0;kolkf;d ijh{k.k fjikVZ (प्रारंभिक) Lk[;k/No. : **T- 1274/1801/2019**

COMMERCIAL TEST REPORT (Initial) ekg/Month : **October, 2019**

(यह परीक्षण रिपोर्ट 31/10/2022 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/10/2022)

INDO FARM, 3048 DI C-MESH TRACTOR

Hkkjr ljdkj
df"k ,oa fdlku dY;k.k e=kky;
¼df"k] lgdkfjrk ,o fdlku dY;k.k foHkkx] e'khuhdj.k ,o ik|kfxdh iHkkx½

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

dsUnh; df"k e'khujh izf'k{k.k ,oa ijh{k.k laLFkku
VSDVj uxj] cqnuh ¼e-iz-½466 445

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
(An ISO 9001: 2015 Certified Institute)
TRACTOR NAGAR, BUDNI (M.P.) 466 445

E-mail: fmti-mp@nic.in **Web site: http://www.fmttibudni.gov.in**
Telephone: 07564-234729, Fax-07564-234743

Manufacturer : **M/s. Indo Farm Equipment Ltd,**
EPIP-II, Village-Thana, Baddi-173205,
Distt. Solan, (HP) INDIA

Month: October	Test Report No. T- 1274/1801/2019	Year: 2019

सत्यमेव जयते

GOVERNMENT OF INDIA
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA
E-mail**: fmti-mp@nic.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 2014) IS: 9253-2013 and IS: 12207-2019
Period of Test	:	November, 2018 to August, 2019
Test Report No.	:	**T-1274/1801/2019**
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 submitted by the applicant, for tests.

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

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

SELECTED CONVERSIONS & ABBREVIATIONS

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	1.01387 metric 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
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

C O N T E N T S

Manufacturer	:	**M/s. Indo Farm Equipment Ltd, EPIP-II, Village-Thana, Baddi-173205, Distt. Solan, (HP)**
Test requested by (applicant)	:	The manufacturer
Selected for test by	:	Applicant
Place of running-in	:	At manufacturer's works
Duration of said running-in (h):		
- Engine	:	05
- Transmission	:	10
Method of Selection	:	The tractor was submitted directly by the applicant

1. SPECIFICATIONS

1.1 Tractor:

Make	:	Indo Farm
Model	:	3048 DI C-Mesh
Variants, if any	:	None
Brand name	:	Indo Farm
Type	:	Four wheeled, rear wheel driven, standard agricultural tractor.
Year of manufacture	:	April, 2018
Chassis number	:	DNW30482WD00001CM
1st Chassis number	:	DNW30482WD00001CM
Country of Origin	:	India

1.2 Engine:

Make	:	Indo Farm
Model	:	Indo Farm 3052 DI
Type	:	Four stroke, naturally aspirated, water cooled, direct injection, diesel engine.
Serial number	:	C328608094NV
Engine speed (Manufacturer's recommended production setting, (rpm) :		
- Maximum speed at no load,(rpm)	:	2350 to 2450
- Low idle speed, (rpm)	:	550 to 650
- Speed at maximum torque, (rpm)	:	1200 to 1400
Rated speed, (rpm):		
- For PTO use	:	2200
- For drawbar use	:	2200

1.3 Cylinder & Cylinder Head:

Number	:	Three
Disposition	:	Vertical, inline
Bore/stroke, (mm)	:	105/110
Capacity as specified by the applicant,(cc)	:	2858
Compression ratio, (apa)	:	19.0± 0.5 : 1 (apa)
Type of cylinder head	:	Individual
Type of cylinder liners	:	Wet, replaceable
Type of combustion chamber	:	Re-entrant, cavity on piston crown
Arrangement of valves	:	Over head, Inline
Valve clearance (cold/hot):		
- Inlet valve, (mm)	:	0.30 / 0.30
- Exhaust valve, (mm)	:	0.40 / 0.40

1.4 Fuel System:

Type of fuel system	:	Gravity and force feed

1.4.1 Fuel tank:

Capacity, (l)	:	65.0
Location	:	Above clutch housing
Provision for draining of sediments /water	:	Provided
Material of fuel tank	:	Metallic

1.4.2 Water separator:

Make	:	SAI
Type	:	Inverted funnel, gravity separation
Location	:	On LHS of engine, between fuel tank and fuel filter assembly

1.4.3 Fuel feed pump:

Make	:	Bosch, India
Type	:	Plunger
Model/Group combination No.	:	FP/KS 22AD 62, 9 440 030 029
Provision of sediment bowl	:	Provided
Method of drive	:	Through cam shaft of fuel injection pump

1.4.4 Fuel filters:

Make	:	Bosch, India
Model/Group combination No.	:	9 450 030 119
Number	:	Two
Type of element:		
- Primary	:	Cloth
- Secondary	:	Paper
Capacity of final stage filter, (l)	:	0.43

1.4.5 Fuel Injection pump:

Make	:	Bosch, India
Model/Group combination No.	:	F 002 A0Z 704, PES3A90D320RS3500
Type	:	Inline, plunger
Serial number	:	71941115
Method of drive	:	Through timing gears

1.4.6 Fuel injectors:

Make	:	Bosch, India
Nozzle Holder No.	:	F 002 C70 552
Nozzle No.	:	DSLA 146P 5506 753 030
Type	:	Multi hole (Five holes)
Manufacturer's production pressure setting, (MPa)	:	25.0 to 25.8
Injection timing	:	$12^{o} \pm 1$ before TDC
Firing order	:	1-3-2

1.4.7 Governor:

Make	:	Bosch, India
Model/Group combination No.	:	RSV300...1100A1C1579R
Type	:	Mechanical, Centrifugal, Variable speed.
Rated engine speed, (rpm)	:	2200
Governed range of engine speed,(rpm)	:	550 to 2450

1.5 Air Intake System:

1.5.1	**Pre-cleaner**	:	**Not provided**
1.5.2	**Air cleaner:**		
	Make	:	Luman
	Type	:	Dry type
	Location	:	In front of radiator under the bonnet.
	Range of suction pressure at maximum power, (kPa)	:	4.0 to 4.3

Details of paper element	:	**Primary**	**Secondary**
- Size (OD/ID), (mm)	:	127.5/ 84.1	80.3/ 61.1
- Length, (mm)	:	308.0	299.0

Air flow restriction indicator	:	Provided at dash board
Dust unloading valve	:	Provided
Maintenance schedule	:	**Primary element:** Clean after every 300 hours or earlier whenever air flow restriction indicator glows. Replace the element after every three cleanings or 900 hours of operation. **Secondary element:** Replace element after every three times replacement of primary element.

1.6 Exhaust system:

Type of silencer	:	Updraft, (Elliptical)
Position of silencer outlet with Respect to SIP, (mm):		
- Vertical	:	1055
- Longitudinal	:	1475
- Lateral	:	490 (on RHS)
Range of exhaust gas pressure at maximum power, (kPa)	:	8.8 to 9.0
Provision of spark arresting device	:	None
Provision against entry of rain water	:	A bend is provided on the outlet of silencer.

1.7 Lubricating system:

Type	:	Force feed cum splash
Oil sump capacity, (l)	:	8.05
Total lub oil capacity, (l)	:	8.55
Oil change period	:	First change after 50 hours and subsequently after every 200 hours of operation.
Cooling device, (if any)	:	None
Filters:		
Make	:	Indofarm (apa)
Type	:	Full flow, spin-on throw away, paper element
Pump:		
Type	:	Gear
Method of drive	:	Through timing gear
Pressure release setting, (kPa)	:	392±49 (apa)
Minimum permissible pressure, (kPa)	:	147 (apa)

1.8 Cooling system:

Type	:	Forced circulation of water with coolant liquid
Brand name of coolant	:	Valvoline Cummins, HP coolguard
Coolant water ratio	:	1 : 3
Details of pump	:	Centrifugal, semi-open impeller of 89.9 mm diameter, having 12 number of vanes and driven through crankshaft pulley by a cogged “V”-belt common to alternator.

	Details of fan	:	Suction type, 6 polypropylene blades of 383 mm diameter and mounted on water pump shaft.
	Means of temperature control	:	Thermostat
	Bare radiator capacity, (l)	:	4.50
	Capacity of expansion flask, (l)	:	1.0
	Total coolant capacity, (l)	:	11.1
	Radiator cap pressure, (kPa)	:	49
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 & MF70Z
	Type	:	Lead acid
	Capacity and rating	:	12V, 75 Ah at 20 hours discharge rate
	Location	:	In-front of radiator under the bonnet.
1.10.2	**Starter:**		
	Make	:	Spark minda
	Model	:	Not available
	Type	:	Pre-engaging solenoid operated
	Capacity and rating	:	12V and 2.7 kW
	Serial Number	:	16022-0857
1.10.3	**Generator:**		
	Make	:	Spark minda
	Model	:	I6047-2857
	Type	:	Alternator
	Serial number	:	Not available
	Output rating	:	12V, 42 Amp
	Method of drive	:	Through crankshaft pulley by a cogged V-belt common to water pump.
1.10.4	**Voltage regulator:**	:	In built with alternator

1.10.5 Details of lights:

Description	No. & capacity of bulbs	Height of the centre of beam above ground level,(mm)	Size of beam, (mm)	Distance between centre of the beam and outside edge of tractor at standard rear track setting,(mm)
1	**2**	**3**	**4**	**5**
Front Lights:				
- Head lights	2, 12V, 60/55 W	1280	155 x 95	772
- Parking lights	2, 12V, 5 W	1280	60 x 65	170
- Turn-cum-hazard Indicator light	2, 12V, 21 W	1280	75 x 65	105
-Reflector (white)	2	1280	30 x 55	215
Rear lights:				
- Stop light/Tail light	2, 12V, 21/5 W	1255	60 x 65	185
- Turn-cum-hazard Indicator light	2, 12V, 21 W	1255	75 x 65	120
Reflector (Red)	2	1255	30 x 55	230
Plough light	1, 12 V, 35 W	1460	125 Φ	155
Registration plate light	Part of rear parking light			

1.10.6 Main switch : Key turn type having three positions viz.
i) OFF
ii) Circuit 'ON'
iii) START

1.10.7 Light switch : Rotary type having five positions viz.
i) OFF
ii) Parking + Dash board light 'ON'
iii) Head light (short beam) + (ii)
iv) Head light (long beam) + (ii)
v) Turn indicator switch
vi) Horn push button

1.10.8 Horn:

Make : Addon

Type : 2B, electromagnetically vibrated diaphragm type

Location : In front of radiator, under the bonnet

1.10.9 Fuse box : Contains six number of fuses having following capacities**:**

30 A	20 A	10 A
01	01	04

1.10.10 Details of other electrical accessories:

1.10.10.1 Flasher Unit:

Make : Wesco

Capacity**:**

-Turn signal : 21W x 2 + 2W x 1

- Hazard signal : 21W x 4 + 2W x 2

Flashes/Min. : 85

1.10.10.2 Safety switch : Provided on high/low shifting gear, engine will not start unless the high/low gear shifting lever is in neutral position

1.11 Instrument panel details:

i) Engine rpm cum cumulative digital run hour meter (0 to 30) x 100 rpm
ii) Water temperature gauge (with coloured zones)
iii) Lubricating oil pressure gauge (with coloured zones)
iv) Fuel level gauge (with coloured zones)
v) Turn and hazard light indicator
vi) Battery charging warning indicator
vii) Voltmeter gauge (with coloured zones)
viii) Air flow restriction warning indicator
ix) Staring switch (key-turn-type)
x) Light switch (rotary type)
xi) Hazard light switches with indicator
xii) Head light long beam 'ON' indicator
xiii) Horn push button
xiv) Mobile charging socket
xv) Steering control wheel
xvi) Fuel shut-off knob
xvii) Hand throttle lever
xviii) Rear view mirror

1.12 Transmission System:

1.12.1 Clutch:

Make : Luk India Ltd.

Type : Dual, dry friction pads, Diaphragm

No. of friction plate, (s) : Two

Size, (mm)

Transmission ,(OD/ID) : 278 Φ mm dia. and having four pads of 27.9 cm^2 area of each pad

PTO,(OD/ID) : 279 Φ mm dia. and having four pads of 27.9 cm^2.area of each pad

Material of clutch lining : Ceramic(Transmission),Non-Asbestos (PTO)

Method of operation:

-Transmission : By pressing the clutch pedal half way, on LHS

-PTO : By pressing the clutch pedal, fully

1.12.2 Gear box:

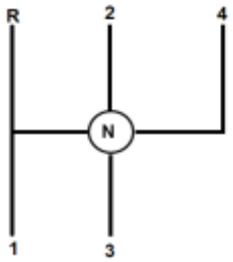
Make : Indo Farm

Type : Combination of sliding & constant mesh

No. of speeds:

- Forward : 08
- Reverse : 02

Gear shifting pattern :



Gear selection lever

Range selection lever

Location of gear shifting levers : Side shift arrangement

- Main gear shift lever : RHS of operator's seat
- Range selector lever : LHS of operator's seat

Oil capacity, (l) : 55.45 (common with differential, final drive, hydraulic & brakes system).

