

Application Reference No. 28/2022-23/155

(यह परीक्षण रिपोर्ट 31/10/2028 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/10/2028)



Make of Agricultural Tractor : SWARAJ  
Model : 744 FE N  
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  
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CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE  
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T-1786/2317/2023	SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST
	THIS TEST REPORT IS VALID UPTO: 31/10/2028

## 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 15<sup>th</sup> 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: October	Test Report No.: T-1786/2317/2023	Year: 2023
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CENTRAL FARM MACHINERY TRAINING AND TESTING INSTITUTE – BUDNI	Page 2 of 31
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T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
	<b>THIS TEST REPORT IS VALID UPTO: 31/10/2028</b>

[C]	Manufacturer	:	<b>M/s. Mahindra &amp; Mahindra Ltd. (Farm Equipment Sector),</b> Swaraj Division, Phase- IV, Industrial Area, S.A.S. Nagar, Mohali, Punjab – 160 055
[D]	Location of other manufacturing plants (apa)	:	<b>M/s. Mahindra &amp; Mahindra Ltd. (Farm Equipment Sector),</b> 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]	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 (trade name)	:	744 FE N
[C]	Type	:	Rear Wheel Drive, Standard Agricultural Tractor.
[C]	Month & year of manufacture	:	08/23
[D]	Country of origin	:	India

#### 1.1.2 Numbers:

[D]	1 <sup>st</sup> Serial No. or prototype	:	MBNAV53NANCM41914
[C]	Serial No.	:	MBNAV53NAPCK75605

### 1.2 Engine:

[D]	Manufacturer's address	:	<b>M/s. Swaraj Engine Ltd.</b> Plot No. 2, Industrial Area, Phase-9, Mohali, Punjab-160062
[C]	Make	:	Swaraj
[C]	Model	:	RB30TR1
[C]	Type	:	Four stroke, naturally aspirated, liquid cooled, direct injection, diesel engine.
[C]	Serial No.	:	DE.4001/SFK17063

#### 1.2.1 Cylinders:

[C]	Number/disposition	:	Three/ Vertical
[D]	Bore / Stroke, (mm)	:	110 / 116
[D]	Capacity, cm <sup>3</sup>	:	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	:	Open, re-entrant cavity on piston crown

1.2.2	<b>Supercharging</b>	:	<b>Not Available</b>
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T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
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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
<b>MANDATORY TESTS: (As per Ministry's Office Memorandum No. 13-17/2021-M&amp;T (I&amp;P) dated 28<sup>th</sup> of July, 2022).</b>						
<b>6.1.1</b>	<b>PTO Performance:</b>					
<b>a)</b>	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 $\leq 26$ kW.	30.1 (D)	31.4	Yes
<b>b)</b>	Power at rated engine speed, (kW)	Non Evaluative	-do-	30.1 (D)	31.4	Yes
<b>c)</b>	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	Should not be more than 10% of declared value	257 (D)	238	Yes
<b>d)</b>	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	165(D)	187.8	<b>No</b>
<b>e)</b>	Back-up torque, percent	Evaluative	Should be minimum 12 percent	12 (D) 12 (R)	25.3	Yes
<b>f)</b>	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)	96	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)	89	Yes
<b>g)</b>	Engine oil consumption, (g/kWh)	Evaluative	The value would be based on the test conducted under natural ambient condition	2.38 Maximum (R)	0.17	Yes
<b>h)</b>	Smoke level, $m^{-1}$	Evaluative	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 Maximum (R)	0.10	Yes

