

व्यावसायिक परीक्षण रिपोर्ट (प्रारंभिक)
COMMERCIAL TEST REPORT (INITIAL)

संख्या/No. : T-1670/2201/2022
माह/Month : July, 2022

[ONLINE TESTING]

(यह परीक्षण रिपोर्ट 31/07/2025 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/07/2025)



MAHINDRA, YUVO TECH+ 405 DI TRACTOR



भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(DEPARTMENT OF AGRICULTURE & FARMERS WELFARE)

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1. SPECIFICATIONS

1.1 Tractor:

Make	: Mahindra
Model	: YUVO TECH+ 405 DI
Brand name, if any	: Not available
Type	: Rear Wheel Drive, Standard Agricultural Tractor.
Month & year of manufacture	: 10/21
Chassis number	: MBNPFAFBEMNG00385
Country of origin	: India

1.2 Engine:

Manufacturer's address	: M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Hingna Road, Hingna MIDC, Nagpur- 440 028
Make	: Mahindra
Model	: MTHCI27NA039B3A
Type	: Four stroke, naturally aspirated, liquid cooled, direct injection, diesel engine.
Serial number	: NMG7KAE0076
Country of origin	: India

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

- Maximum speed at no load	: 2175 to 2375
- Low idle speed	: 750 to 850
- Speed at maximum torque	: 1000 to 1400

Rated speed, (rpm):

- For PTO use	: 2000
- For drawbar use	: 2000

1.3 Cylinder & Cylinder Head:

Number	: Three
Disposition	: Vertical, Inline
Bore/stroke, (mm)	: 98/122
Capacity as specified by the applicant, (cc)	: 2760
Compression ratio	: 19.7 ± 1 : 1
Type of cylinder head	: Monoblock
Type of cylinder liners	: Wet, replaceable
Type of combustion chamber	: Re-entrant cavity on piston head
Arrangement of valves	: Overhead, inline

Valve clearance (cold/hot):

	<u>Cold</u>	<u>Hot</u>
- Inlet valve, (mm)	: 0.4	: 0.3
- Exhaust valve, (mm)	: 0.5	: 0.4

1.4 Fuel System:

Type of fuel feed system	: Gravity and force feed
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1.4.1 Fuel tank:

Capacity, (l)	: 52.8
Location	: Above clutch housing
Provision for draining of sediments/ water	: Provided
Material of fuel tank	: Metallic

1.4.2 Water separator

: Not provided

1.4.3 Fuel feed pump:

Make	: Bosch
Type	: Plunger with hand primer
Model/Group combination No.	: FP/KSG22AD119, F002 A50 062
Provision of sediment bowl	: Provided
Method of drive	: Through cam shaft of fuel injection pump

