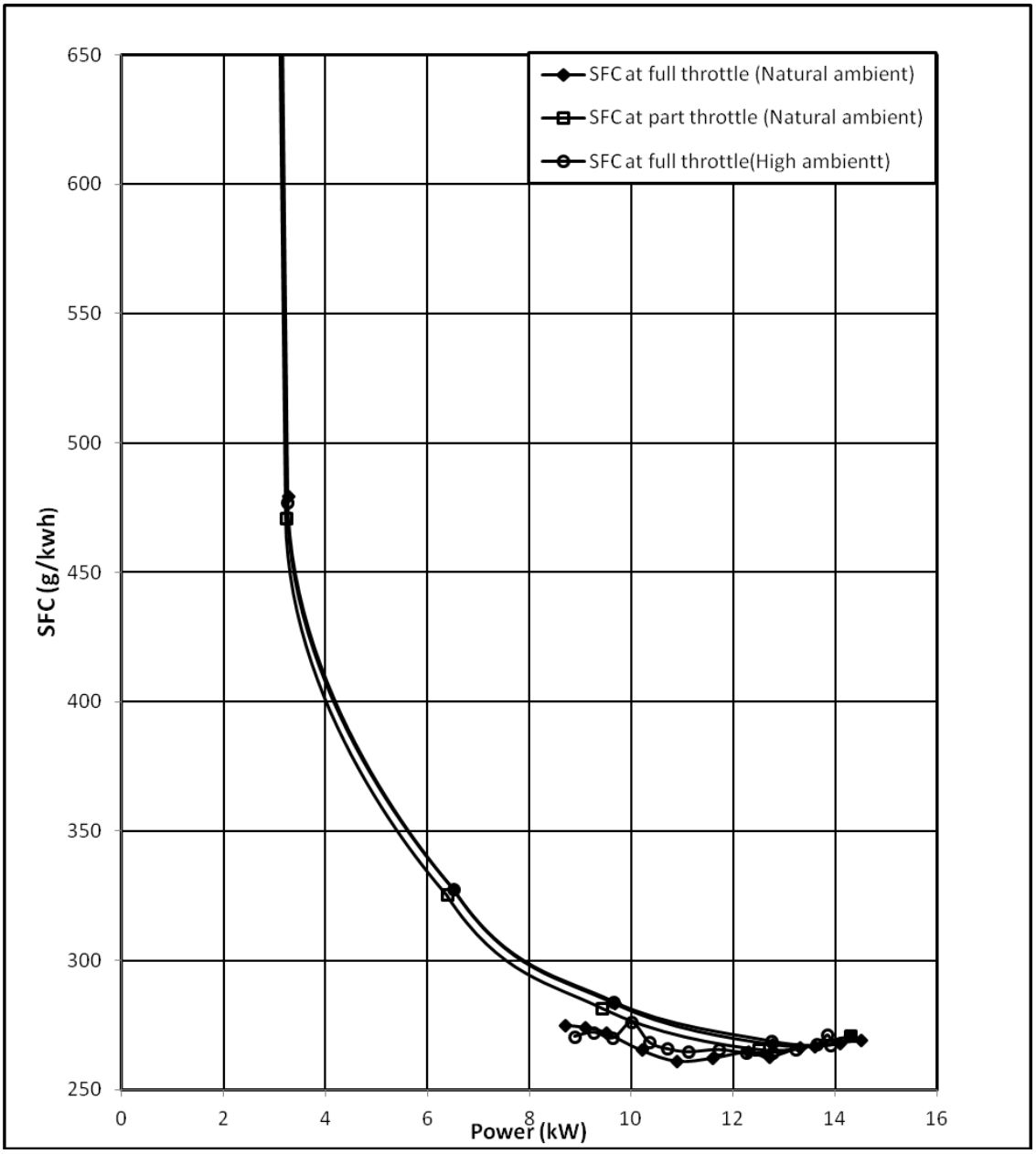


Fig. 5: PTO PERFORMANCE CHARACRERISTICS (HIGH AMBIENT)

4. DRAWBAR PERFORMANCE TEST

Date(s) of test	:	09.01.2017 and 10.01.2017
Tractor run at the Institute prior to start of drawbar test, (h)	:	38.23
Type of track	:	Concrete
Height of drawbar, (mm):		
- Without ballast	:	450

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 without ballast, are also represented graphically in **Fig.6 & 7**

5. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE TEST

Date(s) of test	:	28.12.2016 and 29.12.2016
Tractor run at the Institute prior to start of hydraulic test, (h)	:	28.37
Pump speed at rated engine speed, (rpm)	:	2200

5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (lpm)	:	14.80
Maximum hydraulic power, (kW)	:	3.0
Pump delivery rate at maximum hydraulic power, (lpm)	:	14.24
Pressure at maximum hydraulic power, (Mpa)	:	12.5
Sustained pressure of the open relief valve, (Mpa)	:	14.5
Tapping point:		
a) Relief valve test	:	External circuit
b) Pump performance test	:	Pump outlet pipe connector
Temperature of hydraulic fluid, (°C)	:	60 to 62

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)	Maximum corresponding pressure, (Mpa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (degrees)
At hitch points	200	405	6.75	13.1	4.25	-
On the standard frame	200	415	3.99	13.1	4.94	25.5

