



Model document of a draft International Standard

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ISO TC 34/SC 4

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ISO/DIS 17301-1

ISO TC 34/SC 4/WG

Secretariat: SAC

Cereals and pulses — Specification and test methods — Part 1: Rice

Céréales et légumineuses — Spécifications et méthodes d'essai — Partie 1: Riz

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As a rule of thumb, the table of contents is useful for documents exceeding 10 pages. For shorter documents, it is not necessary and is generally deleted.



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A **foreword** shall appear in each document. It shall not contain requirements, recommendations, figures or tables.

In documents in which patent rights **have not** been identified, the following fixed text is included in the foreword:

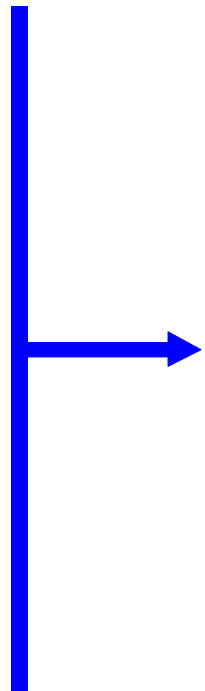
“Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.”

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In addition to the fixed text, give the designation and name of the technical committee and subcommittee that prepared the document, together with the following, if appropriate:

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- a statement that the document cancels and replaces other documents in whole or in part;
- a statement of significant technical changes from the previous edition;
- titles of other parts, either already publicly available or registered in the work programme;
- the relationship of the document to other standards or other documents.

The list of parts includes only those parts that are publicly available [i.e. those that have reached the enquiry stage (stage 40.00)]. Parts that are between stages 20.00 and 30.99 are not publicly available and are mentioned as being under preparation.



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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

ISO 17301-1 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*, in collaboration with the International Association for Cereal Science and Technology (ICC).

This second edition cancels and replaces the first edition (ISO 17301-1:1978), which has been extended to include requirements for parboiled rice.

ISO 17301 consists of the following parts, under the general title *Cereals and pulses — Specification and test methods*:

- *Part 1: Rice*
- *Part 2: Wheat*
- *Part 3: Peas*
- *Part 4: Beans*

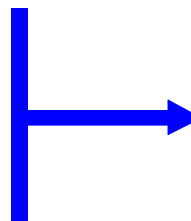
The following parts are under preparation:

- *Part 5: Lentils*
- *Part 6: Mixed cereals*

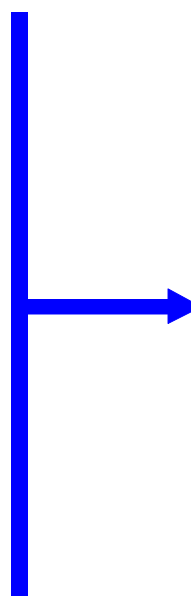
The **introduction** is an optional element containing commentary about the technical content of the document or background information.

It shall not contain requirements (implied by the word “shall”).

The ISO template automatically puts the introduction on a separate page, after the foreword and before the page containing the scope.



If a patent right has been identified, the information on the facing page (fixed text) shall be included. Details concerning the references to the patent right and the patent holder shall be provided. The details provided in this model document are fictitious.



Introduction

This part of ISO 17301 was developed in response to worldwide demand for minimum specifications for rice traded internationally, since most commercial bulks of grain, which have not been screened or aspirated, contain a proportion of other grains, weed seeds, chaff, straw, stones, sand, etc. The vegetable materials may have physical and biological properties which differ from those of the main constituent and may therefore affect the storage behaviour.

In addition, it should be noted that rice is a permanent host to a considerable microflora; most of these microorganisms are cosmopolitan, the majority are innocuous, but some produce harmful by-products. Microflora communities present on freshly harvested rice include many types of bacteria, moulds and yeasts. While the rice is ripening and its moisture content falling, the number of field microorganisms, mainly bacteria, diminishes. When the rice is harvested, it is invaded by storage microorganisms and the field microflora gradually die out. If the mass fraction of moisture (formerly expressed as moisture content) is less than 18 %, the microflora does not multiply, whereas above 18 % it does so rapidly. Thus, at harvest, the qualitative and the quantitative composition of the microflora depends more upon ecological factors than upon the variety of the rice. During transport and storage, additions to the microfloral population occur. Microorganisms on the rice at harvest tend to die out during storage and are replaced by microorganisms adapted to storage conditions.

Storage losses have been estimated as being an average of 5 %, and as much as 30 %, especially in countries with climates favourable to the rapid development of agents of deterioration and where storage techniques are poorly developed, such as developing countries in the damp tropics. The magnitude of these figures highlights the need for promoting throughout the world a rapid improvement in techniques of conservation.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning sample dividers given in Annex A and shown in Figure A.1.

ISO takes no position concerning the evidence, validity and scope of this patent right.

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The **scope** describes what the document *does* (“specifies”, “establishes”, “gives guidelines for”, “defines terms”). It shall be worded as a series of statements of fact.

Accordingly it shall not contain requirements, nor anything worded as a recommendation or permission.

The following examples contain wording (*shown in italics*) which is not acceptable in the scope (example 1 contains a requirement, and examples 2 and 3 contain recommendations). Such texts shall be transferred to another part of the document, e.g. to a requirements or recommendations clause, or shall be reworded as statements of fact.

EXAMPLE 1 In addition, this International Standard *shall be applied* with due reference to the national governmental regulations of the country where the vehicle is to be operated.

EXAMPLE 2 In order to ensure product quality and safety for consumers, an appropriate microbiological risk analysis *should be performed* to determine the types of cosmetic products to which this International Standard applies.

EXAMPLE 3 *It is recommended* to put these graphical symbols on all new equipment and to retrofit all existing equipment as far as possible.

The scope shall be succinct so that it can be used as an abstract for bibliographic purposes. (For example, it is used on ISO Online.)

It shall explain the applicability of the document (and, if necessary, cases where the document is not applicable).

Use this title for the **normative references** clause as well as the fixed text (introductory paragraph) generated by the ISO template. The fixed text is plural even when there is only one normative reference.

List here only those referenced documents which are cited in such a way that they need to be consulted in order to use the document (e.g. “in accordance with ISO #####”). The list shall not include the following:

- referenced documents which are not publicly available (e.g. documents which have not yet reached the enquiry stage);
- referenced documents to which only informative reference is made;
- referenced documents which have merely served as references in the preparation of the document.

Such referenced documents may be listed in a bibliography.

