სსტ ენ 12516-1:2014/2015

საქართველოს სტანდარტი

კონსტრუქციის კორპუსის საანგარიშო სიმტკიცე-ნაწილი 1: ტაბულირების მეთოდი ფოლადის სარქველიანი კორპუსისთვის

საქართველოს სტანდარტებისა და მეტროლოგიის
ეროვნული სააგენტო
თბილისი

სსტ ენ 12516-1:2014/2015

საინფორმაციო მონაცემები

1 **დამტკიცებულია და შემოღებულია სამოქმედოდ** საქართველოს სტანდარტებისა და მეტროლოგიის ეროვნული სააგენტოს 2015 წლის 30 ოქტომბრის № 71 და 2015 წლის 09 ივლისის № 46 განკარგულებებით

2 **მიღებულია გარეკანის თარგმნის მეთოდით** სტანდარტიზაციის ევროპული კომიტეტის სტანდარტი ენ 12516-1:2014 „კონსტრუქციის კორპუსის საანგარიშო სიმტკიცე-ნაწილი 1: ტაბულირების მეთოდი ფოლადის სარქველიანი კორპუსისთვის“

3 **პირველად**

4 **რეგისტრირებულია** საქართველოს სტანდარტებისა და მეტროლოგიის ეროვნული სააგენტოს რეესტრში: 2015 წლის 30 ოქტომბერი №268-1.3-8095

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12516-1

October 2014

ICS 23.060.01

Supersedes EN 12516-1:2005

English Version

Industrial valves - Shell design strength - Part 1: Tabulation method for steel valve shells

Robinetterie industrielle - Résistance mécanique des enveloppes - Partie 1: Méthode tabulaire relative aux enveloppes d'appareils de robinetterie en acier

Industriearmaturen - Gehäusefestigkeit - Teil 1: Tabellenverfahren für drucktragende Gehäuse von Armaturen aus Stahl

This European Standard was approved by CEN on 9 August 2014.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 12516-1:2014 E

Contents

Page

Foreword

This document (EN 12516-1:2014) has been prepared by Technical Committee CEN/TC 69 “Industrial valves”, the secretariat of which is held by AFNOR.

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 April 2015 and conflicting national standards shall be withdrawn at the latest by April 2015.

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 12516-1:2005.

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 97/23/EC (Pressure Equipment Directive).

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

EN 12516 consists of four parts:

— EN 12516-1, *Industrial valves — Shell design strength — Part 1: Tabulation method for steel valve shells* (the present document);

— EN 12516-2, *Industrial valves — Shell design strength — Part 2: Calculation method for steel valve shells*;

— EN 12516-3, *Valves — Shell design strength — Part 3: Experimental method*;

— EN 12516-4, *Industrial valves — Shell design strength — Part 4: Calculation method for valve shells manufactured from metallic material other than steel*.

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

a) addition of new PN values PN 160, PN 250, PN 320, PN 400;

b) B designation rating have been replaced by the PN designation;

c) B20 rating values have been replaced by Class 150 and use of the calculation method given in ASME B16.34;

d) new PN values have been added to Table 7 for the valve body minimum wall thickness values;

e) material tables have been updated to be in line with EN 1092-1 for the EN materials;

f) materials 1.0345 and 1.4458 have been deleted;

g) Annex B material groups has been updated and made normative;

h) special Class in EN material have been moved to an informative Annex C;

i) EN materials properties for pressure temperature calculation have been modified (R_m/3,5) to be consistent with the new ASME rules, and using $R_{p1\,\%}$ for stainless steel consistent with EN 12516-2;

j) ASTM material properties used for rating calculation have been updated to the new ASME B16.34 rules;

k) in the pressure-temperature calculation formula the stress factor S has been changed to 120,7 MPa in order to get a Ps of 775,7 bar which is the ceiling pressure when calculating the Special Class 4 500;

l) pressure/temperature ratings have been recalculated. For PN values they are now limited to the PN number; this has been done by increasing the Pc value in the pressure rating calculation method consequently the wall thickness for the PN designation has been increased;

m) Annexes D, E, F, G for NDE have been updated to the new EN standards and made informative;

n) Annex H limited Class has been made informative;

o) ASTM/ASME materials have been moved to an informative Annex I;

p) an informative Annex J on the relationship between DN, NPS, pipe inside diameter and outside diameter has been added;

q) Annex ZA has been updated.

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

EN 12516, *Industrial valves — Shell design strength*, is in four parts. EN 12516-1 and EN 12516-2 specify methods for determining the thickness of steel valve shells by tabulation or calculation methods respectively. EN 12516-3 establishes an experimental method for assessing the strength of valve shells in steel, cast iron and copper alloy as a type test by applying an elevated hydrostatic pressure at ambient temperature. EN 12516-4 specifies method for calculating the thickness for valve shells in metallic material other than steel.

The tabulation method, EN 12516-1, is similar in approach to ASME B16.34 in that the designer can look up the required minimum wall thickness dimension of the valve body from a table. The internal diameter of the inlet bore of the valve, gives the reference dimension from which the tabulated wall thickness of the body are calculated. It applies only to valve bodies, bonnets and covers with essentially circular cross-section. For valve shells with oval or rectangular shapes and for additional loads, EN 12516-2 should be used (see 8.6).

The calculation method, EN 12516-2 is similar in approach to the former DIN 3840 where the designer is required to calculate the wall thickness for each point on the pressure temperature curve using the allowable stress at that temperature for the material he has chosen. The allowable stress is calculated from the material properties using the safety factors that are defined in EN 12516-2. The formulae in EN 12516-2 consider the valve as a pressure vessel and ensure that there will be no excessive deformation or plastic instability.

EN 12516-1 specifies Standard and Special pressure/temperature ratings for valve shells with bodies having the tabulated thickness.

The tabulation method gives one thickness for the body for each PN (see 3.1) or Class designation depending only on the inside diameter, D_i, of the body at the point where the thickness is to be determined.

The thicknesses are calculated using the thin cylinder formula that is also used in EN 12516-2. The allowable stress used in the formula is equal to 120,7 MPa and the calculation pressure Pc varies according PN and Class designation.

For the Class designations, the rules for determining the pressure/temperature ratings are the same for both valve shells and flanges.

For PN designations rules for determining the pressure /temperature ratings are different for flanges and for valves, but this revision of the standard has adjusted the rules to get at room temperature the same pressure. The change of pressure in temperature needs to be taken into account by the piping/assembler.

The main reasons for the differences are due to the treatment of ceiling values. In PN flanges, a constant ceiling stress of 140 MPa at room temperature is applied. In PN and Class designations, the EN 12516-1 ceiling criteria apply, which are temperature dependent.

The reason for the down rating of Standard rating values relative to Special rating is that the Standard rating body is not subject to the specified non-destructive examination procedures and acceptance levels.

The thicknesses for all designations are approximately proportional to the Class 4 500 thickness in the ratio of the pressures.

This standard tabulates the commonly used ratings. It is possible to design shells to suit particular applications or markets using intermediate ratings. This data can be obtained using linear interpolation of the tabulated data in EN 12516-1.

A merit of the tabulation method, which has a fixed set of shell dimensions irrespective of the material of the shell, is that it is possible to have common patterns and forging dies. The allowable pressure/temperature rating for each material group varies proportional to the selected stresses of the material group to which the material belong.

A merit of the calculation method is that it allows the most efficient design for a specific application using the allowable stresses for the actual material selected for the application.

The two methods are based on different assumptions, and as a consequence the detail analysis is different. Both methods offer a safe and proven method of designing pressure-bearing components of valve shells.