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JAPANESE INDUSTRIAL STANDARD

Unitary Air Conditioners

JIS B 8616—1984

Translated and Published

by

Japanese Standards Association

Printed in Japan



Documents

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Unitary Air Conditioners

B 8616-1984

1. Scope

This Japanese Industrial Standard specifies the unitary air conditioners of integrated type (compressor, fans, etc. are accommodated in one cabinet) or separate type (compressor, fans, etc. are accommodated in two cabinets) with rated power consumption at cooling exceeding 3 kW and rated cooling capacity less than 23000 kcal/h { 26 744 W } among unitary air conditioners which carry out cooling (conditioners which also serve as heaters are included) by means of air circulation for the purpose of comfortable air conditioning of rooms, these unitary air conditioners are hereinafter referred to as the "unitary air conditioners". However, air conditioners shown in the following items are not included.

- (1) Such air conditioners that the condition of suction air is special⁽¹⁾.
- (2) Air conditioners mainly intended to carry out air conditioning of machinery and apparatus, and foods.
- (3) Air conditioners intended to carry out air conditioning mainly by introducing open air only into the room.
- (4) Air conditioners mainly intended to supply cool air to certain workers working in a certain area of a factory.
- (5) Such separate type air conditioners that the outdoor unit and indoor unit do not correspond one to one.
- (6) Air conditioners mainly intended to carry out air conditioning of vehicles.
- (7) Air conditioners intended to be used for special purpose like those shown in (1) to (6).

Note (1) For example, those for computer rooms, those of all fresh type, etc.

Remark: The units and numerical values given in { } in this standard are in accordance with the International System of Units (SI), and are appended for reference.

2. Definitions

For the purpose of this standard the following principal definitions shall apply:

- (1) rated cooling capacity The heat quantity which an unitary air conditioner removes from the room when operated under the cooling condition specified in 4.1 (2) of JIS B 8615 expressed in kcal/h {W} and marked on the body of conditioner.
- (2) rated power consumption at cooling The total electric power consumed by an unitary air conditioner operated under the cooling condition specified in 4.1 (2) of JIS B 8615, marked on the body of conditioner.

Applicable Standards: see page 25.

- (3) rated heat-pump heating capacity The heat quantity added to the room air by an unitary air conditioner operated under the heating condition specified in 4.1 (2) of JIS B 8615, expressed in kcal/h {W} and marked on the body of conditioner (heat quantity given by auxiliary electric heater is excluded).
- (4) rated power consumption at heat-pump heating The total electric power consumed by an unitary air conditioner operated under the heating condition specified in 4.1 (2) of JIS B 8615, marked on the body of conditioner (consumed power by auxiliary electric heater is excluded).
- (5) energy efficiency ratio The quotient of the rated cooling capacity (kcal/h) divided by the rated power consumption at cooling (W).

$$EER = \frac{C}{H} \left\{ = \frac{0.86C}{H} \right\}$$

where EER : energy efficiency ratio kcal/h W {W/W}

C : rated cooling capacity kcal/h {W}

H : rated power consumption at cooling W

- (6) rated air-flow The rate of flow of air when the fan of a duct connecting type unitary air conditioner is operated at the rated static pressure, it is assigned by the manufacturer and converted to that at 20°C, 760 mmHg {101.3 kPa}, relative humidity of 65 %.
- (7) rated static pressure at outside of apparatus The static pressure at outside of the apparatus assigned by the manufacturer for a duct connecting type unitary air conditioner.
- (8) heat-pump heating The heating of such system that the heat is received from the outside of room (air or water) and radiated to the room by changing-over the refrigerant circuit.
- (9) auxiliary electric heater This device means an electric heating device intended to carry out the heating together with heat-pump, and the devices which can be attached to conditioners (not accommodated in) are included.

3. Classification

The unitary air conditioners are classified, according to the function, constitution of units, cooling system, fan system, and rated cooling capacity, as follows:

(1) Classification by Function

- (a) Conditioners used for cooling only
- (b) Conditioners used for cooling and heat-pump heating (those in which auxiliary electric heater is used, and those in which auxiliary electric heater or heat-pump is used by changing-over are included).
- (c) Conditioner used for cooling and also electrical heating

(2) Classification by Constitution of Units

- (a) Integrated type conditioner
- (b) Separated type conditioner

(3) Classification by Cooling System of Condenser (at cooling-operation)

- (a) Air cooled type
- (b) Water cooled type

(4) Classification by Discharge Air System

- (a) Direct discharge type
- (b) Combined direct discharge and duct connection type
- (c) Duct connection type

(5) Classification by Rated Cooling Capacity [kcal/h {W}]

5000 {5814}	5600 {6512}	6300 {7326}	7100 {8256}	8000 {9302}
9000 {10465}	10000 {11628}	11200 {13023}	12500 {14535}	14000 {16279}
16000 {18605}	18000 {20930}	20000 {23256}	22400 {26047}	

4. Rated Voltage and Rated Frequency

The rated voltage of an unitary air conditioner shall be single-phase a.c. 100 V, single-phase a.c. 200 V or three-phase a.c. 200 V, and the rated frequency shall be 50 Hz, 60 Hz, or 50/60 Hz in common.