Normative references may be undated unless it is considered that future editions will not be applicable.

Normative references shall be dated if reference is made to a specific clause, subclause, figure, table or other element; see the ISO/IEC Directives, Part 2, 2004, 6.2.2 and 6.6.7.5. Note that when a normative reference is dated, that specific edition of the referenced document (and only that edition) is applicable. No other edition (past or future) of the referenced document, or any amendments or revisions to that referenced document, are applicable.

Dated referenced documents which have not yet been published but are publicly available (enquiry and approval stages) are indicated as shown: the year is replaced by a dash and an explanatory footnote is provided. When revising a document, it is particularly important to review the validity of the dated normative references.

Cereals and pulses — Specification and test methods —

Part 1: Rice

1 Scope

This part of ISO 17301 specifies minimum requirements and test methods for rice (*Oryza sativa* L.).

It is applicable to husked rice, husked parboiled rice, milled rice and milled parboiled rice, suitable for human consumption, directly or after reconditioning.

It is not applicable to cooked rice products.

2 Normative references

The following referenced documents are indispensable for the application 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 — Routine reference method*

ISO 950:1979, *Cereals — Sampling (as grain)*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 6646, *Rice — Determination of the potential milling yield from paddy and from husked rice*

ISO 8351-1:1994, *Packaging — Method of specification for sacks — Part 1: Paper sacks*

ISO 8351-2, *Packaging — Method of specification for sacks — Part 2: Sacks made from thermoplastic flexible film*

ISO 16634:—¹⁾, *Cereals, pulses, milled cereal products, oilseeds and animal feeding stuffs — Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content*

ISO 20483:—²⁾, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

IEC 61010-2, *Safety requirements for electric equipment for measurement, control, and laboratory use — Part 2: Particular requirements for laboratory equipment for the heating of material*

1) To be published. (Revision of ISO 16634:2000)

2) To be published.

Use this title for the **terms and definitions** clause as well as the fixed text (introductory paragraph) generated by the ISO template. The fixed text is plural even when there is only one term and definition.

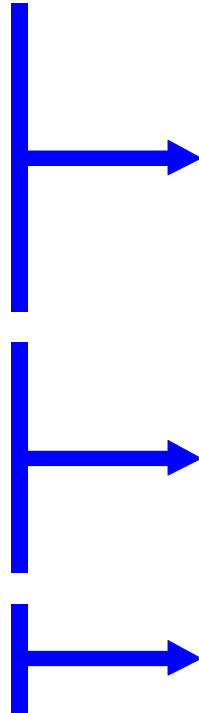
If terms and definitions given in another document are referred to, adapt the fixed text as shown here. A document referred to in this way shall be cited in the normative references clause.

A definition shall not take the form of, or contain, a requirement or recommendation. The form of a definition shall be a single phrase that can replace the term in context. See the ISO/IEC Directives, Part 2, 2004, Annex D.

If a term should no longer be used, indicate it in light type face followed by “(deprecated)” as shown in **3.2**.

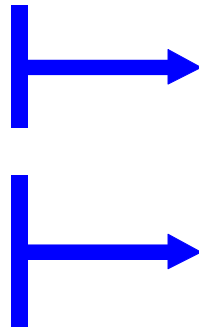
If a definition is quoted directly from another document, cite the document as shown in **3.2** in square brackets. Note that since the term and definition are given in their entirety, the document from which they are cited is not considered as normative since there is no need to consult it. Therefore, the document is cited for informative purposes only and shall be listed in the bibliography.

If the definition has been changed slightly and is not verbatim, use a note and precede the reference by “Adapted from” as shown in **3.3**.



If a term can have multiple meanings, the subject field to which it belongs (e.g. “rice” in **3.6**) shall be indicated in angular brackets before the definition.

Where both a term and an abbreviated term are given, list that which is preferred first. In **3.6**, the term is preferred over the abbreviated term; in **3.7** the abbreviated term is preferred over the term. In **3.9**, the “preferred term” is given first in bold type face and the “admitted term” is indicated in light type face. See the ISO/IEC Directives, Part 2, 2004, D.3.3.



Terms and definitions are styled in the ISO template as shown in the following example:

TermNum	▪ 3.5
Term(s)	▪ waxy-rice
Definition	special varieties of rice (<i>Oryza sativa</i> L.: <i>glutinosa</i>), the kernels of which have a white and opaque appearance and the starch of which consists almost entirely of amylopectin
Note	NOTE → Adapted from ISO 7301.
TermNum	▪ 3.6
Term(s)	▪ extraneous matter
Term(s)	▪ EM
Definition	⟨rice⟩ organic and inorganic components other than whole or broken kernels
Example	EXAMPLE → Foreign seeds, husks, bran, sand and dust

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6646 and the following apply.

3.1

paddy rice

rice retaining its husk after threshing

[ISO 7301:2002, definition 3.1]

3.2

husked rice

cargo rice (deprecated)

paddy from which the husk only has been removed

[ISO 7301:2002, definition 3.2]

3.3

milled rice

rice obtained after milling which involves removing all or part of the pericarp and germ from husked rice

NOTE Adapted from ISO 7301.

3.4

parboiled rice

rice whose starch has been fully gelatinized by soaking paddy rice or husked rice in water followed by a heat treatment and a drying process

NOTE Adapted from ISO 7301.

3.5

waxy rice

special varieties of rice (*Oryza sativa* L. *glutinosa*), the kernels of which have a white and opaque appearance and the starch of which consists almost entirely of amylopectin

NOTE Adapted from ISO 7301.

3.6

extraneous matter

EM

⟨rice⟩ organic and inorganic components other than whole or broken kernels

EXAMPLE Foreign seeds, husks, bran, sand and dust.

3.7

HDK

heat-damaged kernel

kernel, whole or broken, which has changed its normal colour as a result of heating

NOTE This category includes whole or broken kernels that are yellow due to alteration. Parboiled rice in a batch of non-parboiled rice is also included in this category.

3.8

damaged kernel

kernel, whole or broken, showing obvious deterioration due to moisture, pests, disease or other causes, but excluding HDK (3.7)

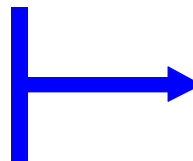
3.9

immature kernel

unripe kernel

kernel, whole or broken, which is unripe and/or underdeveloped

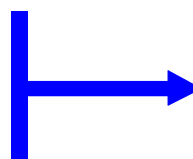
When the reference number of the quoted term and definition is cited (as in **3.10**), the referenced document is dated. In the case where the referenced document is publicly available but has not yet been published (as in **3.11**), the year is replaced by a dash (without an explanatory footnote, which is given only where the entire reference is cited, i.e. in the normative references clause or the bibliography).



