



**MAHINDRA, ARJUN 605 DI V2
(Brand Name : Ultra -1) TRACTOR**



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रौद्योगिकी 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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S. No.	Variant models*	Brand name , If any	Variant features
1.	Mahindra ARJUN 605 DI V2	Ultra 1 Dlx	RCR PTO, Dual clutch type, Oil immersed brake, Power steering

* The variant models have not been tested yet at this Institute.

- Type : Four wheeled, two wheel drive unit construction general purpose Agricultural Tractor.
- Year of manufacture : GB (October, 2011)
- Chassis serial number : NPA134
- Country of origin : India
- 1.2 Engine:**
- Make : Mahindra
- Model : NE457R3A
- Type : Four stroke, turbo charged , liquid cooled, direct injection, diesel engine.
- Serial number : NPA134
- 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 : 1300 to 1500
- Rated speed, (rpm):**
- For PTO use : 2000
- For drawbar use : 2000
- 1.3 Cylinder & Cylinder Head:**
- Number : Four
- Disposition : Vertical, Inline
- Bore/stroke, (mm) : 96/115
- Capacity as specified by the applicant, (cc) : 3329
- Compression ratio : 17.2 ± 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):**
- Inlet valve, (mm) : 0.30
- Exhaust valve, (mm) : 0.30
- 1.4 Fuel System:**
- Type of fuel feed system : Gravity and force feed
- 1.4.1 Fuel tank:**
- Capacity, (l) : 68.00
- Location : Above clutch housing
- Provision for draining of sediments/ water : Yes provided
- Material of fuel tank : Metallic



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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: 12207-2008 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	36.7 (D)	36.4	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	36.7 (D)	36.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	251 (D)	231	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	227.0 (D)	206.2	No
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7% (R)	20.4	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)	128	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.	112 (D)	101	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.33 (R) / 2.33 (D)	0.45	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)	1.74	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	21.45 (R) 21.33 (D)	27.79	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	15.14 (R) 15.02 (D)	20.73	Yes
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	28.1 (R) 29.4 (D)	32.2	Yes
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (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%]	16.18 (D)	15.41	Yes
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	11.28 (D) 8.74 (R) (Minimum)	11.50	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]	100 (D)	31	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)	7.10 to 7.17	Yes
2)	Hot brake	Evaluative	10	10 (R)	7.58	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	225 to 245	Yes
16.1.5 Noise measurement :						
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	94	Yes



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1	2	3	4	5	6	7	
16.1.6	Amplitude of mechanical vibrations at :						
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	100	Yes	
2)	Right foot rest				60	Yes	
3)	Seat (with driver seated)				140	No	
4)	Steering Wheel				60	Yes	
16.1.7	Haulage requirements :						
a)	Gross mass of the trailers, (tones):						
1)	Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes	
2)	Four wheel	Evaluative	--	7.0 (D)	7.0	Yes	
b)	Distance travelled / litre of fuel consumption, (km/l):						
1)	Two wheel	Non Evaluative	--	3.00 to 6.00 (D)	4.80 to 4.83	Yes	
2)	Four wheel			3.00 to 6.00 (D)	4.26 to 4.38	Yes	
c)	Fuel consumption (ml/km/tonne):						
1)	Two wheel	Non Evaluative	--	30.00 to 45.00 (D)	41.4 to 41.7	Yes	
2)	Four wheel			30.00 to 45.00 (D)	32.6 to 33.4	Yes	
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	
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		--	ARJUN 605 DI V2	Yes	
3)	Year of manufacture	Evaluative		--	2011 GB	Yes	
4)	Engine number	Evaluative		--	NPA 134	Yes	
5)	Chassis number	Evaluative		--	NPA 134	Yes	
6)	Declaration of PTO power, kW (hp)	Evaluative		--	36.7(49.21)	Yes	



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1	2	3	4	5	6	7	
16.1.11	Discard limit for:						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	96.522 (D)	96.0 to 96.01	Yes	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.50 (D)	0.114 to 0.118	Yes	
(c)	Ring end gap (mm):						
	- Top comp ring.	Evaluative	-do-	2.50	0.40 to 0.45	Yes	
	- 2 nd comp ring.			2.50	0.95 to 1.00	Yes	
	- Oil ring.			2.00	0.45 to 0.55	Yes	
(d)	Ring groove clearance (mm):						
	- Top comp ring.	Evaluative	-do-	Taper Ring 0.30	--	Yes	
	- 2 nd comp ring.			0.25	0.051 to 0.054	Yes	
	- Oil ring.						
(e)	Clearance of main bearings (mm):						
	- Diametrical clearance	Evaluative	To be specified by manufacturer	0.80	0.152 to 0.165	Yes	
	- Crankshaft end float	Evaluative		0.90	0.25	Yes	
(f)	Clearance of big end bearings, (mm):						
	- Diametrical	Evaluative	-do-	0.20	0.077 to 0.092	Yes	
	- Axial	Evaluative	-do-	0.75	0.15	Yes	
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.20	0.04 to 0.07	Yes	
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.21	0.09 to 0.10	Yes	
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.	Two (Mn 6)	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.	Two	Yes		



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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.	Provided	Yes
		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	Does not meet 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.	Provided	Yes

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)] : 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 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)] : 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] : **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



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- ix) Guide lines for location and operation of operator : Conforms controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009)]
- 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 backup torque was observed as 20.4%.
- ii) The specific fuel consumption corresponding to maximum power was measured as 231 g/kWh against the declaration of 251 g/kWh, which is within the tolerance limit of IS: 12207-2008.

