SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS1303 REV. A

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Portable Chemical Oxygen

1. SCOPE:

This SAE Aerospace Standard (AS) applies to a portable chemical oxygen generator assembly intended for the following uses:

a. First aid treatment of aircraft occupants after an emergency descent following a decompression or other emergency condition.

b. Use by cabin attendants to maintain their mobility after a decompression.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP1894	Useful Life Determination for Chemical Oxygen Generators
AS8010	Aviators Breathing Oxygen Purity Standard

2.1.2 RTCA Documents: Available from Radio Technical Commission for Aeronautics Secretariat, Suite 500, 1425 K Street, N.W., Washington, DC 20005. The latest issue of applicable RTCA documents shall apply.

RTCA/DO-160	Environmental Conditions and Test Procedures for Airborne Equipment

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http://www.sae.org/technical/standards/AS1303A

2.1.3 EUROCAE Documents: Available from EUROCAE - 11, rue Hamelin - 75783 PARIS CEDEX 16, France.

ED-14 Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments

NOTE: EUROCAE ED-14C and RTCA/DO-160C are equivalent documents. It is anticipated this equivalency will be maintained in future revisions. However, in the event of differences between future versions of these documents, the requirements stated in RTCA/DO-160 shall take precedence.

2.1.4 FAA Documents: Available from US Government Printing Office, Superintendent of Documents, Washington, DC 20402-9329.

TSO C64a Oxygen Mask Assembly, Continuous Flow, Passenger

2.1.5 ASQC Documents: Available from American Society for Quality Control, 230 Wells St., Milwaukee, WI 53203.

The ASQC Basic References in Quality Control, Volume 4: How to Perform Skip-Lot and Chain Sampling, by Kenneth S. Stephens

2.2 Related Publications:

2.2.1 NATO Publications: Available from North Atlantic Treaty Organization, Military Agency for Standardization (MAS), 1110 Brussels, Belgium. Also available from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

STANAG 3688 GGS Characteristics Of Breathable Oxygen Supplied By Chemical Solid Generators

2.3 Definitions:

CHEMICAL CORE: An object, composed of sodium chlorate or an analogous alkali metal chlorate or perchlorate, formulated with fuels, catalysts, and other modifiers and additives as required by the particular design, which evolves oxygen by a controlled chemical decomposition reaction, when actuated. Also sometimes called a chlorate candle.

CHEMICAL OXYGEN GENERATOR: A device comprising a chemical core and its surrounding mechanical enclosure, insulating material, actuation means for the chemical core, pressure relief means, and any necessary filtering means. A means of conveying evolved oxygen to the masks is also frequently included, although that function can also be fulfilled by an external manifold.

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2.3 (Continued):

CHLORATE CANDLE: An alternate term sometimes applied to a chemical core, possibly because the progress of the organized decomposition reaction along the length of the core can be likened to the burning of a candle. This term is also sometimes loosely applied to the entire chemical oxygen generator.

GENERATOR CARTRIDGE: An assembly comprising a chemical core and its surrounding mechanical enclosure, insulating material, initiation means for the chemical core, pressure relief means, and any necessary filtering means, which is designed as a replaceable component, and is intended for insertion into a reusable portable chemical oxygen device, as a means of recharging the device.

PORTABLE CHEMICAL OXYGEN DEVICE: A piece of equipment used as a portable supply of oxygen, which is produced by means of a chemical reaction. Generally comprises the oxygen generator, carrying case, oxygen mask, and all other system components, assembled in an integrated package.

SKIP-LOT SAMPLING: A method of selecting samples for inspection by applying the principles of a continuous sampling plan to a continuing series of lots or batches rather than to individual product lots. For processes having a high degree of process capability this approach can be more cost effective than conventional sampling plans. Consult the ASQC reference cited in 2.1.5 for more details regarding construction of this type of sampling plan.

STPD: Standard Temperature and Pressure, Dry. Conditions comprising a temperature of 0 °C (32 °F) and one atmosphere absolute pressure (101.3 kPa or 760 mm of Hg), dry basis (partial pressure of water vapor equals zero).

3. REQUIREMENTS:

3.1 Device Characteristics:

3.1.1 The portable chemical oxygen device should typically comprise the following components. However, alternate design features which accomplish equivalent performance are acceptable.

a. Outer Case to house the remainder of the components and to protect the user from contact with the hot inner components during operation.

b. Adjustable Carrying Strap, sufficiently large to stretch across an aircraft seat back.

c. At least one oxygen mask or other oxygen dispensing device and flexible tubing.

d. One or more replaceable oxygen generator cartridges, which generate the oxygen supply, unless the entire oxygen generator is intended as a single use device.

e. Relief valves or other relief means on each generator cartridge.

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3.1.1 (Continued):

f. Actuating mechanisms to be part of each generator assembly.

g. One or more initiators, to be part of each generator cartridge.

h. Manifold to connect multiple cartridges to the mask tubing. May be a reusable part of the generator assembly, or may be a disposable part of the generator cartridge.

i. Brackets, as necessary, for mounting the device to the aircraft.

3.1.2 Means shall be provided for determining whether the generator cartridge is expended.

3.1.3 If the design of the device is intended to accomplish sustained operation by successive replacement of generator cartridges, each generator cartridge or the housing assembly must be placarded to show:

3.1.3.1 The rate of oxygen flow, in liters per minute.

3.1.3.2 The minimum duration of oxygen flow, in minutes, for the replaceable generator cartridge.

3.1.3.3 A warning that the replaceable generator cartridge may be hot, unless the cartridge is constructed such that the surface temperature cannot exceed 37.8 °C (100 °F), when the device is operated at an ambient temperature of 21.1 °C (70 °F).