The unit shall not be part of the definition but shall be given in a separate note. See **3.11**.



If a term is always used in the plural, give it this way in the terms and definitions. See **3.12**.



The symbol is given after the term as shown in **3.15**. Note that variables are presented in Times New Roman or Times, in italics and light type face. Descriptive subscripts may be affixed to the symbol to provide additional information. If they are not a variable, they should be in Arial or Helvetica, upright, light type face.



3.10**husked rice yield**

amount of husked rice obtained from paddy

[ISO 6646:2000, definition 3.1]

3.11**nitrogen content**

quantity of nitrogen determined after application of the procedure described in ISO 20483

NOTE 1 It is expressed as a mass fraction of dry product, in percent.

NOTE 2 Adapted from ISO 20483:—, definition 3.8.

3.12**crude proteins**

quantity of crude proteins obtained from the nitrogen content as determined by applying the method described in ISO 20483, calculated by multiplying this content by an appropriate factor depending on the type of cereal or pulse

NOTE 1 It is expressed as a mass fraction of dry product, in percent.

NOTE 2 Adapted from ISO 20483:—, definition 3.9.2.

3.13**gelatinization**

hydration process conferring the jelly-like state typical of the coagulated colloids, which are named “gels”, on kernels

[ISO 14864:1998, definition 3.1]

See Figure C.1.

3.14**gel state**

condition reached as a consequence of **gelatinization** (3.13), when the kernel is fully transparent and absolutely free from whitish and opaque granules after being pressed between two glass sheets

[ISO 14864:1998, definition 3.2]

3.15**gelatinization time**

t_{90}
time necessary for 90 % of the kernels to pass from their natural state to the **gel state** (3.14)

[ISO 14864:1998, definition 3.3]

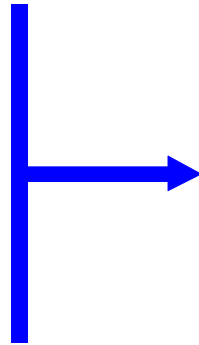
In **4.2.1**, ISO 712 and IEC 61010-2 are cited in a normative manner and therefore shall be listed in the normative references clause. However, ISO 6322-1, ISO 6322-2 and ISO 6322-3 are cited for information only and therefore shall be listed in the bibliography.



The expressions % (*m/m*) and % (*V/V*) are deprecated. The correct terminology is mass fraction (symbolized by *w*) and volume fraction (symbolized by *φ*) respectively, expressed as a percentage. If users are unfamiliar with the correct terminology, add a footnote as shown in **4.2.1**.



Notes and **examples integrated in the text** of the document (see the ISO/IEC Directives, Part 2, 2004, 6.5.1) shall only be used for giving additional information intended to assist the understanding or use of the document. They shall not contain requirements [shall] or any information considered indispensable for the use of the document, e.g. instructions [imperative mood], recommendations [should] or permission [may]. Notes may be written as a statement of fact.



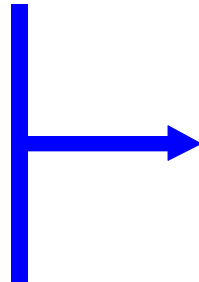
Notes and examples are not numbered unless more than one appears in the same clause, subclause, term entry, figure or table.

The type face is one size smaller than normal text so that the extent of the note is clearly distinguishable.

Annexes shall be designated by a capital letter (A, B, C, etc.) in the order in which they are cited in the text, irrespective of whether they are normative or informative. Annex A is the first annex cited.

All annexes shall be cited in the document.

The status of an annex (normative or informative) is indicated by the manner in which the annex is cited. In **4.2.1**, Annex A is normative because it is required to determine the mass fraction of extraneous matter and defective kernels in husked and milled rice “in accordance with” the method given in this annex.



Refer to a specific document, e.g. ISO 950:1979, Clause 7, rather than repeating the relevant text.



4 Requirements

4.1 General, organoleptic and health characteristics

Kernels of rice, whether parboiled, husked or milled, and whether whole or broken, shall be sound, clean and free from foreign odours or odour which indicates deterioration.

The levels of additives and pesticide residues and other contaminants shall not exceed the maximum limits permitted by the national regulations of the country of destination or, in their absence, by the Joint FAO/WHO Codex Alimentarius Commission.

The presence of living insects which are visible to the naked eye is not permitted. This should be determined before separating the bulk sample into test samples.

4.2 Physical and chemical characteristics

4.2.1 The mass fraction of moisture, determined in accordance with ISO 712, using an oven complying with the requirements of IEC 61010-2, shall not be greater than 15 %³⁾.

The mass fraction of extraneous matter and defective kernels in husked and milled rice, whether or not parboiled, determined in accordance with Annex A, shall not be greater than the values specified in Table 1.

NOTE Lower mass fractions of moisture are sometimes needed for certain destinations depending on the climate, duration of transport and storage. For further details, see ISO 6322-1, ISO 6322-2 and ISO 6322-3.

4.2.2 The defect tolerance for the categories considered, and determined in accordance with the method given in Annex A, shall not exceed the limits given in Table 1.

4.3 Contract specifications

All commercial contracts shall show clearly the following:

- a) the total mass fraction of broken kernels permitted, classified according to the agreed categories, and the relative proportions of each category;
- b) the total mass fraction of extraneous matter and of defective kernels permitted in each category specified in Table 1.

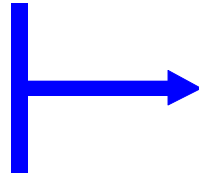
5 Sampling

Sampling shall be carried out in accordance with ISO 950:1979, Clause 7.

3) Formerly denoted as 15 % (*m/m*).

Column headings are given in bold type face. Subheadings are given in bold or light type face.

When applicable, the symbol (e.g. w_{\max}) and units (e.g. %) are given on separate lines after the heading. Symbols and units shall be presented in accordance with ISO 31 (all parts), *Quantities and units* (under revision as ISO 80000).



The **decimal sign** shall be a comma on the line.



If a **requirement** refers to the whole table, put it as a separate paragraph within the frame of the table, before any notes and footnotes to the table.



