

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Batch Test)

संख्या / No. : T-1011/1535/2016
माह / Month : March, 2016



FORCE MOTORS LTD, BALWAN 450 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

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FORCE MOTORS LTD, BALWAN 450 TRACTOR –
Commercial (Batch Test)

Manufacturer : M/s. Force Motors Ltd.
Mumbai - Pune Road
Akurdi- 411 035, PUNE (M.S.)

Test requested by : M/s. Force Motors Ltd.
Mumbai - Pune Road
Akurdi- 411 035, PUNE (M.S.)

Place of running-in : CFMT&TI, Budni

Duration of said running-in, (h):

- Engine : 30
- Transmission : 33

Method of Selection : The test sample was selected randomly out of ten tractors from the production line by the representative of testing authority.

1. SPECIFICATION

1.1 Tractor:

Make : FORCE MOTORS LTD.

Model : BALWAN 450

Brand name : Force

Variants if any : **None**

Type : Four wheeled, rear-wheel driven, standard agricultural tractor.

Year of manufacture : 2015

Chassis Serial number : T07022713 A 15

Country of Origin : India

1.2 Engine:

Make : Force Motors Ltd.

Model : TD 1950 F(41)

Type : Four stroke, naturally aspirated, water, cooled, direct injection, diesel engine.

Serial number : D10029079

Year of manufacture : 2014

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

- Maximum speed at no load : 2700 to 2800
- Low idle speed : 700 to 750
- Speed at max. torque : 1300 to 1500

Rated speed, (rpm):

- For PTO use : 2500
- For drawbar use : 2500



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15. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

15.1 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:

S. 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
15.1.1 PTO Performance :						
a)	Maximum power under 2 hours 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	27.0 (D)	27.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	27.0 (D)	27.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	265 (D)	272	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	118.0 (D)	113.97	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, minimum (R)	9.2 (D) 10 (R)	11.69	Yes
f)	Maximum operating temperature (°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 (D)	120	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.	110 (D)	92	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.60 (D) 2.73 (R)	0.433	Yes
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)	1.06 per meter	Yes



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1	2	3	4	5	6	7
15.1.2	Drawbar performance :					
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	21 (D) 17.98 (R)	23.03	Yes
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	14 (D) 11.7 (R)	14.28	Yes
c)	Maximum drawbar power without ballast, (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.	22.0(D) 21.81 (R)	23.0	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	130 (D)	105	Yes
15.1.3	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%]	13.7 (D)	13.0	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	9.4 (D) 6.42 (R)	9.26	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 minute, (mm)	Non Evaluative	The observed value should not exceed 50 mm	00 (D)	00	Yes
15.1.4	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 (R)	9.63	Yes
2)	Hot brake	Evaluative	10	10 (R)	9.63	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	152 to 185	Yes



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1	2	3	4	5	6	7
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
15.1.5 Noise measurement :						
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	81	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	96	Yes
15.1.6 Amplitude of mechanical vibrations at :						
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	40	Yes
	Right foot rest			100 (R)	100	Yes
2)	Seat (with driver seated)		-do-	100 (R)	30	Yes
3)	Steering wheel		-do-	100 (R)	40	Yes
15.1.7 Haulage requirements :						
a) Gross mass of the trailers, (tones):						
1)	Two wheel	Non Evaluative	as specified by the manufacturer	4.5 (D)	4.5	yes
2)	Four wheel		---do---	4.5 (D)	4.5	yes
b) Distance travelled / litre of fuel consumption, (km/l):						
1)	Two wheel	Non Evaluative	---do---	6.02 to 6.07 (D)	5.70 to 6.03	No
2)	Four wheel		---do---	6.02 to 6.07 (D)	5.18 to 5.53	No
c) Fuel consumption (ml/km/tonne):						
1)	Two wheel	Non Evaluative	---do---	27.45 to 27.70	36.80 to 38.95	No
2)	Four wheel		---do---	27.45 to 27.70	30.10 to 32.15	No
15.1.8 Wetland cultivation :						
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)	No ingress of mud and / or water was observed	Yes
1)	Clutch assembly	-do-				
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
4)	Engine Oil	-do-				
5)	Transmission Oil	-do-				



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1	2	3	4	5	6	7
15.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	As per CMVR	---	Meet the requirements	Yes
b)	Lighting arrangement	Evaluative	---do---	---	Meet 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)	---	Meet the requirements	Yes
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	---	Meet the requirements	Yes
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS: 4468 (Part-I) (As amended from time to time)	---	Meet the requirements	Yes
f)	Specifications of linkage	Non Evaluative	Should meet the requirements of IS 12953 and IS 12362 (Part 3) (As amended from time to time)	---	Meet the requirements	Yes
	Swinging drawbar			---	Not Provided	---

15.1.10	Labelling of tractors (Provision of labelling plate):					
1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	FORCE MOTORS LTD.	Yes
2)	Model	Evaluative		--	BALWAN 450	Yes
3)	Year of manufacture	Evaluative		--	2015	Yes
4)	Engine number	Evaluative		--	D10029079	Yes
5)	Chassis number	Evaluative		--	T07022713A15	Yes
6)	Declaration of PTO power, (kW)	Evaluative		--	27.0	Yes

