Supplier Quality Requirement Direct Ship Addendum

Table of Contents

Supplier Quality Requirement Direct Ship Addendum

1.0 Purpose / Scope / Timing

This document provides cosmetic appearance requirements for GE Power Conversion and its suppliers. It establishes quality requirements for the cosmetic inspection of purchased components and assemblies. This inspection document may be used to assist in making an accept or reject decision, prior to shipment of deliverables.

1.1 Roles responsibilities

- Supplier
    - Provide all parts and services as outlined in Purchase Order (PO), drawings, and/or specifications Note: Unless otherwise specified, refers to the corporation, company, partnership, sole proprietorship or individual with whom GE PC places a Purchase Order (PO) with.
- Supplier Quality Engineer (SQE)
    - Communicates qualification and production quality requirements to supplier
    - Serves as the key interface with the supplier
    - Communicates qualification acceptance to the supplier
    - Coordinates process improvements, non-conforming material dispositions, corrective actions, and
    - surveillance auditing
- Sourcing Representative
    - Negotiates price, delivery, terms and conditions
    - Places the PO for qualification and production
- Responsible Engineer
    - Engineering, in conjunction with SQE and other appropriate entities, shall 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 the Sourcing Representative and the SQE

Supplier Quality Requirement Direct Ship Addendum

1.2 Communication

All communication with suppliers, including questions or requests for additional information, should be submitted to the appropriate Sourcing Representative. The Supplier Quality Engineer must be on copy of communications regarding audits, surveillances, quality issues/concerns, product qualifications, non-conformances, record package requirements, inspection and testing results, material certificates, SCAR (Supplier Corrective Action Requests), SDR (Supplier Deviation Requests), and calibration of M&TE.

1.3 Compliance Date

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 utilizing eSDR (Clear Orbit) and approved by the appropriate GE representative and documented accordingly.

Supplier Quality Requirement Direct Ship Addendum

2.0 Procedure / Quality Record Requirements

2.1 Global Appearance Guidelines

- Products must meet requirements specified in the drawing.
- Reference EC-SRC-0002 Supplier Quality Requirements section 2.2.1 for the full order of precedence of guiding documents.

2.2 Cosmetic Reference Standard Table

Defect	Class	Part's entire Area Less than 400 in² per side		Part's entire Area Greater than 400 in² per side	
		Max Defect Size Allowed	Max Number Allowed per 50 in²	Max Size Allowed	Max Number Allowed per 100 in²
Applicable to all Parts					
Fracture, Split, Crack	**A, B, C**	A: Not Allowed (None); B: Qty 4 Max Depth .03" sinks/cracks) Max Height 0.015" (Fins); C: Allowed			
Incomplete Fill/ Cold Shot in Cast Metals	**A, B, C**	Defect not Allowed (None)			
Corrosion, Oxidation, Rust	**A, B, C**	Defect not Allowed (None)			
Short Shot injection molded plastic	**A, B, C**	Defect not Allowed (None)			
Burrs and Sharp Edges	**A, B, C**	Defect not Allowed (None)			
Scuff, Abrasion, Mark (light)	**A**	None	0	None	0
	B	0.005"	2	0.020"	4
	C	-	-	-	-
Scratch (catches fingernail)	**A**		0	0.25" Long	1
	B	0.125"	1	0.5" Long	2
	C	0.25"	2	1.0" Long	4
Pits	**A**	None	0	None	0
	B	0.06" dia x 0.15" deep	4	0.06" dia x 0.15" deep	8
	C	-	-	-	-
Gouge	**A**	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
Dent, Ding, Nick	**A**	None	0	None	0
	B	None	0	None	0

Supplier Quality Requirement Direct Ship Addendum

	C	None	0	None	0

Base Material Defect, Composition	A	None	0	None	0
	B	Max Dim: .06 Sq" x .010"Dp	4	Max Dim: .06 Sq" x .010"Dp	8
	C	-	-	-	-
Punch & Die Mark	A	0.06" distance from hardware	Any	0.25" distance from hardware	Any
	B	0.15" distance from hardware	Any	0.5" distance from hardware	Any
	C	0.25" distance from hardware	Any	0.75" distance from hardware	Any
Porosity, Voids & Sink Marks	A	None	0	None	0
	B	Max: 0.05" Dia x .015" H	4	Max: 0.05" Dia x .015" H	8
	C	-	-	-	-
Protrusions	A	None	0	None	0
	B	0.06" Dia. x .010" H	4	0.06" Dia. x .010" H	8
	C	-	-	-	-
Removable Particulate Foreign Material	A	None	0	None	0
	B	Less than 0.030" Dia x .015" H	3	Less than 0.030" Dia x .015" H	6
	C	-	-	-	-
Ejector Pin Mark	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-

