

प्रारंभिक व्यावसायिक परीक्षण रिपोर्ट
INITIAL COMMERCIAL TEST REPORT

संख्या/No. : T-1878/2409/2024
माह/Month : August, 2024

Application Reference No. 28/2023-24/96

(यह परीक्षण रिपोर्ट 31/08/2029 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/08/2029)



Make of Agricultural Tractor : SWARAJ
Model : 744 FE 4X4 N1
Manufactured by : M/s. Mahindra & Mahindra Ltd.,
Farm Equipment Sector - Swaraj Division,
Phase-IV, Industrial Area, S.A.S. Nagar
Mohali, Punjab- 160 055



भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE & FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) 466 445

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

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

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IMPORTANT INFORMATION

The Government of India, Ministry of Agriculture and Farmers Welfare has directed, vide a OM No. 13-17/2021-M&T (I&P) dated 28.07.2022, that since 15th August, 2022, only mandatory tests will be carried out on a tractor unless applicant has expressly requested for optional tests as well, mentioned in the above captioned OM.

In the instant case, there is no request from the applicant to carry out the optional tests hence only Mandatory Tests as given below, have been conducted and reported in this report: -

1. PTO performance
2. Hydraulic performance
3. Drawbar performance
4. Brake performance

Month: August	Test Report No.: T- 1878/2409/2024	Year: 2024
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[C]	Tractor manufacturer's name and address	:	M/s. Mahindra & Mahindra Ltd. Farm Equipment Sector, Swaraj Division, Phase- IV, Industrial Area, S.A.S. Nagar, Mohali, Punjab – 160 055
[C]	Submitted for test by (Applicant)	:	The Manufacturer
[C]	Selected for test by	:	The Ministry vide OM No. 13-17/2021 - M&T (I&P) dated 28.07.2022, has allowed the applicant to submit the test sample directly to the Institute without requiring any random selection for Initial Commercial Testing. Thus, the applicant directly submitted the test sample to the Institute for test.
[D]	Place of running-in	:	The Manufacturer
[D]	Duration of running-in, (h):	:	
	-Engine	:	28
	-Transmission	:	32
[C]	Location of test	:	Government of India, Central Farm Machinery Training and Testing Institute, P.O. - Tractor Nagar, BUDNI – 466445 (M.P.), INDIA

1. SPECIFICATIONS OF TRACTOR

1.1 Identification:

1.1.1 Denomination

[C]	Make of tractor	:	SWARAJ
[C]	Model	:	744 FE 4X4 N1
[C]	Type	:	4WD, Standard Agricultural Tractor
[C]	Month & year of manufacture	:	02/24
[D]	Country of origin	:	India

1.1.2 Numbers:

[D]	1 st Serial No. or prototype	:	Not announced
[C]	Serial No.	:	MBNAW53NNRCB97250

1.2 Engine:

[D]	Manufacturer's address	:	M/s. Swaraj Engines Ltd. Plot No. 2, Industrial Area, Phase-9, Mohali, Punjab-160 062
[C]	Make	:	Swaraj
[C]	Model	:	SK347NR1
[C]	Type	:	Four stroke, liquid cooled, naturally aspirated, direct injection, diesel engine
[C]	Serial No.	:	DG.5001/SGB03673

1.2.1 Cylinders:

[C]	Number/disposition	:	Three / vertical inline
[D]	Bore / Stroke, (mm)	:	110 / 116
[D]	Capacity, cm ³	:	3307.2
[D]	Compression ratio	:	18.5 (±0.5) :1
[D]	Arrangement of valves	:	Overhead
[D]	Cylinder liners	:	Wet, replaceable
[D]	Type of combustion chamber	:	Re-entrant

1.2.2	Supercharging	:	Not available
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6. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

