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Household refrigerating appliances - Characteristics and test methods (ISO 15502:2005)

Haushalt-Kühl-/Gefriergeräte - Eigenschaften und Prüfverfahren (ISO 15502:2005)

Appareils de réfrigération a usage ménager - Caractéristiques et méthodes d'essai (ISO 15502:2005)

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English Version

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This European Standard was approved by CEN on 19 September 2005.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Foreword

This document (EN ISO 15502:2005) has been prepared by Technical Committee ISO/TC 86 "Refrigeration and air-conditioning" in collaboration with Technical Committee CEN/TC 44 "Household refrigerating appliances and commercial refrigeration equipment", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

This document supersedes EN 28187:1991, EN ISO 5155:1995, EN ISO 7371:1995 and EN ISO 8561:1995.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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**Household refrigerating appliances —
Characteristics and test methods**

*Appareils de réfrigération à usage ménager — Caractéristiques et
méthodes d'essai*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

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.

ISO 15502 was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 5, *Testing and rating of household refrigeration appliances*.

This first edition cancels and replaces ISO 5155:1995, ISO 7371:1995, ISO 8187:1991 and ISO 8561:1995, of which it constitutes a technical revision. It also incorporates the amendments ISO 7371:1995/Amd.1:1997, ISO 8187:1991/Amd.1:1997 and ISO 8561:1995/Amd.1:1997.

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Household refrigerating appliances — Characteristics and test methods

1 Scope

This International Standard specifies the essential characteristics of household refrigerating appliances, factory-assembled and cooled by internal natural convection or forced air circulation, and establishes test methods for checking the characteristics. These are type tests, and because of this, when verification of the performance of a refrigerating appliance of a given type in relation to this International Standard is necessary, it is preferable, wherever practicable, that all the tests specified be applied to a single unit. The tests can also be made individually for the study of a particular characteristic.

NOTE For the safety requirements applicable to household refrigerating appliances, see IEC 60335-2-24, for noise requirements applicable to household refrigerators and freezers, see ISO 8960, and for additional safety requirements applicable to the refrigerating systems of household refrigerating appliances, see in ISO 5149.

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 534, *Paper and board — Determination of thickness, density and specific volume*

ISO 817, *Refrigerants — Designation system*

ISO 8960, *Refrigerators, frozen-food storage cabinets and food freezers for household and similar use — Measurement of emission of airborne acoustical noise*

IEC 60335-2-24:—¹⁾, *Household and similar electrical appliances — Safety — Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and icemakers*

3 Terms, definitions and symbols

For the purposes of this document, the following terms, definitions and symbols apply.

3.1

refrigerating appliance

factory-assembled insulated cabinet with one or more compartments and of suitable volume and equipment for household use, cooled by natural convection or a frost-free system whereby the cooling is obtained by one or more energy-consuming means

NOTE From the point of view of installation, there are various types of household refrigerating appliance (free-standing, wall-mounted, built-in, etc.).

1) To be published. (Revision of IEC 60335-2-24:2002)

3.1.1

compression-type refrigerating appliance

refrigerating appliance in which refrigeration is effected by means of a motor-driven compressor

3.1.2

absorption-type refrigerating appliance

refrigerating appliance in which refrigeration is effected by an absorption process using heat as energy source

3.1.3

refrigerator

refrigerating appliance intended for the preservation of food, one of whose compartments is suitable for the storage of fresh food

3.1.3.1

frost-free refrigerator

refrigerator in which all compartments are automatically defrosted with automatic disposal of the defrosted water and at least one compartment is cooled by a frost-free system and at least one is a "frozen-food storage" compartment

NOTE A single-compartment refrigerator using a frost-free system cannot be called a frost-free refrigerator.

3.1.4

refrigerator-freezer

refrigerating appliance having at least one compartment suitable for the storage of fresh food (the fresh-food storage compartment) and at least one other (the food freezer compartment) suitable for the freezing of fresh food and the storage of frozen food under three-star storage conditions

3.1.4.1

frost-free refrigerator-freezer

refrigerator-freezer in which all compartments are automatically defrosted with automatic disposal of the defrosted water and at least one compartment is cooled by a frost-free system

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3.1.5

frozen-food storage cabinet

refrigerating appliance having one or more compartments suitable for the storage of frozen food

3.1.5.1

frost-free frozen-food storage cabinet

frozen-food storage cabinet in which all compartments are automatically defrosted with automatic disposal of the defrosted water and which is cooled by a frost-free system

3.1.6

food freezer

refrigerating appliance having one or more compartments suitable for freezing foodstuffs from ambient temperature down to a temperature of $-18\text{ }^{\circ}\text{C}$ and which is also suitable for the storage of frozen food under three-star storage conditions

NOTE In certain instances, two-star sections and/or compartments are permitted within the compartment or cabinet (see 7.2.8).

