SLOVENSKI STANDARD
oSIST prEN 14276-1:2017

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Tlačna oprema za hladilne sisteme in toplotne črpalke - 1. del: Posode - Splošne zahteve

Pressure equipment for refrigerating systems and heat pumps - Part 1: Vessels - General requirements

Druckgeräte für Kälteanlagen und Wärmepumpen - Teil 1: Behälter - Allgemeine Anforderungen

Équipements sous pression pour systèmes de réfrigération et pompes à chaleur - Partie 1 : Récipients - Exigences générales

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23.020.32	Tlačne posode	Pressure vessels
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English Version

Pressure equipment for refrigerating systems and heat pumps - Part 1: Vessels - General requirements

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 182.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Contents

Page

European foreword

This document (prEN 14276-1:2017) has been prepared by Technical Committee CEN/TC 182 "Refrigerating systems, safety and environmental requirements", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14276-1:2006+A1:2011.

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 Directive 2014/68/EU 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*

— *Part 2: Piping – General requirements.*

Introduction

This European Standard recognizes the unique nature of vessels for refrigerating systems or heat pumps and is intended to address the specific needs of the refrigeration and heat pump industry. This standard should be read in conjunction with the various parts of EN 13445.

When the text of this standard modifies or supplements a clause within EN 13445, then this standard should prevail. Where this standard does not modify or supplement the requirements of a clause, the requirements of EN 13445 should prevail.

The unique nature of a refrigerating system is defined as follows:

a) the purpose of the refrigerating system is to extract and reject heat (this involves both cooling and heating);

b) to operate the refrigerating system a pressure-imposing element (e.g. a compressor or an energy source) is necessary;

c) the refrigerating system has a defined refrigerant charge in a closed circuit;

d) the refrigerant has a chemical composition and purity defined in the relevant standards;

e) the pressure of the refrigerant decreases when the temperature decreases (see typical curve in Annex A of this standard);

f) due to the maximum temperature limit of 150 °C and the maximum pressure limit of 160 bar, the time dependant creep and fatigue due to pressure variation or vibrations are not significant design factors except for some materials such as aluminium, copper and titanium where the fatigue should be taken into account;

g) the risk of overpressure is due to:

   1) the pressure imposing element;

   2) an external heat source (e.g. fire or hot water);

   3) improper operation.

h) the refrigerating system is designed to minimize refrigerant emissions and the ingress of contaminants.

Only hermetic compressors are covered by this standard.

1 Scope

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

This European Standard applies to vessels, including welded or brazed attachments up to and including the nozzle 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.

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

This European Standard applies to both the mechanical loading conditions and thermal conditions as defined in EN 13445-3 associated with refrigerating systems. It applies to pressure vessels subject to the maximum allowable temperatures for which nominal design stresses for materials are derived using EN 13445-2 and EN 13445-3 or as specified in this standard. In addition, vessels designed to this standard should have a maximum allowable temperature not exceeding 150 °C and a maximum design pressure not exceeding 160 bars. Outside of these limits, it is important that EN 13445 be used for the design, construction and inspection of the vessel. Under these circumstances, it is important that the unique nature of refrigerating plant, as indicated in the introduction to this standard, also be taken into account.

It is important that pressure vessels used in refrigerating systems and heat pumps of category less than II as de-fined in Annex H comply with other relevant clauses of EN 378-2 for vessels.

This European Standard applies to pressure vessels where the main pressure bearing parts are manufactured from metallic ductile materials as defined in Clause 4 and Annex I of this standard.

This European Standard does not apply to vessels of the following types:

— vessels of riveted construction;

— multi-layered, autofrettaged or prestressed vessels;

— vessels directly heated by a flame;

— « roll bond » heat exchangers.

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 378-2:2016, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation*

EN 378-3, *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 764-1:2015+A1:2016, *Pressure equipment - Part 1: Vocabulary*

EN 764-2:2012, *Pressure equipment - Part 2: Quantities, symbols and units*

EN 764-4:2014, *Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials*

EN 764-5:2014, *Pressure equipment - Part 5: Compliance and inspection documentation of materials*

EN 837-1, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 1005-2, *Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery*

EN 1045, *Brazing - Fluxes for brazing - Classification and technical delivery conditions*

EN 1173, *Copper and copper alloys - Material condition designation*

EN 10111, *Continuously hot rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions*

EN 10130, *Cold rolled low carbon steel flat products for cold forming - Technical delivery conditions*

EN 10160, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions*

EN 10204, *Metallic products - Types of inspection documents*

EN 12797, *Brazing - Destructive tests of brazed joints*

EN 13445-2:2014, *Unfired pressure vessels - Part 2: Materials*

EN 13445-3:2014, *Unfired pressure vessels - Part 3: Design*

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

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

EN 13445-6, *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, *Unfired pressure vessels - Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN ISO 2553, *Welding and allied processes - Symbolic representation on drawings - Welded joints (ISO 2553)*

EN ISO 3677, *Filler metal for soldering and brazing - Designation (ISO 3677)*

EN ISO 4063, *Welding and allied processes - Nomenclature of processes and reference numbers (ISO 4063)*

EN ISO 5173, *Destructive tests on welds in metallic materials - Bend tests (ISO 5173)*

EN ISO 5817, *Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 7438, *Metallic materials - Bend test (ISO 7438)*

EN ISO 9606-1, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO 9606-1)*

EN ISO 10012, *Measurement management systems - Requirements for measurement processes and measuring equipment (ISO 10012)*

