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ASTM G88 - 13


Standard Guide for Designing Systems for Oxygen Service

Active Standard ASTM G88 | Developed by Subcommittee:
G04.02

Book of Standards Volume: 14.04

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Significance and Use

4.1 Purpose of Guide G88—The purpose of this guide is to furnish qualified technical personnel with pertinent information for use in designing oxygen systems or assessing the safety of oxygen systems. It emphasizes factors that cause ignition and enhance propagation throughout a system's service life so that the occurrence of these conditions may be avoided or minimized. It is not intended as a specification for the design of oxygen systems.

4.2 Role of Guide G88—ASTM Committee G04's abstract standard is Guide G128, and it introduces the overall subject of oxygen compatibility and the body of related work and related resources including standards, research reports and a video³ G04 has developed and adopted for use in coping with oxygen hazards. The interrelationships among the standards are shown in Table 1. Guide G88 deals with oxygen system and hardware design principles, and it is supported by a regulator ignition test (see G175). Other standards cover: (1) the selection of materials (both metals and nonmetals) which are supported by a series of standards for testing materials of interest

and for preparing materials for test; (2) the cleaning of oxygen hardware which is supported by a series of standards on cleaning procedures, cleanliness testing methods, and cleaning agent selection and evaluation; (3) the study of fire incidents in oxygen systems; and (4) related terminology.

TABLE 1 Role of Guide G88 with Respect to Other ASTM G04 Standard Guides and Practices and their Supporting Test Methods^A,
^B

G128 Guide to Control of Hazards and Risks in Oxygen-Enriched Systems

G88 Designing Systems for Oxygen Service

G175 Evaluating the Ignition Sensitivity and Fault Tolerance of Oxygen Regulators

G63 Evaluating Nonmetallic Materials

D2512 Compatibility of Materials With Liquid Oxygen (Mechanical Impact)

D2863 Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion (Oxygen Index)

D4809 Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method)

G72 Autogenous Ignition Temperature of Liquids and Solids in High-Pressure Oxygen Enriched Atmospheres

G74 Ignition Sensitivity of Materials to Gaseous Fluid Impact

G86 Determining Ignition Sensitivity of Materials to Mechanical Impact in Pressurized Oxygen Environments

G114 Aging Oxygen-Service Materials Prior to Flammability Testing

G125 Measuring Liquid and Solid Material Fire Limits in Gaseous Oxidants

G94 Evaluating Metals

G124 Determining the Combustion Behavior of Metallic Materials in Oxygen Enriched Atmospheres

G93 Cleaning Methods for Material and Equipment

G120 Determination of Soluble Residual Contamination in Materials and Components by Soxhlet Extraction

G136 Determination of Soluble Residual Contaminants in Materials by Ultrasonic Extraction

G144 Determination of Residual Contamination of Materials and Components by Total Carbon Analysis Using a High Temperature Combustion Analyzer

G127 Guide to the Selection of Cleaning Agents for Oxygen Systems

G122 Test Method for Evaluating the Effectiveness of Cleaning Agents

G121 Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents

G131 Cleaning of Materials and Components by Ultrasonic Techniques

G145 Studying Fire Incidents in Oxygen Systems

G126 Terminology Related to the Compatibility and Sensitivity of Materials in Oxygen-Enriched Atmospheres

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

^A ASTM D2863 is under the jurisdiction of Committee D20 on Plastics, and D4809 is under the jurisdiction of Committee D02 on Petroleum Products and Lubricants but both are used in the assessment of flammability and sensitivity of materials in oxygen-enriched atmospheres.

^B ASTM Manual 36 – Safe Use of Oxygen and Oxygen Systems can be used as a handbook to furnish qualified technical personnel with pertinent information for use in designing oxygen systems or assessing the safety of oxygen systems. However, Manual 36 is not a balloted technical standard.

4.3 *Use of Guide G88*—Guide G88 can be used as an initial design guideline for oxygen systems and components, but can also be used as a tool to perform safety audits of existing oxygen systems and components. When used as an auditing tool for existing systems, Guide G88 can be applied in two stages: first examining system schematics/drawings, then by visually inspecting the system (that is, “walking the pipeline”). Guide G88 can be used in conjunction with the materials selection/hazards analysis approach outlined in Guides G63 and G94 to provide a comprehensive review of the fire hazards in an oxygen or oxygen-enriched system **(1)**.⁵

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 and health practices and determine the applicability of regulatory requirements prior to use.*

1.3 This standard guide is organized as follows:

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2. Referenced Documents (*purchase separately*)

ASTM Standards

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 Practice for Cleaning Methods and Cleanliness Levels for Material 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 Regulators Used for Medical and Emergency Applications

NFPA Standards

NFPA 50 Standard for Bulk Oxygen Systems at Consumer Sites

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

ICS Code

ICS Number Code 11.040.10 (Anaesthetic, respiratory and reanimation equipment)

UNSPSC Code

UNSPSC Code

Referencing This Standard

Link Here

<http://www.astm.org/cgi-bin/resolver>

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