

व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT (Initial)

संख्या/No. : T- 1251/1778/2019

माह/Month : June, 2019

(यह परीक्षण रिपोर्ट 30/06/2022 तक वैध है। / THIS TEST REPORT IS VALID UPTO: 30/06/2022)



## SONALIKA, DI - 42 HDM TRACTOR



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय

कृषि, सहकारिता एवं किसान कल्याण विभाग

मशीनीकरण एवं प्रौद्योगिकी प्रभाग

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE

Mechanization & Technology Division

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) - ४६६ ४४५

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](mailto:fmti-mp@nic.in)

Phone: 07564-234729

Website: <http://fmonttibudni.gov.in>

T- 1251/1778/2019	SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)
	THIS TEST REPORT IS VALID UPTO: 30/06/2022

Manufacturer : M/s. International Tractors Limited  
Vill. Chak Gujran,  
P.O. Piplanwala, Jalandhar Road,  
Hoshiarpur – 146 022  
(Punjab)

Month: June	Test Report No. T- 1251/1778/2019	Year : 2019
-------------	-----------------------------------	-------------



GOVERNMENT OF INDIA  
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE  
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA

Email: [fmti-mp@nic.in](mailto:fmti-mp@nic.in)  
Web site: <http://fmttibudni.gov.in>  
Telephone: 07564-234729

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

Type of Test : **COMMERCIAL (Initial)**

Test code/Procedure : IS: 5994-1998 (Reaffirmed in 2014)  
IS: 9253-2013 and IS: 12207-2014.

Period of Test : October, 2018 to May, 2019

Test Report No. : **T- 1251/1778/2019**

Month/Year : **June, 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

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

<b>ABBREVIATIONS</b>	
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

		<u>PAGE NO.</u>
1.	Specification	05
2.	Fuel and Lubricants	19
3.	PTO Performance Test	20
4.	Drawbar Performance Test	24
5.	Power Lift And Hydraulic Pump Performance Test	29
6.	Brake Test	30
7.	Noise Measurement	31
8.	Mechanical Vibration Measurement	32
9.	Air Cleaner Oil Pull Over Test	32
10.	Location of Centre of Gravity	33
11.	Turning Ability	33
12.	Operator's Field of Vision	33
13.	Field Test	34
14.	Haulage Test	36
15.	Components/Assembly Inspection	36
16.	Adjustments, Defects, Breakdowns & Repairs	38
17.	Summary of Observations, Comments & Recommendations	39
18.	Citizen Charter	46
19.	Applicant's Comments	46
	<b>ANNEXURE – I, II, III &amp; IV</b>	<b>47 &amp; 48</b>

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

The tractor model namely “**Sonalika International DI-42 RX**” had undergone Commercial (Variant) test vide test report number **T-702/1208/2009 (December, 2009)** and subsequently tested under batch testing vide Test Report No. **T-897/1412/2013 (December, 2013)**. During submission of application for Initial Commercial testing, the firm has declared that the tractor model “**Sonalika International DI-42 RX**” will be phased out from the regular production after release of ICT report of “**Sonalika, DI-42 HDM**” vide letter No. R&D F-18/61/DI-42 HDM dated 30.05.2018. The competent authority has accepted the request of the applicant and accordingly the testing of “**Sonalika, DI-42 HDM**” was carried out under Initial Commercial Test.

The firm has submitted the declaration vide letter No. R&D/F-18/082/DI-42 HDM dated 02.09.2019 and informed that the “**Sonalika DI-42 RX**” would be phase out and the last chassis number would be as HZYSH963650S3.

**In view of the above facts & considering the declarations made by the firm, the following earlier test reports released by this Institute became invalid and hence shall not be considered for any purpose such as Institutional financing, etc. from the date of release of this Test Report.**

S. No.	Make & Model of the tractor	Nature of test	Test report No.
1.	Sonalika International DI-42 RX	Commercial (Variant)	T-702/1208/2009 (December, 2009)
2.	Sonalika International DI-42 RX	Batch	T-897/1412/2013 (December, 2013)

<b>Manufacturer</b>	: <b>M/s. International Tractors Limited Vill. Chak Gujran, P.O. Piplanwala, Jalandhar Road, Hoshiarpur – 146 022 (Punjab)</b>
Test requested by (applicant)	: The manufacturer
Selected for test by	: Applicant
Place of running-in	: At applicant’s works
<b>Duration of said running-in (h):</b>	
- Engine	: 20
- Transmission	: 20
<b>Method of Selection</b>	: The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

## 1. SPECIFICATIONS

<b>1.1 Tractor:</b>	
Make	: Sonalika
Model	: DI – 42 HDM
Variants, if any:	

Sr. No.	Variant model*	Variant features
(i)	Sonalika DI – 42 RX HDM S1	Oil immersed brakes
(ii)	Sonalika DI – 42 RX HDM S2	Nominal speed change
(iii)	Sonalika DI – 42 RX HDM S3	Oil immersed brakes & Nominal speed change

**Remark (\*): The variant model has not been submitted for test at this institute**

Brand name	: None
Type	: Four wheeled, rear wheel driven, unit construction, general purpose, agricultural tractor
Year of manufacture	: GF (i.e. May, 2018)
Chassis number	: FYZSG744175S3
Country of Origin	: India

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

- 1.2 Engine:**  
 Make : Sonalika  
 Model : 3102FLU  
 Type : Four stroke, liquid cooled, direct injection, naturally aspirated, compression ignition, diesel engine.  
 Serial number : 3102FLU83E736815F19  
**Engine speed (Manufacturer's recommended production setting) (rpm) :**  
 - Maximum speed at no load : 1900 to 2000  
 - Low idle speed : 750 to 850  
 - Speed at maximum torque : 1000 to 1200  
**Rated speed, (rpm):**  
 - For PTO use : 1800  
 - For drawbar use : 1800
- 1.3 Cylinder & Cylinder Head:**  
 Number : Three  
 Disposition : Vertical, inline  
 Bore/stroke, (mm) : 102 / 118  
 Capacity as specified by the applicant, (cc) : 2891  
 Compression ratio, (apa) : 20 (±0.2) : 1  
 Type of cylinder head : Individual  
 Type of cylinder liners : Wet, replaceable  
 Type of combustion chamber : Open re-entrant cavity on piston crown  
 Arrangement of valves : Overhead, Inline  
**Valve clearance (cold/hot):**  
 - Inlet valve, (mm) : 0.3 / 0.3  
 - Exhaust valve, (mm) : 0.4 / 0.4
- 1.4 Fuel System:**  
 Type of fuel feed system : Gravity and force feed
- 1.4.1 Fuel tank:**  
 Capacity, (l) : 56.60  
 Location : Above the clutch housing  
 Provision for draining of sediments/ water : Provided  
 Material of fuel tank : Mettalic
- 1.4.2 Water Separator:**  
 Make : Hilux  
 Model/Group combination No. : Not available  
 Type : Inverted funnel gravity separation  
 Location : On LHS of engine between fuel tank and fuel feed pump
- 1.4.3 Fuel feed pump:**  
 Make : Bosch, India  
 Type : Plunger  
 Model/Group combination No. : Not available  
 Provision of sediment bowl : Provided (metallic)  
 Method of drive : Through cam shaft of fuel injection pump
- 1.4.4 Fuel filters:**  
 Make : Bosch, India  
 Model/Group combination No. : F 002 H20 109  
 Numbers : Two  
**Type of elements:**  
 - Primary : Cloth  
 - Secondary : Paper  
 Capacity of final stage filter, ( l ) : 0.40

- 1.4.5 Fuel Injection pump:**  
 Make : Bosch, India  
 Model/Group combination No. : F002 A4Z R22, PES3A95D320RS4000  
 Type : Inline, Plunger  
 Serial number : 85375937  
 Location : On LHS of engine  
 Method of drive : Through timing gears
- 1.4.6 Fuel injectors:**  
 Make : Bosch, India  
 Holder Number : F002 C70 552  
 Nozzle Number : DSLA 148P 1549  
 Type : Multi hole (05 holes)  
 Manufacturer's production pressure setting, (MPa) : 25.0 to 25.8  
 Injection timing : 11° ± 1° before TDC  
 Firing order : 1 – 3 – 2
- 1.4.7 Governor:**  
 Make : Bosch, India  
 Model/Group combination No. : RSV400...900A5C1873R  
 Type : Mechanical, centrifugal, variable speed  
 Rated engine speed, (rpm) : 1800  
 Governed range of engine speed (rpm) : 750 to 2000
- 1.5 Air Intake system:**
- 1.5.1 Pre-cleaner:**  
 Make : Sonalika  
 Type : Centrifugal with transparent dust collector  
 Location : Above main air cleaner inlet tube outside the bonnet
- 1.5.2 Air cleaner:**  
 Make : Not available  
 Type : Oil bath  
 Location : In front of radiator, under the bonnet  
 Range of suction pressure at maximum power, (kPa) : 2.9 to 4.0  
 Maintenance schedule : After every 16 hours of operation in dusty condition and after every 50 hours of operation in normal working condition .  
 Air cleaner bowl capacity,(l) : 1.10
- 1.6 Exhaust System:**  
 Type of silencer : Updraft (Cylindrical)  
 Position of silencer outlet with respect to SIP, (mm):  
 - Vertical : 892  
 - Longitudinal : 1415  
 - Lateral : 400 (on RHS)  
 Range of exhaust gas pressure at maximum power, (kPa) : 3.2 to 3.9  
 Provision of spark arresting device : **None**  
 Provision against entry of rain water : A bend is provided at the top of silencer
- 1.7 Lubricating system:**  
 Type : Force feed cum splash  
 Oil sump capacity, ( l ) : 6.7  
 Total lub oil capacity, ( l ) : 7.60  
 Oil change period : First change after 50 hours of operation and subsequently after every 250 hours of operation.  
 Cooling device, (if any) : **None**

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

<b>1.7.1</b>	<b>Filters:</b>	
	Make	: Sonalika
	Type	: Full flow, spin on, throw away
	Number (s)	: One
<b>1.7.2</b>	<b>Pump:</b>	
	Make	: Not available
	Type	: Gear
	Method of drive	: Through timing gears
	Pressure release setting, (kPa)	: 400 (apa)
	Minimum permissible pressure, (kPa)	: 250
<b>1.8</b>	<b>Cooling system:</b>	
	Type	: Forced circulation of coolant
	Coolant as recommended	: Sonalika Maxima Coolant (apa)
	Coolant and water ratio	: 30 : 70 (apa)
	<b>Details of pump</b>	: Centrifugal pump with semi-open impeller of 89.7 mm outer diameter, having twelve numbers of vanes and driven through crankshaft pulley by a cogged V-belt common to alternator.
	<b>Details of fan</b>	: Suction type having six polypropylene blades of 380 mm diameter and mounted on common shaft of water pump
	Means of temperature control	: Thermostat
	Bare radiator capacity, ( l )	: 2.75
	Capacity of expansion flask, (l)	: 1.10
	Total coolant capacity, ( l )	: 8.30
	Radiator cap pressure, kPa	: 88
<b>1.9</b>	<b>Starting System:</b>	
	Type	: 12V, DC, Electrical
	Aid for cold starting	: None
	Any other device provided for easy starting.	: None
<b>1.10</b>	<b>Electrical System:</b>	
<b>1.10.1</b>	<b>Battery:</b>	
	Make & Model	: Amaron & TR550D31R
	Type	: Lead acid
	Capacity and rating	: 12V, 88 Ah at 20 hours discharge rate
	Location	: On RHS of clutch housing inside a separate metallic box
<b>1.10.2</b>	<b>Starter:</b>	
	Make	: Auto lek
	Model	: Not available
	Voltage/Type	: Pre-engaging, solenoid operated
	Capacity and rating	: 12V & 2.7 kW
	Serial Number	: Not available
<b>1.10.3</b>	<b>Generator:</b>	
	Make	: Auto lek
	Model	: Not available
	Type	: Alternator
	Serial number	: Not available
	Output rating	: 12 V & 36 Amp
	Method of drive	: Driven through crank shaft pulley by a cogged "V" belt, common to water pump pulley



T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

**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)
<b>Front Lights:</b>				
- Head lights	2, 12V, 60/55W	1025	130 Φ	490
- Parking lights	2, 12V, 5W	1285	85 x 110	210
- Turn-cum-Hazard Indicators	2, 12V, 21W	1285	85 x 110	80
-Reflector	2	1285	50 Ø	145
<b>Rear lights:</b>				
- Parking-cum-Brake lights	2, 12V, 21/5W	1250	85 x 110	220
- Turn-cum-Hazard Indicators	2, 12V, 21W	1250	85 x 110	90
Reflectors (Red)	2	1250	50 Ø	160
Plough light (on RHS mudguard)	1, 12V, 55W	1410	120 Φ	370
Registration plate Light	1, 12V, 5W	1120	20 x 85	170

**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  
 iii) Head lights (short beam) + (ii)  
 iv) Head light (long beam) + (ii)  
 v) L/R turn indicator switch  
 vi) Horn push button

