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ANNEXES 1 to 5

**ANNEXES**

**to the**

**COMMISSION REGULATION (EU) .../...**

**laying down ecodesign requirements for refrigerating appliances pursuant to  
Directive 2009/125/EC of the European Parliament and of the Council**

**and repealing Commission Regulation (EC) No 643/2009**

{SEC(2019) 333 final} - {SWD(2019) 341 final} - {SWD(2019) 342 final}

**ANNEX I**  
**Definitions applicable for the Annexes**

The following definitions shall apply:

- (1) 'transparent door(s)' means external door(s) made of a transparent material that allows the end-user to see items through it, at least 75 % of the internal cabinet height and 75 % of the internal cabinet width shall be transparent, both measured at the front of the cabinet;
- (2) 'fast freeze' means a feature that can be activated by the end-user according to the manufacturer's, the importer's or authorised representative's instructions, which decreases the storage temperature of freezer compartment(s) to achieve a faster freezing of unfrozen foodstuffs;
- (3) 'winter setting' means a control feature for a combi appliance with one compressor and one thermostat, which according to the manufacturer's, importer's or authorised representative's instructions can be used in ambient temperatures below +16 °C, consisting of a switching device or function that guarantees, even if it would not be required for the compartment where the thermostat is located, that the compressor keeps on working to maintain the proper storage temperatures in the other compartments;
- (4) 'chill compartment' means a compartment which is able to control its average temperature within a certain range without user-adjustments of its control, with a target temperature equal to 2 °C and storage conditions ranging from -3° C to 3 °C, as set out in Annex III, Table 3;
- (5) 'vacuum insulation panel' (VIP) means an insulation panel consisting of a firm, highly-porous material encased in a thin, gas-tight outer envelope, from which the gases are evacuated and which is sealed to prevent outside gases from entering the panel;
- (6) '2-star section' means part of a 3-star or 4-star compartment which does not have its own individual access door or lid and with a target temperature and storage conditions of - 12°C;
- (7) 'door gasket' means a mechanical seal which fills the space between the door and the cabinet of the refrigerating appliance to prevent leakage from the cabinet to the outdoor air;
- (8) 'spare part' means a separate part that can replace a part with the same or similar function in a product;
- (9) 'professional repairer' means an operator or undertaking which provides services of repair and professional maintenance of refrigerating appliances;
- (10) 'freestanding appliance' means a refrigerating appliance that is not a built-in appliance;
- (11) 'built-in appliance' means a refrigerating appliance that is designed, tested and marketed exclusively:
  - (a) to be installed in cabinetry or encased (top, bottom and sides) by panels; and
  - (b) to be securely fastened to the sides, top or floor of the cabinetry or panels; and
  - (c) to be equipped with an integral factory-finished face or to be fitted with a custom front panel;

- (12) ‘guarantee’ means any undertaking by the retailer or a manufacturer, importer or authorised representative to the consumer to:
- (a) reimburse the price paid; or
  - (b) replace, repair or handle refrigerating appliances in any way if they do not meet the specifications set out in the guarantee statement or in the relevant advertising;
- (13) ‘climate class’ means the range of ambient temperatures, as set out in point 1(i) of Annex III, in which the refrigerating appliances are intended to be used, and for which the required storage temperatures specified in Annex III, Table 3 are met simultaneously in all compartment(s);
- (14) ‘product database’ means a collection of data concerning products, which is arranged in a systematic manner and consists of a consumer-oriented public part, where information concerning individual product parameters is accessible by electronic means, an online portal for accessibility and a compliance part, with clearly specified accessibility and security requirements, as laid down in Regulation (EU) 2017/1369;
- (15) ‘annual energy consumption’ ( $AE$ ) means the average daily energy consumption multiplied by 365 (days per year), expressed in kilowatt hour per year (kWh/a), as calculated in accordance with point 3 of Annex III;
- (16) ‘daily energy consumption’ ( $E_{daily}$ ) means the electricity used by a refrigerating appliance over 24 hours at reference conditions, expressed in kilowatt hour per 24 hours (kWh/24h), as calculated in accordance with point 3 of Annex III;
- (17) ‘dispenser’ means a device that dispenses chilled or frozen load on demand from a refrigerating appliance, such as ice-cube dispensers or chilled water dispensers;
- (18) ‘variable temperature compartment’ means a compartment intended for use as two (or more) alternative compartment types (for example a compartment that can be either a fresh food compartment or freezer compartment) and which is capable of being set by a user to continuously maintain the operating temperature range applicable for each declared compartment type. A compartment intended for use as a single compartment type that can also meet storage conditions of other compartment types (for example a chill compartment that may also fulfil 0-star requirements) is not a variable temperature compartment;
- (19) ‘network’ means a communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols);
- (20) ‘steady-state power consumption’ ( $P_{ss}$ ) means the average power consumption in steady-state conditions, expressed in watt (W);
- (21) ‘incremental defrost and recovery energy consumption’ ( $\Delta E_{d-f}$ ) means the extra average energy consumption for a defrost and recovery operation, expressed in watt hour (Wh);
- (22) ‘auto-defrost’ means a feature by which compartments are defrosted without user intervention to initiate the removal of frost accumulation at all temperature-control settings or to restore normal operation, and the disposal of the defrosted water is automatic;
- (23) ‘defrost interval’ ( $t_{d-f}$ ) means the representative average interval, expressed in hour (h), between one time of activation of the defrost heater and the next in two

