SLOVENSKI STANDARD
SIST EN 14398-1:2004

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Kriogene posode ï Velike premiļ ne, vakuumsko neizolirane posode - 1. del: Osnovne zahteve

Cryogenic vessels - Large transportable non-vacuum insulated vessels - Part 1: Fundamental requirements

Kryo-Behälter - Große ortsbewegliche, nicht vakuum-isolierte Behälter - Teil 1: Grundanforderungen

Récipients cryogéniques - Grands récipients transportables non isolés sous vide - Partie 1: Exigences fondamentales

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23.020.40	Proti mrazu odporne posode (kriogenske posode)	Cryogenic vessels

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English version

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Contents

Foreword

This document (EN 14398-1:2003) has been prepared by Technical Committee CEN/TC 268 “Cryogenic vessels”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2004, and conflicting national standards shall be withdrawn at the latest by February 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the objectives of the framework Directives on Transport of Dangerous Goods.

EN 14398 consists of the following Parts under the general title, *Cryogenic vessels – Large transportable non-vacuum insulated vessels*:

– *Part 1: Fundamental requirements*

– *Part 2: Design, fabrication, inspection and testing*

– *Part 3: Operational requirements*

Annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the fundamental requirements for large transportable non-vacuum insulated cryogenic vessels and designed to operate above atmospheric pressure.

This standard applies to large transportable non-vacuum insulated cryogenic vessels for fluids as specified in 3.1 and is not applicable to such vessels designed for toxic fluids.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1252-1, *Cryogenic vessels - Materials - Part 1: Toughness requirements for temperatures below -80 °C.*

EN 1252-2, *Cryogenic vessels - Materials - Part 2: Toughness requirements for temperatures between -80°C and -20 °C.*

EN 1626, *Cryogenic vessels - Valves for cryogenic service.*

EN 1797, *Cryogenic vessels - Gas/material compatibility.*

EN 10204, *Metallic products - Types of inspection documents.*

EN 12300, *Cryogenic vessels - Cleanliness for cryogenic service.*

EN 13648-1, *Cryogenic vessels - Safety devices for protection against excessive pressure - Part 1 : Safety valves for cryogenic service.*

EN 13648-2, *Cryogenic vessels - Safety devices for protection against excessive pressure - Part 2 : Bursting disc safety devices for cryogenic service.*

EN 13648-3, *Cryogenic vessels - Safety devices for protection against excessive pressure - Part 3 : Determination of required discharge - Capacity and sizing.*

EN 14398-2, *Cryogenic vessels - Large transportable non-vacuum insulated vessels - Part 2 : Design, fabrication, inspection and testing.*

EN 14398-3, *Cryogenic vessels - Large transportable non-vacuum insulated vessels - Part 3: Operational requirements.*

3 Terms and definitions

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

3.1
cryogenic fluid (refrigerated liquefied gas)
gas which is partially liquid because of its low temperature[1]). In the context of all parts of this standard the (refrigerated but) non-toxic gases and mixtures of them given in Table 1 are referred to as cryogenic fluids

[1]) This includes totally evaporated liquids and supercritical fluids.

Table 1 — Refrigerated but non toxic gases

Item and group	Identification number, name and description [a]
3 A	Asphyxiant gases 2187 Carbon dioxide, refrigerated liquid 3158 Gas, refrigerated liquid, N.O.S [b] .
3 O	Oxidizing gases 2201 Nitrous oxide, refrigerated liquid, oxidizing 3311 Gas, refrigerated liquid, oxidizing, N.O.S [b]
[a] Item group, identification number, name and description according to ADR 2001 [b] N.O.S. = not otherwise specified	

3.2
large transportable cryogenic vessel (tank)
thermally insulated vessel of more than 1000 l intended for the transport of one or more cryogenic fluids, consisting of an inner vessel, an outer jacket[2)] , all of the valves and equipment together with any additional framework, this large transportable cryogenic vessel representing a complete assembly ready for putting into service

3.3
thermal insulation
non-vacuum interspace between the inner vessel and the outer jacket. The space is filled with material to reduce the heat transfer between the inner vessel and the outer jacket

3.4
inner vessel [2)]
vessel intended to contain the cryogenic fluid

3.5
outer jacket [2)]
normally not gas-tight weather protection of the thermal insulation and of the inner vessel

