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व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Initial)

संख्या / No. : T-879/1393/2013
माह / Month : July, 2013



**INTERNATIONAL TRACTORS LIMITED, SONALIKA
INTERNATIONAL DI-60 MILEAGE MASTER TRACTOR**



सत्यमेव जयते

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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INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL
DI-60 MILEAGE MASTER TRACTOR- Commercial (Initial)

Manufacturer : M/s. International Tractors Limited,
Vill. Chack 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 : Sonalika International DI-60 Mileage Master
Variant, if any : None
Type : Four wheeled, Rear wheel driven, general
purpose agricultural Tractor.

Year of manufacture : 2012
Chassis number : KZRDD313916S3
Country of Origin : India

1.2 **Engine:**
Make : International Tractors Limited
Model : 3102IL (apa)
Type : Four stroke, naturally aspirated, water cooled,
direct injection, diesel engine.

Serial number : 3102IL23J313558F5

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) : 18.4 (± 0.2) :1
Type of cylinder head : Individual, inline
Type of cylinder liners : Wet replaceable
Type of combustion chamber : Re-entrant cavity on piston crown
Arrangement of valves : Overhead, Inline



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Valve clearance (cold / Hot) :
- Inlet valve, (mm) : 0.30 / 0.30
- Exhaust valve, (mm) : 0.40 / 0.40

1.4 **Fuel System:**
Type of fuel feed system : Gravity & force feed

1.4.1 **Fuel tank:**
Capacity, (l) : 54.0
Location : Above clutch housing
Provision for draining of sediments/
water : Drain plug provided.
Material of fuel tank : Metallic

1.4.2 **Water separator :**
Make : Hilux
Type : Inverted funnel centrifugal separation.
Location : On LHS of engine in between fuel tank & fuel
filter.

1.4.3 **Fuel feed pump:**
Make : Bosch, India
Type : Plunger
Model/Group combination No. : FP/KE 22AD 48/2, 9 440 030 011
Provision of sediment bowl : Provided (Metallic)
Method of drive : Through cam shaft of fuel injection pump.

1.4.4 **Fuel filters:**
Make : Bosch, India
Model/Group combination No. : F002 H20 109
Number : Two

Type of elements:
- Primary : Cloth
- Secondary : Paper
Capacity of final stage filter, (l) : 0.30

1.4.5 **Fuel Injection pump:**
Make : Bosch, India
Model/Group combination No. : F002 AOZ 510, PES3A90D320RS3500
Type : Inline, Plunger
Serial number : 20936675
Method of drive : Through timing gears

1.4.6 **Fuel injectors:**
Make : Bosch, India
Holder Number : F 002 C70 552
Nozzle Number : DSLA 148 P 1568
Type : Multiholes (Five holes)
Manufacturer's production pressure
setting, (MPa) : 25.0 to 25.8
Injection timing : 12 ± 2 degree before TDC
Firing order : 1 – 3 – 2



17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 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
17.1.1 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)	31.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	30.52 (D)	31.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	272 (D)	249	No
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	190 (D)	172.8	No
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7 percent, min. (R)	21.3	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)	107	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)	91	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.48 (R)	0.59	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)	0.22	Yes



1	2	3	4	5	6	7
17.1.2 Drawbar performance :						
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	15.83 (D) 15.52 (R) Minimum	19.66	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	12.88 (D) 12.56 (R) Minimum	14.86	Yes
c)	Maximum drawbar power without ballast, (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	24.42 (D) 25.04 (R) Minimum	28.1	Yes
d)	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	130 (D)	61	Yes
17.1.3 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%]	10.80 (D)	13.27	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	7.40 (D) 7.41 (R) Minimum	12.97	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 (D)	0	Yes
17.1.4 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)	8.23	Yes
2)	Hot brake	Evaluative	10	10 (R)	8.27	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	249 to 304	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
17.1.5	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
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	170	No
2)	Right foot rest			100 (R)	160	No
3)	Seat (with driver seated)			100 (R)	80	Yes
4)	Steering wheel			100 (R)	80	Yes
17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
1)	Two wheel	Non Evaluative	--	4.5 (D)	4.5	Yes
2)	Four wheel	Evaluative	--	5.5 (D)	5.5	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	5.00 to 6.50 (D)	5.29 to 5.47	Yes
2)	Four wheel	Evaluative	--	5.00 to 6.50 (D)	4.56 to 4.90	Yes
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	28 to 38 (D)	40.63 to 41.98	No
2)	Four wheel	Evaluative	--	28 to 38 (D)	37.09 to 39.84	No
17.1.8	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
1)	Clutch assembly	-do-				Yes
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
17.1.9	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
17.1.10	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-60 Mileage Master	Yes
3)	Year of manufacture	Evaluative		--	2012	Yes
4)	Engine serial number	Evaluative		--	3102IL23J313558F5	Yes
5)	Chassis number	Evaluative		--	KZRDD313916S3	Yes
6)	Declaration of PTO power, (kW)	Evaluative		--	30.52	Yes
7.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	102.346	102.04 to 102.06	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45	0.145 to 0.162	Yes
(c)	Ring end gap (mm):					
	-do-			2.00	0.45 to 0.50	Yes
	- Top comp. ring.	Evaluative		2.00	0.60 to 0.70	Yes
	- 2 nd comp. ring.			2.00	0.40 to 0.45	Yes
	- Oil ring.					
(d)	Ring groove clearance (mm):					
	-do-			0.20	Taper rings	--
	- Top comp. ring.	Evaluative		0.20	0.080 to 0.090	Yes
	- 2 nd comp. ring.			0.20	0.042 to 0.056	Yes
	- Oil ring.					
(e)	Clearance of main bearings (mm):					
	-do-			0.40	0.045 to 0.085	Yes
	- Diametrical clearance	Evaluative		0.60	0.22	Yes
	- Crankshaft end float	Evaluative				
(f)	Clearance of big end bearings, (mm):					
	-do-			0.50	0.052 to 0.088	Yes
	- Diametrical	Evaluative		1.00	0.40	Yes
	- Axial	Evaluative				
(g)	Clearance between king pin and bush, (mm)	Non Evaluative		1.00	0.081 to 0.118	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative		1.00	0.105 to 0.152	Yes