Notes to tables (see the ISO/IEC Directives, Part 2, 2004, 6.6.6.6) shall only be used for giving additional information intended to assist the understanding or use of the document. They shall not contain requirements [shall] or any information considered indispensable for the use of the document, e.g. instructions [imperative mood], recommendations [should], or permission [may]. Notes may be written as a statement of fact. They shall follow any table requirements. When there is more than one note, they shall be numbered starting with 1 for each table.



The type face of notes to tables is one size smaller than the table text so that the extent of the note is clearly distinguishable.

The reference to ISO 7301 is useful information and does not constitute a normative reference. It is listed in the bibliography and is dated because a specific element, i.e. Table 1, is cited.



Requirements that refer to specific element(s) in a table may be written as **table footnotes**. They shall be located within the frame of the table and shall follow any notes to the table. They shall be identified using alphabetic characters, starting with “a” for each table. See the ISO/IEC Directives, Part 2, 2004, 6.6.6.7.



Table 1 — Maximum permissible mass fraction of defects

Defect	Maximum permissible mass fraction of defects			
	in husked rice	in milled rice (non-glutinous)	in husked parboiled rice	in milled parboiled rice
Extraneous matter:				
— organic ^a	1,0	0,5	1,0	0,5
— inorganic ^b	0,5	0,5	0,5	0,5
Paddy	2,5	0,3	2,5	0,3
Husked rice, non-parboiled	Not applicable	1,0	1,0	1,0
Milled rice, non-parboiled	1,0	Not applicable	1,0	1,0
Husked rice, parboiled	1,0	1,0	Not applicable	1,0
Milled rice, parboiled	1,0	1,0	1,0	Not applicable
Chips	0,1	0,1	0,1	0,1
HDK	2,0 ^c	2,0	2,0 ^c	2,0
Damaged kernels	4,0	3,0	4,0	3,0
Immature and/or malformed kernels	8,0	2,0	8,0	2,0
Chalky kernels	5,0 ^c	5,0	Not applicable	Not applicable
Red kernels and red-streaked kernels	12,0	12,0	12,0 ^c	12,0
Partly gelatinized kernels	Not applicable	Not applicable	11,0 ^c	11,0
Pecks	Not applicable	Not applicable	4,0	2,0
Waxy rice	1,0 ^c	1,0	1,0 ^c	1,0
Live insects shall not be present. Dead insects shall be included in extraneous matter.				
NOTE 1 This table is based on ISO 7301:2002, Table 1.				
NOTE 2 Some commercial contracts require information in addition to that provided in this table.				
NOTE 3 Only full red husked (cargo) rice is considered in this table.				
^a Organic extraneous matter includes foreign seeds, husks, bran, parts of straw, etc.				
^b Inorganic extraneous matter includes stones, sand, dust, etc.				
^c The maximum permissible mass fraction of defects shall be determined with respect to the mass fraction obtained after milling.				

6 Test methods

6.1 Moisture content

Determine the mass fraction of moisture in accordance with the method specified in ISO 712.

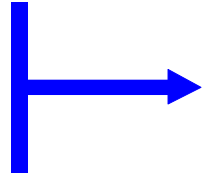
6.2 Waxy rice content

Determine the mass fraction of waxy rice. Annex B gives an example of a suitable method.

References to documents in the bibliography may be presented in two ways:

- either on the line, e.g. Reference [19];
- or as a superscript, e.g. [19].

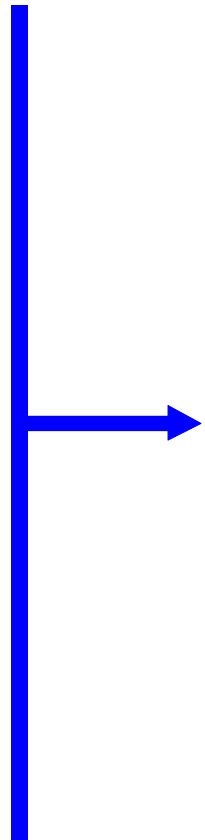
By preference, use the same style of presentation within a single document.



Where a **dated reference** is made to a referenced document which is not yet published (e.g. an enquiry draft), a dash replaces the year of publication, e.g. ISO 20483:—, Annex B.



See ISO 78-2 for examples of presenting precision, repeatability and reproducibility calculations and data.



6.3 Nitrogen content and crude protein content

Determine the nitrogen content and crude protein content in accordance with either ISO 16634:—, Clause 9, or ISO 20483. For details on the determination of protein content using the Kjeldahl method, see Reference [16] in the Bibliography. For details concerning the use of the Dumas method, see References [11] and [20].

Calculate the crude protein content of the dry product by multiplying the value of the nitrogen content by the conversion factor specified in ISO 20483:—, Annex B and Table B.1, that is adapted to the type of cereals or pulses [17][18] and to their use.

6.4 Gelatinization time

Determine the gelatinization time, t_{90} , for rice kernels during cooking. An example of a typical curve is given in Figure C.1. Three typical stages of gelatinization are shown in Figure C.2.

Report the results as specified in Clause 7.

6.5 Husked rice yield

6.5.1 Determination

CAUTION — Only use paddy or parboiled rice for the determination of husked rice yield.

Determine the husked rice yield in accordance with ISO 6646.

6.5.2 Precision

6.5.2.1 Interlaboratory test

The results of an interlaboratory test are given in Annex D for information.

6.5.2.2 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 exceed the arithmetic mean of the values for r obtained from the interlaboratory study for husked rice in more than 5 % of cases:

$$r = 1 \%$$

where r is the repeatability limit.

6.5.2.3 Reproducibility

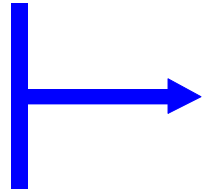
The absolute difference between two single test results, obtained using the same method on identical test material in different laboratories by different operators using different equipment, will not exceed the arithmetic mean of the values for R obtained from the interlaboratory study in more than 5 % of cases:

$$R = 3 \%$$

where R is the reproducibility limit.

This is an example of a typical **test report** clause, listing the minimum information expected, including a reference to the document itself.

Where there is a need to identify the elements of the test report, designate them using a lower-case letter followed by a parenthesis, i.e. a), b), c), etc. See the ISO/IEC Directives, Part 2, 2004, 5.2.5.



ISO 8351-1:1994, Clause 9, and ISO 8351-2 are examples of **dated** and **undated normative references**.



