व्यावसायिक परीक्षण रिपोर्ट	संख्या/No.	:	T-1246/1773/2019
COMMERCIAL TEST REPORT (Variant)	माह/Month	:	June, 2019

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

VST SHAKTI MT 180 D 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

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO 9001: 2008 Certified Institute)

TRACTOR NAGAR, BUDNI (M.P.) 466 445

E-mail: fmti-mp@nic.in Web site: http://www.fmttibudni.gov.in

Telephone: 07564-234729 FAX: 07564-234743

Manufacturer : **M/s. VST Tillers Tractors Ltd**
Plot No 39, Phase I, SIPCOT Industrial Complex, Mookandapalli, Hosur-635126

Month: June	Test Report No. T-1246/1773/2019	Year: 2019

GOVERNMENT OF INDIA
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA
Email : fmti-mp@nic.in
Web site : fmttibudni.gov.in
Telephone: 07564-234729

Type of Test	:	**COMMERCIAL (Variant)**
Test code/Procedure	:	IS: 5994-1998 (Reaffirmed in 2014), IS: 12224-1987 (Reaffirmed in 2014), IS 9253 - 2013 And IS 12207-2014.
Period of Test	:	February, 2019 to May, 2019
Test Report No.	:	**T-1246/1773/2019**
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.)

v) This is a Variant test report and therefore, should be read in conjunction with the Test Report of base model i.e. **"Mitsubishi Shakti MT 180 D"** tractor bearing **No. T-902/1417/2014, January, 2014.**

SELECTED CONVERSIONS

S E L E C T E D C O N V E R S I O N S		
S. No	**Units**	**Conversion Factor**
1	**Force:**	
	1 kgf	9.80665 N
		2.20462 lbf
2	**Power:**	
	1 hp	1.01387 metric hp (Ps)
		745.7 metric hp
	1 metric hp	735.5 W
	1 kW	1.35962 metric hp
3	**Pressure:**	
	1 psi	6.895 kPa
	1 kgf/cm^2	98.067 kPa = 735.56 mm of Hg
	1 bar	100 kPa = 10 N/cm^2
	1 mm of Hg	1.3332 m-bar

A B B R E V I A T I O N S	
As per applicant	apa
Top Dead Centre	TDC
Indian Standard	IS
Left Hand Side/ Right Hand Side	LHS/RHS
Mercury	Hg.
Temperature	Temp.
Not recorded	N.R.
Revolutions per minute	rpm
Outer diameter/ Inner diameter	O.D/I.D
Not available/ Not applicable	N.A.
Power take-off	PTO
Relative Humidity	R.H.

C O N T E N T S **PAGE**

Manufacturer : **M/s. VST Tillers Tractors Ltd**
Plot No 39, Phase I, SIPCOT Industrial Complex, Mookandapalli, Hosur-635126

Test requested by (applicant) : **M/s. VST Tillers Tractors Ltd**
Plot No 39, Phase I, SIPCOT Industrial Complex, Mookandapalli, Hosur-635126

Place of running-in : At Applicant's works
Duration of said running-in, (h):
- Engine : 05
- Transmission : 02

Method of Selection : The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SCOPE OF TEST

The **"M/s VST Tillers Tractors Limited, Mitsubishi Shakti MT 180 D"** tractor had undergone Initial commercial (Batch) testing at this Institute and test report bearing **No. T-902/1417/2014** was released in **January, 2014** Now, the applicant has submitted an application vide letter No – **Nil** dated **04.09.2018** for testing of **"VST Shakti MT 180 D"** tractor as a variant of **"Mitsubishi Shakti MT 180 D"** tractor.

The applicant having enclosed a list of following differences in the technical specifications between tractor base model **"Mitsubishi Shakti MT 180 D"** and variant model **"VST Shakti MT 180 D"** and requested to test the **"VST Shakti MT 180 D"** as a variant of **"Mitsubishi Shakti MT 180 D"** tractor :-

The major differences of Basic model and Variant model are listed below:

S.No.	Particulars	Base model	Present sample
1	2	3	4
1.	Make of tractor	Mitsubishi Shakti	VST Shakti
2.	Model of tractor	MT 180 D	MT 180 D
3.	**Air intake system**		
	Make	VST	VST
	Type	Oil bath	Dry type
	Location	On RHS of engine, outside the bonnet	On RHS of engine, under the bonnet
4.	**Hydraulic system**		
	Make	VST Tillers Tractors Limited	MITA Hydraulics
	Type	Open centre, live, manual depth control	Open centre, live, Automatic draft & depth control
	Sustain pressure of open relief valve,(MPa)	13.5	19.4
	Maximum hydraulic power,(kW)	2.00	3.2
	Pump Delivery at max power, (l/min)	9.62	11.4
	Method of draft sensing mechanism	Not provided	Through top link
	Maximum lifting capacity at hitch point, (kN)	5.6	11.16
	Maximum lifting capacity at standard frame, (kN)	4.0	8.72
	Pressure corresponding to max power, (MPa)	12.5	17
5.	**Three point linkage**		
	Category	Category 1N	Category 1N
	Shape of lower link	Curved	Straight
	Length of lower link	580	495

1	2	3	4
6.	**Brake system**		
	Make	VST(apa)	VST(apa)
	Area of lining(on each wheel side) cm^2	35.42	91.4
7.	**Sheet metal**		
	Style of bonnet & Declas sticker	Mitsubishi Shakti MT 180 D	VST Shakti MT 180 D

Subsequent to the examination of the case in light of clause 8.4 & sr. No. (ii), (vii) and (xii) of table 3 of Indian Standard IS 12207-2014, the following tests were considered to be carried out:

- Specification checking in full
- Nominal speed test
- Two hour maximum PTO power under normal ambient condition
- Hydraulic performance test
- Field test (Dry land conditions)

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:

S.No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Air cleaner oil	NA	As recommended
2.	Engine oil	SAE 20W40	--do--
3.	Transmission and hydraulic system oil	SAE 90	Oil originally filled in the tractor was not changed
4.	Steering housing oil	Gear HP 140	--do--
5.	Grease	Multipurpose	Servo Grease MP

3. ESSENTIAL TESTS

3.1 SPECIFICATION

			Base Model	Variant Model
3.1.1	**Tractor:**			
	Make	:	Mitsubishi Shakti	VST Shakti
	Model	:	MT 180 D	MT 180 D
	Brand name	:	NA	NA
	Variants, if any	:	NA	NA
	Type	:	Four wheeled, four wheel drive, Unit construction, general purpose agricultural tractor	Four wheeled, four wheel drive, Unit construction, general purpose agricultural tractor
	Year of manufacture	:	2012	2018
	Chassis number	:	T12L 038186	T18G 076836
	Country of origin	:	India	India
3.1.2	**Engine:**			
	Make	:	VST Tillers Tractors Limited	VST Tillers Tractors Limited
	Model	:	K 3 C	K 3 C
	Type	:	Four stroke, Water cooled, Vertical inline Indirect injection, naturally aspirated ,diesel engine	Four stroke, Water cooled, Vertical inline Indirect injection, naturally aspirated ,diesel engine
	Serial number	:	C12L 039731	C18G059232
	Country of origin	:	India	India