subsequent defrost and recovery cycles; or if there is no defrost heater one time of deactivation of the compressor and the next in two subsequent defrost and recovery cycles;

- (24) ‘defrost and recovery period’ means the period from the initiation of a defrost control cycle until stable operating conditions are re-established;
- (25) ‘defrosting type’ means the method to remove frost accumulation on the evaporator(s) of a refrigerating appliance; that is auto-defrost or manual defrost;
- (26) ‘manual defrost’ means not having an auto-defrost function;
- (27) ‘load factor’ ( $L$ ) means a factor accounting for the extra (beyond what is already anticipated through the higher average ambient temperature for testing) cooling load from introducing warm foodstuffs, with values as set out in point 3(a) of Annex III;
- (28) ‘standard annual energy consumption’ ( $SAE$ ) means the reference annual energy consumption of a refrigerating appliance, expressed in kilowatt hour per year (kWh/a), as calculated in accordance with point 4 of Annex III;
- (29) ‘combi parameter’ ( $C$ ) means a modelling parameter that takes into account the synergy effect when different compartment types are combined in one appliance, with values as set out in Annex III, Table 4;
- (30) ‘door heat loss factor’ ( $D$ ) means a compensation factor for combi appliances according to the number of different temperature compartments or the number of external doors, whichever is lower and as set out in Annex III, Table 5. For this factor, ‘compartment’ does not refer to sub-compartment;
- (31) ‘defrost factor’ ( $A_c$ ) means a compensation factor that takes into account whether the refrigerating appliance has an auto-defrost or a manual defrost, with values as set out in Annex III, Table 5;
- (32) ‘built-in factor’ ( $B_c$ ) means a compensation factor that takes into account whether the refrigerating appliance is built-in or freestanding, with values as set out in Annex III, Table 5;
- (33) ‘ $M_c$ ’ and ‘ $N_c$ ’ means modelling parameters that take into account the volume-dependence of the energy use, with values as set out in Annex III, Table 4;
- (34) ‘thermodynamic parameter’ ( $r_c$ ) means a modelling parameter which corrects the standard annual energy consumption to an ambient temperature of 24 °C, with values as set out in Annex III, Table 4;
- (35) ‘equivalent model’ means a model which has the same technical characteristics relevant for the technical information to be provided, but which is placed on the market or put into service by the same manufacturer, importer or authorised representative as another model with a different model identifier;
- (36) ‘model identifier’ means the code, usually alphanumeric, which distinguishes a specific product model from other models with the same trade mark or the same supplier's name;
- (37) ‘refrigerator-freezer’ means a combi appliance that has at least one freezer compartment and at least one fresh food compartment.

**ANNEX II**  
**Ecodesign requirements**

1. Energy efficiency requirements:
- (a) From 1 March 2021, the energy efficiency index (EEI) of refrigerating appliances shall not be above the values as set out in Table 1.

**Table 1**  
**Maximum EEI for refrigerating appliances, expressed in %**

|  | EEI |
|--|-----|
| dedicated low noise refrigerating appliances with fresh food compartment(s)  | 375 |
| low noise refrigerating appliances with transparent doors  | 380 |
| other low noise refrigerating appliances, with the exception of low noise combi appliances with a frozen compartment | 300 |
| wine storage appliances with transparent doors   | 190 |
| other wine storage appliances  | 155 |
| all other refrigerating appliances, with the exception of low noise combi appliances with a frozen compartment       | 125 |

- (b) From 1 March 2024, the EEI of refrigerating appliances shall not be above the values set out in Table 2.

