

संख्या / No. : T-1110/1636/2017  
गोपनीय परीक्षण रिपोर्ट  
CONFIDENTIAL TEST REPORT

माह / Month : October, 2017  
व्यावसायिक परीक्षण रिपोर्ट में परिवर्तित  
CONVERTED TO COMMERCIAL TEST REPORT



**VST SHAKTI, MT 270 VIRAAT 4W TRACTOR**



सत्यमेव जयते

भारत सरकार

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

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

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

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

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### 16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments/Defects/Breakdowns and Repairs	Tractor run hours
	None	

### 17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

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

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
<b>17.1.1 PTO Performance :</b>						
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 >28 Kw. -7.5/+10% for PTO power ≤ 28 Kw or -5 / +10% for Engine power >26 Kw. -7.5/+10% for Engine power ≤ 26 Kw	16.4 (D)	15.5	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	16.4 (D)	15.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	360 (D)	330	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	66 (D)	50.2	No
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10 (D)	1.8	No
<b>f) 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.	130 (D)	128	Yes
2)	Coolant (water)	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	120 (D)	112	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	3.31 (R)	0.12	Yes



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1	2	3	4	5	6	7
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per metre (R)	0.61	Yes
<b>17.1.2 Drawbar performance :</b>						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip. (kN)	Non Evaluative	Minimum 65% of static mass with ballast	Ballasting not recommended by the manufacturer	Not applicable	Not applicable
b)	Max. drawbar pull with standard ballast corresponding to 15 percent wheel slip. (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	5.99 (R) 7.00 (D)	8.31	Yes
c)	Maximum drawbar power with standard ballast. (kW).	Evaluative	Minimum 80% of PTO power as referred in Sl. No. i) a) of PTO performance in case of tractors having total static mass >1500 kg. Minimum 75% of PTO power as referred in Sl. No. i) a) of PTO performance in case of light weight tractors. Minimum 75% of the engine power as referred in Sl. No. i) a) of PTO performance in case of tractors which do not have a PTO shaft	11.6 (R) 13.1 (D)	12.4	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	103	Yes
<b>17.1.3 Power lift and hydraulic pump performance :</b>						
a)	Maximum lifting capacity throughout the range of lift. (kN):					
	1) At hitch points	Non Evaluative	[Tolerance of minus 10%]	7.0 (D)	7.69	Yes
	2) With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft	3.65 (R) 5.00 (D)	4.75	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 Minutes. (mm)	Non Evaluative	The observed value should not exceed 50 mm	50 (D)	05	Yes
<b>17.1.4 Brake performance at 25 kmph:</b>						
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 (R)	5.30	Yes
	2) Hot brake	Evaluative	10	10 (R)	5.69	Yes



1	2	3	4	5	6	7
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)	360 to 450	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes / No	Yes (R)	Yes	Yes
<b>17.1.5 Noise measurement :</b>						
a)	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	85 (R)	80	Yes
b)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	96 (R)	94	Yes
<b>17.1.6 Amplitude of mechanical vibrations at :</b>						
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	60	Yes
2)	Right foot rest				50	Yes
3)	Seat (with driver seated)				70	Yes
4)	Steering Wheel				70	Yes
<b>17.1.7 Haulage requirements :</b>						
<b>a) Gross mass of the trailers, (tones):</b>						
1)	Two wheel	Non Evaluative	--	3.0 (D)	3.0	Yes
2)	Four wheel	Evaluative	--	Not Recommended	Not applicable	
<b>b) Distance travelled / litre of fuel consumption, (km/l):</b>						
1)	Two wheel	Non Evaluative	--	5.86 to 6.19 (D)	5.09	Yes
2)	Four wheel	Evaluative	--	Not Recommended	Not applicable	
<b>c) Fuel consumption (ml/km/tonne):</b>						
1)	Two wheel	Non Evaluative	--	53.90 to 56.92 (D)	65.44	No
2)	Four wheel	Evaluative	--	Not Recommended	Not applicable	
<b>17.1.8 Wetland cultivation :</b>						
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11092. 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	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-				



