
**Equipment for harvesting — Combine
harvesters — Test procedure and
performance assessment**

*Matériel de récolte — Moissonneuses-batteuses — Mode opératoire
d'essai et évaluation des performances*

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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 7, *Equipment for harvesting and conservation*.

This second edition of ISO 8210 cancels and replaces ISO 8210:1989 and ISO 6689-2:1997, which have been technically revised.

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

- Test and performance requirements formerly found in ISO 6689-2 have been added.
- Keys have been added to [Figures 1](#) and [2](#).
- Clarifications have been made in [Clause 7](#).

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 — Combine harvesters — Test procedure and performance assessment

1 Scope

This document specifies a test procedure for the measurement and testing of combine harvesters. It applies to either self-propelled or trailed type, either directly cutting the crop or picking it up from a windrow, for use in several crops.

This document specifies the terminology and methods to be used for measuring important characteristics of combine harvesters. It includes both functional and capacity tests, in other words, those conducted over an extended period when ease of operation, ease of adjustment, rate of work and general operating characteristics can be assessed, and those carried out on specific occasions for the determination of grain loss and capacity characteristics.

It applies to all types of combine harvesters.

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

ISO 4254-7, *Agricultural machinery — Safety — Part 7: Combine harvesters, forage harvesters, cotton harvesters and sugar cane harvesters*

ISO 5007, *Agricultural wheeled tractors — Operator's seat — Laboratory measurement of transmitted vibration*

ISO 5131, *Tractors for agriculture and forestry — Measurement of noise at the operator's position — Survey method*

ISO 5687, *Equipment for harvesting — Combine harvesters — Determination and designation of grain tank capacity and unloading device performance*

ISO 5702, *Equipment for harvesting — Combine harvester component parts — Equivalent terms*

ISO 6689:—¹⁾, *Equipment for harvesting — Combine harvesters and functional components — Vocabulary*

ISO 14396, *Reciprocating internal combustion engines — Determination and method for the measurement of engine power — Additional requirements for exhaust emission tests in accordance with ISO 8178*

3 Terms and definitions

For the purposes of the documents, the terms and definitions given in ISO 5702, ISO 6689, ISO 4254-7 and the following 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>

1) Under preparation. Stage at the date of publication: ISO/FDIS 6689:2021.

— IEC Electropedia: available at <http://www.electropedia.org/>

- 3.1 test combine harvester**
subject combine harvester or combine harvester configuration to be tested
- 3.2 comparison combine harvester**
other combine harvester or combine harvester configuration to which the test machine is compared, if applicable
- 3.3 test series**
all events and data comprising several *test runs* (3.4)
- 3.4 test run**
events necessary to record a single set of measurements
- 3.5 catch**
mass of any material collected during the *test run* (3.4)
- 3.5.1 grain catch**
material collected through the primary clean grain discharge point for the purpose of sample analysis
- 3.5.2 separator catch**
material collected from the machine's normal point of discharge from the separator
- 3.5.3 cleaning catch**
material collected from the machine's normal point of discharge from the cleaning system

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4 General requirements

- 4.1** The way in which the combine was selected or obtained for testing and the approximate duration of any running prior to test shall be stated in the test report.
- 4.2** The combine harvester shall normally be operated in accordance with the manufacturer's instructions. The test report shall record and give reasons for any significant departure from them.
- 4.3** Commercially available accessories as necessary or desirable for the various crops in which the combine is to be used shall be reported.
- 4.4** Setting and adjustments of the machine shall be generally in accordance with the manufacturer's operator's manual. The actual settings shall be recorded and reported.

5 Characteristics of machine

5.1 Significant details

All significant details of the combine harvester shall be established and verified in accordance with the definitions, characteristics and performance criteria laid down in ISO 6689. All dimensions and performance relating to combine harvesters and their functional components, shall be assessed in accordance with ISO 6689 and any requirements in this document.

