INTERNATIONAL STANDARD

ISO 8909-2

Second edition

Equipment for harvesting — Forage harvesters —

Part 2: Specification of characteristics and performance

Matériel de récolte — Récolteuses-hacheuses-chargeuses de fourage —
Partie 2: Spécification des caractéristiques et des performances

PROOF/ÉPREUVE

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Foreword

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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).

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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 ISO/Technical Committee TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 7, *Equipment for harvesting and conservation*.

This second edition cancels and replaces the first edition (ISO 8909-2:1994), which has been technically revised.

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

— updates to normative references;

— precision of description of forage harvester characteristics.

A list of all parts in the ISO 8909 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.

Equipment for harvesting — Forage harvesters —

Part 2: Specification of characteristics and performance

1 Scope

This document specifies the methods and requirements in assessing the dimensions and performance of a forage harvester, as defined in ISO 8909-1, and its functional components. It also allows comparison of forage harvester performance through comparative testing.

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 500-1, *Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 — Part 1: General specifications, safety requirements, dimensions for master shield and clearance zone*

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

ISO 789-3, *Agricultural tractors — Test procedures — Part 3: Turning and clearance diameters*

ISO 5715, *Equipment for harvesting — Dimensional compatibility of forage harvesting machinery*

ISO 8909-1:2021, *Equipment for harvesting — Forage harvesters — Part 1: Vocabulary*

ISO 8909-3: 2021, *Equipment for harvesting — Forage harvesters — Part 3: Test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 8909-1 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 Forage harvester assessment requirements

4.1 General

4.1.1 All dimensions and performance, defined in ISO 8909-1:2021, Clauses 5 and 7, and relating to forage harvesters and their components, shall be assessed in accordance with their definition and any requirements in this document.

4.1.2 The dimensions of hubs, wheels and tyres, and the positions of axles shall be recorded on the test report in ISO 8909-3:2021, Clause 7. Tyres shall be inflated to the service pressure recommended by the forage harvester manufacturer.

4.1.3 For dimensional measurements, the forage harvester shall be placed on a hard, level surface.

4.1.4 If a self-propelled forage harvester has a crop container, it shall be empty.

4.1.5 The following data shall be recorded with the forage harvester performance specifications on the test report in ISO 8909-3:2021, Clause 7:

a) type of header used;

b) moisture content of the crop, expressed on the wet basis (mass of water in 100 g of unprocessed sample);

c) the average width and height between adjacent rows of crop collected and the average distance between adjacent rows, in metres to the nearest tenth. For crops planted in rows such as corn or sorghum, the row spacing (see ISO 8909-1:2021, 6.5) and the kernel/stalk ratio or grain stalk ratio (see ISO 8909-1:2021, 6.6);

d) other relevant crop characteristics, as defined in ISO 8909-3:2021, Clause 6;

e) theoretical length of cut (see ISO 8909-1:2021, 5.24);

f) length distribution of particles in the chopped crop, determined using known mechanical separation means, capable of repetition or manual sorting, recorded in terms of average geometrical length and geometrical deviation, in accordance with ISO 8909-3;

g) if necessary, means of particle size reduction used (see ISO 8909-1:2021, 4.6 to 4.9).

4.2 Forage harvester characteristics

4.2.1 The mass (see ISO 8909-1:2021, 5.1) of a self-propelled forage harvester shall be determined with a full fuel tank and a mass of 75 kg simulating the driver. If the transport mass is also to be indicated, the fuel tank shall contain fuel not exceeding 10 % of its capacity.

If the complete machine includes certain optional equipment which influences its total mass, and/or elements such as tyre weights for self-propelled forage harvesters, these shall be specified.

4.2.2 If certain accessories or optional equipment influence the length of the forage harvester (see ISO 8909-1:2021, 5.2), these, and their dimensions, shall be recorded on the test report given in ISO 8909-3:2021, Clause 7.

4.2.3 If certain optional equipment and/or tyre dimensions and position of axles influence the width of the forage harvester (see ISO 8909-1:2021, 5.3), these, and their dimensions, shall be recorded on the test report given in ISO 8909-3:2021, Clause 7.

