Compliance is checked by the following test.

The appropriate part of the appliance under test is subjected to a pressure that is gradually increased hydraulically until the required test pressure is reached. This pressure is maintained for 1 min. The part under test shall show no leakage.

NOTE 103 The test is not carried out on motor-compressors complying with IEC 60335-2-34.

22.17 *Modification:*

The requirement is not applicable to REFRIGERATING APPLIANCES and ICE-MAKERS.

22.33 *Addition:*

Heating conductors having only one layer of insulation, shall not be in direct contact with water or ice during normal use.

NOTE 101 Frozen water is regarded as a conducting liquid.

22.101 Lampholders shall be fixed so that they do not work loose in normal use.

NOTE Normal use includes replacement of lamps.

Compliance is checked by inspection and, if necessary, by subjecting the lampholders to a torque of 0,15 Nm for E14 and B15 lampholders, and 0,25 Nm for E27 and B22 lampholders. The lampholders shall then withstand a push force and then a pull force of 10 N ± 1 N, each applied for 1 min in the direction of the axis of the lampholder.

After the tests, lampholders shall not have worked loose.

Lampholders for a fluorescent lamp shall comply with the test of 4.4.4 i) in IEC 60598-1.

22.101DV.1 DC *Modification of Clause 22.101 of the Part 2 by adding the following at the end of the second paragraph:*

E12 and E17 lamp holders are checked as specified for E14 and B15 lamp holders. E26 lamp holders are checked as specified for E27 and B22 lamp holders.

22.101DV.2 D1 *Modification of Clause 22.101 of the Part 2 by adding the following after the last sentence:*

For appliances rated at 150 V or less, a lampholder with a screw-shell base shall be wired so that the screw-shell is connected to the grounded (identified) conductor of the power supply circuit.

22.102 Insulated wire heaters and their joints located in, and in integral contact with, thermal insulation shall be protected against entry of water.

Compliance is checked by immersing three samples of the complete heating element in water containing approximately 1 % NaCl and having a temperature of 20 °C ± 5 °C for a period of 24 h.

A voltage of 1 250 V is then applied for 15 min between the LIVE PART(S) of the heating element and the water.

During the test, no breakdown shall occur.

NOTE Connections to electrical terminals are not considered as joints.

22.102DV D1 *Modification of Clause 22.102 of the Part 2 by adding Clauses 22.102DV.1 and 22.102DV.2 after the last sentence:*

22.102DV.1 Compliance with Clause 22.102 shall also be checked by cycling the heater assembly or terminal seal in an atmosphere of not less than 98% relative humidity at any convenient temperature above 0 °C (32 °F). The heater shall be energized at its RATED VOLTAGE and operated for 1 000 cycles at a rate of 1,5 min on and 13,5 min off.

22.102DV.2 Immediately after the test, the heater assembly shall withstand the electric strength test of Clause 16.3.

22.103 Appliances employing a TRANSCRITICAL REFRIGERATION SYSTEM shall in the high pressure side of the refrigeration system include a PRESSURE RELIEF DEVICE on the compressor or between the compressor and the GAS COOLER. There shall be no shut off devices or other components except piping between the compressor and the PRESSURE RELIEF DEVICE, which could introduce a pressure drop.

The PRESSURE RELIEF DEVICE shall be mounted so that the refrigerant released from the system cannot cause any harm to the user of the appliance. The aperture shall be located so that it is unlikely to be obstructed in normal use.

The PRESSURE RELIEF DEVICE shall have no provisions for setting by the end user.

The operating pressure of the PRESSURE RELIEF DEVICE shall be no higher than the DESIGN PRESSURE of the high pressure side.

The DESIGN PRESSURE of the high pressure side shall be not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34 divided by 3.

The refrigeration system, including all components, shall withstand the pressures expected in normal and abnormal use and during standstill.

Pressure testing has to be done on the complete refrigeration system, however it can be done separately for the low pressure side and for the high pressure side.

