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# International Standard



# 5691

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

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## Equipment for planting — Potato planters — Method of testing

*Matériel de plantation — Planteuses de pommes de terre — Méthode d'essai*

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## 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 5691 was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in February 1980.

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

Australia	Finland	Romania
Austria	France	South Africa, Rep. of
Belgium	Germany, F. R.	Spain
Bulgaria	India	Switzerland
China	Italy	Turkey
Czechoslovakia	Korea, Dem. P. Rep. of	USSR
Denmark	Poland	
Egypt, Arab Rep. of	Portugal	

The member body of the following country expressed disapproval of the document on technical grounds :

United Kingdom

# Equipment for planting — Potato planters — Method of testing

## 1 Scope

This International Standard specifies a method of testing potato planters to obtain comparable and reproducible measurements with regard to uniform placement of tubers and other aspects of performance of the machine.

## 2 Field of application

This International Standard applies to all types of potato planters. (Fertilizer distribution attachments should be removed from the machine during testing.)

## 3 Reference

ISO 7256, *Sowing equipment — Single seed drills (precision drills) — Methods of test.*<sup>1)</sup>

## 4 Definitions

For the purpose of this International Standard, the following definitions apply.

**4.1 tuber distance** : Distance between adjacent tubers in a row, measured from tuber centre to tuber centre and expressed in centimetres.

**4.2 rated planting distance** : Planting distance, expressed in centimetres, claimed by the manufacturer in his operating instructions.

**4.3 actual planting distance** : Mean value, expressed in centimetres, of at least 100 tuber distances, discarding any misses, doubles, etc.

**4.4 row spacing** : Centre to centre distance, expressed in centimetres, between adjacent rows.

**4.5 number of rows of a planter** : Number of rows formed at the same time by the planter.

**4.6 tuber density** : Number of tuber positions per hectare (ha), expressed in hectares to the power minus one ( $\text{ha}^{-1}$ ) and calculated according to the formula :

$$\text{Tuber density} = \frac{10^8}{\text{Actual planting distance (cm)} \times \text{Row spacing (cm)}}$$

**4.7 tuber mass** : Mass, expressed in grams (g), of potato tuber. The average mass each tuber in a potato batch determined by weighing at least 30 tubers.

**4.8 tuber quantity or plant rate** : Total mass of potatoes planted per hectare expressed in tonnes per hectare (t/ha) and calculated according to the formula :

$$\text{Tuber quantity} = 100 \times \frac{\text{Tuber mass (g)}}{\text{Actual planting distance (cm)} \times \text{Row spacing (cm)}}$$

**4.9 planting frequency** : Average number of tubers planted per minute and per ridge expressed in minutes to the power minus one ( $\text{min}^{-1}$ ).

**4.10 misses** : (See clause 3.9 of ISO 7256).

**4.11 multiples** : (See clause 3.10 of ISO 7256).

**4.12 coefficient of variation (CV)** : Variation of the actual distance within a row, given as a percentage of the rated planting distance.

**4.13 planting errors** : Deviations from the desired equal tuber distribution in a row. Planting errors are the number of misses and multiples expressed as a percentage of the actual planting distance and furthermore by the coefficient of variation.

**4.14 cell filling errors** : In the case of planters with cup elevators, the number of misses or multiples, expressed as a percentage, per hundred cups or other metering units.

<sup>1)</sup> At present at the stage of draft.

**4.15 depth of planting :** Distance, expressed in centimetres, measured between the bottom of the furrow and the original field surface.

## 5 Tests

### 5.1 Test conditions — Tuber specifications

#### 5.1.1 Index of tuber shape (*f*)

$$f = \frac{l^2}{w \times t} \times 100$$

where

*l* is the greatest length;

*w* is the greatest width;

*t* is the greatest thickness.

NOTE — The dimensions are obtained from control of a sample of at least 30 tubers.

Tuber shape	Index
Round	100 up to 160
Oval	160 up to 240
Long	240 up to 340
Very long	Above 340

#### 5.1.2 Square measure

At least 30 tubers are passed through a set of seven square mesh sieves. The mesh widths rise from 25 to 55 mm in 5 mm steps. The square measure is indicated by stating the maximum size of sieve through which none of the sample will pass and the minimum size through which all of the sample will pass, thus for example 35/45.

