

OECD Approval No. : 2/3 144

Date of approval : 12<sup>th</sup> of April 2019

**Report on test in accordance with  
OECD STANDARD CODE 2  
for the Official Testing of Agricultural and Forestry Tractors**



**Agricultural Tractor Make** : **SONALIKA**  
**Model** : **SONALIKA 90 N**  
**Type** : **4 WD (YND, < 30 km/h Speed)**  
**Manufactured by** : **M/s International Tractors Limited,**  
Village- Chak Gujran, P.O. Piplanwala,  
Jalandhar Road, **HOSHIARPUR**  
(Punjab) – 146 022, **INDIA**  
**Submitted for test by** : **The manufacturer**  
**Report No.** : **T-1238/1765/56/OECD/2019**  
**Date** : **April, 2019**

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**GOVERNMENT OF INDIA**  
**Ministry of Agriculture and Farmers Welfare,**  
**(Department of Agriculture, Cooperation and Farmers Welfare)**  
**Mechanization and Technology Division**  
**CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE**  
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This is a report on a tractor test in accordance with **OECD STANDARD CODE 2** for the Official Testing of Agricultural and Forestry Tractors.

It does not contain an evaluation of the tractor on practical work.

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In this report unit of all performance characteristics are given corresponding to the International system of units.

The relationship to the Technical System of Units is given by the following conversions:

Force	1	kN	=	1000	N	=	102	kgf
Power	1	kW	=	1000	W	=	1.36	Ps
Pressure	1	MPa	=	10	bar	=	10.2	kgf/cm <sup>2</sup>
	100	kPa	=	1000	mbar	=	750.1	mm of Hg

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**Statement**

The information opposite each item in the specification portion of this report has been validated by the Testing Station. An item marked [C] indicates to the test report user that the information declared by the manufacturer has been checked whereas an item marked [D] indicates that the manufacturer's declaration has been endorsed.

<b>T-1238/1765/56/OECD/2019</b>	<b>SONALIKA 90 N TRACTOR</b>
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[C]	Tractor manufacturer's name and address	:	<b>M/s International Tractors Limited,</b> Village- Chak Gujran, P.O. Piplanwala, Jalandhar Road, HOSHIARPUR (Punjab) – 146 022, <b>INDIA</b>
[D]	Location of tractor assembly	:	<b>M/s International Tractors Limited,</b> Village- Chak Gujran, P.O. Piplanwala, Jalandhar Road, HOSHIARPUR (Punjab) – 146 022, <b>INDIA</b>
[D]	Submitted for test by	:	The manufacturer
[C]	Selected for test by	:	Testing Authority in the agreement with the manufacturer
[D]	Place of running-in	:	<b>At C.F.M.T&amp;T.I, Budni (M.P.) India</b>
[D]	Duration of running-in:		
	-Engine	:	35 hours
	-Transmission	:	Nil
(C)	Date of start of test	:	15 <sup>th</sup> January, 2018
[C]	Location of test	:	Government of India, Central Farm Machinery Training and Testing Institute, P.O.- Tractor Nagar, BUDNI – 466445 (M.P.), <b>INDIA</b>
[C]	Code version	:	OECD Standard Code 2 (February, 2018)

## 1. SPECIFICATIONS OF TRACTOR

### 1.1 Identification:

#### 1.1.1 Denomination

[C]	Make of tractor	:	Sonalika
[C]	Model (trade name)	:	Sonalika 90 N
[C]	Type	:	4 WD, Agricultural tractor

#### 1.1.2 Numbers:

[D]	1 <sup>st</sup> Serial No. or prototype	:	CYNDE462557WNT
[C]	Serial No.	:	DYNDT681022WNT

#### 1.1.3 Other specification (if applicable):

[D]	Model(s) for other countries	:	i) SONALIKA WORLDTRAC 90 RX N ii) SOLIS 90 N
[C]	Transmission type or gears x ranges	:	Mechanical, Synchromesh gears. 12 forward, 12 Reverse gears.
[C]	Speed version	:	< 30 km/h
[D]	Manufacturer identification or Technical type no.	:	YND

### 1.2 Engine:

[C]	Make	:	Sonalika
[C]	Model	:	4105 ELT
[C]	Type	:	Four stroke, water cooled, direct injection diesel engine
[C]	Serial No.	:	4105ELT731674710

**1.2.1****Cylinders:**

[C]	Number/disposition	:	Four, vertical, in-line
[D]	Bore/Stroke	:	105 mm / 118 mm
[D]	Capacity	:	4087 cm <sup>3</sup>
[D]	Compression ratio	:	18.5 (±0.2):1
[D]	Arrangement of valves	:	Overhead
[D]	Cylinder liners	:	Wet

**1.2.2****Supercharging:**

[C]	Make	:	Holset
[C]	Model	:	HX25W
[C]	Type	:	Waste gated
[D]	Pressure	:	0.17 MPa at Rated engine speed

**1.2.3****Fuel system:**

[C]	Fuel feed system	:	Lift pump, piston-type, integral with fuel injection pump
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**Filter(s):**

[C]	Make	:	Bosch
[C]	Model	:	F 002 H20 109
[C]	Type	:	Primary cloth and secondary paper element
[C]	Number(s)	:	Two
[C]	Capacity of fuel tank	:	75.6 dm <sup>3</sup>

**Injection pump:**

[C]	Make	:	Bosch
[C]	Model	:	F 002 A4Z 010
[C]	Type	:	Plunger, in-line
[C]	Serial Number	:	75532197

**Manufacturer's production setting of injection pump:**

[D]	Flow rate (rated engine speed & full load)	:	16.0 to 16.55 dm <sup>3</sup> / h
[D]	Timing	:	12 ± 2 degree before TDC

**Injectors:**

[D]	Make	:	Bosch, India
[D]	Model	:	F 002 C70 552
[D]	Type	:	Multihole
[D]	Injection pressure	:	25.0 to 25.8 MPa

**1.2.4****Governor:**

[C]	Make	:	Bosch, India
[C]	Model	:	RSV350...1000A5C1789R
[D]	Type	:	Mechanical, variable speed
[D]	Governed range of engine speed	:	700 ± 50 to 2200 ± 50 rev/min
[C]	Rated engine speed	:	2000 rev/min.