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

**1.10.9 Fuse box** : Contains 08 numbers of fuses of following capacities :-

Capacity	15A	10A
Number	03	05

**1.10.10 Details of other electrical accessories:**

**1.10.10.1 Flasher Unit:**

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

**1.10.10.2 Seven pin socket for trailer lights** : Provided

**1.10.10.3 Safety against accidental start** : **Not provided**

**1.11 Instrument panel details:**

- i) Engine speed-cum-cumulative digital run hour meter (0-25)x100 rpm
- ii) Lubricating oil pressure gauge with colour zone
- iii) Coolant temperature gauge with colour zone
- iv) Battery volt meter gauge with colour zone
- v) Battery charging warning indicator lamp
- vi) Fuel level gauge with colour zone
- vii) Head light long beam ON indicator light
- viii) Turn-cum-hazard lights indicator
- ix) Hazard light switch
- x) Hand accelerator lever
- xi) Mobile charging socket
- xii) Main switch (Key turn type)
- xiii) Light switch (rotary type)
- xiv) Steering control wheel
- xv) Rear view mirror
- xvi) Fuel shut-off control knob

**1.12 Transmission System:**

**1.12.1 Clutch:**

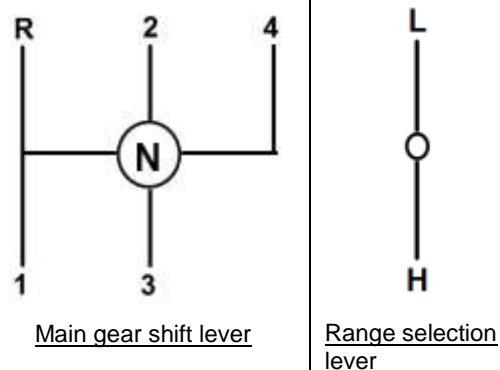
- Make : Luke
- Type : Single, dry friction plate
- No. of friction plate (s) : One
- Size, OD/ID, (mm) : 279.9 / 166.1 Ø
- Method of operation: : By depressing clutch pedal fully provided on LHS of operator's seat
- Material of clutch lining : Non asbestos (apa)

**1.12.2 Gear box:**

- Make : Sonalika
- Model : Not available
- Type : Mechanical, Combination of constant mesh gears

**No. of speeds:**

- Forward : 08
- Reverse : 02
- Location of gear shifting levers: : Side shift
- Main gear shifting lever : On RHS of the operator's seat
- Range selection lever : On LHS of the operator's seat
- Gear shifting pattern :



- Oil capacity, (l) : 49.0 (Common with differential, rear axle, final drive & hydraulic systems).
- Oil changing period : First change after 1000 hours and subsequent after every 1800 hours of operation.

### 1.12.3 Nominal Speed:

Movement	Gear No.	No. of engine revolutions for one revolution of driving wheel	Nominal speed at rated engine speed when fitted with <b>13.6-28</b> size tyres of <b>610</b> mm radius index, (kmph)
Forward	L1	168.45	2.46
	L2	116.19	3.56
	L3	74.48	5.56
	L4	49.58	8.35
	H1	44.71	9.26
	H2	30.82	13.43
	H3	19.73	20.98
	H4	13.16	31.45
Reverse	LR	129.97	3.18
	HR	34.47	12.01

### 1.12.4 Differential unit:

- Type : Crown wheel and bevel pinion, with differential unit accommodated inside the differential housing.
- Reduction through crown wheel and bevel pinion : 3.17 : 1 (38/12T)
- Oil capacity, ( l ) : 49.0 (Common with gearbox, rear axle final drive & hydraulic systems).
- Oil changing period : First change after 1000 hours and subsequent after every 1800 hours of operation.

**Differential lock : Not provided**

### 1.12.5 Rear axle & final drive:

- Type : Bull & pinion type final drive accommodated inside the differential housing
- Reduction through final drive : 4.154 : 1 (54/13T)
- Oil capacity of final drive, ( l ) : 49.0 (Common with gearbox, differential & hydraulic systems).
- Oil changing period : First change after 1000 hours and subsequent after every 1800 hours of operation.

### 1.13 Power lift Hydraulic System:

- Make : Sonalika
- Type : Open centre, live & ADCC
- No. and type of cylinder : One, single acting
- Type of linkage lock for transport : Response control valve is provided on distributor, in fully closed position acts as transport lock.

### 1.13.1 Hydraulic pump:

- Make : Rexroth
- Type : Gear
- Location & drive : On RHS of engine
- No. & type of filters : Two, i) full flow spin on throw away  
ii) One strainer at suction
- Hydraulic oil capacity, ( l ) : 49.0 (Common with transmission & hydraulic systems).
- Oil change period : First change after 1000 hours and subsequent after every 1800 hours of operation.
- Provision for external tapping : Not provided
- Details of control levers : **i)** Position control lever (Black)  
**ii)** Draft control lever (Red)  
**iii)** Response control knob on distributor.
- Method of draft sensing : Through top link

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

### 1.13.2 Three point linkage:

S. No.	Parameters	As per IS: 4468- (Part-1) -1997 (Reaffirmed in October, 2017), (Cat.I / Cat.II), (mm)	As measured (mm)	Remarks
<b>I.</b>	<b>Upper hitch points:</b>			
	a) Dia of hitch pin hole	19.30 to 19.50 / 25.70 to 25.90	19.43 / 25.70	Conforms to Cat. I & II
	b) Width of ball	44.0 (max.) / 51.0 (max)	32.70	Conforms to Cat. I & II
<b>II.</b>	<b>Lower hitch points:</b>			
	a) Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	28.94	Conforms to Cat. II
	b) Width of ball	34.80 to 35.00 / 44.80 to 45.00	44.80	Conforms to Cat. II
<b>III.</b>	Lateral distance from lower hitch point to centre line of tractor	359 / 435	363	<b>Does not conform</b>
<b>IV.</b>	Lateral movement of lower hitch points.	100 (min) / 125 (min)	197	Conforms to Cat. I & II
<b>V.</b>	Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)	450 to 575 / 550 to 625	510	Conforms to Cat. I
<b>VI.</b>	Transport height	820 (min)/ 950 (min)	960	Conforms to Cat. I & II
<b>VII.</b>	Power range (without load)	560 (min)/ 650 (min)	530, 595, 600, 680, 685	Conforms to Cat. I & II
<b>VIII.</b>	Leveling adjustment	100 (min)/ 100 (min)	310	Conforms to Cat. I & II
<b>IX.</b>	Lower hitch point tyre clearance	100 (min)/ 100 (min)	180	Conforms to Cat. I & II
<b>X.</b>	Lower hitch point height	200 (max)/ 200 (max)	200	Conforms to Cat. I & II

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

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

S. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
(1)	(2)	(3)	(4)	(5)
1.	Length of lower link	A	760	760
2.	Length of lift arm	B	250	250
3.	Length of lift rods	C	560 to 470	635
4.	Length of top link	D	450 to 600	500
5.	Distance of lift rod connection point from pivot point of lower link	E	290, 350 & 420	350
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	107, behind	107, behind
	-Vertically	G	155, below	155, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	368, behind	368, behind
	-Vertically	J	335, above	335, above

(1)	(2)	(3)	(4)	(5)
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	35, forward	35, forward
	-Vertically	L	360, above	360, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	15 to 350	185, above
	- In low position	N	-545to -143	410, below
10.	Height of lower link hitch points when locked in transport position		185	

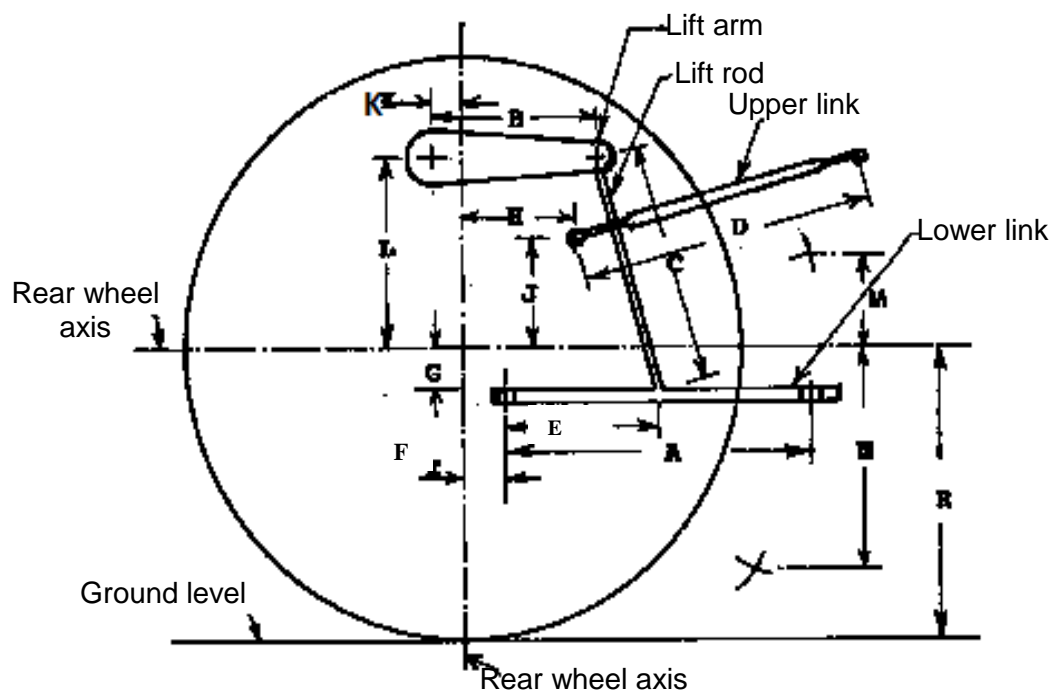
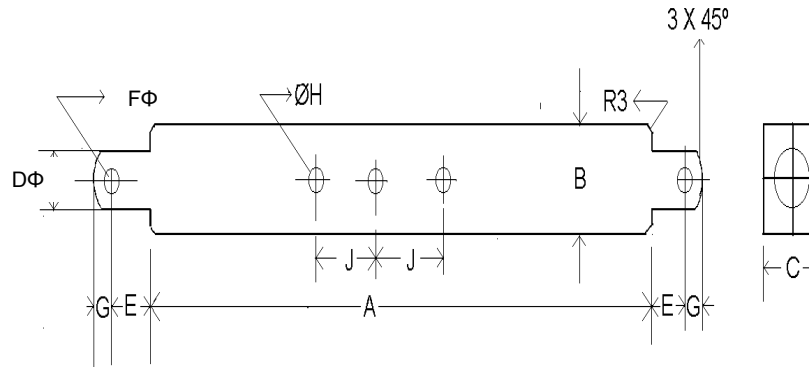


Fig.1 (a): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

#### 1.13.4 Drawbar:

##### 1.13.4.1 Linkage Drawbar (Refer Fig.1 (b)):

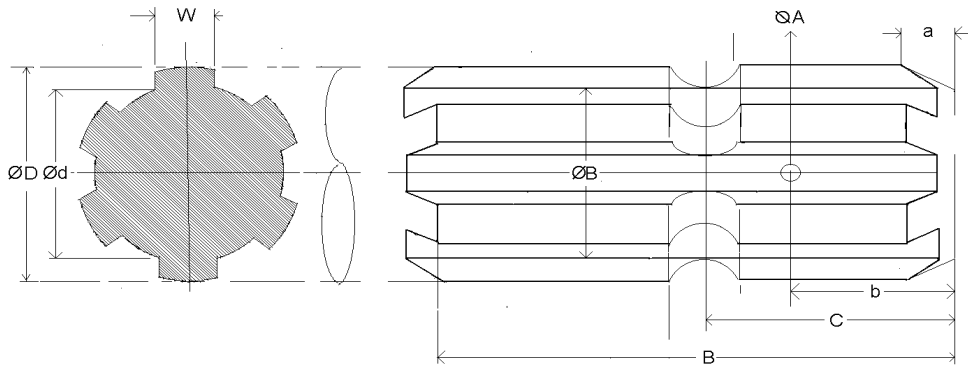
Notation	As per IS: 12953-1990, (Reaffirmed in October, 2017) (Cat. I / Cat. II), (mm)	As measured, (mm)	Remarks
A	683 ± 1.5 / 825 ± 1.5	682.0	Conforms to Cat. I
B	75 (min) / 75 (min)	75.0	Conforms to Cat. I & Cat. II
C	30 (min) / 30 (min)	30.0	Conforms to Cat. I & Cat. II
D $\varnothing$	21.79 to 22.0 / 27.79 to 28.0	27.89	Conforms to Cat. II
E	39.0 (min) / 49.0 (min)	64.82	Conforms to Cat. I & Cat. II
F $\varnothing$	12.0 (min) / 12.0 (min)	12.11	Conforms to Cat. I & Cat. II
G	15.0 (min) / 15.0 (min)	22.81	Conforms to Cat. I & Cat. II
H $\varnothing$	25 ± 1 / 25 ± 1	24.87	Conforms to Cat. I & Cat. II
J	80 ± 1.5 / 80 ± 1.5	79.45	Conforms to Cat. I & Cat. II
No. of holes	7 / 9	07	Conforms to Cat. I

1(b): **DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR**1.13.4.2 **Swinging drawbar** : **Not provided**1.13.4.3 **Provision for coupling of trailer brakes** : **Not provided****1.14 Power take-off shaft:**

Type : Type-I, Not independent  
 Method of engaging : By a hand lever provided on LHS of operator's seat.  
 No. of shaft(s) : One  
 PTO speed corresponding to rated engine speed, (rpm) : 579  
 Distance behind rear axle, (mm) : 355  
 Engine to PTO speed ratio : 3.111:1  
 Whether the PTO shaft is capable of transmitting the full power of engine : Yes

