



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)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

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17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

- 17.1 Evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters 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 requiremen ts (Yes/No.)
1	2	3	4	5	6	7
17.1.1	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	28.18 (D)	28.2	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	28.18 (D)	28.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	265 (D)	261	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	167 (D)	166.1	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10 percent, min (R)	23.4	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)	99	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.	115 (11B)	94	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.61 (R) 1% of SFC (D)	0.37	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)	0.24	Yes



1	2	3	4	5	6	7
17.1.2	Drawbar performance :					
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	18.0 (D) 18.07 (R) Minimum	21.80	Yes
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	13.0 (D) 12.88 (R) Minimum	15.30	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) 22.6 (R) Minimum	24.6	Yes
d)	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	75.0	Yes
17.1.3.	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%]	14.71 (D)	17.45	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	10.78 (D) 6.64 (R) (Minimum)	11.51	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 (R)	31	Yes
17.1.4	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)	8.81	Yes
	2) Hot brake	Evaluative	10	10 (R)	9.39	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	473 to 518	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)	444	Yes
17.1.5	Noise measurement:					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	81	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	93	Yes
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	210	No
2)	Right foot rest	Evaluative			240	No
3)	Seat (with driver seated)	Non Evaluative	100 microns (max)	100 (R)	130	No
4)	Steering Wheel	Non Evaluative	100 microns (max)	100 (R)	180	No
17.1.7	Air Cleaner					
	Max. oil pull over, (%)	Non Evaluative	0.25% (max.)	0.25% (max.)	0.10	Yes
17.1.8	Haulage requirements :					
a)	Gross mass of the trailers, (tonnes):					
1)	Two wheel	Non Evaluative	--	5.0 (D)	6.0	Yes
2)	Four wheel	Evaluative	--	6.0 (D)	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	4.0 to 5.0 (D)	5.0	Yes
2)	Four wheel	Evaluative	--	5.0 to 6.0 (D)	4.9 to 5.0	No
c)	Fuel consumption (cc/km/tonne):					
1)	Two wheel	Non Evaluative	--	30 to 40 (D)	39.7 to 40.4	No
2)	Four wheel	Evaluative	--	30 to 40 (D)	33.2 to 33.8	Yes
17.1.9	Wetland cultivation :					
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11092. 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	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine oil	-do-				
	5) Transmission oil	-do-				



1	2	3	4	5	6	7	
17.1.10 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)	--	Meets the requirement	Yes	
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)	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	
17.1.11 Labelling of tractors (Provision of labelling plate):							
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	SWARAJ	Yes		
	2) Model	Evaluative		742 FE	Yes		
	3) Year of manufacture	Evaluative		WY (i.e. 2016)	Yes		
	4) Engine number	Evaluative		42.1001/SWG13096	Yes		
	5) Chassis number	Evaluative		WYCH92606100001	Yes		
	6) Declaration of PTO power, (kW)	Evaluative		28.18	Yes		
17.1.12 Discard limit for:							
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	110.225 (D)	109.972 to 109.985	Yes	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.60	0.100 to 0.115	Yes	
(c)	Ring end gap (mm):						
	- Top comp. ring	Evaluative	-do-	1.75	0.55	Yes	
	- 2 nd comp. ring		-do-	1.75	0.35 to 0.40	Yes	
	- Oil ring		-do-	1.75	0.30 to 0.40	Yes	
(d)	Ring groove clearance (mm):						
	- Top comp. ring	Evaluative	---Tapered---				--
	- 2 nd comp. ring		-do-	0.25	0.079 to 0.086	Yes	
	- Oil ring		-do-	0.25	0.078 to 0.079	Yes	



1	2	3	4	5	6	7
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.30	0.088 to 0.112	Yes
	- Crankshaft end float	Evaluative		0.50	0.20	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.30	0.100 to 0.129	Yes
	- Axial	Evaluative	-do-	0.60	0.30	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.098 to 0.105	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.80	0.121 to 0.139	Yes
17.1.13	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