<b>1.2.5</b>	<b>Air cleaner:</b>		
	<b>Pre-cleaner:</b>	:	<b>Not available</b>
	<b>Main cleaner:</b>		
[C]	Make	:	Donaldson
[D]	Model	:	Not available
[C]	Type	:	Dry, paper element with additional safety cartridge
[C]	Location of air intake	:	Forward of radiator, under the bonnet
[C]	Maintenance indicator	:	Warning light on dash board
<b>1.2.6</b>	<b>Lubrication System:</b>		
[D]	Type of feed pump	:	Gear pump
[C]	Type of filter(s)	:	Full flow, replaceable paper element
[C]	Number of filter(s)	:	One
<b>1.2.7</b>	<b>Cooling System:</b>		
[C]	Type of coolant	:	Water (with coolant)
[D]	Type of pump	:	Centrifugal pump
	<b>Specification of fan:</b>		
[C]	Number of fan blades	:	06
[C]	Fan diameter	:	360 mm
[C]	Total Coolant capacity	:	10.3 dm <sup>3</sup>
[C]	Type of temperature control	:	Thermostat
[D]	Over pressure system	:	88 kPa
<b>1.2.8</b>	<b>Starting system:</b>		
[C]	Make	:	Panalfa
[C]	Model	:	Not announced
[C]	Type	:	Electrical, solenoid operated
[D]	Starter motor power rating	:	2.7 kW
[C]	Cold starting aid	:	Heater plug provided in the intake manifold
[C]	Safety device	:	Starter will not operate until the clutch pedal is depressed, the PTO lever is disengaged and the 'forward-reverse gear shift lever' is in neutral position.
<b>1.2.9</b>	<b>Electrical System:</b>		
[C]	Voltage	:	12V
	<b>Generator:</b>		
[C]	Make	:	Panalfa
[C]	Model	:	Not announced
[C]	Type	:	Alternator
[D]	Power	:	0.4 kW @ 6000 rev/min
	<b>Battery:</b>		
[C]	Number	:	One
[D]	Rating	:	65 Ah at 20 hours discharge rate

**1.2.10 Exhaust System:**

[D]	Make	:	Sonalika
[D]	Model	:	None
[C]	Type	:	Downdraft, cylindrical
[C]	Location	:	On RHS of engine below the footrest

**1.2.11 Reagent Injection System (if applicable)** : Not fitted on the tested tractor

**1.2.12 Diesel Particulate Filter (if equipped)** : Not fitted on the tested tractor

**1.3 Transmission:****1.3.1 Clutch (Travel and power take-off):**

[D]	Make	:	LUK India
[D]	Model	:	LUK DC
[D]	Type	:	Dual, Dry (for travel and PTO)
[D]	Number of plate(s)	:	Two
[D]	Diameter of plate(s)	:	310 mm (for both travel and PTO)
[C]	Method of operation:		
	- Travel	:	By pressing the clutch pedal, on LHS
	- PTO	:	By a hand lever provided in front of operator's seat.

**1.3.2 Gear Box:**

[D]	Make	:	Carraro
[D]	Model	:	T-100
[D]	Type	:	Mechanical, Synchronesh gears.

	Description:	Forward	Reverse
[C]	Number of gears	4	4
[C]	Number of ranges	3 ('L', 'M' & 'H')	3 ('L', 'M' & 'H')
[C]	Total of arrangements	12	12

'L' = LOW, M = MEDIUM, 'H' = HIGH

[D] Available options : None

**1.3.3 Rear axle and final drives:**

[D]	Make	:	Carraro
[D]	Model	:	Not announced
[D]	Type	:	Epicyclic gear reduction unit

**Differential lock:**

[D]	Type	:	Pin type
[C]	Method of engagement	:	By depressing a pedal, on RHS
[C]	Method of disengagement	:	By releasing the above pedal

**1.3.4 Front axle and final drives:**

[D]	Make	:	Carraro
[D]	Model	:	Not announced
[D]	Type	:	Epicyclic gear reduction unit
	- Differential lock	:	<b>None</b>

**1.3.5 Total ratios and traveling speeds:**

	Movement	GEAR	RANGE	Number of engine revolutions for one revolution of the driving wheels	Nominal traveling speed (*) at rated engine speed of <b>2000</b> rev/min, (km/h)
[C]	Forward	1	L	975.67	0.46
[C]		2	L	668.59	0.67
[C]		3	L	462.25	0.96
[C]		4	L	319.19	1.39
[C]		1	M	212.68	2.09
[C]		2	M	145.77	3.05
[C]		3	M	100.84	4.41
[C]		4	M	69.68	6.38
[C]		1	H	48.15	9.24
[C]		2	H	33.15	13.49
[C]		3	H	22.79	19.52
[C]		4	H	15.77	28.21
[C]	Reverse	1	L	1147.87	0.39
[C]		2	L	786.79	0.57
[C]		3	L	544.09	0.82
[C]		4	L	375.70	1.18
[C]		1	M	250.70	1.78
[C]		2	M	171.35	2.59
[C]		3	M	118.55	3.75
[C]		4	M	82.12	5.42
[C]		1	H	56.74	7.84
[C]		2	H	38.67	11.44
[C]		3	H	26.83	16.59
[C]		4	H	18.53	24.04

'L' = LOW, 'M'=MEDIUM & 'H' = HIGH

\* Calculated with a tyre dynamic radius index of 590 mm (ISO: 4251-1:2005)

[C] Number of revolutions of front wheels for one revolution of rear wheels : 1.52

**1.4 Power take-off:****1.4.1. Main Power Take-Off:**

[C] Type : Independent  
 [C] Method of engagement : Mechanical, by a hand lever  
 [C] Number of shafts : One  
 [C] Method of changing power take-off shaft ends and speeds : **None**