**Table 2**  
**Maximum EEI for refrigerating appliances, expressed in %**

|  | EEI |
|--|-----|
| dedicated low noise refrigerating appliances with fresh food compartment(s)  | 312 |
| low noise refrigerating appliances with transparent door(s)  | 300 |
| other low noise refrigerating appliances, with the exception of low noise combi appliances with a frozen compartment | 250 |
| wine storage appliances with transparent door(s)   | 172 |
| other wine storage appliances  | 140 |
| all other refrigerating appliances, with the exception of low noise combi appliances with a frozen compartment       | 100 |

2. Functional requirements:

From 1 March 2021, refrigerating appliances shall meet the following requirements:

- (a) Any fast freeze facility, or any similar function achieved through modification of the temperature settings in freezer compartments, shall, once activated by the end-user according to the manufacturer's, the importer's or authorised representative's instructions, automatically revert to the previous normal storage conditions after no more than 72 hours.
- (b) Winter settings shall be automatically activated or de-activated according to the need to maintain the frozen compartment(s) at the correct temperature.
- (c) Each compartment shall be marked with the appropriate identification symbol. For the frozen compartments this shall be the number of stars of the compartment. For the chill and unfrozen compartments, this shall be an indication, chosen by the manufacturer, the importer or authorised representative, of the type of food that should be stored in the compartment.
- (d) If the refrigerating appliance contains vacuum insulation panels, the refrigerating appliance shall be labelled with the letters 'VIP' in a clearly visible and readable way.
- (e) For 2-star sub-compartments or 2-star sections:
  - a 2-star sub-compartment or 2-star section is separated from the 3-star or 4-star volume by a partition, container, or similar construction;
  - the volume of the 2-star sub-compartment or 2-star section does not exceed 20 % of the total volume of the containing compartment.
- (f) For 4-star compartments, the specific freezing capacity shall be such that the freezing time to bring the temperature of the light load (3,5 kg/100 l) from +25 to -18 °C at an ambient temperature of 25 °C, is smaller than or equal to 18,5 h.

Until 1 March 2024, the requirements laid down in points 2(a) and (b) shall not apply to combi appliances with one electromechanical thermostat and one compressor which are not equipped with an electronic control board.

### 3. Resource efficiency requirements:

From 1 March 2021, refrigerating appliances shall meet the following requirements:

- (a) Availability of spare parts:
  - (1) manufacturers, importers or authorised representatives of refrigerating appliances shall make available to professional repairers at least the following spare parts: thermostats, temperature sensors, printed circuit boards and light sources, for a minimum period of seven years after placing the last unit of the model on the market;
  - (2) manufacturers, importers or authorised representatives of refrigerating appliances shall make available to professional repairers and end-users at least the following spare parts: door handles, door hinges, trays and baskets for a minimum period of seven years and door gaskets for a minimum period of 10 year, after placing the last unit of the model on the market;
  - (3) manufacturers shall ensure that these spare parts can be replaced with the use of commonly available tools and without permanent damage to the appliance;
  - (4) the list of spare parts concerned by point (1) and the procedure for ordering them shall be publicly available on the free access website of the manufacturer, importer or authorised representative, at the latest two years after the placing

on the market of the first unit of a model and until the end of the period of availability of these spare parts;

- (5) the list of spare parts concerned by point (2) and the procedure for ordering them and the repair instructions shall be publicly available on the manufacturer's, the importer's or authorised representative's free access website, at the moment of the placing on the market of the first unit of a model and until the end of the period of availability of these spare parts.

(b) Access to repair and maintenance information:

After a period of two years after the placing on the market of the first unit of a model or of an equivalent model, and until the end of the period mentioned under (a), the manufacturer, importer or authorised representative shall provide access to the appliance repair and maintenance information to professional repairers in the following conditions:

- (1) the manufacturer's, importer's or authorised representative's website shall indicate the process for professional repairers to register for access to information; to accept such a request, manufacturers, importers or authorised representative may require the professional repairer to demonstrate that:
  - (i) the professional repairer has the technical competence to repair refrigerating appliances and complies with the applicable regulations for repairers of electrical equipment in the Member States where it operates. Reference to an official registration system as professional repairer, where such system exists in the Member States concerned, shall be accepted as proof of compliance with this point;
  - (ii) the professional repairer is covered by insurance covering liabilities resulting from its activity, regardless of whether this is required by the Member State;
- (2) the manufacturers, importers or authorised representatives shall accept or refuse the registration within 5 working days from the date of request by the professional repairer;
- (3) manufacturers, importers or authorised representatives may charge reasonable and proportionate fees for access to the repair and maintenance information or for receiving regular updates. A fee is reasonable if it does not discourage access by failing to take into account the extent to which the professional repairer uses the information;