			Base Model	Variant Model
	Engine speed (Manufacturer's recommended production setting), (rpm):			
	- Maximum speed at no load	:	2900±25	
	- Low idle speed	:	800±50	
	- Speed at maximum torque	:	2050	
	Rated speed, (rpm):			
	- For PTO use	:	2700	
	- For drawbar use	:	2700	
3.1.3	**Cylinder & Cylinder Head:**			
	Number	:	3	
	Disposition	:	Vertical inline	
	Bore/stroke, (mm)	:	70/78	
	Capacity as specified by the applicant, (cc)	:	900.51	
	Compression ratio	:	23 :1	
	Type of cylinder head	:	Monoblock	
	Type of cylinder liners	:	Wet, Non-replaceable	
	Type of combustion chamber	:	In direct injection	
	Arrangement of valves	:	Overhead	
	Valve clearance (cold):			
	- Inlet valve, (mm)	:	0.25	0.30
	- Exhaust valve, (mm)	:	0.25	0.30
3.1.4	**Fuel System:**			
	Type of fuel feed system	:	Gravity	
3.1.4.1	**Fuel tank:**			
	Capacity, (l)	:	17.9	17.5
	Location	:	Above clutch housing	
	Provision for draining of sediments/ water	:	Not Provided	
	Material of fuel tank	:	Metallic	
3.1.4.2	**Water Separator:**			
	Make	:	Not Provided	
3.1.4.3	**Fuel feed pump:**			
	Make	:	Not Provided	
3.1.4.4	**Fuel filters:**			
	Make	:	Bosch	
	Model/Group combination No.	:	F 002 H20 108	
	Number	:	One	
	Type of elements	:	Paper	
	Capacity of final stage filter, (l)	:	0.40	0.35
3.1.4.5	**Fuel Injection pump:**			
	Make	:	Bosch	
	Model/Group combination No.	:	9410 030 523	
	Type	:	Inline Plunger	
	Serial number	:	Not available	
	Method of drive	:	Through cam shaft gear	
3.1.4.6	**Fuel injectors:**			
	Make	:	Bosch	
	Holder number	:	0431 211 013/HB	
	Nozzle number	:	Not available	DN 4SD 24 854
	Type	:	Pintle	
	Manufacturer's production pressure setting, Mpa	:	11.77+0.98	
	Injection timing	:	21 degree BTDC	21± 1 degree BTDC
	Firing order	:	1-3-2	

			Base Model	Variant Model
3.1.4.7	**Governor:**			
	Make	:	VST (apa)	
	Model/Group combination No.	:	Not specified	
	Type	:	Mechanical, centrifugal variable speed	
	Governed range of engine speed, (rpm)	:	800 to 2925	
	Rated engine speed, (rpm)	:	2700	
3.1.5	**Air intake system:**			
3.1.5.1	**Pre-cleaner:**			
	Make	:	VST (apa)	Not provided
	Type	:	Centrifugal with transparent dust collector	Not provided
	Location	:	Above main air cleaner inlet tube, outside the bonnet.	Not provided
3.1.5.2	**Air cleaner:**			
	Make	:	VST	Donaldson
	Type	:	Oil bath	Dry
	Location	:	RHS of engine, outside the bonnet	In front of radiator under the bonnet
	Oil capacity (l)	:	0.200	Not applicable
	Range of suction pressure at maximum power, (kPa)	:	1.6	4.1
	Oil change period	:	After every 50 hours of operation	Not applicable
3.1.6	**Exhaust System:**			
	Type of silencer	:	Horizontal, (Cylindrical) downward opening	
	Position of silencer outlet with respect to SIP, (mm):			
	- Downward	:	210 (downward)	240 (downward)
	- Longitudinal	:	1640	1735
	- Lateral	:	320 (LHS)	320 (LHS)
	Range of exhaust gas pressure at maximum power, (kPa)	:	4.8 to 5.1	6.7 to 6.9
	Provision of spark arresting device	:	None	
	Provision against entry of rain water	:	Horizontal, downward opening	
3.1.7	**Lubricating system:**			
	Type	:	Forced feed-cum-splash	
	Oil sump capacity,(l)	:	3.00	2.9
	Total lub oil capacity, (l)	:	3.40	3.2
	Oil change period	:	First change after 50 hours and subsequently after every 100 hours of operation.	
	Cooling device, (if any)	:	None	
	Filters:			
	Type	:	Full flow, paper element.	Full flow, spin-on throw away, paper element.
	Number	:	One	
	Pump:			
	Type	:	Trochoid	Gear
	Method of drive	:	Through F.I. pump drive shaft	
	Pressure release setting, (kPa)	:	392	
	Minimum permissible pressure, (kPa)	:	49	
3.1.8	**Cooling system:**			
	Type	:	Forced circulation of coolant and water	
	Name and brand name of coolant	:	Servo cool guard (apa)	
	Coolant water ratio	:	3 : 7	

			Base Model	Variant Model
	Details of Pump	:	Centrifugal, semi open impeller of 69.3 mm dia having six vanes, and driven through crankshaft pulley by a 'V'-belt common to alternator.	
	Details of fan	:	Suction type, having six plastic blades of 291 mm diameter and mounted on water pump shaft.	
	Means of temperature control	:	None	None
	Bare radiator capacity, (l)	:	2.60	2.25
	Total coolant capacity, (l)	:	5.30	5.65
	Expansion tank, (l)	:	0.58	0.65
	Radiator cap pressure, (kPa)	:	88	88
3.1.9	**Starting System:**			
	Type	:	12 V DC, Electrical	
	Aid for cold starting	:	Heater plug provide	
	Any other device provided for easy starting	:	Excess fuel button on FI pump is provided	
3.1.10	**Electrical System:**			
3.1.10.1	**Battery:**			
	Make	:	Amco,	Excide,
	Model		N50Z MF	FEF3-MF50Z
	Number	:	One	One
	Type	:	Lead Acid	Lead Acid
	Serial no.		Not available	A4F8A053390 4F85
	Capacity and rating	:	12V, 60 Ah at 20 hour discharge rating	12V, 50 Ah at 20 hour discharge rating
	Location	:	Fitted in front of radiator under the bonnet	
3.1.10.2	**Starter:**			
	Make	:	Rugal	Rugal (apa)
	Model	:	Not available	Not available
	Type	:	Pre-engaging solenoid operated	
	Power rating	:	12V, 1.6 kW	12V, 1.6 kW
	Serial number	:	Not available	Not available
3.1.10.3	**Generator:**			
	Make	:	PMP (apa)	PMP
	Model	:	7068	Not available
	Type	:	Alternator	Alternator
	Serial number	:	Not available	Not available
	Output rating	:	12V, 35 A	12V, 40 A (apa)
	Power rating	:	Not available	480 watt
	Method of drive	:	Through crank shaft pulley by a V-belt in common to water pump.	
3.1.10.4	**Voltage regulator**	:	In-built in alternator	In-built in alternator
3.1.10.5	**Main switch**	:	Key turn type, having three position viz: i) OFF ii) 'Circuit' ON iii) START	
3.1.10.6	**Light switch**	:	Rotary type having four positions viz. i) OFF ii) Parking lights + Dash board lights 'ON' iii) Head lights (short beam) + (ii) iv) Head lights (long beam) + (ii)	
3.1.10.7	**Horn:**			
	Make	:	Addon	
	Type	:	12 V, 2B, Electromagnetically vibrated diaphragm,	
	Location	:	In front of radiator, under the bonnet	

3.1.10.8 Fuse box: : **Base Model** | **Variant Model**
Capacity and Number : Contains 4 number of fuses 10 Amp capacity each

