



SLOVENSKI STANDARD

SIST EN 1252-1:1999

01-januar-1999

Kriogene posode - Materiali - 1. del: Zahteve za žilavost za temperature pod -80 °C

Cryogenic vessels - Materials - Part 1: Toughness requirements for temperatures below -80°C

Kryo-Behälter - Werkstoffe - Teil 1: Anforderungen an die Zähigkeit bei Temperaturen unter -80°C

Réipients cryogéniques - Matériaux - Partie 1: Exigences de tenacité pour les températures inférieures à -80°C

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ICS:

23.020.40 Proti mrazu odporne posode Cryogenic vessels
(kriogenske posode)

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1252-1

March 1998

ICS 27.200

Descriptors: pressure vessels, cryogenics, operating requirements, materials, metals, mechanical properties, mechanical strength, flexural strength, impact tests, strength, acceptability

English version

Cryogenic vessels - Materials - Part 1: Toughness requirements
for temperatures below - 80 °C

Réipients cryogéniques - Matériaux - Partie 1: Exigences
de ténacité pour les températures inférieures à - 80 °C

Kryo-Behälter - Werkstoffe - Teil 1: Anforderungen an die
Zähigkeit bei Temperaturen unter - 80 °C

This European Standard was approved by CEN on 15 February 1998.

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 Central Secretariat 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 Central Secretariat 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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard 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 September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

This European Standard 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 standard.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard is composed of the following parts :

EN 1252-1	Cryogenic vessels - Materials - Part 1: Toughness requirements for temperatures below - 80 °C
prEN 1252-2 ¹⁾	Cryogenic vessels - Materials - Part 2 : Mechanical characteristics for temperatures between - 80°C to - 10°C

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¹⁾ This European Standard is in preparation

Introduction

The use of materials at low temperatures entails special problems which have to be addressed. Consideration has to be given, in particular, to changes in mechanical characteristics, expansion and contraction phenomena and the thermal conduction of the various materials. Austenitic stainless steel may transform from austenitic to martensitic phase when cooled down ; this will lead to dimensional change that need to be considered during design. However, the most important property to be considered is the material toughness at low temperature.

1 Scope

This European standard specifies the toughness requirements of metallic materials for use at a temperature below - 80 °C to ensure their suitability for cryogenic vessels.

This standard is not applicable to unalloyed steels and cast materials.

This standard is not applicable to cryogenic vessels for liquefied natural gas (LNG).

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.

EN 485-3	1993	Aluminium and aluminium alloys - Sheet, strip and plate - Part 3 : Tolerances on shape and dimensions of hot-rolled products
EN 1652		Copper and copper alloys - Plate, sheet, strip and circles for general purposes
EN 1653		Copper and copper alloys - Plate, sheet and circles for boilers, pressure vessels and hot water storage units
prEN 1981		Copper and copper alloys - Master alloys
EN 10028-1	1992	Flat products made of steels for pressure purposes - Part 1 : General requirements
EN 10028-4	1994	Flat products made of steels for pressure purposes - Part 4 : Nickel alloy steels with specified low temperature properties
prEN 10028-7		Flat products made of steels for pressure purposes - Part 7 : Stainless steels
EN 10045-1		Metallic materials - Charpy impact test - Part 1 : Test method
EN 12163		Copper and copper alloys - Rod for general purposes

3 Definition

For the purposes of this standard, the following definition applies :

minimum working temperature : The lowest temperature likely to be reached by the vessel or by one of the vessel components during operation.

4 Toughness requirements

4.1 General

The toughness of the materials used shall be either guaranteed by the material producer or verified by conducting an impact test on the material in accordance with the following requirements.

Additionally for welded vessels, impact tests shall be performed as part of welding procedure qualification and production weld tests as specified in the product standard.

4.2 Steels

The materials used for the manufacture of the vessels, the welds and the heat affected zone shall meet the minimum impact energy values given in table 1 at minimum working temperature.

Table 1 : Impact energy requirements for steels

Material	Impact energy of parent metal, welds and heat affected zone at minimum working temperature	
	J/cm ²	or J
ferritic alloy steel Ni < 5 %	34	27
ferritic alloy steel 5 % ≤ Ni ≤ 9 %	34	27
austenitic stainless steels Cr-Ni	34	27
NOTE 1 : The values relate to V-notch impact test pieces as specified in EN 10045-1:1990. NOTE 2 : In the case of austenitic stainless steels (see EN 10028-7) : - only the weld shall be subjected to the impact test ; - for working temperatures below - 196 °C, it is sufficient to perform the impact test at - 196 °C. NOTE 3 : Nickel steels shall meet the requirements of EN 10028-4:1994.		

4.3 Aluminium or aluminium alloys (see EN 485-3:1993)

Toughness of aluminium and aluminium alloys is inherently high enough at low temperatures to render impact tests unnecessary.