Oil changing period : Change after every 1600 hrs of operation

1.12.3 Nominal Speeds:

Movement	Gear No.	No of engine revolutions for one revolution of driving wheel	Nominal speed at rated engine speed when fitted with **13.6-28 size** tyres of **610 mm** radius index, (kmph)
Forward	L1	197.10	2.57
	L2	138.52	3.65
	L3	87.65	5.78
	L4	64.61	7.83
	H1	49.13	10.29
	H2	34.56	14.69
	H3	21.85	23.13
	H4	16.10	31.40
Reverse	LR	148.54	3.41
	HR	37.06	13.64

1.12.4 Differential unit:

Type	:	Crown wheel and bevel pinion with differential unit accommodated inside the differential housing
Reduction through crown wheel & pinion	:	3.166 **:** 1 (38/12 T)
Oil capacity of differential unit, (l)	:	55.45 (common with gear box, final drive, hydraulic & brakes system)
Oil changing period	:	Change after every 1600 hrs of operation
1.12.4.1 Differential lock	:	**Not provided**

1.12.5 Rear axle & Final drive:

Make	:	Indo Farm (apa)
Type	:	Bull gear and pinion type final drive accommodated inside the differential housing
Reduction through final drive	:	5.091 **:** 1 (56/11 T)
Oil capacity of final drive, (l)	:	55.5 (common with gear box, differential housing, hydraulic & brakes system)
Oil changing period	:	Change after every 1600 hrs of operation

1.13 Power lift (Hydraulic system):

Make	:	Indo Farm
Type	:	Open centre, live, ADDC
No. and type of cylinder	:	One, single acting
Type of linkage lock for transport	:	Hydraulic, response control knob in fully closed position act as transport lock

1.13.1 Hydraulic pump :

- Make	:	United
- Type	:	Gear
- Location & drive	:	On RHS of engine and driven through timing gears
No. & type of filters	:	Two, one wire mesh strainer and one spin-on filter in between suction line
Hydraulic oil capacity, (l)	:	55.5 (common with gear box, differential, final drive & brakes system).
Oil change period	:	Change after every 1600 hrs of operation
Provision for external tapping	:	Provided
Details of control levers	:	**i)** Position control lever **ii)** Draft control lever **iii)** Response control valve **iv)** External circuit knob
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
1	**2**		**3**	**4**	**5**
I.	**Upper hitch points:**				
	a)	Dia of hitch pin hole	19.30 to 19.50 / 25.70 to 25.90	25.73	Conforms to Cat. II
	b)	Width of ball	44.0 (max.) / 51.0 (max.)	44.0/51.0	Conforms to Cat. I & II

1	2	3	4	5
II	**Lower hitch points:**			
	a) Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	28.95	Conforms to Cat. II
	b) Width of ball	34.8 to 35.0 / 44.8 to 45.0	45.0	--do--
III	Lateral distance from lower hitch point to centre line of tractor	359 / 435	364.5	**Does not conform**
IV	Lateral movement of lower hitch points	100 (min) / 125 (min)	222	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	535	Conforms to Cat. I
VI	Transport height	820 (min)/ 950 (min)	885	--do—
VII	Power range (without force)	560(min)/ 650 (min)	595	--do—
VIII	Levelling adjustment	100 (min)/ 100 (min)	360	Conforms to Cat. I & II
IX	Lower hitch point clearance	100 (min)/ 100 (min)	160	--do--
X	Lower hitch point height	200 (max)/ 200 (max)	200	--do--

1.13.3 Linkage geometry dimensions {Refer Fig.-1(a)}:

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

S. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1	**2**	**3**	**4**	**5**
1.	Length of lower link	A	790	790
2.	Length of lift arm	B	235	235
3.	Length of lift rods	C	648 to 760	695
4.	Length of top link	D	530 to 730	550
5.	Distance of lift rod connection point from pivot point of lower link	E	400	400
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	100, behind	100, behind
	-Vertically	G	203, below	203, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	365, behind	365, behind
	-Vertically	J	290, above	290, above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	65, forward	65, forward
	-Vertically	L	370, above	370, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	95 to 275	185, above
	- In low position	N	-482 to -215	410, below
10.	Height of lower link hitch points when locked in transport position	185		

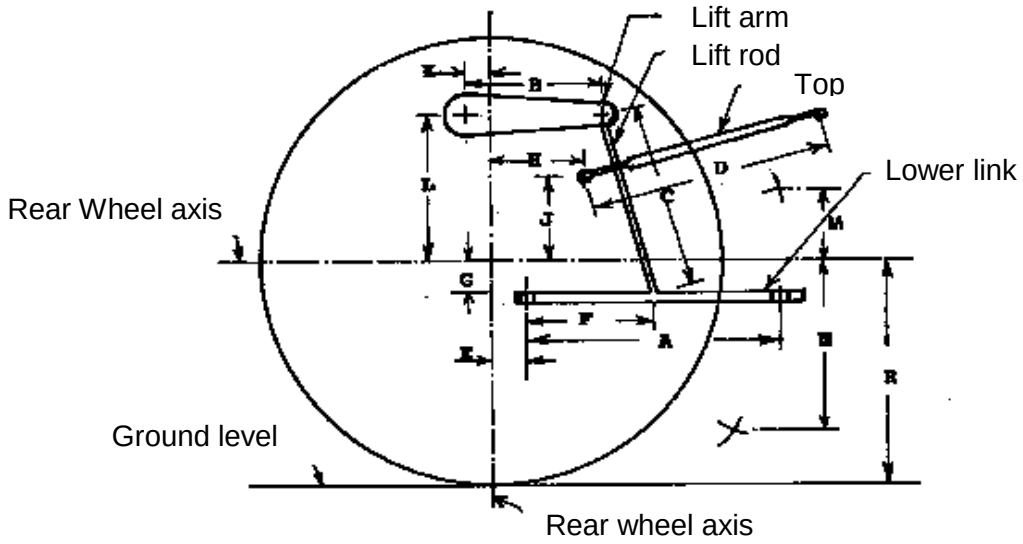


Fig. 1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

1.13.4 Drawbar:

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

Notation	As per IS: 12953-1990 (Reaffirmed in Oct.,2017),**(Cat.I) / (Cat.II),** (mm)	As measured, (mm)	Remarks
A	683 ± 1.5 / 825 ± 1.5	684.0	Conforms to Cat.-I
B	75 (min) / 75 (min)	75	Conforms to Cat. I & II
C	30 (min) / 30 (min)	30	--do--
D∅	21.79 to 22.0 / 27.79 to 28.0	27.97	Conforms to Cat. II
E	39.0 (min) / 49.0 (min)	55.0	Conforms to Cat. I & II
F∅	12.0 (min) / 12.0 (min)	12.1	--do--
G	15.0 (min) /15.0 (min)	16.9	--do--
H∅	25 ± 1 / 25 ± 1	25.0	--do--
J	80 ± 1.5 / 80 ± 1.5	79.5	--do--
No. of holes	7 / 9	07	Conforms to Cat. I

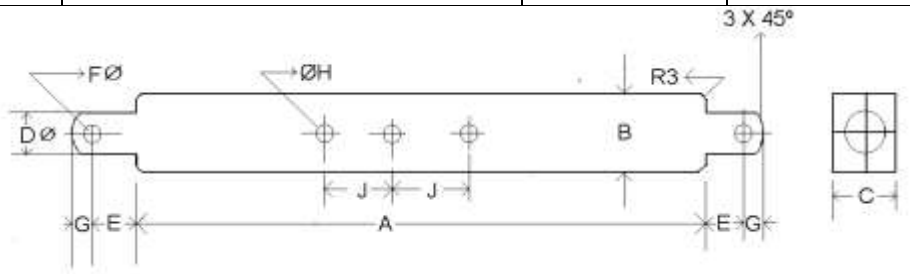


Fig. 1 (b): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

1.13.4.2 Swinging drawbar: : Not provided

1.14 Power take-off shaft:

Type	:	Type-I, Semi Independent
Method of engaging	:	By a hand lever provided on LHS of operator's seat
No. of shaft,(s)	:	One
PTO speed corresponding to rated engine speed, (rpm)	:	707
Distance behind rear axle, (mm)	:	360
Engine to PTO speed ratio	:	3.11:1
Other speeds, if any	:	None
Power restriction, (if any)	:	None

1.14.1 Specifications of Power Take-Off Shaft:

Specification	As per IS: 4931-1995 (Type-1) (Reaffirmed in 2014)	As observed	Remarks
1	2	3	4
Nominal speed, (rpm)	540 ± 10	540 rpm of PTO shaft corresponds to 1680 rpm of engine	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 right or left of the centre line of the tractor.	Centrally located	--do--
Dimensions, (mm) {See Fig. 2(a)}:			
D∅	34.79 ± 0.06	34.76	Conforms
d∅	28.91 ± 0.05	28.93	--do--
B∅	29.40 ± 0.10	29.44	--do--
A∅ (Optional)	8.30 ± 0.10	8.30	--do--
W	8.69 – 0.09 -0.16	8.61	--do--
a	7	7	--do--
b	25 ± 0.50	24.5	--do--
c	38.0	38.0	--do--
x	30^o	30^o	--do--
B	76 (min)	82	--do--
h	450 to 675	600	--do--

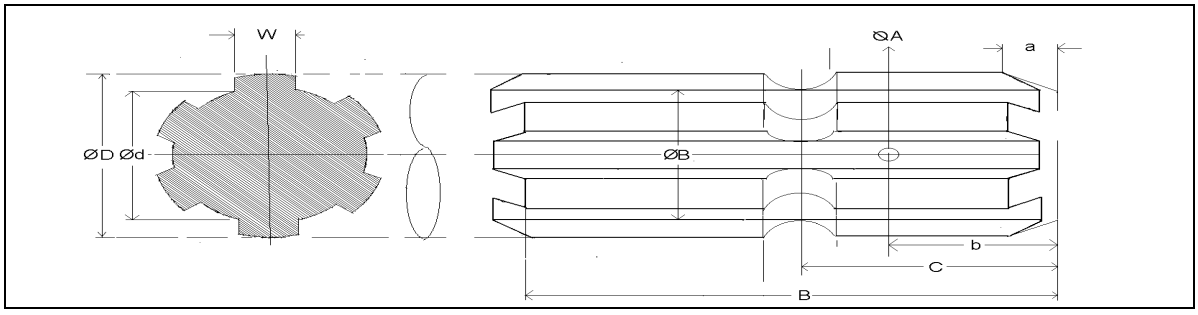


Fig. 2: DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT

1.14.2 Power Take-off Master Shield : Not Provided

1.15 Towing hitch:

1.15.1 Front:

Type : Clevis
Location : At front of axle support bracket.
Height above ground level, (mm) : 700 (fixed)
Type of adjustment : None
Dia of pin hole, : 34.0
Width of clevis, : 60.0

1.15.2 Rear:

Type : Clevis
Location : At rear of differential housing.
Height above ground level, (mm):
- Maximum : 835
- Minimum : 515

Number of positions : 08
Type of adjustment : By changing and reversing the position of hitch on its mounting bracket.

Distance of hitch point, (mm):

- From rear wheel centre	:	475
- From power take-off shaft end	:	115
Dia of pin hole,	:	34.4
Width of clevis,	:	80.0

1.16 Steering:

Make	:	Rane
Type	:	Hydrostatic, Open centre
Location	:	Above clutch housing
Method of operation	:	Through steering control wheel.
Diameter of steering control wheel, (mm)	:	430
Type & make of pump	:	Gear & United
Location	:	On RHS of engine
Method of drive	:	Through timing gear
Number, Type of hydraulic ram cylinder	:	02, Double acting , Double connecting
Make of hydraulic ram cylinder	:	Not available
Lubrication capacity (l)	:	1.9
Oil change period	:	Change after every 1600 hours of operation.

1.17 Brakes:

1.17.1 Service Brake:

Make	:	JMI
Type	:	Mechanical oil immersed
Location	:	On half axle shaft of bull pinion
No. of disc(s)	:	03 (on each wheel side)
Area of liners, (cm^2)	:	664.3 (on each wheel side)
Material of liners	:	Non-asbestos (apa)
Method of operation	:	Independent or combined operation of brake pedal provided on RHS of operator

1.17.2 Parking Brake:

Type	:	Pawl and ratchet arrangement
Location and method of operation	:	Service brake act as a parking brake when locked in position by a hand lever provided on RHS of operator's seat.

