SLOVENSKI STANDARD
SIST EN 14825:2019

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Nadomešča:
SIST EN 14825:2016

Klimatske naprave, enote za hlajenje kapljevine ter toplotne črpalke za ogrevanje in hlajenje prostora z električnimi kompresorji - Preskušanje in ocenitev ob delni obremenitvi ter izračun letnega učinka

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

Luftkonditionierer, Flüssigkeitskühlsätze und Wärmepumpen mit elektrisch angetriebenen Verdichtern zur Raumbeheizung und -kühlung - Prüfung und Leistungsbemessung unter Teillastbedingungen und Berechnung der jahreszeitbedingten Leistungszahl

Climatiseurs, groupes refroidisseurs de liquide et pompes à chaleur avec compresseur entraîné par moteur électrique pour le chauffage et la réfrigération des locaux - Essais et détermination des caractéristiques à charge partielle et calcul de performance saisonnière

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23.120	Zračniki. Vetrniki. Klimatske naprave	Ventilators. Fans. Air-conditioners
27.080	Toplotne črpalke	Heat pumps
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14825

December 2018

ICS 27.080; 91.140.30

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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

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This European Standard was approved by CEN on 25 June 2018.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14825:2018) 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of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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 14825:2016.

The revision was necessary in order to harmonize this European standard with 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.

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

For relationship with EU Regulation(s), see informative Annex ZA, Annex ZB, Annex ZC and Annex ZD, which are integral parts of this document.

The technical content of the previous edition remains unchanged with the exceptions of technical modification that were deferred to the next revision at UAP stage of EN 14825:2016. The main changes with respect to requirements for *forthcoming regulations* are:

a) modification of the scope to include hybrid heat pumps; DX-to-water(brine) units and process chillers;

b) modification of Clause 3 in order to be harmonized with Commission Regulation (EU) 2015/1095 of 5 May 2015;

c) modification of Table 1 to include references to European regulations which use different terms and symbols;

d) new numbering of Clause 5 and Clause 6;

EN 14825:2016	EN 14825:2018
Clause 5	Clause 6
Clause 6	Clause 5

e) modification of Clause 5 to include new requirement for seasonal space cooling efficiency;

f) modification of Clause 6 to include requirements for hybrid heat pumps and DX-to-water(brine) units;

g) new Clause 7 with test methods for hybrid heat pumps with fossil fuel boilers;

h) modification of Clause 8 to include air-to-air units above 12 kW and hybrid heat pumps;

i) new Clause 9 to cover process cooling;

j) new Clause 10 to cover calculation of SEPR;

k) renumbering of Clause 8 to Clause 11

EN 14825:2016	EN 14825:2018
Clause 8	Clause 11
Clause 9	Clause 12
Clause 10	Clause 13
Clause 11	Clause 14

l) modification of Clause 11, Clause 12, Clause 13 and Clause 14 to include units below 12 kW and ground coupled units;

m) new Annex C for process chillers;

n) new Annex D for air conditioners and air-to-air heat pumps above 12 kW, water(brine)-to-air units and liquid chilling packages;

o) renumbering of Annex C to Annex H

EN 14825:2016	EN 14825:2018
Annex C	Annex E
Annex D	Annex F
Annex E	Annex G
Annex F	Annex H
Annex G	Annex J
Annex H	Annex L

p) new E.3 for hybrid heat pumps, new E.4 for process chillers, new E.5 for comfort chillers and air/water(brine)-to-air and air-conditioners below or equal to 2 MW and E.6 for Air-to-air and water(brine)-to-air heat pumps below or equal to 2 MW;

q) new Annex K for Calculation example for $SCOP_{on}$ for variable speed hybrid heat pump based on heat pump and boiler separated test;

r) new Annex N for rating of outdoor units of multi-split air conditioners and heat pumps;

s) modification Annex ZA to reflect the new numbering;

t) modification split of Annex ZB into Annex ZB and Annex ZC to reflect the new numbering and the different scheme of annexes for ecodesign and ecolabelling;

u) new informative Annex ZD, Relationship between this European Standard and the requirements of Commission Regulation (EU) 2015/1095 of 5 May 2015.

NOTE Some modifications listed above were drafted in anticipation of Commission Regulation 2016/2281.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Heat pumps, air conditioners and liquid chilling packages can be selected and compared at standard rating conditions. These conditions do not represent the usual operating conditions of the equipment over a season. Better comparison for equipment can be assessed by determining Seasonal Energy Efficiency Ratio and Seasonal Coefficient of Performance that enable to take into account more representative operating conditions and performance at rated capacities.

