



MAHINDRA YUVO 415 DI 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

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001 - 2008 Certified Institute)

Tractor Nagar, Budni (M.P.) 466 445

E-mail fmti-mp@nic.in

Website : <http://cfmtti.dacnet.nic.in>

Telephone : 07564 - 234729

Fax : 07564 - 234743



T-985/1509/2015

MAHINDRA YUVO 415 DI TRACTOR - Commercial (Initial)

Address of Manufacturer

- : Mahindra & Mahindra Ltd.
(Farm Equipment Sector)
- : 1. MahindraResearch Valley-AS,
Mahindra World City, Plot No. 41/1, Anjur
P.O.: Chengalpattu- Kanchipuram district
– 603004
 - : 2. Akurli Road, Kandivli (E)
Mumbai – 400 101
 - : 3. Hingna Road, Hingna MIDC
Nagpur– 440 016.
 - : 4. Agri Business Development Center,
Khatima Panipat Highway, Udham Singh
Nagar, Vil. Lalpur, Tehsil-Kichha,
Rudrapur – 263 153
 - : 5. Agri Development Center, Vil-Mehla
Tehsil - Dudu Jaipur- Ajmer Road,
Jaipur– 303 007
 - : 6. Near Bidar "T" Junction , Mahindra
Nagar,Zaheerabad- 502 220
Medak District, Andhra Pradesh

Test requested by (applicant)

- : Mahindra & Mahindra Ltd.(FES), Akurli Road,
Kandivli (E)
Mumbai – 400 101

Place of running-in

- : At applicant's works

Duration of said running-in (h):

- Engine

- : 30 hrs and 2 min.

- Transmission

- : 39 hrs

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 : Mahindra
Model : YUVO 415 DI

Optional feature provided during ICT

- Optional feature**
- i) Power assisted steering system
 - ii) Dual clutch
 - iii) Different tyre sizes

Additional test carried out

- : Physical Inspection and turning ability test
: Physical Inspection and measurement of
a) Wheel base
b) Engine to PTO speed ratio
: Physical Inspection and Nominal Speed test

(One step upper from 13.6-28,12 PR
to 14.9-28, 12PR)

*Variants, if any	:	
Mahindra YUVO 575Di	:	30.2kW PTO Power
Mahindra YUVO 575Di DC	:	30.2 kW PTO Power

* As declared by the Manufacturer, not to be tested at this Institute.

- Type : Four wheeled, rear-wheel driven, General
Purpose Agricultural Tractor.

16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

16.1 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 require- ments (Yes/No)
1	2	3	4	5	6	7
16.1.1 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	26.10	26.2	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	26.10	26.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	239	238.4	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	162	158.5	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10% (R) 27% (D)	26.6	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)	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.	110 (D)	95	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	0.15% of SFC (D)	0.048	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) 0.50 (D)	0.20	Yes



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1	2	3	4	5	6	7	
16.1.2 Drawbar performance :							
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	18.4 (R)	26.13	Yes	
				18.0(D)			
b)	Max. drawbar pull with Unballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	12.88 (R)	18.12	Yes	
				12.60(D)			
c)	Maximum drawbar power with Unballast, (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.	21.0(R)	25.1	Yes	
				20.9 (D)			
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	120(D)	81	Yes	
16.1.3 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%]	14.7 (D)	15.64	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	6.17 (R) (Minimum) 11.77 (D)	10.34	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	Observed value should not exceed 50 mm.	50 max (R)	0	Yes	
				50 (D)			
16.1.4 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)	8.59	Yes
	2)	Hot brake	Evaluative	10	10 (R)	8.61	Yes

