International Standard ISO 6689

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Equipment for harvesting — Combines and functional components — Definitions, characteristics and performance

Matériel de récolte — Moissonneuses-batteuses et parties constitutives fonctionnelles — Définitions, caractéristiques et performances

First edition — 1981-11-01

UDC 631.354 **Ref. No. ISO 6689-1981 (E)**

Descriptors : agricultural machinery, harvest equipment, combines, definitions, specifications, performance evaluation.

Price based on 9 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6689 was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in June 1980.

It has been approved by the member bodies of the following countries :

Australia	Finland	Portugal
Austria	France	Romania
Belgium	Germany, F. R.	South Africa, Rep. of
Brazil	India	Spain
Bulgaria	Iran	Sweden
Canada	Italy	Switzerland
China	Korea, Rep. of	Turkey
Denmark,	New Zealand	United Kingdom
Egypt, Arab Rep. of	Poland	USSR

No member body expressed disapproval of the document.

Equipment for harvesting — Combines and functional components — Definitions, characteristics and performance

1 Scope and field of application

This International Standard establishes the definitions relative to combines and their component parts; lays down dimensional and other characteristics aimed at allowing comparison of operation of the component parts, and also determines the performances of the combines either by calculation or by comparative tests.

2 References

ISO 789/3, *Agricultural tractors — Test procedures — Part 3 : Turning and clearance diameters.* [1)]

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

3 Definitions

3.1 For the combine

3.1.1 header (table) : Portion of the combine comprising the mechanism for gathering and cutting, stripping or picking the crop.

3.1.2 sickle (knife) : Reciprocating component of the header for cutting the crop.

3.1.3 pickup attachment : Device for gathering a crop from a windrow.

3.1.4 threshing cylinder : Balanced rotating assembly, comprising rasp, beater bars or spikes on its periphery and their supports, for threshing the crop.

3.1.5 concave : Concave-shaped grating partly surrounding the cylinder against which the cylinder rubs and detaches the grain from the ears and through which the grain is discharged.

3.1.6 concave grates : Portions of the concaves which are permeable (for separation).

3.1.7 transition grate : Permeable element to provide transition from one cylinder/concave unit to the next, or from a cylinder/concave unit, or concave grate extension to straw walkers or rack, as shown in figure 6.

3.1.8 separating devices : All non-threshing separation elements.

3.1.8.1 rotary combine separation element : Permeable element or elements approximately concentric with the rotating member or members (see figure 8).

3.1.8.2 shoe : Oscillating structure shown in figures 7a) and 7b) which supports the cleaning sieve or sieves and which may also support the chaffer sieve and chaffer sieve extension.

3.2 For the performances of the combine

3.2.1 cutting : Detaching of the grain or seed and necessary portion of the straw, stem, stalk or grass from the remaining portion of the same, rooted to the ground.

3.2.2 feeding : Conveying of the cut or picked up crop into the combine.

3.2.3 threshing : Detaching of grain or seed from the head, cob or pod.

3.2.4 separating : Isolating of detached grain or seed, small debris, and incompletely threshed seed from the bulk or straw, stem, stalk or grass.

1) At present at the stage of draft.

3.2.5 cleaning : Isolating of desired grain or seed from chaff, small debris and incompletely threshed seed, cob or pod.

3.2.5.1 sieving : Isolating of desired grain or seed by a device where the desired seed penetrates it and the undesired material is carried over the device.

3.2.5.2 screening : Isolating of desired grain or seed by a device where the desired seed is carried over the device, and the undesired material penetrates it.

3.2.6 returns : Process for recirculating incompletely threshed grain for further processing.

4 Characteristics of the combine and functional components

4.1 Combine

4.1.1 Combine mass

The mass of the machine shall be determined separately for front and rear axles, with empty grain tank, full fuel tank, and including standard mass of 75 kg in the operator's position, in both the following conditions :

4.1.1.1 Equipped for road travel, without header mass (table) or any accessories; if the header (table) cannot be removed from the base machine then the header (table) size shall be quoted.

4.1.1.2 Equipped for operation in the field complete with accessories and available grain, corn/maize header (table) or pickup fitted, fully raised, and with the reel fully forward.

4.1.2 Combine length

Overall length of the machine measured parallel to the longitudinal centre line, both in road travel condition and equipped for field operation.

In the field condition, the table 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.

