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व्यावसायिक परीक्षण रिपोर्ट COMMERCIAL TEST REPORT (Initial) संख्या / No. : T-1058/1583/2016

माह / Month: December, 2016



TRISHUL 125 DI TRACTOR



भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय (कृषि, सहकारिता एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO: 9001 - 2008 Certified Institute)

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TRISHUL 125 DI TRACTOR - Commercial (Initial)

Name of the manufacturer : M/s. Trishul Tractors Pvt. Ltd.

Ghoghavadar Road, Gondal-360311

Test requested by (applicant)

Selected for test by

Place of running-in

Duration of said running-in (h)

- Engine

- Transmission

Method of Selection

Distt. Rajkot (Gujarat) India

: The manufacturer

: The Applicant

: At manufacturer's works

: 18

: 08

: The tractor was submitted directly by the applicant for test. Hence, method of selection is

not known.

1. SPECIFICATIONS

1.1 Tractor:

Make

Trishul Tractors Pvt. Ltd.

Model

Trishul 125 DI

Variants, if any Brand name, if any

None : None

Type

: Four wheeled, rear wheel driven, general

purpose, Agricultural Tractor.

Year of manufacture

Chassis number : 041400001

Country of Origin

2014

India

1.2 Engine:

Make

: M/s. Marshal Motors Pvt. Ltd.

Model

: FH 785

Type

: Four stroke, air cooled, direct injection, single

cylinder (vertical), naturally aspirated diesel

engine

Serial number

: GH09663

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

Maximum speed at no load,

2700 to 2900

- Low idle speed

900 to 1250

Speed at maximum torque

1400 to 1600

Rated speed, (rpm):

- For PTO use

2600

- For drawbar use

2600

1.3 Cylinder & Cylinder Head:

Number

One

Disposition

Vertical :

Bore/stroke, (mm)

85 / 110

Capacity as specified by the

624

applicant, (cc)

Compression ratio

17.1:1

Type of cylinder head

Mono block, Aluminum alloy

Type of cylinder liners Type of combustion chamber Dry, Non-replaceable, Integral with cylinder block

Re-entrant, Cavity on piston crown

Arrangement of valves

Over-head, Inline





17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

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

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant(D)/ Requirement (R)	As observed	Whethe meets the require ments (Yes/No
1	2	3	4	5	6	7
17.1.1	PTO Perfor	mance :				2
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26 kW7.5/+10% for PTO power ≤ 26 kW or-5 / +10% for Engine power >26 kW7.5/+10% for Engine power ≤ 26 kW	5.0 (D)	5.4	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	5.0 (D)	5.4	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	275 (D)	378	No
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	31 (D)	26.4	No
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	7 percent (D)	33.3	Yes
f)	Maximum Operatin	g Temperature	o (°C) :-			
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130	136	No
	2) Cylinder liner wall	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.	85	70	Yes

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1	2	3	4	5	6	7
g)	Engine oil consumption,	Evaluative	Not exceeding 1% of SFC at max. power	3.75 (R)	2.91	Yes
	(g/kWh)		under High ambient conditions	1% of SFC (D)		
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per meter (R)	1.79	Yes

17.1.2	Drawbar performa	ince:					
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	Not applicable	Not applicable	Not applic able	
b)	Maximum drawbar pull without ballast	Evaluative	Minimum 65% of static	6.12 (D)		100000	
	corresponding to 15 percent wheel slip, (kN)		mass of tractor without ballast	6.06 (R) Minimum	7.58	Yes	
c)		power without		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	4.30 (D)		
			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.	4.05 (R) Minimum	4.8	Yes	
d)	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	77	Yes	