3.1.10.9 Flasher Unit:

Make	:	PMP
Capacity:		
Turn Signal	:	12V, 21Wx2 + 2Wx1
Hazard Signal	:	12V, 21Wx4 + 2Wx2
Flasher /Min	:	85

3.1.10.10 Details of lights For Base Model:

Description	No. & capacity of bulb	Height of the centre of beam above ground level, (mm)	Size, (mm)	Distance between centre of the beam and outside edge of tractor at standard rear track setting, (mm)
1	**2**	**3**	**4**	**5**
Front Lights:				
- Head lights	2,12V,35/35W	765	140 x 80	348
- Parking lights	2, 12V, 5W	970	60 x 90	180
-Turn-cum-hazard Indicator light	2, 12V,21W	970	60 x 90	90
-Reflector (white)	Not Provided			
Rear lights:				
- Stop/ Tail light	2, 12V, 5W	960	60 x 90	180
- Turn Indicator cum-hazard light	2,12V, 21W	960	60 x 40	90
- Reflectors (Red)	2	860	60 x 40	144
- Plough light (on RHS mudguard)	Not provided			
-Registration plate light (RHS)	2,12V, 5W	860	85 x 15	80

3.1.10.11 Details of lights For Variant Model (apa):

Description	No. & capacity of bulb	Height of the centre of beam above ground level, (mm)	Size, (mm)	Distance between centre of the beam and outside edge of tractor at standard rear track setting, (mm)
Front Lights:				
- Head lights	2,12V,35/35W	760	140 x 90	412
- Parking lights	2, 12V, 5W	975	110 x 35	215
-Turn-cum-hazard Indicator light	2, 12V,21W	1005	110 x 40	215
-Reflector (white)	Not Provided			
Rear lights:				
- Stop/tail light	2, 12V,5W	975	105 x 35	212
- Turn Indicator	2,12V, 21W	935	105 x 35	212
- Hazard worming light	2,12V,21W	1005	110 x 40	212
- Reflectors (Red)	2	860	60 x 40	160
- Plough light(on RHS mudguard)	Plough light is not provided			
-Registration plate light (RHS)	1, 12V, 5W	900	80 x 15	155

3.1.11 Instrument panel details:	**Base Model**	**Variant Model**
i) Engine speed (0 – 30 x 100 rpm) cum cumulative run hour meter	Provided	Provided
ii) Water temperature gauge (with colour zone)	Provided	Provided
iii) Low Lubricating oil pressure indicator light	Provided	Provided
iv) Fuel level gauge (with colour zones).	Provided	Provided

		Base Model	Variant Model
v)	Battery charging indicator light	Provided	Provided
vi)	Hazard/side indicator tell tally	Provided	Provided
vii)	Head light long beam indicator light	Provided	Provided
viii)	Main switch key turn type	Provided	Provided
ix)	Horn cum light switch rotary type	Provided	Provided
x)	Side indicator cum hazard light indicator switch	Provided	Provided
xi)	Hand accelerator lever	Provided	Provided
xii)	Steering control wheel	Provided	Provided
xiii)	Engine stop knob	Provided	Provided
xiv)	Heat plug indicator	Provided	Provided

3.1.12 Transmission System:

		Base Model	Variant Model
3.1.12.1	**Clutch:**		
	Make :	Ceekay	
	Type :	Dry friction plate	
	No. of friction plate(s) :	One	
	Size, OD/ID (mm): :	180	180 /126Ø (apa)
	Method of operation: :	By a pedal on LHS of operator's seat	

3.1.12.2 Gear box:

Make : VST (apa)

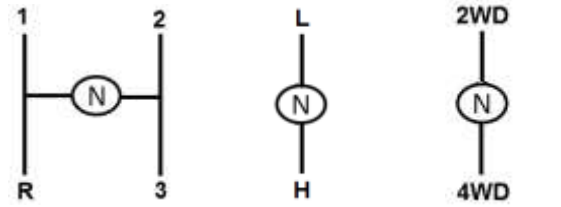
Type : Mechanical, combination of constant and sliding mesh gear

No. of speeds:

- Forward : 6
- Reverse : 2

Location of gear shifting levers : Main gear shifting lever in front of operator's seat, Range section and Drive engaged lever in RHS of operator's seat.

Gear shifting pattern in base and variant :



Main gear shifting lever | **Range section lever** | **Drive engaged lever**

Oil capacity (l) : 11.90 | 11.70

(Common with differential, rear axle & final drive, and hydraulic system)

Oil changing period : First check and replace after 50 hours of operation and subsequently check every 100 hours of operation and replace every 200 hours of operation of tractor.

3.1.12.3 Rear Differential Unit:

Type : Crown wheel & pinion with differential unit accommodated inside the differential housing.

Reduction through crown wheel & bevel pinion : 5.833:1(35/6T) (apa) | 5.833:1(35/6T)

Oil capacity (l) : 11.90 | 11.70

(Common with gearbox, rear axle & final drive, and hydraulic system).

Oil changing period : First check and replace after 50 hours of operation and subsequently check every 100 hours of operation and replace every 200 hours of operation of tractor.

Differential lock :		**Base Model**	**Variant Model**
Type	:	Dog clutch	
Location	:	On RHS of operator's seat	
Method of operation	:	By pressing a pedal provided at RHS of operator's seat	

3.1.12.4 Rear axle & final drive:

Make	:	VST (apa)	
Model	:	Not specified	
Type	:	Bull gear and pinion accommodated inside the differential housing	
Reduction through final drive	:	6.545:1 (72/11T) (apa)	6.545:1 (72/11T)
Oil capacity of final drive, (l)	:	11.90 (Common with gearbox, differential, hydraulic system).	11.70
Oil changing period	:	First check and replace after 50 hours of operation and subsequently check every 100 hours of operation and replace every 200 hours of operation of tractor.	

3.1.12.5 Front differential:

Make	:	VST (apa)	
Type	:	Crown wheel & pinion with differential unit accommodated inside the front axle.	
Location	:	At center	
Oil capacity	:	2.50 (Common with front axle & final drive)	
Oil changing period	:	First change after 50 hours and subsequently after every 200 hours of operation.	
Speed reduction through crown wheel & pinion	:	5.833 : 1 (35/6T) (apa)	5.833 : 1 (35/6T)
Differential lock	:	Not provided	

3.1.12.6 Front axle and final drive:

Type	:	Crown wheel & pinion	
Speed reduction	:	1:1 (14/14T)(apa) 1.933:1 (29/15T)(apa)	1:1(14/14T) 1.933:1 (29/15T)
Oil capacity	:	2.30 (Common with front differential)	
Oil changing period	:	First change after 50 hours and subsequently after every 200 hours of operation.	

3.1.13 Power lift (Hydraulic System):

- Make		VST (apa)	MITA Hydraulics
- Type	:	Open centre, Live, Manual Depth Control	Open centre, Live, ADDC
- No. and type of cylinder	:	One , single acting	
- Type of linkage lock for transport	:	Not available	Hydraulic, response control valve in it's fully closed position acts as transport lock.

