

Product Quality Requirements for Manufacturers of ZMicro Sheet Metal, Machined, and Carbon Fiber Parts Quality

Document #: 24-01512
Revision: B

Table of Contents

1	Purpose.....	3
2	Scope	3
3	Responsibilities	3
3.1	Communication	3
3.2	Compliance	3
4	Cosmetic Quality Requirements.....	3
4.1	Surface Classes	3
4.2	General Inspection Guidelines	4
4.2.1	Viewing Condition	4
4.2.2	Viewing Distance and Time	4
4.3	General Acceptance Criteria.....	4
4.4	Acceptance Criteria: Sheet Metal and Machined Parts	4
4.4.1	Silkscreen.....	4
4.4.2	Powder Coat	5
4.4.3	Chem film.....	5
4.4.4	Anodize	5
4.4.5	Staining and Discoloration.....	5
4.4.6	Scratches, Tooling Marks, Bend Lines	5
4.4.7	Welding.....	6
4.4.8	Hardware	6
4.5	Acceptance Criteria: Carbon Fiber Parts	6
4.5.1	Panel thickness	6
4.5.2	A1/A2 Finish Requirements.....	6
4.5.3	B1/B2 Finish Requirements	6
4.5.4	Staining and Discoloration.....	6
4.5.5	Countersinks	6
4.5.6	Packaging.....	6
5	Record Retention.....	7
6	Related Documents	7
7	Appendix A: Cosmetic Reference Standard Table	8

1 Purpose

This document provides cosmetic appearance guidelines and acceptance and rejection criteria for ZMicro's sheet metal, machined, and carbon fiber parts manufacturers. It is intended to be used as a reference by the manufacturers/suppliers of these commodities.

2 Scope

This procedure applies to ZMicro sheet metal, machined, and carbon fiber parts manufacturers and establishes quality requirements for the cosmetic acceptance of purchased custom ZMicro sheet metal, machined, and carbon fiber parts. This specification shall be used to ensure parts manufactured for ZMicro comply with ZMicro requirements.

3 Responsibilities

- Supplier
 - Provide all parts and services as outlined in Purchase Order, drawings, and specifications.
- Supplier Quality (SQ) representative
 - Communicates product quality requirements to supplier.
 - Serves as the key interface with the supplier
 - Coordinates process improvements, non-conforming material dispositions, corrective actions, and surveillance auditing as needed.
- Responsible Engineer
 - Engineering, in conjunction with SQ and Quality, will be responsible for establishing the appropriate cosmetic specifications for products that fall under the scope of this document.
 - Communication with the Responsible Engineer must be done with the knowledge of Quality.

3.1 Communication

All product-quality related communication between ZMicro and its suppliers, including questions or requests for additional information, should include the SQ representative.

3.2 Compliance

Full compliance from all organizations within scope is expected at the time of issuance of this document. Any specification exceptions to references in this document by the supplier must be submitted by the supplier and approved by the appropriate ZMicro representative and documented accordingly.

4 Cosmetic Quality Requirements

4.1 Surface Classes

The surfaces of all parts are classified into specific areas to differentiate between the various levels of part visibility on a finished product. These areas are referred to as surface classes. The four zones used by ZMicro are defined as A, B, C, and D.

4.2 General Inspection Guidelines

4.2.1 Viewing Condition

- Viewing distance: As specified by the corresponding surface classes.
- Viewing tools: Inspection conducted using the unaided eye. Magnification may be used as an aid to evaluate an observed condition.
- Viewing angle: 45° ± 15° to the surface, unless otherwise specified.
- Light source: Cool white fluorescent light; the light source will be positioned and distanced to provide optimal viewing and minimized glare and shadowing of the component under inspection.

4.2.2 Viewing Distance and Time

- Unless otherwise stated, viewing distance and duration shall be based on part classification, which will be defined on part drawings.
- Cosmetic inspection of ZMicro parts shall use the Time and Distance method of inspection described in this document.

