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व्यावसायिक परीक्षण रिपोर्ट (प्रथम बैच परीक्षण)
COMMERCIAL TEST REPORT (First Batch Test)

संख्या / No. : T-1152/1678/2018
माह / Month : May, 2018



**INTERNATIONAL TRACTORS LTD.,
SONALIKA INTERNATIONAL DI-20 GARDENTRAC TRACTOR**



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि, सहकारिता एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001 - 2015 Certified Institute)

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T-1152/1678/2018

INTERNATIONAL TRACTORS LIMITED,
SONALIKA INTERNATIONAL DI-20 GARDENTRAC TRACTOR
Commercial (First Batch) Test

Manufacturer : M/s. International Tractors Ltd.
Village - Chak Gurjan,
P.O.- Piplanwala, Jalandhar road,
Distt. HOSHIARPUR –146022
(PUNJAB)

Test requested by (applicant) : The manufacturer
Selected for test by : The testing authority
Place of running-in : At CFMT&TI, Budni

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

Method of Selection : The test sample was selected randomly
out of five tractors from the production line
by the representative of testing authority.

1. SPECIFICATIONS

- 1.1 Tractor:**
Make : International Tractors Limited
Model : Sonalika International DI-20 Gardentrac
Variants, if any : **None**
Brand name : Sonalika (apa)
Type : Four Wheeled, Four Wheel Driven,
General Purpose, Agricultural Tractor
Year of manufacture : 2016
Chassis number : MMGSF545795G
Country of Origin : India
- 1.2 Engine:**
Make : M/s. MHI-VST Diesel Engines Pvt. Ltd.
Model : MVL3E
Type : Four stroke, naturally aspirated, liquid
cooled, indirect injection, diesel engine
Serial number : A32206
Engine speed (Manufacturer's recommended production setting), (rpm) :
- Maximum speed at no load : 2920 to 3020
- Low idle speed : 970 to 1030
- Speed at maximum torque : 2000 to 2600
Rated speed, (rpm):
- For PTO use : 2700
- For drawbar use : 2700
- 1.3 Cylinder & Cylinder Head:**
Number : Three
Disposition : Vertical, inline
Bore/stroke, (mm) : 76/70
Capacity as specified by the applicant, (cc) : 952
Compression ratio, (apa) : 23 (± 0.5) :1
Type of cylinder head : Monoblock



| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------|---|--|---|------|------|-----|
| 13.5.2 | Power lift and hydraulic pump performance : | | | | | |
| a) | Maximum lifting capacity throughout the range of lift, (kN): | | | | | |
| 1) | At hitch points | [Tolerance of minus 10%] | The performance shall be within 7.5 of ICT or limit specified under column 3 which ever is higher | 6.35 | 9.10 | No |
| 2) | With the standard frame | The lift capacity should at least be 24 kg/PTO kW, and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft | | 5.29 | 8.74 | No |
| 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 minute, (mm) | The observed value should not exceed 50 mm | | 4 | 0 | Yes |

14. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

14.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameters 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: 12207-2014 | Values declared by the applicant (D)/ Requirement (R) | As observed | Whether meets the requirements (Yes/No.) |
|---------------|---|--|---|---|-------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14.1.1 | PTO Performance: | | | | | |
| a) | - Max. 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 | 10.3 (D) | 9.7 | Yes |
| b) | Power at rated engine speed, (kW) | Non Evaluative | -do- | 10.3 (D) | 9.7 | Yes |
| c) | Specific fuel consumption corresponding to maximum power, (g/kWh) | Non Evaluative | + 5% | 323 (D) | 329 | Yes |
| d) | Maximum equivalent crankshaft torque, (Nm) | Non Evaluative | ± 8% | 45 (D) | 38.7 | No |
| e) | Back-up torque, percent | Non Evaluative | 10 percent, min. | 10 percent, min (R) | 12.8 | Yes |

