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DOKUMENTATSIOON

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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 378-2:2016 sisaldab Euroopa standardi EN 378-2:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 378-2:2016 consists of the English text of the European standard EN 378-2:2016.
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English Version

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

Systèmes frigorifiques et pompes à chaleur - Exigences
de sécurité et d'environnement - Partie 2: Conception,
construction, essais, marquage et documentation

Kälteanlagen und Wärmepumpen -
Sicherheitstechnische und umweltrelevante
Anforderungen - Teil 2: Konstruktion, Herstellung,
Prüfung, Kennzeichnung und Dokumentation

This European Standard was approved by CEN on 3 September 2016.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 378-2:2016) has been prepared by Technical Committee CEN/TC 182 “Refrigerating systems, safety and environmental requirements”, 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of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

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 378-2:2008+A2:2012.

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 Annexes ZA and ZB, which are integral parts of this document.

EN 378 consists of the following parts under the general title “*Refrigerating systems and heat pumps — Safety and environmental requirements*”:

- *Part 1: Basic requirements, definitions, classification and selection criteria;*
- *Part 2: Design, construction, installing, testing, marking and documentation;*
- *Part 3: Installation site and personal protection;*
- *Part 4: Operation, maintenance, repair and recovery.*

The main changes in part 2 with respect to the previous edition are listed below:

- *Harmonization as far as possible with ISO 5149:2014 and ISO 817:2014;*
- *Harmonizing requirements with DIRECTIVE 2014/68/EU (PED), related to pressure and DIRECTIVE 2006/42/EC (MD).*

Following detailed changes are worth noting:

- *In 5.2.1, the application of harmonized standard for components has been clarified, by making the note normative;*
- *The content of the former Table 3 has been integrated in 6.2.6.2, with necessary modifications of the flow chart in Figure 1;*
- *Replacement of 6.2.2.3 with requirements related to pressure rise in case of external fire;*
- *Improvement 6.2.5.2.2, regarding electronic safety switching devices for limiting the pressure;*
- *Rearrangement of the transport and vibration tests formerly 6.2.12 and now 6.2.12 and 6.2.13;*

- *Modification of the explosion hazard requirements in 6.2.14 (formerly 6.2.13);*
- *Addition of Annex H on stress corrosion cracking, Annex I on leak simulation test, Annex J on commissioning procedure, Annex K on ignition sources;*
- *Modification of Annex ZA for harmonization with DIRECTIVE 2014/68/EU (PED);*
- *Deletion of Annex ZB and the update of Annex ZC (now new Annex ZB).*

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

The introduction of EN 378-1 is applicable.

This standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This European Standard specifies the requirements for the safety of persons and property, provides guidance for the protection of the environment and establishes procedures for the operation, maintenance and repair of refrigerating systems and the recovery of refrigerants.

The term “refrigerating system” used in this European Standard includes heat pumps.

This Part 2 of this Standard is applicable to the design, construction and installation of refrigerating systems including piping, components and materials. It includes ancillary equipment not covered in EN 378-1, EN 378-3 or EN 378-4 which is directly associated with these systems. It also specifies requirements for testing, commissioning, marking and documentation. Requirements for secondary heat transfer circuits are excluded except for any protection requirements associated with the refrigerating system. Ancillary equipment includes, for example, fans, fan motors, electrical motors and transmission assemblies for open compressor systems.

This standard applies:

- a) to refrigerating systems, stationary or mobile, of all sizes except to vehicle air conditioning systems covered by a specific product standard, e.g. ISO 13043;
- b) to secondary cooling or heating systems;
- c) to the location of the refrigerating systems;
- d) to replaced parts and added components after adoption of this standard if they are not identical in function and in the capacity.

Systems using refrigerants other than those listed in EN 378-1:2016, Annex E are not covered by this standard.

This standard does not apply to goods in storage.

This standard is not applicable to refrigerating systems which were manufactured before the date of its publication as a European Standard except for extensions and modifications to the system which were implemented after publication.

This standard is applicable to new refrigerating systems, extensions or modifications of already existing systems, and for existing stationary systems, being transferred to and operated on another site.

This standard also applies in the case of the conversion of a system to another refrigerant type, in which case conformity to the relevant clauses of parts 1 to 4 of the standard shall be assessed.

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

EN 378-3:2016, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 3: Installation site and personal protection*

