INTERNATIONAL STANDARD

ISO 23953-2

First edition
2005-10-15

Refrigerated display cabinets —

Part 2: Classification, requirements and test conditions

Meubles frigorifiques de vente —

Partie 2: Classification, exigences et méthodes d'essai

Reference number
ISO 23953-2:2005(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 23953-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 44, *Household refrigerating appliances and commercial refrigeration equipment*, in collaboration with Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 7, *Testing and rating of commercial refrigerated display cabinets*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 23953-2, together with the first edition of ISO 23953-1, cancels and replaces ISO 1992-1:1974, ISO 1992-4:1974, ISO 1992-5:1974, ISO 1992-6:1974, ISO 5160-1:1979 and ISO 5160-2:1980, of which it constitutes a technical revision.

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

— *Part 1: Vocabulary*

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

Refrigerated display cabinets —

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 or cabinets intended for use in catering or similar non-retail applications; nor does it cover the choice of the types of foodstuffs chosen to be displayed in the cabinets.

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 817, *Refrigerants — Designation system*

ISO 9050, *Glass in building — Determination of light transmittance, solar direct transmittance, total solar energy transmittance and ultraviolet transmittance, and related glazing factors*

ISO 23953-1:2005, *Refrigerated display cabinets — Part 1: Vocabulary*

IEC 60335-2:89, *Safety of household and similar electrical appliance — Part 2: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit*

EN 378-2, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 60335-1, *Safety of household and similar electrical appliances — Part 1: General requirements*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO 23953-1 and the following symbols and abbreviated terms apply.

3.1 General

t_{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

t_{run75} 75 % of the running time between defrosts, excluding the time just after defrost, 0,75 t_{run}

t_{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

t_{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

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

Δt time between two consecutive measuring samples

N_{max} number of measuring samples in 24 hours

N_{75} number of measuring samples during 75 % of the running time period between 2 defrosts, excluding time just after defrost

n_{deft} number of defrosts during 24 h

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

REC_{RC} refrigeration electrical energy consumption, in kilowatt hours per 2 h period, for remote cabinet for compression-type refrigerating system

REC_{RI} refrigeration electrical energy consumption, in kilowatt hours per 2 h period, for remote cabinet for indirect refrigerating system

TEC total energy consumption in kilowatt hours per 24 h period

t_{rr} relative or percentage running time:

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

where $t_{run} + t_{stop} + t_{deft} = 24$ h

Φ_n instant heat extraction rate

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

θ_7 refrigerant mean temperature at evaporator outlet

θ_{mrun} arithmetic average of evaporator-saturated temperature obtained from pressure p_7 by referring to table of saturation properties for refrigerant in use — during t_{run}, in degrees Celsius

θ_{min} arithmetic average of evaporator-saturated temperature obtained from pressure p_7 by referring to table of saturation properties for refrigerant in use — during the last 10 % of all running periods, in degrees Celsius

T_{mrun} = θ_{mrun} + 273,18

3.3 Indirect refrigeration-type systems

θ_i secondary refrigerant temperature at cabinet inlet, in degrees Celsius

θ_o secondary refrigerant temperature at cabinet outlet, in degrees Celsius

θ secondary refrigerant median temperature, in degrees Celsius (θ_i + θ_o)/2

θ_{mrun} arithmetic average of the secondary refrigerant median temperature (θ) during t_{run}, in degrees Celsius

θ_{min} arithmetic average of the secondary refrigerant median temperature (θ) 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 newtons per square metre

PEC pumping electrical energy consumption

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