
**Cryogenic vessels — Large
transportable vacuum-insulated
vessels —**

**Part 2:
Operational requirements**

iTeh STANDARD PREVIEW
*Réipients cryogéniques — Grands récipients transportables, isolés,
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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Preliminaries before putting into service	2
4.1 General.....	2
4.2 Marking and labelling.....	2
4.2.1 Marking.....	2
4.2.2 Labelling (or placarding).....	3
4.3 Handover documents.....	3
5 Personnel training	3
6 General safety requirements	4
6.1 General.....	4
6.2 Safety considerations.....	4
7 Putting into service	5
8 Location	5
9 Transport	6
10 Filling	6
10.1 General.....	6
10.2 Prefill checks.....	7
10.3 Preparations.....	7
10.4 After-fill check.....	8
11 Product withdrawal	8
12 Change of service	8
13 Taking out service	9
14 Maintenance and repair	9
15 Periodic inspection	10
16 Additional requirements for flammable gases	11
16.1 General safety requirements.....	11
16.1.1 General.....	11
16.1.2 Electrical equipment.....	11
16.1.3 Grounding (earthing) system.....	11
16.2 Putting into service (see also Clause 7).....	12
16.3 Location (see also Clause 8).....	12
16.4 Transport (see also Clause 9).....	12
16.5 Filling (see also Clause 10).....	12
16.6 Change of service (see also Clause 12).....	12
16.7 Taking out of service (see also Clause 13).....	12
16.8 Maintenance and repair (see also Clause 14).....	12
16.9 Emergency equipment and procedures.....	13
Bibliography	14

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).

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 (see 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 220, *Cryogenic vessels*.

This second edition cancels and replaces the first edition (ISO 20421-2:2005), which has been technically revised.

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A list of all parts in the ISO 20421 series can be found on the ISO website.

Introduction

Elements of this document support the requirements of the UN-Recommendations on the Transport of Dangerous Goods and other international, national or local requirements.

Large transportable cryogenic vessels are often partly equipped by the manufacturer, but may be completed or re-equipped by another party, such as the operator or owner. For this reason, some of the scope of this document, which includes putting into service, inspection, filling, maintenance and emergency procedures, overlaps with ISO 20421-1.

This document applies to vessels for cryogenic fluids, primarily as specified in ISO 20421-1. It may also be used for vessels for cryogenic fluids manufactured and designed to other standards, e.g. EN 13530-2. In case of conflict between the requirements of this document with applicable regulations, regulations take precedence.

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Cryogenic vessels — Large transportable vacuum-insulated vessels —

Part 2: Operational requirements

1 Scope

This document specifies operational requirements for large transportable vacuum-insulated cryogenic vessels.

These operational requirements include putting into service, filling, withdrawal, transport within the location, storage, maintenance, periodic inspection and emergency procedures.

For the transport of these vessels by public road, rail, waterway, sea and air, additional requirements can apply; these are defined in specific regulations.

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 20421-1, *Cryogenic vessels — Large transportable vacuum-insulated vessels — Part 1: Design, fabrication, inspection and testing* ISO 20421-2:2017
https://standards.iteh.ai/catalog/standards/sis/585c8b50-a87a-45b1-87d0-1a56918fe41c/iso-20421-2-2017

3 Terms and definitions

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

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

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

3.1

putting into service

operation by which a new vessel being used for the first time or an existing vessel being returned to service is prepared for use

Note 1 to entry: Initial inspections and tests are covered in ISO 20421-1 or similar design standards, e.g. EN 13530-2.

3.2

filling

operation by which a transportable vessel 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 connected to the supply system

**3.4
outdoor**

location outside of any building or structure and not enclosed by more than two walls or one wall if a roof is also present

**3.5
underground**

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

**3.6
large transportable cryogenic vessel**

thermally insulated vessel of more than 450 l intended for the transport of one or more cryogenic fluids, consisting of an inner vessel, an outer jacket, all of the valves and service equipment together with the structural parts

Note 1 to entry: The large transportable cryogenic vessel comprises a complete assembly that is ready for service.

Note 2 to entry: A “large transportable cryogenic vessel” is hereinafter referred to as “vessel”.

**3.7
authorized person**

person authorized by the applicable regulations

**3.8
enterprise**

any person or company that has a legal duty of care

**3.9
filler**

any enterprise which loads cryogenic fluids into a cryogenic vessel

**3.10
owner**

enterprise that legally owns the cryogenic vessel

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**3.11
operator**

any enterprise for filling, storage, transport and withdrawal of cryogenic product

**3.12
holding time**

time that will elapse from the establishment of the initial filling condition until the pressure has risen due to heat influx to the lowest set pressure of the pressure limiting device(s)

4 Preliminaries before putting into service

4.1 General

Before putting into service, verification shall take place to ensure that the vessel is suitable for the intended service and that the marking, labelling and handover documents are complete.

4.2 Marking and labelling

4.2.1 Marking

Marking shall be in accordance with the applicable design standard and/or regulations, e.g. ISO 20421-1.

