



FORCE MOTORS LTD, BALWAN 400 DLX 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@gov.in

Website : <http://www.fmttibudni.gov.in>

Telephone : 07564 - 234729

Fax : 07564 - 234743



T-1056/1581/2016

FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
Batch Test -Commercial

The tractor model "Balwan-400 DLX" had undergone commercial (variant) test vide test report number T-846 /1356 released in September, 2012. The base model of this tractor was "Balwan 400" tested vide test report No.T-499/976, August, 2004. Now, the applicant has submitted an application vide letter no. FORCE/ASY/2977, dated 09.08.2016, informed that the "Balwan 400" tractor model is not in production & submitted the last chassis cut off number as T07021648K12 (October, 2012) and also requested to consider the "Balwan 400 DLX" tractor as a base model.

The competent authority has accepted the applicant request under clause 7.5 of IS: 12207-2014 and therefore, the tractor was subjected to different tests as per clause 6.0, Table -1 of IS: 5994-1998.

Manufacturer	: M/s. Force Motors Limited Mumbai - Pune Road Akurdi- 411 035, PUNE (M.S.)
Test requested by	: M/s. Force Motors Limited Mumbai - Pune Road Akurdi- 411 035, PUNE (M.S.)
Place of running-in	: CFMT&TI, Budni,(M.P)
Duration of said running-in, (h):	
- Engine	: 30
- Transmission	: 30
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 400 DLX
Brand name	: None
Variants if any	: None
Type	: Four wheeled, rear-wheel driven, general purpose agricultural tractor.
Year of manufacture	: 2015
Chassis Serial number	: T07023514H15
Country of Origin	: India

1.2 Engine:

Make	: Force Motors Ltd.
Model	: TD 1950 F(36)
Type	: Four stroke, naturally aspirated, water, cooled, direct injection, diesel engine.
Serial number	: D10033176
Year of manufacture	: 2015
Engine speed (Manufacturer's recommended production setting),(rpm) :	
- Maximum speed at no load	: 2400 to 2500
- Low idle speed	: 700 to 750
- Speed at max. torque	: 1300 to 1500
Rated speed, (rpm):	
- For PTO use	: 2200
- For drawbar use	: 2200



T-1056/1581/2016

**FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
Batch Test -Commercial**

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	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	24.0 (D)	24.5	Yes
b)	Power at rated engine speed, (Kw)	Non Evaluative	-do-	24.0 (D)	24.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	247 (D)	251	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	114.3(D)	117.4	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, minimum	10 (R)	10.2	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)	106	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)	98	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.54 l	0.54	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 l	0.60 per meter	Yes
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	17.2 (D) 16.67 l	17.91	Yes



T-1056/1581/2016

**FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
Batch Test -Commercial**

1	2	3	4	5	6	7
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (Kn)	Evaluative	Minimum 65% of static mass of tractor without ballast	12.8(D) 11.79 I	12.88	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.	20.8(D) 19.6 I	20.4	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	130 (D)	100	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%]	14.18 (D)	11.9	No
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	9.88 (D) 5.77 I	7.44	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	0 (D)	0	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 I	8.46	Yes
2)	Hot brake	Evaluative	10	10 I	8.73	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 I	407 to 431	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 I	Yes	Yes
15.1.5 Noise measurement :						
a)	Maximum ambient noise emitted by the tractor Db(A)	Evaluative	As per CMVR	88 I	82	Yes
b)	Maximum noise at operator's ear level Db(A)	Evaluative	As per CMVR	96 I	94	Yes