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|--|-------------------------|----------------|---|--------------------|----------------|-----|
| f) | Maximum operating temperature ($^{\circ}\text{C}$) | | | | | | |
| | 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) | 114 | 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. | 118 (D) | 94 | Yes |
| g) | Engine oil consumption, (g/kWh) | | Evaluative | Not exceeding 1% of SFC at max. power under High ambient conditions | 3.29, Max (R) | 0.77 | Yes |
| h) | Smoke level | | Evaluative | Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR) | 3.25 per meter (R) | 0.51 per meter | Yes |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 14.1.2 Drawbar performance : | | | | | | | |
| a) | Max. drawbar pull with standard ballast corresponding to 15 percent wheel slip, (kN) | | Evaluative | Minimum 65% of static mass of tractor with standard ballast | 5.04 (R) | 6.63 | Yes |
| | | | | | 4.97 (D) | | |
| b) | Maximum drawbar power with standard ballast, (kW). | | Evaluative | Min. 75 % of PTO power as referred in 17.1.1(a) of PTO performance | 7.3 (R) | 8.0 | Yes |
| | | | | | 8.24 (D) | | |
| c) | Maximum transmission oil temperature ($^{\circ}\text{C}$) | | Non Evaluative | The declared value should not exceed the maximum value specified by oil company | 130 (D) | 59 | Yes |
| 14.1.3 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%] | 4.00 (D) | 9.10 | 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 | 2.28 (R) | 8.74 | Yes |
| 3.0 (D) | | | | | | | |
| b) | Maximum drop in the height of the point of application of the force after each 5 minutes | | Non Evaluative | The observed value should not exceed 50 mm | 50 (D) | 0 | Yes |



| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|--|---|----------------|-------------------|------------------|----------------|-----|----|
| 14.1.4 | Brake performance at maximum attainable speed of 14.90 kmph: | | | | | | |
| a) | Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with ballast* (m): | | | | | | |
| | 1) Cold brake | Evaluative | 10 | 10 (R) | 1.60 | Yes | |
| | 2) Hot brake | Evaluative | 10 | 10 (R) | 1.90 | Yes | |
| b) | Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N) | Evaluative | 600 | 600 (R), maximum | 315 to 365 | 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 | |
| *The manufacturer has not recommended ballasting for road test. Therefore, the brake test was conducted under standard ballast condition only. | | | | | | | |
| 14.1.5 | Noise measurement: | | | | | | |
| a) | Maximum ambient noise emitted by the tractor dB(A) | Evaluative | As per CMVR | 88 (R) | 79 | Yes | |
| b) | Maximum noise at operator's ear level dB(A) | Evaluative | As per CMVR | 98 (R) | 92 | Yes | |
| 14.1.6 | Amplitude of mechanical vibrations at : | | | | | | |
| | 1) Left foot rest | Non Evaluative | 100 microns (max) | 100 (R) | 110 | No | |
| | Right foot rest | | | 100 (R) | 130 | No | |
| | 2) Seat (with driver seated) | | | -do- | 100 (R) | 150 | No |
| | 3) Steering wheel | | | -do- | 100 (R) | 150 | No |
| 14.1.7 | Air cleaner: | | | | | | |
| | Air cleaner oil pull over, (%) | Non Evaluative | 0.25 % (maximum) | 0.25 % (maximum) | 0.15 | Yes | |
| 14.1.8 | Haulage requirements: | | | | | | |
| a) | Gross mass of the trailers, (tones): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 3.0 (D) | 3.0 | Yes | |
| b) | Distance travelled / liter of fuel consumption, (km/l): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 5 to 6 (D) | 5.66 to 5.74 | Yes | |
| c) | Fuel consumption (ml/km/tonne): | | | | | | |
| | 1) Two wheel | Non Evaluative | -- | 55 to 58 (D) | 58.02 to 58.83 | No | |

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------|---|----------------|---|--|--|-----|
| 14.1.9 | 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 | The major breakdowns were not observed in the field test during supplementary testing of the tractor model having test report No. T-012/1536/ 2016 | Yes |
| 1) | Clutch assembly | -do- | | | | |
| 2) | Brake housings | -do- | | | | |
| 3) | Front axle hubs | -do- | | | | |
| 14.1.10 | Safety features : | | | | | |
| a) | Guards against moving and hot parts | Evaluative | Belt drives, pulleys, silencer, hydraulic pipes (As per IS 12239 (Part2)) | -- | Provided | Yes |
| b) | Lighting arrangement | Evaluative | As per CMVR | -- | Provided | Yes |
| c) | Seating requirements (Tractors having more than 1150 mm rear track width) | Non Evaluative | Should meet the requirements of IS: 12343 (As amended from time to time) | -- | Does not meet the requirements | No |
| d) | Technical requirements for PTO shaft | Non Evaluative | Should meet the requirements of IS: 4931 (As amended from time to time) | -- | Meets the requirement | Yes |
| e) | Dimensions of three point linkage | Non Evaluative | Should meet the requirements of IS: 4468 (Part-I) (As amended from time to time) | -- | Does not meet the requirements | No |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| f) | Specifications of linkage drawbar | Non Evaluative | Should meet the requirements of IS 12953 and IS 12362 (Part 3) (As amended from time to time) | -- | Does not meet the requirements | No |
| | Swinging drawbar | | | -- | Not Provided | -- |
| 14.1.11 | 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-20 GARDENTRAC | Yes |
| 3) | Year of manufacture | Evaluative | | -- | 2016 | Yes |
| 4) | Engine number | Evaluative | | -- | A32206 | Yes |
| 5) | Chassis serial number | Evaluative | | -- | MMGSF545795G | Yes |
| 6) | Declaration of PTO power, (kW) | Evaluative | | -- | 10.3 | Yes |

