



SWARAJ 834 XM PXPDS540 TRACTOR



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)

Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५ TRACTOR NAGAR, BUDNI (M.P.) 466445

Phone : 07564-234729 Fax : 07564-234743 E-mail : fmti-mp@nic.in Website : http://cfmmtti.dacnet.nic.in



Manufacturer	: M/s. Mahindra & Mahindra Limited, Farm Equipment Sector, Swaraj Division, Phase-IV, Industrial Area, S.A.S. Nagar, Mohali Punjab-160 055
Test requested by (applicant)	: M/s. Mahindra & Mahindra Limited, Farm Equipment Sector, Swaraj Division, Phase-IV, Industrial Area, S.A.S. Nagar, Mohali Punjab-160 055
Place of running-in	: At Applicant's works
Duration of said running-in, (h):	
- Engine	: 28
- Transmission	: 32
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	: Swaraj
Model	: 834 XM PXPDS540
Type	: Four wheeled, rear-wheel driven, unit construction general purpose, agricultural tractor
Year of manufacture	: 2013
Chassis number	: WRTK 24419130 622
Country of origin	: India
1.2 Engine:	
Make	: Swaraj engines Ltd.
Model	: RV 30 XM + 3 A
Type	: Water cooled, naturally aspirated, four stroke, direct injection, diesel engine
Serial number	: 33.1008/SSK3297A
1.2.1 Engine speed(Manufacturer's recommended production setting), (rpm):	
- Maximum speed at no load	: 1900 to 2000
- Low idle speed	: 580 to 700
- Speed at maximum torque	: 1000 to 1400
Rated speed, (rpm):	
- For PTO use	: 1800
- For drawbar use	: 1800
1.3 Cylinder & Cylinder Head:	
Number	: Three
Disposition	: Vertical, Inline
Bore/stroke, (mm)	: 100/110 (apa)
Capacity as specified by the applicant, (cc)	: 2592
Compression ratio:	: 20.4 (± 0.5) : 1 (apa)
Type of cylinder head	: Integral. C.I.
Type of cylinder liners	: Wet, replaceable
Type of combustion chamber	: Re-entrant cavity on piston head
Arrangement of valves	: Overhead, inline

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15.6 Steering system:Visual condition of the components of : Normal
complete steering assembly**15.7 Starter motor & Alternator:**Presence of soil/oil in housing : None
Condition of bearings and other : Normal
components**16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS**

S. No.	Adjustments/Defects/Breakdowns and repairs	Tractor run hours
1.	Nil	

17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 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:

Sl. 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 requirements (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	20.6	20.9	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	20.6	20.9	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	272 (D)	260	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	150 (D)	141.7	Yes
e)	Back-up percent torque,	Non Evaluative	10 percent, min.	7 % min. (D)	27.66	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)	109	Yes

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1	2	3	4	5	6	7	
	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 (D)	103	Yes
g)	3)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.63 (R)	0.280	Yes
h)	4)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per metre (R)	0.21	Yes

17.1.2 Drawbar performance :						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	16.86 (R) min. 16.6, min (D)	21.05	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	11.8 (R) min. 11.6, min (D)	14.16	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.	16.7 (R) Minimum 16.48 (D) min.	17.6	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	77	Yes

17.1.3 Power lift and hydraulic pump performance :		Maximum lifting capacity throughout the range of lift, (kN):					
a)	1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	8.83 (D)	10.04	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	4.92 (R) Minimum 6.90 (D)	8.30	Yes

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1	2	3	4	5	6	7
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)	8.31	Yes
	2) Hot brake	Evaluative	10	10 (R)	8.43	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	244 to 264	Yes
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

17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	88 (R)	82	Yes
b)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	98 (R)	91	Yes

17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	70	Yes
2)	Right foot rest				70	Yes
3)	Seat (with driver seated)				90	Yes
4)	Steering Wheel				100	Yes

17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
1)	Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
2)	Four wheel		--	5.5 (D)	5.5	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	5.0 to 6.5 (D)	4.58 to 4.62	No
2)	Four wheel		--	5.0 to 6.5(D)	4.48 to 4.51	No
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	30 to 35 (D)	31.43 to 32.40	No
2)	Four wheel		--	30 to 35 (D)	28.13 to 28.57	No



1	2	3	4	5	6	7
17.1.8	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 mud and / or water was observed	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine oil	-do-				
	5) Transmission oil	-do-				
17.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 part 2) -1999	--	Meets the requirement	Yes
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR 14603-1999	--	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)	--	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
17.1.10	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Swaraj	Yes
	2) Model	Evaluative		--	834 XM PXPDS540	Yes
	3) Year of manufacture	Evaluative		--	WR (2013)	Yes
	4) Engine number	Evaluative		--	33.1008 / SSK 3297 A	Yes
	5) Chassis number	Evaluative		--	WRTK 24419130 622	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	20.6	Yes



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1	2	3	4	5	6	7
17.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	100.225	100.00 to 100.01	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.60	0.084 to 0.092	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	2.5	0.25 to 0.35	Yes
	- 2 nd comp. ring.		-do-	2.5	0.40 to 0.50	Yes
	- Oil ring.		-do-	2.0	0.30 to 0.45	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	--	Taper rings	--
	- 2 nd comp. ring.		-do-	0.50	0.050 to 0.063	Yes
	- Oil ring.		-do-	0.25	0.030 to 0.036	Yes