7 Test report

For each test method, the test report shall specify the following:

- a) all information necessary for the complete identification of the sample;
- b) a reference to this part of ISO 17301 (i.e. ISO 17301-1);
- c) the sampling method used;
- d) the test method used;
- e) the test result(s) obtained or, if the repeatability has been checked, the final quoted result obtained;
- f) all operating details not specified in this part of ISO 17301, or regarded as optional, together with details of any incidents which may have influenced the test result(s);
- g) any unusual features (anomalies) observed during the test;
- h) the date of the test.

8 Packaging

The packaging shall not transmit any odour or flavour to the product and shall not contain substances which may damage the product or constitute a health risk.

If bags are used, they shall comply with the requirements of ISO 8351-1:1994, Clause 9, or ISO 8351-2, as appropriate.

9 Marking

The packages shall be marked or labelled as required by the country of destination.

State whether an **annex** is normative or informative. See the ISO/IEC Directives, Part 2, 2004, 6.3.8 and 6.4.1. The ISO template prompts the user to select the status of annexes and generates the corresponding fixed text.

Annexes shall be designated by a capital letter (A, B, C, etc.) in the order in which they are cited in the text, irrespective of whether they are normative or informative.

Note the numbering of clauses: A.1, A.2, etc.

Test methods shall be presented in accordance with the ISO/IEC Directives, Part 2, 2004, 6.3.5. For methods of chemical analysis, see ISO 78-2.

The text under the heading “**Apparatus**” is an introductory phrase before an apparatus *list*. It is *not* a hanging paragraph (as described in the ISO/IEC Directives, Part 2, 2004, 5.2.4, second paragraph).

List the apparatus in the apparatus clause as shown here: reference number in bold type face; name of item of apparatus in bold type face; descriptive text (if necessary) in light type face. Each item of apparatus is styled in the ISO template as a subclause without a title. See also the following typical example:

Heading 1	6 → Apparatus
Normal	Usual laboratory apparatus and, in particular, the following.
p2	6.1 → Automatic apparatus for gluten separation , single or double, consisting of washing chamber(s), kneader(s) (see Figures A.1 and A.2) and a dispensing device under electronic control for gluten separation.
p3	6.1.1 → Washing chamber(s) , equipped with interchangeable chromed sieve holder(s) and with 88 μ m aperture polyester sieves or 80 μ m aperture metal sieves, and 840 μ m aperture polyamide sieves or 800 μ m aperture metal sieves.
p3	6.1.2 → Kneader hook , at a distance from the chromed sieve holder of 0,7 $\text{mm} \pm 0,05\text{mm}$. This value should be checked using the stamped metal plates supplied.
p3	6.1.3 → Plastic container , of capacity 10 l , containing a reservoir of sodium chloride solution (5.1) connected to the equipment by plastic tubing.
p3	6.1.4 → Dispensing device , consisting of a peristaltic pump, to deliver the sodium chloride solution (5.1) for gluten washing at a constant flow rate of 50 ml/min to 56 ml/min .
Normal	For a detailed description of the equipment and for detailed operating instructions, users of this part of ISO 21415 should consult the manufacturer's manual for the equipment employed.
p2	6.2 → Adjustable dispenser , for the sodium chloride solution, capable of dispensing 3 ml to 10 ml with an accuracy of $\pm 0,1\text{ml}$.
p2	6.3 → Centrifuge , capable of maintaining a rotational frequency of 6000 ± 5 per minute (see Figure A.3) and of producing a radial acceleration of 2000 g , equipped with perforated plates having apertures 500 μ m in diameter.

Note the grammatical style of a **procedure** clause: imperative tense. Instructions to carry out the procedure, expressed here using the imperative, are requirements.

Recommendations are expressed using the verbal form “should”.

Annex A (normative)

Determination of defects

A.1 Principle

Extraneous matter, broken kernels, damaged kernels and other kinds of rice are separated manually according to the following types: husked rice, milled rice, husked parboiled rice and milled parboiled rice. Each type is then weighed.

A.2 Apparatus

The usual laboratory apparatus and, in particular, the following.

A.2.1 Sample divider, consisting of a conical sample divider or multiple-slot sample divider with a distribution system, e.g. "Split-it-right" sample divider, such as that shown in Figure A.1.

A.2.2 Sieve, with round perforations of diameter 1,4 mm.

A.2.3 Tweezers.

A.2.4 Scalpel.

A.2.5 Paintbrush.

A.2.6 Steel bowls, of diameter 100 mm \pm 5 mm; seven per test sample.

A.2.7 Balance, which can be read to the nearest 0,01 g.

A.3 Sampling

See Clause 5.

A.4 Procedure

A.4.1 Preparation of test sample

Carefully mix the laboratory sample to make it as uniform as possible, then proceed to reduce it, using a divider (A.2.1), until a quantity of about 30 g is obtained.

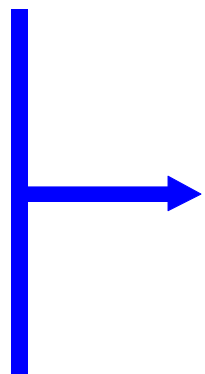
All parts of kernels which get stuck in the perforations of a sieve should be considered to be retained by the sieve.

Since the “Split-it-right” sample divider, shown in Figure A.1, is the subject of patent rights, it is necessary to provide details in the introduction.



This **equation** is not numbered because it is not cross-referenced anywhere else in the document.

Explain the meaning of the **symbols** used in an equation in a list below the equation, unless the symbols are listed in a symbols clause (see the ISO/IEC Directives, Part 2, 2004, 6.3.2).



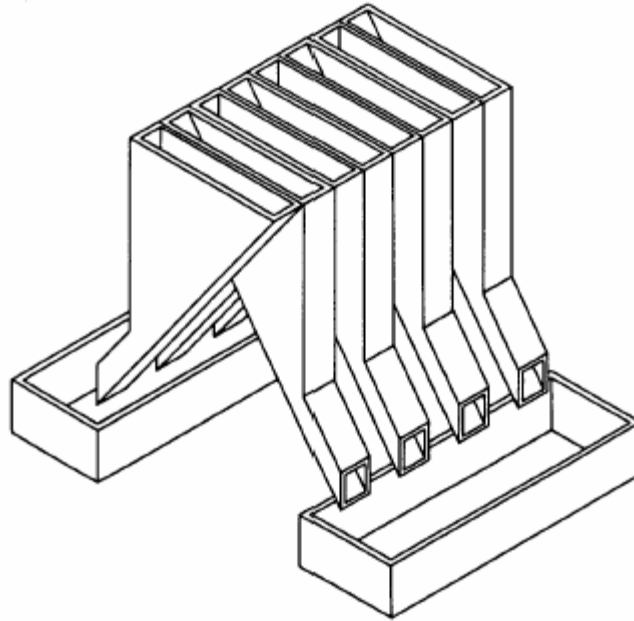


Figure A.1 — “Split-it-right” sample divider

A.4.2 Determination

Weigh, to the nearest 0,1 g, one of the test samples obtained in accordance with A.4.1 and separate the different defects into the bowls (A.2.6). When a kernel has several defects, classify it in the defect category for which the maximum permissible value is the lowest (see Table 1).