Once registered, a professional repairer shall have access, within one working day after requesting it, to the requested repair and maintenance information. The available repair and maintenance information shall include:

- the unequivocal appliance identification;
- a disassembly map or exploded view;
- list of necessary repair and test equipment;
- component and diagnosis information (such as minimum and maximum theoretical values for measurements);
- wiring and connection diagrams;

- diagnostic fault and error codes (including manufacturer-specific codes, where applicable); and
  - data records of reported failure incidents stored on the refrigerating appliance (where applicable).
- (c) Maximum delivery time of spare parts:
- (1) during the period mentioned under point 3(a)(1) and point 3(a)(2), the manufacturer, importer or authorised representatives shall ensure the delivery of the spare parts for refrigerating appliances within 15 working days after having received the order;
  - (2) in the case of spare parts available only to professional repairers this availability may be limited to professional repairers registered in accordance with point b.
- (d) Requirements for dismantling for material recovery and recycling while avoiding pollution:
- (1) manufacturers, importers or authorised representatives shall ensure that refrigerating appliances are designed in such a way that the materials and components referred to in Annex VII to Directive 2012/19/EU can be removed with the use of commonly available tools;
  - (2) manufacturers, importers and authorised representatives shall fulfil the obligations laid down in Point 1 of Article 15 of Directive 2012/19/EU.

#### 4. Information requirements:

From 1 March 2021, instruction manuals for installers and end-users, and free access website of manufacturers, importers or authorised representatives shall include the following information:

- (a) the combination of drawers, baskets and shelves that result in the most efficient use of energy for the refrigerating appliance;
- (b) clear guidance about where and how to store foodstuffs in a refrigerating appliance for best preservation over the longest period, to avoid food waste;
- (c) the recommended setting of temperatures in each compartment for optimum food preservation. These settings shall not contradict the storage conditions set out in Annex III, Table 3;
- (d) an estimation of the impact of temperature settings on food waste;
- (e) a description of the effects of special modes and features, and in particular how temperatures are affected in each compartment and for how long;
- (f) for wine storage appliances: ‘this appliance is intended to be used exclusively for the storage of wine’. This shall not apply to refrigerating appliances that are not specifically designed for wine storage but may be used for this purpose, or to refrigerating appliances that have a wine storage compartment combined with any other compartment type;
- (g) instructions for the correct installation and end-user maintenance, including cleaning, of the refrigerating appliance;
- (h) for a freestanding appliance: ‘this refrigerating appliance is not intended to be used as a built-in appliance’;

- (i) for appliances without a 4-star compartment: ‘this refrigerating appliance is not suitable for freezing foodstuffs’;
- (j) access to professional repair, such as internet webpages, addresses, contact details;
- (k) relevant information for ordering spare parts, directly or through other channels provided by the manufacturer, importer or authorised representative;
- (l) the minimum period during which spare parts, necessary for the repair of the appliance, are available;
- (m) the minimum duration of the guarantee of the refrigerating appliance offered by the manufacturer, importer or authorised representative;
- (n) for refrigerating appliances with climate class:
  - extended temperate: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 10 °C to 32 °C’;
  - temperate: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 32 °C’;
  - subtropical: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 38 °C’;
  - tropical: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 43 °C’;
- (o) instruction on how to find the model information in the product database, as defined in Regulation (EU) 2019/XXX [*OP - Please insert the number of Regulation C(2019) 1806 for energy labelling regulation for refrigerating appliances*] by means of a weblink that links to the model information as stored in the product database or a link to the product database and information on how to find the model identifier on the product.

### ANNEX III

#### Measurement methods and calculations

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards, or other reliable, accurate and reproducible methods, which takes into account the generally recognised state-of-the-art methods and are in line with the provisions set out below. The reference numbers of these harmonised standards have been published for this purpose in the *Official Journal of the European Union*:

