

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Initial)
(Converted from Confidential to Commercial)

संख्या / No. : T-987/1511/2015
माह / Month : November, 2015

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TITAGARH, TITAGARH SUPER DI 50 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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TITAGARH, TITAGARH SUPER DI 50 TRACTOR – Commercial

Manufacturer	: Titagarh Agrico Pvt. Ltd. Factory address:- Mal godown Road, Bharatpur, Rajasthan - 321001 Corporate office:- Plot No.50, Type A, Harton Complex, Electronic City, Sector - 18, Gurgaon, Haryana - 122015
Test requested by (applicant)	: Titagarh Agrico Pvt. Ltd. Factory address:- Mal godown Road, Bharatpur, Rajasthan - 321001 Corporate office:- Plot No.50, Type A, Harton Complex, Electronic City, Sector - 18, Gurgaon, Haryana - 122015
Place of running-in	: At Applicant's works
Duration of said running-in, (h):	
- Engine	: 24 hrs
- Transmission	: 24 hrs
Method of Selection	: The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

1.1 Tractor:

Make	: TITAGARH
Model	: TITAGARH SUPER DI 50
Variants, if any:	None
Type	: 4 Wheeled, Rear two wheel driven, General purpose, Agricultural tractor
Year of manufacture	: 2014
Chassis number	: TNKC50000029
Country of origin	: India

1.2 Engine:

Make	: Kirloskar oil engines Ltd.
Model	: 3 R 1040
Type	: 4 Stroke, 3 Cylinder, Inline, Direct Injection, Water Cooled, Diesel Engine
Serial number	: 3H.2123/1400305

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

- Maximum speed at no load	: 2300 to 2400
- Low idle speed	: 650 to 750
- Speed at maximum torque	: 1200 to 1400
Rated speed, (rpm):	
- For PTO use	: 2200
- For drawbar use	: 2200



16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

16.1 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 require- ments (Yes/No.)
1	2	3	4	5	6	7
16.1.1 PTO Performance :						
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -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	33.60 (D)	32.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	33.60 (D)	32.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	263 (D)	257	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	167.79 (D)	168.35	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	18	19.97	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.	125 (D)	123	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)	96	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.58 (max.) (R)	0.61	Yes
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per meter (R)	0.16 per meter	Yes



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1	2	3	4	5	6	7	
16.1.2 Drawbar performance :							
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip. (kN)	Non Evaluative	Minimum 65% of static mass with ballast	20.50 (D)	20.45	Yes	
				18.17(R)			
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip. (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	16.00 (D)	17.49	Yes	
				13.32 (R)			
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	26.88 (D)	28.8	Yes	
				25.8 (R)			
d)	Max. transmission oil temperature ($^{\circ}$ C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	105	84	Yes	
16.1.3 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%]	11.80 (D)	10.39	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW, and it should be 215 kg/engine kW where the tractor is not provided with a PTO shaft	9.50 (D)	9.57	Yes
				7.6 Minimum, (R)			
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	Observed value should not exceed 50 mm.	70 (D)	152	No	
16.1.4 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)	9.65	Yes
	2)	Hot brake	Evaluative	10	10 (R)	9.65	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (N)	Evaluative	600	600 (R)	354 to 377	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
16.1.5 Noise measurement :						
a)	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	92	Yes
16.1.6 Amplitude of mechanical vibrations at :						
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	100	Yes
	2) Right foot rest			100 (R)	70	Yes
	3) Seat (with driver seated)			100 (R)	40	Yes
	4) Steering wheel			100 (R)	100	Yes
16.1.7 Haulage requirements :						
a) Gross mass of the trailers, (tones):						
	1) Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2) Four wheel	Evaluative	--	6.5 (D)	6.5	Yes
b) Distance travelled / litre of fuel consumption, (km/l):						
	1) Two wheel	Non Evaluative	--	5.5 to 6.00 (D)	6.26 to 6.46	No
	2) Four wheel		--	5.25 to 5.75 (D)	6.08 to 6.17	No
c) Fuel consumption (ml/km/tonne):						
	1) Two wheel	Non Evaluative	--	34.0 to 38.0 (D)	30.95 to 31.91	No
	2) Four wheel		--	38.0 to 42.0 (D)	24.92 to 25.29	No
16.1.8 Safety features :						
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2)	--	Meets the requirement	Yes
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR	--	Meets 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)	--	Meets the requirement	Yes