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17.1.12 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

17.2 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.)	0.17	Yes
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. If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	--
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	ROPS not fitted	--
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Meets the requirement	Yes
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.	Meets the requirement	Yes
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Not provided	Not applicable
			Provided	Yes

17.3 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)] : Conforms



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- iv) Drawbar for agricultural tractors – Link type [IS : 12953:1990 (Reaffirmed in March, 2007)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement (First revision) [IS 12343:1998 (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 (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)-2006 (Reaffirmed in March, 2009) and IS:6283 (Part-2)-2007 (Reaffirmed in March, 2009)] : Does not conform
- 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

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO Performance:

- i) The specific fuel consumption corresponding to maximum power was measured as 249 g/kWh against the declaration of 272 g/kWh, which does not meet the tolerance limit of IS: 12207-2008. This should look into for necessary corrective action.
- ii) The maximum equivalent crankshaft torque was recorded as 172.8 Nm against the declaration of 190 Nm, which does not meet the requirement of IS: 12207-2008 in respect of tolerance. This should look into for necessary corrective action.

17.4.1.2 Drawbar performance

During drawbar performance test, rear tyre creeping was observed as 25 & 35 mm for LHS and RHS tyres respectively which is on higher side and calls for necessary corrective action.

17.4.1.3 Hydraulic Performance:

The maximum angle of mast of lift from vertical was observed as 5.0 degrees only against the requirement of minimum 10.0 degrees and which does not meet the requirement of IS: 12224-1987. This should look into for necessary corrective action.

17.4.1.4 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.



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INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL
DI-60 MILEAGE MASTER TRACTOR- Commercial (Initial)**17.4.1.5 Three point linkage:**

- i) The diameter of hitch pin hole of upper hitch points & lateral distance from lower hitch point to center line of tractor does not meet the requirements of IS: 4468(Part I)-1997. This should be looked into for necessary corrective action.
- ii) Some of the parameters of the three point linkage conform to Cat. I and some of them conform to Cat.II. Keeping in view of the spirit of standardization, the necessary improvements may be incorporated.

17.4.1.6 Linkage drawbar:

- i) The dimension "A" & "B" of the linkage drawbar does not meet the requirements of IS: 12953-1990. This should be looked into for necessary corrective action.
- ii) Some of the parameters of linkage drawbar conform to Cat. I and some of them conform to Cat.II. In view of the spirit of standardization, necessary improvements may be incorporated.

17.4.1.7 Operator's Seat:

Width of Operator's seat does not meet the requirements of IS: 12343:1998 and calls for necessary corrective action.

17.4.1.8 Symbols of operator's control and other displays:

The oil lubricant type & frequency and amber zone of water temperature gauge are not identifiable with the symbols as per IS: 6283 (Part-2)-2007. This needs to be looked into.

17.4.2 Wetland operation (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 operation (Puddling)). The tractor is suitable for wetland operation.

17.4.3 Haulage performance:

The specific fuel consumption (ml/km/tonne) with two wheel and four wheel trailer was observed as 40.63 to 41.98 and 37.09 to 39.84 ml/km/tonne against the declaration of 30 to 40 ml/km/tonne, which does not meet the requirements of IS: 12207-2008. This should look into for necessary corrective action.

17.4.4 Wear assessment and final inspection:

During wear assessment and final inspection, overall thickness of brake disc after test was observed as 4.81 to 4.89 mm. Whereas, the initial thickness of brake disc has been specified as '13+0.5 mm' vide specification sheet. From the above, it may be seen that the wear of brake disc was 62% to 63% over the initial specified thickness of 13.0 mm and which was considered on higher side. This should be looked into for necessary corrective action.

17.5 Maintenance / Service Problems:

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

17.6 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.
- v) Provision of PTO shaft master shield.
- vi) Differential lock may be provided.



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INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL
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The following literature has been supplied with the tractor (For Sonalika International DI-60 Mileage Master tractors).

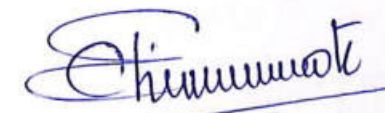
- i) Operator's manual (For Sonalika International DI-60 Mileage Master tractors).
- ii) Service manual (For Sonalika International DI-60 Mileage Master tractors).
- iii) Spare part's catalogue (For Sonalika International DI-60 Mileage Master tractors).

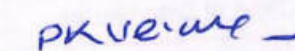
17.7.1 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

18. 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	6 Months (December, 2012 to June, 2013)	Yes	None

TESTING AUTHORITY:


C. V. CHIMOTE
TEST ENGINEER


P. K. VERMA
SENIOR AGRICULTURAL ENGINEER


C.R. LOHI
DIRECTOR

Test Report compiled by: Shri. Pramod Yadav, Senior Technical Assistant.