SLOVENSKI STANDARD
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Klimatske naprave, enote za hlajenje kapljevine, toplotne črpalke za ogrevanje in hlajenje prostora ter procesne hladilne naprave z električnimi kompresorji - 3. del: Preskusne metode

Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 3: Test methods

Luftkonditionierer, Flüssigkeitskühlsätze und Wärmepumpen für die Raumbeheizung und -kühlung und Prozess-Kühler mit elektrisch angetriebenen Verdichtern - Teil 3: Prüfverfahren

Climatiseurs, groupes refroidisseurs de liquide et pompes à chaleur pour le chauffage et le refroidissement des locaux et refroidisseurs industriels avec compresseur entraîné par moteur électrique - Partie 3 : Méthodes d'essai

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EUROPEAN STANDARD

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Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 3: Test methods

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This European Standard was approved by CEN on 10 July 2022.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14511-3:2022) has been prepared by Technical Committee CEN/TC 113 “Heat pumps and air conditioning units”, the secretariat of which is held by UNE.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2023, and conflicting national standards shall be withdrawn at the latest by March 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14511-3:2018.

The main changes compared with EN 14511-3:2018 are as follows:

— update of the flowchart with steps procedure;

— addition of new annexes for the liquid enthalpy test method;

— addition of a new Annex ZC on the relationship with Commission Regulation (EU) No 2016/2281.

This document has been prepared in the frame of:

— Commission Regulation (EU) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans;

— Commission Delegated Regulation (EU) No 626/2011 of 4 May 2011 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of air conditioners;

— Commission Regulation (EU) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters;

— Commission Delegated Regulation (EU) No 811/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device;

— Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers;

— Commission Regulation (EU) 2016/2281 of 30 November 2016 implementing Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-related products, with regard to ecodesign requirements for air heating products, cooling products, high temperature process chillers and fan coil units.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Regulation(s).

For relationship with EU Regulation(s), see informative Annex ZA, ZB or ZC, which is an integral part of this document.

EN 14511, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors*, currently comprises the following parts:

— *Part 1: Terms and definitions*;

— *Part 2: Test conditions*;

— *Part 3: Test methods*;

— *Part 4: Requirements*.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

1.1 The scope of EN 14511-1:2022 is applicable.

1.2 This document specifies the test methods for the rating and performance of air conditioners, liquid chilling packages and heat pumps using either air, water or brine as heat transfer media, with electrically driven compressors when used for space heating and cooling. These test methods also apply for the rating and performance of process chillers.

It also specifies the method of testing and reporting for heat recovery capacities, system reduced capacities and the capacity of individual indoor units of multisplit systems, where applicable.

This document also makes possible to rate multisplit and modular heat recovery multisplit systems by rating separately the indoor and outdoor units.

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.

EN 14511-1:2022, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors — Part 1: Terms and definitions*

EN 14825:2018, *Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling — Testing and rating at part load conditions and calculation of seasonal performance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14511-1:2022 apply.

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

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

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

4 Tests for determination of capacities

4.1 Basic principles and methods

4.1.1 Air-to-air and water(brine)-to-air units

Heating and/or cooling capacity of air-to-air or water(brine)-to-air units shall be determined from measurements in a calorimeter room (see Annex A) or by the air enthalpy method (see Annex B).

NOTE 1 Annex C (informative) provides additional information to Annex B for reducing uncertainties of measurement of capacities.

The measured heating capacity Φ_{thi} shall be corrected for the heat from the indoor fan as specified in 4.1.3.2 or 4.1.3.3 to obtain the heating capacity P_H.

The measured cooling capacity Φ_{tci} shall be corrected for the heat from the indoor fan as specified in 4.1.3.2 or 4.1.3.3 to obtain the cooling capacity P_C.

NOTE 2 For rating indoor units and/or outdoor units separately, Annex G can be used.

4.1.2 Air-to-water(brine) and water(brine)-to-water(brine) units

The heating and/or cooling capacity of air-to-water(brine) and water(brine)-to-water(brine) units shall be determined in accordance with the liquid enthalpy test method at the liquid indoor heat exchanger (see Annex D).

