



International
Standard

ISO 21009-2

**Cryogenic vessels — Static vacuum-
insulated vessels —**

**Part 2:
Operational requirements**

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

**Third edition
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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 document 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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 268, *Cryogenic vessels and specific hydrogen technologies applications*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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”;
- 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 that 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;

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- 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.

Cryogenic vessels — Static vacuum-insulated vessels —

Part 2: Operational requirements

1 Scope

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

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

Static cryogenic vessels are often partly equipped by the manufacturer, but can 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.

NOTE 2 Some requirements of this document can be covered by local regulations, e.g. safety distances, occupational safety and health.

NOTE 3 Additional requirements can apply to the operation of large scale and field-fabricated vessels.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 23208, *Cryogenic vessels — Cleanliness for cryogenic service*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 putting into service

operation by which a vessel (3.7) 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 (3.7) undergoes a prefill check, filling with a cryogenic fluid, and an after-fill check

3.3

outdoor location

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

3.4

underground location

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

3.5

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).

3.6

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 release 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.

3.7

vessel

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

[SOURCE: ISO 21009-1:2022, 3.17, modified — The term “static cryogenic vessel” was changed to “vessel”; the Note to entry was removed.]

3.8

authorized person

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

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);
- basic risk assessment methods and techniques;
- hazards of the cryogenic liquid stored in the vessel.

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.