



SLOVENSKI STANDARD
SIST EN 14276-2:2007+A1:2011
01-maj-2011

Tlačna oprema za hladilne sisteme in toplotne črpalke - 2. del: Cevovodi - Splošne zahteve

Pressure equipment for refrigerating systems and heat pumps - Part 2: Piping - General requirements

Druckgeräte für Kälteanlagen und Wärmepumpen - Teil 2: Rohrleitungen - Allgemeine Anforderungen

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Equipements sous pression pour systèmes de réfrigération et pompes à chaleur - Partie 2: Tuyauteries - Exigences générales

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Ta slovenski standard je istoveten z: EN 14276-2:2007+A1:2011

ICS:

23.020.30	Tlačne posode, plinske jeklenke	Pressure vessels, gas cylinders
27.080	Toplotne črpalke	Heat pumps
27.200	Hladilna tehnologija	Refrigerating technology

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Pressure equipment for refrigerating systems and heat pumps - Part 2: Piping - General requirements

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This European Standard was approved by CEN on 17 February 2007 and includes Amendment 1 approved by CEN on 13 December 2010.

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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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Foreword

This document (EN 14276-2:2007+A1:2011) 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of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

This document includes Amendment 1, approved by CEN on 2010-12-13.

This document supersedes EN 14276-2:2007.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** and **A1**.

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 European Standard 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 97/23/EC concerning pressure equipment.

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

This document consists of the following parts under the general title *Pressure equipment for refrigerating systems and heat pumps*:

— *Part 1: Vessels — General requirements*;

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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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EN 14276-2:2007+A1:2011 (E)**Introduction**

This European Standard recognises the unique nature of piping for refrigerating systems or heat pumps and is intended to address the specific needs of the refrigeration and heat pump industry. This European Standard should be read in conjunction with the various parts of EN 13480 and [EN 14276-1:2006+A1](#).

The unique nature of a refrigerating system is defined in the introduction of [EN 14276-1:2006+A1](#).

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1 Scope

1.1 This European Standard specifies the requirements for material, design, manufacturing, testing and documentation for stationary piping intended for use in refrigerating systems, heat pumps and secondary cooling and heating systems. These refrigerating systems and heat pump systems are referenced in this standard as refrigerating systems as defined in EN 378-1.

1.2 This European Standard applies to piping including welded or brazed attachments up to and including the flanges, screwed, welded or brazed connectors or to the edge to be welded or brazed at the first circumferential joint connecting piping or other elements.

1.3 This European Standard applies to the selection, application and installation of safety accessories intended to protect the piping during the various phases of the refrigeration cycle.

1.4 This European Standard applies to the following piping:

- heat exchanger consisting of piping for the purpose of cooling or heating air where piping aspects are predominant;
- piping incorporated into an assembly (e.g. self contained system, condensing unit);
- field erected piping.

1.5 This European Standard applies to piping with an internal pressure down to – 1 bar, to account for the evacuation of the piping prior to charging with refrigerant.

1.6 This European Standard applies to both the mechanical loading conditions and thermal conditions as defined in EN 13480-3 associated with refrigerating systems. It applies to piping subject to the maximum allowable temperatures for which nominal design stresses for materials are derived using **EN 14276-1:2006+A1** or as specified in this European Standard. In addition piping designed to this standard needs to have a maximum design temperature not exceeding 200 °C and a maximum design pressure not exceeding 64 bar. Outside of these limits, EN 13480 should be used for the design construction and inspection of the piping. Under these circumstances the unique nature of a refrigerating plant, as indicated in the introduction of **EN 14276-1:2006+A1**, needs also to be taken into account.

1.7 This European Standard applies to piping where the main pressure bearing parts are manufactured from metallic ductile materials as defined in Clause 4 and in **EN 14276-1:2006+A1**.

EN 14276-2:2007+A1:2011 (E)**2 Normative references**

The following referenced documents are indispensable for the application 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.

[A1] EN 378-1:2008+A1:2010, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2:2008+A1:2009, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 378-3:2008, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 3: Installation site and personal protection*

EN 378-4:2008, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery* **[A1]**

EN 571-1:1997, *Non destructive testing — Penetrant testing — Part 1: General principles*

EN 583-4:2002, *Non-destructive testing — Ultrasonic examination — Part 4: Examination for discontinuities perpendicular to the surface*

EN 764-1:2004, *Pressure equipment — Terminology — Part 1: Pressure, temperature, volume, nominal size*

EN 764-2:2002, *Pressure equipment — Part 2: Quantities, symbols and units*

EN 764-3:2002, *Pressure equipment — Part 3: Definition of parties involved*

EN 764-4:2002, *Pressure equipment — Part 4: Establishment of technical delivery conditions for metallic materials*

