SLOVENSKI STANDARD
kSIST FprEN 14825:2015

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Klimatske naprave, enote za tekočinsko hlajenje in toplotne črpalke z električnimi kompresorji za ogrevanje in hlajenje prostora - 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 saisonalen Arbeitszahl

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

Ta slovenski standard je istoveten z: **FprEN 14825**

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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

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

FINAL DRAFT
FprEN 14825

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ICS 27.080; 91.140.30

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English Version

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 draft European Standard is submitted to CEN members for unique acceptance procedure. It has been drawn up by the Technical Committee CEN/TC 113.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Foreword

This document (FprEN 14825:2015) has been prepared by Technical Committee CEN/TC 113 “Heat pumps and air conditioning units”, the secretariat of which is held by AENOR.

This document is currently submitted to the Unique Acceptance Procedure.

This document will supersede EN 14825:2013.

The revision was necessary in order to harmonize this European standard with *Commission Regulation (EC) 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* and *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.*

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 and Annex ZB, which are integral parts of this document.

The technical content of the previous edition remains unchanged with the exception of the correction of some errors. The main changes with respect to requirements for *Commission Regulation (EC) No 813/2013 of 2 August 2013* and *Commission Delegated Regulation (EU) No 811/2013* are:

a) Clause 3 “Terms, definitions, symbols, abbreviated terms and units” has been modified in order to be harmonized with Commission Regulation (EC) No 813/2013;

b) harmonization of the terms for temperature applications; introduction of low, intermediate, medium and high instead of low, medium, high and very high;

c) modifications so that the text is aligned to the modified terms and definitions;

d) combination of tables for better readability:

EN 14825:2015	EN 14825:2013
Table 2	Table 2
Table 3	Table 3
Table 4	Table 4
Table 5	Table 5
Table 6	Table 6, Table 7, Table 8
Table 7	Table 9, Table 10, Table 11
Table 8	Table 12, Table 13, Table 14
Table 9	Table 15, Table 16, Table 17
Table 10	Table 18, Table 19, Table 20
Table 11	Table 21, Table 22, Table 23
Table 12	Table 24, Table 25, Table 26
Table 13	Table 27, Table 28, Table 29
Table 14	Table 30, Table 31, Table 32
Table 15	Table 33, Table 34, Table 35

e) new 7.1 for the calculation of the seasonal space heating efficiency η_S;

f) new calculation for fossil fuel backup in 7.5;

g) a new normative Annex B - Applicable climate bin hours and hours for active, thermostat-off, standby, off and crankcase heater modes for space heaters, air to water and water/brine to water units below or equal to 400 kW;

h) a new normative C.2, Template for technical data sheet for space heaters, air to water and water/brine to water units below or equal to 400 kW;

i) deletion of Annex E because it is not needed anymore; it is valid only for air conditioners < 12 kW. The tables of hours are given in Annex A;

j) new informative Annex G with a calculation example for SCOPon and SCOPnet for a brine-to-water heat pump;

k) a new informative Annex ZB, Relationship between this European Standard and the requirements of Commission Regulation (EC) No 813/2013 of 02 August 2013 and the requirements of Commission Delegated Regulation (EU) No 811/2013 of 18 February 2013;

l) structural changes to the annexes in order to have normative annexes first:

EN 14825:2015	EN 14825:2013
Annex A	Annex A
Annex B	
Annex C	Annex G
Annex D	Annex D
Annex E	Annex B
Annex F	Annex C
Annex G	-
Annex H	Annex F
Annex ZA	Annex ZA
Annex ZB	
-	Annex E
Bibliography	Bibliography

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 standard 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.

Introduction

Heat pumps, air conditioners and liquid chilling packages can be selected and compared at part load conditions. This condition does not represent the usual operating conditions of the equipment over a season. This operating condition can be better assessed by comparing equipment at representative reduced capacities and determining the Seasonal Energy Efficiency Ratio and Seasonal Coefficient of Performance.

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 European Standard provides part load conditions and calculation methods for calculating the Seasonal Energy Efficiency Ratio (SEERon) and Seasonal Coefficient of Performance (SCOPon and SCOPnet) of such units when they are used to fulfil the cooling and heating demands.

Other 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.

SEER/SEERon and SCOP/SCOPon/SCOPnet calculations may be based on calculated or measured values. In case of measured values, this European Standard 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.

1 Scope

This European Standard covers air conditioners, heat pumps and liquid chilling packages. It applies to factory made units defined in EN 14511-1, except single duct, double duct, control cabinet and close control units.

This European Standard gives the temperatures and part load conditions and the calculation methods for the determination of seasonal energy efficiency SEER and SEERon, seasonal coefficient of performance SCOP, SCOPon and SCOPnet, and seasonal space heating energy efficiency η_s.

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

In case of measured values, this European Standard 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 electric power consumption during thermostat-off mode, standby mode, off-mode and crankcase heater mode.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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 (unless otherwise stated) and the following apply.

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
SCOPon
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 SCOPon, the power consumption during thermostat-off mode, standby mode, off mode or crankcase heater mode are excluded. The power 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 back up heater is included in the unit or not.

Note 2 to entry: Expressed in kWh/kWh.

3.1.3
active mode seasonal energy efficiency ratio
SEERon
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 the bin condition occurs

Note 1 to entry: For calculation of SEERon, power consumption during thermostat-off mode, standby mode, off mode or that of the crankcase heater are excluded.

