
**Agricultural trailers and trailed
equipment — Drawbar jacks —**

**Part 1:
Design safety, test methods and
acceptance criteria**

Remorques agricoles et matériel traîné — Béquilles d'attelage —

*Partie 1: Sécurité par conception, méthode d'essai et critères
d'acceptation*

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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).

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For an explanation of 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 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 3, *Safety and comfort*.

This first edition of ISO 12140-1, together with ISO 12140-2, cancels and replaces ISO 12140:2013, which has been technically revised.

The main changes compared to the previous edition are as follows:

- the application requirements have been moved to a separate part (i.e. ISO 12140-2);
- the term used for describing machinery types has been clarified.

A list of all parts in the ISO 12140 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Agricultural trailers and trailed equipment — Drawbar jacks —

Part 1: Design safety, test methods and acceptance criteria

1 Scope

This document specifies criteria for construction, establishes performance test methods and defines acceptance criteria for telescopic mechanical screw- and nut-type drawbar jacks and hydraulic drawbar jacks intended to be fitted on the implement tongue of interchangeable towed machinery [here after referred to as "implement(s)"] as original equipment or as replacement jacks. In addition, it specifies minimum markings and information for use to be provided by the jack manufacturer.

These jacks are used specifically for

- supporting the hitch points of implements during storage;
- lifting and lowering of implement tongues to facilitate attaching to or disconnecting from an agricultural tractor; and
- levelling an implement for stationary use.

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 cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

3.1 jack

hand or power-operated telescopic mechanism with a ground contact pad (base) or wheel and fixing point [*jack mount* (3.11) or mounting point] designed for controlled vertical movement

Note 1 to entry: A hand-operated jack typically uses mechanical means to control vertical movement. A powered-operated jack typically uses hydraulic fluid displacement to control vertical movement.

3.2 static compressive load

vertical force used to support the intended application under static conditions

**3.3
dynamic compressive load**

vertical force used to lift the intended application measured during actuation of the jack

**3.4
static tensile load**

force opposite of *static compressive load* (3.2) resulting in a tension load applied to the *jack* (3.1)

**3.5
dynamic tensile load**

force opposite of dynamic *compressive load* (3.3) resulting in a tension load applied to the *jack* (3.1)

**3.6
side load**

<fore-aft>force applied in a plane perpendicular to the longitudinal axis of the *jack* (3.1) in a direction generally aligning with the towing direction of the implement

**3.7
side load**

<lateral>force applied in a plane perpendicular to the longitudinal axis of the *jack* (3.1) at right angles to the general towing direction of the implement

**3.8
screw and nut**

threaded shaft and nut that transforms rotational motion of the *crank assembly* (3.13) into linear motion of the *jack* (3.1)

**3.9
outer tube**

tube with the largest cross-sectional dimension

**3.10
inner tube**

free-moving and generally smaller tube moving within the *outer tube* (3.9)

**3.11
jack mount**

portion of the *outer tube* (3.9) that mates with the implement mount

**3.12
swivel mount**

mounting method that allows the *jack* (3.1) to be rotated to a storage position without removing the jack from the implement

**3.13
crank assembly**

device used to actuate the *screw* (3.8) to extend or retract the *jack* (3.1)

**3.14
base**

contact pad
bottom load bearing portion of the *inner tube* (3.10) or drop leg, if provided, that transmits force to the ground or floor

**3.15
jack cycle**

extension of the jack through 65 % of the jack travel and retraction back to its original length

Note 1 to entry: If a particular jack has added travel for the purpose of greater unloaded range, the jack cycle can be based on 65 % of the normal travel.

3.16**extended length**

maximum attainable dimension from the centre of the *jack mount* (3.11) to the bottom of the *base* (3.14) of the *jack* (3.1)

3.17**basic rated life**
 L_{10}

90 % of the reliable life of samples tested that pass a given requirement

3.18**rated static compressive load capacity**

static compressive load (3.2) that the *jack* (3.1) is rated to support or sustain while meeting the requirements of this document

3.19**rated dynamic compressive load capacity**

dynamic compressive load (3.3) that the *jack* (3.1) is rated to repeatedly lift while meeting the requirements of this document

3.20**rated static tensile load capacity**

static tensile load (3.4) that the *jack* (3.1) is rated to sustain while meeting the requirements of this document

3.21**rated dynamic tensile load capacity**

dynamic tensile load (3.5) that the *jack* (3.1) is rated to repeatedly pull while meeting the requirements of this document

3.22**rated static side load capacity**

side load (3.6, 3.7) that the *jack* (3.1) is rated to sustain while meeting the requirements of this document

3.23**rated static side torque class**

value generated by calculating the torque resulting from the *rated static side load capacity* (3.22) and the *extended length* (3.16)

Note 1 to entry: See [Table 1](#).