Table - 2

DRAWBAR PERFORMANCE TEST

Gear	Travel Speed, (Km/h)	Draw-bar power, (kW)	Draw-bar pull, (kN)	Engine Speed (rpm)	Wheel Slip, (%)	Fuel consumption		Specific Energy, (kWh/l)	Atmospheric conditions			Temperature (°C)				Max. sust-ained pull, (kN)
						kg/ kWh	l/h		Temp (°C)	Pre-Ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Cool ant	En-gine oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor unballasted):																
L1	2.71	5.2	6.84	2310	14.9	0.410	2.55	2.04	22	98.8	54	28	59	72	91	7.86
L2	4.53	8.9	7.08	2271	15.1	0.347	3.39	2.51	23	98.8	53	29	56	73	92	7.81
L3	7.53	12.2	5.84	2205	9.8	0.318	4.64	2.63	23	98.8	55	29	55	75	91	6.62
H1	5.17	10.6	7.34	2276	14.6	0.321	4.07	2.60	23	98.8	53	29	59	74	90	7.96
H2	9.10	12.1	4.79	2202	7.9	0.321	4.65	2.60	23	98.8	58	29	39	74	84	5.66
ii) Five hours test at 75 percent of pull obtained at maximum Power (unballasted wheeled tractor):																
H1	5.56	8.48	5.50	2292	09.3	0.353	3.60	2.37	13 to 19	99.4 to 99.6	47 to 63	17 to 26	31 to 61	71 to 73	73 to 91	--
iii) Five hours test at pull corresponding to 15 percent wheel slip (Unballasted wheeled tractor):																
L1	2.85	5.40	6.88	2315	--	0.389	2.56	2.14	20 to 21	99.2 to 99.4	40 to 45	25 to 28	55 to 58	72	88 to 90	--

i) The lubricating oil & coolant consumption during ten hours test were observed as **NIL.**
ii) Creeping in front and rear tyres, (mm): LHS & RHS : NIL
iii) Maximum temperatures during entire drawbar test, (°C)

Engine oil	:	92
Coolant	:	75
Transmission oil	:	61
Fuel	:	29

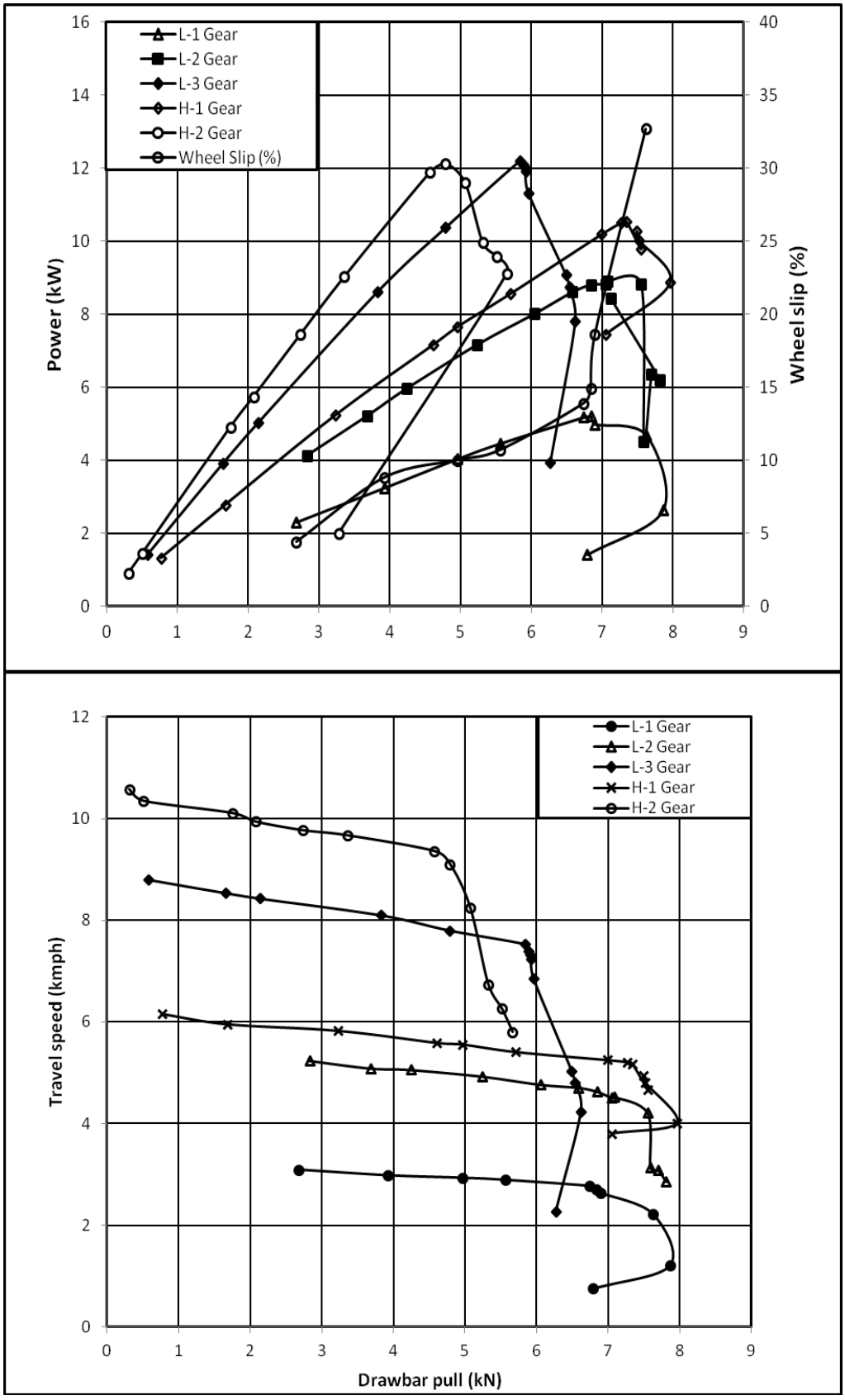


Fig. 6: DRAWBAR PERFORMANCE CHARACRERISTICS (UN BALLASTED)

