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Tlačna oprema in sklopi - 8. del: Preskušanje

Pressure equipment and assemblies - Part 8: Proof test

Druckgeräte und Zusammenbauten- Teil 8: Druckprüfung

Équipements sous pression et ensembles - Partie 8 : Épreuve

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Pressure equipment and assemblies - Part 8: Proof test

Équipements sous pression et ensembles - Partie 8: Épreuve

Druckgeräte und Zusammenbauten- Teil 8: Druckprüfung

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Ref. No. CEN/TS 764-8:2016 E

Contents

Page

European foreword

This document (CEN/TS 764-8:2016) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

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 consists of eight parts, which are currently:

Part 1 *Vocabulary;*

Part 2 *Quantities, symbols and units;*

Part 4 *Establishment of technical delivery conditions for metallic materials;*

Part 5 *Inspection documentation of metallic materials and compliance with the material specification;*

Part 6 *Structure and content of operating instructions [technical report];*

Part 7 *Safety systems for unfired pressure equipment;*

Part 8 *Proof test [technical specification].*

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: 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 document is intended to establish a common approach for the proof testing by pressure test of items of pressure equipment and assemblies, in order to fulfil the essential requirement 3.2.2 of Annex 1 of the pressure equipment directive 97/23/CE.

It is intended to be used as a basis in the specific product standards, or directly by a manufacturer.

It takes into account the existing guidelines adopted by the European Commission, detailed in Annex A.

For the determination of the pressure test value, this document provides two methods in 5.1. Further investigation will take place, in order to better specify the method to be retained in the future. The determination of the nominal design stress will be part of this analysis.

CEN technical committees, which apply this document in their product standard, are encouraged to give feedback to CEN/TC 54, for the future revision of this document.

1 Scope

This document specifies the purpose, form and procedure of proof testing by pressure test of items of pressure equipment and assemblies.

It also specifies how to determine the value of the test pressure.

2 Terms and definitions

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

NOTE Other useful definitions can be found in EN 764–1 to -7.

2.1
pressure equipment
vessel, piping, safety accessory or pressure accessory with a maximum allowable pressure PS greater than 0,5 bar

Note 1 to entry: Where applicable, pressure equipment includes elements attached to pressurized parts, such as flanges, nozzles, couplings, supports, lifting lugs, etc.

[SOURCE: Directive 97/23/CE]

2.2
assembly
several pieces of pressure equipment assembled by a manufacturer to constitute an integrated and functional whole

[SOURCE: Directive 97/23/CE]

2.3
product standard
standard that specifies requirements to be fulfilled by a product or a group of products, to establish its fitness for purpose

Note 1 to entry: For this document, a product standard is a standard dealing with a pressure equipment or an assembly.

[SOURCE: EN 45020]

2.4
maximum allowable pressure
PS
p_s
maximum pressure for which the equipment is designed, as specified by the manufacturer

Note 1 to entry: The subscript “max” is added to the symbol for maximum values.

[SOURCE: EN 764-1]

2.5
test pressure
PT
p_t
pressure to which the equipment is subjected for test purposes

[SOURCE: EN 764-1]

3 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations shall be in accordance with Table 1.

Table 1 — Symbols, descriptions and units

Symbol	Description	Unit
PS, p_s a	maximum allowable pressure	MPa b
PT, p_t a	test pressure	MPa b
k c	material strength characteristic	MPa

a p_s or p_t for calculation purposes ; PS or PT for marking purposes

b MPa for calculation purpose, otherwise the unit may be bar (1 MPa = 10 bar)

c subscript 20 or T is used for ambient temperature or maximum allowable temperature, respectively

4 General

4.1 Purpose of proof testing by pressure test

Proof testing by pressure test shall be a test for the pressure containment aspect, which verifies the adequacy of manufacture. In addition, it can demonstrate tightness of the equipment.

NOTE 1 The proof testing by pressure test is not primarily intended to prove the design or to change material behaviour or dimensioning of the equipment.

NOTE 2 Leak tightness, in the frame of this document, only considers testing under positive hydraulic or pneumatic pressure and aims at ensuring a visually leak tight assembly without a precise quantification. If necessary, additional tightness test are conducted as per the requirements of the product standard.

4.2 Form of the pressure test

For pressure equipment, the hydrostatic pressure test, as described in 5.1, shall be the standard pressure test. If this is not practical then it may be substituted by:

a) a pneumatic test as described in 5.2;

b) a combined hydrostatic/pneumatic test.

The manufacturer shall document the form of the pressure test in the documentation, which shall be reviewed before manufacturing commencing.

For assemblies, refer to Clause 6.

NOTE Local regulations may apply to the performance of pneumatic testing.

4.3 Pressure test procedure

Any item of pressure equipment shall be subjected to a pressure test; however items of category I may be tested on a statistical basis.

The test sequence shall consist of the following:

— filling the equipment and pressurising it gradually;

— maintaining the required test pressure for a sufficient length of time;

— reducing the pressure for inspection where necessary;

— visually inspecting it to check if there has been any deterioration, deformation and/or leak resulting from the pressure test;

— deciding if any possible deterioration, deformation and/or leak is acceptable;

— then, fully draining and cleaning the equipment.

Items that have a value of p_t less than that determined in accordance with the requirements of Clause 5, and that are not part of the pressure-bearing housing of the equipment, shall be removed or isolated during the pressure test.

For assemblies, refer to Clause 6.

5 Pressure equipment

5.1 Hydrostatic test

5.1.1 Basic rule

The test pressure shall be based on p_s and k, with possible specific adjustment as stated in 5.1.2.

NOTE 1 Design takes account of maximum loadings and variation in allowable stresses across the design temperature range. This leads to selection of material grades, thicknesses and permanent joining processes. To test the adequacy of manufacture, the value of k is considered a practical parameter, which is applicable to determining the temperature related effects.

The test pressure shall be determined by the greater of the following values for p_t:

$$p_t = a \cdot p_s \frac{k_{20}}{k_T}$$

or

$$p_t = b \cdot p_s$$

where

a and b are coefficients depending on the type of pressure equipment, defined as follows:

— for vessels, a = 1,25 and b = 1,43;

— for piping, pressure accessories, safety accessories, or items of pressure equipment constituting boilers, a and b are defined in the product standard, generally the same values as for vessels.

NOTE 2 Boilers as such are considered as assemblies, covered under Clause 6.