



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 20088-1:2015**  
**01-december-2015**

---

**[Not translated]**

Determination of the resistance to cryogenic spillage of insulation materials - Part 1:  
Liquid phases (ISO/DIS 20088-1:2015)

Bestimmung der Beständigkeit von Isoliermaterialien bei kryogenem Auslaufen - Teil 1:  
Flüssigkeit

Détermination de la résistance des matériaux d'isolation thermique suite à un  
refroidissement cryogénique - Partie 1: Phase liquide (ISO/DIS 20088-1:2015)

[https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-](https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-0b1f7a6920ca/sist-en-iso-20088-1-2015)

**Ta slovenski standard je istoveten z: prEN ISO 20088-1**

---

**ICS:**

23.020.40      Proti mrazu odporne posode      Cryogenic vessels  
(kriogenske posode)

**oSIST prEN ISO 20088-1:2015**

**en,de**



# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 20088-1

ISO/TC 67

Secretariat: NEN

Voting begins on:

Voting terminates on:

2015-10-22

2016-01-22

## Determination of the resistance to cryogenic spillage of insulation materials —

### Part 1: Liquid phase

*Détermination de la résistance des matériaux d'isolation thermique suite à un refroidissement cryogénique*

ICS: 75.200

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 20088-1:2017

<https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-0b1f0af920ca/sist-en-iso-20088-1-2017>

### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.



Reference number  
ISO/DIS 20088-1:2015(E)

© ISO 2015

# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 20088-1:2017

<https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-0b1f0af920ca/sist-en-iso-20088-1-2017>



## **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

## Contents

<b>Foreword</b> .....	<b>5</b>
<b>Introduction</b> .....	<b>6</b>
<b>1 Scope</b> .....	<b>7</b>
<b>2 Normative references</b> .....	<b>7</b>
<b>3 Terms and definitions</b> .....	<b>7</b>
<b>4 Test configurations</b> .....	<b>8</b>
4.1 General.....	8
4.2 Sample holder .....	8
<b>5 Construction of the test items and substrates</b> .....	<b>8</b>
5.1 General.....	8
5.2 Material .....	9
5.3 Injection set-up .....	9
5.4 Specimen support .....	10
5.5 Sample holder .....	11
5.6 Test method.....	12
<b>6 Cryogenic spillage protection materials</b> .....	<b>13</b>
6.1 General.....	13
6.2 Panel test specimens.....	13
6.3 Wet applied materials .....	13
<b>7 Instrumentation</b> .....	<b>13</b>
7.1 General.....	13
7.2 Thermocouple location.....	13
<b>8 Test apparatus and conditions</b> .....	<b>14</b>
8.1 Injection point and position.....	14
8.1.1 General .....	14
8.1.2 Injection point position .....	14
8.3 Test environment.....	14
<b>9 Test Procedure</b> .....	<b>15</b>
<b>10 Repeatability and reproducibility</b> .....	<b>16</b>
<b>11 Uncertainty of measurement</b> .....	<b>16</b>

## ISO\_DIS\_20088-1:2015

<b>12 Test report .....</b>	<b>16</b>
<b>13 Practical applications of test results .....</b>	<b>17</b>
13.1 General.....	17
13.2 Performance criteria .....	17
13.2.1 General.....	17
13.2.2 Coatings and spray-applied materials.....	17
13.2.3 Systems and assemblies .....	18
13.3 Factors affecting the validity of the test.....	18
13.3.1 General.....	18
13.3.2 Leakage of the release tank.....	18
13.3.3 Failure of thermocouples.....	18
13.3.4 Loss of sample integrity/Loss of containment.....	19
<b>Annex A (normative) Methods of fixing thermocouples.....</b>	<b>20</b>
A.1 General .....	20
A.2 “Quick Tip” attachment .....	20
A.3 Capacitive discharge welding .....	20
A.4 Drilling and peening .....	20
A.5 Adhesive .....	20
A.6 Central web thermocouples (structural steel work test specimen) .....	20
<b>Annex B (normative) Complete set-up .....</b>	<b>22</b>
<b>Annex C (normative) Thermocouple positioning inside the sample holder .....</b>	<b>24</b>
<b>Annex D (informative) Classification .....</b>	<b>26</b>
D.1 General .....	26
D.2 Type of exposure.....	26
D.3 Type of application.....	26
D.4 Critical temperature drop .....	26
D.5 Period of resistance .....	26

## 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. [www.iso.org/directives](http://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. [www.iso.org/patents](http://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](#)

ISO 20088 Part 1 was prepared by Technical Committee ISO/TC 67, Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries, JWG 13 Resistance to cryogenic spillage.

Further parts of the ISO 20088 are planned for future publication:

Part 2 – Vapour phase;

Part 3 – High pressure jet release.

## Introduction

The test described in the procedure described in this part of ISO 20088 is one in which some of the properties of cryogenic spillage protection materials can be determined. This test is designed to give an indication of how cryogenic spillage protection materials will perform in a sudden exposure to cryogenic liquid.

