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Wheat (*Triticum aestivum* L.) — Specification

*Blé tendre (*Triticum aestivum *L.) — Spécifications*

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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 Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*.

This fourth edition cancels and replaces the third edition (ISO 7970:2011), which has been technically revised. The main changes compared with the previous edition are as follows:

— a precision of impurities determination has been added in Annex C.

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.

Wheat (*Triticum aestivum* L.) — Specification

1 Scope

This document establishes minimum specifications for wheat (*Triticum aestivum* L.) grains intended for human consumption and which are the subject of international trade. It is also applicable to local wheat trade.

NOTE Wheat (*Triticum aestivum* L.) is also called "common wheat" in some regions.

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 712, *Cereals and cereal products — Determination of moisture content — Reference method*

ISO 3093, *Wheat, rye and their flours, durum wheat and durum wheat semolina — Determination of the falling number according to Hagberg-Perten*

ISO 6639-3, *Cereals and pulses — Determination of hidden insect infestation — Part 3: Reference method*

ISO 6639-4, *Cereals and pulses — Determination of hidden insect infestation — Part 4: Rapid methods*

ISO 7971-1, *Cereals — Determination of bulk density, called mass per hectolitre — Part 1: Reference method*

ISO 7971-3, *Cereals — Determination of bulk density, called mass per hectolitre — Part 3: Routine method*

ISO 24333, *Cereals and cereal products — Sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
impurity
element that is conventionally considered as undesirable in a sample or batch of cereals

Note 1 to entry: In wheat, impurities comprise four main categories: *damaged wheat grains* (3.2), *other cereals* (3.13), *extraneous matter* (3.14), and *harmful and/or toxic matter* (3.17). See also Table C.1.

3.2
damaged wheat grain
grain of the main cereal that comprises the following fractions: *broken grain* (3.3), *wheat of decreased value* (3.4), *grain attacked by pests* (3.8), *unsound grain* (3.9) and *sprouted grain* (3.12) (not to count)

Note 1 to entry: See Table C.1.

3.3
broken grain
grain in which part of the endosperm is exposed or grain without germ

[SOURCE: ISO 5527:2015, 2.1.46.4]

3.4
wheat of decreased value
grain, not fully developed or with discoloration in germ and its surrounding area, that is less valuable in end-use performance due to external factors

3.5
shrivelled grain
shrunken grain
grain that is poorly filled, light and thin, and in which the build-up of reserves has been halted due to physiological or pathological factors

[SOURCE: ISO 5527:2015, 2.1.31]

3.6
immature grain
grain that is unripe and/or badly developed

3.7
black point grain
grain that has a distinct dark brown or black discoloration of the whole germ and surrounding area

3.8
grain attacked by pests
grain that shows damage owing to an attack by rodents, insects, mites or other pests

[SOURCE: ISO 11051:1994, 3.2.4, modified — "visible damage" has been changed to simply "damage".]

3.9
unsound grain
grain with a certain degree of discoloration on the surface of the kernel that could have been caused by microorganisms or abnormal heating

3.10
mouldy grain
grain that has mould visible to the naked eye on 50 % of the surface and/or in the kernel

[SOURCE: ISO 11051:1994, 3.2.3.1]

3.11
heat-damaged grain
grain with a chestnut to black colouration, resulting from the effect of too extreme heat, and of which a section of the endosperm is yellowish-grey or brownish black

[SOURCE: ISO 5527:2015, 2.1.17]

3.12
sprouted grain
grain in which the radicle or plumule is clearly visible to the naked eye and where changes make it easy to distinguish the sprouted grain from the normal grain

Note 1 to entry: Sprouted grains are reflected by the α-amylase activity and expressed as the falling number (see 4.3.4), therefore, they are not counted as *damaged wheat grains* (3.2).

3.13
other cereals
grains belonging to cereal species other than the main cereal in the sample or batch under consideration

Note 1 to entry: For the purposes of this document, the "main cereal" is wheat (*Triticum aestivum* L.).

3.14
extraneous matter
fraction consisting of *inorganic extraneous matter* (3.15) and *organic extraneous matter* (3.16)

3.15
inorganic extraneous matter
stones, glass, pieces of soil and other mineral matter

Note 1 to entry: All the components which pass through a sieve with long rounded apertures 1,00 mm wide (see ISO 5223[1]) are considered to be inorganic matter.