1. General conditions for testing:
  - (a) for refrigerating appliances with anti-condensation heaters that can be switched on and off by the end-user, the anti-condensation heaters shall be switched on and — if adjustable — set at maximum heating and included in the annual energy consumption ( $AE$ ) as daily energy consumption ( $E_{daily}$ );
  - (b) for refrigerating appliances with ambient controlled anti-condensation heaters, the ambient controlled electric anti-condensation heaters shall be switched off or otherwise disabled, where possible, during the measurement of energy consumption;
  - (c) for refrigerating appliances with dispensers that can be switched on and off by the end-user, the dispensers shall be switched on during the energy consumption test but not operating;
  - (d) for the measurement of energy consumption, variable temperature compartments shall operate at the lowest temperature that can be set by the end-user to continuously maintain the temperature range, as set out in Table 3, of the compartment type which has the lowest temperature;
  - (e) for refrigerating appliances that can be connected to a network, the communication module shall be activated but there is no need to have a specific type of communication or data exchange or both during the energy consumption test. During the energy consumption test it has to be ensured that the unit is connected to a network;
  - (f) for the performance of chill compartments:
    - (1) for a variable temperature compartment rated as a fresh food and/or chill compartment, the energy efficiency index (EEI) shall be determined for each temperature condition and the highest value shall be applied;
    - (2) a chill compartment shall be able to control its average temperature within a certain range without user-adjustments of its control, this can be verified during the energy consumption tests at 16 °C and 32 °C ambient temperature;
  - (g) for adjustable volume compartments, when the volumes of two compartments are adjustable relative to one another by the end-user, the energy consumption and the volume shall be tested when the volume of the compartment with the higher target temperature is adjusted to its minimum volume;
  - (h) the specific freezing capacity is calculated as 12 times the light load weight, divided by the freezing time to bring the temperature of the light load from +25 to -18 °C at an ambient temperature of 25 °C expressed in kg/12h and rounded to one decimal place; the light load weight is 3,5 kg per 100 litre of the compartment volume of the frozen compartments, and shall be at least 2,0 kg;

- (i) for the determination of the climate classes, the acronym for the ambient temperature range, that is SN, N, ST or T:
- (1) the extended temperate (SN) has a temperature range from 10 °C to 32 °C;
  - (2) the temperate (N) has a temperature range from 16 °C to 32 °C;
  - (3) the subtropical (ST) has a temperature range from 16 °C to 38 °C; and
  - (4) the tropical (T) has a temperature range from 16 °C to 43 °C.

2. Storage conditions and target temperatures per compartment type:

Table 3 sets out the storage conditions and target temperature per compartment type.

3. Determination of the *AE*:

- (a) For all refrigerating appliances, except for low noise refrigerating appliances:

The energy consumption shall be determined by testing at an ambient temperature of 16 °C and 32 °C.

To determine the energy consumption, the average air temperatures in each compartment shall be equal to or below the target temperatures specified in Table 3 for each compartment type claimed by the manufacturer, the importer or authorised representative. Values above and below target temperatures may be used to estimate the energy consumption at the target temperature for each relevant compartment by interpolation, as appropriate.

The main components of energy consumption to be determined are:

- a set of steady state power consumption values ( $P_{ss}$ ), expressed in W and rounded to one decimal place, each at a specific ambient temperature and at a set of compartment temperatures, which are not necessarily the target temperatures;
- the representative incremental defrost and recovery energy consumption ( $\Delta E_{d-f}$ ), expressed in Wh and rounded to one decimal place, for products with one or more auto-defrost systems (each with its own defrost control cycle) measured at an ambient temperature of 16 °C ( $\Delta E_{d-f16}$ ) and 32 °C ( $\Delta E_{d-f32}$ );
- defrost interval ( $t_{d-f}$ ), expressed in h and rounded to three decimal places, for products with one or more defrost systems (each with its own defrost control cycle) measured at an ambient temperature of 16 °C ( $t_{d-f16}$ ) and 32 °C ( $t_{d-f32}$ ).  $t_{d-f}$  shall be determined for each system under a certain range of conditions;
- for each test performed the  $P_{ss}$  and  $\Delta E_{d-f}$  are added together to form a daily energy consumption at a certain ambient temperature  $E_T = 0,001 \times 24 \times (P_{ss} + \Delta E_{d-f}/t_{d-f})$ , expressed in kWh/24h, specific to the settings applied;
- $E_{aux}$ , expressed in kWh/a and rounded to three decimal places.  $E_{aux}$  is limited to the ambient controlled anti-condensation heater and is determined from the heater's power consumption at a number of ambient temperature and humidity conditions, multiplied with the probability that this ambient temperature and humidity condition occurs and summed; this result is subsequently multiplied with a loss factor to account for heat leakage into the compartment and its subsequent removal by the refrigeration system.

