

व्यावसायिक परीक्षण रिपोर्ट (प्रथम बैच)
COMMERCIAL TEST REPORT (1st Batch)

संख्या/No. : T- 1594/2125/2021

माह/Month : October, 2021

[ONLINE TESTING]

(यह परीक्षण रिपोर्ट 31/10/2026 तक वैध है/THIS TEST REPORT IS VALID UPTO 31/10/2026)



SWARAJ 742 FE 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)

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“Swaraj 742 FE” tractor had undergone initial commercial test at this institute and report number **T-1122/1648/2017** was released in December, 2017, it's administrative extension report no. **T-1352/1879/2020**, released in March, 2020 and it's Technical Extension report no. **T-1593/2124/2021** was released in October, 2021. Now the applicant has submitted an application no. 28/2020-21/45 dated 11.01.2021 for 1st batch testing of “Swaraj 742 FE” tractor. The performance results of the test sample submitted for the batch testing were evaluated as per IS: 12207-2019 and test report is released as under.

Manufacturer : **M/s. Mahindra & Mahindra Ltd.
Farm Equipment Sector,
Swaraj Division
Phase- IV, Industrial Area, S.A.S.
Nagar, Mohali, Punjab – 160 055**

Test requested by (applicant) : The manufacturer
Selected for test by : Applicant
Place of running-in : At manufacturer's works

Duration of said running-in (h):

- Engine : 28
- Transmission : 32
Method of Selection : Due to Covid-19 Pandemic, it was not possible to conduct the random selection. Nor was possible for applicant to facilitate the random selection. As a last resort, applicant requested to allow the direct submission of Test Sample, which was allowed.

1. SPECIFICATIONS

1.1 Tractor:

Make : Swaraj
Model : 742 FE
Variants if any : None
Brand name : Swaraj
Type : Four wheeled, rear wheel driven, general purpose agricultural tractor.
Month & Year of manufacture : 01/21
Chassis number : MBNBJ49AGMCA27194
Country of Origin : India

1.2 Engine:

Make : M/s. Swaraj Engines Limited
Model : SK342NR
Type : Four stroke, naturally aspirated, liquid cooled, direct injection, diesel engine.
Serial number : 42.4001/SDA02356
Engine speed (Manufacturer's recommended production setting, (rpm)) :
- Maximum speed at no load,(rpm) : 2100 to 2200
- Low idle speed, (rpm) : 580 to 700
- Speed at maximum torque, (rpm) : 1000 to 1400
Rated speed, (rpm):
- For PTO use : 2000
- For drawbar use : 2000

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15. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

15.1 On the basis of tests conducted the performance results have been summarized as evaluative (mandatory) and non-evaluative (not-mandatory) parameter applicable for qualifying Minimum Performance Criteria as per Clause-4 (Table-1) of **IS: 12207-2019** 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: 12207-2019	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 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: $\pm 5\%$ for PTO power or engine power >26 kW, $\pm 10\%$ for PTO power or Engine power ≤ 26 kW.	28.18 (D)	27.0	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	28.18 (D)	27.0	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% Max.	265 (D)	279	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	167 (D)	161.0	Yes
e)	Back-up torque, percent	Evaluative	12 percent, min.	12 percent, min (R)	24.8	Yes
f)	Maximum operating temperature, ($^{\circ}$C)					
	1) Engine oil	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)	100	Yes
	2) Coolant	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.	115 (D)	91	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.79 (Max.) 1% of SFC (D)	0.89	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)	3.25 per meter Max.	0.08	Yes

1	2	3	4	5	6	7	
15.1.2	Drawbar performance :						
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 70% of static mass with ballast	19.43 (D) 19.19 (R) (Min.)	22.79	Yes	
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 70% of static mass of tractor without ballast	13.87 (D) 13.63 (R) (Min.)	15.68	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.	23.0 (D) 21.6 (R) (Min.)	24.3	Yes	
d)	Max. transmission oil temperature (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	81.0	Yes	
15.1.3	Power lift and hydraulic pump performance :						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Evaluative	±10%	16.5 (D)	17.84	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	10.78 (D) 6.35 (R) (Min.)	12.66	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	Observed value should not exceed 50 mm.	50 (D) 50 (Max.)	107	No	
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	7.07	Yes
	2)	Hot brake	Evaluative	10	10	7.14	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (Max.)	201 to 259	Yes	

