INTERNATIONAL STANDARD

ISO 15859-12

First edition
2004-06-01

Space systems — Fluid characteristics, sampling test methods —

Part 12: Carbon dioxide

Systèmes spatiaux — Caractéristiques, échantillonnage et méthodes d'essai des fluides —

Partie 12: Dioxyde de carbone

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

Reference number
ISO 15859-12:2004(E)

© ISO 2004

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

© ISO 2004

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

 © ISO 2004 – All rights reserved

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 15859-12 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15859 consists of the following parts, under the general title *Space systems — Fluid characteristics, sampling test methods*:

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

— *Part 1: Oxygen*

— *Part 2: Hydrogen*

— *Part 3: Nitrogen*

— *Part 4: Helium*

— *Part 5: Nitrogen tetroxide propellants*

— *Part 6: Monomethylhydrazine propellant*

— *Part 7: Hydrazine propellant*

— *Part 8: Kerosine propellant*

— *Part 9: Argon*

— *Part 10: Water*

— *Part 11: Ammonia*

— *Part 12: Carbon dioxide*

— *Part 13: Breathing air*

© ISO 2004 – All rights reserved

Introduction

Fluid operations at a spaceport or launch site may involve a number of operators and supplier/customer interfaces, from the fluid production plant to the delivery to the launch vehicle or spacecraft. The purpose of ISO 15859 is to establish uniform requirements for the components, sampling and test methods of fluids used in the servicing of launch vehicles, spacecraft and ground support equipment. The fluid composition limits specified are intended to define the purity and impurity limits of the fluid for loading into the launch vehicle or spacecraft. The fluid sampling and test methods are intended to be applied by any operator. The fluid sampling and test methods are acceptable methods for verification of the fluid composition limits.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

© ISO 2004 – All rights reserved

Space systems — Fluid characteristics, sampling test methods —

Part 12: Carbon dioxide

1 Scope

This part of ISO 15859 specifies limits for the composition of carbon dioxide (CO_2) and establishes the sampling and test requirements applicable for the verification of the carbon dioxide composition.

This part of ISO 15859 is applicable to composition, sampling, and test methods for carbon dioxide intended for purging and pressurization in both space systems flight hardware and ground support facilities, systems, and equipment. This part of ISO 15859 may be applied to carbon dioxide influents. Carbon dioxide may be of the gaseous or liquid type.

iTeh STANDARD PREVIEW

This part of ISO 15859 is applicable to any sampling operation required to ensure that, when the fluid enters the launch vehicle or spacecraft, the fluid composition complies with the limits provided hereafter or with any technical specification agreed to for a particular use.

(standards.iteh.ai)
ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

2 Normative references

The following referenced documents are indispensable for the application 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 9000, *Quality management systems — Fundamentals and vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9000 and the following apply.

3.1
verification test
analysis performed on the fluid in the container, or a sample thereof, which is representative of the supply, permitting the verification of fluid composition limits

4 Chemical composition

Unless otherwise provided in an applicable technical specification, the composition of carbon dioxide delivered to the flight vehicle interface shall be in accordance with the limits given in Table 1 when tested in accordance with the applicable test methods.

© ISO 2004 – All rights reserved

Table 1 — Composition limits

Component		Limit
Carbon dioxide purity	volume fraction, %, min.	99
Water, at 21 °C and 760 mm Hg	mg per litre of gas, max.	0,092

5 Procurement

The carbon dioxide specified in Clause 1 should be procured in accordance with an applicable national standard.

6 Fluid sampling

CAUTION — Carbon dioxide is an asphyxiant. Care should be taken to prevent high concentrations of gaseous carbon dioxide in confined spaces.

6.1 Plan

In order to ensure that the fluid composition complies with the limits specified in this part of ISO 15859, a fluid sampling plan should be established by all the involved operators, from the production to the space vehicle interface, and approved by the final user. Sampling activities and test methods shall comply with all safety regulations and rules applicable to that task. This plan shall specify

iTeh STANDARD PREVIEW
(standards.iteh.ai)

— the sampling points,

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004

— the sampling procedures,

— the sampling frequency,

— the sample size,

— the number of samples,

— the test methods, and

— the responsibilities of any involved operator.

6.2 Responsibility for sampling

Unless otherwise provided in an applicable technical specification, the carbon dioxide delivered to the flight vehicle interface shall be sampled and verified by the supplier responsible for providing the carbon dioxide to the flight vehicle. The supplier may use his/her or any other resources suitable for the performance of the verification tests specified herein unless otherwise directed by the customer.

