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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIALS SPECIFICATION

SAE AMS 3412D

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Superseding AMS 3412C

## Flux, Aluminum Brazing For Torch or Furnace Brazing



1. SCOPE:

1.1 Form:

This specification covers an aluminum brazing flux in the form of powder.

1.2 Application:

This flux has been used typically for brazing aluminum and aluminum alloys at 1050 °F (566 °C) and above, but usage is not limited to such applications.

1.3 Classification:

Flux covered by this specification is classified as follows:

Type 1 - For torch brazing
Type 2 - For furnace brazing

1.3.1 Where a type is not specified, type 1 shall be supplied.

1.4 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.



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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 4001 Aluminum Sheet and Plate, (1100-0), 0.12Cu, Annealed
AMS 4006 Aluminum Alloy Sheet and Plate, (3003-0), 1.25Mn - 0.12Cu, Annealed
AMS 4184 Filler Metal, Aluminum Brazing, 10Si - 4Cu, (4145)
AMS 4185 Filler Metal, Aluminum Brazing, 12Si, (4047)

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Flux shall be a finely ground and uniformly blended mixture of ingredients, containing not more than 5% water by weight.

3.1.1 Flux shall not harden in the container. A slight amount of agglomeration is permissible provided the lumps can be readily broken into a powder not coarser than the remainder of the material.

3.2 Properties:

Flux shall conform to the following requirements:

3.2.1 Fluxing Ability: Flux shall permit production of satisfactory brazed joints of any type on applicable aluminum alloys, determined in accordance with 3.2.1.2.

3.2.1.1 Flux, mixed with water in the proportions of 3 parts flux to 1 part water by weight, with or without a suitable wetting agent, shall form a smooth paste, free from coarse particles, having acceptable fusibility and application and fluxing characteristics.

3.2.1.2 The test sample shall consist of two pieces of suitably cleaned and prepared aluminum alloy, conforming to AMS 4001 or AMS 4006, each 1 x 4 inches (25 x 102 mm), held by tack welding, wiring, or fixturing to create a "T" configuration with a suitable gap between the two parts. Material thickness may vary from 0.02 to 0.07 inches (0.5 to 1.8 mm). Filler metal shall conform to AMS 4184 or AMS 4185.

3.2.1.2.1 For Type 1 flux, the specimen and the filler metal shall be liberally coated with flux. It may be necessary to preheat the filler metal to facilitate adhesion of the flux. The filler metal shall be fed into the joint while the specimen is heated with an oxyacetylene torch flame or equivalent.

3.2.1.2.2 For Type 2 flux, the filler metal shall be preplaced on one side of the 4 inch (102 mm) long joint. Both the specimen and the filler metal shall be liberally coated with flux. The fluxed assembly shall be placed in a preheated air furnace and held at 1100 °F ± 10 (593 °C ± 6) for sufficient time to permit the specimen to achieve braze temperature, but not longer than 3 minutes at temperature. The specimen may be furnace or air cooled.

3.2.1.2.3 After cooling, flux shall be removed in accordance with 3.2.4. The resultant joint shall exhibit a uniform fillet of braze filler metal on both sides of the joint.

3.2.2 Fusion Temperature: On heating, flux shall fuse at 1050 °F (566 °C) or lower; on cooling from 1100 °F (593 °C) or higher, flux shall remain in the liquid state until the temperature drops to 1050 °F (566 °C) or lower.

3.2.3 Flame or Smoke Emission:

3.2.3.1 Flux shall not produce, during use, a flame or smoke of sufficient intensity to obscure the work.

3.2.3.2 Flux shall not produce toxic or suffocating fumes under normal conditions of use.

3.2.4 After being subjected to brazing operations, flux should be readily removable by water at 190 °F (88 °C) or hotter. If the flux is not completely removed by the hot water, but is removed by immersion for not more than 15 minutes in a 10% solution of nitric acid, to which 0.25% hydrofluoric acid is added, at a temperature not higher than 100 °F (38 °C), followed by a final hot water rinse, flux is acceptable.

3.3 Quality:

Flux, as received by purchaser, shall be uniformly blended and free from foreign materials and contaminants detrimental to usage of the flux.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of flux shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the flux conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Fluxing ability (3.2.1), fusion temperature (3.2.2) and solubility (3.2.4) are acceptance tests and shall be performed on each lot of flux.

4.2.2 Periodic Tests: Flame and smoke emission (3.2.3) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

At least one sample shall be taken at random from each lot; a lot shall be all flux produced in a single production run from the same batches of raw materials and presented for vendor's inspection at one time.

4.4 Reports:

The vendor of flux shall furnish with each shipment a report stating that the flux conforms to all technical requirements. This report shall include the purchase order number, lot number, AMS 3412D, date of manufacture, identification, and quantity.

4.5 Resampling and Retesting:

If any sample used in the above tests fails to meet specified requirements, disposition of the flux may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet specified requirements shall be cause for rejection of the flux represented.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

5.1.1 Flux shall be assigned a unique name, a code consisting of letters and/or numbers, or other identification traceable to a specific set of raw materials, ingredients, manufacturing processes, procedures and sequences, and methods of inspection. If necessary to make any change in the raw materials, ingredients, manufacturing processes, procedures or sequences, or methods of inspection, the identifying name or code shall also be changed.