T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
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1	2	3	4	5	6	7	
<b>6.1.2</b>	<b>Drawbar performance:</b>						
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non-Evaluative	Minimum 70% of static mass of tractor with ballast.	*	*	*	
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 70% of static mass of tractor without ballast or with standard ballast, as the case may be.	14.14 (D)	17.08	Yes	
				14.18 (R)			
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 ≤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.	24.08 (D)	27.3	Yes	
				25.1 (R)			
d)	Maximum transmission oil temperature, (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	77	Yes	
*Applicant vide letter no. SD/Budni/ICT/22-23/744 FE N/A-01/L-02 dated 26.09.2023 has requested not to conduct the ballasted drawbar performance & ten-hour drawbar test which was allowed as per the additional guidelines for testing of tractors as per new regime of testing of tractors vide a OM No. 13-32/2023-M&T(I&P) (FTS-125476) dated 16.05.2023. Accordingly, only unballasted drawbar performance test was conducted.							
<b>6.1.3</b>	<b>Power lift and hydraulic pump performance:</b>						
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	19.43	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) 7.39(R) Minimum	14.68	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	870	No	

T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
	<b>THIS TEST REPORT IS VALID UPTO: 31/10/2028</b>

1	2	3	4	5	6	7	
<b>6.1.4</b>	<b>Brake performance at 25 kmph:</b>						
<b>a)</b>	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)	7.38	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.69	Yes
<b>b)</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
<b>6.1.5</b>	<b>OPTIONAL TESTS: As the applicant has not applied for any optional tests, therefore no optional tests was conducted.</b>						
<b>6.1.6</b>	<b>Safety features:</b>						
<b>a)</b>	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulic pipes [As per IS 12239 (Part2)]	Meets the requirement	Yes		
<b>b)</b>	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement	Yes		
<b>c)</b>	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)	<b>Does not meet the requirement</b>	<b>No</b>		
<b>d)</b>	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	Meets the requirement	Yes		
<b>e)</b>	Dimensions of three-point linkage	Non Evaluative	Should meet the requirements of IS: 17231-2019 (As amended from time to time)	<b>Does not meet the requirement</b>	<b>No</b>		
<b>f)</b>	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement	Yes		
<b>g)</b>	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		
<b>h)</b>	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 provided	Not applicable		
<b>6.1.7</b>	<b>Labelling of tractors (Provision of labelling plate):</b>						
	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 MM YY 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 N	Yes	
	3)	Month & Year of manufacture	Evaluative		08 & 23	Yes	
	4)	Engine number	Evaluative		DE.4001/SFK 17063	Yes	
	5)	Chassis number	Evaluative		MBNAV53NA PCK75605	Yes	
	6)	Maximum PTO power, (kW)	Evaluative		30.1	Yes	
	7)	Specific fuel consumption, g/kWh	Evaluative		257	Yes	

T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
	<b>THIS TEST REPORT IS VALID UPTO: 31/10/2028</b>

1	2	3	4	5	6	7
<b>6.1.8</b>	<b>Literature (Submission to test agency):</b>					
(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	
<b>6.1.9</b>	<b>Fitment of Roll Over Protective Structures (ROPS):</b>					
	For tractor having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS:1182 or OECD code or equivalent International Standard	Not fitted	Not applicable	
<b>6.1.10</b>	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor	Provided	Yes	
<b>6.1.11</b>	Accessories (optional)	Non Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR	Not fitted	Not applicable	

<b>6.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2022):</b>					
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 be of repetitive nature.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of break downs should exceed five that is, (2major + 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**
- 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**

T-1786/2317/2023	<b>SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST</b>
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- 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 PTO performance:**

- i) During two hour max power test under natural ambient condition, the fuel over flow pipe got cracked. It is specified as leak off pipe extension (NS) (Part No. P210024) as per part catalogue. Upon this, the applicant vide letter no. SD/Budni/ICT/22-23/744FEN/A-01/L-05 dated 12.10.2023 has requested to allow to cut the leak off pipe extension (NS) & refit the same pipe, which was allowed. This defect of leak off pipe extension (NS) has not been categorized in breakdown/defects as per IS: 12207 – 2022. This should be looked into for necessary corrective action.
- ii) The maximum equivalent crankshaft torque was recorded as **187.8 Nm** against the declaration of **165 Nm**, which does not meet the non-evaluative requirement of IS: 12207-2022. This should be looked into for necessary corrective action.

