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British Standard Specification for

Safety of household and similar electrical appliances

Part 202. Particular requirements

Section 202.24 Refrigerators and food freezers

Sécurité des appareils électrodomestiques et analogues

Partie 202. Règles particulières

Section 202.24 Réfrigérateurs et congélateurs

Sicherheit von Elektrogeräten für den Haushalt und ähnliche Zwecke

Teil 202. Besondere Anforderungen

Abschnitt 202.24 Kühlschränke und Gefriergeräte

This European Standard EN 60 335-2-24 : 1989 has the status of a British Standard.

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National foreword

This Section of BS 3456 : Part 202 has been prepared under the direction of the Light Electrical Engineering Standards Policy Committee and is the English language version of EN 60 335-2-24, 'Safety of household and similar electrical appliances : Part 2 : Particular requirements for refrigerators and food freezers', published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived by that organization from IEC Publication 335-2-24 (1984) edition 2, including Amendment No 1 (1987), which has the same title as the European Standard.

The CENELEC Common Modifications have been implemented at the appropriate places in the text of IEC Publication 335-2-24 (1984) edition 2 into which Amendment No 1 (1987) has been incorporated, and are indicated by a side line in the margin. The foreword and preface of IEC Publication 335-2-24 (1984) edition 2, the preface of Amendment No 1 (1987) and the deleted parts of the original IEC text which do not form part of the text of EN 60 335-2-24 have been quoted in national appendix NA. Annexes designated 'normative' are part of the body of the standard. Annexes designated 'informative' are given for information only. National appendices are designated 'informative'.

This Section of BS 3456 : Part 202 is to be read in conjunction with BS 3456 : Part 201 : 1990 'General requirements', which it supplements or modifies. The many references to Part 1 should be read as references to BS 3456 : Part 201, which is the English language version of EN 60 335-1 which was derived from the 1983 reprint of IEC Publication 335-1 (1976) edition 2, including Amendments 1, 2 and 3 to IEC 3335-1. For the purposes of this British Standard, any references to IEC page numbers in the text should be ignored.

This Section of BS 3456 : Part 202 supersedes BS 3456 : Part 102 : Section 102.24 : 1988 which will be withdrawn on 31 December 1990 in accordance with the CENELEC Internal Regulations.

Cross-references. British Standards corresponding to international standards quoted in this standard are listed in national appendix NB.

Product approval. Attention is drawn to the fact that products conforming to this British Standard may be approved by the British Electrotechnical Approvals Board for the purposes of participation in the CENELEC Certification Agreement and in the CB Scheme of the IECEE. (Details of the BEAB Approval Marks Scheme are given on the inside back cover.)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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English version

Safety of household and similar electrical appliances Part 2: Particular requirements for refrigerators and food freezers

(IEC 335-2-24 (1984) 2nd edition, modified)

Sécurité des appareils électrodomestiques
et analogues
Deuxième partie: Règles particulières pour les
réfrigérateurs et les congélateurs
(CEI 335-2-24 (1984) 2ème édition, modifiée)

Sicherheit elektrischer Geräte für den
Hausgebrauch und ähnliche Zwecke
Teil 2: Besondere Anforderungen für Kühlschränke
und Gefriergeräte
(IEC 335-2-24 (1984) 2. Ausgabe, modifiziert)

This European Standard was ratified by CENELEC on 13 September 1988.

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
CENELEC member into its own language and notified to the CENELEC Central Secre-
tariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Brief history

The proposal to endorse the second edition of IEC Publication 335-2-24, document CENELEC/TC 61 (SEC) 436, was circulated under the enquiry procedure in March 1985.

This proposal was discussed during the Zandvoort meeting in June 1986 when it was decided to submit a draft for EN 60 335-2-24 to the voting procedure. This procedure started in March 1988.

The text of this draft was ratified by the CENELEC Technical Board on the 13th of September 1988.

Foreword

This European Standard has been prepared by the Secretariat of CENELEC Technical Committee 61.

The following dates are applicable:

- date of announcement (doa) 1989-09-01
- date of latest publication (dop) 1990-01-01
- date of withdrawal of conflicting national standards (dow) 1991-01-01

This European Standard replaces HD 269 S2.

This document supplements or modifies the corresponding clauses of IEC 335-2-24, second edition including its Amendment No. 1, so as to convert that standard into the European Standard EN 60 335-2-24, which has to be used in conjunction with EN 60 335-1 (1988), Safety of household and similar electrical appliances, Part 1: General requirements.

