Commission Regulation (EC) No 643/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household refrigerating appliances (Text with EEA relevance)

ANNEX IV

Method for calculating the Energy Efficiency Index

1. CLASSIFICATION OF HOUSEHOLD REFRIGERATING APPLIANCES

Household refrigerating appliances are classified in categories as in Table 1. Each category is defined by the specific compartment composition as specified in Table 2 and is independent of the number of doors and/or drawers.

TABLE 1

Household refrigerating appliances categories

Category	Designation
1	Refrigerator with one or more fresh-food storage compartments
2	Refrigerator-cellar, cellar and wine storage appliances
3	Refrigerator-chiller and refrigerator with a 0-star compartment
4	Refrigerator with a 1-star compartment
5	Refrigerator with a 2-star compartment
6	Refrigerator with a 3-star compartment
7	Refrigerator-freezer
8	Upright freezer
9	Chest freezer
10	Multi-use and other refrigerating appliances

Household refrigerating appliances that cannot be classified in categories 1 to 9 because of compartment temperature are classified in Category 10.

TABLE 2

Household refrigerating appliance classification and relevant compartment composition

Nominal temperature (for the EEI) (°C)	Design temperature	+ 12	+ 12	+ 5	0	0	– 6	– 12	– 18	– 18	Category(number)
a also includes 3-star frozen-food cabinets.											

Notes:

Y = the compartment is present;
N = the compartment is not present;
O = the presence of the compartment is optional;

Compartment types	**Other**	**Wine storage**	**Cellar**	**Fresh food storage**	**Chill**	**0-star/ Ice making**	**1-star**	**2-star**	**3-star**	**4-star**	
Appliance Category	**Compartments composition**										
REFRIGERATOR WITH ONE OR MORE FRESH-FOOD STORAGE COMPARTMENTS	N	N	N	Y	N	N	N	N	N	N	1
REFRIGERATOR-CELLAR, CELLAR AND WINE STORAGE APPLIANCE	O	O	O	Y	N	N	N	N	N	N	2
	O	O	Y	N	N	N	N	N	N	N	
	N	Y	N	N	N	N	N	N	N	N	
REFRIGERATOR-CHILLER AND REFRIGERATOR WITH A 0-STAR COMPARTMENT	O	O	O	Y	Y	O	N	N	N	N	3
	O	O	O	Y	O	Y	N	N	N	N	
REFRIGERATOR WITH A 1-STAR COMPARTMENT	O	O	O	Y	O	O	Y	N	N	N	4
REFRIGERATOR WITH A 2-STAR COMPARTMENT	O	O	O	Y	O	O	O	Y	N	N	5
REFRIGERATOR WITH A 3-	O	O	O	Y	O	O	O	O	Y	N	6

a also includes 3-star frozen-food cabinets.

Notes:

Y = the compartment is present;
N = the compartment is not present;
O = the presence of the compartment is optional;

STAR COMPARTMENT										
REFRIGERATOR-FREEZER	O	O	Y	O	O	O	O	O	Y	7
UPRIGHT FREEZER	N	N	N	N	N	N	O	Y[a]	Y	8
CHEST FREEZER	N	N	N	N	N	N	O	N	Y	9
MULTI-USE AND OTHER APPLIANCES	O	O	O	O	O	O	O	O	O	10

a also includes 3-star frozen-food cabinets.

Notes:

Y = the compartment is present;
N = the compartment is not present;
O = the presence of the compartment is optional;

Household refrigerating appliances are classified in one or more climate classes as shown in Table 3

TABLE 3

Climate classes

Class	Symbol	Ambient average temperature °C
Extended temperate	SN	+ 10 to + 32
Temperate	N	+ 16 to + 32
Subtropical	ST	+ 16 to + 38
Tropical	T	+ 16 to + 43

The refrigerating appliance shall be capable of maintaining the required storage temperatures in the different compartments simultaneously and within the permitted temperature deviations (during the defrost cycle) as defined in Table 4 for the different types of household refrigerating appliances and for the appropriate climate classes.