3.1.13.1 Hydraulic pump:

		Base Model	Variant Model
- Make	:	Dowty(apa)	Dowty
- Type	:	Gear	
- Location and drive	:	On LHS of engine driven through timing gears.	
No. & Type of filter	:	One strainer at suction inside the transmission housing	
Hydraulic oil capacity, (l)	:	11.90 (Common with gearbox, rear axle, and hydraulic system).	11.70
Oil change period	:	First check and replace after 50 hours of operation and subsequently check every 100 hours of operation and replace every 200 hours of operation of tractor.	
Provision for external tapping	:	Provided	Provided
Details of control levers:	**i)**	Position control lever	Position control lever
	ii)	Response control knob at distributor	Draft control lever
	iii)	---	Response control knob at distributor
Method of draft sensing	:	Not provided	Through top link

3.1.13.2 Three point linkage:

S.No.	Observations		As per IS: 4468 (Part-2) – 1993 (Cat.1N), (mm)	As measured, (mm)		Remarks (Variant)
				Base model	Variant model	
1	2		3	4	5	6
I.	**Upper hitch points:**					
	a)	Dia of hitch pin hole	19.30 to 19.51	19.95	19.35	Conforms
	b)	Width of ball	44.0 (max.)	34.44	43.8	Conforms
II.	**Lower hitch points:**					
	a)	Dia of hitch pin hole	22.40 to 22.73	23.15	22.63	Conforms
	b)	Width of ball	34.80 to 35.00	27.4	34.81	Conforms
III.	Lateral distance from lower hitch point to centre line of tractor		218	311	260	**Does not conform**
IV.	Lateral movement of lower hitch points		50 (min)	125	160	Conforms
V.	Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)		300 to 375	455	385	**Does not conform**
VI.	Transport height		600 (min)	665	610	Conforms
VII.	Movement (power) range (Without force)		420 (min)	385	305	**Does not conform**
VIII.	Leveling adjustment		75 (min)	160	145	Conforms
IX.	Lower hitch point tyre clearance		100 (min)	210	170	Conforms
X.	Lower hitch point height		200 (max)	200	200	Conforms

3.1.13.3 Drawbar:

3.1.13.3.1	Linkage Drawbar [Refer Fig. 1]:			
Notation	**As per IS: 12953-1990& IS4468 (Pt 2)-1993 (mm)**	**As measured, (mm)**		**Remarks**
		Base model	**Variant model**	
A	400 ± 1.5	595	485	**Does not conform**
B	75 (min)	74.2	74.7	**Does not conform**
C	30 (min)	28.72	30.3	Conforms
D∅	21.79 to 22.00	20.17	4.80	Conforms
E	39.0 (min)	64.0	50.1	Conforms
F∅	12.0 (min)	11.3	12.0	Conforms
G	15.0 (min)	14.2	15.4	Conforms
H∅	25 ± 1	22.14	25.0	Conforms
J	80 ± 1.5	110	80.3	Conforms
No. of holes	5	05	05	Conforms

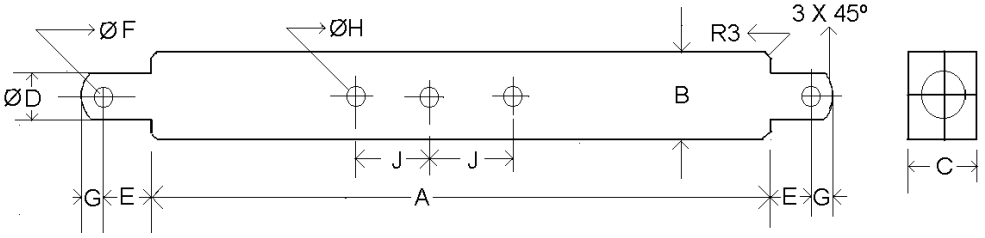


Fig.1: DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

			Base model	**Variant model**
3.1.13.3.2	**Swinging drawbar**	**:**	**Not provided**	

3.1.14 Power take-off shaft:

Type	:	Not Independent, Type-I	
Method of engaging	:	By a hand lever	
No. of shaft(s)	:	One	
PTO speed corresponding to rated engine speed (rpm)	:	623	
Distance behind rear axle, (mm)	:	255	250
Engine to PTO speed ratio	:	4.334 :1	
Whether the PTO shaft is capable of transmitting full power of the engine.	:	None	
Other speeds, if any	:	Not available	1020 (apa)

3.1.14.1	Specifications of Power Take-Off Shaft [Refer Fig. 2 (a)] :			
Specification	As per IS:4931-1995, **Type-I**	**As observed**		**Remarks**
		Base model	**Variant model**	
1	**2**	**3**	**4**	**5**
Nominal speed (rpm)	540 ± 10	540 rpm of PTO shaft corresponds to 2340 rpm of engine.		Conforms
No. of splines	6	6	6	Conforms
Direction of rotation	Clockwise	Clockwise	Clockwise	Conforms
Location	The position of the centre of the end of PTO shaft shall be within 50 mm to right or left of the centre line of the tractor.	In center	Centrally located	Conforms

1	2	3	4	5
Dimensions (mm) [See Fig. 2(a)]:				
D∅	34.79 ± 0.06	34.84	34.81	Conforms
d∅	28.91 ± 0.05	27.74	27.89	**Does not conform**
B∅	29.4 ± 0.1	29.5	29.50	Conforms
A∅ (Optional)	8.3 ± 0.1	8.3	8.3	Conforms
W	8.69 – 0.09 - 0.16	8.6	8.6	Conforms
A	7	7	8	**Does not conform**
b (Optional)	25 ± 0.5	25.5	20.6	**Does not conform**
C	38	38	33.0	Conform
X	30^0	30^o	30^0	-do-
B	76 (min)	85.5	81	-do-
H*	450 to 675	455	460	-do-
*350 mm for tractors having track width less than 1150 mm.				

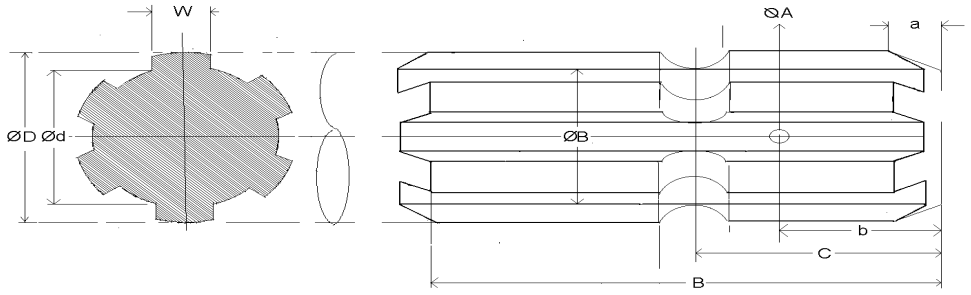


Fig. 2(a): <u>DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT</u>

			Base Model	Variant Model
3.1.14.2	**Master Shield of Power Take-Off Shaft**	:	**Not provided**	
3.1.15	**Towing hitch:**			
3.1.15.1	**Front:**	:	**Not provided**	
3.1.15.2	**Rear:**			
	Type	:	Clevis	
	Location	:	At rear of transmission housing	
	Height above ground level, (mm)	:	245(fixed)	260 (fixed)
	- Type of adjustment	:	None	
	Distance of hitch point,(mm):			
	- From rear axle centre	:	225	235
	- From power take-off shaft end	:	30	15
	Dia of pin hole, (mm)	:	26	27
	Width of clevis, (mm)	:	63	61
3.1.16	**Steering:**			
	Make	:	XLO, India	M/s Rane (apa)
	Type	:	Mechanical worm and roller with single drop arm	Mechanical recalculating ball type with single drop arm
	Location	:	Above clutch housing	
	Method of operation	:	Manual, by steering control wheel	
	Diameter of steering control wheel,(mm)	:	390	395
	Lubricant capacity of system (l)	:	0.26	
	Lubricant change period	:	Not required periodical service, replaced only when overhauling	First change after 50 hours of operation and subsequently change every 500 hours of operation