Note 2 to entry: Intended for jacks manufactured with specific mount/mounting location, this is an indicator of the maximum torque to be withstood resulting from side loading independent of *jack* (3.1) length.

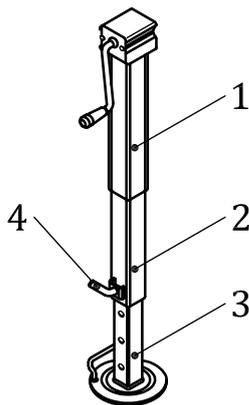
3.24**crank effort**

tangential force, measured at the crank handling position, required to actuate the *jack* (3.1)

3.25**drop leg**

free moving element that has the smallest section tube in a telescopic jack

Note 1 to entry: See [Figure 1](#).



Key

- 1 outer tube (3.9)
- 2 inner tube (3.10)
- 3 drop leg (3.25)
- 4 locking pin

Figure 1 — Example of drop leg

4 Design requirements

4.1 Base

The base of the jack shall be substantially flat and shall be of sufficient size so that the average ground pressure does not exceed 760 kPa at the rated dynamic compressive load capacity. The base shall be securely fixed to the inner tube or, if provided, to the drop leg of the jack. Jacks equipped with a wheel or other base configuration intended for use on an improved or special surface are excluded from this requirement.

4.2 Jack overtravel

4.2.1 The jack shall be fitted with sufficient means to withstand the applied force when attempting to extend or retract beyond the intended travel.

4.2.2 Screw- and nut-type jacks shall be able to sustain one and one-half times the maximum crank effort experienced at the rated dynamic compressive lift capacity or if applicable, the rated dynamic tensile load capacity without a functional or catastrophic failure.

4.3 Hydraulic jacks

4.3.1 Controls shall be designed to provide a means of operation and adjustment which will protect the operator and others from injury when operated in accordance with the manufacturer's instructions. Controls shall be clearly marked with the direction of movement of the jack (for example, up/down).

4.3.2 A means to minimize the risk of unintended retraction (for example, a locking device) shall be provided.

4.4 Drop leg

A drop leg, if provided, shall be equipped with

- a locking pin with its axial retaining device;
- drop leg safety retaining device.

See [Figure 1](#) for example.

5 Performance requirements

5.1 Crank effort

During the jack cycle, the crank effort shall not exceed 225 N while the jack is loaded to its rated dynamic compressive load capacity or if applicable, its rated dynamic tensile load capacity. If the crank effort exceeds 110 N a knob shall be included in the crank assembly. The knob shall be designed to rotate freely on the crank.

5.2 Corrosion protection

5.2.1 The components of the jack which are directly exposed to external environment shall have a duration of not less than 48 hours when exposed to salt spray exposure, according to ISO 9227, before the appearance of rust.

5.2.2 This requirement is considered to be fulfilled if the test is made on a small portion of the painted metal of the jack.

NOTE Guidance can also be drawn from ASTM B-117-09.

5.3 Water ingress

The jack shall be designed to minimize the ingress of rain water and to promote drainage of any water that does enter.

5.4 Basic rated life

The basic rated life for the jack shall be greater than 250 jack cycles when tested in accordance with this document.

5.5 Rated static compressive load capacity

The rated static compressive load capacity shall not exceed one half that of the static compressive load sufficient to cause catastrophic failure. This load shall be applied through the intended jack mount or swivel mount. The jack shall also be able to support the rated static compressive load and afterward meet the requirements of [6.12](#).

NOTE This is a maximum value and can be reduced by the jack or implement manufacturer based on application.

5.6 Rated dynamic compressive load capacity

The rated dynamic compressive load capacity shall not exceed the largest dynamic compressive load to be moved by the jack through a jack cycle while meeting the basic rated life requirements of this document. In addition, for screw- and nut-type jacks the crank effort requirements shall not be exceeded. This load shall be applied through the intended jack mount or swivel mount. The jack shall

also independently meet the requirements of 6.12. The rated dynamic compressive load capacity shall not exceed the rated static compressive load capacity.

NOTE This is a maximum value and can be reduced by the jack or implement manufacturer based on application.

