S C H E D U L E S

SCHEDULE 14   Regulation 29

Measurement methods and calculations for refrigerating appliances

1.—(1) Sub-paragraphs (2) to (5) apply for the purposes of the measurements and calculations referred to in paragraphs 2 to 7.

(2) For refrigerating appliances with anti-condensation heaters that can be switched on and off by the end-user, the anti-condensation heaters must be—

    (a) switched on;

    (b) if adjustable, set at maximum heating; and

    (c) included in the annual energy consumption as daily energy consumption (E_{daily});

(3) For refrigerating appliances with ambient controlled anti-condensation heaters, the ambient controlled anti-condensation heaters must be switched off or otherwise disabled, where possible, during the measurement of energy consumption.

(4) For refrigerating appliances with dispensers that can be switched on and off by the end-user, the dispensers must be switched on but not operating during the energy consumption test.

(5) For the measurement of energy consumption, variable temperature compartments must operate at the lowest temperature that can be set by the end-user to continuously maintain the temperature range of the compartment type which has the lowest temperature, as set out in Table 17.

(6) For the energy consumption test of refrigerating appliances that can be connected to a network, the communication module must be activated and the unit must be connected, but it is not a requirement that any communication or data exchange should take place during the test.

(7) For the performance of chill compartments—

    (a) in the case of a variable temperature compartment rated as a fresh food or chill compartment, the energy efficiency index (EEI) must be determined for each temperature condition and the highest value must be applied;

    (b) a chill compartment must be able to control its average temperature within a certain range without user adjustments; this must be checked during the energy consumption tests at 16 °C and 32 °C ambient temperature.

(8) For adjustable volume compartments, where the volumes of two compartments are adjustable relative to one another by the end-user, the energy consumption and the volume must be tested when the volume of the compartment with the higher target temperature is adjusted to its minimum volume.

(9) The specific freezing capacity must be calculated as 24 times the light load weight, divided by the freezing time to bring the temperature of the light load from +25 °C to -18 °C at an ambient temperature of 25 °C, expressed in kg/24 h and rounded to one decimal place.

(10) For the determination of climate classes, the ambient temperature ranges SN, N, ST or T are as follows—

    (a) the extended temperate (SN) has a temperature range from 10 °C to 32 °C;

    (b) the temperate (N) has a temperature range from 16 °C to 32 °C;

    (c) the subtropical (ST) has a temperature range from 16 °C to 38 °C; and

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(d) the tropical (T) has a temperature range from 16 °C to 43 °C.

(11) The light load weight for each 4-star compartment must be—

(a) 3.5 kg/100 l of the volume of the 4-star compartment evaluated, rounded up to the nearest 0.5 kg; and

(b) 2 kg for a 4-star compartment with a volume for which 3.5 kg/100 l leads to a value lower than 2 kg.

(12) Where a refrigerating appliance includes a combination of 3-star and 4- star compartments, the sum of the light load weights is increased so that the sum of the light load weights for all the 4-star compartments must be—

(a) 3.5 kg/100 l of the total volume of all 3-star and 4-star compartments, rounded up to the nearest 0.5 kg; and,

(b) 2 kg for a total volume of all 3-star and 4-star compartments for which 3.5 kg/100 l leads to a value lower than 2 kg.

Storage conditions and target temperatures per compartment type

2.—(1) Table 17 sets out the storage conditions and target temperature per compartment type.

Table 17

Storage conditions and target temperature per compartment type

Group	Compartment type	Storage conditions	Storage conditions	T_c
		T_{min}	T_{max}	
		°C	°C	°C
Unfrozen compartments	Pantry	+14	+20	+17
	Wine storage	+5	+20	+12
	Cellar	+2	+14	+12
	Fresh food	0	+8	+4
Chill compartment	Chill	-3	+3	+2
Frozen compartments	0-star and ice-making	N/A	0	0
	1-star	N/A	-6	-6
	2-star	N/A	-12	-12
	3-star	N/A	-18	-18
	Freezer (4-star)	N/A	-18	-18

(2) For the purposes of Table 17—

(a) for the entries relating to pantry, cellar and fresh food, T_{min} and T_{max} are the average values measured over the test period (average over time and over a set of sensors);

(b) for the entry relating to wine storage—

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(i) 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;

(ii) the average temperature variation over the test period for each sensor must be no more than ± 0.5 kelvin (K); during a defrost and recovery period the average of all sensors must not rise more than 1.5 K above the average value of the compartment;

(c) for the entry relating to chill, T_{min} and T_{max} are the instantaneous values during the test period;

(d) for all the entries relating to frozen compartments, T_{max} is the maximum value measured over the test period (maximum over time and over a set of sensors);

(e) for the entries relating to 2-star, 3-star and 4-star frozen compartments, where the compartment is of the auto-defrosting type, the temperature (defined as the maximum of all sensors) must not rise more than 3.0 K during a defrost and recovery period.

Determination of the *AE*

3.—(1) For all refrigerating appliances other than low noise appliances, the energy consumption must be determined as follows.

(2) Testing must be carried out at ambient temperatures of 16 °C and 32 °C.

(3) The average air temperatures in each compartment must be equal to or below the target temperatures specified in Table 17 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.

