



EUROPEAN
COMMISSION

Brussels, **XXX**
[...] (2018) **XXX** draft

ANNEXES 1 to 5

ANNEXES

to the

COMMISSION REGULATION

**implementing Directive 2009/125/EC of the European Parliament and of the Council
with regard to ecodesign requirements for refrigerating appliances**

**repealing Regulation (EC) No 643/2009 with regard to ecodesign requirements for
household refrigerating appliances**

ANNEX I
Definitions applicable for the Annexes

In addition to the definitions set out in Directive 2009/125/EC and the definitions set out in Article 2 of this Regulation, the following definitions shall apply:

- (1) 'transparent door' means a door made of a transparent material that allows the user to clearly see items through it;
- (2) 'fast freeze' means a feature that can be activated by the end-user according to the manufacturer's instructions, which decreases the storage temperature of the freezer or freezer compartment to achieve a faster freezing of unfrozen foodstuffs;
- (3) 'freezer' means a refrigerating appliance with only frozen compartments, at least one of which is a freezer compartment;
- (4) 'freezer compartment' or '4-star compartment' means a frozen compartment with a target temperature and storage conditions of -18 °C and which fulfils the requirements for the specific freezing capacity as indicated in Annex III.1.(j);
- (5) 'combi appliance' means a refrigerating appliance that has more than one compartment type. An appliance with a 3- or 4-star compartment with a 2-star section or sub-compartment is not a combi appliance;
- (6) 'winter switch' means a control feature for a refrigerator-freezer with one compressor and one thermostat in the fresh food compartment, consisting of a switching device that guarantees, even if it would not be required for the fresh food compartment, that the compressor keeps on working to maintain the proper minimum temperature in the freezer compartment;
- (7) 'frozen compartment' means a compartment type with a target temperature equal to or below 0 °C; i.e. a 0-star, 1-star, 2-star, 3-star or 4-star compartment, with storage conditions and target temperatures, as set out in Annex III, Table 3;
- (8) 'chill compartment' means a compartment which is able to control its average temperature within a certain range without 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;
- (9) 'unfrozen compartment' means a compartment type with a target temperature equal to or above 4 °C, i.e. a pantry, wine storage, cellar or fresh food compartment with storage conditions and target temperatures, as set out in Annex III, Table 3;
- (10) '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;
- (11) 'refrigerator' means a refrigerating appliance with at least one fresh food compartment;
- (12) 'refrigerator-freezer' means a combi appliance that has at least one freezer compartment and one or more unfrozen or chill compartments, of which at least one is a fresh food compartment;
- (13) '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;

- (14) ‘wine storage compartment’ means an unfrozen compartment with a target temperature of 12 °C and storage conditions ranging from 5 °C to 20 °C, as set out in Annex III, Table 3;
- (15) ‘compartment type’ means the declared compartment type in accordance with the refrigerating performance parameters T_{min} , T_{max} , T_c and others as set out in Annex III, Table 3;
- (16) ‘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,
 - (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;
- (17) ‘freestanding appliance’ means a refrigerating appliance that is not a built-in appliance;
- (18) ‘spare part’ means a separate part that can replace a part with the same or similar function in a product;
- (19) ‘commercial guarantee’ means any undertaking by the trader or a producer (the guarantor) to the consumer, in addition to any legal obligation relating to the guarantee of conformity, to reimburse the price paid or to replace, repair or service goods in any way if they do not meet the specifications or any other requirements not related to conformity set out in the guarantee statement or in the relevant advertising available at the time of, or before, the conclusion of the contract;
- (20) ‘climate class’ means the range of ambient temperatures, as per Annex III.1.(k), in which the refrigerating appliances are intended to be used, and for which the required storage temperatures specified in Table 3 are met;
- (21) ‘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 per Regulation (EU) 2017/1369;
- (22) ‘temperature rise time’ means the time taken, after the operation of the refrigerated system has been interrupted, for the temperature in a 3- or 4-star compartment to increase from –18 to –9 °C expressed in hours (h);
- (23) ‘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;
- (24) ‘door heat loss factor’ (D) means a compensation factor for combi appliances according to the number of different temperature compartments or the number of doors, whichever is lower and as set out in Annex III, Table 5. For the purpose of this factor, ‘compartment’ does not refer to sub-compartment;
- (25) ‘load factor’ (L) means a compensation factor for the extra cooling load from introducing warm foodstuffs beyond what is already anticipated through the higher average ambient temperature for testing with values as set out in Annex III, Table 5;

