



SLOVENSKI STANDARD
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Kriogene posode - Stabilne, vakuumsko izolirane posode - 2. del: Zahteve za obratovanje (ISO/DIS 21009-2:2023)

Cryogenic vessels - Static vacuum insulated vessels - Part 2: Operational requirements (ISO/DIS 21009-2:2023)

Kryo-Behälter - Ortsfeste vakuumisolierte Behälter - Teil 2: Betriebsanforderungen (ISO/DIS 21009-2:2023)

Réceptifs cryogéniques - Réceptifs fixes isolés sous vide - Partie 2: Exigences de fonctionnement (ISO/DIS 21009-2:2023)

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(kriogenske posode)

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Cryogenic vessels — Static vacuum insulated vessels — Part 2: Operational requirements

*Réceptacles cryogéniques — Réceptacles fixes isolés sous vide —**Partie 2: Exigences de fonctionnement*

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Contents

	Page
Foreword.....	iv
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Personnel training.....	2
5 General safety requirements.....	3
5.1 General.....	3
5.2 Safety considerations.....	3
6 Installation.....	3
6.1 General requirements.....	3
6.2 Outdoor installation.....	4
6.3 Indoor installation.....	5
6.4 Safety distances.....	5
7 Inspection.....	6
7.1 General.....	6
7.2 Inspection before putting into service.....	6
7.3 Marking and labelling.....	6
7.4 Handover documents.....	6
7.5 Equipment.....	7
7.6 Periodic inspection.....	7
7.6.1 General.....	7
7.6.2 Inspections.....	7
7.7 Inspection of pressure-relief devices.....	8
7.7.1 General.....	8
7.7.2 Certificates and marking.....	8
7.7.3 Visual inspection.....	8
7.7.4 Performance test.....	8
7.7.5 Changing bursting discs (inner vessel).....	9
8 Putting into service.....	9
9 Filling.....	9
10 Taking out of service.....	10
11 Maintenance and repair.....	10
12 Additional requirements for flammable gases.....	11
12.1 General.....	11
12.2 Electrical equipment.....	11
12.3 Grounding (earthing) system.....	12
12.4 Installation.....	12
12.5 Filling.....	13
12.6 Maintenance, repair and taking out of service.....	13
13 Emergency equipment/procedures.....	13
Annex A (informative) Safety distances.....	15
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2014/68/EU (Pressure Equipment Directive) aimed to be covered.....	16
Bibliography.....	17

ISO/DIS 21009-2:2023(E)

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 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 220, *Cryogenic vessels*.

This third edition cancels and replaces the second edition (ISO 21009-2:2015), which has been technically revised.

The main changes are as follows:

- updated definition of authorized person and noted that some national regulations require third-parties to serve as authorized persons;
- updated requirements for protective clothing to prevent exposure to cryogenic fluids;
- added requirements for dealing with oxygen-enriched condensation;
- added requirements to use the results of a risk assessment for the design on underground installations;
- added requirements to use measures such as gas monitoring systems and ventilation to mitigate hazards for underground installations;
- added requirements to consider the risks associated with spill containment (diking) for outdoor installations if diking is needed;
- added requirements that controls for filling an indoor tank from an outdoor source shall be accessible to the operator and that vents shall be piped to a safe location;
- added requirements for automatic control devices shall fail to a safe operating mode upon the loss of power or pneumatic supply;
- added requirement to remove moisture as well as contaminants during a first fill;
- added option to use approved first fill procedure in place of manufacturer instructions;
- added requirements to ensure the fill process does not fill beyond a maximum level and pressure;

- added requirement to cap fill fittings to avoid moisture or contaminant entry to the tank;
- added separate recommended procedures for purging hydrogen tanks with helium and for other inert gases;
- updated safety distances for flammable cryogenic fluids.

A list of all parts in the ISO 21009 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Cryogenic vessels — Static vacuum insulated vessels —

Part 2: Operational requirements

1 Scope

This part of ISO 21009 specifies operational requirements for static vacuum insulated vessels designed for a maximum allowable pressure of more than 50 kPa (0,5 bar). It may also be used as a guideline for vessels designed for a maximum allowable pressure of less than 50 kPa (0,5 bar).

This part of ISO 21009 applies to vessels designed for cryogenic fluids specified in ISO 21009-1.

Static cryogenic vessels are often partly equipped by the manufacturer, but may be installed or re-installed by another party, such as the operator, user or owner.

NOTE 1 For the installation of these vessels, additional requirements can apply; these are defined in specific regulations.

NOTE 2 Some requirements of this standard can be covered by local regulations, e.g. safety distances, occupational safety and health. Where there is a conflict between the requirements of this International Standard and any applicable local regulation, the local regulation always takes precedence.

