



Designation: G88 – 21

Standard Guide for Designing Systems for Oxygen Service¹

This standard is issued under the fixed designation G88; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide applies to the design of systems for oxygen or oxygen-enriched service but is not a comprehensive document. Specifically, this guide addresses system factors that affect the avoidance of ignition and fire. It does not thoroughly address the selection of materials of construction for which Guides G63 and G94 are available, nor does it cover mechanical, economic or other design considerations for which well-known practices are available. This guide also does not address issues concerning the toxicity of nonmetals in breathing gas or medical gas systems.

NOTE 1—The American Society for Testing and Materials takes no position respecting the validity of any evaluation methods asserted in connection with any item mentioned in this guide. Users of this guide are expressly advised that determination of the validity of any such evaluation methods and data and the risk of use of such evaluation methods and data are entirely their own responsibility.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 This standard guide is organized as follows:

Section Title	Section
Referenced Documents	2
ASTM Standards	2.1
ASTM Adjuncts	2.2
ASTM Manuals	2.3
NFPA Documents	2.4
CGA Documents	2.5
EIGA Documents	2.6
Terminology	3
Significance and Use	4
Purpose of G88	4.1

¹ This guide is under the jurisdiction of ASTM Committee G04 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres and is the direct responsibility of Subcommittee G04.02 on Recommended Practices.

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Section Title	Section
Role of G88	4.2
Use of G88	4.3
Factors Affecting the Design for an Oxygen or Oxygen-Enriched System	5
General	5.1
Factors Recognized as Causing Fires	5.2
Temperature	5.2.1
Spontaneous Ignition	5.2.2
Pressure	5.2.3
Concentration	5.2.4
Contamination	5.2.5
Particle Impact	5.2.6
Heat of Compression	5.2.7
Friction and Galling	5.2.8
Resonance	5.2.9
Static Electric Discharge	5.2.10
Electrical Arc	5.2.11
Flow Friction	5.2.12
Mechanical Impact	5.2.13
Kindling Chain	5.2.14
Other Ignition Mechanisms	5.2.15
Test Methods	6
System Design Method	7
Overview	7.1
Final Design	7.2
Avoid Unnecessarily Elevated Temperatures	7.3
Avoid Unnecessarily Elevated Pressures	7.4
Design for System Cleanliness	7.5
Avoid Particle Impacts	7.6
Minimize Heat of Compression	7.7
Avoid Friction and Galling	7.8
Avoid Corrosion	7.9
Avoid Resonance	7.10
Use Proven Hardware	7.11
Design to Manage Fires	7.12
Anticipate Indirect Oxygen Exposure	7.13
Minimize Available Fuel/Oxygen	7.14
Avoid Potentially Exothermic Material Combinations	7.15
Anticipate Common Failure Mechanism Consequences	7.16
Avoid High Surface-Area-to-Volume (S/V) Conditions where Practical	7.17

Section Title	Section
Avoid Unnecessarily-Elevated Oxygen Concentrations	7.18
Anticipate Permutations from Intended System Design	7.19
Avoid Designs and Failure Scenarios that can Introduce Potential Flow Friction Ignition Hazards	7.20
Use Only the Most Compatible of Practical Materials and Designs	7.21
Provide Thorough Safety Training for All Personnel	7.22
Working with Oxygen or Oxygen-Enriched Components or Systems, including Design, Cleaning, Assembly, Operations, and Maintenance as Applicable to Personnel	
Miscellaneous Examples	7.23
Key Words	8
References	9

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- G63 Guide for Evaluating Nonmetallic Materials for Oxygen Service
- G72 Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment
- G74 Test Method for Ignition Sensitivity of Nonmetallic Materials and Components by Gaseous Fluid Impact
- G93 Guide for Cleanliness Levels and Cleaning Methods for Materials and Equipment Used in Oxygen-Enriched Environments
- G94 Guide for Evaluating Metals for Oxygen Service
- G128 Guide for Control of Hazards and Risks in Oxygen Enriched Systems
- G175 Test Method for Evaluating the Ignition Sensitivity and Fault Tolerance of Oxygen Pressure Regulators Used for Medical and Emergency Applications

NOTE 2—The latest versions of these referenced documents should be consulted.

2.2 ASTM Adjuncts:³

ADJG0088DVD Oxygen Safety DVD

2.3 ASTM Manual:

Manual 36 Safe Use of Oxygen and Oxygen Systems: Guidelines for Oxygen System Design, Materials Selection, Operations, Storage, and Transportation

2.4 NFPA Standards⁴

NFPA 50 Standard for Bulk Oxygen Systems at Consumer Sites

NFPA 53 Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres

2.5 CGA Documents:⁵

CGA E-4 Standard for Gas Pressure Regulators

CGA G-4.1 Cleaning Equipment for Oxygen Service

CGA G-4.4 Oxygen Pipeline and Piping Systems

CGA G-4.6 Oxygen Compressor Installation and Operation Guide

CGA G-4.7 Installation Guide for Stationary Electric Motor Driven Centrifugal Liquid Oxygen Pumps

CGA G-4.8 Safe Use of Aluminum Structured Packing for Oxygen Distillation

CGA G-4.9 Safe Use of Brazed Aluminum Heat Exchangers for Producing Pressurized Oxygen

CGA G-4.11 Reciprocating Oxygen Compressor Code of Practice

CGA G-4.13 Centrifugal Compressors for Oxygen Service

CGA P-8.4 Safe Operation of Reboilers/Condensers in Air Separation Units

CGA P-8 Safe Practices Guide for Air Separation Plants

CGA P-25 Guide for Flat Bottomed LOX/LIN/LAR Storage Tank Systems

CGA PS-15 Toxicity Considerations of Nonmetallic Materials in Medical Oxygen Cylinder Valves

CGA SB-2 Definition of Oxygen Enrichment/Deficiency Safety Criteria

2.6 EIGA Documents:⁶

EIGA/IGC 4 Fire Hazards of Oxygen and Oxygen Enriched Atmospheres

EIGA/IGC 10 Reciprocating Oxygen Compressors For Oxygen Service

EIGA/IGC 13 Oxygen Pipeline and Piping Systems

EIGA/IGC 27/12 Centrifugal Compressors For Oxygen Service

EIGA/IGC 33 Cleaning of Equipment for Oxygen Service Guideline

EIGA/IGC 65 Safe Operation of Reboilers/Condensers in Air Separation Units

EIGA/IGC 73/08 Design Considerations to Mitigate the Potential Risks of Toxicity when using Non-metallic Materials in High Pressure Oxygen Breathing Systems

EIGA/IGC 115 Storage of Cryogenic Air Gases at Users Premises

EIGA/IGC 127 Bulk Liquid Oxygen, Nitrogen and Argon Storage Systems at Production Sites

EIGA/IGC 144 Safe Use of Aluminum-Structured Packing for Oxygen Distillation

EIGA/IGC 145 Safe Use of Brazed Aluminum Heat Exchangers for Producing Pressurized Oxygen

² For referenced ASTM adjuncts and standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from ASTM Headquarters, Order ADJG0088DVD.

⁴ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

⁵ Available from Compressed Gas Association (CGA), 8484 Westpark Drive, Suite 220, McLean, VA 22102, <https://www.cganet.com>.

⁶ Available from European Industrial Gases Association (EIGA), <https://www.eiga.eu/>.