SLOVENSKI STANDARD
SIST EN 327:2014

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Nadomešča:
SIST EN 327:2002
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Prenosniki toplote – Zračno hlajeni kondenzatorji hladiva s prisilno konvekcijo - Postopki preskušanja za ugotavljanje lastnosti

Heat exchangers - Forced convection air cooled refrigerant condensers - Test procedures for establishing performance

Wärmeaustauscher - Ventilatorbelüftete Verflüssiger - Prüfverfahren zur Leistungsfeststellung

Échangeurs thermiques - Aérocondenseurs à convection forcée - Procédures d'essai pour la détermination de la performance

Ta slovenski standard je istoveten z: **EN 327:2014**

ICS:

27.060.30	Grelniki vode in prenosniki toplote	Boilers and heat exchangers

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EUROPEAN STANDARD

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English Version

Heat exchangers - Forced convection air cooled refrigerant condensers - Test procedures for establishing performance

Echangeurs thermiques - Aérocondenseurs à convection forcée - Procédures d'essai pour la détermination de la performance

Wärmeübertrager - Ventilatorbelüftete Verflüssiger - Prüfverfahren zur Leistungsfeststellung

This European Standard was approved by CEN on 22 May 2014.

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

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Foreword

This document (EN 327:2014) has been prepared by Technical Committee CEN/TC 110 “Heat exchangers”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.

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 327:2000 and EN 327:2000/A1:2002.

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

a) Clause 3 “Terms and definitions” is modified;

b) The revised standard takes into account the application of CO_2.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard is one of a series of European Standards dedicated to heat exchangers.

1 Scope

This European Standard applies to non-ducted forced convection air cooled refrigerant condensers/gas coolers with dry air side surface within which the refrigerant changes phases or is cooled. Its purpose is to establish uniform methods of performance assessment. It does not deal with evaluation of conformity.

This European Standard does not apply to air cooled condensers/gas coolers, designed primarily for installation within the machinery compartment of packaged products or in factory-assembled condensing/gas cooling units.

This European Standard does not apply to condensers with an integral subcooling part.

This European Standard specifies methods to test and ascertain the following:

— product identification;

— standard capacity;

— nominal air flow rate;

— nominal fan power.

This European Standard does not cover technical safety aspects.

2 Normative references

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

EN 60034-1, *Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

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

3.1
forced convection air cooled refrigerant condenser
refrigeration system component that condenses refrigerant vapour by rejecting heat to air, which is mechanically circulated over its dry heat transfer surface by integral fans and fan drives

Note 1 to entry: The heat transfer coil includes distributing and collecting headers.

Note 2 to entry: In the following “forced convection air cooled refrigerant condenser” is referred to as “condenser”.

3.2
forced convection air cooled refrigerant gas cooler
refrigeration system component that cools the refrigerant by rejecting heat to air, which is mechanically circulated over its dry heat transfer surface by integral fans and fan drives

Note 1 to entry: In the following “forced convection air cooled refrigerant gas cooler” is referred to as “gas cooler”.

3.3
refrigerant
working fluid used for heat transfer in a cooling system, which absorbs heat at a low temperature and a low pressure and rejects heat at a higher temperature and a higher pressure usually involving changes of the state of the fluid

3.4
capacity
total heat flow rejected by the refrigerant. This total heat flow of rejection is equal to the product of the mass flow rate of the refrigerant and the difference between the enthalpies of the refrigerant at the condenser/gas cooler inlet and outlet connections

3.5
pressures
3.5.1
condensing/gas cooling pressure
pressure of the refrigerant at the inlet connection of the condenser/gas cooler

3.5.2
evaporating pressure
pressure of the refrigerant at the outlet connection of the calorimeter (applicable only to low pressure calorimeter method)

3.5.3
calorimeter pressure
pressure in the secondary fluid side of the calorimeter vessel (applicable only to low pressure calorimeter method and high pressure calorimeter with indirect heat inducement)

Note 1 to entry: All pressures are average values ascertained over the test duration, and are absolute pressures.

3.6
temperatures
Note 1 to entry: All air temperatures are dry bulb temperatures.