			Base Model	Variant Model
3.1.17	**Brakes:**			
3.1.17.1	**Service Brake:**			
	Make	:	VST (apa)	
	Type	:	Mechanical, Internal expanding shoe	
	Location	:	On differential half axle shaft	
	No. of shoe	:	Two (on each wheel side)	
	Area of liners. (cm^2)	:	35.4(each wheel side)	91.4(each wheel side)
	Material of liners	:	asbestos (apa)	Non-asbestos (apa)
	Method of operation	:	Individual/ combined RHS foot pedal operated.	
3.1.17.2	**Parking Brake:**			
	Type	:	Pawl & ratchet arrangement for locking service brakes.	
	Location and Method of operation	:	By locking the service brake in position through a hand lever provided on RHS of operator's seat.	
3.1.18	**Wheel Equipment:**			
3.1.18.1	**Steering Wheel(s):**			
	Make	:	Dunlop	Apollo Fx-212
	Number(s)	:	Two	
	Type of tyre	:	Pneumatic, traction	
	Size	:	5.00 - 12	
	Ply rating	:	4	
	Maximum permissible load on each tyre at inflation pressure recommended for road work (216kPa), kgf	:	220	
	Recommended inflation pressure, kPa	:		
	- for field work	:	177	
	- for transport	:	216	
	Track width, (mm)	:	790	
	Method of changing track width	:	None	
	Make & size of rims	:	WIL & 4.0BX12	
3.1.18.2	**Driving wheel:**			
	Make	:	Dunlop	Apollo
	Number	:	Two	
	Type of tyre	:	Pneumatic, traction	
	Size	:	8.0-18	
	Ply rating	:	4	
	Maximum permissible load on each tyre at inflation pressure recommended for road work (216kPa), kgf	:	520	
	Recommended inflation pressure, (kPa):			
	- for field work	:	84	84
	- for transport	:	160	157
	Track width, (mm)		725 (Std.) & 805	890 (Std.) & 710
	Method of changing track width	:	By reversing the wheel	
	Make & size of rim	:	Wheels India ltd.& W 6 X 18	
3.1.18.3	**Wheel base (mm)**	:	1420	
	Method of changing wheel base, if any	:	None	
3.1.19	**Operator's seat:**			
	Make	:	Not specified	
	Type	:	Cushioned	
	Type of suspension	:	Hinged	
	Type of dampening	:	Helical coil spring two numbers	

Range of adjustment, (mm):		Base Model	Variant Model
- Vertical	:	Nil	Nil
- Lateral	:	Nil	Nil
- Longitudinal	:	±35	±30

3.1.20 Provision for safety and comfort of operator:

3.1.20.1 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**:

Base model	Variant model
i) Width of seat	**i)** Width of seat
ii) Vertical distance from SIP to centre of steering control wheel	**ii)** Longitudinal distance from SIP to centre of steering control wheel

3.1.20.2 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), **except the following**:-

Base model	Variant model
i) Starting switch	**i)** Meet the requirements
ii) Fuel shut off knob	
iii) PTO shaft (ON- OFF)	

3.1.20.3 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**:-

Base model	Variant model
i) The fuel shut off knob does not remain in "stop" position	**i)** The fuel shut off knob does not remain in "stop" position

3.1.20.4 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**:

Base model	Variant model
i) Provision of spark arresting device in the exhaust system.	**i)** Provision of spark arresting device in the exhaust system.

3.1.20.5 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**:

Base model	Variant model
i) The working clearance between range selector and main gear shifting levers.	**i)** The working clearance between range selector and main gear shifting levers.
ii) Power Take Off master shield is not provided.	**ii)** Power Take Off master shield is not provided.

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

Lightings meet the requirements of IS: 14683-1999.

3.1.20.7 Rear view mirror:

Rear view mirror is provided.

3.1.21 Mass of tractor, (kg): (Standard ballast condition)		Base model	Variant model
- Front	:	380	390
- Rear	:	475	425
- Total	:	855	815

3.1.21.1 Standard ballast if any:

Particulars		Base Model	Variant Model
		Front	
C.I. Weights, (kg)	:	60	
Location	:	On front axle support	
		Rear	
C.I. Weights, (kg)	:	60	
Location	:	At Rear Wheel	

3.1.22 Over all dimensions (mm): without ballast:

- Length	:	2690	2685
- Width	:	970	1080
- Height	:	1245	1295 (at operator's seat back rest)
Minimum ground clearance, (mm)	:	190 (Below lower link pivot point bracket)	

3.1.23 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in March, 2014): which is meet the requirement of **IS: 10273-1987**

The Labelling plate riveted on LHS of transmission hosing, provides the following information:

Name of Manufacturer	**V.S.T. TILLERS TRACTORS LTD BANGLORE 560084**
Make	VST SHAKTI
Model	MT 180 D
Year of manufacturer	2018
Chassis serial number	T18G 076836
Engine serial number	C18G059232
Maximum P.T.O Power, kW (hp)	10.3
Specific fuel consumption, g/kWh (g/hph)	355

3.1.24

Number of external lubricating points:		Base Model	Variant Model
- Oiling	:	Nil	Nil
- Grease cups	:	Nil	Nil
- Grease nipples	:	08	09

3.1.25 Colour of tractor:

Chassis and engine	:	Black	Black
Sheet metal:			
Bonnet, Mudguards	:	Red	Red & Silver
Rims & discs	:	Light yellow	Silver

3.2 NOMINAL SPEED TEST

Move -ment	Gear No.	No. of engine revolutions for one revolution of driving wheel		Nominal speed at rated engine speed when fitted with **8.00-18** size tyres of **395** mm radius index, (kmph)		Variation in nominal speed (%)
		Base model	**Variant model**	**Base model**	**Variant model**	
Forward	L1	340.64	340.77	1.18	1.18	0.00
	L2	225.1	224.84	1.79	1.79	0.00
	L3	132.44	132.23	3.04	3.04	0.00
	H1	77.5	77.33	5.19	5.19	0.00
	H2	51.18	51.10	7.86	7.86	0.00
	H3	30.08	30.09	13.37	13.36	-0.07
Reverse	RL	267.28	266.91	1.50	1.51	0.66
	RH	60.74	60.67	6.62	6.63	0.15

Number of revolution of front wheel for one revolution of rear wheel	:	Not available	1.493

3.3 PTO PERFORMANCE TEST

Date(s) of test : 20.03.2019
Tractor run at the Institute prior to start of PTO test (h) : 1.56
Type of dynamometer bench : Eddy current, SAJ AG 250

3.3.1 The results of power take-off performance are tabulated in **Table-1**

Table – 1

	Power, (kW)	Speed, (rpm)		Fuel Consumption			Specific energy, (kWh/ l)
		PTO	Engine	(l/h)	(kg/h)	(kg/kWh)	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
a) Maximum power – 2 hours test:							
Base model	10.0	623	2700	4.07	3.40	0.341	2.45
Variant model	11.1	623	2700	4.34	3.63	0.327	2.56
b) Power at rated engine speed (2700 rpm):							
Base model	10.0	623	2700	4.07	3.40	0.341	2.45
Variant model	11.1	623	2700	4.34	3.63	0.327	2.56