4.2.4 The height of the forage harvester (see ISO 8909-1:2021, 5.4), determined when the fuel tank contains fuel not exceeding 10 % of its capacity, shall only be given for self-propelled forage harvesters, with all components in the transport position and in the working position. The type of header mounted during measurements shall be indicated. If certain optional equipment influences machine height, this equipment, and its dimensions, shall be specified. The tyre size and inflation pressure shall be recorded on the test report in ISO 8909-3:2021, Clause 7.

4.2.5 When the forage harvester spout discharge height (see ISO 8909-1:2021, 5.5) is adjustable, the minimum and maximum heights shall be recorded on the test report given in ISO 8909-3:2021, Clause 7. The type of header mounted during measurements shall be indicated.

For self-propelled forage harvesters, the fuel tank shall contain fuel not exceeding 10 % of its capacity of fuel and the spout discharge height shall be in accordance with ISO 5715. The tyre size and inflation pressure shall be indicated.

For towed forage harvesters, the tractor tow bar height at the attachment point shall also be indicated, in millimetres.

4.2.6 The engine maximum power of self-propelled forage harvesters shall be determined in accordance with the standards or test codes mentioned in ISO 8909-1:2021, 5.6.

4.2.7 The engine displacement of self-propelled forage harvesters shall be given, in litres to the nearest hundredth.

4.2.8 The turning diameter of self-propelled forage harvesters shall be determined, on a hard and level surface, in accordance with ISO 789-3, without applying the brakes. It shall be expressed in metres to the nearest hundredth. The wheelbase and the track width of the steered-wheels shall be indicated.

4.2.9 The clearance diameter of self-propelled forage harvesters shall be determined in accordance with ISO 789-3, without applying the brakes, with the harvesting header completely raised, and with the same wheelbase and the track width of the steered-wheels indicated in 4.2.8. The clearance diameter shall be expressed in metres, to the nearest hundredth. If certain optional equipment influences this machine dimension, this equipment, and its dimensions, shall be recorded on the test report in ISO 8909-3:2021, Clause 7.

4.2.10 For tractor-mounted or towed forage harvesters, the PTO drive-shaft class and the PTO type shall be specified in accordance with ISO 500-1. The PTO rotational frequency (540 min^{-1} or 1 000 min^{-1}) shall be given together with an indication of nominal power rating (see ISO 8909-1:2021, 5.12).

The category of the tractor three-point hitch needed to raise and operate the machine shall be given in accordance with ISO 730.

4.2.11 The number of harvesting rows shall be indicated with the effective header harvesting width for row crops or maize headers (see ISO 8909-1:2021, 5.13). Where the width between harvesting headers is adjustable, the minimum and maximum distances between row axes shall be indicated, in millimetres. In this case, the effective minimum and maximum cutting widths shall be indicated.

4.2.12 The header theoretical cutting height (see ISO 8909-1:2019, 5.14) shall be determined, to the nearest 5 mm, for the minimum and maximum working heights, at the lowest and highest working points to which the cutting means may be raised or lowered by means of the normal lift mechanism, in accordance with the manufacturer's instructions. The header type fitted at the time of measurement shall be indicated.

For towed forage harvesters, the tractor towbar height at the attachment point shall be indicated, in millimetres.

4.2.13 If optional equipment influences the mass of the header (see ISO 8909-1:2021, 5.15), it shall be recorded on the test report given in ISO 8909-3:2021, Clause 7.

4.2.14 Cutterbar frequency and stroke of oscillating scissor knives, determined at the furthest forward cutting edge in accordance with ISO 8909-1:2021, 5.16 and 5.17 respectively, shall be recorded on the test report given in ISO 8909-3:2021, Clause 7.

4.2.15 For cylindrical rotors, the following characteristics shall be indicated:

— number of knives passing a given point per cycle;

— rotational frequency, in revolutions per minute;

— rotor width and diameter, expressed in millimetres.