17.1.3	Pow	er lift and h	ydraulic pun	np performance :							
a)	Maximum lifting capacity throughout the range of lift, (kN):										
	1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	5 (D)	4.99	Yes				
	2)	With the	Evaluative	The lift capacity should at least be 24 kg/PTO kW.	1.679 (D)		Yes				
		standard frame		and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft	1.27 (R) (minimum)	3.13					
minutes inter for a total durat	neight of the of cation of the	Non Evaluative	[Tolerance of plus 5 mm]	20 (D)		V					
	force after each 5 minutes interval for a total duration of 30 minute,				50 (R)	- 06	Yes				



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	10001	1000	201	v

1		2	3	4	5	6	7				
17.1.4	Brake	performance	at 25 kmph:								
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):										
	1) (Cold brake	Evaluative	10	10(D)	6.25	Yes				
	2)	Hot brake	Evaluative	10	10(D)	6.35	Yes				
b)	Maximu exerted brake achieve deceler 2.5 m/s	on the pedal to a a ation of	Evaluative	600	600 (R)	430 to 445	Yes				
c)	at a fo N at fo	er parking is effective rce of 600 ot pedal(s) N at hand	Evaluative	Yes / No	Yes	Yes	Yes				

17.1.5 a)	Noise measurement :									
	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes				
b)	Maximum noise at operator's ear level	Evaluative	As per CMVR	96 (R)	96	Yes				

17.1.6	Amplitude of mechanical vibrations at :									
	1)	Left foot rest	- 1007	52.5	Mary 38.0s	270	No			
		Right foot rest 2) Seat (with driver seated)	Non	100 microns (max)	100 (R)	170 140	No			
	2)		Evaluative		microns		No			
	3)	Steering wheel				270	No			

17.1.7	Air cleaner oil pull-over test								
	Maximum percentage of oil pull-over	Non evaluative	0.25 percent maximum	0.25%	0.13 %	Yes			

17.1.8	Hau	Haulage requirements									
a)	Gross mass of trailers (tones)										
3-3/5/5	1)	Two wheel	Non Evaluative		1.5 (D)	1.5	Yes				
b)	Distance travelled / liter of fuel consumption (km/l)										
	1)	Two wheel	Non Evaluative		10 to 12 (D)	9.51 to 9.85	No				
c)	Fuel consumption (ml/km/tone)										
- 17.	1)	Two wheel	Non Evaluative		55 to 60 (D)	68 to 70	No				
17.1.9	We	tland cultiva	ation :Tractor is	s not reco	mmended for wetl	and cultivation					

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17.1.10 b) d) e) f)

17.1.11

17.1.12 (a)

(b)

(c)

1	2		3	4			5	6	7	
17.1.10	Safety features							AL		
a)	Guards against moving and hot parts	Evaluative		drives, per, hydraulic r IS 12239 par		-	Conforms	Y	es	
b)	Lighting arrangement	Evaluative				-	Conforms	Y	Yes	
c)	Seating requirement (Tractors having more than 1150 mm rear track width)	Non- Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)		-	Not applicable	1	Not applicable		
d)	Technical requirements for PTO shaft	Non- Evaluative		meet ments of IS nended from to		= 8	Does not conform		No	
e)	Dimension of three point linkage	Non- Evaluative	Should meet the - Does no		Does not conform	,	lo			
f)	Specification of linkage and swinging drawtians	Non- Evaluative	and IS	meet ements of IS 12362 (part fied from tin	3) (as	-0	Does not conform	N	lo	

17.1.11	Lab	elling of tractors	(Provision o	of labeling plate):		
	1)	Make	Evaluative	3 14-11-11	TRISHUL TRACTORS PVT. LTD.	Yes
	2)	Model	Evaluative	last the second	TRISHUL 125 DI	Yes
	3)	Year of manufacture	Evaluative	Should conform to the requirements of CMVR along- with declared value of PTO HP	2014	Yes
	4)	Engine serial number	Evaluative		GH 09 663	Yes
	5)	Chassis serial number	Evaluative		04 14 00001	Yes
	6)	Declaration of PTO power, kW	Evaluative		5	Yes
	7)	SFC, gliants	Evaluative		303	Yes

