

Application Reference No. 28/2022-23/40



Make of Agricultural Tractor : Mahindra
Model : 605 DI MS 4WD
Manufactured by : M/s. Mahindra & Mahindra Limited
(Farm Equipment Sector)
Mahindra Research Valley, Mahindra World City,
Plot no. 41/1, Anjur P.O., District Chengalpattu –
603004.



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)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) 466 445

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (M.P.) 466 445
(An ISO 9001:2015 Certified Institute)

**1. SPECIFICATIONS OF TRACTOR
[As Specified by the Applicant]**

1.1 Identification:**1.1.1 Denomination**

[C]	Make of tractor	:	Mahindra
[C]	Model (trade name)	:	605 DI MS 4WD
[C]	Type	:	Four Wheel Driven, Standard Agricultural Tractor.
[C]	Month & year of manufacture	:	03 & 22
[D]	Country of origin	:	India

1.1.2 Numbers:

[D]	1 st Serial No. or prototype	:	MBNWHBDWFNNM01001
[C]	Serial No.	:	MBNWHBDWFNNM01006

1.2 Engine:

[D]	Manufacturer's address	:	<ul style="list-style-type: none"> i) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Akurli Road, Kandivli (E), MUMBAI – 400 101 ii) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Hingna Road, Hingna MIDC, Nagpur– 440016 iii) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Agri Business Development Center, Khatima Panipat Highway, Udham Singh Nagar, Vil. Lalpur, Tehsil-Kichha, Rudrapur – 263 153 iv) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Agri Development Center, Vil-Mehla Tehsil - Dudu Jaipur- Ajmer Road, Jaipur– 303 007 v) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector), Near Bidar "T" Junction , Mahindra Nagar, Zaheerabad- 502 220 Medak District, Andhra Pradesh vi) M/s. Mahindra & Mahindra Limited (Farm Equipment Sector) Mahindra Research Valley, Mahindra World City, Plot no. 41/1, Anjur P.O., District Chengalpattu – 603004.
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[C]	Make	:	Mahindra
[C]	Model	:	Msi 450 3A
[D]	Type	:	Four stroke, naturally aspirated, liquid cooled, direct injection, diesel engine.
C]	Serial No.	:	NNL4WBE0005

1.2.1 Cylinders:

[C]	Number/disposition	:	Four, vertical, in-line
[D]	Bore / Stroke, (mm)	:	96/112
[D]	Capacity, cm ³	:	3532
[D]	Compression ratio	:	18.3 (±0.5): 1
[D]	Arrangement of valves	:	Overhead, inline
[D]	Cylinder liners	:	Wet, replaceable
[D]	Type of combustion chamber	:	Re-entrant cavity on piston crown

5. REPAIRS

- 5.1** During PTO performance, maximum power search test under natural ambient condition, the lube oil pressure of the engine was recorded as 1.9 kg/cm² at 2123 engine rpm and 2100 engine rpm (i.e. at rated engine speed), against the minimum permissible lubricating oil pressure of 2.04 kg/cm². Hence on the request of the applicant test was not carried out further
- 5.2** Upon which applicant vide letter No. FD/BVH/ICT/605MS4WD/22-23/07, dated 13.01.2023 has requested for inspection of oil leakage check in clutch housing, lubricating oil pump strainer clean & refit, lubricating oil filter replace, rocker arm stud check for any damage and correct accordingly, oil pressure sensor calibration, checking of pressure pipe, check for oil contamination and level to be maintained, which was allowed.
- 5.3** Applicant vide letter No. FD/BVH/ICT/605MS4WD/22-23/09, dated 20.01.2023 has requested for dismantling of engine lubrication oil pump (Part No. 006029256C91) and inspection as per parts catalogue, which was allowed and there found no defect in the lube oil pump. During inspection it was noticed that one of the cam bush (1st from radiator side) was rotating along with camshaft.
- 5.4** Applicant vide letter No. FD/BVH/ICT/605MS4WD/22-23/15, dated 03.03.2023 and letter No. FD/BVH/ICT/605MS4WD/22-23/16, dated 14.03.2023 has requested for dismantling of front axle support & timing gears, cylinder head, etc for removal of damaged parts, inspection and measurement of cam bush bore and replacement of BUSH BIMETALLIC (48.975 X 53.030 X 21.50) (Part No. 006002987c1) 01 No., CAMSHAFT (4 CYLINDER) (Part No. 000020127E05) 01 No (**Major Breakdown/defect – Mj6**) and GASKET CYLINDER HEAD (Part No. 006000798F2) 01 No. Applicant has also requested reaming operation on the bush after fitment to maintain 48.99 to 49.02 mm bush and running-in of engine for 30 minutes, which was allowed. After dismantling the front axle support of engine and timing gears, cam shaft was removed from the crankcase. It was noticed that the cam bush was seized on the camshaft and came out of cam bore, damaging cam bore due to abnormal wear on it.

6. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

- 6.1** 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: 12207-2022** 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: 12207-2022	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
6.1.1	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)	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	Non 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

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1	2	3	4	5	6	7	
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement		Yes	
g)	Swinging drawbar (wherever fitted)	Non Evaluative	Should meet the requirement of IS: 12362 (Part 3) (As amended from time to time)	Not provided		Not applicable	
h)	Audible warning signal on tractor	Evaluative	If tractor travel speed in reverse gear exceeds 20 kmph, an audible warning signal on tractor shall get activated. A sticker to the effect that "operating the tractor beyond 20 kmph speed in reverse gear is not safe" should be prominently displayed.	Provided (Max. travel speed in reverse gear is 30.59 kmph)		Yes	
6.1.2	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; width: 100px; text-align: center;"> <tr> <td style="width: 50px;">MM</td> <td style="width: 50px;">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		605 DI MS 4WD	Yes		
	3) Month & Year of manufacture	Evaluative		03 & 22	Yes		
	4) Engine number	Evaluative		NNL4WBE0005	Yes		
	5) Chassis number	Evaluative		MBNWHBDWFNNM01006	Yes		
	6) Maximum PTO power, (kW)	Evaluative		33.5	Yes		
	7) Specific fuel consumption, g/kWh	Evaluative	258	Yes			
6.1.3	Literature (Submission to test agency):						
(a)	Operator manual		Provided / Not Provided	Provided	Provided	Yes	
(b)	Parts Catalogue		Provided / Not Provided	Provided	Provided	Yes	
(c)	Workshop/Service manual		Provided / Not Provided	Provided	Provided	Yes	
6.1.4	Fitment of Roll Over Protective Structures (ROPS):						
	For tractor having more than 1150 mm rear track width	Evaluative if fitted	ROPS should meet the requirement of IS:11821 or OECD code or equivalent International Standard	Not fitted		Not applicable	
6.1.5	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor	Provided		Yes	
6.1.6	Accessories (optional)	Non Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR	Not fitted		Not applicable	

6.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2022):					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2022	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 of repetitive in nature	None	Yes
3.	Minor	Evaluative	Not more than five and neither of them should be of repetitive in nature	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

6.3 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 Year 2019)] : **Conforms**
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed Year 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 (Reaffirmed in 2022)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed Year 2022)] : **Conforms**
- v) Agricultural tractors- Operator’s seat technical requirement [IS12343 - 2021] : **Does not conform**
- vi) Guide for safety & comfort of operator of agricultural tractors:Part 1 General requirements (first revision):[IS 12239 (Part 1) - 2018] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (Part 2) 1999) (Reaffirmed Year 2019)] : **Does not conform**
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery [IS: 8133 - 2021] : **Does not conform**
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays Part2 Symbols for agricultural tractors and machinery [IS: 6283(Part-1) - 2006 (Reaffirmed Year 2019) and IS: 6283 (Part-2) – 2007 (Reaffirmed Year 2019)] : **Conforms**

6.4 Salient Observations:

6.4.1 Laboratory tests:

6.4.1.1 PTO performance test:

During PTO performance test, the lubricating oil pressure was observed as “1.9 kg/cm²” at 2123 rpm & 2100 rpm (rated engine speed), which is below the minimum permissible lubricating oil pressure declared as “2.04 kg/cm²” by the applicant. Applicant vide letter No. FD/BVH/ICT/605MS4WD/22-23/15, dated 03.03.2023 and letter No. FD/BVH/ICT/605MS4WD/22-23/16, dated 14.03.2023 has requested for dismantling of front axle support & timing gears, cylinder head, etc for removal of damaged parts, inspection and