6.1 On the basis of test conducted the performance results have been summarized as evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters applicable for Qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2022 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: 12207-2022	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
MANDATORY TESTS: (As per Ministry's Office Memorandum No. 13-14/2020-M&T (I&P) 82979 dated 28th of August, 2023)						
6.1.1	PTO Performance:					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: $\pm 5\%$ for PTO power and or engine power > 26 kW. $\pm 10\%$ for PTO power and or engine ≤ 26 kW.	31.5 (D)	30.7	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	31.5 (D)	30.7	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	Should not be more than 10% of declared value	257 (D)	256	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	200 (D)	189.7	Yes
e)	Back-up torque, percent	Evaluative	Should be minimum 12 percent	12 (D) 12 (R) Minimum	29.7	Yes
f)	Maximum operating temperature, ($^{\circ}$ C):					
	1) Engine oil	Evaluative	The declared value should not exceed the <i>Max</i> value specified by the oil company and the observed value under natural ambient/high ambient condition should not exceed the declaration	130 (D)	94	Yes
	2) Coolant	Evaluative	Observed value should not exceed the declared value or boiling point of coolant at radiator cap pressure whichever is lower. The boiling point of the coolant at radiator pressure shall be provided by the applicant.	115 (D)	92	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under natural ambient conditions.	2.56 (R) Maximum	0.35	Yes
h)	Smoke level, m^{-1}	Evaluative	Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR). Max Smoke level shall be reported out of 6 readings tested as per IS 12062 and observed value should be well within the required limits.	3.25 per meter (R) Maximum	0.29	Yes

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1	2	3	4	5	6	7
6.1.2 Drawbar performance:						
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non-Evaluative	Minimum 70% of static mass of tractor with ballast.	Ballasting not recommended by the manufacturer	Not applicable	Not applicable
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	In case of tractors having total static mass \geq 1500 kg, Min 70% of static mass of tractor without ballast or with standard ballast, as the case may be. In case of light weight tractors having \leq 1500 kg total static mass of tractor, Min. 65% of static mass of tractor without ballast or with standard ballast, as the case may be.	16.25 (D) 16.61 (R) Minimum	21.80	Yes
c)	Maximum drawbar power without ballast/ with standard 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 \leq 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.	25.2 (D) 24.6 (R)	24.7	Yes
d)	Maximum transmission oil temperature, ($^{\circ}$ C)	Evaluative	The declared value should not exceed the recommendation by the oil manufacturer. The observed value should not exceed the declared value throughout the drawbar test.	110 (D)	77	Yes
6.1.3 Power lift and hydraulic pump performance:						
a)	Maximum lifting capacity throughout the range of lift, (kN):					
1)	At hitch points	Evaluative	Should not be less than 90% of declared value.	19.61 (D) 17.65 (R) Minimum	19.78	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.	15.69 (D) 7.21 (R) Minimum	15.96	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 Minutes, (mm)	Non-Evaluative	The observed value should not exceed 50 mm	50 (D) Maximum	145	No

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1	2	3	4	5	6	7
6.1.4	Brake performance at 25 kmph:					
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal without ballast, (m):					
	1) Cold brake	Evaluative	10	10 (R)	7.50	Yes
	2) Hot brake	Evaluative	10	10 (R)	7.89	Yes
b)	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	Yes	Yes
6.1.5	OPTIONAL TESTS: As the applicant has not applied for any optional tests, therefore no optional tests was conducted.					
6.1.6	Safety features:					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulic pipes [As per IS 12239 (Part2)]	Meets the requirement	Yes	
b)	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement	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 requirement	No	
d)	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	Meets the requirement	Yes	
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS: 17231-2019 (As amended from time to time)	Does not meet the requirement	No	
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement	Yes	
g)	Specifications of Swinging drawbar (wherever fitted)	Non Evaluative	Should meet the requirement of IS: 12362 (Part-3) (As amended from time to time)	Not provided	Not applicable	
h)	Audible warning signal on tractor	Evaluative	If tractor travel speed in reverse gear exceeds 20 kmph, an audible warning signal on tractor shall get activated. A sticker to the effect that "operating the tractor beyond 20 kmph speed in reverse gear is not safe" should be prominently displayed.	Not fitted (11.44 kmph in HR gear)	Not applicable	
6.1.7	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO in kW, Specific fuel consumption (SFC) corresponding to maximum power in g/kWh and year of manufacture in numerical form Digit 01-12 in box No. 1 for MM will represent the month and next two digit in the box No. 2 for YY will represent the year of manufacturing	SWARAJ	Yes	
	2) Model	Evaluative		744 FE 4X4 N1	Yes	
	3) Month & Year of manufacture	Evaluative		02/24	Yes	
	4) Engine number	Evaluative		DG.5001 / SGB03673	Yes	
	5) Chassis number	Evaluative		MBNAW53NNRCB9 7250	Yes	
	6) Maximum PTO power, (kW)	Evaluative		MM YY 31.5	Yes	
	7) Specific fuel consumption, g/kWh	Evaluative		257	Yes	