- (26) ‘anti-condensation heater’ means a heater which prevents condensation on the refrigeration appliance;
- (27) ‘steady state power consumption’ (P_{ss}) means the average power consumption in steady state conditions, expressed in Watts (W);
- (28) ‘daily energy consumption’ (E_{daily}) means the electricity used by a refrigerating appliance over 24 hours at reference conditions expressed in kWh/24h, calculated as per Annex III.3;
- (29) ‘incremental defrost and recovery energy consumption’ (ΔE_{d-f}) means the extra average energy consumption for a defrost and recovery operation expressed in Wh;
- (30) ‘defrost interval’ (t_{d-f}) means the representative average interval between the time of activation of the defrost heater, or the time of deactivation of the compressor if there is no defrost heater, in two subsequent defrost and recovery cycles expressed in h;
- (31) ‘target temperature’ (T_c) means the reference temperature inside a compartment c during testing as set out in Annex III, Table 3, and relates to the maximum temperature for testing energy consumption expressed as the average over time and over a set of sensors;
- (32) ‘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;
- (33) ‘c’ means the index number suffix for a compartment type in an appliance;
- (34) ‘ 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;
- (35) ‘defrost factor’ (A_c) means a compensation factor that takes into account whether the refrigerating appliances has an auto-defrost or a manual defrost, with values as set out in Annex III, Table 5;
- (36) ‘built-in factor’ (B_c) means a compensation factor that takes into account whether the refrigerating appliances is built-in or freestanding, with values as set out in Annex III, Table 5;
- (37) ‘pantry compartment’ means an unfrozen compartment with a target temperature of 17 °C and storage conditions ranging from 14 °C to 20 °C, as set out in Annex III, Table 3;
- (38) ‘cellar compartment’ means an unfrozen compartment with a target temperature of 12 °C and storage conditions ranging from 2 °C to 14 °C, as set out in Annex III, Table 3;
- (39) ‘fresh food compartment’ means an unfrozen food compartment with a target temperature of 4 °C and storage conditions ranging from 0 °C and 8 °C, as set out in Annex III; Table 3;
- (40) ‘0-star compartment’ and ‘ice-making compartment’ means a frozen compartment with a target temperature and storage conditions of 0 °C, as set out in Annex III, Table 3;
- (41) ‘1-star compartment’ means a frozen compartment with a target temperature and storage conditions of -6 °C, as set out in Annex III, Table 3;
- (42) ‘2-star compartment’ means a frozen compartment with a target temperature and storage conditions of -12 °C, as set out in Annex III, Table 3;

- (43) ‘3-star compartment’ means a frozen compartment with a target temperature and storage conditions of $-18\text{ }^{\circ}\text{C}$, as set out in Annex III, Table 3;
- (44) ‘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 in which the temperature is not warmer than $-12\text{ }^{\circ}\text{C}$;
- (45) ‘variable temperature compartment’ means a compartment intended for use as two (or more) alternative compartment types (e.g. 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 compartment type claimed. A compartment intended for use as a single compartment type that can also meet storage conditions of other compartment types (e.g. a chill compartment that may also fulfil zero-star requirements) is not a variable temperature compartment;
- (46) ‘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;
- (47) ‘annual energy consumption’ (AE) means the average daily energy consumption multiplied with 365 (days per year) expressed in kWh, as calculated in Annex III.3;
- (48) ‘ambient controlled anti-condensation heater’ means a heater which prevents condensation on the refrigeration appliance and where the heating capacity is depending on either the ambient temperature or the ambient humidity or both;
- (49) ‘auxiliary energy’ (E_{aux}) means the energy used by functions or features that affect the energy consumption of a refrigerating appliance, which is limited to the ambient controlled anti-condensation heater, and where their actual energy consumption depends on the conditions of use or operation in kWh/a, ;
- (50) ‘through-the-door device’ means a device that dispenses chilled or frozen load on demand from a refrigerating appliance, through an opening in its external door and without opening that external door. Examples are ice-cube dispensers or chilled water dispensers;
- (51) ‘network’ means a communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols);
- (52) ‘minimum temperature’ (T_{min}) means the minimum temperature inside a compartment during storage testing, as set out in Annex III, Table 3;
- (53) ‘maximum temperature’ (T_{max}) means the maximum temperature inside a compartment during storage testing, as set out in Annex III, Table 3;
- (54) ‘defrost and recovery period’ means the period from the initiation of a defrost control cycle until stable operating conditions are re-established;
- (55) ‘defrosting type’ means the method to remove frost accumulation on the evaporator(s) of a refrigerating appliance, i.e. auto-defrost or manual defrost;
- (56) ‘standard annual energy consumption’ (SAE) means the reference annual energy consumption of a refrigeration appliance expressed in kWh, as calculated in Annex III.4;

