AEROSPACE STANDARD

AS8660™	REV. A

Issued 1999-07
Cancelled 2020-09

Superseded by AMS8660

Silicone Compound
NATO Code Number S-736

FSC 6850

RATIONALE

AMS8660 was issued April 2018 to supersede AS8660, originally issued in July of 1999. In 1999, AS8660 was taken directly from U.S. Military Specification MIL-S-8660C, Amendment 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. Revisions in the initial release of AMS8660 include updates to referenced standards, required testing, and testing procedures to current methods. It is the recommendation of AMS-M to cancel AS8660 with suppression to AMS8660.

CANCELLATION NOTICE

This Technical Report has been declared “CANCELLED” as of September 2020 and has been superseded by AMS8660. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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NOTICE

This document has been taken directly from U.S. Military Specification MIL-S-8660C, Amendment 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-S-8660C, Amendment 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE:

1.1 Scope:

This specification covers one type of a nonmelting, heat stable silicone compound for use in high tension electrical connections, ignition systems and electronics equipment; for application to unpainted mating threaded or non-threaded surfaces, and as a lubricant for components fabricated from rubber. This compound is effective in the temperature range from -54°C (-65°F) to +204°C (+400°F) for extended periods and to 260°C (500°F) for short periods. This compound is identified by NATO symbol S-736 (see 6.5).

2. APPLICABLE DOCUMENTS:

2.1 Government documents:

2.1.1 Specifications, standards, and handbooks: Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-A-548	Antifreeze/Coolant, Engine, Ethylene Glycol, Inhibited, Concentrated
O-G-491	Glycerol, Technical (High Gravity)
QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-B-613	Brass, Leaded and Non-Leaded, Flat Products, (Plate, Bar, Sheet and Strip)
QQ-C-502	Copper Rods and Shapes, and Flat Products with Finished Edges (Flat Wire, Strips and Bars)
QQ-L-201	Lead Sheet
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-S-571	Solder, Tin Alloy, Lead-Tin Alloy, and Lead Alloy
QQ-Z-301	Zinc Sheet and Strip
TT-I-735	Isopropyl Alcohol

MILITARY

MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-E-463	Ethyl Alcohol (For Ordnance Use)
MIL-E-480	Enamel, Baking, Phenol-or-Urea-Formaldehyde
MIL-I-631	Insulation, Electrical, Synthetic-Resin Composition, Non-rigid
MIL-R-3065	Rubber, Fabricated Parts
MIL-C-3702	Cable, Power, Electrical, Ignition, High Tension
MIL-S-5059	Steel, Corrosion Resistant (18-8), Plate, Sheet and Strip
MIL-I-24092	Insulation Varnish, Electrical, Impregnating, Solvent Containing

2.1.1 (Continued):

STANDARDS

FEDERAL

FED-STD-313 Material Safety Data Sheets Preparation and the Submission of
FED-STD-791 Lubricant, Liquid Fuel and Related Products, Methods of Testing

MILITARY

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-290 Packaging of Petroleum and Related Products

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications:

The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM A 569 Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
ASTM D 149 Dielectric Breakdown, Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 150 A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D 217 Cone Penetration of Lubricating Grease
ASTM D 257 D-C Resistance or Conductance of Insulating Materials
ASTM D 495 High Voltage, Low Current, Dry Arc Resistance of Solid Electrical Insulation
ASTM D 1478 Low-Temperature Torque of Ball Bearing Greases

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC (SAE)

AMS 4377 Sheet and Plate - 3.0 AL 1.0 Zn

(Application for copies should be addressed to SAE, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence:

In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS:

3.1 Qualification:

The silicone compound furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.2 Materials:

The materials used in the formulation of the silicone compound shall be of high quality and suitable for the intended use. The final product shall be a smooth, non-lumpy grease-like compound.

3.2.1 Toxicity: The material shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an adviser to the contracting agency.

3.2.2 Color: In its natural form, the compound shall be translucent and of a color similar to light gray or cream. When specified (see 6.2c), a dye or pigment may be incorporated in the material provided the finished compound meets the requirements of this specification in all other respects.

3.3 Performance characteristics:

3.3.1 Physical properties: Physical properties of the silicone compound shall be in accordance with the requirements in Table I.

