

**Advanced Surface Technologies, Inc.**

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## Passivation

Passivation is a chemical treatment applied to stainless steel parts to provide resistance to oxidation, rusting and mild chemical attack. The Passivation process removes free iron (ferric material) from the surface of the parts that can be created during finishing operations such as milling, buffing, lapping, cutting, etc. These contaminants create potential sites for corrosion that result in premature deterioration of the component. The acids used for Passivation dissolve much of the alloyed iron on an atomic level right at the surface leaving a chromium and nickel-rich surface. It then creates the formation of a thin oxide film that protects the stainless steel from corrosion.

Advance Surface Technologies provides both Nitric and Citric Passivation treatments on Titanium and Stainless Steel alloys that adhere to QQ-P-35C, AMS-QQ-P-35A, AMS 2700C, ASTM A 967-05 and ASTM A 380-06 standards. Passivation alone will not remove heavy adherent oxide films created from heat treatment, welding, hot-forming and other high-temperature operations. Therefore AST uses different types of pickling acids designed to remove these films prior to the Passivation of the parts. Our extensive experience with Passivation allows us to choose and match the appropriate Passivation and pickling procedure for your needs and specific stainless steel grades.

[ASTM A 967-05 SPECIFICATIONS](#) · [QQ-P-35C/AMS-QQ-P-35A SPECIFICATIONS](#) · [AMS 2700C SPECIFICATIONS](#)

### ASTM A 967-05 SPECIFICATIONS

Nitric Acid Methods	<ul style="list-style-type: none"> <li>Nitric 1: 20-25 v% Nitric Acid, 2.5 w% Sodium Dichromate, 120-130°F, 20 minutes minimum</li> <li>Nitric 2: 20-45 v% Nitric Acid, 70-90°F, 30 minutes minimum</li> <li>Nitric 3: 20-25 v% Nitric Acid, 120-140°F, 20 minutes minimum</li> <li>Nitric 4: 45-55 v% Nitric Acid, 120-130°F, 30 minutes minimum</li> <li>Nitric 5: Other combinations of temperature, time, and acid with or without accelerants, inhibitors or proprietary solutions capable of producing parts that pass the specified test requirements</li> </ul>
Citric Acid Methods	<ul style="list-style-type: none"> <li>Citric 1: 4-10 w% Citric Acid, 140-160°F, 4 minutes minimum</li> <li>Citric 2: 4-10 w% Citric Acid, 120-140°F, 10 minutes minimum</li> <li>Citric 3: 4-10 w% Citric Acid, 70-120°F, 20 minutes minimum</li> <li>Citric 4: Other combinations of temperature time and concentration of citric acid with or without chemicals to enhance cleaning, accelerants or inhibitors capable of producing parts that pass the specified test requirements</li> <li>Citric 5: Other combinations of temperature time and concentration of citric acid with or without chemicals to enhance cleaning, accelerants or inhibitors capable of producing parts that pass the specified test requirements. Immersion bath to be controlled at pH of 1.8-2.2</li> </ul>
Testing Methods	<p>Practice A—Water Immersion Test (performed at AST)  Practice B—High Humidity Test  Practice C—Salt Spray Test  Practice D—Copper Sulfate Test (performed at AST)  Practice E—Potassium Ferricyanide–Nitric Acid Test  Practice F—Freelron Test (performed at AST)</p>

### QQ-P-35C/AMS-QQ-P-35A SPECIFICATIONS

Passivation Types	<p>Type I – Withdrawn  Type II – 20-25 v% Nitric, 2-2.5 w% Sodium Dichromate, 120-130°F, 20 minutes minimum  Type III – Withdrawn  Type IV – Withdrawn  Type V – Withdrawn  Type VI – 25-45 v% Nitric, 70-90°F, 30 minutes minimum  Type VII – 20-25 v% Nitric, 120-150°F, 20 minutes minimum  Type VIII – 45-55 v% Nitric, 120-130°F, 30 minutes minimum</p>
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Testing Methods	4.4.1.1 – Water Immersion Test (performed at AST) 4.4.1.2 – High Humidity Test 4.4.2.1 – Salt Spray Test 4.4.2.2 – Copper Sulfate Test (performed at AST)
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AMS 2700C SPECIFICATIONS

Passivation Types <sup>1</sup>	<ul style="list-style-type: none"> <li>• Type 1- 20-25 v% Nitric Acid, 2-3 w% Sodium Dichromate, 70-90°F, 30 minutes minimum</li> <li>• Type 2- 20-25 v% Nitric Acid, 2-3 w% Sodium Dichromate, 120-130°F, 20 minutes minimum</li> <li>• Type 3- 20-25 v% Nitric Acid, 2-3 w% Sodium Dichromate, 145-155°F, 10 minutes minimum</li> <li>• Type 4- 38-42 v% Nitric Acid, 2-3 w% Sodium Dichromate, 70-120°F, 30 minutes minimum</li> <li>• Type 5- 20-25 v% Nitric Acid, 2-3 w% Sodium Dichromate, 70-90°F, 2 minutes minimum, Part anodic at 3-5 volts (not done at AST) <ul style="list-style-type: none"> <li>• Type 6- 25-45 v% Nitric Acid 70-90°F, 30 minutes minimum</li> </ul> </li> <li>• Type 7- 20-25% v% Nitric Acid, 120-140°F, 20 minutes minimum <ul style="list-style-type: none"> <li>• Type 8- 45-55 v% Nitric Acid, 120-130°F, 30 minutes</li> </ul> </li> </ul>
Testing Methods	3.2.1.1 Humidity 3.2.1.2 Water Immersion (performed at AST) 3.2.1.3.1 Copper Sulfate (performed at AST) 3.2.1.3.2 Salt Spray

<sup>1</sup> Method 1- Passivation in Nitric Acid; Method 2- Passivation in Citric Acid