Viewing Surface	Class A	Class B	Class C	Class D
Viewing Distance	18 inches	24 inches	30 inches	N/A
Viewing Time	10 seconds	8 seconds	6 seconds	N/A

4.3 General Acceptance Criteria

- Products must meet requirements specified in this document and the drawing.
 - Note: When a discrepancy exists between this document and the drawing, the drawing takes priority.
- Acceptable defects shall not affect the fit, form, or function of the product.
- Dimensions on drawing apply to the finished part after painting and coating.
- Cleanliness of parts:
 - Product should be free of dirt, grease, oils, contaminants, touch-up paint/ink, and any removable foreign material. The exception to this is mylar/protective film used to protect carbon fiber parts during the manufacturing/handling/shipping process.
 - ZMicro may clean or reject material for unacceptable cleanliness. Powder coat, silkscreen, and finish should not become faded when cleaned with isopropyl alcohol.

4.4 Acceptance Criteria: Sheet Metal and Machined Parts

4.4.1 Silkscreen

- Must match the PMS or other standard referenced color +/- one shade.
- Should have no defects in the lettering or surface
- The following shall NOT be allowed when viewed from the distances outlined in the Distance and Time table:
 - Smearred/smudged ink.
 - Spreading/bleeding of ink.
 - Fading of ink.
 - FOD within ink.
 - Peeling/flaking of ink.
 - Unfilled apertures in letters.
 - Missing ink in the body of symbol/lettering (voids).

4.4.2 Powder Coat

- Color must match the RAL, PCS, or other standard referenced +/- one shade.
- Powder coat must be uniform with no bare metal showing through.
- Texture must be consistent throughout the entire part.
- Any debris in the painted surface which falls within the measurement restrictions referenced in the chart in Appendix A and should be fully covered by paint. There must be 3 inches separating individual debris.
- Scratches must conform to the width and length restrictions referenced in the Appendix A chart. No bare metal may be visible through any scratch or blemish.
- Follow the ZMicro part drawing for masked areas and allowable overspray.
- It is not acceptable for powder coatings on surfaces to cause dimensions to exceed the allowable drawing dimensions greater than .010" per side.

4.4.3 Chem film

- There are two types of chemical (chem) film used by ZMicro. One is gold (containing Hexavalent chromate), while the other is clear.
- Chem film on a part should be full coverage, leaving no bare metal exposed.
- Chem film should be as even in finish as the chem film application process allows, avoiding darker/lighter patches/stains caused by masking residue, oversaturation, or incomplete cleaning.
- Chem film should be set/cleaned enough so that application and subsequent removal of adhesives such as painter's tape or QA stickers does not cause fading/visually apparent removal of chem film (except surface class D).
- Scratches may be permissible provided they fall within the dimensional criteria of the Appendix A chart, and they are covered by chem film.

4.4.4 Anodize

- Finish shall not cause dimensions to exceed the drawing tolerances.
- Finish shall be even and fully adhered, with no bare metal exposed and no flaking.
- Masking/plugging shall be used to prevent overspray in areas referred to on the drawing, such as threaded holes.

4.4.5 Staining and Discoloration

- For powder coated and uncoated parts, staining and discoloration must not be visible from the viewing distances/surface classes outlined in Appendix A.
- Standard mill finish applies unless more stringent criteria are defined on the drawing.

4.4.6 Scratches, Tooling Marks, Bend Lines

- Scratches:
 - Shall be permitted per guidelines in Appendix A chart.
- Tool Marks:
 - Shall be permitted per guidelines in Appendix A chart.
- Bend Lines
 - Shall be allowed permitting they are straight, consistent lines as referenced per the guidelines in Appendix A. Lines shall remain as shallow as the manufacturing process reasonably permits.
- On Chem Film parts, all scratches, tool marks, and bend lines must remain covered by chem film, regardless of surface class.

4.4.7 Welding

- Excess weld may be permitted only if it does not affect form, fit, function, and it is internal (Surface Class D).
- Welded area must not be cracked, incomplete, or have voids.

4.4.8 Hardware

- Hardware shall be securely installed per specific hardware requirements.
- PEMs/self-locking clinch nuts shall be installed flush, neither protruding or depressed, so that teeth are sufficiently gripping metal.

4.5 Acceptance Criteria: Carbon Fiber Parts

4.5.1 Panel thickness

- Panel shall be the thickness stated in the materials callout on the drawing. It is critical that it does not exceed the maximum tolerance stated.

