

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Variant)

संख्या / No. : T-1042/1567/2016
माह / Month : October, 2016



**MAHINDRA, 605 DI i 4WD S+ Tractor
(Brand Name : Arjun Novo)**



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

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3. ESSENTIAL TESTS

3.1. SPECIFICATIONS

	<u>Base Model</u>	<u>Variant Model</u>
3.1.1 Tractor:		
Make	: Mahindra	Mahindra
Model	: 605 DI PS	605 DI i 4WD S +
Brand name, if any	: Arjun Novo	Arjun Novo
Type	: Four wheeled, Rear wheel driven (2WD), General purpose, Agricultural tractor.	Four wheel, Four wheel drive (4WD), General Purpose, Agricultural Tractor
Year of manufacture	: 2014	CF (i.e. June, 2015)
Chassis number	: N9MB 00002	N84J 00004
Country of Origin	: India	India
3.1.2 Engine:		
Make	: Mahindra	Mahindra
Model	: MSI 452 3A	MSI 457 3A
Type	: Four strokes, liquid cooled, direct injection, natural aspirated, diesel engine.	
Serial number	: N9MB 00002	N84J 00004
Engine speed (Manufacturer's recommended production setting)(rpm) :		
- Maximum speed at no load	: 2400 to 2500	2400 to 2500
- Low idle speed	: 750 to 850	750 to 850
- Speed at maximum torque	: 1100 to 1300	1100 to 1300
Rated speed, (rpm):		
- For PTO use	: 2100	2100
- For drawbar use	: 2100	2100
3.1.3 Cylinder & Cylinder Head:		
Number	: Four	Four
Disposition	: Vertical, Inline	Vertical, Inline
Bore/stroke, (mm)	: 96/122	96/122
Capacity as specified by the applicant, (cc)	: 3532	3532
Compression ratio, (apa)	: 18.3 (± 0.5) : 1	18.3 (± 0.5) : 1
Type of cylinder head	: Monoblock	Monoblock
Type of cylinder liners	: Wet, replaceable	Wet, replaceable
Type of combustion chamber	: Re-entrant bowl cavity on piston head	Re-entrant bowl cavity on piston head
Arrangement of valves	: Overhead, inline	Overhead, inline
Valve clearance (cold/hot):		
- Inlet valve, (mm)	: 0.3 / 0.4	0.3 / 0.4
- Exhaust valve, (mm)	: 0.3 / 0.4	0.4 / 0.5
3.1.4 Fuel System:		
Type of fuel feed system	: Gravity and forced feed	
3.1.4.1 Fuel tank:		
Capacity, (l)	: 65.0	65.0 (apa)
Location	: Above clutch housing	
Provision for draining of sediments/ water	: Provided	
Material of fuel tank	: Metallic	



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1	2	3	4	5	6
	m)	Front towing hitch	Not provided	Various configuration in base & variant models (refer para 3.1.15.1).	Changed
	n)	Min. & Max. height of rear towing hitch, (mm)	735 & 460	760 & 480	Changed
	o)	Front wheel:	Various configuration in base & variant models (refer para 3.18.1).		Changed
	p)	Rear wheel:	Various configuration in base & variant models (refer para 3.18.2).		Changed
	q)	Front differential			
		Type	NA	Crown wheel & bevel pinion	Changed
	r)	Reduction through crown wheel and bevel pinion	NA	2.85:1 (37/17T)	Changed
	s)	Front final drive			
		Type	NA	Epicyclic	Changed
		Reduction through final drive	NA	6.0:1 (Sun - 12T, Planet - 23T & Ring - 60T)	Changed
		Sheet metal:			
		Style of bonnet & Fender			
	t)	- Colour	Red	Red	No change
		-Decals (Sticker)	Mahindra 605 DI PS (Arjun Novo)	Mahindra 605 DI i 4WD S+ (Arjun Novo)	Changed
	u)	Unballasted mass of tractor, (kg)	2540	2795	Changed

7. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

On the basis of test conducted the performance results have been summarized as evaluative (mandatory) and non - evaluative (not mandatory) parameters applicable for qualifying Minimum Performance Criteria as per clause-4 table-1 of Indian Standard 12207: 2014 for acceptance of tractor for the purpose of subsidies/NABARD financing for the applicable features for this tractor model.