**Table 3**  
**Storage conditions and target temperature per compartment type**

| Group   | Compartment type    | Note   | Storage conditions |           | $T_c$ |
|---|---------------------|--------|--------------------|-----------|-------|
|   |                     |        | $T_{min}$          | $T_{max}$ |       |
| Name  | Name                | no.    | °C                 | °C        | °C    |
| Unfrozen compartments   | Pantry              | [1]    | +14                | +20       | +17   |
|   | Wine storage        | [2][6] | +5                 | +20       | +12   |
|   | Cellar              | [1]    | +2                 | +14       | +12   |
|   | Fresh food          | [1]    | 0                  | +8        | +4    |
| Chill compartment   | Chill               | [3]    | -3                 | +3        | +2    |
| Frozen compartments   | 0-star & ice-making | [4]    | n.a.               | 0         | 0     |
|   | 1-star              | [4]    | n.a.               | -6        | -6    |
|   | 2-star              | [4][5] | n.a.               | -12       | -12   |
|   | 3-star              | [4][5] | n.a.               | -18       | -18   |
|   | freezer (4-star)    | [4][5] | n.a.               | -18       | -18   |
| <b>Notes:</b>   |                     |        |                    |           |       |
| [1] $T_{min}$ and $T_{max}$ are the average values measured over the test period (average over time and over a set of sensors).   |                     |        |                    |           |       |
| [2] The average temperature variation over the test period for each sensor shall be no more than $\pm 0,5$ kelvin (K). During a defrost and recovery period the average of all sensors is not permitted to rise more than 1,5 K above the average value of the compartment. |                     |        |                    |           |       |
| [3] $T_{min}$ and $T_{max}$ are the instantaneous values during the test period.  |                     |        |                    |           |       |
| [4] $T_{max}$ is the maximum value measured over the test period (maximum over time and over a set of sensors).   |                     |        |                    |           |       |
| [5] If the compartment is of the auto-defrosting type, the temperature (defined as the maximum of all sensors) is not permitted to rise more than 3,0 K during a defrost and recovery period.   |                     |        |                    |           |       |
| [6] $T_{min}$ and $T_{max}$ are the average values measured over the test period (average over time for each sensor) and define the maximum allowed temperature operating range.  |                     |        |                    |           |       |
| n.a.=not applicable   |                     |        |                    |           |       |

Each of these parameters shall be determined through a separate test or set of tests. Measurement data is averaged over a test period which is taken after the appliance has been in operation for a certain time. To improve the efficiency and accuracy of testing, the length of the test period shall not be fixed; it shall be such that the appliance is in steady state condition during this test period. This is validated by examining all data within this test period against a set of stability criteria and whether enough data could be collected in this steady state.

AE, expressed in kWh/a and rounded to two decimal places, shall be calculated as follows:

$$AE = 365 \times E_{daily} / L + E_{aux}$$

with

- the load factor  $L = 0,9$  for refrigerating appliances with only frozen compartments and  $L = 1,0$  for all other appliances; and
- with  $E_{daily}$ , expressed in kWh/24h and rounded to three decimal places calculated from  $E_T$  at an ambient temperature of 16 °C ( $E_{16}$ ) and at an ambient temperature of 32 °C ( $E_{32}$ ) as follows:

$$E_{daily} = 0,5 \times (E_{16} + E_{32})$$

where  $E_{16}$  and  $E_{32}$  are derived by interpolation of the energy test at the target temperatures set out in Table 3.

- (b) For low noise refrigerating appliances:

The energy consumption shall be determined as provided for in point 3(a), but at an ambient temperature of 25 °C instead of at 16 °C and 32 °C.

$E_{daily}$ , expressed in kWh/24h and rounded to three decimal places for the calculation of the  $AE$  is then as follows:

$$E_{daily} = E_{25}$$

where  $E_{25}$  is  $E_T$  at an ambient temperature of 25 °C and derived by interpolation of the energy tests at the target temperatures listed in Table 3.

4. Determination of the standard annual energy consumption ( $SAE$ ):

- (a) For all refrigerating appliances:

$SAE$ , expressed in kWh/a and rounded to two decimal places, is calculated as follows:

$$SAE = C \times D \times \sum_{c=1}^n A_c \times B_c \times [V_c/V] \times (N_c + V \times r_c \times M_c)$$

where

- $c$  is the index number for a compartment type ranging from 1 to  $n$ , with  $n$  the total number of compartment types;
- $V_c$ , expressed in dm<sup>3</sup> or litres and rounded to the first decimal place is the compartment volume;
- $V$ , expressed in dm<sup>3</sup> or litres and rounded to the nearest integer, is the total volume with  $V \leq \sum_{c=1}^n V_c$ ;
- $r_c$ ,  $N_c$ ,  $M_c$  and  $C$  are modelling parameters specific to each compartment with values as set out in Table 4; and
- $A_c$ ,  $B_c$  and  $D$  are the compensation factors with values as set out in Table 5.

When carrying out the calculations above, for the variable temperature compartments, the compartment type with the lowest target temperature for which it is declared suitable is chosen.

- (b) Modelling parameters per compartment type for the calculation of  $SAE$ :

The modelling parameters are set out in Table 4.

