

**Külmasüsteemid ja soojuspumbad.
Rõhuvabastusseadmed ja nendega seotud torustik.
Arvutamise meetodid**

**Refrigerating systems and heat pumps - Pressure relief
devices and their associated piping - Methods for
calculation**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 13136:2013 sisaldab Euroopa standardi EN 13136:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 13136:2013 consists of the English text of the European standard EN 13136:2013.
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 09.10.2013.	Date of Availability of the European standard is 09.10.2013.
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 standardiosakond@evs.ee.

ICS 27.080, 27.200

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; www.evs.ee; telefon 605 5050; e-post info@evs.ee

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; www.evs.ee; phone 605 5050; e-mail info@evs.ee

English Version

Refrigerating systems and heat pumps - Pressure relief devices and their associated piping - Methods for calculation

Systèmes frigorifiques et pompes à chaleur - Dispositifs de
limitation de pression et tuyauteries associées - Méthodes
de calcul

Kälteanlagen und Wärmepumpen -
Druckentlastungseinrichtungen und zugehörige Leitungen -
Berechnungsverfahren

This European Standard was approved by CEN on 24 August 2013.

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

Contents

Page

Foreword.....	3
Introduction	4
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions	5
4 Symbols.....	6
5 General	8
6 Pressure relief devices for protection of system components	8
6.1 General	8
6.2 Excessive pressure caused by heat sources	9
6.2.1 External heat sources	9
6.2.2 Internal heat sources	10
6.3 Excessive pressure caused by compressors	11
6.4 Excessive pressure caused by liquid expansion	11
7 Discharge capacities of pressure relief devices.....	12
7.1 General	12
7.2 Determination of pressure relief valve performance	12
7.2.1 Determination of coefficient of discharge.....	12
7.2.2 Critical and sub-critical flow	12
7.2.3 Function of the isentropic exponent (C)	12
7.2.4 Correction factor for sub-critical flow	13
7.2.5 Discharge capacity of pressure relief valves.....	13
7.3 Calculation of capacity and flow area of bursting discs or fusible plugs	14
7.4 Pressure loss in upstream/downstream lines.....	14
7.4.1 General	14
7.4.2 Pressure loss in components.....	14
7.4.3 Pressure loss in the upstream line.....	15
7.4.4 Pressure loss in the downstream line.....	15
Annex A (normative) Values of functions, factors and properties of refrigerants	17
Annex B (informative) Calculation of flow areas for non-evaporating and evaporating liquids.....	24
B.1 Calculation of the flow area for non-evaporating liquids	24
B.2 Calculation of the flow area for evaporating liquids.....	24
Annex C (informative) Example of calculation for sizing pressure relief devices with the corresponding pipes.....	26
C.1 Assumptions for the calculation example.....	27
C.2 Calculation of the required minimum discharge capacity, Q_{md} at standard heat flow rate	27
C.3 Calculation of the required minimum discharge capacity Q_{md} at reduced heat flow rate.....	28
C.4 Calculation of flow area A_c , selection of pressure relief valve.....	28
C.5 Pressure loss in upstream line (from vessel to pressure relief valve).....	29
C.6 Pressure loss in downstream line (from pressure relief valve to atmosphere).....	30
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	32
Bibliography.....	33

Foreword

This document (EN 13136:2013) 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 April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

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 13136:2001.

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 EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Compared to EN 13136:2001, EN 13136:2013 takes into account the application of CO₂ and the amendment A1, published in 2005.

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, 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 European Standard is based on applicable parts of EN ISO 4126-1:2013, EN ISO 4126-2:2003 and EN 12284.

It is suited to the specific requirements, and includes the data, of refrigerating systems. It provides means of satisfying the pressure relief devices requirements of EN 378-2:2008+A2:2012.

1 Scope

1.1 This European Standard describes the calculation of mass flow for sizing pressure relief devices for components of refrigerating systems.

NOTE The term "refrigerating system" used in this European Standard includes heat pumps.

1.2 This European Standard describes the calculation of discharge capacities for pressure relief valves and other pressure relief devices in refrigerating systems including the necessary data for sizing these when relieving to atmosphere or to components within the system at lower pressure.

1.3 This European Standard specifies the requirements for selection of pressure relief devices to prevent excessive pressure due to internal and external heat sources, the sources of increasing pressure (e.g. compressor, heaters, etc.) and thermal expansion of trapped liquid.

1.4 This European Standard describes the calculation of the pressure loss in the upstream and downstream line of pressure relief valves and other pressure relief devices and includes the necessary data.

1.5 This European Standard refers to other relevant standards in Clause 5.

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 378-1:2008+A2:2012, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2:2008+A2:2012, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 764-1:2004, *Pressure equipment — Part 1: Terminology — Pressure, temperature, volume, nominal size*

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

EN 12284:2003, *Refrigerating systems and heat pumps — Valves — Requirements, testing and marking*

EN ISO 4126-1:2013, *Safety devices for protection against excessive pressure — Part 1: Safety valves (ISO 4126-1:2013)*

EN ISO 4126-2:2003, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices (ISO 4126-2:2003)*

ISO 817, *Refrigerants — Designation system*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 378-1:2008+A2:2012, EN 12284:2003, EN ISO 4126-1:2013, EN ISO 4126-2:2003 and EN 764-1:2004 apply.