15.1.11	Discard limit for:						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	91.128	90.89 to 90.91	Yes	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative	-do-	0.120	0.20 to 0.054	Yes	
(c)	Ring end gap (mm):						
	-	1 st comp. ring.	Evaluative	-do-	1.50	0.35 to 0.45	Yes
	-	2 nd comp. ring.		-do-	1.00	0.95 to 1.00	Yes
-	Oil ring.	-do-		1.50	0.35 to 0.45	Yes	



1	2	3	4	5	6	7
(d)	Ring groove clearance (mm):					
	- 1 st comp. ring.	Evaluative	-do-	0.20	0.127 to 0.129	Yes
	- 2 nd comp. ring.		-do-	0.15	0.072 to 0.078	Yes
	- Oil ring.		-do-	0.10	0.044 to 0.045	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.24	0.037 to 0.071	Yes
	- Crankshaft end float	Evaluative	-do-	0.22	0.15	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.24	0.48 to 0.60	Yes
	- Axial	Evaluative	-do-	0.50	0.15 to 0.20	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.5	0.068 to 0.084	Yes
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	1.5	0.051 to 0.072	Yes
15.1.12	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		Provided	Yes
(c)	Workshop/Service manual	Evaluative	Provided/Not Provided		Provided	Yes
15.1.13	CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Category of Breakdown	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	As observed	Whether meets the requirement (Yes/No.)	
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	



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15.2 Optional requirements as per Clause-4 (Table-2) of IS: 12207-2014				
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether the requirement (Yes/No.)
1	2	3	4	5
1	Air cleaner oil pull over, max. oil pull over (%)	0.25% (max.)	Meets the requirements	Yes
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Meets the requirements	Yes
3.	Fitment of ROPS	With a provision for fitment of ROPS.	NA	---
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not fitted	---
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	Meets the requirements	Yes
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Meets the requirements	Yes
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meets the requirements	Yes
	Specifications of swinging drawbar	Should meet the requirements of IS:12362 Part 3-1994.	Not provided	---
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Meets the requirements	Yes

15.3 Conformity with following IS:

- i) Guide lines 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-I):1997/ISO 730-1:1994 (Reaffirmed in March,2009)] : **Conforms**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March,2007)] : **Conforms**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision)] (Reaffirmed in March,2009)] : **Conforms**



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- 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 in March,2007)] : **Does not conform**
- vii) 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) –1998/ISO 3767-2:1991]] (Reaffirmed in March,2009)] : **Does not conform**
- viii) 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**
- x) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) [(IS: 8133 – 1983/ISO 3789:1982 (Reaffirmed in March,2009))] : **Conforms**
- xi) Agricultural Tractor & Machinery Lighting device for travel on public roads [IS: 14683-1999) (Reaffirmed in March,2009)] : **Conforms**

15.4 Salient Observations:

15.4.1 Laboratory tests:

15.4.1.1 PTO Performance:

- i) The backup torque is observed as 11.69 % against the declared value of 14.6 %. This should be looked into.

15.4.1.2 Drawbar performance:

After completion of 10 h test in drawbar test the air tube of RHS tyre was got burst due to excessive creeping. This should be looked into.

15.4.1.3 Hydraulic performance:

The lifting capacity at standard frame was recoded as 9.26 kN and the moment about rear axle was computed as 13.24 kN-m, which is on higher side as compare to the moment from front axle i.e. 10.66 kN-m. It is therefore recommended that the lifting capacity may be reduced suitably or standard mass at front axle may be provided to avoid front lifting of the tractor.

15.4.1.3 Mechanical Vibration:

The amplitude of mechanical vibration at various locations of the tractor marked with * were found on higher side. This calls for dampening down of vibrations to improve the service life of components.

15.4.1.5 Three point Linkage :

- i) Some of the parameters conform to Category-I and some of them conform to Category-II. Keeping in the view of the spirit of standardization necessary improvement may be incorporated.



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15.5 Maintenance / Service Problems:

After completion of 10 h test in drawbar test the air tube of RHS tyre was got burst due to excessive creeping that's why it was changed so this should be looked into.

15.6 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 working clearance around the position control lever may be provided as per IS: 12239 (Part-2) – 1999.

15.7 Adequacy of Literature supplied with machine:

The following literature was supplied with the tractor:

- a) Operator's manual
- b) Workshop manual
- c) Parts catalogue

The supplied literature was found adequate. However, it may be updated with regard to inclusion of following information:

- i) Fuel saving tips
- ii) Information regarding drawbar performance such as maximum drawbar power and pull may also be included in the technical specification of the tractor.

The literature should be brought out in national as well as other regional languages of India for guidance of users.

16. 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	13 Months (March, 2015 to March, 2016)	No	Not released within frame time due to waiting

TESTING AUTHORITY:

**P. C. Meshram
SENIOR AGRICULTURAL ENGINEER**

**C.R. LOHI
DIRECTOR**

Test Report compiled by: **Mr. Rajneesh Patel**, Senior Technical Assistant.