



EICHER, 278 TRACTOR



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रौद्योगिकी 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)

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T-926/1443/2014

EICHER,278 TRACTOR - Commercial (Initial)

Manufacturer : **EICHER TRACTORS**
(A unit of TAFE Motors & Tractors Limited,
a wholly owned subsidiary of TAFE)
Plot No.1, Sector - D, Industrial Area,
Mandideep – 462 046,
Distt. Raisen (M.P.)

Test requested by (applicant) : The manufacturer
Place of running-in : At Applicant's works
Duration of said running-in, (h):
- Engine : 21
- 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 : Eicher
Model : 278
Variants, if any : None
Type : Four wheeled, rear-wheel driven, unit
construction, Standard Agricultural Tractor

Year of manufacture : 2013
Chassis number : 920711914347
Country of origin : India

1.2 Engine:

Make : Eicher
Model : 298E26
Type : Air cooled, naturally aspirated, four stroke,
direct injection, diesel engine

Serial number : 520628896733

1.2.1 Engine speed(Manufacturer's recommended production setting), (rpm):

- Maximum speed at no load : 2250 to 2350
- Low idle speed : 650 to 750
- Speed at maximum torque : 800 to 1200

Rated speed, (rpm):

- For PTO use : 2150
- For drawbar use : 2150

1.3 Cylinder & Cylinder Head:

Number : Two
Disposition : Vertical, Inline
Bore/stroke, (mm) : 100/125 (apa)
Capacity as specified by the applicant, : 1963
(cc)
Compression ratio : 17.5 ± 0.5 : 1
Type of cylinder head : Individual, Cast iron alloy with swirl port.
Type of cylinder liners : Dry, replaceable
Type of combustion chamber : Direct combustion, re-entrant type



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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: 12207-2008 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: 12207-2008	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 >35hp. -7.5/+10% for PTO power ≤ 35 hp	17.3 (D)	16.5	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	17.3 (D)	16.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	265 (D)	278	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	98 (D)	99.5	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7 percent, min	35.93	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.	140 (D)	115	Yes
2)	Cylinder liner wall	Evaluative	The observed value under high ambient condition should not exceed the declaration	200 (D)	162	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.65 (D) 2.80 (R)	0.347	Yes
h)	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)	0.20	Yes



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1	2	3	4	5	6	7	
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	14.0 (D)	17.67	Yes	
				21.87 (R)			
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	11.0 (D)	14.67	Yes	
				17.36 (R)			
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	13.8 (D)	16.0	Yes	
				13.2 (R)			
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	110	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%]	8.8 (D)	8.16	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 18 kg/PTO hp. and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	8.8 (D) 3.91 Minimum, (R)	8.56	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	[Tolerance of plus 5 mm]	25 (D)	02	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)	7.71	Yes
	2)	Hot brake	Evaluative	10	10 (R)	8.90	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	412 to 499	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	



1	2	3	4	5	6	7
17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	96	Yes
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	100	Yes
2)	Right foot rest				90	Yes
3)	Seat (with driver seated)				160	No
4)	Steering Wheel				100	Yes
17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
1)	Two wheel	Non Evaluative	--	3.5 (D)	3.5	Yes
2)	Four wheel	Evaluative	--	3.5 (D)	3.5	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	6.0 to 8.0 (D)	7.19 to 7.35	Yes
2)	Four wheel		6.0 to 8.0 (D)	6.24 to 6.49	Yes	
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	30 to 35 (D)	38.86 to 39.72	No
2)	Four wheel		--	30 to 35 (D)	44.04 to 45.76	No
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	Manufacturer has recommended that the tractor is not suitable for wet land cultivation (puddling operation)	--
1)	Clutch assembly	-do-				
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
17.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	As per CMVR	At present no requirements	Provided	--
b)	Lighting arrangement	Evaluative	As per CMVR	--	Provided	Yes



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1	2	3	4	5	6	7	
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	--	Eicher	Yes	
	2) Model	Evaluative		--	278	Yes	
	3) Year of manufacture	Evaluative		--	2013	Yes	
	4) Engine number	Evaluative		--	520628896733	Yes	
	5) Chassis number	Evaluative		--	920711914347	Yes	
	6) Declaration of PTO power, (kW)	Evaluative		--	17.3	Yes	
17.1.11	Discard limit for:						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	100.25	99.99 to 100	Yes	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.52	0.113 to 0.126	Yes	
(c)	Ring end gap (mm):						
	- Top comp. ring.	Evaluative	-do-	4.00	0.40	Yes	
	- 2 nd comp. ring.		-do-	4.00	0.45	Yes	
	- Oil ring.		-do-	2.5	0.35 to 0.40	Yes	
(d)	Ring groove clearance (mm):						
	- Top comp. ring.	Evaluative	-do-	0.25	Taper rings	--	
	- 2 nd comp. ring.		-do-	0.25	0.054 to 0.062	Yes	
	- Oil ring.		-do-	0.25	0.077 to 0.081	Yes	
(e)	Clearance of main bearings (mm):						
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.60	0.086 to 0.121	Yes	
	- Crankshaft end float	Evaluative		0.80	0.20	Yes	
(f)	Clearance of big end bearings, (mm):						
	- Diametrical	Evaluative	-do-	0.60	0.077 to 0.091	Yes	
	- Axial	Evaluative	-do-	0.80	0.30	Yes	
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.10 to 0.12	Yes	
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.60	0.14 to 0.16	Yes	