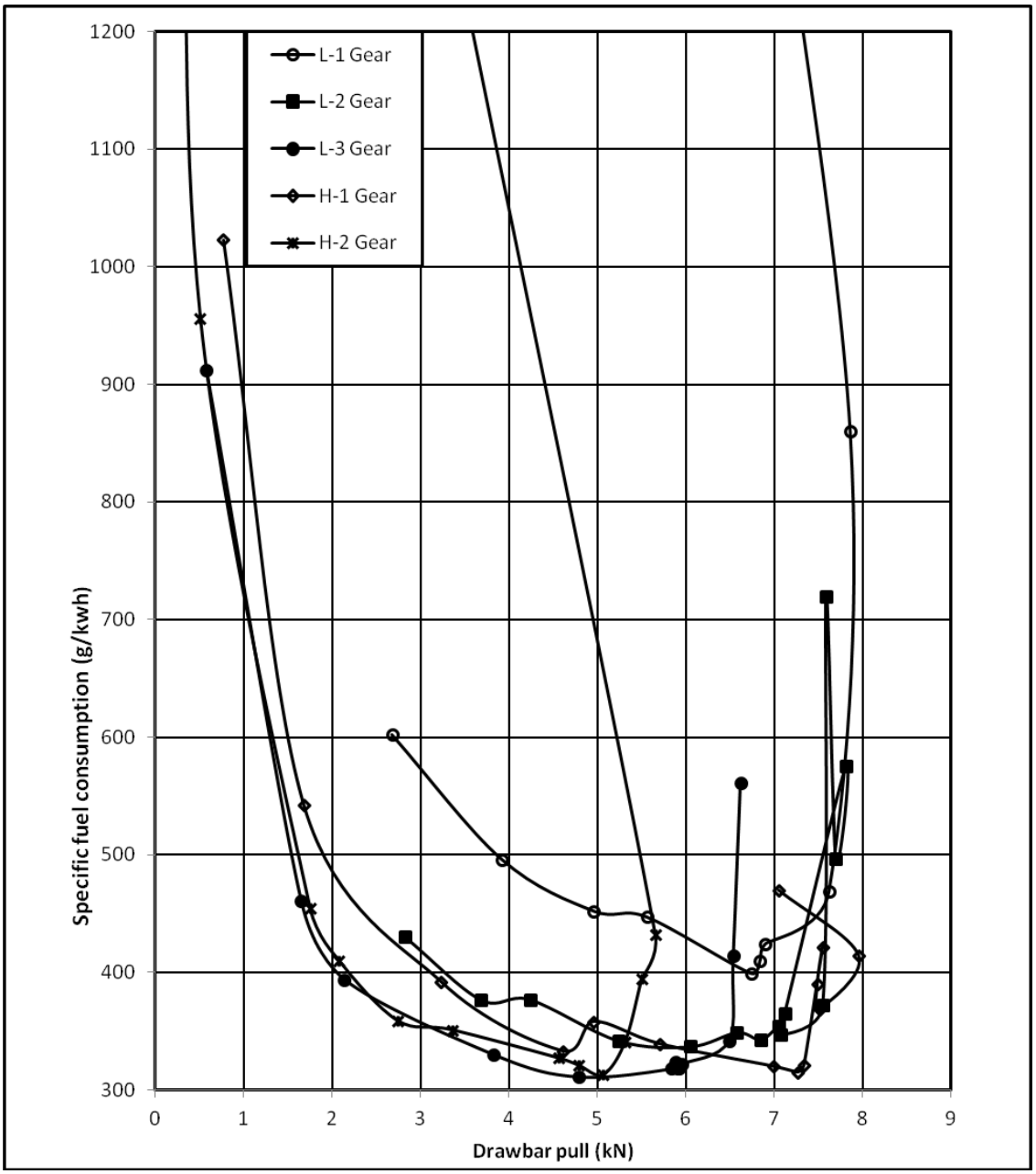


Fig. 7: DRAWBAR PERFORMANCE CHARACRERISTICS (UN BALLASTED)

5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 3.59

Temperature of hydraulic fluid at the start of test, (^{o}C) : 60

Test data:

Elapsed time, (minute)	05	10	15	20	25	30
Cumulative drop in height of lift, (mm)	00	00	00	00	00	00

6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test: : 14.01.2017

Type of track : Concrete

Maximum attainable speed (kmph): : 24.50 (Unballasted)

		At maximum attainable speed			
Unballasted Tractor	Braking device control force, (N)	490	450	380	280
	Mean deceleration, (m/sec^2)	3.41	3.31	2.88	2.50
	Stopping distance, (m)	6.80	7.00	8.03	9.26

6.1.2 Brake fade test:

		At maximum attainable speed			
Unballasted Tractor	Braking device control force,(N)	553	450	380	305
	Mean deceleration, (m/sec^2)	3.19	3.01	2.72	2.50
	Stopping distance, (m)	7.25	7.70	8.50	9.26

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 0.95 tonnes	
	Facing Up	Facing Down	Facing Up	Facing Down
Braking device control force, (N)	386	392	316	323
Efficacy of parking brake	---------- **Effective** ----------			

7. NOISE MEASUREMENT

7.1 Noise at bystander's position

Date of test : 23.12.2016

Type of track : Concrete

Background noise level dB (A) : 54

Atmospheric conditions

Temperature, (°C) : 24

Pressure, (kPa) : 97.4

Relative humidity, (%) : 52

Av. Wind velocity, (m/s) : 1.7

Test data:			
S. No.	Gear Used	Traveling speed before acceleration, (kmph)	Noise level, dB(A)
1.	L1	3.18	81
2.	L2	5.27	79
3.	L3	8.32	80
4.	L4	12.19	79
5.	H1	6.04	79
6.	H2	9.85	80
7.	H3	16.06	79
8.	H4	23.51	80

7.2 Noise at operator's ear level:

Date of test : 09.01.2017
Type of track : Concrete
Background noise level, dB(A) : 55

Atmospheric conditions:

Temperature, (°C) : 21
Pressure, (kPa) : 99.6
Relative humidity, (%) : 42
Average wind velocity, (m/s) : 1.1

Test data:

Gear	Drawbar pull at which the tractor develops the max. noise level, (kN)	Corresponding traveling speed, (kmph)	Noise level dB(A)
L1	6.74 to 6.84	2.77 to 2.74	92
L2	6.73 to 7.08	4.63 to 4.53	93
L3	5.84 to 5.91	7.53 to 7.32	94
*H1	7.34	5.17	93
H2	3.36 to 4.80	9.67 to 9.04	93

*Gear corresponds to the nominal travelling speed nearest to **7.5 km/h**.

