



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. It offers little wear resistance, and no corrosion resistance unless accompanied by additional supplemental topcoat or oil.

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.

1.4 Remarks. 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.

2 References

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

2.1 External Standards/Specifications.

SAE/USCAR 5

2.2 GM Standards/Specifications.

GMW3059 GMW14729
GMW14458

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

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 on significant surfaces.

Note: This coating does not change the surface appearance, therefore, luster, roughness; etc., in finished parts will be essentially same as in pre-coated parts.

Oiling and/or waxing of the finished parts impart a high luster to the surface. Any oil or wax that is chemically inert and non-corrosive is satisfactory. The oil or wax may be applied by wiping, dipping, or tumbling with wax or oil moistened sawdust. The oil or wax parts shall be dry to the touch and shall not chip, peel, crack, flake, or rub off on hands or under any conditions incident to normal handling.

3.2 Surface Attack. The oxide coating process generates some pitting on the part surface. The degree of pitting or metal loss shall in no case be detrimental to the performance of the part. The process used for the oxide formation shall not result in any intergranular attack. Examination for such attack shall be made by the microscopic method and at a magnification, which will clearly establish the condition.

3.3 Prevention of Embrittlement. The processing shall not embrittle the parts. Parts loaded to 90% of the yield strength shall not crack after 72 h.

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

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

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

3.6 Cass Test. Parts shall pass 16 h exposure to the Copper-Accelerated Salt-Spray (CASS) test per GMW14458 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.

4 Manufacturing Process

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. Hardened parts which have been tempered at <200 °C shall be processed at a temperature of 150 °C for at least 8 h.

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.

If not otherwise agreed, all release tests shall be repeated and documented by the supplier prior to commencement of delivery of non-conforming bulk supplies. In individual cases, a shorter test can be agreed to between the responsible Engineering department and the supplier.

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. In addition, product MSDS/SDS submissions must be in compliance with specific country General Motors TMC003 Material Safety Data Sheet/Safety Data Sheet guidance documents where available.

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.

7 Notes

7.1 Glossary.

MATSPC: Global repository of GM approved materials for corresponding GM Engineering Standards.

7.2 Acronyms, Abbreviations, and Symbols.

CASS	Copper-Accelerated Salt-Spray
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
HRc	Hardness Rockwell C scale
MSDS	Material Safety Data Sheet
PPAP	Production Part Approval Process
SAE	SAE International
SDS	Safety Data Sheet
USCAR	United States Council for Automotive Research

8 Coding System

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

Coat parts per GMW17156 (optional supplementary oil or topcoat).