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1	2	3	4	5	6	7
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)	--	Meets the requirement	Yes
16.1.10 Labelling of tractors (Provision of labelling plate):						
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	TITAGARH	Yes
	2) Model	Evaluative		--	TITAGARH SUPER DI 50	Yes
	3) Year of manufacture	Evaluative		--	2014	Yes
	4) Engine serial number	Evaluative		--	3H.2123/1400305	Yes
	5) Chassis number	Evaluative		--	TNKC50000029	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	33.6	Yes
16.1.11 Discard limit for:						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	105.185	105.00 to 105.01	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non-Evaluative		0.2	0.121 to 0.164	Yes
(c)	Ring end gap (mm):					
	- 1 st comp. ring.	Evaluative	-do-	1.0	0.40 to 0.45	Yes
	- 2 nd comp. ring.		-do-	1.0	0.43 to 0.45	Yes
	- Oil ring.		-do-	1.0	0.45 to 0.48	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	---	Taper rings	--
	- 2 nd comp. ring.		-do-	0.10	0.036 to 0.052	Yes
	- Oil ring.		-do-	0.20	0.033 to 0.043	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.30	0.062 to 0.087	Yes
	- Crankshaft end float	Evaluative		0.80	0.14	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.30	0.075 to 0.096	Yes
	- Axial	Evaluative	-do-	0.60	0.43 to 0.48	Yes



1	2	3	4	5	6	7
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.90	0.164 to 0.279	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.90	0.270 to 0.312	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	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

15.1.13 CATEGORY OF BREAKDOWNS / DEFECTS :

S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	01	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	03	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.	04	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 requirements (Yes/No.)
1.	Air cleaner oil pull over, max. Oil pull over (%)	0.25% (max.)	NA (Dry type)	Not applicable
2.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	Not applicable
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	Not applicable
3.	Specification of swinging drawbar	Should meet the requirements of IS: 12362 Part 3-1994.	Not provided	Not applicable
4.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes

**16.3 Conformity with following IS:**

- i) Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)] : **Conforms**
- ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS: 4931-1995 (Reaffirmed in March, 2009)] : **Does not conform**
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in February, 2012)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in February, 2012)] : **Conforms**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 -1998 (First revision) (Reaffirmed in March, 2009)] : **Conforms**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (Part-1)-1996 (Reaffirmed in February, 2012) / ISO 4254-1:1989] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) IS 12239 (Part-2)-1999 (Reaffirmed in March, 2009)] : **Does not conform**
- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Symbols for Agricultural Tractors and Machinery [IS: 6283 (Part-2) – 2007(Reaffirmed in March, 2009) / ISO 3767-2:1991]] : **Conforms**
- ix) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009) / ISO 3789: 1982] : **Does not conform**
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads [IS: 14683-1999 (Reaffirmed in March, 2009)] : **Conforms**

16.4 Salient Observations:**16.4.1 Laboratory tests:****16.4.1.1 PTO Performance:**

- i) The backup torque is 19.75 %.

16.4.1.2 Drawbar performance test:

During drawbar test the no load rpm was not achieved, thereafter governor linkage was adjusted. This may be looked into for necessary corrective action.

**16.4.1.3 Hydraulic performance test:**

- i) During the hydraulic test the hydraulic pump discharge was not achieved as per applicant declaration. The cleaning of strainer, replacing the hydraulic filter and checking of the hydraulic system was done. This should be look into.
- ii) During hydraulic load maintenance test the vertical height of the point of application of the force was observed as 152 mm. It means internal leakage in the system was observed. It was not rectified by manufacture. This may be looked into for necessary corrective action.

16.4.1.4 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-8 of this test report are on higher side. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

16.4.1.5 Three point linkage:

The Diameter of upper hitch pin hole and lateral distance from lower hitch point to center line of tractor does not meet the requirements of IS: 4468(Part I)-1997. This should be looked into for necessary corrective action.

16.4.2 Field and haulage performance test:**16.4.2.1 Field test:**

- i) During ploughing the no load rpm of engine was not achieved due to bended link of hand throttle lever. Then the bended linkage of hand throttle accelerator was replaced by new one of same specification. Which needs in quality during production level.
- ii) During Rotavation the PTO gear was not engaging. The transmission system was dismantled and it was found that the needle bearing was broken and PTO shaft was damaged. Which consider under consequential failure. Thereafter needle bearing and PTO shaft was changed with new one of same specification. It should be looked into for necessary improvement.

