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Household electric refrigerators, refrigerator-freezer and freezers

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS C 9607 : 1993** is replaced with **JIS C 9607 : 1999**.

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Household electric refrigerators, refrigerator-freezer and freezers

Introduction This Japanese Industrial Standard has been prepared by adopting the requirements for safety performances stated in **JIS C 9607** issued in 1993 as the type A requirements to form the main part (text), and the requirements stated in **JIS C 9335-2-24** prepared based on the corresponding International Standard as the type B requirements to form the Annex.

1 Scope This Japanese Industrial Standard specifies household electric refrigerators of storage volume 800 L or less, and household vertical electric freezers of storage volume 400 L or less, with a compression type refrigerating machine and storage cabinet integrated in one body (hereafter household electric refrigerators, refrigerator-freezers and freezers are generically called “electric refrigerators”).

Remarks 1 In Annex 1, the requirements for safety performances of electrical refrigerators to which **JIS C 9335-2-24** is applicable (type B) are specified.

2 The text (type A) and Annex 1 (type B) shall be applied individually.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions (including amendments) of the standards indicated below shall be applied.

JIS C 0602 *General rules of colour identification for protective conductor and neutral conductor and terminal marking for apparatus*

JIS C 0702 *General rules for insulation construction of class II electrical appliances*

JIS C 1102 *Direct acting indicating analogue electrical measuring instruments and their accessories*

JIS C 1211 *Alternating-current watt-hour meters (for direct connection)*

JIS C 1302 *Insulation resistance testers*

JIS C 1502 *Sound level meters*

JIS C 3306 *Polyvinyl chloride insulated flexible cords*

JIS C 3312 *600 V Grade polyvinyl chloride insulated and sheathed portable power cables*

JIS C 8303 *Plugs and receptacles for domestic and similar general use*

JIS C 8367 *Electromechanical pressure type thermostats for household appliances*

JIS C 9335-2-24 *Safety of household and similar electrical appliances—Part 2 : Particular requirements for refrigerating appliances and ice-makers*

Remarks : This is Japanese Industrial Standard prepared based on **IEC 60335-2-24** (*Safety of household and similar electrical appliances—Part 2 Particular requirements for refrigerating appliances and ice-makers*) issued in 1996 as the third edition by taking special circumstances in Japan into account for some portions.

JIS C 9801 *Household refrigerating appliance—Characteristics and test methods*

Remarks : This is Japanese Industrial Standard prepared based on **ISO 8561** (*Household frost-free refrigerating appliances—Refrigerators, refrigerator-freezers, frozen food storage cabinets and food freezers cooled by internal forced air circulation—Characteristics and test methods*) issued in 1995 as the first edition, by taking special circumstances in Japan into account for some portions.

JIS F 8832 *Marine watertight type plugs*

JIS K 5400 *Testing methods for paints*

JIS K 7202 *Method of rockwell hardness test for plastics*

JIS K 8116 *Ammonium chloride*

JIS S 6006 *Pencils and coloured pencils*

JIS Z 8401 *Rules for rounding off of numerical values*

JIS Z 8703 *Standard atmospheric conditions for testing*

JIS Z 8731 *Acoustics—Description and measurement of environmental noise*

3 Definitions

For the purposes of this Standard, the following definitions apply:

- a) **refrigerator** An appliance cooled by an electrically driven compression type refrigerating machine, having one or more compartments intended for the preservation of food except frozen food which can be kept at a temperature necessary to store them (called fresh food compartment).
- b) **refrigerator-freezer** An appliance cooled by an electrically driven compression type refrigerating machine, having two or more compartments for the preservation of food, at least one of which is a fresh food compartment and at least one of which can be maintained at a temperature necessary to store frozen food (called freezer compartment).
- c) **electric refrigerator** A generic term for the refrigerator of a) and the refrigerator-freezer in b).
- d) **electric freezer** An appliance cooled by an electrically driven compression type refrigerating machine having only freezer compartments in which the mean freezer load temperature specified in 6.2.1 of **JIS C 9801** is $-18\text{ }^{\circ}\text{C}$ or lower (hereafter referred to as “freezer”).
- e) **specific fresh food compartment** A fresh food compartment intended for storage of only such specific food as vegetables, fruits, fish and meats.
- f) **specific low-temperature compartment** A specific fresh food compartment intended for storage of such specific food as fish and meats at low temperature.
- g) **one-star compartment** A freezer compartment in which the mean freezer load temperature specified in 6.2 is $-6\text{ }^{\circ}\text{C}$ or lower.
- h) **two-star compartment** A freezer compartment in which the mean freezer load temperature specified in 6.2 is $-12\text{ }^{\circ}\text{C}$ or lower.
- i) **three-star compartment** A freezer compartment in which the mean freezer load temperature specified in 6.2 is $-18\text{ }^{\circ}\text{C}$ or lower.

- j) **four-star compartment** A freezer compartment which satisfies the freezing performance of 6.4 and in which the mean freezer load temperature specified in 6.2 is -18°C or lower.
- k) **compression type refrigerating machine** A device in which refrigeration is effected by the latent heat of vaporization of the refrigerant, namely by the continuous cyclic change of the refrigerant. At first the refrigerant is compressed mechanically to high pressure and temperature, secondly cooled down by the condenser to liquefy, to reduce its pressure, and evaporated at low pressure in the cooler (also called evaporator) to perform cooling.
- l) **compressor** A machine driven by an electric motor or electromagnetic vibrator (hereafter referred to as "electric motor") which mechanically compresses the vaporized refrigerant from the cooler to a high pressure and high temperature.
- m) **condenser** A heat exchanger in which the gaseous refrigerant after compression is liquefied by radiating heat to an external cooling medium.
- n) **cooler** A heat exchanger in which the liquid refrigerant is vaporized at low pressure by absorbing heat from the medium to refrigerate the storage cabinet.
- o) **refrigerant** Materials which absorb heat from the medium to cool a storage cabinet to a required temperature.
- p) **rated storage volume** The space surrounded by the interior walls of a storage cabinet with the door(s) closed, determined according to 7.2.8 of JIS C 9801.
- q) **automatic temperature control device** An automatic control device which keeps the temperature of fresh food compartment or freezer compartment at a certain value by detecting temperature of cooler, food storage compartment, etc. (hereafter referred to as "control device").
- r) **rated power consumption of electric motor** The total electric power consumed by the motors for the compressor, the internal air circulating fan and condenser fan which have direct relation with cooling when an electric refrigerator is operated under the conditions of 8.2.7 a). It is the value indicated on the product.
- s) **rated power consumption of heating device** The total electric power consumed simultaneously by the defrosting, dew preventing and compartment heating devices when an electric refrigerator is operated under the conditions of 8.2.7 b). It is the largest value if there are two or more circuit configurations, and it is the value indicated on the product.
- t) **electrical energy consumption** The electric energy consumed per a year measured when an electric refrigerator is operated under the conditions of clause 15 of JIS C 9801. It is the value indicated on the product.
- u) **mean fresh food compartment temperature** The mean value of the highest temperature and the lowest temperature during one cycle of operation⁽¹⁾, measured at the fresh food compartment temperature measurement points specified in 8.1.5.

Note ⁽¹⁾ One cycle of operation means the interval from the instant when the motor operates first to the instant when it operates next, or the interval between the first motor stop and the next motor stop.