Sl. No.	Parameters	Base model		Variant model
		Natural Ambient	High Ambient	Natural Ambient
1	**2**	**3**	**4**	**5**
i)	No load maximum speed, (rpm)	2899	2908	2878
ii)	Equivalent crankshaft torque at maximum power (Nm)	35.3	34.2	39.1
iii)	Maximum equivalent crank shaft torque (Nm)	37.1	35.0	--
iv)	Engine speed at maximum equivalent crankshaft torque, (rpm)	2340	2249	--
v)	Backup torque (%)	5.1	2.34	--
vi)	**Smoke level**, maximum light absorption coefficient, (per meter)	0.58	--	--
v)	**Range of atmospheric condition :**			
	- Temperature, (^{O}C)	27 to 29	41 to 45	25 to 28
	- Pressure, (kPa)	97.5 to 99.2	98.7 to 99.0	98.9 to 99.1
	- Relative humidity, (%)	59 to 65	38 to 48	39.5 to 41.9
vi)	**Maximum Temperature, (^{O}C):**			
	- Engine oil	104	117	93
	- Coolant	93	109	83
	- Fuel	29	43	30
	- Air intake	41	55	30
	- Exhaust gas	525	552	444
vii)	**Pressure at maximum power:**			
	- Intake air, (kPa)	1.6	1.5 to 1.6	4.1
	- Exhaust gas, (kPa)	4.8 to 5.1	4.7 to 4.8	6.7 to 6.9
viii)	**Consumptions:**			
	Lub. Oil (g/kWh)	--	0.23	--
	-Coolant (% of total coolant capacity)	--	0.95	--

4. OTHER APPLICABLE TESTS

4.1 POWER LIFT & HYDRULIC PUMP PERFORMANCE TEST

Date(s) of test : 26.03.2019, 27.03.2019, & 28.03.2019
Tractor run at the Institute prior to start of hydraulic test, (h) : 4.49
Pump speed at rated engine speed (rpm) : 623

4.1.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (l/min) : 12.1
Maximum hydraulic power,(kW) : 3.2
Pump delivery rate at maximum hydraulic power, (l/min) : 11.4
Pressure at maximum hydraulic power, (MPa) : 17.0
Sustained pressure of the open relief valve, (MPa) : 19.4

Tapping point:

a) Relief valve test : External circuit
b) Pump performance test : At pump outlet
Temperature of hydraulic fluid, (°C) : 60 to 64

4.1.2 Lifting capacity test :

Test	Height of lower hitch point above ground in down position, (mm)	Vertical move-ment with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corres-ponding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (degrees)
At hitch points	200	275	11.16	17.5	7.14	--
On the standard frame	200	290	8.72	17.5	10.90	14

4.1.3 Maintenance of lift load:

Force applied at the frame, (kN) : 7.85
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)	00	00	00	00	00	00

4.2. FIELD TEST

4.2.1 The field tests comprising of Disc ploughing and rotavation were conducted for **10.91**, and **10.42** hours respectively.

All the field tests were conducted at the full accelerator settings, when the no load speed of the engine was 2878 to 2880 rpm.

4.2.2 The brief specifications of the implements used during field tests are given in **Annexure-II.**

4.2.3 The summary of field test observation with Disc plough, rotavator is given in **Table - 3.**

Table - 3

SUMMARY OF FIELD PERFORMANCE TEST

S.No.	Parameter/operation	Disc Ploughing	Rotavation
i)	Date of test	02.04.2019 to 03.04.2019	04.04.2019 & 05.04.2019
ii)	Type of soil (refer IS: 7926-1975)	Heavy	Heavy
iii)	Av. soil moisture, (%)	9 to 11	9 to 11
iv)	Bulk density of soil, (g/cc)	1.5	1.4 to 1.5
v)	Cone index, (kgf/sq.cm)	7.7 to 8.2	2.38 to 5.1
vi)	Gear used	L-3	L-3
vii)	Av. speed of operation, (kmph)	2.55 to 2.70	3.17 to 3.18
viii)	**Av. wheel slip, (%)**		
	Front	11.7 to 11.8	-6.9 to -7.8
	Rear	11.1 to 11.6	-6.5 to -6.6
ix)	Av. depth of cut, (cm)	16.0	10
x)	Av. working width, (cm)	53 to 55	100 to 101
xi)	Area covered, (ha/h)	0.12	0.25 to 0.27
xii)	**Fuel consumption:**		
	- (l/h)	2.09 to 2.20	2.46 to 2.59
	- (l/ha)	17.93 to 18.04	9.21 to 10.55
xiii)	Av. draft of implement, (kN)	2.84 to 3.02	--

Remarks: The average lub oil and coolant (water) consumptions during the entire field tests were observed to be **0.9** and **0.9** ml/h respectively.

5. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

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

6. COMPARISON BETWEEN BASE MODEL AND VARIANT MODEL

(Based on Table 3 of Indian Standard 12207: 2014)

Sl. No.	Clause No	Features	Observation on base model (T- 902/1417/2014, January, 2014)	Observation on variant model	Remakes
1	**2**	**3**	**4**	**5**	**6**
1.	**i)**	**Clutch system:**			
		Single/dual/Dry / wet/ Independent clutch/Increase in size of clutch	Single, dry friction plate	Single, dry friction plate	No change
		Make of clutch plate	Ceekay	Ceekay	No change
2.	**ii)**	**Air cleaner:**			
		Air intake system	Oil bath type	Dry type	**Changed**
		Intake pressure at max. power, (kPa)	1.6	4.1	**Changed**
		Location	RHS of engine, outside the bonnet	In-front of radiator, under the bonnet	**Changed**
3.	**iii)**	**Exhaust system:**			
		Type	Downdraft, Horizontal, cylindrical	Downdraft, Horizontal, cylindrical	No change
		Location	LHS of engine	LHS of engine	No change
		Exhaust pressure at max. power, (kPa)	4.8 to 5.1	6.7 to 6.9	**Changed**
4.	**iv)**	**Gear box:**			
		-Type	Mechanical, Constant and sliding mesh gears		No change
		Reduction ratio of transmission:			

Movement	**Gear**	**Base model**	**Variant model**	**Variation (%)**	**Remark**
Forward	L1	340.64 : 1	340.77 : 1	0.04	No change (Within limit)
	L2	225.1 : 1	224.84 : 1	-0.12	-do-
	L3	132.44 : 1	132.23 : 1	-0.16	-do-
	H1	77.5 : 1	77.33 : 1	-0.22	-do-
	H2	51.18 : 1	51.10 : 1	-0.16	-do-
	H3	30.08 : 1	30.09 : 1	0.03	-do-
Reverse	RL	267.28 : 1	266.91 : 1	-0.14	-do-
	RH	60.74 : 1	60.67 : 1	-0.12	-do-

5.	**v)**	**Range of speeds (kmph):**			
		- Forward	1.18 to 13.37	1.18 to 13.36 (Variation -0.22 to 0.04 %)	No Change
		- Reverse	1.50 to 6.62	1.51 to 6.63 (Variation -0.14 to -0.12 %)	No Change
6.	**vi)**	**Fitment of accessories:**			
		Additional hydraulic pump	None	None	No change
		- Air compressor	None	None	-do-
		- Radiator	Provided	Provided	-do-
		- Bare radiator capacity, (l)	2.60	2.20	**Changed**
		- Expansion tank	0.58	0.65	**Changed**
		Total coolant capacity (l)	5.30	5.65	**Changed**
		- Oil cooler	None	None	No Change