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17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 On the basis of tests conducted the performance results have been summarized as evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of **Indian standard: 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.	26.5 (D)	26.4	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	26.5 (D)	26.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% max.	242 (D)	258	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	170 (D)	168.9	Yes
e)	Back-up torque, percent	Evaluative	12 percent	25 (D) 12 (R) Minimum	35.1	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)	99	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.	119 (D)	95	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. Power under High ambient conditions.	2.58 (Maximum) (R)	0.29	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 per meter Maximum (R)	0.32	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.	17.30 (D) 17.44 (R) Minimum	18.00	Yes	
b)	Max. drawbar pull without 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.	13.00 (D) 13.15 (R) Minimum	14.30	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.	21.20 (D) 21.10 (R) Minimum	21.9	Yes	
d)	Maximum transmission oil temperature, (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	88	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%	16.67 (D)	16.63	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.	13.24 (D) 6.21 (R) Minimum	11.32	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	05	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)	6.96	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.01	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	160 to 231	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)	82	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)	89	Yes
	2)	Right foot rest				87	Yes
	3)	Seat (with driver seated)				85	Yes
	4)	Steering wheel				176	No
17.1.7	Air cleaner:						
	Maximum air cleaner oil pull over, (%)	Evaluative	0.25 (Max.)	Dry type air cleaner fitted		Not applicable	
17.1.8	Haulage requirements:						
a)	Gross mass of the trailers, (tonne):						
	Two wheel	Non Evaluative	As specified by the manufacturer	6.0 (D)	6.0	Yes	
Four wheel	Non Evaluative	8.0 (D)		8.0	Yes		
b)	Distance travelled / liter of fuel consumption, (km/l):						
	Two wheel	Non Evaluative	As specified by the manufacturer	5.0 to 6.0 (D)	5.67 to 5.91	Yes	
Four wheel	Non Evaluative	5.0 to 6.0 (D)		5.24 to 5.44	Yes		
c)	Fuel consumption, (ml/km/tonne):						
	Two wheel	Non Evaluative	As specified by the manufacturer	30 to 35 (D)	28.21 to 29.42	Yes	
Four wheel	Non Evaluative	25 to 30 (D)		22.97 to 23.88	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 observed	Yes
	1)	Clutch assembly	-do-				
	2)	Brake housings	-do-				
	3)	Front axle hubs	-do-				
	4)	Engine Oil	-do-				
5)	Transmission Oil	-do-					
17.1.10	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)	Meets the requirement		Yes	
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	12.69 kmph (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. 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.		MAHINDRA	Yes
2)	Model	Evaluative			YUVO TECH+ 405 DI	Yes
3)	Month & Year of manufacture	Evaluative			10/21	Yes
4)	Engine number	Evaluative		MM YY	NMG7KAE0076	Yes
5)	Chassis number	Evaluative			MBNPFAFBEMNG00385	Yes
6)	Maximum PTO power, (kW)	Evaluative			26.5	Yes
7)	Specific fuel consumption ,g/kWh	Evaluative			242	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	98.422	98.002 to to 98.023	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.50	0.100 to 0.103	Yes
(c)	Piston diameter at skirt, (mm)	Non Evaluative		97.600	97.919 to 97.923	Yes
d)	Ring end gap (mm):					
-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	1.0	0.35 to 0.40	Yes
-	2 nd comp. ring.			2.0	0.95	Yes
-	Oil ring.			1.0	0.20 to 0.25	Yes
(e)	Ring groove clearance (mm):					
-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	2.6	--Tapered--	--
-	2 nd comp. ring.			2.6	0.065 to 0.078	Yes
-	Oil ring.			2.0	0.031 to 0.040	Yes
(f)	Clearance of main bearings (mm):					
-	Diametrical clearance	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.60	0.053 to 0.097	Yes
-	Crankshaft end float	Evaluative		0.90	0.20	Yes
(g)	Clearance of big end bearings, (mm):					
-	Diametrical	Evaluative	-do-	0.40	0.057 to 0.072	Yes
-	Axial	Evaluative	-do-	0.75	0.15	Yes
(h)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.074	0.072 to 0.117	No
(i)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.235	0.035 to 0.047	Yes

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1	2	3	4	5	6	7
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	Not fitted		Not applicable

17.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2019):					
S. 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

17.3 Conformity with following IS:

- i) Guide lines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed in January, 2019)] : Conforms
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed in January, 2019)] : Conforms
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/ISO 730-1:1994 (Reaffirmed in 2017)] : Conforms
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed October, 2017)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –2021] : **Does not conform**

- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 : **Does not conform**
General requirements (first revision): [IS 12239 (PT-1)-2018 /ISO 4254-1:2018]
- vii) Tractors and machinery for agriculture and forestry – Technical : **Does not conform**
means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed in January, 2019)]
- viii) Guide lines for location and operation of operator controls on : **Does not conform**
agricultural tractors and machinery (first revision) IS: 8133- 2021
- ix) Tractors and machinery for agriculture and forestry, powered lawn : **Conforms**
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 in January, 2019)]
- x) Agricultural Tractors and Machinery - Lighting device for travel on : **Conforms**
public roads (IS: 14683-1999) (Reaffirmed in January, 2019)]

