



VST SHAKTI, MT 180D 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, Cooperation & Farmers Welfare, Mechanization & Technology Division)

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

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2. ESSENTIAL TESTS

2.1. SPECIFICATIONS

The following are the brief specifications of the tractor. However, for detail specifications, the test report No. T- 1246/1773/2019 released in May, 2019 should be referred.

2.1.1 Tractor:	<u>Previous sample</u>	<u>Present sample</u>
Make	: VST SHAKTI	VST SHAKTI
Model	: MT 180D	MT 180D
Brand name	: None	None
Type	: Four wheeled, 4WD, Unit construction, General purpose, Agricultural Tractor	
Month & Year of manufacture	: 2018	03 20
Chassis Serial number	: T18G 076836	BCDTCC080400
Country of Origin	: India	India
2.1.2 Engine:		
Make	: VST Tillers Tractors Limited	
Model	: K3C	V3D1
Type	: Four stroke, liquid cooled, naturally aspirated, Indirect injection, diesel engine	
Serial number	: C18G059232	BEAEBC026395
Engine speed (Manufacturer's recommended production setting)(rpm) :		
- Maximum speed at no load	: 2875 to 2925	2875 to 2925
- Low idle speed	: 750 to 850	800 to 900
- Speed at maximum torque	: 2050	2000 to 2100
Rated speed, (rpm):		
- For PTO use	: 2700	2700
- For drawbar use	: 2700	2700
2.1.3 Cylinder & Cylinder Head:		
Number	: Three	Three
Disposition	: Vertical inline	Vertical inline
Bore/stroke, (mm)	: 70/78	73/78
Capacity as specified by the applicant, (cc)	: 900.51	979.5
2.1.4 Fuel System:		
Type of fuel feed system	: Gravity and forced feed	
2.1.4.1 Fuel feed pump:	: Not provided	
2.1.4.2 Fuel Injection pump:		
Make	: Bosch	
Model/Group combination No.	: 9410 030 523	
Type	: Inline Plunger	
Serial number	: Not available	
2.1.4.3 Fuel injectors:		
Make	: Bosch, India	Bosch, India
Holder number	: 0431211013/HB	0431211013/HB
Nozzle no.	: DN 4SD 24 090	DN 4SD 24 090
Type	: Pintle type	Pintle type
Injection timing	: 21± 1° before TDC	21± 1° before TDC
2.1.4.4 Governor:		
Make	: VST (apa)	
Model/Group combination No.	: Not specified	
Type	: Mechanical, centrifugal variable speed	

**5.1.5 Main bearings:**

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end Float, (mm)	Max. permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.091 to 0.093	0.10	0.40	1.50
2.	0.090 to 0.104			
3.	0.114 to 0.120			
4.	0.107 to 0.121			

5.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. permissible clearance limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.071 to 0.078	0.25	0.40	0.80
2.	0.052 to 0.076	0.25		
3.	0.068 to 0.084	0.25		

5.1.7 Valve, guides and timing gears:

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

Spring Rate, (N/mm):

-Intake valve	: 18.41 to 19.29	Against the Discard limit of 15.69 N/mm
-Exhaust valve	: 18.69 to 19.07	

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

-Intake valve	: 0.061 to 0.064	Against the Discard limit of 0.50 mm
-Exhaust valve	: 0.067 to 0.087	

6. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

- 6.1** The performance results have been reproduced variant test report no. T- 1246/1773/2019 (June, 2019) / On the basis of test conducted the performance results have been summarized as evaluative (mandatory) and non – evaluative (not mandatory) parameters applicable for Qualifying Minimum Performance Criteria as per clause-4 Table-1 of Indian Standard **12207: 2019** for acceptance of tractor for the purpose of subsidies / NABARD financing are summarized as under.

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	Values declared by the applicant (D)/ Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
6.1.1 PTO Performance :						
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: $\pm 5\%$ for PTO power and or Engine power >26 kW. $\pm 10\%$ for PTO power and or engine ≤ 26 kW	10.3 (D)	11.0	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	10.3 (D)	10.9	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10%	360 (D)	320	Yes



1		2		3		4		5		6		7			
d)		Maximum equivalent crankshaft torque, (Nm)		Non Evaluative		± 8%		46 (D)		50.2		Yes			
e)		Back-up torque, percent		Evaluative		12 percent, min.		12 % (D) 12 % (R) Minimum		30.1		Yes			
f)		Maximum operating temperature, (°C)													
		1)	Engine oil	Evaluative		The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.				135 (D)		114		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.				120 (D)		113		Yes	
g)		Engine oil consumption, (g/kWh)		Evaluative		Not exceeding 1% of SFC at max. power under High ambient conditions		3.25 (D) Maximum		1.50		Yes			
h)		Smoke level, m ⁻¹		Evaluative		Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value.		3.25 per meter (R)		1.13 per meter		Yes			
6.1.2		Drawbar performance (*):													
a)		Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)		Evaluative		Minimum 70% of static mass with ballast		Ballasting not recommended by the manufacturer		Not applicable		Not applicable			
b)		Maximum drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN)		Evaluative		Minimum 70% of static mass of tractor without/ standard ballast		6.0 (D) 5.59(R) (Minimum)		7.03		Yes			
c)		Maximum drawbar power with standard ballast as the case may be, 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.				10.4 (D) 8.3 (R)		8.8		Yes	
d)		Maximum transmission oil temperature (°C)		Evaluative		The declared value should not exceed the maximum value specified by oil company.		121 (D)		86		Yes			

