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**Kriogene posode - Varnostna oprema proti prekoračitvi tlaka - 2. del: Varnostne membrane za kriogeno področje**

Cryogenic vessels - Safety devices for protection against excessive pressure - Part 2: Bursting disc safety devices for cryogenic service

Kryo-Behälter - Sicherheitseinrichtungen gegen Drucküberschreitung - Teil 2: Berstscheibeneinrichtungen

Réceptifs cryogéniques - Dispositifs de protection contre les supressions - Partie 2: Dispositif de sécurité a disque de rupture pour service cryogénique

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 13648-2**

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English version

**Cryogenic vessels - Safety devices for protection against  
excessive pressure - Part 2: Bursting disc safety devices for  
cryogenic service**

Réceptifs cryogéniques - Dispositifs de protection contre  
les suppressions - Partie 2: Dispositif de sécurité à disque  
de rupture pour service cryogénique

Kryo-Behälter - Sicherheitseinrichtungen gegen  
Drucküberschreitung - Teil 2: Berstscheibeneinrichtungen

This European Standard was approved by CEN on 5 April 2002.

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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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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## Foreword

This document (EN 13648-2:2002) has been prepared by Technical Committee CEN/TC 268 "Cryogenic vessels", 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of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.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(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This document also supports the objectives of the framework Directives on Transport of Dangerous Goods. This standard has been submitted for reference into the RID and/or the technical annexes of the ADR.

This European Standard is composed of the following Parts :

EN 13648-1, *Cryogenic vessels – Safety devices for protection against excessive pressure – Part 1 : Safety valves for cryogenic service* ;

EN 13648-2, *Cryogenic vessels – Safety devices for protection against excessive pressure – Part 2 : Bursting discs safety devices for cryogenic service* ;

prEN 13648-3, *Cryogenic vessels – Safety devices for protection against excessive pressure – Part 3 : Determination of required discharge Capacity and sizing*.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

**EN 13648-2:2002 (E)****1 Scope**

This European Standard specifies the requirements for the design, manufacture and testing of bursting disc safety devices for cryogenic service, i.e. for operation with cryogenic fluids below  $-10\text{ °C}$  in addition to operation at ambient temperature. It is a requirement of this standard that the bursting disc safety device(s) comply with prEN ISO 4126-2. In the event of different requirements, this standard takes precedence over that standard.

This standard is restricted to bursting disc safety devices not exceeding a size of DN 100 designed to relieve single phase vapours or gases. A bursting disc assembly can be specified, constructed and tested such that it is suitable for use with more than one gas or with mixtures of gases.

NOTE This standard does not provide methods for determining the capacity of bursting disc safety devices for a particular cryogenic vessel. Such methods are provided in prEN 13648-3.

**2 Normative references**

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1251-1:2000, *Cryogenic vessels – Transportable vacuum insulated vessels of not more than 1 000 litres volume – Part 1: Fundamental requirements.*

EN 1252-1:1998, *Cryogenic vessels – Materials – Part 1: Toughness requirements for temperatures below  $-80\text{ °C}$ .*

EN 1797-1, *Cryogenic vessels - Gas/material compatibility - Part 1: Oxygen compatibility.*

EN 12300:1998, *Cryogenic vessels – Cleanliness for cryogenic service.*

EN ISO 6708:1995, *Pipework components – Definition and selection of DN (nominal size) (ISO 6708:1995).*

prEN 1252-2, *Cryogenic vessels – Materials – Part 2: Toughness requirements for temperatures between  $-80\text{ °C}$  and  $-20\text{ °C}$ .*

EN 13458-1, *Cryogenic vessels – Static vacuum insulated vessels – Part 1: Fundamental requirements.*

EN 13530-1, *Cryogenic vessels – Large transportable vacuum insulated vessels – Part 1: Fundamental requirements.*

prEN 13648-3, *Cryogenic Vessels – Safety devices for protection against excessive pressure – Part 3: Determination of required discharge - Capacity and sizing.*

prEN ISO 4126-2, *Safety devices for protection against excessive pressure - Part 2: Bursting disc safety devices (ISO/FDIS 4126-2:2002).*

### 3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply in addition to those given in prEN ISO 4126-2.

#### 3.1

##### **DN (nominal size)**

alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections

[EN ISO 6708:1995]

#### 3.2

##### **pressure**

pressure for which the value is equal to the algebraic difference between the absolute pressure and the atmospheric pressure

#### 3.3

##### **specified minimum temperature**

lowest temperature for which the bursting disc safety device is specified

#### 3.4

##### **specified maximum temperature**

highest temperature for which the bursting disc safety device is specified

#### 3.5

##### **coincident temperature**

temperature of the bursting disc associated with a bursting pressure and which is the expected temperature of the bursting disc at the pressure in the emergency situation

#### 3.6

##### **cryogenic fluids**

fluid defined as cryogenic fluid in EN 1251-1:2000 or prEN 13458-1 or prEN 13530-1

NOTE This includes totally evaporated liquids and supercritical fluids.

