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Space systems – Fluid characteristics, sampling and test methods –
Part 1: Oxygen (ISO 15859-1:2004, IDT)

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The International Standard ISO 15859-1:2004 has the status of a Swedish Standard. This document contains the official English version of ISO 15859-1:2004.

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Foreword

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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 15859-1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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

— *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*

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.

Space systems — Fluid characteristics, sampling and test methods —

Part 1: Oxygen

1 Scope

This part of ISO 15859 specifies the limit values for the composition of oxygen and establishes the sampling and test requirements applicable for the verification of the oxygen composition.

This part of ISO 15859 is applicable to oxygen, used in both flight hardware and ground facilities, systems and equipment, of the following types and grades.

- Type I: gaseous
  - Grade A: standard, purging/pressurization,
  - Grade CB: crew breathing,
  - Grade F: fuel-cell;
- Type II: liquid
  - Grade A: oxidizer,
  - Grade B: oxidizer,
  - Grade F: fuel-cell.

This part of ISO 15859 is applicable to influents only within the specified limits herein.

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.

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
particulate matter
undissolved solids retained on a filter paper with a 10 µm absolute rating

3.2
total hydrocarbon content (as methane)
single carbon atom equivalent

3.3
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 chemical composition of oxygen 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.

Table 1 — Composition limits

Component			Limits					
			Type I (gaseous)			Type II (liquid)		
			Grade A	Grade CB	Grade F	Grade A	Grade B	Grade F
Purity	Oxygen (O_2)	Volume fraction, %, min.	99,6	99,5	99,989	99,2	99,5	99,989
Impurities	Total hydrocarbons (as methane)	µl/l, max.	50	50	23	75	67,7	23
	Alkynes (as acetylene)	µl/l, max.	—	—	0,05	1,55	0,5	0,05
	Water	µl/l, max.	8	10	3	26,3	26,3	3
	Particulate matter	mg/l, max.	—	—	—	—	1,0	—
	Methane	µl/l, max.	—	—	16	—	—	16
	Ethane	µl/l, max.	—	—	2	—	—	2
	Propane and higher hydrocarbons (as propane)	µl/l, max.	—	—	1	—	—	1
	Nitrous oxide	µl/l, max.	—	4	1	—	—	1
	Halogenated hydrocarbons	µl/l, max.	—	2	1	—	—	1
	Chlorinated hydrocarbons	µl/l, max.	—	0,2	0,01	—	—	0,01
	Odour	µl/l, max.	—	None	—	—	—	—
	Carbon monoxide (CO) and carbon dioxide (CO_2)	µl/l, max.	—	a	1	b	b	1
	Other [nitrogen (N_2), argon (Ar), krypton (Kr), etc.]	µl/l, max.	—	c	75	—	—	75

a 10 µl/l for CO and 10 µl/l for CO_2.

b 0,1 µl/l for CO and 3 µl/l for CO_2 when required to meet hardware needs.

c Other discernible impurities shall be identified, measured and recorded.