(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.30	0.095 to 0.136	Yes
	- Crankshaft end float	Evaluative		0.50	0.20	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.30	0.047 to 0.080	Yes
	- Axial	Evaluative	-do-	0.60	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.10 to 0.15	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.80	0.149 to 0.150	Yes

17.1.12 Literature (Submission to test agency)						
(a)	Operator manual	Evaluative	Provided/Not Provided	As relevant Code 8132)	per IS (IS	Provided Yes
(b)	Parts Catalogue	Evaluative	Provided/Not Provided	As relevant Code 8132)	per IS (IS	Provided Yes
(c)	Workshop/Service manual	Evaluative	Provided/Not Provided	As relevant Code 8132)	per IS (IS	Provided Yes

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17.1.13 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	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	2	3	4	5
1	Maximum oil pull over, (%)	0.25% (max.)	0.215	Yes
2.	Fitment of ROPS	With a provision for fitment of ROPS. If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	--
3.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Meets the requirement	Yes

17.3 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-1):1997 (Reaffirmed in March, 2007)] : Does not conform
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement (First revision) [IS 12343:1998 (Reaffirmed in March, 2009)] : Conforms
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) :[IS 12239 (PT-1)-1996 (Reaffirmed in March, 2007)]/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 (PT-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 [IS: 6283 (Part-1)-2006 (Reaffirmed in March, 2009) and IS:6283 (Part-2)-2007 (Reaffirmed in March, 2009)] : Conforms



- ix) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983 (Reaffirmed in March, 2009)) : Conforms
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads [(IS: 14683-1999 (Reaffirmed in March, 2009))] : Conforms

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO Performance:

- i) The backup torque 27.66 %.
- ii) The maximum power was observed as 20.9 kW against the declaration of 20.6 kW, which meet the requirement of IS: 12207-2014 with regard to tolerance.
- iii) The specific fuel consumption corresponding to maximum power was measured as 260 g/kWh against the declaration of 272 g/kWh, which is within the tolerance limit of IS: 12207-2014.
- iv) The maximum equivalent crankshaft torque was observed as 141.7 Nm against the declaration 150 Nm which is not within the tolerance limit of IS: 12207-2014 which calls for necessary corrective action.

17.4.1.2 Drawbar performance:

During drawbar performance test, rear tyre creeping was observed as 55 & 40 mm for LHS and RHS tyres respectively which is on higher side and calls for necessary corrective action.

17.4.1.3 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 to improve the operational comfort and service life of components.

17.4.1.4 Three point linkage:

- i) The 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.
- ii) Some of the parameters of the three point linkage conform to Cat. I and some of them conform to Cat.II. Keeping in view of the spirit of standardization, the necessary improvements may be incorporated.

17.4.1.5 Drawbar linkage:

- i) All the dimension of the linkage drawbar meets the requirements of IS: 12953-1990.

17.4.2 Field performance test:

17.4.2.1 Wet land cultivation (Puddling operation):

No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is recommended as suitable for wetland operation (Puddling).

17.5 Haulage test:

- i) The distance travelled / litre of fuel consumption and Specific Fuel Consumption with two wheel trailer and four wheel was not meeting the requirement of IS: 12207-2014 and therefore, should be looked into for necessary corrective action.



- 17.6 **Maintenance / Service Problems:**
No noticeable maintenance/ service problem was observed during the test.
- 17.7 **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) Width of step.
 - iv) Adequately gripable working clearance around the position control lever.
- 17.8 **Adequacy of Literature supplied with machine:**
- 17.8.1
- i) Operator's Manual
 - ii) Parts Catalogue
 - iii) Service Manual
- 17.8.2 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

18. Citizen charter

Duration of Test	Test duration under citizen charter	Whether the report released within time frame given citizen charter	Remark, if any
10 Months	10 Months (April, 2014 to February 2015)	Yes	None

TESTING AUTHORITY:


A. K. SINGH
 SENIOR AGRICULTURAL ENGINEER


C.R. LOHI
 DIRECTOR

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



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19. Applicant's Comments

Para No.	Our Reference	Applicant's comments
19.1	17.3 (ii), (iii), (vi) & (vii)	These requirements are being revisited for necessary corrective action at our end.
19.2	17.4.1.2, 17.4.1.3 & 17.5 (i)	Study and trails are under progress for necessary corrective action.
19.3	17.4.1.1 (i)(ii) & (iv),	These requirements are being revisited for necessary corrective action at our end.
19.4	17.7 (i)(ii)(ii) & (iv)	Study and trails are under progress for necessary corrective action.
19.5	17.8.2	Literature are already printed in all regional language for end user.

ANNEXURE- I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S.No	Item	M.B. Plough	Rotavator	Paddy puddler
1.	Make	Anil Industries	Dashmesh	ACE
2.	Type	Mounted	Mounted	Mounted
3.	No. of bottoms /blades	3	42 in 7 flange	12 (6 in each gang)
4.	Type of bottom /blades	M.B.	L type	Notched
5.	Size of bottoms/blades, (mm)	300	130 x 55 x 5	500
6.	Spacing of bottoms/flanges, (mm)	345	240	180
7.	Lower hitch point span, (mm)	780	875	835
8.	Mast height, (mm)	520	510	510
9.	Overall dimensions, (mm):			
	- Length	2020	2000	1020
	- Width	1065	1700	2070
	- Height	1170	980	1050
10.	Gross mass, (kg)	335	480	305