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DIN EN ISO 23953-2:2012-09

# Refrigerated display cabinets – Part 2: Classification, requirements and test conditions (ISO 23953-2:2015); English version EN ISO 23953-2:2015, English translation of DIN EN ISO 23953-2:2016-03

Verkaufskühlmöbel –
Teil 2: Klassifizierung, Anforderungen und Prüfbedingungen (ISO 23953-2:2015);
Englische Fassung EN ISO 23953-2:2015,
Englische Übersetzung von DIN EN ISO 23953-2:2016-03

Meubles frigorifiques de vente –
Partie 2: Classification, exigences et méthodes d'essai (ISO 23953-2:2015);
Version anglaise EN ISO 23953-2:2015,
Traduction anglaise de DIN EN ISO 23953-2:2016-03

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Translation by DIN-Sprachendienst.

In case of doubt, the German-language original shall be considered authoritative.



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*A comma is used as the decimal marker.*

# National foreword

This document (EN ISO 23953-2:2015) has been prepared by Technical Committee CEN/TC 44 “Commercial and Professional Refrigerating Appliances and Systems, Performance and Energy Consumption” (Secretariat: UNI, Italy), Working group WG 1 “Commercial refrigerated display cabinets” in collaboration with Technical Committee ISO/TC 86 “Refrigeration and air-conditioning”.

The responsible German body involved in its preparation was *DIN-Normenausschuss Kältetechnik* (DIN Standards Committee Refrigeration Technology), Working Committee NA 044-00-07 AA *Gewerbe- und Verkaufskühlmöbel*.

**Amendments**

This standard differs from DIN EN ISO 23953-2:2012-09 as follows:

a) editorial and technical improvements, corrections and/or clarifications have been made throughout the text to better apply the standard;

b) a new Annex D “Performance and energy rating of commercial refrigerated display cabinets” has been added.

**Previous editions**

DIN 8954: 1964-07
DIN 8954-1: 1980-04
DIN 8954-2: 1974-02
DIN 8954-3: 1974-02, 1983-10
DIN 8954-4: 1974-04, 1983-10
DIN 8954-5: 1974-02
DIN 8954-6: 1974-02
DIN 8954-8: 1974-02
DIN 8954-9: 1974-02
DIN 8954-10: 1981-12
DIN 8963: 1983-10, 1987-05
DIN EN 441-2: 1995-01
DIN EN 441-3: 1995-01
DIN EN 441-4: 1995-01
DIN EN 441-5: 1996-03
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DIN EN 441-9: 1995-01
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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN ISO 23953-2

November 2015

ICS 97.130.20

Supersedes EN ISO 23953-2:2005

English Version

# Refrigerated display cabinets - Part 2: Classification, requirements and test conditions (ISO 23953-2:2015)

Meubles frigorifiques de vente - Partie 2: Classification, exigences et méthodes d'essai (ISO 23953-2:2015)

Verkaufskühlmöbel - Teil 2: Klassifizierung, Anforderungen und Prüfbedingungen (ISO 23953-2:2015)

This European Standard was approved by CEN on 3 October 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

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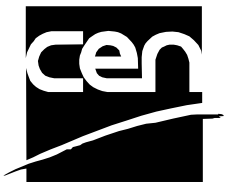

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COMITÉ EUROPÉEN DE NORMALISATION
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## European foreword

This document (EN ISO 23953-2:2015) has been prepared by Technical Committee CEN/TC 44 “Commercial refrigerated cabinets, catering refrigerating appliances and industrial refrigeration", the secretariat of which is held by UNI, in collaboration with Technical Committee ISO/TC 86 "Refrigeration and air-conditioning"

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 May 2016, and conflicting national standards shall be withdrawn at the latest by May 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 23953-2:2005.

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

### Endorsement notice

The text of ISO 23953-2:2015 has been approved by CEN as EN ISO 23953-2:2015 without any modification.

# 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.

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 7, and by Technical Committee CEN/TC 44, *Commercial refrigerated cabinets, catering refrigerating appliances and industrial refrigeration* in collaboration.

This second edition cancels and replaces the first edition (ISO 23953-2:2005 and ISO 23953-2:2005/Amd 1:2012), which has been technically revised as follows:

— editorial and technical improvements, corrections and/or clarifications throughout the text to better apply the standard

— addition of a new Annex D "Performance and energy rating of commercial refrigerated display cabinets"

ISO 23953 consists of the following parts, under the general title *Refrigerated display cabinets*:

— *Part 1: Vocabulary*

— *Part 2: Classification, requirements and test conditions*

# 1 Scope

This part of ISO 23953 specifies requirements for the construction, characteristics and performance of refrigerated display cabinets used in the sale and display of foodstuffs. It specifies test conditions and methods for checking that the requirements have been satisfied, as well as classification of the cabinets, their marking and the list of their characteristics to be declared by the manufacturer. It is not applicable to refrigerated vending machines. It is also not applicable to cabinets intended for storage or cabinets intended for use, for instance, in catering or non-retail refrigerated applications nor does it cover the choice of the types of foodstuffs chosen to be displayed in the cabinets.