- v) **mean freezer load temperature** The mean value of the highest temperature and the lowest temperature during one cycle of operation of a refrigerator-freezer or freezer, measured on the M load specified in 8.1.6.
- w) **mean freezer compartment temperature** The mean value of the highest temperature and the lowest temperature during one cycle of operation of a refrigerator-freezer or freezer, measured at the freezer compartment temperature measurement points specified in 8.1.7.
- x) **steady state** The state where either the mean fresh food compartment temperature or the mean freezer compartment temperature (excluding that of refrigerator) does not vary by more than 1 °C for a duration of 2 h, and/or when the mean freezer load temperature (refrigerator is excluded) does not vary by more than 1 °C for a duration of 24 h.

4 Classification Electric refrigerators are classified as follows:

- a) **Refrigerator**
- b) **Refrigerator-freezer**
- c) **Freezer**

5 Rated voltage and rated frequency The rated voltage of electric refrigerators shall be a voltage not exceeding single phase a.c. 300 V, and the rated frequency shall be 50 Hz or 60 Hz, or 50 Hz and 60 Hz in common.

6 Running performances

6.1 Refrigerant leakage There shall be no leakage of refrigerant from any part of the refrigerant circuit when the appliance is tested by the method of 8.2.1.

6.2 Cooling performance When the appliance is tested by the method of 8.2.2 with the control device positioned at the specified setting, the performance shall comply with the provision of Table 1.

In this case the mean fresh food compartment temperature t_3 shall be 5 °C or lower. An appliance equipped with a control device incapable of being controlled manually, shall comply with the cooling performance of Table 1 at its original set position.

In a specific fresh food compartment, the mean fresh food compartment temperature t_3 shall be 10 °C or lower, with the control device set to the maximum cooling position, but the specification of Table 1 is not applicable.

In a specific-low temperature compartment, the mean fresh food compartment temperature t_3 shall be 2 °C or lower, with the control device set to the maximum cooling position, but the specification of Table 1 is not applicable.

Table 1 Cooling performance

Unit : °C

Ambient temperature	Mean fresh food compartment temperature	Mean freezer load temperature		
	t_1, t_2, t_3	One-star compartment	Two-star compartment	Three-star compartment and four-star compartment
15	$0 \leq t_1, t_2, t_3 \leq 10$	≤ -6	≤ -12	≤ -18
30				

- Remarks 1 The provisions given in Table 1 for mean fresh food compartment temperature and for mean freezer load temperature of one-star compartment and two-star compartment are not applicable to freezers.
- 2 Concerning an appliance having two or more separate fresh food compartments, the cooling performance of Table 1 shall apply to each fresh food compartment.
- 3 Concerning an appliance having two or more separate freezer compartments, the cooling performance of Table 1 shall apply to each freezer compartment.
- 4 The fresh food compartment and the freezer compartment of a refrigerator-freezer shall satisfy the respective cooling performance of Table 1 at the same time.
- 5 The t_1, t_2 and t_3 show the temperatures measured at the measuring positions of T_1, T_2 and T_3 in Fig. 2, respectively.

6.3 Cooling rate The cooling rate shall comply with the provisions of Table 2, when the test is made in accordance with 8.2.3. For the four-star compartment and specific fresh food compartment, however, the above requirement does not apply.

Table 2 Cooling rate

Unit : h

Measuring item	Necessary time to reach specified temperature
Mean fresh food compartment temperature t_3	≤ 3
Mean freezer compartment temperature	≤ 3

6.4 Freezing capability The freezing capability shall comply with the following requirements, when the test is made in accordance with 8.2.4:

- The test load which is 4.5 kg per storage volume 100 L of freezer compartment shall be frozen to -18°C within 24 h.
- During the measurement of a), the mean value of the temperatures measured at the same time, of the existing test loads shall be -15°C or lower.

- c) The mean fresh food compartment temperature during the measurement of a) and before and after it shall be within a range of 0 °C to 10 °C (refrigerator-freezer only, exclusive of specific fresh food compartment).