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1	2	3	4	5	6	7
6.1.8	Literature (Submission to test agency):					
(a)	Operator manual	Evaluative	The printed literature in booklet form should be provided as per IS 8132 and should submit along with the test sample.	Provided	Yes *	
(b)	Parts Catalogue	Evaluative		Provided	Yes	
(c)	Workshop/ Service manual	Evaluative		Provided	Yes	

* The applicant has submitted revised operator's manual of "Swaraj 744 FE 4x4 N1" tractor model vide letter No. SD/Budni/ICT/23-24/744FE4X4N1/A-21/L-04 dated 05.08.2024.

6.1.9	Fitment of Roll Over Protective Structures (ROPS):				
	For tractor having more than 1150 mm rear track width	Evaluative if fitted	ROPS should meet the requirement of IS:11821 or OECD code or equivalent International Standard	Not fitted	Not applicable
6.1.10	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor	Provided	Yes
6.1.11	Accessories (optional)	Non Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR	Not fitted	Not applicable

6.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2022):					
S. No.	Category of break-downs	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2022	As observed	Whether meets the requirements (Yes/No)
1.	Critical	Evaluative	There is no 'critical breakdown' during the course of testing	None	Yes
2.	Major	Evaluative	There are not more than 2 major break downs and neither of them should be of repetitive nature.	None	Yes
3.	Minor	Evaluative	There are not more than 5 minor defects during the test and neither of them should of repetitive nature.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of break downs should exceed five that is, (2 major + 3 minor) or (1 major + 4 minor) or 5 minor breakdowns.	None	Yes

6.3 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 Year 2019)] : Conforms
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed Year 2019)] : Conforms
- iii) Agricultural wheeled tractors – Rear mounted three-point linkage: Categories 1N,1,2N, 2, 3N, 3,4N & 4 [IS: 17231:2019] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed Year 2022)] : Conforms
- v) Agricultural tractors- Operator's seat technical requirement [IS12343 - 2021] : **Does not conform**

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- vi) Guide for safety & comfort of operator of agricultural tractors:Part 1 General requirements (first revision):[IS 12239 (Part 1) - 2018] : **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 Year 2019)] : **Does not conform**
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery [IS: 8133 - 2021] : **Does not conform**
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays Part2 Symbols for agricultural tractors and machinery [IS: 6283(Part-1) - 2006 (Reaffirmed Year 2019) and IS: 6283 (Part-2) – 2007 (Reaffirmed Year 2019)] : Conforms
- x) Agricultural Tractors and Machinery-Lighting device for travel on public roads (IS:14683-1999) (Reaffirmed Year 2019)] : Conforms

6.4 Salient Observations:

6.4.1 Hydraulic performance test

- i) During maximum lifting capacity throughout the range of lift test at standard frame, the angle of rotation of mast was observed as **2.3 degrees** over the full range of lift against the minimum requirement of 10.0 degrees, which does not meet the requirement of IS: 12224-1987.
- ii) During maintenance of lift load test, cumulative drop in the height of lower links was measured as **145 mm** against the maximum permissible limit of 50 mm which does not meet the Non-Evaluative requirement of IS: 12207-2022.

These should be looked into for necessary correction.