**1.14.1 Specifications of Power Take-Off Shaft: -**

Specification	As per IS: 4931-1995 (Reaffirmed in 2014), Type-I	As observed	Remarks
Nominal speed, (rpm)	540 ± 10	540 rpm of PTO shaft corresponds to 1680 rpm of engine	Conforms
No. of splines	6	6	Conforms
Direction of rotation	Clockwise	Clockwise	Conforms
Location	The position of the centre of the end of PTO shaft shall be within 50mm to right or left of the centre line of the tractor	In the center line of the tractor	Conforms
<b>Dimensions, (mm) Refer Fig. 2 :</b>			
DØ	34.79 ± 0.06	34.76	Conforms
dØ	28.91 ± 0.05	28.90	Conforms
BØ	29.4 ± 0.1	29.80	<b>Does not Conform</b>
AØ (Optional)	8.3 ± 0.1	NA	--
W	8.69 - 0.09 - 0.16	8.53	Conforms
a	7	7	Conforms
b (Optional)	25 ± 0.5	NA	--
c	38	38	Conforms
X	30°	30°	Conforms
B	76 (min)	81.35	Conforms
h	450 to 675	610	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:**
- Type : Clevis  
 Location : On front of engine  
 Height above ground level, (mm): : 690 (fixed)  
 Dia of pin hole, (mm) : 28.7  
 Width of clevis, (mm) : 109.9
- 1.15.2 Rear:**
- Type : Clevis  
 Location : Rear of the differential housing  
**Height above ground level, (mm):**  
 - Maximum : 830  
 - Minimum : 350  
 - No. of positions : 10  
 Type of adjustment : By changing and reversing the position of hitch on its mounting bracket.
- Distance of hitch point,(mm):  
 - From rear axle centre : 490  
 - From power take-off shaft end : 135  
 Dia of pin hole, (mm) : 34.1  
 Width of clevis, (mm) : 86.4
- 1.16 Steering:**
- Make : Rane  
 Type : Mechanical, worm & screw with single drop arm  
 Location : Above clutch housing  
 Method of operation : Manually by steering control wheel  
 Diameter of steering control wheel, (mm) : 430  
 Steering oil capacity, ( l ) : 0.7  
 Lubricant change period : First change after 250 hours of operation and subsequent after 1000 hours of operation.

**1.17 Brakes:**

**1.17.1 Service Brake:**

Make : Not available  
 Type : Mechanical, dry discs brake  
 Location : At the rear half axle shaft  
 No. of disc(s) : Two (on each wheel side)  
 Area of liners, (cm<sup>2</sup>) : 804.4 (on each wheel side)  
 Material of liners : Molded friction (apa)  
 Method of operation : Independent or combined pedal operated by right foot.

**1.17.2 Parking Brake:**

Type : Pawl & ratchet arrangement  
 Location & Method of operation : Service brake acts as parking brake when locked in position by a hand lever after pressing service brake pedal, provided on RHS of operator's seat

**1.18 Wheel Equipment:**

**1.18.1 Steered Wheel(s):**

Make : Apollo  
 Number(s) : 02  
 Type of tyre : Pneumatic, ribbed  
 Size : 6.00-16  
 Ply rating : 8  
 Maximum permissible load on each tyre at inflation pressure recommended for road work, (kgf) : 670 @ 450 kPa

**Recommended inflation pressure, (kPa) :**

- For field work : 250  
 - For transport : 250  
 Track width, (mm) : **1320 (std)** & 1490  
 Method of changing track width : By reversing the wheel disc  
 Make & size of wheel rim : CWPL & 4.50E x 16

**1.18.2 Drive wheel(s):**

Make : Apollo  
 Number (s) : 02  
 Type of tyre : Pneumatic, Traction  
 Size : 13.6 – 28  
 Ply rating : 12  
 Maximum permissible load on each tyre at inflation pressure recommended for road work, (kgf) : 1800 @ 230 kPa

**Recommended inflation pressure, (kPa):**

- For field work : 110  
 - For transport : 150  
 Track width, (mm) : **1345 (std.)**, 1385, 1435, 1545, 1585, 1695, 1885,  
 Method of changing track width : By reversing & changing the position of wheel disc on off-set rim lugs.  
 Make & size of wheel rim : WIL & W12 x 28

**1.18.3 Wheel base, (mm)**

: 1975  
 Method of changing wheel base, if any, and range : **None**



**1.19 Operator's seat:**

Make : Not available  
 Type : Cushioned seat with back rest  
 Type of Suspension : Two helical coil springs  
 Type of Dampening : One, Hydraulic shock absorber

**Range of adjustment,(mm):**

- Vertical (back rest) : 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 meet with the requirements of IS: 12343-1998: (Re-affirmed in 2014), **except the following:-**

- i) Inclination of back rest of seat from the vertical plane.
- ii) Vertical distance of centre of steering control wheel from seat index point.

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

All the controls are identifiable with symbols as per IS: 6283 (Part-1) – 2006 (Re-affirmed in 2014) & IS: 6283 (Part-2) – 2007 (Re-affirmed 2014).

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

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

- i) Safety switch against the accidental start is not provided.
- ii) Differential lock is not provided

**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) Spark arresting device in the exhaust system is not provided.

**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) PTO shaft master shield is not provided
- ii) Working clearance between draft control lever and RHS fender is less than the minimum requirement.

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

All lighting arrangements meet the requirements of IS: 14683-1999 (Re-affirmed in 2014).

**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 March, 2014):**

**Locations of labelling plate:-** The labelling plate is riveted on outside of LHS fender and provides the following information:

<b>Name of Manufacturer</b>	<b>M/s. International Tractors Ltd., Hoshiarpur, Punjab (India)</b>
Make	SONALIKA
Model	DI - 42 HDM
Year of manufacture	GF (i.e. May, 2018)
Engine Serial Number	3102FLU83E736815F19
Chassis Serial Number	FYZSG744175S3
Maximum PTO Power, kW	29.5
Specific fuel consumption, g/kWh	245

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

### 1.22 Ballast Mass, (kg):

Particulars		As used during drawbar test	As used during field test		As used during Haulage test
			Dry land	Puddling	
Front	C.I. weight	Nil	Nil	Nil	Nil
	Water	Nil	Nil	Nil	Nil
Rear	C.I. weight	340	136	Full cage wheels of 150 kg each	Nil
	Water	220	220		Nil
	Additional weight, if any	Nil	Nil		Nil

1.22.1 Standard ballast, if any: Not applicable

### 1.23 Masses:

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	Unballast	755	1215	1970
ii)	With ballast as used during drawbar performance test.	765	1765	2530
iii)	With ballast as used during ploughing dry land field test	765	1550	2315
iv)	As used during wetland operation	775	1240	2015
v)	With ballast as used during haulage test with trailer hitch, canopy and drawbar.	755	1215	1970

### 1.24 Overall dimensions:

Condition	Length, (mm)	Width, (mm)	Height, (mm)		Ground Clearance, (mm)
			With exhaust pipe	Without exhaust pipe	
With Unballast	3585	1720	2285	1730 (At air pre cleaner)	390 (Below transmission drain plug)

### 1.25 Number of external lubricating points:

- Oiling : Nil
- Grease nipples : 21
- Grease cups : 02

### 1.26 Colour of tractor:

- Chassis & engine : Black
- Bonnet & Mudguard : Blue
- Rim and disc : Silver

### 1.27 Optional features, if any : Yes

#### 1.27.1 Air Intake system:

1.27.1.1 Pre cleaner : **Not provided**

#### 1.27.1.2 Air cleaner:

- Make : Donaldson
- Type : Dry
- Location : In front of radiator, under the bonnet

#### Details of elements:

- |                    | <u>Primary</u> | <u>Secondary</u> |
|--------------------|----------------|------------------|
| No. of elements    | One            | One              |
| Type of elements   | Paper          | Febric           |
| Size, (mm) (OD/ID) | 128.4 / 85.3   | 83.2 / 63.0      |
| Length             | 310.7          | 302.1            |

Vacuum Indicator & it's range (mm of water / mm of hg) : Provided

Provision of dust unloading valve : Provided

Service / maintenance schedule : Replace primary & secondary element after every 750 hours of operation or after each three cleaning of filter which on is earlier

#### 1.27.2 Clutch:

- Make : Luk, India
- Type : Dual dry friction plates
- No. of friction plate, (s) : Two

- Size, OD/ID, (mm):**
- Transmission : 279.2 / 167.1  $\phi$
  - PTO : 279.6 / 165.8  $\phi$
- Method of operation:
- Transmission : By pressing clutch pedal halfway provided on LHS of operator's seat
  - PTO : By pressing same clutch pedal full
- 1.27.3 Location of gear shifting levers**
- Centre shift : Centre shift
  - Main gear shifting lever : In front of operator's seat
  - Range selection lever : In front of operator's seat
- 1.27.4 Power take-off shaft:**
- Type : Type-I, Semi independent
  - Method of engaging : By a hand lever provided on LHS of operator's seat.
  - Other PTO speed corresponding to rated engine speed, (rpm) : Clockwise: L1/H1 - 288, L2/H2 - 417, L3/H3 - 652 & L4/H5 - 978  
Anti-clockwise: LR/HR - 374
- 1.27.5 Steering:**
- Make : Danfoss
  - Type : Open centre, Hydrostatic power steering
  - Location : Above the clutch housing
  - Method of operation : Manually by steering control wheel
  - Diameter of steering control wheel, (mm) : 380
- Distributor:**
- Make : Danfoss
  - Type : Open centre
  - Location : Above the clutch housing
- Pump:**
- Make : Rexroth
  - Type : Gear
  - Location : On front, RHS of engine coupled with hydraulic pump drive shaft
  - Method of drive : Through timing gear
  - Make, type & number of hydraulic ram cylinder : Not available, double acting, one (single connecting)
  - Location of ram cylinder : On LHS, Behind the front axle
  - Steering oil capacity, ( l ) : 0.95
  - Lubricant change period : First change after 250 hours, subsequently after every 1000 hours of operation.
- 1.27.6 Bonnet style** : Refer **ANNEXURE-IV**

## 2. FUEL AND LUBRICANTS

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

### 2.2 Lubricants:

Sl. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Air Cleaner & Engine	SAE 20 W 40	SAE 20 W 40
2.	Gearbox, differential, rear axle, final drive, brake, Steering housing & hydraulic system oil	SAE EP-80	Oil originally filled in the tractor systems was not changed
3.	Grease	Multipurpose Grease	MP Grease

### 3. PTO PERFORMANCE TEST

Date(s) of test : 05.11.2018 & 06.11.2018

Tractor run at the Institute prior to start of : 5.09

PTO test (h)

Type of dynamometer bench used : SAJ AG-250 Eddy Current.

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

**Table – 1**

Power, (kW)	Speed (rpm)		Fuel consumption			Specific energy (kWh/l)
	PTO	Engine	(l/h)	(kg/h)	Specific, (kg/ kWh)	
1	2	3	4	5	6	7
<b>a) Maximum power – 2 hours test:</b>						
29.9	579	1801	8.68	7.25	0.242	3.44
28.2	579	1801	8.24	6.89	0.244	3.42*
<b>b) Power at rated engine speed (1800 rpm):</b>						
29.9	579	1801	8.68	7.25	0.242	3.44
28.2	579	1801	8.24	6.89	0.244	3.42*
<b>c) Power at standard power take-off speed (540 ± 10 rpm):</b>						
28.7	540	1680	8.22	6.87	0.239	3.49
27.1	540	1680	7.84	6.56	0.242	3.46*
<b>d) Varying loads at rated engine speed:</b>						
<b>i) Torque corresponding to maximum power available at rated engine speed:</b>						
29.9	579	1801	8.68	7.25	0.242	3.44
<b>ii) 85% of the torque obtained in (i):</b>						
26.8	611	1901	7.85	6.57	0.245	3.41
<b>iii) 75% of the torque obtained in (ii) :</b>						
20.3	617	1919	6.26	5.23	0.258	3.24
<b>iv) 50% of the torque obtained in (ii) :</b>						
13.7	624	1941	4.80	4.01	0.293	2.85
<b>v) 25% of the torque obtained in (ii) :</b>						
6.96	633	1969	3.49	2.92	410	1.99
<b>vi) Unloaded:</b>						
0.20	639	1988	2.26	1.89	9.450	0.09
<b>e) Varying loads at Standard PTO Speed:</b>						
<b>i) Torque corresponding to maximum power available at standard PTO speed: (540 ± 10 rpm):</b>						
28.7	540	1680	8.22	6.87	0.239	3.49
<b>ii) 85% of the torque obtained in (i) :</b>						
25.9	574	1786	7.43	6.21	0.240	3.49
<b>iii) 75% of the torque obtained in (ii) :</b>						
19.6	580	1804	5.92	4.95	0.253	3.31
<b>iv) 50% of the torque obtained in (ii):</b>						
13.3	586	1823	4.49	3.76	0.283	2.96
<b>v) 25% of the torque obtained in (ii) :</b>						
6.7	595	1851	3.24	2.71	0.404	2.07
<b>vi) Unloaded:</b>						
0.2	602	1873	2.02	1.69	8.895	0.09

