SLOVENSKI STANDARD
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Refrigerant compressors - Rating conditions, tolerances and presentation of manufacturer's performance data

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Kältemittel-Verdichter - Nennbedingungen, Toleranzen und Darstellung von Leistungsdaten des Herstellers

Compresseurs pour fluides frigorigènes - Conditions de détermination des caractéristiques, tolérances et présentation des performances du fabricant

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 12900

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ICS 23.140; 27.200

English version

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

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This European Standard has been prepared by Technical Committee CEN/TC 113 "Heat pumps and air conditioning units", the secretariat of which is held by AENOR.

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of an identical text or by endorsement, at the latest by december 1999, and conflicting national standards shall be withdrawn at the latest by december 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the rating conditions, tolerances and presentation of manufacturer's performance data for-single-stage refrigerant compressors of the positive-displacement type. This is required so that a comparison of different refrigerant compressors can be made. The data relate to the refrigerating capacity and power absorbed and include correction factors and part-load performance where applicable.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

prEN 378-1 : 1996
Refrigerating systems and heat pumps – Safety and environmental requirements – Basic requirements, definitions, classification and selection criteria

ISO 817
Refrigerants – Number designation

ISO 917
Testing of refrigerant compressors

3 Definitions

For the purposes of this Standard, the definitions of prEN 378-1 : 1996 and the following apply:

3.1 positive displacement compressor: Compressor in which compression is obtained by changing the internal volume of the compression chamber, see 3.4.6 of prEN 378-1 : 1996.

3.2 refrigerating capacity: Product of the mass flow of refrigerant through the compressor and the difference between the specific enthalpy of the refrigerant at the compressor inlet and the specific enthalpy of saturated liquid. The refrigerant at the compressor inlet is superheated above the suction dew point temperature to the stated value (see table 1). The saturated liquid is at a pressure corresponding to the compressor discharge dew point temperature.

3.3 subcooling: Difference between the bubble point temperature of the refrigerant corresponding to the compressor discharge pressure and the temperature of the liquid refrigerant below the bubble point.

3.4 superheat: Difference between the dew point temperature of the refrigerant corresponding to the compressor suction pressure and the suction vapour temperature of the refrigerant at the compressor inlet.

3.5 power absorbed: – for externally driven compressors: the power at the compressor shaft;

– for motor compressors: the electrical power input at the motor terminals.

3.6 coefficient of performance, COP_r: Ratio of refrigerating capacity to the power absorbed.

4 Parameters for the presentatation of performance data

The parameters as shown in table 1 shall be used for the presentation of the performance data.

Table 1: Parameters for the presentation of performance data

Refrigerant	Parameters	
	Suction vapour temperature (°C) or superheat (K) at the compressor inlet	Compressor application
Most commonly used halocarbons and hydrocarbons including refrigerant blends	32 °C	Household and similar refrigerators/freezers
	20 °C or 10 K	Other applications
R717	5 K	Any application using ammonia
Other refrigerants	As appropriate, to be clearly specified in performance data	

The refrigerating capacity shall not allow for any subcooling.

5 General requirements

The performance data of a refrigerant compressor shall be presented in either tabular or graphical form as shown in 6.2 and in addition in polynomial form as shown in 6.3. Data outside the allowable working range of the compressor shall not be included.

The performance of the compressor at the standard reference points in table 2 shall also be reported.

Where the ambient temperature has a significant effect on capacity, the compressor shall be tested at an ambient temperature of 32 °C.

To calculate the performance at other suction vapour temperatures or superheat and part-load, correction factors shall be given as shown in clause 9.

Refrigerants shall be designated in accordance with ISO 817. The source from which the thermodynamic properties are taken shall be stated.

NOTE 1: It is recommended that an example illustrating the use of the performance data and the correction factors should be given.

NOTE 2: Other data such as the swept volume, number of cylinders and speed range may also be shown.

6 Performance data

6.1 General

6.1.1 Published performance shall be based on data obtained from tests performed in accordance with ISO 917. If an oil separator is required to reach the performance, then this shall be indicated.

6.1.2 The performance data shall be presented for:

– open compressors at the rated speed;

– motor compressors at the rated voltage and frequency.

6.2 Tabular or graphical form

The performance data to be given, in either tabular or graphical form, shall comprise:

a) the refrigerating capacity, in values able to be read to an accuracy of ± 2 %;

b) the absorbed power, in values able to be read to an accuracy of ± 2 %;

c) the evaporating temperatures at suction dew point with intervals not greater than 5 K;

d) the condensing temperatures at discharge dew point with intervals not greater than 10 K.

6.3 Polynomial form

6.3.1 The polynomial equation shall be a third degree equation utilizing ten coefficients as follows:

$$X = C1+C2 \cdot (S)+C3 \cdot (D)+C4 \cdot (S)^2+C5 \cdot (S \cdot D)+C6 \cdot (D^2)+C7 \cdot (S^3)+C8 \cdot (D \cdot S^2)+C9 \cdot (S \cdot D^2)+C10 \cdot (D^3)$$

where:

X is the refrigerating capacity, in Watts, absorbed power, in Watts, or mass flow in kilogrammes per second;

S is the evaporating temperature at suction dew point, in degree Celsius;

D is the condensing temperature at discharge dew point, in degree Celsius;

C is a coefficient.

6.3.2 The polynomial equation above shall not be used to extrapolate beyond the range of the tabulated data. Interpolation for different superheats is allowed, if the polynomes for different superheat conditions are given.

7 Standard reference points

The standard reference points shall be in accordance with table 2.

Table 2: Standard reference points

Reference points	Compressor applications			
	High evaporating temperature	Medium evaporating temperature	Low evaporating temperature	Household and similar refrigerators/ freezers
Evaporating temperature (°C) at suction dew point	+ 5	- 10	- 35	- 25
Condensing temperature (°C) at discharge dew point	+ 50	+ 45	+ 40	+ 55
Suction vapour temperature (°C) or superheat (K)	+ 20 10 or 5[1])	+ 20 10 or 5[1])	+ 20 10 or 5[1])	+ 32
Subcooling (K)	0	0	0	0
[1]) For R717				

8 Tolerances

The following tolerances shall apply to manufacturer's stated performance in relation to the measured data obtained at the standard reference points in table 2. These tolerances are needed to take into account manufacturing differences during production.

Table 3: Tolerances

Tolerances	Compressor applications			
	High evaporating temperature	Medium evaporating temperature	Low evaporating temperature	Household and similar refrigerators/ freezers
Refrigerant capacity[1]) or mass flow	- 5 %	- 7,5 %	- 10 %	- 5 % or - 5W[2])
Power absorbed[1])	+ 5 %	+ 7,5 %	+ 10 %	+ 5 % or + 5W[2])
[1]) In any case the tolerance on COP_r shall not exceed 10 %.				
[2]) For values less than 100 Watts.				

9 Correction factors

9.1 Superheat

The correction factors applicable to the performance data relating to superheat (see clause 5) shall comprise:

a) the change in refrigerating capacity (or mass flow) as a function of the superheat;

b) the change in power absorbed as a function of the superheat.

Correction factors for different values of superheat shall be based on experimental data.

9.2 Compressor speed

The correction factors applicable to the performance data relating to the rated speed (see 6.1.2) shall comprise:

a) the refrigerating capacity (or mass flow) as a function of varying compressor speeds;

b) the power absorbed as a function of varying compressor speeds.

These correction factors do not apply to motor compressors.

9.3 Part-load

For compressors supplied with a capacity control mechanism, part-load correction factors shall be given enabling the following to be determined:

a) the refrigerating capacity (or mass flow);

b) the power absorbed.