17.1.12	Discard limit for:					
(a)	Cylinder bore diameter. (mm)	Evaluative	To be declared by the	85.15(D)	85.02 to 85.04	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative	manufacturer	0.29 (D)	0.12	Yes
(c)	Ring end gap (ma	m(t				
	1 st comp. ring.		To be declared	2.0 (D)	0.60 to 0.70	Yes
	2 rd comp. ring.	Evaluative	by the	2.0 (D)	0.60 to 0.70	Yes
	Oil ring	Cranative	manufacturer	2.0 (D)	0.65 to 0.80	Yes



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17.2

S. No.

1.

2.

17.3

ii)

iii)

iv)

V)

vii)

viii)

ix)

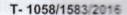
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1	2	3	4	5	6	7
(d)	Ring groove clear	rance (mm):		-		-
	1st comp. ring.	1	To be	0.25 (D)	0.136	Yes
	2 nd comp. ring.		declared by	0.25 (D)	0.093	Yes
	Oil ring.	Evaluative	the manufactur er	0.30 (D)	0.054	Yes
(e)	Clearance of mair	bearings (mr	n):			
	Diametrical clearance	Evaluative	-do-	Roller be	earing provided	-
	Crankshaft end float	Evaluative	-do-	1.2 (D)	0.15	Yes
(f)	Clearance of big e	end bearings.	(mm):			
	Diametrical	Evaluative	-do-	0.20 (D)	0.128 to 0.134	Yes
	Axial	Evaluative	-do-	0.75	0.30	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-		Tapper roller bearing provided	-
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-		Tapper roller bearing provided	•

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

17.1.14	CATEGORY	OF BREAKD	OWNS / DEFECTS :		
Sr.No.	Characteris tic	Category (Evaluativ e / Non Evaluativ e)	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	02 (Mj -10 & Mj-13)	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.	02 (Mj -10 & Mj-13)	Yes

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17.2	Optional require	ements as per Clause-4 (Table-2) o	f IS:12207-2014	
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether meets the require- ments (Yes/No.)
1.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	No
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	Not applicable
2.	Accessories	Linkage drawbar may be provided.	Provided	No
		Trailer hitch, front tow hook	Not provided	No

17.3 Conformity with following IS:

- Guide lines for declaration of power and specific fuel : Conforms consumption and labelling of agricultural tractors (First revision) [IS10273 1987 (Reaffirmed 2009)]
- Agricultural tractions Rear mounted power take-off Types 1, 2 : Does not conform and 3 (third revision) (IS 4931-1995 (Reaffirmed 2009))
- iii) Agricultural wheeled tractors Three-point linkage: Part 2 : Does not conform Category 1N (Namow Hitch) (Third Revision) [IS 4468 (Part-2):1993/ISO 730-2-1979 Restirmed 2009)]
- Drawbar for agricultural tractors Link type [IS 12953:1990 ; Does not conform (Reaffirmed 2007)
- V) Agricultural tractors Operator's seat technical requirement [IS: Not Applicable 12343 - 1998 (First revision) (Reaffirmed 2009))
- vi) Guide for salety & comfort of operator of agricultural tractors: : Does not conform Part 1 General requirements (first revision): [IS 12239 (PT-1) 1996/ISO 4254-1 1989 (Reaffirmed 2009)]
- vii) Tractors and machinery for agriculture and forestry Technical : Does not conform means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999 (Reaffirmed 2009)]
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2009)
- ix) Tractors and machinery for agriculture and forestry, powered: Does not conform lawn and garden equipment Symbols for operator controls and other displays Fam 2 Symbols for agricultural tractors and machinery (IS 6283) Fam 11- 2006 and IS: 6283 (Part-2)-2007 (Reaffirmed 2008)
- Agricultural Tractors and Machinery Lighting device for travel : Conforms on public roads (IS: 14583-1999) (Reaffirmed 2009)]



