

The following clauses, when specifically referenced in the Purchase Order by number, form a part of the Purchase Order in addition to all other clauses, terms, and conditions, drawings, and specifications, which are also made a part of the Purchase Order. Unless otherwise noted, specifications referenced herein shall be of the issue in effect on the date of the Purchase Order.

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## DOCUMENTATION CODES

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### **D01 AS9102 First Article Inspection Report:**

When listed as a deliverable item on the Rugged Science purchase order, the supplier is required to submit an electronic copy of a First Article Inspection Report (FAIR) for the relevant part number(s) and revision level(s) listed on the Rugged Science purchase order in accordance with the requirements of AS9102. The FAIR format shall comply to the current revision of AS9102. Supplier shall maintain record of FAIR for a minimum of seven (7) years. Shipment of material is contingent on Rugged Science Quality Assurance acceptance of the submitted report.

### **D02 First Piece Dimensional Inspection:**

Regardless of prior approvals or status, for material on the subject purchase order line, the supplier shall inspect one piece for all dimensional characteristics and notes listed on the drawing, recording all results as objective evidence of the inspection. Recorded data shall be packaged and sent to Rugged Science with the material in question.

### **D03 Certificate of Conformance:**

The supplier shall provide a Certificate of Conformance / Compliance (C of C) with each delivery of product. This C of C is acknowledgement by the supplier that the requirements of the purchase order/subcontract have been fully met and any required chemical / physical analysis has been performed with substantiating evidence/data on file and available upon request by Rugged Science, LLC.

At a minimum, the C of C shall include the following information:

- Rugged Science Purchase Order Number
- Rugged Science Part Number and Revision
- Supplier Part Number and Revision (if applicable)
- Part Description/Name
- Quantity
- Serial Number / Lot Code / Date Code / Batch Number (as applicable)
- Supplier Name and Address
- Signature and title of an authorized member of the supplier's Quality department
- Date of issue / approval

If supplier is not the original manufacturer, supplier is responsible for obtaining all necessary information from the original manufacturer. C of C may be part of the packing list, at supplier's discretion.

### **D04 Certificate of Special Process:**

All Special Process suppliers, utilized on this purchase order/subcontract shall have accreditation by Nadcap current as of the date of issue of the purchase order. The Supplier accepting Rugged Science's purchase order is responsible for verification of Nadcap certification of the Special Process supplier through

www.eAuditNet.com (other equivalent source) and must document the verification date and Nadcap accreditation code(s) as through a Certificate of Conformance.

A Special Process Certificate of Conformance issued by the Special Process supplier shall accompany all shipments. The Special Process Supplier's Certificate of Conformance shall certify compliance with all Special Processes required by this Purchase Order (PO)/Subcontract and associated specifications and/or drawings.

This requirement shall be flowed down to all sub-tier suppliers. All costs associated with Nadcap accreditation shall be borne by the Special Process Supplier. Special Processes are as defined in AS9100 and as defined by Nadcap. Examples of special processes include but are not limited to Chemical Processes (including Plating, Conversion Coating), Heat Treating, Protective Coatings (Conformal/Paint Epoxy), Welding (EG: Resistance/ EB Fusion), Brazing (Vacuum/ Dip), Non-Destructive Inspection or Test (NDI/NDT), Material Testing Laboratories, Composites, Non-conventional Machining & Surface Enhancements, X-Ray Inspection, etc.

If a First Article Inspection Report (FAIR) is also imposed by the PO/Subcontract, the Special Process Certificate of Conformance and other data, such as material certifications and paint gloss readings, etc. shall be attached as part of the FAIR.

Records pertaining to this requirement must be maintained by supplier for not less than seven (7) years.

#### **D05 Raw Material Report and/or Certificate of Conformance:**

The supplier shall provide a Report and/or Certificate of Conformance (C of C), with each delivery, for the raw material supplied or used in the parts supplied. The C of C shall be from the original raw material supplier and include original supplier, lot number, material specification, tests conducted, and any other relevant information needed to identify the raw material. Acceptable examples include foundry report, mill report, dimension/ description, temper/hardness, alloy and condition. The supplier shall maintain the original mill certification and any secondary independent test laboratory certification(s) if any additional process was done after original mill certification for procured metallic material that shall include physical properties, chemical analysis and lot number(s). For plastics and other "proprietary" materials a C of C from the OEM / OCM to that material specification is acceptable. In addition, material must meet any other contractual requirements as stated in the Purchase Order, and any applicable DFARs such as Specialty Metals. Supplier records shall be retained for a minimum of 7 years after completion of the purchase order or subcontract. These requirements shall be flowed down to any sub-tier suppliers.