Compliance is checked by inspection and by the following test:

The PRESSURE RELIEF DEVICE is made inoperable and the test pressure is raised gradually

− for the high pressure side, until a pressure not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34 is reached, however not less than 3 times the DESIGN PRESSURE;

− for the low pressure side, until a pressure not less than the minimum low side test pressure required in Table 102 of IEC 60335-2-34 is reached.

For a refrigeration system with an intermediate pressure between high pressure side and low pressure side, all parts subjected to the intermediate pressure are considered to be on the low pressure side.

The pressure is maintained for one minute and the parts under test shall show no leakage.

NOTE The test is not carried out on motor-compressors complying with IEC 60335-2-34.

22.104 Appliances with two or more temperature control devices which control the same motor-compressor shall not cause undue operation of the thermal motor-protector of the motor-compressor.

Compliance is checked by the following test.

The appliance is operated at RATED VOLTAGE under NORMAL OPERATION except that user adjustable temperature control devices are set to give cyclic operation.

When steady conditions are established, and immediately after a breaking of the first control device the second control device is activated. The thermal motor-protector of the motor-compressor shall not operate.

In the case of appliances where more than two control devices may act on a motor-compressor, the test is carried out separately with each combination of control devices.

22.105 For mains-operated appliances which can also be battery operated, the battery circuit shall be insulated from LIVE PARTS by DOUBLE INSULATION or REINFORCED INSULATION.

Moreover, it shall not be possible to touch LIVE PARTS when making the connections to the battery. This applies even if covers, or other parts, which have to be removed to make the connections are NON-DETACHABLE PARTS.

Compliance is checked by inspection and by the tests specified for DOUBLE INSULATION or REINFORCED INSULATION.

22.106 The mass of refrigerant in COMPRESSION-TYPE APPLIANCES which use FLAMMABLE REFRIGERANT in their cooling system shall not exceed 150 g in each separate refrigerant circuit.

Compliance is checked by inspection.

22.107 COMPRESSION-TYPE APPLIANCES with a protected cooling system and which use FLAMMABLE REFRIGERANTS shall be constructed to avoid any fire or explosion hazard, in the event of leakage of the refrigerant from the cooling system.

NOTE 1 Separate components such as THERMOSTATS which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

NOTE 2 Appliances with a protected cooling system are those

– without any part of the cooling system inside a food storage compartment;

– where any part of the cooling system which is located inside a food storage compartment is constructed so that the refrigerant is contained within an enclosure with at least two layers of metallic materials separating the refrigerant from the food storage compartment. Each layer shall have a thickness of at least 0,1 mm. The enclosure has no joints other than the bonded seams of the evaporator where the bonded seam has a width of at least 6 mm;

– where any part of the cooling system which is located inside a food storage compartment has the refrigerant contained in an enclosure which itself is contained within a separate protective enclosure. If leakage from the containing enclosure occurs, the leaked refrigerant is contained within the protective enclosure and the appliance will not function as in normal use. The protective enclosure shall also withstand the test of 22.7. No critical point in the protective enclosure shall be located within the food storage compartment.

NOTE 3 Separate compartments with a common air circuit are considered to be a single compartment.

Compliance is checked by inspection and by the tests of 22.107.1, 22.107.2 and if necessary, 22.107.3.

NOTE 4 An appliance with a protected cooling system which, when tested, is found not to comply with the requirements specified for a protected cooling system, may be considered as having an unprotected cooling system if it is tested in accordance with 22.108 and found to comply with the requirements for an unprotected cooling system.

22.107.1 *A leakage is simulated at the most critical point of the cooling system. For refrigerant circuits that do not meet the corrosion requirements of 22.107.3 a leak is also simulated at any point of the cooling circuit that is nearest to an entry of a pipe or cable into a food storage compartment.*

NOTE 1 Critical points are only interconnecting joints between parts of the refrigerant circuit including the gasket of a semi-hermetic motor compressor. Aluminium to copper joints are also critical points unless they are protected against corrosion by a coating or sleeving that excludes oxygen. Welded telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints. To find the most critical point of the cooling system, it may be necessary to carry out more than one test.