\* Under high ambient conditions

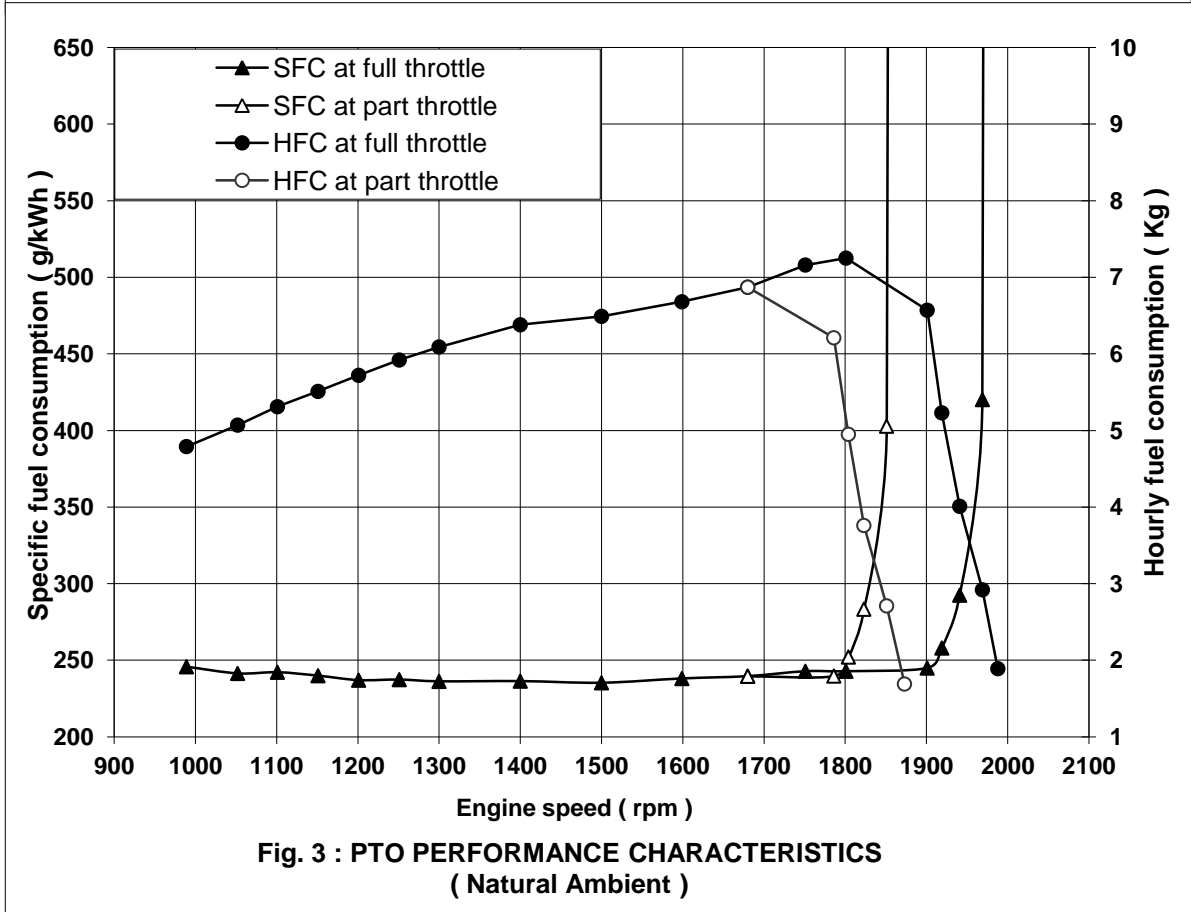
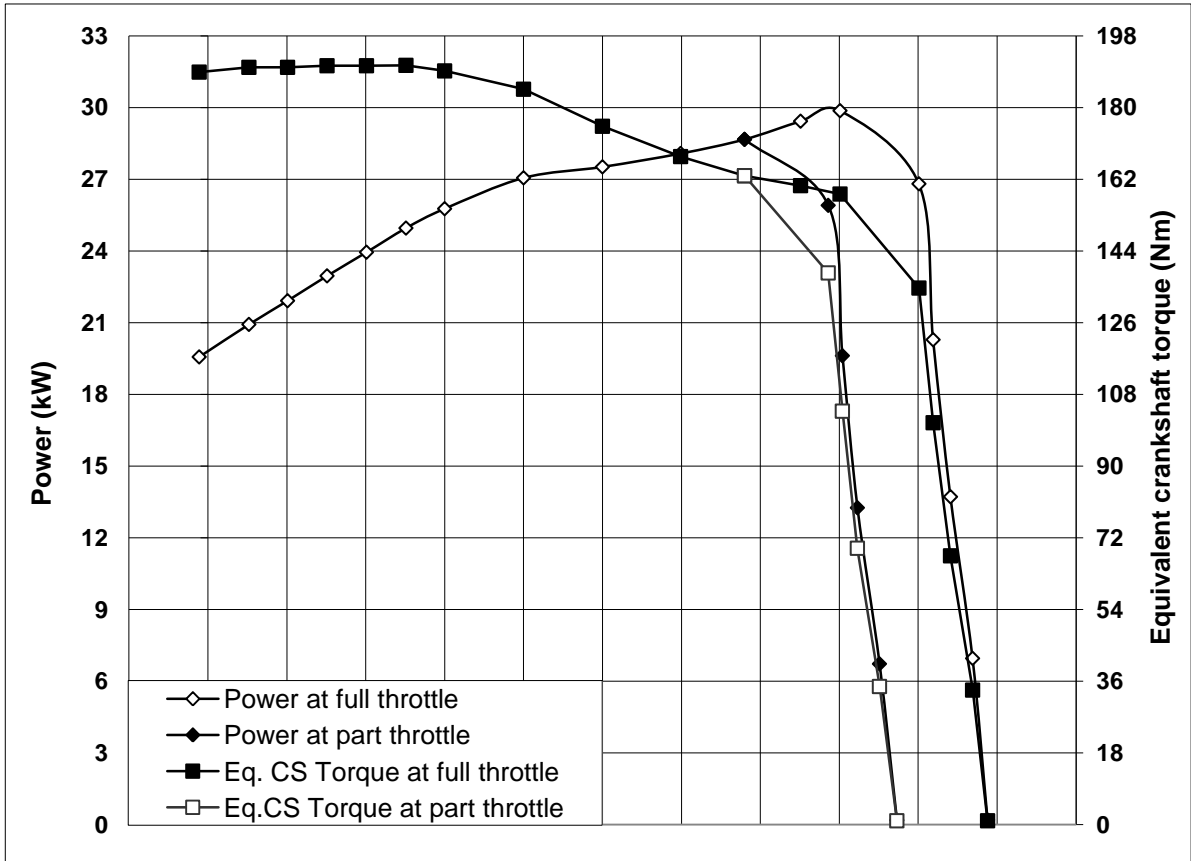


Fig. 3 : PTO PERFORMANCE CHARACTERISTICS  
 ( Natural Ambient )

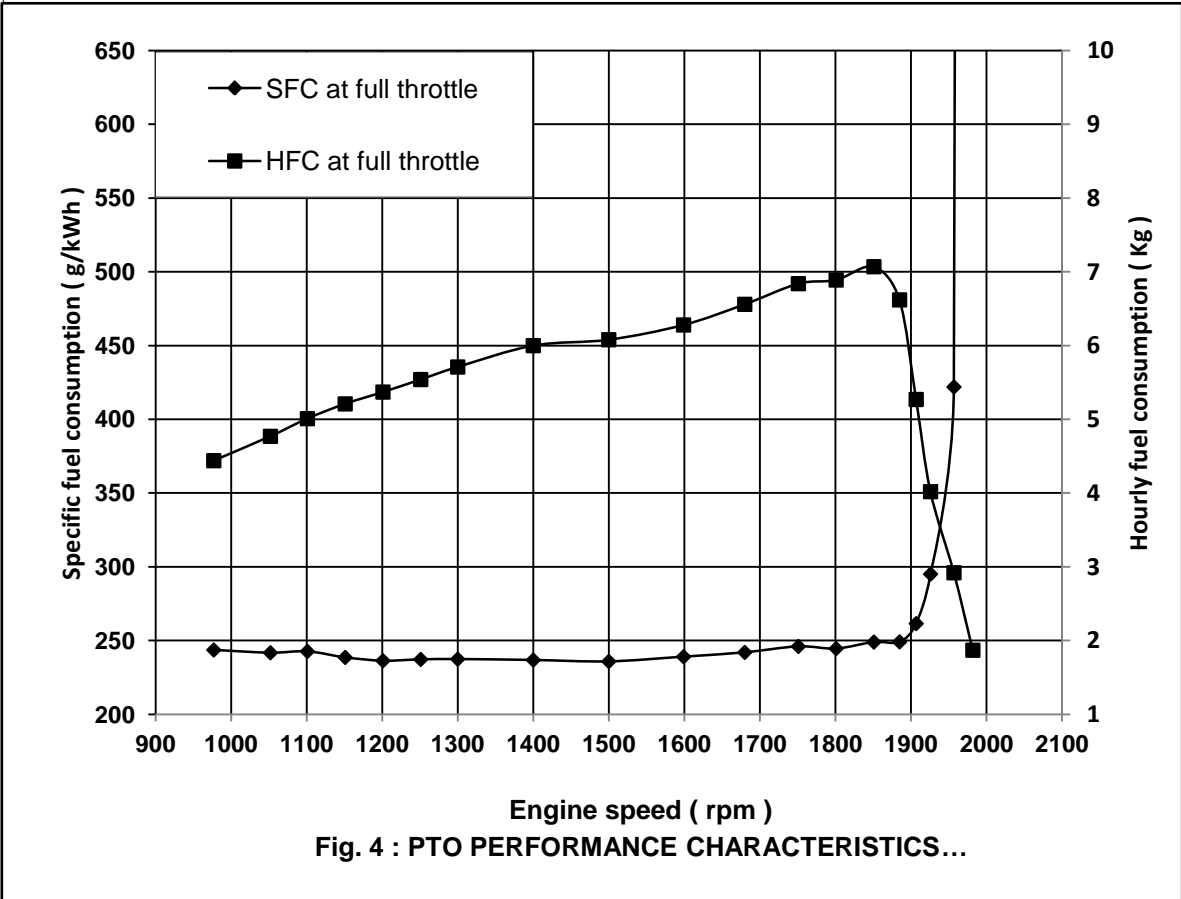
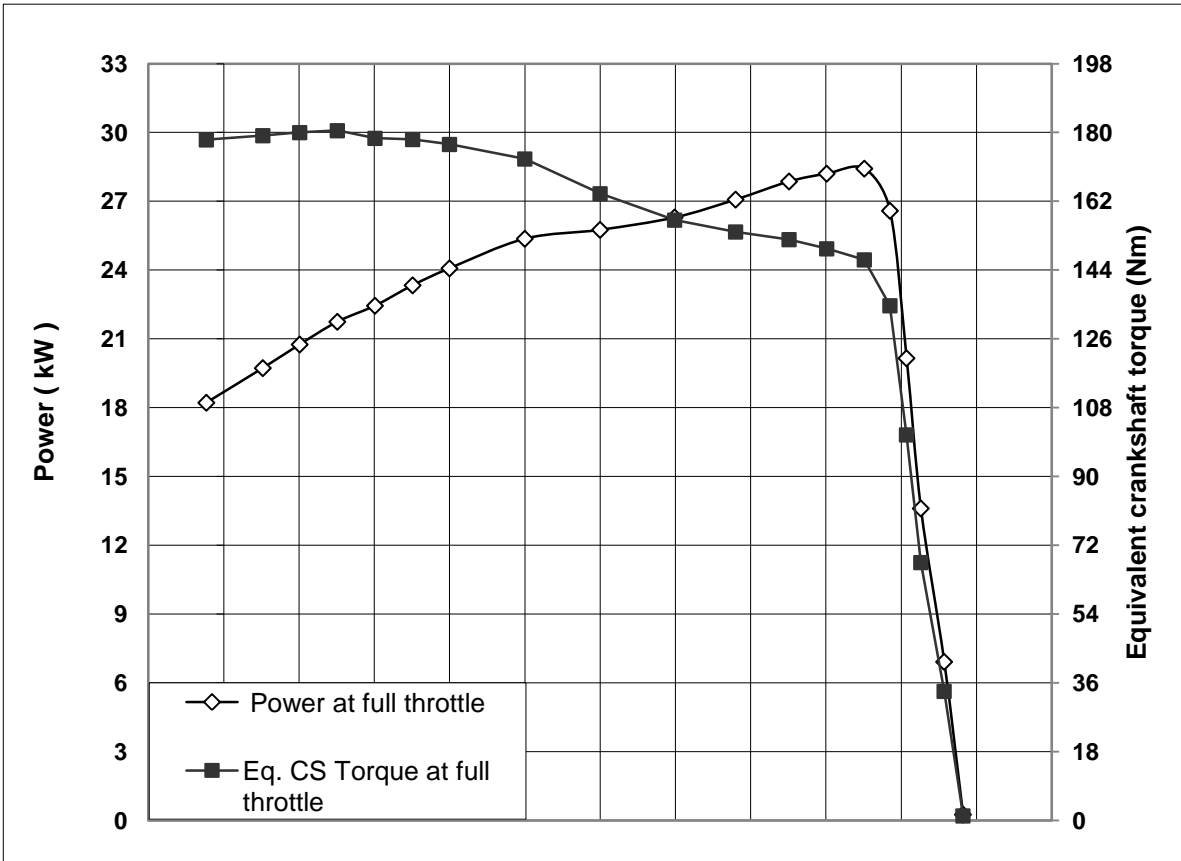
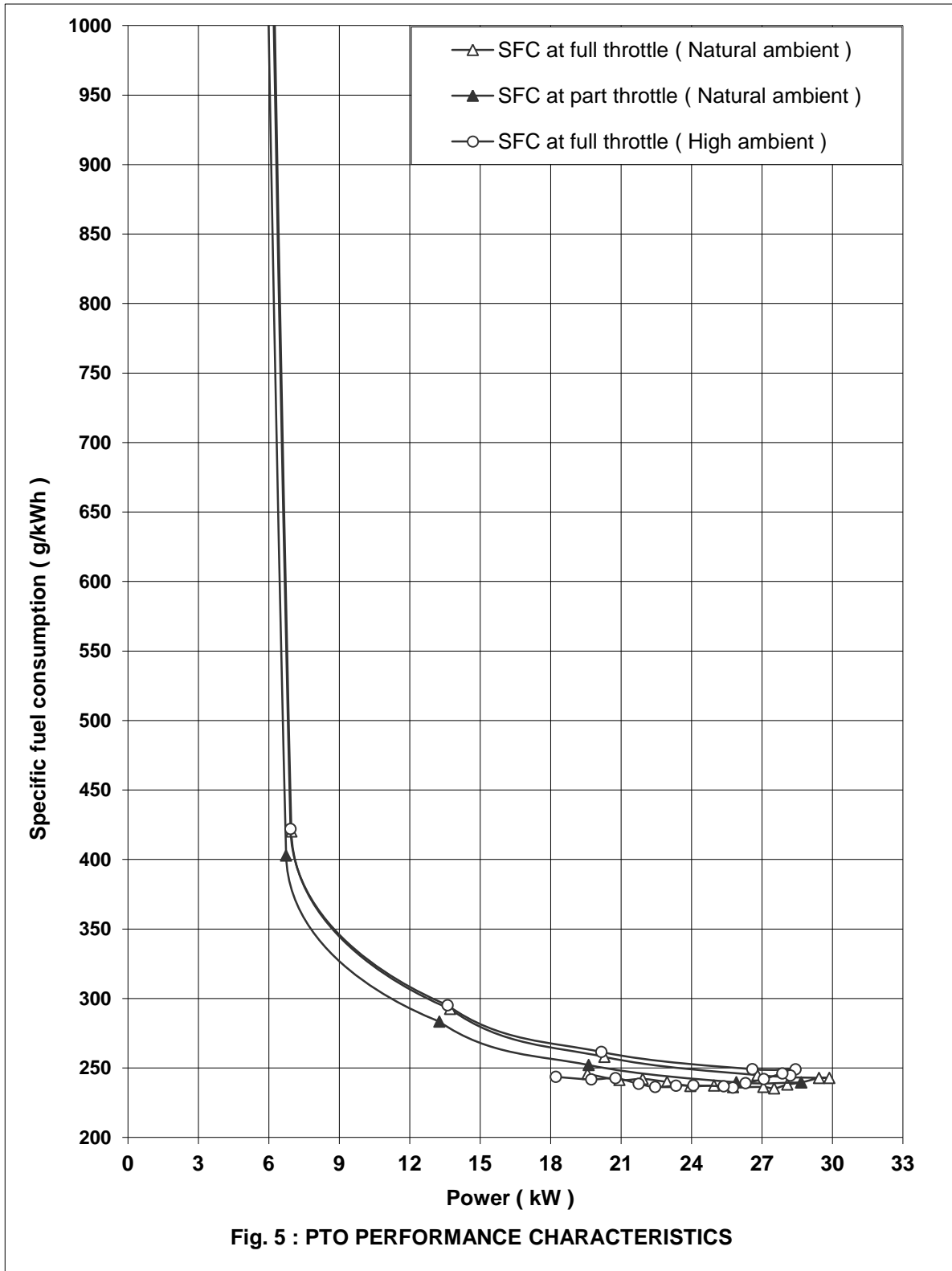