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------|--|----------------|--------------------------------------|--------|------------------|-----|
| 14.1.12 | Discard limit for: | | | | | |
| (a) | Cylinder bore diameter, (mm) | Evaluative | To be specified by the manufacturer- | 76.700 | 76.002 to 76.012 | Yes |
| (b) | Clearance between piston & cylinder liner at skirt, (mm) | Non Evaluative | | 0.200 | 0.106 to 0.107 | Yes |
| (c) | Ring end gap (mm): | | | | | |
| | - Top comp. ring. | Evaluative | -do- | 1.50 | 0.20 to 0.25 | Yes |
| | - 2 nd comp. ring. | | -do- | 1.50 | 0.25 to 0.35 | Yes |
| | - Oil ring. | | -do- | 1.50 | 0.20 | Yes |
| (d) | Ring groove clearance (mm): | | | | | |
| | - Top comp. ring. | Evaluative | -do- | 0.200 | Tapper | -- |
| | - 2 nd comp. ring. | | -do- | 0.200 | 0.095 to 0.097 | Yes |
| | - Oil ring | | -do- | 0.200 | 0.057 to 0.060 | Yes |
| (e) | Clearance of main bearings, (mm): | | | | | |
| | - Diametrical clearance | Evaluative | -do- | 0.150 | 0.049 to 0.071 | Yes |
| | - Crankshaft end float | Evaluative | -do- | 0.50 | 0.20 | Yes |
| (f) | Clearance of big end bearings, (mm): | | | | | |
| | - Diametrical | Evaluative | -do- | 0.150 | 0.081 to 0.100 | Yes |
| | - Axial | Evaluative | -do- | 0.50 | 0.20 | Yes |
| (g) | Clearance between king pin and bush, (mm) | Non Evaluative | -do- | 0.10 | Not applicable | -- |
| (h) | Clearance between center pin and bush, (mm) | Non Evaluative | -do- | 0.10 | 0.058 to 0.072 | Yes |

| 14.1.13 CATEGORY OF BREAKDOWNS / DEFECTS : | | | | | |
|--|------------------|--|---|--------------------|--|
| S. No. | Characteristic | 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 | Mj 8 | Yes |
| 3. | Minor | Evaluative | Not more than five and frequency of each should not be more than two. | Mn 14 | 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 (Mj 8 & Mn 14) | Yes |

| 14.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2014: | | | | |
|--|-----------------|---|---------------------------------|-----------------------|
| S.No. | Characteristic | Requirements as per IS: 12207-2014 | As observed | Remarks |
| 1. | Fitment of ROPS | With a provision for fitment of ROPS. If ROPS fitted it should meet the requirement of IS: 11821 (As amended from time to time) or equivalent International Standards | Not provided ROPS not fitted | Yes Not applicable |
| 2. | Accessories | Trailer hitch, front tow hook, may be provided. | Front tow hook not provided | No |

**14.3 Conformity with following IS:**

- i) Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed 2009)] : **Conforms**
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2009)] : **Conforms**
- iii) Agricultural wheeled tractors - Three-point linkage: Part 2 Category 1N (Narrow Hitch) (Third Revision) [IS 4468 (Part-2):1993/ ISO 730-2:1979 (Reaffirmed 2009)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed 2007)] : **Does not conform**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2009)] : **Does not conform**
- vi) Guide for safety & comport of operator of agricultural tractors: Part 1 General requirements (first revision): [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed 2009)] : **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 2009)] : **Does not conform**
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2009)] : **Does not conform**
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays Part 2 Symbols for agricultural tractors and machinery [IS:6283 (Part-1)-2006 and IS: 6283 (Part-2)-2007 (Reaffirmed 2009)] : **Does not conform**
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2009)] : **Conforms**

14.4 Salient Observations:**14.4.1 Laboratory tests:****14.4.1.1 PTO Performance:**

- i) The maximum PTO power was recorded as **9.7 kW** against the declaration of **10.3 kW**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **329 g/kWh** against the declaration of **323 g/kWh**, which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- iv) The maximum equivalent crankshaft torque was recorded as **38.7 Nm** against the declaration of **45.0 Nm**, which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into.
- v) The backup torque is **12.8 %**.

