



AEROSPACE STANDARD

AS611™**REV. F**

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Superseding AS611E

Hose Assembly and Tubing, Polytetrafluoroethylene, Cleaning Methods for

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE

1.1 This SAE Aerospace Standard (AS) describes cleaning methods for four cleanliness levels of polytetrafluoroethylene hose assemblies and rigid tube assemblies for use in aerospace systems.

1.2 Classification

Class 0	Cleaning, Hydraulic & Other General Purpose Applications
Class I	Cleaning, Moderate Clean Hydraulic & Similar Applications
Class II	Cleaning, Oxygen and Similar Applications
Class III	Cleaning, Highly Reactive Fluid Systems

2. APPLICABLE DOCUMENTS

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be the issue in effect on the date of the purchase order. In 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 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP598 Aerospace Microscopic Sizing and Counting of Particulate Contamination for Fluid Power Systems

AMS-T-22085 Tapes, Pressure-Sensitive, Adhesion, Preservation and Sealing

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 2109 Methods of Test for Non Volatile Matter in Halogenated Organic Solvents and Their Admixtures

ASTM D 4080 Standard Specification for Trichloroethylene, Technical and Vapor-Degreasing Grade

ASTM D 4101 Standard Specification for Propylene Plastic Injection and Extrusion Materials

ASTM D 4126 Standard Specification for Vapor-Degreasing Grade and General Solvent Grade 1,1,1-Trichloroethane (R 1990)

ASTM D 4376 Standard Specification for Vapor-Degreasing Grade Perchloroethylene

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

A-A-59282 Chemical, Analytical, General Description

A-A-53880 Alcohol, USP

MIL-PRF-680 Degreasing Solvent

A-A-59503 Nitrogen, Technical

TT-I-735 Isopropyl Alcohol

A-A-1689 Tape, Pressure-Sensitive Adhesive (Plastic Film)

MIL-PRF-27401 Propellant Pressurizing Agent, Nitrogen Gas

MIL-C-81302 Cleaning Compound, Solvent, Trichlorotrifluoroethane

MIL-PRF-81705 Barrier Materials, Flexible, Electrostatic Protective, Heat Sealable

MIL-STD-889 Metals, Definition of Dissimilar

2.4 ANSI/ASQC Standards

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036- 8002, Tel: 212-642-4900, www.ansi.org.

ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

3. TECHNICAL REQUIREMENTS

3.1 Cleaning/Preservation

Cleaning and cleanliness pertain only to the wetted surfaces (fluid passage) of the polytetrafluoroethylene hose assemblies. Cleaning tools and equipment shall remove dirt, dust, grit, rust, corrosion, flux, oil, grease and other contaminants, to achieve the cleanliness levels specified under 4.2 and in Table 4. It is particularly important to avoid the entrapment of injurious particles or fluids.

3.1.1 Cleaning Equipment

Equipment and fluids used for the final cleaning procedures shall be of such purity that they will not cause residual contaminant particles larger than final permitted particle size to be deposited in the final rinsing fluids and drying gases. Adequate cleanliness and filtration of new gases and liquids, as well as reusable materials, shall be maintained to insure the attainment of the above objective.

3.1.2 Water

Water used for Class 0 cleaning or as a carrier for detergents shall be clean, grease-free water, containing less than 50 ppm suspended or dissolved solids. The use of water containing impurities which would react chemically with any part of the components, or with the dissolved cleaning compound, is prohibited. . Distilled water or water that has been passed through a 5 micron filter may be used as an acceptable alternate for deionized or demineralized water if it demonstrates a chlorination level below 200 ppm as measured by the local municipality or from samples collected at the point of use on quarterly basis. Water used for testing or for final flushing or cleaning of Class I, II, or III hose assemblies shall be deionized or demineralized water and shall have a specific resistance of at least 50 000 Ω . Distilled water may be used as an acceptable alternate for deionized or demineralized water.

3.1.3 Cleaning Fluids

Cleaning fluids such as ASTM D 4080 Trichloroethylene, ASTM D 4126 Trichloroethane, ASTM D 4376 Perchloroethylene, MIL-C-81302 Trichlorotrifluoroethane and P-D-680 Stoddard's solvents may be used at the supplier's discretion, provided that the cleaned items meet the requirements listed in this specification. Hydrofluoroether (3M™ HFE-7100, other grades should be tested for compatibility) fluids may be used, provided that the cleaned items meet the requirements listed in this specification. Chlorinated solvents are not recommended for use in cleaning of titanium alloys which will see service temperature above 500 °F.

3.1.4 Aqueous/Semi-Aqueous Solutions

Alkaline surfactants, non-ionic wetting agents, emulsifiers, detergents (such as trisodium phosphate) and combinations thereof may be used. The pH of the solutions shall be maintained between 8.0 and 12.0. Foaming should be minimized to increase efficiency. The cleaning cycle should be followed by thoroughly rinsing all wetted surfaces with water per 3.1.2 to remove traces of the cleaning solution when dried. Organic solvents such as terpenes, high boiling point alcohols, and petroleum distillates may also be used. Specific process requirements should be obtained from the manufacturer. All aqueous/semi-aqueous cleaning methods should be followed by a final drying operation with purging gases per 3.2 or a suitable oven dry. The use of physical agitation or ultrasonic energy may be beneficial in increasing the efficiency of cleaning methods which utilize aqueous/semi-aqueous solutions.

3.1.5 Preservation Materials

a. Caps and Closures, Threaded

The type closure used for an intimate barrier shall be selected to resist corrosion, deterioration or loosening and shall prohibit installation of the hose assembly unless the closure is removed. Fully threaded, hard plastic caps (high density polyethylene, polypropylene per ASTM D 4101 or acetal copolymer materials are preferred). When metallic closures are used, they shall have a machined or rolled thread or shall be fabricated from a sufficiently hard material to prevent shaving. Metallic closures shall be of a material similar to that of the hose fitting. Similar and dissimilar metals are defined in MIL-STD-889. The closures shall be at least as clean as the internal surfaces of the hose assembly onto which they are installed.

b. Bags, Tubing, and Film - Intimate Barrier

Intimate barrier bags, tubing, and film may be used as an alternative for threaded caps and closures. Materials shall be transparent thermoplastic, low sloughing, anti-static polyamide (modified nylon 6) without talc or starch slip agents; minimum thickness of 2 mil. The bag, tubing, or film shall be at least as clean as the internal surfaces of the hose assembly onto which they are installed.

c. Tape

Material shall be per A-A-1689 or MIL-T-22085 and is used to secure the intimate barrier bag, tubing, or film to the hose assembly. The tape may also be used to close the open ends of bags, tubing, or film when used for an outer barrier.