SLOVENSKI STANDARD
SIST EN 13771-2:2018

01-marec-2018

Nadomešča:
SIST EN 13771-2:2008

Kompresorji in kondenzacijske enote za hladilne naprave - Preskušanje lastnosti in preskusne metode - 2. del: Kondenzacijske enote

Compressors and condensing units for refrigeration - Performance testing and test methods - Part 2: Condensing units

Kältemittel-Verdichter und Verflüssigungssätze für die Kälteanwendung - Leistungsprüfung und Prüfverfahren - Teil 2: Verflüssigungssätze

Compresseurs et unités de condensation pour la réfrigération - Essais de performance et méthodes d'essais - Partie 2: Unités de condensation

Ta slovenski standard je istoveten z: **EN 13771-2:2017**

ICS:

23.140	Kompresorji in pnevmatični stroji	Compressors and pneumatic machines
27.200	Hladilna tehnologija	Refrigerating technology

SIST EN 13771-2:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13771-2

September 2017

ICS 23.140; 27.200

Supersedes EN 13771-2:2007

English Version

Compressors and condensing units for refrigeration - Performance testing and test methods - Part 2: Condensing units

Compresseurs et unités de condensation pour la réfrigération - Essais de performance et méthodes d'essais - Partie 2 : Unités de condensation

Kältemittel-Verdichter und Verflüssigungssätze für die Kälteanwendung - Leistungsprüfung und Prüfverfahren - Teil 2: Verflüssigungssätze

This European Standard was approved by CEN on 26 July 2017.

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This European Standard exists 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13771-2:2017 E

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European foreword

This document (EN 13771-2:2017) 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 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.

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

This document supersedes EN 13771-2:2007.

The following significant changes compared to the previous edition have been incorporated in this European Standard:

a) alignment of symbols and indexes with EN 13771-1;

b) introduction of a new Figure 1 "Condensing unit configurations" and revision of the Figures 2 to 7;

c) introduction of the new Clause 4 "Uncertainty of measurement and test conditions";

d) specification of a detailed test room and setup description to reduce testing uncertainty, aligned with EN 327 and EN 14511-3;

e) adoption to transcritical operation and cyclic capacity control.

EN 13771 consists of the following parts, under general title *Compressors and condensing units for refrigeration — Performance testing and test methods*:

— *Part 1: Refrigerant compressors*

— *Part 2: Condensing units*

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.

1 Scope

This European Standard applies only to condensing units for refrigeration and describes a number of selected performance test methods. These methods provide sufficiently accurate results for the determination of the refrigerating capacity, power absorbed, refrigerant mass flow and the coefficient of performance.

This European Standard applies only to performance tests conducted at the manufacturer's works or wherever the instrumentation and load stability for testing to the accuracy required is available.