- (57) 'compartment volume' (V_c) means the volume of the space within the inside liner of the compartment, expressed in dm^3 or litres;
- (58) 'manual defrost' means not having an auto-defrost feature;
- (59) 'equivalent model' means a model with the same relevant technical and performance characteristics but placed on the market under a different model identifier;
- (60) 'airborne acoustical noise emission' means the sound power level of the refrigerating appliance, expressed in dB(A) re 1 pW (A-weighted);
- (61) 'average power consumption' (P) means the average rate of energy consumption of a refrigerating appliance for a specific test condition or operation expressed in Watts.

ANNEX II
Ecodesign requirements

1. Energy efficiency requirements:

- (a) From 1 April 2021, the EEI of refrigerating appliances shall not be above the values in Table 1.

Table 1
Maximum EEI for refrigerating appliances, expressed in % from 01/04/2021 onwards

	EEI
refrigerating appliances, except for wine storage appliances	125
wine storage appliances, except for those with transparent doors	155
wine storage appliances with transparent doors	190
low noise refrigerating appliances, except for those with transparent doors	300
low noise refrigerating appliances with transparent doors	360

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

Table 2
Maximum EEI for refrigerating appliances, expressed in % from 01/04/2024 onwards

	EEI
refrigerating appliances, except for wine storage appliances	100
wine storage appliances	140
wine storage appliances with transparent doors	190
low noise refrigerating appliances, except for those with transparent doors	250
low noise refrigerating appliances with transparent doors	300

2. Functional requirements:

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

- (a) the fast freeze facility, or any similar function achieved through modification of the thermostat settings in freezer compartments, shall, once activated by the end-user according to the manufacturer's instructions, automatically revert to the previous normal storage temperature conditions after no more than 72 hours;
- (b) combi appliances with one thermostat and one compressor which according to the manufacturer's instructions can be used in ambient temperatures below + 16 °C and have a winter switch, shall have this winter switch automatically activated or deactivated according to the need to maintain the frozen compartment 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 of the type of food that should be stored in the compartment;
- (d) vacuum insulation panels shall be labelled with the letters ‘VIP’ in a clearly visible and readable way.

Requirement 2(a) and (b) shall only apply to refrigerator-freezers with one thermostat and one compressors from 1 April 2024.

3. Additional ecodesign requirements on repair and end-of-life aspects:

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

- (a) manufacturers shall ensure that refrigerating appliances are designed so that the components described in Annex VII of Directive 2012/19/EU can be removed with non-proprietary and commonly available tools;
- (b) manufacturers shall be able to supply end-users with spare parts, including at least thermostats, temperature sensors and printed circuit boards, for their refrigerating appliances for at least 7 years after the production of the specific model has ceased;
- (c) door gaskets and light sources shall be replaceable without special tools and without permanent damage, and manufacturers shall be able to supply end-users with door gaskets and light sources for their refrigerating appliances for at least 10 years after the production of the specific model has ceased.

