

**In the event of any doubt or misunderstanding arising from this translation,
the standard in Thai will be held to be authoritative.**

Unofficial Translation

TIS 2214-2548 (2005)

THAI INDUSTRIAL STANDARD

for

HOUSEHOLD REFRIGERATORS :

SAFETY REQUIREMENTS

1. Scope

Clause 1. of TIS 1375 is replaced by the following.

This standard deals with the safety of the **household refrigerators**, their **rated voltage** being not more than 250 V for single-phase **household refrigerators**, 480 V for other **household refrigerators**, hereinafter referred to as “refrigerator”.

- refrigerators intend to be operated from the mains;
- **compression-type refrigerators.**

As far as is practicable, this standard deals with the common hazards presented by refrigerators that are encountered by all persons in and around the home. However in general it does not take into account

- the use of refrigerators by young children or infirm persons without supervision;
- playing with the refrigerators by young children.

NOTE 1 Attention is drawn to the fact that

- for refrigerators intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
- additional requirements are specified by the health authorities, the authorities responsible for the protection of labour and the authorities responsible for transportation.

NOTE 2 This standard does not apply to

- refrigerators intended to be used in the open air;
- refrigerators designed exclusively for industrial purposes;

- refrigerators intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- refrigerators incorporating a battery intended as a power supply for the refrigerating function;
- refrigerators assembled on site by the installer;
- refrigerators with remote motor-compressors;
- motor-compressors (IEC 60335-2-34);
- commercial dispensing appliances and vending appliances (IEC 60335-2-75);
- commercial ice-cream appliances.

2. Normative references

Clause 2. of TIS 1375 is applicable except as follows.

Addition:

IEC 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

IEC 60079-4A, *Electrical apparatus for explosive gas atmospheres - Part 4: Method of test for ignition temperature - First supplement*

IEC 60079-15:1987, *Electrical apparatus for explosive gas atmospheres - Part 15: Electrical apparatus with type of protection "n"*

IEC 60079-20:1996, *Electrical apparatus for explosive gas atmospheres - Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus*

IEC 60335-2-34, *Household and similar electrical appliances - Safety - Part 2-34: Particular requirements for motor-compressors*

ISO 817:1974, *Organic refrigerants - Number designation*

ISO 3864:1984, *Safety colours and safety signs*

ISO 5149:1993, *Mechanical refrigerating systems used for cooling and heating – Safety requirements*

3. Definitions

Clause 3. of TIS 1375 is applicable except as follows.

3.1.9 *Replacement:*

normal operation

operation of the refrigerator under the following conditions

3.2.9.101 normal operation of household refrigerator

operation at an ambient temperature in accordance with 5.7, empty, with the doors and lids closed. User-adjustable temperature control devices which control the operation of the motor-compressor in **compression-type refrigerators**, are short-circuited or otherwise rendered inoperative

3.2.9.103 normal operation of incorporated ice-maker

operation of refrigerator incorporating ice-maker at the normal temperature of the frozen food storage compartment, with the supply water at a temperature of $15\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

3.101 household refrigerator

enclosed thermally insulated appliance of suitable volume for household use, cooled by an incorporated device which operated from the mains and having one or more compartments intended for the preservation of foodstuffs

3.102 compression-type refrigerator

refrigerator in which refrigeration is effected by the vaporization at low pressure in an **evaporator** of a liquid refrigerant, the vapour thus formed being restored to the liquid state by mechanical compression at a higher pressure and subsequent cooling in condenser

3.104 incorporated ice-maker

ice-maker specially designed to be incorporated into a frozen food storage compartment and without independent means for freezing water

3.105 heating system

heating element with associated components such as timers, switches, **thermostats** and other controls

3.107 condenser

heat exchanger in which, after compression, vaporized refrigerant is liquefied by losing heat to an external cooling medium

3.108 evaporator

heat exchanger in which, after pressure reduction, the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated

3.109 flammable refrigerant

refrigerant with a flammability classification of group 2 or 3 in accordance with ISO 5149

NOTE For refrigerant blends, which have more than one flammability classification, the most unfavourable classification is taken for the purposes of this definition.

3.111 free space

space with a volume exceeding 60 l where a child can be entrapped and which is accessible after opening any door, lid or drawer and removing any detachable internal part, including shelves, containers or removable drawers which are themselves only accessible after opening any door or lid. In calculating the volume, a space with any single dimension not exceeding 150 mm or any two orthogonal dimensions, each of which do not exceed 200 mm, is ignored.

4. General requirement

Clause 4. of TIS 1375 is applicable except as follows.

Addition:

NOTE 101 The use of **flammable refrigerants** involves additional hazards which are not associated with appliances using non-flammable refrigerants.

This standard addresses the hazards due to ignition of leaked **flammable refrigerant** by potential ignition sources associated with the appliance.

The hazard due to ignition of leaked **flammable refrigerant** by an external potential ignition source associated with the environment in which the appliance is installed is compensated by the low probability of ignition.

5. General conditions for the tests

Clause 5. of TIS 1375 is applicable except as follows.

5.2 Addition:

At least one additional specially prepared sample is required for the tests of 22.107

NOTE 101 Unless the motor-compressor conforms to IEC 60335-2-34, at least one additional specially prepared sample may be required for the test of 19.1.

NOTE 102 At least one additional sample of the fan motor and its thermal motor protector may be required for the test of 19.1.

NOTE 103 The test of 22.7 may be performed on separate sample.

NOTE 104 Due to the potentially hazardous nature of the tests of 22.107, 22.108 and 22.109, special precautions may need to be taken when performing the tests.

5.3 Addition:

Before starting the tests

- **compression-type refrigerators** shall be operated at **rated voltage** for at least 24 h, then switched off and left to stand for at least 12 h.

The test of 11.102 is carried out immediately after the tests of Clause 13.

The test of 15.105 is carried out immediately after the tests of 11.102.

The test of 15.102, and 15.103 are carried out immediately after the tests of 15.2.

5.7 Addition:

For refrigerators, tests specified in Clauses 10, 11, 13 are carried out at an ambient temperature of

32 °C ± 1 °C on refrigerators of extended temperate class (SN) and temperate class (N);

38 °C ± 1 °C on refrigerators of subtropical class (ST);

43 °C ± 1 °C on refrigerators of tropical class (T).

Before starting these tests, the refrigerator with the doors or lids open is brought to within 2 K of the ambient temperature specified.

Refrigerators classified for several climatic classes are tested at the ambient temperature relevant to the highest climatic class.

Refrigerators use in Thailand are tested at the ambient temperature of tropical class (T) only.

Other tests are carried out at an ambient temperature of 20 °C ± 5 °C

NOTE 101 Steady conditions are considered to be established when three-successive readings of the temperature, taken at approximately 60 min intervals, at the same point of any operating cycle, do not differ by more than 1 K.

5.9 *Addition:*

refrigerators incorporating an ice-maker are tested with the **incorporated ice-maker** operating to give the most unfavourable results.

5.10 *Addition:*

For the tests of 22.107, 22.108 and 22.109, the refrigerator is empty and installed as outlined below:

Built-in refrigerators are installed in accordance with the instructions for installation.

Other refrigerators are placed in a test enclosure, the walls enclosing the refrigerator as near to all its sides and the top of the refrigerator as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

5.101 Refrigerators which are constructed so that an ice-maker may be incorporated are tested with the **incorporated ice-maker**.