Special national conditions (snc) causing a deviation from this European Standard are listed in Annex ZX and are in addition to those in EN 60 335-1.

National deviations from this European Standard are listed in Annex ZY and are in addition to those in EN 60 335-1.

NOTE. Where reference is made to other harmonized standards, the latest edition of that standard is applicable.

The following print types referred to in the preface of IEC 335-2-24 are used:

- requirements proper: in roman type
- *test specifications*: in italic type
- explanatory matter: in smaller roman type

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SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES

Part 2: Particular requirements for refrigerators and food freezers

1. Scope

This clause of Part 1 is applicable except as follows:

1.1 *Replacement:*

This standard applies to electrical refrigerators with or without frozen food storage compartments, frozen food storage cabinets and food freezers and their combinations for household and similar use.

It deals with safety rules for such appliances, but does not cover features of construction and operation which are dealt with in ISO Recommendations R 824 and R 825.

Some tests related to stability and mechanical hazards are introduced in Appendix BB. Some of these tests are taken from ISO Recommendation R 824. The others have been introduced until ISO establishes rules concerning them.

Where applicable, clauses of Part 1 related to safety of heating appliances apply to absorption-type refrigerators or food freezers, and to heating elements incorporated in compression-type refrigerators or food freezers.

Appliances not intended for normal household use, but which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

This standard does not take into account the special hazards which exist in nurseries and other places where there are young children or aged or infirm persons without supervision; in such cases additional requirements may be necessary.

This standard does not apply to:

- appliances designed exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- separate motors;
- separate motor-compressors, which are covered by HD 277.

For appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

Attention is drawn to the fact that in many countries additional requirements are specified by the national health authorities and the national authorities responsible for the protection of labour.

2. Definitions

This clause of Part 1 is applicable except as follows:

Additional definitions:

- 2.2.101 *A refrigerator* denotes an enclosed thermally insulated appliance of suitable volume and equipment for household use, cooled by a device consuming electric energy and having one or more compartments intended for the preservation of foodstuffs, one of them at least being maintained at a temperature above 0 °C.

- 2.2.102 *A frozen food storage compartment* denotes an enclosed thermally insulated compartment of a refrigerator whose temperature is such that under the ambient reference conditions foodstuffs placed in it at a temperature of -6°C , -12°C or -18°C according to ISO classification are maintained at this temperature or below.
- 2.2.103 *A frozen food storage cabinet* denotes an enclosed thermally insulated appliance or cabinet suitable for household use, cooled by means of a device consuming electric energy and having one or more compartments whose temperature is such that under ambient reference conditions foodstuffs placed therein, at a temperature equal to or below -18°C , are maintained at this temperature or below.
- 2.2.104 *A food freezer* denotes an enclosed thermally insulated appliance or cabinet of suitable volume and equipment for household use, cooled by means of a device consuming electric energy, and furnished with one or more compartments intended for the freezing of foodstuffs and suitable for the preservation of such foodstuffs at a temperature equal to or below -18°C .
- 2.2.105 *A compression-type appliance* denotes an appliance in which refrigeration is effected by the vaporization at low pressure in a heat exchanger (evaporator) of a liquid refrigerant, the vapour thus formed being restored to the liquid state by mechanical compression to a higher pressure and subsequent cooling in another heat exchanger (condenser).
- 2.2.106 *An absorption-type appliance* denotes an appliance in which refrigeration is effected by the evaporation in a heat exchanger (evaporator) of a liquid refrigerant, in the liquid state, the resulting vapour being then absorbed by an absorbant medium from which it is subsequently expelled at a higher partial vapour pressure by heating and liquefied by cooling in another heat exchanger (condenser).
- 2.2.107 *A condenser* denotes a heat exchanger in which after compression, vaporized refrigerant is liquefied by rejecting heat to an external cooling medium.
- 2.2.108 *An evaporator* denotes a heat exchanger in which after pressure reduction, the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated.
- 2.2.109 *A free-standing appliance* denotes an appliance intended for open-type installation only.
- 2.2.110 *Steady-state* is considered to be obtained when three successive readings of the temperature, taken at approximately 60 min intervals, at the same point of any operating cycle, do not differ by more than 1°C (1 K).
- 2.2.111 *An ancillary heating element* denotes a heating device such as a defrost heater, door heater, anti-condensation heater, etc., which performs an auxiliary function.

