



**INTERNATIONAL TRACTORS LIMITED,
SONALIKA INTERNATIONAL DI-740 III CM SERIES TRACTOR**



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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T-871/1385/2013

INTERNATIONAL TRACTORS LIMITED, SONALIKA INTERNATIONAL DI-740 III CM SERIES TRACTOR- Commercial (Initial)

Manufacturer : M/s. International Tractors Limited.
Vill. Chack Gujran, P.O. Piplanwalan,
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 : 35

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-740 III CM series
Variant, if any : No variant models declared by the manufacture
Type : Four wheeled, Rear wheel driven, general purpose, standard Agricultural Tractor.
Year of manufacture : 2012
Chassis number : KZESD 315424S3
Country of Origin : India

1.2 **Engine:**
Make : Sonalika
Model : 3100ELI (apa)
Type : Four stroke, naturally aspirated, water cooled, direct injection, diesel engine.
Serial number : 3100ELI 23J315085F3
Engine speed (Manufacturer's recommended production setting)(rpm):
- Maximum speed at no load : 2150 to 2250
- Low idle speed : 600 to 700
- Speed at maximum torque : 1100 to 1300
Rated speed, (rpm):
- For PTO use : 2000
- For drawbar use : 2000

1.3 **Cylinder & Cylinder Head:**
Number : Three
Disposition : Vertical, in-line
Bore/stroke, (mm) : 100 / 118
Capacity as specified by the applicant, (cc) : 2780
Compression ratio, (apa) : 18.2 (± 0.2) :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



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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) : 0.45

1.4.5 **Fuel Injection pump:**
Make : Bosch, India
Model/Group combination No. : F002 AOZ 635, PES3A90D320RS3500
Type : Inline, Plunger
Serial number : 20945007
Method of drive : Through timing gears

1.4.6 **Fuel injectors:**
Make : Bosch, India
Model/Group combination No. : F 002 C70 552
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



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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	27.50 (D)	28.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	27.50 (D)	28.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	265 (D)	245	No
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	165 (D)	168.6	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	7 percent, min. (R)	24.7	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)	108	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.	110 (D)	96	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.44 (max.)(R)	0.309	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)	0.08 per metre	Yes



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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	16.70 (D)	21.56	Yes
				16.70 (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	12.37 (D) Minimum	15.82	Yes
				12.37 (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	22 (D)	24.4	Yes
				22.6 (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)	59	Yes
17.1.3 Power lift and hydraulic pump performance :						
Maximum lifting capacity throughout the range of lift, (kN):						
a)	Maximum lifting capacity throughout the range of lift, (kN):			10.00 (D)	11.96	Yes
1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	7.00 (D)	8.88	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	6.70 (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)	15	Yes
17.1.4 Brake performance at 25 kmph:						
Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):						
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):			10	10 (R)	7.10
1)	Cold brake	Evaluative	10	10 (R)	7.12	Yes
2)	Hot brake	Evaluative	10	600 (R)	177 to 187	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	177 to 187	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



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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)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	92	Yes
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	130	No
2)	Right foot rest			100 (R)	200	No
3)	Seat (with driver seated)			100 (R)	90	Yes
4)	Steering wheel			100 (R)	120	No
17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tonnes):					
1)	Two wheel	Non Evaluative	--	4.0 (D)	4.0	Yes
2)	Four wheel	Evaluative	--	5.0 (D)	5.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	5.0 to 6.0 (D)	6.02 to 6.18	No
2)	Four wheel	Evaluative	--	5.0 to 6.0 (D)	5.19 to 5.33	Yes
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	30 to 40 (D)	40.42 to 41.56	No
2)	Four wheel	Evaluative	--	30 to 40 (D)	37.48 to 38.53	Yes
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	Yes
1)	Clutch assembly	-do-				Yes
2)	Brake housings	-do-				Yes
3)	Front axle hubs	-do-				Yes
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