The heat recovery capacity of air-to-water(brine) and water(brine)-to-water(brine) units shall be determined in accordance with the liquid enthalpy test method at the liquid heat recovery heat exchanger (see Annex D).

NOTE Annex E (informative) provides additional information to Annex D regarding the test installation and measurements.

The measured heating capacity Φ_{thi} shall be corrected for the heat from the indoor liquid pump as specified in 4.1.3.4 to obtain the heating capacity P_H.

The measured cooling capacity Φ_{tci} shall be corrected for the heat from the indoor liquid pump as specified in 4.1.3.4 to obtain the cooling capacity P_C.

The measured heat recovery capacity Φ_{hr} shall be corrected for the heat from the heat recovery liquid pump as specified in 4.1.3.4 to obtain the heating recovery capacity P_{HR}.

4.1.3 Capacity correction

4.1.3.1 General

The capacity shall include the correction due to the heat output of the indoor fan or pump, integrated into the unit or not as follows.

4.1.3.2 Capacity correction due to indoor fan for non-ducted units

In the case of units which are not designed for duct connection, i.e. which do not permit any external pressure difference, and which are equipped with an integral fan, no capacity correction due to heat provided by the fan shall apply.

4.1.3.3 Capacity correction due to indoor fan for ducted units

4.1.3.3.1 Units with integrated indoor fan

If the fan at the indoor heat exchanger is an integral part of the unit, the power input correction of the fan, as calculated with Formula (5) (see 4.1.4.3.1) shall be:

— subtracted from the measured heating capacity;

— added to the measured cooling capacity.

4.1.3.3.2 Units with non-integrated indoor fan

If the fan at the indoor heat exchanger is not an integral part of the unit, the power input correction as calculated with Formula (6) (see 4.1.4.3.2) shall be:

— added to the measured heating capacity;

— subtracted from the measured cooling capacity.

4.1.3.4 Capacity correction due to indoor liquid pump

4.1.3.4.1 Units with integrated liquid pump

If the liquid pump is an integrated part of the unit, the capacity correction as specified in 4.1.3.4.3 or 4.1.3.4.4 shall be:

— subtracted from the measured heating capacity;

— added to the measured cooling capacity;

— subtracted from the measured heat recovery capacity.

In case, the integrated liquid pump does not provide any available external static pressure difference, no capacity correction applies.

4.1.3.4.2 Units with non-integrated liquid pump

If the liquid pump is not an integral part of the unit, the capacity correction as specified in 4.1.3.4.5 shall be:

— added to the measured heating capacity;

— subtracted from the measured cooling capacity;

— added to the measured heat recovery capacity.

4.1.3.4.3 Capacity correction for integrated glandless circulator

If the unit is equipped with a glandless circulator, the capacity correction, expressed in W, is calculated using Formula (1).

$$\left(q \times \Delta_{pe}\right) \times \frac{1-\eta}{\eta} \quad (1)$$

where

q is the measured liquid flow rate, expressed in m^3/s.

Δp_e is the measured available external static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.3;

η is the global efficiency of the pump calculated according to Annex F.

4.1.3.4.4 Capacity correction for integrated dry motor pump

If the unit is equipped with a dry-motor pump, the capacity correction, expressed in W, shall be calculated using Formula (2).

$$\left(q \times \Delta_{pe}\right) \times \frac{IE - \eta}{\eta} \tag{2}$$

where

q is the measured liquid volume flow rate, expressed in m^3/s;

Δp_e is the measured available external static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.3;

IE is the motor efficiency as specified in the EC 2019/1781 regulation;

η is the global efficiency of the pump calculated according to Annex F.

4.1.3.4.5 Capacity correction for non-integrated liquid pump

If the measured hydraulic power according to Annex F is ≤ 300 W, the liquid pump is considered as a glandless circulator. The capacity correction, expressed in W, is calculated using Formula (3).

$$\left(q \times -\Delta_{pi}\right) \times \frac{1 - \eta}{\eta} \tag{3}$$

where

q is the measured liquid flow rate, expressed in m^3/s;

Δp_i is the measured internal static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.30;

η is the global efficiency of the pump calculated according to Annex F.

