

This is a preview of "ISO 21009-1:2008". [Click here to purchase the full version from the ANSI store.](#)

First edition
2008-09-01

Corrected version
2008-12-01

Cryogenic vessels — Static vacuum- insulated vessels —

Part 1: Design, fabrication, inspection and tests

Réipients cryogéniques — Réipients isolés sous vide statiques —

*Partie 1: Exigences de conception de fabrication, d'inspection, et
d'essais*



Reference number
ISO 21009-1:2008(E)

© ISO 2008

This is a preview of "ISO 21009-1:2008". [Click here to purchase the full version from the ANSI store.](#)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2008

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

This is a preview of "ISO 21009-1:2008". Click here to purchase the full version from the ANSI store.

Contents

Page

Foreword.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols	5
5 General requirements.....	7
6 Mechanical loads	7
6.1 General.....	7
6.2 Load during the pressure test	7
7 Chemical effects	8
8 Thermal conditions.....	8
9 Material	8
9.1 Selection of materials.....	8
9.2 Inspection certificate.....	9
9.3 Materials for outer jackets and service equipment	9
10 Design	9
10.1 Design options	9
10.2 Common design requirements.....	9
10.3 Design by calculation	16
11 Fabrication.....	43
11.1 General.....	43
11.2 Cutting	43
11.3 Cold forming.....	47
11.4 Hot forming.....	49
11.5 Manufacturing tolerances	50
11.6 Welding.....	53
11.7 Non-welded permanent joints	54
12 Inspection and testing.....	54
12.1 Quality plan	54
12.2 Production control test plates.....	56
12.3 Non-destructive testing.....	57
12.4 Rectification	60
12.5 Pressure testing.....	60
13 Marking and labelling	61
14 Final assessment.....	62
15 Periodic inspection.....	62
Annex A (normative) Elastic stress analysis	63
Annex B (normative) Additional requirements for 9 % Ni steel	72
Annex C (normative) Pressure strengthening of vessels from austenitic stainless steels	74
Annex D (informative) Pressure limiting systems	85
Annex E (normative) Further use of the material cold properties to resist pressure loads.....	86
Annex F (informative) Specific weld details	90

This is a preview of "ISO 21009-1:2008". [Click here to purchase the full version from the ANSI store.](#)

Annex G (normative) Additional requirements for flammable fluids	94
Annex H (informative) Relief devices	95
Annex I (normative) Outer jacket relief devices	96
Annex J (informative) Increased material property for austenitic stainless steel	97
Annex K (normative) Base materials	98
Annex L (normative) Cylindrical shells subject to external pressure (pressure on the convex surface) — Calculation	107
Annex M (normative) Design of openings in cylinders, spheres and cones — Calculation	112
Annex N (normative) Design of ends for internal pressure	122
Bibliography	124

This is a preview of "ISO 21009-1:2008". [Click here to purchase the full version from the ANSI store.](#)

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 21009-1 was prepared by Technical Committee ISO/TC 220, *Cryogenic vessels*.

ISO 21009 consists of the following parts, under the general title *Cryogenic vessels — Static vacuum-insulated vessels*:

- *Part 1: Design, fabrication, inspection and tests*
- *Part 2: Operational requirements:*

This corrected version incorporates the following corrections:

- a single safety factor is given for the knuckle-region;
- the straight flange length requirement is expressed in terms of s ;
- the formulae specifying cones which come under the field of application have been corrected;
- the cone angle is specified for internal pressure calculation;
- the formulae used for internal pressure calculation have been corrected;
- the formulae used for external pressure calculation have been corrected;
- the symbols used to denote wall thickness in Figure 7 have been changed;
- the Greek symbols used in Figures 10.1 to 10.8 (with the exception of φ) have been replaced by Latin symbols;
- the relationship to the pressure vessel code has specified with regard to calculations made for austenitic stainless steels;
- the cross-references in Annex G have been corrected;
- the formula for calculating moment of inertia, I , in relation to stiffening rings has been corrected;
- the formulae for calculating limits of reinforcement normal to the vessel wall by increased nozzle thickness have been corrected.