
**Agricultural tractors — Test
procedures —**

Part 2:
**Rear three-point linkage lifting
capacity**

Tracteurs agricoles — Méthodes d'essai —

Partie 2: Capacité de relevage de l'attelage trois points arrière

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 2, *Common tests*.

This fourth edition cancels and replaces the third edition (ISO 789-2:1993), which has been technically revised for the technical harmonization with OECD Code 2: February 2017.

A list of all the parts in the ISO 789 series can be found on the ISO website.

Agricultural tractors — Test procedures —

Part 2: Rear three-point linkage lifting capacity

1 Scope

This document specifies test procedures for determining the lifting capacity of rear-mounted three-point linkage systems:

- a) the maximum vertical force which can be exerted by the hydraulic lift at the lower hitch points throughout their full range of movement;
- b) the maximum vertical force which can be exerted by the hydraulic lift, at a point 610 mm to the rear of the hitch points on a frame attached to the three-point linkage, throughout its full range of movement.

NOTE 1 A static test provides an adequate comparison between tractors. The test results are used only as a means of comparing tractors and not as a way of recommending the size of an implement which can be carried by the tractor.

NOTE 2 This test procedure can be used to determine the lifting capacity of front-mounted three-point hitch systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 730:2009, *Agricultural wheeled tractors — Rear-mounted three-point linkage — Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4*

ISO 730:2009/Amd 1:2014, *Agricultural wheeled tractors — Rear mounted three-point linkage – Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4 — Amendment 1*

ISO 789-13:2018, *Agricultural tractors — Test procedures — Part 13: Vocabulary and specimen test report*

ISO 3448:1992, *Industrial liquid lubricants — ISO viscosity classification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 789-13 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Measurement units and tolerances

The following units and tolerances apply to the maximum value measured:

- rotational frequency, in revolutions per minute (r/min): $\pm 0,5 \%$;
- time, in seconds (s): $\pm 0,2 \text{ s}$;
- distance, in metres or millimetres (m or mm): $\pm 0,5 \%$;
- force, in newtons (N): $\pm 1 \%$;
- mass, in kilograms (kg): $\pm 0,5 \%$;
- pressure, in kilopascals (kPa): $\pm 2 \%$;
- temperature, in degrees Celsius: $\pm 0,5 \text{ }^\circ\text{C}$.

5 General requirements

5.1 Selection

In the case of a third party performing the assessment, the tractor manufacturer and the third party shall work together to select a tractor to be submitted for testing. The tractor submitted for the test shall require a serial number, shall comply with the manufacturer's product specification, and shall be operated in accordance with the manufacturer's instructions. The manufacturer shall provide a representative to be present throughout the entire testing of the tractor.

5.2 Running-in and preliminary adjustments

5.2.1 The tractor shall be new and run-in prior to the test in accordance with the manufacturer's usual instructions. If a third party is responsible for the testing, the third party itself may run-in the tractor provided an authority of the manufacturer or the manufacturer's representative, who will remain responsible for the running-in, is obtained.

The test report shall state the place and duration of running in.

5.2.2 The adjustment of the carburettor or injection pump as well as the setting of the governor shall conform to the specifications provided by the manufacturer. The manufacturer may make adjustments in conformity with these specifications prior to testing, but adjustments shall not be made during the test.

5.3 Manufacturer's instructions

Once the test has started, the tractor shall never be operated in a way that is not in accordance with the manufacturer's published instructions in the form of an operating handbook unless specifically required by test criteria and then only by arrangement with the manufacturer.

5.4 Repairs

All repairs made during the tests shall be noted in the test report, together with comments on any practical defects or shortcomings about which there is no doubt.

5.5 Preliminary information

Specification information of the tractor consisting of the items listed in the ISO 789-13 specimen test report, as well as any further data required to carry out the tests, shall be recorded and used to set up the test.

These technical specifications shall be validated as thoroughly as possible by the entity performing the test.

5.6 Hydraulic fluid

5.6.1 The hydraulic fluid shall be as recommended by the manufacturer and identified by type and viscosity in accordance with ISO 3448:1992.

5.6.2 At the start of each test, the temperature of the hydraulic fluid in the tank shall be measured to be $65\text{ °C} \pm 5\text{ °C}$. If this cannot be achieved, due to the presence of an oil cooler for example, the temperature measured during the test shall be stated in the test report.

5.6.3 A pressure gauge shall be fitted immediately next to the external tapping of the tractor. The hydraulic fluid pressure shall be checked during each test.

5.7 Ambient conditions

5.7.1 No corrections shall be made to the test results for the 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 injection pump setting may have to be used, details of which shall be included in the report.

