SLOVENSKI STANDARD
SIST EN 13215:2017/oprA1:2018

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Kondenzacijske enote za hladilne naprave - Ocenjevalni pogoji za razvrščanje, tolerance in predstavitev podatkov o lastnostih, ki jih navede proizvajalec - Dopolnilo A1

Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data

Verflüssigungssätze für die Kälteanwendung - Nennbedingungen, Toleranzen und Darstellung von Leistungsdaten des Herstellers

Unités de condensation pour la réfrigération - Détermination des caractéristiques, tolérances et présentation des performances du fabricant

Ta slovenski standard je istoveten z: **EN 13215:2016/prA1:2018**

ICS:

27.200	Hladilna tehnologija	Refrigerating technology

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EUROPEAN STANDARD

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English Version

Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data

Unités de condensation pour la réfrigération - Détermination des caractéristiques, tolérances et présentation des performances du fabricant

Verflüssigungssätze für die Kälteanwendung - Nennbedingungen, Toleranzen und Darstellung von Leistungsdaten des Herstellers

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 113.

This draft amendment A1, if approved, will modify the European Standard EN 13215:2016. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

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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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European foreword

This document (EN 13215:2016/prA1:2018) has been prepared by Technical Committee CEN/TC 113 “Heat pumps and air conditioning units”, the secretariat of which is held by UNE.

This document is currently submitted to the CEN Enquiry.

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 Directive(s), see informative Annex ZA of EN 13215:2016.

The main changes with respect to the previous edition are listed below:

a) part load conditions according to M/495 “Standardisation mandate to CEN, CENELEC and ETSI under Directive 2009/125/EC relating to harmonised standards in the field of Ecodesign” are taken into account;

b) inclusion of the calculation of seasonal energy performance ratio (*SEPR*);

c) updated terms and definitions;

d) inclusion of refrigerant blends with temperature glide.

1 Modification to Clause 2, Normative references

Replace

EN 378-1:2008+A2:2012, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

with

EN 378-1:2016, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria.*

2 Modifications to Clause 3, Terms and definitions

In the 1st paragraph, replace

EN 378-1:2008+A2:2012

with

EN 378-1:2016.

Insert

3.2
evaporating temperature
t_o
arithmetic average of the evaporator inlet temperature and the evaporating dew point temperature of the refrigerant at the pressure of the condensing unit inlet

Note 1 to entry: For more information, see B.1.

Note 2 to entry: For refrigerants without glide the evaporating temperature is equal to the dew point temperature at the condensing unit inlet pressure.

Note 3 to entry: For refrigerants with glide the evaporating temperature is the mean of the evaporator inlet temperature and dew point temperature at the condensing unit inlet pressure with the following assumptions: isenthalpic expansion from condensing unit outlet temperature to the condensing unit inlet pressure, isobaric evaporation, no suction line pressure drop, enthalpy, entropy and temperature changes of the refrigerant are linear with the vapour mass fraction (vapour quality) during evaporation and effects of oil circulation are ignored.

after

3.1
condensing unit
combination of one or more compressors, condensers/gas coolers and, where applicable, liquid receivers and the regularly furnished accessories

and renumber the following terms and definitions accordingly up to 3.8.

3 Modification to 7.3, Tabular or graphical form

In c), replace

"c) the evaporating temperature/suction dew point temperature, at intervals not greater than 5 K."

with

"c) the evaporating temperature, at intervals not greater than 5 K.".

4 Modification to 8.2, Standard reference points

Table 4, first column, second row, delete

"— **suction dew point**"

5 Addition of a new Annex B

Add the following new Annex B:

"

Annex B
(normative)

Evaporating temperature with refrigerant mixtures

B.1 Determination of evaporating temperature

The efficiency comparison with zeotropic blends uses the evaporating midpoint temperature as the reference. This temperature is determined from the isobaric change of the temperature from the inlet of the evaporator to the dew point temperature at the same pressure.

The determination of the inlet temperature in the area of two phases is done by linear interpolation between dew point and bubble point temperature at evaporating pressure, via the enthalpy at the expansion device inlet.

$$t_{om} = \frac{t_{o1} + t_{oD}}{2}$$

$$t_{o1} = t_{oB} + \left(t_{oD} - t_{oB}\right) \cdot \frac{h_{EX} - h_{oB}}{h_{oD} - h_{oB}}$$

where

t_{om} is the temperature of the evaporating midpoint, expressed in degree Celsius (°C) ;

t_{o1} is the temperature at the inlet of the evaporator at unit inlet pressure *p1*, expressed in degree Celsius (°C)*;*

t_{oD} is the temperature of the evaporating dew point at unit inlet pressure *p1*, expressed in degree Celsius (°C)*;*

t_{oB} is the temperature of the bubble point at unit inlet pressure *p1*, expressed in degree Celsius (°C)*;*

h_{EX} is the enthalpy at the expansion device inlet, expressed in Joule per kilogram (J/kg);

h_{oB} is is the enthalpy at the bubble point at condensing unit inlet pressure, expressed in Joule per kilogram (J/kg);

h_{oD} is is the enthalpy at the dew point at condensing unit inlet pressure, expressed in Joule per kilogram (J/kg).

