
**Gas cylinders — Design, construction
and testing of refillable composite gas
cylinders and tubes —**

Part 2:

**Fully wrapped fibre reinforced
composite gas cylinders and tubes up
to 450 l with load-sharing metal liners**

*Bouteilles à gaz — Conception, construction et essais des tubes et
bouteilles à gaz rechargeables en matériau composite —*

*Partie 2: Tubes et bouteilles à gaz entièrement bobinés en matériau
composite renforcés de fibres et d'une contenance allant jusqu'à 450 l
avec liners métalliques structuraux*

<https://standards.iteh.ai/catalog/standards/iso/48ea12ec-058a-4018-a6f8-c2d24bbd3713/iso-11119-2-2020>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 11119-2:2020

<https://standards.iteh.ai/catalog/standards/iso/48ea12ec-058a-4018-a6f8-c2d24bbd3713/iso-11119-2-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols	4
5 Inspection and testing	4
6 Materials	4
6.1 Liner materials	4
6.2 Composite materials	5
7 Design and manufacture	5
7.1 General	5
7.2 Design submission	6
7.3 Manufacturing	7
8 Type approval procedure	8
8.1 General requirements	8
8.2 Prototype tests	8
8.3 New design	9
8.4 Design variants	10
8.5 Type approval test procedures and criteria	13
8.5.1 Proof pressure test	13
8.5.2 Hydraulic volumetric expansion test	13
8.5.3 Liner burst test	14
8.5.4 Cylinder burst test	14
8.5.5 Ambient cycle test	15
8.5.6 Environmental cycle test	17
8.5.7 Flaw test	18
8.5.8 Drop/impact test	19
8.5.9 High velocity impact (gunfire) test	23
8.5.10 Fire resistance test	24
8.5.11 Salt water immersion test	26
8.5.12 Torque test	27
8.5.13 Environmentally assisted stress rupture test	27
8.5.14 Resin shear strength	27
8.5.15 Glass transition temperature	28
8.6 Failure of type approval tests	28
9 Batch inspection and testing	28
9.1 Liner	28
9.2 Failure of liner batch tests	29
9.3 Overwrap materials	29
9.4 Composite cylinder	29
9.5 Cylinder failure during type approval or batch testing	30
10 Cylinder marking	31
10.1 General	31
10.2 Additional marking	31
Annex A (informative) Examples of design approval certificate	32
Annex B (informative) Specimen test reports	33
Annex C (informative) Test report for equivalency	36

Annex D (informative) Standardized test requirements for thermally activated pressure relief devices	38
Bibliography	43

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[ISO 11119-2:2020](https://standards.itih.ai/catalog/standards/iso/48ea12ec-058a-4018-a6f8-c2d24bbd3713/iso-11119-2-2020)

<https://standards.itih.ai/catalog/standards/iso/48ea12ec-058a-4018-a6f8-c2d24bbd3713/iso-11119-2-2020>

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 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 58, *Gas cylinders*, Subcommittee SC 3, *Cylinder design*.

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.

This third edition cancels and replaces the second edition (ISO 11119-2:2012), which has been technically revised. It also incorporates the Amendment ISO 11119-2:2012/Amd.1:2014.

The main changes compared to the previous edition are as follows:

- References updated.
- [7.1.3](#) Minimum fibre stress ratios added.
- [8.5.8](#) Drop Test. Addition of new alternative test for cylinders up to and including 50 l water capacity with dedicated compressed gas service. Addition of alternative impact test for tubes 150 l and above.
- [8.5.10](#) Fire resistance test. Changes to the procedure to make the test more consistent. Adding a criteria for tubes above 150 l to be tested for 5 min.
- [8.5.12](#) Torque Test is now only required for taper threads.

A list of all parts in the ISO 11119 series can be found on the ISO website.

Introduction

The purpose of this document is to provide a specification for the design, manufacture, inspection and testing of cylinders for worldwide usage. The objective is to balance design and economic efficiency against international acceptance and universal utility.

This document aims to eliminate the concern about climate, duplicate inspection and restrictions currently existing because of lack of definitive International Standards and is not to be construed as reflecting on the suitability of the practice of any nation or region.

This document has been written so that it is suitable to be referenced in the UN Model Regulations^[1].

This document addresses the general requirements on design, construction and initial inspection and testing of pressure receptacles of the *Recommendations on the transport of dangerous goods: Model regulations* developed by the United Nations^[15].

iTeh Standards (<https://standards.iteh.ai>) Document Preview

ISO 11119-2:2020

<https://standards.iteh.ai/catalog/standards/iso/48ea12ec-058a-4018-a6f8-c2d24bbd3713/iso-11119-2-2020>

Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes —

Part 2:

Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners

1 Scope

This document specifies minimum requirements for the material, design, construction and workmanship, manufacturing processes, examination and testing at time of manufacture for:

- type 3 fully wrapped cylinders or tubes with a load-sharing metal liner and composite reinforcement on both the cylindrical portion and the dome ends;
- water capacities up to 450 l;
- storage and conveyance of compressed or liquefied gases;
- cylinders and tubes with composite reinforcement of carbon fibre, aramid fibre or glass fibre (or a mixture thereof) within a matrix;
- a minimum design life of 15 years.

This document does not address the design, fitting, and performance of removable protective sleeves.

This document does not apply to cylinders with welded liners.

NOTE 1 References to cylinders in this document include composite tubes if appropriate.

NOTE 2 ISO 11439 applies to cylinders intended for use as fuel containers on natural gas vehicles and ISO 11623 covers periodic inspection and re-testing of composite cylinders.

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 3341, *Textile glass — Yarns — Determination of breaking force and breaking elongation*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 7225, *Gas cylinders — Precautionary labels*

ISO 7866, *Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing*

ISO 9809-1, *Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa*