



Black Oxide Finish

1 Scope

This specification covers black oxide finishes applied over iron and steel parts and 300 series stainless steel parts for decorative or identification purposes.

1.1 Material Description. The finish is a magnetite type black oxide conversion layer produced by immersion of the part in a hot alkaline salt solution or mixed salt fusion bath.

1.2 Symbols. Not applicable.

1.3 Applicability. Black oxide is not generally used for 400 series stainless steel and offers little protection when applied over 200 series stainless steel parts. This finish offers little wear resistance, and no corrosion resistance unless accompanied by additional supplemental topcoat or oil.

1.4 Remarks.

1.4.1 Protective oils and waxes may be applied over black oxide to improve resistance to corrosion, in which case the improvement is proportionally equal to the quality of the oil/wax. Oil and/or wax coating shall be specified as a suffix to this specification in the drawing as required.

1.4.2 The coating process may generate pitting and/or intergranular attack. The acceptable level of attack on the intended substrate material and application shall be determined before the start of production and documented.

2 References

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

2.1 External Standards/Specifications.

ISO 9227 SAE/USCAR-5

2.2 GM Standards/Specifications.

GMW3059 GMW14729

3 Requirements

3.1 Appearance. The coating shall cover the base metal completely. The color shall be uniformly black with no evidence of reddish-brown or green discolorations.

If an oil, wax, or topcoat is applied on top of the black oxide coating, the parts shall be dry to the touch and shall not chip, peel, crack, flake, or rub off on hands or under normal handling.

3.2 Hardness Retention. Parts that underwent the black oxide process and hydrogen de-embrittlement baking per Section 4, shall not show a drop in hardness.

3.3 Humidity Resistance. Completely processed parts shall withstand without evidence of corrosion, exposure to 120 h of humidity per GMW14729.

Note: This applies to oiled, waxed or topcoated parts other than stainless steels.

3.4 NSS Test. Parts shall pass 96 h exposure to the neutral salt spray (NSS) test per ISO 9227 with no evidence of red rust or other discoloration on significant surfaces.

Significant surfaces for test evaluation of fasteners shall be all exposed surfaces of the fastener when installed, including but are not limited to fastener heads, socket recess, washers, and external surface of nuts. Fastener threads and point are excluded unless otherwise specified on the drawing. Significant surfaces on parts other than threaded fasteners shall be all surfaces. Deep recesses, such as blind holes and the interior of tubes are excluded unless otherwise specified on the drawing.

Note: This test applies to stainless steel parts only. 300 series stainless steels can be surface sensitized or contaminated easily by heat exposure, machining, and general chemical exposure during the manufacturing process. It would be prudent to test uncoated parts alongside to ensure any failures are not due to pre-existing conditions.

3.5 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

4 Manufacturing Process

The black oxide coating process generally does not generate hydrogen, but certain cleaning and pickling processes may generate hydrogen and put parts at risk for hydrogen embrittlement. All parts heat treated or highly cold worked to the specified core hardness >HRc 32 or surface hardness HRc 35, which are processed through the hydrogen generating processes such as acid pickling shall be processed per SAE/USCAR-5.

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.

6 Approved Sources

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

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.

7 Notes

7.1 Glossary. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

NSS	Neutral Salt Spray
HRc	Rockwell C hardness number
GSSLT	Global Subsystem Leadership Team
IMDS	International Material Data System
PPAP	Production Part Approval Process
SAE	Society of Automotive Engineers
USCAR	United States Council for Automotive Research

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Coating per GMW17156 (optional supplementary oil or topcoat)