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS...



	<u>Natural ambient</u>	<u>High ambient</u>
-No load maximum engine speed, (rpm) :	1988	1982
-Equivalent crankshaft torque at maximum power, (Nm) :	158.3	149.6
-Maximum equivalent crankshaft torque, (Nm) :	190.6	180.5
-Engine speed at maximum equivalent crankshaft torque, (rpm) :	1251	1151
Backup torque, (%) :	20.4	20.7
Smoke level (maximum light absorption coefficient, per meter) :	0.22	---
<b>- Range of atmospheric conditions:</b>		
Temperature, ( °C) :	27 to 29	42 to 45
Pressure, (kPa) :	98.9 to 99.3	100.7 to 100.9
Relative humidity, (%) :	56 to 63	24 to 29
<b>-Maximum temperatures, (°C):</b>		
Engine oil :	91	103
Coolant (Water + Coolant) :	91	105
Fuel :	48	61
Air intake :	29	47
Exhaust gas :	421	408
<b>-Pressure at maximum power:</b>		
Intake air, (kPa) :	2.9 to 4.0	4.1 to 4.4
Exhaust gas, (kPa) :	3.2 to 3.9	3.9 to 4.5
<b>-Consumptions:</b>		
Lub oil, (g/kWh) :	--	0.48
Coolant (% of total coolant capacity) :	--	Nil

#### 4. DRAWBAR PERFORMANCE TEST

Date(s) of test	:	06.03.2019, 07.03.2019 & 08.03.2019
Tractor run at the Institute prior to start of drawbar test, (h)	:	29.86
Type of track	:	Concrete

**Height of drawbar, (mm):**

- Without ballast	:	550
- With ballast	:	500

- 4.1** The results of drawbar performance test consisting of maximum power and pull with unballast / 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. sustained pull, (kN)	
						(kg/kWh)	(l/h)		Temp (°C)	Pressure (kPa)	R.H. (%)	Fuel	Trans. oil	Coolant (water)		Eng. oil
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>i) Maximum power test (Tractor unballasted):</b>																
L1	2.34	9.2	14.21	1933	14.9	0.414	4.56	2.02	25	98.9	38	40	55	78	88	15.67
L2	3.34	13.2	14.20	1915	15.2	0.364	5.75	2.30	24	99.0	39	39	56	79	89	15.25
L3	5.13	20.1	14.10	1885	15.3	0.341	8.20	2.45	24	99.1	43	39	55	80	89	14.94
L4	8.02	23.9	10.71	1800	7.7	0.306	8.75	2.73	24	99.1	37	38	58	81	88	13.38
H1	9.03	24.1	9.60	1800	6.3	0.299	8.62	2.80	23	99.2	41	37	39	81	85	12.00
<b>ii) Maximum power test (Tractor ballasted):</b>																
L1	2.27	12.0	19.07	1914	15.2	0.381	5.47	2.19	27	98.7	29	40	59	79	91	20.25
L2	3.24	17.0	18.91	1892	15.4	0.349	7.10	2.39	27	98.7	26	41	58	80	90	20.15
L3	5.17	23.0	16.02	1799	9.1	0.313	8.61	2.67	27	98.7	30	41	56	82	90	19.74
L4	8.17	23.9	10.53	1801	4.5	0.302	8.63	2.77	27	98.7	32	41	52	82	88	13.44
H1	9.3	23.9	9.41	1800	3.7	0.305	8.72	2.74	28	98.7	30	40	39	82	86	11.93

**Table-2 Contd..**

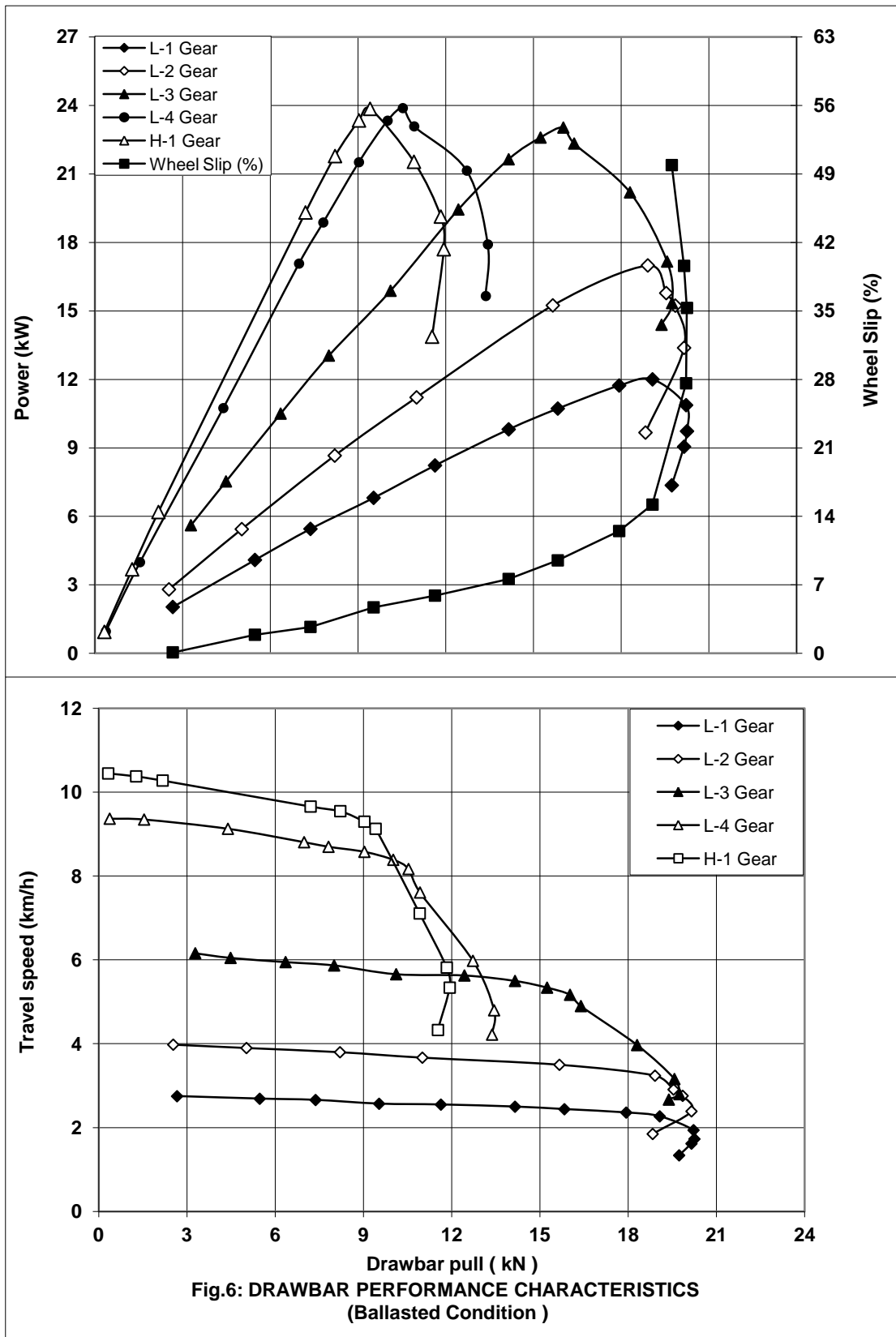
Contd..Table-2

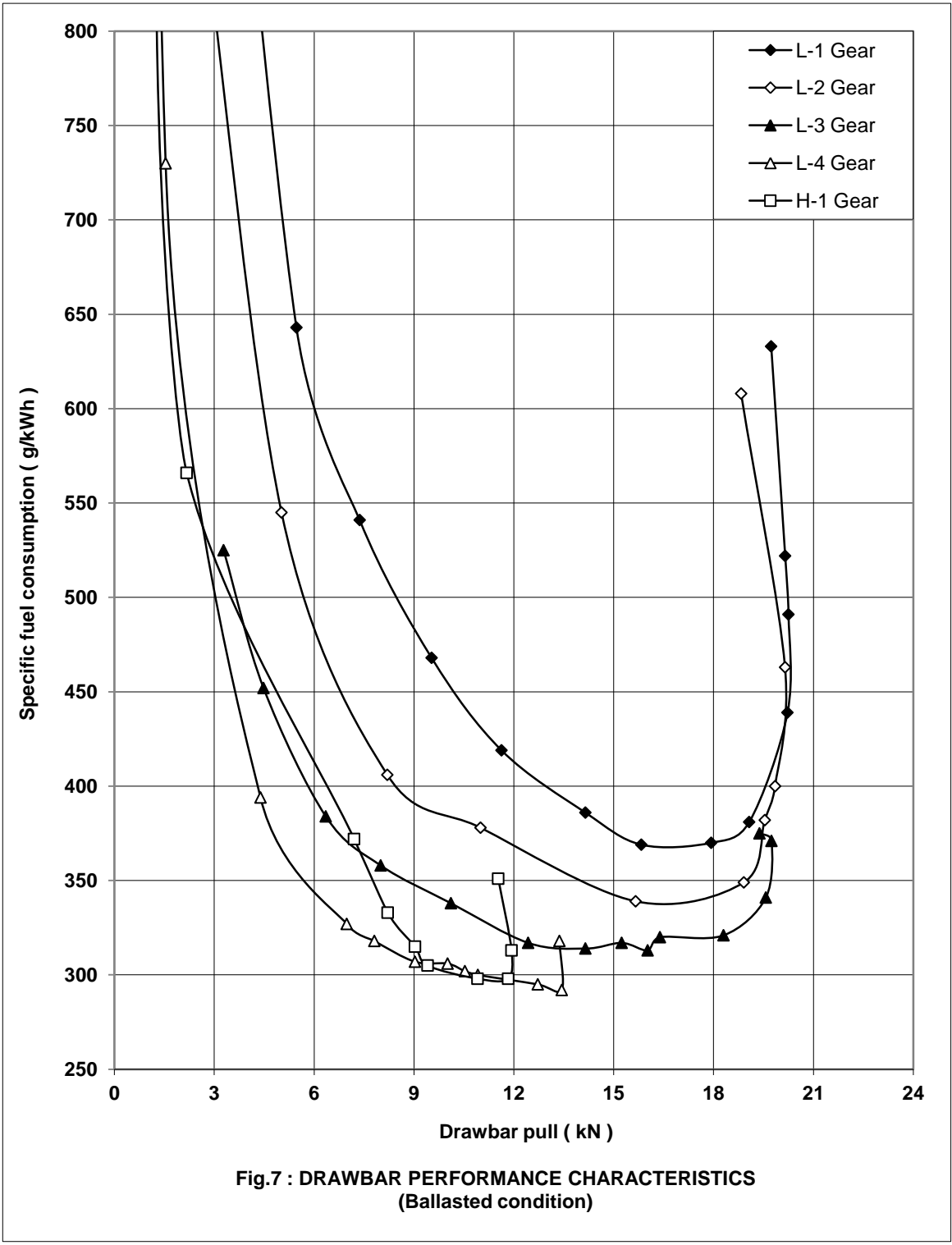
Gear	Travel Speed, (km/h)	Draw-bar power, (kW)	Draw-bar pull, (kN)	Engine Speed, (rpm)	Wheel Slip, (%)	Fuel consumption		Specific Energy, (kW/h/l)	Atmospheric conditions				Temperature (°C)				Max. sustained pull, (kN)
						(kg/kWh)	(l/h)		Temp (°C)	Pre-ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Coolant (water)	Eng-ine oil		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>iii) Five hours test at 75 percent of pull obtained at max. Power (ballasted wheeled tractor):</b>																	
L3	5.66	18.9	12.04	1894	6.8	0.323	7.44	2.55	18	99.1	24	31	38	78	80	--	
<b>iv) Five hours test at pull corresponding to 15 percent wheel slip (ballasted wheeled tractor):</b>																	
L2	3.28	17.23	18.92	1894	---	0.34	7.12	2.42	28	98.7	25	44	64	77	91	--	