Non-painted and Non coated Areas (Also includes specifications from section "Applicable to All Parts")					
Rainbow Effect	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
Burnish Marks	A	None	0	None	0
	B	None	0	None	0
	C	0.010"	4	0.010""	8
Bend Line (Edge Area)	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
	A	None	0	None	0
	B	None	0	None	0

Welded Area (showing burn	C	-	-	-	-

Plated, Painted and Coated Parts (Also includes specifications from section "Applicable to All Parts")					
Runs	A	None	0	None	0
	B	0.06" W x 0.5" L	2	0.12"	4
	C	-	-	-	-
Blistering, Peeling, Flaking, Chipping	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
Fisheye	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
Orange Peel/Orange Skin	A	None	0	None	0
	B	None	0	None	0
	C	-	-	-	-
Delamination	A	None	0	None	0
	B	None	0	None	0
	C	None	0	None	0
Bleed Out	A	None	0	None	0
	B	0.06" W x 0.5" L	2	0.12"	4
	C	-	-	-	-
Slug Mark	A	None	0	None	0
	B	0.06"x 0.12"	1	0.06"x0.12"	1
	C	0.06"x 0.12"	3	0.06"x0.12"	3
Flow Marks & Ripples	A	None	0	None	0
	B	less than 0.5 in2	4	less than 0.5 in2	8
	C	-	-	-	-

Supplier Quality Requirement Direct Ship Addendum

Plastic Parts (Also includes specifications from section "Applicable to All Parts")					
Gates	A	None	0	None	0
	B	Acceptable	I	Acceptable	I
	C	Acceptable	I	Acceptable	I
Parting Line	A	None	0	None	0
	B	0.002"	2	0.002"	4
	C	-	-	-	-
Flash	A	None	0	None	0
	B	0.005" protrusion	Any	0.005" protrusion	Any
	C	0.01" protrusion	Any	0.01" protrusion	Any
Weld (Knit) Line	A	None	0	None	0
	B	0.002' Wide	2	0.002' Wide	2
	C	0.002' Wide	4	0.002' Wide	4
Sink (for Plastic Parts)	A	None	0	None	0
	B	0.005"	2	0.005"	2
	C	-	-	-	-
Specks and Bubbles (for Plastic Parts)	A	None	0	None	0
	B	0.006"	4	0.006"	4
	C	-	-	-	-
Scratches (for Plastic Parts)	A	None	0	None	0
	B	0.25" L x 0.020" W	4	0.25" L x 0.020" W	4
	C	-	-	-	-
Discoloration	A	None	0	None	0
	B	0.010"	4	0.010"	4
	C	-	-	-	-

The following defects are not allowed on plastic parts in A and B zones. Consult drawing for criteria in C and D zones: Splits, Burns, Gas Marks, Marbling, Orange Peel, Non-Uniform Texture, Pitting, Cracking, Delamination and Cold Slugs

3.0 Bus Bar – Copper and Aluminium

3.1 Acceptance criteria

- Due to consequential damage that could result from defective surfaces on bus bars, there are NO acceptable defects.
- For General inspection requirements and viewing conditions- reference Section 4 (Surface Cosmetics and viewing conditions).
- This section applies to all bus bar – copper and/or aluminum

3.2 Surface condition

- Bus bars must be delivered free of chipping, metal shavings, oxidation, and extraneous material. Any bus bar with discolored or polluted surfaces will be rejected.
- Surfaces can have a small amount of oil that means the existence of a film lubricant residue on cold-rolled semi-finished material will be accepted. If the surface has been affected by any manufacturing process the surface must be cleaned.
- Cracks, tooling marks and porous surfaces, especially on formed edges will be rejected.
- Material surface must be free of burrs, bending marks and dents.

3.3 Edges

- All edges must be free of burrs and sharp edges, any bus bar with sharps edges will be rejected. Unless noted otherwise undercut all edges 0.1 – 0.3mm
- Cut edges must be even and free of notches.

3.4 Contact area

The contact area is defined by the rectangular area (a x b) around connection holes.

- For connection holes 5.5mm ≥ 11mm = 2.8 x diameter.
- For connection holes greater than 11mm = 50mm.
- To guarantee the correct functionality of the bus bar the following dimensions for roughness in the contact area must be maintained: ≤12µm and Rt must be between 30µm (ideal) and 100µm.

