Annex C
(normative)

Ageing test on motors

This annex of Part 1 is applicable except as follows.

Addition:

This annex does not apply to motor-compressors.

This is a preview. Click here to purchase the full publication.

Annex D
(normative)

Thermal motor protectors

This annex of Part 1 is applicable except as follows.

Addition:

This annex does not apply to motor-compressors or condenser fan motors.

This is a preview. Click here to purchase the full publication.

Annex P
(informative)

Guidance for the application of this standard to appliances used in tropical climates

This annex of Part 1 is applicable except as follows.

5 General conditions for the tests

5.7 *Modification:*

The ambient temperature of the tests of Clauses 10, 11 and 13 is 43 °C ± 1 °C.

11 Heating

11.8 *Modification:*

The values of Table 3 are reduced by 18 K.

This is a preview. Click here to purchase the full publication.

Annex R
(normative)

Software evaluation

R.2.2.5 *Modification:*

For PROGRAMMABLE ELECTRONIC CIRCUITS *with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1, detection of a fault/error shall occur before compliance with Clause 19 and 22.116 is impaired.*

R.2.2.9 *Modification:*

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clause 19 and 22.116 is impaired.

This is a preview. Click here to purchase the full publication.

Annex AA
(normative)

Locked-rotor test of fan motors

The winding of a fan motor shall not reach excessive temperatures if the motor locks or fails to start.

Compliance is checked by the following test.

The fan and its motor are mounted on wood or similar material. The motor's rotor is locked. Fan blades and motor brackets are not removed.

The motors are supplied at their supplied voltage when the appliance is supplied at RATED VOLTAGE *or at the upper limit of the* RATED VOLTAGE RANGE. *The supply circuit is given in Figure AA.1.*

The assembly is to operate under these conditions for 15 days (360 h) unless the PROTECTIVE DEVICE, *if any, permanently open circuits prior to the expiration of that time. In this case, the test is discontinued.*

If the temperature of motor windings stays lower than 90 °C, the test is discontinued when steady conditions are established.

Temperatures are measured under conditions specified in 11.3.

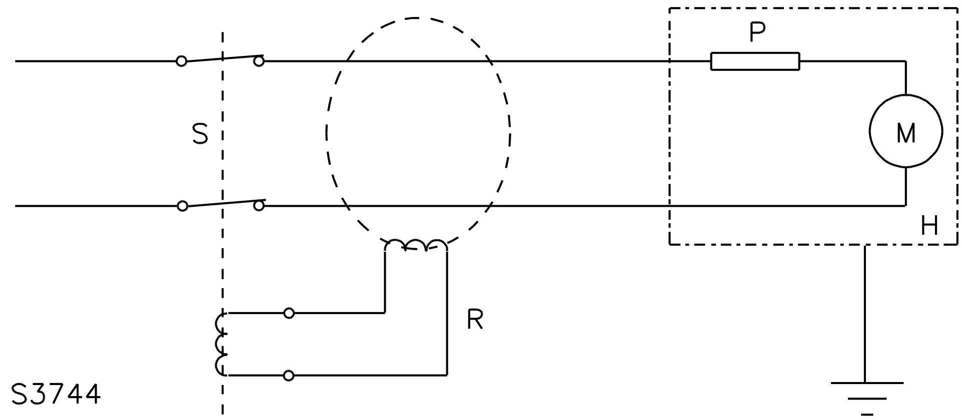
During the test, winding temperatures shall not exceed the values given in Table 8.

After a period of 72 h from the beginning of the test, the motor shall withstand the electric strength test of 16.3.

For other than DC motors, a residual current device with a rated residual current of 30 mA is connected so as to disconnect the supply in the event of an excessive earth leakage current.

At the end of the test, the leakage current is measured between windings and the body at a voltage equal to twice the RATED VOLTAGE; *its value shall not exceed 2 mA.*

This is a preview. Click here to purchase the full publication.



Key

S supply source

H housing

R residual current device ($I_{\Delta n}$ = 30 mA)

P thermal motor-protector (external or internal) if fitted

M motor

The circuit shall be modified for three-phase fan motors. For DC motors the RCD is not necessary.