5.7.2 The surrounding temperature shall be $23\text{ °C} \pm 7\text{ °C}$.

6 Test procedures

6.1 Common procedures

6.1.1 Secure

Secure the unballasted tractor in a horizontal position such that the tyres and suspension are not deflected by the relative force of the power lift.

6.1.2 Adjustment

6.1.2.1 The linkage shall be adjusted in the same way for tests both with and without the coupled frame, to achieve typical and repeatable arrangements as specified in [6.1.2.2](#) to [6.1.2.6](#). [Figures 1](#) and [2](#) provide clarification of the linkage components.

6.1.2.2 The linkage shall be adjusted in such a way as to achieve the power range and lower hitch point height as specified in ISO 730. For those tractors unable to achieve the standard power range, measure the lifting force at the maximum achievable power range. If the tractor cannot achieve the specified power range and lower hitch point height, the fact shall be stated in the test report.

6.1.2.3 The upper link shall be adjusted to the length necessary to bring the mast of the frame vertical when the lower links are horizontal.

6.1.2.4 Where more than one upper or lower link point is available on the tractor, the points used shall be those specified by the manufacturer and shall be stated in the test report.

6.1.2.5 Where there is more than one point attachment to connect the lift rod to the lower links, the connection points used shall be those specified by the manufacturer and shall be stated in the test report.

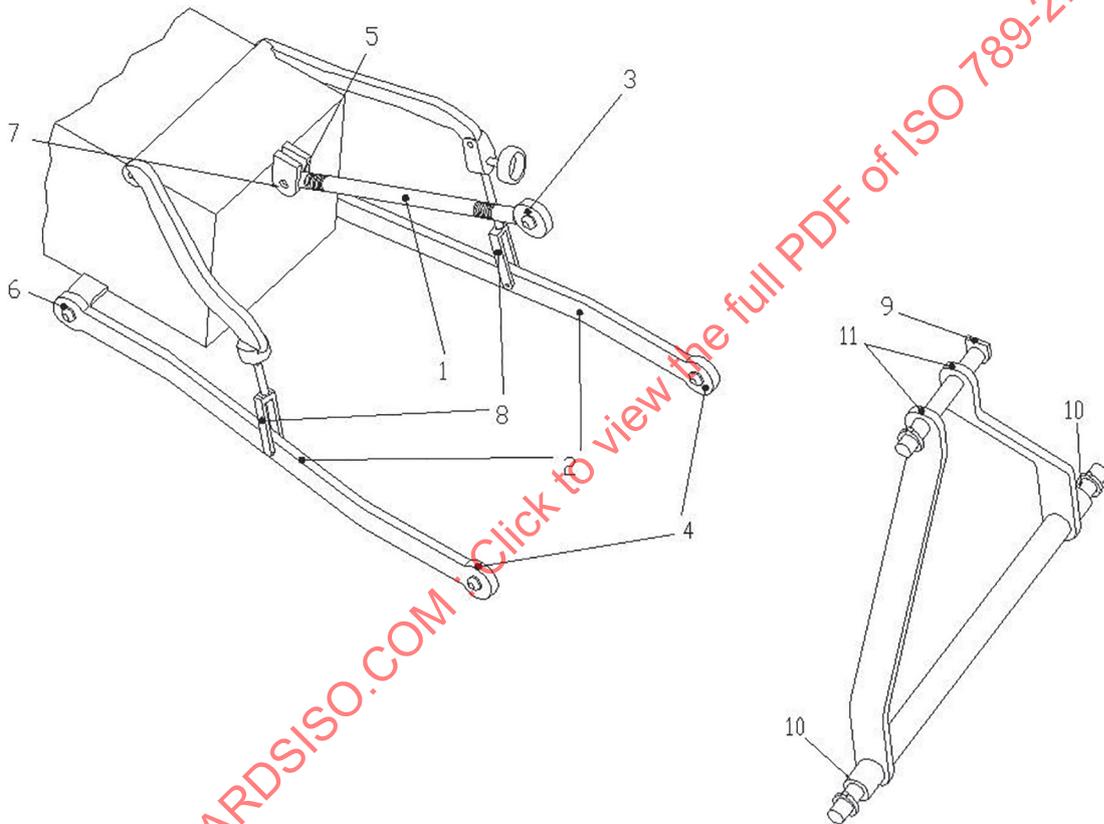
6.1.2.6 These initial adjustments, as far as possible, shall cause the mast to rotate through a minimum of 10° from the vertical to the angle at which the frame is in the uppermost position. If this is not possible, the fact shall be stated in the test report.