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

ii) Tyre Creeping, (mm):  
- LHS : 35  
- RHS : 55

iii) Maximum temperatures during entire drawbar test, (°C):  
Engine oil : 98  
Coolant (water) : 89  
Transmission oil : 77  
Fuel : 46





## 5. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE TEST

Date(s) of test : 13.11.2018, 13.12.2018,  
14.12.2018

Tractor run at the Institute prior to start of hydraulic test, (h) : 15.43

Pump speed at rated engine speed, (rpm) : 1800

### 5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (l/min) : 21.7

Maximum hydraulic power, (kW) : 5.4

Pump delivery rate at maximum hydraulic power, (l/min) : 20.33

Pressure at maximum hydraulic power, (MPa) : 16.0

Sustained pressure of the open relief valve, (MPa) : 20.0

### Tapping point:

a) Relief valve test : At external circuit

b) Pump performance test : At pump outlet

Temperature of hydraulic fluid, (°C) : 60 to 65

### 5.2 Lifting capacity test:

Test	Height of lower hitch point above ground in down position, (mm)	Vertical movement with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corresponding pressure, (MPa)	Moment about rear axle, (kN-m)	Max. tilt angle of mast from vertical (degrees)
At hitch points	200	560	7.65	18.09	6.63	--
On the standard frame	200	550	7.49	18.09	11.06	12.5

### 5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 6.75

Temperature of hydraulic fluid at the start of test, (°C) : 60

### Test data:

Elapsed time (minute)	5	10	15	20	25	30
Cumulative drop in height of lift, (mm)	03	04	04	07	07	10

## 6. BRAKE TEST

### 6.1 Service brake:

#### 6.1.1 Cold brake test:

Date of test(s) : 28.12.2018  
 Type of Track : Concrete  
 Maximum attainable speed (kmph):  
 -Without Ballast : 35.0  
 -With Road Ballasted : 35.0

		At maximum attainable speed			
Unballasted tractor	Braking device control, force (N)	469	384	300	215
	Mean deceleration, (m/sec <sup>2</sup> )	3.59	3.43	3.34	2.50
	Stopping distance, (m)	13.52	13.79	14.14	18.90
		At 25 kmph travel speed			
Unballasted tractor	Braking device control, force(N)	416	350	284	218
	Mean deceleration, (m/ sec <sup>2</sup> )	3.41	3.36	3.06	2.50
	Stopping distance, (m)	7.13	7.17	7.87	9.65

#### 6.1.2 Brake fade test:

		At maximum attainable speed			
Braking device control force (N)		540	434	327	220
Mean deceleration, (m/ sec <sup>2</sup> )		3.53	3.28	3.05	2.50
Stopping distance, (m)		13.71	14.39	15.48	18.90
		At 25 kmph travel speed			
Braking device control force,(N)		420	354	289	223
Mean deceleration, (m/ sec <sup>2</sup> )		3.32	3.19	2.92	2.50
Stopping distance, (m)		7.49	7.57	8.26	9.65

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

### 6.2 Parking brake test:

Particulars	18 percent slope		12 percent slope with trailer of 1.97 tones.	
	Up	Down	Up	Down
Braking device control force, (N)	388	422	342	385
Efficacy of parking brake	-----Effective-----			

## 7. NOISE MEASUREMENT

### 7.1 Noise at bystander's position:

Date of test : 10.01.2019  
 Type of track : Concrete  
 Background noise level, dB (A) : 54

#### Atmospheric conditions:

Temperature, (°C) : 25  
 Pressure, (kPa) : 97.7  
 Relative humidity, (%) : 31  
 Wind velocity, (m/s) : 2.7

#### Test Data:

S. No.	Gear	Traveling speed before acceleration, (kmph)	Noise level, dB (A)
1.	L1	2.10	83
2.	L2	3.05	82
3.	L3	4.77	82
4.	L4	7.11	82
5.	H1	7.89	82
6.	H2	11.31	81
7.	H3	17.71	82
8.	H4	26.36	85

### 7.2 Noise at operator's ear level:

Date of test : 06.03.2019  
 Type of track : Concrete  
 Background noise level, dB(A) : 53

#### Atmospheric conditions:

Temperature, (°C) : 26  
 Pressure, (kPa) : 98.7  
 Relative humidity, (%) : 37  
 Wind velocity, (m/s) : 1.4

#### Test Data:

Gear	Drawbar pull at which the tractor developed the max. noise level, (kN )	Corresponding traveling speed, (kmph)	Noise level, dB(A)
L1	12.01 to 14.21	2.45 to 2.34	94
L2	14.20	3.34	95
L3	13.87	5.26	96
L4*	10.21 to 10.68	8.27 to 8.04	96
H1	8.63 to 9.60	9.49 to 9.00	95

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

### 8. MECHANICAL VIBRATION MEASUREMENT

Date of test : 25.01.2019  
Type of test surface : Concrete

Sl. No.	Measuring points		Vibration, microns			
			At load corresponding to 85% of max. PTO power		At no load	
			VD	HD	VD	HD
<b>1</b>	<b>2</b>		<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
i)	Foot rest	Left	210*	120*	300*	100
		Right	220*	100	60	60
ii)	Steering wheel		130*	180*	180*	210*
iii)	Seat	Bottom	100	60	30	20
		Back	30	40	20	20
iv)	Mudguard	Left	80	60	40	30
		Right	90	40	80	60
v)	Head light	Left	150*	90	120*	130*
		Right	100	100	130*	120*
vi)	Battery base, centre		180*	60	120*	100
vii)	Tail light	Left	120*	60	60	50
		Right	130*	50	140*	40
viii)	Plough light		200*	150*	350*	250*
ix)	Gear shifting lever		60	30	20	30
x)	Accelerator lever	Hand	100	70	140*	60
		Foot	30	30	30	30
xi)	Brake pedal	Left	90	80	30	30
		Right	130*	120*	40	30
xii)	Clutch pedal		40	60	130*	80
xiii)	Main hydraulic control lever		70	50	10	20
xiv)	PTO engaging lever		30	70	30	10

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

### 9. AIR CLEANER OIL PULL OVER TEST

Date of test : 25.10.2018

**Atmospheric conditions**

Temperature, (°C) : 32 to 34  
Pressure, (kPa) : 98.6 to 98.8  
Relative humidity, (%) : 25 to 45  
Mass of oil before test, (g) :

Sl .No.	Position of tractor	Loss of oil (g)	Oil pull over (%)	Engine oil pressure
i)	Tractor parked on level ground	0.50	0.06	Normal
ii)	Tractor tilted to 15 deg laterally with RHS up	0.90	0.11	Normal
iii)	Tractor tilted to 15 deg laterally with LHS up	0.40	0.05	Normal
iv)	Tractor tilted to 15 deg longitudinally with front end up	0.40	0.05	Normal
v)	Tractor tilted to 15 deg longitudinally with rear end up	Nil	Nil	Normal



### 10. LOCATION OF CENTRE OF GRAVITY

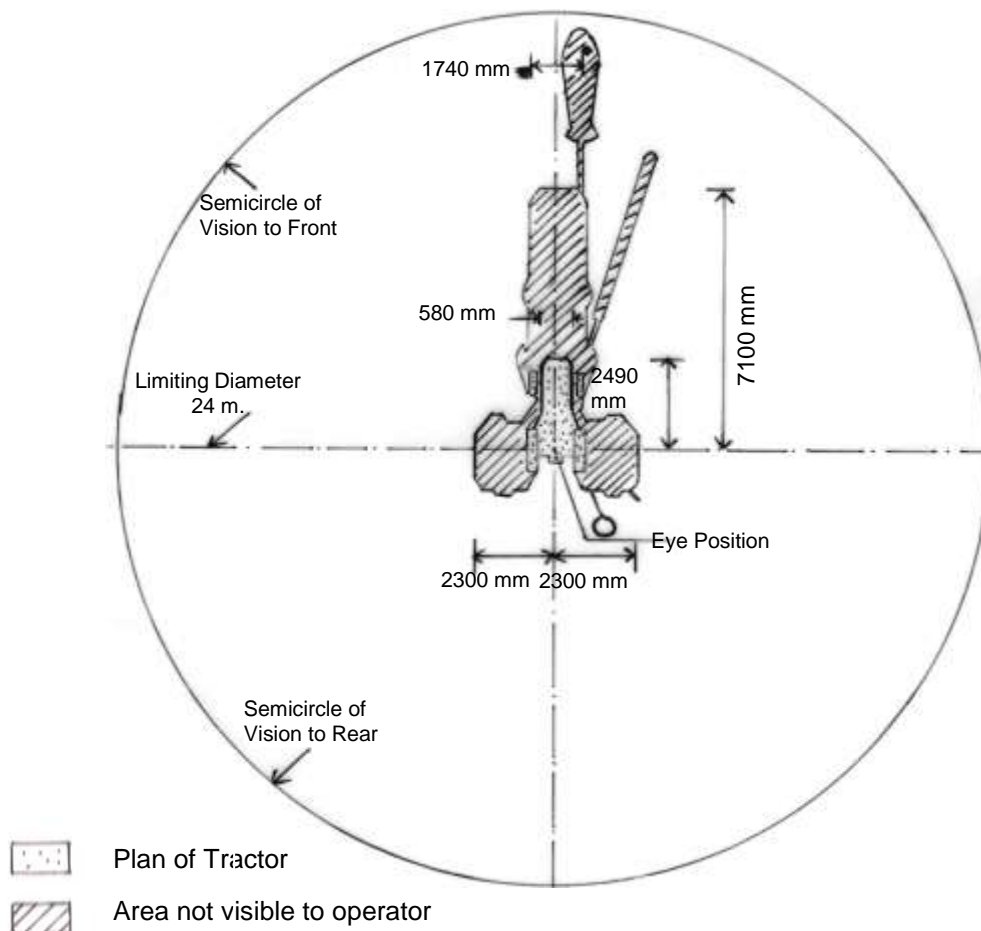
Condition	Particulars	Coordinates
Tractor under standard ballasted condition but with all the liquid reservoirs full & the operator replaced by a 75 kg mass on the seat	Height above ground, (mm)	860
	Distance forward from the vertical plane containing the axis of rear wheels, (mm)	771
	Distance from the median plane parallel to the longitudinal axis of tractor bisecting the track, (mm)	11 (in RHS)

### 11. TURNING ABILITY

Characteristics		Minimum turning diameter, (m)		Minimum clearance diameter, (m)	
		LHS	RHS	LHS	RHS
With mechanical steering (Standard fitment)	Brakes released	6.58	6.58	7.14	7.13
	Brake applied	5.77	5.79	6.45	6.45
With hydraulic power steering (Optional fitment)	Brakes released	7.45	7.45	7.75	7.77
	Brake applied	6.70	6.64	6.96	6.92