5.7 Rated static tensile load capacity

The rated static tensile load capacity shall not exceed one-half that of the static tensile load sufficient to cause catastrophic failure. This load shall be applied through the intended jack mount or swivel mount. The jack shall also be able to support the rated static tensile load and afterward meet the requirements of 6.12.

NOTE This is a maximum value and can be reduced by the jack or implement manufacturer based on application.

5.8 Rated dynamic tensile load capacity

The rated dynamic tensile load capacity shall not exceed the largest dynamic tensile load that the jack will repeatedly retract (pull) while meeting the basic rated life requirements of this document. In addition, for screw- and nut-type jacks the crank effort requirements shall not be exceeded. This load shall be applied through the intended jack mount or swivel mount. The jack shall also independently meet the requirements of 6.12. The rated dynamic tensile load capacity shall not exceed the rated static tensile load capacity.

NOTE This is a maximum value and can be reduced by the jack or implement manufacturer based on application.

5.9 Rated static side load capacity

The rated static side load capacity shall not exceed one-half that of the static side load sufficient to cause catastrophic failure. This load shall be applied through the intended jack mount or swivel mount. The jack shall also be able to support the rated static side load and afterward meet the requirements of 6.12. The rated static side load capacity is the smallest rating resulting from loading in any direction such as fore-aft, lateral, or other.

NOTE This is a maximum value and can be reduced by the jack or implement manufacturer based on application.

5.10 Rated static side torque class

The rated static side torque class shall be chosen from Table 1.

NOTE Jacks not manufactured with a specific mount or mounting location are exempted from this requirement.

Table 1 — Side torque classifications

Rated static side torque class	Torque resulting from the rated static side load capacity and the maximum extended length (Nm)
I	≥ 1 350
II	≥ 2 050
III	≥ 2 700
IV	≥ 3 400
V	≥ 4 100
VI	≥ 5 400
VII	≥ 6 800

6 Jack stand system design verification tests

6.1 General procedures and installation of jack

- a) For all tests, the jack shall be installed according to the manufacturer's instructions with the jack fully extended using a fixture that simulates the mounting on an implement tongue. The jack shall be fitted with the same mounting hardware with which the jack would normally be mounted.
- b) All forces and restraints shall be applied in such a manner as to closely simulate actual field conditions.
- c) A new jack shall be used for each test.

NOTE 1 A break-in period of 10 jack cycles is allowed for each new jack.

- d) Thermal and environmental conditions shall, as much as possible, closely resemble field or application conditions.
 - e) Jack actuation shall resemble the input force in both type and direction found in actual practice.
- NOTE 2 Jack actuation generally consists of a force at an offset distance as determined by the crank assembly.
- f) If the intended application includes an outboard bearing, elimination of the tangential crank effort can more closely simulate field experience.

6.2 Crank effort test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) Load the jack to the rated dynamic compressive load capacity or, if applicable, its rated dynamic tensile load capacity.
- c) Measure the crank effort.
- d) Verify that the test results meet the requirements of [5.1](#).

6.3 Jack overtravel test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) Extend and retract the jack until all internal stops have been encountered.
- c) Verify that the test results meet the requirements of [4.3](#).

6.4 Ground pressure calculation

The following calculations shall be made and verified.

- a) Determine the projected base area.
- b) Calculate the ground pressure using the dynamic compressive load capacity.
- c) Verify that the calculations meet the requirements of [4.1](#).

6.5 Corrosion protection test

Expose a small portion of the jack (see 5.2) in its typical static position to a 48-h salt spray test according to ISO 9227.