5. Performance

5.1 Leakage of Refrigerant There shall be no leakage of refrigerant in each part of the refrigerant circuit when a conditioner is tested in accordance with the method specified in 4.2.2 of JIS B 8615.

5.2 Cooling Capacity The cooling capacity shall have a value not less than 92 % of the value marked in accordance with the provision of 9., when tested by the air-enthalpy method specified in 2 (1) (a) of Appendix 1 of JIS B 8615. However, for direct discharge type conditioners, the test may be carried out by means of a room-type calorimeter calibrated by the air-enthalpy method.

5.3 Power Consumption at Cooling The power consumption at cooling shall have a value not more than 115 % of the value marked in accordance with 9., when tested in accordance with the method specified in 4.2.4 of JIS B 8615.

5.4 Heat-Pump Heating Capacity The heating capacity shall have a value not less than 92 % of the value marked in accordance with 9., when a conditioner which performs heat-pump heating is tested by means of the air-enthalpy method specified in 2 (1) (a) of Appendix 1 of JIS B 8615 (for a conditioner with auxiliary electric heater, the heating capacity of the heater is not included). However, for direct discharge type conditioners, the test may be carried out by means of a room-type calorimeter calibrated by the air-enthalpy method.

5.5 Power Consumption at Heat-Pump Heating The consumed power shall have a value not more than 115 % of the value marked in accordance with 9., when a conditioner which performs heat-pump heating is tested in accordance with the method specified in 4.2.6 of JIS B 8615 (for a conditioner with auxiliary electric heater, the power consumed by the electric heater is not included).

5.6 Power Consumption of Electric Heater The power consumption of electric heater shall meet the following requirements:

- (1) For conditioners which perform heat-pump heating having auxiliary electric heater, the consumed power shall have a value within $\pm 5 \%$ ($\pm 10 \%$ for devices not exceeding 1 kW) from the value marked in accordance with 9., when the test is carried out in accordance with the method specified in 4.2.7 of JIS B 8615.
- (2) For conditioners which perform heating by electric heater, the consumed power shall have a value within $\pm 5 \%$ ($\pm 10 \%$ for devices not exceeding 1 kW) from the value marked in accordance with 9., when the test is carried out in accordance with the method specified in 4.2.7 of JIS B 8615.

5.7 Air-flow (duct connecting type unitary air conditioner only) The air-flow means such quantity that the test is carried out in accordance with the method specified in 4.2.8 of JIS B 8615 and the result is converted to the standard air-flow, and shall be not less than 90 % of the rated air-flow.

5.8 Cooling Overload Performance The conditioner shall be capable of being operated without any abnormality on the motors, electrical components, wirings, etc., when the overload test is carried out in accordance with the method specified in 4.2.9 of JIS B 8615.

5.9 Heat-Pump Heating Overload Performance The conditioner shall be capable of carrying out the heat-pump heating without any abnormality on the motor, electrical components, wirings, etc., when the overload test is carried out in accordance with the method specified in 4.2.10 of JIS B 8615. (Stop of operation of electric heater is allowed.)

5.10 Low Temperature Performance No ice shall fall nor water shall drop or be discharged from the unitary air conditioner into the room during the test, when the test is carried out in accordance with the method specified in 4.2.11 of JIS B 8615.

5.11 Automatic Defrost Performance (unitary air conditioners which perform heat-pump heating utilizing air as heat source and equipped with automatic defrosting device only) The sum of the times necessary for defrosting shall not exceed 20 % of the operating time in the continuous operation after completion of the first defrosting, when the test is carried out in accordance with the method specified in 4.2.12 of JIS B 8615.

5.12 Sweating The dew adhered on the outer surface shall not drop to the floor or the like or be discharged from the unitary air conditioner during the test, when the test is carried out in accordance with the method specified in 4.2.13 of JIS B 8615.

5.13 Voltage Fluctuation Characteristic The characteristic to voltage fluctuation under cooling operation and heat-pump heating operation shall meet the respective following requirements:

- (1) The characteristic to voltage fluctuation under cooling operation shall be such that the overload protective device does not operate and the operation is continued without any abnormality, when the test is carried out in accordance with the method specified in 4.2.14 of JIS B 8615.
- (2) The characteristic to voltage fluctuation under heat-pump heating operation shall be such that the overload protective device does not operate, the protective device to prevent over-heating for conditioner with auxiliary electric heater does not operate, and the operation is continued without any abnormality, when the test is carried out in accordance with the method specified in 4.2.14 of JIS B 8615.