6.5 Defrosting performance The defrosting performance, when the test is made in accordance with 8.2.5, on an appliance whose defrosting is commenced manually and finished automatically, and that commenced automatically and finished automatically shall comply with the following:

- a) Upon completion of defrosting there shall be no residual frost or ice liable to adversely affect the function and performance of the cooler and drainage system.
- b) In the freezer compartment, whose defrosting is commenced automatically and finished automatically, the temperature rise of freezer load during and after defrosting shall be not more than 5 °C.

6.6 Thermal insulation The thermal insulation, when the test is made in accordance with 8.2.6, shall be such that the temperature at the three center points of the both outside and the rear surface of cabinet is not 5 °C lower than the ambient temperature.

6.7 Power consumption The power consumption, when the test is made in accordance with 8.2.7, shall be within the appropriate tolerance given in Table 3 from the rated power consumption.

Table 3 Tolerance on power consumption

Kind of equipment	Rated power consumption W	Tolerance %
Motor	—	+15
Heating device	Up to and including 20	+20
	Over 20 up to and including 100	±15
	Over 100 up to and including 1 000	±10

6.8 Electrical energy consumption When the test is made in accordance with 8.2.8, the electrical energy consumption shall be within 115 % of the indicated value of electrical energy consumption.

6.9 Door opening force When the test is made in accordance with 8.2.9, the force required to open the door shall be not more than 70 N at the beginning and the end of the test, and there shall be no defect in any part of the door. The door of compartment whose storage volume is under 60 L and drawer type door, however, are exempted from the above requirement.

6.10 Freezer compartment door retaining force When the test of 8.2.10 is made for the freezer compartment door retaining force, on the refrigerator-freezer having separate doors for fresh food compartment and freezer compartment, the freezer compartment door shall not open. When the door closes immediately after momental opening such case is an exception.

6.11 Noise When the test is made in accordance with 8.2.11, the noise levels shall not exceed 45 dB.

7 Safety performances

7.1 Temperature When the test is carried out in accordance with 9.1 a), the temperatures of various parts of the appliance shall be not more than the respective values of Table 4, and there shall be no abnormal heat generation in any other parts. However, the motor used in refrigerant is exempted from the above requirement if the temperatures of various parts are not more than the respective values of Table 5, as the results of the test carried out in accordance with 9.1 b).

Table 4 Temperature limit (Part 1)

Unit : °C

Measuring position		Temperature	
Winding	Class A insulation	100	
	Class E insulation	115	
	Class B insulation	125 (120)	
	Class F insulation	150 (140)	
	Class H insulation	170 (165)	
Rectifier (only for use in power circuit)	Selenium	75	
	Germanium	60	
	Silicon	135	
Contact of fuse clip		90	
Handle operated by man while in use	Metal, porcelain or glass	55	
	Other materials	70	
Knob and push button of switches, etc.	Metal, porcelain or glass	60	
	Other materials	75	
External frame	Parts which come in contact with man while in use (accessed part)	Metal, porcelain or glass	55
		Other materials	70
	Parts which are likely to come in contact with man while in use (easily accessible parts)	Metal, porcelain or glass	85
		Other materials	100
	Parts which are not likely to come in contact with man while in use (not easily accessible parts)		100

- Remarks
- 1 The values in parentheses apply to the windings of rotating machines.
 - 2 The temperature of the winding of motor used in the refrigerant shall be taken at 5 °C higher than the value given in Table 4.
 - 3 Compressor case and refrigerant piping connected thereto and lying within 50 mm from the case are regarded as "the parts not likely to come in contact with man".

Table 5 Temperature limit (Part 2)

Unit : °C

Measuring position		Temperature
Winding of motor used in refrigerant	Synthetic resin insulation	140
	Other materials	130
External frame of motor used in refrigerant		150

7.2 Insulation resistance The insulation resistance shall comply with the following items:

- a) When the test is made in accordance with 9.2 a), the insulation resistance shall be not less than 1 MΩ.
- b) The insulation resistance of joints with power source, capacitor, etc. which are easily accessible shall be not less than 0.3 MΩ, when the test is made in accordance with 9.2 b).