**Table 4**  
**The values of the modelling parameters per compartment type**

| Compartment type    | $r_c^a$ | $N_c$ | $M_c$ | $C$   |
|---------------------|---------|-------|-------|---|
| Pantry              | 0,35    | 75    | 0,12  | between 1,15 and 1,56 for combi appliances with 3- or 4-star compartments <sup>b</sup> , 1,15 for other combi appliances, 1,00 for other refrigerating appliances |
| Wine storage        | 0,60    |       |       |   |
| Cellar              | 0,60    |       |       |   |
| Fresh food          | 1,00    |       |       |   |
| Chill               | 1,10    | 138   | 0,12  |   |
| 0-star & ice-making | 1,20    | 138   | 0,15  |   |
| 1-star              | 1,50    |       |       |   |
| 2-star              | 1,80    |       |       |   |
| 3-star              | 2,10    |       |       |   |
| Freezer (4-star)    | 2,10    |       |       |   |

<sup>a</sup>  $r_c = (T_a - T_c)/20$ ; with  $T_a = 24$  °C and  $T_c$  with values as set out in Table 3.  
<sup>b</sup>  $C$  for combi appliances with 3- or 4-star compartments is determined as follows:  
where  $frzf$  is the 3- or 4-star compartment volume  $V_{fr}$  as a fraction of  $V$  with  $frzf = V_{fr}/V$ :

- if  $frzf \leq 0,3$  then  $C = 1,3 + 0,87 \times frzf$ ;
- else if  $0,3 < frzf < 0,7$  then  $C = 1,87 - 1,0275 \times frzf$ ;
- else  $C = 1,15$ .

(c) Compensation factors per compartment type in the calculation of  $SAE$ :

The compensation factors are set out in Table 5.

**Table 5**  
**The values of the compensation factors per compartment type**

| Compartment type    | <i>A<sub>c</sub></i> |              | <i>B<sub>c</sub></i>   |                    | <i>D</i>         |                |                |                  |
|---------------------|----------------------|--------------|------------------------|--------------------|------------------|----------------|----------------|------------------|
|                     | Manual defrost       | Auto-defrost | Freestanding appliance | Built-in appliance | ≤ 2 <sup>a</sup> | 3 <sup>a</sup> | 4 <sup>a</sup> | > 4 <sup>a</sup> |
| Pantry              | 1,00                 |              | 1,00                   | 1,02               | 1,00             | 1,02           | 1,035          | 1,05             |
| Wine storage        |                      |              |                        |                    |                  |                |                |                  |
| Cellar              |                      |              |                        |                    |                  |                |                |                  |
| Fresh food          |                      |              |                        |                    |                  |                |                |                  |
| Chill               |                      |              |                        | 1,03               |                  |                |                |                  |
| 0-star & ice-making | 1,00                 | 1,10         | 1,00                   | 1,05               | 1,00             | 1,02           | 1,035          | 1,05             |
| 1-star              |                      |              |                        |                    |                  |                |                |                  |
| 2-star              |                      |              |                        |                    |                  |                |                |                  |
| 3-star              |                      |              |                        |                    |                  |                |                |                  |
| Freezer (4-star)    |                      |              |                        |                    |                  |                |                |                  |

<sup>a</sup> number of external doors or compartments, whichever is lowest.

5. Determination of the EEI:

EEI, expressed in % and rounded to the first decimal place, calculated as:

$$EEI = AE / SAE.$$

## **ANNEX IV**

### **Verification procedure for market surveillance purposes**

The verification tolerances set out in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer, importer or authorised representative as an allowed tolerance to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicating better performance by any means.

Where a model has been designed to be able to detect it is being tested (e.g. by recognizing the test conditions or test cycle), and to react specifically by automatically altering its performance during the test with the objective of reaching a more favourable level for any of the parameters specified in this Regulation or included in the technical documentation or included in any of the documentation provided, the model and all equivalent models shall be considered not compliant.