5.102 **Compression-type refrigerators with heating systems** are tested as **combined appliances**.

5.103 **Compression-type refrigerators** which use **flammable refrigerants** and which, according to the instructions, may be used with other electrical

appliances inside a food storage compartment are tested with such recommended appliances incorporated and being operated as in normal use.

NOTE Examples of such electrical appliances are deodorizers.

6. Classification

Clause 6. of TIS 1375 is applicable except as follows.

6.1 Addition:

Refrigerators use in Thailand shall be **class 0I, class I, class II** and **class III** only.

6.101 Refrigerators shall be of one or more of the following climatic classes:

- refrigerators of extended temperate class (SN);
- refrigerators of temperate class (N);
- refrigerators of subtropical class (ST);
- refrigerators of tropical class (T).

Compliance is checked by inspection.

NOTE The climatic classes are specified In ISO standards.

7. Marking and Instructions

Clause 7. of TIS 1375 is applicable except as follows.

7.1 Addition:

Refrigerators shall also be marked with

- the power input, In watts, of **heating systems**, if greater than 100 W;
- the defrosting input, in watts, if greater than the input corresponding to the **rated power input**;
- **rated current** in amperes;
- the maximum rated wattage of lamps, in watts;
- the total mass of the refrigerant;
- for a single component refrigerant, at least one of the following:

- the chemical name;
 - the chemical formula;
 - the refrigerant number;
- for a blended refrigerant, at least one of the following:
- the chemical name and nominal proportion of each of the components;
 - the chemical formula and nominal proportion of each of the components;
 - the refrigerant number and nominal proportion of each of the components;
 - the refrigerant number of the refrigerant blend;
- the chemical name or refrigerant number of the principal component of the insulation blowing gas.

NOTE 102 Refrigerant numbers are given in ISO 817.

For **compression-type refrigerators**, the defrosting power input in watts shall be marked separately if the current corresponding to the defrosting power input is greater than the **rated current** of the refrigerator.

Refrigerators designed for incorporating an ice-maker shall be marked with the maximum power input for an **incorporated ice-maker**, if greater than 100 W.

For **compression-type refrigerating systems**, the refrigerator shall also be marked with the mass of the refrigerant for each separate refrigerant circuit.

Compression-type a refrigerators which use **flammable refrigerants** shall be marked with warning sign B.3.2 from ISO 3864.

7.6 *Addition:*

The perpendicular height of the triangle containing the warning sign B.3.2 from ISO 3864 shall be at least 15 mm.

7.10 *Addition:*

NOTE 101 As an alternative, temperature values in degrees Celsius may be indicated on a control scale.

7.12 *Addition:*

For **compression-type refrigerators** which use **flammable refrigerants**, the instructions shall include information pertaining to the installation, handling, servicing and disposal of the refrigerator.

The instructions shall also include the substance of the warnings listed below.

- **WARNING:** Keep ventilation openings, in the refrigerator enclosure or in the built-in structure, clear of obstruction.
- **WARNING:** Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.
- **WARNING:** Do not damage the refrigerant circuit.

NOTE 103 This warning is only applicable to refrigerators with refrigerating circuits which are accessible to the user.

- **WARNING:** Do not use electrical appliances inside the food storage compartments of the refrigerator, unless they are of the type recommended by the manufacturer.

For refrigerator s which use flammable insulation blowing gases, the instructions shall include information regarding disposal of the refrigerator.

7.12.1 *Addition:*

Instructions shall include the method for replacing illuminating lamps.

For refrigerators designed for incorporating ice-makers, the instructions shall include the types of ice-makers which can be incorporated.

The instructions shall include information on the installation of **incorporated ice-makers** which are available as optional accessories and intended to be installed by the user. If it is intended that **incorporated ice-makers** are to be installed only by the manufacturer or its service agent, this shall be stated.

The instructions for **incorporated ice-makers** intended to be connected to the water supply shall state

- the maximum permissible inlet water pressure, in pascals or bars;
- the minimum permissible inlet water pressure, in pascals or bars, if this is necessary for the correct operation of the appliance;

- the substance of the following warning:

WARNING: connect to potable water supply only.

The instructions for **fixed refrigerators** shall include the substance of the following warning:

WARNING: To avoid a hazard due to instability of the refrigerator, it must be fixed in accordance with the instructions.

7.12.4 *Modification:*

This subclause is also applicable to **fixed refrigerators**.

7.15 *Addition:*

The marking of the maximum rated wattage of illuminating lamps shall be easily discernible while the lamp is being replaced.

For **compression-type refrigerators** the marking of the type of flammable refrigerant and of the flammable insulation blowing gas, as well as the warning sign B.3.2 from ISO 3864, shall be visible when gaining access to the motor-compressors.

For other refrigerators the marking of the type of flammable insulation blowing gas shall be on the external enclosure.

8. Protection against access to live parts

Clause 8. of TIS 1375 is applicable except as follows.

8.1.1 *Modification:*

Replace the second paragraph of the test specification by the following:

Lamps are not removed, provided that the the appliance can be isolated from the supply by means of a plug or an all-pole switch. However, during the insertion or removal of lamps, protection against contact with **live parts** of the lamp cap shall be ensured.

9. Starting of motor-operated appliances

This clause of TIS 1375 is not applicable.

10. Power input and current

Clause 10. of TIS 1375 is applicable except as follows.

10.1 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

- the refrigerator being operated under **normal operation** except that user adjustable temperature controls are set to give the lowest temperature.

Addition:

The power input is considered to be stabilized when steady conditions are established or when any incorporated timer operates, whichever occurs first.

A representative period is one between the marking and the breaking of the temperature control, or between the highest and lowest values of power input measured, excluding starting power input but including the power input of the **incorporated ice-makers**, if any .

NOTE 101 The power input of a defrosting system which is separately marked on, is not taken into consideration during the test.

10.2 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

- the refrigerator being operated under **normal operation** except the user adjustable temperature controls are set to give the lowest temperature.

Addition:

The refrigerator is operated for a period of 1 h or the maximum setting of an incorporated timer whichever is shorter. Excluding starting current, the maximum value of the current averaged over any 5 min period is obtained. The interval between current measurements shall not exceed 30 s.

NOTE 101 Starting current is considered to be excluded if the first current measurement is made approximately 1 min after starting.

10.101 The power input of the defrosting system shall not deviate from the defrosting power input marked on the appliance by more than the deviation shown in Table 1.

Compliance is checked by operating the refrigerator at **rated voltage** and measuring the power input of the defrosting system after the power input has stabilized.

- 10.102 The power input of any **heating system** shall not deviate from the power input of these systems marked on the refrigerator by more than the deviation shown in Table 1.

Compliance is checked by operating the refrigerator at **rated voltage** and measuring the power input of the heating system after the power input has stabilized.

11. Heating

Clause 11. of TIS 1375 is applicable except as follows.

11.1 *Modification:*

Compliance is checked by determining the temperature rise of the various parts under the conditions specified in 11.2 to 11.7.

If the winding temperatures of motor-compressors exceed the values given in Table 101, compliance is checked by the test of 11.101.

The winding temperatures of motor-compressors conforming to IEC 60335-2-34 (including its Annex AA) are not measured.

11.2 *Replacement:*

Built-in refrigerators are installed in accordance with the instructions for installation.

