



Anodic Oxidation Coating on Aluminum Process Requirements

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard describes the process requirements for Anodic oxidation coatings on Aluminum, known throughout the rest of this specification as the "Process". The purpose of these requirements is to ensure that the level of the final finish and performance on anodized aluminum parts meet or exceeds the level expected by the vehicle owner. This standard applies to finished parts produced by both GM Suppliers and internal GM facilities, known throughout the rest of this specification as the "Part Supplier".

1.2 Applicability. Anodized Aluminum parts.

1.3 Remarks. This specification is intended to assist supplier quality engineers in evaluating a Part Supplier's ability to produce anodized aluminum parts that meet GM's requirements. Emphasis is placed on the ability to supply a uniform and consistent part. While this specification details the requirements for global qualification, additional information and/or qualification may be requested by GM regional Supplier Quality Engineer (SQE) representatives. Additional data required to be submitted will be determined by the regional SQE representatives. Addressed in this specification are the following:

- Polishing
- Anodizing
- Chemicals/Chemical process controls
- Performance testing
- Production Part Approval Process (PPAP) Automotive Industry Action Group (AIAG) PPAP-4 (or equivalent)

1.3.1 GMW3286, GMW3417, GMW14458, GMW14669, GMW14729, GMW14865 and GMW16209 is not required to be purchased for this test and is not included in 2.2 as a reference.

1.4 Requirement Wording Conventions. Within this specification, the following conventions are applied:

- The word "shall" states a binding requirement which verifiable proof shall be provided to GM within 24 h upon request.
- The word "should" denoted a preference or desired conformance.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

AIAG CQI-12	AIAG FMEA-4	AIAG PPAP-4	DIN EN 573-3
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2.2 GM Standards/Specifications.

GMW3059	GMW14458	GMW14729	GMW17205
GMW3286	GMW14665	GMW14865	
GMW3417	GMW14669	GMW16209	

2.3 Additional References.

- Automotive Industry Action Group (AIAG)

- Dimensional Control System (DCS) File Log from Unigraphics (UG)
- GM1927-16b Aluminum Extrusion Process Audit spreadsheet available at GM SupplyPower at Uniform Resource Locator (URL) <https://gmsupplypower.covisint.com/>
- GM1927-16b Anodizing Process Audit spreadsheet available at GM SupplyPower at URL <https://gmsupplypower.covisint.com/>
- Process Control Plan
- Statement of Requirements (SOR)

3 Requirements

3.1 Raw Material.

3.1.1 Specified Alloy. The raw material shall select a specified alloy that meets the requirements defined in DIN EN 573-3. This substrate cannot be changed after PPAP without approval from GM SQE.

3.1.2 Mechanical Properties. The incoming aluminum coil stock or extrusion should be monitored for hardness, tensile, and yield strengths.

3.2 Polishing. Process shall be automated with control parameters for wheel speed (rpm), pressure or distance of buffing wheel to the parts, and buffing compound usage.

3.3 Anodizing Line.

3.3.1 Rack Loading/Unloading Area. Loading and unloading areas shall have adequate spacing between stations to allow for ease of loading and unloading parts. Work instructions shall be available for review at each station.

3.3.2 Aluminum Pretreat. The Anodizer shall define if the pretreat cycle is specific to a bright or matte appearance. The aluminum pretreat shall be in place to sufficiently polish, etch, and prepare the substrate to ensure removal of the Bielby layer and a surface free of contaminants is available for good anodizing.

- Degreasing/Soap Rinse.** Used to remove contaminants on parts. Air agitation or ultrasonic assistance can be used to enhance the cleaning of the surface. Anodizer should use continuous flow rinses with weirs built on tank to remove any oils in the bath. Parts should be checked for a "water break-free" surface upon exiting the process.
- Etch Process.** Follow AIAG CQI-12 Process Table J recommendations.
- Post Etch Rinse.** Follow AIAG CQI-12 Process Table J recommendations.
- Electro Polish/Bright dip.** Follow AIAG CQI-12 Process Table J recommendations.
- Electro Polish Rinse.** Follow AIAG CQI-12 Process Table J recommendations.
- Deoxidation.** Follow AIAG CQI-12 Process Table J recommendations.

3.3.3 Anodizing Process.

- Anodizing.** Follow AIAG CQI-12 Table J recommendations.
- Cold Sealing.** Follow AIAG CQI-12 Process Table J recommendations.
- Hot Water Sealing.** Follow AIAG CQI-12 Process Table J recommendations.
- Hot Water Rinsing.** Follow AIAG CQI-12 Process Table J recommendations.

3.3.4 General.

3.3.4.1 Hoist Control. The motion of the part shall be controlled automatically. Manual operation or timing is not allowed without a detailed deviation. This is required to ensure consistent processing.

3.3.4.2 Current Control. Current delivered to the part shall be controlled and monitored in both amperage and voltage.

3.3.4.3 Temperature/Level Control. All heated baths shall have automatic temperature controllers. The controller shall manage the temperature to remain in a defined range and shall alarm if a deviation occurs. This is not only important for process control, but also to mitigate fire hazards. Bath level should be automatically controlled. This is especially important in process tanks utilizing electric heat to mitigate fire hazards.