



MAHINDRA, 605 DI R TRACTOR

(Brand Name : Arjun Novo)



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)
Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

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1. SPECIFICATIONS

1.1 Tractor:

Make	: Mahindra
Model	: 605 DI R
Brand Name	: Arjun Novo
Variants, if any	: Not announced
Type	: Four wheeled, rear-wheel driven, General Purpose Agricultural Tractor.
Year of manufacture	: 2013
Chassis serial number	: NAMB 00001
Country of origin	: India

1.2 Engine:

Make	: Mahindra
Model	: MS457 3A
Type	: Four strokes, Turbo charged with intercooler, liquid cooled, direct injection, diesel engine.
Serial number	: NAMB 00001

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

- Maximum speed at no load	: 2150 to 2250
- Low idle speed	: 800 to 900
- Speed at maximum torque	: 1100 to 1300

Rated speed, (rpm):

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

1.3 Cylinder & Cylinder Head:

Number	: Four
Disposition	: Vertical, Inline
Bore/stroke, (mm)	: 96/122
Capacity as specified by the applicant, (cc)	: 3531
Compression ratio	: 18.3 ± 0.5 : 1
Type of cylinder head	: Monoblock
Type of cylinder liners	: Wet, replaceable
Type of combustion chamber	: Re-entrant bowl cavity on piston top
Arrangement of valves	: Overhead, inline
Valve clearance (cold):	Cold Hot
- Inlet valve, (mm)	0.3 0.4
- Exhaust valve, (mm)	: 0.3 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)	: 66.0
Location	: Above clutch housing
Provision for draining of sediments/ water	: Provided
Material of fuel tank	: Polymer

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15. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments/Defects/Breakdowns and Repairs	Tractor run hours
		27.75
1.	During drawbar performance test, water leakage was observed from the radiator and hence leakage was checked by welding the leakage passage this defects was categorised as minor defect as Mn4.	47.13
2.	During ten hour test @ 15% wheel slip in drawbar performance test, the rear RHS tyre was punctured and it was repaired, which is due to high creeping on tyre over rim.	

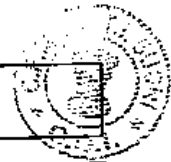
16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

16.1 Evaluative (mandatory) / Non-evaluative (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2008 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: 12207-2008	Values declared by the applicant (D) / Requirement (R)	As observed	Whether meets the requirements (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 >35hp. -7.5/+10% for PTO power ≤ 35 hp	37.51	37.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	37.51	37.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	251	244	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	241.3	236.9	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7% (R) 18(D)	32.94	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)	120	Yes
2)	Coolant	Evaluative	The declared value should not exceed the boiling temperature of the coolant under pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	112 (D)	101	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.44 (R)	0.133	Yes

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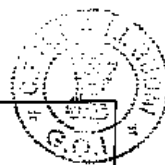


1	2	3	4	5	6	7
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per metre (R) 0.20 (D)	0.45	Yes
16.1.2 Drawbar performance :						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	21.86 (R) 22 (D)	32.88	Yes
b)	Max. drawbar pull with Unballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	16.25 (R) 16 (D)	22.12	Yes
c)	Maximum drawbar power with Unballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	29.8 (R) 30 (D)	32.3	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	86	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%]	21.5 (D)	19.3	No
	2) With the standard frame	Evaluative	The lift capacity should at least be 18 kg/PTO hp. and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	8.95 (R) (Minimum) 17.6 (D)	14.5	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	[Tolerance of plus 5 mm]	50 max (R) 250 (D)	50	Yes
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)	6.90	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)	126 to 133	Yes