EN 764-5:2002, *Pressure equipment — Part 5: Compliance and inspection documentation of materials*

EN 970:1997, *Non-destructive examination of fusion welds — Visual examination*

EN 1289:1998, *Non-destructive examination of welds — Penetrant testing of welds — Acceptance levels*

EN 1435:1997, *Non-destructive examination of welds — Radiographic examination of welded joints*

EN 1653:1997, *Copper and copper alloys — Plate, sheet and circles for boilers, pressure vessels and hot water storage units*

EN 1712:1997, *Non-destructive examination of welds — Ultrasonic examination of welded joints — Acceptance levels*

EN 1714:1997, *Non-destructive examination of welds — Ultrasonic examination of welded joints*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 10246-9:2000, *Non-destructive testing of steel tubes — Part 9: Automatic ultrasonic testing of the weld seam of submerged arc welded steel tubes for the detection of longitudinal and/or transverse imperfections*

EN 10246-16:2000, *Non-destructive testing of steel tubes — Part 16: Automatic ultrasonic testing of the area adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections*

EN 12178:2003, *Refrigerating systems and heat pumps — Liquid level indicating devices — Requirements, testing and marking*

EN 12517-1:2006, *Non-destructive testing of welds — Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography — Acceptance levels*

EN 12735-1:2001, *Copper and copper alloys — Seamless, round copper tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*

EN 12735-2:2001, *Copper and copper alloys — Seamless, round copper tubes for air conditioning and refrigeration — Part 2: Tubes for equipment*

Ⓐ₁ EN 13445-3:2009, *Unfired pressure vessels — Part 3: Design* Ⓐ₁

EN 13480-2:2002, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2002, *Metallic industrial piping — Part 3: Design and calculation*

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

EN 22553:1994, *Welded, brazed and soldered joints — Symbolic representation on drawings (ISO 2553:1992)*

Ⓐ₁ EN ISO 4063:2009, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:2009)* Ⓐ₁

EN ISO 10042:2005, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections (ISO 10042:2005)*

Ⓐ₁ EN ISO 23277:2009, *Non-destructive testing of welds — Penetrant testing of welds — Acceptance levels (ISO 23277:2006)* Ⓐ₁

ISO 817:2005, *Refrigerants — Designation system*

3 Terms, definitions, symbols, quantities and units

Ⓐ₁ For the purposes of this document, the terms, definitions, symbols, quantities and units given in EN 378-1:2008+A1:2010, EN 764-1:2004, EN 764-2:2002, EN 764-3:2002, EN 764-4:2002, EN 764-5:2002, EN 14276-1:2006+A1:2011 and the following apply. Ⓐ₁

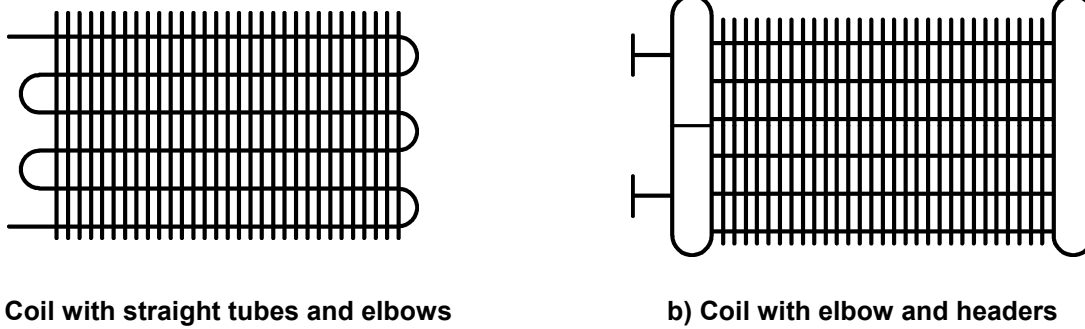
3.1 Terms and definitions

3.1.1 coil

heat exchanger consisting of pipe or tubing (more particularly made from one or more bent pipes) used to cool or heat air

NOTE see Figure 1

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a) Coil with straight tubes and elbows

b) Coil with elbow and headers

Figure 1 — Coil

3.2 Symbols, quantities and units

Symbols, quantities and units used in this standard are listed in Table 1.

Table 1 — Symbols, quantities and units

Symbol	Quantity	Unit
DN^a	Nominal diameter	—
D_e	External diameter of tube	mm
f	Nominal design stress at design temperature	MPa
P_c	Calculation pressure (in formula, P_c can be replaced by P)	MPa or bar ^b
P_d	Design pressure	MPa or bar ^b
PS	Maximum allowable pressure	MPa or bar ^b
P_{test}	Test pressure	MPa or bar ^b
R	Radius of curvature for tube	mm
t_c	Calculation temperature	°C
t_d	Design temperature	°C
z	Joint coefficient for welds	—
^a See also Annex A ^b 1 bar = 100 000 Pa = 0,1 MPa = 0,1 N/mm ²		

4 Material

4.1 General

The materials referenced in this European Standard shall meet the requirements of [EN 14276-1:2006+A1](#) unless modified by the subclauses of this clause.