8. AIR CLEANER OIL PULL-OVER TEST

Date of test : 30.12.2016

Atmospheric conditions :

Temperature (ºC) : 20 to 33
Pressure (kPa) : 97.60 to 97.70
Relative humidity (%) : 25 to 46
Mass of oil before test (g) : 269.1

S.No.	Position of tractor	Loss of oil (g)	Oil pull-over (%)	Engine oil pressure
i)	Tractor parked on level ground	0.6	0.22	Normal
ii)	Tractor tilted 15º laterally on RHS	11.8	4.38	Normal
iii)	Tractor tilted 15º laterally on LHS	1.8	0.66	Normal
iv)	Tractor tilted 15º longitudinally with front end up	27.78	10.29	Normal
v)	Tractor tilted 15º longitudinally with rear end up	0.20	0.07	Normal

9. MECHANICAL VIBRATION MEASUREMENT

Date of test : 23.12.2016
Type of test surface : Concrete

Sl. No.	Measuring points		Vibration (micron)			
			At load corresponding to 85% of max. PTO power		At no load	
			HD	VD	HD	VD
i)	Foot rest	Left	230*****	160*****	160*****	90
		Right	210*****	400*****	210*	190*
ii)	Steering control wheel		720*****	690*****	480*****	500*****
iii)	Seat	Bottom	380*	430*****	120*	180*
		Back	400*	250*	70	90
iv)	Mudguard	Left	580*****	500*****	100	130*
		Right	380*****	400*****	370*	250*
v)	Head light	Left	330*	210*	180*****	240*
		Right	420*	270*****	170*****	120*
vi)	Battery base centre		330*****	160*****	160*****	180*****
vii)	Tail light	Left	380*****	310*****	180*	140*
		Right	560*****	460*****	100	240*
viii)	Plough light		810*****	650*****	310*	570*
ix)	Gear shifting lever		270*****	270*	150*****	100
x)	Accelerator lever	Hand	360*****	580*****	130*****	200*
		Foot	530*****	490*****	190*****	360*****
xi)	Brake pedal	Left	310*****	270*****	270*****	300*****
		Right	270*****	400*****	300*****	180*****
xii)	Clutch pedal		160*****	130*****	130*****	210*****
xiii)	Main hydraulic control lever		80	190*****	90	60
xiv)	PTO engaging lever		60	180*	70	50

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

10. LOCATION OF CENTRE OF GRAVITY

Condition	Particulars	Coordinates
Tractor under unballasted condition but with all the liquid reservoirs full & the operator replaced by a 75 kg mass on the seat	Height above ground, (mm)	558
	Distance forward from the vertical plane containing the axis of rear wheels, (mm)	594
	Distance from the median plane parallel to the longitudinal axis of tractor bisecting the track, (mm)	6.3 (towards RHS)

11. TURNING ABILITY

Characteristics	Minimum turning diameter, (m)		Minimum clearance diameter, (m)	
	LHS	RHS	LHS	RHS
Brake applied	5.59	5.62	6.12	6.12
Brakes released	6.12	6.29	6.64	6.81

12. OPERATOR'S FIELD OF VISION

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

1. The non-visible space in front is **4570** mm which is **2.94** times of its wheel base (i.e.1555 mm).
2. The non-visible space in LHS and RHS is **1050** mm which is **1.26** times of its rear track width (i.e. 835 mm).

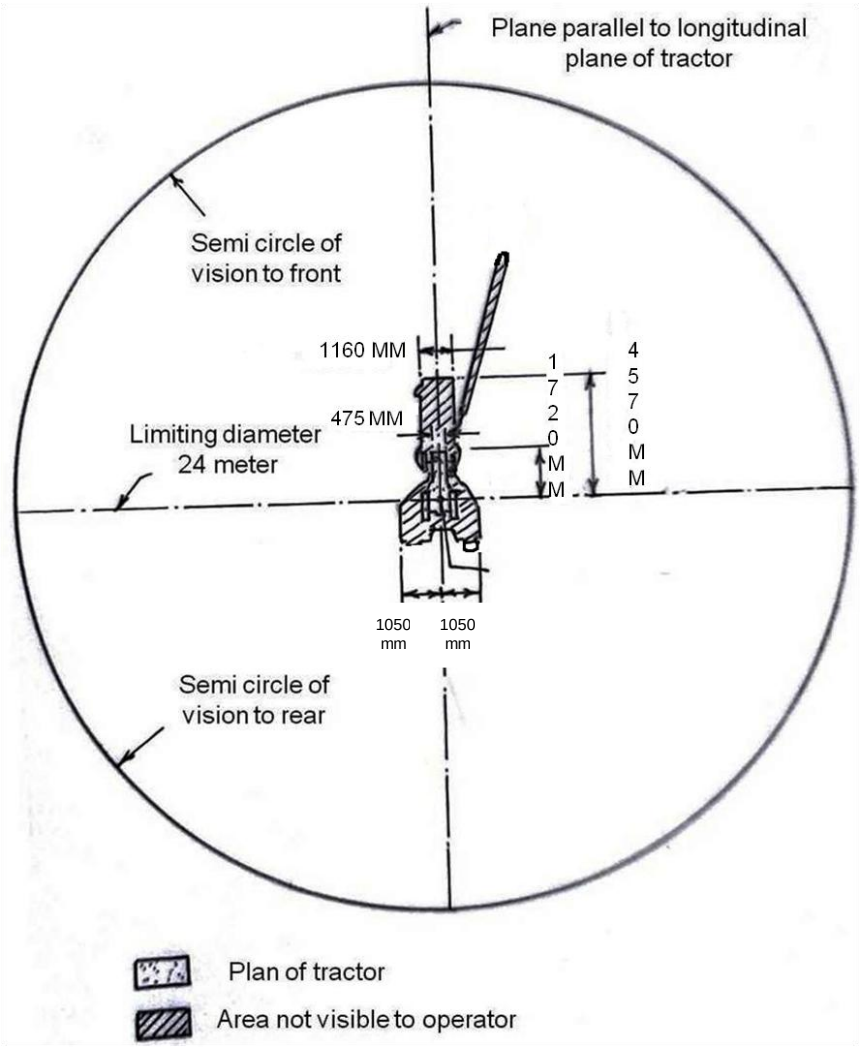


Fig. 8: Operator's field of vision

13. FIELD TEST

13.1 The field tests comprising of MB Ploughing and rotavation were conducted for **20.4** and **15.5** hours respectively.