**14.4.1.2 Drawbar performance test:**

During the drawbar performance test, the drawbar power was recorded on lower side when compared with the drawbar power observed during Initial Commercial Test of same model and not meeting the qualifying criteria as per clause 7.6 of IS: 12207-2014. To rectify the problem the following replacements were done-

a) On inspection it was found that the clutch plate surface was not fully in contact with the flywheel surface. It is therefore the clutch assembly (Pt. No. 10051324AA) was replaced with new ones having same specifications, b) Fuel filter Pt. No 703008219A) was replaced with new ones and c) Engine lubricating oil and filter (Pt. No. 803007059A) was replaced with new ones. This should be looked into for necessary corrective action.

14.4.1.3 Power lift and hydraulic pump performance:

The moment about rear axle was computed as **6.19 kN-m** and **11.27 kN-m**, at hitch point and at standard frame respectively which is on higher side when compared to the moment of tractor about front axle i.e. **4.98 kN-m**. It is therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or standard ballast mass at the front may be increased to avoid front lifting of the tractor.

14.4.1.4 Mechanical Vibration:

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

14.4.1.5 Haulage test:

The specific fuel consumption with two wheel trailer was observed as **58.02 to 58.83 ml/km/tonne** against the declaration **55 to 58 ml/km/tonne**. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.

14.4.1.6 Three point linkage:

The following dimensions of three point linkage does not meet the requirement of IS: 4468 (Part-2) -1993. This should be looked into for necessary corrective action.

- i) The diameter of lower hitch pin hole.
- ii) The lateral distance from lower hitch point to centre line of tractor.
- iii) The distance from end of PTO shaft to centre of lower hitch point (lower links in horizontal position).

14.4.1.7 Linkage drawbar:

Dimension "A" and "DØ" [Refer Fig. 1(b)] of linkage drawbar does not meet the requirement of IS: 12953-1990. This should be looked into for necessary corrective action.

14.4.1.8 Operator's Seat:

The width of operator's seat does not meet the requirement of the IS: 12343 -1998. This should be looked into for necessary corrective action.

14.5 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 system.

14.6 Recommendation with regard to safety on tractor:

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



| | |
|------------------|--|
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|------------------|--|

- i) Spark arrester should be provided in the exhaust system.
- ii) The width of operator's seat should meet the requirement of relevant standard.
- iii) There should be provision of safety against the accidental start of engine.
- iv) The fuel shut-off knob should remain in stop position.
- v) There should be a provision for mounting a canopy above driver's seat.
- vi) Provision to attach trailer brake valve assembly.

14.7 Adequacy of Literature supplied with machine:

14.7.1 The following literature was supplied with test sample for reference during the test:

- a) Operator's manual
- b) Service manual
- c) Parts catalogue

14.7.2 The printed literature supplied with the test sample is in English. The literature may be brought out as per IS: 8132-1999 (Reaffirmed in March, 2009) for the guidance of user and service personnel in national as well as other regional languages.

15. 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 | 14 Months (January, 2017 to March, 2018) | No | Breakdowns occurred during drawbar performance test. |

TESTING AUTHORITY:

C. K. TIJARE
AGRICULTURAL ENGINEER

C.V. CHIMOTE
TEST ENGINEER

Y.K. RAO
SENIOR AGRICULTURAL ENGINEER

J.J.R. NARWARE
DIRECTOR

16. APPLICANT'S COMMENTS

| Para No. | Our Reference | Applicant's comments |
|----------|---|---|
| 16.1 | 14.4.1.2, 14.4.1.3, 14.4.1.4, 14.4.1.5, 14.4.1.6, 14.4.1.7, 14.4.1.8 | Observations will be studied and necessary action will be incorporated. |
| 16.2 | 14.6 (i), 14.6 (ii), 14.6 (iii), 14.6 (iv), 14.6 (v), 14.6 (vi), 14.7.2 | Necessary quality check implemented in quality system. |