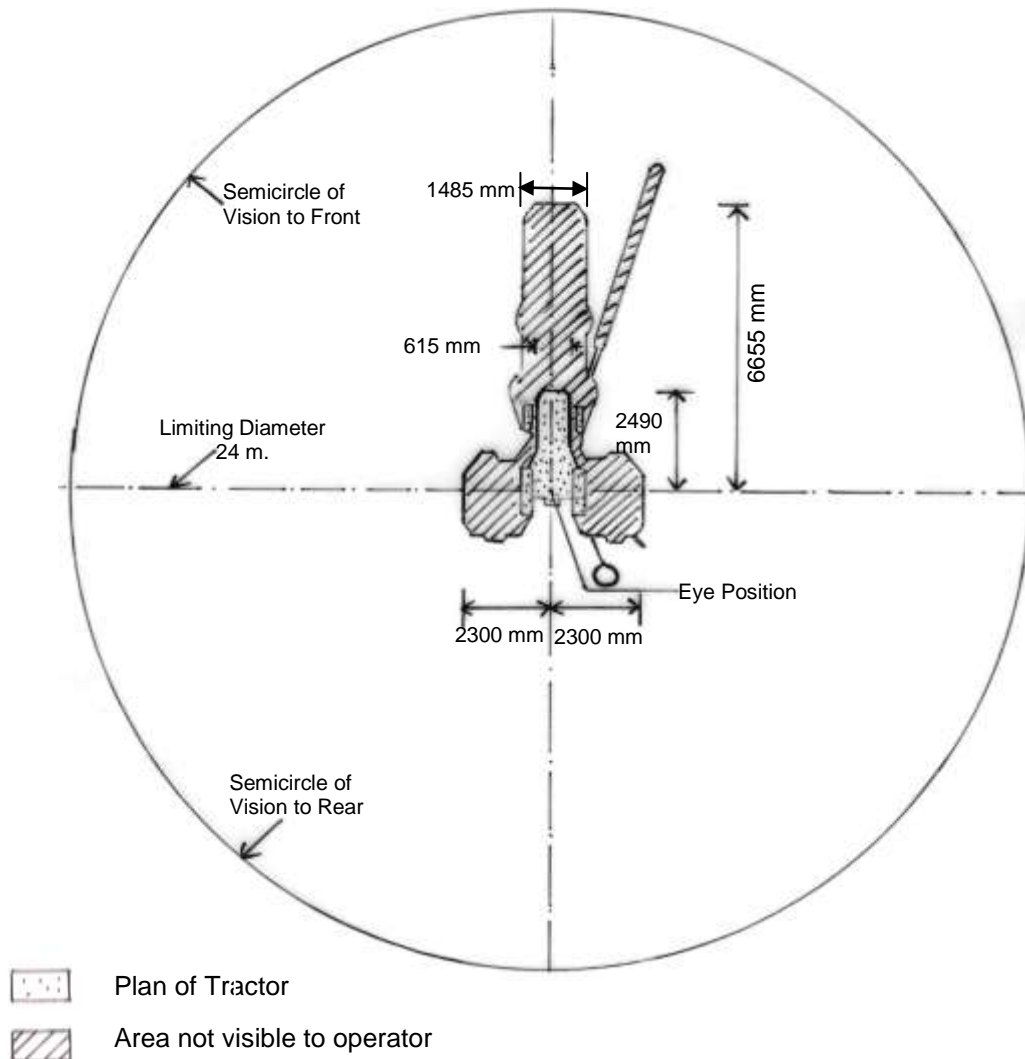
### 12. OPERATORS'S FIELD OF VISION

- 12.1** The operator's field of vision to the front and rear from the operator's seat with standard fitment of bonnet style is represented in **Fig. 8 (a)** as per the following details:
- The non visible space in front is **7100 mm** which is **3.60** times of its wheel base i.e. 1975 mm.
  - The non visible space in LHS & RHS is **2300 mm** which is **1.71** times of its rear standard track width i.e.1345mm.



**Fig. 8 (a): OPERATOR'S FIELD OF VISION (WITH STANDARD FITMENT OF BONNET STYLE)**

- 12.2 The operator's field of vision to the front and rear from the operator's seat with optional fitment of bonnet style is represented in **Fig. 8 (b)** as per the following details:
- (i) The non visible space in front is **6655 mm** which is **3.37** times of its wheel base i.e. 1975 mm.
  - (ii) The non visible space in LHS & RHS is **2300 mm** which is **1.71** times of its rear standard track width i.e.1345 mm.



**Fig. 8 (b) : OPERATOR'S FIELD OF VISION (WITH OPTIONAL FITMENT OF BONNET STYLE)**

### 13. FIELD TEST

13.1 The field tests comprising of Disc ploughing, Rotavation and Wet land cultivation (including puddling and water proof) were conducted for 10.42, 13.59 and 15.41 hours respectively.

All the field tests were conducted at the full accelerator settings, when the no load speed of the engine varied from 1960 to 2000 rpm.

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

13.3 The summary of field test observation with disc plough, rotavator and full cage wheel are given in **Table – 3**.

**Table – 3**

T- 1251/1778/2019	SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)
	THIS TEST REPORT IS VALID UPTO: 30/06/2022

**SUMMARY OF FIELD PERFORMANCE TEST**

S No.	Parameter/operation	Disc Ploughing	Rotavation	Puddling
i)	Type of soil	Heavy	Heavy	Heavy
ii)	Av. Soil moisture, (%) / Av. Depth of water, (cm)	9 to 16	8 to 12	15 to 17
iii)	Bulk density of soil, (g/cc)	1.5 to 1.7	1.5 to 1.6	--
iv)	Cone index, (kg/cm <sup>2</sup> ) / Puddling index, (%)	7.66 to 8.51	6.81 to 8.51	79.4 to 85.7
v)	Gear used	L-2	L-1	L-2
vi)	Av. Speed of operation, (kmph)	3.21 to 3.27	2.72 to 2.75	3.68 to 3.77
vii)	Av. Wheel slip / Av. Travel reduction, (%)	11.6 to 15.2	-4.4 to -3.9	2.2 to 3.7
viii)	Av. Depth of cut / depth of puddle, (cm)	16 to 18	7 to 8	18 to 35
ix)	Av. Working width, (cm)	70	161 to 168	--
x)	Area covered, (ha/h)	0.184 to 0.191	0.360 to 0.364	--
xi)	Fuel consumption:			
	- (l/h)	3.47 to 3.54	4.54 to 5.05	3.30 to 3.36
	- (l/ha)	19.24 to 18.18	12.49 to 14.03	--
xii)	Av. Draft of implement, (kN)	6.09 to 6.31	--	--

**Remarks:** The average lub oil and coolant (water) consumptions during the entire field tests were observed to be **1.45 ml/h & 1.45 ml/h** respectively.

**13.4 Wet land cultivation (Puddling):**

**13.4.1** The tractor was fitted with full cage wheel for conducting the puddling operation. The brief specification of full cage wheel used is given in **Annexure - II** respectively.

**13.4.2** 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 (Re-affirmed in October, 2017) (Technical requirement of Agriculture tractors for wet land cultivation). The observations recorded were as under.

S. No.	Location	Whether ingress of mud and/or water	Remarks
1.	King pin assemblies	No	None
2.	Stub axles	No	
3.	Centre pin assembly	No	
4.	Clutch housing	No	
5.	Lubricating oil in engine sump, transmission system, hydraulic, brake & steering system	No	
6.	Starter motor	No	
7.	Alternator	No	

#### 14. HAULAGE TEST

Type of trailer	:	<b>Two wheel (Single axle)</b>	<b>Four wheel (Double axle)</b>
Gross mass of trailer (Tonne)	:	5.5	6.0
Height of trailer hitch above ground level, (mm)	:	520	585
Gear used during the test for negotiating slopes upto 8%	:	H4	H4
Average travel speed,(kmph)	:	33.4	33.9
Average fuel consumption:			
- (l/h)	:	5.28	4.84 to 5.00
- (ml/km/(Tonne)	:	28.6 to 28.8	23.8 to 24.6
Average distance traveled per litre of fuel consumption, (km)	:	6.31 to 6.36	6.78 to 7.01
<b>General observations:</b>			
Effectiveness of brakes	:	Effective	Effective
Maneuverability of tractor-trailer combination	:	Satisfactory	Satisfactory

#### 15. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after 88.09 hours of tractor operation at this Institute.

##### 15.1 Engine:

##### 15.1.1 Cylinder bore:

Cylinder No.	Cylinder bore dia, (mm)						Max. permissible wear limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Thrust side	Non-thrust Side	
1.	102.011	102.011	102.016	102.010	102.017	102.008	102.4
2.	102.013	102.006	102.017	102.009	102.004	102.017	
3.	102.016	102.019	102.018	102.017	102.011	102.023	

##### 15.1.2 Piston:

Piston No.	Piston dia, (mm)				Max. permissible wear limit, for piston dia. at the skirt, (mm)	Clearance between piston to cylinder liner at the skirt, (mm)	
	Top (above top compression ring)		At skirt			As measured	Max. permissible limit
	Thrust side	Non-thrust Side	Thrust side	Non-thrust Side			
1.	101.481	101.422	101.940	***	101.70	0.077	0.500
2.	101.367	101.480	101.937	***		0.080	
3.	101.485	101.432	101.938	***		0.085	

(\*\*\*) 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 No. 1			Cylinder No. 2			Cylinder No. 3			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1 <sup>st</sup> comp. ring	0.48	0.48	0.48	0.53	0.53	0.63	0.60	0.60	0.60	2.00
2 <sup>nd</sup> comp. ring	0.90	0.90	0.90	0.93	0.93	0.93	0.93	0.93	0.93	2.00
Oil ring	0.63	0.63	0.63	0.63	0.63	0.63	0.70	0.73	0.80	2.00

**15.1.4 Ring side clearance:**

Rings	Ring side clearance, (mm)			Max. permissible clearance limit, (mm)
	Piston-I	Piston-II	Piston-III	
1 <sup>st</sup> Compression ring	--Tapped--			--
2 <sup>nd</sup> Compression ring	0.067	0.067	0.056	0.20
Oil ring	0.041	0.048	0.052	0.20

**15.1.5 Main Bearing:**

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. permissible wear limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.185 to 0.298	0.17	0.40	0.70
2.	0.197 to 0.255			
3.	0.138 to 0.151			
4.	0.204 to 0.321			

**15.1.6 Big end bearings:**

Bearing No.	Clearance, (mm)		Max. permissible wear limit,(mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.189 to 0.281	0.30	0.50	1.00
2.	0.184 to 0.202	0.35		
3.	0.102 to 0.224	0.35		

**15.1.7 Valve, guides and timing gears:**

Any marked sign of overheating of valves : None  
Pitting of seat/faces of valves : None  
Any visual damage to the teeth of timing gears : None

**Observation**

**Spring rate, ( N/mm):**

Intake valve spring	Inner	: 2.65 to 2.85	Against discard limit of Inner & outer spring is 2.12 & 5.61 N/mm respectively.
	Outer	: 7.06 to 7.26	
Exhaust valve spring	Inner	: 2.65 to 2.75	
	Outer	: 7.06 to 7.36	

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

- Intake valve : 0.045 to 0.075 | Against discard limit of 0.20 mm  
- Exhaust valve : 0.044 to 0.057

**15.2 Clutch:**

Any marked wear on clutch friction plates : None  
 Condition of clutch release bearing : Normal  
 Condition of pilot bearing : Normal  
 Condition of springs and release leavers : Normal  
 Presence of oil in clutch housing : None  
 Any marks on fly wheel/ pressure plate : None  
 Overall thickness of plate : 10.99 to 11.06 Above rivet  
 Height of lining over rivet head, (mm) : 2.89 to 3.13 head

**15.3 Transmission gears:**

Any visual damage, pitting & chipping of any : None  
 transmission gear teeth  
 Backlash between crown wheel and pinion, : 0.18 | Against the discard  
 (mm) limit of 1.20 mm

**15.4 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	13 ± 0.5	13.22 to 13.35	2.19 to 2.52	Up to rivet head
Right	13 ± 0.5	13.17 to 13.46	2.00 to 2.43	Up to rivet head

**15.5 Front axle:**

Any marked wear of king pins : None  
 Any marked wear of king pin bushes : None  
 Clearance between king pin and bushes, (mm) : 0.11 to 0.45 | Against discard limit of  
 1.00 mm  
 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) : 0.09 to 0.19 | Against discard limit of  
 1.00 mm

**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**

S. No.	Adjustment/ Defects/ Breakdowns and Repairs	Category of breakdown	Tractor run hours
1.	During haulage test hand throttle accelerator lever rod was got broken. Thereafter the hand throttle accelerator lever rod (Part No. 100002753A) was replaced with new one of same specification.	--	25.0

## 17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

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

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant (D)/ Require- ment (R)	As observed	Whether meets the re- quire- ments (Yes/No.)
1	2	3	4	5	6	7
<b>17.1.1</b>	<b>PTO Performance :</b>					
<b>a)</b>	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	29.5 (D)	29.9	Yes
<b>b)</b>	Power at rated engine speed, (kW)	Non Evaluative	-do-	29.5 (D)	29.9	Yes
<b>c)</b>	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	245 (D)	242	Yes
<b>d)</b>	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	197 (D)	190.6	Yes
<b>e)</b>	Back-up torque, percent	Non Evaluative	10 percent, minimum.	10%	20.4	Yes
<b>f)</b>	<b>Maximum operating temperature (°C):</b>					
	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.	132 (D)	103	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.	118 (D)	105	Yes
<b>g)</b>	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at maximum power under High ambient conditions.	Maximum 2.44 (R)	0.48	Yes
<b>h)</b>	Smoke level, m <sup>-1</sup>	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	0.22	Yes

