

Testing for rating of room air-conditioners —

Part 1: Method of testing for rating of room air-conditioners for cooling performance

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Foreword

This revised British Standard has been prepared under the direction of the Refrigeration, Heating and Air-conditioning Standards Committee. It deals with air-conditioners of capacity up to 7 kW; more powerful air-conditioners are dealt with in BS 5491, which includes psychrometric methods of determining cooling capacities.

Technical Committee TC 86, “*Refrigeration*”, of the International Organization for Standardization (ISO) embarked on a programme of work some time ago which included the preparation of a series of ISO Recommendations on air-conditioning units. The provisions of the revised edition of the first of this series, ISO 859 “*Testing and rating room air conditioners*”, have been incorporated into this British Standard, but the scope has been enlarged to include units with water-cooled condensers. A set of test conditions similar to field conditions met within the UK has also been added.

This Part of BS 2852, which deals with room air-conditioners used for cooling, supersedes BS 2852:1970 which is therefore withdrawn. Other Parts will deal with room air-conditioners used for heating in which the heat is supplied by electrical resistance, steam or hot water.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard describes a method of rating the performance of single package and split system room air-conditioners employing air-and water-cooled condensers. It also describes a method of testing the performance characteristics of these room air-conditioners. It deals with air-conditioners of capacity up to 7 kW.

This Part of this British Standard deals with room air-conditioners used for cooling. Units designed for use with additional ducting are not included, but, if inlet or outlet ducting is supplied as an integral part of the assembly, tests for that particular assembly can be carried out in accordance with this standard.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purposes of this Part of this British Standard, the following definitions apply.

3.1

room air-conditioner

an encased assembly or assemblies, designed as a unit, intended primarily to provide free delivery of conditioned air to an enclosed space, room or zone (conditioned space). It includes a prime source of refrigeration for cooling and dehumidification, and may operate as a heat pump

NOTE 1 Room air-conditioners are usually designed to be mounted in a window or through the wall or as a console.

NOTE 2 A room air-conditioner may include means for circulating, cleaning, heating, humidifying, ventilating or exhausting air. Where such equipment is provided in more than one assembly, the separate assemblies should be designed to be used together; the method of rating described in this standard is based upon the use of matched assemblies.

3.2

standard barometric pressure

barometric pressure of 101.325 kPa (1.013 25 bar)

3.3

wet bulb temperature

temperature indicated when the temperature-sensing element and wetted wick have reached a state of constant temperature (evaporative equilibrium) (see 6.1.5)

3.4

room discharge airflow of a unit

rate of flow of air from the room-side outlet of the unit

3.5

room intake airflow of a unit

rate of flow of air into the unit from the conditioned space

3.6

ventilation airflow of a unit

rate of flow of air introduced to the conditioned space through the unit from the outside

3.7

outdoor discharge airflow of a unit

rate of flow of air from the outdoor side of the unit

3.8

outdoor intake airflow of a unit

rate of flow of air into the unit from the outdoor side

3.9

exhaust airflow of a unit

rate of flow of air from the room side through the unit to the outdoor side

3.10

leakage airflow

rate of flow of air interchanged between the room side and outdoor side through the unit as a result of its construction features and sealing techniques

3.11

bypassed room airflow of a unit

flow of conditioned air directly from the room-side outlet to the room-side inlet of the unit

3.12

bypassed outdoor airflow of a unit

flow of air directly from the outdoor-side outlet to the outdoor-side inlet of the unit

3.13

equalizer opening airflow

rate of flow of air through the equalizer opening in the partition wall of a calorimeter

NOTE to 3.4 to 3.13. The definitions given in 3.4 to 3.13 relating to airflow are illustrated in Figure 1.

