

व्यावसायिक परीक्षण रिपोर्ट (प्रथम बैच परीक्षण)

संख्या/No. : T-1640/2171/2022

COMMERCIAL TEST REPORT (First Batch Test)

माह/Month : April, 2022

[ONLINE TESTING]

(यह परीक्षण रिपोर्ट 30/04/2027 तक वैध है / THIS TEST REPORT IS VALID UPTO 30/04/2027)



MAHINDRA, 415 DI (Brand Name: Bhoomiputra) TRACTOR



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 & FARMERS WELFARE)

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1. BACKGROUND

1. Base model "MAHINDRA, 415 DI (Brand Name: Bhoomiputra) tractor was tested under Initial Commercial Testing vide Test Report No. T-1079/1604/2017 (March, 2017).
2. Now, the applicant has submitted an online application, 28/2021-22/30 dated 25.06.2021 for 1st batch testing of "MAHINDRA, 415 DI (Brand Name : Bhoomiputra) " tractor.

2. FUEL AND LUBRICANTS

- 2.1 Fuel** : The High-speed diesel oil supplied by M/s Indian Oil Corporation Limited having density of 0.826 g/cc at 15°C was used.

2.2 Lubricants:

S. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine oil & Air cleaner bowl	SAE 20W40	SAE 20W40
2.	Transmission, differential, final drive, hydraulic & brake oil	MTRAC 30	Oil originally filled in the tractor was not changed
	Steering housing	EP 140	
3.	Grease	MP Lithium Base	MP grease

3. SPECIFICATIONS

- 3.1 Tractor:**
- Make : Mahindra
 Model : 415 DI
 Brand Name : Bhoomiputra
 Type : Rear Wheel Drive, Standard Agricultural Tractor.
 Month & year of manufacture : 09/21
 Chassis number : MBNAAVDHMF00011
 Country of origin : India
- 3.2 Engine:**
- Manufacturer's address : M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Near Bidar "T" Junction , Mahindra Nagar, Zaheerabad-502 220, Medak District, Andhra Pradesh (apa)
- Make : Mahindra
 Model : MDI27403A
 Type : Four strokes, liquid cooled, direct injection, naturally aspirated, compression ignition, diesel engine.
 Serial number : ZMF4YAA7800
 Country of origin : India
- 3.2.1 Engine speed (rpm), (Manufacturer's recommended production settings):**
- Maximum speed at no load : 2075 to 2175
 - Low idle speed : 750 to 850
 - Speed at maximum torque : 1300 to 1500
- Rated speed, (rpm):**
- For PTO use : 1900
 - For drawbar use : 1900

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17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 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: 12207-2019** 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: 12207-2019	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: $\pm 5\%$ for PTO power and or engine power > 26 kW. $\pm 10\%$ for PTO power and or engine ≤ 26 kW.	26.8 (D)	26.4	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	26.8 (D)	26.4	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% max.	235 (D)	244	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	177 (D)	163.3	Yes
e)	Back-up torque, percent	Evaluative	12 percent	12.0 (D) 12.0 (R)	23.3	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)	96	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.	112 (D)	106	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. Power under High ambient conditions.	2.48 Maximum (R)	0.99	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 Maximum (R)	0.42	Yes

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1	2	3	4	5	6	7	
17.1.2	Drawbar performance :						
a)	Max. drawbar pull with ballasted corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 70% of static mass of tractor with ballast.	18.65 (D) 16.29 Minimum (R)	19.98	Yes	
b)	Max. drawbar pull with standard 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.	12.3 (D) 11.99 (R) Minimum	15.11	Yes	
c)	Maximum drawbar power 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.	21.5 (D) 21.1 (R) Minimum	24.3	Yes	
d)	Maximum transmission oil temperature, (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	80	Yes	
17.1.3	Power lift and hydraulic pump performance :						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Evaluative	Tolerance of ± 10%	14.6 (D)	13.53	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.	10.2 (D) 5.79 (R) Minimum	11.03	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	28	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)	6.41	Yes	
	2) Hot brake	Evaluative	10	10 (R)	6.56	Yes	
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² , (N)		Evaluative	600	600 (R) Maximum	164 to 319	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	Yes	Yes
17.1.5	Noise measurement :						
a)	Maximum ambient noise emitted by the tractor, dB(A)		Evaluative	As per CMVR	88 (R)	79	Yes
b)	Maximum noise at operator's ear level, dB(A)		Evaluative	As per CMVR	96 (R)	90	Yes
17.1.6	Amplitude of mechanical vibrations at:						
	1) Left foot rest	Non Evaluative	100 microns (max.)	100(R)	191	No	
	2) Right foot rest				240	No	
	3) Seat (with driver seated)				184	No	
	4) Steering wheel				242	No	
17.1.7	Air cleaner:						
	Maximum air cleaner oil pull over, (%)		Evaluative	0.25 (Max.)	0.11		Yes
17.1.8	Haulage requirements :						
a)	Gross mass of the trailers, (tones):						
	Two wheel		Non Evaluative	As specified by the manufacturer	4.0 (D)	4.0	Yes
	Four wheel		Non Evaluative	As specified by the manufacturer	5.5 (D)	5.5	Yes
b)	Distance travelled / liter of fuel consumption, (km/l):						
	Two wheel		Non Evaluative	As specified by the manufacturer	6.0 to 7.0 (D)	5.91 to 6.08	No
	Four wheel		Non Evaluative	As specified by the manufacturer	6.0 to 7.0 (D)	5.51 to 5.83	No
c)	Fuel consumption, (ml/km/tonne):						
	Two wheel		Non Evaluative	As specified by the manufacturer	25 to 35 (D)	41.1 to 42.3	No
	Four wheel		Non Evaluative	As specified by the manufacturer	35 to 45 (D)	31.2 to 33.0	Yes