The method for simulating a leakage is to inject the refrigerant vapour through a capillary tube at the critical point. The capillary tube shall have a diameter of 0,7 mm ± 0,05 mm and a length between 2 m and 3 m.

NOTE 2 Care should be taken that the installation of the capillary tube does not unduly influence the results of the test and that the foam does not enter the capillary tube during foaming. The capillary tube may need to be positioned before the appliance is foamed.

During this test the appliance is tested with doors and lids closed, and is switched off or operated under NORMAL OPERATION at RATED VOLTAGE, whichever gives the more unfavourable result.

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The quantity of refrigerant of the type indicated by the manufacturer to be injected is equal to 80 % of the nominal charge of the refrigerant ±1,5 g or the maximum which can be injected in one hour, whichever is the smaller.

The quantity injected is taken from the vapour side of a gas bottle which shall contain enough liquid refrigerant to ensure that at the end of the test there is still liquid refrigerant left in the bottle.

If a blend can fractionate, the test is carried out using the fraction that has the smallest value of the lower explosive limit.

The gas bottle is kept at a temperature of

a) 32 °C ± 1 °C for leakage simulation on low-side pressure circuits;

b) 70 °C ± 1 °C for leakage simulation on high-side pressure circuits.

NOTE 3 The quantity of gas injected should preferably be measured by weighing the bottle.

The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test and for at least 24 h after injection of the gas has stopped, inside and outside the food storage compartment, as close as possible to electrical components which, during NORMAL OPERATION, or abnormal operation, produce sparks or arcs.

The concentration is not measured close to

– NON-SELF-RESETTING PROTECTIVE DEVICES necessary for compliance with Clause 19 even if they produce arcs or sparks during operation;

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests of Clause 19 even if they produce arcs or sparks during operation;

– electrical apparatus that has been tested and found to comply with at least the requirements in Annex CC.

NOTE 4 The instrument used for monitoring gas concentration, such as those which use infrared sensing techniques, should have a fast response, typically 2 s to 3 s and should not unduly influence the result of the test.

NOTE 5 If gas chromatography is to be used, the gas sampling in confined areas should occur at a rate not exceeding 2 ml every 30 s.

NOTE 6 Other instruments are not precluded from being used provided that they do not unduly influence the results.

The measured value shall not exceed 75 % of the lower explosive limit of the refrigerant specified in Table 102 and shall not exceed 50 % of the lower explosive limit of the refrigerant specified in Table 102 for a period exceeding 5 min.

NOTE 7 For appliances with a protected cooling system, there are no additional requirements applicable to electrical components located inside food storage compartments.

22.107.2 *All ACCESSIBLE surfaces of protected cooling system components, including ACCESSIBLE surfaces in intimate contact with protected cooling systems, are scratched using the TOOL whose tip is shown in Figure 102.*

The TOOL is applied using the following parameters:

– force at right angles to the surface to be tested ..... 35 N ±3 N;

– force parallel to the surface to be tested ..... not exceeding 250 N.

The TOOL is drawn across the surface to be tested at a rate of approximately 1 mm/s.

The surface to be tested is scratched at three different positions in a direction at right angles to the axis of the channel and at three different positions on the channel in a direction parallel to it. In the latter case, the length of the scratch shall be approximately 50 mm.

The scratches shall not cross each other.

The appropriate part of the appliance shall withstand the test of 22.7, the test pressure being reduced by 50 %.

22.107.3 *If aluminium having a purity of less than 99,5 % according to ISO 209 is used in a protected cooling system that is embedded in thermal insulation, a sample of the cooling system is subjected to the salt mist test of IEC 60068-2-11for a test duration of 48 h.*

After the test there shall be no sign of blistering, pitting or other active corrosion of the aluminium or its coating, if any.