3.3.2 Waterproof sealing: When tested as specified in 4.6.9, the test paper discs from 3 of the 5 tests shall show no pink coloration. Color changes within 1/8 inch of the edges of the test discs shall be disregarded.

3.3.3 Electrical properties: Electrical properties of the silicone compound shall be in accordance with Table II.

3.3.4 Storage stability: Unworked and worked penetration of the compound after the 6 months of storage at 37.8 ± 3°C (100 ± 5°F) as specified in 4.6.14 taken at 25 ± 1°C (77 ± 2°F) shall conform to the requirement in Table I.

3.3.5 Workmanship: The compound shall be processed to produce a homogeneous mixture free from lumps, cakes, abrasives, and foreign materials.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection:

The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection:

The qualification inspection shall consist of all the requirements and tests specified in Tables I and II.

4.3.1 Qualification inspection sample: The qualification inspection sample shall consist of 10 pounds of the compound packaged as specified in Section 5 of this specification. The sample shall be forwarded to the qualifying laboratory, Commander, Naval Air Development Center, Attention: Aircraft and Crew Systems Technical Directorate (6062), Warminster, PA 18974. The sample shall be plainly and durably marked with the following information:

Sample for qualification inspection
SILICONE COMPOUND, NATO CODE NUMBER S-736
MIL-S-8660C
Name of manufacturer
Product code number
Date of manufacture
Submitted by (name) (date) for qualification inspection in accordance with the requirements of MIL-S-8660C under authorization (reference authorizing letter) (see 6.3).

4.3.2 Manufacturer's data: Two copies of the manufacturer's test report, containing complete test data showing that material submitted for qualification conforms to the requirements of this specification, shall be submitted with the qualification sample. The location and identity of the plant which produced the sample tested shall also be supplied. Material safety data sheets on toxicity (see 3.2.1) shall be prepared in accordance with FED-STD-313 and submitted to the qualifying laboratory (see 4.3.1).

4.3.3 Retention of qualification: In order to retain qualification of a product approved for listing on the qualified products list (QPL), the manufacturer shall verify by certification to the qualifying activity, that the manufacturer's product complies with the requirements of this specification. The time of periodic verification by certification shall be in two-year intervals from the date of original qualification. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

4.4 Quality conformance inspection:

4.4.1 Lot information: Unless otherwise specified herein or in the contract, a lot shall consist of all the silcone compound manufactured as one batch (see 6.4), forming part of one contract or order and submitted for inspection at one time.

4.4.2 Sampling for quality conformance inspection:

4.4.2.1 Sampling for tests: Two-5 pound samples of silicone compound shall be randomly selected from each lot and tested as specified in 4.4.3.1.

4.4.2.2 Sampling for packaging:

4.4.2.2.1 Unit container: A random sample of filled containers shall be selected from each lot in accordance with Inspection Level I of MIL-STD-105 and examined as specified in 4.4.3.2. The lot size shall be the total number of unit containers.

4.4.2.2.2 Shipping containers: Shipping containers, just prior to closure, shall be randomly selected from each lot in accordance with Inspection Level I of MIL-STD-105 and examined as specified in 4.4.3.2. The lot size shall be the total number of shipping containers.

4.4.3 Testing and examination of quality conformance samples:

4.4.3.1 Testing: The sample selected in 4.4.2.1 shall be tested to the requirements in Table III on a lot by lot basis or once in ten lots as specified in that table. Nonconformance of a test specimen to a single requirement in Table III shall be cause to reject the lot represented by the sample. Should the failure occur in a one in ten lot examination, the Government may, at its option, require testing on each subsequent lot.

4.4.3.2 Packaging: Samples selected in 4.4.2.2.1 and 4.4.2.2.2 shall be examined to the requirements in MIL-STD-290 and Table IV. The acceptable quality level (AQL) for this examination shall be 4.0 percent defective.

4.5 Test conditions:

4.5.1 Standard conditions: Standard laboratory conditions shall be 25°C ± 1°C (77° ± 2°F) with a relative humidity (RH) of 50 ± 5 percent. Unless otherwise specified in the test method, testing of the silicone compound shall be at standard conditions.