**1.4.1.1 Power take-off proportional to engine speed:**

		<b>540 (rev/min)</b>	<b>540 E (rev/min)</b>
[C]	- Location	: At rear of tractor	At rear of tractor
[C]	- Diameter of power take-off shaft end	: 34.77 mm	34.77 mm
[C]	- Number of splines	: 6, Not in conformity with ISO:500 - 3:2004	6, Not in conformity with ISO:500-3 :2004
[C]	- Height above ground	: 590	590 mm
[C]	- Distance from the median plane of the tractor	: 0 mm	0 mm
[C]	- Distance behind rear-wheel axis	: 465 mm	465 mm
[C]	- PTO speed at rated engine speed	: 557 rev/min	655 rev/min
[C]	- Engine speed at standard power take-off speed	: 1938 rev/min	1649 rev/min
[C]	- Ratio of rotation speeds (Engine speed/ PTO speed)	: 3.588 : 1	3.053 : 1
[D]	- Power restriction	: <b>None</b>	None
[D]	Maximum torque transmissible	: 1305 Nm	1305 Nm
[C]	Direction of rotation (viewed from rear of tractor)	: Clockwise	Clockwise

**1.4.1.2 Power take-off proportional to ground speed : None**

**1.4.2 Optional power take-off : None**

**1.5 Hydraulic power-lift:**

[D]	Make	: MITA
[D]	Model	: Not announced
[C]	Type of hydraulic system	: Open centre
[C]	Type and number of cylinders	: Single acting, one
[C]	Type of linkage lock for transport	: Hydraulic
[D]	Relief valve pressure setting (tolerance)	: 19 ± 1 MPa
[D]	Opening pressure of cylinder safety valve	: 22 ± 1 MPa
[D]	Lift pump type	: Gear type
[D]	Transmission between pump and engine	: Gear drive
[D]	Number and Type of filter(s)	: Two, one strainer type at suction and one canister throw away type at pump input line
[C]	Site of oil reservoir	: Transmission housing
[C]	<b>Type, number and location of tapping points:</b>	
[C]	- Type	: Quick coupling
[C]	- Number	: Four
[C]	- Location	: Behind the operator's seat
[D]	- Maximum volume of oil available to external cylinders	: 37.8 dm <sup>3</sup>

**1.6 Three point linkage:**

[C] Category : 2 ( Not In conformity with ISO 730-2009)  
 [C] Category adapter : None

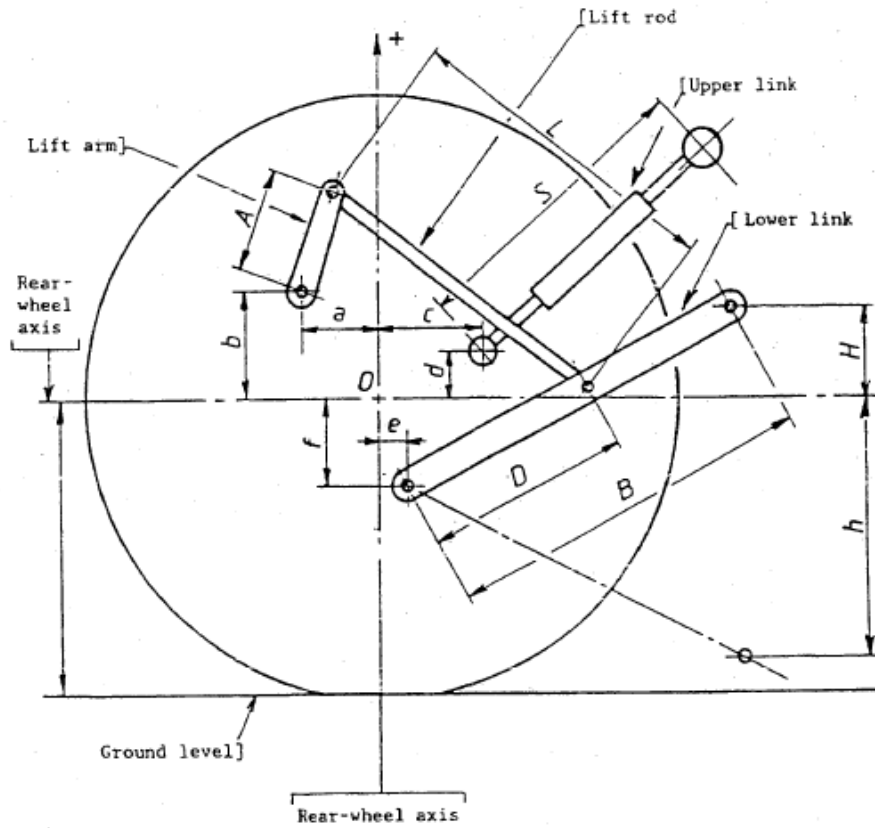


Fig. 1.1

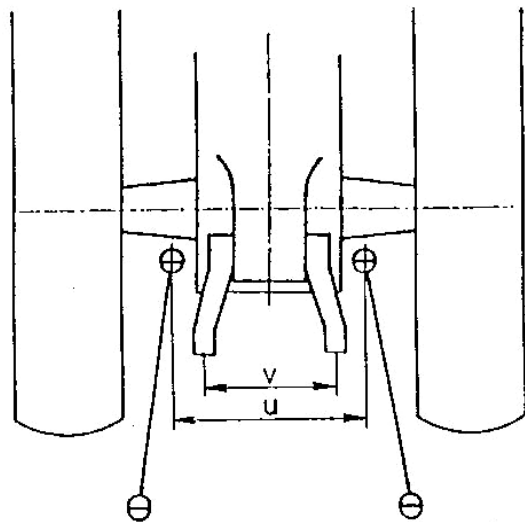


Fig. 1.2

Table: Linkage Geometry dimensions (Ref. fig. 1.1 & 1.2):