**6.4.2 Power lift & hydraulic pump performance test:**

During Maintenance of lift load test, the hydraulic lift was unable to hold the lift load and it dropped & touched the ground level within 5 minutes from its initial height of 870mm. The drop in hydraulic lift was 870 mm within five minutes against the maximum allowable drop of 50 mm for a duration of 30 minutes and does not meet the non-evaluative requirements of as per IS: 12207-2022. This should be looked into for necessary corrective action.

**6.4.3 Three-point linkage:**

The dimensions viz. diameter of hitch pin hole & width of ball of upper hitch points, diameter of hitch pin hole & width of ball of lower hitch points and lateral distance from lower hitch point to centre line of tractor does not meet the requirements of IS: 17321-2019. This should be looked into for corrective action.

**6.4.4 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.

**6.4.5 Operator's seat:**

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

- i) Longitudinal distance of SIP from clutch pedal has been measured as 365 mm against the requirement of 410 to 720 mm.
- ii) Vertical distance of SIP from clutch pedal, brake pedal & accelerator pedal has been measured as 510 mm, 580 mm & 490 mm respectively against the requirement of 230 to 460 mm.
- iii) Vertical distance of SIP from centre of steering control wheel has been measured as 490 mm against the requirement of 265 to 385 mm.
- iv) Longitudinal distance of SIP from centre of steering control wheel has been measured as 225 mm against the requirement of 425 to 525 mm.

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

**6.4.6 Operator's work place:**

**Operator's work place meets the requirements of IS: 12239 (Part-I) 2018, except the following:**

- (i) Provision of vertical retainers at inner sides of clutch pedal.
- (ii) Width of foot step has been measured as 165 against the minimum requirement of 200 mm.
- (iii) Provision of spark arresting device in the exhaust system.

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 hand control by colour coding of engine speed control, transmission control, parking brake (orange) & differential locks (yellow) has not been provided as per the requirement as laid down in Table – 5 of IS: 8133-2021.
- ii) 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.
- iii) PTO master shield has not been provided as per IS: 12239 (Part-2).
- iv) Fuel shutoff knob should be located within 150 mm of the engine start control as per the requirement of IS: 8133-2021.

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

**6.7 Adequacy of Literature supplied with machine:****6.7.1** Literature was supplied with the tractor for reference during the test.


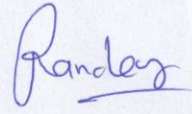
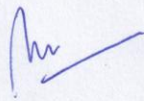
- a) Operator's manual (For Swaraj 744 FE N tractors model)
- b) Part's catalogue (For Swaraj 744 FE N tractors model)
- c) Service manual (For Swaraj 744 FE N tractors model)

**6.7.2** The operator manual may be brought out for the guidance of users and service personnel as per IS:8132-1999 incorporating, inter alia, the following:

- i) Safe hitch height while using trailer
- ii) Engine to PTO speed ratio
- iii) Details of multispeed PTO Particularly Reverse PTO

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

## TESTING AUTHORITY

<b>C.K. TIJARE</b> AGRICULTURAL ENGINEER	
<b>R.P. PANDEY</b> SENIOR INSTRUMENTATION ENGINEER	
<b>A. K. UPADHYAY</b> DIRECTOR (I/C)	

Draft Test Report compiled by **Poonam Khurasia**, Senior Technical Assistant

T-1786/2317/2023	SWARAJ, 744 FE N TRACTOR– INITIAL COMMERCIAL TEST
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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	These requirements are being revisited for necessary corrective action at our end.
7.2	6.4.5, 6.4.6 & 6.6	Study & trials are under progress for necessary corrective action.
7.3	6.7.2	Necessary changes suggested by the institute will be incorporated in the manual for end user.

### ANNEXURE-I

#### TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	Applicant has declared it to be conducted on their work place.
2.	PTO performance test	14.1
3.	Power lift and hydraulic pump performance test	3.7
4.	Drawbar performance test	3.9
5.	Brake performance test	1.3
6.	Nominal speed test	0.7
<b>B.</b>	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test.	0.7
<b>TOTAL:</b>		<b>24.4</b>