3.1.6.1

frost-free food freezer

food freezer in which all compartments are automatically defrosted with automatic disposal of the defrosted water and at least one compartment is cooled by a frost-free system

3.1.7

built-in appliance

fixed refrigerating appliance intended to be installed in a cabinet, in a prepared recess in a wall or similar location

3.2**frost-free system**

system automatically operated to prevent the permanent formation of frost, in which cooling is provided by forced air circulation, the evaporator or evaporators are defrosted by an automatic defrost system and the water from defrosting is disposed of automatically

3.3 Compartments and sections**3.3.1****fresh-food storage compartment**

compartment intended for the storage of unfrozen food, which may itself be divided into sub-compartments

NOTE The storage temperatures can be maintained according to Clause 6.

3.3.2**cellar compartment**

compartment intended for the storage of particular foods or beverages at a temperature warmer than that of the fresh-food storage compartment

NOTE The storage temperatures can be maintained according to Clause 6.

3.3.3**chill compartment**

compartment intended specifically for the storage of highly perishable foodstuffs whose volume is capable of containing at least 2 M packages

NOTE The storage temperatures can be maintained according to Clause 6.

3.3.4**ice-making compartment**

low-temperature compartment intended specifically for the freezing and storage of ice

3.3.5**frozen-food storage compartment**

low-temperature compartment intended specifically for the storage of frozen food

NOTE Frozen-food storage compartments are classified according to temperature, see 3.3.5.1 to 3.3.5.5.

3.3.5.1**one-star compartment**

frozen-food storage compartment in which the temperature is not warmer than $-6\text{ }^{\circ}\text{C}$

3.3.5.2**two-star compartment**

frozen-food storage compartment in which the temperature is not warmer than $-12\text{ }^{\circ}\text{C}$

3.3.5.3**three-star compartment**

frozen-food storage compartment in which the temperature is not warmer than $-18\text{ }^{\circ}\text{C}$

3.3.5.4**food freezer compartment****four-star compartment**

compartment suitable for freezing foodstuffs from ambient temperature down to $-18\text{ }^{\circ}\text{C}$, and which is also suitable for the storage of frozen food under three-star storage conditions

NOTE Two-star sections and/or compartments are permitted within the compartment or cabinet (see 7.2.8).

3.3.5.5

two-star section

part of a food freezer compartment or cabinet, or three-star compartment or cabinet, which is not self-contained (i.e. does not have its own individual access door or lid) and in which the temperature is not warmer than $-12\text{ }^{\circ}\text{C}$

3.4

rated

stated as a value (e.g. a volume) by the manufacturer

3.5 Physical aspects and dimensions

3.5.1

top-opening type

refrigerating appliance in which the compartment(s) are accessible from the top

3.5.2

upright type

refrigerating appliance in which the compartment(s) are accessible from the front

3.5.3

overall dimensions

space — height, width and depth — with doors or lids closed taken up by the refrigerating appliance

3.5.4

overall space required in use

total space — height, width and depth — with doors or lids open necessary for the refrigerating appliance for normal use

3.5.5

gross volume

volume within the inside liner of the refrigerating appliance, or of a compartment with an external door, without internal fittings and with the doors or lids closed

3.5.6

storage volume

part of the gross volume of any compartment that remains after deduction of the volume of components and spaces recognized as unusable for the storage of food

NOTE See 7.2.

3.5.7

shelf

horizontal surface (shelves, partitions, etc.) on which food can be placed

NOTE It can be formed by one component or by components fitted side by side, which can be fixed or removable.

3.5.8

storage shelf area

sum of the horizontal projections of the storage surfaces within the storage volume, including door shelves and the bottom of each compartment

NOTE See 7.3.

3.5.9

load limit

surface enveloping a frozen-food storage volume

3.5.10**load-limit line**

permanent mark indicating limit of three-star frozen-food storage volume

3.5.11**storage plan**

arrangement of test packages within a refrigerating appliance

3.6 Definitions relating to performance characteristics**3.6.1****energy consumption**

energy consumed by a refrigerating appliance calculated over a period of 24 h when tested according to this International Standard

3.6.2**fresh-food storage temperature**

t_{ma}

mean temperature of the fresh-food storage compartment

3.6.3**frozen-food storage temperature**

t^* , t^{**} , t^{***}

maximum temperature of any M package during the test period

NOTE 1 The superscript attached to the symbol t corresponds to the one-star, two-star or three-star temperature.