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1	2	3	4	5	6	7
17.1.9	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 (R)	No ingress of water and / or mud was reported during Initial commercial testing of this tractor model tested vide test report no. T-1079/1604/2017 released in March, 2017	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine Oil	-do-				
	5) Transmission Oil	-do-				
17.1.10	Safety features :					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulic pipes (As per IS 12239 (Part2))	Meets the requirement	Yes	
b)	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement	Yes	
c)	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)	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)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS: 4468 (Part-I) (As amended from time to time)	Does not meet the requirement	No	
f)	Specifications of linkage drawbar	Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement	Yes	
g)	Swinging drawbar (wherever fitted)	Evaluative	Should meet the requirement of IS: 12362 (Part 3) (As amended from time to time)	Not provided	Not applicable	
h)	1) Maximum travelling speed at rated engine speed in reverse gears, kmph	Evaluative	Should not exceed 20 kmph	10.77 (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. The safety aspects about the operation of shuttle technology shall be brought in operation and manufacturer /dealer shall ensure the training on this aspect to operator before the delivery of tractor.	Not fitted	Not applicable	

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1	2	3	4	5	6	7		
17.1.11	Labelling of tractors (Provision of labelling plate):							
	1)	Make	Evaluative	Should conform to the requirements of CMVR along with maximum PTO Power in kW and year of manufacture in numerical form. <table border="1" style="margin: 5px 0;"><tr><td>MM</td><td>YY</td></tr></table> Digit 01 – 12 in box No.1 for MM will represent the months and next two digits in box No.2 for YY will represent the year of Manufacturing.	MM	YY	Mahindra	Yes
	MM	YY						
	2)	Model	Evaluative		415 DI	Yes		
	3)	Month & Year of manufacture	Evaluative		09/21	Yes		
	4)	Engine number	Evaluative		ZMF4YAA7800	Yes		
	5)	Chassis number	Evaluative		MBNAAAVDHMZF00 011	Yes		
6)	Maximum PTO power, (kW)	Evaluative	26.82		Yes			
17.1.12	Discard limit for:							
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	89.13	88.899 to 88.909	Yes		
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.20	0.082 to 0.084	Yes		
(c)	Piston diameter at skirt, (mm)	Non Evaluative		88.150	88.825 to 88.826	Yes		
(d)	Ring end gap (mm):							
-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	2.50	0.30 to 0.40	Yes		
-	2 nd comp. ring.			2.50	0.40 to 0.55	Yes		
-	Oil ring.			2.00	0.35 to 0.45	Yes		
(e)	Ring groove clearance (mm):							
-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.30	Tapered	Yes		
-	2 nd comp. ring.			0.30	0.063 to 0.065	Yes		
-	Oil ring.			0.20	0.045 to 0.047	Yes		
(f)	Clearance of main bearings (mm):							
-	Diametrical clearance	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.20	0.071 to 0.090	Yes		
-	Crankshaft end float	Evaluative		0.60	0.10	Yes		

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1	2	3	4	5	6	7	
(g)	Clearance of big end bearings, (mm):						
	-	Diametrical	Evaluative	-do-	0.20	0.082 to 0.097	Yes
	-	Axial	Evaluative	-do-	0.75	0.20 to 0.25	Yes
(h)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.30	0.103 to 0.106	Yes	
(i)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.30	0.097 to 0.100	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	Fitment of Roll Over Protective Structures (ROPS):						
	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	
17.1.15	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor		Provided	Yes	
17.1.16	Accessories (optional)	Non Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR		Provided	Yes	

17.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2019):					
Sl. No.	Category of break-downs	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	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 (1 major + 4 minor) or 5 minor breakdowns.	None	Yes

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17.3 Salient Observations:

17.3.1 Laboratory tests:

17.3.1.1 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter – 10 of this test report is on higher side. This calls for dampening down of vibrations especially on LHS and RHS foot rest, operator's seat & steering control wheel to improve the operational comfort and service life of components.

17.3.1.2 Specifications of three point linkage:

- i) Lateral movement of lower hitch points was observed as 90 mm against the requirement of 100 mm minimum for category I three point linkage.

This observation of three point linkage was found conform vide Test Report No. T-1079/1604/2017 and now found not meeting the relevant standard, which calls for necessary corrective action.