3.14

net total room-cooling effect of a unit

total capacity of the unit for removing sensible and latent heat from the space to be conditioned

3.15

net room-dehumidifying effect (latent cooling effect)

capacity of the unit for removing latent heat from the space to be conditioned

3.16

net room sensible cooling effect

capacity of the unit for removing sensible heat from the space to be conditioned

3.17
net room sensible heat ratio

ratio of the net room sensible cooling effect to the net total room-cooling effect

3.18
room calorimeter

test facility consisting of two contiguous calorimeters with a common partition. One is designated as the room-side compartment, and the other as the outdoor compartment. Each side is equipped with instrumented reconditioning equipment whose output may be measured and controlled to counterbalance the room-side dehumidifying and cooling effects and the outdoor-side humidifying and heating effects of the room air-conditioner under test

3.19
rated voltage(s)

voltage(s) shown on the nameplate of the unit

3.20
rated frequency(ies)

frequency(ies) shown on the nameplate of the unit

4 Rating and test conditions

4.1 Rating conditions for determination of the cooling capacity

4.1.1 The test conditions given in Table 1, columns A, B or C shall be the standard rating conditions.

4.1.2 Units manufactured for use in a climate similar to that described in Table 1, column A only, shall have a nameplate rating determined by tests conducted at those conditions and shall be designated type A units.

4.1.3 Units manufactured for use in a climate similar to that described in Table 1, column B only, shall have a nameplate rating determined by tests conducted at those conditions and shall be designated type B units.

4.1.4 Units manufactured for use in a climate similar to that described in Table 1, column C only, shall have a nameplate rating determined by tests conducted at those conditions and shall be designated type C units.

4.1.5 Units manufactured for use in more than one of the types of climate described in Table 1, columns A, B and C, shall have marked on the nameplate the designation, type and rating determined by test for each of the conditions for which they have been designated and tested.

4.1.6 When a capacity rating is cited the corresponding voltage and frequency rating shall also be given.

4.1.7 All standard ratings for equipment in which the condenser or condensing unit is separated from the cooling coil shall be determined with the length of interconnecting tubing on each line being the maximum specified by the manufacturer, or 7.5 m, whichever is the shorter. Such equipment in which the interconnecting tubing is furnished as an integral part of the machine, and is not recommended for cutting to length, shall be tested with the complete length of tubing furnished. Unless constrained by the design, at least half of the interconnecting tubing shall be exposed to the outside conditions, with the rest of the tubing exposed to the inside conditions. The line sizes, insulation, details of installation, evacuation and charging shall be in accordance with the manufacturer's published recommendations.

Table 1 — Test conditions for the determination of the cooling capacity

Property	Test conditions		
	A	B	C
<i>Room air temperature, °C</i>			
dry bulb	27	29	21
wet bulb	19	19	15
<i>Outside air temperature, °C</i>			
dry bulb	35	46	27
wet bulb	24	24	19
<i>Condenser water temperature^a, °C</i>			
inlet	—	30	22
outlet	—	35	27
Test frequency	Rated frequency ^b		
Test voltage	Rated voltage ^c		
^a Representative of units working with cooling towers. ^b Units with dual-rated frequencies shall be tested at each frequency. ^c Units with dual-rated voltages shall be tested at each voltage, or at the lower of the two voltages if only a single rating is published.			