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 Mechanical Vibration

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-9 of this test report is on higher side especially at especially on steering wheel. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.2 Operator's seat:

- i) Vertical distance from SIP to centre of accelerator pedal has been measured as 485 mm against the requirement of 230 to 460 mm.
- ii) Vertical distance from SIP to centre of steering control wheel has been measured as 205 mm against the requirement of 265 to 385 mm.
- iii) Vertical distance of SIP from foot rest has been measured as 555 mm against the requirement of 450 to 520 mm.

Above parameters does not meet the requirement of IS: 12343-1998, (Re-affirmed in January, 2019). This should be looked into for necessary corrective action at production level.

17.4.1.3 Operator's work place:

- i) Vertical retainer has not been provided on inner side of clutch pedal.
- ii) Spark arresting device has not been provided in the exhaust system.

Above parameters does not meet the requirement of IS: 12239 (Part-I) 2018. This should be looked into for necessary corrective action at production level.

17.4.1.4 PTO master shield:

PTO master shield has not been provided on tractor. This should be looked into for necessary corrective action.

17.4.2 Haulage performance:

The applicant has recommended gross mass as 6.0 tonne during haulage test with 2 wheel trailer. So, haulage test was conducted with two wheel trailer having 6.0 tonne gross mass. The recommendation by applicant of 6.0 tonne gross mass of 2 wheel trailer is not in line with provision contained in clause 6.1.1 of IS: 8213-2000. This should be looked into for necessary corrective action.

17.5 Component/ assembly inspection:

The clearance between king pin and bush was recorded as 0.072 to 0.117 mm against the specified discard limit of 0.074 mm, which does not meet the non - evaluative requirement of IS: 12207-2019 with regard to tolerance. This should be looked into for necessary corrective action.

- 17.6 Recommendation with regard to safety on tractor:**
The following requirements, inter alia, may be considered for incorporation on the tractor:
- Provision of spark arrester in the exhaust system of tractor's engine as per IS: 12239 (Part-I) 2018.
 - Vertical retainer has not been provided on inner side of clutch pedal.
 - Spark arresting device has not been provided in the exhaust system.
 - Fuel shut-off knob does not remain in "STOP" position as per requirement of IS: 8133-2021.
 - The working clearance around draft control lever and RHS fender has been measured as 60 mm. This should be provided as per the requirement of IS: 12239 (Part-2) - 1999, (Reaffirmed in January, 2019).
 - Master shield on PTO shaft should be provided.

- 17.7 Specification**
- The model of tractor has been specified as "YUVO TECH+ 405 DI" vide specification sheet. Whereas, the same has been specified as "405 YUVO TECH+" vide P. No. 3-1 to 3-4 of Operator's manual.
 - The type of steering fitted on tractor is hydrostatic, and the optional fitment specified is "Mechanical (re-circulating ball & nut) steering" vide specification sheet. But, the same has been specified as Mechanical (re-circulating ball & nut) steering as the standard fitment on the tractor and Power steering as optional fitment vide page no. 3-2 of Operator's manual.
- Above observation should be looked into for necessary corrective action.

17.8 Adequacy of Literature supplied with machine:

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

- Operator Manual for "Mahindra Yuvo Tech+ 405 DI" tractor model.
- Parts catalogue for "Mahindra Yuvo Tech+ 405 DI" tractor model.
- Service manual for "Mahindra Yuvo Tech+ 405 DI" tractor model.

17.8.2 The operator manual may be brought out for the guidance of users and service personnel as per IS:8132-1999 incorporating, inter alia, the following:

- Safe hitch height while using four wheel trailer.
- Coolant water ratio.
- Recommended water ballasting mass for different operations.

TESTING AUTHORITY:

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

Draft test report compiled by: **Pramod Yadav**, Agricultural Engineer