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		Dimension or range, (mm)	Settings used during test, (mm)
(1)	(2)	(3)	(4)
[C]	Length of lift arms:	275	275
[C]	Length of lower links:	890	890
	Distance of lift arm pivot point from rear-wheel axis:		
[C]	- Horizontally	170	170
[C]	- Vertically	310	310
[C]	Horizontal distance between the 2 lower link points:	415	415
[C]	Horizontal distance between the 2 lift arm end points:	405	405
[C]	Length of upper link:	530 to 765	595
	Distance of upper link pivot point from rear wheel axis:		
[C]	- Horizontally	400,408 & 415	408
[C]	- Vertically	275,310 & 345	310
	Distance of lower link pivot point from rear wheel axis:		
[C]	- Horizontally	110	110
[C]	- Vertically	195	195
[C]	Distance of lower link pivot points to lift rod pivot points on lower links:	420	420
[C]	Length of lift rods:	435 to 555	505
	Height of lower hitch points relative to the rear-wheel axis:		
[C]	- in low position	-495 to -240	390
[C]	- in high position	75 to 290	160
[C]	Height above ground of lower hitch points when locked in transport position (*)	--	Any height within lift range

(\*) Assuming r = 590 mm, tyre dynamic radius index of ISO: 4251-1:2005 (pneumatic tyred tractors only).

### 1.7 Swinging drawbar:

[C]	Type	: Clevis
[C]	Height above ground:	
[C]	- Maximum	: 430 mm
[C]	- Minimum	: 330 mm
[C]	Type of adjustment	: Vertical, by different holes on mounting bracket
[C]	Distance of hitch point from rear-wheel axis, horizontally	: 875 mm
	Distance of hitch point from power take-off shaft end:	
[C]	- Vertically	: 160, 210 and 260 mm
[C]	- Horizontally	: 410 mm
	Lateral adjustment (centre of clevis)	
[C]	- Right hand	: 150 mm
[C]	- Left hand	: 150 mm

[C]	Distance of pivot point from rear-wheel axis, horizontally	:	80 mm
[C]	Diameter of drawbar pin hole	:	33.2 mm
[D]	Maximum vertical permissible load	:	7.7 kN
<b>1.8</b>	<b>Trailer hitch:</b>		
[C]	- Type	:	Clevis
[C]	- Hole diameter	:	24.8 mm
[C]	- Height above ground	:	880 mm
[C]	- Distance of hitch point from rear-wheel axis, horizontally	:	665 mm
	Distance of hitch point from power take-off shaft end:		
[C]	- Vertically	:	235 mm & 265 mm
[C]	- Horizontally	:	200 mm
[D]	- Maximum vertical permissible load	:	7.7 kN
<b>1.9</b>	<b>Holed drawbar:</b>		
[C]	Number of holes	:	7
[C]	Distance between holes	:	80 mm
[C]	Hole diameter	:	25 mm
[C]	Thickness / Width of drawbar	:	29 mm / 74 mm
[C]	Height above ground:		
	- Minimum	:	95 mm
	- Maximum	:	880 mm
[C]	Horizontal distance to power take-off shaft end (rear)	:	535 mm
<b>1.10</b>	<b>Steering:</b>		
[D]	Make	:	Danfoss
[D]	Model	:	Not announced
[D]	Type	:	Hydrostatic, open center
[D]	Method of operation	:	Manual, through steering control wheel
[D]	Pump(s)	:	Gear type
[D]	Ram(s)	:	Double acting cylinder
[D]	Working pressure	:	10±1 MPa
<b>1.11</b>	<b>Brakes:</b>		
<b>1.11.1</b>	<b>Service brake:</b>		
[D]	Make	:	Carraro
[D]	Model	:	Not announced
[D]	Type	:	Oil immersed disc brake
[C]	Method of operation	:	Mechanical, independent or coupled pedal operation
[C]	Trailer braking take-off (hydraulic or air brake)	:	None
<b>1.11.2</b>	<b>Parking brake:</b>		
[C]	Type	:	Pawl and ratchet
[C]	Method of operation	:	Manual, by pawl & ratchet arrangement on a hand lever

**1.12 Wheels:**

	Number	
[C]	Front	: Two (driving & steering)
[C]	Rear	: Two (driving)
[C]	Wheel base	: 2220 mm

**Track width adjustment:**

		Minimum [mm]	Maximum [mm]	Adjustment method
[D]	Front	1110	1270	Reversing wheels and offset lug rims
[D]	Rear	960	1235	Reversing wheels and offset lug rims

**1.13 Protective structure:**

[D]	Make	: Sonalika
[D]	Model	: Not announced
[D]	Type	: Two post front ROPS with rear hard fixture
[D]	Manufacturers name and address	: <b>M/s International Tractors Limited,</b> Village- Chak Gujran, P.O. Piplanwala, Jalandhar Road, HOSHIARPUR (Punjab) – 146 022, <b>INDIA</b>
[D]	Protective device	: Two post front ROPS with rear hard fixture
[D]	Tiltable / not tiltable	: Tiltable with tool

**OECD approval:**

[D]	Approval number	: Not applicable
[D]	Date of approval	: Not applicable
[D]	Number of minor modification certificates, if any	: Not applicable

**1.14 Seat:****1.14.1 Driver's seat:**

[D]	Make	: M/s.Pilot
[D]	Model	: 10052753
[C]	Type	: Cushioned
[C]	Seat and steering wheel reversible	: No
[C]	Type of suspension	: Coil springs
[C]	Type of dampening	: Hydraulic shock absorber
	<b>Range of adjustment:</b>	
[C]	Longitudinally	: ± 60 mm
[C]	Vertically	: ± 33 mm
[C]	Safety belt	: Provided
[C]	Type	: Retractable seat belt (Push button style)
<b>1.14.2</b>	Optional driver's seat(s)	: Not fitted on tractor
<b>1.14.3</b>	Passenger seat	: Not fitted on tractor

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### 1.15 Lighting:

		Height of centre above ground	Size	Distance from outside edge of lights to median plane of tractor
		[mm]	[mm]	[mm]
[C]	Head lights	1060	160 x 100	220
[C]	Side lights	1305	70 Ø	700
[C]	Rear lights	1380	110 x 35	475
[C]	Reflectors	1175	85 x 30	540

## 2. TEST CONDITIONS

<b>2.1</b>	<b>Overall dimensions (unballasted tractor):</b>			
Length [mm]	Width		Height at top of	
	Minimum [mm]	Maximum [mm]	ROPS [mm]	Exhaust pipe [mm]
3910	1380	1630	2580	635

- 2.2** Ground clearance (unballasted tractor) : 257 mm  
Clearance – limiting part : Below check chain locking device.