6.1.3 Throttle lever

During all tests, the throttle lever shall be set fully open unless specified otherwise.

6.1.4 Measured maximum performance

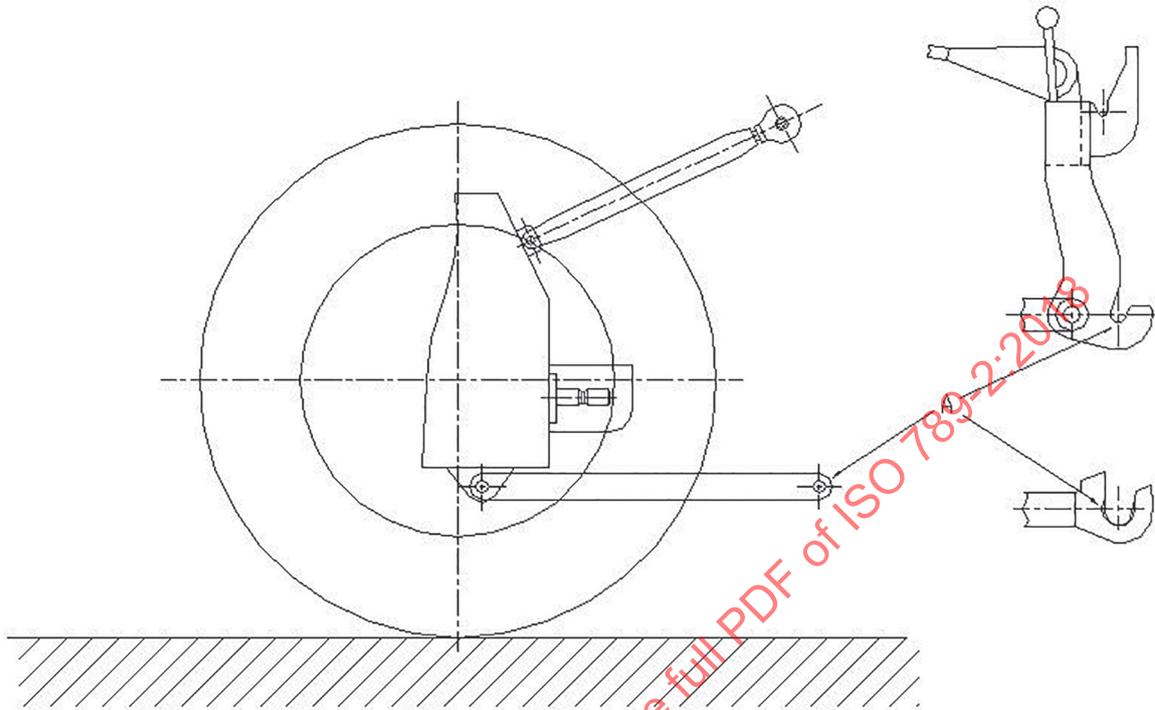
To ensure that the lifting capacity and the hydraulic power are adequate for effective practical use and to allow for variation in the performance of nominally identical tractors, the measured maximum performance is reported as that which would be obtained with the hydraulic fluid pressure maintained at 90 % of the pressure sustained by the relief valve.



Key

- | | | | |
|---|--------------------|----|------------------------|
| 1 | upper link | 7 | upper link attachment |
| 2 | lower links | 8 | lift rods |
| 3 | upper hitch point | 9 | upper hitch attachment |
| 4 | lower hitch points | 10 | lower hitch attachment |
| 5 | upper link point | 11 | mast |
| 6 | lower link point | | |

Figure 1 — Components of three-point linkage

**Key**

A Lower hitch point

Figure 2 — Lower hitch points for various linkages**6.2 Lift at lower hitch points**

6.2.1 Apply an external vertical downward force to a horizontal bar connecting the lower hitch points. This force, which shall be capable of being measured, shall lie in the central longitudinal plane of the tractor and shall be maintained vertical throughout the lift range.

Care should be taken to avoid torsional components in this force, which can affect the accuracy of measurements.

6.2.2 Determine the lifting force available and the corresponding pressure of the hydraulic fluid at a minimum of six points approximately equally spaced throughout the range of movement of the lift, including one at each extremity. At each point, the force shall be the maximum which can be exerted against a static load. Additionally, measure the range of movement.

The pressure recorded during the test shall exceed the minimum relief valve pressure setting.

6.2.3 The values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90 % of the actual relief valve pressure setting of the hydraulic lift system. The corrected value of the lowest lifting force constitutes the maximum vertical force which can be exerted by the hydraulic lift throughout its full range of motion.

NOTE Lifting force is presumed to be directly proportional to pressure.