(4) The main components of energy consumption to be determined are—

(a) a set of steady state power consumption values (P_{ss}), expressed in Watts 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;

(b) the representative incremental defrost and recovery energy consumption (ΔE_{d-f}), expressed in watt-hours (Wh) and rounded to one decimal place, for products with one or more auto-defrost system (each with its own defrost control cycle) measured at an ambient temperature of 16 °C (ΔE_{d-f16}) and 32 °C (ΔE_{d-f32});

(c) defrost interval (t_{d-f}), expressed in hours (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 (td-f16) and 32 °C (td-f32); td-f must be determined for each system under a certain range of conditions;

(d) for each test performed the Pss and ΔEd-f are added together to form a daily energy consumption at a certain ambient temperature (ET) as follows—

ET = 0.001 × 24 × (Pss + ΔEd-f /td-f),

expressed in kilowatt-hours per day (kWh/24 h), specific to the settings applied;

(e) E_{aux} , expressed in kilowatt-hours per year (kWh/a) and rounded to three decimal places.

(5) Each of the parameters in sub-paragraph (4) must be determined through tests.

(6) For the purposes of sub-paragraph (5)—

(a) measurement data must be averaged over a test period which is taken after the appliance has been in operation for a certain time;

(b) to improve the efficiency and accuracy of testing, the length of the test period is not fixed; it must be such that the appliance is in steady state condition during this test period;

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(c) the steady state condition is validated by examining all data within this test period against a set of stability criteria determined in accordance with regulation 31.

(7) AE, expressed in kWh/a, must be rounded to two decimal places and calculated as follows—

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

Where—

(a) the load factor L is—

(i) 0.9 for refrigerating appliances with only frozen compartments; and

(ii) 1.0 for all other appliances;

(b) E_{daily} is rounded to three decimal places expressed in kWh/24 h, and 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—

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

(8) For the purposes of sub-paragraph (7) E_{16} and E_{32} are derived by interpolation of the energy test at the target temperatures set out in Table 17.

(9) For low noise refrigerating appliances, the energy consumption is determined in accordance with the preceding provisions of this paragraph except—

(a) testing must be carried out at an ambient temperature of 25 °C;

(b) E_{daily}, expressed in kWh/24 h and rounded to three decimal places for the calculation of the AE is 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 17.

Determination of the standard annual energy consumption (S*AE*)

4.—(1) 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—

(a) c is the index number for a compartment type ranging from 1 to n, with n the total number of compartment types;

(b) V_c, expressed in dm^3 or litres and rounded to the first decimal place is the compartment volume;

(c) V, expressed in dm^3 or litres and rounded to the nearest integer, is the total volume where—

$$V \leq \sum_{c=1}^{n} V_c$$

(d) r_c, N_c, M_c and C are modelling parameters specific to each compartment with values as set out in Table 18; and

(e) A_c, B_c and D are the compensation factors with values as set out in Table 19.

(2) When carrying out the calculations in this paragraph, for the variable temperature compartments, the compartment type with the lowest target temperature for which the manufacturer has declared it suitable must be chosen.

Modelling parameters per compartment type for the calculation of SAE

5.—(1) Table 18 sets out the modelling parameters per compartment type for the calculation of SAE.

Table 18

The values of the modelling parameters per compartment type

Compartment type	r_c	N_c	M_c	C
Pantry	0.35	75	0.12	(a) between 1.15 and 1.56 for combi appliances with 3- or 4-star compartments;
Wine storage	0.6			
Cellar	0.6			
Fresh food	1.00			
Chill	1.10	138	0.12	(b) 1.15 for other combi appliances;
0-star and ice-making	1.20	138	0.15	
1-star	1.50			(c) 1.00 for other refrigerating appliances.
2-star	1.80			
3-star	2.10			
Freezer (4-star)	2.10			

(2) For the purposes of table 18—

(a) r_c is $(T_a-T_c)/20$, where T_a = 24 °C and T_c is the determined value as set out in Table 17;

(b) C for combi appliances is determined as follows—

(i) frzf = Vfr/V, where—

(aa) Vfr is the 3- or 4-star compartment volume;

(bb) V is the total volume of the appliance;

(ii) if frzf $\leq$ 0.3, C = 1.3 + 0.87 × frzf;

(iii) if 0.3 < frzf < 0.7, C = 1.87 − 1.0275 × frzf;

(iv) in any other case, C = 1.15.

Compensation factors per compartment type in the calculation of SAE:

6. Table 19 sets out the compensation factors per compartment type.

Table 19

Values of compensation factors per compartment type

Compartment type	A_c	A_c	B_c	B_c	D			
	Manual defrost	Auto-defrost	Freestanding appliance	Built-in appliance	≤ 2	3	4	> 4
Pantry	1		1	1.02	1	1.02	1.035	1.05

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Compartment type	A_c	A_c	B_c	B_c	D			
	Manual defrost	*Auto-defrost*	*Freestanding appliance*	*Built-in appliance*	*≤ 2*	*3*	*4*	*> 4*
Wine storage								
Cellar								
Fresh food								
Chill				1.03				
0-star and ice-making	1	1.10		1.05				
1-star								
2-start								
3-star								
Freezer (4-star)								

For the purposes of Table 19, the numbers in the second row of the column headed "D" are the number of external doors or compartments, whichever is lower.

Determination of the EEI

7. EEI, expressed in per cent and rounded to the first decimal place, is calculated as—

EEI = AE/SAE.