4.5.2 Specimen preparation: Unless otherwise specified, the compound shall be examined and tested as taken from the container without treatment or preconditioning of any kind. However, if the compound contains air bubbles, they shall be removed before testing by subjecting the compound to vacuum and heat.

4.6 Test methods:

4.6.1 Appearance: The silicone compound shall be visually examined for conformance to 3.2 and 3.2.2.

4.6.2 Insolubility: A determination of the compounds insolubility in solvents shall be made using distilled water, isopropyl alcohol (TT-I-735) diluted with water to 90% by weight, ethyl alcohol (MIL-E-463), ethylene glycol (0-A-548) and glycerine (0-G-491).

4.6.2.1 Procedure: Approximately 3 grams of the compound, accurately weighed, shall be smeared around the inside of a weighed glass beaker, 250 ml capacity. Prepare 16 specimens in this manner. Three for each solvent (4.6.2) and one to act as control during the drying operation. Approximately 100 ml of the solvent, or enough to immerse the compound, shall be poured into the container. The container shall be tightly capped with metal foil and left to stand for a period of 7 days at standard conditions. At intervals of approximately 24 hours, the solution shall be stirred by moderate manual rotation of the container. At the end of the 7 day period, the solvent shall be poured off, and the container and compound rinsed carefully with successive washes of distilled water until all solvent has been removed. The container and compound shall be dried for 20 hours in an oven at 70° ± 1°C (160° ± 2°F) followed by drying over calcium chloride in a suitable desiccator. The degree of solubility in each solvent shall not exceed the requirement in Table I.

4.6.3 Penetration: Penetration of the compound, worked and unworked, shall be determined in accordance with ASTM D 217, except that the worked and unworked temperatures shall be those specified in Table I. Two specimens shall be tested for each temperature condition.

4.6.4 Flammability: A 10 gram specimen of the sample shall be placed on a 10 to 20 mesh stainless steel screen. The areas covered by the specimen shall be approximately 1 inch in diameter. The areas covered by the specimen shall be approximately 1 inch in diameter. The underside of the screen shall be cautiously heated with a Bunsen burner in a manner that will not cause the flame to project through or above the screen. As soon as the compound begins to decompose or volatilize, a second burner shall be used to ignite the vapors evolved. The material will be considered non-flammable if the burning ceases as both burners are withdrawn from the screen. Heating shall be continued until the sample is at a red heat; and both upper and under surfaces shall be examined for a self supporting flame. Two specimens shall be tested.

4.6.5 Corrosive effect: Corrosive effect of the silicone compound against various metals, combinations of metals, and non-metals shall be determined as specified in 4.6.5.1 through 4.6.5.2.

4.6.5.1 Specimen preparation:

4.6.5.1.1 Metals: All metal strips in Table V, except cadmium plated steel, shall be polished to a bright finish, swabbed with a hot suitable chemically pure solvent, followed by two successive 5 minute immersions in the same hot solvent. Each dry polished strip shall be coated with the silicone compound. Combination of metals to be mated are identified in footnote 1/ of Table V. The mated metals and remaining individual metal strips shall be exposed as specified in 4.6.5.2. The number of strips in Table V will yield two test specimens for each kind of metal.

4.6.5.1.2 Non-metals: All non-metal materials shall be wiped with a dry clean, lintless cloth. Three specimens for each material identified in Table V are required. The silicone compound shall be coated on two specimens of each material, with the third piece acting as a control. All specimens shall be exposed as specified in 4.6.5.2.

4.6.5.2 Procedure: All specimens shall be placed in a convection current air oven maintained at 100°C ± 1°C (212° ± 2°F) for a period of 70(+1, -0) hours. Upon completion of the exposure period, all specimens shall be removed from the oven, wiped gently with a soft dry cloth to remove the compound (all mated strips shall be disassembled). Each specimen shall be visually examined for evidence of corrosion or degradation as specified in Table I. Change in hardness of the rubber specimens (compared to control) shall be determined using a Shore A durometer. The remaining non-metal specimens shall be given a scratch test, using a metal spatula, to determine apparent hardness changes.

4.6.6 Volume change: The percent change in volume of a rubber specimen due to swelling effect of the silicone compound shall be determined in accordance with Method 3603 of FED-STD-791, using the standard rubber NBR-L (see 6.6 and Table I) within 6 months of date of manufacture.