4. Information requirements:

- (a) From 1 April 2021, instruction manuals for installers and end-users, and free access website of manufacturers, their authorised representatives and importers shall include the following information, in the order as set out below:
 - (1) the combination of drawers, baskets and shelves that result in the most efficient use of energy for the refrigerating appliance;
 - (2) clear guidance about where and how to store fresh foodstuffs and beverages in a refrigerating appliance for best preservation over the longest period, to avoid food waste;
 - (3) the recommended setting of temperatures in each compartment for optimum food preservation;
 - (4) an estimation of the impact of temperature settings on food waste;
 - (5) a description of the effects of special modes and features, and in particular how temperatures are affected in each compartment and for how long;
 - (6) for dedicated wine storage appliances: ‘this appliances 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, nor to refrigerating appliances that have a wine storage compartment combined with any other compartment type;
 - (7) instructions for the correct installation and maintenance of the refrigerating appliance;

- (8) for a built-in appliance: ‘refrigerating appliances in cabinetry or encased by panels use more energy than when they stand freely’;
 - (9) for a freestanding appliance: ‘this refrigerating appliance is not intended to be used as a built-in appliance, the energy consumption will increase significantly if it is used as such’;
 - (10) access to professional repair (internet webpages, addresses, contact details);
 - (11) relevant information for ordering spare parts, directly or through other channels;
 - (12) the minimum date until when spare parts, necessary for the repair of the appliance, are available;
 - (13) the duration of the commercial guarantee of the refrigerating appliance in years;
 - (14) 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’; for refrigerating appliances with climate class ‘temperate’: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 32 °C’; for refrigerating appliances with climate class ‘Subtropical’: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 38 °C’; for refrigerating appliances with climate class ‘Tropical’: ‘this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 43 °C’;
 - (15) a weblink to the product database, as defined in Regulation [*Please insert here references of the specific energy labelling regulation*].
- (b) The technical documentation for the purposes of conformity assessment pursuant to Article 4 shall include the information in the order and as set out in Table 6 of Regulation [*Please insert here references of the specific energy labelling regulation*]. For market surveillance purposes, manufacturers may refer to the technical documentation uploaded to the product database which contains the same information as per Regulation [*Please insert here references of the specific energy labelling regulation*].

ANNEX III

Measurements 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 the reference numbers of which have been published for this purpose in the *Official Journal of the European Union*, or other reliable, accurate and reproducible methods, which take into account the generally recognised state-of-the-art methods and are in line with the following provisions:

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 will be switched off or otherwise disabled, where possible, during the measurement of energy consumption. The energy consumption of these heaters shall be determined from their power consumption declared by the manufacturer for a set of ambient temperature and humidity conditions and added to the auxiliary energy;
 - (c) for refrigerating appliances with through-the-door devices that can be switched on and off by the end-user, the through-the-door devices shall be switched on during the energy consumption measurement 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 user to continuously maintain the temperature range, as indicated in Annex III, Table 3, of the compartment type which has the lowest temperature;
 - (e) for refrigerating appliances that can be digitally connected to a network, this functionality shall not be disabled but there will be no active sending or receiving of data;
 - (f) for the performance of chill compartments:
 - (1) for a variable temperature compartment rated as fresh food and/or chill, the energy efficiency index 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;
 - (g) for adjustable volume compartments, when the volumes of two compartments are adjustable relative to one another by the 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) for two star compartments or sections:
 - (1) is separated from the three-star or four-star volume by a partition, container, or similar construction;
 - (2) the rated volume does not exceed 20 % of the total volume of the compartment;

- (i) 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; the light load weight is 3,5 kg per 100 litre of freezer volume, and should be at least 2,0 kg.
- (j) for 4-star compartments, the freezing time to bring the temperature of the light load from +25 to -18 °C at all ambient temperatures, within the ambient temperature operating range indicated by the manufacturer or importer, is smaller than or equal to 24h;
- (k) for the determination of the climate classes ('acronym' for 'ambient temperature range'): the Extended Temperate (SN) has a temperature range from 10 °C to +32 °C, the Temperate (N) has a temperature range from 16 °C to 32 °C, the Subtropical (ST) with a temperature range from 16 °C to 38 °C, and Tropical (T) has temperature range from 16 °C to 43 °C.