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1	2	3	4	5	6	7
16.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	85	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	93	Yes
16.1.6	Amplitude of mechanical vibrations at :					
					70	Yes
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	70	Yes
2)	Right foot rest				70	Yes
3)	Seat (with driver seated)				70	Yes
4)	Steering Wheel				100	Yes
16.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):			5.0	5.0	Yes
1)	Two wheel	Non Evaluative	--	8.0	8.0	Yes
2)	Four wheel		--			
b)	Distance travelled / litre of fuel consumption, (km/l):			3 to 6	4.53 to 4.94	Yes
1)	Two wheel	Non Evaluative	--	3 to 6	3.83 to 3.90	Yes
2)	Four wheel		--			
c)	Fuel consumption (ml/km/tonne):			30 to 45	40.5 to 44.1	Yes
1)	Two wheel	Non Evaluative	--	30 to 45	32.1 to 32.7	Yes
2)	Four wheel		--			
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-				
16.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	As per CMVR	At present no requirements	Provided	--
b)	Lighting arrangement	Evaluative	As per CMVR		Provided	Yes



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1	2	3	4	5	6	7	
16.1.100	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		--	605 DI R	Yes
	3)	Year of manufacture	Evaluative		--	2013	
	4)	Engine number	Evaluative		--	NAMB 00001	Yes
	5)	Chassis number	Evaluative		--	NAMB 00001	Yes
	6)	Declaration of PTO power, (kW)	Evaluative		--	37.51	Yes
16.1.11	Discard limit for:				96.522	96.01 to 96.02	Yes
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	0.50	0.104 to 0.106	Yes	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative					
(c)	Ring end gap (mm):		-do-	2.5	0.95 to 1.00	Yes	
	- Top comp ring.	Evaluative	-do-	2.5	0.35 to 0.45	Yes	
	- 2 nd comp. ring.		-do-	2.0	0.35 to 0.45	Yes	
	- Oil ring.						
(d)	Ring groove clearance (mm):		-do-	Tapped	NA	...	
	- Top comp ring.	Evaluative	-do-	0.30	0.060 to 0.067	Yes	
	- 2 nd comp. ring.		-do-	0.25	0.045 to 0.054	Yes	
	- Oil ring.						
(e)	Clearance of main bearings (mm):			0.30	0.069 to 0.104	Yes	
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.90	0.15	Yes	
(f)	Clearance of big end bearings, (mm):			-do-	0.20	0.022 to 0.079	Yes
	- Diametrical	Evaluative	-do-	0.75	0.30	Yes	
	- Axial	Evaluative		0.20	0.069 to 0.104	Yes	
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-				
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.20	0.160 to 0.163	Yes	

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**16.1.12 CATEGORY OF BREAKDOWNS / DEFECTS :**

S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	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.	1	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.	1	Yes

16.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2008:

S. No.	Characteristic	Requirements as per IS: 12207-2008	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. If ROPS fitted it should meet the requirement of IS: 11821-1992	Provided	Yes
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	ROPS not fitted	Not applicable
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meet the requirements	No
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.	Meets the requirements	Yes
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Not provided	Not applicable
			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] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS : 12953:1990 (Reaffirmed in March, 2007)] : **Conforms**



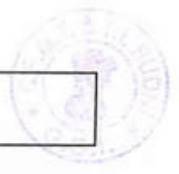
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16.1.12 CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No)
1.	Critical	Evaluative	No critical breakdown	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.	1	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.	1	Yes

16.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2008:				
S. No.	Characteristic	Requirements as per IS: 12207-2008	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. If ROPS fitted it should meet the requirement of IS: 11821-1992	Provided	Yes
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	ROPS not fitted	Not applicable
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meet the requirements	No
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.	Meets the requirements	Yes
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Not provided	Not applicable
			Front tow hook not provided	No

- 16.3
- i) **Conformity with following IS:**
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] : **Does not conform**
 - 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)] : **Does not conform**
- 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] : **Does not conform**
- 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)] : **Does not conform**
- 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 32.94 %.
- ii) The maximum power was observed as 37.3 kW against the declaration of 37.5 kW, which meet the requirement of IS:12207-2008 with regard to tolerance.
- iii) The specific fuel consumption corresponding to maximum power was measured as 0.244 g/kWh against the declaration of 251 g/kWh, which is within the tolerance limit of IS: 12207-2008.
- iv) The power drop of 6.7 % was recorded in high ambient condition as compared to natural ambient condition. It is considered on higher side and calls for necessary corrective action.