3.16
organic extraneous matter
animal or plant matter other than grains of wheat, *damaged wheat grains* (3.2), *other cereals* (3.13), *inorganic extraneous matter* (3.15) and *harmful and/or toxic matter* (3.17)

3.17
harmful and/or toxic matter
substances in wheat bulk that can have a damaging or dangerous effect on health

3.18
harmful and/or toxic seed
seed that, if present in quantities above a certain limit, can have a damaging or dangerous effect on health, sensory properties or technological performance

Note 1 to entry: An indicative list of these seeds is given in Annex A.

3.19
bunted grain
grain filled with a fetid smelling dust comprising the spores of bunts

Note 1 to entry: Adapted from ISO 5527:2015, 2.1.4.

3.20
***Fusarium*-contaminated grain**
grain typically characterized by thin or shrunken chalk-like kernels caused by *Fusarium* head blight

3.21
rotten grain
grain that is discoloured, swollen and soft as a result of decomposition by fungi or bacteria

3.22
ergot
sclerotium of the fungus *Claviceps purpurea*

[SOURCE: ISO 11051:1994, 3.7]

4 Requirements

4.1 General characteristics and sensory properties

Wheat grains shall be sound, clean and have no foreign odours or odours indicating any deterioration.

4.2 Health characteristics

4.2.1 Wheat grains shall not contain added compounds, heavy metals, mycotoxins, pesticides residues or other contaminants that can affect human health. The maximum levels authorized are laid down by national regulations, or the joint FAO/WHO Codex Alimentarius Commission (see References [7] and [8]).

4.2.2 Wheat shall be free from the living insects listed in Annex B, when determined in accordance with ISO 6639-3 or ISO 6639-4, and of mites when determined by the sieving method.

4.3 Physical and chemical characteristics

4.3.1 Moisture content

The moisture content of wheat, determined in accordance with ISO 712, shall not be greater than 14,5 % mass fraction.

NOTE It is possible that different water contents are required for certain destinations, in relation to the climate, and duration of transport and storage. For further information, see ISO 6322-1.

4.3.2 Bulk density

The bulk density, called mass per hectolitre, of wheat shall be determined using instruments calibrated in accordance with the reference method specified in ISO 7971-1 or, by default, in accordance with the routine method specified in ISO 7971-3. It shall not be less than 70 kg/hl.

4.3.3 Impurities

The maximum impurities content, determined using the method specified in Annex C, shall not exceed the value given in Table 1.

Table 1 — Maximum levels of impurities

Impurities	Maximum permissible level % mass fraction
Broken grains	7,0[a]
Wheat of decreased value	12,0[a b]
Grains attacked by pests	2,0[a]
Unsound grains	1,0[a]
Other cereals	3,0[a]
Extraneous matter	2.0
Inorganic extraneous matter	0,5
Harmful and/or toxic matter	0,5
Each of any toxic seeds	0,05
Ergot	0,05

[a] The maximum content of broken grains, wheat of decreased value, unsound grains, grains attacked by pests and other cereals shall not exceed 15,0 % mass fraction in total.

[b] Black point grains benefit from a tolerance of 8 % and are accounted only for the fraction above 8 %. Examples include: 5 % of black point grains are considered as 0 %, 8 % of black point grains are considered as 0 %, 10 % of black point grains are considered as 2 %.

4.3.4 α-Amylase activity

The α-amylase activity, determined in accordance with ISO 3093, and expressed as the falling number, shall not be less than 180 s.

5 Sampling

Sampling shall be carried out in accordance with ISO 24333.

6 Test methods

The tests shall be carried out using the methods specified in 4.3 and Annex C.

Annex A
(informative)

Indicative list of harmful and toxic seeds

WARNING — This is a non-exhaustive list that can be added to as necessary.

Table A.1 — Toxic seeds

Botanical name	Common name
Acroptilon repens (L.) DC.	
Agrostemma githago L.	Corn-cockle
Coronilla varia L.	Coronilla, Crown vetch
Crotalaria spp.	Crotalaria
Datura fastuosa L.	
Datura stramonium L.	Stramony, thorn apple
Heliotropium lasiocarpum Fisher et C.A.	Meyer Heliotrope
Lolium temulentum L.	Darnel
Ricinus communis L.	Castor-oil plant
Sophora alopecuroides L.	Stagger bush, Russian centaury
Sophora pachycarpa Schrank ex C.A. Meyer	
Thermopsis montana	Buffalo pen
Thermopsis lanceolata R. Br. In Aiton	
Trichoderma incanum	