Care has to be taken to complete the earthing system to permit the correct operation of the residual current device (RCCB/RCBO).

Figure AA.1

Supply circuit for locked-rotor test of a single-phase fan motor

This is a preview. Click here to purchase the full publication.

Annex BB
(normative)

Non-sparking “n” electrical apparatus

Where reference is made to IEC 60079-15, the following clauses are applicable as modified below.

7 Requirements for non-incendive components

Clause 7 is applicable.

8 Requirements for hermetically sealed devices

Clause 8 is applicable.

9 Requirements for sealed devices

All of the subclauses of Clause 9 are applicable, except 9.1 and 9.6, which are replaced by the following.

9.1 Non-metallic materials

Seals are tested using 11.2. However, if the device is tested in the appliance, then 11.2.1 and 11.2.2 are not applicable. After the tests of Clause 19 in IEC 60335-2-89, by inspection, no damage that could impair the type of protection shall be evident.

9.6 Type tests

The type tests described in 11.2 shall be performed where relevant.

10 Requirements for restricted-breathing enclosures

Clause 10 is applicable.

This is a preview. Click here to purchase the full publication.

Annex CC
(normative)

Test method for determining gas concentration beyond the boundary of the appliance

CC.1 Arrangement

The appliance is installed according to the instructions empty with doors or lids closed, or roller blinds closed or open, whichever is the more unfavourable and energized if necessary. Positioning of the appliance shall be against the centre of the shortest wall within the test room at a distance from the wall of the distance specified in the instructions or 50 mm whichever is greater. If the appliance can be fitted with any accessories, they shall be used or arranged in a manner that gives the most unfavourable result.

NOTE Accessories can include condensing unit cover, roof panels and kick-plates.

The test room floor area A (m^2) is given by

$$24 \geq A \geq \frac{M}{0{,}55LFL}$$

where

M is the FLAMMABLE REFRIGERANT CHARGE *(kg);*

LFL is the lower flammability limit of the FLAMMABLE REFRIGERANT *(kg/m^3).*

The room height shall be not less than 2,2 m. The distance between the top of the appliance and the ceiling shall be not less than 0,5 m. The floor aspect ratio shall be not more than 2:1 (width:length).

During the test, the temperature of the room shall be maintained within 2 K of any convenient value between 15 °C and 25 °C. The room temperature is measured at one of the air velocity measurement locations.

Air velocity shall be measured at two positions located 1 m from the centreline of the appliance front at a height above floor level of 0,1 m and 2 m. The air velocity is measured using omnidirectional anemometers The air velocity measured shall not exceed 0,1 m/s with the appliance and all its fans off.

CC.1DV.1 D2 ***Modify Clause CC.1 of the Part 2 by adding the following:***

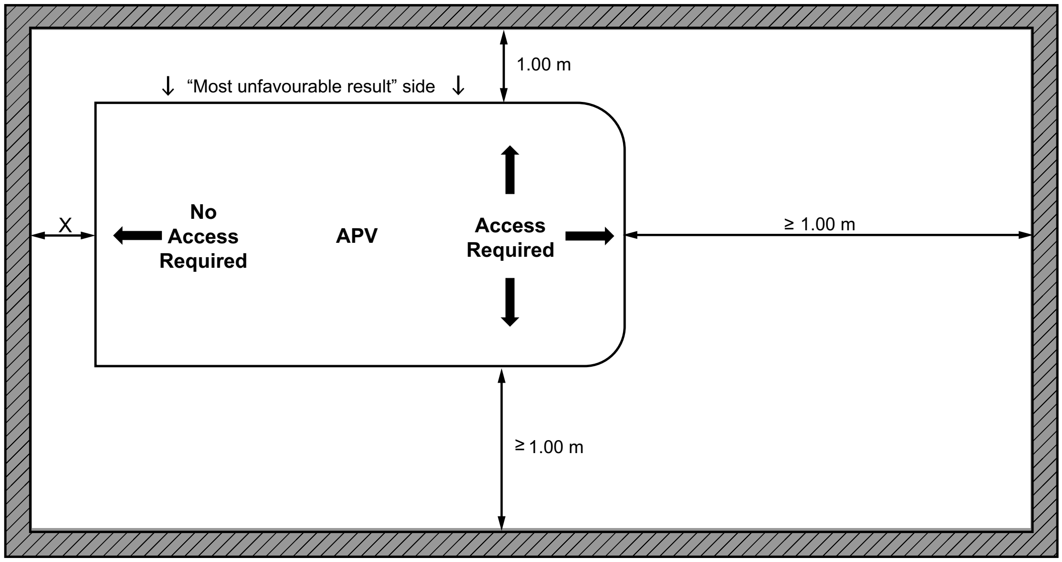
For ice machines that are not integral with a storage bin, and are designed to allow installation on top of a storage bin or an ice/beverage dispenser, the test shall be conducted with the ice machine mounted on the shortest height storage bin, or on the shortest ice/beverage dispenser available from the manufacturer placed on a 91.4 cm (36,0 in) tall countertop that is equal in depth to the base of the ice/beverage dispenser, whichever is lower in overall height. The countertop shall extend 610 ±50 mm beyond the outer edge of the appliance, on either side (see Figure CC.2DV)