When verifying the compliance of a product model with the requirements laid down in this Regulation pursuant to Article 3(2) of Directive 2009/125/EC, the authorities of the Member States shall apply the following procedure for the requirements referred to in Annex II:

1. The Member State authorities shall verify one single unit of the model.
2. The model shall be considered to comply with the applicable requirements if:
  - (a) the values given in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer, importer or authorised representative than the results of the corresponding measurements carried out pursuant to point (g) thereof; and
  - (b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer, importer or authorised representative does not contain values that are more favourable for the manufacturer, importer or authorised representative than the declared values; and
  - (c) when the Member State authorities check the unit of the model, they check whether the manufacturer, importer or authorised representative has put in place a system that complies with the requirements in the second paragraph of Article 6; and
  - (d) when the Member State authorities check the unit of the model, it complies with the functional requirements in point 2 of Annex II points from (a) to (f) and the requirements on resource efficiency in point 3 of Annex II; and
  - (e) when the Member State authorities test the unit of the model, the determined values (the values of the relevant parameters as measured in testing and the values calculated from these measurements) comply with the respective verification tolerances as set out in Table 6.
3. If the results referred to in point 2(a), (b), (c) or (d) are not achieved, the model and all equivalent models shall be considered not to comply with this Regulation.
4. If the result referred to in point 2(e) is not achieved, the Member State authorities shall select three additional units of the same model for testing. As an alternative, the three additional units selected may be of one or more equivalent models.
5. The model shall be considered to comply with the applicable requirements if, for these three units, the arithmetical mean of the determined values complies with the respective verification tolerances set out in Table 6.

6. If the result referred to in point 5 is not achieved, the model and all equivalent models shall be considered not to comply with this Regulation.
7. The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay once a decision has been taken on the non-compliance of the model according to points 3 or 6.

The Member State authorities shall use the measurement and calculation methods set out in Annex III.

The Member State authorities shall only apply the verification tolerances that are set out in Table 6 and shall use only the procedure described in points 1 to 7 for the requirements set out in this Annex. For the parameters in Table 6, no other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

**Table 6**  
**Verification tolerances**

| Parameters                                       | Verification tolerances   |
|--|---|
| Total volume and compartment volume              | The determined value <sup>a</sup> shall not be more than 3 % or 1 litre lower — whichever is the greater value — than the declared value. |
| Freezing capacity                                | The determined value <sup>a</sup> shall not be more than 10 % lower than the declared value.  |
| <i>E<sub>16</sub></i> , <i>E<sub>32</sub></i>    | The determined value <sup>a</sup> shall not be more than 10 % higher than the declared value.   |
| <i>E<sub>aux</sub></i>                           | The determined value <sup>a</sup> shall not be more than 10 % higher than the declared value.   |
| Annual energy consumption                        | The determined value <sup>a</sup> shall not be more than 10 % higher than the declared value.   |
| Internal humidity of wine storage appliances (%) | The determined value <sup>a</sup> shall not differ from the limits of the prescribed range by more than 10 %.                             |
| Airborne acoustical noise emission               | The determined value <sup>a</sup> shall not be more than 2 dB(A) re 1 pW more than the declared value.                                    |

<sup>a</sup> in the case of three additional units tested as prescribed in point 4, the determined value means the arithmetic mean of the values determined for these three additional units.

## **ANNEX V**

### **Benchmarks**

At the time of entry into force of this Regulation, the best available technology on the market for refrigerating appliances in terms of their energy efficiency index (EEI) and airborne acoustical noise emissions was identified as outlined below.

The figures below were obtained using a simplified conversion from the EEI-values as determined according to Regulation (EC) No 643/2009. The figures in brackets indicate the EEI-value as determined according to Regulation (EC) No 643/2009.

Refrigerating appliances:

Dedicated fresh food refrigerating appliance ('refrigerator'):

Large: EEI = 57 % [18 %], V = 309 litre, AE = 70 kWh/a

Table-top: EEI = 63 % [22 %], V = 150 litre, AE = 71 kWh/a

Wine storage appliance:

Insulated external door: EEI = 113 % [33 %], V = 499 litre, AE = 111 kWh/a

Transparent door: EEI = 140 % [42 %], V = 435 litre, AE = 133 kWh/a

Refrigerator-freezer:

EEI=59 % [18 %], V = 343 litres (223/27/93 litres for fresh-food/chill/freezer),  
AE = 146 kWh/a

Freezer:

Upright Small: EEI = 52 % [20 %], V = 103 litre, AE = 95 kWh/a

Upright Medium: EEI = 63 % [22 %], V = 206 litre, AE = 137 kWh/a

Chest: EEI = 55 % [22 %], V = 230 litre, AE = 116 kWh/a

Lowest noise reported (of all models): 34-35 dB(A) re 1 pW

Low-noise refrigerating appliance (dedicated cellar or pantry refrigerating appliance):

Insulated external door: EEI = 233 % [73 %], V = 30 litre, AE = 182 kWh/a

Transparent door: EEI = 330 % [102 %], V = 40 litre, AE = 255 kWh/a

Low noise appliances are reported to have airborne acoustical noise emissions lower than 15 dB(A) re 1 pW according to current test standards.