5.2 Speeds

5.2.1 For self-propelled combine harvesters, measurements of the speed of any component shall be made under “no-load” conditions with the governor control lever set in the normal working position corresponding to the required working combine harvester regime.

5.2.2 For power take-off (PTO) driven machines, these speeds shall be measured at standard PTO rotational frequency ($540 \text{ min}^{-1} \pm 10 \text{ min}^{-1}$ or $1\,000 \text{ min}^{-1} \pm 25 \text{ min}^{-1}$). (See ISO 500-1).

5.2.3 Ground speeds shall be measured on a hard, horizontal surface (see ISO 3965), with the governor control lever in the normal working position and the crop processing mechanism disengaged.

5.2.4 If the combine harvester is fitted with stepless speed change mechanism, the maximum and minimum speeds obtained for each gear shall be measured. Otherwise, speeds obtained for all combinations of the gears shall be measured.

5.3 Configurations

Component modes for each configuration shall be in accordance with the manufacturer's recommendations. Refer to the combine harvester's operator's manual for applicable configuration for each operating environment.

NOTE [Table 1](#) is presented for reference.

Table 1 — Component modes for each configuration

Item #	Component	Position of component	
		Transport	Field
1	Front axle	Transport mode	Operational
2	Rear axle	Transport mode	Operational
3	Auxiliary axle	Down	Up
4	Operator access ladders	Narrowest	Safest position
5	Covers/shielding/cosmetic panels	Narrowest	Operational
6	Unload device	Cradle	Outermost limit
7	Unload device auxiliary	Collapsed	Operational
8	Feederhouse	Recommended	Operational
9	Straw and/or chaff spreader	Transport mode	Operational
10	Grain tank extension	Transport mode	Operational
11	Lighting and marking	Transport mode	Operational
12	Mirrors	Transport mode	Operational
13	Antennas	Transport mode	Operational

5.4 Dimensions

Dimensions of combine harvesters shall be measured according to either field operation or transport operation as indicated in [Table 2](#) and as defined in [5.4.1](#) to [5.4.8](#).

Table 2 — Summary of machine configurations for each measurement

Subclause reference	Measurement	Configuration	
		Transport	Field
5.4.1	Combine harvester length	X	X
5.4.2	Combine harvester height	X	X
5.4.3	Combine harvester width	X	X
5.4.4	Turning diameter	X	X
5.4.5	Clearance diameter	X	X
5.4.6	Head working widths		X
5.4.7	Head working widths - Maize		X
5.4.8	Ground clearance		X
5.4.8	Maximum discharge height		X
5.4.8	Maximum clearance height		X
5.4.8	Maximum reach		X
5.4.8	Height of cutterbar		X

5.4.1 Combine harvester length shall be measured, both in transport configuration and equipped for field configuration. In the field conditions, the head shall be fully raised and the reel fully forward; the longest available divider shall be fitted. If other equipment, options or attachments affect the length, such equipment shall be specified.

5.4.2 Combine harvester height shall be measured with all components in position for transport configuration. The height with all components in position for field configuration shall be measured. It shall be stated whether or not the combine harvester is fitted with a cab.

5.4.3 Combine harvester width shall be measured both in the transport configuration and equipped for field configuration. In the field condition, the head fitted shall be the same as that fitted when determining head working width and effective cutterbar width as specified in ISO 6689.

5.4.4 The turning diameter shall be measured in accordance with ISO 789-3 without applying the brakes.

If the left-hand and right-hand turning radius are not equal, both should be stated.

5.4.5 The clearance diameter shall be measured in accordance with ISO 789-3.

If the left-hand and right-hand clearance diameter are not equal, both should be stated.

5.4.6 Where adjustable dividers are used, the minimum and maximum head working widths shall be indicated.

5.4.7 Where the header width is adjustable, the minimum and maximum effective working widths of maize head cutters shall be indicated, including the number of picking units.