### 2.3 Tractor Mass (without protective structure):

		Unballasted	
		Without driver	With driver
		[kg]	[kg]
	Front	1455	1470
	Rear	1460	1520
	Total	2915	2990

### 2.4 Tyres and track width specifications:

Tyres		Front	Rear
- Dimensions		8.00 - 18	14.9 – 24
- Ply rating		6	12
- Type		Pneumatic, diagonal	Pneumatic, diagonal
- Maximum load (tyre manufacturer's)		kN	6.57 kN
- Maximum load (tractor manufacturer's)		kN	19.86
- Inflation pressure (tyre manufacturer's)		kPa	190
- Dynamic radius index		mm	220
- Chosen track width		mm	395
			590
			1085

- 2.5 Fuel:**  
Type : High speed diesel conforming to IS:1460-2005  
Density at 15 °C : 0.836 g/cm<sup>3</sup>

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## 2.6 Oils and lubricants:

### 2.6.1 Capacity and change interval:

	Capacity, ( dm <sup>3</sup> )	Oil change, ( h )	Filter change, ( h )
Engine oil sump	12.3	First change after 50 hours of operation and subsequently after every 250 hours of operation.	First change after 50 hours of operation and subsequently after every 250 hours of operation.
Gear box, rear axle, rear final drive and service brakes	37.8	First change after 1000 hours of operation and subsequently after every 1800 hours of operation.	First change after 50 hours of operation and subsequently after every 250 hours of operation.
Hydraulic	In common with gear box		First change after 50 hours of operation and subsequently after every 250 hours of operation.
Front axle	4.5	First change after 50 hours of operation and subsequently after every 250 hours of operation.	Not applicable
Front final drive	0.35	First change after 50 hours of operation and subsequently after every 250 hours of operation.	Not applicable
Steering housing	0.6	First change after 50 hours of operation and subsequently after every 1000 hours of operation.	Not applicable

### 2.6.2 Specifications:

	Recommended	Used during test
<b>Engine:</b>		
Type	SAE 20W-40	As recommended
Viscosity	14.0 to 16.0 cSt at 100°C	
Classification	API CD	
<b>Transmission, Hydraulic fluid, Service brake , Front axle, front final drive, Rear axle and final drive oil:</b>		
Type	Tract-elf-2412	As recommended
Viscosity	10.5 to 12.5 cSt at 100°C	
Classification	GL-2	
<b>Steering oil :</b>		
Type	Dexron II-D	As recommended
Viscosity	7.4 cSt @ 100°C	
Classification	Psf-3	

### 2.6.3 Grease:

Number of lubricating points:

Grease nipples : 14 Nos.  
Grease cups : None

### 3. COMPULSORY TESTS RESULTS

#### 3.1 Main power take-off test:

Date and location of tests : 17.07.2018, CFMTTI, BUDNI (M.P.), India

Type of dynamometer bench : FUCHINO ESF- 1000 S, Eddy current

Power, (kW)	Speed			Fuel consumption			Specific Energy, (kWh/l)
	Engine	PTO	Fan	Hourly		Specific	
	(rev/min)			(kg/h)	(l/h)	(g/kWh)	
1	2	3	4	5	6	7	8
<b>3.1.1 Maximum Power – One-Hour Test:</b>							
51.9	1999	557	3828	13.54	16.20	261	3.20
<b>3.1.2 Power at Rated Engine Speed (2000 rev/min) :</b>							
51.9	1999	557	3828	13.54	16.20	261	3.20
<b>3.1.3 Standard Power Take-Off Speed [540 ± 10 (rev/min)] :</b>							
51.6	1938	540	3711	13.34	15.96	259	3.23
<b>3.1.4 Part Loads:</b>							
<b>3.1.4.1 The torque corresponding to maximum power at rated engine speed :</b>							
51.9	1999	557	3828	13.54	16.20	261	3.20
<b>3.1.4.2 85 % of torque obtained in 3.1.4.1 :</b>							
45.8	2070	586	3964	12.73	15.23	278	3.00
<b>3.1.4.3 75 % of torque defined in 3.1.4.2 :</b>							
34.8	2099	595	4020	10.35	12.38	297	2.81
<b>3.1.4.4 50 % of torque defined in 3.1.4.2 :</b>							
23.5	2124	602	4068	8.06	9.64	343	2.44
<b>3.1.4.5 25 % of torque defined in 3.1.4.2 :</b>							
12.0	2167	614	4150	6.04	7.23	503	1.66
<b>3.1.4.6 Unloaded :</b>							
0.9	2196	612	4205	4.28	5.12	4756	0.18
<b>3.1.5 Part Loads at Standard Power Take-Off Speed [540± 10 (rev/min)] :</b>							
<b>3.1.5.1 The torque corresponding to maximum power :</b>							
51.6	1938	540	3711	13.34	15.96	259	3.23
<b>3.1.5.2 85 % of torque obtained in 3.1.5.1 :</b>							
45.6	2016	562	3861	12.37	14.80	271	3.08
<b>3.1.5.3 75 % of torque defined in 3.1.5.2 :</b>							
34.6	2042	569	3910	10.05	12.02	291	2.88
<b>3.1.5.4 50 % of torque defined in 3.1.5.2 :</b>							
23.3	2060	574	3745	7.66	9.16	329	2.54