4.2.2 Labelling (or placarding)

For labelling, the following shall be affixed:

- a) a flow sheet denoting operation;
- b) danger labels and marks in accordance with transport regulations;
- c) risk and safety phrases associated with the gas content;
- d) name of the owner;
- e) name of the operator;
- f) actual holding time for gases being transported;
- g) maximum permissible gross mass;
- h) unladen (tare) mass;
- i) an unshortened identification of the fluid which is transported in accordance with the transport and substance regulations and its net mass in accordance with the documentation. As an alternative, this information can be included in a transport document.

NOTE 1 Items a) to i) can appear on the vessel, name plate or transport document depending on the requirements of the particular transport mode or operator requirements.

NOTE 2 Items e) to i) can be required by the design standards and do not need to be repeated.

Specific transport regulations shall always be consulted prior to the carriage. The holding time shall be calculated for each journey in accordance with applicable transport regulations.

4.3 Handover documents

In addition to the manufacturer's documentation, where necessary, the cryogenic vessel shall be accompanied by vessel-specific documents and instructions for all items supplied covering the

- operation,
- auxiliary equipment, and
- inspection records.

These documents shall be retained by the owner of the vessel.

The operator shall have appropriate instructions available. Such instructions may be attached to the vessel in a permanent manner, or carried by or available to the operator.

5 Personnel training

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

The training programme shall include

- normal procedures,
- product and hazard identification,
- safe operating limits,
- emergency procedures,

- physical and chemical properties of the vessel's content and their effects on the human body,
- personal protection, and
- confined spaces entry, if applicable.

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

6 General safety requirements

6.1 General

Before any operation, the operator shall ensure that all equipment is free from any obvious damage or defect which could affect its safe operation.

Marking and labelling shall not be removed or defaced.

Consideration shall be given to the product properties and the use of appropriate personal protective equipment.

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

Leaking valves or connections shall be depressurized before rectification. When this is not possible, leaking valves under pressure shall be tightened using suitable tools and procedures.

Direct flame or direct intense heat shall never be used to raise the pressure or de-ice frozen components.

All surfaces which may come in contact with the product shall be clean for the intended service. For cleanliness requirements, see ISO 23208.

Outlets, seals and transfer hoses shall be checked to be clean, dry and free from contaminants and visible defects before connection.

Vessels and transfer hoses shall not be modified without proper authorization. It is recommended that the couplings be attached to the vessels and/or hoses in a manner that prevents unauthorized removal of the product couplings.

Operating valves should be opened and closed slowly.

6.2 Safety considerations

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

- 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. Appropriate measures shall be taken for all these cases, e.g. ventilation.
- Because of the possibility of cold embrittlement, cryogenic fluids shall only be used in product systems with components which are suitable for low temperatures.
- Vaporizing cryogenic fluids produce gases that are heavier than air and can accumulate in lower areas (e.g. pits, trenches).
- Because of their extremely low temperatures, cryogenic fluids will produce cold burns when coming into contact with the skin. Cold burns can also be produced from contact with uninsulated equipment and piping.
- Oxygen enrichment due to liquefaction of ambient air can occur on the cold surfaces of uninsulated equipment which contains a fluid with a boiling point lower than that of oxygen.

- Consideration should be given to establishing proper safety distances during parking or product transfer.

7 Putting into service

This operation shall follow a written procedure and the results of the steps involved should be recorded (e.g. in a check list). Such lists should be retained by the operating company.

Vessels and accessories shall be visually checked for damage.

The following shall be verified.

- The vessel and accessories are appropriate for the intended service, comply with the flow sheet and are appropriately marked and labelled; all labels shall be clearly displayed and appropriate for the product.
- A relief device with a set pressure not higher than the maximum allowable working pressure of the vessel is fitted. Pressure, size and installation shall comply with the documentation. Devices requiring approval shall be correctly stamped and matching certificates shall be available.
- All valves are operable.
- All required checks and tests have been carried out.

Ensure that the vessel and accessories are clean and compatible for the intended service; see ISO 23208 and ISO 21010.

The vessel should be purged with an appropriate gas until the gas emerging from the vessel is sufficiently dry and pure for the intended service.

The vessel shall be cooled down according to the manufacturer's recommendations. Steps shall be taken to avoid uncontrolled pressure rise due to rapid liquid vaporization. The cool-down gas chosen shall take into account the risk of solidification.

Measuring and controlling devices (level gauge, pressure gauge, etc.) shall be checked for correct operation and setting.

8 Location

The requirements listed in this clause are valid for storage and parking, as well as for other activities such as filling and withdrawal.

- Vessels shall be located in a suitable area such as in the open air or in a sufficiently ventilated enclosed area, away from sources of heat (welding source, open fire, etc.). Hot work shall be subject to appropriate safety measures. The area shall be kept appropriately clean and suitable access shall be provided.
- Adequate ventilation shall be provided. In locations at or above ground level, natural ventilation is generally sufficient, provided that the room is large enough or that the outdoor area is not closely surrounded by walls. In other circumstances, forced ventilation or other precautions shall be provided.
- Vessels should not be located underground. However, where this is unavoidable, relief device outlet(s) should be piped to a safe external venting point. As an alternative, appropriate marking (e.g. indicating the risk of asphyxiation) and sufficient continuous ventilation to deal with product releases should be provided. The vent pipework shall be designed in such a way as to ensure proper pressure relief from the vessel and to prevent the accumulation or blockage of rainwater by airborne material. The same measures shall be taken if vessels are indoors for extended periods (i.e. overnight or weekends).