5.4.8 The ground clearance, the maximum discharge height, the maximum clearance height, the maximum reach, length of unloader, and the height of the cutterbar shall be determined under the following conditions.

- a) Tyre and wheel or track equipment shall be stated, and tyres shall be inflated to the field operating pressures recommended by the combine harvester manufacturer.
- b) The plane on which the combine harvester is standing shall be substantially level.

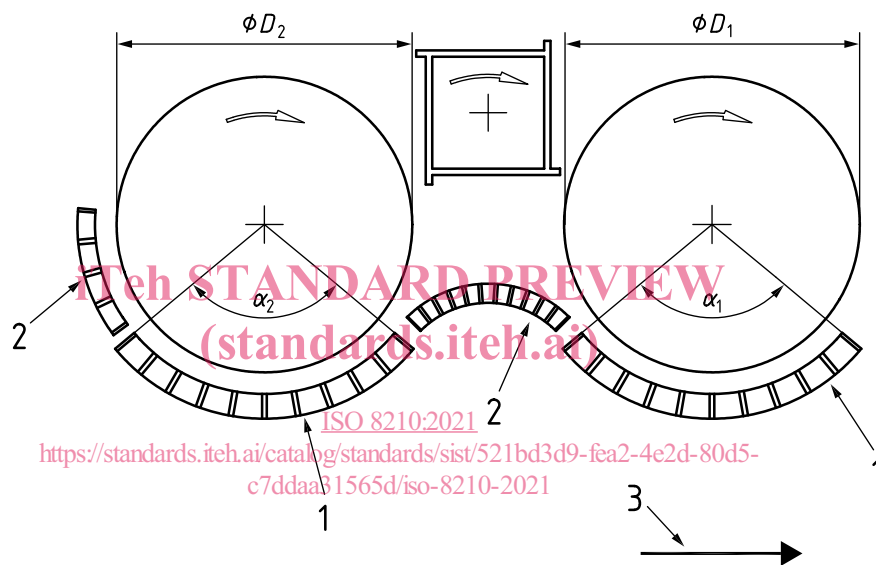
- c) The size and type of head and reel installed at the time of measuring shall be stated.
- d) All optional equipment mounted on the combine harvester shall be specified.

5.4.9 Furthermore, the height of the cutterbar shall be stated as the highest point and the lowest point to which the cutterbar can be raised or lowered, measured from the ground plane to the tip of the knife section.

5.5 Other measurements

5.5.1 Cylinders and rotors

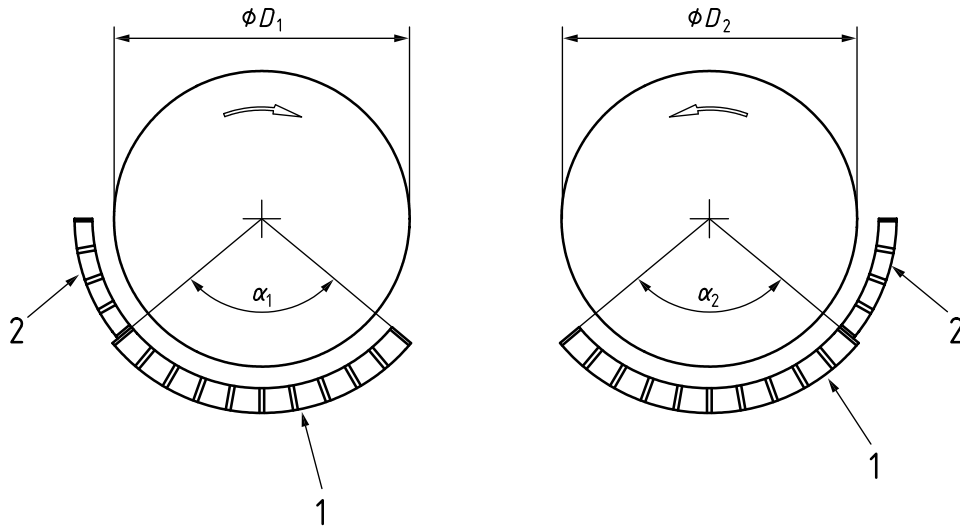
Single or multiple cylinders or rotors may be disposed laterally (see [Figure 1](#)) or longitudinally (see [Figure 2](#)) within the combine harvester. If multiple cylinders or rotors are used, the number shall be stated, and the dimensions given as in [Figures 1](#) and [2](#).