Table A.2 — Harmful seeds

Botanical name	Common name
Allium sativum L.	Garlic
Cephalaria syriaca (L.) Roemer et Shultes	Teasel
Melampyrum arvense L.	Cow-cockle
Melilotus spp.	Melilot
Sorghum halepense (L.) Pers.	Johnson grass
Trogonella foenum-graecum L.	Fenugreek

Annex B
(informative)

Unacceptable mites and insect pests of stored cereals

The following are unacceptable in stored cereals:

— *Ahasverus advena* (Waltl)
— *Attagenus brunneus* Faldermann
— *Attagenus unicolor japonicus* Reitter
— *Corcyra cephalonica* (Stainton)
— *Cryptolestes ferrugineus* (Stephens)
— *Cryptolestes pusillus* (Schönherr)
— *Cryptolestes turcicus* (Grouville)
— *Ephestia cautella* (Walker)
— *Ephestia kiihniella* Zeller
— *Latheticus oryzae* Waterhouse
— *Liposcelis bostrychophila* Badonnel
— *Nemapogon granella* (L.)
— *Oryzaephilus mercator* (Fauvel)
— *Oryzaephilus surinamensis* (L.)
— *Plodia interpunctella* (Hübner)
— *Prostephanus truncatus* (Hom)
— *Rhizopertha dominica* (Fabricius)
— *Sitotroga cerealella* (Olivier)
— *Sitophilus granarius* (L.)
— *Sitophilus oryzae* (L.)
— *Sitophilus zeamais* Motschulsky
— *Tenebroides mauritanicus* (L.)
— *Tribolium castaneum* (Herbst)
— *Tribolium confusum* Jacquelin du Val
— *Trogoderma granarium* Everts
— *Trogoderma variabile* (Ballion)
— *Tyroglyphus ovatus* Troupeau

— *Tyrophagus putrescentiae* (Schrank)

Annex C
(normative)

Determination of impurities

C.1 Principle

The impurities are separated by sieving and are graded into the categories shown in Table C.1.

Table C.1 — Categories of impurities

Category of impurity	Corresponding main category
Broken grain Wheat of decreased value (including shrivelled grain, immature grains and black point grain) Grain attacked by pests Unsound grain (including mouldy grain and heat-damaged grain)	Damaged wheat grain
Other cereals	Other cereals
Organic extraneous matter Inorganic extraneous matter	Extraneous matter
Harmful and/or toxic seeds, bunted grains, *Fusarium*-contaminated grain, rotten grain and ergot	Harmful and/or toxic matter

C.2 Apparatus

C.2.1 Set of test sieves, with long rounded apertures, comprising sieves of 1,00 mm × 20,0 mm, 1,70 mm × 20,0 mm and 3,55 mm × 20,0 mm, see ISO 5223[1], a receiver and a lid.

C.2.2 Sample divider, i.e. conical sampler or multiple-slot sampler with a distribution system.

C.2.3 Tweezers, **scalpel** and **paintbrush**.

C.2.4 Dishes, could be aluminium, stainless or other material that are non-electrostatic, to avoid the adherence of the organic matter like husk.

C.2.5 Shallow container, having a surface area of at least 200 cm^2.

C.2.6 Balance, capable of being read to the nearest 0,01 g.

C.3 Sampling

See Clause 5.

C.4 Procedure

C.4.1 General

See Figure C.1.

If a grain exhibits several defects, it shall be classified in the category with the lowest maximum permissible level (see Table 1).

Any components that become stuck in the apertures of a sieve shall be considered as being retained by the sieve.

C.4.2 Preparation of test sample

Reduce the laboratory sample by using a divider (C.2.2) until a quantity of approximately 1 000 g is obtained.

Weigh, to the nearest 1 g, the test sample so obtained and place it in the container (C.2.5).

During the preparation of the test sample, note whether any particular odour foreign to that of wheat is detected, whether any living insects (specified in Annex B) are present or other anomalies.

C.4.3 Determination of ergot

Separate ergot from the test sample (see C.4.2), put it in a dish (C.2.4) and weigh it to the nearest 0, 01 g.

C.4.4 First division

Divide the sample from which the ergot has been removed by using the divider (C.2.2) until a quantity of approximately 250 g is obtained.

Weigh, to the nearest 0,01 g, the test portion so obtained. If any husked grains are observed, separate them from their envelopes before the first sieving.