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17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO performance:

- The maximum power was observed 5.4 kW against the declaration of 5.0 kW. Which is within the tolerance limit of IS: 12207-2014.
- ii) The specific fuel consumption corresponding to maximum power was measured as 378 g/kWh against the declaration of 275 g/kWh which is not within the tolerance limit of IS:12207 – 2014. This should be looked into for necessary corrective action.
- iii) The maximum equivalent crankshaft torque was recorded as 26.4 Nm against the declaration of 31.0 Nm, which does not meet the requirement of IS 12207 – 2014. This should be looked into for necessary corrective action.
- iii) The backup torque was observed as 33.3 %.
- Iv) The maximum operating temperature of engine oil was recorded as 136°C against the declaration of 130°C, which does not meet the requirement of IS 12207 2014. This should be looked into for necessary corrective action.
- v) The PTO shaft found not rotating due to bend and PTO shaft end (part no 000910) replaced with new one before starting the laboratory tests.
- Fuel filters found dirty and changed before the servicing schedule before starting the PTO performance test.
- viii) Rear wheels of tractor found rolling itself and PTO shaft not rotating at the time of PTO performance test. Pinion drive gear shaft (part no. TR 07010800) changed with new one of same specification.

17.4.1.2 Hydraulic Performance test:

 Maximum flow of hydraulic oil at full throttle was observed as 5.0 l/min. against the declared of 15.0 l/min. To rectify the defect, hydraulic oil filter & pipe line were cleaned.

17.4.1.3 Mechanical Vibration:

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

17.4.1.4 Power take-off shaft:

The dimensions of "dØ", "W", "c" and "B" of PTO shaft does not meet the minimum requirements of IS: 4931 - 1995 (Reaffirmed 2009). This should be looked into for necessary corrective action.

17.4.1.5 Three point linkage:

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

17.4.1.6 Linkage Drawbar:

The dimensions of "A", "DØ", "FØ", "G", "HØ", "J", & no. of holes of linkage drawbar does not meet the minimum requirements of IS: 12953-1990. This should be looked into for necessary corrective action.

17.4.1.7 Operator's work place:

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

Spark arrester was not provided.

17.4.1.8

17.4.1.9

17.4.1.1

17.4.2

17.4.2.1

17.5

17.4.1.8 Location and movement of operator's controls:

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

i) The fuel shut-off knob for stop does not remain in stop position without application of sustains manual effort. This should be looked into for corrective action.

17.4.1.9 Identification of operator's controls:

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

- i) Power Take Off
- ii) Starting switch
- iii) Fuel level
- iv) Grease lubricant frequency
- v) Oil lubricant, type & frequency
- vi) Caution

17.4.1.10 Safety Guards

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

The working clearance for hand control between draft control and

17.4.2 Field performance test:

17.4.2.1 Wetland cultivation (Puddling operation):

The bas recommended that the tractor is not suitable for wetland cultivation (Puddling operation). Hence The wetland cultivation (Puddling operation) was not considered. Therefore, the declaration of the fact that the tractor is not suitable to add cultivation (Puddling operation) should be mentioned clearly and bodd to a tractor relevant to this tractor model.

17.5 Maintenance / Service Problems:

- During the PTO performance test, the PTO shaft was not rotating due to its eccentricity. To rectify the problem, the following replacement was done.
 - The PTO shaft (Pt no. 000910) was replaced with new one and this breakdown has been categorized as "Mj-13".
- Fuel filters was found dirty and replaced with new one before conducting the PTO performance test.
- Thereafter PTO performance test, again it was observed that, the tractor test of the performance test and PTO shaft was not rotating at the time of PTO performance test. To rectify the problem, the following replacement was
 - The PTO drive gear (Pt no. TR 07010800) and pinion drive gear (Pt no. TR 07010900) was replaced with new one and the breakdown has been called the drive gear (Mi-10".
- W) Measure flow of hydraulic oil at full throttle was observed as 5.0 l/min. against the declared of 15.0 l/min. To rectify the defect, hydraulic oil filter & coe line were cleaned.