4.5.2 A1/A2 Finish Requirements

- Color must match the RAL, PCS, or other standard referenced +/- one shade.
- Weave, finish, texture, and color shall have full, consistent coverage and match sample coupon TM-00054 provided by ZMicro.
- Scratches/tool marks must conform to the width and length restrictions referenced in Appendix A.
- It is not acceptable for finish on surfaces to cause dimensions to exceed the allowable drawing dimensions.

4.5.3 B1/B2 Finish Requirements

- Any debris in the copper conductive coated surface which falls within the measurement restrictions referenced the Appendix A table should be fully covered by copper finish.
- All scratches and tool marks must remain covered by copper finish. Touch-ups are permitted as long as they do not cause dimensional issues.
- Pocket depths must be consistent to the entire pocket, and shall not have tooling “steps” or gradients (results of machining process) that interfere with these pocket depth measurements.

4.5.4 Staining and Discoloration

- Staining and discoloration on the top of the part must not be visible from the viewing distances/surface classes outlined below.

4.5.5 Countersinks

- Countersinks should be clean with no fibers protruding from the circumference.
- Countersinks should be correctly dimensioned so that hardware (provided by ZMicro to aid inspection at supplier’s site) lies completely flush, with no protrusion.

4.5.6 Packaging

- Parts shall be individually wrapped and protected using bubble wrap, plastic bags, or other similar packaging to protect each panel from damage caused during stacking/shipping.
- Part number and revision shall be labeled on the exterior of the lot packaging.

5 Record Retention

Records required by this procedure are maintained per 30-0007P, Control of Records.

6 Related Documents

30-0007P- Control of Records

24-01553- Inspection Standard: Sheet Metal, Machined Parts, and Carbon Fiber Parts

7 Appendix A: Cosmetic Reference Standard Table

CLASS	A1	A2	B1	B2	C1	C2	D1	D2
APPLICATION	SMALL EXTERNAL	LARGE EXTERNAL	SMALL EXTERNAL	LARGE EXTERNAL	SMALL EXTERNAL	LARGE EXTERNAL	SMALL INTERNAL	LARGE INTERNAL
FOD in powder coat	None	QTY 2: .025" DIA x .015" H	QTY 2: .030" DIA x .015" H	QTY 4: .050" DIA x .015" H	N/A	N/A	Acceptable	Acceptable
Phantom Scratch (light surface marring, visible at certain angles through manipulation)	None	QTY 2: 0.25" L x .010 W	QTY 2: 0.25" L x .010" W	QTY 4: 0.50" L x .010" W	QTY 4: 3.0" L x .020W	QTY 8: 4.0" L x .020W	Acceptable	SEE NOTE 1
Scratch (catches fingernail) No exposed metal	None	None	QTY 1: 0.15" L x 0.005" W	QTY 4: 0.25" L x 0.005" W	QTY 4: 2.0" L x .010 W	Qty 4: 4.0" L x .010 W	Acceptable	SEE NOTE 1
Tooling Marks (process marks consistent on all parts, doesn't catch fingernail) NOTE: No exposed metal	None	QTY 2: .025" L x .015" W	QTY 2: 0.25" L x .015" W	QTY 4: .050" L x .015" W	QTY 2: 0.5" L x .015 W	QTY 4: 1.0" L x .015" W	Acceptable	Acceptable
Bend lines- straight, consistent, shallow lines. NOTE: No exposed metal	None	None	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Dent, Ding, Nick NOTE: No exposed metal; 0.05" depth max	None	None	QTY 1: 0.15" DIA	QTY 2: 0.15" DIA	QTY 1: 0.25" DIA	Qty 2: 0.25" DIA	SEE NOTE 1	SEE NOTE 1
Fracture, split, crack	Defect not allowed							
Incomplete fill/ cold shot in cast metals	Defect not allowed							
Corrosion, oxidation, rust	Defect not allowed							
Burrs and sharp edges	Defect not allowed							
Protruding fasteners (PEMs, hardware, rivets, etc)	Defect not allowed							

NOTE 1: Flaws exceeding those allowed under Class C2 are permitted; however, the flaws must not be so severe as to affect form, fit or function.