### 5.2 Test to determine the variation of row spacing

Variation between actual and nominal row spacing shall be measured on both horizontal field surfaces, and on fields with a sideways slope of 20 %.

### 5.3 Test of assessment of uniformity of tuber distribution

#### 5.3.1 Test of tuber distribution in the row

The assessment to be made on rows planted separately with round, oval and long potatoes with a square measure of 35/45 and 35/55 mm (see 5.1). For each row, 100 measurements are necessary, to be repeated at least four times. The coefficient of variation (*CV*) and planting error shall be determined.

#### 5.3.2 Test of determination of cell filling errors in the case of cup elevator planters or metering units

To determine cell filling errors, samples of non-sprouted, sound potatoes shall be prepared as follows :

Commercial plant tubers of several size grades and varieties are mixed thoroughly, and size graded through square sieves in 5 mm steps (see 5.1.2 for description of sieves). Each grade is then sub-divided according to tuber length, and test samples I, II and III prepared by mixing size grades/tuber lengths as in the table.

Square measure	Tuber length		
	35/40	Up to 45 mm	Up to 56 mm
40/45	Up to 51 mm	Up to 63 mm	Up to 78 mm
45/50	Up to 57 mm	Up to 73 mm	Up to 87 mm
50/55	Up to 64 mm	Up to 79 mm	Up to 97 mm
Test sample	I	II	III

Test sample I contains predominately round tubers, test sample II oval and test sample III long tubers.

The planting machine in a horizontal position shall be driven on a test bench by means of an engine with infinitely variable speed control. The hopper shall be fed with at least 50 kg per row of a test sample and the elevating errors shall be determined at planting frequencies of 120, 180, 240, 300 min<sup>-1</sup>, etc.

As the efficiency of some cup-fed planters falls off with decreasing quantities of tubers in the hopper, the test should continue until the hopper is at most one quarter full.

### 5.4 Test of damage to sprouts on pre-sprouted tubers

Sprout damage or breakage depends on the type, number, elasticity, length and arrangement of sprouts on the tubers.

Degree of sprouting can be defined as :

Slight pre-sprouting — sprouts 3 to 5 mm long

Medium pre-sprouting — sprouts 5 to 15 mm long

Strong pre-sprouting — sprouts 15 to 25 mm long

Assessment shall be carried out on a stationary test bench at several planting frequencies.

The amount of breakage to sprouts caused by a planter shall be measured using samples of tubers having green sprouts 10 to 15 mm in length.

## 6 Test report

See details in the annex.

## Annex

### Test report of potato planters

#### A.1 Technical data

##### A.1.1 Characteristics

- a) Manufacturer.
- b) Make, type.
- c) Main dimensions : length, height, working width, transport width in metres.
- d) Unladen weight in kilograms.
- e) Laden weight in kilograms.
- f) Capacity of the hopper, in kilograms, level and heaped up.
- g) Loading height of hopper in centimetres.
- h) Number of ridges.
- j) Adjustment range for planting distance and the number of steps.
- k) Adjustment range for row spacing.
- m) Adjustment range for furrow opener.
- n) Adjustment range for depth of setting and of the working width of ridging/covering devices.
- p) Number of greasing points.

##### A.1.2 Description

- a) Planting units.
- b) Control and correction of missing tubers.
- c) Frames and wheels.
- d) Coupling method.
- e) Type of drive.
- f) Covering device.

#### A.2 Test results

- a) Missing tubers.
- b) Multiple tubers.
- c) Coefficient of variation of tuber distance within row.
- d) Planting frequency.
- e) Forward speed in metres per second.
- f) Depth of planting in centimetres.
- g) Variation between nominal and actual row spacing.
- h) Damage to sprouts.
- j) Effect on performance of longitudinal and lateral slopes.

#### A.3 Performance – Time

- a) Surface area planted per hour, net and spot rates of work.
- b) Time to fill hopper in minutes (min).
- c) Routine servicing time, in minutes.
- d) Turning time, in minutes.
- e) Time needed to adapt for use on public roads, in minutes.
- f) Draught and power requirements, in kilowatts.
- g) Lifting capacity necessary, bearing in mind :
  - unladen weight of machine;
  - laden weight of machine;
  - force required to lift soil engaging components clear of the ground.

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