7.3 Dielectric withstand voltage When the test is made in accordance with 9.3, the appliance shall withstand the test voltage.

7.4 Voltage fluctuation characteristics When the test is made in accordance with 9.4, the appliance shall be capable of continuing operation without any trouble.

7.5 Starting characteristics of compressor When the test is made in accordance with 9.5, the motor shall be capable of starting regardless of the position of the rotor.

7.6 Leakage current The leakage current shall not exceed 1 mA, excepting such a case that there is no risk of electric shock at a frequency not less than the power frequency, when the test is made in accordance with 9.6.

7.7 Construction

7.7.1 Construction in general The construction of appliance shall comply with the following requirements:

- a) There shall be no possibility of danger arising under normal conditions of use. The shape shall be correct, the assembly and the finish of the individual components shall be satisfactory, and the operations shall be smooth.
- b) There shall be no possibility of turning over under normal condition of use. The associated shelves, drip tray and other various containers without putting water or food shall be placed in their respective designated positions, the stopper shall be set for the one which has any possibility of slipping, the casters of fixing devices, if any, are fixed to keep the appliance body horizontal. Under the above conditions the appliance body shall not overturn, when tilted through an angle of 10° to the horizon, with the doors open.

- c) Any metallic cover or box to which an arc is likely to reach during a switching operation, shall be lined with arc-resistant insulating materials.
- d) The insulation thickness shall comply with the following:
- 1) When the material of appliance body serves as an electrical insulation, exclusive of the part built in the apparatus, the insulation shall have a thickness of 0.8 mm at the minimum (0.5 mm for non-accessible parts), and shall be free from pinholes. However, such body materials (insulation) are exempted from the above requirement, that have no pinholes and that do not cause any fissure, crack or abnormality which results in such hazard as electric shock and fire, when a weight 250 g in mass, having a spherical surface of 10 mm radius, finished with polyamide to have Rockwell hardness HRR100 specified in **JIS K 7202** is dropped vertically 3 times from the height specified in the middle column of Table 6 for respective classes specified in the left column of the table, or when an impact force specified in the right column of the table is applied 3 times with the impact testing device given in Attached Fig. 1.

Table 6 Height of fall of impact weight

Classification	Height cm	Impact force Nm
Non-accessible parts	14	0.35
Others	20	0.5

- 2) The insulation used for the parts liable to be damaged externally other than specified in 1) [Only the insulation used to comply with the provision of **7.7.3**. The same applies within item d).] shall have a thickness not less than 0.3 mm, and shall be free from pinholes. However, the insulation which passes the tests of 2-1) and 2-2) and is free from pinholes, is exempted from the above requirement.
- 2-1) The insulation shall withstand continuous application for 1 min of the a.c. voltage specified in the right column of Table 7 in relation with the voltage classification under which the insulation serves given in the left column of the table.

Table 7 Dielectric withstand voltage of insulation

Unit : V

Classification of voltage under which insulation serves	a.c. voltage
Up to and including 30	500
Over 30 up to and including 150	1 000
Over 150 up to and including 300	1 500

- 2-2) The specimen shall show no break to reach the test plate when subjected to the scratch test by pencil specified in **8.4.1** of **JIS K 5400** using the pencil of hardness 8H specified in **JIS S 6006**.