1	2	3	4	5	6	7
<b>17.1.9 Safety features:</b>						
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 part 2)	--	Meet the requirements	Yes
b)	Lighting arrangement	Evaluative	As per CMVR	--	Meet the requirements	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, as the rear track width of tractor is less than 1150 mm.	Not applicable
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Does not meet the requirements	No
e)	Dimension of three point linkage	Non Evaluative	Should meet the requirements of IS: 4468- (Part-2) -1993 (Cat. 1N Narrow Hitch)	--	Does not meet the requirements	No
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS: 12953-1990 & IS: 4468 (Part-2) -1993.	--	Does not meet the requirements	No
	Specifications of swinging drawbar	Non Evaluative	Should meet the requirements of IS: 12362 (Part 3) -1994.	--	Not Provided	Not applicable
<b>17.1.10 Labelling of tractors (Provision of labelling plate):</b>						
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	VST SHAKTI	Yes
	2) Model	Evaluative		--	MT 270 VIRAAAT 4W	Yes
	3) Year of manufacture	Evaluative		--	2016	Yes
	4) Engine number	Evaluative		--	E16K001831	Yes
	5) Chassis number	Evaluative		--	K16L000893	Yes
	6) Declaration of PTO power, kW	Evaluative		--	16.40	Yes
<b>17.1.11 Discard limit for:</b>						
a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	73.95	72.96 to 72.97	Yes
b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.30	0.056 to 0.065	Yes
<b>c) Ring end gap (mm):</b>						
c)	- Top comp. ring.	Evaluative	-do-	1.5	0.25 to 0.30	Yes
	- 2 <sup>nd</sup> comp. ring.		-do-	1.5	0.30	Yes
	- 3 <sup>rd</sup> comp. ring.		-do-	1.5	0.30	Yes
	- Oil ring.		-do-	1.5	0.35	Yes
<b>d) Ring groove clearance (mm):</b>						
d)	- Top comp. ring.	Evaluative	-do-	0.30	Taper Ring	--
	- 2 <sup>nd</sup> comp. ring.		-do-	0.30	0.032 to 0.046	Yes
	- 3 <sup>rd</sup> comp. ring.		-do-	0.30	0.051 to 0.056	Yes
	- Oil ring.		-do-	0.30	0.049 to 0.057	Yes



1	2	3	4	5	6	7
<b>e)</b>	<b>Clearance of main bearings (mm):</b>					
	- Diametrical clearance	Evaluative	To specified by the manufacturer	0.20	0.069 to 0.104	Yes
	- Crankshaft end float	Evaluative		1.00	0.10	Yes
<b>f)</b>	<b>Clearance of big end bearings, (mm):</b>					
	- Diametrical	Evaluative	-do-	0.15	0.061 to 0.077	Yes
	- Axial	Evaluative	-do-	0.50	0.10 to 0.15	Yes
<b>g)</b>	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.50	Not applicable	--
<b>h)</b>	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	1.0	0.10	Yes
<b>17.1.12</b>	<b>Literature (Submission to test agency):</b>					
<b>(a)</b>	Operator manual	Evaluative	Provided/Not Provided	As per relevant IS- 8132	Provided	Yes
<b>(b)</b>	Parts Catalogue	Evaluative	Provided/Not Provided		Provided	Yes
<b>(c)</b>	Workshop/ Service manual	Evaluative	Provided/Not Provided		Provided	Yes
<b>17.1.13</b>	<b>CATEGORY OF BREAKDOWNS / DEFECTS :</b>					
<b>S. No.</b>	<b>Category of Breakdown</b>	<b>Category (Evaluative / Non Evaluative)</b>	<b>Requirements as per IS: 12207-2014</b>	<b>As observed</b>	<b>Whether meets the requirement (Yes/No.)</b>	
1.	Critical breakdown	Evaluative	No critical breakdown	None	Yes	
2.	Major breakdowns	Evaluative	Not more than two and neither of them should be repetitive in nature	None	Yes	
3.	Minor breakdowns	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>					
<b>S. No.</b>	<b>Characteristic</b>	<b>Requirements as per IS: 12207-2014</b>	<b>As observed</b>	<b>Whether meets the requirements (Yes/No.)</b>		
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.	ROPS not fitted	Not applicable		
2.	Accessories	Trailer hitch, front tow hook may be provided.	Trailer hitch provided and front tow hook not provided	No		
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**17.3 Conformity with following IS:**