CC.1DV.2 D2 ***Modify Clause CC.1 of the Part 2 by adding the following after the formula and subsequent variable key:***

CC.1DV.2.1 ***For equipment that is designed for access on more than one side, the equipment shall be installed in the test room with a minimum of 1 m of clearance on the accessible sides. The longest accessible side that produces the most unfavorable result shall be aligned with the longest wall of the test room, 1 m from the wall. One of the***

This is a preview. Click here to purchase the full publication.

nonaccessible sides, if one exists, shall be placed against the shortest wall of the test room, at a dimension X as shown in Figure CC.1DV.2.



su4075

Figure CC.1DV.2

Example Installation of Equipment Designed for Access on More Than One Side in Test Room

CC.1DV.2.2 ***For equipment designed for access on multiple sides, with a footprint area > 7,2 m², the test room area may be increased to be no greater than 24 m² plus the size of the footprint area, to allow sufficient clearance for all sides requiring access.***

CC.1DV.3 D1 ***Modify Clause CC.1 of the Part 2 by adding the following after the sentence "M is the flammable refrigerant charge (kg)";***

0,55 is a constant (m)

CC.2 Release conditions

Refrigerant is leaked from any CRITICAL POINT*, in the direction that gives the most unfavourable result.*

CC.2DV.1 DE ***Modify the first sentence of Clause CC.2 of the Part 2 by replacing it with the following:***

Refrigerant vapour is leaked from any critical point, in the direction that gives the most unfavourable result.

This is a preview. Click here to purchase the full publication.

The test is carried out with the appliance supplied at RATED VOLTAGE and with the motor-compressor operating. If fan operation can be controlled manually and independent of the motor-compressor operation fans are switched on or off whichever is more unfavourable. The test is then repeated with the appliance operating in the most unfavourable operational mode that automatically changes the fan operation.

The test shall include a CRITICAL POINT inside the refrigerated space with the door or drawers closed. After a period of 30 s ± 5 s at the end of the leak, the door or drawer shall be opened at a uniform rate over 3 s ± 0,5 s except that automatic doors are opened at the maximum speed setting. The position of the door or drawer after opening is as follows:

– drawers are fully opened;

– hinged doors are opened to an angle of 60°;

– sliding doors are opened to the end of the opening stroke;

CC.2DV.2 D2 *Modify the third paragraph of Clause CC.2 of the Part 2 by replacing it with the following:*

For units with doors or drawers, the test shall also include a CRITICAL POINT inside the refrigerated space with the door or drawers closed. After a period of 30 s ± 5 s at the end of the leak, the door or drawer shall be opened at a uniform rate over 3 s ± 0,5 s except that automatic doors are opened at the maximum speed setting. The position of the door or drawer after opening is as follows:

For ice machines with ice making evaporators that do not qualify as protected cooling systems as defined in Clause 22.111, the test shall also include a CRITICAL POINT inside the ice machine food zone with the ice storage bin door closed or the ice/beverage dispenser ice dispensing mechanism closed or in the de-energized state. A drain line shall be attached to the drain from the ice storage bin according to instructions provided by the manufacturer of the storage bin. After a period of 30 s ± 5 s at the end of the leak, the bin door shall be opened at a uniform rate over 3 s ± 0,5 s, or in the case of an ice/beverage dispenser, the ice dispenser shall be operated for a period not less than 30 s.

