SVENSK STANDARD
SS-EN 14276-1:2020

Tryckutrustning för kylsystem och värmepumpar –
Del 1: Kärl – Generella krav

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

Svenska Institutet för Standarder

Språk: engelska/English
Utgåva: 2

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Fastställd: 2020-03-03
ICS: 23.020.30;27.080;27.200

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Europastandarden EN 14276-1:2020 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 14276-1:2020.

Denna standard ersätter SS-EN 14276-1:2006+A1:2011, utgåva 1.

The European Standard EN 14276-1:2020 has the status of a Swedish Standard. This document contains the official version of EN 14276-1:2020.

This standard supersedes the SS-EN 14276-1:2006+A1:2011, edition 1.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14276-1

February 2020

ICS 23.020.30; 27.080; 27.200

Supersedes EN 14276-1:2006+A1:2011

English Version

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

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

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

This European Standard was approved by CEN on 1 December 2019.

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Ref. No. EN 14276-1:2020 E

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European foreword

This document (EN 14276-1:2020) 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of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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

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

This document has been prepared under a standardization request 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 Annex ZA, which is an integral part of this document.

EN 14276, *Pressure equipment for refrigerating systems and heat pumps*, is currently composed with the following parts:

— *Part 1: Vessels – General requirements*;

— *Part 2: Piping – General requirements*.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document 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 document should be read in conjunction with the various parts of the EN 13445 series.

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

f) due to the maximum temperature limit of 200 °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.

Hermetic compressors are covered by this document.

1 Scope

This document 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 document as refrigerating systems as defined in EN 378-1:2016.

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

This document 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 document 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 document applies to both the mechanical loading conditions and thermal conditions as defined in EN 13445-3:2014[1] 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 13445-2:2014[2] and EN 13445-3:2014[1] or as specified in this document. In addition, vessels designed to this document can have a maximum allowable temperature not exceeding 200 °C and a maximum design pressure not exceeding 160 bar. Outside of these limits, it is important that the EN 13445 series 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 document, also be taken into account.

It is important that pressure vessels used in refrigerating systems and heat pumps of category less than II as defined in Annex H comply with other relevant clauses of EN 378-2:2016 for vessels.

This document 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 document.

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

[1] As impacted by EN 13445-3:2014/A1:2015, EN 13445-3:2014/A2:2016, EN 13445-3:2014/A3:2017, EN 13445-3:2014/A4:2018 and EN 13445-3:2014/A5:2018.

[2] As impacted by EN 13445-2:2014/A1:2016, EN 13445-2:2014/A2:2018 and EN 13445-2:2014/A3:2018.

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

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

EN 378-4:2016, *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: Inspection documentation of metallic materials and compliance with the material specification*

CEN/TR 764-6:2012, *Pressure equipment — Part 6: Structure and content of operating instructions*

EN 837-1:1996,[3] *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 1005-2:2003+A1:2008, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

EN 1045:1997, *Brazing — Fluxes for brazing — Classification and technical delivery conditions*

EN 1173:2008, *Copper and copper alloys — Material condition designation*

EN 10111:2008, *Continuously hot rolled low carbon steel sheet and strip for cold forming — Technical delivery conditions*

EN 10130:2006, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

EN 10160:1999, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10164:2018, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*

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

EN 12735-1:2016, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*

EN 12735-2:2016, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 2: Tubes for equipment*

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[3] A impacted by EN 837-1:1996/AC:1998.

EN 12797:2000,[4] *Brazing — Destructive tests of brazed joints*

EN 13445-2:2014,[5] *Unfired pressure vessels — Part 2: Materials*

EN 13445-3:2014,[6] *Unfired pressure vessels — Part 3: Design*

EN 13445-4:2014,[7] *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2014,[8] *Unfired pressure vessels — Part 5: Inspection and testing*

EN 13445-6:2014,[9] *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,[10] *Unfired pressure vessels — Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN ISO 2553:2013, *Welding and allied processes — Symbolic representation on drawings — Welded joints (ISO 2553:2013)*

EN ISO 3677:2016, *Filler metal for soldering and brazing — Designation (ISO 3677:2016)*

EN ISO 4063:2010, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:2009)*

EN ISO 5173:2010,[11] *Destructive tests on welds in metallic materials — Bend tests (ISO 5173:2009)*

EN ISO 5817:2014, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2014)*

EN ISO 6892-1:2016, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2016)*

EN ISO 7438:2016, *Metallic materials — Bend test (ISO 7438:2016)*

EN ISO 9606-1:2017, *Qualification testing of welders — Fusion welding — Part 1: Steels (ISO 9606-1:2012)*

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[4] As impacted by EN 12797:2000/A1:2003.

[5] As impacted by EN 13445-2:2014/A1:2016, EN 13445-2:2014/A2:2018 and EN 13445-2:2014/A3:2018.

[6] As impacted by EN 13445-3:2014/A1:2015, EN 13445-3:2014/A2:2016, EN 13445-3:2014/A3:2017, EN 13445-3:2014/A4:2018 and EN 13445-3:2014/A5:2018.

[7] As impacted by EN 13445-4:2014/A1:2016.

[8] As impacted by EN 13445-5:2014/A1:2018.

[9] As impacted by EN 13445-6:2014/A1:2015 and EN 13445-6:2014/A2:2018.

[10] As impacted by EN 13445-8:2014/A1:2014.

[11] As impacted by EN ISO 5173:2010/A1:2011.

EN ISO 10012:2003, *Measurement management systems — Requirements for measurement processes and measuring equipment (ISO 10012:2003)*

EN ISO 10675-1:2016, *Non-destructive testing of welds — Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys (ISO 10675-1:2016)*

EN ISO 13585:2012, *Brazing — Qualification test of brazers and brazing operators (ISO 13585:2012)*

EN ISO 14732:2013, *Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732:2013)*

EN ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials — General rules (ISO 15607:2003)*

CEN ISO/TR 15608:2017, *Welding — Guidelines for a metallic materials grouping system (ISO/TR 15608:2013)*

EN ISO 15609-1:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15609-2:2001,[12] *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding (ISO 15609-2:2001)*

EN ISO 15611:2003, *Specification and qualification of welding procedures for metallic materials — Qualification based on previous welding experience (ISO 15611:2003)*

EN ISO 15612:2018, *Specification and qualification of welding procedures for metallic materials — Qualification by adoption of a standard welding procedure specification (ISO 15612:2018)*

EN ISO 15614-1:2017, *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 15614-1:2017)*

EN ISO 15614-8:2016, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 8: Welding of tubes to tube-plate joints (ISO 15614-8:2016)*

EN ISO 17672:2016, *Brazing — Filler metals (ISO 17672:2016)*

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

ISO 5187:1985, *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*

[12] As impacted by EN ISO 15609-2:2001/A1:2003.

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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1
temperatures stress cases

3.1.1.1
min $t_{\mathbf{0\ 100}}$
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 $t_{\mathbf{0\ 75}}$
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 $t_{\mathbf{0\ 25}}$
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 and used for the design

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 and used for the design

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 by diameter is greater than or equal to 0,45

Note 1 to entry: See Figure 1.