6.4.2 Three-point linkage:

The following parameters does not meet the requirements of IS:17231- 2019 and needs to be looked into for necessary corrective actions:

- i) Diameter of upper and lower hitch point holes have been measured as 25.90 and 28.95 mm against the requirement of 19.30 to 19.50 mm and 22.40 to 22.65 mm respectively.
- ii) Width of upper and lower hitch point holes have been measured as 50.9 and 44.8 mm against the requirement of 43.5 to 44.0 mm and 34.5 to 35.0 mm respectively
- iii) Lateral distant from lower hitch point to centre line of tractor have been measured as 364 mm against the requirement of 359 mm.

6.4.3 PTO master shield:

PTO master shield has not been provided on tractor as per IS: 12239-1999 (Part-2). This should be looked into for necessary corrective action.

6.4.4 Operator's seat:

The following parameters does not meet the requirement of IS: 12343-2021:

- i) Vertical distance from SIP to centre of accelerator pedal was measured 500 mm against the required range of 230 to 460 mm.
- ii) Vertical distance from SIP to foot rest was measured 570 mm against the required range of 450 to 520 mm.
- iii) Longitudinal distance from SIP to centre of steering control wheel was measured 545 mm against the required range of 425 to 525 mm.
- iv) Vertical distance from SIP to foot rest was measured 610 mm against the required range of 450 to 520 mm.

Therefore, all of the above should be looked into for necessary corrective action.

6.4.5 Operator's work place:

The following parameters does not meet the requirement of IS: 12239 (Part-I) 2018.

- (i) Provision of vertical retainers at inner sides of clutch pedal.
- (ii) Provision of spark arresting device in the exhaust system.
- (iii) Width of step was measured 170 mm against the required the minimum requirement of 200 mm.

Therefore, all of the above should be looked into for necessary corrective action.

6.5 Maintenance / Service Problems:

No noticeable maintenance or service problem was observed during the test.

6.6 Recommendation with regard to safety on tractor:

The following requirements, inter alia, may be considered for incorporation on the tractor:

- (i) Identification of control levers by colour has not been provided as per the requirement as laid down in Table - 5 of IS: 8133-2021.
- (ii) The distance between engine stop control and start control was measured 325 mm against the maximum requirement of 150 mm.
- (iii) The hand accelerator lever, when moved away from the operator (i.e., forward) decreases the engine speed, which does not meet the requirement as laid down in Table - 1 of IS: 8133-2021.
- (iv) PTO master shield has not been provided as per IS: 12239 (Part-2).
- (v) Fuel shutoff knob does not remain in stop position as per the requirement of IS: 8133-2021.
- (vi) The working clearance between position control lever and draft control lever has been measured as 40 mm against the minimum requirement of 70 mm.

All of the above should be looked into for necessary corrective action.




6.7 Adequacy of Literature supplied with machine:

The following literatures were supplied with the test tractor for reference during the test: -

- a) Operator's Manual for "Swaraj 744 FE 4x4 N1" tractor models.
- b) Parts Catalogue for "Swaraj 744 FE 4x4 N1" tractor models.
- c) Service Manual for "Swaraj 744 FE 4x4 N1" tractor models.

TEST CARRIED OUT AT C.F.M.T. & T.I., BUDNI (M.P.), INDIA

TESTING AUTHORITY

B. N. DIXIT AGRICULTURAL ENGINEER	
R. P. PANDEY S.I.E. (TESTING HEAD)	
Dr. P. P. RAO DIRECTOR	

Draft Test Report compiled by **B.N. Dixit**, Agricultural Engineer & **Poonam Khurasia**, Senior Technical Assistant

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7. APPLICANT'S COMMENTS

Para No.	Our reference	Comments
7.1	6.4.1, 6.4.2, 6.4.3, 6.4.4 & 6.4.5	These requirements are being revisited for necessary corrective action at our end.
7.2	6.6	Study & trials are under progress for necessary corrective action.

ANNEXURE- I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	The applicant has declared that it has already been conducted on their work place.
2.	PTO performance test	13.6
3.	Power lift and hydraulic pump performance test	4.7
4.	Drawbar performance test	6.1
5.	Brake performance test	1.0
6.	Nominal speed test	1.5
B.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test.	1.0
TOTAL:		27.9