If the measured hydraulic power according to Annex F is > 300 W, the liquid pump is considered as a dry-motor pump. The capacity correction, expressed in W, is calculated using Formula (4).

$$\left(q \times -\Delta_{pi}\right) \times \frac{IE - \eta}{\eta} \tag{4}$$

where

q is the liquid volume flow rate, expressed in m^3/s;

Δp_i is the measured internal static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.30;

IE is equal to 0,88 (average motor nominal efficiency specified in the EC 2019/1781 regulation for IE3 efficiency level);

η is the global efficiency of the pump calculated according to Annex F.

4.1.4 Effective power input

4.1.4.1 General

The effective power input shall include the correction due to power input of indoor and/or outdoor fans and/or pumps, integrated into the unit or not as follows.

4.1.4.2 Power input correction due to fans for non-ducted units

In the case of units which are not designed for duct connection, i.e. which do not permit any external pressure difference, and which are equipped with an integral fan, the power absorbed by the fan shall be included in the effective power absorbed by the unit.

4.1.4.3 Power input correction due to fans for ducted units

4.1.4.3.1 Power input correction of integrated fans

If a fan is an integral part of the unit, only a fraction of the power input of the fan motor shall be included in the effective power absorbed by the unit. The fraction that is to be excluded from the total power absorbed by the unit, expressed in W, shall be calculated using Formula (5):

$$\frac{q \times \Delta p_{e(corr)}}{\eta} \tag{5}$$

where

q is the air volume flow rate, expressed in m^3/s and set according to 4.4.1.3 ($q_{v,lab}$) or 4.4.1.4 ($q_{v,outdoor,lab}$);

$\Delta p_{e\ (corr)}$ is the available external static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.3 and set according to 4.4.1.3 ($\Delta p_{e,lab}$) or 4.4.1.4 ($\Delta p_{e,outdoor,lab}$);

η is equal to η_{target} as declared by the fan manufacturer according to the ecodesign regulation (EU) No 327/2011 for fans driven by motors between 125 W and 500 kW; otherwise is equal to 0,3 by convention.

4.1.4.3.2 Power input correction of non-integrated fans

If no fan is provided with the unit, the proportional power input which is to be included in the effective power absorbed by the unit, expressed in W, shall be calculated using the Formula (6):

$$\frac{q \times \left(-\Delta p_i\right)}{\eta} \tag{6}$$

where

q is the air volume flow rate, expressed in m^3/s and set according to 4.4.1.3 or 4.4.1.4;

Δp_i is the measured internal static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.30;

η is 0,3 by convention.

4.1.4.4 Power input correction due to liquid pumps

4.1.4.4.1 Power input correction of integrated liquid pumps

When the liquid pump is integrated into the unit, it shall be connected for operation. When the liquid pump is delivered by the manufacturer apart from the unit, it shall be connected for operation according to the manufacturer's instructions and be then considered as an integral part of the unit.

For an integrated liquid pump, only a fraction of the input to the pump motor shall be included in the effective power absorbed by the unit. The fraction which is to be excluded from the total power absorbed by the unit, expressed in W, shall be calculated using Formula (7):

$$\frac{q \times \Delta p_e}{\eta} \tag{7}$$

where

q is the measured liquid flow rate, expressed in m^3/s;

Δp_e is the measured available external static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.3;

η is the efficiency of the pump calculated according to Annex F.

In case the liquid pump is not able to provide any external static pressure difference, then this correction does not apply but the correction shall be made according to 4.1.4.4.2.

4.1.4.4.2 Power input correction of non-integrated liquid pumps

If no liquid pump is provided with the unit, the proportional power input which is to be included in the effective power absorbed by the unit, expressed in W, shall be calculated using Formula (8):

$$\frac{q \times \left(-\Delta p_i\right)}{\eta} \tag{8}$$

where

q is the measured liquid flow rate, expressed in m^3/s;

Δp_i is the measured internal static pressure difference, expressed in Pa, as defined in EN 14511-1:2022, 3.30;

η is the efficiency of the pump calculated according to Annex F.

4.1.5 Units on a distribution network of pressured water

In the case of appliances designed specially to operate on a distributing network of pressurized water without water-pump, no correction shall be applied to the power input.

4.1.6 Units for use with remote condenser

The power from the auxiliary liquid pump of the remote condenser shall not be taken into account in the effective power input.