2. Storage conditions and target temperatures per compartment type:

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

3. Determination of the Annual Energy Consumption (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 5 for each compartment type claimed by the supplier. 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:

- steady state power consumption (P_{ss}), in W, measured at an ambient temperature of 16 °C (P_{ss16}) and 32 °C (P_{ss32});
- incremental defrost and recovery energy consumption (ΔE_{d-f}), in W, for products with one or more auto-defrost systems (each with its own defrost control cycle) measured at an ambient temperature of 16 °C (ΔE_{d-f16}) and 32 °C (ΔE_{d-f32}). The defrost and recovery energy consumption for a representative number of defrost and recovery periods for each system shall be determined;
- defrost interval (t_{d-f}), in h, 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}). The defrost interval t_{d-f} shall be determined for each system under a range of conditions;
- auxiliary energy (E_{aux}) in kWh/a.

Each of these parameters will be determined through separate (sets of) tests. To improve the efficiency and accuracy of testing, the test period is not fixed, but is determined by whether a 'steady state' is reached.

The AE, expressed in kWh/a and rounded to two decimal places, is then calculated as follows:

$$AE = 365 \cdot E_{daily} + E_{aux};$$

with the daily energy consumption E_{daily} in kWh/24h and rounded to three decimal places calculated from the daily energy consumption at an ambient temperature of 16 °C (E_{16}) and at an ambient temperature of 32 °C (E_{32}) as follows:

$$E_{daily} = 0.5 \cdot (E_{16} + E_{32});$$

with

$$E_{16} = 0.001 \cdot 24 \cdot (P_{ss16} + \Delta E_{d-f16} / t_{d-f16}), \text{ and};$$

$$E_{32} = 0.001 \cdot 24 \cdot (P_{ss32} + \Delta E_{d-f32} / t_{d-f32}).$$

Table 3
Storage conditions and target temperature per compartment type

Group	Compartment type	Note	Storage conditions		T_c note [1]
			T_{min}	T_{max}	
Name	Name	nr.	°C	°C	°C
Unfrozen compartments	Pantry	[2]	+14	+20	+17
	Wine storage	[3][7]	+5	+20	+12
	Cellar	[2]	+2	+14	+12
	Fresh food	[2]	0	+8	+4
Chill compartment	Chill	[4]	-3	+3	+2
Frozen compartments	0-star & ice-making	[5]	n.a.	0	0
	1-star	[5]	n.a.	-6	-6
	2-star	[5][6]	n.a.	-12	-12
	3-star	[5][6]	n.a.	-18	-18
	freezer (4-star)	[5][6]	n.a.	-18	-18
<p><u>Notes:</u></p> <p>[1] T_c relates to the target temperature for testing energy consumption and is the average over time and over a set of sensors.</p> <p>[2] T_{min} and T_{max} relate to average values measured over the test period (average over time and over a set of sensors).</p> <p>[3] The average temperature variation over the test period for each sensor shall be no more than $\pm 0,5$ 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.</p> <p>[4] T_{min} and T_{max} relate to instantaneous values during the test period.</p> <p>[5] T_{max} relates to the maximum value measured over the test period (maximum over time and over a set of sensors).</p> <p>[6] If the compartment is of the auto-defrosting type, then during a defrost and recovery period, the maximum temperature of all sensors is not permitted to rise more than 3.0 K.</p> <p>[7] T_{min} and T_{max} relate to the average values measured over the test period (average over time for each sensor) and define the maximum allowed temperature operating range</p> <p>n.a.=not applicable</p>					

(b) For low noise refrigerating appliances:

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

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

$$E_{daily} = E_{25} = 0.001 \cdot 24 \cdot (P_{ss25} + \Delta E_{d-f25} / t_{d-f25}).$$

4. Determination of the Standard Annual Energy Consumption (SAE):

(a) For all refrigerating appliances:

The Standard Annual Energy consumption SAE , in kWh/a and rounded to two decimal places, is calculated as follows:

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

where c is the compartment index suffix and n is the total number of compartment types; V_c (in dm³ or litres, with one decimal) is the compartment volume; V (in dm³ or litres, 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 6; and A_c , B_c , D and L are the compensation factors with values as set out in Table 7.