Refrigerators are placed in a test enclosure. The walls enclose the refrigerator as near to all its side and above as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the wall or the ceiling, in which case this distance is observed during the test.

Dull back painted plywood approximately 20 mm thick used for the test corner, supports and installation of **built-in refrigerators**.

11.7 *Replacement:*

The refrigerator is operated until steady conditions are established.

11.8 *Modification:*

Replace the text above Table 3 by the following:

During the test, **protective devices** other than self-resetting thermal motor-protectors for motor-compressors shall not operate. When steady conditions are established, self-resetting thermal motor-protectors for motor-compressors shall not operate.

During the test, sealing compound, if any, shall not flow out.

During the test, temperature rises are monitored continuously.

For refrigerators of extended temperate class (SN) or temperate class (N), the temperature rises shall not exceed the values given in Table 3.

For refrigerators of subtropical class (ST) or tropical class (T), the temperature rises shall not exceed the values given in Table 3 reduced by 7 K.

Addition:

The entry in Table 3 relating to the temperature rise of the external enclosure of **motor-operated refrigerators** is applicable to all refrigerators covered by this standard. However it is not applicable to those parts of the external enclosure which are,

- for **built-in refrigerators**, not **accessible parts** after installation in accordance with the instructions for installation;
- for other refrigerators, on that part of the refrigerator which according to the instructions for installation is intended to be placed against a wall with a free distance not exceeding 75 mm.

Temperatures of

- enclosures of motor-compressors other than those with an enclosure for which the temperature rise is specified in Table 3, and
- windings of motor-compressors shall not exceed the values given in Table 101.

For motor-compressors conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of their

- enclosures, other than those with an enclosure for which the temperature rise is specified in Table 3, and
- windings and other parts .

are not measured.

Table 101 – Maximum temperatures for motor-compressors

(11.8 and 11.101)

Part of the motor-compressor	Temperature °C
Windings with - synthetic insulation	140
- cellulose insulation or the like	130
External enclosure	150

11.101 If the temperatures of the windings of motor-compressors other than those complying with IEC 60335-2-34 (including its Annex AA) are higher than the temperature limits given in Table 101, the test is carried out again, the thermostat or similar control device being set at the lowest temperature, and the short circuit of the user-adjustable temperature control device removed.

The winding temperatures are measured at the end of a running cycle.

The temperatures shall be not higher than the temperature limits given in Table 101.

11.102 Any defrosting system shall not give rise to excessive temperatures.

Compliance is checked by the following test.

The refrigerator is supplied at the most unfavourable voltage between 0.49 and 1.06 times the **rated voltage**:

- in the case of refrigerators where defrosting is manually controlled, until the evaporator is coated with a layer of frost;
- in the case of refrigerators where defrosting is automatically or semi-automatically controlled, until the **evaporator** is coated with a layer of frost; however, this layer shall be not thicker than that which occurs in normal use during the intervals between the successive automatic defrosting operations or, for the semi-automatic defrosting, during the intervals between the defrosting operations recommended by the manufacturer, if any.

NOTE 1 One method of accumulation of frost for refrigerators is given in Annex BB.

With the defrosting system operating:

- for **compression-type refrigerators** in which the defrosting system can be energized with the rest of the refrigerator unenergized, the supply voltage is as specified in 11.4;
- for other **compression-type refrigerators**, the supply voltage is as specified in 11.6.

NOTE 2 The defrosting system is regarded as being able to be energized separately if this can be done without the use of a tool.

If the defrosting time is controlled by an adjustable device, the device is set to the time recommended by the manufacturer. If a control device is used which stops the defrosting at a given temperature or pressure, the defrosting period is automatically terminated when the control operates.

For manually controlled defrosting, the test is continued until steady conditions are established, otherwise the test is continued until the defrosting period is automatically terminated by a control device.

The temperatures of combustible materials and of electrical components liable to be affected by the defrosting operation are measured with thermocouples.

The temperatures and temperature rises shall not exceed the values given in 11.8.

NOTE 3 During the recovery period after defrosting, the thermal overload protector of the motor compressor may operate.

11.103 **Heating systems**, other than defrosting systems, incorporated in a refrigerator shall not give rise to excessive temperatures.

Compliance is checked by the following test.

Heating systems other than defrosting systems are energized as follows:

- for **compression-type refrigerators** in which the heating system can be energized with the rest of the refrigerator unenergized, the supply voltage is as specified in 11.4;
- for other **compression-type refrigerators** the supply voltage is as specified in 11.6.

NOTE The defrosting system is regarded as being able to be energized separately, if this can be done without the use of a tool.

The test is continued until steady conditions are established.

Temperature rises are measured by means of thermocouples fixed on the outside surface of the insulation of the **heating systems**.

Temperature rises shall not exceed the values given in 11.8.

12. Void

13. Leakage current and electric strength at operating temperature

Clause 13. of TIS 1375 is applicable except as follows.

13.2 *Modification:*

Instead of the values specified for **class 0I** and **class I** refrigerators, the following values apply:

- for **class 0I** refrigerators 0,75 mA;
- for **class I** refrigerators the values specified for the stationary **class I appliances**.

13.3 *Addition:*

The test voltage specified in Table 4 for reinforced insulation is applied between separate circuits for battery operation and mains supply operation.

14. Transient overvoltages

Clause 14. of TIS 1375 is applicable.

15. Moisture resistance

Clause 15. of TIS 1375 is applicable except as follows.

15.2 *Addition:*

Lamp covers are not removed.

- 15.101 Refrigerators subject to spillage of liquid from containers onto the inside walls of the cabinet or compartment, or onto the top of the cabinet shall be constructed so that such spillage does not affect their electrical insulation.

Compliance is checked by the relevant tests of 15.102, 15.103 and 15.104.

- 15.102 The apparatus shown in Figure 101 is filled with water containing approximately 1% NaCl and 0.6% of acid rinsing agent, as specified in Annex AA of IEC 60335-2-5, to the level of the lip, and the displacement block is supported just above the water by means of any suitable release mechanism and bridge support.

All shelves and containers which can be removed without the use of a **tool** are removed and the refrigerator is disconnected from the supply. Lamp covers are not removed.

The apparatus is supported with its base horizontal and so positioned and at such a height that when the release mechanism is operated, the water is discharged over the back and side interior walls of the cabinet or compartment including any electrical components mounted thereon, in the most unfavourable manner. The test is made only once with the apparatus in any on position, but the test may be repeated as many times as necessary in different positions, provided that there is no residual water on parts wetted by a previous test.

Immediately after the test, the refrigerator shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.

Furthermore, if the inspection shows that water is in contact with the defrost heating element or its insulation, then the apparatus shall withstand the test of 22.102.

- 15.103 Refrigerators are tilted at an angle of up to 2° in relation to the position of normal use in the direction which is likely to be the most unfavourable for this test. One half-litre of water containing approximately 1% NaCl and 0.6% of acid rinsing agent, as specified in Annex AA of IEC 60335-2-5, is poured uniformly over the top of the refrigerator in approximately 60 s at the most unfavourable place from a height of approximately 50 mm with the controls in the on position and the refrigerator disconnected from the supply.

Immediately after the test, the refrigerator shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.

15.105 Operation of a defrosting system shall not affect the electrical insulation of defrost heating elements.

Compliance is checked by the following test.

Immediately after the test of 11.102, the refrigerator shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.

