

INTERNATIONAL STANDARD

ISO
789-7

First edition
1991-11-15

Agricultural tractors — Test procedures — Part 7: Axle power determination

*Tracteurs agricoles — Méthodes d'essai —
Partie 7: Détermination de la puissance aux roues motrices*



Reference number
ISO 789-7:1991(E)



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 789-7 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 2, *Common tests*.

ISO 789 consists of the following parts, under the general title *Agricultural tractors — Test procedures*:

- *Part 1: Power tests for power take-off*
- *Part 2: Rear three-point linkage lifting capacity*
- *Part 3: Turning and clearance diameters*
- *Part 4: Measurement of exhaust smoke*
- *Part 5: Partial power PTO — Non-mechanically transmitted power*
- *Part 6: Centre of gravity*
- *Part 7: Axle power determination*
- *Part 8: Engine air cleaner*
- *Part 9: Power tests for drawbar*
- *Part 10: Measurement of hydraulic power — Tractor/implement interface*

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International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

— *Part 11: Steering capability — Wheeled tractors*

Annex A forms an integral part of this part of ISO 789. Annexes B, C, D and E are for information only.

Agricultural tractors — Test procedures —

Part 7:

Axle power determination

1 Scope

This International Standard specifies test procedures for determining the power available at the axle or axles of wheeled or track-laying agricultural tractors having one or two driven axles.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 789. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 789 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3448:1975, *Industrial liquid lubricants — ISO viscosity classification*.

ISO 4251-1:1988, *Tyres and rims (existing series) for agricultural tractors and machines — Part 1: Tyre designation and dimensions*.

3 Definitions

For the purposes of this part of ISO 789, the following definitions apply.

3.1 rated engine speed: Engine speed specified by the tractor manufacturer for continuous operation at full load.

3.2 axle power: Sum of the powers measured at all powered axles.

3.3 maximum permissible torque: Maximum torque specified by the manufacturer for the purposes of this test.

3.4 specific fuel consumption: Mass of fuel consumed per unit of work.

4 Measurement units and tolerances

The following units and tolerances are used in this part of ISO 789:

- a) rotational frequency, in revolutions per minute: $\pm 0,5 \%$
- b) time, in seconds: $\pm 0,2 \text{ s}$
- c) distance, in metres or millimetres: $\pm 0,5 \%$
- d) force, in newtons: $\pm 1 \%$
- e) torque, in newton metres: $\pm 1 \%$
- f) mass, in kilograms: $\pm 0,5 \%$
- g) fuel consumption, in kilograms per kilowatt hour: $\pm 1 \%$
- h) atmospheric pressure, in kilopascals: $\pm 0,2 \text{ kPa}$
- i) temperature of fuels, etc., in degrees Celsius: $\pm 2 \text{ }^{\circ}\text{C}$
- j) wet and dry bulb thermometers, in degrees Celsius: $\pm 0,5 \text{ }^{\circ}\text{C}$

5 General requirements

5.1 Specification

The tractor tested shall conform to the specification in the test report (see annex A) and shall be used in accordance with the manufacturer's recommendations for normal operation.

5.2 Running-in and preliminary adjustments

The tractor shall be run-in prior to the test. For spark-ignition engines fitted with a means for the operator to vary the ratio of the fuel/air mixture, the tests shall be carried out with the settings recommended for normal operation. The adjustment of the carburettor or the injection pump shall conform to the manufacturer's specification. Run-in shall be done with the governor set at full throttle and with the engine operating at rated speed.

5.3 Fuels and lubricants

The compression-ignition (diesel) fuel used for the test shall comply with the CEC reference fuel CEC-RF-03-A-84. For spark-ignition engines, the test shall be carried out using CEC reference fuel CEC-RF-01-A-80 for premium leaded gasoline and CEC RF-08-A-85 for premium unleaded gasoline. (See annex B, annex C and annex D, respectively.)

The lubricants used for the test shall comply with the manufacturer's specification and be identified by trade-name, type, and viscosity class in accordance with ISO 3448. If different lubricants are used, precise information shall be given as to where they are used (engine, transmission, etc.).

If the lubricant conforms to other national or International Standards, reference to these shall be made.

5.4 Ancillary equipment

For all tests, accessories such as the hydraulic lift pump or air compressor may only be disconnected if it is practicable for the operator to do so as normal practice in work, in accordance with the operator's manual and without using tools. If not, they shall remain connected and operate at minimum load.

If the tractor is equipped with devices that create variable parasitic power losses such as a variable speed cooling fan, intermittent hydraulic or electrical demands, etc., the device shall not be disconnected or altered for test purposes. If it is practical for the operator to disconnect the device as outlined by the operator's manual, it may be disconnected for test purposes; this shall be recorded in the test report.

Power variations during tests caused by these devices exceeding $\pm 5\%$ shall be recorded in the test report in terms of percent variation from the mean.

5.5 Operating conditions

Make no corrections to the measured values of torque or power for atmospheric conditions or other factors. Atmospheric pressure shall not be less than 96,6 kPa. If this is not possible because of conditions of altitude, a modified carburettor or fuel pump setting may have to be used, details of which shall be included in the report.

The surrounding temperature shall be $23\text{ }^{\circ}\text{C} \pm 7\text{ }^{\circ}\text{C}$.

Stable operating conditions shall have been attained at each load setting before beginning test measurements.

5.6 Fuel consumption

Arrange the fuel measurement apparatus so that the fuel pressure at the carburettor or the fuel injection pump is equivalent to that which exists when the tractor fuel tank is half-full. The fuel temperature shall be comparable to that occurring during full-load operation for 2 h of the tractor when fuel is taken from the tractor fuel tank.

When consumption is measured by volume, calculate the mass of fuel per unit of work using the density corresponding to the appropriate fuel temperature. This figure shall then be used to calculate the volumetric data using the fuel density at $15\text{ }^{\circ}\text{C}$.

Alternatively, when the consumption is measured by mass, calculate volumetric data using the fuel density (specific gravity) value at $15\text{ }^{\circ}\text{C}$.

6 Test procedure

6.1 General

All the driven axles of the tractor shall be coupled to the dynamometer. All measurements shall be made with the engine governor control set for maximum engine speed.

The various tests shall normally be carried out continuously.

The angularity of any shaft connecting the driving axles to the dynamometer shall not exceed 2° .

If an exhaust gas discharge device for the test area is used, it shall not change the engine performance.