1	2	3	4	5	6
7.	**vii)**	**Brake system:**			
		Type & location	Same configuration in base & variant models (refer para 3.1.17)		No Change
		Area of shoe (cm^2)	35.4	91.4	**Changed**
		Steering:			
		Make	XLO, India	M/s Rane	**Changed**
		Type	Mechanical worm and roller with single drop arm	Mechanical re-circulating ball with single drop arm	**Changed**
8.	**viii)**	**Type of three point linkage:**			
		Length of lower link	580	495	**Changed**
9.	**ix)**	**PTO shaft (s):**	Same configuration in base & variant models (refer para 3.1.14.1)		No Change
		Features and location of electrical and instrumentation:	Various configuration in base & variant models (refer para 3.1.10)		**Changed**
10.	**x)**	**Type of drive:**	4WD	4WD	No change
11.	**xi)**	**Hydraulic System:**			
		Pump			
		- Location and	On LHS of engine	On LHS of engine	No change
		drive of pump	Through timing gears.	Through timing gears.	No change
		Speed of pump at rated engine speed	2465	2465	No change
		Distributor assembly:			
		Make	VST (apa)	MITA Hydraulics	**Changed**
		Type	Open centre, Live, Manual Depth Control	Open centre, Live, ADDC	**Changed**
		Type of linkage lock for transport	Not available	Provided	**Changed**
		Sustain pressure of open relief valve,(MPa)	13.5	19.4	**Changed**
		Maximum hydraulic power,(kW)	2.00	3.2	**Changed**
		Pump Delivery at max power, (l/min)	9.62	11.4	**Changed**
		Maximum lifting capacity at hitch point, (kN)	5.6	11.16	**Changed**
		Maximum lifting capacity at standard frame, (kN)	4.0	8.72	**Changed**
		Pressure corresponding to max power, (MPa)	12.5	17	**Changed**
12.	**xii)**	**Position of hydraulic sensing mechanism**			
		Top link , lower link etc.	Not provide	Through top link	**Changed**
13.	**xiii)**	**Location and type of final reduction**			
		Rear differential	Same configuration in base & variant models (refer para 3.1.12.3)		No change
		Rear final reduction	Same configuration in base & variant models (refer para 3.1.12.4)		No change
		Front differential	Same configuration in base & variant models (refer para 3.1.12.5)		No change
		Front Final Reduction	Same configuration in base & variant models (refer para 3.1.12.6)		No change
14	**xiv)**	Type of fuel Injection pump	Same configuration in base & variant models (refer para 3.1.4)		No change

15.	xv)	Other parameters			
	(a)	Position of silencer with respect to SIP, mm	Various configuration in base & variant models (refer para 3.1.6)		No change
	(b)	Longitudinal adjustment of operator seat, mm	±35	±30	**Changed**
	(c)	**Mass of tractor**			
		Front	380	390	**Changed**
		Rear	475	425	**Changed**
		Total	855	815	**Changed**
	(d)	Overall dimensions of tractor, mm	Various configuration in base & variant models (refer para 3.1.22)		No change
	(e)	Number of lubricating points	08	09	**Changed**

7. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

7.1 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: 2014 for acceptance of tractor for the purpose of subsidies/NABARD financing for the applicable features for this tractor model.

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant (D)/ Requirement (R)		As observed		Whether Variant model meets the require-ments (Yes/No.)
1	2	3	4	5		6		7
7.1.1	**PTO Performance :**							
a)	- Max. 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	10.3 (D)	10.3 (D)	10.0	11.1	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	10.3 (D)	10.3 (D)	10.0	11.1	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	355	355	342	327	Yes
7.1.2	**Power lift and hydraulic pump performance:**							
a)	Maximum lifting capacity throughout the range of lift, (kN):							
	1) At hitch points	Non Evaluative	[Tolerance of minus 10%]	5.63 (D)	5.63 (D)	4.14	11.16	Yes

1	2		3	4	5		6		7
	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	3.99 (D) 2.30 (R)	3.99 (D) 2.61 (R)	2.93	8.72	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	50	00	00	Yes
7.1.3	**Safety features :**								
a)	Guards against moving and hot parts		Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2)	---		Meet the requirement		Yes
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)		Evaluative	As per CMVR	---		Meet the requirement		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)	---		**---**		**---**
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 requirement**		**No**
e)	Dimension of three point linkage		Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	---		**Does not meet the requirement**		**No**
f)	Specification of linkage and swinging drawbars		Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	---		**Does not meet the requirement**		**No**
7.1.4	**Labelling of tractors (Provision of labelling plate):**								
	1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--		VST SHAKTI		Yes
	2)	Model	Evaluative		--		MT 180 D		Yes
	3)	Year of mfg.	Evaluative		--		2018		Yes
	4)	Engine serial number	Evaluative		--		T18G 076836		Yes
	5)	Chassis serial number	Evaluative		--		C18G059232		Yes
	6)	Declaration of PTO power, kW	Evaluative		--		10.3		Yes
	7)	S.F.C. (gm/kWh)	Evaluative		--		355		Yes

7.1.5	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	Provided/ Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
(b)	Parts Catalogue	Evaluative	Provided/ Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
(c)	Workshop/Service manual	Evaluative	Provided/ Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes

7.1.6	Characteristic	Optional Requirements as per IS: 12207-2014 (table-2)	Base model	Variant model	
i)	Fitment of ROPS	With a provision for fitment of ROPS. If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	Not provided	NA
ii)	Accessories	Trailer hitch, linkage drawbar may be provided.	Front tow hook not provided	Front tow hook not provided	Yes

7.2	Conformity with following IS:		Base model	Variant model
i)	Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed 2014)]	:	Conformed	**Does not conform**
ii)	Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2014)]	:	**Did not conform**	**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)]	:	**Did not conform**	**Does not conform**
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed October, 2017)]	:	**Did not conform**	**Does not conform**
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2014)]	:	**Did not conform**	**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)]	:	**Did not conform**	Conforms
vii)	Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed 2014)]	:	**Did not conform**	**Does not conform**
viii)	Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2014)]	:	**Did not conform**	**Does not conform**
ix)	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)]	:	**Did not conform**	**Does not conform**
x)	Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2014)]	:	**Conformed**	Conforms

7.3 Salient Observations:

7.3.1 Laboratory tests:

7.3.1.1 PTO performance

i) The maximum PTO power was recorded as **11.1 kW** against the declaration of **10.3 kW** which is within the tolerance limit of IS: 12207-2014.

ii) The specific fuel consumption corresponding to maximum power was recorded as **327 g/kWh** against the declaration of **355 g/kWh** which is not within the tolerance limit and does not meet requirement IS: 12207-2014. This should be looked into for necessary corrective action.

7.3.1.2 Three point linkage

i) The parameters as Lateral distance from lower hitch point to centre line of tractor, does not meet requirement of IS: 4468-1997.

ii) The distance from end of power take-off to centre of lower hitch point (lower links in horizontal position), does not meet requirement of IS: : 4468-1997

iii) The power /movement range observation of three point linkage does not meet requirement of IS: 4468-1997.
This should be looked into for necessary corrective action.

7.3.1.3 Linkages drawbar

Notations of fig. 1 as 'A'&'B' of linkage drawbar does not meet the requirement of IS: IS: 12953-1990.This should be looked into for necessary corrective action.