Furthermore, if the inspection shows that water is in contact with the defrost heating element or its insulation, then the apparatus shall withstand the test of 22.102.

16. Leakage current and electric strength

Clause 16. of TIS 1375 is applicable except as follows.

16.2 Modification:

Instead of the values specified for **class 0I** refrigerators and **class I** refrigerators, the following values apply:

- for **class 0I** refrigerators 0.75 mA;
- for **class I** refrigerators the values specified for the stationary **class I appliances**.

17. Overload protection of transformers and associated circuits

Clause 17. of TIS 1375 is applicable.

18. Endurance

This clause of TIS 1375 is not applicable.

19. Abnormal operation

Clause 19. of TIS 1375 is applicable except as follows.

19.1 *Addition:*

Subclauses 19.2 and 19.3 do not apply to **heating systems**.

In addition, fan motors and their thermal motor-protectors, if any, are subjected to the test specified in Annex AA.

NOTE 101 For any given type of fan motor and thermal motor-protection combination, this test is performed only once.

Motor-compressors not conforming to IEC 60335-2-34 are subjected to the tests specified in IEC 60335-2-34, 19.101 and 19.102, and shall also conform to 19.104 of that standard.

NOTE 102 For any given type of motor-compressor, this test is performed only once.

19.8 *Addition:*

This test is not applicable to three-phase motor-compressors complying with IEC 60335-2-34.

19.9 Not applicable

19.13 *Addition:*

The temperature of the housing of motor-compressors other than those which comply with IEC 60335-2-34 is determined at the end of the test period and shall not exceed 150 °C

19.101 **Heating systems** shall be so dimensioned and located that there is no risk of fire even in the case of abnormal operation.

Compliance is checked by inspection and the following test.

Doors and lids of the refrigerator are closed and the refrigerating system is switched off.

Any **heating system** intended to be switched on and off by the user is switched on.

Heating systems are continuously energized at a voltage equal to 1.1 times their **working voltage**, until steady conditions are established. If there is more than one heating system, they are operated each in turn,

unless failure of a single component will cause two or more to operate together, in which case they are tested in combination.

NOTE It may be necessary to short-circuit one or more components which operate during **normal operation** in order to ensure that the **heating systems** are continuously energized. **Self-resetting thermal cut-outs** are short-circuited unless they comply with 24.1.2, the number of cycles of operation being 100 000.

The refrigerating system is not switched off if this prevents the **heating system** from operating.

During and after the test, the refrigerator shall comply with 19.13.

19.102 Compliance is checked by applying any defect which may be expected in normal use, while the **incorporated ice-maker** of refrigerators is operated under **normal operation** at **rated voltage**. Only one fault condition is reproduced at a time and the tests are made consecutively.

During the tests, the temperatures of the windings of the **incorporated ice-maker** incorporating the refrigerator shall not exceed the values given in Table 8.

During and after the tests, the refrigerator shall comply with 19.13.

NOTE 1 Examples of fault conditions are:

- timer stopping in any position;
- disconnection and reconnection of one or more phases of the supply during any part of the programme;
- open-circuiting or short-circuiting of components;
- failure of a magnetic valve;
- operation with an empty container.

NOTE 2 In general, tests are limited to those cases which may be expected to give the most unfavourable results.

NOTE 3 The tests are made with the tap closed or opened, whichever gives the more unfavourable result.

NOTE 4 For the purpose of these tests, thermal controls are not short-circuited.

NOTE 5 Components complying with the relevant IEC standard are not open-circuited or short-circuited, provided the appropriate standard covers the conditions which occur in the refrigerator.

NOTE 6 Water level switches complying with IEC 61058-1 are not short-circuited during these tests.

NOTE 7 The test during which the automatic filling device is held open has already been made during the test of 15.104.

19.104 Illuminating equipment shall not cause any fire hazard under abnormal operating conditions.

Compliance is checked by the following test,

The refrigerator complete with illuminating equipment including its protective cover, fitted with a lamp as recommended by the manufacturer, and with a rated wattage equal to the maximum rated wattage marked on the refrigerator, is operated for 12 h at 1.06 times the **rated voltage**. The refrigerating system is switched off with the refrigerator empty and door or lids fully opened.

If the lamp does not attain the maximum rated wattage at **rated voltage**, the voltage is varied until the maximum rated wattage is reached and then increased to 1.06 times this voltage.

During and after the test, the refrigerator shall comply with 19.13.

20. Stability and mechanical hazards

Clause 20. of TIS 1375 is applicable except as follows.

20.101 Refrigerators shall have adequate stability. If stability of the appliance is provided by an open door, the door shall be designed to provide support.

This requirement does not apply to **built-in refrigerators**.

Compliance is checked by inspection and by the tests of 20.102, 20.103 and 20.104 which are carried out after the empty refrigerator has been disconnected from the supply, placed on a horizontal support and leveled in accordance with the instructions for installation, with castors and rollers, if any, oriented or adjusted to the most unfavourable position. **Fixed refrigerators** having a height (including stand) exceeding 1.3 m are installed in accordance with the instructions for installation.

NOTE 1 Fixed refrigerators with a height (including stand) not exceeding 1.3 m are tested as free-standing refrigerators.

During these tests the refrigerator shall not tip and, after the tests, compliance with Clauses 8, 16 and 29 shall not be impaired.

NOTE 2 Any displacement of the refrigerator from its horizontal position by more than 2° is considered tipping.

20.102 Refrigerators provided with doors shall be subjected to the following test.

Unless otherwise specified in this standard, all door shelves, other than those which are specifically designed for storing eggs shall be loaded using cylindrical weights having a diameter of 80 mm and a mass of 0.5 kg.

NOTE 1 If egg racks can be removed, the relevant shelf is not considered to be specifically designed for storing eggs.

The weights are placed on the door shelves starting as far as possible from the hinge and touching each other along the shelf, except for a space less than 80 mm wide at the end of the shelf. Two of these weights are placed in each position on those shelves where a container with a height of 170 mm can be accommodated, whereas one weight at each position is used on the other shelves to be loaded.

NOTE 2 If the shelf is too narrow to accommodate the weights lying flat, the weights may overhang the shelf or be tipped up.

Liquid containers located on the door are filled with a quantity of water to their full mark or, in the absence of a full mark, are completely filled.

For refrigerators with only one door, this is opened through an angle of approximately 90° and a weight of 2.3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For refrigerators with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2.3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

The test is repeated with the door or doors opened through an angle of approximately 180° or to the limit of the door stop, whichever results in the smaller angle of opening.

Where refrigerators are provided with reversible doors, the test with the doors open to 180° or to the limit of the door stop is repeated with the doors hinged on the other side in accordance with the instructions, if this will give a more unfavourable result.

- 20.103 Refrigerators provided with sliding drawers inside food storage compartments are subjected to the following test.

Each drawer is loaded with a uniformly distributed load/unit storage volume of the drawer of 0.5 kg/l

NOTE Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.

In refrigerators provided with up to three sliding drawers within food storage compartments, one of the drawers, selected to give the most unfavourable result, is pulled to the most onerous out position or to its stops, if fitted, with the appropriate door opened through an angle of approximately 90°.

In refrigerators provided with more than three sliding drawers within food storage compartments, two non-adjacent drawers, selected to give the most unfavourable result, are pulled to their most onerous out position or to their stops, if fitted, with any door necessary to gain access to the drawers opened through an angle of approximately 90°.