#### **D06 Test Data by Lot:**

The supplier shall provide, with each shipment, one reproducible copy of the documented Test Data, including electrical, mechanical, or environmental, as applicable. Lot type data shall be included with each shipment. The supplier shall also retain such records for a minimum of seven (7) years after delivery of product. All retained records shall remain legible, readily identifiable and retrievable. These requirements shall be flowed down to any sub-tier suppliers. Records shall be made available to Rugged Science, their customers or government representatives upon request for the duration of the retention period.

#### **D07 Test Data by Serial Number:**

The supplier shall provide, with each serialized unit, one reproducible copy of the documented Test Data, including electrical, mechanical, or environmental, as applicable. The supplier shall also retain such records for a minimum of seven (7) years after delivery of product. All retained records shall remain legible, readily identifiable and retrievable. These requirements shall be flowed down to any sub-tier suppliers. Records

shall be made available to Rugged Science, their customers or government representatives upon request for the duration of the retention period.

**D08 Retention of Records:**

Records of product conformity for serialized or lot controlled items shall be retained for a minimum of seven (7) years after delivery of product. All retained records shall remain legible, readily identifiable, and retrievable. These requirements shall be flowed down to any sub-tier suppliers. Records shall be made available to Rugged Science, their customers or government representatives upon request for the duration of the retention period.

**D09 OEM Pedigree Traceability:**

Original Manufacturer (OEM) lot traceability is required. Each piece delivered in the subject lot shall be clearly marked with a lot code or date code which provides traceability to the manufacturer. If the part is too small to mark, the minimum protective package shall contain the information.

**D10 Parts Subject to QPL Control:**

The product furnished under this order shall be the product which are listed on the Qualified Products List (QPL) applicable to the product ordered.

**D11 Counterfeit Parts Prohibited:**

No counterfeit parts, as defined herein, shall be supplied to or used in products supplied to Rugged Science.

Rugged Science shall perform inspection for evidence of gross or common indications of counterfeiting within 14 days of receipt. Rugged Science shall notify seller in writing of suspect or confirmed counterfeit parts within 14 days of discovery at any time during the liability period.

Rugged Science reserves the right to withhold payment for all suspect items pending the results of the investigation.

If suspect/counterfeit materiel is furnished under this purchase agreement, such items shall be impounded. Rugged Science is under no obligation to return suspect or confirmed counterfeit materiel and may elect to scrap any known counterfeit materiel or may turn such items over to Authority Having Jurisdiction for investigation.

The seller shall promptly replace such items with items acceptable to Rugged Science. The seller may be liable for all costs relating to impoundment, removal, and replacement for a period of two years from date of delivery.

Seller shall notify Rugged Science in writing of any known instances of fraud or attempted fraud within the seller's supply chain related to materiel covered by this purchase agreement.

Definition:

(A) "Counterfeit Part": Any part that is a copy or substitute without legal right or authority to do so or one whose material, performance, or characteristics are knowingly misrepresented by a supplier at any level in the supply chain. Examples of counterfeit parts may include, but are not limited to:

- (1) Parts which do not contain the proper internal construction (Die, Manufacturer, Wire Bonding, etc.) consistent with the ordered part;
- (2) Parts which have been used, refurbished, or reclaimed, but represented as new product;

- (3) Parts which have a different package style or surface plating/finish than the ordered parts;
- (4) Parts which have not successfully completed the OEM's full production and test flow, but are not represented as completed product;
- (5) Parts sold as upscreens parts, which have not successfully completed upscreening; or,
- (6) Parts sold with modified labeling or markings intended to misrepresent the part's form, fit, function, grade, or manufacturing date.

(B) "Part": The lowest level of separately identifiable items (e.g. piece parts).

### **D12 Prohibition Against Use of Non-Authorized Distributors:**

All Electrical, Electronic, and Electromechanical (EEE) Parts shall be purchased through Original Component Manufacturer (OCM) / Original Equipment Manufacturer (OEM), or an OCM/OEM-Authorized Distributor (a.k.a. Franchised Distributor). Use of Non-Authorized Distributors is prohibited without expressed written consent by Rugged Science and may include approval of test reports ensuring parts are of OEM design/manufacture and not counterfeit parts.

