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Non-ducted portable air-cooled air conditioners and air-to-air heat pumps having a single exhaust duct — Testing and rating for performance

Climatiseurs refroidis par air et pompes à chaleur portables non raccordés à simple conduit — Essais et détermination des caractéristiques des performances

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 6, *Testing and rating of air-conditioners and heat pumps*.

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Introduction

Single duct portable air conditioners and heat pumps can be selected for their ease and rapidity of use, handling and installation, in particular when the use of other categories of air conditioners is not convenient or forbidden, for example in rented or holiday houses or in historical buildings where an external unit cannot be placed outdoors.

The operational mode and features of such appliances are quite different from those of the well-known non-ducted air conditioners and heat pumps largely diffused worldwide and covered by ISO 5151.

There are presently no internationally recognized standards for single duct portable air conditioners and heat pumps. The economic operators involved in the production and distribution of such products face significant problems in verifying and declaring performance and energy consumption data in an objective and internationally recognized way.

This being considered, ISO/TC 86/SC 6 decided to prepare a specific standard for single duct portable air conditioners and heat pumps.

During the discussion of its contents it was acknowledged that it is necessary to provide the users with information on the specific characteristics of single duct portable air conditioners and heat pumps, on their correct installation and on their use. This will be covered by a future Amendment to this document which is currently under discussion.

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Non-ducted portable air-cooled air conditioners and air-to-air heat pumps having a single exhaust duct — Testing and rating for performance

1 Scope

This document specifies the standard conditions for capacity and efficiency ratings of non-ducted portable air-cooled air conditioners having a single exhaust duct and non-ducted portable air-cooled heat pumps having a single exhaust duct. Such air conditioners and heat pumps may include an evaporatively cooled condenser cooled by air and the evaporation of:

a) condensate collected from the evaporator;

b) external supplementary water stored in a supplementary water tank; or

c) both a) and b).

This document also specifies the test methods for determining the capacity and efficiency ratings.

This document applies to equipment that is factory-made, electrically driven and uses mechanical compression. This document is applicable to equipment utilizing one or more refrigeration systems.

This document is not applicable to the rating and testing of the following:

i) Water-source heat pumps or water-cooled air conditioners;

ii) Multi-split-system air conditioners and air-to-air heat pumps (see ISO 15042:2017 for the testing of such equipment);

iii) Individual assemblies not constituting a complete refrigeration system;

iv) Equipment using the absorption refrigeration cycle;

v) Ducted equipment (see ISO 13253:2017 for the testing of such equipment);

vi) Evaporative coolers or any other cooling systems that are not of the vapour compression type;

vii) Dehumidifiers;

viii) Spot coolers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 817, *Refrigerants — Designation and safety classification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

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— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
bypassed indoor airflow
rate of flow of conditioned air directly from the indoor-side outlet to the indoor-side inlet of the equipment

Note 1 to entry: See Figure 1.

3.2
coefficient of performance
COP
ratio of the heating capacity to the total power input to the device at any given set of rating conditions

Note 1 to entry: Where the COP is stated without an indication of units, it is understood that it is derived from watts/watt.

3.3
conditioned space
enclosed space, room or zone to which conditioned air is delivered

3.4
dehumidifer
encased assembly designed to remove moisture from its surrounding atmosphere using either an electrically operated refrigeration system or a desiccant type of material including a means to circulate air and a drain arrangement for collecting and storing and/or disposing of the condensate

3.5
total power input
P_t
average electrical power input to the equipment as measured during the test

Note 1 to entry: Total power input is expressed in units of watts.

3.6
ventilation airflow
rate of flow of air introduced to the conditioned space through the equipment

3.7
equalizer opening airflow
rate of flow of air from the outdoor side through the equalizer opening in the partition wall of a calorimeter to the indoor side

Note 1 to entry: See Figure 1.

3.8
evaporatively cooled condenser
heat exchanger that condenses refrigerant vapour by rejecting heat to a water and air mixture causing the water to evaporate and increase the enthalpy of air

Note 1 to entry: Desuperheating and sub-cooling of the refrigerant may also occur.

3.9
exhaust airflow
rate of flow of air from the indoor side through the equipment to the outdoor side

Note 1 to entry: See Figure 1.

3.10
full-load operation
operation with the equipment and controls configured for the maximum continuous duty refrigeration capacity specified by the manufacturer and allowed by the unit controls

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3.11
heating capacity
amount of heat that the equipment can add to the conditioned space (but not including supplementary heat) in a defined interval of time

Note 1 to entry: Heating capacity is expressed in units of watts. Manually selectable supplementary heaters are disabled during capacity tests, but any automatic supplementary heaters are permitted to operate.

3.12
indoor compartment
indoor-side compartment
testing room simulating the conditioned space (and containing the tested appliance)

Note 1 to entry: See Figure 1.

3.13
indoor discharge airflow
rate of flow of air from the outlet of the equipment into the conditioned space

Note 1 to entry: See Figure 1.

3.14
indoor heat exchanger
heat exchanger which is designed to remove heat from the indoor part of the building or to transfer heat to it

Note 1 to entry: In the case of an air conditioner or heat pump operating in the cooling mode, this is the evaporator. In the case of an air conditioner or heat pump operating in the heating mode, this is the condenser.