C.4.5 First sieving

Fit together the 3,55 mm sieve, the 1,00 mm sieve and the receiver, so that the sieve apertures are positioned parallel to each other.

Place the test portion (see C.4.4) on the 3,55 mm sieve and put on the lid.

Shake manually for 45 s with a forwards-and-backwards motion in the direction of the apertures of the sieve, keeping the sieve in a horizontal plane.

From the material that did not pass through the 3,55 mm sieve, separate, by placing in separate dishes (C.2.4), the other cereals, the organic and inorganic components of the extraneous matter, harmful and/or toxic seeds, *Fusarium*-contaminated grains, rotten grains, bunted grains and black point grains, and any wheat grains that should have been retained. Wheat grains retained shall then be added to the material that does not pass through the 1,00 mm sieve. Add the inorganic elements of the extraneous matter to the material that has passed through the 1,00 mm sieve. Weigh the fractions thus obtained to the nearest 0,01 g.

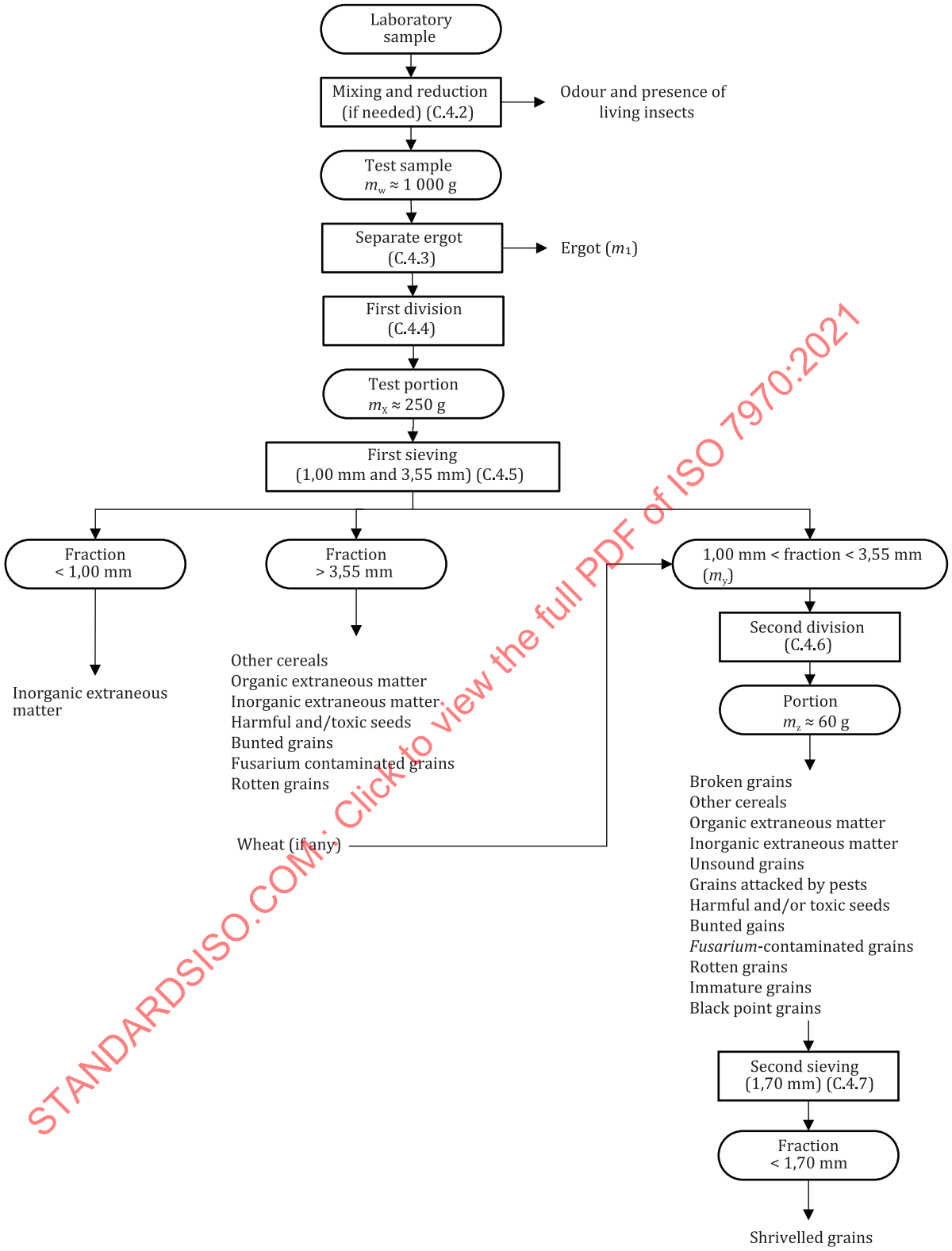

Figure C.1 — Flow chart of procedure

C.4.6 Second division

Thoroughly mix the fraction retained between the 1,00 mm sieve and the 3,55 mm sieve. Then add the wheat grains retained on the 3,55 mm sieve, and divide it using the divider (C.2.2) until approximately 60 g is obtained. Weigh to the nearest 0,01 g the portion thus obtained.

Spread out the portion, then separate and classify it by placing in the dishes the broken grains, other cereals, organic and inorganic extraneous matter, unsound grains, grains attacked by pests, harmful and/or toxic seeds, bunted grains, *Fusarium*-contaminated grains, rotten grains, immature grains and black point grains. Weigh each fraction to the nearest 0,01 g.

Verify that the sum of impurities plus wheat is equal to the mass of the portion with a tolerance of ± 0,5 %.

C.4.7 Second sieving

Pour the portion from which the impurities specified in C.4.6 were removed onto the 1,70 mm sieve fitted with a receiver and put on the lid.

Shake manually for 45 s with a forwards-and-backwards motion in the direction of the apertures of the sieve, keeping the sieve in the horizontal plane.

Weigh, to the nearest 0,01 g, the undersize grain thus obtained that corresponds to the shrivelled grains.

C.4.8 Number of determinations

Repeat the determination on the same test sample, using another test portion obtained as specified in C.4.4.

C.5 Expression of results