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17.6 Recommendation with regard to safety on tractor:

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

- Provision for spark arresting device in exhaust system.
- The fuel shut-off knob for stop does not remain in stop position without application of sustains manual effort so it should be provided in this way that should be easy handling of tractor for safety propose.
- iii) The working clearance for hand control between draft control and mudguard.
- iv) Provision of differential lock.
- v) Provision for identifiable symbol for PTO control lever, starting switch fuel level gauge, Grease lubricant frequency & water temperature gauges.
- Vi) Provision for track adjustment for working under sloppy condition.
- vii) Power take off master shield.

17.7 Adequacy of Literature supplied with machine:

- 17.7.1 The following literature was supplied with the tractor for reference during the testing.
 - Operator's Manual in respect of Trishul 125 DI tractor.
 - Tractor Parts Catalogue in respect of Trishul 125 DI tractor.
 - Service Manual in respect of Trishul 125 DI tractor.
- 17.7.2 The literatures supplied by applicant should also in national as well as other regional languages for the guidance of users 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	28 Months (August, 2014 to December, 2016)	No	Breakdowns and response delayed from the applicant end.

TESTING AUTHORITY:

Tommunde	lelen	D. Holan
C. V. CHIMOTE TEST ENGINEER	Y. K. RAO SENIOR AGRICULTURAL ENGINEER	R.M.TIWARI SENIOR AGRICULTURAL ENGINEER
	Alarwaref J.J.R. NARWARE DIRECTOR	

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

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Para 1

19.2

S.No 1. 2.

3. 4. 5.

6. 7.

9.

8.

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A. 1. 2.

3. 4.

5. 6. 7.

8. 9.

10. 11. B.

B. C.

1. 2.

D.

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19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	17.4.1.1, 17.4.1.2, 17.4.1.4, 17.4.1.5, 17.4.1.6, 17.4.1.7, 17.4.1.9, 17.4.1.10, 17.5, 17.6	These are being studied & corrective action will be taken in near future wherever required.
19.2	17.1, 17.3, 17.4.1.3, 17.4.1.8	Your valuable comments & suggestion for improvements are well taken. Under our policy of continuous product improvement these aspects are further being looked into & will try to eliminate these deviations soon wherever necessary.

ANNEXURE- I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S.No	Parameters	M B Plough	Rotavator
1	Make	Mould board plough	Promise
2.	Type	Mounted	Mounted
3.	No. of Discibilates	Mounted reversible	24, in 5 flanges
4.	Type of Discibilades	Two	L type
5.	Size of bottoms/blades, (mm)	General purpose	195 X 44 X 6
6.	Spacing of bottoms/flanges, (mm)	130	185
7.	Lower hitch point span, (mm)	150	500
8.	Mast height, (mm)	506	485
9.	Overall dimensions, (mm):		
-	- Length	300	630
	- Width	900	1095
	- Height	840	845
10.	Gross mass. (kg)	185	165

ANNEXURE-II

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running-in	-
2.	Initial inspection	0.30
3.	Location of centre of gravity	0.40
4.	Noise level at by stander's position	0.83
5.	Brake performance test	0.75
6.	PTO performance test	18.29
7.	Hydraulic performance test	6.05
8.	Mechanical vibration measurement	0.75
9.	Nominal speed test	2.00
10.	Drawbar performance test	15.58
11.	Air cleaner oil pullover test	3.50
B.	HAULAGE TEST	5.99
C.	FIELD TEST	
1.	MB plough	20.37
2.	Rotavation	15.45
D.	Miscellaneous test and other run hours including idle run, transportation trials and preparation for test	5.20
	TOTAL	95.46