4.6.7 High temperature weight loss (evaporation and bleeding): The compound shall be tested in accordance with Method 321 of FED-STD-791, except as follows:

a. Cone shall be suspended from a rod supported on the edges of the beaker without covering the beaker.
b. Oven temperature shall be 204° ± 6°C (400° ± 10°F).
c. Time shall be 30(+1, -0) hours.

4.6.7.1 Evaporation: The loss in weight of the entire assembly, after 30 hours at the test temperature, divided by the weight of the sample used, multiplied by 100 shall be reported as the percent evaporation.

4.6.7.2 Bleeding: The gain in weight of the beaker divided by the weight of the sample used, multiplied by 100 shall be reported as the percent bleeding.

4.6.8 Low temperature torque: Torque properties shall be determined in accordance with ASTM D 1478 at -54° ± 1°C (-65° ± 2°F) with a 60 minute running time.

4.6.9 Waterproof seal: Five 7/8 inch disks of filter paper shall be dipped in a 25 percent by weight aqueous solution of cobaltous chloride, blotted off to remove excess solution and then dried at 105° ± 1°C (221° ± 2°F) until completely blue. The test paper disks shall then be placed in five Norma-Hoffman bomb oxidation dishes and the dishes filled with compound to be tested, avoiding incorporation of air bubbles. After leveling off the compound to the height of each dish, the latter shall be immersed in water at 25° ± 3°C (77° ± 5°F) for 24 hours, at the end of which time, the test paper disks shall be examined for development of a pink color.

4.6.10 Dielectric strength: Dielectric strength shall be determined in air at 23° ± 2°C (73.4° ± 3.6°F) and 50 ± 5 percent RH and in accordance with ASTM D 149, except that 172 inch hemispherical electrodes shall be rigidly mounted with the axis in a horizontal plane, in a suitable apparatus. The electrodes shall be pressed into the compound in order to form the specified electrode gap. For lot inspection testing, an electrode gap of 0.050 inch shall be used.

4.6.11 Volume resistivity: Volume resistivity shall be determined in accordance with ASTM D 257, at 23° ± 2°C (73.4° ± 3.6°F) and RH of 50 ± 5 percent. Test electrodes shall be in accordance with Figure 1. Extreme care should be exercised to avoid trapping air bubbles in the compound.

4.6.12 Dielectric constant and dissipation factor: Dielectric constant and dissipation factor shall be determined in accordance with ASTM D 150 with the compound spread in a layer 1/8 inch thick on the fixed electrode plate of the apparatus shown in Figure 1, using extreme care to avoid trapping air bubbles in the compound. The compound shall then be exposed to a temperature of 23°C ± 2°C (73.4° ± 3.6°F) and a RH of 50 ± 5 percent for 24 hours. At the end of this period, the compound shall be tested at frequencies of 1 kilohertz (KHz), 1 megahertz (MHz), and 10 MHz for measurements of dissipation factor and dielectric constant. This test shall be performed in a suitable apparatus where the ratio of surface to thickness of compound layer is sufficient to give a capacitance of not less than 70 microfarads.

4.6.13 Arc resistance: The arc resistance time shall be determined in air at 23°C ± 2°C (73.4° ± 3.6°F) and a RH of 50 ± 5 percent RH in accordance with ASTM D 495, except that the test shall be conducted using a 1/8 inch layer of the compound spread on a layer of thermal glass, such as quartz, Pyrex, etc. The electrodes shall consist of two tungsten rods 0.186 inch diameter, with tips 0.060 inch in diameter, which have conical points with a 60 degree included angle. The electrodes shall be mounted to an insulated block at 45 degrees to the vertical, and shall be adjusted to give a gap of 0.320 inch. Both electrodes shall be in the same horizontal and vertical planes. The arc electrodes shall be cleaned with a soft clean cloth dampened with alcohol, then dried with a soft, clean dry cloth before each determination. The time in seconds from the start of test until failure of the material shall be recorded as the measure of the arc resistance of the compound. Failure shall be considered to have occurred at the instant that a continuous bright line is completed between the electrodes.