The door shelves on opened doors are loaded in accordance with 20.102

- 20.104 Refrigerators provided with sliding drawers accessible without opening a door are subjected to the following test.

Each drawer is loaded with a uniformly distributed load/unit storage volume of the compartments of 0.5 kg/l.

NOTE Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.

One drawer, selected to give the most unfavourable result is pulled to its most onerous out position or to its stops; if fitted, and a weight of 23 kg is gently applied to or suspended from the centre of the drawer.

For refrigerators with a door or doors, the door shelves are loaded as specified in 20.102.

For refrigerators with only one door, this is opened through an angle of approximately 90° and a weight of 2.3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For refrigerators with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2.3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

21. Mechanical strength

Clause 21. of TIS 1375 is applicable except as follows.

NOTE 101 Covers of lamps within the appliance are considered likely to be damaged in normal use. Lamps are not tested.

21.102 Lamps shall be protected against mechanical shocks.

Compliance is checked by applying a 75 mm ± 0.5 mm diameter sphere without appreciable force in an attempt to touch the lamp with the lamp cover in place.

The sphere shall not touch the lamp.

22. Construction

Clause 22. of TIS 1375 is applicable except as follows.

22.6 Addition:

Thermostats (with the exception of their thermosensitive parts) shall not be in contact with the evaporator unless they are adequately protected against condensation on cold surfaces and against the effect of water formed during the defrosting process.

NOTE 101 Attention is drawn to the fact that fluids may flow along parts such as stems and tubes of thermostats.

22.7 Replacement:

Compression-type refrigerators, including protective enclosures of a protected cooling system, using **flammable refrigerants** shall withstand

- a pressure of 3.5 times the saturated vapour pressure of the refrigerant at 70 °C for parts exposed to the high-side pressure during normal operation;
- a pressure of 5 times the saturated vapour pressure of the refrigerant at 20 °C for parts exposed only to low-side pressure during normal operation.

NOTE 101 Specific constructional requirements of compression-type refrigerators with a protected cooling system are given in 22.107

NOTE 102 All pressures are gauge pressures.

Compliance is checked by the following test.

The appropriate part of the refrigerators 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 This requirement is not applicable to refrigerators.

22.33 *Addition:*

Heating conductors having only one layer of insulation shall not be indirect 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 $10\text{ N} \pm 1\text{ N}$, each applied for 1 min in the direction of the axis of the lampholder.

After the tests, lampholders shall not have worked loose.

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 $20\text{ °C} \pm 5\text{ °C}$ 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.

- 22.103 Refrigerators incorporating ice-makers shall withstand the water pressure to which they may be subjected in normal use.

Compliance is checked by subjecting those parts of the refrigerator incorporating an ice-maker, which are under pressure from the water supply mains, for 5 min, to a static pressure equal to twice the maximum permissible inlet water pressure or 1.2 MPa (12 bar), whichever is the greater.

During the test, there shall be no leakage from any part including the inlet water hose.

- 22.104 Refrigerators 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 refrigerator 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 refrigerators where more than two control devices may act on a motor-compressor, the test is carried out separately with each combination of control devices.

- 22.106 The mass of refrigerant in **compression-type refrigerators** 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 refrigerators** 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 Refrigerators 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 refrigerator 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 and 22.107.2.

NOTE 4 A **compression-type refrigerator** 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.

NOTE 1 Critical points are only interconnecting joints between parts of the refrigerant circuit including the gasket of a semi-hermetic motor compressor. Welded telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the 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 $0.7 \text{ mm} \pm 0.05 \text{ mm}$ 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 refrigerator 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 refrigerator is operated, gas injection is started at the same time as the refrigerator 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 $\pm 1.5 \text{ g}$ 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) $32 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$ for leakage simulation on low-side pressure circuits;
- b) $70 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$ 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 continuously from the beginning of the test and for at least 1 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
 - IEC 60079-15:1987, Clause 16, in the case of luminaires;
 - IEC 60079-15:1987, Section 4, in the case of group IIA gases or the refrigerant used, if this electrical apparatus produces arcs or sparks during operation.

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 refrigerators 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 refrigerator shall withstand the test of 22.7, the test pressure being reduced by 50%

22.108 For **compression-type refrigerators** 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 IEC 60079-15:1987, Section 4, 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.

Luminaires shall at least comply with IEC 60079-15:1987, Clause 16, for group IIA gases or the refrigerant used.

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 IEC 60079-15:1987, Section 4, 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.

Luminaires shall at least comply with IEC 60079-15:1987, Clause 16, for group IIA gases or the refrigerant used.

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 Compression-type refrigerators with and 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 in Section 4 of IEC 60079-15:1987 may be carried out using the stoichiometric concentration of the refrigerant used. However the apparatus which been independently tested and found to comply with Section 4 of IEC 60079-15:1987 using the gas specified for group IIA need not be tested.

NOTE 6 Irrespective of the requirement given in 4.3 of IEC 60079-15:1987, surface temperature limits are specified in 22.110.

The test is performed in a draught-free location with the refrigerator switched off or operated under conditions of **normal operation** at **rated**

voltage, whichever gives the more unfavourable result.

During a test in which the refrigerator 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 \pm 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 **compression-type refrigerators** having more than one door or lid, the most unfavourable sequence or combination for opening the lids or doors is used.

For **compression-type refrigerators** fitted with fan motors the test is done with the most unfavourable combination of motor operation.

The concentration of leaked refrigerant is measured continuously from the beginning of the test, a position as close as possible to electrical components. However, it is not measured at the position 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 value 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 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 refrigerators** 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.

Unless

- components that produce arcs and 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 IEC 60079-15:1987, Section 4, for group IIA gases or the refrigerant used and
- luminaires have been tested and found at least comply with IEC 60079-15:1987, Clause 16.

NOTE 2 Irrespective of the requirement given in 4.3 of IEC 60079-15:1987 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 60079:1987 series are also acceptable.

The test is performed in a draught-free location with the refrigerator switched off or operated under **normal operation** at **rated voltage** whichever gives the more unfavourable result.

During a test in which the refrigerator 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 component 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 fusite are not considered to be pipework joints.

The concentration of leaked refrigerant as close as possible to the electrical component is measured continuously 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
(22.110)

Refrigeran 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 ₃ CH ₂ CH ₃	470	1.7
R600	n-Butane	CH ₃ CH ₂ CH ₂ CH ₃	372	1.4
R600a	Isobutane	CH(CH ₃) ₃	494	1.8

^a Values for other **flammable refrigerants** can be obtained from IEC 60079-4A 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 required data is not contained in IEC 60079-20.

^d Concentration of refrigerant in dry air.

22.111 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 refrigerator 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 refrigerator, 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.

22.112 Drawers which are only accessible after opening a door or lid shall not contain a **free space**.

Compliance is checked by inspection and measurement.

22.113 Drawers which are accessible without opening a door or lid and which contain a **free space** shall

- have an opening in their rear wall that has a height of at least 250 mm and a width of at least two-thirds of the inner width of the drawer;
- be capable of being opened from the inside.

Compliance is checked by inspection, measurement and by the following test which is carried out with a weight of 23 kg placed inside the drawer.

The empty refrigerator 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 drawers are left unlocked.

Drawers shall be maintained closed for a period of 15 min.