3.15
indoor intake airflow
rate of flow of air into the equipment from the conditioned space

Note 1 to entry: See Figure 1.

3.16
latent cooling capacity
amount of latent heat that the equipment can remove from the conditioned space in a defined interval of time

Note 1 to entry: Latent cooling capacity is expressed in units of watts.

Note 2 to entry: “Latent cooling capacity” is also known as “room dehumidifying capacity”.

3.17
leakage airflow
rate of flow of air interchanged between the indoor side and outdoor side through the equipment as a result of its construction features and sealing techniques

Note 1 to entry: See Figure 1.

3.18
non-ducted portable air-cooled air conditioner having a single exhaust duct
encased assembly, designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone which takes its source of air for cooling the condenser from the conditioned space, and discharges this air through a duct to the outdoor space

Note 1 to entry: Such air conditioners comprise a primary source of refrigeration for cooling and dehumidification. They can also include means for heating other than a heat pump, as well as means for circulating, cleaning, humidifying, ventilating or exhausting air.

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3.19
non-ducted portable air-cooled heat pump having a single exhaust duct
encased assembly designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone and includes a prime source of refrigeration for heating and which takes its source of air for the evaporator from the conditioned space, and discharges this air through a duct to the outdoor space

Note 1 to entry: Such heat pumps can be constructed to remove heat from the conditioned space and discharge it to a heat sink if cooling and dehumidification are desired from the same equipment. They can also include means for circulating, cleaning, humidifying, ventilating or exhausting air.

3.20
outdoor compartment
compartment where the exhaust air is rejected through the duct of single duct air conditioner

3.21
outdoor exhaust airflow
discharge rate of flow of air from the equipment through the exhaust duct

Note 1 to entry: See Figure 1.

3.22
outdoor heat exchanger
heat exchanger that is designed to transfer heat to the outdoor ambient environment or to remove heat from it

Note 1 to entry: In the case of an air conditioner or heat pump operating in the cooling mode, this is the condenser. In the case of an air conditioner or heat pump operating in the heating mode, this is the evaporator.

3.23
rated frequency
frequency shown on the nameplate of the equipment

3.24
rated voltage
voltage shown on the nameplate of the equipment

3.25
sensible cooling capacity
amount of sensible heat that the equipment can remove from the conditioned space in a defined interval of time

Note 1 to entry: Sensible cooling capacity is expressed in units of watts.

3.26
sensible heat ratio
SHR
ratio of the sensible cooling capacity to the total cooling capacity

3.27
spot cooler
encased assembly air conditioner that lies wholly within a conditioned space and that draws air for both the evaporator and condenser from the conditioned space and expels both of these back into the conditioned space

Note 1 to entry: A spot cooler is usually portable.

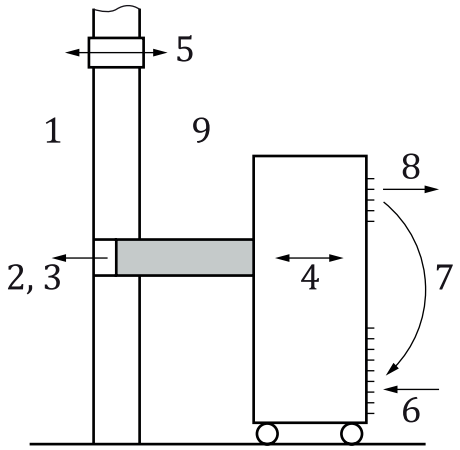
3.28
standard air
dry air at 20 °C and at a standard barometric pressure of 101,325 kPa, having a mass density of 1,204 kg/m^3

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3.29
supplementary water tank
tank designed as an integral part of the unit to contain external supplementary water which is fed to the evaporatively cooled condenser

3.30
total cooling capacity
amount of sensible and latent heat that the equipment can remove from the conditioned space in a defined interval of time

Note 1 to entry: Total cooling capacity is expressed in units of watts.



Key
1 outdoor compartment (3.20)
2 outdoor exhaust airflow (3.21)
3 exhaust airflow (3.9)
4 leakage airflow (3.17)
5 equalizer opening airflow (3.7)
6 indoor intake airflow (3.15)
7 bypassed indoor airflow (3.1)
8 indoor discharge airflow (3.13)
9 indoor compartment (3.12)

Figure 1 — Airflow diagram illustrating the airflow definitions

4 Symbols

Symbol	Description	Unit
A_l	coefficient, heat leakage	J/(s·K)
A_n	area, nozzle	m^2
C_d	nozzle discharge coefficient	[a]
c_{pa}	specific heat of air, moist air	J/(kg·K)
c_{pw}	specific heat of water	J/(kg·K)
D_n	nozzle throat diameter	m
D_t	outside diameter of refrigerant tube	m
f	factor, dependent on temperature, for R_e	—
h_{w1}	specific enthalpy of water or steam supplied to indoor side compartment	J/kg
h_{w2}	specific enthalpy of condensed moisture leaving indoor side compartment	J/kg

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