#### 3.7

##### **bursting disc safety device with a non-replaceable bursting disc assembly**

bursting disc safety device whose bursting disc assembly is permanently joined to the bursting disc holder by the manufacturer

## 4 Requirements

### 4.1 General

The bursting disc safety device shall satisfy all the requirements of prEN ISO 4126-2 except in event of different requirements, where this standard takes precedence.

### 4.2 Design

#### 4.2.1 Design temperature

The specified minimum temperature shall be equal to the equilibrium temperature at atmospheric pressure of the coldest fluid to be relieved. The specified maximum temperature shall be + 65 °C unless a higher temperature is specified in the purchase order.

#### 4.2.2 Coincident temperature

The coincident temperature shall be 20 °C unless otherwise specified by the purchase order.

**EN 13648-2:2002 (E)****4.2.3 Sublimating cryogenics**

Where the bursting disc safety device is specified as suitable for service with products that, when vented to atmosphere from a pressure anywhere between the device's specified maximum and minimum bursting pressures and at a temperature anywhere between the device's specified maximum and minimum temperatures, condense from gas or vapour directly to solid, e.g. CO<sub>2</sub>, the design shall be such as to avoid reduction of the discharge area below that required due to accumulation of solid product.

**4.3 Materials**

NOTE This clause indicates important material properties for safe use of safety valves (absence of brittleness, gas compatibility, etc.). It does not address all the PED essential requirements relevant to materials (e.g. no recommended materials are listed).

**4.3.1 General**

Materials shall be compatible with the process fluid.

**4.3.2 Metallic materials**

Metallic materials shall be in conformance with EN 1252-1:1998 or prEN 1252-2 as appropriate to the specified minimum temperature. The strength of the materials shall be adequate for their duty at the maximum specified temperature.

**4.3.3 Corrosion resistance**

In addition to normal atmospheric corrosive agents associated with industrial atmospheres the environment surrounding cryogenic vessels is characteristically one of persistent low ambient temperatures together with high humidity. Thus particular care must be taken to ensure that the selected materials of the bursting disc, together with any coating, and of the bursting disc safety device are appropriate such that premature failure or any other malfunction cannot occur. Aluminium discs shall be coated with a corrosion resistant polymer on the atmospheric side only.

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Some copper alloys are susceptible to stress corrosion cracking, consequently careful consideration shall be given before selection of these materials for components under stress.

**4.3.4 Oxygen compatibility**

If the specified minimum temperature is equal to or below the boiling point of air or the bursting disc assembly is intended for service with oxygen or oxidising products, the materials shall be oxygen compatible in accordance with EN 1797-1.

**4.3.5 Acetylene compatibility**

Metallic materials shall contain less than 70 % copper if specified for use with mixtures containing acetylene.

**4.3.6 Non-metallic materials**

Non-metallic materials are, so far, well established for use for non-integral bursting discs and for seals and gaskets. If such materials are to be used for structural parts, such as the holder, they shall have properties appropriate to the application and at least meet the requirements of 4.3.2.

Non-metallic materials shall also :

- have mechanical properties that will allow the bursting disc safety device to pass the tests defined in clause 5 ;
- meet the requirements of 4.3.4.



## 5 Production testing

### 5.1 Pressure and burst tests

They shall be performed in accordance with the requirements of prEN ISO 4126-2. Bursting discs with a corrosion resisting coating shall have the effectiveness of that coating demonstrated prior to pressure testing. The pressure test medium shall be clean water for hydraulic tests or oil free air or an inert gas such as nitrogen for pneumatic tests.

### 5.2 Additional tests for bursting disc safety devices with non-replaceable bursting disc assemblies

#### 5.2.1 Leak tests

Each bursting disc safety device with a non-replaceable bursting disc assembly shall be subjected to an appropriate leak test that will demonstrate the integrity of the joint between the bursting disc and its holder. Typical tests might include, but are not restricted to, a mass spectrometer sensing helium calibrated for a leak of  $10^{-9}$  mbar l/s, with vacuum on the vent side or a pneumatic leak test under water with a pressure of 70 % of the burst pressure on the inlet. There shall be no detectable leakage. The requirements of prEN ISO 4126-2 shall be satisfied.

#### 5.2.2 Visual examination

Each bursting disc safety device with a non-replaceable bursting disc assembly shall be subjected to an appropriate test which will demonstrate that only a single bursting disc / bursting disc assembly is built into each device. The requirements of prEN ISO 4126-2 shall be satisfied.

## 6 Cleanliness

All parts shall be clean such that they satisfy the requirements of EN 12300:1998.

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## 7 Marking

Marking shall be in accordance with the requirements of prEN ISO 4126-2 with the following modifications :

- each bursting disc assembly shall be marked with the specified minimum temperature ;
- the number of the European Standard that shall be shown shall be that of this standard.

## 8 Prevention of substitution

Where bursting discs and their holders are specified with pin-coding or an equivalent system to prevent a replacement bursting disc with an incorrect specified bursting pressure being fitted, the disc manufacturer shall maintain records of the coding appropriate to the specified bursting pressure of each type of disc. The continued availability of such records shall be guaranteed by the manufacturer by effective back-up procedures. The manufacturer shall operate a Quality System that guarantees that the appropriate coding is applied to his products.