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

1	2	3	4	5	6	7
<b>17.1.2</b>	<b>Drawbar performance :</b>					
<b>a)</b>	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	16.50 (D) 16.13 (R)	19.07	Yes
<b>b)</b>	Maximum drawbar pull with unballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast as the case may be.	12.90 (D) 12.56 (R)	14.21	Yes
<b>c)</b>	Maximum drawbar power with standard ballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg. Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having 1500 kg total static mass of tractor. Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	23.6 (D) 23.9 (R)	24.1	Yes
<b>d)</b>	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	130	77	Yes
<b>17.1.3</b>	<b>Power lift and hydraulic pump performance :</b>					
<b>a)</b>	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Non Evaluative	To be declared by manufacturer [Tolerance of minus 10%]	15.0 (D)	7.65	No
	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 and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	12.0 (D) 7.03 (R)	7.49	Yes
<b>b)</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.	50 mm	10	Yes
<b>17.1.4</b>	<b>Brake performance at 25 kmph:</b>					
<b>a)</b>	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):					
	1) Cold brake	Evaluative	10	10 (R)	7.13	Yes
	2) Hot brake	Evaluative	10	10 (R)	7.49	Yes
<b>b)</b>	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s <sup>2</sup> (N).	Evaluative	600	600 (R)	218 to 223	Yes
<b>c)</b>	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	422	Yes



T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

1	2	3	4	5	6	7
<b>17.1.5</b>	<b>Noise measurement :</b>					
<b>a)</b>	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	85	Yes
<b>b)</b>	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	96	Yes
<b>17.1.6</b>	<b>Amplitude of mechanical vibrations at :</b>					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	300	<b>No</b>
	2) Right foot rest			100 (R)	220	<b>No</b>
	3) Seat (with driver seated)		-do-	100 (R)	100	Yes
	4) Steering wheel		-do-	100 (R)	210	<b>No</b>
<b>17.1.7</b>	<b>Air cleaner</b>					
	Air cleaner oil pull over (%).	Non Evaluative	0.25% (maximum)	0.25% (D)	0.11	Yes
<b>17.1.8</b>	<b>Haulage requirements :</b>					
<b>a)</b>	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	5.5 (D)	5.5	Yes
	2) Four wheel		--	6.0 (D)	6.0	Yes
<b>b)</b>	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	4.0 to 7.0 (D)	6.31 to 6.36	Yes
	2) Four wheel		--	4.0 to 7.0 (D)	6.78 to 7.01	Yes
<b>c)</b>	Fuel consumption (ml/km/ton):					
	1) Two wheel	Non Evaluative	--	20 to 60 (D)	28.6 to 28.8	Yes
	2) Four wheel		--	20 to 60 (D)	23.8 to 24.6	Yes
<b>17.1.9</b>	<b>Wetland cultivation :</b>					
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud (R)	No ingress of water and / or mud was observed	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4. Engine oil	-do-				
	5. Transmission oil	-do-				

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

1	2	3	4	5	6	7
<b>17.1.10</b>	<b>Safety features :</b>					
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 (tractor having more than 1150 mm rear track width)	Non Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	<b>Does not Meet the requirement</b>		<b>No</b>
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	<b>Does not Meet the requirement</b>		<b>No</b>
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	<b>Does not Meet the requirement</b>		<b>No</b>
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	Meets the requirement		Yes
g)	Specifications of swinging drawbar	Non Evaluative		Not provided		NA

<b>17.1.11 Labeling of tractors (Provision of labeling plate):</b>						
	1) Make	Evaluative	Should conform to the requirements of CMVR	--	SONALIKA	Yes
	2) Model	Evaluative		--	DI - 42 HDM	Yes
	3) Year of manufacture	Evaluative		--	GF (i.e. May, 2018)	Yes
	4) Engine serial number	Evaluative		--	3102FLU83E736815F19	Yes
	5) Chassis serial number	Evaluative		--	FYZSG744175S3	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	29.5	Yes

<b>17.1.12 Discard limit for:</b>						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by printed literature	102.4	102.017 to 102.023	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.50	0.077 to 0.085	Yes
(c)	<b>Ring end gap (mm):</b>					
	- Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by printed literature	2.00	0.48 to 0.63	Yes
	- 2 <sup>nd</sup> comp. ring.		-do-	2.00	0.90 to 0.93	Yes
	- Oil ring.		-do-	2.00	0.63 to 0.80	Yes
(d)	<b>Ring groove clearance (mm):</b>					
	- Top comp. ring.	Evaluative	-do-	0.20	--Tapered--	--
	- 2 <sup>nd</sup> comp. ring.		-do-	0.20	0.056 to 0.067	Yes
	- Oil ring.		-do-	0.20	0.041 to 0.052	Yes

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

1	2	3	4	5	6	7
<b>(e)</b>	<b>Clearance of main bearings (mm):</b>					
-	Diametrical clearance	Evaluative	-do-	0.40	0.138 to 0.298	Yes
-	Crankshaft end float	Evaluative	-do-	0.70	0.17	Yes
<b>(f)</b>	<b>Clearance of big end bearings, (mm):</b>					
-	Diametrical	Evaluative	-do-	0.50	0.102 to 0.281	Yes
-	Axial	Evaluative	-do-	1.00	0.30 to 0.35	Yes
<b>(g)</b>	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.00	0.11 to 0.46	Yes
<b>(h)</b>	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	1.00	0.09 to 0.19	Yes

<b>17.1.13</b>	<b>Literature as per IS:8132 (Submission to test agency)</b>					
<b>(a)</b>	Operator manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes
<b>(b)</b>	Parts Catalogue	Evaluative	Provided/Not Provided	Provided	Provided	Yes
<b>(c)</b>	Workshop/ Service manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes

<b>17.1.14</b>	<b>CATEGORY OF BREAKDOWNS / DEFECTS :</b>				
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

<b>17.2</b>	<b>Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:</b>			
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1.	Fitment of ROPS	With a provision for fitment of ROPS. If ROPS fitted it should meet the requirement of IS: 11821-1992 (Reaffirmed in October, 2017).	Provided  ROPS not fitted	Yes  Not applicable
2.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

**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 2014)] : Conforms
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2014)] : **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 2014)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed October, 2017)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2014)] : **Does not conform**
- 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 October, 2017)] : **Does not conform**
- vii) 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
- viii) 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 October, 2017)] : **Does not conform**
- ix) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2014)] : **Does not conform**
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2014)] : Conforms

**17.4 Salient Observations:**

**17.4.1 Laboratory tests:**

**17.4.1.1 PTO Performance:**

- i) The maximum PTO power was recorded as **29.9 kW** against the declaration of **29.5 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **242 g/kWh** against the declaration of **245 g/kWh**, which is within the tolerance limit of IS: 12207-2014.
- iii) The maximum equivalent crankshaft torque was recorded as **190.6 N-m** against the declaration of **197 N-m**, which is within the permissible limit as per requirement of IS: 12207-2014.
- iv) The backup torque is **20.4 %**.
- v) The maximum PTO power under natural and high ambient condition was recorded as **29.9 kW & 28.2 kW** respectively. There is power drop of **5.7 %** from natural to high ambient condition. This should be looked into for necessary corrective action.

**17.4.1.2 Drawbar Performance:**

The creeping of LHS & RHS tyre over rim was recorded as **35 & 55 mm** respectively during 10 hours drawbar performance test. This should be looked into for necessary corrective action.

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

**17.4.1.3 Hydraulic Performance:**

The maximum lifting capacity throughout the range of lift (kN) at lower hitch point has been recorded as **7.65 kN** against the declaration of **15.0 kN**. Which is **5.94 kN** less than the minimum requirement of **13.59 kN**. Hence it does not meet the requirement as per IS: 12207-2014. This should be looked into for necessary corrective action

**17.4.1.4 Mechanical Vibration:**

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

**17.4.1.6 Three Point Linkage:**

- i) The parameter lateral distance from lower hitch point to centre line of the tractor of three point linkage does not meet the requirement of IS: 4468 (Part-I): 1997 (Re-affirmed in October, 2017). This should be looked into for necessary corrective action
- ii) Some of the parameters of three point linkages conform to Cat. I and some of them conform to Cat. II. Keeping in view the spirit of standardization, necessary improvements may be incorporated.

**17.4.1.7 Linkage Drawbar:**

The some of the parameters of linkage drawbar meet to the Cat.I and some of Cat. II of IS: 12953 (Part-I): 1990 (Re-affirmed in October, 2017). This should be looked into for necessary corrective action

**17.4.1.8 Specifications of Power Take-off Shaft:**

The dimension "BØ" of PTO shaft Refer Fig.2 of PTO shaft does not meet the requirement of IS: 4931:1995 (Re-affirmed in 2014). This should be looked into for corrective action.

**17.4.1.9 Operator's Seat:**

Inclination of backrest of seat from vertical and vertical distance from seat index point to centre of steering control wheel does not meet the requirements of IS: 12343:1998 (Re-affirmed in 2014). This should be looked into for necessary corrective action

**17.4.2 Field performance test:**

**17.4.2.1 Wet land cultivation (Puddling operation):**

No ingress of mud/or water was 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).

**17.4.2.2 Haulage test:**

During haulage test hand throttle accelerator lever rod was got broken. Thereafter the hand throttle accelerator lever rod (Part No. 100002753A) was replaced with new one of same specification. It is the premature failure of the components. This should be looked into for necessary corrective action in production line of component.

**17.5 Maintenance / Service Problems:**

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

**17.6 Recommendation with regard to safety on tractor:**

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

- i) Provision of spark arrester in the exhaust system.
- ii) The working clearance between draft control lever of hydraulic system and RHS fender should be provided as per the requirement of relevant Indian Standard.
- iii) Inclination of back rest of seat from vertical and vertical distance from seat index point to centre of steering control wheel should be within the limit for easy and comfortable controlling of tractor.
- iv) Coupling to attach trailer brakes should be provided.
- v) Safety switch should be provided to avoid the accidental start.
- vi) There should be provision of differential lock.
- vii) Master shield on PTO shaft should be provided.

T- 1251/1778/2019	<b>SONALIKA, DI-42 HDM TRACTOR - Commercial (Initial)</b>
	<b>THIS TEST REPORT IS VALID UPTO: 30/06/2022</b>

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

**17.7.1** The following literature has been supplied with the tractor for reference during the testing.

- i)** Operator's manual for Sonalika DI – 42 HDM tractors
- ii)** Spare part's catalogue of Sonalika DI – 42 HDM tractors
- iii)** Service manuals Part - I & Part - II of Sonalika DI – 42 HDM tractors

**17.7.2** The supplied literature was found adequate, **except the following:-**

- i)** Oil change period of air cleaner bowl, steering system, transmission / hydraulic system given in the schedule & maintenance chart of Operator's manual and Service manual (Part I) does not match with specifications submitted by applicant.
- ii)** Tractor model Sonalika DI – 42 HDM have been not mentioned in the recommended grade lubricants & grease chart of the Operator's manual and Service manual.
- iii)** Various specifications of different tractor model have been provided in operator's manual and Service manual (Part I) except Sonalika DI – 42 HDM.

**17.7.3** These literatures may also be brought out in national & other regional languages for the guidance of user's and service personnel.

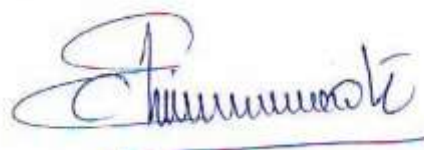
**18. CITIZEN CHARTER**

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	08 Months (October, 2018 to May, 2019)	Yes	---

**TESTING AUTHORITY:**



**RAJNEESH PATEL  
AGRICULTURAL ENGINEER**



**C.V. CHIMOTE  
TEST ENGINEER**



**J.J.R. NARWARE  
DIRECTOR**

**19. APPLICANT'S COMMENTS**

Para No.	Our Reference	Applicant's comments
<b>19.1</b>	17.4.1.3	It will be rechecked at our end to conform the value
<b>19.2</b>	17.4.1.8 & 17.4.2.2	This is quality issue and will be taken care in the production of tractor

**ANNEXURE- I**

**BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S. No.	Parameters	Disc Plough	Rotavator
1	Make	Sonalika	Fieldking
2	Type	Mounted	Mounted
3	No. of Discs / Blades	Two	42 in 7 flanges
4	Type of Discs / Blades	Plain concave	Hatchet
5	Size of Discs / Blades (mm)	600	280 x 90 x 05
6	Spacing of Discs /Flanges, (mm)	555	255
7	Lower hitch point span, (mm)	760	800
8	Mast height, (mm)	600	601
9	Overall Dimensions (mm):		
	Length	1940	2040
	Width	1040	1140
	Height	1220	1110
10	Gross Mass, (Kg)	270	360

**ANNEXURE-II**

**BRIEF SPECIFICATION OF FULL CAGE WHEEL**

S. No.	Parameters	Specification
1	Type	Full cage wheel
2	Outer dia. (mm)	1270
3	Width (mm)	860
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 05
6	Length of lug, (mm)	415
7	Spacing of lug, (mm)	320
8	Weight of each cage wheel (kg)	150

**ANNEXURE-III**

**TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	10.36
3.	Power lift and hydraulic pump performance test	2.92
4.	Drawbar performance test	14.50
5.	Turning ability	0.25
6.	Location of centre of gravity	0.25
7.	Operator's field of vision	Nil
8.	Brake test	1.25
9.	Noise measurement	1.48
10.	Mechanical vibration test	1.00
11.	Air cleaner oil pull over test	3.50
12.	Theoretical speed test	0.43
<b>B.</b>	<b>FIELD TEST:</b>	
1.	Disc ploughing	10.42
2.	Rotavation	13.59
3.	Wetland cultivation (including water proof)	15.41
<b>C.</b>	<b>HAULAGE TEST:</b>	4.91
<b>D.</b>	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	7.82
	<b>TOTAL:</b>	<b>88.09</b>

ANNEXURE-IV



**BONNET STYLE (STANDARD FITMENT)**



**BONNET STYLE (OPTIONAL FITMENT)**