4.6.14 Storage stability: The penetration after storage shall be determined on an unworked and a worked sample of compound which has been stored at a temperature of 37.8° ± 3°C (100° ± 5°F) in a 1 pound oiltight container for 6 months subsequent to the original determination of the unworked and worked penetration. The unworked and worked penetration, after storage, shall be determined as specified in 4.6.3.

5. PACKAGING:

5.1 Preservation, packing and marking:

The silicone compound shall be preserved, packed and marked in accordance with the provisions of MIL-STD-290 and in accordance with the details specified by the acquiring activity with respect to the various options, choices, and alternatives indicated in MIL-STD-290 (see 6.2.1e and f).

6. NOTES:

6.1 Intended use:

The compound covered by this specification is intended for use, as follows:

a. As a lubricant and sealant for rubber components, such as “0” rings and gaskets.

b. When mixed with molybdenum disulfide powder, as a lubricant for threaded connections on piping and valves to be used with liquids and gases.

c. As a sealant to prevent galvanic corrosion due to moisture penetration in areas of dissimilar metal contact.

d. For use under extreme conditions of service and storage, where freezing at -54°C (-65°F) or exudation and deterioration at +204°C (+400°F) is not permissible, and wherein water insolubility and sealing properties are essential.

6.1 (Continued):

e. For sealing high tension electrical connections of aircraft and automotive engines.

f. For sealing and insulating electronic equipment, subassemblies and components where it is essential that the material remain in a soft state in order to allow easy disassembly or change.

g. As a sealant to protect the threads on shells from moisture and corrosion. When used in this manner, the silicone compound should not come into contact with surfaces that are to be painted.

6.1.1 Use restrictions: This silicone compound is not intended for use as a heat sink. Materials having more suitable properties are available commercially.

6.2 Ordering data:

Acquisition documents should specify the following:

a. Title, number and date of this specification.

b. Quantity desired in pounds.

c. Color of dye or pigment, if required (see 3.2.2).

d. Size and type of container in which silicone compound is to be furnished.

e. Levels of preservation and packing (see 5.1).

f. Other options, choices and alternatives of MIL-STD-290 (see 5.1).

6.3 Qualification:

With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in qualified products list (QPL 8660) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Washington, DC 20361; however, information pertaining to qualification of products and letter of authorization for submittal of sample may be obtained from the Commander, Naval Air Development Center, Attn: Aircraft and Crew Systems Technical Directorate (Code 6062), Warminster, PA 18974.

6.4 Batch:

A batch is defined as the end product of all raw materials mixed or blended in a single operation.

6.5 International standardization agreements:

Certain provisions of this specification (see 1.1) are the subject of international standardization agreement, ASCC AIR STD 15/1, ABC-NAVY STD 17, and NATO STANAG NAT-STD-1135. When amendment, revision, or cancellation of this specification is proposed, which will affect or violate the international agreement concerned, the preparing activity should take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.6 Standard rubber samples:

Samples of the standard synthetic rubber NBR-L for the test specified in 4.6.6 may be obtained from the Precision Rubber Products Corp. Aerospace Division, 1217 South 26 Place, Phoenix, AZ 85035.

6.7 This paragraph was deleted as it did not pertain to the converted SAE document.

TABLE I. Physical properties

Characteristic	Paragraph	
	Requirement	Test
Insolubility, percent weight loss, maximum, in:		4.6.2
Distilled water	0.4	
Isopropyl alcohol	10.0	
Ethyl alcohol	7.0	
Ethylene glycol	0.5	
Glycerine	0.5	
Penetration at standard conditions:		4.6.3
Unworked	230 + 30	
Worked, maximum	310	
Worked, after 24 hours at 204 ± 5°C (400° ± 10°F)	310	
Flammability	Nonflammable	4.6.4
Corrosive effect:		4.6.5
On metals	No pitting or other visual evidence of corrosion.	
On non-metals	No change in appearance when compared to control. No change in hardness.	
Volume change of rubber, percent maximum, after 168 hours at 70° ± 1°C (158° ± 2°F)	7	4.6.6
High temperature, percent weight loss, maximum:		4.6.7
Evaporation	2	
Bleeding	8	
Low temperature torque, gram-cm, maximum:		4.6.8
Starting	5,000	
Running	1,000	