Express the content of each category of impurity, using Formulae (C.1) to (C.3), as a percentage mass fraction of the grains as received.

For ergot:

$$\frac{100}{m_w} \times m_1 \qquad \text{(C.1)}$$

where

m_w is the mass, in grams, of the test sample (about 1 000 g);

m_1 is the mass, in grams, of ergot in the test sample.

For broken grains, shrivelled grains, unsound grains and grains attacked by pests:

$$w_1 w_2 m_2 \tag{C.2}$$

where w_1 is the mass fraction after the first division, given by:

$$\frac{m_w - m_1}{m_w}$$

where w_2 is the mass fraction after the second division, given by:

$$\frac{100}{m_z} \times \frac{m_y}{m_x}$$

where

m_x is the mass, in grams, of the test portion (about 250 g);

m_y is the mass, in grams, of the material retained on the 1,00 mm sieve;

m_z is the mass, in grams, of the portion obtained in C.4.6 (about 60 g);

m_2 is the mass, in grams, of the relevant impurity.

For other cereals, extraneous matter (organic and inorganic), inorganic extraneous matter and harmful and/or toxic matter without ergot:

$$w_1 \times \frac{100}{m_x} \times m_3 + w_1 w_2 m_4 \tag{C.3}$$

where

m_3 is the mass, in grams, of the impurity group concerned after the first sieving;

m_4 is the mass, in grams, of the impurity group concerned after the second division.

The calculation should be carried out to the nearest 0,01 %. Take as the result the arithmetic mean of the two determinations (see C.4.8). The absolute difference between the values of two determinations carried out in rapid succession by the same analyst on the same test sample should be less than or equal to the repeatability limit r specified in C.6.2. Otherwise, repeat the determinations on the same test sample, using the rest test portion obtained as specified in C.4.4. Check the acceptability of test result and take the final quoted result, see the method given in ISO 5725-6:1994, 5.2.2[9].

C.6 Precision

C.6.1 General

An international interlaboratory test about the precision of a method of determination of impurities content is summarized in EN 15587:2018, Annex F. The values derived from this test may not be applicable to concentration ranges and matrices other than those given. Complete results are given in CEN/TR 16324.

The formulae in C.6.2 to C.6.4 use the data of this interlaboratory test.

Precision data could be given for impurities for which the definitions are similar between EN 15587 and this document. This similarity is given in the Table C.2.

