



AEROSPACE MATERIAL SPECIFICATION

AMS2700™**REV. F**Issued 2000-03
Revised 2018-03Superseding AMS2700E
AMS-QQ-P-35
QQ-P-35

Passivation of Corrosion Resistant Steels

RATIONALE

AMS2700F results from a Five-Year Review and update of this specification that adds Ordering Information and changes paragraphs 1.3.1 Methods, 3.2.1 Corrosion Resistance, 3.2.1.2 Water Immersion, 3.2.1.3.1 Copper Sulfate Test, and 3.2.2 Surface Appearance. Appendix A was deleted.

NOTICE

ORDERING INFORMATION: The following information shall be provided to the passivation processor by the purchaser.

1. Purchase documents should specify not less than the following:

- AMS2700F
- Material being processed
- Quantity of parts to be processed
- Method (1.3.1), type (1.3.2) if required, and class (1.3.3)
- Test method in AMS-STD-753, if required
- Post treatment when required (see 3.1.5)

2. Parts manufacturing operations such as heat treating, forming, joining and media finishing can affect the condition of the substrate for passivation, or if performed after passivation, could adversely affect the passivated part. The sequencing of these types of operations should be specified by the cognizant engineering organization or purchaser and is not controlled by this specification.

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1. SCOPE

1.1 Purpose

This specification covers the requirements for a process to assure removal of free iron or other less noble contaminants from the surfaces of corrosion resistant steel parts.

1.2 Application

The processes defined in this specification have been used typically to dissolve tramp metallic elements from the surfaces of corrosion resistant steels to improve their corrosion resistance, but usage is not limited to such applications.

1.3 Classification

1.3.1 Methods

Passivation methods covered by this specification are as follows:

Method 1 - Passivation in Nitric Acid

Method 2 - Passivation in Citric Acid

Either method may be used unless a method is specified by purchaser. Where QQ-P-35 or AMS-QQ-P-35 is specified, Method 1 shall be used unless Method 2 is authorized by the cognizant engineering organization.

1.3.2 Types

The following types may be specified for Method 1:

- Type 1 Low Temperature Nitric Acid with Sodium Dichromate
- Type 2 Medium Temperature Nitric Acid with Sodium Dichromate
- Type 3 High Temperature Nitric Acid with Sodium Dichromate
- Type 4 40% Nitric Acid for Free Machining Steels
- Type 5 Anodic, for High Carbon Martensitic Steels
- Type 6 Low Temperature Nitric Acid
- Type 7 Medium Temperature Nitric Acid
- Type 8 Medium Temperature, High Nitric Acid Concentration

Where no type is specified, the processor may use any of the listed types that meet the requirements given herein.

1.3.3 Classes

Passivation verification classes are as follows:

1.3.3.1 Class 1

The following types of parts shall be selected for testing in accordance with 4.3.1.

- 1.3.3.1.1 Fasteners, including nuts, bolts, washers, rivets and related hardware where a test frequency is not defined in the procurement documents.
- 1.3.3.1.2 Standard parts defined by drawings labeled AN, MS, NAS or similar where frequency of test is not otherwise defined.
- 1.3.3.1.3 When specified by purchaser.

1.3.3.2 Class 2

Frequency of corrosion testing shall be one part per lot.

1.3.3.3 Class 3

Frequency of testing shall be on a periodic basis.

1.3.3.4 Class 4

Parts for which AMS-QQ-P-35 or QQ-P-35 is specified shall be acceptance tested in accordance with 4.3.4.

1.3.3.5 When no class is specified and neither 1.3.3.1 nor 1.3.3.4 apply, class 2 shall apply.

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.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS2390 Chemical Process Test Specimen Material

AMS-STD-753 Corrosion-Resistant Steel Parts: Sampling, Inspection and Testing for Surface Passivation

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 B117 Operating Salt Spray (Fog) Apparatus

3. REQUIREMENTS

3.1 Procedure

3.1.1 Passivation shall be performed only on surfaces free from water breaks and visible rust or scale (see 8.7).

3.1.2 Method 1 - Passivation in Nitric Acid

3.1.2.1 Passivation shall be accomplished by immersion in a bath in accordance with Table 1. When permitted by the cognizant engineering organization, other nitric acid solutions may be used (see 8.12).

3.1.2.2 When a specific passivation type is not specified, Table 4 may be consulted for recommended types.

Table 1 - Method 1 passivation types

Type	Feature	Value
1	Bath Composition	20 to 25% by volume of HNO ₃ 2 to 3% by weight Na ₂ Cr ₂ O ₇ ·2H ₂ O
	Bath temperature	70 to 90 °F (21 to 32 °C)
	Immersion time	30 minutes minimum
2	Bath Composition	20 to 25% by volume of HNO ₃ 2 to 3% by weight Na ₂ Cr ₂ O ₇ ·2H ₂ O
	Bath temperature	120 to 130 °F (49 to 54 °C)
	Immersion time	20 minutes minimum
3	Bath Composition	20 to 25% by volume of HNO ₃ 2 to 3% by weight Na ₂ Cr ₂ O ₇ ·2H ₂ O
	Bath temperature	145 to 155 °F (63 to 68 °C)
	Immersion time	10 minutes minimum
4	Bath Composition	38 to 42% by volume of HNO ₃ 2 to 3% by weight Na ₂ Cr ₂ O ₇ ·2H ₂ O
	Bath temperature	70 to 120 °F (21 to 49 °C)
	Immersion time	30 minutes minimum
5	Bath Composition	20 to 25% by volume of HNO ₃ 2 to 3% by weight Na ₂ Cr ₂ O ₇ ·2H ₂ O
	Bath temperature	70 to 90 °F (21 to 32 °C)
	Immersion time	2 minutes minimum
6	Voltage	Part anodic at 3 to 5 volts
	Bath Composition	25 to 45% by volume HNO ₃
	Bath temperature	70 to 90 °F (21 to 32 °C)
7	Immersion time	30 minutes minimum
	Bath Composition	20 to 25% by volume HNO ₃
	Bath temperature	120 to 140 °F (49 to 60 °C)
8	Immersion time	20 minutes minimum
	Bath Composition	45 to 55% by volume HNO ₃
	Bath temperature	120 to 130 °F (49 to 54 °C)
	Immersion time	30 minutes minimum
NOTE: Nitric acid concentration shown is by volume of 42° Baume (sp. gr. 1.4) nitric acid (see 8.11).		

3.1.3 Method 2 - Passivation in Citric Acid

3.1.3.1 Bath Composition

Parts shall be immersed in an aqueous solution of 4 to 10 weight percent citric acid, with additional wetting agents and inhibitors as applicable.

3.1.3.2 Operating Conditions

3.1.3.2.1 Temperature

Bath temperature shall be 70 to 160 °F (21 to 71 °C) with an immersion time of not less than 4 minutes for baths operating over 140 °F (60 °C), not less than 10 minutes for baths operating in the 120 to 140 °F (49 to 60 °C) range, not less than 20 minutes for baths operating in the range of 100 to 119 °F (38 to 48 °C) or not less than 30 minutes for baths operating below 100 °F (38 °C).

3.1.4 Final Rinse

Immediately after removal from the passivating solution the parts shall be thoroughly rinsed. Final rinse shall be carried out in clean water (see 8.13).