- 3) The insulation used for the part where external damage is not possible (except the parts between coils together with the leads of transformer and those between coils together with the leads of motors, which withstand a continuous application for a period of 5 min of the voltage equal to twice the rated primary voltage of frequency of 2 or more times the rated frequency) shall pass the test of 2-1) in 2) and shall be free from pinholes. However, the insulation with a thickness not less than 0.3 mm and free from pinholes is exceptions.
- e) Switches and the like shall be smooth in operation and shall be certain in electrical contact.
- f) The appliance which may cause hazards due to temperature rise shall be equipped with a temperature limiter (including a thermal fuse) and that which may cause hazards due to overcurrent or overload shall be equipped with a overload protective device. This temperature limiter (including a thermal fuse) and this overload protective device shall not operate during normal service.
- g) Accessible movable parts under normal use shall be equipped with suitable protective frame or protective net so as to prevent easy access. However, the parts exposure of which is unavoidable due to their function or the movable part having no possibility to cause danger such as electric shock and injury, if accessed by a man, are exempted from the above requirements.
- h) For attaching or detaching a part of the appliance body, such operations shall be capable of being carried out easily, positively and safely.
- i) The appliance having lamps or the like in the compartments shall be so constructed that there is no possibility of danger during putting into or taking out foodstuff or during opening and closing the door. If the lamps are protected by guard frames or by other suitable means, such a case is an exception.
- j) Those parts which are opened and closed in order to exchange or clean the lamp shall be capable of being clamped easily, positively and safely.
- k) The on-off operation or on-off condition of manual switches shall be indicated using characters, symbols or colours at an easily visible location. If it is difficult to provide the above indication or there is no possibility to cause danger, such a case is an exception.
- l) The appliance shall not generate undue vibration or noise in use and shall be safe in operation.
- m) There shall be no possibility of leakage of refrigerating machine oil or refrigerant.
- n) The control device as specified in 7.7.2 shall be equipped.
- o) The doors of electric refrigerator shall be so constructed that they can be easily opened from the inside. The door of fresh food compartment of net volume less than 60 L and the drawer type door, however, are exempted from the above requirement.
- p) The internal surface of the storage compartment shall be free from offensive odours caused by paint and so on.

- q) Appliances equipped with fuses shall have the fuse mounts complying with the following requirements:
- 1) The circuit shall be completely opened as the result of the fuse melting.
 - 2) Neither short circuit nor grounding shall be caused by arc when the fuse melts.
 - 3) When the fuse melts, the cover, box or base in which the fuse is contained shall not be damaged.
 - 4) Fixing terminal of the fuse shall be able to fix the fuse easily and positively, and shall not cause rotation of fuse link when it is tightened.
 - 5) For the fuse employing a conical washer, the size of fuse mount shall be not smaller than the size of the base of the conical washer.
 - 6) In the appliance employing a non-enclosed-fuse, the space between the fuse and the appliance body shall be 4 mm or more.
 - 7) The screw for the fuse fixing terminal shall not serve for fixing other parts than the fuse. If there is no possibility to loosen the fixing of other part than the fuse, at the time of mounting or removing of the fuse, such a case is an exception.
- r) An appliance equipped with fuses shall be clearly and indelibly marked either on its nameplate or its fuse mount, with the rated current for current fuses or with the rated operating temperature for thermal fuses. Fuses which can not be replaced, however, shall be excepted.
- s) When semiconductor elements (excepting simple rectifiers) are employed to control temperature, revolution speed or the like, the following requirements shall be satisfied in the event that the semiconductor elements lose their control function.
- 1) The components connected to the control circuit shall not burn. If other components do not burn when a component connected to the circuit burns, such a case is an exception.
 - 2) Dead metal part liable to be grounded or exposed live part shall comply with any one of the following requirements.
 - 2-1) The voltage to ground and the line voltage shall be 30 V (hereafter, r.m.s. value) for a.c. and 45 V (hereafter, the mean value) for d.c.
 - 2-2) When 1 k Ω resistors are connected between appliance and the ground, between lines and between dead metal parts and live parts, the current following through the said resistor shall not exceed 1 mA excluding such a case that there is no risk of electric shock at frequencies not less than the power frequency.
 - 2-3) The insulation resistance between live parts and dead metal parts liable to be grounded, measured immediately after the test with a d.c. 500 V insulation resistance tester, shall be not less than 0.1 M Ω .