1.18 Wheel Equipment:

1.18.1 Steered Wheel,(s):

Make	:	MRF Shakti Life
Number	:	02 (Two)
Type of tyre	:	Pneumatic, ribbed
Size	:	6.00-16
Ply rating	:	8
Maximum permissible loading capacity of each tyre at 196 kPa pressure for road work	:	410 kg
Recommended inflation pressure, (kPa)	:	
- For field work	:	196
- For transport	:	196
Track width, (mm)	:	1340 (std.) & 1545
Method of changing track width	:	By reversing the wheel
Make & size of rim	:	Wheel India & W4.50 E × 16

1.18.2 Drive wheel(s):

Make	:	MRF SHAKTI LIFE
Number	:	02
Type of tyre	:	Pneumatic, traction
Size	:	13.6-28
Ply rating	:	12
Maximum permissible loading capacity of each tyre at 118 kPa pressure for road work	:	1230 kg

Recommended inflation pressure, (kPa):

- For field work	:	98
- For transport	:	118
Track width, (mm)	:	1320, 1390, **1440 (std.),** 1490, 1670, 1730, 1770 & 1810
Method of changing track width	:	By reversing wheel disc and by changing position of disc on offset rim lugs
Make & size of rim	:	WIL & W12 x 28

1.18.3 Wheel base, (mm) : 2080

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

1.19 Operator's seat:

Make	:	SAL (apa)
Type	:	Cushioned seat with backrest
Type of suspension	:	02, Helical coil spring
Type of damping	:	01, Hydraulic shock absorber

Range of adjustment, (mm):

Vertical	:	NIL
Lateral	:	NIL
Longitudinal	:	± 55

1.20 Provision for safety and comfort of operator:

1.20.1 Conformity with IS: 12343-1998 (Reaffirmed in 2014)

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

i) Length & width of seat are less than the minimum requirement.

ii) Vertical distance from centre of clutch pedal to Seat Index Point is less than the requirement.

1.20.2 Conformity with IS: 6283 (Part-1 & 2) – 2006 – 2007 (Re-affirmed in 2014):

Controls and displays are identifiable with symbols meets the requirements as per **IS: 6283 (Part 1&2) – 2006 – 2007 (Re-affirmed in 2014)**

1.20.3 Conformity with IS:8133-1983 (Re-affirmed in 2014), except the following:

Location and movement of various controls meets the requirement of IS:8133-1983 (Re-affirmed in 2014), **except the following**:

i) The fuel shut-off knob does not remain in stop position.

1.20.4 Conformity with IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017):

Meets the requirements of IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017), **except the following:**

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

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

Meets the requirements of IS:12239 (Part-2)-1999 (Re-affirmed in 2014), **except the following:**

i) Differential lock has not been provided.

ii) PTO Master shield has not been provided.

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 has been provided.

1.20.8 Slow moving emblem:

Slow moving emblem has been provided.

1.21 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in 2014):
Location of labelling plate: The labelling plate is riveted on outside of LHS fender and provides the following information:

Name of Manufacturer	**INDO FARM EQUIPMENT LIMITED**
Make	INDO FARM
Model	3048 DI C-Mesh
Year of manufacturer	04/18
Engine Serial Number	C328608094NV
Chassis Serial Number	DNW30482WD000001CM
Maximum P.T.O Power, kW	33.5
Specific fuel consumption, g/kWh	280

1.22 Ballast Conditions:

Particulars		As used during drawbar test	As used during field test		As used during Haulage test
			Dry land	Wet land	
Front	C.I. weight	81	Nil	Half cage Wheel with puddler	Nil
	Water	Nil	Nil		Nil
Rear	C.I. weight	400	200		Nil
	Water	320	320		Nil

1.22.1 Standard ballast, if any**: None**

Masses:

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	Without ballast	865	1260	2125
ii)	With ballast as used during drawbar performance test	980	1945	2925
iii)	With ballast as used during field test	890	1750	2640
iv)	As used during wet land operation (half cage wheel with puddler)	880	1405	2285
v)	As used during haulage test with trailer hitch and canopy	865	1260	2125

1.23 Overall dimensions:

Condition	Length, (mm)	Width, (mm)	Height, (mm)		Ground clearance, (mm)
			With exhaust Pipe	Without exhaust pipe	
Without ballast	3685	1825	2405	1675 (at steering wheel)	385 (below differential housing)

1.24 Number of external lubricating Points:

- Oiling : Nil
- Greasing cups : 02
- Greasing nipples : 19

1.25 Colour of tractor:

Chassis & engine : Black

Sheet metal:

Bonnet and mudguard : Green

Wheel rim & disc : Silver

1.26 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:

Sl. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine	SAE 20W40	As recommended
2.	Transmission, brakes, Steering system & Hydraulic system	EP 80	Oil originally filled in the tractor's system was not changed
3.	Grease	Multipurpose grease	As recommended

3. PTO PERFORMANCE TEST

Date(s) of test : 02.01.2019, 08.01.2019,14.03.2019 & 15.03.2019

Tractor run at the Institute prior to start of PTO test (h) : 2.50

Type of dynamometer bench : SAJ AG-250, Eddy Current

3.1 During the course of testing PTO performance test, max power was recorded as 30.8 kW against the declaration of 33.5 kW which is less than the minimum requirement of 31.8 kW. To rectify the problem in the engine the following checking /adjustment were carried out.

a) Injector pressure has been checked.

Before observed (kgf/cm^2)	Adjust as per service manual (kgf/cm^2)
250,243 & 246	260 for each

b) Tappet valve clearance was checked & measured as 0.35 mm & 0.45 mm for Inlet & Exhaust valve respectively against the specified value of 0.30 mm & 0.40 mm respectively .The Valve clearance was set at 0.30 mm & 0.40 mm for both Inlet & exhaust valves.

c) Fuel injection timing was checked & found correct.

d) Clutch pedal free play was checked & found correct.

e) Air cleaner filter were cleaned.

3.1.1. Again the PTO performance test, max power search test was conducted & power was observed as 31.3 kW @2199 engine rpm against the declaration of 33.5 kW, which is less than the minimum requirement of 31.8 kW. Thereafter the no load engine rpm was set as 2445 rpm & the test was conducted & the power was observed as 31.6 kW @ 2245 engine rpm ,which is 5.6 % less the declared value & does not meet the evaluative requirement of IS:12207-2019

3.1.2 Thereafter, applicant wants to introduce radiator side top sealing arrangement. In this regard applicant submitted drawing and parts catalogue of existing arrangement versus modified arrangement. Sealing plate assembly' having the part no. 40001013AA fitted in between radiator & bonnet sheet metal provided in Annexure –IV ,to reduce air intake temperature and "**Repeat test**" was conducted.

3. 2 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:						
32.0	723	2249	11.48	9.60	0.300	2.79
29.6	723	2249	10.92	9.13	0.308	2.71*
b) Power at rated engine speed (2200 rpm):						
31.6	707	2199	11.41	9.54	0.302	2.77
29.8	707	2199	11.00	9.20	0.309	2.71*
c) Power at standard power take-off speed (540 ± 10 rpm):						
27.9	540	1680	8.94	7.47	0.268	3.12
26.0	540	1680	8.49	7.10	0.273	3.06*
d) Varying loads at rated engine speed:(2200 rpm)						
i) Torque corresponding to maximum power available at rated engine speed						
31.6	707	2199	11.41	9.54	0.302	2.77
ii) 85% of the torque obtained in (i):						
28.6	749	2330	10.45	8.74	0.306	2.74
iii) 75% of the torque obtained in (ii):						
21.7	756	2352	8.23	6.88	0.317	2.64
iv) 50% of the torque obtained in (ii):						
14.7	765	2380	6.52	5.45	0.371	2.25
v) 25% of the torque obtained in (ii):						
7.4	773	2405	5.01	4.19	0.566	1.48
vi) Unloaded:						
0.3	786	2445	3.70	3.09	10.300	0.08
e) Varying loads at standard PTO speed (540 ± 10 rpm):						
i) Torque corresponding to maximum power available at standard PTO speed (540 ± 10 rpm):						
27.9	540	1680	8.94	7.47	0.268	3.12
ii) 85% of the torque obtained in (i):						
24.9	569	1770	7.73	6.46	0.259	3.22
iii) 75% of the torque defined in (ii):						
18.9	576	1792	6.06	5.07	0.268	3.12
iv) 50% of the torque defined in (ii):						
12.8	583	1814	4.64	3.88	0.303	2.76
v) 25% of the torque defined in (ii):						
6.4	591	1839	3.35	2.80	0.437	1.91
vi) Unloaded:						
0.3	609	1895	2.28	1.91	6.37	0.13

*** Under high ambient conditions**

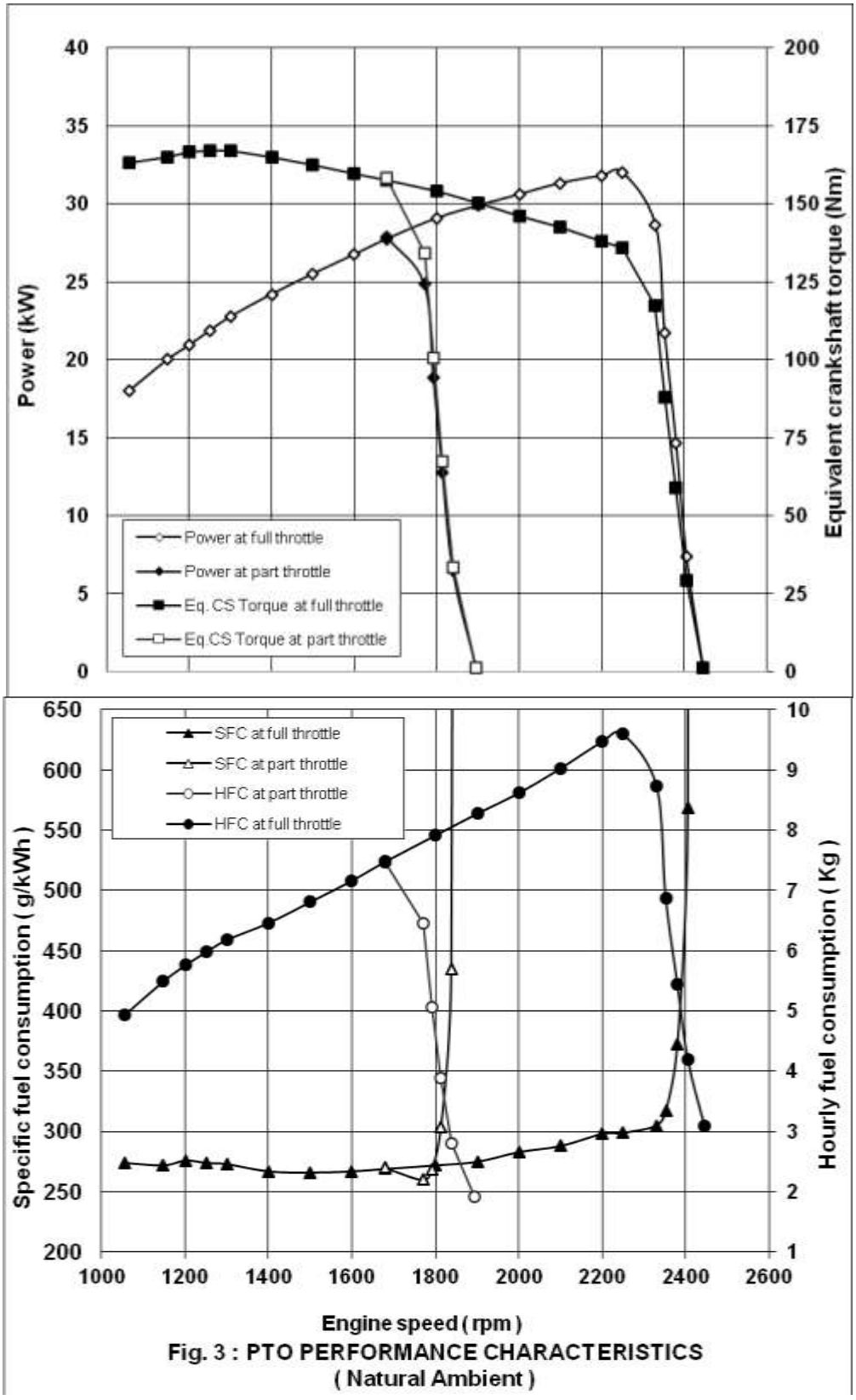
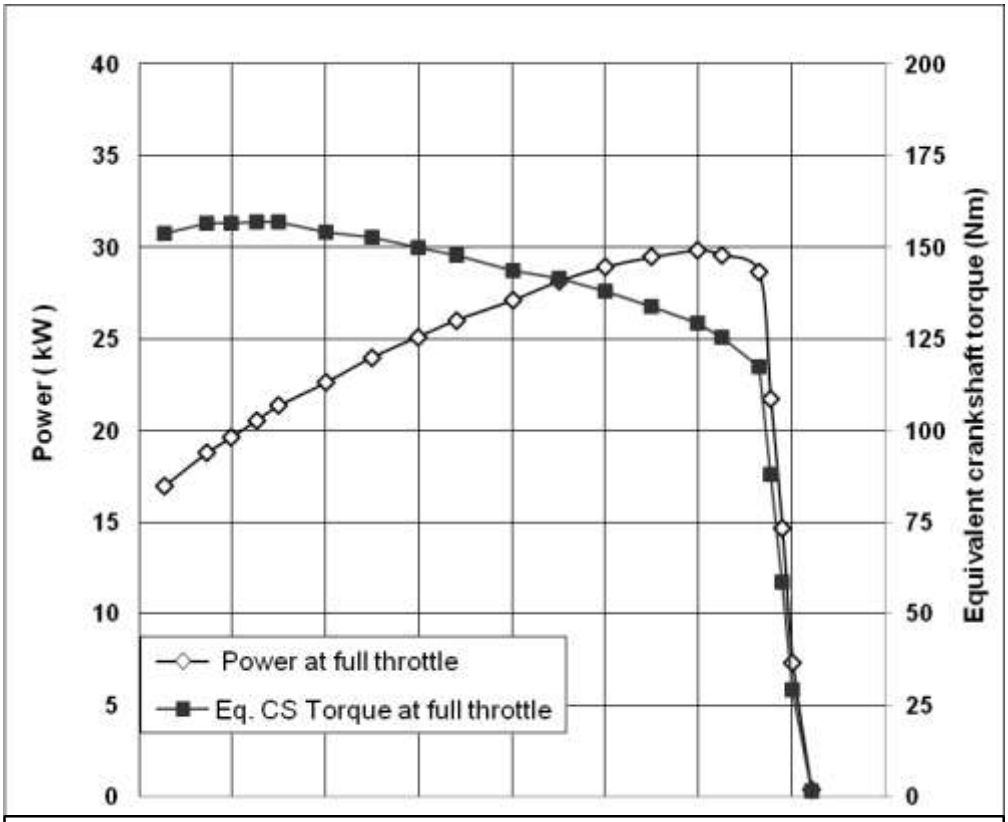