7.1 Evaluative & Non Evaluative Parameters:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant/ requirement		As observed		Whether Variant model meets the requirements (Yes/No)
				Base model	Variant Model	Base model	Variant model	
1	2	3	4	5 a	5 b	6 a	6 b	7
7.1.1	PTO Performance :							
a)	- Max. 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	33.5	37.5	33.7	37.8	Yes

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1	2	3	4	5 a	5 b	6 a	6 b	7
b)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	251	251	246	241	Yes
7.1.2 Drawbar performance :								
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	21.8 (R) Minimum 22.0 (D)	21.5 (R) Minimum 24.3 (D)	27.36	31.55	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast as the case may be.	16.20 (R) Minimum 16.0 (D)	17.82 (R) Minimum 17.76 (D)	19.94	25.60	Yes
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in Sl No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg. Minimum 75 % of PTO power as referred in Sl 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 Sl No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	27.0 (R) Minimum 26.8 (D)	30.2 (R) Minimum 30.0 (D)	27.7	31.4	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110	110	80	89	Yes
7.1.3 Noise measurement:								
a)	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	88 (R)	88 (R)	85	83	Yes
b)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	96 (R)	96 (R)	93	93	Yes



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1	2	3	4	5 a	5 b	6 a	6 b	7
7.1.4	Labelling of tractors (Provision of labeling plate):							
1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Mahindra			Yes
2)	Model	Evaluative		--	605 DI i 4WD S+			Yes
3)	Year of manufacture	Evaluative		--	CF (i.e June, 2015)			Yes
4)	Engine number	Evaluative		--	N 84 J 0000 4			Yes
5)	Chassis number	Evaluative		--	N 84 J 0000 4			Yes
6)	Declaration of PTO power, kW	Evaluative		--	37.5			Yes
7.1.5	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	Provided	Provided			Yes
(c)	Workshop/Service manual	Evaluative	Provided/Not Provided	Provided	Provided			Yes

7.2 Salient Observations:

7.2.1 Laboratory tests:

7.2.1.1 PTO Performance:

- i) The maximum PTO power was observed as **37.8 kW** against the declaration of **37.5 kW** which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **241 g/kWh** against the declaration of **251 g/kWh**, which is within the tolerance limit of IS: 12207-2014.

7.2.1.2 Drawbar performance:

- i) The creeping of RHS tyre of front wheel over rim was recorded as 05 mm during 10 hours drawbar performance test. This should be looked into for necessary corrective action.

7.2.1.3 Nominal speed:

The maximum nominal speed of the tractor was recorded as **32.09 kmph** in high reverse gear (HR5), which is very close to the maximum forward speed recorded as **33.56 kmph** in H5 gear. The speed recorded in reverse gear HR5 is not safe as far as the reversing of the tractor is concerned. This should be looked into for necessary corrective action.

7.2.1.4 Three point linkage:

The parameter width of ball & lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS 4468 (Part-I): 1997. Some of the parameters of three point linkages meet to the Cat.I and some of Cat. II of IS 4468 (Part-I): 1997. This should be looked into for necessary corrective action.

7.2.1.5 Linkage Drawbar:

The parameter $D\emptyset$ (Refer Fig.1) does not meet the requirement of IS: 12953:1990. (Reaffirm in 2000). This should be looked into for necessary corrective action.


7.2.1.6 Specifications of Power Take-off Master Shield:

The parameter N, Refer Fig.2 (b) of PTO master shield does not meet the requirement of IS: 4931:1995. This should be looked into for compliance.

7.2.1.7 Operator's Seat:

- i) Inclination of seat towards rear direction (degree)
 - ii) Longitudinal distance from seat index point to centre of differential lock pedal.
 - iii) Longitudinal distance from seat index point to centre of steering control wheel
- The above point i), ii) & iii) does not meet the requirements of IS: 12343:1998 (Re-affirmed in March, 2009) and calls for necessary corrective action.

7.3 Labelling Plate of tractor:

The tractor chassis number and engine serial number are punched same, which does not meet the requirement of AIS: 117- 2011. This should be looked into for necessary corrective action.

7.4 Maintenance / Service Problems:

Problem was faced during dismantling of transmission system.