3. General requirement

This clause of Part 1 is applicable.

4. General notes on tests

This clause of Part 1 is applicable except as follows:

4.2 Addition:

Tests according to this standard may be carried out in conjunction with those of the corresponding ISO Recommendation.

Tests on separate motor-compressors are given in HD 277: Safety of Household and Similar Electrical Appliances, Part 2: Particular Requirements for Motor-compressors.

4.3 Replacement:

Tests according to Clause 9 are carried out after tests according to Sub-clause 11.7.

Tests according to Clause 10 are carried out after tests according to Clause 9.

Tests according to Sub-clauses 11.9 to 11.103 are carried out after tests according to Clause 10.

Before testing, the appliance shall be operated at rated voltage for 24 h.

4.5 Addition:

Tests according to Clauses 9, 10, 11 and 12 are carried out at an ambient temperature of 32 ± 1 °C on appliances of temperate class, or 43 ± 1 °C on appliances of tropical class.

Other tests are carried out at an ambient temperature of 20 ± 5 °C.

4.13 Not applicable.

5. Rating

This clause of Part 1 is applicable.

6. Classification

This clause of Part 1 is applicable except as follows:

6.1 Addition:

3. According to room temperature:

In accordance with ISO Recommendations 824 and 825:

- appliances of temperate class;
- appliances of tropical class.

7. Marking

This clause of Part 1 is applicable except as follows:

7.1 *Addition:*

Refer snc.

Moreover, appliances shall be marked with:

- the rated input of heating elements and any auxiliary components if greater than 100 W;
- the defrosting input, in watts, if greater than the input corresponding to the rated input;
- the letter N or T indicating the climatic class of the appliance (N = temperate, T = tropical);
- the rated maximum input of lamps, in watts;
- the chemical name or formula or the refrigerant number of the refrigerant or, when a mixture is used, the individual names, numbers or chemical formulae.

For compression-type refrigerating systems, the appliance shall also be marked with the mass of the refrigerant, or of each refrigerant in a mixture other than those of the azeotropic type.

7.2 Not applicable.

7.12 Refer snc.

7.14 *Addition:*

In the case of free-standing appliances, the marking shall be visible, if necessary after moving the appliance away from the wall.

The marking of the input of the lamp shall be easily discernible while the lamp is being replaced.

8. Protection against electric shock

This clause of Part 1 is applicable except as follows:

8.1 *Addition:*

Protecting covers of lamps, except those which do not need to be removed when replacing the bulb, are removed before applying the standard test finger.

8.2, 8.3 and 8.7 Not applicable.

9. Starting of motor-operated appliances

This clause of Part 1 is applicable except as follows:

Addition after the title:

The tests of this clause are carried out at least 15 min after those of Sub-clause 11.7, but not later than 1 h after the latter. The test of Sub-clause 9.1 is not carried out on appliances incorporating no other motors than motor-compressors complying with the locked rotor test as specified in Sub-clause 19.3 of HD 277 and condenser fan motors complying with the locked rotor test of Appendix AA.

9.1 Replacement:

Motors shall start under all normal voltage conditions which may occur in use.

Compliance is checked by the following test:

The appliance is started three times at 0.85 times the rated voltage at an ambient temperature of 32 °C or 43 °C according to its class (see Sub-clause 6.1, Item 3), the doors and lids being closed.

The appliance is kept switched on after each start for a sufficient time to ensure that the motors start properly and that there is adequate lubrication.

The interval between two successive starts shall be sufficiently long to prevent excessive overheating of the motors, and to avoid an abnormal increase in the pressure of the liquid refrigerant, as well as to reach equalization of pressure between the high-pressure and low-pressure sides.

Three chatterings of the starting relay of the motor-compressor are permitted.

The supply source is such that the drop in voltage does not exceed 1% during the test.

9.2 Modification:

Replace the test specifications after the table by the following:

The wire has a silver content not less than 99.9% and is stretched horizontally along the centre line of a box with inside dimensions of 80 mm × 80 mm × 150 mm.

The appliance is then started ten times at a voltage equal to 0.9 times rated voltage and ten times at a voltage equal to 1.1 times rated voltage.

The appliance is kept switched on after each start for a sufficient time to ensure that the motors start properly and that there is adequate lubrication.