Fig. 3 : PTO PERFORMANCE CHARACTERISTICS
(Natural Ambient)



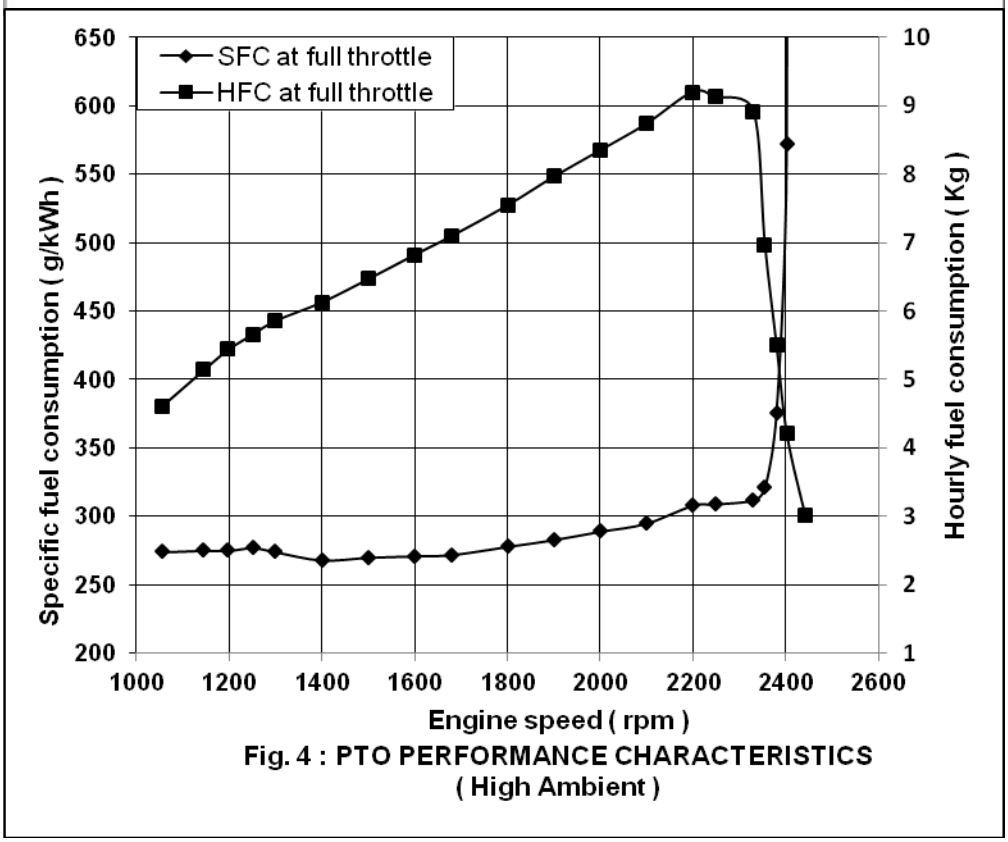


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS
(High Ambient)

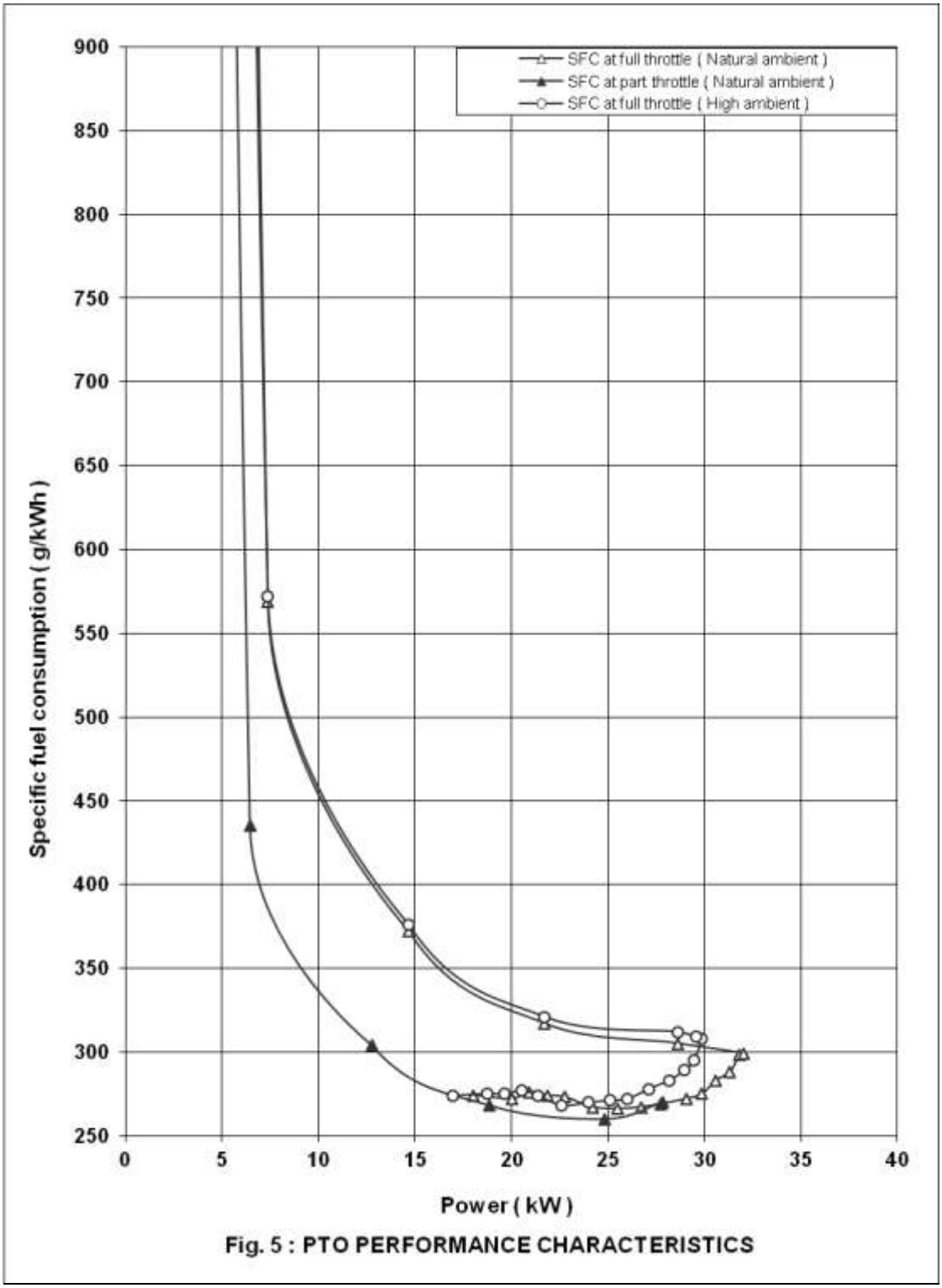


Fig. 5 : PTO PERFORMANCE CHARACTERISTICS

		Natural ambient	High ambient
-No load maximum engine speed, (rpm)	:	2445	2442
-Equivalent crankshaft torque at maximum power, (Nm)	:	135.9	125.6
-Maximum equivalent crankshaft torque, (Nm)	:	167.2	156.9
-Engine speed at maximum equivalent crankshaft torque, (rpm)	:	1251	1300
Backup torque, (%)	:	23.0	24.9
Smoke level (maximum light absorption coefficient, per meter)	:	0.46	---
- Range of atmospheric conditions:			
Temperature, (^{o}C)	:	25 to 28	41 to 44
Pressure, (kPa)	:	99. 2 to 99.6	100.3 to 100.7
Relative humidity, (%)	:	45 to 50	24 to 29
-Maximum temperatures, (^{o}C):			
Engine oil	:	100	108
Coolant (Water + Coolant)	:	90	104
Fuel	:	45	62
Air intake	:	42	60
Exhaust gas	:	676	688
-Pressure at maximum power:			
Intake air, (kPa)	:	4.0 to 4.3	4.1 to 4.1
Exhaust gas, (kPa)	:	8.8 to 9.0	8.3 to 9.7
-Consumptions:			
Lub oil, (g/kWh)	:	--	0.48
Coolant (% of total coolant capacity)	:	--	0.45

4. DRAWBAR PERFORMANCE TEST

Date(s) of test	:	14.06.2019, 17.06.2019, 18.06.2019 & 19.06.2019
Tractor run at the Institute prior to start of drawbar performance test, (h)	:	22.5
Type of track	:	Concrete
Height of drawbar, (mm):		
- Without ballast	:	600
- With ballast	:	550

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

Table - 2

DRAWBAR PERFORMANCE TEST

Gear	Travel Speed, (km/h)	Draw-bar power, (kW)	Draw-bar pull, (kN)	Engine Speed, (rpm)	Wheel Slip, (%)	Fuel consumption		Specific Energy, (kWh/l)	Atmospheric conditions			Temperature (°C)				Max. sust-ained pull, (kN)
						(kg/ kWh)	(l/h)		Temp (°C)	Pre-ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Cool-ant (wate r)	Eng-ine oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor under unballasted condition):																
L1	2.42	10.4	15.40	2374	15.4	0.515	6.41	1.62	32	98.2	54	46	64	77	106	17.05
L2	3.42	14.8	15.59	2355	15.2	0.444	7.86	1.88	31	98.2	53	45	64	78	108	16.87
L3	5.30	22.9	15.58	2292	14.8	0.413	11.31	2.02	30	98.2	52	45	63	85	108	16.32
L4	7.52	25.7	12.31	2201	7.0	0.369	11.34	2.27	30	98.2	54	43	63	86	108	14.78
H1	10.14	26.9	9.56	2200	4.6	0.356	11.45	2.35	29	98.2	51	43	55	87	108	11.07
ii) Maximum power test (Tractor under ballasted condition):																
L1	2.39	13.7	20.67	2358	15.0	0.442	7.24	1.89	35	97.7	40	50	77	79	110	22.06
L2	3.34	19.5	21.00	2316	14.8	0.420	9.79	1.99	35	97.8	42	51	77	86	112	22.31
L3	5.44	24.4	16.17	2205	8.0	0.387	11.29	2.16	34	97.9	42	50	64	90	111	19.53
L4	7.57	23.2	11.05	2200	5.2	0.412	11.43	2.03	33	98.0	42	48	56	89	109	14.31
H1	10.18	25.6	9.04	2202	3.1	0.371	11.36	2.25	32	98.0	47	47	39	85	102	10.30