It is permitted to use non-metallic materials (e.g. gaskets, coatings, insulating materials, sight glasses) provided they are compatible with the other materials, refrigerants and lubricants present.

Sight glasses shall comply with EN 12178 for pressure bearing requirements.

4.2 Requirements for materials to be used for pressurised parts

Materials listed in this European Standard have been identified for use in refrigerating piping. If it is required to utilise a material not listed in this European Standard, the requirements of EN 13480-2 shall be followed where applicable and the unique nature of refrigerating plant requirements shall also be taken into account.

4.3 Materials

4.3.1 Piping manufactured from the following materials satisfies the requirements of this European Standard for the pressurised parts:

4.3.1.1 Where mechanical properties may be modified by the piping manufacturing process, the material shall be selected from the following material groups as defined in [A1](#) EN 14276-1:2006+A1:2011, Annex I [A1](#):

steel groups: St 1.1, St 1.2, St 8.1;

aluminium and aluminium alloys groups: 21, 22;

copper groups: 31, 32, 33, 34, 35 included in EN 1653, EN 12735-1, EN 12735-2.

When materials do not comply with the above requirements, it is also permitted to use materials which comply with European Approval of Material (EAM) or with particular appraisal according to EN 764-4.

4.3.1.2 Where the piping manufacturing process does not modify mechanical properties, metallic materials other than those quoted in 4.3.1.1 can be used if they comply with European Approval of Material (EAM) or with particular appraisal according to EN 764-4.

4.3.2 Special considerations

The requirements of [A1](#) EN 14276-1:2006+A1:2011, 4.3.3 [A1](#) shall apply.

4.4 Requirements for the prevention of brittle fracture

The requirements of [A1](#) EN 14276-1:2006+A1:2011, 4.4 [A1](#) shall apply.

NOTE The brittle fracture should be determined only when the material thickness can permit to make a test piece according to EN 10045-1 with a minimum section size 5 mm x 10 mm.

4.5 Material documentation

The requirements of [A1](#) EN 14276-1:2006+A1:2011, 4.5 [A1](#) shall apply.

4.6 Materials for non-pressure retaining parts

The requirements of [A1](#) EN 14276-1:2006+A1:2011, 4.6 [A1](#) shall apply.

5 Piping classification

5.1 Category of piping

The pressure piping is classified into 2 categories according to Table 2 in accordance with the following:

- a) the product of maximum allowable pressure PS (in bar) times DN ;

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- b) the fluid classification as defined in A1 EN 14276-1:2006+A1:2011, 5.2 A1 ;
- c) the fluid state:
- 1) gases, liquefied gases, gases dissolved under pressure and those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar;
 - 2) liquids having a vapour pressure at the maximum allowable temperature of not more than 0,5 bar.

For this European Standard, the refrigerant containing parts are always considered as a gas circuit.

Table 2 — Classification of piping by categories

Category	Fluid A1 EN 14276-1:2006+A1:2011, 5.2 A1	Criteria
X	Group 1	$PS < 0,5$ bars, no limit of DN or $0,5 \text{ bar} < PS \leq 10 \text{ bar}$, $DN \leq 100$ or $10 \text{ bar} < PS \leq 40 \text{ bar}$: $PS \times DN \leq 1\,000$ or $PS > 40 \text{ bar}$, $DN \leq 25$
	Group 2	$PS < 0,5$ bar, no limit of DN or $0,5 \text{ bar} < PS \leq 35 \text{ bar}$, $PS \times DN \leq 3\,500$ or $PS > 35 \text{ bar}$, $DN \leq 100$
Y	Group 1	Other than criteria for category X group 1
	Group 2	Other than criteria for category X group 2

NOTE Where refrigerating systems are subject to the Low Voltage Directive and/or the Machinery Directive, exclusion in Article 1.3.6 of the Pressure Equipment Directive (PED) may apply. In these cases, piping of category X is not subject to PED requirements.

5.2 Piping typology

In refrigerating systems, the following 3 types of pressure equipment can be classified as piping:

- type A: heat exchangers where air is the secondary fluid (they are used in air conditioning and heat pumps) and where the piping aspects are predominant defined as coil (see Figure 1);

NOTE The predominant aspect of piping is defined in Guideline 2/4.

- type B: piping incorporated into an assembly (e.g. self contained system, condensing unit);
- type C: field erected piping;
 - type C1: with pre-fabricated piping;
 - type C2: totally built on site.

For the different types of piping, the following requirements shall apply (if applicable):