### **D13.1 Interconnect Stress Test (IST), Lot Acceptance:**

Subject material must have Interconnect Stress Test performed for Lot Acceptance. Testing shall be compliant to IPC-TM-650 Number 2.6.26, Method A, Dual Sense Testing. Capacitance Testing per Section 5.2.4 is required when capacitance test circuitry is provided on the test coupons. Any coupons failing the IST test shall require failure analysis per Section 6.2. Sample selection, conditioning, pre-conditioning, test conditions and acceptance criteria shall be according to Rugged Science document 50000-80008 Interconnect Stress Test for PCB Lot Acceptance. Electronic copy of test data report shall be provided to Rugged Science for each sample lot.

### **D13.2 Interconnect Stress Test (IST), Process Qualification:**

Subject material must have Interconnect Stress Test performed for Process Qualification. Testing shall be compliant to IPC-TM-650 Number 2.6.26, Method A, Dual Sense Testing. Capacitance Testing per Section 5.2.4 is required when capacitance test circuitry is provided on the test coupons. Any coupons failing the IST test shall require failure analysis per Section 6.2. Sample selection, conditioning, pre-conditioning, test conditions and acceptance criteria shall be according to Rugged Science document 50000-80008 (Interconnect Stress Test for PCB Lot Acceptance). Electronic copy of test data report shall be provided to Rugged Science for first lot.

Any change in Part Number/Revision and/or change in Printed Circuit Board manufacturing process will require new Process Qualification test.

### **D14.01 X-Ray inspection of Bottom Terminated Components, Process Qualification:**

X-ray inspection of the bottom termination solder joints is required for Process Qualification at a sampling rate of AQL 1%, Level II, Normal on the first run of any new configuration (defined as any change to assembly revision, stencil artwork, or any other change that may affect the solder paste or SMT reflow process).

## **D14.02 X-Ray inspection of Bottom Terminated Components, AQL Sampling of Each Lot:**

X-ray inspection of the bottom termination solder joints is required for Lot Acceptance at a sampling rate of AQL 1%, Level II, Normal on each production run (defined as any continuous operation without change to raw material, or component lots).

## **D14.03 X-Ray inspection of Bottom Terminated Components, 100%:**

X-ray inspection of the bottom termination solder joints is required 100% of bottom terminated components.

## **D14.04 X-Ray inspection of Bottom Terminated Components, Special requirement per SOW or PO:**

X-ray inspection of the bottom termination solder joints as defined in Statement-of-Work, Purchase Order, or other procurement documentation.

## **D15.01 X-Ray inspection of Area Array Components, Process Qualification:**

Area Array Components (including but not limited to Ball Grid Array (BGA), Land Grid Array (LGA), and Column Grid Array (CGA) require X-Ray inspection with acceptance criteria as defined in IPC-A-610.

X-ray inspection of the Area Array component solder joints is required for Process Qualification at a sampling rate of AQL 1%, Level II, Normal on the first run of any new configuration (defined as any change to assembly revision, stencil artwork, or any other change that may affect the solder paste or SMT reflow process).

## **D15.02 X-Ray inspection of Area Array Components, AQL Sampling of Each Lot:**

Area Array Components (including but not limited to Ball Grid Array (BGA), Land Grid Array (LGA), and Column Grid Array (CGA) require X-Ray inspection with acceptance criteria as defined in IPC-A-610.

X-ray inspection of the Area Array component solder joints is required for Lot Acceptance at a sampling rate of AQL 1%, Level II, Normal on each production run (defined as any continuous operation without change to raw material, or component lots).

## **D15.03 X-Ray Inspection of Area Array Components, 100%:**

Area Array Components (including but not limited to Ball Grid Array (BGA), Land Grid Array (LGA), and Column Grid Array (CGA) require X-Ray inspection with acceptance criteria as defined in IPC-A-610.

X-ray inspection of the Area Array component solder joints is required for 100% of Area Array components.

## **D15.04 X-Ray Inspection of Area Array Components, Special Requirement per SOW or PO:**

Area Array Components (including but not limited to Ball Grid Array (BGA), Land Grid Array (LGA), and Column Grid Array (CGA) require X-Ray inspection with acceptance criteria as defined in IPC-A-610.

X-ray inspection of the Area Array component solder joints shall be as defined in Statement-of-Work, Purchase Order, or other procurement documentation.