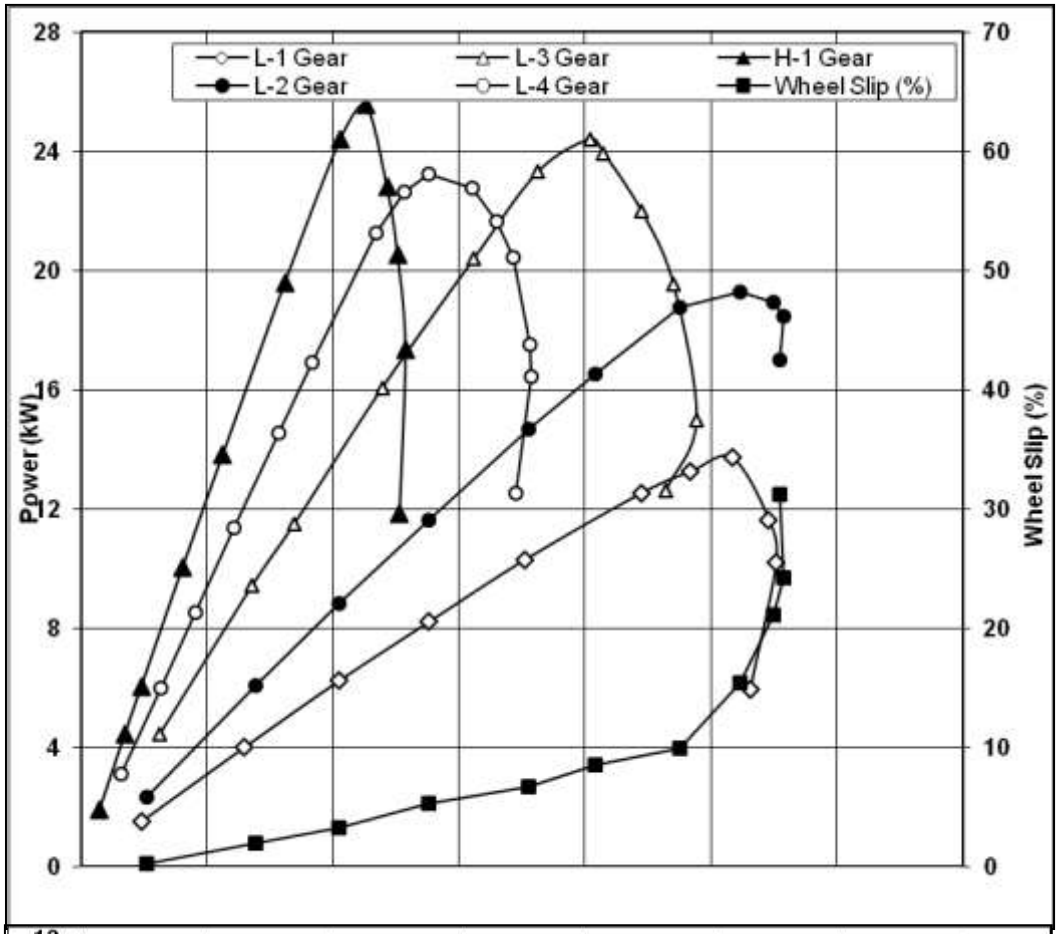
Contd..Table-2

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. sust-ained 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	5.94	20.02	12.13	2325	5.4	0.387	9.49	2.09	27 to 31	97.8 to 97.9	50 to 60	41 to 46	55 to 80	77 to 81	106 to 110	--
iv) Five hours test at pull corresponding to 15 percent wheel slip (ballasted wheeled tractor):																
L1	3.46	20.21	21.02	2331	--	0.397	9.84	2.05	30 to 33	97.5 to 97.9	54 to 63	45 to 49	77 to 80	77 to 82	107 to 111	--

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

ii) Tyre Creeping, (mm):
- LHS : 30
- RHS : 30

iii) Maximum temperatures during entire drawbar test, (°C):
Engine oil : 112
Coolant (water) : 90
Transmission oil : 80
Fuel : 51



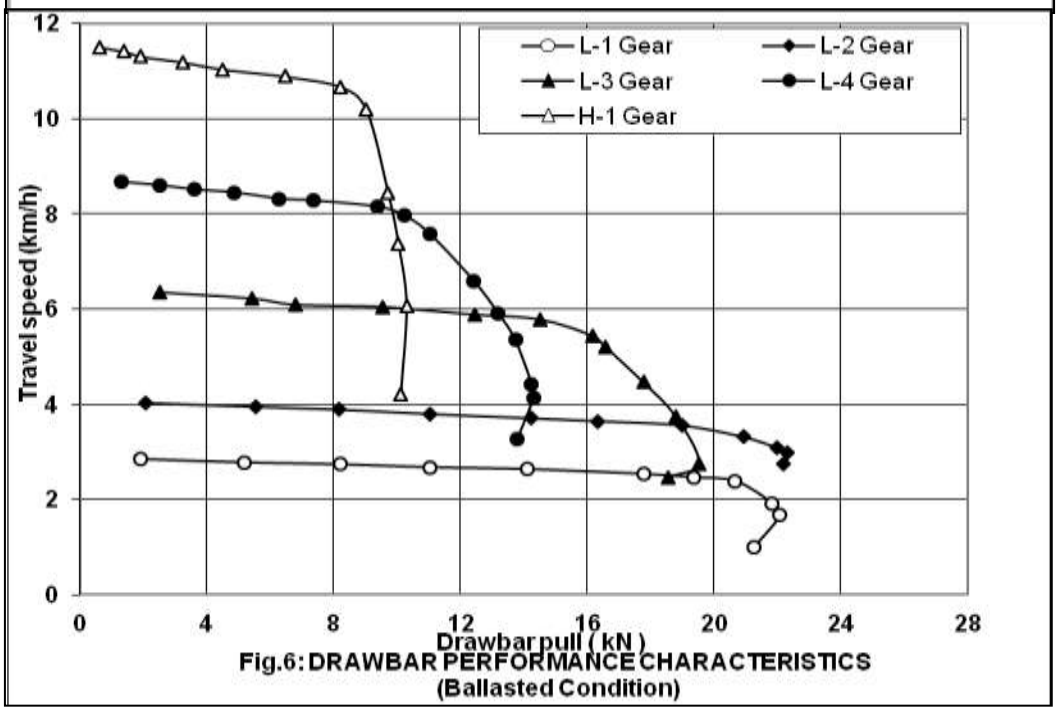


Fig.6: DRAWBAR PERFORMANCE CHARACTERISTICS
(Ballasted Condition)

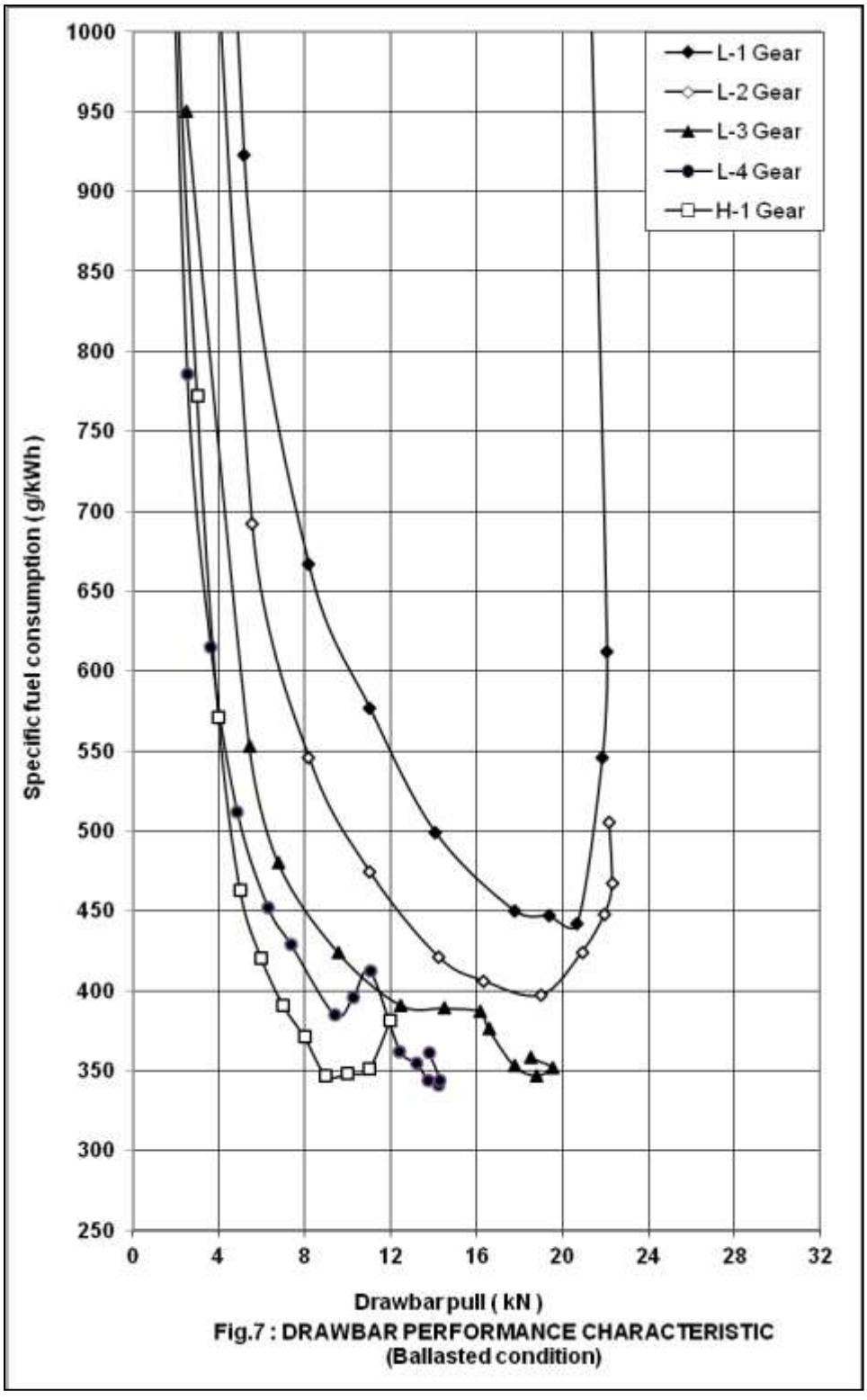


Fig.7 : DRAWBAR PERFORMANCE CHARACTERISTIC
(Ballasted condition)

5. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE TEST

Date(s) of test	:	21.05.2019 & 22.05.2019
Tractor run at the Institute prior to start of hydraulic test, (h)	:	20.0
Pump speed at rated engine speed, (rpm)	:	2200

5.1 Hydraulic power test:

Pump delivery rate at min. pressure and rated engine speed, (l/min)	:	26.2
Maximum hydraulic power,(kW)	:	5.2
Pump delivery rate at maximum hydraulic power, (l/min)	:	19.6
Pressure at maximum hydraulic power, (MPa)	:	16.0
Sustained pressure of the open relief valve, (MPa)	:	20.5

Tapping point:

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

5.2 Lifting capacity test:

Test	Height of lower hitch point above ground in down position, (mm)	Vertical Movement with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corres-ponding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical , (degrees)
At hitch points	200	570	12.78	18.45	11.37	-
On the standard frame	200	570	9.21	18.45	13.82	12.5

5.3 Maintenance of lift load:

Force applied at the frame, (kN)	:	8.29
Temperature of hydraulic fluid at the start of test, (°C)	:	60

Test data:

Elapsed Time, (minute)	05	10	15	20	25	30
Cumulative drop in height of lift, (mm)	32	47	57	61	64	67

6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test : 07.12.2018
Type of track : Concrete
Maximum attainable speed, (kmph):
- With Unballasted : 35.0

		At maximum attainable speed			
With Unballasted	Braking device control force, (N)	593	470	347	223
	Mean deceleration, (m/sec^2)	3.23	3.03	2.92	2.50
	Stopping distance, (m)	14.88	15.60	16.21	18.90

		At 25 kmph travel speed			
With Unballasted	Braking device control force, (N)	513	445	378	310
	Mean deceleration, (m/sec^2)	2.81	2.66	2.55	2.50
	Stopping distance, (m)	8.64	9.06	9.46	9.65

6.1.2 Brake fade test:

		At maximum attainable speed			
With Unballasted	Braking device control force, (N)	619	488	356	225
	Mean deceleration, (m/sec^2)	3.20	3.04	2.80	2.50
	Stopping distance, (m)	14.98	15.55	16.89	18.90

		At 25 kmph travel speed			
With Unballasted	Braking device control force, (N)	515	449	383	317
	Mean deceleration, (m/sec^2)	2.79	2.58	2.53	2.50
	Stopping distance, (m)	8.89	9.36	9.54	9.65

Maximum deviation of tractor from its original course, (m) : None
Abnormal vibration : None
The brakes were heated by : Self braking

6.2 Parking brake test:

Particulars	Parked on 18 percent slope		Parked on 12 percent slope with trailer of 2.13 tonnes.	
	Facing Up	Facing Down	Facing Up	Facing Down
Braking device control force, (N)	321	305	210	238
Efficacy of parking brake	---------- Effective ----------			

Remarks: The applicant had not recommended any ballasting for road application. Hence, the brake fade test was conducted in unballasted condition.