Weigh, to the nearest 0,01 g, the fractions so obtained.

A.5 Calculation

Express the mass fraction of each defect using the following equation:

$$w = \frac{m_D}{m_S}$$

where

w is the mass fraction of grains with a particular defect in the test sample;

m_D is the mass, in grams, of grains with that defect;

m_S is the mass, in grams, of the test sample.

A.6 Test report

Report the results as specified in Clause 7.

This **annex** is informative because the use of the method is optional (see 6.2 where the annex is cited). However, note that it contains requirements as it specifies the procedure to be followed if the user of the document chooses to follow this method.

Test methods shall be presented in accordance with the ISO/IEC Directives, Part 2, 2004, 6.3.5. For methods of chemical analysis, see ISO 78-2.

A **principle** clause (optional) indicates the essential steps in a test method. It shall not contain requirements.

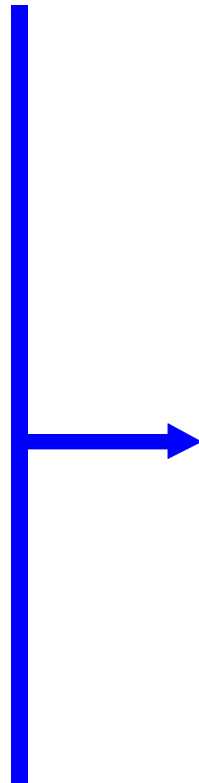


B.2.4 shows an example of how to express **tolerances**.

If any dangerous reagents are listed in the **reagents** clause, provide a **warning** presented in bold type face.

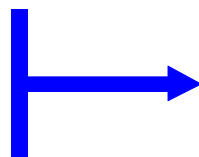
As in the apparatus clause (see A.2), any introductory phrase before the *list* of reagents is *not* a hanging paragraph (as described in the ISO/IEC Directives, Part 2, 2004, 5.2.4, second paragraph). The layout is similar to that of the apparatus clause: reference number in bold type face; name of item in bold type face; descriptive text (if necessary) in light type face. Each reagent item is styled in the ISO template as a subclause without a title.

Heading 1	5 → Reagents
Normal	Use only nitrogen-free reagents of recognized analytical grade, except for the reference materials, and distilled or demineralized water or water of equivalent purity.
Special	WARNING — The reagent described in 5.4 shall be handled with precaution.
p2	5.1 → Potassium sulfate (K ₂ SO ₄).
p2	5.2 → Copper(II) sulfate pentahydrate (CuSO ₄ ·5H ₂ O).
p2	5.3 → Sodium chloride solution , 20 g/l.
Normal	Dissolve 200 g of sodium chloride (NaCl) in water then dilute it to 10 l. The temperature of the solution when used should be 22°C ± 2°C.
Normal	It is advisable to prepare this solution freshly every day.
p2	5.4 → Sulfuric acid , c(H ₂ SO ₄) = 18 mol/l, ρ ₂₀ (H ₂ SO ₄) = 1,84 g/ml.
p2	5.5 → Acetanilide (C ₈ H ₉ NO), having a melting point of 114°C and nitrogen content of 10,36 g/100 g.



Avoid the use of **trade names**. Instead give a designation or description of a product. If, however, the use of a trade name cannot be avoided (see **B.3.2**), add a **footnote** (see the ISO/IEC Directives, Part 2, 2004, 6.6.3).

Footnote 4) gives an example of suitable wording to be used when a trade name is given.



Annex B (informative)

Determination of the waxy rice content of parboiled rice

B.1 Principle

Waxy rice kernels have a reddish brown colour when stained in an iodine solution, while non-waxy rice kernels show a dark blue colour.

B.2 Apparatus

Use usual laboratory apparatus and, in particular, the following.

B.2.1 Balance, capable of weighing to the nearest 0,01 g.

B.2.2 Glass beaker, of capacity 250 ml.

B.2.3 Small white colour bowls, or any white colour container of a suitable size.

B.2.4 Wire sieve, with long rounded apertures of $(1 \text{ mm } \begin{smallmatrix} +0,02 \\ 0 \end{smallmatrix} \text{ mm}) \times (20 \text{ mm } \begin{smallmatrix} +2 \\ -1 \end{smallmatrix} \text{ mm})$.

B.2.5 Stirrer rod.

B.2.6 Tweezers or forceps.

B.2.7 Tissue paper.

B.3 Reagents

WARNING — Direct contact of iodine with skin can cause lesions so care should be taken in handling iodine. Iodine vapour is very irritating to eyes and mucous membranes.

B.3.1 Deionized water, Grade 3 quality as specified in ISO 3696.

B.3.2 Iodine stock solution, containing a mass fraction of 4,1 % iodine and 6,3 % potassium iodide in deionized water, for example Lugols⁴⁾.

B.3.3 Iodine working solution, dilute the stock solution (B.3.2) two times (by volume) with deionized water (B.3.1).

Prepare fresh daily.

B.4 Sampling

Sampling shall be carried out in accordance with Clause 5.

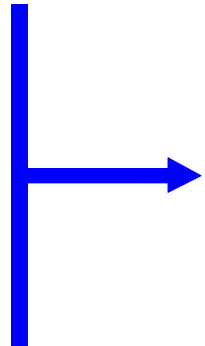
4) Lugols is an example of a suitable product available commercially. This information is given for the convenience of users of this part of ISO 17301 and does not constitute an endorsement by ISO of this product.

Use the **International System of units** as set out in ISO 31 (all parts), *Quantities and units* (under revision as ISO 80000). See the ISO/IEC Directives, Part 2, 2004, 6.6.9 and Annex I.

Equations between quantities are preferred to equations between numerical values.

To obtain the correct numerical result, the numerical values of the measured quantities shall have the same unit, otherwise a conversion factor is necessary. In the example shown [Equation (B.1)], since the equation is between quantities as defined in ISO 31 (under revision as ISO 80000), the phrase “expressed in grams” could be omitted.

Equation (B.1) is numbered because it is cross-referenced elsewhere in the text.