4.1.3 Combine height

Vertical distance from the place on which the combine is standing, to the highest point on the combine.

This height shall be measured under the conditions specified for the measuring of the cutter bar height (see 4.2.2.3).

The height with all components in position for transport, and the height with all components in position for field operation shall be specified.

It shall be stated whether or not the combine is fitted with a cab.

4.1.4 Combine width

Overall width of the machine measured both in road travel condition and equipped for field operation.

In the field condition, the header (table) fitted shall be the same as that fitted when determining working width and effective cutterbar width as specified in 4.2.2.3.

4.1.5 Engine power

See ISO 2288.

4.1.6 Turning radius

See ISO 789/3.

4.1.7 Clearance radius

See ISO 789/3.

4.1.8 Ground clearance

Minimum height from the ground to any part of the combine excluding header (table) and straw elevator assembly, and expressed in millimetres.

NOTE — The ground clearance shall be measured under the conditions specified in 4.2.2.3.

4.1.9 Maximum discharge height

Vertical distance from the plane on which the combine is standing to the lowest point under discharge opening with the unloader in operating position as shown in figure 1.

The height shall be measured under conditions specified in 4.2.2.3. Discharge height shall be expressed in millimetres.

4.1.10 Maximum clearance height

Vertical distance from the plane on which the combine is standing to a point on the underside of the unloader at a horizontal distance of 1 000 mm from the lowest point of the discharge opening as shown in figure 1. This height shall be measured under the conditions specified in 4.1.3 and expressed in millimetres.

4.1.11 Maximum reach

Horizontal distance measured from the innermost point of the unloader discharge opening to the outermost point of the header (table) on the unloader side as shown in figure 1. The reach shall be measured under conditions specified in 4.2.2.3 and expressed in millimetres.

Dimensions in millimetres

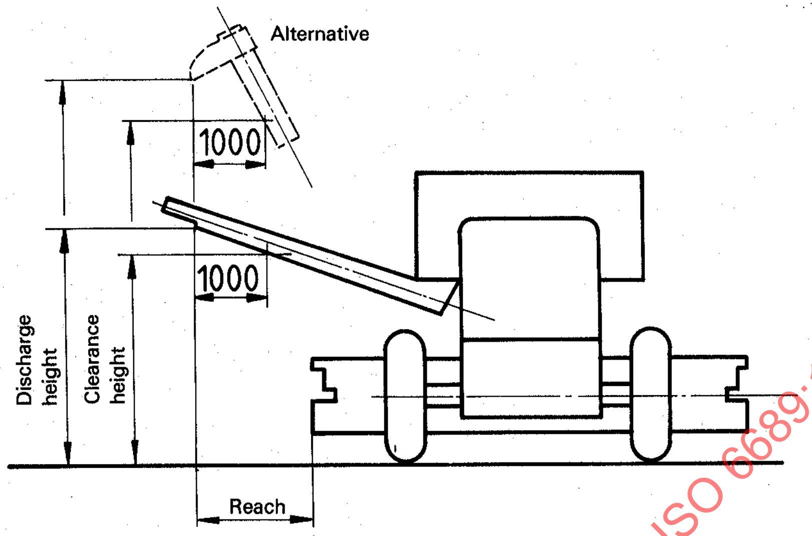

Figure 1 — Discharge height and clearance height

4.2 Functional components

4.2.1 Header

4.2.1.1 Working width

Distance between the centre lines of the outermost divider points, expressed in millimetres. Where adjustable dividers are used, the maximum and minimum dimensions shall be stated.

4.2.1.2 Effective cutterbar width

Distance in millimetres, between the vertical side sheets of the feed table, measured immediately above the tips of the knife sections. Where the feed table is asymmetrical about the centre line of the machine, the amount of offset and whether it is to left or right must be stated.

4.2.1.3 Maize (ear corn) header effective working width

Average distance between the centre lines of adjacent picking units multiplied by the number of units. Where the header width is adjustable, the maximum and minimum dimensions shall be stated. The effective width shall be expressed in millimetres and the number of picking units shall be stated.

4.2.2 Sickle (knife)

4.2.2.1 Sickle (knife) frequency

Number of cycles which the sickle (knife) makes in a given period of time. One cycle is the full movement of the sickle (knife) in one direction and its return to the starting point.

The frequency shall be expressed in whole cycles per second.