7. NOISE MEASUREMENT

7.1 Noise at bystander's position:

Date of test : 30.11.2018
Type of track : Concrete
Background noise level, dB (A) : 55.1

Atmospheric conditions:

Temperature, (°C) : 29.5
Pressure, (kPa) : 98.1
Relative humidity, (%) : 42
Wind velocity, (m/s) : 2.6

Test Data:

S. No.	Gear	Travelling speed before acceleration, (kmph)	Noise level, dB(A)
1.	L1	2.14	85
2.	L2	3.08	85
3.	L3	4.86	85
4.	L4	6.55	85
5.	H1	8.56	84
6.	H2	12.20	84
7.	H3	19.39	83
8.	H4	25.81	82

7.2 Noise at operator's ear level:

Date of test : 19.03.2019
Type of track : Concrete
Background noise level, dB(A) : 53

Atmospheric conditions:

Temperature, (°C) : 32
Pressure, (kPa) : 98.4
Relative humidity, (%) : 25
Wind velocity, (m/s) : 1.2

Test Data:

Gear	Drawbar pull at which the tractor develops the max. noise level, (kN)	Corresponding travelling speed, (kmph)	Noise level dB(A)
L1	11.11 to 15.31	2.67 to 2.45	93
L2	4.96 to 15.21	3.99 to 3.52	93
L3	13.68 to 15.56	5.75 to 5.26	94
*L4	1.55 to 11.51	8.78 to 7.85	93
H1	0.47 to 9.20	11.66 to 9.97	92

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

8. MECHANICAL VIBRATION MEASUREMENT

Date of test : 15.07.2019
Type of test surface : Concrete

Sl. No.	Measuring points		Vibration, microns			
			At load corresponding to 85% of max. PTO power		At no load	
			HD	VD	HD	VD
i)	Foot rest	Left	83	52	21	46
		Right	96	80	56	63
ii)	Steering wheel		110*	124*	106*	120*
iii)	Seat	Bottom	52	37	60	24
		Back	24	70	22	60
iv)	Mudguard	Left	58	125*	39	106*
		Right	40	97	35	88
v)	Head light	Left	72	60	53	64
		Right	60	68	40	63
vi)	Battery base, centre		96	92	64	82
vii)	Tail light	Left	105*	220*	56	166*
		Right	59	102*	61	79
viii)	Plough light		160*	221*	124*	127*
ix)	Gear shifting lever		28	35	25	40
x)	Accelerator lever	Hand	367*	259*	314*	208*
		Foot	24	84	19	70
xi)	Brake pedal	Left	75	111*	57	92
		Right	119*	136*	69	107*
xii)	Clutch pedal		92	115*	59	115*
xiii)	Main hydraulic control lever		51	30.80	41	37
xiv)	PTO engaging lever		31	45	20	14
xv)	Differential lock lever		NA	NA	NA	NA

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

9. 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)	773.71
	Distance forward from the vertical plane containing the axis of rear wheels, (mm)	842.01
	Distance from the median plane parallel to the longitudinal axis of tractor bisecting the track, (mm)	1.58 (towards RHS)

10. TURNING ABILITY

Characteristics	Minimum turning diameter,(m)		Minimum clearance diameter,(m)	
	LHS	RHS	LHS	RHS
Brakes released	7.45	7.70	7.83	8.06
Brake applied	6.43	6.66	6.71	6.96

11. OPERATOR'S FIELD OF VISION

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

1. The non visible space in front is **7720 mm** which is **3.71** times of wheel base (i.e. 2080mm).
2. The non-visible space on LHS and RHS is **2530 mm** which is **1.76** times of standard rear track width (i.e. 1440 mm).
3. Silencer is creating masking effect.

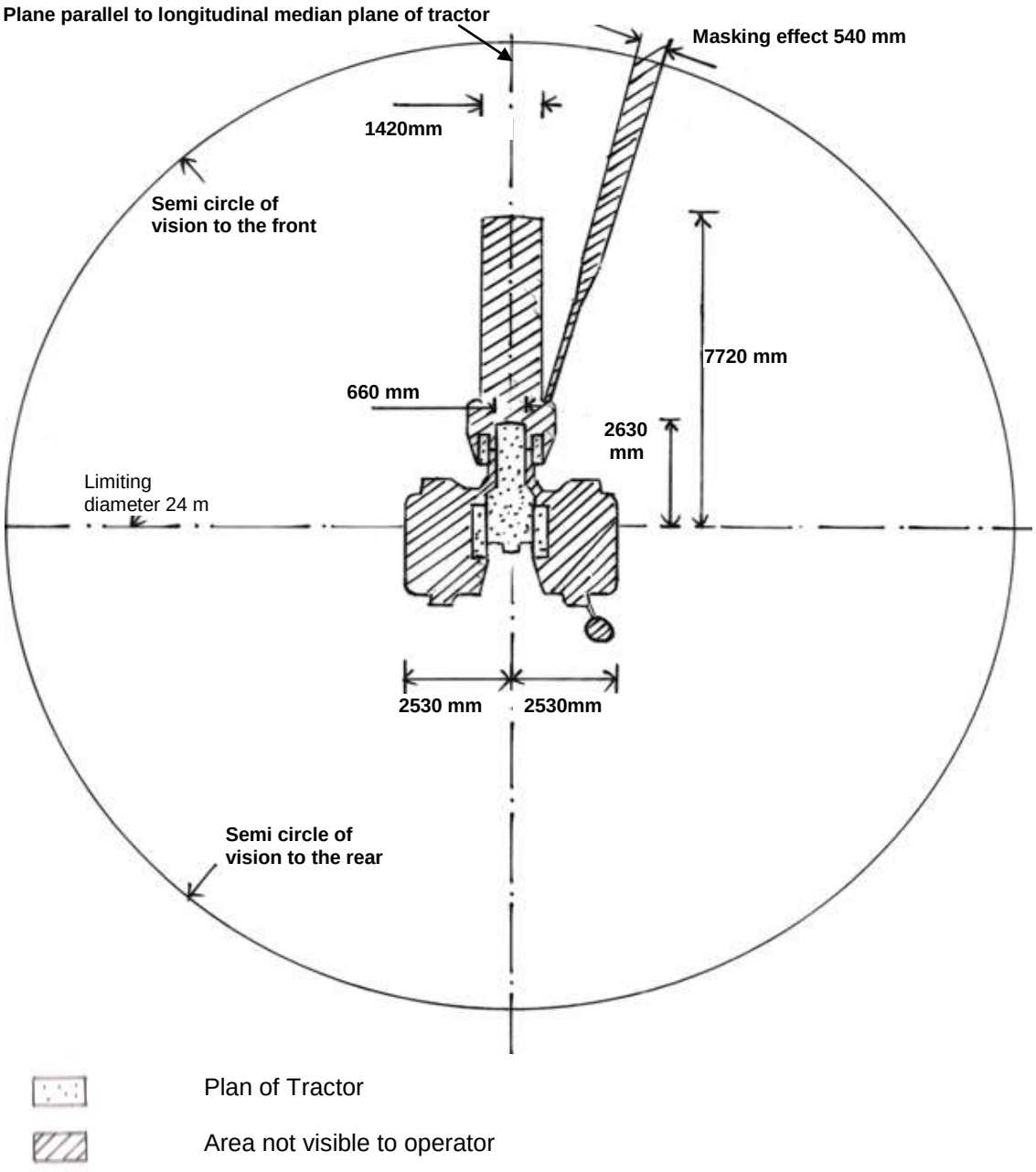


Fig.8 Operator's Field of Vision

12. FIELD TEST

12.1 The field tests comprising of Disc Ploughing, rotavation and puddling (including water proof test) were conducted for **10.7, 10.1** and **15.3** hours respectively.
All the field tests were conducted at the full accelerator settings, when the no load speed of the engine varied from **2404** to **2440 rpm**.

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

12.3 The summary of field test observation with Disc Plough, rotavator and puddling is given in **Table - 3.**

Table – 3

SUMMARY OF FIELD PERFORMANCE TEST

Sl. No.	Parameter/operation	Disc Ploughing	Rotavation	Puddling
i)	Type of soil	Heavy	Heavy	Heavy
ii)	Av. soil moisture, (%) / Av. depth of standing water, (cm)	15 to 18	15 to 17	15
iii)	Bulk density of soil, (g/cc)	1.60	1.50 to 1.55	-
iv)	Cone index, (kg/sq.cm) / Puddling index, (%)	5.78 to 6.80	6.80 to 7.65	72.5 to 73.8
v)	Gear used	L-2	L-1	L-2
vi)	Av. speed of operation, (kmph)	3.56 to 3.59	2.74 to 2.79	3.06 to 3.09
vii)	Av. wheel slip, (%) / Av. Travel reduction, (%)	8.20 to 8.42	-1.7 to -0.54	21.3 to 21.9
viii)	Av. depth of cut, (cm) / Av. Depth of puddles, (cm)	18 to 19	7 to 8	25 to 26
ix)	Av. working width, (cm)	60 to 67	147 to 148	--
x)	Area covered, (ha/h)	0.189 to 0.203	0.309 to 0.326	--
xi)	**Fuel consumption:**			
	- (l/h)	4.75 to 5.10	6.31 to 6.48	5.04 to 5.21
	- (l/ha)	23.4 to 27.0	19.85 to 20.39	--
xii)	Av. draft of implement, (kN)	9.32 to 9.52	--	--

Remarks: The average lub oil and coolant (water) consumptions during the entire field tests were observed **0.55** and **8.81 ml/h** respectively.

12.4 Wet land cultivation (Puddling):

12.4.1 The tractor was fitted with half cage wheels and puddler for conducting the pudlling operation. The brief specifications of half cage wheels and puddler are given in **Annexure – I and II.**

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

S. No.	Location	Whether ingress of mud/or water	Remarks
1.	Clutch Assembly	No	Ingress of water was observed on LHS & RHS king pin assemblies.
2.	Brake housing	No	
3.	Front Axle hubs	No	
4.	King pin assemblies (LHS & RHS)	Yes	
5.	Engine oil	No	
5.	Transmission oil	No	
6.	Alternator	No	
7.	Starter motor	No	

13. HAULAGE TEST

Type of trailer:		Two wheel (Single axle)	Four wheel (Double axle)
Gross mass of trailer, (tonnes)	:	5.0	6.0
Height of trailer hitch above ground level, (mm)	:	520	650
Gear used during the test for negotiating slopes upto 8%	:	H4	H4
Average travel speed, (kmph)	:	31.02 to 31.41	30.64 to 31.02
Average fuel consumption:			
- (l/h)	:	6.79 to 6.99	6.96 to 7.09
- (ml/km/tonne)	:	43.8 to 44.5	37.9 to 38.1
Average distance travelled per litre of fuel consumption, (km)	:	4.50 to 4.57	4.38 to 4.40
General observations:			
Effectiveness of brakes	:	Effective	Effective
Maneuverability of tractor-trailer Combination	:	Satisfactory	Satisfactory

14. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **92.6** hours of tractor operation at this Institute.