1	2	3	4	5	6	7
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	207 to 258	Yes
16.1.5 Noise measurement :						
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	80	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	93	Yes
16.1.6 Amplitude of mechanical vibrations at :						
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	40	Yes
2)	Right foot rest				90	Yes
3)	Seat (with driver seated)				20	Yes
4)	Steering Wheel				90	Yes
16.1.7 Haulage requirements :						
a)	Gross mass of the trailers, (tones):					
1)	Two wheel	Non Evaluative	--	5.0	5.0	Yes
2)	Four wheel	Evaluative	--	6.0	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	4 to 5	6.17 to 6.46	No
2)	Four wheel	Evaluative	--	4 to 5	5.24 to 5.91	No
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	25 to 30	30.95 to 32.40	No
2)	Four wheel		--	25 to 30	28.21 to 31.84	No

16.1.8 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-				



1	2	3	4	5	6	7
16.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2))	At present no requirements	Provided	--
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR	--	Provided	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)	--	Conforms	Yes
d)	Technical requirements for PTO shaft	Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Conforms	Yes
e)	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	Conforms	Yes
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)	Not provided	NA	No

16.1.10	Labelling of tractors (Provision of labelling plate):					
1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Mahindra	Yes
2)	Model	Evaluative		--	YUVO 415 DI	Yes
3)	Year of manufacture	Evaluative		--	FE	Yes
4)	Engine number	Evaluative		--	ZJDA00019	Yes
5)	Chassis number	Evaluative		--	ZJDA00019	Yes
6)	Declaration of PTO power, (kW)	Evaluative		--	26.1	Yes

16.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	89.13	88.87 to 88.92	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.20	0.086 to 0.093	Yes

(c)	Ring end gap (mm):					
-	Top comp ring.	Evaluative	-do-	2.5	0.25 to 0.30	Yes
-	2 nd comp. ring.		-do-	2.5	0.50 to 0.55	Yes
-	Oil ring.		-do-	2.0	0.50	Yes



1	2	3	4	5	6	7
(d)	Ring groove clearance (mm):					
	- Top comp ring.	Evaluative	-do-	Tapered	NA	...
	- 2 nd comp. ring.		-do-	0.30	0.06 to 0.068	Yes
- Oil ring.	-do-		0.25	0.039 to 0.040	Yes	
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.20	0.033 to 0.067	Yes
- Crankshaft end float	Evaluative	0.60		0.10	Yes	
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.20	0.037 to 0.058	Yes
	- Axial	Evaluative	-do-	0.75	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.30	0.067 to 0.080	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.30	0.016 to 0.090	Yes

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

16.1.13 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



16.2 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	Maximum oil pull over, (%)	0.25% (max.)	Dry type air cleaner provided	Not applicable
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Meets the requirements	Yes
3.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	Not applicable
		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	Meets the requirements	Yes
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Meets the requirements	Yes
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meets the requirements	Yes
	Specification of swinging drawbar	Should meet the requirements of IS: 12362 Part 3-1994.	Not provided	Not applicable
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Front tow hook not provided	No

16.3 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-I):1997 (Reaffirmed in March, 2007)/ISO 730-1:1994] : Conforms
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)] : Conforms
- 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) : [IS 12239 (PT-1)-1996 (Reaffirmed in March, 2009)/ISO 4254-1:1989] : Conforms
- 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)] : Conforms



- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays [IS: 6283 (Part-1 & Part-2) –2006 & 2007(Reaffirmed in March, 2009)/ ISO 3767-2:1991] : 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

16.4 Salient Observations:

16.4.1 Laboratory tests:

16.4.1.1 PTO Performance:

- i) The maximum backup torque was observed as 26.6 %.
- ii) The maximum power was observed as 26.2 kW against the declaration of 26.10 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 238.41g/kWh against the declaration of 239 g/kWh, which is within the tolerance limit of IS: 12207-2014.

16.4.1.2 Drawbar performance:

- i) During ten hours drawbar test, creeping of LHS & RHS rear tyre over the rims was observed as 45 mm & 50 mm respectively. This should be looked into for necessary corrective action.

16.4.1.3 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-8 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.