4.2.16 For flywheel cutterheads, the following characteristics shall be indicated:

— number of knives;

— number of blower paddles to throw the crop, if so equipped;

— rotational frequency, in revolutions per minute;

— effective inside and outside cutting diameters of the knives around the axis of rotation, expressed in millimetres;

— tip diameter and effective width of blower paddles, in millimetres, if so equipped;

— internal width of blower, in millimetres.

4.2.17 The recutter screen opening dimensions shall be given, in millimetres.

4.2.18 For random-cut flail chopping rotors, the following characteristics shall be indicated:

— number of rows of flails passing a given point in one cycle;

— total number of flails;

— rotational frequency of rotor, in revolutions per minute;

— width of rotor, in metres to the nearest hundredth.

4.2.19 For cylinder impeller blowers, the following characteristics shall be indicated:

— number of rows of paddles; total number of paddles;

— rotational frequency, in revolutions per minute;

— diameter and width of rotor, in millimetres.

4.2.20 For flywheel impeller blowers, the following characteristics shall be indicated:

— number of paddles;

— rotational frequency, in revolutions per minute;

— blower diameter and inside width of the blower housing, in millimetres.

4.2.21 In the case of forage harvesters for which the crop mat velocity of the cut mechanism consists of feedrolls, the theoretical length of cut (see ISO 8909-1:2021, 5.25), *TLOC*, in millimetres, is calculated using Formula (1).

NOTE It is assumed that no crop fragments get through the feedrolls and that stalks are cut perpendicular to their longitudinal axis.

$$TLOC = \frac{\pi (D_1 N_1) + (D_2 N_2)}{Nkz} \quad (1)$$

where

D_1 is the effective diameter of the upper rear feedroll, in millimetres;

D_2 is the effective diameter of the lower rear feedroll if used, in millimetres;

N_1 is the rotational frequency of the upper rear feedroll, in revolutions per minute;

N_2 is the rotational frequency of the lower rear feedroll if used, in revolutions per minute;

N is the rotational frequency of the rotor, in revolutions per minute;

k is the number of knives, or, in the case of a rotor with multiple knives, the total number of knives in each unit;

z corresponds to the number feedrolls: z = 1, if the machine has one upper rear feedroll and z = 2, if the machine has one upper and one lower rear feedroll.

If the forage harvester does not use feedrolls as a means of supplying the cutting mechanism, the following requirements apply.

a) For forage harvesters where the feeding auger is positioned substantially parallel to the cutterhead, the numerator shall be replaced by the linear speed of the auger flights multiplied by a combined slip and compaction factor of 0,7, and z shall be taken equal to 1. Where the manufacturer(s) specify a different factor, this shall be used.

b) For forage harvesters where the feeding auger is positioned substantially perpendicular to the cutterhead, the numerator shall be replaced by the linear speed of the auger flights multiplied by a combined slip and compaction factor of 0,85, and z shall be taken equal to 1. Where the manufacturer(s) specify a different factor, this shall be used.

c) For forage harvesters with a different feed mechanism, the manufacturer's crop mat velocity data (see ISO 8909-1:2021, 5.25) at the feed-on point of the cutterhead may be used in the numerator, and z shall be taken equal to 1.

d) For random-cut (flail-type) forage harvesters gathering pre-cut crop, there is no reliable method to calculate the theoretical length of cut. When the crop is cut directly, the numerator shall be taken equal to the forward speed of the machine, k shall be taken equal to the ratio of the sum of the cutting widths of all the flails to the effective width of the rotor, and z shall be taken equal to 1.

4.3 Performance

4.3.1 The crop throw distance (see ISO 8909-1:2021, 7.3) shall be indicated, in addition to the information specified in 4.2.5.

4.3.2 The whole grain or maize fraction (see ISO 8909-1:2021, 7.4) shall be expressed as the ratio in percentage, to the nearest half-percent, of the mass of whole grain or maize to the total mass yield, or, alternatively, as the total grain or maize yield of the crop, as a mass. The calculation method used shall be indicated. Dye penetrants may be used to detect broken grain.

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