7.5 Recommendation with regard to safety on tractor:

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

- i) Inclination of operator's seat towards rear direction (degree) should be within the limit for human comfort while operating the tractor.
- ii) Longitudinal distance from seat index point to centre of differential lock pedal should be within the limit for easy handling of tractor.
- iii) Longitudinal distance from seat index point to centre of steering control wheel should be within the limit for easy handling of tractor.
- iv) The spark arrester has not been provided in the exhaust system.
- v) Rear wheels should be fully covered to prevent the accident while seating on the tractor
- vi) Grease lubricant frequency and oil lubricant, type & frequency scheduling chart should be pasted on tractor for time to time servicing and maintenance.
- vii) The stop control knob should remain in stop position after pulling it to prevent the accident against start of the tractor.
- viii) The working clearance around the various control lever should be sufficient for safely operating.
- ix) Coupling to attach trailer brakes should be provided.

7.6 Adequacy of Literature supplied with machine:

7.6.1 The following literature has been supplied with the tractor

- a) Service Manual of **MAHINDRA 605 DI i 4WD S + (Brand Name: Arjun Novo)** tractor.
- b) Parts Catalogue of **MAHINDRA 605 DI i 4WD S + (Brand Name: Arjun Novo)** tractor.
- c) Operator's manual of **MAHINDRA 605 DI i 4WD & CABIN (Brand Name: Arjun Novo)** tractor.

- 7.6.2**
- i) The supplied literature was found adequate, however, the servicing schedule of various systems time to time specified on operator's manual and specifications data provided by applicant does not match to each other.
 - ii) It is therefore, recommended that following literature may be brought out as per IS: 8132-1999 (Reaffirmed in March, 2009) for the guidance of users and service personnel in national as well as regional languages for this model of tractor.



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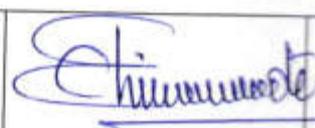
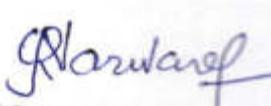
**MAHINDRA, 605 DI i 4WD S+ TRACTOR
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The results of the tests carried out on variant model "MAHINDRA 605 DI i 4WD S +" Tractor have been compared with those on base model "MAHINDRA 605 DI PS" Tractor and found within the limit, as specified in Indian Standard: 12207-2014.

8. CITIZEN CHARTER

Duration of Test	Time frame for Testing & Evaluation as per Citizen Charter	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
6 Month (April , 2016 to September, 2016)	10 Months	Yes	None

TESTING AUTHORITY:

 RAJNEESH PATEL AGRICULTURAL ENGINEER	 C.V CHIMOTE TEST ENGINEER	 Y.K RAO SENIOR AGRICULTURAL ENGINEER
 J.J.R. NARWARE DIRECTOR		

The report compiled by: Shri **Rajneesh Patel**, Agricultural Engineer.

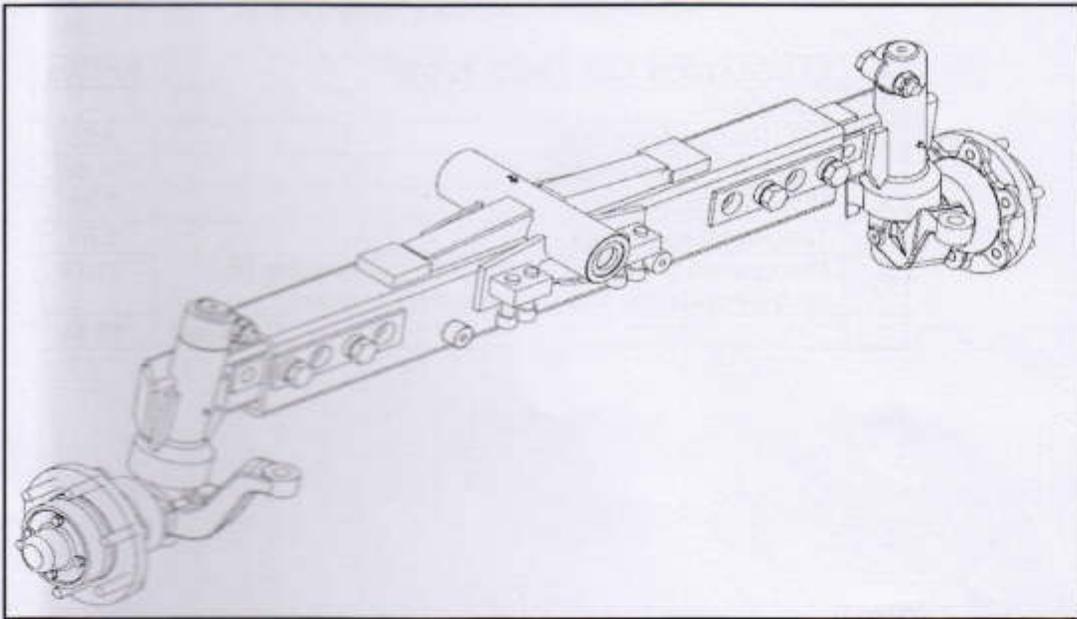
9. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
9.1	7.2.1.2, 7.2.1.4, 7.2.1.5, 7.2.1.6, 7.2.1.7, 7.4 (iv, vi, vii, viii, ix) & 7.5.2 (i & ii)	Observations will be studied and necessary action will be incorporated.
9.2	7.3	We have studied your valuable suggestion and initiated the process for implementation of 17 digits Chassis number as per AIS: 117-2011 & 11 digits Engine serial numbering system on Mahindra Tractor models.
9.3	7.4	Forward - Reverse synchro shuttle assembly was dismantled without proper tools. However, after arrangement of proper tools, it was assembled efficiently.