T-1056/1581/2016	FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR Batch Test -Commercial
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1	2	3	4	5	6	7	
15.1.6	Amplitude of mechanical vibrations at :						
1)	Left foot rest	Non Evaluative	100 microns (max)	100 I	40	Yes	
	Right foot rest			100 I	60	Yes	
	2) Seat (with driver seated)			-do-	100 I	60	Yes
	3) Steering wheel			-do-	100 I	160	No
15.1.7	Haulage requirements :						
a)	Gross mass of the trailers, (tones):						
1)	Two wheel	Non Evaluative	As specified by the manufacturer	4.0 (D)	4.0	Yes	
	Four wheel		----do--	5.5 (D)	5.5	Yes	
b)	Distance travelled / litre of fuel consumption, (km/l):						
1)	Two wheel	Non Evaluative	----do--	5 (D)	5.77 to 6.57	No	
	Four wheel		----do--	6 (D)	5.44 to 5.59	No	
c)	Fuel consumption (ml/km/ abe):						
1)	Two wheel	Non Evaluative	----do--	35 (D)	38 to 43	No	
	Four wheel		----do--	40 (D)	33 to 33	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 I	No ingress of water and/or mud in the identified assembly	Yes	
1)	Clutch assembly	-do-					
2)	Brake housings	-do-					
3)	Front axle hubs	-do-					
4)	Engine Oil	-do-					
5)	Transmission Oil	-do-					
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)	---	Does not meet the requirements	No	
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	---	-do-	No	
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	---	



T-1056/1581/2016

**FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
Batch Test -Commercial**

1	2	3	4	5	6	7
15.1.10	Labelling of tractors (Provision of labeling 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 400 DLX	Yes
	3) Year of manufacture	Evaluative		--	2015	Yes
	4) Engine number	Evaluative		--	D10033176	Yes
	5) Chassis number	Evaluative		--	T07023514H15	Yes
	6) Declaration of PTO power, (Kw)	Evaluative		--	24.0	Yes
15.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	91.128	90.92 to 90.93	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative	-do-	0.120	0.056 to 0.070	Yes
i	Ring end gap (mm):					
	- 1 st comp. ring.	Evaluative	-do-	1.50	0.40 to 0.45	Yes
	- 2 nd comp. ring.		-do-	1.50	1.00 to 1.05	Yes
	- Oil ring.		-do-	1.50	0.40	Yes
(d)	Ring groove clearance (mm):					
	- 1 st comp. ring.	Evaluative	-do-	0.20	0.119 to 0.125	Yes
	- 2 nd comp. ring.		-do-	0.15	0.084 to 0.094	Yes
	- Oil ring.		-do-	0.10	0.038 to 0.052	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.24	0.056 to 0.072	Yes
	- Crankshaft end float	Evaluative	-do-	0.50	0.24	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.24	0.68 to 0.81	Yes
	- Axial	Evaluative	-do-	0.50	0.15	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.5	0.059 to 0.340	Yes
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	1.5	0.068 to 0.101	Yes
15.1.12	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	Provided/Not Provided	As per relevant 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

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 meets the requirement (Yes/No.)
1	2	3	4	5
1	Air cleaner oil pull over, max. oil pull over (%)	0.25% (max.)	0.13 %	Yes
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Does not Meet the requirements	No
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	Not applicable
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Meets the requirements	Yes



15.3 Salient Observations:

15.3.1 Laboratory tests:

15.3.1.1 PTO Performance:

- i) The maximum power was recorded as **22.6 & 24.5 kW** in case of previous & present sample respectively against the declaration of **24.0 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance.
- ii) The specific fuel consumption corresponding to maximum power in case of previous and present sample was measured as **255 & 251 g/kWh** respectively against the declaration of **247 g/kWh**, which meets the requirement of IS: 12207-2014 with regard to tolerance.
- iii) The back-up torque was observed as **10.2 %**.

15.3.1.2 Drawbar Performance:

- i) The maximum drawbar power under unballasted condition was observed as **19.3 kW & 20.4 kW** in case of previous & present sample respectively.
- ii) The maximum drawbar pull under unballasted condition was observed as **12.16 kN & 12.88 kN** in case of previous & present sample respectively.

15.3.1.3 Hydraulic performance:

The lifting capacity at hitch frame was recorded as **11.9 kN** against the declaration of **14.18 kN**. This should be looked into for necessary corrective action.

15.3.1.4 Mechanical Vibration:

The amplitude of mechanical vibration at various locations of the tractor marked with * in Chapter 9 of this report were found on higher side. This calls for dampening down of vibrations to improve the service life of components.