16.4.1.4 Specifications of Power Take-off Shaft:

All specifications of PTO shaft meets the requirements however the dimensions of PTO masters shield doesn't meet the requirement so necessary improvement may be incorporated.

16.4.1.5 Specifications of Three point linkage

Some of the parameters of three point linkages are meets to the Cat.I and some are to Cat.II. Hence as per spirit of standardization this should me meets either any one category. This should be looked into.

16.4.2 Field Performance:

16.4.2.1 Wetland Cultivation (Puddling Operation):

No ingress of mud/or water was noticed during puddling operation of the tractor. Hence, It meets the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). The tractor is suitable for wetland operation (Puddling).

16.5 Haulage performance:

The distance travelled per liter (kms) & the fuel consumption (ml/km/tonne) for two & four wheeler does not meet the requirement of IS : 12207-2014 so necessary improvement may be incorporated.



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- 16.6 Recommendation with regard to safety on tractor:**
The following requirements, inter alia, may be considered for incorporation on the tractor:
Provision for spark arresting device in exhaust system.
- 16.7 Adequacy of Literature supplied with machine:**
- 16.7.1** The following literature has been supplied with the tractor
- Service Manual for Mahindra, YUVO 415 DI tractor
 - Parts Catalogue for Mahindra, YUVO 415 DI tractor
 - Operator's manual Mahindra, YUVO 415 DI tractor
- 16.7.2** The literature supplied was found adequate. However, The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

17.0 Citizen charter

Duration of Test	Test duration under citizen charter	Whether the report released within time frame given in the citizen charter	Remark
7 Months (March, 2015 to September, 2015)	10 Months	Yes	--

TESTING AUTHORITY:

 PRADIPKUMAR C MESHAM SENIOR AGRICULTURAL ENGINEER	 C.R. LOHI DIRECTOR
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Test report compiled by: - Sh. Shwetabh Singh, Senior Technical Assistant.

18. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
18.1	16.4.1.2,16.4.1.3,16.4.1.4 & 16.6	Observation will be studied and necessary action will be incorporated.

**ANNEXURE-I****BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S. No.	Items	Disc Plough	Rotavator
1.	Make	John Deere	Shaktiman
2.	Type	Mounted	Mounted
3.	No. of Disc/blades	02	36
4.	Type of Disc/blades	Plane concave	Hatched
5.	Size of bottoms/blades, (mm)	635	245X75X6
6.	Spacing of bottoms/flanges, (mm)	510	245
7.	Lower hitch point span, (mm)	635	735
8.	Mast height, (mm)	470	470,610
9.	Overall dimensions, (mm):		
	- Length	1520	1020
	- Width	1190	1985
	- Height	1005	1045
10.	Gross mass, (kg)	310	440

ANNEXURE - II**BRIEF SPECIFICATION OF HALF CAGE WHEEL**

S. No.	Items	Specification
1.	Type	Half cage wheel
2.	Dia., (mm)	1085
3.	Width, (mm)	355
4.	No. and types of lugs	12, Straight lugs
5.	Size of angle section, (mm)	50X50X5
6.	Length of lugs, (mm)	350
7.	Spacing of lugs, (mm)	285
8.	Weight of each cage wheels (kg)	60



TRACTOR RUN HOURS DURING TEST

ANNEXURE - III

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	11.35
3.	Power lift and hydraulic pump performance test	2.49
4.	Drawbar performance test	16.62
5.	Turning ability	0.2
6.	Location of centre of gravity	0.2
7.	Operator's field of vision	0.2
8.	Brake test	2.29
9.	Noise measurement	1.42
10.	Mechanical vibration test	1.0
11.	Nominal speed test	1.0
B.	FIELD TEST:	
1.	Disc ploughing	10.17
2.	Rotavation	10.0
3.	Puddling (including 5.0 hours water proof test)	15.25
C.	HAULAGE TEST:	5.18
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	4.28
	TOTAL:	81.65