2 Normative references

The following referenced 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 23208, *Cryogenic vessels — Cleanliness for cryogenic service*

ISO 21009-1, *Cryogenic vessels — Static vacuum-insulated vessels — Part 1: Design, fabrication, inspection and tests*

3 Terms and definitions

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

3.1

putting into service

operation by which a *vessel* (3.8) is prepared to be used

Note 1 to entry: It applies to either a new vessel being used for the first time or an existing vessel being returned to service.

3.2

filling

operation by which a *vessel* (3.8) undergoes a prefill check, filling with a cryogenic fluid and an after-fill check

3.3

withdrawal

operation by which the product is taken from a *vessel* (3.8) connected to the supply system

ISO/DIS 21009-2:2023(E)

3.4 outdoor location

location outside of any building or structure and not enclosed by more than two walls

3.5 underground location

area or room whose ground or floor is on all sides lower than the adjacent ground surfaces

Note 1 to entry: Installations are to be considered on an individual basis after a suitable and sufficient risk assessment has been carried out.

3.6 safety distance

minimum distance separating a piece of equipment from its inherent hazard that will mitigate the effect of a likely foreseeable incident and prevent a minor incident escalating into a larger incident

Note 1 to entry: The safety distance also can provide protection from foreseeable external impact (e.g. roadway, flare) or activities outside the control of the operation (e.g. plant or customer station boundary).

3.7 gas release

escape of gas due to operating conditions, or to malfunctions that cannot be reasonably excluded

Note 1 to entry: Gas release for operating reasons can be produced, for example, on vent lines and pressure-release lines.

Note 2 to entry: Gas escape due to malfunctions which cannot be excluded can occur, for example, in the case of overfilling, failure of fittings, loose connections, faulty operation, and leakages.

3.8 vessel

thermally insulated vessel intended for use with one or more cryogenic fluids in a stationary condition

[SOURCE: ISO 21009-1, 3.19, modified: Term changed to short form "vessel" for this document]

3.9 authorized person

trained and qualified person approved or assigned by the applicable regulations to perform specific types of duties

Note 1 to entry: Depending on national regulations some duties shall be performed under involvement of third party.

4 Personnel training

Only authorized persons trained for the specific task shall be allowed to install, put into service, fill, handle, operate or maintain the vessel and its equipment.

The training programme shall include

- normal operating procedures;
- product and hazard identification;
- safe operating limits;
- emergency procedures;
- physical and chemical properties of the vessel's contents and their effects on the human body;
- personnel protective equipment (e.g. safety boots, goggles, gloves).

Training shall be repeated as necessary to ensure that authorized personnel remain competent. A training record shall be maintained which details the information authorized personnel have received

5 General safety requirements

5.1 General

Identification labels and plates shall not be removed or defaced.

Appropriate warning signs regarding product and operational hazards and personnel protective equipment requirements shall be displayed.

Parts under pressure shall be disconnected only if they have been previously depressurized.

All surfaces which may come in contact with the product shall be kept free from oil and grease. For cleanliness requirements, see ISO 23208.

Leaking valves or connections should be depressurized before rectification. When this is not possible, leaking valves under pressure shall be tightened using suitable tools and procedures. Direct flame or intense heat shall never be used to raise the pressure or de-ice frozen components.

Valve outlets shall be kept clean, dry and free from contaminants.

Vessels and their accessories shall not be modified without proper authorization.

5.2 Safety considerations

In all operations and training, the following safety considerations shall be taken into account:

- Systems for oxygen service shall consider the compatibility of the materials.
- Small amounts of cryogenic fluids will produce large volumes of vaporized gas. Spillage of oxygen can result in an oxygen-enriched atmosphere; spillage of other cryogenic fluids can result in an oxygen-deficient atmosphere. Provision is to be made for appropriate measures for this, e.g. ventilation or usage of self-contained breathing apparatus.
- Due to the possibility of cold embrittlement, cryogenic fluids shall not come in contact with materials (metals or plastics) which are not suitable for lower bound of the design temperatures.
- Hydrogen embrittlement shall be considered for materials exposed to hydrogen.
- Because of their extremely low temperatures, cryogenic fluids will produce cold burns when coming in contact with the skin. Cold burns can also be produced from contact with uninsulated equipment and pipe. When using vessels, it is necessary to use protective means for exposed areas of the face and skin, as well as clothing which does not allow spilled cryogenic liquid to enter into the shoes.
- Oxygen enrichment due to liquefaction of ambient air can occur on the cold surfaces of equipment which contain fluids with a boiling point lower than that of oxygen; e.g. liquid helium or liquid hydrogen. Areas where this condensate can collect shall be considered for oxygen compatibility.

6 Installation

6.1 General requirements

Vessels shall be installed and operated in such a way, that employees or third parties are not endangered. Necessary minimum safety distances shall be observed; see also [Annex A](#).

Vessels shall be installed so that the name plate is easily readable.