Note that for the variable temperature compartments the compartment type with the lowest target temperature is chosen for which it is declared suitable.

(b) Modelling parameters per compartment type for the calculation of the 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 refrigerator-freezers ^b , 1,15 for other combis, 1,00 for dedicated refrigerating appliances
Wine storage	0,60			
Cellar	0,60			
Fresh food	1,00	138	0,12	
Chill	1,10			
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			

^a $r_c = (T_a - T_c) / 20$; with $T_a = 24$ °C and T_c with values as set out in Annex III, Table 5.

^b C for refrigerator-freezers is determined as follows:

where $frzf$ is the freezer volume $V_{freezer}$ as a fraction of total volume with $frzf = V_{freezer} / V$:

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

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

The correction factors are set out in Table 5.

Table 5
The values of the correction factors per compartment type

Compartment	<i>A_c</i>		<i>B_c</i>		<i>D</i>				<i>L</i>	
	Manual defrost	Auto-defrost	Freestanding appliance	Built-in appliance	≤ 2 ^a	3 ^a	4 ^a	> 4 ^a	Dedicated 3-or 4-star ^b	Other
Pantry	1,00		1,00	1,04	1,00	1,02	1,035	1,05	0,90	1,00
Wine storage										
Cellar										
Fresh food										
Chill				1,06						
0-star & ice-	1,00	1,10	1,00	1,10	1,00	1,02	1,035	1,05	0,90	1,00
1-star										
2-star										
3-star										
Freezer (4-star)										
^a number of doors or compartments, whichever is lowest; ^b for dedicated 3- or 4-star refrigerating appliances or combi appliances with only 3- and 4-star compartments.										

5. Determination of the Energy Efficiency Index (EEI):

The Energy Efficiency Index EEI, expressed in % and rounded to the first decimal place, compares the Annual Energy consumption AE (in kWh/a) with the reference Standard Annual Energy consumption SAE (in kWh/a) and is calculated as:

$$EEI = AE / SAE$$

ANNEX IV

Verification procedure for market surveillance purposes

The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer or importer 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 communicate better performance by any means.

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, for the requirements referred to in Annex II, the authorities of the Member States shall apply the following procedure:

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 4 of Annex II to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer or importer than the results of the corresponding measurements carried out pursuant to paragraph (g) thereof; and
 - (b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer or importer does not contain values that are more favourable for the manufacturer or importer than the declared values; and
 - (c) 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 given in Table 6; and
 - (d) when the Member State authorities check the unit of the model, it complies with the functional requirements and the requirements on repair and end-of-life aspects.
3. If the results referred to in point 2.(a),(b) and (d) are not achieved, the model and all models that have been listed as equivalent refrigerating appliance models in the manufacturer's or importer's technical documentation shall be considered not to comply with this Regulation.
4. If the result referred to in point 2.(c) 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 different models that have been listed as equivalent models in the manufacturer's or importer's technical documentation.
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 given in Table 6.
6. If the result referred to in point 5 is not achieved, the model and all models that have been listed as equivalent refrigerating appliance models in the manufacturer's or importer's technical documentation 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 after a decision being taken on the non-compliance of the model according to points 3 and 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 (a) to (g) for the requirements referred to in this Annex. 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
Volume	The determined value shall not be less than the declared value by more than 3 % or 1 litre, whichever is the greater value.
Freezing capacity	The determined value shall not be less than the declared value by more than 10 %.
Energy consumption	The determined value shall not exceed the declared value of the annual energy consumption <i>AE</i> by more than 10 %.
Airborne acoustical noise emission	The determined value shall meet the declared value
Temperature rise time	The determined value shall not exceed the declared value by more than 15 %.

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 follows. Please note that below figures were obtained using a simplified conversion from the EEI-values as determined according to the repealed Commission Regulation (EC) 643/2009; the figures in brackets indicate the EEI-value as determined according to the repealed Commission Regulation (EC) 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 (no glass door)

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

Glass 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

Dedicated freezer refrigerating appliance:

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)

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

Insulated 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 smaller than 15 dB(A) according to current test standards.