NOTE Aluminium with an ISO designation of Al 99,5 or an international registration record of 1050 A has a purity of 99,5 %.

22.108 For COMPRESSION-TYPE APPLIANCES with unprotected cooling systems and which use FLAMMABLE REFRIGERANTS, any electrical component located inside the food storage compartment, which during NORMAL OPERATION or abnormal operation produces sparks or arcs and luminaires, shall be tested and found at least to comply with the requirements in Annex CC for group IIA gases or the refrigerant used.

This requirement does not apply to

– NON-SELF-RESETTING PROTECTIVE DEVICES necessary for compliance with Clause 19, even if they produce arcs or sparks during operation; nor to

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests of Clause 19, even if they produce arcs or sparks during operation.

Refrigerant leakage into food storage compartments shall not result in an explosive atmosphere outside the food storage compartments in areas where electrical components that produce arcs and sparks during NORMAL OPERATION or abnormal operation or luminaires are mounted, when doors or lids remain closed or when opening or closing doors or lids, unless these components have been tested and found at least to comply with the requirements in Annex CC, for group IIA gases or the refrigerant used.

This requirement does not apply to

– NON-SELF-RESETTING PROTECTIVE DEVICES necessary for compliance with Clause 19, even if they produce arcs or sparks during operation; nor to

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests of Clause 19 even if they produce arcs or sparks during operation.

NOTE 1 Separate components such as THERMOSTATS which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

NOTE 2 Appliances with an unprotected cooling system are those where at least one part of the cooling system is placed inside a food storage compartment or those which do not comply with 22.107.

NOTE 3 Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by the IEC 60079 series are also acceptable.

NOTE 4 Changing of a lamp is not considered a potential explosion hazard, because the door or lid is open during this operation.

Compliance is checked by inspection, by the appropriate tests of IEC 60079-15 and by the following test.

NOTE 5 The tests called up by Annex CC may be carried out using the stoichiometric concentration of the refrigerant used. However, apparatus which has been independently tested and found to comply with Annex CC using the gas specified for group IIA need not be tested.

NOTE 6 Irrespective of the requirement given in 5.4 of IEC 60079-15, surface temperature limits are specified in 22.110.

The test is performed in a draught-free location with the appliance switched off or operated under conditions of NORMAL OPERATION at RATED VOLTAGE, whichever gives the more unfavourable result.

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The test is carried out twice and is repeated a third time if one of the first tests gives more than 40 % of the lower explosive limit.

Through an appropriate orifice, 80 % of the nominal refrigerant charge ±1,5 g, in the vapour state is injected into a food storage compartment in a time not exceeding 10 min. The orifice is then closed. The injection shall be as close as possible to the centre of the back wall of the compartment at a distance from the top of the compartment approximately equal to one-third of the height of the compartment. Thirty minutes after the injection is completed, the door or lid is opened at a uniform rate in a time between 2 s and 4 s, to an angle of 90° or to the maximum possible, whichever is less.

For appliances having more than one door or lid, the most unfavourable sequence or combination for opening the lids or doors is used.

For appliances fitted with fan motors the test is done with the most unfavourable combination of motor operation.

The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test, at positions as close as possible to electrical components. However, it is not measured at the positions of

– NON-SELF-RESETTING PROTECTIVE DEVICES necessary for compliance with Clause 19, even if they produce arcs or sparks during operation;

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests of Clause 19, even if they produce arcs or sparks during operation.

The concentration values are recorded for a period of 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower explosive limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower explosive limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

The above test is repeated, except that the door or lid is subjected to an open/close sequence at a uniform rate in a time of between 2 s and 4 s, the door or lid being opened to an angle of 90° or to the maximum possible, whichever is less, and closed during the sequence.