7.3.1.4 Specifications of Power Take-off Shaft:

The parameters dØ, a, b, c of the dimension of PTO does not conform to IS: 4931-1995.This should be looked into for necessary corrective action.

7.4 Maintenance / Service Problems:

Oil change period of engine lubrication and transmission system including steering and hydraulic system is very less but now a day's different grade of oil are available in the market which has more than 1000 hours of operation oil changing period

7.5 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) Fuel shut off knob remains at stop position

iii) Provision of master shield on PTO shaft

iv) Longitudinal distance from SIP to centre of steering control should be as per the requirement of IS: 12343 – 1998.

v) The working clearance around draft and position control levers may be provided as per IS: 12239 (Part-2) – 1999.

7.6 Adequacy of Literature supplied with machine:

The following literature has been supplied with the tractor

I) Operator's manual of VST SHAKTI MT 180 D,VT 224 1D & AJAI 4WB TRACTOR

Ii) Parts catalogue of VST SHAKTI MT 180 D TRACTOR

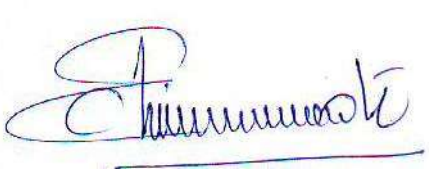
Iii) Service manual of VST SHAKTI MT 180 D, VT 224 1D & AJAI 4WB TRACTOR

The results of the test carried out on variant model " **VST Shakti MT 180 D**" has been compared with those on base model " **Mitsubishi Shakti MT 180D** " vide test report number **T-902/1417/2014**, January, **2014**. And found with the limit, as specified in Indian standard 12207: 2014.

8. 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	4 Months (February, 2019 to May, 2019)	Yes	None

TESTING AUTHORITY:



C.V.CHIMOTE
TEST ENGINEER

Y. K. RAO
SENIOR AGRICULTURAL ENGINEER

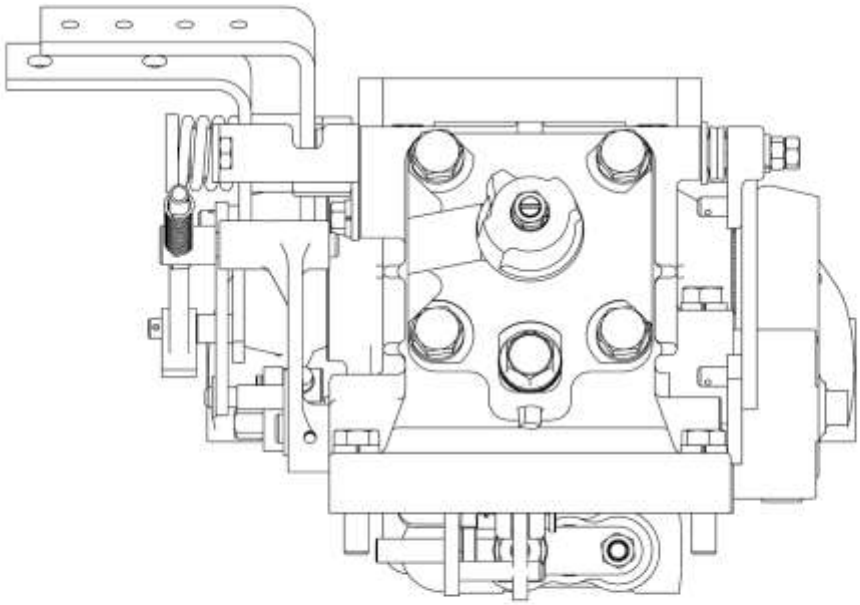
J.J.R. NARWARE
DIRECTOR

Test Report compiled by: **Sh. Shwetabh Singh**, Senior Technical Assistant and
Sh. Dev Vrat Kumar, Senior Technical Assistant.

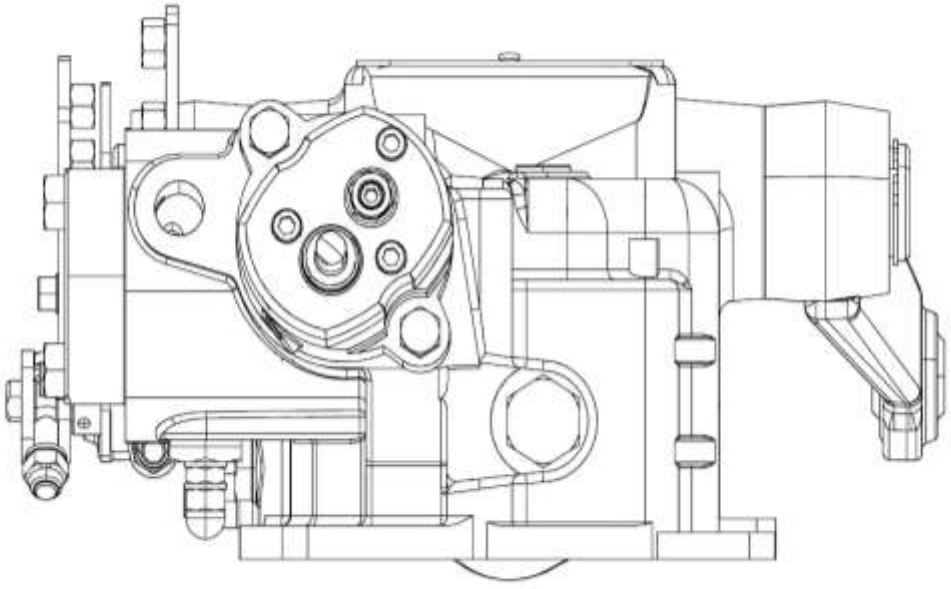
9. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
9.1	7.3.1.1(ii), 7.3.1.2, 7.3.1.3 & 7.3.1.4	This will be looked into and necessary corrective action will taken
9.2	7.4	We already gave corrected plate with mentioned SFC. Kindly allow us to put corrected labeling plate.
9.3	7.5, 7.6 (i), (ii), (iii), (iv) & (v)	Will be studied and this will be implemented immediately.
9.4	7.7 (i), (ii) & (iii)	We are submitting these manuals with these comments.

ZAnnexure-II



VST HYDRAULIC ASSEMBLY IN BASE MODEL



MITA HYDRAULIC ASSEMBLY IN VARIANT MODEL

ANNEXURE- II

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S.No.	Parameters	Disc Plough	Rotavator
1	Make	Capain	VST
2	Type	Mounted	Mounted
3	No. of Discs / Blades	Two	28 spacing of 45 mm
4	Type of Discs / Blades	General purpose	Hatchet
5	Size of Discs / Blades (mm)	225	210 x 40 x 5
6	Spacing of Discs /Flanges, (mm)	200	80
7	Lower hitch point span, (mm)	430	260
8	Mast height, (mm)	450	220
9	**Overall Dimensions (mm):**		
	Length	955	1200
	Width	640	1550
	Height	870	800
10	Gross Mass, (Kg)	85	140

Annexure-III

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running-in	--
2.	- Nominal speed test	1.31
3	-Two hour maximum PTO power under normal ambient condition	2.93
4	- Hydraulic performance test	1.50
5	- Field test (Dry land conditions)	21.33
B.	Miscellaneous test and other run hours, including idle run transportation, trial and preparation for test.	4.60
	TOTAL	31.67