4.0 Definitions, Acronyms and References

4.1 Definitions

Abrasion: area damaged by scraping or wearing away that does not remove or displace material

Base Metal: bare metal used to fabricate the part

Bend Line: a mark created parallel to an edge bend (created by press brake tooling)

Bleed Out: a discolored substance that runs out of seams or holes leaving a stain

Blistering: area of air, gas or moisture entrapment that causes non-adhesion or a bubbling surface finish

Burnish Marks: marks or lines caused by friction at the surface

Burns: black or brown marks on the surface of a part caused by overheating

Burrs: a rough or sharp edge caused by manufacturing processes such as punching, shearing, milling or drilling

Chipping: area where paint or coating has been mechanically displaced from the surface

Composition: foreign particulate that has been added to the base material

Corrosion: oxidation reaction of a metal when exposed to air or contaminant

Crack: a narrow break or split in the material

Delamination: separation or peeling of a thin layer of material

Dent: a noticeable depression on a surface caused by a force or impact

Die Marks: a mark made by insertion tooling around the perimeter of inserted hardware

Supplier Cosmetic Requirements

Ding: surface damage similar to a dent or nick

Discoloration: unintended contrasting shade on the surface or in the material

Ejector Pin Mark: a mark created by pins used to eject work piece from a tool, die or mold

Fisheye: a surface defect having the form of a spot or bubble

Flaking: area in which adhesion between the paint and surface is poor causing the paint to come off

Flash: excess material located around the mold parting line or internal shutoff areas

Flash: plastic in unintended areas, often at the parting line

Flow Marks: excess wavy or streaked appearance visible at the surface

Fracture: a break, fissure, or split

Gates: a point where plastic is injected in cavity

Gates: area where the sprue intersects the molded part, often leaving a small protrusion on the part

Gouge: a groove or depression caused by a sharp object that may dig into the base metal

Grease: a thick oily material that is often used as a lubricant causing shiny or glossy patches on the surface

Incomplete Fill/Cold Shot: areas of incomplete fill in the casting process

Insufficient/Excess Coverage: too much or too little paint or coating

Mark: a visible impression of something, such as a line, cut, dent stain, or bruise that remains visible even after coating

Nick: a small notch, groove, or chip that is cut into a part or dented into a material

Oil Spots: a hydrocarbon residue remnant

Orange Peel/Orange Skin: a paint defect caused by improper painting or drying which leaves a rippled or mottled appearance on the surface similar to the appearance of the surface of an orange

Supplier Cosmetic Requirements

Overspray: excess paint or other coating that spreads beyond the designated area

Oxidation: a coating of rust that leaves a discolored area on the surface

Parting Line: a raised line formed at the seam of two halves of the mold

Parting Line: area where the two halves of the mold come together, leaving a seam

Peeling: area where adhesion between paint and surface is poor causing paint to strip or rip off.

Pits: small craters on the surface

Porosity: a collection of multiple small voids or air bubbles in a material that shows on the surface as one or more voids or bubbles

Protrusions: a section of material that extends beyond or above a surface

Punch Mark: mark on the surface caused by the punch process

Rainbow Effect: discoloration causing a colored appearance

Removable Particulate Foreign Material: air fibers, metal flakes, dirt, lint, specks, and other particles

Ripples: small undulations, ruffles or folds on a surface

Runs: area of excess paint that is noticeably thicker and flowed downward before drying

Rust: an area of corrosion or oxidation on a metal surface

Scratch: a long, narrow (less than 0.015" wide) mark on the surface deep enough to catch the fingernail

Scuff: a light mark caused by scraping or wear that can be seen but not felt

SOR (Supplier Deviation Request): a request initiated by the supplier to deviate from purchase order technical requirements (drawings, specifications, engineering instructions, etc.) or the approved qualification package.

Supplier Cosmetic Requirements

Short-Shot: molded part that is incomplete because of insufficient material injected into mold

Sink Marks: a depression or dimple caused by non-uniform material shrinkage

Slug Mark: surface deformity caused by the punch process

Split: a cleaved area in a section of material

Stains: a discoloration produced by foreign material having reacted with the surface or base material

Standard Mill Finish: ASTM- B209 defines Standard Mill Finish as, "Sheet having a non-uniform finish which may vary from sheet to sheet and within a sheet and may not be entirely free from stains or oil." Federal Specification QQ-A-250/8 defines Mill Finish Workmanship as follows: "The plate and sheet should be uniform in quality and condition; clean, sound, smooth, commercially flat, and free from buckles, blisters, and other injurious defects within the limits consistent with the best commercial practice. Discoloration due to thermal treatment should not be cause for rejection.

Tooling Marks: impact from a tool during the fabrication process

Voids: an empty space, gap or opening in a material

Water spots: residue or discoloration remaining after water on the surface dries

Weld Line: area where molten plastic flows come together during injection molding without knitting together leaving a mechanically weaker area

Welded Area showing burn: black area where welding process had excess heat or soot on the surface

Supplier Cosmetic Requirements

5.0 Supporting Documents

- 7.3-PIT-QM002 Rev.001 Cosmetic Specification
- EC-SRC-0002 Latest Rev Supplier Quality Requirements

6.0 Document Revisions and Approvals

Version	Section Modified and Revision Description	Date	Author
1.0	New Issuance	Nov 19, 2021	Georgette A. Diab Eric Boff John Kurzawski

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