6.6 Rated static compressive load capacity test

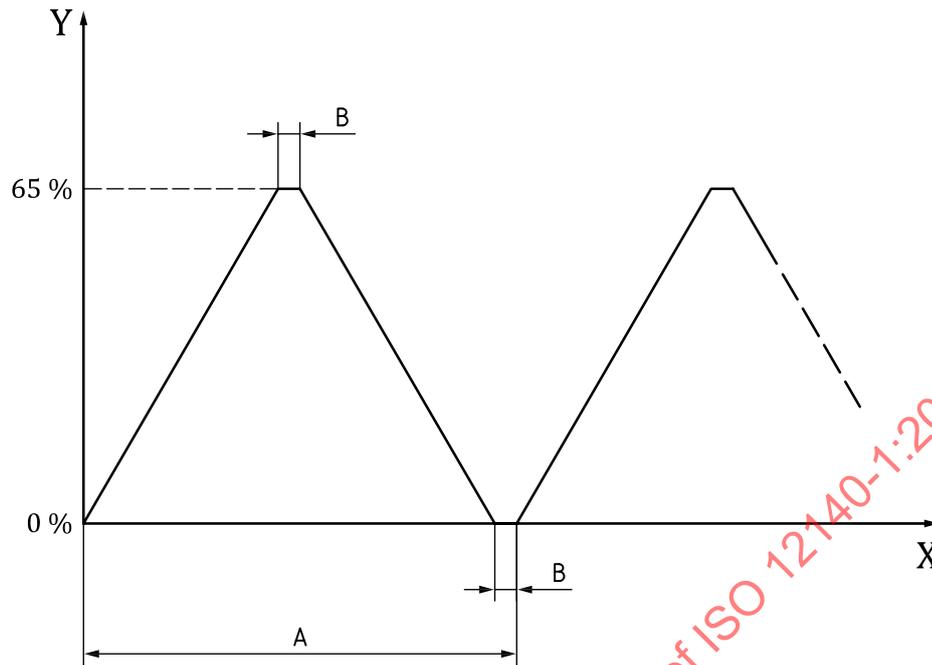
The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in 6.1.
- b) Extend the jack to its maximum extended length.
- c) Apply a static compressive load in increments determined by the jack manufacturer.
- d) Verify the test results meet the requirements of 5.5.

6.7 Rated dynamic compressive load capacity test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in 6.1.
- b) Load the jack to the expected rated dynamic compressive load capacity.
- c) Complete adequate jack cycles (see Figure 2) to satisfy the basic rated life requirements of 5.4, under the following test conditions:
 - Ambient temperature = $20\text{ °C} \pm 5\text{ °C}$.
 - Actuation speed
 - Crank speed = $10\text{ min}^{-1} \pm 1\text{ min}^{-1}$
 - or
 - Linear speed of 5 to 30 mm/s
 - Pause time at each jack travel inversion during jack cycle of $4\text{ min} \pm 1\text{ min}$.

**Key**

- Y jack travel
- X time
- A jack cycle
- B pause time

Figure 2 — Jack cycle

- d) Verify the test results meet the requirements of [5.6](#).

6.8 Rated static tensile load capacity test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) Extend the jack to its maximum extended length.
- c) Apply a static tensile load in increments determined by the jack manufacturer.
- d) Verify the test results meet the requirements of [5.7](#).

6.9 Rated dynamic tensile load capacity test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) Load the jack to the expected rated dynamic tensile load capacity.
- c) Complete adequate jack cycles to satisfy the basic rated life requirements of [5.4](#) meeting the test conditions outlined in [6.7 c](#)).
- d) Verify the test results meet the requirements of [5.8](#).

6.10 Rated static side load capacity test

The following test shall be performed and verified.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) With the base of the jack held against a rigid vertical step, extend the jack to its maximum extended length and apply a side load in increments.
- c) Verify the test results meet the requirements of [5.9](#).

6.11 Maintenance of the load

This procedure applies to hydraulic jacks only.

- a) Mount the jack to the fixture using the method described in [6.1](#).
- b) Apply a load equal to the rated static load.
- c) Extend the jack to its maximum extended length and measure the vertical height of the point of application of the load.
- d) At each interval of 10 min over a period of 30 min, re-measure the vertical height.
- e) The decrease in the height of the point of application of the load after each 10-min interval shall not exceed 1 mm.
- f) The ambient temperature and hydraulic fluid temperature at the start of measuring shall be recorded.

6.12 Acceptance criteria

6.12.1 General

When the test force has been removed, there shall be no functional or catastrophic failure of the jack stand system and the jack shall not have suffered any crack, fracture or permanent distortion and shall remain fully operable.

6.12.2 Functional failure

The jack or jack stand system is described as having a functional failure if the jack does not meet any one of the following items:

- a) Have the ability to complete 10 jack cycles per the rated dynamic compressive load capacity test described in [6.7](#);
- b) Have the ability to complete 10 jack cycles per the rated dynamic tensile load capacity test described in [6.9](#), if applicable;
- c) In the case of a swivel mount, the jack shall be able to rotate;
- d) If a drop leg is fitted, it shall be verified that the drop leg safety retaining device, and that the locking pin and its retaining device function properly.

6.12.3 Catastrophic failure

The jack or jack stand system is described as having a catastrophic failure if the jack does not meet any one of the following items:

- a) Have the ability to withstand the rated static compressive load test described in [6.6](#);