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Helium cryostats - Protection against excessive pressure

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English Version

Helium cryostats - Protection against excessive pressure

Cryostats pour hélium - Protection contre les surpressions

Helium Kryostate - Schutz gegen Drucküberschreitung

This European Standard was approved by CEN on 15 November 2021.

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European foreword

This document (EN 17527:2021) has been prepared by 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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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Introduction

Helium cryostats, other than cryogenic vessels used for storage of cryogenic liquids covered by EN ISO 21009-2 and EN 13458, include additional specific components such as superconducting magnets and cavities, electrical heaters, heat exchangers, bellows, circulation pumps and internal control valves. These components imply additional risks for sudden excessive pressure rise, which strongly influences the design of pressure relief systems and is not covered by existing standards. Helium cryostats are characterized by a variety of complex and individual design solutions, often exploiting small design margins for cutting-edge performance. Therefore, a common and specific technical solution for the protection against excessive pressure rise cannot be standardized. Rather, the approach on how to obtain the state-of-the-art protection can be standardized and therefore is covered by this document, specifying the procedure and minimum requirements for the various aspects in the main part of the document. Additional information, example solutions and exemplary measures are provided in the extensive Annex, which mirrors the structure of the main part.

This document covers the typical sources that can lead to excessive pressure rise in helium cryostats and the conditions, which are relevant for the protection against excessive pressure rise during system failures, in order to harmonize risk assessments and design best practices. The document uses common SI-based units.

The user of this document can refer to CEN/CENELEC Internal Regulations Part 3, which deals with the use of verbal forms for the formulation of provisions.

1 Scope

This document specifies the minimum requirements for the protection of helium cryostats against excessive pressure rise, including the specific risks associated with cryostats for superconducting magnets and cryostats for superconducting radio-frequency cavities, coldboxes of helium refrigerators and liquefiers as well as helium distribution systems including valve boxes. It includes information on risk assessment, protection concepts, dimensioning of pressure relief devices, types of pressure relief devices, substance release and operation of helium cryostats.

In order to fulfil the aim of this document, the characteristics of pressure relief devices are taken into account.

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 13445-2, *Unfired pressure vessels - Part 2: Materials*

EN 13445-3, *Unfired pressure vessels - Part 3: Design*

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

EN ISO 4126-3:2020, *Safety devices for protection against excessive pressure - Part 3: Safety valves and bursting disc safety devices in combination (ISO 4126-3:2020)*

EN ISO 4126-6:2014, *Safety devices for protection against excessive pressure - Part 6: Application, selection and installation of bursting disc safety devices (ISO 4126-6:2014)*

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