SAE The Engineering Society For Advancing Mobility Land Sea Air and Space ®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 1539

Issued AUG 1996

CLEANING COMPOUND, TERPENE
Circuit Board Cleaner

1. SCOPE:

1.1 Form:

This specification covers a terpene base solvent cleaner in the form of a liquid, which forms a transient emulsion with water.

1.2 Application:

The cleaner has been used typically for the removal of residual soldering flux and polar and non-polar contaminants from component populated circuit boards subsequent to soldering operations, but usage is not limited to such applications. The cleaner is used in in-line and batch cleaning systems with provisions for spray-under-immersion, ultrasonic immersion or immersion-spin cleaning, and with provisions for a water rinse.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

1.4 Precautions:

Repeated contact with the skin can cause irritation. Use of solvent resistant gloves and eye shield protection is recommended. The cleaner is combustible and is a Class II liquid based on National Fire Protection Association (NFPA) Standards.

1.4.1 Conventional industrial aqueous cleaning equipment systems are not suitable for use with cleaning compound covered by this specification.

1.4.2 Marking inks for use on circuit boards, components, and other parts to be cleaned in terpene cleaning compounds should be of the cross-linked or polymerizing type.

1.4.3 Components, used on circuit boards to be cleaned in terpene cleaners must be capable of complete immersion in water in that thorough water rinsing is required for removal of residual cleaning compound.

1.4.4 Use of silicone rubber, natural rubber, neoprene rubber, rubber based adhesives, styrene, or polyvinyl chloride resins on circuit board assemblies or other parts, to be cleaned using cleaner in accordance with this specification, must be evaluated for compatibility with the cleaner.

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 publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

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

AMS 2825 Material Safety Data Sheets

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 93 Flash Point by Pensky-Martens Closed Tester
ASTM D 445 Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D 891 Specific Gravity of Liquid Industrial Chemicals
ASTM D 1078 Distillation Range of Volatile Organic Liquids
ASTM E 70 pH of Aqueous Solutions with the Glass Electrodes
ASTM E 1194 Vapor Pressure

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

2.4 IPC Publications:

Available from IPC, 7380 N. Lincoln Avenue, Lincolnwood, IL 60640

IPC-TR-580 Cleaning and Cleanliness Test Program, Phase 1

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall be a terpene based hydrocarbon/surfactant blend, colorless to slightly yellow liquid. Composition of the cleaning compound shall be optional, but shall provide a product meeting the requirements of 3.2.

3.1.1 Toxicity: The product shall not produce vapors in such concentration as to become a medical hazard to personnel when used in accordance with manufacturer's recommendations for its intended use.

3.2 Properties:

The cleaning compound shall conform to the requirements shown in Table 1; tests shall be performed in accordance with specified test methods on the product supplied.

TABLE 1 - Requirements

Paragraph	Property	Requirement	Test Method
3.2.1	Flash Point, Closed Cup, minimum	49°C ± 3 (120 °F ± 5)	ASTM D 93
3.2.2	Vapor Pressure, 77 °C (25 °C)	≤ 2.0 mm Hg	ASTM E 1194
3.2.3	Nonvolatile Residue	≤ 0.5%	4.5.1
3.2.4	Specific Gravity, 77 °F (25 °C)	0.85 ± 0.02	ASTM D 891
3.2.5	Viscosity at 77 °F (25 °C)	0.8 m ± 0.05 Pa·s	ASTM D 445
3.2.6	pH, 5% dispersion in water	5 to 7	ASTM E 70
3.2.7	Boiling Point	365 °F ± 25 (185 °C ± 15)	ASTM D 1078
3.2.8	Storage Stability	No change in properties	4.5.2
3.2.9	Emulsion Separation Time	Pass	4.5.3
3.2.10	Ionics and Residual Flux Removal	Pass	4.5.4

3.3 Quality:

The cleaning compound as received by purchaser shall be homogeneous, uniform in quality and condition, and free from foreign materials and from other contaminants detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of cleaning compound shall supply all samples and shall be responsible for performance of all required tests. Purchaser reserves the right to sample and perform any confirmatory testing deemed necessary to ensure that the cleaning compound conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Flash point (3.2.1), nonvolatile residue (3.2.3), and emulsion separation time (3.2.9) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Vapor pressure (3.2.2), specific gravity (3.2.4), viscosity (3.2.5), pH (3.2.6), and boiling point (3.2.7) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified.

4.2.3 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product to the purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2 and when purchaser deems confirmatory testing to be required. Preproduction approval shall not be withheld pending completion of the storage stability (3.2.8) test.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 Sufficient cleaning compound shall betaken at random from each lot to perform all required tests.

4.3.1.1 A lot shall be all the cleaning compound produced in a single production run from the same batch of raw materials, under the same fixed conditions and presented for manufacturer's inspection at one time.

4.3.1.2 The contents of each container selected for sampling shall be thoroughly mixed prior to sampling.

4.4 Approval:

4.4.1 Cleaning compound shall be approved by purchaser before cleaning compound for production use is supplied, unless such approval be waived by purchaser. Results of tests on production cleaning compound shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production cleaning compound which are essentially the same as those used on the approved sample. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample cleaning compound. Production cleaning compound shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Tests to determine conformance to the technical requirements shall be conducted in accordance with the following; standard laboratory test condition shall be 25 °C ±1 (77 °F ± 2) and 55% ± 5 relative humidity. All laboratory tests shall be conducted at standard conditions unless otherwise specified herein.

4.5.1 Nonvolatile Content: Shall be determined by transferring approximately two grams of the cleaning compound to a tared glass dish. Weigh the cleaning compound and glass dish to the nearest milligram. Place the sample in a vacuum oven at 30 inches ± 1 (762 mm ± 25) Hg for 2 hours ± 5 minutes at 65 °C ± 5 (140 °F ± 9) followed by heating in a circulating air oven at 105 °C ± 3 (221 °F ± 5) and holding at heat for 30 minutes ± 1 at atmospheric pressure. Remove the sample from the oven and cool to room temperature in a desiccator. Reweigh the sample. Percent nonvolatile content shall be determined from the average of three samples, calculated using Equation 1.

$$\text{Percent Nonvolatile} = \frac{W_3 - W_1 \times 100}{W_2 - W_1} \qquad \text{(Eq. 1)}$$

where:

W_1 = weight of tared glass dish
W_2 = weight of glass dish and cleaning compound
W_3 = weight of sample and glass dish after testing

4.5.2 Storage Stability: The cleaning compound, as supplied, shall be stored at room temperature in original unopened shipping container. After 12 months of storage, the cleaning compound shall show no evidence of color change, separation, or formation of precipitate and shall conform to the requirements of 3.2.