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

EN ISO 13585, *Brazing - Qualification test of brazers and brazing operators (ISO 13585)*

EN ISO 14732, *Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1)*

EN ISO 15611, *Specification and qualification of welding procedures for metallic materials - Qualification based on previous welding experience (ISO 15611)*

EN ISO 15612, *Specification and qualification of welding procedures for metallic materials - Qualification by adoption of a standard welding procedure (ISO 15612)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1)*

EN ISO 15614-8, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 8: Welding of tubes to tube-plate joints (ISO 15614-8)*

ISO 817, *Refrigerants - Designation and safety classification*

ISO 5187, *Welding and allied processes - Assemblies made with soft solders and brazing filler metals - Mechanical test methods*

ISO/TR 25901-3:2016, *Welding and allied processes - Vocabulary - Part 3: Welding processes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 378-1:2016, EN 764-1:2015+A1:2016, EN 764-2:2012, EN 764-4:2014, EN 764-5:2014, ISO/TR 25901-3:2016 and the following apply.

3.1 Definitions

3.1.1
temperatures stress cases

3.1.1.1
min
$t_{0\ 100}$
lowest temperature at which pressurized parts are allowed to be used at a stress of up to 100 % of the design stress at 20 °C (standard design stress)

3.1.1.2
min
$t_{0\ 75}$
lowest temperature at which pressurized parts are allowed to be used when their stress is a maximum of 75 % of the design stress at 20 °C (reduced stress)

3.1.1.3
min
$t_{0\ 50}$
lowest temperature at which pressurized parts are allowed to be used when their stress is a maximum of 50 % of the design stress at 20 °C (medium stress)

3.1.1.4
min
$t_{0\ 25}$
lowest temperature at which pressurized parts are allowed to be used when their stress is a maximum of 25 % of the design stress at 20 °C (low stress)

3.1.2
corrosion
all forms of material wastage (e.g. oxidation, erosion, wear and abrasion)

3.1.3
safety data sheet
document which gives all necessary information for prevention, safety, storage, transportation, labelling, use and disposal of substances and preparations which have a risk for health, safety or environment

3.1.4
maximum allowable temperature
highest temperature that can occur during operation or standstill of the refrigerating system or during testing under test conditions

3.1.5
minimum allowable temperature
lowest temperature that can occur during operation or standstill of the refrigerating system or during testing under test conditions

3.1.6
main pressure bearing part
components of the vessel retaining the pressure and contributing to the vessel strength such as shell, tubesheet, end plate, dished ends, connection or fitting

3.1.7
volume
internal volume of a compartment ready for operation, including the volume of nozzles to the first connection (flange, coupling, weld, braze) and excluding the volume of permanent internal part

3.1.8
nominal diameter
DN
numerical designation of the size of a component in a piping system as defined by EN ISO 6708 and the value is given in material standard; if it is not defined in the standard, it is a nominal outside diameter minus two times the nominal wall thickness

3.1.9
« roll bond » heat exchanger
heat exchanger consisting of two plates which are weld-bonded together with the exception of the printed circuit forming the refrigerant passage which is obtained by inflation under pressure

3.1.10
maximum operating pressure
maximum pressure which the vessel can withstand without the operation of any safety accessory with a continuous operation of the pressure generator (compressor, heat source...)

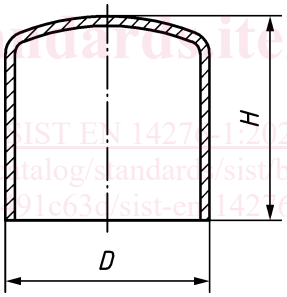
Note 1 to entry: This pressure determines the maximum operating conditions for equipment users.

3.1.11
maximum standstill pressure
maximum pressure which the vessel can withstand without operation of any safety accessory when the pressure generator is not in operation

Note 1 to entry: This pressure occurs during transportation, storage or shut down of the pressure generator.

3.1.12
deep drawing
process of forming by stamping when the ratio of depth (*H*) by diameter (*D*) is greater than or equal to 0,45

Note 1 to entry: See Figure 1.



Key
H depth
D diameter

Figure 1 — Deep drawing

3.1.13
manual brazing
brazing operation performed and controlled by hand

3.1.14
semi-automatic brazing
brazing with equipment which controls only the brazing filler metal feed

Note 1 to entry: The advance of the brazing is manually controlled.

3.1.15
machine brazing
brazing with equipment which performs the brazing operation under the constant control of a brazing operator

3.1.16
automatic brazing
brazing with equipment which performs the brazing operation without constant observation and adjustment by a brazing operator

3.1.17
brazer
person who performs a manual or semiautomatic brazing operation

3.1.18
brazing operator
person who operates a machine or automatic brazing equipment

3.1.19
semiautomatic expansion
expansion with equipment which controls the operation and where the operator manually introduces the equipment to the inside of the tube

3.1.20
machine expansion
expansion with equipment which performs the expansion operation under the constant control of operator

3.1.21
automatic expansion
expansion with equipment which performs the expansion operation without constant observation and adjustment by an expansion operator

3.1.22
expansion operator
person who makes an expansion joint

3.1.23
rolling
plastic cold forming of tubes by means of a tool which have several rolls turning during the operation

3.1.24
micro channel heat exchanger
heat exchanger using multiple multiport extruded tubes with flow channels of a nominal diameter DN ≤ 2 which are connected in parallel on a circular header pipe

3.2 Symbols, descriptions and units

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