Fixed capacity heat pumps, air conditioners and liquid chilling packages deal with varying loads by varying the operation time. The efficiency of the system is dependent on the effectiveness of the controlling thermostats. Variable capacity air conditioners, liquid chilling packages and heat pumps, by continuous or step control of the compressor, can more closely match the varying load improving system efficiency.

This document provides part load conditions and calculation methods for calculating the Seasonal Energy Efficiency Ratio ($SEER_{on}$) and Seasonal Coefficient of Performance ($SCOP_{on}$ and $SCOP_{net}$) of such units when they are used to fulfil the cooling and heating demands.

Other electric energy consumptions can occur when the unit is not used to fulfil the cooling and heating demands such as those from a crankcase heater or when the unit is on standby. These consumptions are considered in the calculation methods for *SEER* and *SCOP*.

This documentalso considers Seasonal Energy Performance Ratio of process chillers (*SEPR*) which is representative of variations in loads throughout a complete year. Test conditions and test method are described to calculate this *SEPR*.

SEER/$SEER_{on}$, *SCOP*/$SCOP_{on}$, $SCOP_{net}$ and *SPER* calculations may be based on calculated or measured values. In case of measured values, this document gives the methods for testing heat pumps, air conditioners and liquid chilling packages at part load conditions.

The standard rating conditions and test methods are given in EN 14511-2 and EN 14511-3.

Although this document was prepared in the frame of the Commission Regulation (EU) No 206/2012 implementing Directive 2009/125/EC with regard to ecodesign requirements for air conditioners and comfort fans, it may also be used to show compliance with the requirements of the European Directive 2010/30/EU and Commission Delegated Regulation (EU) No 626/2011.

This document was prepared in the frame of the Commission Regulation (EU) No 813/2013 implementing Directive 2009/125/EC with regard to ecodesign requirements for space heaters and combination heaters. This European standard also aims at showing compliance with the requirements of the European Directive 2010/30/EU and Commission Delegated Regulation (EU) No 811/2013.

This document was prepared in the frame of the 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.

1 Scope

This document covers air conditioners, heat pumps and liquid chilling packages, including comfort and process chillers. It applies to factory made units defined in EN 14511-1, except single duct, double duct, control cabinet and close control units. It also covers direct exchange-to-water(brine) heat pumps (DX-to-water(brine)) as defined in EN 15879-1.

This document also covers hybrid heat pumps as defined in this standard.

This document gives the temperatures and part load conditions and the calculation methods for the determination of seasonal energy efficiency *SEER* and $SEER_{on}$, seasonal space cooling energy efficiency $\eta_{s,c}$ seasonal coefficient of performance *SCOP*, $SCOP_{on}$ and $SCOP_{net}$, and seasonal space heating energy efficiency $\eta_{s,h}$ and seasonal energy performance ratio *SEPR*.

Such calculation methods can be based on calculated or measured values.

In case of measured values, this document covers the test methods for determination of capacities, *EER* and *COP* values during active mode at part load conditions. It also covers test methods for power input during thermostat-off mode, standby mode, off-mode and crankcase heater mode.

NOTE 1 The word “unit” is used instead of the full terms of the products.

NOTE 2 The word “cooling” is used to refer to both space cooling and process cooling.

NOTE 3 The word “heating” is used to refer to space heating.

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 267, *Automatic forced draught burners for liquid fuels*

EN 303-2, *Heating boilers - Part 2: Heating boilers with forced draught burners - Special requirements for boilers with atomizing oil burners*

EN 304, *Heating boilers - Test code for heating boilers for atomizing oil burners*

EN 14511-1, *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 14511-2, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions*

EN 14511-3, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 3: Test methods*

EN 15879-1, *Testing and rating of direct exchange ground coupled heat pumps with electrically driven compressors for space heating and/or cooling - Part 1: Direct exchange-to-water heat pumps*

EN 15502-1, *Gas-fired heating boilers - Part 1: General requirements and tests*

3 Terms, definitions, symbols, abbreviated terms and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14511-1 and EN 15879-1 and the following apply.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
active mode
mode corresponding to the hours with a cooling or heating load of the building and whereby the cooling or heating function of the unit is activated

Note 1 to entry: This condition may involve on/off-cycling of the unit in order to reach or maintain a required indoor air temperature.

3.1.2
active mode seasonal coefficient of performance
***SCOP*$_{on}$**
average coefficient of performance of the unit in active mode for the designated heating season, determined from the part load, supplementary heating capacity (where required) and bin-specific coefficients of performance ($COP_{bin}(T_j)$) and weighted by the bin hours where the bin condition occurs

Note 1 to entry: For calculation of $SCOP_{on}$, the energy consumption during thermostat-off mode, standby mode, off mode and crankcase heater mode are excluded. The energy consumption of a supplementary heater is added for the part load conditions where the declared capacity of the unit is lower than the heating load, regardless whether this supplementary heater is included in the unit or not included in the unit.