3.6.1
air inlet temperature
average dry bulb temperature of the air at the inlet of the condenser/gas cooler taking into consideration the local air velocities

3.6.2
ambient air temperature
average temperature of the air surrounding the calorimeter, responsible for the heat exchange with the ambient

3.6.3
inside air temperature
average temperature of the air inside the calorimeter, responsible for the heat exchange with the ambient

3.6.4
refrigerant temperatures
3.6.4.1
dew point temperature
temperature of the refrigerant corresponding to the condensing pressure

3.6.4.2
condenser/gas cooler inlet temperature
temperature of the refrigerant vapour at the inlet connection of the condenser/gas cooler

3.6.4.3
subcooled refrigerant temperature
temperature of the liquid refrigerant in the receiver

3.6.4.4
gas cooler outlet temperature
temperature of the refrigerant gas at the outlet connection of the gas cooler

3.6.4.5
evaporating temperature
dew point temperature of the refrigerant corresponding to the evaporating pressure (applicable only to low pressure calorimeter method)

3.6.4.6
vapour temperature
temperature of the refrigerant at the calorimeter outlet connection

3.6.4.7
bubble point temperature at condenser outlet
temperature corresponding to the absolute pressure of the refrigerant at the outlet connection of the condenser

3.6.5
water temperatures
(applicable only to air side calorimeter method)

3.6.5.1
water inlet temperature
temperature of the water as it enters the calorimeter

3.6.5.2
water outlet temperature
temperature of the water as it leaves the calorimeter

Note 1 to entry: All temperatures are average values ascertained over the test duration.

3.7
temperature differences
3.7.1
condenser inlet temperature difference
difference between the condensing temperature and the air inlet temperature

3.7.2
gas cooler inlet temperature difference
difference between the gas cooler inlet temperature and the air inlet temperature

3.7.3
superheating
difference between the condenser inlet temperature and the condensing temperature

3.7.4
subcooling
difference between the bubble point temperature and the subcooled refrigerant temperature

3.8
high glide
refrigerant where the difference between the condensing and bubble point temperatures at a condensing temperature of 40 °C is greater than 3 K

3.9
fan power
electrical power, absorbed by the fan motor(s) measured at the electrical terminals of the motor(s)

3.10
nominal fan power
fan power measured during the air flow test and corrected to the nominal atmospheric pressure of 1 013,25 hPa

Note 1 to entry: The fan power will also differ with the temperature at which the fan runs. As the fan power is only a small proportion of the total cooling load, the deviations are considered to be negligible.

3.11
rotational speed of the fans
average rotational speed of the fans

3.12
nominal air flow
air volume flow rate, flowing through the condenser/gas cooler

3.13
internal volume
volume of the refrigerant containing parts of the condenser/gas cooler between its two connections

3.14
fouling resistance
thermal resistance due to unwanted deposit on the heat exchanger surface reducing its heat transfer performance

Note 1 to entry: The fouling resistance for a clean surface is zero.

Note 2 to entry: Clean, in this context, means that all production residues have been removed from the heat transfer surface and the fan(s) by the factory's cleaning process.

3.15
oil content
the proportion of oil by mass in the pure refrigerant circulating in the heat exchanger

4 Symbols

For the purposes of this document, the symbols of Table 1 apply:

Table 1 — Symbols

E	energy supply to the calorimeter (refrigerant side calorimeters)	kWh
HLF	heat loss factor from calorimeter	kW/K
h_{sup}	spec. enthalpy of superheated vapour at condenser inlet connection	kJ/kg
h_{sub}	spec. enthalpy of subcooled liquid refrigerant at condenser outlet connection	kJ/kg
h_{R1}	specific enthalpy of the refrigerant at gas cooler inlet connection	kJ/kg
h_{R2}	specific enthalpy of the refrigerant at gas cooler outlet connection	kJ/kg
h_{R4}	specific enthalpy of the refrigerant at inlet connection of the calorimeter	kJ/kg
h_{R5}	specific enthalpy of the superheated refrigerant at outlet connection of the calorimeter	kJ/kg
h_{W1}	specific enthalpy of water entering the calorimeter	kJ/kg
h_{W2}	specific enthalpy of water leaving the calorimeter	kJ/kg
N	rotational speed of the fans	min^{-1}
P_{fan}	electrical power of the fan(s)	kW
p_{atm}	atmospheric pressure	hPa
p_c	condensing or gas cooling pressure	kPa
p_{R1}	gas cooler inlet pressure	kPa
p_{R2}	gas cooler outlet pressure	kPa
p_e	evaporating pressure	kPa
p_i	pressure of the secondary fluid in the calorimeter	kPa
q_{mR}	mass flow rate of refrigerant	kg/s
q_{mW}	mass flow rate of water	kg/s
q_{va}	volumetric flow rate of the air	m^3/s
t_{A1}	air inlet temperature	°C
t_R	refrigerant temperatures	°C
t_{R1}	gas cooler inlet temperature	°C
t_{R2}	gas cooler outlet temperature	°C
t_{RM}	refrigerant temperature at flow meter	°C
t_{sup}	superheated vapour temperature	°C
t_{sub}	subcooled refrigerant temperature	°C
t_W	water temperatures	°C
t_{WM}	water temperature at flow meter	°C
t_{amb}	ambient temperature	°C
t_i	temperature inside calorimeter	°C