The test shall also be conducted without opening the ice storage bin door or without operation of the ice/beverage ice dispenser.

Thereafter, the door or drawer shall remain open for the duration of the test.

Appliances with more than one REFRIGERATING CIRCUIT require tests on each REFRIGERATING CIRCUIT containing more than 150 g of FLAMMABLE REFRIGERANT.

The mass released during the test shall be equal to the REFRIGERANT CHARGE of the tested REFRIGERATING CIRCUIT. It shall be released at a mass flow rate given by

$$\dot{m} = 0{,}32 \times \dot{q} \times M \times \left(\frac{476}{\rho_r}\right)$$
$$= \frac{152\dot{q}\,M}{\rho_r}$$

where

$\dot{m}$ is the mass flow rate of the release in g/min;

This is a preview. Click here to purchase the full publication.

$\dot{q}$ is the mass flux from Table CC.1 in (g/min)/mm^2;

ρ_r is the density in kg/m^3 of the saturated liquid refrigerant at the dew point temperature of 35 °C;

M is the REFRIGERANT CHARGE in kg;

0,32 is a constant (mm^2/kg);

476 is the saturated liquid density of R-290 at 35°C in kg/m^3.

The values of $\dot{q}$ and ρr for some FLAMMABLE REFRIGERANTS are given in Table CC.1.

CC.2DV.3 DE *Modify the sixth paragraph of Clause CC.2 of the Part 2 by replacing it with the following:*

The mass released during the test shall be equal to the RELEASABLE CHARGE (m_{rel}) of the tested refrigerating circuit. It shall be released at a mass flow rate given by

$$\dot{m} = 0{,}32 \times \dot{q} \times m_{rel} \times \left(\frac{476}{\rho_r}\right)$$
$$= \frac{152\dot{q}\, m_{rel}}{\rho_r}$$

The refrigerant shall be released such that the pressure at the inlet to the release orifice is not less than 300 kPa (gauge).

For low-pressure parts of the system, the mass flux $\dot{q}$ shall be in accordance with condition A in Table CC.1.

For high-pressure parts of the system, the mass flux $\dot{q}$ shall be in accordance with condition A in Table CC.1 to simulate motor-compressor off operating conditions and in accordance with condition B in Table CC.1 to simulate motor-compressor on operating conditions.

Table CC.1
Relevant properties and mass flux for selected flammable refrigerants

Refrigerant	Saturated Liquid density at 35°C, ρ_r [kg/m^3]	Condition A (Dew point temperature 35 °C)				Condition B (Dew point temperature 63°C)			
		Vapour pressure, ρ_o [Pa]	Ratio of specific heats k	Vapour density, ρ_o [kg/m^3]	Mass flux $\dot{q}$ [(g/min)/mm^2]	Vapour pressure, ρ_o [Pa]	Ratio of specific heats k	Vapour density, ρ_o [kg/m^3]	Mass flux $\dot{q}$ [(g/min)/mm^2]
R-32	917	2,190 x 10^6	1,84	63	316	4,200 x 10^6	3,37	150	810
R-143a	885	1,620 x 10^6	1,52	77	279	3,060 x 10^6	3,18	189	762
R-152a	873	0,790 x 10^6	1,30	25	101	1,610 x 10^6	1,46	52	225
R-E170	645	0,780 x 10^6	1,26	16	81	1,550 x 10^6	1,37	33	172
R-290	476	1,220 x 10^6	1,32	27	134	2,250 x 10^6	1,60	53	281
R-600	561	0,330 x 10^6	1,14	8	32	0,690 x 10^6	1,17	17	74

Table CC.1 Continued on Next Page

This is a preview. Click here to purchase the full publication.