Note 2 to entry: Expressed in kWh/kWh.

3.1.3
active mode seasonal energy efficiency ratio
***SEER*$_{on}$**
average energy efficiency ratio of the unit in active mode for the cooling function, determined from part load and bin-specific energy efficiency ratios ($EER_{bin}(T_j)$) and weighted by the bin hours where the bin condition occurs

Note 1 to entry: For calculation of $SEER_{on}$, energy consumption during thermostat-off mode, standby mode, off mode and that of the crankcase heater is excluded.

Note 2 to entry: Expressed in kWh/kWh.

3.1.4
annual energy consumption for space cooling
***Q*$_{CE}$**
energy consumption required to meet the reference annual cooling demand and calculated as the reference annual space cooling demand divided by the active mode seasonal energy efficiency ratio ($SEER_{on}$) and the energy consumption of the unit for thermostat-off-, standby-, off- and crankcase heater-mode during the cooling season

Note 1 to entry: Expressed in kWh.

3.1.5
annual energy consumption for heating
Q_{HE}
energy consumption required to meet the reference annual heating demand for a designated heating season and calculated as the reference annual heating demand divided by the active mode seasonal coefficient of performance ($SCOP_{on}$) and the energy consumption of the unit for thermostat-off-, standby-, off- and crankcase heater-mode during the heating season

Note 1 to entry: Expressed in kWh.

3.1.6
average climate conditions
temperature conditions characteristic for the city of Strasbourg for the heating season

3.1.7
bin
outdoor temperature interval of 1 K

3.1.8
bin hours
h_j
hours per season for which an outdoor temperature occurs for each bin j

3.1.9
bin limit temperature
temperature in the bin for which no more heating or cooling is required

Note 1 to entry: The bin limit temperature equals 16 °C for all climates in space cooling and space heating applications.

3.1.10
bin-specific coefficient of performance
$COP_{bin}(T_j)$
coefficient of performance specific for every bin j with outdoor temperature T_j in a season

3.1.11
bin-specific energy efficiency ratio
$EER_{bin}(T_j)$
energy efficiency ratio specific for every bin j with outdoor temperature T_j in a season

3.1.12
bin temperature
T_j
outdoor air dry bulb temperature

Note to entry 1: Expressed in °C

Note to entry 2: The relative humidity may be indicated by a corresponding wet bulb temperature

3.1.13
bivalent temperature
T_{biv}
lowest outdoor temperature point at which the unit is declared to have a capacity able to meet 100 % of the heating load without supplementary heater, whether it is integrated in the unit or not

Note 1 to entry: Below this point, the unit may still provide capacity, but additional supplementary heating is necessary to fulfil the full heating load.

Note 2 to entry: Bivalent temperature does not apply to hybrid heat pumps.

3.1.14
capacity control
ability of the unit to change its capacity by changing the volumetric flow rate of the refrigerant

Note 1 to entry: Units are indicated as '*fixed*' if the unit cannot change its volumetric flow rate, '*staged*' if the volumetric flow rate is changed or varied in series of not more than two steps, or '*variable*' if the volumetric flow rate is changed or varied in series of three or more steps.

3.1.15
capacity ratio
CR
cooling (or heating) part load or full load divided by the declared cooling (or heating) capacity of the unit at the same temperature conditions

3.1.16
climate conditions
temperature conditions (dry bulb) characteristic for a specific location

3.1.17
coefficient of performance at declared capacity
COP_d
declared heating capacity of the unit divided by the effective power input of the unit at specific temperature conditions, A, B, C, D, E, F and G, where applicable

Note 1 to entry: Expressed in kW/kW.

3.1.18
coefficient of performance at part load
COP_{bin}
coefficient of performance at the declared capacity, corrected with the degradation coefficient, where applicable

Note 1 to entry: When the declared capacity of the unit is higher than the heating load, the *COP* includes degradation losses. When the declared capacity of the unit is lower than the heating load (i.e. below the bivalent temperature condition), the *COP* of the declared capacity is used.

Note 2 to entry: Expressed in kW/kW.

3.1.19
colder climate conditions
temperature conditions characteristic for the city of Helsinki for the heating season

3.1.20
compressor-off state
compressor is not running while the unit is operating in active mode

Note 1 to entry: This is the "off" phase in on/off cycling