measurement of cam bush bore and replacement of BUSH BIMETTALIC (48.975 X 53.030 X 21.50) (Part No. 006002987C1) 01 No., CAMSHAFT (4 CYLINDER) (Part No. 000020127E05) 01 No (Major Breakdown/defect – Mj6) and GASKET CYLINDER HEAD (Part No. 006000798F2) 01 No. Applicant has also requested for reaming operation on the bush after fitment to maintain 48.99 to 49.02 mm bush inner diameter and running-in of engine for 30 minutes, which was allowed. After dismantling the front axle support of engine and timing gears, cam shaft was removed from the crankcase. It was noticed that the cam bush was seized on the camshaft and came out of cam bore, damaging cam bore due to abnormal wear on it. Upon this Applicant vide letter No. FD/BVH/ICT/605MS4WD/22-23/17, dated 03.04.2023 has requested for replacement of ASSY-CRANKCASE-INLINE-4CYL-MASTER (Part No. 006015411C93) 01 No. (Critical Breakdown/defect – C9) with BUSH BIMETTALIC (48.975 X 53.030 X 21.50) (Part No. 006002987C1) 01 No. fitted in crankcase assembly from manufacturing plant. The applicant's request was examined in the light of IS: 12207 – 2022 and Test regulations, which do not permit replacement of complete "Crankcase assembly/Cylinder block". Hence the request of the applicant was not accepted.

Upon this, the firm has requested to withdraw the test sample from the test vide letter No. FD/BVH/ICT/605MS4WD/22-23/18 dated 10.04.2023, which was allowed. Hence, this withdrawn initial commercial test report is released as under.

6.4.1.2 Operator's seat:

The following parameters does not meet the requirement of IS: 12343 - 2021

- i) Vertical adjustment upward and downward from the mid position was measured as ± 28 mm, against the minimum requirement of 30 mm.
- i) Provision for adjustment of driver's mass has been specified as 50 to 120 kg against the requirement of 40 to 100 kg.
- ii) The vertical distance from SIP to centre of steering control wheel has been measured as 210 mm against the requirement of 265 to 385 mm.
This should be looked into for necessary corrective action.

6.4.1.3 Operator's work place:

The following parameters does not meet the requirement of IS: 12239 (Part-I) 2018.

- i) Vertical retainers on inner side of clutch pedal are not provided.
- ii) Spark arresting device has not been provided in the exhaust system.
This should be looked into for necessary corrective action.

6.4.1.4 Three point linkage:

The dimensions viz. diameter of hitch pin hole & width of ball of lower hitch points and lateral distance from lower hitch point to centre line of tractor does not meet the requirements of IS:4468 (Part-I) – 1997. This should be looked into for necessary corrective action.

6.4.1.5 Constructional requirement with regard to safety:

Meets the requirements of IS: 12239 (Part-II)-1996 (Re-affirmed in January, 2019), except the following:

- i) PTO master shield has not been provided.
This should be looked into for necessary corrective action.

6.5 Maintenance / Service Problems:

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

6.6 Recommendation with regard to safety on tractor:

- i) The engine stop control does not remain in stop position as per the requirement of IS: 8133-2021.
- ii) Identification of hand controls by colour code has not been provided for engine stop control & engine speed control as per the requirement as laid down in Table – 5 of IS: 8133-2021.
- iii) Engine stop control is located 335 mm from engine start control as against the requirement of within 150 mm as per IS: 8133-2021.
- iv) The hand accelerator lever, when moved away from the operator (i.e. forward) decreases the engine speed, which does not meet the requirement as laid down in Table – 1 of IS: 8133-2021.
- v) Master shield on PTO shaft should be provided.

Above parameters should be looked into for necessary corrective action.

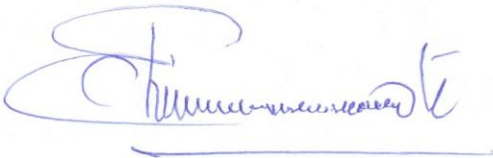

6.7 Adequacy of Literature supplied with machine:

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

- a) Operator manual for "Mahindra, 605 DI MS 4WD" tractor model.
- b) Parts catalogue for "Mahindra, 605 DI MS 4WD" tractor model.
- c) Service manual for "Mahindra, 605 DI MS 4WD" tractor model.

TEST CARRIED OUT AT C.F.M.T. & T.I., BUDNI (M.P.), INDIA

TESTING AUTHORITY

<p>C. V. CHIMOTE TEST ENGINEER</p>	
<p>A.K. UPADHYAY DIRECTOR(I/C)</p>	

Draft test report compiled by C. K. Tijare, Agricultural Engineer.

7. APPLICANT'S COMMENTS

Para no.	Our reference	Comments
7.1	6.4.1.1	We acknowledge the reported concern. We already have manufacturing quality process checks in place for machining, assembly and at functional testing related to cam bush. However, this reported observations needs further investigation in detail to conclude the root cause. Once, we get back the reported test tractor, we will analyze the failure mode in detail and necessary corrective action will be implemented in the production.

ANNEXURE-I**TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	Applicant has declared it to be conducted on their work place.
2.	PTO performance test	0.7
3.	Nominal speed test	6.5
B.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	0.8
TOTAL:		8.0