The interval between two successive starts shall be sufficiently long to prevent excessive overheating of the motors and to avoid an abnormal increase in the pressure of the liquid refrigerant, as well as to reach equalization of pressure between the high-pressure and low-pressure sides.

Three chatterings of the starting relay of the motor-compressor are permitted.

During the test, the ambient temperature is 32 °C or 43 °C according to the class of the appliance (see Sub-clause 6.1, Item 3), the doors and lids being closed. Heating elements incorporated in the appliance are operated, but are not connected to a separate supply.

During the test, the silver wire shall not melt and neither shall any overload protection device operate.

10. Input and current

This clause of Part 1 is applicable except as follows:

Addition after the title:

For the sake of rational testing, it is recommended that the tests of Clause 10 should be carried out after the tests of Clause 9 and before the tests of Sub-clauses 11.9 to 11.103.

10.1 *Modification:*

Replace the test specifications by the following:

Compliance is checked by measuring the input of the appliance under the following conditions:

For appliances other than those pre-set at the manufacturer's works, the thermostat is set to give the lowest temperature. The appliance is empty, with the doors and lids closed and the lamps, if any, switched off.

The tests are carried out at the rated voltage, the appliance being operated at an ambient temperature of 32 °C or 43 °C according to its class (see Sub-clause 6.1, Item 3).

The input is measured when steady-state conditions are established.

The measured input is the arithmetic mean value of the input between the making and the breaking of the thermostat, or between the highest and lowest value measured respectively, excluding the starting current.

10.2 *Modification:*

Replace the test specifications by the following:

The test is made under the conditions given in Sub-clause 10.1.

The current is measured when steady-state conditions are established.

The maximum value of the current measured between the making and breaking of the thermostat, excluding the starting current, is considered to be the current taken by the appliance.

Additional sub-clauses:

- 10.101 The measured input of a defrosting system shall not exceed the rated defrost input marked on the appliance by more than 10%, when such marking is given.

Compliance is checked by measuring the input of the defrosting system when the appliance operates on defrosting, at rated voltage.

- 10.102 The measured input of any auxiliary component shall not exceed the input marked on the appliance for these components by more than 20%, when such marking is given.

Compliance is checked by measuring the input of auxiliary components when operated at rated voltage, when the input is stabilized.

11. **Heating**

This clause of Part 1 is applicable except as follows:

11.2 *Replacement:*

Appliances for building-in are built in, dull black painted plywood walls, about 20 mm thick, being used.

Free-standing appliances are placed in a test enclosure of plywood walls as specified above, the walls enclosing the appliance, as near to all its sides and above as possible

unless the manufacturer indicates in the instruction sheet that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

Other appliances are placed in a test corner. The test corner consists of two walls at right angles, a floor and, if necessary, a ceiling as specified above. The appliance is placed in the test corner as follows:

Appliances normally fixed to a wall are mounted on one of the walls, as near to the other wall and to the floor or ceiling of the test corner as is likely to occur in normal use, unless the manufacturer has given other instructions concerning their installation.

Appliances normally fixed to a ceiling are fixed to the ceiling of the test corner as near to the walls as is likely to occur in normal use, provided the manufacturer has not given special instructions concerning their installation.

The appliance is placed in a room maintained at a temperature of 32 °C or 43 °C according to its class (see Sub-clause 6.1, Item 3) with the doors or lids open until the whole assembly is at room temperature.

11.4 Replacement:

Absorption-type appliances and heating elements, if any, are supplied at such a voltage that the input is 1.15 times the maximum rated input.

11.5 Replacement:

The resistance of windings of compressor-type appliances is measured before the test, when the appliance has reached room temperature.

The appliance is supplied at the most unfavourable voltage between 0.94 times the rated voltage and 1.06 times the rated voltage until steady-state has been reached.

For this test, heating elements are supplied under the conditions indicated in Sub-clause 11.4.

The measurement of the resistance of the windings is not made on motor-compressors complying with HD 277.

11.6 Replacement:

In general, the supply conditions specified for absorption-type appliances apply also to motors incorporated in such appliances. In case of doubt, however, the conditions specified below apply.

For combined appliances, when the motors are operated at a voltage equal to 1.06 times the maximum rated voltage, the input to the heating elements is as specified in Sub-clause 11.4. When the motors are operated at a voltage equal to 0.94 times the minimum rated voltage, the input to the heating elements is reduced to 0.90 times the minimum rated input.