4.2.2.2 Sickle (knife) stroke

Distance that a point on the sickle (knife) travels with respect to the centre line of a guard in one half cycle.

The stroke shall be expressed in millimetres.

4.2.2.3 Cutterbar height (in millimetres)

Height of the forward tip of any sickle (knife) section above the plane on which the basic machine, as described by the manufacturers, is standing, measured under the following conditions :

a) the maximum and minimum dimensions shall be 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;

b) tyre and wheel or track equipment shall be stated, and tyres shall be inflated to the field operating pressures recommended by the combine manufacturer;

c) the plane on which the combine is standing shall be substantially level;

d) the size and type of table and reel installed at the time of measuring shall be stated;

e) all machine options shall be specified.

4.2.3 Pickup attachment

4.2.3.1 Pickup attachment width

Minimum distance including the width of the outermost conveying elements but not including the gather of the flared sickle (knife) sheets.

The width shall be expressed in metres to two decimals.

4.2.4 Threshing cylinder

4.2.4.1 Cylinder diameter

Diameter of the circle generated by the outermost point of the cylinder threshing elements (dimension D, figure 2) expressed in millimetres.

NOTE — One or more threshing cylinders can be disposed laterally (see figure 3), or axially (see figure 4) within the combine.

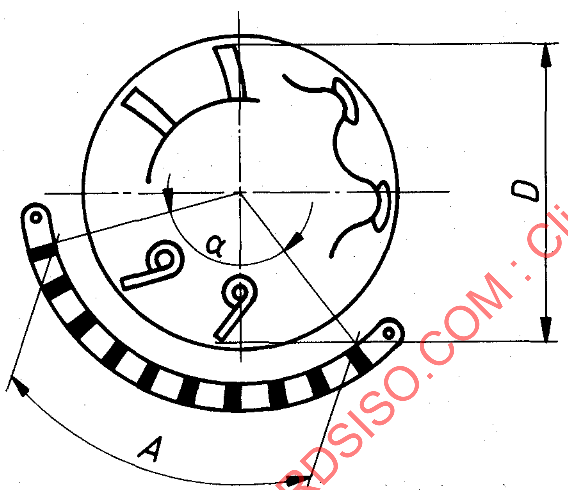

Figure 2 — Cylinder diameter

4.2.4.2 Cylinder width or length

Length of the cylindrical volume generated by the outermost points of the cylinder threshing elements as it rotates about its own axis expressed in millimetres (dimension L_1, figure 5).

4.2.4.3 The term "cylinder width" shall be used in reference to cylinders disposed laterally; "cylinder length" in reference to those disposed axially.

NOTE — In some countries, and for many years, the diameter and width of the threshing cylinder, particularly its width, have been quoted as basic indicators of machine size. The threshing cylinder, whether of rasp, spike, or spring type, is actually an object of complex outline, and there is an implied simplification : i.e. that its diameter and width are those of a cylindrical solid generated by its outermost points when the cylinder rotates.

Reflecting as it does the width available for the stream of crop, the width dimension is also often used to indicate a machine's capacity or accepted level of output. This is quite proper as far as gross differences of width are concerned, but not in the case of small differences (say less than 15 %) for the cylinder width is only one of a great many characteristics, even of the machine alone, which influence its capacity or usefulness.

The above definitions take account of the prevailing conventions so far as they can be reconciled with definite measurable characteristics of the geometrical body under consideration.

4.2.5 Concave

4.2.5.1 Width or length of concave

Minimum distance between the two panels of the combine in which the concave is mounted, expressed in millimetres. (dimension L_2 in figure 5).

4.2.5.2 Concave arc

Common (alternative) means of defining concave length of arc in degrees. This shall be measured from the front of the first bar to the rear of the last bar. When using this means of defining the concave length of arc, the cylinder diameter shall also be quoted (see 4.2.4.1).

It shall not be assumed that this concave arc, so described, is totally permeable unless it is so stated (angle α, figure 2).

4.2.5.3 *Concave length of arc*

Distance from the front of the first bar to the rear of the last bar, measured around the contour formed by the inner surfaces of the concave bars (dimension A, figure 2).

The concave length shall be expressed in millimetres.

4.2.5.4 Concave area

Product of the concave length and the concave length of arc ($L_2 \times A$) expressed in square metres.