All the field tests were conducted at the full accelerator settings when the no load speed of the engine was **2394** rpm.

13.2 The brief specifications of the implements used during field tests are given in **Annexure – I.**

13.3 The summary of field test observation with M.B. ploughing & rotavation is given in **Table – 3.**

Table – 3

SUMMARY OF FIELD PERFORMANCE TEST

S. No.	Parameter/Operation	M.B.Ploughing	Rotavation
i)	Type of soil (refer IS: 7926-1975)	Heavy	Heavy
ii)	Av. Soil moisture (%)/ Av. Depth of standing water, (cm,)	8.4 to 12.5	7.0 to 10.3
iii)	Bulk density of soil, (g/cc)	1.60 to 1.80	1.55 to 1.60
iv)	Cone index, (Kgf/sq.cm)/ Pudding index (%)	6.3 to 8.2	6.3 to 9.4
v)	Gear used	L-1	L-1
vi)	Av. Speed of operation, (kmph)	2.28 to 2.63	3.06 to 3.12
vii)	Av. Wheel slip (%) / Av. Travel reduction, (%)	16.6 to 20.6	-1.85 to -0.56
viii)	Av. Depth of cut, (cm) / Av. Depth of puddle, (cm)	15 to 19	6.0 to 7.0
ix)	Av. Working width, (cm)	53 to 56	81 to 93
x)	Area covered, (ha/h)	0.088 to 0.108	0.214 to 0.241
xi)	Fuel consumption		
	- (l/h)	1.51 to 1.67	2.30 to 2.52
	- (l/ha)	15.19 to 18.35	4.15 to 4.67
xii)	Average draft of implement (kN)	2.2 to 2.7	-------

Remarks: The average lub oil & coolant consumption during the entire field test were observed **2.8 ml/h** & **1.4 ml/h** respectively**.**

13.4 Wet land cultivation (Puddling):

The manufacturer does not recommend the tractor for wet land cultivation (puddling operation). Therefore, the tractor was not tested for wetland cultivation (puddling operation).

14. HAULAGE TEST

Type of trailer:	**:**	**Two wheel (Single axle)**
Gross mass of trailer, (tones)	**:**	3.0
Height of trailer hitch above ground level, (mm)	**:**	300
Gear used during the test for negotiating slopes up to 8%	**:**	H4
Average travel speed, (kmph)	**:**	22.36 to 24.24
Average fuel consumption:		
- (l/h)	**:**	2.51 to 2.73
- (ml/km/tone)	**:**	31.07 to 40.30
Average distance traveled per liter of fuel consumption, (km)	**:**	8.27 to 8.99
General observations:		
Effectiveness of brakes	**:**	Effective
Maneuverability of tractor-trailer combination	**:**	Satisfactory

15. COMPONENTS / ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **100.7** hours of tractor operation at this Institute.

15.1 Engine:

15.1.1 Cylinder bore:

Cylinder No.	Cylinder bore dia, (mm)						Maximum 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	95.00	95.01	95.00	95.00	95.01	95.00	95.200
2	95.00	95.01	95.00	95.00	95.00	95.01	

15.1.2 Piston:

Piston No.	Piston diameter, (mm)					Piston to cylinder liner clearance at skirt, (mm)	
	Top (above top compression ring)		At skirt		Max. permissible wear limit,		
	Thrust side	Non thrust side	Thrust side	Non-thrust side		As observed	Discard limit
1	94.450	94.355	94.922	*	94.800	0.088	0.250
2	94.441	94.356	94.891	*		0.119	

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

15.1.3 Ring end gap:

Rings	**Ring end gap, (mm)**						Max. permissible ring end gap limit, (mm)
	Cylinder-1			Cylinder-2			
	Top	Middle	Bottom	Top	middle	bottom	
1st comp.	0.50	0.55	0.55	0.45	0.50	0.50	1.5 mm for all
2nd comp.	0.60	0.60	0.60	0.60	0.55	0.60	
Oil ring	0.25	0.25	0.30	0.25	0.25	0.25	

15.1.4 Ring side clearance:

Rings	Ring side clearance (mm)		Max. permissible ring end gap limit, (mm)
	Piston-1	Piston-2	
1st comp.	0.120	0.122	0.40
2nd comp.	0.067	0.064	0.40
Oil ring	0.056	0.051	0.40

15.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Maximum permissible wear limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.063	0.30	0.40	0.80
2.	0.049 to 0.084			
2.	0.059 to 0.089			

15.1.6 Big end bearings :

Bearing No.	Clearance, (mm)		Maximum permissible wear limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1	0.054 to 0.091	0.25	0.40	0.80
2.	0.052 to 0.092	0.25		

15.1.7 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	:	19.52 to 19.81	Against the discard limit of 30.0 N/mm
- Exhaust valve	:	19.12 to 19.52	
Clearance between valve guide and valve stem, (mm):			
- Intake valve	:	0.036 to 0.046	Against the discard limit of 0.140 mm
- Exhaust valve	:	0.047 to 0.070	

15.2 Clutch:

Any marked wear on clutch friction plates	:	None	
Condition of clutch release bearing	:	Normal	
Condition of diaphragm spring	:	Normal	
Condition of pilot bearing	:	Normal	
Presence of oil in clutch housing	:	No	
Any marks on fly wheel/pressure plate	:	None	
Overall thickness of clutch plate, (mm):			
- Transmission	:	7.86 to 8.02	Against the discard limit of 2.0 ± 0.1 mm of lining over rivet head
Height of lining over rivet head, (mm):			
- Transmission clutch	:	1.44 to 1.75	Against the discard limit of 0.2 mm over rivet head

15.3 Transmission gears:

Any visual damage, pitting & chipping of any transmission gear teeth	:	None	
Backlash between crown wheel and pinion, (mm)	:	0.431	Against the discard limit of 0.80 mm