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, N	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 (Max.)	86	Yes
b)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	96 (Max.)	95	Yes
15.1.6	Amplitude of mechanical vibrations at :					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (Max.)	116	No
	2) Right foot rest	Evaluative			124	No
	3) Seat (with driver seated)	Non Evaluative	100 microns (max)	100 (Max.)	176	No
	4) Steering Wheel	Non Evaluative	100 microns (max)	100 (Max.)	48	Yes
15.1.7	Air Cleaner					
	Max. oil pull over, (%)	Evaluative	0.25% (max.)	0.25% (max.)	0.11	Yes
15.1.8	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	As specified by the manufacturer	5.0 (D)	5.0	Yes
	2) Four wheel			6.0 (D)	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	As specified by the manufacturer	4.0 to 5.0 (D)	4.67 to 4.78	Yes
	2) Four wheel			5.0 to 6.0 (D)	4.65 to 4.70	No
c)	Fuel consumption (cc/km/tonne):					
	1) Two wheel	Non Evaluative	As specified by the manufacturer	30 to 40 (D)	41.8 to 42.8	No
	2) Four wheel			30 to 40 (D)	35.5 to 35.9	Yes
15.1.9	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	No ingress of water and/or mud was observed during ICT vide report no. T-1122/1648 /2017	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	
15.1.10	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	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)	--	Does not meet the requirement	No	
d)	Technical requirements for PTO shaft	Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Meets the requirement	Yes	
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 drawbar	Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	--	Meets the requirement	Yes	
g)	Specifications of Swinging drawbar (wherever fitted)	Evaluative	Should meet the requirements of IS 12362 (Part 3) (As amended from time to time)	--	Not fitted	Not applicable	
h)	1)	Maximum travelling speed at rated engine speed in reverse gears, (kmph)	Evaluative	Should not exceed 20 Kmph	11.39	11.39 (meets the requirement)	Yes
	2)	Audible warning signal on tractor	Evaluative	As soon as the travelling speed in reverse gear reaches to 20 kmph, an audible warning signal on tractor shall be activated. Not applicable	--	Not applicable	Not applicable

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1	2	3	4	5	6	7
15.1.11	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 and year of manufacture in numerical 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		742 FE	Yes	
	3) Month & Year of manufacture	Evaluative		01/21	Yes	
	4) Engine number	Evaluative		42.4001/SDA02356	Yes	
	5) Chassis number	Evaluative		MBNBJ49AG MCA27194	Yes	
	6) Declaration of maximum PTO power, (kW)	Evaluative		28.18	Yes	
15.1.12	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	110.225 (D)	109.945 to 109.978	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.50	0.091 to 0.099	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring	Evaluative	-do-	1.75	0.45 to 0.50	Yes
	- 2 nd comp. ring		-do-	1.75	0.50 to 0.55	Yes
	- Oil ring		-do-	1.75	0.35 to 0.45	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring	Evaluative	---Tapered---			--
	- 2 nd comp. ring		-do-	0.25	0.065 to 0.072	Yes
	- Oil ring		-do-	0.25	0.059 to 0.061	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.30	0.081 to 0.107	Yes
	- Crankshaft end float	Evaluative		0.50	0.22	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.30	0.093 to 0.132	Yes
	- Axial	Evaluative	-do-	0.60	0.35	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.063 to 0.104	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.80	0.150 to 0.208	Yes
15.1.13	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes
(b)	Parts Catalogue	Evaluative	Provided/Not Provided	Provided	Provided	Yes
(c)	Workshop/ Service manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes

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1	2	3	4	5	6	7
15.1.14	Fitment of Roll Over Protective Structure (ROPS): for tractors having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS:11821 or OECD code or equivalent International Standard	Not Provided	Not fitted	Not applicable
15.1.15	Standard accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor	Provided	Provided	Yes
15.1.16	Accessories (Optional)	Non Evaluative	Ballast weights if fitted should meet the requirement of CMVR.	Provided	Provided	Yes

15.2 CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	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 1 major breakdowns and neither of them is of repetitive nature	None	Yes
3.	Minor	Evaluative	There are not more than 3 minor defects during the test and the frequency of each is not be more than two	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed four that is, (1 major + 3 minor) or 4 minor breakdowns	None	Yes

15.2 Salient Observations:

15.2.1 Laboratory tests:

15.2.1.1 PTO Performance Test:

- i) The maximum PTO power was recorded as 27.0 kW against the declaration of 28.2 kW, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as 279 g/kWh against the declaration of 265 g/kWh, which is within the tolerance limit of IS: 12207-2019

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- iii) The backup torque is 24.8%, which meets the evaluative requirement of IS: 12207-2019.