B.5 Determination

B.5.1 Weigh a portion of about 100 g of milled rice and put it into a glass beaker (B.2.2).

B.5.2 Add enough iodine working solution (B.3.3) to soak the kernels, and stir (B.2.5) until all the kernels are submerged under the solution. Let the kernels soak in the solution for 30 s.

B.5.3 Pour the rice and solution into a wire sieve (B.2.4), and shake the basket slightly in order to drain out the solution. Then place the wire sieve on a piece of tissue paper (B.2.7) to absorb the excess liquid.

B.5.4 Pour the stained kernels into a bowl (B.2.3). Using tweezers or forceps (B.2.6), separate the reddish brown kernels of waxy rice from the dark blue kernels of non-waxy rice.

B.5.5 Weigh the waxy rice portion (m_1) and the non-waxy rice portion (m_2) to the nearest 0,1 g.

B.6 Calculation

Calculate the mass fraction, expressed as a percentage, of the waxy rice, w_{wax} , using the equation:

$$w_{\text{wax}} = \frac{m_1}{m_1 + m_2} \times 100 \% \quad (\text{B.1})$$

where

m_1 is the mass, expressed in grams, of the waxy rice portion;

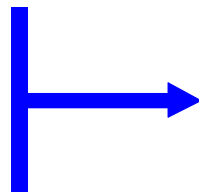
m_2 is the mass, expressed in grams, of the non-waxy rice portion.

B.7 Test report

Report the results as specified in Clause 7, giving the results calculated using Equation (B.1).

Figures shall be language independent. The axes shall be labelled using symbols (as shown here) or using X and Y rather than using words.

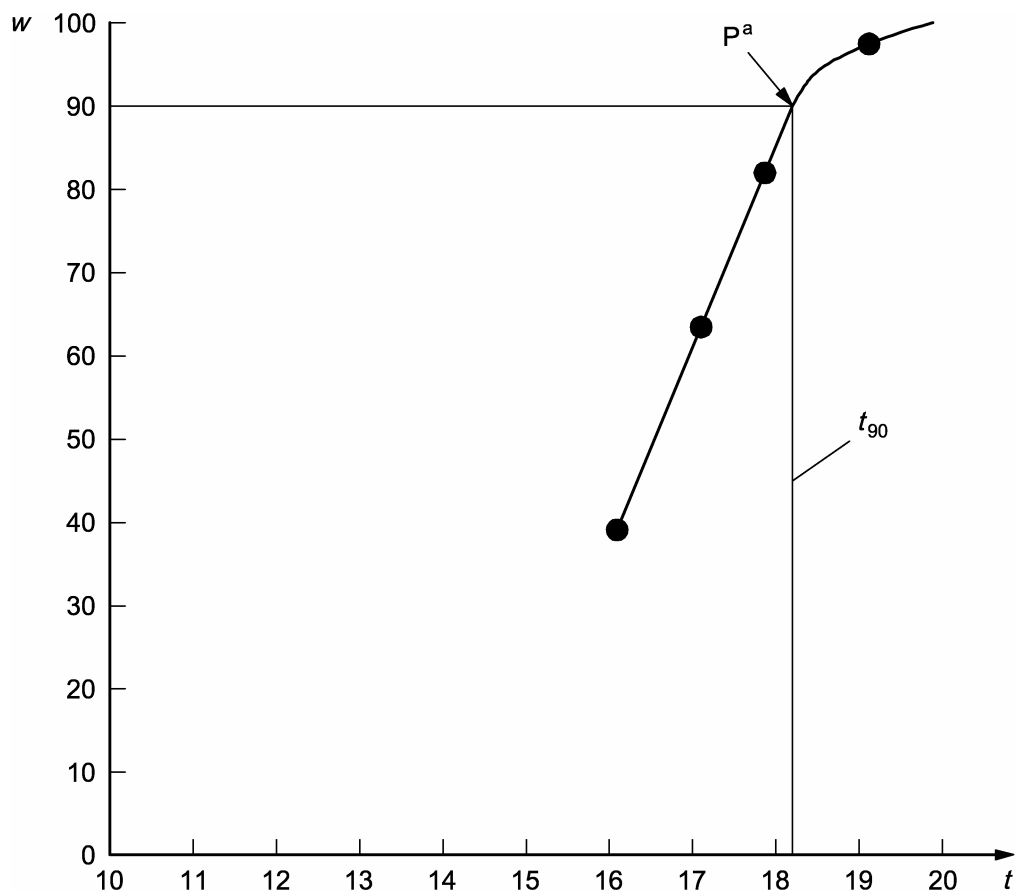
Computer-generated artwork in DXF format or EPS (if revisable) is preferred. Photographs will be accepted only if it is not possible to convert them into line drawings. Photocopies are not acceptable.



Annex C (informative)

Gelatinization

Figure C.1 gives an example of a typical gelatinization curve. Figure C.2 shows the three stages of gelatinization.



Key

- w mass fraction of gelatinized kernels, expressed in per cent
- t cooking time, expressed in minutes
- t_{90} time required to gelatinize 90 % of the kernels
- P point of the curve corresponding to a cooking time of t_{90}

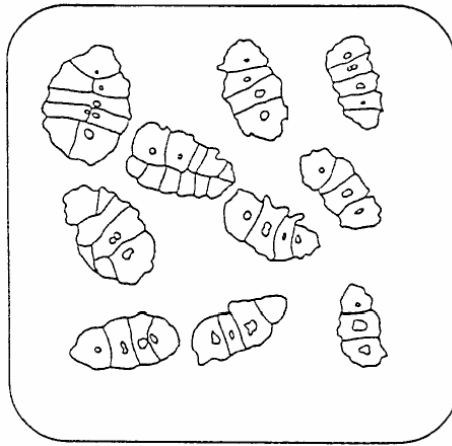
NOTE These results are based on a study carried out on three different types of kernel.

^a The time t_{90} was estimated to be 18,2 min for this example.

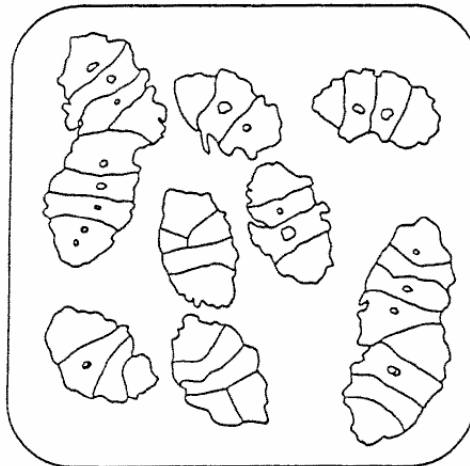
Figure C.1 — Typical gelatinization curve

Figures may be subdivided as shown in Figure C.2. The **subfigures** are identified using alphabetic characters followed by a parenthesis, i.e. a), b), etc.