15.4 Brakes:

Description	Initial specified Thickness of liner, (mm)	Measured over all thickness of brake shoe after test, (mm)	Measured Height of liner over rivet head, (mm)	Discard limit,(mm)
Left	4.75 ± 0.1	7.57 to 8.16	3.40 to 4.77	Up to rivet head
Right	4.75 ± 0.1	7.54 to 8.01	3.10 to 4.11	

15.5 Front axle:

Any marked wear of king pins	:	None
Condition of king pin bushes	:	Normal
Clearance between king pin & bush, (mm)	:	Not measured due to taper roller bearing is provided
Condition of thrust bearing	:	Normal
Condition of bearings for stub axles	:	Normal
Condition of seals for stub axles and king pins	:	Normal
Clearance between centre pin and bush, (mm)	:	Not measured due to taper roller bearing is provided

15.6 Steering system:

Visual condition of the components of complete steering assembly	:	Normal

15.7 Starter motor & Alternator:

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

16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments, Defects, Breakdowns and Repairs		Tractor run hours
	PTO Performance:		
1.	**i)**	During PTO performance test under high ambient condition, the coolant temperature was recorded as 122 degree C at 1700 speed of engine, against the maximum declaration of 120 degree C and further test was suspended. The overheating tendency of the engine in the vicinity of maximum torque was observed and does not meet the evaluative requirement of IS: 12207-2014.	11.18
	ii)	The exhaust gas back pressure was recorded as 32.3 to 35.0 kPa against declaration of 6±1 kPa.	
	To rectify the above problem of overheating tendency of engine the following checking/ adjustments were done.		
	i)	Cleaning of radiator was done by forced air.	
	ii)	Thermostat valve was checked for its proper functioning and found correct.	
	iii)	Calibration of coolant & oil temperature sensors was done and found correct.	
2.	Thereafter, again PTO performance test under high ambient condition was repeated as per clause 3.2.3 of IS:12207:2014, but no improvement in the performance of the engine was observed. The coolant temperature was recorded as 124 degree C at 1700 speed of engine, against the maximum declaration of 120 degree C and further test was suspended. The overheating tendency of the engine in the vicinity of maximum torque was persist as such and does not meet the evaluating requirement of IS: 12207-2014.		12.81
	To rectify the problem of overheating tendency of engine the following replacements were done. The comparative specifications of existing & modified parts are tabulated in **Annexure-III.**		
	i)	Radiator (Pt. No. 001752.00 was replaced with modified radiator) [(Pt No. 002252 (SM-AR-580-0000)] along with its mounting bracket.	
	ii)	Exhaust silencer (Pt. No. 010036.00) having vertical flow was replaced with circular flow (Pt. No. 012313.00).	
	After above replacement/repair work the supplementary PTO test as per clause 3.2.4 (a) of IS:12207:2014 was conducted successfully.		
3.	During the field test, the leakage of fuel was observed from fuel supply pipe line between fuel filter to fuel injection pump (Pt. No. 011839) and it replace with new one.		78.72

17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

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

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant(D)/ Requirement I	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5	6	7
17.1.1	**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	14.5 (D)	14.5	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	14.5 (D)	14.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	259 (D)	269	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	80 (D)	69.7	**No**
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	7 percent (D)	10.8	Yes
f)	**Maximum Operating Temperature (^{O}C) :-**					
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130	106	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.	120	103	Yes

1	2	3	4	5	6	7
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.67 (R) 1% of SFC (D)	0.36	Yes
h)	Smoke level	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 (R)	0.09	Yes
17.1.2	**Drawbar performance:**					
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	Not applicable	Not applicable	Not applicable
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	5.80(D) 5.80 (R) Minimum	7.34	Yes
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in Sl No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in Sl No. i) a) of PTO performance in case of light weight tractors having 1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in Sl No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	10.87 (D) 10.88 (R) Minimum	12.20	Yes
d)	Max. transmission oil temperature (^{o}C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	58	Yes
17.1.3	**Power lift and hydraulic pump performance :**					
a)	**Maximum lifting capacity throughout the range of lift, (kN):**					
	1) At hitch points	Non Evaluative	[Tolerance of minus 10%]	4.00 (D)	6.75	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	3.30 (D) 3.41 (minimum)	3.99	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 minute, (mm)	Non Evaluative	Observed value should not exceed 50 mm	20 (D)	Nil	Yes

1	2	3	4	5	6	7
17.1.4	**Brake performance at 25 kmph:**					
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):					
	1) Cold brake	Evaluative	10	10 (D)	6.80	Yes
	2) Hot brake	Evaluative	10	10 (D)	7.25	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (N)	Evaluative	600	600 l	280 to 305	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes / No	Yes	Yes	Yes

17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 l	81	Yes
b)	Maximum noise at operator's ear level	Evaluative	As per CMVR	96 l	94	Yes

17.1.6	Amplitude of mechanical vibrations at :					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 l microns	230	**No**
	Right foot rest				400	**No**
	2) Seat (with driver seated)				430	**No**
	3) Steering wheel				720	**No**

17.1.7	Air cleaner oil pull-over test					
	Maximum percentage of oil pull-over	Non evaluative	0.25 percent maximum	0.25%	10.29 %	**No**

17.1.8	Haulage requirements						
a)	Gross mass of trailers (tones)						
	1) Two wheel	Non Evaluative	-	3.0 (D)	3.0		Yes
b)	Distance travelled / liter of fuel consumption (km/l)						
	1) Two wheel	Non Evaluative	-	8 to 10 (D)	8.27 to 8.99		Yes
c)	Fuel consumption (ml/km/tone)						
	1) Two wheel	Non Evaluative	-	50 to 70 (D)	31.1 to 40.3		Yes

17.1.9	Wetland cultivation :Tractor is not recommended for wetland cultivation						
	Sealing for the following assemblies:	Evaluative	**The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2.** If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud	The manufacturer has recommended that the tractor is not suitable for wet land cultivation .	Not applicable
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine oil	-do-				
	5) Transmission oil	-do-				