16.4.1.2 Other Lab test :

- i) Leakage of engine oil was observed from clutch housing. The engine rear oil seal retainer Part No (000020524E05) and expansion plug (Part No 000020299E05) were found defective and were replaced with new one. This should be examined and improved at production level

- 16.4.1.3 Drawbar performance:**
During ten hours drawbar test, creeping of LHS & RHS rear tyre over the rims was observed as 45 mm & 145 mm respectively. This should be looked into for necessary corrective action.

- 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:**
- i) The width of ball for lower hitch point & the lateral distance of lower hitch point from center line of tractor does not meet the requirements of IS 4468 (Part-I):1997 this should be looked in to
- ii) 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 Labelling Plate:

- i) The engine and chassis serial number of the tractor were embossed/ punched same (NPA 134) at engine housing & labelling plate respectively.
The engine and chassis serial number of the tractor should be given separately for its noteworthy identification.
- ii) The model of tractor has been specified as "Arjun 605 DI V2 (Brand – Ultra1)" vide specification sheet. Whereas, the same has been specified as "Arjun 605 DI V2" vide labeling plate of the tractor.
- iii) The brand name of the tractor has been specified as "Ultra 1" vide specification sheet. Whereas, the same has not been mentioned on the labelling plate. It is, therefore, recommended that the brand name "Ultra 1" may be mentioned on the labeling plate of tractor for its noteworthy identification.



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MAHINDRA, ARJUN 605 DI V 2 TRACTOR
(Brand Name : Ultra-1) - Commercial (Initial)**16.4.2 Field Performance:****16.4.2.1 Dryland Operation:**

- i) The average area covered in disc ploughing operation with recommended size of plough was recorded in the range of 0.202 to 0.205 ha/h. Keeping in view the PTO power of the tractor, the area coverage is considered less, hence the recommended size of the plough may be reviewed.
- ii) The average fuel required to cover one hectare area was recorded in the range of 23.16 to 24.40 liters/ha; during disc ploughing operation with recommended size of plough. The fuel consumed in ploughing operation is considered very high and calls for necessary corrective action.

16.4.2.2 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 Component and assembly inspection

The backlash between crown wheel and pinion was observed 0.35 mm against the discard limit of 0.21 mm. This should be looked into corrective action.

16.6 Maintenance / Service Problems:

No noticeable maintenance or service problem was observed during the test. However, Suitable provision for draining of the sediments/water may be provided at the fuel tank.

16.7 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) Provision of suitable guard at exhaust silencer.
- iii) The working clearance between the parking brake lever and the mudguard is 50 mm and hence does not meet the requirement of IS: 12239 (Part-2) – 1999.

16.8 Adequacy of Literature supplied with machine:

- 16.8.1 The following literature has been supplied with the tractor
 - i) Operator's Manual (Arjun ultra-1 model tractors)
 - ii) Tractor's part's catalogue (Arjun ultra-1 model tractors)
 - iii) Service Manual (Arjun ultra-1 model tractors)

- 16.8.2 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.



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Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	9 Months (June 2012 to February, 2013)	Yes	None

TESTING AUTHORITY:

R.K. Nema
R. K. NEMA
AGRICULTURAL ENGINEER

P.K. Verma
P. K. VERMA
SENIOR AGRICULTURAL ENGINEER

C.R. Lohi
C.R. LOHI
DIRECTOR

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, 16.4.1.5, 16.5, 16.7(i,ii,iii)	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
		M&M	Green System
1.	Make	Mounted	Mounted
2.	Type	Three	42, in 9 flanges
3.	No. of Disc/blades	Plain concave	Hatchet
4.	Type of Disc/blades	610	170 x 140 x 5
5.	Size of bottoms/blades, (mm)	520	245
6.	Spacing of bottoms/flanges, (mm)	855	870
7.	Lower hitch point span, (mm)	440	470
8.	Mast height, (mm)		
9.	Overall dimensions, (mm):	1890	1150
	- Length	1080	1950
	- Width	1070	1040
	- Height	365	490
10.	Gross mass, (kg)		



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MAHINDRA, ARJUN 605 DI V 2 TRACTOR
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S. No.	Items	Specification
1.	Type	Full cage wheel
2.	Dia. (mm)	1210
3.	Width (mm)	900
4.	No. and type of lugs	24, straight lugs made up of MS angle section welded to angle iron frame.
5.	Size of angle section, (mm)	40 x 40 x 5
6.	Length of lugs, (mm)	444
7.	Spacing lugs, (mm)	290
8.	Weight of cage wheels (kg)	120

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

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	13.8
3.	Power lift and hydraulic pump performance test	4.9
4.	Drawbar performance test	18.0
5.	Turning ability	0.2
6.	Location of centre of gravity	0.2
7.	Operator's field of vision	0.1
8.	Brake test	1.5
9.	Noise measurement	1.6
10.	Mechanical vibration test	1.0
11.	Theoretical speed test	0.7
B.	FIELD TEST:	
1.	Disc ploughing	10.4
2.	Rotavation	10.2
3.	Puddling (including 5.0 hours water proof test)	15.2
C.	HAULAGE TEST:	8.8
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	9.4
	TOTAL:	96.0