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1	2	3	4	5	6	7	8
<b>3.1.5.5 25 % of torque defined in 3.1.5.2 :</b>							
11.9	2099	585	4020	5.78	6.91	486	1.72
<b>3.1.5.6 Unloaded :</b>							
0.8	2121	591	4062	3.92	4.69	4900	0.17
<b>3.1.6 PART LOADS AT DIFFERENT ENGINE SPEEDS</b>							
<b>3.1.6.1 Maximum power at rated engine speed:</b>							
51.9	1999	557	3828	13.54	16.20	261	3.20
<b>3.1.6.2 80% of power obtained in 3.1.6.1 at max. speed setting :</b>							
41.5	2081	600	3985	11.75	14.06	283	2.95
<b>3.1.6.3 80% of power obtained in 3.1.6.1 with governor control set to 90% of rated engine speed :</b>							
41.5	1801	502	3449	10.5	12.56	253	3.30
<b>3.1.6.4 40% of power obtained in 3.1.6.1 with governor control set to 90% of rated engine speed :</b>							
20.8	1801	502	3449	6.23	7.45	300	2.79
<b>3.1.6.5 60% of power obtained in 3.1.6.1 with governor control set to 60% of rated engine speed :</b>							
31.1	1202	335	2302	6.89	8.24	221	3.77
<b>3.1.6.6 40% of power obtained in 3.1.6.1 with governor control set to 60% of rated engine speed :</b>							
20.8	1202	335	2302	4.84	5.79	233	3.59

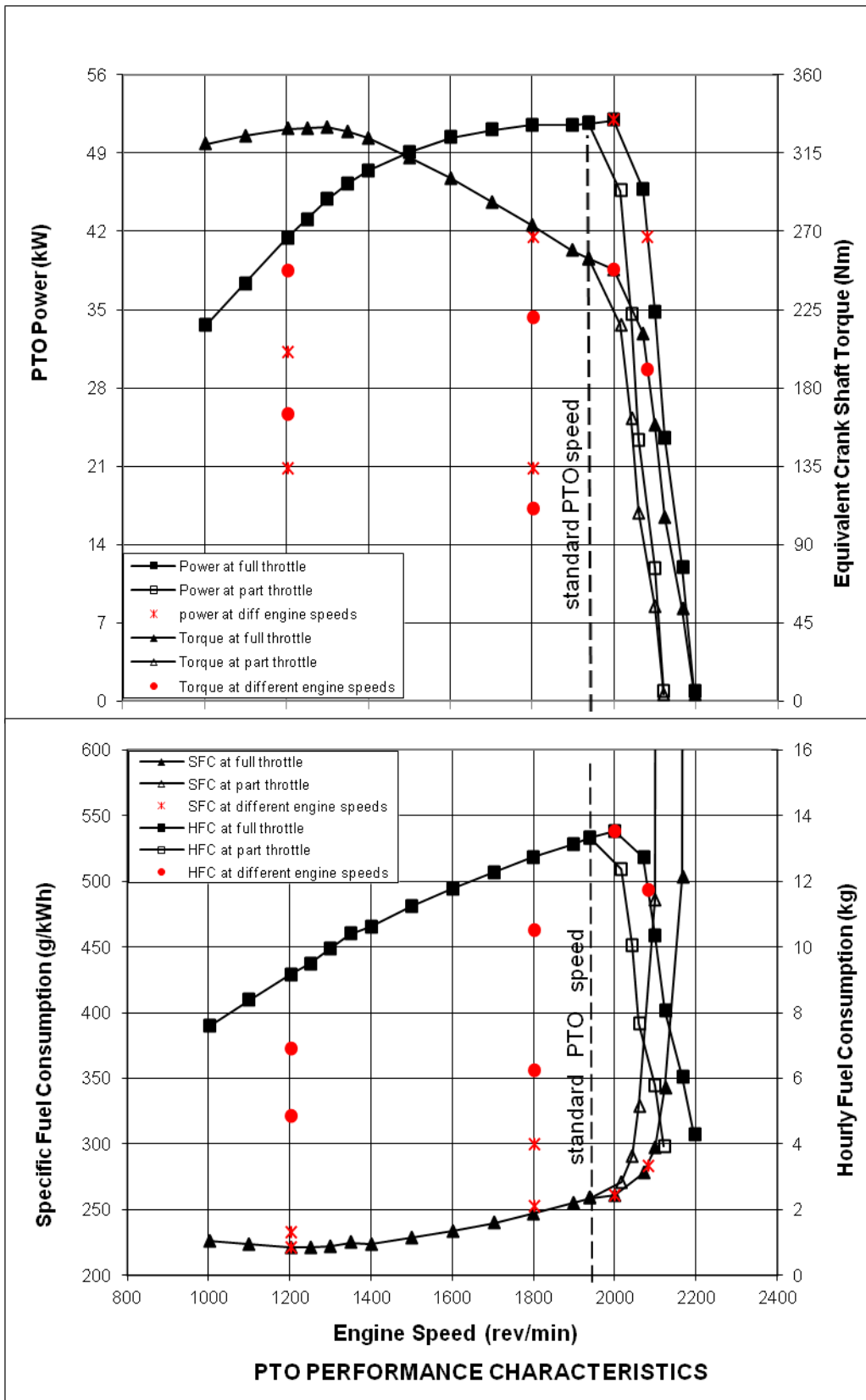
No load maximum engine speed : 2196 rev/min  
Torque (equivalent crankshaft) at maximum power :  
-At rated engine speed : 248.1 Nm  
-At one hour test : 248.1 Nm  
Maximum torque (equivalent crank- shaft) (Engine speed : 1299 rev/min) : 329.6 Nm