If it is necessary to make the test at an intermediate voltage, the input of the heating elements is adjusted proportionately.

11.7 Replacement:

Except for the tests of Sub-clauses 11.101 to 11.103, the thermostat or similar control device is short-circuited and doors or lids are closed.

The appliance is then operated until steady-state conditions are established.

Temperatures of the different parts of the appliance are then measured.

11.8 Modification:

Replace the text above the table by the following:

During the test and before steady-state conditions are established the overload protection devices, if any, may operate. When steady-state conditions are established these devices shall not operate. During the test, sealing compound, if any, shall not flow out.

For this test, the appliances are considered as liable to operate continuously for long periods.

For the appliances of temperate class, the temperature rises are measured and shall not exceed the values given in the following table.

For appliances of tropical class, the temperature rises are measured and shall not exceed the values given in the following table reduced by 7 K.

Addition after the table:

Moreover, the temperatures of windings and the enclosure of the hermetic motor-compressors other than those complying with HD 277 are measured and shall not exceed the following values:

<i>Parts of the appliance</i>	<i>Temperature (°C)</i>
<i>Windings of hermetic motor-compressors:</i>	
– synthetic insulation	140
– cellulosic insulation or the like	130
<i>External enclosures of hermetic motor-compressors</i>	150

11.10 Replacement:

If the winding temperature of a hermetic compressor motor is higher than the temperature limit indicated in the table, the test is carried out again, the thermostat or similar control device being set at the lowest temperature.

The winding resistance is measured at the end of a running cycle.

The corresponding temperature shall be not higher than the temperature limit indicated in the table.

If this value is higher than the temperature limit, a life test should be carried out to check that temperatures attained do not affect the safety of the appliance. This life test is carried out only once for a given type of hermetic compressor motor.

A test procedure is under consideration.

Additional sub-clauses:

- 11.101 Any defrosting assembly shall not give rise to temperatures likely to cause a fire or serious damage to the electrical insulation, combustible material, electro-valves or other electrical components.

Compliance is checked by the following test:

The appliance is supplied at the most unfavourable voltage between 0.94 and 1.06 times the rated voltage:

- In the case of appliances where defrosting is manually controlled, until the evaporator is coated with a layer of ice or frost.*

A method of accumulation of frost for refrigerators only is given in Sub-clause 11.102. For other appliances, a method is under consideration.

- In the case of appliances where defrosting is automatically or semi-automatically controlled, until the evaporator is coated with a layer of frost; however, this layer shall be not thicker than that which occurs, in normal use, during the intervals between the successive automatic defrosting operations, or, for the semi-automatic defrosting, during the intervals between the defrosting operations recommended by the manufacturer.*

The defrosting assembly is then switched on by closing the circuit supplying the heating element or the valve, the supply voltage of the heating element being as defined in Sub-clause 11.4.

When it is not possible to disconnect the heating element, the test is made with a supply voltage equal to 1.06 times the rated voltage for all the elements.

If the defrosting time is controlled by an adjustable device, the device is set to the time given by the manufacturer. If a control device is used which stops the defrosting at a given evaporation temperature or pressure, the defrosting period is automatically terminated when the control operates.

The temperatures of combustible materials and of electrical components liable to be affected by the defrosting operation are measured with thermocouples.

The test is continued until the maximum temperatures are reached. The temperatures and temperature rises shall not exceed the values given in the tables of Sub-clause 11.8.

During the recovery period after defrosting, the thermal overload protector may operate.

- 11.102 *The accumulation of frost shall be produced by the use of a device having a controllable heat source directed on a measured amount of water for the purpose of evaporating this water over a predetermined period with a minimum of extraneous heat loss to the refrigerator cabinet.*

A convenient form of the apparatus would comprise a block enclosure of thermally insulating material having a vertical hole at its centre containing a light bulb mounted on a bottom plug directly below an evaporating dish with a high thermal conductivity base and low thermal conductivity walls (see Figures 101A and 101B, pages 44 and 45).

The device described above should be mounted at the geometric centre of the refrigerator cabinet and the electrical connection brought conveniently to the outside so that the voltage applied may be varied and the power consumed measured with the refrigerator door in the closed position.

Water is then introduced into the evaporating dish at the required rate through a length