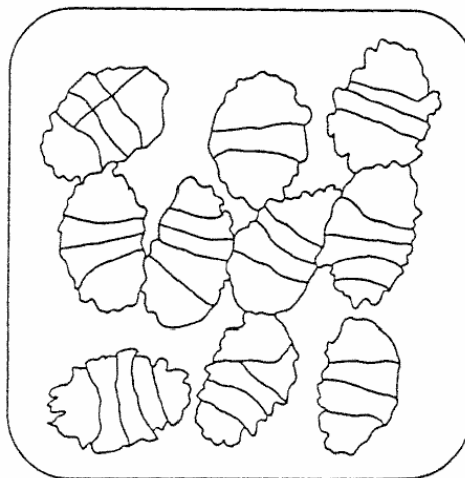




**a) Initial stages: No grains fully gelatinized
(ungelatinized starch granules are visible inside the kernels)**



b) Intermediate stages: Some fully gelatinized kernels are visible



c) Final stages: All kernels are fully gelatinized

Figure C.2 — Stages of gelatinization

This is an example of how to express precision results. The annex is informative as such results are not part of the test method.

A **figure** or a **table** has a number even if there is only one.



Annex D (informative)

Results of interlaboratory test for husked rice yields

An interlaboratory test^[19] was carried out by the ENR [Rice Research Centre (Italy)] in accordance with ISO 5725-1 and ISO 5725-2, with the participation of 15 laboratories. Each laboratory carried out three determinations on four different types of kernel. The statistical results are shown in Table D.1.

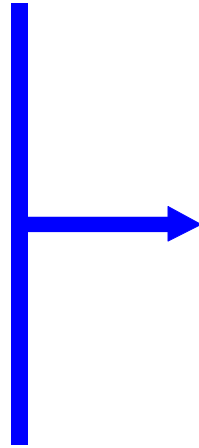
Table D.1 — Repeatability and reproducibility of husked rice yield

Description	Rice sample			
	Arborio	Drago ^a	Balilla	Thaibonnet
Number of laboratories retained after eliminating outliers	13	11	13	13
Mean value, g/100 g	81,2	82,0	81,8	77,7
Standard deviation of repeatability, s_r , g/100 g	0,41	0,15	0,31	0,53
Coefficient of variation of repeatability, %	0,5	0,2	0,4	0,7
Repeatability limit, r (= 2,83 s_r)	1,16	0,42	0,88	1,50
Standard deviation of reproducibility, s_R , g/100 g	1,02	0,20	0,80	2,14
Coefficient of variation of reproducibility, %	1,3	0,2	1,0	2,7
Reproducibility limit, R (= 2,83 s_R)	2,89	0,57	2,26	6,06
^a Parboiled rice.				

The **bibliography** is an optional element; it is not an annex. When present, it shall be placed after the last annex and before any indexes.

There are two ways of structuring the bibliography:

- a) by numerical order of the standards, followed by literature references, as follows:
 - 1) ISO standards followed by other international standards;
 - 2) regional standards;
 - 3) national standards;
 - 4) literature references;
- b) in the order in which they are cited in the text.



Examples are given of the correct styles for various types of bibliographic reference.

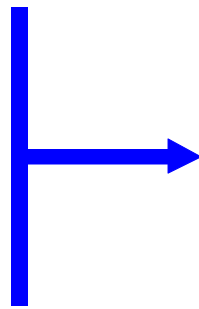
Reference [7] is dated because a specific part of it (a table) is cited in the text.



For online referenced documents for which a **URI** is given, as far as possible, the URI should remain valid for the expected life of the document. If this cannot be guaranteed, provide sufficient information to identify and locate the source (preferably the primary source) of the referenced document.

The bibliographic reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters as given in the source.

Reference [11] provides an example of a reference identified by a URL.



The ISO template automatically puts the bibliography on a separate page and generates the reference numbers when the correct styles are applied.

zzBiblio	Bibliography
	▪
bibliography	[1] → ISO [°] 78-2, <i>Chemistry[°]—Layouts for standards[°]—Part[°]2: Methods of chemical analysis</i>
bibliography	[2] → ISO [°] 5725-1, <i>Accuracy (trueness and precision) of measurement methods and results[°]—Part[°]1: General principles and definitions</i>
bibliography	[3] → ISO [°] 5725-2, <i>Accuracy (trueness and precision) of measurement methods and results[°]—Part[°]2: Basic method for the determination of repeatability and reproducibility of a standard measurement method</i>

Bibliography

- [1] ISO 78-2, *Chemistry — Layouts for standards — Part 2: Methods of chemical analysis*
- [2] ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*
- [3] ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*
- [4] ISO 6322-1, *Storage of cereals and pulses — Part 1: General recommendations for keeping of cereals*
- [5] ISO 6322-2, *Storage of cereals and pulses — Part 2: Practical recommendations*
- [6] ISO 6322-3, *Storage of cereals and pulses — Part 3: Control of attack by pests*
- [7] ISO 7301:2002, *Rice — Specification*
- [8] ISO 14864:1998, *Rice — Evaluation of gelatinization time of kernels during cooking*
- [9] *Guide to the expression of uncertainty in measurement (GUM)*, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1993⁵⁾
- [10] OIML Recommendations R 15, *Instruments for measuring the hectolitre mass of cereals*, 1974
- [11] ICC Standard No. 167. *Determination of the protein content in cereal and cereal products for food and animal feeding stuffs according to the Dumas combustion method* (see <http://www.icc.or.at>)
- [12] *Energy and protein requirements*. Technical Report No. 522, Ad Hoc Expert Committee. Rome FAO/WHO, 1973
- [13] European Directive 71/347/EEC, *Approximation of the laws of the Member States relating to the measuring of the standard mass per storage volume of grain*, Annex I, October 12, 1971
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5) Corrected and reprinted in 1995.

- [20] TKACHUK, R. Nitrogen-to-protein conversion factors for cereals and oilseed meals. *Cereal Chem.*, **46** (4), 1969, pp. 419-423
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- [26] *International vocabulary of basic and general terms in metrology (VIM)*, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1993