6.3 Sampling points

Unless otherwise specified, sampling shall be conducted at the fluid storage site or the flight vehicle interface.

6.4 Sampling frequency

Sampling shall be performed annually or in accordance with a time agreed upon by the supplier and the customer.

© ISO 2004 – All rights reserved

6.5 Sample size

The quantity in a single sample container shall be sufficient to perform the analysis for the limiting characteristics. If a single sample does not contain a sufficient quantity to perform all of the analyses for the required quality verification test, additional samples shall be taken under similar conditions.

6.6 Number of samples

The number of samples shall be in accordance with one of the following:

a) one sample per storage container;

b) any number of samples agreed upon by the supplier and the customer.

6.7 Storage container

Unless otherwise provided by the applicable sampling plan, the fluid storage container shall not be refilled after the sample is taken.

6.8 Gaseous samples

Gaseous samples shall be a typical specimen of the carbon dioxide supply. Samples shall be obtained in accordance with one of the following.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

a) By filling the sample container and storage containers at the same time, on the same manifold, and under the same conditions and with the same procedures.

b) By withdrawing a sample from the supply container through a suitable connection into the sample container. No pressure regulator shall be used between the supply and the sample containers. (Suitable valves are permissible.) For safety reasons, the sample container and sampling system shall have a rated service pressure at least equal to the pressure in the supply container.

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/...
...-15859-12-2004

c) By connecting the container being sampled directly to the analytical equipment using suitable pressure regulation to prevent over-pressurizing this equipment.

6.9 Rejection

When any sample of the fluid tested in accordance with Clause 7 fails to conform to the requirements specified herein, the fluid represented by the sample shall be rejected. Disposal of the rejected fluid shall be specified by the customer.

7 Test methods

7.1 General

The supplier will ensure, by standard practice, the quality level of carbon dioxide. If required, alternate test methods are described in 7.3 to 7.4. Other test methods not listed in this part of ISO 15859 are acceptable if agreed upon between the supplier and the customer.

These tests are a single analysis or a series of analyses performed on the fluid to ensure the reliability of the storage facility to supply the required quality level. This can be verified by analysis of representative samples of the fluid from the facility at appropriate intervals as agreed upon between supplier and the customer. Tests may be performed by the supplier or by a laboratory agreed upon between the supplier and the customer.

The analytical requirements for the tests shall include the determination of all limiting characteristics of carbon dioxide.

© ISO 2004 – All rights reserved

7.2 Parameters of analysis

The parameters for analytical techniques contained in 7.3 and 7.4 are the following:

a) purity shall be expressed as a percentage by volume (volume fraction, %) unless otherwise noted;

b) calibration gas standards containing the applicable gaseous components may be required to calibrate the analytical instruments used to determine the limiting characteristic levels of fluid;

c) if required by the customer, the accuracy of the measuring equipment used in preparing these standards shall be traceable to an established institute for standards;

d) analytical equipment shall be operated in accordance with the manufacturer's instructions.

7.3 Carbon dioxide purity

The carbon dioxide purity shall be determined by one of the following procedures.

a) By a volumetric absorption (Orsat type) gas analysis apparatus.

b) By a gas chromatograph capable of separating and determining the components of interest.

c) By determining the amount of the aggregate impurities using other acceptable methods. The purity of carbon dioxide is the value obtained when the quantity of aggregate impurities, expressed as a volume fraction (%), is subtracted from 100.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

7.4 Water content

The water content shall be determined by one of the following procedures.

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-0b1a6d27986c/iso-15859-12-2004

a) By an apparatus employing a detector tube filled with a colour-reactive chemical. The degree of accuracy is dependent on the precision of the measurements and the analytical bias of the tube.

b) By an electrolytic hygrometer having an indicator graduated in cubic centimetres per cubic metre within a range which is not greater than 10 times the specified maximum water content.

c) By a dew-point analyser in which the temperature of a viewed surface is measured at the time water first begins to form.

d) By a piezoelectric sorption hygrometer, of which the accuracy of analysis shall be $\pm$ 0,1 cm^3/m^3 or 5 % of the reading, whichever is greater.

e) By a metal-oxide-capacitor-equipped analyser within a range which is not greater than 10 times the specific maximum water content.

© ISO 2004 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15859-12:2004
https://standards.iteh.ai/catalog/standards/sist/5f35b2cc-3e49-4046-99b9-031a64779867/iso-15859-12-2004