1	2	3	4	5	6	7
17.1.10	**Safety features**					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 part 2)	--	Conforms	Yes
b)	Lighting arrangement	Evaluative	As per CMVR	--	Conforms	Yes
c)	Seating requirement (Tractors having more than 1150 mm rear track width)	Non-Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	--	Not applicable	Not applicable
d)	Technical requirements for PTO shaft	Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	**Does not conform**	**No**
e)	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	**Does not conform**	**No**
f)	Specification of linkage and swinging drawbars	Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	--	Conforms	Yes

17.1.11	**Labelling of tractors (Provision of labeling plate):**					
	1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	CAPTAIN	Yes
	2)	Model	Evaluative		250 DI	Yes
	3)	Year of manufacture	Evaluative		2016	Yes
	4)	Engine serial number	Evaluative		SC 21304397	Yes
	5)	Chassis serial number	Evaluative		D 216010513	Yes
	6)	Declaration of PTO power, kW	Evaluative		14.5	Yes
	7)	SFC, g/kwh	Evaluative		259	Yes

17.1.12	**Discard limit for:**					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be declared by the manufacturer	95.20 (D)	95.00 to 95.01	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.25 (D)	0.088 to 0.119	Yes
I	**Ring end gap (mm):**					
	1st comp. ring.	Evaluative	To be declared by the manufacturer	1.5 (D)	0.45 to 0.55	Yes
	2nd comp. ring.			1.5 (D)	0.55 to 0.60	Yes
	Oil ring			1.5 (D)	0.25 to 0.30	Yes
(d)	**Ring groove clearance (mm):**					
	1st comp. ring.	Evaluative	do	0.400(D)	0.120 to 0.122	Yes
	2nd comp. ring.		-do-	0.400(D)	0.064 to 0.067	Yes
	Oil ring.		-do-	0.400(D)	0.051 to 0.056	Yes

1	2	3	4	5	6	7
(e)	**Clearance of main bearings (mm):**					
	Diametrical clearance	Evaluative	-do-	0.40 (D)	0.049 to 0.089	-
	Crankshaft end float	Evaluative	-do-	0.80 (D)	0.30	Yes
(f)	**Clearance of big end bearings, (mm):**					
	Diametrical	Evaluative	-do-	0.40 (D)	0.052 to 0.092	Yes
	Axial	Evaluative	-do-	0.80	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	-	Taper roller bearing provided	-
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	-	Taper roller bearing provided	-

17.1.13	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes
(b)	Parts Catalogue	Evaluative	Provided/Not Provided	Provided	Provided	Yes
I	Workshop/ Service manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes

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

17.2	Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:			
S. No.	**Characteristic**	**Requirements as per IS: 12207-2014**	**As observed**	**Whether meets the require-ments (Yes/No.)**
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: 11821-1992	Not provided	Not applicable
2.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Trailer hitch and linkage draw bar provided	Yes

17.3 Conformity with following IS:

i)	Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed 2009)]	**:**	Conforms
ii)	Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2009)]	**:**	**Does not conform**
iii)	Agricultural wheeled tractors - Three-point linkage: Part 2 Category 1N (Narrow Hitch) (Third Revision) [IS 4468 (Part-2):1993/ ISO 730-2:1979 (Reaffirmed 2009)]	**:**	**Does not conform**
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed 2007)]	**:**	Conforms
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2009)] (Tractors having more than 1150 mm rear track width)	**:**	Not applicable
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 2009)]	**:**	**Does not conform**
vii)	Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed 2009)]	**:**	**Does not conform**
viii)	Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2009)]	**:**	Conforms
ix)	Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays Part 2 Symbols for agricultural tractors and machinery [IS:6283 (Part-1)- 2006 and IS: 6283 (Part-2)-2007 (Reaffirmed 2009)]	**:**	**Does not conform**
x)	Agricultural Tractors and Machinery – Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2009)]	**:**	Conforms

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO performance:

i) During PTO performance test under high ambient condition, the coolant temperature was observed as 122 degree C at 1700 engine speed, against the declaration of maximum coolant temperature of 120 degree C. The overheating tendency of engine was observed in the vicinity of maximum torque. To rectify the problem, (a) Radiator (Pt. No. 001752.00) was replaced with modified radiator [(Pt No. 002252 (SM-AR-580-0000)] along with its mounting bracket and (b) Exhaust silencer (Pt. No. 010036.00) having vertical gas flow was replaced with circular gas flow (Pt. No. 012313.00). The details of old and modified design along with parts of radiator and silencer is given in **Annexure – III.**

The tractor cooling system meet the evaluative requirements only after supplementary test therefore, it is recommended that, the modified radiator [(Pt No. 002252 (SM-AR-580-0000)] and silencer (Pt. No. 012313.00) should be provided in the regular production and tractors already sold.

ii) The maximum power was observed **14.5 kW** against the declaration of **14.5 kW.** Which is within the tolerance limit of IS: 12207-2014.

iii) The specific fuel consumption corresponding to maximum power was measured as **269 g/kWh** against the declaration of **259 g/kWh** which is within the tolerance limit of IS 12207 – 2014.

iii) The maximum equivalent crankshaft torque was recorded as **69.7 Nm** against the declaration of **80.0 Nm** which does not meet the requirement of IS 12207 – 2014. This should be looked into for necessary corrective action.

Iv) The backup torque was observed as **10.8 %.**

17.4.1.2 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-9 of this test report is on higher side, especially on the left and right foot rest, seat and steering wheel. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.3 Air Cleaner Oil Pullover Test:

Air cleaner oil pullover is considerably on higher side than the normal air cleaner oil pullover limit 0.25% specified in Indian Standard. Necessary corrective action should be taken to keep the air cleaner oil pullover within the prescribed limit.

17.4.1.4 Power take-off shaft:

The dimension "dØ" of PTO shaft does not meet the minimum requirements of IS 4931 - 1995 (Reaffirmed 2009). This should be looked into for necessary corrective action.

17.4.1.5 Three point linkage:

The diameter of hitch pin hole of upper hitch point of tractor does not meet the minimum requirements of IS: 4468-(Part I)-1997. This should be looked into for necessary corrective action.