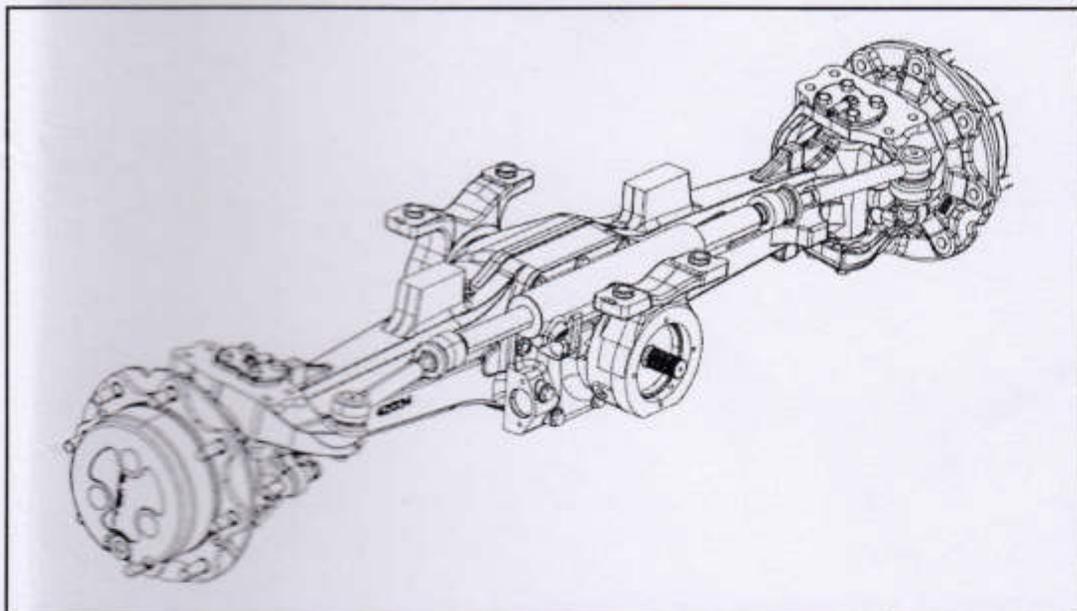


ANNEXURE-I

FRONT AXLE DESIGN ON BASE MODEL MAHINDRA 605 DI PS TRACTOR
(Brand Name: Arjun Novo)



FRONT AXLE DESIGN ON VARIANT MODEL MAHINDRA 605 DI i 4WD S+ TRACTOR
(Brand Name: Arjun Novo)





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MAHINDRA, 605 DI i 4WD S+ TRACTOR
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A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running -in	--
2.	PTO Performance Test	3.56
3.	Drawbar Performance Test	21.66
4.	Noise Measurement	2.33
5.	Theoretical speed test	3.59
B.	Miscellaneous test and other run hours, including idle run transportation, trial and preparation for test.	31.14
	Total	33.46