- i) Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)] : **Conforms**
- ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3(third revision)[IS: 4931-1995 (Reaffirmed in March, 2009)] : **Does not conform**
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-2):1993 (Reaffirmed in March, 2007) / ISO 730-1:1994] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)] : **Does not conform**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 -1998 (First revision) (Reaffirmed in March, 2009)] [Tractors having morethan 1150 mm rear track width] : **Not applicable as the rear track width of the tractor is less than 1150 mm.**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (PT-1)-1996 (Reaffirmed in March, 2009)/ISO 4254-1:1989] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) IS 12239 (PT-2)-1999 (Reaffirmed in March, 2009)] : **Does not conform**
- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays [IS: 6283 (Part-1 & Part-2) -2006 & 2007(Reaffirmed in March, 2009)/ISO 3767-2:1991)] : **Conforms**
- ix) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009)] : **Conforms**
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in March, 2009)] : **Conforms**

**17.4 Salient Observations:****17.4.1 Laboratory tests:****17.4.1.1 PTO Performance:**

- i) The maximum power was recorded as **15.5 kW** against the declaration of **16.4 kW**, which is within the tolerance limit specified in IS: 12207-2014.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **330 g/kWh** against the declaration of **360 g/kWh** which is within the tolerancelimit specified in IS: 12207-2014. The specific fuel consumption is considered on very higher side for this power range of tractor and call for necessary corrective action.
- iii) The backup torque is only **1.8 %** against the minimum requirements of **10 %**. This should be looked into for necessary corrective action.
- iv) The maximum equivalent crankshaft torque was observed as **50.2 Nm** against the declaration of **66 Nm** and which does not meet the requirement of IS: 12207-2014 with regard to tolerance. This should be looked into for necessary corrective action.



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**17.4.1.2 Mechanical Vibration:**

The amplitude of mechanical vibration on various assemblies marked as (\*) in Chapter-9 of this test report are on higher side. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

**17.4.1.3 Power take off shaft :**

- i) The dimension 'B $\Phi$ ' of power take off shaft does not meet the requirements of IS 4931-1995. This should be looked into for necessary corrective action.

**17.4.1.4 Three point linkage:**

- i) The lateral distance from lower hitch point to centre line of tractor does not meet the requirements of does not meet the requirements of IS: 4468- (Part-2) -1993 (Cat. 1N Narrow Hitch). This should be looked into for necessary corrective action.
- ii) The distance from end of power take-off to centre of lower hitch point (lower links in horizontal position) does not meet the requirements of does not meet the requirements of IS: 4468- (Part-2) -1993 (Cat. 1N Narrow Hitch). This should be looked into for necessary corrective action.
- iii) The lower hitch point tyre clearance does not meet the requirements of does not meet the requirements of IS: 4468- (Part-2) -1993 (Cat. 1N Narrow Hitch). This should be looked into for necessary corrective action.

**17.4.1.5 Linkage drawbar :**

- i) The dimension A & D $\Phi$  does not meet the requirements of IS 12953-1990. This should be looked into for necessary corrective action.

**17.4.2 Field performance test:**

- i) The manufacturer has recommended only rotavator for field operation, which is secondary tillage implement. It is therefore, recommended that, suitable matching implement for other operations such as primary tillage & interculture should be developed before commercialization of this tractor model.
- ii) The tractor has no provision for track width adjustment of rear wheel, this limits the use of tractor for interculture operation.
- iii) Rear working light (plough light) is not provided on the tractor, for operation in the field during night. As per clause 4.1.7 of IS: 14683-1999, at least one lamp projection a general flood pattern of light should be provided at rear.

**7.4.2.1 Wetland cultivation (Puddling operation):**

No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is found suitable for wetland operation (Puddling).

**17.4.2.2 Haulage performance:**

The fuel consumption with two wheel trailer were observed 65.44 ml/km/tonne against the declaration of 53.90 to 56.92 ml/km/tonne and does not meet the requirement of IS: 12207-2014 and therefore, should be looked into for necessary corrective action.

**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 for spark arresting device in exhaust system.
- ii) The fuel shut-off knob for stop does not remain in stop position without application of sustains manual effort.





- iii) Provision of master shield for PTO shaft.
- iv) Provision of front tow hook.
- v) The full width of rear wheels of tractor is not fully guarded by the mud guard, the rear mudguards should be re designed/improved to enhance the safety.

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

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

- i) Operator's manual & service log book for VST Shakti MT 270 VIRAAAT 4W tractor.
- ii) Service manual for VST Shakti MT 270 VIRAAAT 4W tractor.
- iii) Part's catalogue for VST Shakti MT 270 VIRAAAT 4W tractor.

**17.7.2** The supplied literature was found adequate, however, these literatures should be brought out in national as well as other regional languages of India for guidance of users.

**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	07 Months (Feburay 2017 to September 2017)	Yes	--

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