Multi-use appliances and/or compartments shall be capable of maintaining the required storage temperatures of the different compartment types where these temperatures can be set by the end-user according to the manufacturer’s instructions.

TABLE 4

Storage temperatures

Storage temperatures (°C)							
Other compartment	**Wine storage compartment**	**Cellar compartment**	**Fresh-food storage compartment**	**Chill compartment**	**One-star compartment**	**Two-star compartment and section**	**Food freezer and three-star compartment/ cabinet**
t_{om}	t_{wma}	t_{cm}	t_{1m}, t_{2m}, t_{3m}, t_{ma}	t_{cc}	t*	t**	t***
> + 14	+ 5 ≤ twma ≤ + 20	+ 8 ≤ t_{cm} ≤ + 14	0 ≤ t_{1m}, t_{2m}, t_{3m} ≤ + 8; t_{ma} ≤ + 4	– 2 ≤ t_{cc} ≤ + 3	≤ – 6	≤ – 12[a]	≤ – 18[a]

a for frost-free household refrigerating appliances during the defrost cycle, a temperature deviation of no more than 3 K during a period of 4 hours or 20 % of the duration of the operating cycle, whichever is the shorter, is allowed

Notes:

t_{om} : storage temperature of the other compartment
t_{wma} : storage temperature of the wine storage compartment with a variation of 0,5 K
t_{cm} : storage temperature of the cellar compartment
t_{1m}, t_{2m}, t_{3m} : storage temperatures of the fresh-food compartment
t_{ma} : average storage temperature of the fresh-food compartment
t_{cc} : instantaneous storage temperature of the chill compartment
t*, t**, t*** : maximum temperatures of the frozen-food storage compartments
storage temperature for the ice-making compartment and for the '0-star' compartment is below 0 °C

2. CALCULATION OF THE EQUIVALENT VOLUME

The equivalent volume of a household refrigerating appliance is the sum of the equivalent volumes of all compartments. It is calculated in litres and rounded to the nearest integer as:

$$V_{eq} = \left[\sum_{c=1}^{c=n} V_c \times \frac{25-T_c}{20} \times FF_c\right] \times CC \times BI$$

where:

— n is the number of compartments

— V_c is the storage volume of the compartment(s)

— T_c is the nominal temperature of the compartment(s) as set out in Table 2

— $\frac{25-T_c}{20}$ is the thermodynamic factor as set in Table 5

— FF_c, CC and BI are volume correction factors as set out in Table 6.

The thermodynamic correction factor $\frac{25-T_c}{20}$ is the temperature difference between the nominal temperature of a compartment T_c (defined in Table 2) and the ambient temperature under standard test conditions at + 25 °C, expressed as a ratio of the same difference for a fresh-food compartment at + 5 °C.

The thermodynamic factors for the compartments described in Annex I, points (i) to (p), are set out in Table 5.

TABLE 5

Thermodynamic factors for refrigerating appliance compartments

Compartment	**Nominal temperature**	**(25 – T_c)/20**
Other compartment	**Design temperature**	$\frac{25-T_c}{20}$
Cellar compartment/Wine storage compartment	+ 12 °C	0,65
Fresh-food storage compartment	+ 5 °C	1,0
Chill compartment	0 °C	1,25
Ice-making compartment and 0-star compartment	0 °C	1,25
One-star compartment	– 6 °C	1,55
Two-star compartment	– 12 °C	1,85
Three-star compartment	– 18 °C	2,15
Food freezer compartment (four-star compartment)	– 18 °C	2,15

Notes:

(i) for multi-use compartments, the thermodynamic factor is determined by the nominal temperature as given in Table 2 of the coldest compartment type capable of being set by the end-user and maintained continuously according to the manufacturer's instructions;

(ii) for any two-star section (within a freezer) the thermodynamic factor is determined at $T_c = -12$ °C;

(iii) for other compartments the thermodynamic factor is determined by the coldest design temperature capable of being set by the end-user and maintained continuously according to the manufacturer's instructions.

