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Forage harvesters -- Part 2: Specification of characteristics and performance

Récolteuses-hacheuses-chargeuses de fourrage -- Partie 2: Spécification des caractéristiques et des performances

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INTERNATIONAL STANDARD

ISO 8909-2

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Forage harvesters —

Part 2: Specification of characteristics and performance

Récolteuses-hacheuses-chargeuses de fourrage —

Partie 2:
Spécification des caractéristiques et des performances

Reference number
ISO 8909-2:1994(E)

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 8909-2 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 7, *Equipment for harvesting and conservation*.

ISO 8909 consists of the following parts, under the general title *Forage harvesters*:

— *Part 1: Vocabulary*

— *Part 2: Specification of characteristics and performance*

— *Part 3: Test methods*

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Forage harvesters —

Part 2:
Specification of characteristics and performance

1 Scope

This part of ISO 8909 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 standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8909. 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 8909 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 500:1991, *Agricultural tractors — Rear-mounted power take-off — Types 1, 2 and 3.*

ISO 730-1:1990, *Agricultural wheeled tractors — Rear-mounted three-point linkage — Part 1: Categories 1, 2 and 3.*

ISO 730-2:1979, *Agricultural wheeled tractors — Three-point linkage — Part 2: Category 1 N (Narrow hitch).*

ISO 730-3:1982, *Agricultural wheeled tractors — Three-point linkage — Part 3: Category 4.*

ISO 789-3:1993, *Agricultural tractors — Test procedures — Part 3: Turning and clearance diameters.*

ISO 2288:1989, *Agricultural tractors and machines — Engine test code (bench test) — Net power.*

ISO 5673:1993, *Agricultural tractors and machinery — Power take-off drive shafts and position of power-input connection.*

ISO 5715:1983, *Equipment for harvesting — Dimensional compatibility of forage harvesting machinery.*

ISO 8909-1:1994, *Forage harvesters — Part 1: Vocabulary.*

ISO 8909-3:1994, *Forage harvesters — Part 3: Test methods.*

3 Forage harvester assessment requirements

3.1 General

3.1.1 All dimensions and performance, defined in ISO 8909-1:1994 in 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 part of ISO 8909.

3.1.2 The dimensions of hubs, wheels and tyres, and the positions of axles shall be indicated. Tyres shall be inflated to the service pressure recommended by the forage harvester manufacturer.

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

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

3.1.5 The following data shall be given with the forage harvester performance specifications:

a) type of head used;

b) moisture content of the crop, expressed as a percentage of wet and dry material;

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 (ISO 8909-1:1994, definition 6.5) and the kernel/stalk ratio or grain stalk ratio (ISO 8909-1:1994, definition 6.6);

d) other relevant crop characteristics, as defined in ISO 8909-3:1994, clause 6;

e) theoretical length of cut (ISO 8909-1:1994, definition 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 8909-1:1994, definitions 4.6 to 4.9).

3.2 Forage harvester characteristics

3.2.1 The mass (ISO 8909-1:1994, definition 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 5 l of fuel at most.

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.

3.2.2 If certain accessories or optional equipment influence the length of the forage harvester (ISO 8909-1:1994, definition 5.2), these, and their dimensions, shall be specified.

3.2.3 If certain optional equipment and/or tyre dimensions and position of axles influence the width of the forage harvester (ISO 8909-1:1994, definition 5.3), these, and their dimensions, shall be specified.

3.2.4 The height of the forage harvester (ISO 8909-1:1994, definition 5.4), determined when the fuel tank contains 5 l at most, shall only be given for self-propelled forage harvesters, with all components in the transport position and in the working position. The type of head mounted during measurements shall be indicated. If certain optional equipment influences machine height, this equipment, and its dimensions, shall be specified.

3.2.5 When the forage harvester spout discharge height (ISO 8909-1:1994, definition 5.5) is adjustable, the minimum and maximum heights shall be specified. The type of head mounted during measurements shall be indicated.

For self-propelled forage harvesters, the fuel tank shall contain 5 l at most of fuel and the spout discharge height shall be in accordance with ISO 5715.

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

3.2.6 The engine net power of self-propelled forage harvesters shall be determined in accordance with ISO 2288, at engine nominal speed. Where commercial requirements indicate use of a different test code to determine engine power, this test code shall be indicated.

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

3.2.8 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 steered-wheels track width shall be indicated.

3.2.9 The clearance diameter of self-propelled forage harvesters shall be determined in accordance with ISO 789-3, without applying the brakes, with the harvesting head completely raised, and with the same wheelbase and the steered-wheels track width indicated in 3.2.8. 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 specified.

3.2.10 For tractor-mounted or towed forage harvesters, the PTO drive-shaft class and the PTO type shall be specified in accordance with ISO 5673 and ISO 500 respectively. The PTO rotational frequency (540 min^{-1} or 1 000 min^{-1}) shall be given together with an indication of nominal power rating (ISO 8909-1:1994, definition 5.12).

The category of the tractor three-point hitch needed to raise and operate the machine shall be given in accordance with ISO 730-1, ISO 730-2 or ISO 730-3.

3.2.11 The number of harvesting rows shall be indicated with the effective head harvesting width for row crops or maize heads (ISO 8909-1:1994, definition 5.13). Where the width between harvesting heads 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.

3.2.12 The head theoretical cutting height (ISO 8909-1:1994, definition 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 head 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.

3.2.13 If optional equipment influences the mass of the head (ISO 8909-1:1994, definition 5.15), it shall be indicated.

3.2.14 Cutterbar frequency and stroke of oscillating scissor knives, determined at the furthest forward cutting edge in accordance with ISO 8909-1:1994, definitions 5.16 and 5.17 respectively, shall be specified.

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

— number of knives passing a given point per cycle;

— rotational frequency, in minutes to the power minus one;

— rotor width and diameter, expressed in millimetres.

3.2.16 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 minutes to the power minus one;

— 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.

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

3.2.18 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 minutes to the power minus one;

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

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

— number of rows of paddles;

— total number of paddles;

— rotational frequency, in minutes to the power minus one;

— diameter and width of rotor, in millimetres.

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

— number of paddles;

— rotational frequency, in minutes to the power minus one;

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

3.2.21 In the case of forage harvesters for which the crop mat velocity of the cut mechanism consists of feedrolls, the theoretical length of cut (ISO 8909-1:1994, definition 5.24), TLOC, in metres, is calculated using the following equation.

NOTE 1 It is assumed that no crop fragments get through the feedrolls and that stalks are cut perpendicular to their longitudinal axis.

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

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 minutes to the power minus one;

N_2 is the rotational frequency of the lower rear feedroll if used, in minutes to the power minus one;

N is the rotational frequency of the rotor, in minutes to the power minus one;

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

z corresponds to the number of feedrolls: $z = 1$, if the machine has one feedroll and $z = 2$ in other cases.

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 (ISO 8909-1:1994, definition 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 precut 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.

3.3 Performance

3.3.1 The crop throw distance (ISO 8909-1:1994, definition 7.3) shall be indicated, in addition to the information specified in 3.2.5.

3.3.2 The whole grain or maize fraction (ISO 8909-1:1994, definition 7.4) shall be expressed as the ratio, to the nearest half-percent, of the mass of whole grain or maize to the total mass yield, or, as an alternative, 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 or maize.