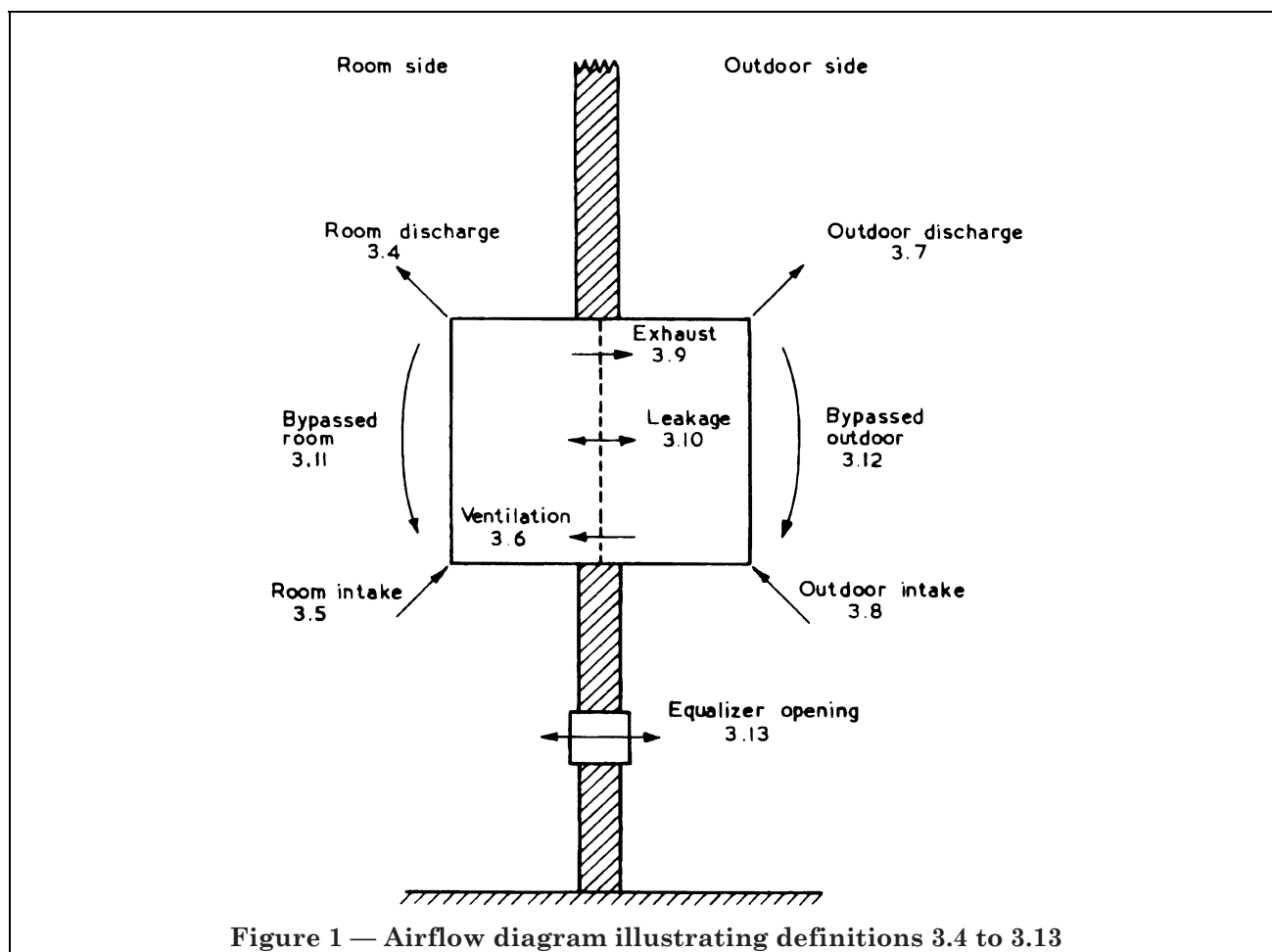


Figure 1 — Airflow diagram illustrating definitions 3.4 to 3.13

4.2 Conditions for the maximum operating test

4.2.1 The conditions given in Table 2 shall be used during tests for maximum operating conditions. Tests shall be carried out under the conditions given in column A, column B or column C according to the intended use as determined in 4.1.

4.2.2 Units intended for use under more than one set of operating conditions shall be tested under the highest relevant set of intended operating conditions.

4.3 Conditions for the freeze-up test. The conditions given in Table 3 shall be used during freeze-up tests for all models.

4.4 Conditions for the enclosure sweat test. The conditions given in Table 4 shall be used during enclosure sweat tests for all models.

4.5 Conditions for the condensate disposal test. Condensate disposal tests shall be conducted at the same conditions as those specified for enclosure sweat tests (see 4.4).

NOTE These tests do not apply to water-cooled units.

4.6 Conditions for measuring airflow. When airflows are being determined for rating purposes, tests shall be conducted at standard rating conditions (see Table 1) with the means of refrigeration in operation and after condensate equilibrium has been established.

4.7 Conditions for the minimum operating test. The conditions given in Table 5 shall be used during tests for minimum operating conditions (starting test, cooling) for all models.

5 Calorimeters

5.1 General

5.1.1 *Principle.* The calorimeter provides a method for determining cooling capacity simultaneously on the room side and the outdoor side. The room-side capacity is determined by balancing the cooling and dehumidifying effects with measured heat and water inputs. The outdoor-side capacity provides a confirming test of the cooling and dehumidifying effects by balancing the heat and water rejection on the condenser side with a measured amount of cooling medium. See also clause 8.