SLOVENSKI STANDARD
oSIST prEN ISO 20088-2:2019

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Ugotavljanje obstojnosti izolacijskih materialov pri razlitju v kriogenem področju - 2. del: Parna faza (ISO/DIS 20088-2:2019)

Determination of the resistance to cryogenic spill of insulation materials - Part 2: Vapour phase (ISO/DIS 20088-2:2019)

Bestimmung der Beständigkeit von Isoliermaterialien bei kryogenem Auslaufen - Teil 2: Dampfphase (ISO/DIS 20088-2:2019)

Détermination de la résistance des matériaux d'isolation thermique suite à un refroidissement cryogénique - Partie 2: Phase vapeur (ISO/DIS 20088-2:2019)

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75.200	Oprema za skladiščenje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment

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Determination of the resistance to cryogenic spill of insulation materials —

Part 2:
Vapour release

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

Partie 2: Phase gazeuse

ICS: 75.200

Member bodies are requested to consult relevant national interests in ISO/TC 8/SC 8 before casting their ballot to the e-Balloting application.

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Foreword

ISO (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

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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 (World Trade Organisation) principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

ISO 20088 Part 2 was prepared by the Sub Committee ISO/TC 67/SC 9, Liquefied Natural Gas (LNG) installations and equipment, JWG 3 resistance to cryogenic spill.

Other parts of this standard are:

Part 1- Liquid phase: This is applied where a pool of liquid is expected to result either from jet release or low pressure release conditions of cryogenic liquid

Part 3 – Jet Release; This is to be applied where a cryogenic liquid jet as a result of a pressurised release impinges structural steel not resulting in immersion or standing liquid conditions

Introduction

The test is intended to be, as far as practicable, representative of a potential accidental pressurised release of cryogenic LNG material manufactured in industrial plants. The test includes:

a. Release from of cryogenic liquid under pressure,

b. Scenarios where the conditions in the jet characterised predominantly by gaseous exposure.

This test is designed to give an indication of how cryogenic spill protection materials will perform in a sudden exposure to cryogenic jet where it is expected that little or no liquid fraction is present.

The dimensions of the test specimen may be smaller than typical items of structure and plant. The liquid cryogenic jet mass flow rates can be substantially less than that which might occur in a credible event. However, individual thermal loads imparted to the cryogenic spill protection materials, from the cryogenic release defined in the procedure described in this part of ISO 20088, have been shown to be representative of areas exposed to a cryogenic LNG accidental release where little or no liquid is present.

Determination of the resistance to cryogenic spill of insulation materials —

Part 2:
Vapour release

CAUTION — the attention of all persons concerned with managing and carrying out cryogenic spill testing is drawn to the fact that liquid nitrogen testing can be hazardous and that there is a danger of oxygen condensation (risk of explosion), 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 identified and provided. Appropriate training and Personal Protection Equipment (PPE) shall be given to relevant personnel.

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

1 Scope

This document describes a method for determining the resistance of cryogenic spill protection (CSP) systems to vapour generated from a cryogenic liquid release where the liquid content is practically zero. It is applicable where CSP systems are installed on carbon steel.

Liquid jet release may be formed upon release of Liquified Natural Gas (LNG) from process equipment operating at pressure, e.g., some liquefaction processes utilise 40 - 60 bar operating pressure. However at specific distances from the release point it is expected that the liquid fraction will diminish such that there is practically no effect from liquid cooling in the stream.

It should be recognised that it is not practical in this test to cover the whole range of cryogenic process conditions found in real plant conditions; in particular the test does not cover high pressure cryogenic liquid releases that may be found in refrigeration circuits and in LNG streams immediately post-liquefaction.

Liquid nitrogen (LN_2) is used as the cryogenic medium due to the ability to handle the material at the pressures described in this part of the standard safely.

ISO 20088-1 covers cryogenic liquid releases which may lead to pool formation for steel work protected by CSP. ISO 20088-3 covers jet exposure conditions where there is predominantly liquid in the stream.

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 22899-1, *Determination of the resistance to jet fires of passive fire protection materials — Part 1: General requirements*

3 Terms and definitions

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

3.1
Cryogenic jet release
unintended exposure to cryogenic liquid as a result of a pressurised release.

3.2
Cryogenic spill protection
CSP
coating or cladding arrangement, or free-standing system which, in the event of a cryogenic jet release, will provide insulation to restrict the heat transfer rate from the substrate

3.3
Limiting temperature
minimum temperature that the equipment, assembly or structure to be protected may be allowed to reach.

3.4
Nozzle
assembly from which the cryogenic liquid is released as a jet.

3.5
Sponsor
person or organization who/which requests a test

3.6
Specimen owner
person or company that holds/produces a material to test

3.7
Cooling power
The amount of heat transferred per unit area per unit time from a surface (W/m^2)

3.8
DBTT
Ductile Brittle Transition Temperature

4 Test configurations

4.1 General

The configuration under which the test is conducted is where the plate specimen is placed vertically. The material to be tested is exposed to a liquid nitrogen release under pressure where the liquid fraction is practically zero (i.e. gaseous exposure). Due to safety concerns, it is proposed that the test should only be performed outside, unless there are sufficient safeguards implemented to mitigate the confined space and LN_2 safety risks.

5 Construction of the test apparatus and substrates

5.1 General

The key items required for the test are:

— A nozzle and cryogenic liquid feed assembly where the temperature and pressure of the liquid can be measured at the point the liquid enters the nozzle;

— An environmental chamber (3-sided plastic tunnel) up to a length of 6m;