4.4 Copper or copper alloys (see EN 1652, EN 1653, prEN 1981, EN 12163)

Toughness of copper and copper alloys is inherently high enough at low temperatures to render impact energy unnecessary.

4.5 Methods of test

4.5.1 General

The impact energy values specified in 4.2 relate to test pieces measuring 10 mm × 10 mm with a V-notch.

For materials of thickness less than 10 mm but equal to or greater than 5 mm, test pieces with a cross-section of 10 × e mm, where "e" is the thickness of the material, shall be used. If standard test pieces cannot be obtained from the material, reduced section test pieces, with a width equal to the product thickness, 7,5 mm or 5 mm, may be used as specified in EN 10045-1. A minimum value of 34 J/cm² as specified in 4.2 shall be met.

Impact test shall not be carried out on plate of thickness less than 5 mm or on their welds.

4.5.2 Test piece locations for plates

The impact test shall be performed on 3 test pieces. Each test piece shall be taken transverse to the rolling direction and the notch, therefore, parallel to the direction of rolling and perpendicular to the plate surface.

4.5.3 Test piece locations for welds and heat affected zones

4.5.3.1 For thicknesses $e \leq 10$ mm

The test pieces shall be taken as follows :

- three test pieces from the centre of the weld
- three test pieces from the heat affected zone created by the weld. The notch shall be completely outside the fused zone but be as close as possible to it.

i.e. six test pieces in total (see figure 1).

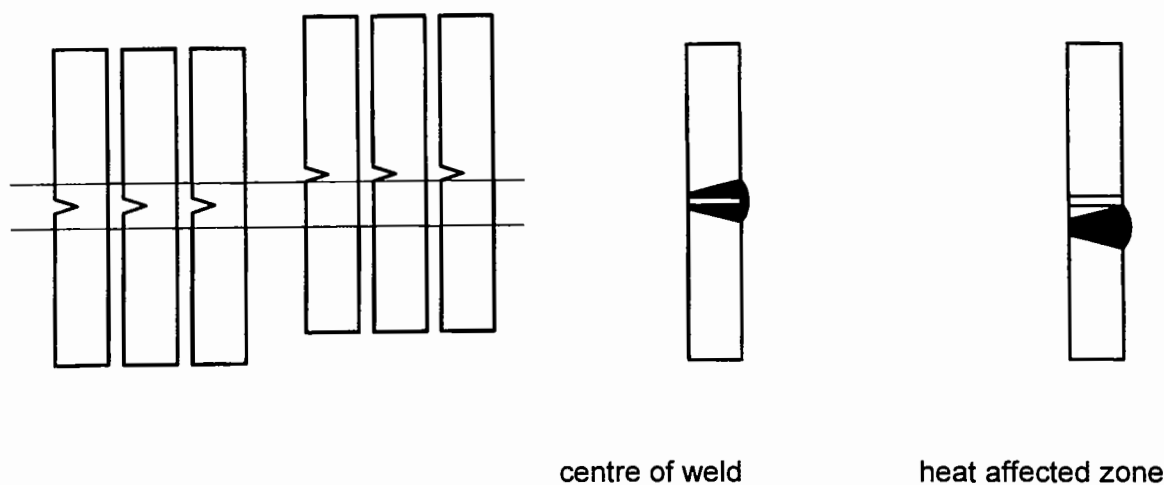


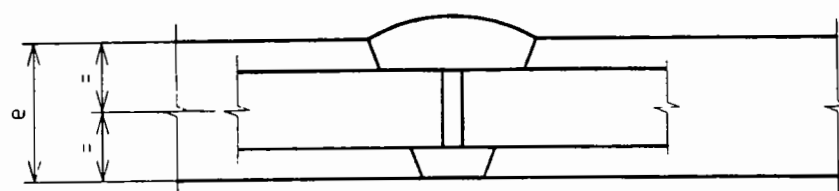
Figure 1 : Test pieces for $e \leq 10$ mm

4.5.3.2 For thicknesses $10 \text{ mm} < e \leq 20 \text{ mm}$:

The test pieces shall be taken as follows :

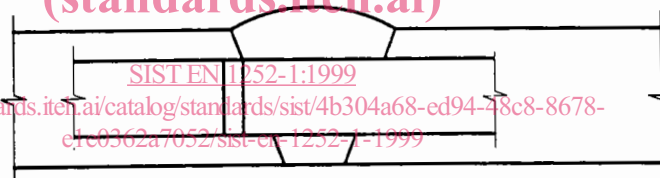
- three test pieces from the centre of the weld ;
- three test pieces from the heat affected zone.

i.e. six test pieces in all (see figure 2).



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heat affected zone

Figure 2 : Test pieces for $10 \text{ mm} < e \leq 20 \text{ mm}$