Note 2 to entry: Expressed in kWh/kWh.

3.1.4
annual electricity consumption for cooling
Q_{CE}
electricity consumption [kWh] required to meet the reference annual cooling demand and calculated as the reference annual cooling demand divided by the active mode seasonal energy efficiency ratio (SEERon) and the electricity consumption of the unit for thermostat-off-, standby-, off- and crankcase heater-mode during the cooling season

3.1.5
annual energy consumption for heating
Q_{HE}

energy consumption [kWh] which is required to meet the indicated reference annual heating demand, which pertains to a designated heating season and which is calculated as the reference annual heating demand divided by the active mode seasonal coefficient of performance (SCOPon) and the electricity consumption of the unit for thermostat-off-, standby-, off- and crankcase heater-mode during the heating season

3.1.6
application SCOP, application SCOPon and application SCOPnet
SCOP and SCOPon/SCOPnet that take into account the specific application and the specific location of the unit, which are different from the ones used for determining the SCOP and SCOPon/SCOPnet given in this European Standard

Note 1 to entry: The calculation procedures used to determine the application SCOPon/SCOPnet, if required, are those in this European Standard for SCOPon/SCOPnet. However, the heating bins used in the calculations will be those of the actual location of the building. The heating loads as well as the hours of use will be those of the actual building.

3.1.7
application SEER and application SEERon
SEER and SEERon that take into account the specific application and the specific location of the unit, which are different from the ones used for determining the SEER and SEERon given in this European Standard

Note 1 to entry: The calculation procedures used to determine the application SEERon, if required, are those in this European Standard for SEERon. However, the cooling bins used in the calculations will be those of the actual location of the building. The cooling loads as well as the hours of use will be those of the actual building.

3.1.8
average climate conditions
temperature conditions characteristic for the city of Strasbourg

3.1.9
bin
outdoor temperature interval

Note to entry: For the calculation of SCOP and SEER a bin of 1 K is used

3.1.10
bin hours
h_j
hours per season for which an outdoor temperature occurs for each bin

3.1.11
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 cooling and heating applications.

3.1.12
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

3.1.13
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

3.1.14
bin temperature
outdoor temperature
T_j
dry bulb outdoor air temperature

Note to entry 1: The bin temperature is expressed in °C

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

3.1.15
bivalent temperature
$T_{bivalent}$
lowest outdoor temperature point at which the unit is declared to have a capacity able to meet 100 % of the heating load without back up heater, whether it is integrated in the unit or not

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

3.1.16
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.

3.1.17
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

3.1.18
climate conditions
temperature conditions (dry bulb) characteristic for a specific location

3.1.19
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.

3.1.20
coefficient of performance at part load
COP_{bin}
heating capacity at part load or full load divided by the effective power input of a unit at specific temperature conditions

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

Note 2 to entry: Expressed in kW/kW.

3.1.21
colder climate conditions
temperature conditions characteristic for the city of Helsinki

3.1.22
compensation load
heating or cooling load imposed by the test apparatus on the test object

3.1.23
conversion coefficient
CC
coefficient reflecting the estimated 40% average EU power generation efficiency referred to in Directive 2012/27/EU of the European Parliament and of the Council, the value CC is equal to 2,5

3.1.24
crankcase heater mode operating hours
H_{CK}
annual number of hours the unit is considered to be in crankcase heater mode, the value of which depends on the designated season and function

Note 1 to entry: Expressed in h.

3.1.25
crankcase heater mode power consumption
P_{CK}
power consumption of the unit while in crankcase heater operation mode

Note 1 to entry: Expressed in kW.

3.1.26
crankcase heater (operation) mode
condition where the unit has activated a heating device to avoid the refrigerant migrating to the compressor in order to limit the refrigerant concentration in oil at compressor start

3.1.27
cycling interval capacity for cooling
P_{cycc}
(time-weighted) average cooling capacity output over the cycling test interval

Note 1 to entry: Expressed in kW.

3.1.28
cycling interval capacity for heating
P_{cych}
(time-weighted) average heating capacity output over the cycling test interval

Note 1 to entry: Expressed in kW.

3.1.29
cycling interval efficiency for cooling
EER_{cyc}
average energy efficiency ratio over the cycling test interval (compressor switching on and off)

Note 1 to entry: The cycling interval efficiency for cooling is calculated as the integrated cooling capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh].

3.1.30
cycling interval efficiency for heating
COP_{cyc}
average coefficient of performance over the cycling test interval (compressor switching on and off)

Note 1 to entry: The cycling interval efficiency for heating calculated as the integrated heating capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh].

3.1.31
declared capacity
DC
cooling (Pdc) or heating (Pdh) capacity of the vapour compression cycle a unit can deliver at any temperature condition A, B, C, D, E, F or G, as declared by the manufacturer

Note 1 to entry: This is the capacity delivered by the refrigerant cycle of the unit without supplementary heaters, even if those are integrated in the unit.

3.1.32
degradation coefficient in cooling mode
Cdc
measure of efficiency loss in cooling mode due to the cycling of the unit

Note 1 to entry: If Cdc is not determined by measurement then the default degradation coefficient for air to water and water/brine to water units is 0.9.

Note 2 to entry: If Cdc is not determined by measurement then the default degradation coefficient for air to air and water/brine to air units is 0.25