3.2 Generator Assembly Performance:

Manufacturer shall declare the intended category of installation and use, to establish the appropriate category of RTCA/DO-160 test conditions. Manufacturer shall declare any installation or stowage limitations, such as required mounting means or any required clearances.

3.2.1 Oxygen Flow:

3.2.1.1 The assembly must have the capability to supply a minimum flow rate of 4 l/min STPD of oxygen to one user.

3.2.1.2 Provision may be made in the design to permit dividing the flow, to supply 2 l/min STPD of oxygen to two users. If such provision is made, the design shall include suitable features to prevent inadvertently changing the flow supplied to a single user to 2 l/min.

3.2.1.3 Oxygen should be supplied for a duration of at least 30 min. This capability may be accomplished by having multiple cartridges. Manufacturer shall declare the minimum duration of operation for each device or cartridge.

3.2.2 Oxygen Purity: The oxygen delivered to the dispensing device shall be free of objectionable odor and smoke, and shall satisfy the applicable purity requirements defined in AS8010.

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3.2.3 Gas Temperature: The temperature of the oxygen at the mask shall not be more than 35 °C (95 °F) when the device is operating at 26.7 °C (80 °F) ambient temperature in still air.

3.2.4 Generator Assembly Outer Case Temperature: The outer case temperature shall not exceed 60 °C (140 °F) during or following operation, when the ambient temperature is 26.7 °C (80 °F) at sea level ambient pressure in still air.

3.2.5 Generator Assembly Pressure: The internal operating pressure of the generator assembly should be kept at the lowest practical level consistent with design performance requirements.

3.2.6 Generator Assembly Orientation: The assembly shall be designed to operate properly under the range of conditions specified herein when employed in all orientations.

3.2.7 Generator Assembly Leakage: Allowable leakage of oxygen from the assembly during operation shall not exceed 10 ml/min STPD. Flow through the oxygen outlet manifold or through the relief valve, when such flow is in accordance with the intended functioning of the design, shall not be considered leakage within the meaning of this paragraph.

3.2.8 Relief Valve Performance: The relief valve or other pressure relief means shall protect the generator from any harmful over-pressurization. Flow from the relief means during operation shall not be considered a malfunction, so long as performance requirements are met in spite of such flow condition.

3.3 Generator Environmental Performance:

3.3.1 The assembly shall operate as specified herein when actuated, across the full range of operating conditions anticipated to be encountered in the declared category of installation and use. In addition, the generator shall not experience premature actuation or performance degradation as a result of exposure to operating and storage conditions anticipated to be encountered in the intended application.

3.3.2 The assembly shall operate over the range of environmental operating conditions applicable to the declared category of installation as specified in RTCA/DO-160. At a minimum, environmental operating conditions which must be satisfied include: operating low temperature, operating high temperature, altitude (including decompression and overpressure), operational shock, and operational vibration.

3.3.2.1 In the case of short term operating high temperature, the generator may operate at an accelerated flow rate, but must not exhibit any dangerous malfunction.

3.3.3 The assembly shall not experience premature actuation or performance degradation as a result of exposure to operating and storage conditions applicable to the declared category of installation as specified in RTCA/DO-160. At a minimum, conditions which must be satisfied include ground survival low temperature, ground survival high temperature, altitude, humidity, and operational shock and vibration. Beyond these minimums, special conditions may include fluids, sand and dust, fungus, salt spray, or others, as required by the application.

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3.4 Generator Safety Performance:

3.4.1 The design of the assembly shall be such that failure or any malfunction causing performance degradation below the minimum specified level shall not create a hazardous condition by reason of its mode of failure or by the direct effect of such failure on the aircraft, related equipment, or personnel.

3.4.1.1 No hazardous condition shall result from actuation of the generator in its installed location with its container closure not opened and the generator and mask in the stowed condition. This requirement shall apply only to installations which conform to the installation requirements and limitations declared by the manufacturer.

3.4.2 Crash Safety: 3.4.2.1In all declared installation conditions (stowed), the design of the device shall satisfy the crash safety shock requirements of RTCA/DO-160. In the event the device is subjected to a shock of the magnitude defined in the crash safety shock requirements, subsequent normal operation is not required.

3.4.2.2 In the event the device is subjected to a shock of the magnitude defined in the crash safety shock requirements while operating, continued normal operation is not required, but the shock shall result in no release of burning or molten core material. In the event the device is not operating, exposure to crash shock shall not cause self actuation.

3.4.3 Drop Test: The generator assembly shall be dropped once from a height of two meters onto a rigid surface, with initial impact occurring on any of the six major faces without actuation occurring. After being dropped, the equipment may display evidence of damage, but must operate normally when subsequently actuated, regardless of which face incurred the impact.

3.4.3.1 If the device is subjected to a two meter drop while in operation, continued normal operation is not required, but the shock shall result in no release of burning or molten core material.

3.5 Generator Reliability Performance:

3.5.1 The design shall be capable of maintaining an appropriate degree of reliability throughout the useful life of the device. The predicted reliability shall be stated by the manufacturer.

3.5.2 The predicted useful life shall be stated by the manufacturer. ARP1894 offers guidance regarding useful life determination.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Qualification Tests:

4.1.1 Qualification tests shall be conducted using assemblies which are representative of serial production.

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