17.3.2 Haulage performance test:

- i) During haulage test, distance travelled / liter of fuel consumption was observed as 5.91 to 6.08 km/l and 5.51 to 5.83 for two wheel and four wheel trailer respectively against the declaration of 6.0 to 7.0 km/l.
- ii) During haulage test, fuel consumption for two wheel trailer was observed as 41.1 to 42.3 ml/km/tonne against the declaration of 25 to 35 ml/km/tonne. This should be looked into for necessary corrective action.

17.3.3 Specifications

- i) Frequency of oil change period in the technical specification for engine and steering system is mentioned as 250 hours and 500 hours of operation respectively. As per operator's manual for the tractor model frequency of oil change period for engine and steering system is mentioned as First at 250 hours and then after every 350 hours of operation. This should be looked into for necessary corrective action.
- ii) Coolant brand and Coolant water ratio should be mentioned the operator and) service manual

17.4 Maintenance / Service Problems:

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

17.5 Recommendation with regard to safety on tractor:

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

- i) Longitudinal distance from seat index point to the centre of differential lock pedal has been measured as 225 mm against the requirement of 355 to 770 mm.
- ii) Longitudinal distance from seat index point to the centre of steering control wheel has been measured as 600 mm against the requirement of 425 to 525 mm.
- iii) Fuel shut-off knob should be remained in "STOP" position without application of sustainable manual effort.
- iv) Vertical retainers at both sides of clutch pedal should be provided as per IS: 12239 (Part-1) – 2018.
- v) Spark arrester should be provided in the exhaust system as per the requirement of IS: 12239 (Part-2)-1999 (Re-affirmed in January, 2019).
- vi) The working clearance between position and draft control lever of hydraulic system was measured as 30 mm against the minimum requirement 70 mm as per IS: 12239 (Part-2)-1999 (Re-affirmed in January, 2019).

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vii) Master shield of PTO shaft should be provided as per the requirement of IS: 4931-1995 (Re-affirmed in January, 2019).

The recommendations at serial no. (ii), (iii),(iv),(v),(vi) were also made in the previous Test Report No. T-1079/1604/2017 (March, 2017) but no improvement have been made in this regard so far. Besides these observations, serial no. (i) and (vii) were found conform vide Test Report No. T-1079/1604/2017 and now found not meeting the relevant standard, which calls for necessary corrective action.


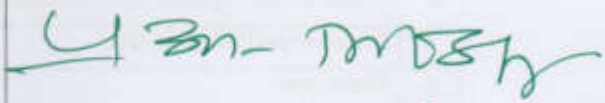
17.6 Adequacy of Literature supplied with machine:

17.6.1 The following literatures were supplied with the test tractor for reference during the test:-

- Operator Manual for "Mahindra 415 DI" tractor model.
- Parts catalogue for "Mahindra 415 DI" tractor model.
- Service manual for "Mahindra 415 DI" tractor model.

17.6.2 The operator manual may be brought out for the guidance of users and service personnel as per IS:8132-1999.

TESTING AUTHORITY:

C.V. CHIMOTE TEST ENGINEER	
P. K. PANDEY DIRECTOR	

Draft test report is compiled by: Nitesh Kumar Verma, Agricultural Engineer.

18. Applicant's comments

Para no.	Our reference	Applicant's comments
18.1	16.3.1.1, 16.3.1.2, 16.5 (i, ii, iii, iv, v & vi)	Parameters will be studied and necessary action will be initiated.
18.2	16.3.2 (i & ii)	Observations will be studied and necessary corrective actions for improvement in the manuals will be ensured.

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ANNEXURE-I

BRIEF SPECIFICATION OF TRAILER DECLARED AS MATCHING TRAILER BY APPLICANT

SI No.	Item	Trailer	Trailer
1.	Make	Kisan Engineering Works, MIDC, Awadhan Dhule, (M.S.)	
2.	Model	Kisan 1062	Not available
3.	Type of trailer	Semi - Trailer	Semi – Trailer
4.	Number of axles	Single	Double
5.	Un laden Weight of Trailer, kg	1670	2800
6.	Fully laden Weight of Trailer, Tons (Kg)	4000	5500
7.	Overall dimensions of Trailer, (mm):		
	Overall Width	1870	2140
	Overall Length	4180	5785
	Overall Height	2175	2110
	Wheel Base	Not applicable	2835
	Wheel Track	1600	1740(Front) &1765(Rear)
8.	Dimension of fitted Platform, (mm):		
	Length	3040	4225
	Width	1830	2135
	Height from ground	1190	1305
9.	Brakes of Trailer	Not Provided	Not Provided

ANNEXURE-II

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	47.0
2.	PTO performance test	12.38
3.	Power lift and hydraulic pump performance test	4.75
4.	Drawbar performance test	19.52
5.	Brake test	2.75
6.	Noise measurement	1.50
7.	Mechanical vibration test	0.75
8.	Air cleaner oil pull over test	3.50
9.	Nominal speed test	0.63
B.	HAULAGE TEST:	5.51
C.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	2.95
TOTAL:		101.24