22.109 COMPRESSION-TYPE APPLIANCES which use FLAMMABLE REFRIGERANTS shall be constructed so that leaked refrigerant will not stagnate and thus cause a fire or explosion hazard in areas outside the food storage compartments where components producing arcs or sparks or luminaires are mounted.

This requirement does not apply to areas where

– NON-SELF-RESETTING PROTECTIVE DEVICES necessary for compliance with Clause 19, or

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests of Clause 19

are mounted, even if they produce arcs or sparks during operation.

NOTE 1 Separate components such as THERMOSTATS which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage of the component itself.

Compliance is checked by the following test, unless luminaires and components that produce arcs or sparks during NORMAL OPERATION or abnormal operation, and which are mounted in the areas under consideration, have been tested and found at least to comply with the requirements in Annex CC for group IIA gases or the refrigerant used.

NOTE 2 Irrespective of the requirement given in 5.4 of IEC 60079-15, surface temperature limits are specified in 22.110.

NOTE 3 Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by the IEC 60079 series are also acceptable.

The test is performed in a draught-free location with the appliance switched off or operated under NORMAL OPERATION at RATED VOLTAGE whichever gives the more unfavourable result.

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

A quantity equal to 50 % of the refrigerant charge ±1,5 g is injected into the considered area.

Injection is to be at constant rate over a period of 1 h and is to be at the point of closest approach of

– pipework joints in external parts of the cooling circuit, or

– the gasket of semi-hermetic motor-compressors

to the electrical apparatus under consideration; any direct injection shall be avoided.

NOTE 4 Welding telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints.

The concentration of leaked refrigerant as close as possible to the electrical component is measured at least every 30 s from the beginning of the test until 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower explosive limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower explosive limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

22.110 Temperatures on surfaces that may be exposed to leakage of FLAMMABLE REFRIGERANTS shall not exceed the ignition temperature of the refrigerant as specified in Table 102, reduced by 100 K.

Compliance is checked by measuring the appropriate surface temperatures during the tests specified in Clauses 11 and 19.

Temperatures of

– NON-SELF-RESETTING PROTECTIVE DEVICES that operate during the tests specified in Clause 19, or of

– INTENTIONALLY WEAK PARTS that become permanently open-circuited during the tests specified in Clause 19

are not measured during those tests specified in Clause 19 that cause these devices to operate.

Table 102
Refrigerant flammability parameters

Refrigerant number	Refrigerant name	Refrigerant formula	Refrigerant ignition temperature [a c] °C	Refrigerant lower explosive limit [b c d] % V/V
R50	Methane	CH_4	537	4,4
R290	Propane	$CH_3CH_2CH_3$	470	1,7
R600	n-Butane	$CH_3CH_2CH_2CH_3$	372	1,4
R600a	Isobutane	$CH(CH_3)_3$	494	1,8

[a] Values for other FLAMMABLE REFRIGERANTS can be obtained from IEC 60079-4/IEC 60079-4A and IEC 60079-20.

[b] Values for other FLAMMABLE REFRIGERANTS can be obtained from IEC 60079-20 and ISO 5149.

[c] IEC 60079-20 is the reference standard. ISO 5149 may be used if the may be used if the required data is not contained in IEC 60079-20.

[d] Concentration of refrigerant in dry air.

Table 102DV D1 ***Modification of Table 102 of the Part 2 by replacing with the following:***

Table 102DV
Refrigerant flammability parameters

Refrigerant number	Refrigerant name	Refrigerant formula	Refrigerant ignition temperature [a c] °C	Refrigerant lower explosive limit [b c d e] % V/V
R50	**Methane**	**CH_4**	**600**	**4,4**
R290	**Propane**	**$CH_3CH_2CH_3$**	**450**	**1,7**
R600	**n-Butane**	**$CH_3CH_2CH_2CH_3$**	**372**	**1,4**
R600a	**Isobutane**	**$CH(CH_3)_3$**	**460**	**1,8**

[a] Values for other FLAMMABLE REFRIGERANTS can be obtained from IEC 60079-20-1 and ISO 5149-1.