A force is then applied to the drawer of the appliance at the geometrical centre of the front plane of the drawer equivalent to an accessible inside point, in the direction perpendicular to the front plane of the drawer.

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

22.114 In refrigerator intended for household use and which contain compartments with a **free space**, any door or drawer giving access to these compartments shall not be fitted with a self-latching lock.

Key operated locks shall require two independent movements to actuate the lock or be of a type that automatically ejects the key when unlocked.

NOTE Push and turn is considered to be an example of two independent movements.

Compliance is checked by inspection and test.

23. Internal wiring

Clause 23. of TIS 1375 is applicable except.as follows.

23.3 Addition:

NOTE 101 The requirement concerning open-coil springs does not apply to external conductors.

24. Components

Clause 24. of TIS 1375 is applicable except as follows.

24.1 Addition:

Motor-compressors are not required to be separately tested in accordance with IEC 60335-2-34 nor are they required to meet of this standard.

24.1.3 Addition:

The number of operations for other switches shall be as follows:

- | | |
|---|--------|
| - quick-freeze switches | 300 |
| - manual and semi-automatic defrost switches. | 300 |
| - door switches | 50 000 |
| - on/off switches | 300 |

24.1.4 Addition:

- | | |
|---|--|
| - Self-resetting thermal cut-outs which may influence the test results of 19.101 and which are not short-circuited during the test of 19.101 | 100 000 |
| - thermostats which control the motor-compressor | 100 000 |
| - motor-compressor starting relays | 100 000 |
| - automatic thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type | minimum 2 000, but not less than the number of operations during the locked-rotor test |
| - manual reset thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type | 50 |
| - other automatic thermal motor-protectors | 2 000 |

24.5 *Addition:*

For starting capacitors, the voltage across the capacitors shall not exceed 1.3 times the **rated voltage** of the capacitor when the appliance is operating at 1.1 times **the rated voltage**.

24.101 Lampholders shall be of the insulated type.

Compliance is checked by inspection.

25. Supply connection and external flexible cords

Clause 25. of TIS 1375 is applicable except as follows.

Addition:

This clause of TIS 1375 is not applicable to those parts related to motor-compressors with facilities for connecting a **supply cord**, complying with the appropriate requirements of IEC 60335-2-34.

25.2 *Modification:*

Replace the requirement by the following.

Mains-operated refrigerators shall not be provided with more than one means of connection to the supply unless

- the refrigerator consists of two or more completely independent units built together in one enclosure,
- the relevant circuits are adequately insulated from each other.

25.7 *Modification:*

Replace the fourth and fifth dashed items by the following:

- light polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 52).

26. Terminals for external conductors

Clause 26. of TIS 1375 is applicable except as follows.

Addition:

This clause of TIS 1375 is not applicable to those parts of motor-compressors with

facilities for connecting a **supply cord** and complying with the appropriate requirements of IEC 60335-2-34.

27. Provision for earthing

Clause 27. of TIS 1375 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

28. Screws and connections

Clause 28. of TIS 1375 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

29. Clearances, creepage distances and solid insulation

Clause 29. of TIS 1375 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor conforms to IEC 60335-2-34. For motor-compressors not conforming to Part 2-34, the additions and modifications specified in Part 2-34 are applicable.

29.2 Addition:

Unless insulation is enclosed or located so that it is unlikely to be exposed to pollution by condensation due to normal use of the refrigerators is in pollution degree 3 and shall have a CTI value of not less than 250.

30. Resistance to heat and fire

Clause 30. of TIS 1375 is applicable except as follows.

30.1 *Addition:*

NOTE 101 Accessible parts of non-metallic material within the storage compartment are regarded as external parts.

The ball pressure test is not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34.

NOTE 102 The temperature rises attained during the test of 19.101 are not taken into account.

Modification:

For accessible parts of non-metallic material within the storage compartment, the temperature of $75\text{ °C} \pm 2\text{ °C}$ is replaced by $65\text{ °C} \pm 2\text{ °C}$.

30.2 *Addition:*

These tests are not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34 with no ignition.

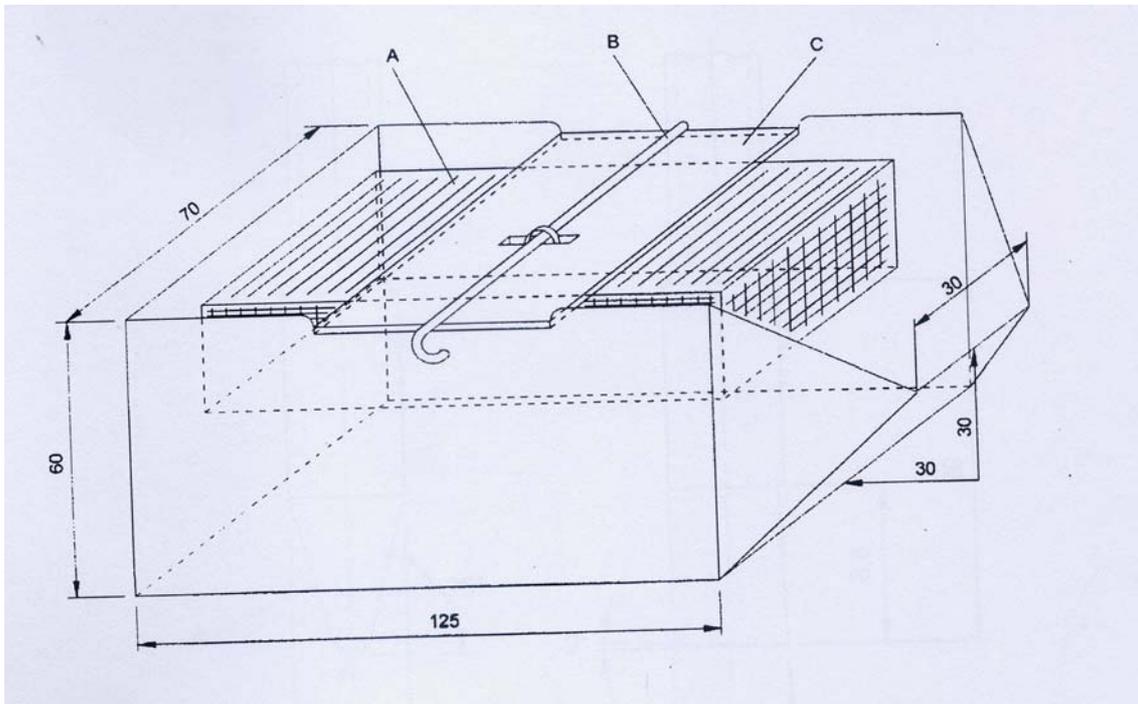
30.2.2 Not applicable.

31. Resistance to rusting

Clause 31. of TIS 1375 is applicable.

32. Radiation, toxicity and similar hazards

This clause of TIS 1375 is not applicable.