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

EN 378-2, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation*

ISO 817, *Refrigerants — Designation and safety classification*

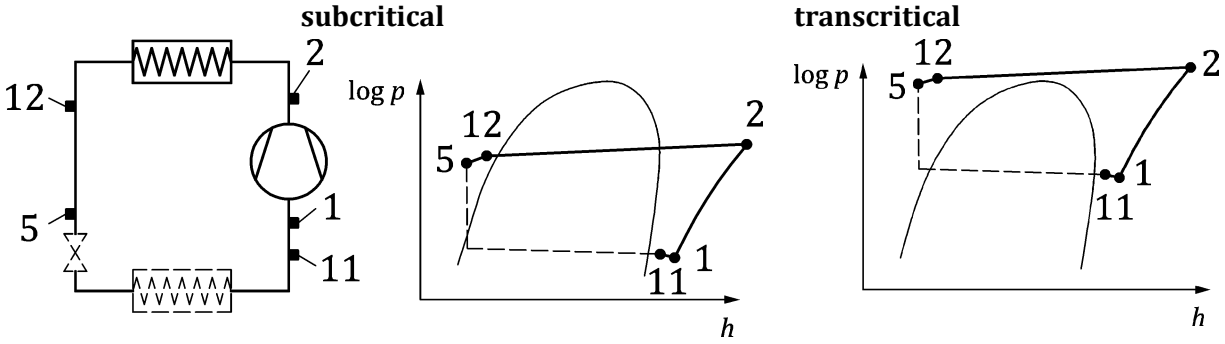
3 Terms, definitions and symbols

3.1 Terms and definitions

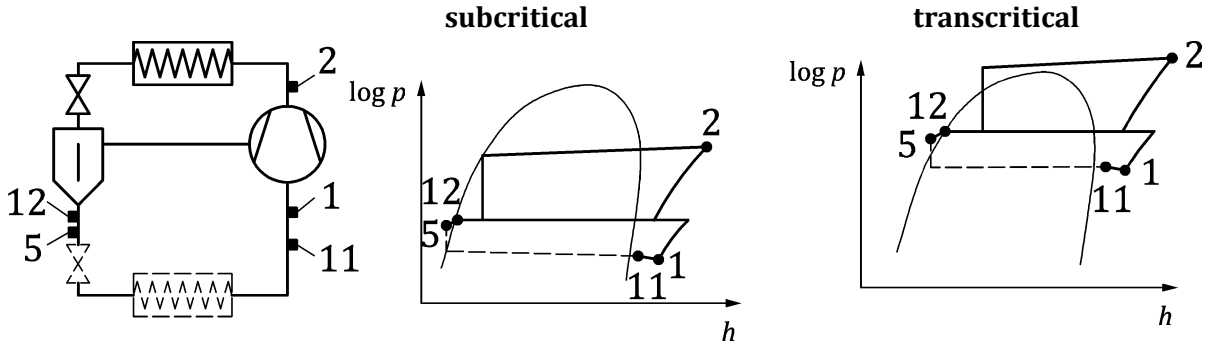
For the purposes of this document, the following terms and definitions apply.

3.1.1
refrigerating capacity
Q
⟨condensing unit⟩ product of the refrigerant mass flow and the difference between the specific enthalpy of the refrigerant at the inlet of the condensing unit (Figure 1, point 11) and the specific enthalpy of the fluid at the outlet of the condensing unit (Figure 1, point 12)

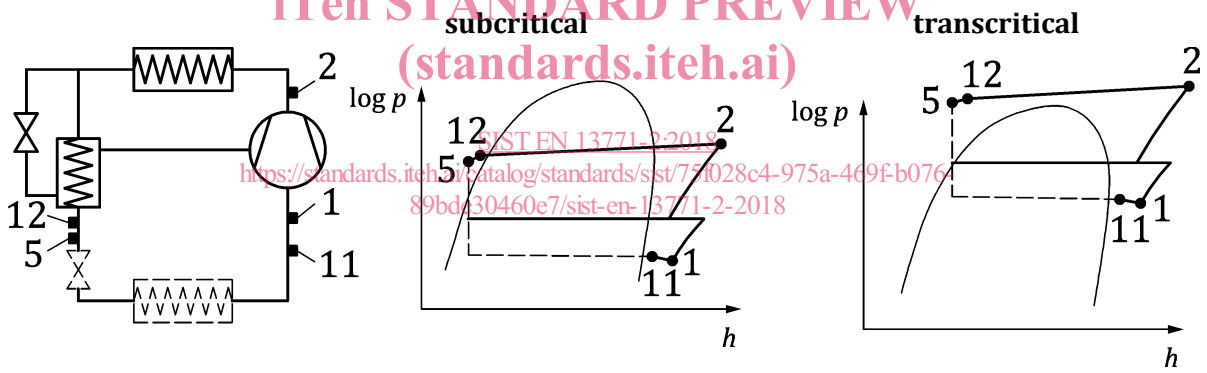
Note 1 to entry: The outlet (point 12) of condensing unit depends on design (single stage or two stage or internal heat exchangers, see Figure 1 a), b), c) and d).