EN 378-4, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery*

- EN 809, *Pumps and pump units for liquids — Common safety requirements*
- EN 837-1:1996, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*
- EN 837-2:1997, *Pressure gauges — Part 2: Selection and installation recommendations for pressure gauges*
- EN 837-3:1996, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimensions, metrology, requirements and testing*
- EN 1012-3, *Compressors and vacuum pumps — Safety requirements — Part 3: Process compressors*
- EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*
- EN 1092-3:2003, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 3: Copper alloy flanges*
- EN 1736:2008, *Refrigerating systems and heat pumps — Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes — Requirements, design and installation*
- EN 1861:1998, *Refrigerating systems and heat pumps — System flow diagrams and piping and instrument diagrams — Layout and symbols*
- EN 12178:2003, *Refrigerating systems and heat pumps — Liquid level indicating devices — Requirements, testing and marking*
- EN 12263:1998, *Refrigerating systems and heat pumps — Safety switching devices for limiting the pressure — Requirements and tests*
- EN 12284:2003, *Refrigerating systems and heat pumps — Valves — Requirements, testing and marking*
- EN 12693:2008, *Refrigerating systems and heat pumps — Safety and environmental requirements — Positive displacement refrigerant compressors*
- EN 12735-1, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*
- EN 12735-2, *Copper and copper alloys - Seamless, round tubes for air conditioning and refrigeration - Part 2: Tubes for equipment*
- EN 12799:2000, *Brazing — Non-destructive examination of brazed joints*
- EN 13136:2013, *Refrigerating systems and heat pumps — Pressure relief devices and their associated piping — Methods for calculation*
- EN 13313:2010, *Refrigerating systems and heat pumps — Competence of personnel*
- EN 13445-1:2014, *Unfired pressure vessels — Part 1: General*
- EN 13445-2:2014, *Unfired pressure vessels — Part 2: Materials*
- EN 13445-3:2014, *Unfired pressure vessels — Part 3: Design*

EN 13445-4:2014, *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2014, *Unfired pressure vessels — Part 5: Inspection and testing*

EN 13445-6:2014, *Unfired pressure vessels — Part 6: Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron*

EN 13445-8:2014, *Unfired pressure vessels — Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN 13480-1:2012, *Metallic industrial piping — Part 1: General*

EN 13480-2:2012, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2012, *Metallic industrial piping — Part 3: Design and calculation*

EN 13480-4:2012, *Metallic industrial piping — Part 4: Fabrication and installation*

EN 13480-5:2012, *Metallic industrial piping — Part 5: Inspection and testing*

EN 13480-6:2012, *Metallic industrial piping — Part 6: Additional requirements for buried piping*

EN 13480-8:2012, *Metallic industrial piping — Part 8: Additional requirements for aluminium and aluminium alloy piping*

EN 14276-1:2006+A1:2011, *Pressure equipment for refrigerating systems and heat pumps — Part 1: Vessels — General requirements*

EN 14276-2:2007+A1:2011, *Pressure equipment for refrigerating systems and heat pumps — Part 2: Piping — General requirements*

EN 16084:2011, *Refrigerating systems and heat pumps — Qualification of tightness of components and joints*

EN 60079-15:2010, *Explosive atmospheres — Part 15: Equipment protection by type of protection "n" (IEC 60079-15:2010)*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60335-1:2012, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2010, modified)*

EN 60335-2-24:2010, *Household and similar electrical appliances — Safety — Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers (IEC 60335-2-24:2010)*

EN 60335-2-34:2013, *Household and similar electrical appliances — Safety — Part 2-34: Particular requirements for motor-compressors (IEC 60335-2-34:2012)*

EN 60335-2-40:2003, *Household and similar electrical appliances — Safety — Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers (IEC 60335-2-40:2002)*

EN 60335-2-89:2010, *Household and similar electrical appliances — Safety — Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor (IEC 60335-2-89:2010)*

EN 61000-6-1:2007, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:2005)*

EN 61000-6-2:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2:2005)*

EN 61000-6-3:2007, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)*

EN 61000-6-4:2007, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:2006)*

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 4126-1:2013, *Safety devices for protection against excessive pressure — Part 1: Safety valves (ISO 4126-1:2013)*

EN ISO 4126-2:2003, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices (ISO 4126-2:2003)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 6708:1995, *Pipework components — Definition and selection of DN (nominal size) (ISO 6708:1995)*

EN ISO 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*

EN ISO 10675-1:2013, *Non-destructive testing of welds — Acceptance levels for radiographic testing — Part 1: Steel, nickel, titanium and their alloys (ISO 10675-1:2008)*

EN ISO 10675-2:2013, *Non-destructive testing of welds — Acceptance levels for radiographic testing — Part 2: Aluminium and its alloys (ISO 10675-2:2010)*

EN ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN ISO 17636-1:2013, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film (ISO 17636-1:2013)*

EN ISO 17636-2:2013, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors (ISO 17636-2:2013)*

EN ISO 17638:2009, *Non-destructive testing of welds — Magnetic particle testing (ISO 17638:2003)*

EN ISO 17640:2010, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment (ISO 17640:2010)*

ISO 817:2014, *Refrigerants — Designation and safety classification*

ISO 13043:2011, *Road vehicles — Refrigerant systems used in mobile air conditioning systems (MAC) — Safety requirements*

ASTM D 4728:2006, *Standard Test Method for Random Vibration Testing of Shipping Containers*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in EN 378-1:2016 apply.

Designation, classification, and selected properties of the refrigerant such as:

- refrigerant number, e.g. R-717;
- safety classes A1, A2L, A2, A3, B1, B2L, B2, B3;
- lower flammability limits (LFL)

are specified in EN 378-1:2016, Annex E.

For the purposes of this document, abbreviated terms given in EN 378-1:2016 and the following apply.

DN Nominal size (see EN 378-1:2016, 3.5.14)

PS Maximum allowable pressure in bar (1 bar = 0,1 MPa) (see EN 378-1:2016, 3.3.2)

LFL Lower flammability limit in kg/m³ (see EN 378-1:2016, 3.7.8)