Dimensions in millimeters

Key

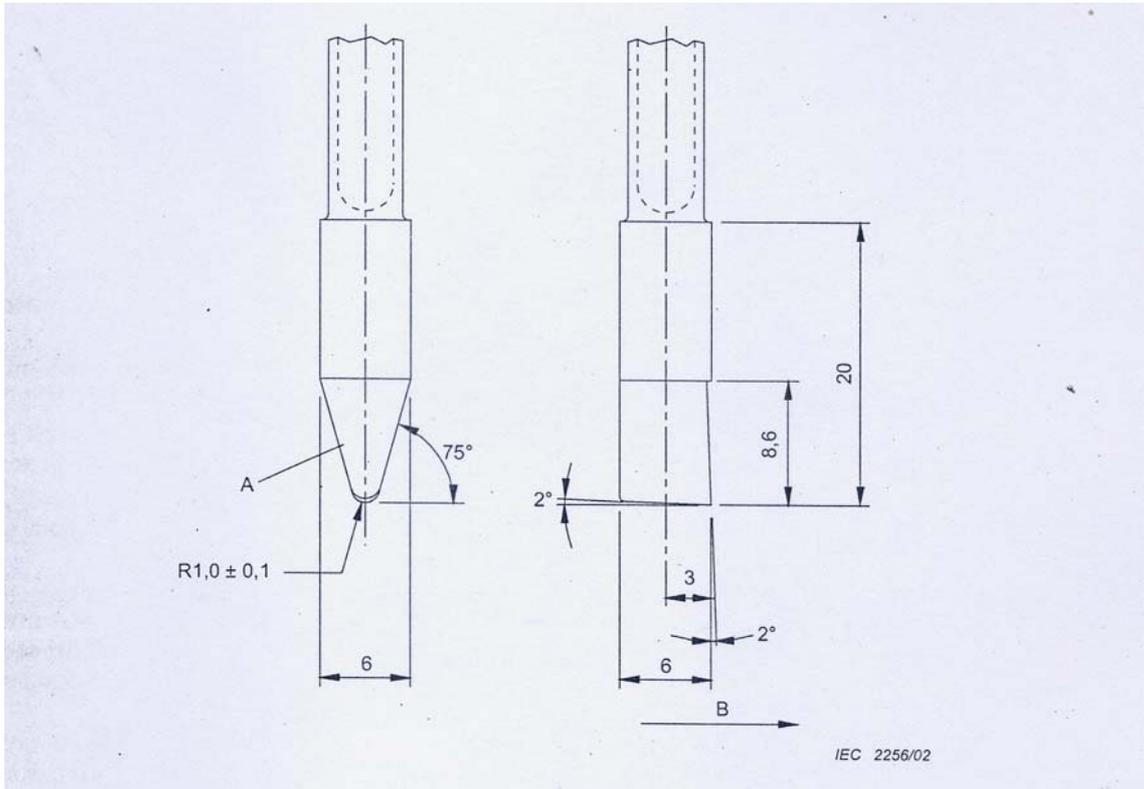
- A Displacement block
- B Release pin
- C Removable bridge support

This displacement block has a volume of $140 \text{ ml} \pm 5 \text{ ml}$ and a mass of $200 \text{ g} \pm 10 \text{ g}$,

Its dimensions are approximately $112 \text{ mm} \times 50 \text{ mm} \times 25 \text{ mm}$.

The dimensions of the vessel and inside dimensions and the tolerance is ± 2

Figure 101 – Apparatus for spillage test
(15.102)



Dimensions in millimeters

Key

A Hard-soldered carbide tip K10

B Direction of movement

**Figure 102 – Detail of scratching tool tip
(22.107.2)**

Annexes

The annexes of TIS 1375 are applicable except as follows.

Annex C

Ageing test on motors

Addition:

This annex does not apply to motor-compressors.

Annex D

Alternative requirements for protected motor units

Addition:

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

Annex AA

(normative)

Locked-rotor test of fan motors

(11.1, 11.8 and 11.101)

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 rotor is locked. Fan blades and motor brackets are not removed.

The motor is supplied at **rated voltage**. The supply circuit is given in Figure AA. 1.

The assembly is to operate under these conditions for 15 days (360 h) or at least 2 000 operations of automatic thermal motor-protectors, whichever is the greater, unless the **protective device**, if any, permanently opens the circuit prior to the expiration of that time. In this case, the test is discontinued.

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

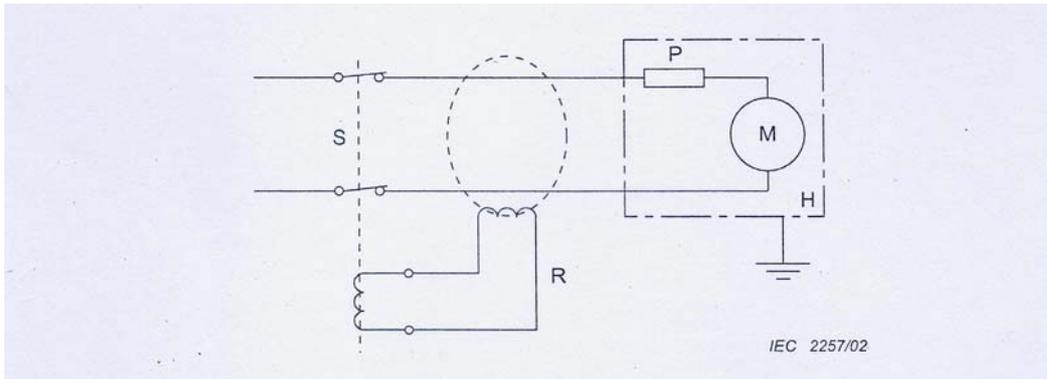
Temperatures are measured under conditions specified in 11.3.

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

72 hours after the beginning of the test, the motor shall withstand the electric strength test of 16.3.

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 the windings and the body at a voltage equal to twice the **rated voltage**. Its value shall not exceed 2 mA.



Key

S Supply source

H Housing

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

P Thermal motor-protector (external of internal), if fitted

M Motor

NOTE 1 The circuit is modified for three-phase fan motors.

NOTE 2 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 (Annex AA)

Annex BB

(informative)

(11.102)

Method for accumulation of frost

The accumulation of frost may be produced by the use of a device having a controllable heat source directed on a measured amount of water for the purpose of evaporating this water over a predetermined period with a minimum of extraneous heat loss to the cabinet of the refrigerator.

A convenient form of the apparatus would comprise a block enclosure of thermally insulating material having a vertical hole at its centre containing a lamp mounted on a bottom plug directly below an evaporating dish with a high thermal conductivity base and low thermal conductivity walls (see Figures BB. 1 and BB.2).

The device described above should be mounted at the geometric centre of the cabinet of the refrigerating appliance and the electrical connection brought conveniently to the outside so that the voltage applied may be varied and the power input measured with the door of the refrigerator in the closed position.

Water is then introduced into the evaporating dish at the required rate through a length of small bore tube passing into the cabinet. A continuous flow is not necessary but the water should be injected at appropriate intervals.

Provision should be made (for example in the control of the supply of electrical energy to the device) to ensure that the evaporation of water under normal conditions of use is capable of being maintained at a rate equal to 2 g of water per litre of gross cabinet volume per week.

The electrical energy to the device should not be excessive, but shall be sufficient to ensure the complete evaporation of the water.