1	2	3	4	5	6	7
6.1.3	Power lift and hydraulic pump performance :					
a)	Maximum lifting capacity throughout the range of lift, (kN):					
1)	At hitch points	Evaluative	Tolerance of $\pm 10\%$	6.50 (D)	6.08	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	4.0 (D) 2.59 (R) Minimum	3.94	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) Maximum	00	Yes
6.1.4	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 m	10 (R)	3.30	Yes
2)	Hot brake	Evaluative	10 m	10 (R)	3.25	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600 N	600 (R) Maximum	168 to 189	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal (s) or 400 N at hand lever, N	Evaluative	Yes / No	Yes	309 to 365	Yes
6.1.5	Noise measurement : (*)					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	88 dB (A) for >1.5 tonne GVW and 85 db (A) for <1.5 tonne GVW (as per CMVR)		79	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	96 (as per CMVR)		93	Yes
6.1.6	Amplitude of mechanical vibrations at: (*)					
1)	Left foot rest	Non Evaluative	100 microns (max)		180	No
2)	Right foot rest				180	No
3)	Seat (with driver seated)				160	No
4)	Steering wheel				160	No
6.1.7	Air cleaner Oil Pull-Over:					
	Maximum air cleaner oil pull over, (%)	Evaluative	0.25% (Maximum)	Dry type air cleaner fitted		Not applicable



1		2		3		4		5		6		7	
6.1.8		Haulage requirements : (*)											
a)		Gross mass of the trailers, (tones):											
		Two wheel		Non Evaluative		To be specified by manufacturer		3.0 (D)		3.0		Yes	
		Four wheel		Not Recommended									
b)		Distance travelled / liter of fuel consumption, (km/l):											
		Two wheel		Non Evaluative		-do-		6.0 (D)		4.96 to 5.01		No	
		Four wheel		Not Recommended									
c)		Fuel consumption (ml/km/tonne):											
		Two wheel		Non Evaluative		-do-		58.0 (D)		66.49 to 67.0		No	
		Four wheel		Not Recommended									
6.1.9		Wetland cultivation (Puddling Operation): (*)											
		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)		As per clause 7.2 of IS: 12207, the field test (wet land cultivation) during the batch testing, this tractor model was not conducted.		Yes	
1)		Clutch assembly		-do-									
2)		Brake housings		-do-									
3)		Front axle hubs		-do-									
4)		Engine oil		-do-									
5)		Transmission oil		-do-									
6.1.10		Safety features :											
a)		Guards against moving and hot parts		Evaluative		Belt drives, pulley, silencer, hydraulic pipes (As per IS: 12239 (Part-2))		Meets the requirements		Yes			
b)		Lighting arrangement		Evaluative		As per CMVR		Meets the requirements		Yes			
c)		Seating requirements (Tractors having more than 1150 mm rear track width)		Non Evaluative		Should meet the requirements of IS: 12343 (As amended from time to time)		Not applicable as the rear track width of tractor is less than 1150 mm.		Not applicable			
d)		Technical requirements for PTO shaft		Evaluative		Should meet the requirements of IS: 4931 (As amended from time to time)		Meets the requirements		Yes			
e)		Dimensions of three point linkage		Non Evaluative		Should meet the requirements of IS: 4468 (Part-2) Category 1N (As amended from time to time)		Meets the requirements		Yes			
f)		Specifications of linkage drawbar		Evaluative		Should meet the requirements of IS 12953 Category 1N (As amended from time to time)		Meets the requirements		Yes			
g)		Swinging drawbar (wherever fitted)		Evaluative		Should meet the requirements of IS 12362 (Part 3) (As amended from time to time)		Not applicable		Not applicable			
h)		1) Maximum traveling speed at rated engine speed in reverse gear, kmph		Evaluative		Should not exceed 20 kmph		6.66 kmph (Meets the requirement)		Yes			
		2) Audible warning signal on tractor		Evaluative		As soon as the travelling speed in reverse gear reaches to 20 kmph, an audible warning signal on tractor be activated. The safety aspects about the operation of shuttle technology shall be brought in operation and manufacturer /dealer shall ensure the training on this aspect to operator before the delivery of tractor.		Not Applicable		Not Applicable			