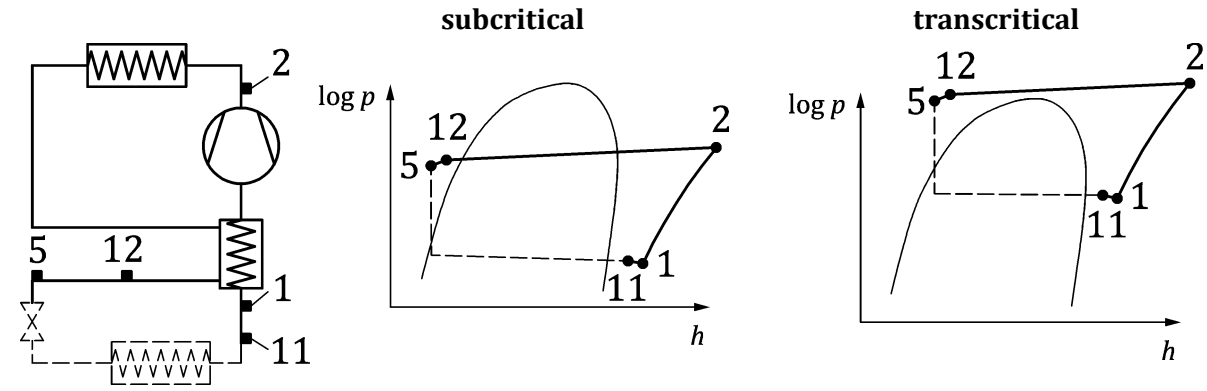
a) Single stage condensing units



b) Two stage / open flash / condensing units



c) Condensing units with economizer



d) Condensing unit with internal HX

Key

1 refrigerant gas at the compressor inlet
2 refrigerant gas at the compressor outlet
5 refrigerant liquid/fluid at the expansion device inlet
11 refrigerant gas at the condensing unit inlet
12 refrigerant liquid/fluid at the condensing unit outlet

Figure 1 — Condensing unit configurations

3.1.2
specific enthalpy
3.1.2.1
specific enthalpy of the refrigerant at the inlet of the condensing unit
specific enthalpy of the refrigerant at pressure and temperature to the inlet (superheated above the dew point temperature to the stated value)

3.1.2.2
specific enthalpy of the refrigerant fluid at the outlet of the condensing unit
specific enthalpy of the refrigerant at pressure and temperature at the outlet

3.1.3
subcooling
ΔT_{12}
difference between the bubble point temperature of the refrigerant corresponding to the pressure at the condensing unit outlet and the temperature of the liquid refrigerant measured at the same place

Note 1 to entry: Applicable for subcritical pressure only.

3.1.4
power absorbed
P
power demand to drive the condensing unit

3.1.5
refrigerant mass flow
m
refrigerant mass flow at the condensing unit inlet

3.1.6
coefficient of performance
COP_R
ratio of the refrigerating capacity to the power absorbed

Note 1 to entry: Both the above are at the specified test condition.

3.1.7
subcritical operation
operating condition with condensing unit outlet pressure below the critical pressure of the refrigerant

3.1.8
transcritical operation
operating condition with condensing unit outlet pressure above the critical pressure of the refrigerant

3.1.9
part load operation
operation with active capacity control at reduced capacity for compressors with capacity control mechanism

Note 1 to entry: On/off cycling of the compressor motor is not considered as capacity control.

3.1.10
fluid
refrigerant liquid, gas or vapour including the state of appearance close to and above the critical pressure

3.1.11
oil circulation ratio
x_{oil}
ratio of the measured oil mass flow to the mass flow of the circulating oil/refrigerant mixture

3.1.12
condensing unit
combination of one or more compressors, condensers/gas coolers and, where applicable, liquid receivers and the regularly furnished accessories

Note 1 to entry: In transcritical operation the condenser operates as gas cooler.

3.1.13
cyclic capacity control
control that reduces suction flow in cycles shorter than the test period, without switching off compressor motors

3.2 Symbols

For the purposes of this document, the symbols in Table 1 and the indices in Table 2 apply.