[b] Values for other FLAMMABLE REFRIGERANTS can be obtained from IEC 60079-20-1 and ISO 817.

[c] IEC 60079-20-1 is the reference standard. ISO 5149-1 and ISO 817 may be used if the required data is not contained in IEC 60079-20-1.

[d] Concentration of refrigerant in dry air.

[e] In some standards, the term "flammability limit" is used for "explosive limit".

22.111 In COMPRESSION-TYPE APPLIANCES which use FLAMMABLE REFRIGERANT in their cooling system, all possible inadvertent contact points between uncoated aluminium and copper pipes or similar dissimilar metals shall be prevented from galvanic coupling by positive means such as the use of insulated sleeving or spacers.

Compliance is checked by inspection.

22.112 The doors and lids of compartments in appliances with a free space shall be capable of being opened from the inside.

Compliance is checked by the following test.

The empty appliance is disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented, adjusted or blocked so as to prevent the appliance from moving. Locks, if any, on doors or lids are left unlocked.

Doors and lids are closed for a period of 15 min.

A force is then applied to a point, equivalent to an ACCESSIBLE *inside point, of each appropriate door or lid of the appliance, at the midpoint of the edge farthest from the hinge axis in the direction perpendicular to the plane of the lid or door.*

The force shall be applied at a rate not exceeding 15 N/s and the lid or door shall open before the force exceeds 70 N.

NOTE 1 The force may be applied by means of a spring balance with the aid of a suction pad if necessary, to the point on the outer surface of the door or lid which corresponds to the ACCESSIBLE inside point.

NOTE 2 If the handle of the door or lid is at the mid-point of the edge farthest from the hinge axis, the force may be applied by means of a spring balance, to the handle. In this case, the value of the force required to open the door or lid from the inside may be determined by the proportional calculation relating to the distances of the handle and the ACCESSIBLE inside point from the hinge axis.

22.112DV DR *Modification of Clause 22.112 of the Part 2 to replace paragraphs three through six and the notes with Clause 22.112DV.1:*

22.112DV.1 Door latch release test

NOTE For the US, reference 16 CFR Part 1750.

22.112DV.1.1 A door-latching device shall permit the door to open with a force of 66,7 N (15 lbf) or less applied at the rate of 13 – 18 N/s (3 – 4 lbf/s). This test shall be conducted before and after the conditioning specified in Clause 22.112DV.1.5.

22.112DV.1.2 A magnetic door gasket shall be considered a door-latching device, although not a self-latching lock.

22.112DV.1.3 When the test in Clause 22.112DV.1.1 is applied to a door with an adjustable spring closing or counterbalancing mechanism, the mechanism shall be adjusted to the position requiring maximum opening force.

22.112DV.1.4 The release force measurements shall be made by means of a force gauge at three points on the inside ACCESSIBLE door or door liner edge on the side opposite the hinges. One point shall be near the top of the door, one point near the bottom of the door, and one point midway between these two points. The test shall be conducted with the entire refrigerator in any convenient ambient temperature. The force measurements shall be made at points on the outer door surface corresponding to the three internal points.

22.112DV.1.5 A refrigerator or combination refrigerator-freezer door shall be subjected to 300 000 cycles of door operation. A freezer door shall be subjected to 150 000 cycles of operation. The door shall be opened sufficiently on each cycle to provide a complete cycle of operation of the latch mechanism. At the conclusion of this test, the latch release device shall comply with the requirements of Clause 22.112DV.1.1.

22.113 Drawers which are only ACCESSIBLE after opening a door or lid shall not contain a FREE SPACE.

Compliance is checked by inspection and measurement.

22.114 Drawers which are ACCESSIBLE without opening a door or lid and which contain a free space shall