17.1.14 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	None	Yes
3.	Minor	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

17.2 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.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	No
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	Not applicable
2.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes



17.3 Conformity with following IS:

- i) Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed 2009)] : **Conforms**
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2009)] : **Conforms**
- iii) Agricultural wheeled tractors - Three-point linkage: Part 2 Category 1N (Narrow Hitch) (Third Revision) [IS 4468 (Part-2):1993/ ISO 730-2:1979 (Reaffirmed 2009)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed 2007)] : **Conforms**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2009)] : **Conforms**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision): [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed 2009)] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed 2009)] : **Does not conform**
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2009)] : **Does not conform**
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays Part 2 Symbols for agricultural tractors and machinery [IS:6283 (Part-1)- 2006 and IS: 6283 (Part-2)-2007 (Reaffirmed 2009)] : **Conforms**
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2009)] : **Conforms**

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO Performance Test:

- i) The maximum PTO power was recorded as **28.2 kW** against the declaration of **28.2 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **261 g/kWh** against the declaration of **265 g/kWh**, which is within the tolerance limit of IS: 12207-2014.
- iii) The maximum equivalent crankshaft torque was recorded as **166.1 N-m** against the declaration of **167.0 N-m**, which is within the permissible limit as specified in IS: 12207-2014.
- iv) The backup torque is **23.4 %**.
- v) There is PTO power drop of **4.96 %** from natural to high ambient condition. This should be looked into for necessary corrective action.

17.4.1.2 Drawbar performance test:

- i) During ten hours drawbar test creeping of RHS rear tyre over the rims was recorded as **15 mm**. This should be looked into for necessary corrective action.

**17.4.1.3 Hydraulic performance test:**

- i) The moment about rear axle at lower hitch and with standard frame was calculated as **15.27 & 17.09 kN-m** respectively, whereas, the moment about front axle was calculated as **14.92 kN-m** under unballasted condition. The moment about rear axle is on higher side as compared to the moment about front axle under unballasted condition. It is, therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or ballast recommendation may be reviewed to avoid the front lifting of the tractor.

17.4.1.4 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, operator's seat and steering control wheel to improve the operational comfort and service life of components.

17.4.1.5 PTO shaft:

The dimension "AØ" of PTO shaft does not meet the requirement of the IS: 4931 - 1995. This should be looked into for necessary corrective action.

17.4.1.6 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.

17.5 Maintenance / Service Problems:

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

17.6 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.

17.7 Adequacy of Literature supplied with machine:

17.7.1 Literature was supplied with the tractor for reference during the test.

- a) Operator's manual of tractor model **SWARAJ 742 FE**.
- b) Parts catalogue of tractor model **SWARAJ 742 FE**.
- c) Service Manual of tractor model **SWARAJ 742 FE**.

17.7.2 The supplied literature was found adequate; except the following

- a) Oil grade recommended in operator's manual for steering system does not match with specifications submitted by applicant.

However, these literatures should also be brought out in other vernacular languages of India for guidance of users



18. Citizen charter

Duration of Test	Time frame for testing & evaluation as per citizen charter	Whether the report released within time frame given in the citizen charter	Remark
08 Months (March, 2017 to October, 2017)	10 Months	Yes	--

TESTING AUTHORITY:

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AGRICULTURAL ENGINEER

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19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	1.20.3, 1.20.4, 1.20.5 (i), 17.6	This requirement is being revisited for necessary corrective action at our end.
19.2	17.3 (iii), (vi), (vii) & (viii)	Study & trials are under progress for necessary corrective action.
19.3	17.4.1.1 (v), 14.7.1.2 (i), 17.4.1.3, 17.4.1.4, 17.4.1.5 & 17.4.1.6	These requirements are being revisited for necessary corrective action at our end.
19.4	17.7.2	Literatures are already printed in all regional language for end user and necessary corrective action will be incorporated.