Table 1 — Symbols

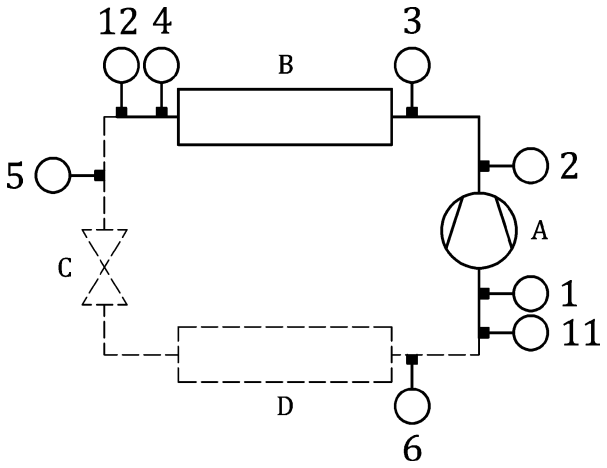
Symbol	Designation	SI unit
c	specific heat capacity	J/(kg K)
c_{oil}	specific heat capacity of oil	J/(kg K)
COP_R	coefficient of performance	
f	electrical frequency	Hz
F	heat leakage factor	W/K
h	specific enthalpy	J/kg
n	compressor speed	1/min
P	power absorbed	W
P_m	actual compressor power absorbed where the motor is not an integral part of the unit	W
P_{el}	actual compressor power absorbed where the motor is an integral part of the unit	W
P_f	power absorbed by the fans and other regularly furnished auxiliaries	W
P_h	electrical power input to the heater	W
p	absolute pressure	MPa
m	mass flow	kg/s
V	volume flow	m^3/s
ΔT_{12}	subcooling	K
t	temperature	°C
t_{cal}	mean surface temperature of the calorimeter	°C
t_{s1}	inlet temperature of heating or cooling liquid	°C
t_{s2}	outlet temperature of heating or cooling liquid	°C
t_{mid}	mean of the bubble and dew point temperature of the refrigerant at the condensing unit outlet pressure	°C
t_{bs}	bubble temperature of the secondary fluid	°C
t_x	reference temperature	°C
U	nominal electrical voltage	V
v	specific volume of refrigerant gas	m^3/kg
ρ	density of the refrigerant gas/fluid; indexed for other fluids	kg/m^3
Q_i	heat flow to the calorimeter	W
Q	refrigerating capacity	W
x_{oil}	oil circulation ratio	—

Table 2 — Indices

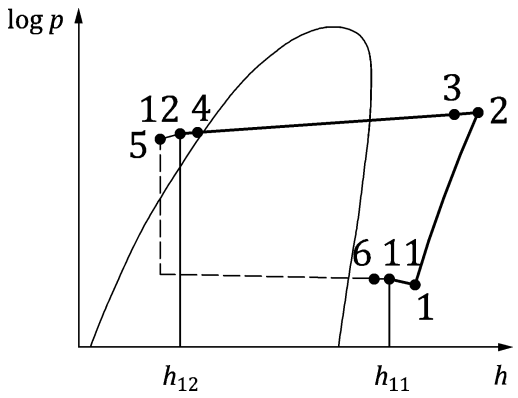
Index	Designation	
1	refrigerant gas at the compressor inlet	
2	refrigerant gas at the compressor outlet	
3	condenser inlet	
4	condenser outlet	
5	inlet expansion device	
6	evaporator (or calorimeter) outlet	
11	condensing unit inlet	
12	condensing unit outlet	
a	actual	
A	air	
amb	ambient	
cal	calorimeter surface	
f	heat transfer fluid	
in	inlet	
M	flow meter	
oil	oil	
out	outlet	
s	secondary fluid (secondary refrigerant, brine or water)	
x	oil/liquid refrigerant mixture	
F	fans and other auxiliary components	

3.3 Refrigerant circuit state points

Figure 2b) shows the state of the refrigerant in the refrigerating circuit shown in Figure 2a).



a) Circuit diagram



b) Pressure vs enthalpy diagram

Key

1	refrigerant gas at the compressor inlet	A	compressor
2	refrigerant gas at the compressor outlet	B	condenser (including any receiver and/or sub-cooler forming an integral part of the unit)
3	refrigerant gas at the condenser inlet	C	expansion device
4	refrigerant liquid at the condenser outlet	D	evaporator
5	refrigerant liquid at the expansion device inlet		
6	refrigerant gas at the evaporator outlet		
11	refrigerant gas at the condensing unit inlet		
12	refrigerant liquid at the condensing unit outlet		

Figure 2 — Refrigerant circuit

4 Uncertainty of measurement and test conditions

4.1 Uncertainty of performance data

Measuring instruments shall be selected and calibrated so that the final result is within the maximum uncertainties of the measured value as indicated:

— refrigerating capacity: ± 2,5 %,

— electrical power absorbed: ± 1 % and

— mechanical power absorbed: ± 2,5 %.

4.2 Uncertainty of measurement

Uncertainty values are considered to cover a 95 % confidence interval, i.e. ± 2 times the standard deviation. Except where otherwise stated in the particular clauses, measurements shall be carried out within the maximum uncertainty of the measured value as given in Table 3.