
**Gas cylinders — Service life
performance of composite cylinders
and tubes**





COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

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	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 History of composite cylinder design	2
5 Current testing regimes	2
5.1 General.....	2
5.2 Requirements at the design, construction and testing stage.....	2
5.3 Requirements at Pre-fill inspection.....	5
5.4 Requirements at Periodic inspection and testing.....	6
6 Significance of cylinder test on their performance	6
7 Service performance including pre-fill and periodic inspection and test	8
8 Summary and conclusions	8
Bibliography	9

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 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 the following URL: 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.

Introduction

Composite gas cylinders have been manufactured for more than 50 years. Over that time, several specifications have been developed at the national, regional and international levels.

The following ISO standards cover the design of composites cylinders and tubes:

- ISO 11119 series (cylinders and tubes up to 450 l);
- ISO 11515 (tubes from 450 l to 3 000 l).

When the above-mentioned standards were proposed for reference in the UN Model Regulations, a lot of discussion took place because the two main regions using composite gas cylinders (Europe and North America) had different approaches. In Europe, regulations permitted non-limited lifetime for composite cylinders, while in North America, the lifetime was limited to 15 years by the US Department of Transportation.

To reach consensus, the concept of a service life test programme for composite cylinders and composite tubes of more than 15 years design life time was incorporated into the United Nations Recommendations on the Transport of Dangerous Goods (The Orange Book), as adopted in the 19th revision, in NOTE 2 of 6.2.2.1.1 and 6.2.2.1.2. This statement has raised several questions over the years:

- When are the tests to be performed?
- On which cylinders are the tests to be performed? How will the sampling be established?
- What tests are to be performed?
- Are all the tests really needed?
- Can the service life test programme be included in the design standard?

To answer these questions, ISO/TC 58/SC 3/WG 36 developed ISO/TR 19811. Indeed, to understand what testing programmes are in use by ISO P-member countries, competent authorities were asked to provide information regarding the composite cylinder approvals that are accepted in their country and any service life test programmes currently practiced.

The information received from the competent authorities was used to determine the similarities and differences in the service life test programmes used.

In 2018, ISO/TC 58/SC 3/AHG 1 concluded that there is no standardized global test protocol, and the worldwide feasibility of such programmes was difficult to put in place.

Finally in 2019, taking into account the previous work of ISO/TC 58/SC 3/WG 36 and ISO/TC 58/SC 3/AHG 1, ISO/TC 58/SC 3 asked WG 36 to develop a document to support the removal of service life test programme from the UN Model Regulations.

The aim of this proposed Technical Report was to build a rationale to answer the following question:

“Is a service life test programme needed to guarantee the safe and reliable performance of cylinders with a design life longer than 15 years?”

It is important to note that the current document deals only with the need (or not) of having a service life test programme for a cylinder with design life of more than 15 years or non-limited life to guarantee its “safety”.

NOTE The aim of the current document is not to discuss the merit of the tests performed to extend the life beyond its design life nor the frequency of periodic inspections