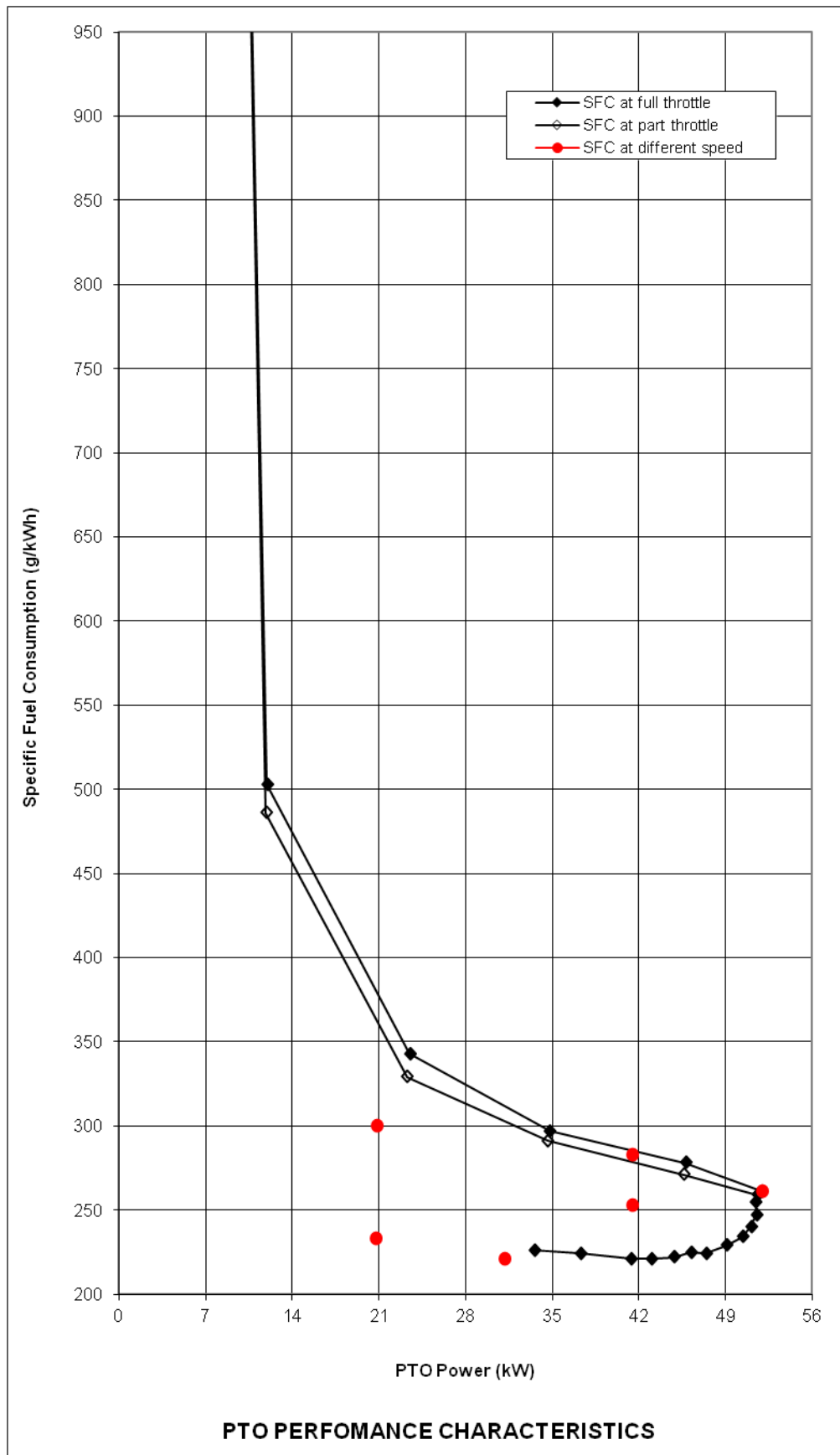
**Mean atmospheric conditions:**

-Temperature : 23 °C  
-Pressure : 96.7 kPa  
-Relative humidity : 75 %

**Maximum temperatures:**

-Coolant : 88 °C  
-Engine oil : 95 °C  
-Fuel : 44 °C  
-Engine air intake : 33 °C





**3.2 Hydraulic Power and Lifting force :**

Date of tests : 27.07.2018 and 31.07.2018, CFMTTI,  
BUDNI (M.P.), India

**3.2.1 Hydraulic Power test :****3.2.1.1 Hydraulic Fluid Data:**

- Hydraulic fluid type : Tractelf 2412  
- Viscosity index : 9.5 to 11 cSt  
(ISO 3448: 1992+ corr 1: 1993)  
- Viscosity at 65 °C : 65 cSt

**3.2.1.2 Compulsory Reporting (Test Results):**

1	2	Press- ure, (MPa)	Reservoir oil Temp. °C		Engine speed, (rev/min)	Flow rate, (l/min)	Power, (kW)
			(min.)	(max.)			
1.	Rated Engine speed (Manufacturer's specification)	--	--	--	2000	--	--
2.	Maximum (sustained) pressure with relief valve open as measured at the coupler. Pump stalled- No	18.7	60	67	2145	0.0	0.0
3.	Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power.	16.8	65		2148	33.2	9.3
4.	Maximum available flow and maximum power from one coupler pair	16.0	64		2149	39.4	10.5
5.	Maximum available flow and maximum power from coupler pairs operating simultaneously (flow through two or in over coupler pair if required)	Not applicable	Not applicable		Not applicable	Not applicable	Not applicable

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### 3.2.2 Power Lift Test:

-Linkage settings for test - See Table at Page 11, and Fig. 1.1 & 1.2

	At hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement:		
- Without lifting force	550 mm	550 mm
- With lifting force	515 mm	485 mm
Maximum corrected force exerted through full range	19.46 kN	17.86 kN
Corresponding pressure of hydraulic fluid	16.8 MPa	16.8 MPa
Moment about rear wheel axle	19.46 kNm	28.75 kNm
Maximum tilt angle of mast from vertical	--	5.5 degree

Lifting height relative to the horizontal plane including the lower link pivot points:									
Mm	-195	-100	0	+100	+175	+245	+270	+290	+320
Lifting forces (the values of the force measured have been corrected to correspond to a hydraulic pressure equivalent to 90% of actual relief valve pressure setting of the hydraulic lift system.)									
At the hitch point in (kN)	19.84	20.61	20.71	20.23	20.02	19.68	19.59	19.47	19.46
Corresponding pressure 16.8 MPa:									
At the frame in (kN)	28.29	25.74	23.89	21.86	20.20	19.08	18.03	17.86	--
Corresponding pressure 16.8 MPa									

### 3.3 Drawbar power and fuel consumption test (unballasted tractor):

Date(s) of tests : 22.01.2019

Type of track : Concrete

Height of drawbar above ground, (mm)	Tyre inflation pressure	
	Front	Rear
	[kPa]	[kPa]
430	190	220

## DRAWBAR TEST RESULTS

Gear Number & Range	Draw-bar power	Draw-bar pull	Speed	Engine speed	FAN speed	Slip of wheels	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
									Fuel	Coolant	Engine oil	Temperature	R.H.	Pressure
	(kW)	(kN)	(km/h)	(rev/Min)	(rev/Min)	(%)	(g/kWh)	(kWh/l)	(°C)	(°C)	(°C)	(°C)	(%)	(kPa)
<b>3.3.1</b>	<b>Maximum Power in tested Gears (Unballasted tractor):</b>													
1M	13.5	25.21	1.93	2134	4087	15.4	544	1.54	35	80	83	23	41	99.2
2M	19.4	24.97	2.80	2114	4048	15.1	450	1.86	33	80	84	22	42	99.3
3M	28.1	25.20	4.01	2092	4006	15.0	397	2.11	32	80	83	20	44	99.3
4M	38.9	24.87	5.63	2000	3830	13.7	355	2.35	31	82	90	19	44	99.4
1H	42.2	17.33	8.76	1999	3828	7.3	326	2.56	30	82	88	18	48	99.3

**Remark:** Maximum power in the gear '2H' was not measured because forward speed in this gear exceeded the safety limit of testing equipment.

Gear Number & Range	Draw-bar power	Draw-bar pull	Speed	Engine speed	FAN speed	Slip of wheels	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
									Fuel	Coolant	Engine oil	Temperature	R.H.	Pressure
	(kW)	(kN)	(km/h)	(rev/Min)	(rev/Min)	(%)	(g/kWh)	(kWh/l)	(°C)	(°C)	(°C)	(°C)	(%)	(kPa)
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>	<b>(9)</b>	<b>(10)</b>	<b>(11)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>
<b>3.3.2</b>	<b>Fuel Consumption:</b>													
<b>3.3.2.1</b>	In Selected gear / speed setting nearest 7.5 km/h, at maximum power at rated engine speed:													
4M	38.9	24.87	5.63	2000	3830	13.7	355	2.35	31	82	90	19	44	99.4
<b>3.3.2.1.1</b>	75% of pull corresponding to maximum power at rated engine speed:													
4M	32.4	18.65	6.25	2082	3987	8.0	356	2.35	35	81	90	23	41	99.2
<b>3.3.2.1.2</b>	50% of pull corresponding to maximum power at rated engine speed:													
4M	22.6	12.43	6.55	2107	4035	4.7	392	2.13	35	80	87	23	41	99.2
<b>3.3.2.1.3</b>	Higher gear / speed setting at reduced engine speed: Same pull and traveling speed as in 3.3.2.1.1:													
1H	32.4	18.65	6.26	1445	2767	8.3	285	2.93	36	84	83	23	36	99.1
<b>3.3.2.1.4</b>	Same gear / speed selection as 3.3.2.1.3 at reduced engine speed: Same pull and traveling speed as in 3.3.2.1.2:													
1H	22.6	12.44	6.55	1461	2798	5.1	302	2.77	35	80	83	24	39	99.0
<b>3.3.2.2</b>	In Selected gear/speed nearest between 7 km/h and 10 km/h at rated engine speed:													
1H	42.2	17.33	8.76	1999	3828	7.3	326	2.56	30	82	88	18	48	99.3
<b>3.3.2.2.1</b>	75% of pull corresponding to maximum power at rated engine speed:													
1H	33.7	13.00	9.32	2083	3989	5.3	352	2.37	36	81	92	24	38	99.0
<b>3.3.2.2.2</b>	50% of pull corresponding to maximum power at rated engine speed:													
1H	23.3	8.67	9.65	2110	4041	3.2	383	2.18	37	80	89	24	40	99.0
<b>3.3.2.2.3</b>	Higher gear / speed setting at reduced engine speed: Same pull and traveling speed as in 3.3.2.2.1:													
2H	33.7	13.00	9.32	1427	2733	5.3	278	3.01	37	83	83	24	39	99.0

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
3.3.2.2.4	Same gear / speed selection as 3.3.2.2.3 at reduced engine speed: Same pull and traveling speed as in 3.3.2.2.2:													
2H	23.3	8.69	9.65	1445	2767	3.2	286	2.92	36	80	81	24	35	98.9

#### 4. OPTIONAL TESTS RESULTS

##### 4.1 Waterproofing test:

Date of tests : 28.01.2019

Water level from ground to top : 400 mm

Gear number : M4

Test results:

Parts	Checking method (describe in accordance with test procedures)	Result (Pass/Fail/Not Applied for)
Wheel axles	Visual Method	Pass
Brake assembly	Visual Method	Pass
Clutch housing	Visual Method	Pass

**Statement** : The tractor is a waterproof tractor in accordance with the code.

#### 5. REPAIR AND ADJUSTMENTS PRIOR TO TESTS

--None--

#### 6. REMARKS

- i) The maximum tilt angle of mast from vertical over the full range of lift was observed as 5.5 degrees against the minimum requirement of 10 degrees.

TEST CARRIED OUT AT C.F.M.T. & T.I., BUDNI (M.P.), INDIA

TESTING AUTHORITY



C.S. RAGHUWANSHI  
AGRICULTURAL ENGINEER



C. V. CHIMOTE  
TEST ENGINEER



J. J. R. NARWARE  
DIRECTOR