17.4.1.6 Operator's work place:

Operator's work place meets the requirements of IS-12239 (part-I)--1996.**except the following.**

i) Provision of hand holds for easy mounting and dismounting of the operator.
ii) Provision of spark arrester

17.4.1.7 Location and movement of operator's controls:

Location and movement of operator's controls meets the requirements of IS: 8133 – 1993, **except the following.**

i) Provision of differential lock

17.4.1.8 Identification of operator's controls:

All the controls shall be identifiable with symbols as per requirements of IS: 6283 (Part I & Part II) – 1998, **except the following.**

i) Differential lock
ii) Pressurized, open, slowly
iii) Grease lubricant frequency

17.4.1.9 Safety Guards

Safety Guards meets the minimum requirements of IS: 12239 (Part II) – 1999, **except the following.**

(i) The working clearance around hand control between the draft control and mudguard is less than 70 mm.

17.5 Field performance test:

17.5.2.1 Wetland cultivation (Puddling operation):

The manufacturer does not recommend the tractor for wet land cultivation (puddling operation). Hence, the wetland cultivation (puddling operation) was not conducted. Therefore, the declaration of the fact that the tractor is not suitable for wetland cultivation (puddling operation) should be mention clearly and boldly in all literature relevant to this tractor model as well as on the bonnet of tractor.

17.6 Maintenance / Service Problems:

i) During the field test, the leakage of fuel was observed from fuel supply pipe lin between fuel filter to fuel injection pump (Pt. No.011839) and it replace with nev one.

17.7 Recommendation with regard to safety on tractor:

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

i) Provision for spark arresting device in exhaust system.
ii) The working clearance around hand control between the draft control and mudguard is less than 70 mm.
iii) Provision of differential lock.
iv) Provision for identifiable symbol for (1) differential lock & (2) pressurized, open, slowly
v) Provision of PTO shaft master shield.
vi) The tractor is not suitable for wet land cultivation (puddling operation) should be mention clearly and boldly in all literature relevant to this tractor model as well as on the bonnet of tractor.

17.8 Adequacy of Literature supplied with machine:

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

i) Operator's Manual in respect of CAPTAIN 250 DI TRACTOR.
ii) Tractor Parts Catalogue in respect of CAPTAIN 250 DI TRACTOR.
iii) Service Manual in respect of CAPTAIN 250 DI TRACTOR.

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

18. CITIZEN CHARTER

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	12 Months (March, 2016 to March, 2017)	No	Delay is due to occurrence of breakdowns

TESTING AUTHORITY:

C.V.CHIMOTE
TEST ENGINEER

Y.K.RAO
SENIOR AGRICULTURAL ENGINEER

R.M.TIWARI
SENIOR AGRICULTURAL ENGINEER

J.J.R.NARWARE
DIRECTOR

This test report is compiled by Shri. R.M.Tiwari, Senior Agricultural Engineer.

19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's Comments
19.1	17.4.1.1	Will be studied & necessary action will be taken.
19.2	17.4.1.2, 17.4.1.3,17.4.1.4,17.4.1.5, 17.4.1.6, 17.4.1.7, 17.4.1.8 & 17.4.1.9	Suggestion & recommendation will be incorporated for the quality of product
19.3	17.5,17.6,17.7, & 17.7.2	Suggestion & recommendation will be incorporated for the quality of product

ANNEXURE- I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S.No	Parameters	M B Plough	Rotavator
1.	Make	Captain	Captain
2.	Type	Mounted	Mounted
3.	No. of bottom/blades	Two	30 in 6 flanges
4.	Type of bottom/blades	Mould board, general purpose	L type
5.	Size of bottoms/blades, (mm)	225	95 X 50 X 6
6.	Spacing of bottoms/flanges, (mm)	200	156
7.	Lower hitch point span, (mm)	470	395
8.	Mast height, (mm)	470	445
9.	**Overall dimensions, (mm):**		
	- Length	985	780
	- Width	640	1200
	- Height	870	870
10.	Gross mass, (kg)	85	180

ANNEXURE- II

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running-in	-
2.	Initial inspection	0.75
3.	PTO performance test	25.62
4.	Mechanical vibration measurement	1.25
5.	Noise level at bystander's position	0.75
6.	Hydraulic performance test	4.41
7.	Air cleaner oil pullover test	4.00
6.	Brake performance test	1.25
7.	Drawbar performance test	14.50
B.	**HAULAGE TEST**	7.32
C.	**FIELD TEST**	
1.	MB plough	20.42
2.	Rotavation	15.50
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	4.95
	TOTAL	**100.72**

ANNEXURE- III

Technical Specification of Parts Replaced During Supplementary Test

Parameters	Modified	Old
(A) Radiator		
Make & model	S. M. Auto	Banco
Core thickness (mm)	56	40
Size of frontal area (cm^2)	887	897
Core martial	Aluminum	Copper
Coolant to water ratio	50 % coolant & 50 % water	50 % coolant & 50 % water
Radiator tank material	Plastic tank both top & bottom	Metal tank both top & bottom
Bare capacity, (l)	2.20	2.40
Total capacity of cooling system (ltrs)	4.5	4.5
Recommended cap pressure (Kpa)	88	88
Brand name of coolant	Castrol	Lubzs
Part number	002252.00(SM-AR-580-0000)	001752.00
Cooling Fan :		
Inner dia of cowl, (mm)	313	313
Outer dia. Of fan, (mm)	289.6	290
(B) Silencer		
Make	Not available	Not available
Type	Updraft, cylindrical	Updraft, cylindrical
Exhaust gas pressure at max. power (Kpa)	6±1	30±1 (observed at the time of PTO test.)
Exhaust flow	Circular flow	Vertical flow
Provision of spark arresting device	Not provided	Not provided
Entry against of rain water	A bet is provided at outlet	A bet is provided at outlet
Location	On RHS of engine, outside the bonnet	On RHS of engine, outside the bonnet
Part number	012313.00	010036.00

provided as per letter received from the applicant