Key

- 1 concave grate
- 2 concave grate extension
- 3 direction of combine harvester travel
- α_1 concave arc
- α_2 concave arc
- ϕD_1 threshing cylinder diameter
- ϕD_2 separating cylinder diameter

Figure 1 — Laterally disposed cylinders or rotors



Key

- 1 concave grate
- 2 concave grate extension
- α_1 concave arc #1
- α_2 concave arc #2
- ϕD_1 rotor diameter #1
- ϕD_2 rotor diameter #2

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Figure 2 — Longitudinally disposed cylinders or rotors (viewed from rear)

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5.5.2 Concaves

5.5.2.1 If more than one concave is used, the dimensions and surfaces of each of them shall be indicated separately. The concave grate surfaces are cumulative.

5.5.2.2 If the combine harvester has more than one rotor, with its related concave and separating grates, the quantity shall be indicated with the length and the area of the separating grate.

5.5.2.3 When using concave arc to describe the concave, the diameter of the associated cylinder, or rotor, shall also be noted (see [Figures 1](#) and [2](#)). If the concave arc varies with concave adjustment, then the ranges of arc should be noted.

5.5.3 Separating devices

5.5.3.1 [5.5.2.2](#) also applies for separating grates and secondary separating grates.

5.5.3.2 The surface of auxiliary separating devices shall not be added to that of separating devices.

5.5.4 Straw walker

If there are adjustable sections at the rear of the straw walker, they shall be fully extended when determining the length of the walkers.

5.5.5 Conveying devices

Devices that only convey material within the combine harvester (for example, grain pans, augers, paddles and other non-permeable conveyors) while they can contribute to good separation by stratifying

the material advantageously, do no actual separation of grain from material other than grain (MOG), and their areas may not be classified as separating areas, or added to the other separating areas.

5.5.6 Sieves and sieve area

To determine the sieve area where sieve extensions are used in the standard specifications of the combine harvester, their surfaces shall be measured by the same means and these conditions shall be stated. The component sieves and sieve extensions may be totalled and represented as total sieve area. If a grain pan extension comb (grate or fingers) is used to achieve suspension of the grain mat, its area should not be included when establishing the cleaning area.

5.5.7 Dirt screens, recleaners and other auxiliary cleaning devices

These surface areas of these devices shall be specified.

5.5.8 Permeable surfaces

Sieve area and pneumatic cleaning areas shall be calculated and expressed.

5.5.9 Functional components

For the purposes of reporting combine harvester specifications, the functional component areas defined in ISO 6689:—, 3.6 and covered in 5.5 shall be listed separately and individually. Areas shall not be used singly or in combination as a measure of a combine harvester's capacity, performance or value.

5.6 Other characteristics (standards.iteh.ai)

5.6.1 The engine net power shall be determined in accordance with ISO 14396.

5.6.2 The throughputs defined in ISO 6689:— 4.1 and measured in 7.2.5, shall be indicated with the corresponding MOG:G ratio value.

5.6.3 When indicating the combine harvester mass equipped for operation in the field, the accessories fitted to the combine harvester shall be listed and their mass indicated.

5.7 Position of centre of gravity

5.7.1 It shall be specified, for the machine tested, whether it is equipped with powered rear-wheel drive or not and if it has a chopper attachment. This is a supplementary measurement applicable to self-propelled combine harvesters only.

5.7.2 The position of the centre of gravity shall be determined under the conditions outlined in Table 3. See also ISO 16231-2.