



**INTERNATIONAL TRACTORS LIMITED, SONALIKA
INTERNATIONAL DI-745 III RX POWER PLUS 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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T-923/1440/2014

INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL
DI-745 III RX POWER PLUS TRACTOR- Commercial (Initial)

T-923/1440

Manufacturer : M/s. International Tractors Limited
Vill. Chak Gujran, P.O. Piplanwala,
Jalandhar Road,
HOSHIARPUR (Punjab) – 146 022

Test requested by (applicant) : The Manufacturer
Selected for test by : The Applicant
Place of running-in : At manufacturer's works

Duration of said running-in (h):
- Engine : 35
- Transmission : Nil

Method of Selection : The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

- 1.1 Tractor:**
Make : International Tractors Limited
Model : DI-745 III RX Power Plus
Variant, if any : No variant models declared by the manufacture
Type : Four wheeled, Rear wheel driven, general purpose, standard Agricultural Tractor.
Year of manufacture : 2013
Chassis number : AYBSV 337077S3
Country of Origin : India
- 1.2 Engine:**
Make : Sonalika
Model : 3102 IL (apa)
Type : Four stroke, naturally aspirated, water cooled, direct injection, diesel engine.
Serial number : 3102IL 33B334937F5
Engine speed (Manufacturer's recommended production setting)(rpm):
- Maximum speed at no load : 2200 to 2400
- Low idle speed : 650 to 750
- Speed at maximum torque : 1100 to 1300
Rated speed, (rpm):
- For PTO use : 2100
- For drawbar use : 2100
- 1.3 Cylinder & Cylinder Head:**
Number : Three
Disposition : Vertical, in-line
Bore/stroke, (mm) : 102 / 118
Capacity as specified by the applicant, (cc) : 2893
Compression ratio, (apa) : 18.5 (± 0.3) :1
Type of cylinder head : Individual, inline
Type of cylinder liners : Wet replaceable
Type of combustion chamber : Direct combustion, Re-entrant
Arrangement of valves : Overhead, Inline

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:

S. 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	30.52 (D)	31.8	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	30.52 (D)	31.8	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	272 (D)	251	No
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	168 (D)	172.19	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7 percent, min. (R)	18.90	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.	132 (D)	118	Yes
	2) Coolant (water)	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.	118 (D)	110	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.54 (max.)(R)	0.39	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 meter (R)	0.18	Yes

1	2	3	4	5	6	7	
16.1.2 Drawbar performance :							
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	16.63 (D) Minimum	20.31	Yes	
				16.22 (R) Minimum			
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	13.07 (D) Minimum	14.33	Yes	
				12.65 (R) Minimum			
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	24.41(D)	27.2	Yes	
				25.5 (R) Minimum			
d)	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	130 (D)	78	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%]	10.82 (D)	12.68	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	7.22 (D)	9.46	Yes
				7.53 (R) Minimum			
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 (D)	30	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)	7.26	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.36	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	248 to 296	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 (R)	Yes	Yes	

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)	86	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	91	Yes
16.1.6	Amplitude of mechanical vibrations at :					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	150	No
	2) Right foot rest			100 (R)	140	No
	3) Seat (with driver seated)			100 (R)	70	Yes
	4) Steering wheel			100 (R)	170	No
16.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	5.5 (D)	5.5	Yes
	2) Four wheel		--	6.0 (D)	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	4.5 to 6.0 (D)	5.25 to 5.38	Yes
	2) Four wheel		--	4.5 to 6.0 (D)	4.16 to 4.22	No
c)	Fuel consumption (ml/km/tonne):					
	1) Two wheel	Non Evaluative	--	28 to 38 (D)	33.79 to 34.62	Yes
	2) Four wheel		--	28 to 38 (D)	39.50 to 40.05	No
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 (R)	No ingress of water and/or mud was observed	Yes 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	Yes
b)	Lighting arrangement	Evaluative	As per CMVR	--	Provided	Yes