This interpolation assumes that the temperature follows the vapour content linearly, which can differ from reality.

For some refrigerant blends, particularly those with large temperature glide, the linear interpolation approach may lead to additional uncertainties."

6 Addition of a new Annex C

Add the following new Annex C:

"

Annex C
(informative)

Application considerations

C.1 Limitations for efficiency comparisons

The EU Regulation 2015/1095 targets air cooled condensing units for refrigeration, for low and medium temperature application and defines ambient temperatures and capacity ranges in the scope.

The temperature change of the heat source very much influences whether the refrigerant temperature glide can be utilised efficiently.

Example calculations for air coolers show, that the temperature glide partly can be utilized. For dry expansion evaporators in the capacity range targeted by the Regulation, a midpoint temperature down to 2 K below the dew point temperature can be effective (see also C.3).

$$t_o = t_{om} \; ; \; t_o \geq t_{oD} - 2\,K$$

where

t_o is the evaporating temperature at the inlet pressure of the condensing unit *p1*, expressed in degree Celsius (°C);

t_{om} is the temperature of the evaporating midpoint, expressed in degree Celsius (°C);

t_{oD} is the temperature of the evaporating dew point at unit inlet pressure *p1*, expressed in degree Celsius (°C).

C.2 Explanations of limitations

EN 13215 has been established to compare performance data of different condensing units, at same rating conditions, assuming same refrigerant or similar refrigerant behaviour. For this the rating conditions were established. Some of the combinations of reference values for rating conditions were not realistic for specific condensing unit designs, but valid reference for direct comparisons. The extension of EN 13215 as base for efficiency rating and thus comparison according to the EU Regulation 2015/1095, including ratings at low ambient temperature, broadens the scope of the performance data.

With the more widespread use of refrigerant blends with significant temperature glide more realistic conditions have to be defined by assumptions for realistic refrigeration systems. For this, the scope of the EU Regulation 2015/1095 is helpful, as it mentions air cooled condensing units for medium and low temperature refrigeration. Based on this, the descriptions in this annex were developed.

Two examples follow for clarification. For the following examples the effective evaporating temperature can be interpreted to be a maximum of 2 K below the dew point temperature for refrigerant mixtures.

It is further on assumed for this example calculation: Evaporator with direct expansion, cooling air, designed for high efficiency utilizing small temperature difference between air and refrigerant, air cooled down by 5 K and counterflow between air and refrigerant.

EXAMPLE 1 Refrigerant with no temperature glide:

— Air inlet temperature difference 8 K to evaporating temperature;

— Superheat 5 K;

— Approximately 20 % evaporator area for superheating.

EXAMPLE 2 Refrigerant with 10 K temperature glide in the evaporator:

— As the inlet evaporating temperature is much colder now, the heat exchange increases there.

— Thus, the superheated evaporator outlet might come closer to the air inlet temperature.

— This lifts the dew point temperature up to 2 K above the previous evaporating temperature.

— This results in 8 K lower refrigerant temperature at the inlet of the evaporator.

— Approximately 50 % of the evaporator area might be used for superheating.

The same evaporator capacity thus is reached with an evaporating temperature of 3 K below the evaporating temperature of example 1.

C.3 Calculation of dew point temperatures from a given midpoint temperature

C.3.1 Condensing

The condensing midpoint temperature t_{cm} is explicitly given by the arithmetic mean value of the bubble point temperature and the dew point temperature for a given pressure at the condensing unit outlet

$$t_{cB} = f\left(p_2\right)$$

$$t_{cD} = f\left(p_2\right)$$

$$t_{cm} = \frac{t_{cB} + t_{cD}}{2}$$

where

p_2 is the absolute unit outlet pressure, expressed in bar;

t_{cB} is the temperature of the condensing bubble point at unit outlet pressure, expressed in degree Celsius (°C);

t_{cD} is the temperature of the condensing dew point at unit outlet pressure, expressed in degree Celsius (°C);

t_{cm} is the condensing midpoint temperature at the condensing unit outlet pressure,