# 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 817, *Refrigerants — Designation and safety classification*

ISO 5149-2:2014, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

ISO 23953-1:2015, *Refrigerated display cabinets — Part 1: Vocabulary*

IEC 60335-1, *Household and similar electrical appliances - Safety - Part 1: General requirements*

IEC 60335-2-89, *Household and similar electrical appliances - Safety - Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor*

# 3 Terms, definitions, symbols and abbreviated terms

## 3.1 General

$t_{\mathrm{run}}$ running time — time during which compressor is running (or solenoid valve is open) or secondary refrigerant is circulating (or solenoid valve is open), within 24 h, expressed in hours

$t_{\mathrm{stop}}$ stopping time — time during which compressor is not running (or solenoid valve is closed) or secondary refrigerant is not circulating (or solenoid valve is closed), within 24 h and excluding defrost time, expressed in hours

$t_{\mathrm{deft}}$ defrost time — time during defrost during which compressor is not running (or solenoid valve is closed) or secondary refrigerant is generally not circulating, within 24 h, but not considered as stopping time, expressed in hours

$q_m$ mass flow rate of liquid refrigerant or secondary refrigerant in kilograms per second

$\Delta t$ time between two consecutive measuring samples, in hours

$N_{max}$ number of measuring samples in 24 hours

$n_{deft}$ number of defrosts during 24 h

$\Phi_{24}$ heat extraction rate during a whole day excepting defrost time, in kilowatts

$\Phi_{24\text{-deft}}$ heat extraction rate during a whole day excepting defrost time, in kilowatts

DEC direct daily electrical energy consumption, in kilowatt hours per 24 h period

DECR revised direct daily electrical energy consumption, in kilowatt hours per 24 h period

$REC_{RC}$ refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for compression-type refrigerating system

$REC_{RI}$ refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for indirect refrigerating system

$RECR_{RC}$ revised refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for compression-type refrigerating system

$RECA_{RC}$ additional refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for compression-type refrigerating system

$RECR_{RI}$ revised refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for indirect refrigerating system

$RECA_{RI}$ additional refrigeration daily electrical energy consumption, in kilowatt hours per 24 h period, for remote cabinet for indirect refrigerating system

TEC total daily electrical energy consumption in kilowatt hours per 24 h period

TECR total revised daily electrical energy consumption in kilowatt hours per 24 h period

TDA total display area, in square meters (see Annex A)

SEC TEC/TDA Specific Daily Electrical Energy Consumption (SEC) for Refrigerated Display Cabinet expressed in kilowatt hours per 24h per square meters

$t_{rr}$ relative or percentage running time:

$$t_{rr} = \frac{t_{run}}{t_{run} + t_{stop}} = \frac{t_{run}}{24 - t_{deft}}$$

where

$$t_{run} + t_{stop} + t_{deft} = 24\text{h}$$

$\Phi_n$ instant heat extraction rate in kilowatts

## 3.2 Compression-type refrigeration systems

$h_8, h_4$ specific enthalpy in kilojoules per kilogram, where state at point 8 corresponds to refrigerant outlet, and state at point 4 to refrigerant inlet, of cabinet

$\theta_7$ refrigerant temperature at evaporator outlet, in degrees Celsius

$\theta_8$ refrigerant temperature at cabinet outlet, in degrees Celsius

$\theta_4$ refrigerant temperature at cabinet inlet, in degrees Celsius

$\theta_5$ refrigerant temperature at evaporator inlet, in degrees Celsius

$p_8$ refrigerant pressure at cabinet outlet, in Pascals

$\theta_{mrun}$ arithmetic average of evaporator-saturated temperature obtained from pressure $p_8$ by referring to table of saturation properties for refrigerant in use, during $t_{run}$, in degrees Celsius

$\theta_{min}$ arithmetic average of evaporator-saturated temperature obtained from pressure $p_8$ by referring to table of saturation properties for refrigerant in use, during the last 10 % of all running periods, in degrees Celsius

$T_{mrun}$ = $\theta_{mrun}$ + 273,15 in Kelvin

## 3.3 Indirect refrigeration-type systems

$\theta_i$ secondary refrigerant temperature at cabinet inlet, in degrees Celsius

$\theta_o$ secondary refrigerant temperature at cabinet outlet, in degrees Celsius

$\theta$ secondary refrigerant median temperature, in degrees Celsius $(\theta_i + \theta_o)/2$

$\theta_{mrun}$ arithmetic average of the secondary refrigerant median temperature ($\theta$) during $t_{run}$, in degrees Celsius

$\theta_{min}$ arithmetic average of the secondary refrigerant median temperature ($\theta$) during last 10 % of all running periods, in degrees Celsius

$q_{mrun}$ arithmetic average of the secondary refrigerant mass flow during $t_{run}$, in kilograms per second

$c_i$ specific heat of secondary refrigerant, in kilojoules per kilogram per degree Celsius at cabinet inlet

$c_o$ specific heat of the secondary refrigerant, in kilojoules per kilogram per degree Celsius, at cabinet outlet

$p_{irun} - p_{orun}$ pressure drop between inlet and outlet of cabinet during $t_{run}$, in kilo Pascals

CPEC pumping electrical energy consumption expressed in kilowatt hours per 24 h period

$v$ specific volume of secondary refrigerant, in cubic metres per kilogram (simplification: $v$ = const. = 0,001 $m^3/kg$)

# 4 Requirements

## 4.1 Construction

### 4.1.1 General

#### 4.1.1.1 Strength and rigidity

The cabinet and its parts shall be constructed with adequate strength and rigidity for normal conditions of handling, transport and use. Attention shall be given to the following:

a) interior fittings, including shelves, baskets, rails, etc. and their supports, shall be sufficiently strong for the duty required;