Table C.2 — Classes of impurity

Classes of impurity defined in this document	Similar classes in EN 15587
Broken grain	Broken grain
Wheat of decreased value	Grain impurities
Grain attacked by pests	Grains damaged by pests
Unsound grain	Unsound grains
Other cereals	Other cereals
Organic extraneous matter	Extraneous matter
Inorganic extraneous matter	Extraneous matter
Harmful and/or toxic matter	Extraneous seeds
Each of any toxic matter	Ergot

C.6.2 Repeatability

The absolute difference between two independent single test results, obtained using the same method on identical test material in the same laboratory by the same operator using the same equipment within a short interval of time, will not in more than 5 % of cases be greater than the repeatability limit *r*. The calculations for the different classes are shown in Formulae (C.4) to (C.12).

Broken grains:

$$r = 2{,}8 \times [(0{,}07 \times w_{\text{broken grains}}) + 0{,}15] \quad \text{(C.4)}$$

Wheat of decreased value:

$$r = 2{,}8 \times [(0{,}03 \times w_{\text{wheat of decreased value}}) + 0{,}33] \quad \text{(C.5)}$$

Grains attacked by pests:

$$r = 2{,}8 \times [(0{,}26 \times w_{\text{grains attacked by pests}}) + 0{,}05] \quad \text{(C.6)}$$

Unsound grains:

$$r = 2{,}8 \times [(0{,}27 \times w_{\text{unsound grains}}) + 0{,}05] \quad \text{(C.7)}$$

Other cereals:

$$r = 2{,}8 \times [(0{,}09 \times w_{\text{other cereals}}) + 0{,}20] \quad \text{(C.8)}$$

Organic extraneous matter:

$$r = 2{,}8 \times [(0{,}01 \times w_{\text{extraneous matter}}) + 0{,}06] \quad \text{(C.9)}$$

Inorganic extraneous matter:

$$r = 2{,}8 \times [(0{,}01 \times w_{\text{inorganic extraneous matter}}) + 0{,}06] \quad \text{(C.10)}$$

Harmful and/or toxic matter:

$$r = 2{,}8 \times [(0{,}10 \times w_{\text{harmful/toxic matter}}) + 0{,}03] \quad \text{(C.11)}$$

Each toxic matter:

$$r = 2{,}8 \times [(0{,}17 \times w_{\text{toxic matter}}) + 0{,}07] \quad \text{(C.12)}$$

where w is the arithmetic mean of mass fraction of impurity fractions (%) in the two determinations.

These values are estimated from the interlaboratory test reported in CEN/TR 16324. The tables in Annex D provide advice for the application of these repeatability limits.

C.6.3 Reproducibility

The absolute difference between two single test results, obtained using the same method on identical test material in different laboratories with different operators using different equipment, will not in more than 5 % of cases be greater than the reproducibility limit R. The calculations for the different classes are shown in Formulae (C.13) to (C.21).

Broken grains:

$$R = 2{,}8 \times [(0{,}04 \times w_{\text{broken grains}}) + 0{,}35] \quad \text{(C.13)}$$

Wheat of decreased value:

$$R = 2{,}8 \times [(0{,}79 \times w_{\text{wheat of decreased value}}) - 0{,}88] \quad \text{(C.14)}$$

Grains attacked by pests:

$$R = 2{,}8 \times [(0{,}75 \times w_{\text{grains attacked by pests}}) + 0{,}05] \quad \text{(C.15)}$$

Unsound grains:

$$R = 2{,}8 \times [(0{,}70 \times w_{\text{unsound grains}}) + 0{,}07] \quad \text{(C.16)}$$

Other cereals:

$$R = 2{,}8 \times [(0{,}20 \times w_{\text{other cereals}}) + 0{,}19] \quad \text{(C.17)}$$

Organic extraneous matter:

$$R = 2{,}8 \times [(0{,}11 \times w_{\text{extraneous matter}}) + 0{,}14] \quad \text{(C.18)}$$

Inorganic extraneous matter:

$$R = 2{,}8 \times [(0{,}11 \times w_{\text{inorganic extraneous matter}}) + 0{,}14] \quad \text{(C.19)}$$

Harmful and/or toxic matter:

$$R = 2{,}8 \times [(0{,}18 \times w_{\text{harmful/toxic matter}}) + 0{,}04] \quad \text{(C.20)}$$

Each toxic matter:

$$R = 2{,}8 \times [(0{,}17 \times B_{\text{toxic matter}}) + 0{,}08] \quad \text{(C.21)}$$

where w is the arithmetic mean of mass fraction of impurity fractions (%) in the two determinations.

These values are estimated from the interlaboratory test reported in CEN/TR 16324. The tables in Annex D provide advice for the application of these reproducibility limits.