The dimensions of the test specimen can be smaller than typical items of structure and plant and the release of liquid can be substantially less than that which might occur in a credible event. However, individual thermal and mechanical loads imparted to the cryogenic spillage protection materials, from the cryogenic spillage defined in the procedure described in this part of ISO 20088, have been shown to be similar to those by large-scale cryogenic spillage.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[SIST EN ISO 20088-1:2017](https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-0b1f0af920ca/sist-en-iso-20088-1-2017)

<https://standards.iteh.ai/catalog/standards/sist/5bb06680-ed33-499b-9d72-0b1f0af920ca/sist-en-iso-20088-1-2017>



# Determination of the resistance to cryogenic spillage of insulation materials - Part 1: Liquid

**CAUTION** — the attention of all persons concerned with managing and carrying out cryogenic spillage test is drawn to the fact that liquid nitrogen testing can be hazardous and that there is a danger of receiving a 'cold burn' and/or the possibility that harmful gases (risk of anoxia) can be evolved during the test. Mechanical and operational hazards can also arise during the construction of the test elements or structures, their testing and disposal of test residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Appropriate training shall be given to relevant personnel.

## 1 Scope

This part of ISO 20088 describes a method for determining the resistance to liquid cryogenic spillage on Cryogenic Spillage Protection (CSP) systems. It is applicable where CSP systems are installed on carbon steel and will be in contact with cryogenic fluids.

Liquid nitrogen is used as the cryogenic medium since it has a lower boiling point than liquid natural gas or liquid oxygen. Additionally, it can be safely used for experiment.

Future parts of the standard will cover vapour phase and high pressure jet exposure conditions.

The test laboratory is responsible to conduct an appropriate risk assessment according to local regulation in order to consider the impact of liquid and gaseous nitrogen exposure to equipment and personnel.

## 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.

ISO 630-1, *Structural steels – Part 1: General technical delivery conditions for hot-rolled products.*

ISO 845, *Cellular plastics and rubbers -- Determination of apparent density*

ISO 8301, *Determination of steady-state thermal resistance and related properties -- Heat flow meter apparatus.*

ISO 22899-1, *Determination of the resistance to jet fires of passive fire protection materials Part 1: General Requirements.*

EN 10029, *Tolerances on dimensions, shape and mass for hot rolled steel plates 3mm thick or above.*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

## ISO\_DIS\_20088-1:2015

### 3.1

#### **Floating Liquid Natural Gas FLNG**

floating liquid natural gas facilities such as LNG-FPSO (floating production storage and offloading), LNGFSRU (floating storage and re-gasification unit)

### 3.2

#### **Cryogenic spill**

cryogenic spill in relation to this standard is defined to be the unintended exposure to cryogenic liquid (CL) at -196°C

### 3.3

#### **Cryogenic spill protection CSP**

coating or cladding arrangement, or free-standing system which, in the event of a cryogenic spill, will provide thermal protection to restrict the heat transfer rate of the substrate

### 3.4

#### **limiting temperature**

minimum temperature that the equipment, assembly or structure to be protected may be allowed to reach

### 3.5

#### **release point**

assembly from which the cryogenic fluid flows out

### 3.6

#### **sponsor**

person or organization who/which requests a test

### 3.7

#### **specimen owner**

person or company that holds/produces a material to test

## 4 Test configurations

### 4.1 General

There is one basic configuration under which the test can be conducted. This is a liquid configuration where the material to be tested is rapidly exposed to liquid nitrogen in a pool at a temperature of -196°C. For reasons of clarity, flexible hoses used for fume extraction are not shown in figures 1 to 4 below.

### 4.2 Sample holder

Samples will be tested in a sample holder with exact dimension as specified in ISO 22899-1.

## 5 Construction of the test items and substrates

### 5.1 General

The key items required for the test are

- a liquid nitrogen injection point,
- a sample holder;
- the insulation part.

It is important to reduce vapour generation during the liquid nitrogen dumping. Flexible hoses are to be used without forced ventilation.

## 5.2 Material

The material normally used is a 10 mm thick steel plate complying with ISO 630-1, Grade Fe 430. An all welded construction shall be used and all welds shall be 5 mm fillet and continuous unless otherwise stated. All dimensions are in millimetres and, unless otherwise stated, the following tolerances shall be used:

- whole number  $\pm 1,0$  mm;
- decimal to point ,0  $\pm 0,4$  mm;
- decimal to point ,00  $\pm 0,2$  mm;
- angles 0' 30";
- radii 0,4 mm.

## 5.3 Injection set-up

The liquid nitrogen is contained within a tank of a constant surface area of 0,5625m<sup>2</sup> either a square base of 750mm or circular base of 846mm diameter. The release orifice shall be 100 mm in diameter.

When there is 250 l of non-boiling liquid nitrogen within the tank, the test is ready to start. The injection tank shall be constructed of cryogenic resistant stainless steel and insulated with flexible aerogel blanket if necessary.