15.3.1.5 Operator's seat:

Length of seat does not meet the requirement of IS: 12343-1988. This should be looked into for necessary corrective action.

15.3.2 Field performance:

15.3.2.1 Wetland cultivation (Puddling operation):

No ingress of water and/or mud was noticed in the identified assemblies whereas; presence of water droplets on LHS of kingpin was noticed during puddling operation of the tractor. Hence, It meets the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). The tractor is suitable for wetland operation (Puddling).

15.4 Maintenance / Service problems:

No noticeable maintenance and service problems was observed during the test.

15.5 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) The working clearance around the position control lever may be provided as per IS: 12239 (Part-2) – 1999.
- iii) "Minimum cautionary notice" as per clause 11.2 of IS: 12239 (part-2)-1999.

15.6 Adequacy of Literature supplied with machine:

The following literature was supplied with the tractor:

- a) Operation and maintenance owner's manual for Balwan 400/400DLX/450/500/500DLX
- b) Spare Parts Catalogue for Balwan 400/400DLX/450/500/500DLX







T-1056/1581/2016

FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
Batch Test -Commercial**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	12 Months (Decmber,2015 to November,2016)	No	Seasonal delay

TESTING AUTHORITY:

		
C.S RAGHUWANSHI AGRICULTURAL ENGINEER	C. V. CHIMOTE TEST ENGINEER	Y.K.RAO SENIOR AGRICULTURAL ENGINEER
 J.J.R.NARWARE DIRECTOR		

Report compiled by: Shri C. S. Raghuwanshi, Agricultural Engineer.

17. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
17.1	1.20.1, 14.1.8 (V), 15.1.9 (C), 15.2, 2)	We will ensure dimensional conformance in series production.
17.2	1.20.2, 14.1.8 (ix)	We have noticed the point and we will establish the compliance.
17.3	1.20.3	We will ensure fuel shut off knob to remain in stop position.
17.4	1.20.4 i), 14.1.8 (vi)	We have noticed the point and we will establish the compliance.

**ANNEXURE - I****BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

Sl. No.	Item	Disc Plough	Rotavator	Puddler
1.	Make	Sonalika	Kubota	Not available
2.	Type	Mounted	Mounted	Mounted
3.	No. of bottoms/blades	2 bottom	36 in 7 flange	12 (6 in each gang)
4.	Type of bottoms/blades	Plain concave	Hatchet	Notched
5.	Size of bottoms/blades & rotar diameter, (mm)	660	240 x 65 x 8 & 398 Ø	460
6.	Spacing of bottoms/flanges, (mm)	555	200	164
7.	Lower hitch point span, (mm)	760	665	680
8.	Mast height, (mm)	600	410	680
9.	Overall dimensions, (mm):			
	- Length	1940	2000	1190
	- Width	1040	870	1810
	- Height	1220	1070	1330
10.	Gross mass, (kg)	260	310	240

ANNEXURE - II**BRIEF SPECIFICATION OF CAGE WHEEL**

Sl. No.	Items	Specification
1.	Type	Half cage wheel
2.	Outer Dia (mm)	1075
3.	Width, (mm)	355
4.	No. and types of lugs	16 made of M.S. angle section welded to angle iron frame
5.	Size of angle section, (mm)	50 x 20 x 6
6.	Length of lug, (mm)	350
7.	Spacing of lug, (mm)	190
8.	Weight of each cage wheel, (kg)	80



T-1056/1581/2016

FORCE MOTORS LTD, BALWAN 400 DLX TRACTOR
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A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	
	-Engine	31.3
	-Transmission	30.3
2.	PTO performance test	10.7
3.	Power lift and hydraulic pump performance test	0.90
4.	Drawbar performance test	18.9
5.	Brake test	1.4
6.	Noise measurement	1.8
7.	Mechanical vibration test	1.00
8.	Theoretical speed test	0.50
9.	Air cleaner oil pull over test	3.50
B.	FIELD TEST:	
1.	Disc Ploughing	10.8
2.	Rotavation	10.6
3.	Puddling (Including five hours water proof test)	15.2
C.	HAULAGE TEST:	6.3
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	11.0
	TOTAL:	154.6