14.1 Engine:

14.1.1 Cylinder bore:

Cylinder No.	Cylinder bore diameter, (mm)						Max. permissible limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust Side	Non-thrust Side	Thrust side	Non-thrust side	
1.	105.065	105.069	105.075	105.070	105.080	105.078	105.3
2.	105.078	105.052	105.078	105.060	105.078	105.064	
3.	105.076	105.074	105.085	105.070	105.090	105.068	

14.1.2 Piston:

Piston No.	Piston diameter, (mm)				Max. permissible wear limit,	Piston to cylinder liner clearance at skirt (mm)	
	Top (above top compression ring)		At skirt			As observed	Max. permissible limit,
	Thrust Side	Non-thrust side	Thrust side	Non-thrust side			
1.	104.493	104.442	104.941	104.511	104.71	0.139	0.45
2.	104.440	104.410	104.943	104.515		0.135	
3.	104.493	104.445	104.943	104.517		0.147	

14.1.3 Ring end gap:

Rings	Ring end gap, (mm)									Max. Permissible end gap limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No.3			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1st comp ring	0.50	0.55	0.55	0.55	0.55	0.55	0.55	0.50	0.50	2.0
2nd comp ring	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.95	2.0
Oil ring	0.65	0.70	0.75	0.65	0.60	0.65	0.60	0.60	0.60	2.0

14.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)			Max. Permissible clearance Limit, (mm)
	Piston-I	Piston-II	Piston-III	
1st Compression ring	---------- Tapered ----------			--
2nd Compression ring	0.091	0.085	0.085	0.22
Oil ring	0.048	0.039	0.046	0.20

14.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.094 to 0.078	0.320	0.40	0.60
2.	0.106 to 0.280			
3.	0.123 to 0.095			
4.	0.105 to 0.082			

14.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. permissible clearance limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.089 to 0.061	0.25	0.60	0.70
2.	0.072 to 0.078	0.25		
3.	0.074 to 0.056	0.25		

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

Any marked sign of overheating of valves	:	None	
Pitting of seat/faces of valves	:	None	
Any visual damage to the teeth of timing gears	:	None	
Spring Rate, (N/mm):			
Intake valve spring	:	2.55 to 2.60	Against the discard limit of 5 N/mm
Exhaust valve spring	:	2.55 to 2.65	
Clearance between valve guide and valve stem, (mm):			
Intake valve	:	0.051 to 0.055	Against discard limit of 0.60 mm
Exhaust valve	:	0.044 to 0.047	

14.2 Clutch:

Any marked wear on clutch friction plate(s)	:	None	
Condition of clutch release bearing	:	Normal	
Condition of pilot bearing	:	Normal	
Condition of diaphragm springs.	:	Normal	
Presence of oil in clutch housing	:	None	
Any marks on fly wheel/pressure plate	:	None	
Overall thickness (mm):			
Transmission		10.82 to 11.06	Against discard limit of 6.6 mm
PTO		7.60 to 7.70	
Height of lining over rivet head, (mm):			
Transmission	:	2.72 to 2.89	Against discard limit of 0.1 mm
PTO	:	1.13 to 1.27	

14.3 Transmission gears:

Any visual damage, pitting & chipping of any transmission gear teeth	:	None	
Backlash between crown wheel and Pinion, (mm)	:	0.301	Against discard limit of 0.60 mm

14.4 Brakes:

Description	Initial specified thickness of brake disc, (mm)	Measured overall thickness of brake disc after test,(mm)	Measured depth of groove above rivet head, (mm)	Minimum permissible depth of oil groove of brake lining (mm)
Left	4.9±1	4.85 to 4.96	1.06 to 1.18	0.20
Right	4.9±1	4.84 to 4.94	1.06 to 1.16	

14.5 Front axle:

Any marked wear of king pins	:	None	
Any marked wear of king pin bushes	:	None	
Clearance between king pin and bushes, (mm)	:	0.063 to 0.190	Against discard limit of 0.40 mm
Condition of thrust bearings	:	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)	:	0.063 to 0.122	Against discard limit of 0.40 mm

14.6 Steering system:

Visual condition of the components of complete steering assembly	:	Normal

14.7 Starter motor & Alternator:

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

15. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments/Defects/Breakdowns and Repairs		Tractor run hours
1.	During the PTO performance test, max power was recorded as 30.8 kW against the declaration of 33.5 kW which is less than the minimum requirement of 31.8 kW. To rectify the problem persist in the engine the following checking /adjustment were carried out.		4.3
	i)	Injector pressure has been also checked.	
		Before observed (kgf/cm^2) / Adjust as per service manual (kgf/cm^2)	
		250,243 & 246 / 260	
	ii)	Tappet valve clearance was checked & measured as 0.35 mm & 0.45 mm for Inlet & Exhaust valve respectively against the specified value of 0.30 mm & 0.40 mm respectively .The Valve clearance was set at 0.30 mm & 0.40 mm for both Inlet & exhaust valves.	
	iii)	Fuel injection timing was checked & found correct.	
	iv)	Clutch pedal free play was checked & found correct.	
	v)	Air cleaner filter were cleaned.	
2.	Again the PTO performance test, max power search test was conducted & power was observed as 31.3 kW @2199 engine rpm against the declaration of 33.5 kW, which is less than the minimum requirement of 31.8 kW. Thereafter the no load engine rpm was set as 2445 rpm & the test was conducted & the power was observed as 31.6 kW @ 2245 engine rpm ,which is 5.6 % less the declared value & does not meet the evaluative requirement of IS:12207-2019		8.20
3.	Now, applicant wants to introduce radiator side top sealing arrangement. In this regard applicant submitted drawing and parts catalogue of existing arrangement versus modified arrangement. Sealing plate assembly' having the part no. 40001013AA fitted in between radiator & bonnet sheet metal to reduce air intake temperature and "Repeat test" was conducted.		8.20
4.	During the preparation of hydraulic performance test, lower link was not coming down at the same level while lifting & lowering operation. Thereafter cleaning of transmission oil & checking /gauging of control valve assembly as per operator service manual was done.		19.5
5.	During the drawbar test preparation, water/coolant leakage from water temperature sensor and return line joint were seen, So the internal thread of water temperature sensor has been repaired.		22.5

16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

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

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	Values declared by the applicant (D)/ Require-ment (R)	As observed	Whether meets the require-ments (Yes/No.)
1	2	3	4	5	6	7
16.1.1	**PTO Performance :**					
a)	Maximum power under 2 h test, kW (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of **±**5 percent for PTO power and or engine power > 26 kW **±**10 percent for PTO power and or engine ≤ 26 kW	33.5 (D)	32.0	Yes
b)	Power at rated engine speed, kW	Non Evaluative	-do-	33.5 (D)	31.8	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+10 percent Max.	280 (D)	300	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8 percent	176 (D)	167.2	Yes
e)	Back-up torque, percent	Evaluative	12 percent	17.6 (D)	23.0	Yes
f)	**Maximum operating temperature, (^{O}C)**					
	1) Engine oil	Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	120 (D)	108	Yes
	2) Coolant /cylinder liner temperature, in case of air cooled engine	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	110 (D)	104	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	Max 2.7 (D)	0.48	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 (D)	0.46 per meter	Yes

1	2	3	4	5	6	7
16.1.2	**Drawbar performance :**					
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip or 7 percent slip, kN	Non Evaluative	Minimum 70 percent of static mass with ballast	19 (D) 20.08 (R)	21.00	Yes
b)	Max. drawbar pull without ballast, as the case may be corresponding to 15 percent wheel slip or 7 percent track slip, kN	Evaluative	Minimum 70 percent of static mass of tractor without ballast or with standard ballast, as the case may be	14.0 (D) 14.59 (R)	15.59	Yes
c)	Maximum drawbar power without ballast as the case may be, 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.	26.8 (D) 25.6 (R)	26.9	Yes
d)	For tractors fitted with air conditioned/heated cabin: Maximum drawbar power without ballast, or with standard ballast as the case may be, kW	Evaluative	Minimum 70 % of PTO power as referred in Sl No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg	Not fitted	Not fitted	Not applicable
e)	Max. transmission oil temperature (^{o}C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	80	Yes
16.1.3.	**Power lift and hydraulic pump performance :**					
a)	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Evaluative	[Tolerance of ± 10%]	13.7 (D)	12.78	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	10.2 (D) 7.53 (R)	9.21	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 min. interval for a total duration of 30 min/ mm	Non Evaluative	The observed value should not exceed 50 mm.	Max 49	67	**No**
16.1.4	**Brake performance at 25 kmph travel speed**					
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with standard ballast (m):					
	1) Cold brake	Evaluative	10	10 (R)	8.64	Yes
	2) Hot brake	Evaluative	10	10 (R)	8.89	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (N)	Evaluative	600	600 (R)	310 to 317	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 (R)	Yes	Yes

1	2		3	4	5	6	7
16.1.5	**Noise measurement:**						
a)	Maximum ambient noise emitted by the tractor at bystanders position, dB(A)		Evaluative	88 dB(A) for >1.5 tonne GVW and 85 dB(A) for <1.5 tonne GVW (as per CMVR)	88 (R)	85	Yes
b)	Maximum noise at operator's ear level dB(A)		Evaluative	As per CMVR	96 (R)	94	Yes
16.1.6	**Amplitude of mechanical vibrations at :**						
	1)	Left foot rest	Non Evaluative	100 microns (Max.)	100 (R)	83	Yes
	2)	Right foot rest				96	Yes
	3)	Seat (with driver seated)	Non Evaluative	100 microns (Max.)	100 (R)	60	Yes
	4)	Steering wheel	Non Evaluative	100 microns (Max.)	100 (R)	127	**No**
16.1.7	**Haulage requirements :**						
a)	Gross mass of the trailers, (tones):						
	1)	Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2)	Four wheel		--	6.0 (D)	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):						
	1)	Two wheel	Non Evaluative	--	4 to 7 (D)	4.50 to 4.57	Yes
	2)	Four wheel		--	4 to 7 (D)	4.38 to 4.40	Yes
c)	Fuel consumption (ml/km/tonne):						
	1)	Two wheel	Non Evaluative	--	25 to 50 (D)	43.8 to 44.5	Yes
	2)	Four wheel		--	25 to 50 (D)	37.9 to 38.1	Yes
16.1.8	**Wet land 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	Ingress of water found on LHS & RHS King pin assemblies.	Yes
	1)	Clutch assembly	-do-				
	2)	Brake housing	-do-				
	3)	Front axle assembly hubs	-do-				
	4)	Engine oil	-do-				
	5)	Transmission oil	-do-				
16.1.9	**Safety features :**						
a)	Guards against moving and hot parts		Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 part 2)	--	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 meet the requirement**	**No**

1	2	3	4	5	6	7
d)	Technical requirements for PTO shaft	Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Meets the requirement	Yes
e)	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	**Does not meet the requirement**	**No**
f)	Specification of linkage drawbars	Evaluative	Should meet the requirements of IS 12953 (as amended from time to time)	--	Meets the requirement	Yes
g)	Specification of Swinging drawbars	Evaluative	Should meet the requirements of IS 12362 (Part 3)	--	Not provided	--
h)	1) Maximum travelling speed at rated engine speed in reverse gears, Kmph	Evaluative	Should not exceed 20 Kmph	-	13.64 kmph	Yes
	2) Audible warning signal on tractor	Evaluative	As soon as the travelling speed in reverse gear reaches to 20 kmph, an audible warning signal on tractor shall be activated. The safety aspects about the operation of shuttle technology shall be brought in operation and manufacturer/dealer shall ensure the training on this aspect to operator before the delivery of tractor.	--	Not applicable	--

16.1.10	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with maximum PTO power in kW and year of manufacture in numerical form MM YY Digit 01-12 in box No.1 for MM will represent the months & next two digits in box No.2 for YY will represent the year of manufacturing.	Indo Farm	Yes
	2) Model	Evaluative		3048 DI C-MESH	Yes
	3) Year of manufacture	Evaluative		04/18	Yes
	4) Engine number	Evaluative		C328608094NV	Yes
	5) Chassis number	Evaluative		DNW30482WD00001CM	Yes
	6) Declaration of PTO power, (kW)	Evaluative		33.5	Yes

16.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	105.3 (D)	105.052 to 105.090	Yes
(b)	Piston to cylinder liner Clearance at skirt (mm)	Non Evaluative		0.45	0.135 to 0.147	Yes
(c)	Piston Diameter	Non Evaluative	-do-	104.71	104.511 to 104.943	Yes
(d)	**Ring end gap (mm):**					
	- Top comp. ring	Evaluative	-do-	2.0	0.50 to 0.55	Yes
	- 2nd comp. ring		-do-	2.0	0.85 to 0.95	Yes
	- Oil ring		-do-	2.0	0.60 to 0.75	Yes
(e)	**Ring groove clearance (mm):**					
	- Top comp. ring	Evaluative	---Tappered---			--
	- 2nd comp. ring		-do-	0.22	0.085 to 0.091	Yes
	- Oil ring		-do-	0.20	0.039 to 0.048	Yes
(f)	- Diametrical clearance of main bearings	Evaluative	-do-	0.40	0.078 to 0.123	Yes

1	2	3	4	5	6	7
(g)	**Clearance of big or small end bearings, (mm):**					
	- Diametrical	Evaluative	-do-	0.60	0.061 to 0.089	Yes
	- Axial	Evaluative	-do-	0.70	0.25	Yes
(h)	- Crankshaft end float	Evaluative	-do-	0.60	0.320	Yes
(k)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.40	0.063 to 0.190	Yes
16.1.12	**Literature (Submission to test agency)**					
(a)	Operator manual	Evaluative	The printed literature in booklet form should be provided as per IS 8132 and should submit along with the test sample	As per relevant IS- 8132 As per relevant	Provided	Yes
(b)	Parts Catalogue	Evaluative			Provided	Yes
(c)	Workshop/service manual	Evaluative			Provided	Yes
16.1.13	Fitment of Roll Over Protective Structures (ROPS):For tractors having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS 11821 or OECD code or equivalent International Standard	----	Not fitted	Not applicable
16.1.14	Standard accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with the tractor	---	Provided	Yes
16.1.15	Accessories (optional)	Non Evaluative	Ballast weights, if fitted, should meet the requirement of CMVR	---	----	---

16.1.16	**CATEGORY OF BREAKDOWNS / DEFECTS :**				
S. No.	**Category of breakdowns**	**Category (Evaluative / Non Evaluative)**	**Requirements as per IS: 12207-2019**	**As observed**	**Whether meets the Requirements (Yes/No.)**
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	None	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns.	None	Yes

16.3 Conformity with following IS:

i) Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors [IS10273: 1987 (Reaffirmed: 2014)] **:** Conforms

ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 [IS:4931-1995 (Reaffirmed 2014)] **:** Conforms

iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/ISO 730-1:1994 (Reaffirmed in Oct.,2017)] **: 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 (Reaffirmed 2014)] **: Does not conform**

vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements: [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed Oct., 2017)] **: Does not conform**

vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (IS 12239 (PT-2) 1999) (Reaffirmed- 2014)] **:** Conforms

viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery (IS: 8133-1983 (Reaffirmed in 2014)] **: Does not conform**

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 2014)] **:** Conforms

x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2014)] **:** Conforms

16.4 Salient Observations:

16.4.1 Laboratory tests:

16.4.1.1 PTO performance test:

i) **A.** During the PTO performance test, max power was recorded as 30.8 kW against the declaration of 33.5 kW which is less than the minimum requirement of 31.8 kW. To rectify the problem persist in the engine the following checking /adjustment were carried out.

a) Injector pressure has been also checked.