17.1.12 CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	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:12207-2008:				
S. No.	Characteristic	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5
1.	Maximum oil pull over, (%)	0.25% (max.)	2.39	No
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Meet the requirements	Yes
3.	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	ROPS not fitted	Not applicable
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	Meet the requirements	Yes
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meets the requirements	No
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Does not meets the requirements	No
	Specification of swinging drawbar	Should meet the requirements of IS: 12362 Part 3-1994.	Not provided	--
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	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)] : Conforms
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in February, 2012)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in February, 2012)] : **Does not conform**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 -1998 (First revision) (Reaffirmed in March, 2009)] : Conforms
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : **Does not conform**
[IS 12239 (Part-1)-1996 (Reaffirmed in February, 2012) / ISO 4254-1:1989]
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) IS 12239 (Part-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 – Symbols for Agricultural Tractors and Machinery [IS: 6283 (Part-2) – 2007(Reaffirmed in March, 2009) / ISO 3767-2:1991]] : **Does not conform**
- ix) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009) / ISO 3789: 1982] : 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 Drawbar performance test:**

During 10 hour drawbar test, the creeping of LHS & RHS rear tyre over the rims was observed as 65 mm & 45 mm respectively, which was considered on higher side. This may be looked into for necessary corrective action.

17.4.1.2 Hydraulic performance test:

The maximum tilt angle of mast from vertical over the full range of lift was observed as 2.2 degrees against the minimum requirement of 10 degree as per IS: 12224-1987. This should be looked into for necessary corrective action.

**17.4.1.4 Mechanical Vibration:**

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-9 of this test report are on higher side especially at the steering control wheel, left foot rest. and Seat (with driver seated) . This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.5 Three point linkage:

The lateral distance from lower hitch point to center line of tractor, distance from end of power take-off to centre of lower hitch point (lower links in horizontal position) and transport height does not meet the requirements of IS: 4468(Part I)-1997 for given Cat.II. This should be looked into for necessary corrective action.

17.4.1.6 Linkage drawbar:

The dimension "DØ" of Fig. 1 (b) does not conform to relevant IS. This should be looked into for necessary corrective action.

17.4.1.7 Air Cleaner oil pull over test:

The air cleaner oil pull over test of the tractor was observed as 0.57 to 2.39 %, which exceeds the limit of 0.25 % of IS. This should be improved at production level.

17.4.2 Haulage performance:

The fuel consumption (ml/km/tonne) with two wheel & four wheel trailer was observed as 38.86 to 39.72 & 38.86 to 39.72 ml/km/tonne respectively against the declaration of 30 to 35 ml/km/tonne for two wheel & four wheel trailer. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.

17.4.3 Field performance test:**17.4.3.1 Dry land operation (rotavation):**

- i) The engine rpm during the rotavation operation was dropped below rated speed. This should be looked into at production level and matching implement should be recommended.
- ii) Low pressure pipe line of fuel from fuel filter to FIP was found cracked twice. It was replaced with new. Hence it is recommended that high quality fuel pipe line should be used in the production level. However, repetitive broken in pipe line may examine thoroughly.

17.4.3.2 Wet land cultivation (Puddling operation):

The manufacturer has not recommended the tractor for wetland cultivation (puddling operation). Hence, the wetland cultivation (puddling operation) test was not conducted.

The declaration of the fact that the tractor is not suitable for wetland cultivation (puddling operation) should be mentioned clearly and boldly in all the literature relevant to this tractor model.

17.5 Maintenance / Service Problems:

No noticeable maintenance/ 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) Provision for spark arresting device in exhaust system.
- ii) Colour codes with amber zones on all gauges (engine oil pressure gauges, engine revolution gauges, fuel level gauge, water temperature gauge) as per relevant IS.
- iii) Provision of differential lock.
- iv) Provision of PTO shaft master shield.
- v) The minimum cautionary notice as per clause 11.2 of IS: 12239 (Part-2)-1999.



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17.7 Adequacy of Literature supplied with machine:**17.7.1** The following literature was supplied during draft test report preparation

- i) Operator's manual
- ii) Parts catalogue
- iii) Service manual


The above literatures are found adequate.

17.7.2 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**

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	10 Months (September, 2013 to June, 2014)	Yes	None

TESTING AUTHORITY:

P. C. MESHARAM
AGRICULTURAL ENGINEER



H. L. YADAV
SENIOR AGRICULTURAL ENGINEER



C. R. LOHI
DIRECTOR

19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	17.4.1.7	This will be updated with respect to design
19.2	17.6	Recommendations are being looked into with respect to design, development and implementation.

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