

Heat exchangers — Test procedures for establishing performance of unit air coolers for refrigeration

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National foreword

This Draft for Development has been prepared under the direction of the Refrigeration, Heating and Air Conditioning Standards Policy Committee and is the English language version of European Prestandard ENV 328:1992 *Heat exchangers — Test procedures for establishing performance of unit air coolers for refrigeration* published by the European Committee for Standardization (CEN). Prestandard ENV 328 was produced as a result of international discussion in which the UK took an active part.

NOTE This work was originally undertaken under the auspices of E-16 which has now been reconstructed to form Technical Committee RHE/30.

This publication is not to be regarded as a British Standard

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is still under technical development requiring wider exposure. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. According to the replies received, the responsible BSI committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of the BSI Technical Committee RHE 30 at the BSI London Office, 2 Park Street, London, W1A 2BS.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 18, 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.

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Descriptors: Heat exchangers, refrigerating system, air coolers, definitions, tests, measurement, characteristics

English version

Heat exchangers — Test procedures for establishing performance of unit air coolers for refrigeration

Exchangeurs thermiques — Procédures d'essai pour la détermination de la performance des aérofrigorifères à convection forcée

Wärmeaustauscher — Prüfverfahren zur Bestimmung der Leistungskriterien von Ventilatorluftkühlern

This European Prestandard (ENV) was approved by CEN on 1992-05-13 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European prestandard was prepared by CEN Technical Committee CEN/TC 110 “Heat exchangers”, the secretariat of which is held by SIS.

This European prestandard has been adopted during the meeting of CEN/TC 110 as a European prestandard on 1992-05-12 after consideration of comments received from a public enquiry and establishment of the final version of the European prestandard.

According to the CEN/CENELEC Common Rules, the following countries are bound to announce the existence of this European prestandard: Austria, Belgium, Denmark, Finland, France, Greece, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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1 Scope

1.1 This European Standard applies to unit air coolers for refrigeration operating:

- a) with direct dry expansion of a (primary) refrigerant;
- b) with a secondary refrigerant.

Its purpose is to establish a uniform method of testing.

Air coolers for duct mounting or with natural air convection and coolers operating with ammonia are not covered by this standard.

1.2 To test and ascertain the following:

- a) product identification;
- b) sensible gross air cooler capacity¹⁾;
- c) air flow;
- d) energy requirements;
- e) air throw (if required).

1.3 This European Standard does not cover technical safety aspects.

1.4 This standard should be read and used in conjunction with the following CEN standards:–

ENV 247, *Heat exchangers: Terminology*.

ENV 305, *Heat exchangers: Definitions of performance of heat exchangers and the general test procedure for establishing performance of all heat exchangers*.

EN 306, *Heat exchangers: Methods of measuring the parameters necessary for establishing the performance*.

ENV 307, *Heat exchangers: Guidelines to prepare installation; operating and maintenance instructions required to maintain the performance of each type of heat exchanger*.

2 Definitions

2.1

unit air cooler

a unit air cooler is a ready-made cooling coil with one or more fans for transferring heat from air to a primary or secondary refrigerant with the necessary accessories, e.g. housing, drain pan, defrost heating, liquid-suction heat exchanger if this is integral, but without controls
in the following sections, the term air cooler means unit air cooler

2.2

cooling coil

the part of an air cooler in which the refrigerant absorbs heat from the air which is forced by the fan(s) through the cooling coil including header(s) and the liquid distributor

2.3

(primary) refrigerant

the working fluid in a refrigerating system absorbing the heat flow by evaporation at low temperature and rejecting it at a higher temperature by condensation

2.4

secondary refrigerant

the working fluid in the refrigerating system remaining liquid during the absorption of heat flow

¹⁾ NOTE In this standard the gross air-cooler capacity is chosen for the standard capacity as this value is authoritative for the compressor capacity. According to the usual calculating processes for cooling loads the fan capacity is always introduced separately and the gross capacity

2.5 capacities

2.5.1

sensible (dry) air cooler capacity

the sensible (dry) air cooler capacity is the heat flow when cooling the air, the dew point of which is the same as or lower than the evaporating temperature of the (primary) refrigerant or the secondary refrigerant inlet temperature

2.5.2

latent air cooler capacity

the latent air cooler capacity is the heat flow which is absorbed from the air by condensation of water vapour or frost formation including subcooling on the air cooler surface

2.5.3

total air cooler capacity

the total air cooler capacity is the sum of the sensible and the latent capacities measured at the same time

2.5.4

gross air cooler capacity

the gross air cooler capacity is the total heat flow absorbed in the cooling coil by the refrigerant. It includes the fan heat and serves to determine the necessary compressor capacity

2.5.5

net air cooler capacity

the net air cooler capacity is the air cooler capacity available for cooling the air: it is equal to the gross air cooler capacity minus the power absorbed by the fan motor(s) (P_{fan})

2.6 temperatures

For the purposes of this standard all temperatures are average values ascertained over a certain period of time.

2.6.1 air temperatures

2.6.1.1

the air inlet temperature, t_{11} , is the average dry bulb temperature of the air entering the unit air cooler, taking into consideration the local air velocities

2.6.1.2

the air outlet temperature, t_{12} , is the average dry bulb temperature of the air leaving the unit air cooler taking into consideration the local air velocities

2.6.1.3

the cold room temperature is the average of the air temperatures in the whole cold room

NOTE The cold room temperature cannot be used as a reference temperature for measuring as it is also influenced by factors which do not depend on the forced convection unit air cooler e.g. the type of air distribution, the type of goods stored and their arrangement in the room.

2.6.2 (primary) refrigerant temperatures

2.6.2.1

the evaporating temperature, t_e , is the saturation temperature, corresponding to the absolute pressure of the refrigerant, at the suction outlet of the cooling coil including liquid-suction heat exchanger if this is an integral part of the air cooler

2.6.2.2

the super heating temperature, t_{22} , is the temperature of the refrigerant vapour leaving the air cooler measured on the wall of the tube at the location recommended by the manufacturer for fixing the expansion valve sensing element or downstream of the liquid-suction heat exchanger if this is an integral part of the air cooler

NOTE This location however is to be within a distance of 500 mm from the air cooler and within the cold room.