TABLE 6

Value of the correction factors

Correction factor	**Value**	**Conditions**
FF (Frost-free)	1,2	For frost-free frozen-food storage compartments
	1	Otherwise
CC (climate class)	1,2	For T class (tropical) appliances
	1,1	For ST class (subtropical) appliances
	1	Otherwise

BI (built-in)	1,2	For built-in appliances under 58 cm in width
	1	Otherwise

Notes:

(i) *FF* is the volume correction factor for frost-free compartments.

(ii) *CC* is the volume correction factor for a given climate class. If a refrigerating appliance is classified in more than one climate class, the climate class with the highest correction factor is used for the calculation of the equivalent volume.

(iii) *BI* is the volume correction factor for built-in appliances.

3. CALCULATION OF THE ENERGY EFFICIENCY INDEX

For the calculation of the Energy Efficiency Index (*EEI*), of a household refrigerating appliance model, the Annual Energy Consumption of the household refrigerating appliance is compared to its Standard Annual Energy Consumption.

1. The Energy Efficiency Index (*EEI*) is calculated and rounded to the first decimal place, as:

$$EEI = \frac{AE_c}{SAE_c} \times 100$$

where:

— AEC = Annual Energy Consumption of the household refrigerating appliance

— SAEC = Standard Annual Energy Consumption of the household refrigerating appliance.

2. The Annual Energy Consumption (AE_C) is calculated in kWh/year and rounded to two decimal places, as:

$AE_c = E_{24h} \times 365$

where:

— E_{24h} is the energy consumption of the household refrigerating appliance in kWh/24h and rounded to three decimal places.

3. The Standard Annual Energy Consumption (SAE_C) is calculated in kWh/year and rounded to two decimal places, as:

$SAE_c = V_{eq} \times M + N + CH$

where:

— V_{eq} is the equivalent volume of the household refrigerating appliance

— *CH* is equal to 50 kWh/year for household refrigerating appliances with a chill compartment with a storage volume of at least 15 litres

— the *M* and *N* values are given in Table 7 for each household refrigerating appliance category.

TABLE 7

_M_ and _N_ values by household refrigerating appliance category

Category	M	N
1	0,233	245
2	0,233	245
3	0,233	245
4	0,643	191
5	0,45	245
6	0,777	303
7	0,777	303
8	0,539	315
9	0,472	286
10	[a]	[a]

Note:

a for Category 10 household refrigerating appliances the *M* and *N* values depend on the temperature and star rating of the compartment with the lowest storage temperature capable of being set by the end-user and maintained continuously according to the manufacturer's instructions. When only an 'other compartment' as defined in Table 2 and Annex I, point (p), is present, the *M* and *N* values for Category 1 are used. Appliances with three-star compartments or food-freezer compartments are considered to be refrigerator-freezers.

Changes to legislation:
There are outstanding changes not yet made to Commission Regulation (EC) No 643/2009. Any changes that have already been made to the legislation appear in the content and are referenced with annotations.
View outstanding changes

Changes and effects yet to be applied to :

- Regulation revoked by S.I. 2021/745 Sch. 29 para. 3

Changes and effects yet to be applied to the whole legislation item and associated provisions

- Signature words omitted by S.I. 2019/539 Sch. 2 para. 9(6)
- Annex 5(2)(a) words substituted by S.I. 2019/539 Sch. 2 para. 9(8)(c)(i)
- Annex 5(2)(a) words substituted by S.I. 2019/539 Sch. 2 para. 9(8)(c)(ii)
- Annex 5(7) omitted by S.I. 2019/539 Sch. 2 para. 9(8)(d)