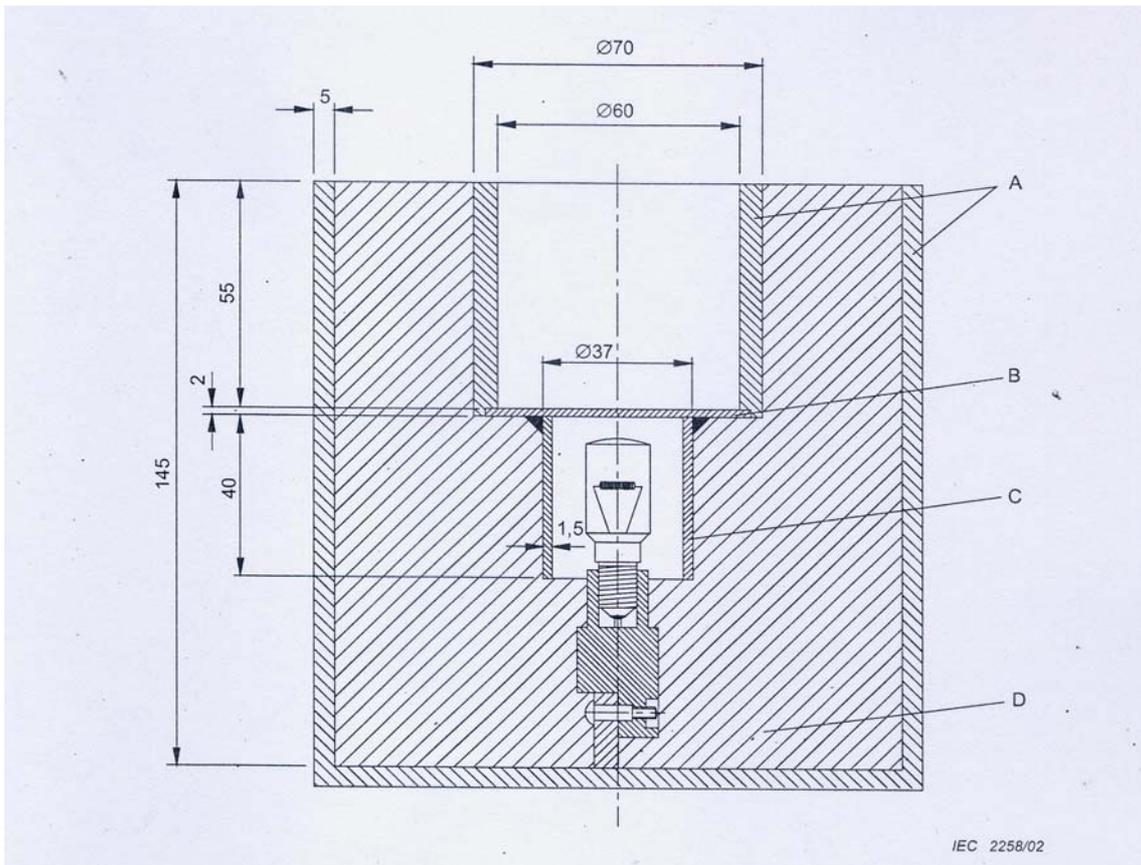
The amount of frost to be accumulated prior to the start of the defrosting test should be based on this rate and on the time interval between two successive defrosts in accordance with the instructions.

NOTE For example, if the instructions recommend defrosting twice weekly, then a refrigerating appliance with a cabinet gross volume of 140 l will require:

$$2\text{g} \times 140 / 2 = 140 \text{ g of water}$$

The above rate may be exceeded in certain circumstances.

The apparatus described has a maximum evaporation rate of approximately 2 g/h when operating with an input of 4 W and with the water to be evaporated entering at cabinet temperature.

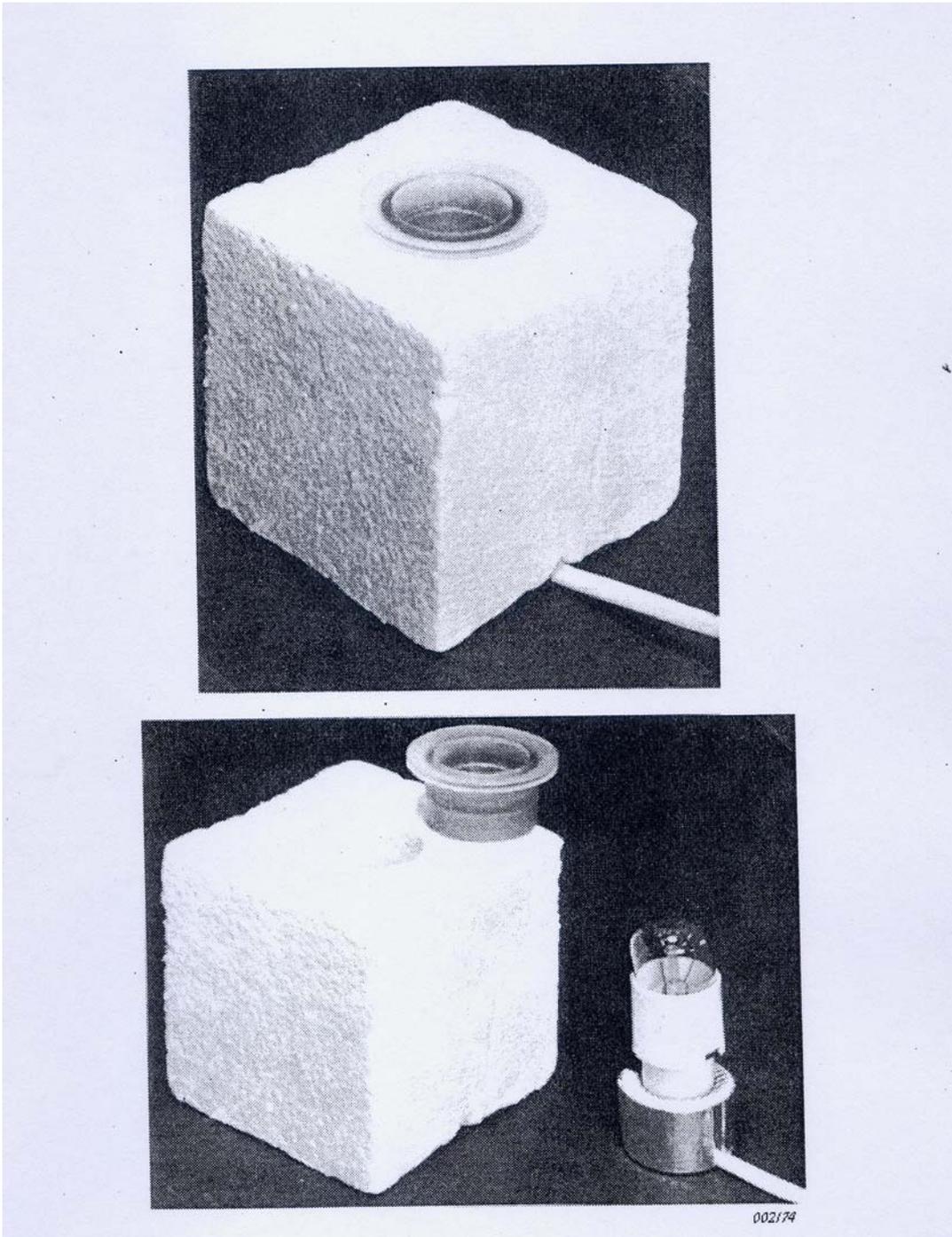


Dimensions in millimeters

Key

- A Insulating material
- B Copper plate
- C Copper tube
- D Thermal insulating foam

Figure BB.1 – Diagram of apparatus for water evaporation for accumulation of frost (Annex BB)



**Figure BB.2 – Apparatus for water evaporation
and for accumulation of frost
(Annex BB)**