16.4.1.2 Drawbar performance:

- i) As manufacturer recommends only 878 kgs of ballasting at rear of the tractor and **Nil at front** so for stability point of view at higher pull requirement front ballasting may be recommended to overcome the situation of front lifting of tractor.
- ii) During ten hours drawbar test, creeping of LHS & RHS rear tyre over the rims was observed as 15 mm & 80 mm respectively. This should be looked into for necessary corrective action.

16.4.1.3 Hydraulic Performance:

- i) The moment about rear axle with standard frame was calculated as 22.48 kN-m. Whereas, the moment about front axle was calculated as 19.98 & 20.39 kN-m under Unballasted and ballasted condition respectively. The moment about rear axle is on higher side as compared to the moment about front axle even under ballasted condition. It is, therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or ballast recommendation may be reviewed to avoid the front lifting of the tractor.



- ii) Maximum lifting capacity throughout the range of lift, at Hitch points was declared as 21.5kN while it was measured as 19.3 kN which towards lower side and doesn't meet the requirement so it need corrective actions.
- iii) Cumulative drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 Minutes, was observed as 50 mm, which touches to the defined limit for it, this may look into for necessary corrective actions.

16.4.1.4 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.

16.4.1.5 Three point linkage:

Some of the parameters of three point linkage conforms to Cat.I and some of them conforms to Cat.II. Keeping in view the spirit of standardization, necessary improvement may be incorporated.

16.4.1.6 Specifications of Power Take-off Shaft:

- i) 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.

16.4.2 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 Maintenance / Service Problems:

Water leakage was observed from the radiator and hence leakage was checked by welding the leakage passage.

16.6 Recommendation with regard to safety on tractor:

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

- i) Provision for spark arresting device in exhaust system.
- ii) The working clearance between the draft control lever and the mudguard is 60 mm and hence does not meet the requirement of IS: 12239 (Part-2) – 1999.

16.7 Adequacy of Literature supplied with machine:

16.7.1 The following literature has been supplied with the tractor

- a) Service Manual for Mahindra, 605 DI R (Brand Name: Arjun Novo)tractor
- b) Parts Catalogue for Mahindra, 605 DI R (Brand Name: Arjun Novo)tractor
- c) Operator's manual Mahindra, 605 DI R (Brand Name: Arjun Novo)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
5 Months (May, 2013 to October, 2013)	10 Months	Yes	--

TESTING AUTHORITY:

P.K.VERMA
SENIOR AGRICULTURAL ENGINEER

C.R.LOHI
DIRECTOR

Report compiled by **Shri Nitesh Kumar Verma**, Senior Technical Assistant.

18. Applicant's Comments

Para No.	Our Reference	Applicant's comments
18.1	16.3 (iii), (v), (vi) & (vii), 16.4.1.1 (iv), 16.4.1.2 (i) & (ii), 16.4.1.3 (i), (ii), 16.4.1.4, 5 & 6, 16.5, 16.6 (i), (ii) & (iii)	Observations 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	M&M	Dashmesh
2.	Type	Mounted	Mounted
3.	No. of Disc/blades	Three	42, in 7 flanges
4.	Type of Disc/blades	Plain concave	Hatchet
5.	Size of bottoms/blades, (mm)	610	170 x 140 x 5
6.	Spacing of bottoms/flanges, (mm)	520	245
7.	Lower hitch point span, (mm)	855	870
8.	Mast height, (mm)	440	470
9.	Overall dimensions, (mm):		1150
	- Length	1890	1950
	- Width	1080	1040
	- Height	1070	490
10.	Gross mass, (kg)	365	