C.6.4 Uncertainty

Uncertainty (U_e) is a parameter representing the distribution of the values that can reasonably be attributed to the result. For impurities contents, the reproducibility standard deviation with a widening factor of 2 could be a good estimation of the uncertainty ($U_e = \pm 2\ S_R$). The calculations for the different classes are shown in Formulae (C.22) to (C.30).

Broken grains:

$$U_e = \pm 2 \times [(0{,}04 \times w_{\text{broken grains}}) + 0{,}35] \quad \text{(C.22)}$$

Wheat of decreased value:

$$U_e = \pm 2 \times [(0{,}79 \times w_{\text{wheat of decreased value}}) - 0{,}88] \quad \text{(C.23)}$$

Grains attacked by pests:

$$U_e = \pm 2 \times [(0{,}75 \times w_{\text{grains attacked by pests}}) + 0{,}05] \quad \text{(C.24)}$$

Unsound grains:

$$U_e = \pm 2 \times [(0{,}70 \times w_{\text{unsound grains}}) + 0{,}07] \quad \text{(C.25)}$$

Other cereals:

$$U_e = \pm 2 \times [(0{,}20 \times w_{\text{other cereals}}) + 0{,}19] \quad \text{(C.26)}$$

Organic extraneous matter:

$$U_e = \pm 2 \times [(0{,}11 \times w_{\text{extraneous matter}}) + 0{,}14] \quad \text{(C.27)}$$

Inorganic extraneous matter:

$$U_e = \pm 2 \times [(0{,}11 \times w_{\text{inorganic extraneous matter}}) + 0{,}14] \quad \text{(C.28)}$$

Harmful and/or toxic matter:

$$U_e = \pm 2 \times [(0{,}18 \times w_{\text{harmful/toxic matter}}) + 0{,}04] \quad \text{(C.29)}$$

Each toxic matter:

$$U_e = \pm 2 \times [(0{,}17 \times w_{\text{toxic matter}}) + 0{,}08] \quad \text{(C.30)}$$

These values are estimated from the interlaboratory test reported in CEN/TR 16324. The tables in Annex D provide advice for the application of these uncertainties.

C.7 Test report

Report the result to one decimal place, with the exception of each of the toxic matter for harmful and/or toxic matter, for which the result shall be given to two decimal places.

The test report shall contain at least the following information:

a) all information necessary for the complete identification of the sample;

b) the sampling method used, if known;

c) the test method used, with reference to this document, i.e. ISO 7970:2021, Annex C;

d) all operating details not specified in this document, or regarded as optional, together with details of any incidents that could have influenced the test result(s);

e) the test result(s) obtained;

f) if the repeatability has been checked, the final result obtained;

g) the date of the test.

Annex D
(informative)

Practical application of fidelity data for different classes of impurities

Table D.1 — Practical application of fidelity data for broken grains

Broken grains (%)	Repeatability limit, r	Reproducibility limit, R	Uncertainty, U_e
1,00	0,62	1,09	0,78
1,50	0,71	1,15	0,82
2,00	0,81	1,20	0,86
2,50	0,91	1,26	0,90
3,00	1,01	1,32	0,94
3,50	1,11	1,37	0,98
4,00	1,20	1,43	1,02
4,50	1,30	1,48	1,06
5,00	1,40	1,54	1,10
5,50	1,50	1,60	1,14
6,00	1,60	1,65	1,18
6,50	1,69	1,71	1,22
7,00	1,79	1,76	1,26

Table D.2 — Practical application of fidelity data for wheat of decreased value

Wheat of decreased value (%)	Repeatability limit, r	Reproducibility limit, R	Uncertainty, U_e
2,00	1,09	1,96	1,40
2,50	1,13	3,07	2,19
3,00	1,18	4,17	2,98
3,50	1,22	5,28	3,77
4,00	1,26	6,38	4,56
4,50	1,30	7,49	5,35
5,00	1,34	8,60	6,14
5,50	1,39	9,70	6,93
6,00	1,43	10,81	7,72
6,50	1,47	11,91	8,51
7,00	1,51	13,02	9,30
7,50	1,55	14,13	10,09
8,00	1,60	15,23	10,88
8,50	1,64	16,34	11,67
9,00	1,68	17,44	12,46
9,50	1,72	18,55	13,25
10,00	1,76	19,66	14,04
10,50	1,81	20,76	14,83