Before observed (kgf/cm^2)	Adjust as per service manual (kgf/cm^2)
250,243 & 246	260 for all three injectors

b) Tappet valve clearance was checked & measured as 0.35 mm & 0.45 mm for Inlet & Exhaust valve respectively against the specified value of 0.30 mm & 0.40 mm respectively .The Valve clearance was set at 0.30 mm & 0.40 mm for both Inlet & exhaust valves.

c) Fuel injection timing was checked.

d) Clutch pedal free play was checked.

e) Air cleaner filter were cleaned.

B. Again the PTO performance test, max power search test was conducted & power was observed as 31.3 kW @2199 engine rpm against the declaration of 33.5 kW, which is 6.6 % less than the minimum requirement of 31.8 kW. Thereafter the no load engine rpm was set as 2445 rpm & the test was conducted & the power was observed as 31.6 kW @ 2245 engine rpm ,which is 5.6 % less the declared value & does not meet the evaluative requirement of IS:12207-2014

C. Now, applicant wants to introduce radiator side top sealing arrangement. In this regard applicant submitted drawing and parts catalogue of existing arrangement versus modified arrangement. Sealing plate assembly' having the part no. 40001013AA fitted in between radiator & bonnet sheet metal ,to reduce air intake temperature and "Repeat test" was conducted .

D. Now, the maximum PTO power was recorded as 32.0 kW against the declaration of 33.5 kW & meets the evaluative requirement of IS: 12207-2019 with regard to tolerance limit. Therefore it is recommended that, the modification incorporated during the test i.e introduction of radiator sealing assembly plate (Part No. 4000101AA) should be permanently incorporated in the commercial production of this tractor model.

ii) The backup torque is 23%.

iii) The specific fuel consumption corresponding to maximum was measured as **300 g/kWh** against the declaration of **280 g/kWh,** which meets the evaluative requirement of IS: 12207-2019.

16.4.1.2 Drawbar performance test:

i) During the drawbar test preparation, water/coolant leakage from water temperature sensor and return line joint were seen. So, the internal thread of water temperature sensor has been repaired.

ii) The creeping of rear tyres over the rims were recorded as 30 mm in both LHS and RHS tyre during 10 hours drawbar performance test. This should be looked into for necessary corrective action.

16.4.1.3 Hydraulic performance test:

i) During the preparation of hydraulic performance test, lower link was not coming down at the same level while lifting & lowering operation. Thereafter cleaning of transmission oil & checking /gauging of control valve assembly as per operator service manual was done

ii) The maximum drop in the height during load maintenance test was observed **63 mm** against the minimum requirement of should not exceed “50 mm”. This should be looked into for necessary corrective action.

16.4.1.4 Mechanical vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter – 8 of this test report is on higher side. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

16.4.1.5 Specification of three point linkage:

The lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS: 4468 (Part-1)-1993. This should be looked into for necessary corrective action.

16.4.1.6 Operator’s seat :

i) Length and width of seat should meet should meet the minimum requirement as per IS: 12343-1998.

ii) Vertical distance form Seat Index Point to centre of clutch should meet the minimum requirement as per IS: 12343-1998.

16.4.1.7 Wetland cultivation (Puddling Operation):

Ingress of water was found in LHS & RHS of king pin assemblies noticed during puddling operation of the tractor. Hence, It meets the requirements of IS: 11082-1984 (Reaffirmed in October, 2017) (Technical requirements of agricultural tractors for wetland operation). The tractor is found suitable for wetland operation (Puddling).

16.5 Maintenance / Service Problems:

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

16.6 Recommendation with regard to safety on tractor:

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

i) There should be provision for spark arresting device in exhaust system.

ii) The fuel shut-off knob should remain in stop position.

iii) Provision of PTO master shield

iv) Provision of Differential lock

16.7 Adequacy of Literature supplied with machine:

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

i) Operator & service manual (C-MESH TRACTORS SERIES – 2WD/4WD) of Indo Farm 3090 DI, 3075 DI, 3065 DI, 3055 NV, 3048 DI, 3040 DI, 3035 DI tractor.

ii) Spare parts catalogue (C-MESH TRACTORS SERIES – 2WD/4WD) of Indo Farm 3035 DI, 3040 DI (2WD), 3048 DI, 3055 NV, 3055 DI, 3065 DI, 3075 DI, 3090 DI (2WD/4WD) tractor.

iii) Workshop manual (C-MESH TRACTORS SERIES – 2WD/4WD) of Indo Farm 3035 DI C-Mesh, 3048 DI C-Mesh, 3055 DI C-Mesh & 3065 DI C-Mesh tractor models

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

17. 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	10 Months (November, 2018 to August, 2019)	Yes	---

TESTING AUTHORITY:

C.S. RAGHUWANSHI
AGRICULTURAL ENGINEER

C.V. CHIMOTE
TEST ENGINEER

J.J.R.NARWARE
DIRECTOR

The report compiled by Smt. Poonam Khurasia, Senior Technical Assistant

18.0 APPLICANT COMMENT'S

Para No.	Our Reference	Applicant's comments
18.1	16.1.6 (4)	We will make efforts to reduce the amplitude of steering wheel vibration.
18.2	16.1.9 (c) ,(e),16.3 (iii),16.3 (ii) ,16.3 (vi) ,16.3 (iii)	We are looking into these for strict compliance to the relevant standards.
18.3	16.4.1.1 (i) D	The modified radiator sealing assembly plate will be permanently incorporated in the future production of this tractor model.
18.4	16.4.1.2, 16.4.1.3 ,16.4.1.4, 16.4.1.5,16.4.1.6 & 16.6	We are looking into these for future improvements.

ANNEXURE-I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No.	Parameters	Disc Plough	Rotavator	Puddler
1	Make	Field King	Shaktimaan	Not available
2	Type	Mounted	Mounted	Mounted
3	No. of Discs / Blades	Three	36 (in 7 flange)	12 (6 in each gang)
4	Type of Discs / Blades	Plain concave	Hatchet	Notched concave
5	Size of Discs / Blades (mm)	525	250 x 65 x 8	450
6	Spacing of Discs /Flanges, (mm)	520	250	170
7	Lower hitch point span, (mm)	855	620	800
8	Mast height, (mm)	440	650	500
9	Overall Dimensions (mm):			
	Length	2030	630	900
	Width	1760	1630	2440
	Height	1070	1170	1050
10	Gross Mass, (Kg)	365	495	240

ANNEXURE-II

BRIEF SPECIFICATION OF HALF CAGE WHEEL

S. No.	Parameters	Specification
1	Type	Half cage wheel
2	Outer dia. (mm)	1100
3	Width (mm)	345
4	No. & Type of Lugs	12, straight lugs made of MS angle section welded to angle iron frame
5	Size of angle section, (mm)	50 x 50 x 5
6	Length of lug, (mm)	345
7	Spacing of lug, (mm)	280
8	Weight of each cage wheel (kg)	60

ANNEXURE - III

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	16.4
3.	Power lift and hydraulic pump performance test	1.80
4.	Drawbar performance test	17.4
5.	Turning ability	0.3
6.	Location of centre of gravity	0.2
7.	Operator's field of vision	--
8.	Brake test	1.3
9.	Noise measurement	2.1
10.	Mechanical vibration test	1.0
11.	Nominal speed test	0.8
B.	**FIELD TEST:**	
1.	Disc ploughing	10.7
2.	Rotavation	10.1
3.	Puddling (including water proof test)	15.3
C.	**HAULAGE TEST:**	6.4
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	8.4
	TOTAL:	92.3

Annexure-IV

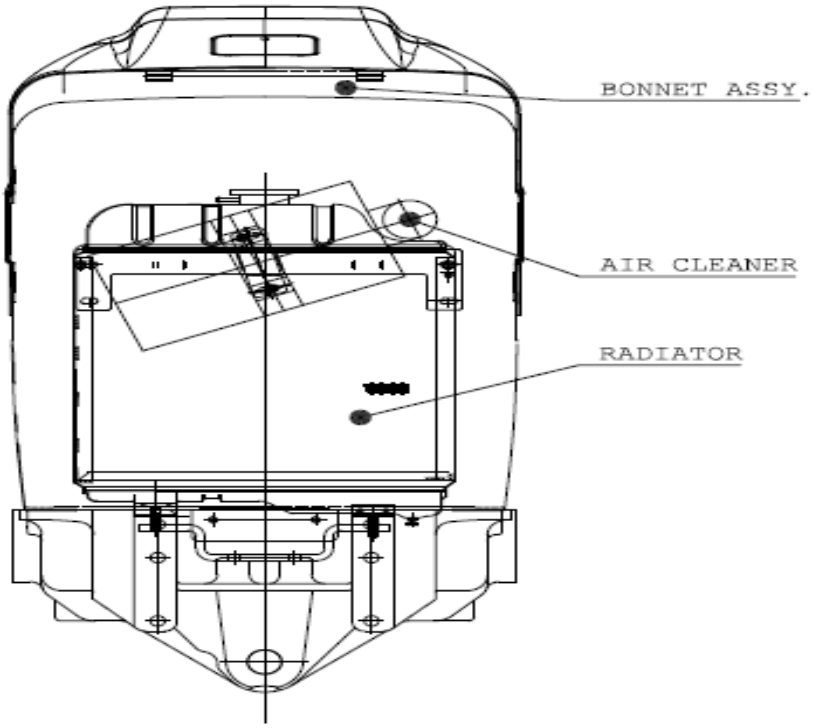


FIG.1 - EXISTING RADIATOR LAYOUT

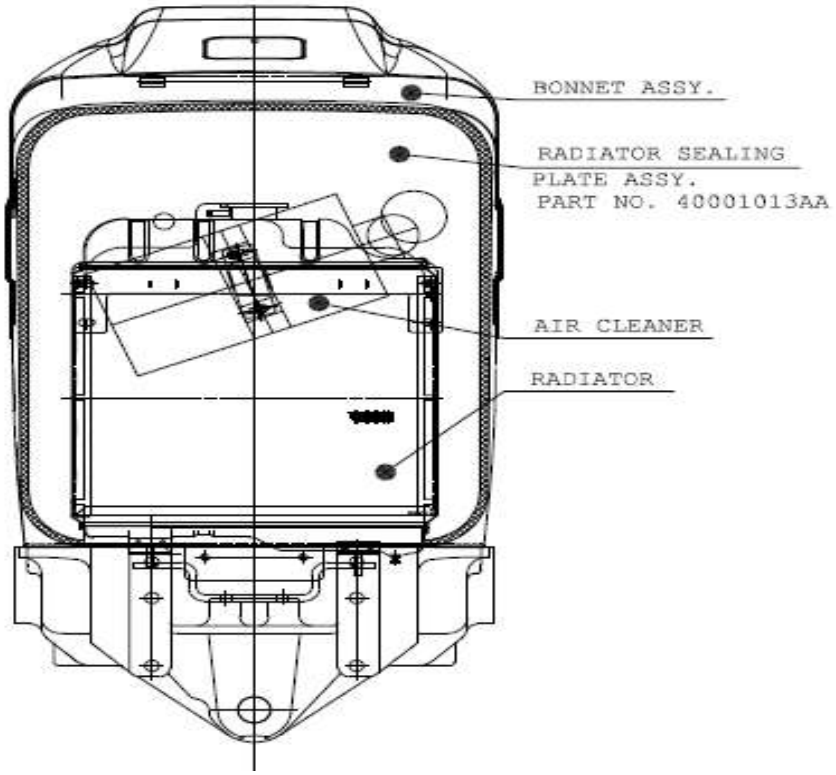


FIG.2 - MODIFIED RADIATOR (SEALING ARANGEMENT) LAYOUT