NOTE 2 See 8.8.3.

3.6.4**cellar compartment storage temperature**

t_{cma}

mean temperature of the cellar compartment

3.6.5**chill compartment storage temperature**

t_{cc}

instantaneous storage temperature of the chill compartment

3.6.6**freezing capacity**

amount of food expressed in kilograms that can be frozen to a temperature of -18 °C in 24 h when tested in accordance with Clause 17 of this International Standard

3.6.7**ice-making capacity**

quantity of ice the refrigerating appliance is capable of producing within 24 h in an automatic icemaker, and/or the time necessary for the freezing of the water in the ice tray(s) supplied with the refrigerating appliance

3.6.8**automatic defrost**

defrosting where no action is necessary by the user to initiate the removal of frost accumulation or to restore normal operation, and the disposal of the defrost water is automatic

3.6.9

semi-automatic defrost

defrosting where an action is necessary by the user to initiate the removal of frost accumulation and normal operation is restored automatically, the defrost water being removed manually or removed and disposed of automatically

3.6.10

semi-automatic defrost

defrosting where no action is necessary by the user to initiate the removal of frost accumulation nor to restore normal operation, but the removal of the defrost water is manual

3.6.11

manual defrost

defrosting where an action is necessary by the user to initiate the removal of frost accumulation and where restoration to normal operation requires a further action by the user, the defrost water being removed manually or removed and disposed of automatically

3.6.12

automatic disposal of defrost water

removal and evaporation of the defrost water which does not require any action by the user

3.6.13

manual removal of defrost water

collection and removal of defrost water that requires actions by the user

3.6.14

adaptive defrost

form of automatic defrosting system where energy consumed in defrosting is reduced by an automatic process whereby the time intervals between successive defrosts are determined by an operating condition variable (or variables) other than, or in addition to, elapsed time or compressor run time.

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3.6.15

test package

food simulant used as load when testing frozen food compartments and chill compartments and during freezing capacity testing in all compartments of refrigerator-freezers

3.6.16

M-package

test package fitted with a temperature sensor at its geometric centre

3.6.17

operating cycle

⟨frost-free systems⟩ period commencing at the initiation of an automatic defrosting cycle and terminating at the moment of initiation of the next automatic defrosting cycle

3.6.18

operating cycle

⟨systems designed to operate continuously⟩ period of 24 h under stable operating conditions

3.6.19

operating cycle

⟨other refrigerating appliances⟩ period between two successive stops of the refrigerating system, or part of the system, under stable operating conditions

3.6.20

automatic defrosting cycle

period between the moment when the means of defrosting the evaporator(s) is switched on and the moment when the refrigeration process is re-established

3.6.21**stable operating conditions**

conditions in which a refrigerating appliance's mean temperatures and energy consumption are stable

3.6.22**ambient temperature**

measured temperature in the space surrounding the refrigerating appliance under test

3.6.23**temperature rise time**

time period needed to raise the temperature of food in the frozen food compartment from -18 °C to -9 °C after the operation of the refrigerated system has been interrupted

3.7 Definitions relating to refrigerating system**3.7.1****refrigerant**

fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and at a low pressure of the fluid and rejects heat at a higher temperature and at a higher pressure of the fluid, usually involving changes of state of the fluid

3.7.2**condenser**

heat exchanger in which vaporized refrigerant is liquefied by rejecting heat to an external cooling medium

3.7.3**evaporator**

heat exchanger in which the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated

3.7.4**temperature control device**

device which automatically regulates the operation of a refrigerating system according to the temperature of an evaporator or of a compartment or cabinet

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3.8 Symbols

T_i, T_{ci}	temperature measurement points
t_i	instantaneous temperature value (fresh food compartment)
t_{ci}	instantaneous temperature value (cellar compartment)
t_{cc}	instantaneous temperature value (chill compartment)
t_{im}	integrated time average of t_i
t_{cim}	integrated time average of t_{ci}
t_a	instantaneous arithmetic average of t_1, t_2, t_3
t_{ca}	instantaneous arithmetic average of t_{c1}, t_{c2}, t_{c3}
t_{ma}	arithmetic average of t_{1m}, t_{2m}, t_{3m}
t_{cma}	arithmetic average of $t_{c1m}, t_{c2m}, t_{c3m}$
i	subscript representing 1, 2 or 3