NOTES

1 The concave area is not to be taken as a means of indicating a component of separation, since there is no distinction between a closed and an open or partly-open concave.

To indicate the size of the concave in the context of, for example, separating characteristics, the concave grate area must be used (see 4.2.6.1).

2 If more than one concave is used, this shall be so stated and the appropriate dimensions quoted.

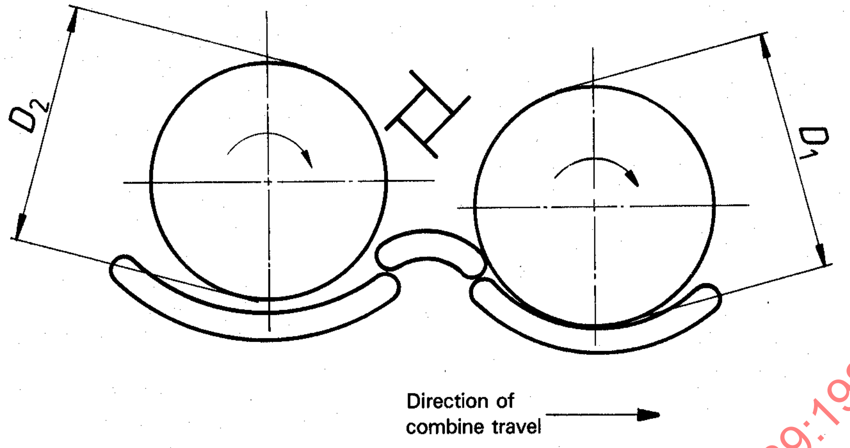

Figure 3 — Cylinder diameters disposed laterally (viewed from the right side of the combine)

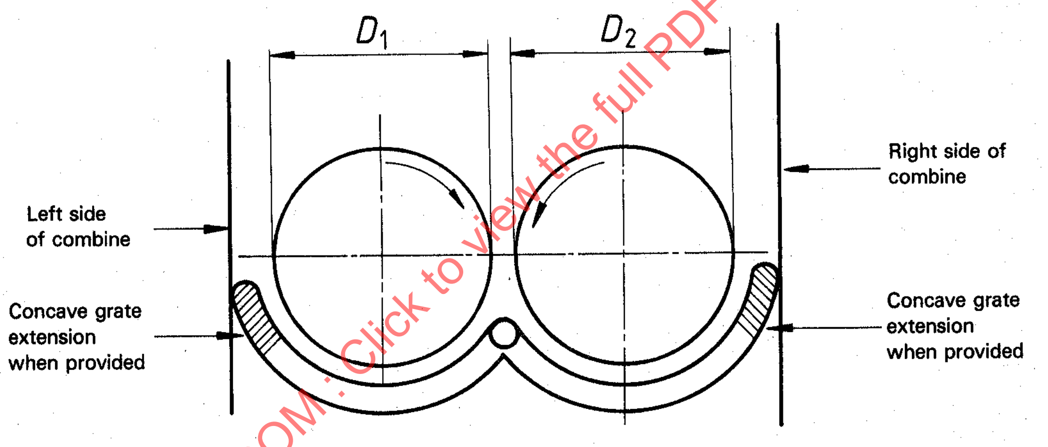

Figure 4 — Cylinder diameters disposed axially (viewed from the rear of the combine)

