



Stainless Steel Fastener Coating

1 Scope

1.1 Material Description. The coating is a dip-spin or spray type coating which provides anti-seizing properties and friction control.

1.2 Symbols. Not applicable.

1.3 Applicability. This coating is suitable for internally and externally threaded stainless steel parts (size greater than or equal to M6), particularly those with a prevailing torque feature in the thread.

1.4 Remarks.

1.4.1 This standard covers the performance requirements for a high wear resistant, low friction coating. The coating is not intended to provide corrosion protection.

1.4.2 This coating is intended to control friction and prevent galling. However, not all material types and interfaces have been tested. It is recommended that Fastening and Materials Engineering are consulted for new applications.

1.4.3 Tin (Sn) may negatively affect the corrosion performance of stainless steel. The coating may not contain measurable amounts of tin.

2 References

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

2.1 External Standards/Specifications.

ASTM D2625-94

ISO 16047

SAE J403

SAE J404

2.2 GM Standards/Specifications.

GMW3059

GMW14270

2.3 Additional References.

- Part No. 11612104, stainless steel bolt
- Part No. 11612105, stainless steel nut
- Part No. 11612106, stainless steel square washer

3 Requirements

3.1 Coefficient of Friction.

The coefficient of friction of the coated parts shall be measured per ISO 16047. After coating, the fastener total friction (μ_{tot}) shall be 0.10 ± 0.03 , with the following additional requirements:

- Use test washer per ISO 16047 type HL with plain surface, uncoated and degreased. Stamped identification is not allowed on the washer surface. Test nuts shall be plain surface, uncoated and degreased.
- For referee purposes, fasteners used for coefficient of friction testing shall be tested after a minimum 24 hour rest period after coating.
- Test nut and washer must be cleaned ultrasonically in acetone or a similar degreaser within 2 h of test.
- After tightening, there shall be a minimum of two (2) full threads outside of the nut and a minimum of one (1) full thread from the maximum grip gauging length.
- Tightening speed shall be $30 \text{ rpm} \pm 3 \text{ rpm}$.

Note: The coefficient of friction ± 3 sigma values based on thirty (30) samples are required to be within 0.10 ± 0.03 .

Test requirements for specific applications are described in 3.1.1. The appropriate test for different situations: new chemical approval, new applicator approval, production part approval process (PPAP), and regular process control testing, are described in Appendix A, Table A1.

3.1.1 If the production coated part cannot be tested as described in 3.1 due to small size or design (studs, lock threads, etc.), use GM bolt part number 11612104 (M10x1.5 stainless steel bolt). PPAP report shall include which coated fastener was used.

3.1.1.1 Chemical and Applicator Approval Only: Apply coating to GM bolt part number 11612104 and test according to 3.1.1. The bolt is the driven part. Use test washer GM part number 11612106 (stainless steel) and test nut GM part number 11612105.

3.2 High Pressure Wear Characteristic. Coated parts shall be tested per ASTM D2625-94 Procedure A. The minimum time to failure of four (4) samples shall be greater than three (3) minutes with the load maintained at 4450N (1000 lbf). Test parameters described as follows (see Appendix B, Figures B1 through B3, for examples of the fixture).

Test Parameters:

- Speed of rotation: 290 rpm $\pm$ 3 rpm.
- Ambient temperature: +22 °C $\pm$ 2 °C.
- Step 1: 1330 N for 3 minutes.
- Step 2: 2220 N for 1 minute.
- Step 3: 3330 N for 1 minute.
- Step 4: 4450 N until failure.

Test Specimens:

- Pin Material: 3135 steel per SAE J404.
- Pin Finish 13 μ m to 25 μ m rms.
- Pint Hardness: 87 HRb to 91 HRb.
- Vee Block Material: 1137 steel per SAE J403.
- Vee Block Finish: 13 μ m to 25 μ m rms.
- Vee Block Hardness: 20 HRc to 24 HRc.

4 Manufacturing Process

The GM-approved process, including pre-treatment (cleaning), coating, and post-treatment shall be performed by one company in one facility. The equipment, process controls, chemicals, and location used must remain the same for regular production. This includes pre-treatment (such as cleaning) and post treatment. These operations cannot deviate without prior approval by GM.

For PPAP and each production lot of coated parts, the applicator shall supply a certificate to their customer with the following information:

- This specification number.
- Applicator name and address.
- Coating system used.
- Part number.
- Date(s) the parts were coated.
- Coefficient of friction of coating at PPAP.
- Coefficient of friction as per most recent process control test.

The applicator shall keep the certificates for a minimum of five (5) years.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements.

5.5 All materials supplied to this standard must comply with the requirements of GMW3059, Restricted and Reportable Substances for Parts.

6 Approved Sources

Materials supplied to this specification must be approved by General Motors.

The appropriate GM Materials Engineering department(s) must confirm material as meeting the requirements of this specification. Any test data sheets of material submitted to General Motors for such confirmation (e.g., during Production Part Approval Process (PPAP)) under this material specification must list all properties and must apply corresponding test methods of this material specification.

Engineering qualifications of an approved source are required for this standard. Only sources listed in the GM Materials File (i.e., GM SupplyPower) under this standard number have been qualified by engineering as meeting the requirements of this standard. To access this list, reference GMW14270 for latest location.

7 Notes

7.1 Glossary. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

µm	micrometer
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GSSLT	Global Subsystem Leadership Team
HRb	Rockwell B hardness number
HRC	Rockwell C hardness number
lbf	foot pounds
IMDS	International Material Data System
MSDS	Material Safety Data Sheet
PPAP	Production Part Approval Process
rms	roughness measurement system
rpm	revolutions per minute
SDS	Safety Data Sheet
Sn	Tin