16.4.2.2 In haulage performance test the observed fuel consumption (ml/km/ton) is less than the declared value means it having the better performance.

16.5 Components/Assembly Inspection

The spring rate was observed as 17.77 to 18.75 N/mm which discarded against the declared value of 21.38 N/mm. This needs to be use higher quality spares during production.

16.6 Maintenance / Service Problems:

The maintenance / service / repair problem was observed during the test and reported in chapter No. 15 adjustments, defects, breakdowns and repairs.

16.7 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) Provision of differential lock.
- iii) Provision of PTO shaft master shield.
- iv) The fuel shut off Knob should maintain the stop position against the start of tractor.
- v) The working clearance around control is 40 mm between position and draft control lever.



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16.8 Adequacy of Literature supplied with machine:**16.8.1** The following literature was supplied with the tractor for reference during the test.

- i) Operator's manual for TITAGARH SUPER DI 50, TITAGARH NGT 45 TITAGARH NGT 50 DI (PS), TITAGARH SUPER DI 45 (optional power steering) TITAGARH SUPER DI 39 & TITAGARH NGT 39 DI tractors.
- ii) Spare parts catalogue for TITAGARH SUPER DI 39, TITAGARH SUPER DI 45 TITAGARH SUPER DI 45 PS, TITAGARH SUPER DI 50, TITAGARH SUPER 50 PS, TITAGARH NGT 39 DI, TITAGARH NGT 45 DI, TITAGARH NGT 45 PS, TITAGARH NGT 50 DI & TITAGARH NGT 50 DI PS tractors.
- iii) Workshop manual for TITAGARH SUPER DI 39, TITAGARH SUPER DI 45 TITAGARH SUPER DI 45 PS, TITAGARH SUPER DI 50, TITAGARH SUPER 50 PS, TITAGARH NGT 39 DI, TITAGARH NGT 45 DI, TITAGARH NGT 45 PS, TITAGARH NGT 50 DI & TITAGARH NGT 50 DI PS tractors.

17. 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	08 Months (March 2015, to October , 2015)	Yes	None

TESTING AUTHORITY:

H.L. YADAV
SENIOR AGRICULTURAL ENGINEER

C.R. LOHI
DIRECTOR

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



18. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
18.1	15	We will take care the proper quality of components, assembly process, cleanliness, Sealing in Hydraulic system to achieve reliability of product.
	16.4.1.2	In regular production we will take care for quality checks & error free adjustments.
	16.4.1.3	We will ensure proper sealing in hydraulic system and we will ensure in product testing after roll out in regular production.
	16.4.1.4	We will take necessary action to provide comfort level to the end user and improve the vibration level within limits.
	16.4.1.5	Page no. 13 point no 1.13.2 sl no. I, III, V and VII will be taken care.
	16.4.2.1	We will take necessary action in regular production to ensure component level quality to avoid such failure/pre mature failure in working service life.
18.2	16.5	We will take necessary action in regular production to ensure component level quality to avoid such failure/pre mature failure in working service life.

Annexure-I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No	Item	Disc Plough	Rotavator
1.	Make	M&M	ACE
2.	Type	Mounted	Mounted
3.	No. of Disc/blades	Three	36 in 6 flange
4.	Type of Disc/blades	Plain concave	Hatchet
5.	Size of bottoms/blades, (mm)	610	250 x 40 x 10
6.	Spacing of bottoms/flanges, (mm)	520	250
7.	Lower hitch point span, (mm)	855	720
8.	Mast height, (mm)	440	650
9.	Overall dimensions, (mm):		
	- Length	1890	1700
	- Width	1080	700
	- Height	1070	1750
10.	Gross mass, (kg)	365	480



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Annexure – II**TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	---
2.	PTO performance test	9.31
3.	Power lift and hydraulic pump performance test	1.17
4.	Drawbar performance test	15.17
5.	Turning ability	0.20
6.	Location of centre of gravity	0.40
7.	Operator's field of vision	Nil
8.	Brake test	2.91
9.	Noise measurement	1.16
10.	Mechanical vibration test	1.0
11.	Nominal speed test	0.34
B.	FIELD TEST:	
1.	Disc Ploughing	20.7
2.	Rotavation	16.38
C.	HAULAGE TEST:	5.88
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	12.67
	TOTAL:	87.29