1	2	3	4	5	6	7
6.1.11	Labelling of tractors (Provision of labelling plate):					
1)	Make	Evaluative	Should conform to the requirements of CMVR along-with maximum PTO power in kW and year of manufacture in numerical form MM YY Digit 01-12 in box No.1 for MM will represent the months & next two digits in box No.2 for YY will represent the year of manufacturing.	VST SHAKTI		Yes
2)	Model	Evaluative		MT 180D		Yes
3)	Month & Year of manufacture	Evaluative		03	20	Yes
4)	Engine number	Evaluative		BEAEBC026395		Yes
5)	Chassis number	Evaluative		BCDTCC080400		Yes
6)	Declaration of PTO power, (kW)	Evaluative		10.3		Yes
7)	Specific fuel consumption (gm/kWh)	Evaluative		360		Yes
6.1.12	Discard limit for, (mm) :					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	73.95 (D)	72.958 to 72.995	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.50 (D)	0.089 to 0.093	Yes
(c)	Piston diameter at skirt, (mm)	Non Evaluative		72.50 (D)	72.900 to 72.902	--
(d)	Ring end gap (mm):					
-	Top comp. ring.	Evaluative	-do-	2.0 (D)	0.20 to 0.35	Yes
-	2 nd comp. ring.			2.0 (D)	0.25 to 0.40	Yes
-	3 rd comp. ring.			2.0 (D)	0.20 to 0.30	Yes
-	Oil ring.			2.0 (D)	0.15 to 0.20	Yes
(e)	Ring groove clearance (mm):					
-	Top comp. ring.	Evaluative	-do-	0.50 (D)	Tapered	--
-	2 nd comp. ring.			0.50 (D)	0.049 to 0.058	Yes
-	3 rd comp. ring.			0.50 (D)	0.045 to 0.061	Yes
-	Oil ring.			0.50 (D)	0.046 to 0.049	Yes
(f)	Clearance of main bearings (mm):					
-	Diametrical clearance	Evaluative	-do-	0.40 (D)	0.090 to 0.121	Yes
-	Crankshaft end float			1.50 (D)	0.10	Yes
(g)	Clearance of big or small end bearings, (mm):					
-	Diametrical	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.40 (D)	0.052 to 0.084	Yes
-	Axial	Evaluative		0.80 (D)	0.25	Yes
(h)	Clearance between king pin and bush, (mm)	Non Evaluative		1.5 (D)	0.088 to 0.096 *	Yes
(i)	Clearance between centre pin and bush, (mm)	Non Evaluative		1.5 (D)	0.66 to 0.88 *	Yes

Remark :- (*) Data / Values taken from obsolete model test report vide report no. T-902/1417/2014 (January, 2014).



1	2	3	4	5	6	7
6.1.13	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	The printed literature in booklet form should be provided as per IS 8132 & should submit along with the test sample		Provided	Yes
(b)	Parts Catalogue	Evaluative			Provided	Yes
(c)	Workshop / Service manual	Evaluative			Provided	Yes
6.1.14	Fitment of Roll Over Protective Structures (ROPS): for tractor having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS 11821 or OECD code or equivalent International standard		Not fitted	Not applicable
6.1.15	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with the tractor.		Provided	Yes
6.1.16	Accessories (optional)	Non Evaluative	Ballast weights, if fitted, should meet the requirement of CMVR		Provided	Yes

6.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per Clause 5.0 of IS:12207-2019) :					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	As observed	Whether meets the Requirements (Yes/No.)
1.	Critical	Evaluative	There is no 'critical breakdown' during the course of testing	None	Yes
2.	Major	Evaluative	There are not more than 1 major breakdowns and neither of them is of repetitive nature	None	Yes
3.	Minor	Evaluative	There are not more than 3 minor defects during the test and the frequency of each is not be more than two	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed four that is, (1 major + 3 minor) or 4 minor breakdowns	None	Yes

6.3 Salient Observations:**6.3.1 Laboratory tests:****6.3.1.1 PTO Performance:**

- i) The backup torque was observed as **30.1%**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) The maximum power was observed as **11.0 kW** against the declaration of **10.3 kW**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iii) The specific fuel consumption corresponding to maximum power was measured as **320 g/kWh** against the declaration of **360 g/kWh**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iv) The maximum equivalent crankshaft torque was recorded as **50.2 Nm** against the declaration of **46.0 Nm** which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- v) The unusual trend of power variation was observed from engine speed 2050 rpm to 2501 rpm. This should be looked into for necessary corrective action.

6.3.1.2 Hydraulic performance test :

- i) The maximum lifting capacity at hitch point throughout the range of lift was observed as **6.08 kN** against the declaration of **6.50 kN**, which meets the requirement of IS: 12207-2019 with regard to tolerance.

6.4 This tractor model meets the evaluative requirements of **IS: 12207-2019**.



7. 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	02 Month (April to May, 2020)	Yes	-None-

TESTING AUTHORITY:

C.S. RAGHUWANSHI
AGRICULTURAL ENGINEER

C.V. CHIMOTE
TEST ENGINEER

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8. APPLICANT'S COMMENTS

Para no.	Our reference	Applicant comments
8.1	6.3.1.1 (v)	Suggestion & recommendation will be incorporated for the quality of product & necessary corrective action will be taken.

**ANNEXURE - I****TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	Nominal speed Test	0.5
3.	PTO performance test	15.0
4.	Hydraulic performance test	1.8
B.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	3.3
	TOTAL:	20.6