1	2	3	4	5	6	7
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	--	International Tractors Ltd.	Yes
	2) Model	Evaluative		--	Sonalika International DI-745 III RX Power plus	Yes
	3) Year of manufacture	Evaluative		--	2013	Yes
	4) Engine serial number	Evaluative		--	3102IL33B334937F5	Yes
	5) Chassis number	Evaluative		--	AYBSV337077S3	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	30.52 (40.92)	Yes
16.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	102.3 2	102.05 to 102.07	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45	0.148 to 0.158	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	2.00	0.6	Yes
	- 2 nd comp. ring.		-do-	2.00	0.9	Yes
	- Oil ring.		-do-	2.00	0.5	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	0.2	Taper rings	Not applicable
	- 2 nd comp. ring.		-do-	0.2	0.073 to 0.074	Yes
	- Oil ring.		-do-	0.2	0.086 to 0.088	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	-do-	0.40	0.054 to 0.065	Yes
	- Crankshaft end float	Evaluative	-do-	0.60	0.16	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.50	0.055 to 0.064	Yes
	- Axial	Evaluative	-do-	1.0	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.0	0.146 to 0.158	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	1.0	0.156 to 0.162	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.	None	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.	None	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	2	3	4	5
1	Air cleaner oil pull over, max. Oil pull over (%)	0.25% (max.)	--	--
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Does not meet the requirement	No
3.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	No
		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	Does not Meets the requirement	No
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meet the requirement	No
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meets the requirement	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 labelling 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 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, 2009)] : **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, 2007) /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 (Part-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) – 2006 (Reaffirmed in March, 2009) and IS: 6283 (Part-2)-2007 (Reaffirmed in March, 2009)] : **Does not conform**
- ix) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed in March, 2009)] : **Does not conform**
- x) Agricultural Tractors and 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 specific fuel consumption corresponding to maximum power was measured as **251 g/kWh** against the declaration of **272 g/kWh**, which does not meets the tolerance limit of IS: 12207-2008. This should look into for necessary corrective action.
- ii) The backup torque is 18.9 %.

16.4.1.2 Mechanical Vibration:

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

16.4.1.3 Three point linkage:

- i) Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position, the lateral distance from lower hitch point to centre line of tractor and Transport height (without force) does not meets the requirement of IS: 4468 (Part-1)-1997. This should be looked into for necessary corrective action.

16.4.1.4 Power take-off shaft

- i) The dimension 'dø' of PTO shaft does not meet the requirement of IS: 4931-1995. This should be improved on production level.

16.4.1.5 Drawbar performance

- i) The tyre creeping of the rear wheel of the tractor was observed as 45 and 70 on LHS and RHS during 10 hr test. This should be looked into.

16.4.1.6 Operator's Seat:

Inclination of seat towards rear direction does not meet the requirement of IS: 12343-1998. This should be looked into for necessary corrective action.

16.4.2 Wetland cultivation (pudding operation) :

The tractor meets the requirements of IS: 11082-1984 and is found suitable for wetland cultivation (puddling operation).

16.4.3 Haulage:

- i) Distance travelled per litre of fuel consumption(km/lit) and the specific fuel consumption (ml/km/tonne) with four wheel trailer was observed as 4.16 to 4.22 and 39.5 to 40.05 ml/km/tonne respectively against the declaration of 4.5 to 6.0 and 28 to 40 ml/km/tonne, which does not meet the requirements of IS: 12207-2008. This should look into for necessary corrective action.

16.5 General:

- i) The spring rates of inner spring of engine valve were observed as 2.06 to 2.35 N/mm against the discard limit of 2.12 N/mm. The Springs discarded and hence quality springs should be used in production level.
- ii) The make of tractor in technical file given as "Sonalika International"; however on labelling plate it is given as "International Tractors Limited". The given make of the tractor in both places are differed. This should be looked into.
- iii) The model of engine has not been punched /embossed on the engine block. It is, therefore, recommended that the separate engine model should be punched /embossed on the engine block.

16.6 Maintenance / Service Problems:

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

16.7 Recommendation with regard to safety on tractor:

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

- i) Provision of safety against accidental start of the engine.
- ii) Provision for spark arresting device in exhaust system.
- iii) Provision for retaining the fuel shut-off lever in "STOP" position.
- iv) The working clearance between the draft control lever and mudguard may be provided as per IS: 12239 (Part-2) – 1999.
- v) Provision of PTO shaft master shield.
- vi) Provision of adequate guards for hydraulic pipe line, alternator and its drive belt.
- vii) "Minimum cautionary notice "as per clause 11.2 above referred standard has not been provided.



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INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL
DI-745 III RX POWER PLUS TRACTOR- Commercial (Initial)

- 16.8 Adequacy of Literature supplied with machine:**
- 16.8.1** Following literatures were supplied after the course of testing against the offered comments of applicant.
- i) Operator's manual
 - ii) Service manual
 - iii) Spare part's catalogue
- 16.8.2** The technical specifications as PTO power, drawbar power, hydraulic power, haulage performance and requirement should be incorporated in the literature for user's use.
- 16.8.3** Details of all variant models and their features at a glance should be included in the operator's manual of the tractor.

17. CITIZEN CHARTER

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 (July, 2013 to April, 2013)	Yes	None

TESTING AUTHORITY:


PRADIPKUMAR C. MESHARAM
 AGRICULTURAL ENGINEER


P.K. VERMA
 SENIOR AGRICULTURAL ENGINEER


C. R. LOHI
 DIRECTOR