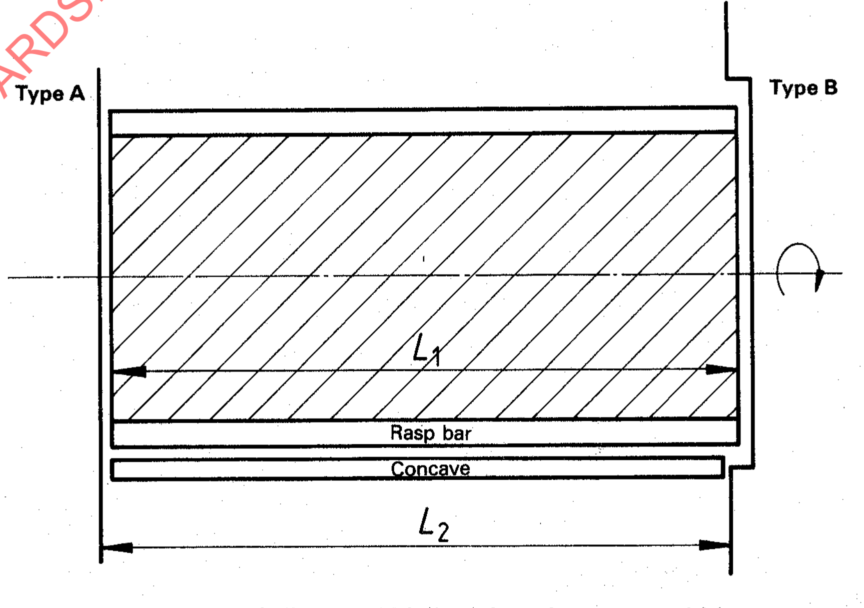

Figure 5 — Cylinder width/length and concave width

4.2.6 Concave grates

4.2.6.1 Concave grate area

Product of dimension A (see figure 6) and width L_2 (see figure 5) that portion of the concave area which is permeable for separation. This area shall be calculated using the outside dimensions of the permeable surface, and shall be expressed in square metres (dimension A, see figure 6).

NOTE — Where two or more concaves are fitted, their separate grate areas must be stated.

4.2.6.2 Concave grate extension

Permeable element generally forming an extension of the concave contour, as shown in figure 6. If this is not permeable it cannot be quoted either separately or as a part of the total area.

4.2.6.3 Concave grate extension area

Product of concave grate extension length (dimension G, figure 6) and the concave length (dimension L_2, figure 5) expressed in square metres.

4.2.7 Transition grate

4.2.7.1 Transition grate area(s)

Product of the transition grate length(s) (B) and the concave length(s) (L_2) [or width(s) (W_2)],expressed in square metres.

4.2.7.2 If there is more than one threshing cylinder, each having a concave associated with it, this shall be stated and the appropriate individual cylinder and concave dimensions, derived as specified above, shall be quoted.

4.2.7.3 The general direction of crop approach towards the area of the rotating threshing devices shall also be indicated : for example tangential or axial.

4.2.8 Straw walker and rack concepts

Product of the straight length [dimension P, figure 7a) and b)] and the inside width [dimension R, figure 7c)] of the separator side structure immediately adjacent to the straw walkers or rack, expressed in square metres.

Where walker extensions are used in the standard specifications of the machine, dimension P shall be taken with the adjustable portions fully extended, and this condition shall be stated.

4.2.9 Rotary separator concepts

4.2.9.1 Rotary separator length

Longitudinal length of the permeable area measured parallel to the axis of the rotor or rotors expressed in metres (dimension L, figure 8).

4.2.9.2 Rotary separator width

Distance of the permeable area measured around the contour formed by the inner surfaces expressed in metres (dimension W, figure 8).

4.2.9.3 Rotary separator area

Product of the separation width (dimension W, figure 8) and length (dimension L, figure 8), expressed in square metres. Where two or more individual centrifugal separator assemblies are used in a combine, the rotary separator area shall be the summation of the permeable areas around the separator sections of the rotating components.

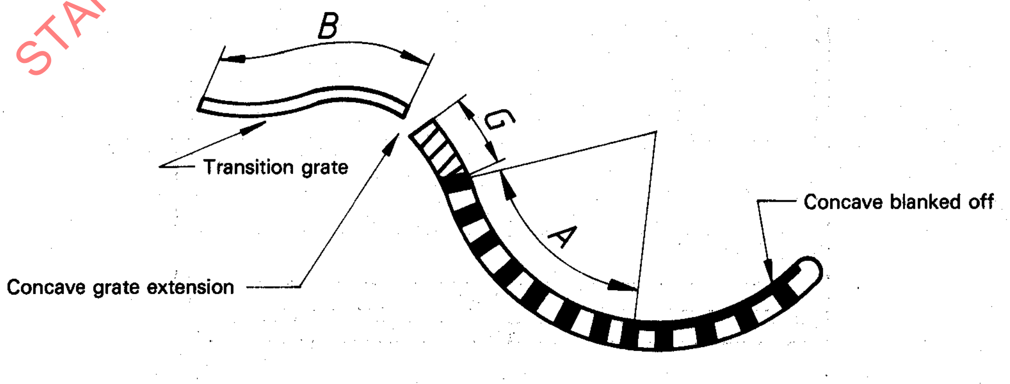

Figure 6 — Concave grate length and transition grate length