15.2.1.2 Drawbar performance test:

During ten hours drawbar test creeping of LHS and RHS rear tyre over the rims was recorded as 25 and 50 mm. This should be looked into for necessary corrective action.

15.2.1.3 Hydraulic performance test:

The Cumulative drop in height of lift during lift load maintenance test was recorded as 107 mm against the maximum limit of 50 mm. This should be looked into for necessary corrective action.

15.2.1.4 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter – 9 of this test report is on higher side. This calls for dampening down of vibrations especially on left & right foot rest and operator’s seat to improve the operational comfort and service life of components.

15.2.1.5 Three point linkage:

The dimension of lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS: 4468 -1997 (Part-1). This should be looked into for necessary corrective action.

15.3 Maintenance / Service Problems:

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

15.4 Recommendation with regard to safety on tractor:

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

- i) There should be provision for spark arresting device in exhaust system.
- ii) There should be provision of differential lock.
- iii) The fuel shut-off knob should remain in stop position.
- iv) The working clearance between the position and draft control lever should be provided as per IS: 12239 (Part-2) – 1999.

15.5 Adequacy of Literature supplied with machine:

15.5.1 The following literature was supplied with test sample for reference during the test.

- a) Operator’s manual for Swaraj 742 FE tractor model
- b) service manual for Swaraj 742 FE tractor model
- c) Spare part’s catalogue for Swaraj 742 FE tractor model

The above manual/catalogue submitted by the applicant was found not found adequate and following discrepancies found:

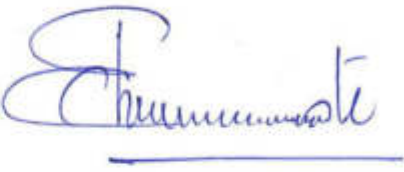


- i) As per supplied service manual, the steering oil capacity is mentioned common with transmission, however it have separate reservoir fitted with tractor. The same discrepancy was found in supplied spare parts catalogue.
- ii) In supplied service manual, the type of clutch is mentioned as “Single” in place of “Duel clutch”.
- iii) In supplied service manual, type of gear box is mentioned as “Constant mesh” while the tractor model is fitted with “sliding mesh gears”.
- iv) In supplied service manual, maximum PTO power was mentioned as 31.33 kW while the same is mentioned as 28.18 kW in technical specifications.
- v) In supplied operator’s manual, engine air cleaner is specified as “Dry type” in place of “oil bath type”.

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- vi) In supplied operator's manual, make of fuel filters is mentioned as "Mico" however it is fitted with "Bosch" make .
- vii) In supplied spare parts catalogue, type of brakes is mentioned as "Dry" in place of "oil immersed brakes.

- 15.2.2**
- i) However, these literatures should also be brought out in other vernacular languages of India for guidance of users.
 - ii) Printing quality of the images in the literature may be improved for the easy approach and understanding of the users and keeping paper quality in view printing may be done on both side of paper.

TESTING AUTHORITY:

C.V. CHIMOTE TEST ENGINEER	
Y.K.RAO SENIOR AGRICULTURAL ENGINEER	
P.K. PANDEY DIRECTOR	

Draft test report is compiled by: NITESH KUMAR VERMA, AGRICULTURAL ENGINEER

16. Applicant's comments

Para no.	Our reference	Comments received from the applicant
16.1	15.2.1.2, 15.2.1.3, 15.2.1.4 & 15.2.1.5	These requirements are being revisited for necessary corrective action at our end.
16.2	1.20.1, 1.20.3, 1.20.4, 1.20.5 & 15.4	Study & trials are under progress for necessary corrective action.
16.3	15.5.1 & 15.5.2	Necessary suggested changes will be incorporated in literatures.

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ANNEXURE - I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	10.64
3.	Power lift and hydraulic pump performance test	3.34
4.	Drawbar performance test	18.55
5.	Brake test	1.75
6.	Noise measurement	1.50
7.	Mechanical vibration test	1.00
8.	Nominal speed test	0.35
9.	Air cleaner oil pull over test	3.50
B.	HAULAGE TEST:	5.27
C.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	4.96
TOTAL:		50.86