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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-740 III CM series	Yes
3)	Year of manufacture	Evaluative		--	2012	Yes
4)	Engine serial number	Evaluative		--	3100ELI23J315085F3	Yes
5)	Chassis number	Evaluative		--	KZESD 315424S3	Yes
6)	Declaration of PTO power, (kW)	Evaluative		--	27.5 (36.878)	Yes
7.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	100.30	100.04 to 100.05	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45	0.134 to 0.143	Yes
(c)	Ring end gap (mm):					
-	Top comp. ring.	Evaluative	-do-	2.00	0.50 to 0.55	Yes
-	2 nd comp. ring.		-do-	2.00	0.90 to 0.95	Yes
-	Oil ring.		-do-	2.00	0.60 to 0.65	Yes
(d)	Ring groove clearance (mm):					
-	Top comp. ring.	Evaluative	-do-	0.16	Taper rings	Not applicable
-	2 nd comp. ring.		-do-	0.16	0.056 to 0.069	Yes
-	Oil ring.		-do-	0.40	0.048 to 0.050	Yes
(e)	Clearance of main bearings (mm):					
-	Diametrical clearance	Evaluative	-do-	0.20	0.10 to 0.123	Yes
-	Crankshaft end float	Evaluative	-do-	0.60	0.40	Yes
(f)	Clearance of big end bearings, (mm):					
-	Diametrical	Evaluative	-do-	0.30	0.094 to 0.126	Yes
-	Axial	Evaluative	-do-	0.75	0.40	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.00	0.125 to 0.143	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	1.00	0.156 to 0.179	Yes



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.)	0.18	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	No
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	Meets the requirement	Yes
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Does not meet the requirement	No
	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 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)] : 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)] : Conforms
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in March, 2009)] : Does not conform

- 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 245 g/kWh against the declaration of 265 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 24.7 %.
- 17.4.1.2 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.
- 17.4.1.3 Three point linkage:
- i) Diameter of hitch pin hole and the lateral distance from lower hitch point to centre line of tractor does not meets the requirement of IS: 4468 (Part-1)-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.



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17.4.1.4 Hydraulic system:

The maximum lifting capacity throughout the range of lift at hitch point was observed as 11.96 kN, which is on higher side of tolerance limit of declared value. This should be looked into.

17.4.1.5 Linkage drawbar:

- i) 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.
- ii) The tyre creeping of the rear wheel of the tractor was observed as 25 and 65 on LHS and RHS during 10 hr test. This should be looked into.

17.4.1.6 Operator's Seat:

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

17.4.2 Wetland cultivation (pudding operation) :

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

17.4.3 Haulage:

- i) The specific fuel consumption (ml/km/tonne) with two wheel trailer was observed as 40.42 to 41.56 ml/km/tonne against the declaration of 30 to 40 ml/km/tonne, which does not meets the requirements of IS: 12207-2008. This should look into for necessary corrective action.
- ii) The distance travelled per litre of fuel consumption with two wheel trailer was observed as 6.02 to 6.18 km/lit against the declaration of 5.0 to 6.0, km/lit, which does not meets the requirements of IS: 12207-2008. This should look into for necessary corrective action.

17.5 General:

- i) The model of engine has not been punched /embossed on the engine block. It is, therefore, recommended that the engine model should be punched /embossed on the engine block.
- ii) The appropriate decade/sticker of "CM Series" for model name is not pasted on the tractor. Hence particular complete model name "Sonalika International DI- 740 III CM Series" as provided on the labelling plate should be provide on the tractor.
- iii) The transmittion diagram provided during testing is just copy of another model. However, the observed power train and transmittion teeth are different. The PTO to engine ratio accordingly provided in the technical sheet was 3.111:1 instead of 2.895:1 which was corrected as 2.894:1 as per given letter vide no. R&D/F-18 dated 26th Dec, 2012 during PTO performance test. Such negligence should avoided in production level and correct information w.r.t particular model may provide to user.

17.6 Maintenance / Service Problems:

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

17.7 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.



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- 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.

17.8 Adequacy of Literature supplied with machine:

17.8.1 Following literature were supplied after issuing the draft test reports of this tractor, in reference to our comments

- i) Operator's manual
- ii) Service manual
- iii) Spare part's catalogue


The supplied literatures are found adequate. However tyre pressure in tractor for road & field operation may be included. The literature should also be provided in national as well as regional languages.


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	4 Months (December, 2012 to March, 2013)	Yes	None

TESTING AUTHORITY:


PRADIPKUMAR C. MESHAM
AGRICULTURAL ENGINEER


P. K. VERMA
SENIOR AGRICULTURAL ENGINEER


C. R. LOHI
DIRECTOR