5.14 Insulation Resistance The insulation resistance shall be 1 M Ω or more, when the test is carried out in accordance with the method specified in 4.2.15 of JIS B 8615.

5.15 Withstand Voltage The conditioner shall withstand the test voltage when the test is carried out in accordance with the method specified in 4.2.16 of JIS B 8615.

5.16 Starting Characteristic The starting characteristic shall meet the following requirements:

- (1) The starting current shall have a value not exceeding the value marked on the nameplate or the like when the test is carried out in accordance with the method specified in 4.2.17 of JIS B 8615. However, for conditions without marking, the starting current shall not exceed 45 A for single-phase a.c. 100 V, or 60 A for single-phase a.c. 200 V.
- (2) The motor(s) shall start irrespective of its rotor position, when the test is carried out in accordance with the method specified in 4.2.17 of JIS B 8615.

5.17 Temperature

5.17.1 Normal Temperature The normal temperatures at cooling operation, heat-pump heating operation and electrical heating operation shall meet the respective following requirements:

- (1) The temperatures at cooling operation shall be such that the temperature of winding is not exceeding the appropriate value of Table 1 and no abnormal heat is produced on other parts when the test is carried out in accordance with the method specified in 4.2.18 (1) of JIS B 8615.
- (2) Conditioners which perform heating operation shall be such that the temperature rise of winding is not exceeding the appropriate value of Table 1, the temperatures of joints with supply wires, knobs and push button of switches, accessible enclosure and the surface of wooden plate on which the test sample is placed are not exceeding the respective values given in Table 2, and no abnormal heat is produced on other parts when tested in accordance with the method specified in 4.2.18 (1) of JIS B 8615.

Table 1

Unit: °C

Place of measurement		Temperature
Winding	of Class A insulation	100 max.
	of Class E insulation	115 max.
	of Class B insulation	125(120) max.
	of Class F insulation	150(140) max.
	of Class H insulation	170(165) max.

Remark 1. The values in parentheses are applied to the windings of rotating machines.

2. For motors used in the refrigerant, the value of Table added by 5°C shall apply.

Table 2

Unit: °C

Place measurement		Temperature
Joints with supply wires		90 max.
Knobs and push buttons of switch	of metal	60 max.
	of porcelain	
	of glass	
	of others	75 max.
Accessible enclosure (protective frame of heating element and outlet of warm air are excluded)		125 max.
Surface of wooden plate on which test sample is placed		80 max.

5.17.2 Abnormal Temperature The abnormal temperature, when the test is carried out on a conditioner having an electric heater in accordance with the method specified in 4.2.18 (2) of JIS B 8615, shall be such that the temperatures at the surfaces of enclosure (protective frame for heating elements and outlets of warm air are excluded) and of the wooden base are not exceeding 150°C (if there is no possibility of burning the test sample and wooden base when the thermal fuse or an automatic switch employed as an over-heat protective device operates, such case is excepted), that the insulation resistance between live parts and dead metal parts liable to be grounded measured with a 500 V insulation resistance tester is 0.1 MΩ or more, and that there is no risk of fire.

5.18 Wet Insulation Performance The wet insulation performance shall be such that the insulation resistance is 1 MΩ or more and the withstand voltage complies with the provision of 5.15, when the test is carried out on the outdoor part of an unitary air conditioner in accordance with the method specified in 4.2.19 of JIS B 8615.

5.19 Noise The noise shall have the appropriate value of Table 3 or less, when the test is carried out in accordance with the method specified in 4.2.20 of JIS B 8615.

Table 3

Unit: dB(A)

Rated cooling capacity (kcal/h) {W}	Indoor side	Outdoor side
Under 11200 {13023}	63 max.	68 max.
11200 {13023} to 23000 {26744} excl.	66 max.	71 max.

5.20 Energy Efficiency Ratio The energy efficiency ratio shall be such that the value of the cooling capacity obtained in 5.2 divided by the power consumption at cooling obtained in 5.3 is not less than 85 % of the value marked in accordance with the provision of 9.

6. Construction, Materials and Dimensions

6.1 Construction in General The construction shall meet the following respective requirements:

- (1) The principal parts shall be made of metals or other suitable materials and shall have good durability.
- (2) The shape shall be correct, and the assembling shall be good.
- (3) Finishing of each part shall be good and corrosion proof treatment shall be applied on iron and steel (excluding stainless steel) by means of plating, coating, oil baking or other suitable means. However, materials employed to the part oxidation of which will not impair the function are exempted from the above.
- (4) The material of each part shall withstand the temperature at that part under normal service conditions.