Cryogenic vessels - Pressure-relief accessories for cryogenic service - Part 3: Sizing and capacity determination (ISO 21013-3:2016)



EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 21013-3:2016 sisaldab Euroopa standardi EN ISO 21013-3:2016 ingliskeelset teksti.	
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 08.06.2016.	Date of Availability of the European standard is 08.06.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile <u>standardiosakond@evs.ee</u>.

ICS 23.020.40

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega: Aru 10, 10317 Tallinn, Eesti; koduleht <u>www.evs.ee</u>; telefon 605 5050; e-post <u>info@evs.ee</u>

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Aru 10, 10317 Tallinn, Estonia; homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD NORME EUROPÉENNE

EN ISO 21013-3

EUROPÄISCHE NORM

June 2016

ICS 23.020.40

Supersedes EN 13648-3:2002

English Version

Cryogenic vessels - Pressure-relief accessories for cryogenic service - Part 3: Sizing and capacity determination (ISO 21013-3:2016)

Récipients cryogéniques - Dispositifs de sécurité pour le service cryogénique - Partie 3: Détermination de la taille et du volume (ISO 21013-3:2016)

Kryo-Behälter - Druckentlastungseinrichtungen für den Kryo-Betrieb - Teil 3: Bestimmung von Größe und Durchfluss (ISO 21013-3:2016)

This European Standard was approved by CEN on 15 April 2016.

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

European foreword

This document (EN ISO 21013-3:2016) has been prepared by Technical Committee ISO/TC 220 "Cryogenic vessels" in collaboration with Technical Committee CEN/TC 268 "Cryogenic vessels and specific hydrogen technologies applications" 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 December 2016, and conflicting national standards shall be withdrawn at the latest by December 2016.

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 13648-3:2002.

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.

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

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.

Endorsement notice

The text of ISO 21013-3:2016 has been approved by CEN as EN ISO 21013-3:2016 without any modification.

Annex ZA

(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive (2014/68/UE — Pressure Equipment Directive)

This European Standard has been prepared under a mandate given to CEN by the European Commission to provide a means of conforming to Essential Requirements of the New Approach Directive (2014/68/UE – Pressure Equipment Directive)

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive (2014/68/UE – Pressure Equipment Directive)

Clause(s)/subclause(s) of this EN	Essential Requirements (ERs) of Directive	Qualifying remarks/Notes
4, 5	Protection against exceeding the allowable limits of pressure equipment	Annex I, 2.10
6, 7	Safety accessories	Annex I, 2.11
4.3	External fire	Annex I, 2.12

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Co	ntent]	Page
Fore	eword		v
1	Scop		1
2	Norn	ative references	1
3		ols	
			4
4	Calci	lation of the total quantity of heat transferred per unit time from the hot wall	_
	(out) 4.1	r jacket) to the cold wall (inner vessel)	
	4.1	Under conditions other than fire	
	7.2	4.2.1 Vacuum-insulated vessels under normal vacuum	_
		4.2.2 Pressure build-up device	
		4.2.3 Vacuum-insulated vessels in the case of loss of vacuum and non-vacuum	
		insulated vessels	7
		4.2.4 Supports and piping	
	4.3	Under fire conditions	
		4.3.1 Insulation system remains fully or partially in place during fire conditions	
		4.3.2 Insulation system does not remain in place during fire conditions	
	4.4	Air or Nitrogen condensation	
		4.4.1 General	
		4.4.2 Loss of vacuum with air and nitrogen4.4.3 Fire with loss of vacuum with air or nitrogen	
	4.5	Heat transfer per unit time (watts)	12
	4.5	4.5.1 General	
		4.5.2 Normal operation	
		4.5.3 Pressure build up regulator fully open	
		4.5.4 Loss of vacuum condition	12
		4.5.5 Fire condition with loss of vacuum, vacuum jacket, and insulation fully or	
		partially in place	13
		4.5.6 Fire condition with loss of vacuum, insulation not in place	
		4.5.7 Total heat transfer rate	13
5	Calcı	lation of the mass flow to be relieved by pressure relief devices	13
	5.1	Relieving pressure, <i>P</i> , less than the critical pressure	13
	5.2	Relieving pressure, <i>P</i> , equal to or greater than the critical pressure	
	5.3	Example	
6	Pipir	g for pressure relief devices	15
	6.1	Pressure drop	15
		6.1.1 General	
		6.1.2 Relief valves	15
		6.1.3 Bursting discs	
	6.2	Back pressure consideration	
	6.3	Heat transfer	16
7	Sizin	g of pressure relief devices	17
	7.1	General	
	7.2	Sizing of pressure relief valves	17
		7.2.1 Discharge capacity	
		7.2.2 Determination of critical vs. subcritical flow for gases	18
		7.2.3 Critical flow	
		7.2.4 Subcritical flow	
		7.2.5 Recommended analysis method	
	F 0	7.2.6 Example	
	7.3	Sizing of bursting discs	
		7.3.1 Discharge capacity	Z b

EVS-EN ISO 21013-3:2016

7.3.4 Subcritical flow 7.3.5 Recommended analysis method 7.3.6 Example Annex A (informative) Cryostats Bibliography	28 31
Annex A (informative) Cryostats Sibliography	34
ibliography	
	33
	5

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 220, *Cryogenic vessels*.

This second edition cancels and replaces the first edition (ISO 21013-3:2006), which has been technically revised.

ISO 21013 consists of the following parts, under the general title Cryogenic vessels — Pressure-relief ervice accessories for cryogenic service:

- Part 1: Reclosable pressure-relief valves
- Part 2: Non-reclosable pressure-relief devices
- Part 3: Sizing and capacity determination
- Part 4: Pressure-relief accessories for cryogenic service