3.6
normal operation
intended operation of the vessel at a pressure not greater than the maximum allowable working pressure including the handling loads defined in 3.7

3.7
handling loads
loads exerted on the transportable cryogenic vessel in all expected situations of transport including loading, unloading, moving lifting equipment

3.8
documentation
technical documents delivered by the manufacturer to the owner consisting of :

— all certificates establishing the conformity with this standard (e.g. material, pressure test, cleanliness, safety devices);

— a short description of the vessel (including characteristic data etc.);

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2) The expressions 'inner vessel' and 'outer jacket' where originally introduced for vacuum insulated vessels. They are used in this set of standards to be consistent with all standards about cryogenic vessels, but in the case of the outer jacket with another meaning in this set of standards.

- a list of fluids and their net mass for which the cryogenic vessel is designed;
- an operating manual (for the user) which consists of:
  - a short description of the vessel (including characteristic data etc.);
  - a statement that the vessel is in conformity with this standard;
  - the instructions for normal operation.

3.9
piping system
all pipes which can come in contact with cryogenic fluids including their valves, fittings, pressure relief devices as well as their supports

3.10
safety accessories
devices which have a safety related function with respect to pressure containment and/or control (e.g. protective or limiting devices, regulating and monitoring devices, valves, indicators)

3.11
manufacturer of the large transportable cryogenic vessel
company who carries out the final assembly of the large transportable cryogenic vessel

3.12
volume of the inner vessel
volume of the shell, excluding nozzles, pipes etc. determined at minimum design temperature and atmospheric pressure

3.13
tare mass
mass of the empty large transportable cryogenic vessel

3.14
net mass
maximum allowable mass of the cryogenic fluid which may be filled. The maximum allowable mass is equal or less of the mass of the cryogenic fluid when filled to 98 %[3)] of the volume of the inner vessel in the case of gases of 3A or 3 O

3.15
gross mass
sum of tare mass plus net mass

3.16
pressure
pressure relative to atmospheric pressure, i. e. gauge pressure

4 General requirements

The large transportable cryogenic vessel shall safely withstand the mechanical and thermal loads and the chemical effects encountered during pressure test and normal operation. These requirements are deemed to be satisfied if clauses 5 to 9 are fulfilled. The vessel shall be marked in accordance with clause 10, tested in accordance with clause 11 and clause 12 and operated in accordance with EN 14398-3.

3) see ADR 2001, Chapter 3.2, Table A, column 13: TU 19

These requirements shall be applied to fixed tanks (of tank-vehicles or tank-wagons), demountable tanks, and tank-containers (TC) for refrigerated liquefied gases in the sense of the regulations of the transport of dangerous goods.

5 Mechanical loads

5.1 General

The large transportable cryogenic vessel shall resist the mechanical loads mentioned in clause 4 without such deformation which could affect safety and which could lead to leakage. This requirement can be validated by:

— the calculation;

— the calculation and pressure strengthening method (see EN 14398-2);

— the calculation and experimental method.

The mechanical loads to be considered are given in 5.2 and 5.3.

5.2 Load during the pressure test

The load exerted during the pressure test is $p_t \geq 1{,}3\,p_s$ where

— p_t = test pressure (in bar);

— p_s = allowable working pressure (= relief device set pressure) (in bar).

5.3 Other mechanical loads during normal operation

5.3.1 The following loads shall be considered to act in combination where relevant:

— a pressure equal to the maximum allowable working pressure in the inner vessel and pipework;

— the pressure exerted by the liquid column when filled to capacity;

— loads produced by the thermal movement of the inner vessel, outer jacket and interspace piping;

— loads imposed in lifting and handling fixtures (at the vessel);

— load due to dynamic effects, when the vessel is filled to capacity, giving consideration to:

  — the inner vessel support system including attachments to the inner vessel and outer jacket;

  — the interspace and external piping;

  — where applicable the outer jacket supports and the supporting frame.

5.3.2 The following dynamic loads during normal operation shall be considered for the fastenings and the support system of the inner vessel:

— equal to twice the mass of the inner vessel when filled to the capacity shown on the data plate exerted by the inner vessel in the direction of travel and vertically downwards;

— equal to the mass of the inner vessel when filled to the capacity shown on the data plate exerted by the inner vessel at right angel to the direction of travel and vertically upwards; for tank-containers: equal to twice the mass in each horizontal direction if the direction of travel is not clearly determined.