Designation: F307 – 13

Standard Practice for Sampling Pressurized Gas for Gas Analysis[1]

This standard is issued under the fixed designation F307; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice describes procedures for obtaining a sample of pressurized gas for gas analysis from a system or component.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *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 limitations prior to use.* For hazard statement, see Section 6.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F310 Practice for Sampling Cryogenic Aerospace Fluids

G93 Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments

3. Terminology

3.1 *Definitions:*

3.1.1 *sample port*—the designated point in a system or component from which a representative gas sample may be taken.

4. Summary of Practice

4.1 *Evacuated Sample Vessel Procedure*—A sample pressure vessel is evacuated and sealed with a minimum vacuum pressure of 10^{-3} torr. The vessel is then attached to the designated pressurized sample port. The pressurized gas is allowed to enter the sample vessel until the pressure is equal to the pressure of the system or component. The pressure is secured and the sample vessel assigned for appropriate analysis.

4.2 *Purged Sample Vessel Procedure*—The pressurized gas sample port is opened to establish a low level purge. A sample vessel with valves opened at each end is attached to the pressurized sample port. The pressurized sample port is opened and the purge pressure is increased to completely purge the vessel prior to sample capture. The vessel valves and sample port valves are then closed and the sample vessel delivered for analysis.

5. Apparatus

NOTE 1—All apparatus used in the sample taking should be verified as cleaned and packaged within the requirements of the allowable contamination of the system.

5.1 *Connecting Lines,* rigid or flexible, pressure rated and identified within recognized safety codes.

5.2 *Miscellaneous Fittings,* as needed for sampling point adaption.

5.3 *Tie-downs,* suitable for sample line restraint in accord with pressure, temperature, and recognized safety codes.

5.4 *Gas Sample Vessel,* rated for the appropriate maximum and minimum pressure for the gas analysis method to be used. This vessel should have valves at inlet and outlet to enable lockup of vacuum or pressure. (See Fig. 1.)

NOTE 2—The gas sample vessel capacity is selected in accord with desired sample volume. For evacuated vessel sampling, a recommended 8-L (500-in^3) volume has been determined adequate to aerospace industry. Evacuated sample vessels should be helium leak tested prior to use.

6. Safety Hazards

6.1 Personnel must stand clear of exiting gas.

6.2 Ear protection must be used when gas flow approaches sonic velocity.

6.3 All lines and associated equipment must be connected and operated within the requirements of recognized safety codes.

[1] This practice is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination. ASTM Committee D02 on Petroleum Products and Lubricants maintains a continued interest in this practice and will make use of it in the future.

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[2] For referenced ASTM 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.

FIG. 1 Gas Sample Vessel.

6.4 Access to the sampling area should be restricted to involved personnel during sampling.

6.5 No welding, heat, or spark-producing operations are allowed in an area where sampling of reactive gases such as hydrogen or oxygen is to take place. Brass (non-sparking) tools and non-static coverall or clothing should be used.

6.6 When sampling pressurized oxygen, the sampling vessel, connecting lines, and fittings must be constructed of materials that are compatible with oxygen at the concentration and pressure being sampled. All sampling components must be cleaned to the cleanliness standards outlined in Practice G93 to prevent flash fires or explosions. Rust and dirt particles are known to cause flash fires within oxygen lines when the particles impact valves or bends in the sampling lines. Organic material such as solvents or even the oil from skin can react violently with pressurized oxygen leading to an explosion. A recommended procedure for cleaning oxygen system sampling components is shown in Practice F310.

7. Evacuated Sample Vessel Procedure

7.1 Establish and maintain a minimum purge at the sample port.

7.2 Connect one end of a suitable connecting line to the sample port, and continue to purge.

7.3 Install a tie-down as required for safety code.

7.4 Continue to purge and connect the other end of sample line to sample vessel inlet.

7.5 Open sample vessel inlet valve.

7.6 Increase purge until system pressure is equalized in sample vessel.

7.7 Open outlet valve and purge for 1 s, then close and secure outlet valve.

7.8 Close and secure inlet valve.

7.9 Reduce system pressure to minimum purge and disconnect sample line from sample vessel.

7.10 Disconnect sample line from sample port and secure system.

7.11 Identify sample vessel and contents to required safety codes and analysis procedure.

7.12 Deliver sample vessel to analysis facility for required analyses, such as impurities by gas chromatography, particle counts, moisture content, or other desired properties.

8. Purged Sample Vessel Procedure

8.1 Establish and maintain a minimum purge at the sample port.

8.2 Connect one end of a suitable connecting line to the sample port, and continue to purge.

8.3 Install a tie-down as required for safety code.

8.4 Open the sample vessel valves at each end to release any pressure.

8.5 Connect the other end of the sample connecting line to the sample vessel inlet.

8.6 Increase purge pressure until system pressure is adequate to evacuate and purge the sample vessel.

8.7 Maintain the sample vessel purge for a minimum of 2 min.

8.8 Close and secure the sample vessel outlet valve to capture the sample. Once the pressure has equalized, close and secure the sample vessel inlet valve.

8.9 Reduce pressure at the sample port to minimum purge and disconnect sample line from sample vessel.

8.10 Disconnect sample line from sample port and secure system.

8.11 Identify sample vessel and contents to required safety codes and analysis procedure.

8.12 Deliver sample vessel to analysis facility for required analyses, such as impurities by gas chromatography.

9. Keywords

9.1 gas analysis; gas sampling; pressurized gas