## **D16 Radiographic Inspection:**

The material on this purchase order requires radiographic inspection. Each Radiograph shall include the image of the number, part serial number, identification of the area radiographed and identification of the view direction. Films shall be interpreted by the supplier's laboratory and findings reported on an appropriate form. Copies of the laboratory report and the radiographs shall accompany the material. Each

report submitted shall be signed by a certified radiographer, stating the level of certification IAW MIL-STD-410/NAS 410.

### **D17 Acoustic Microscopy:**

Acoustic microscopy shall be performed on all plastic encapsulated components with images identified to individual parts and included in shipment upon delivery to Rugged Science. Specific requirements for scanning modes and applicable standards are provided on the Purchase Order. A source control drawing (SCD) is recommended.

### **D18 Notification of Schedule Delay:**

Supplier shall notify the Rugged Science buyer, within one (1) working day of discovering any nonconformity, failure, etc. that could jeopardize the delivery schedule required by this Purchase Order.

### **D19 Change Notification, General:**

Supplier shall notify Rugged Science of proposed changes in design and/or process definition and shall obtain approval from Rugged Science Buyer and cognizant Quality authority prior to implementing the change. Changes affecting processes, production equipment, tools, and programs shall be documented.

### **D20 Authorization to Proceed:**

Prior to start of manufacturing, supplier must receive formal consent to build from Rugged Science. Dependent on the Rugged Science-established complexity of the manufacturing process, this consent will either be conducted at the supplier facility or scheduled as a teleconference. Consent method to be established by Rugged Science. The timing of this activity shall be included as part of the milestone schedule supplied to Rugged Science.

### **D21 DPAS Rated Order:**

If this is a DPAS rated order certified for National Defense Use, you are required by law to follow the provisions of the Defense Priorities Allocations System (15 CFR 700).

Authorized vendor representative must accept or reject a rated order in writing or electronically within fifteen (15) working days after receipt of a "DO" rated order, and within ten (10) working days after receipt of a "DX" rated order. If the order is rejected, the representative must give reasons in writing (NOT electronically) for the rejection, directed to the listed Buyer on the subject order.

If a rated order has been accepted, and vendor/vendor's representative subsequently finds that shipment or performance will be delayed, notification must be provided to Rugged Science immediately, providing the reasons for the delay, and advising of a new shipment/performance date. If notification is given verbally, written or electronic confirmation must be provided within five (5) working days.

### **D22 Mixed DPAS Rated Order:**

This Purchase Order contains combined Unrated and Rated order quantities certified for National Defense use. Vendor is required to follow all provisions of Defense Priorities and Allocation System (15 CFR part 700) only as it pertains to the rated quantities.

### **D23 Classified Information Control:**

Performance under this purchase order involves access to classified information. Approved DD254, "Security Requirements Check List", is applicable to this contract, and should be in supplier's possession.



All classified end items, components, etc., manufactured or procured by supplier must be shipped in accordance with applicable security regulations.

### **D24 Requirements Flow Down:**

Seller shall flow down applicable requirements to all of their suppliers to ensure buyer's requirements, including key characteristics, are appropriately flowed down to all tiers within the supply chain.

### **D25 Critical Item, Raw Material Test Report and Certification:**

When listed as a line item on the purchase order, Test Report(s) verifying the key characteristics of the raw material shall be provided to Rugged Science along with a Certificate of Conformance (C of C) form the original raw material supplier for each delivery. Documentation shall include the name of the original raw material supplier and include lot number, material specification, tests conducted, and any other relevant information needed to identify the raw material. The supplier shall maintain the original mill certification, subsequent special process reports (including heat treatment), all test report(s) and certificates of conformance for a minimum of seven (7) years after completion of the purchase order or subcontract. These requirements shall be flowed down to any sub-tier suppliers. Test samples suitable for third-party testing shall be included in the quantity specified on the purchase order if so indicated.

### **D26 Change Notification, PCBA:**

Supplier shall notify Rugged Science of proposed changes in material, design or process, and shall obtain approval from Rugged Science Buyer or cognizant Quality authority prior to implementing the change. Changes affecting processes, materials and production equipment shall be documented. Supplier may make changes to solder stencils without approval; however, changes must be documented, and Rugged Science must be informed of the change.

### **D27 PCB Microsection Reports:**

Microsectional analysis for structural integrity shall be conducted on test coupons and printed board samples in accordance with the controlling specification (either IPC-6012 or IPC-6018). Test results of all microsection reports, both in-process and final acceptance test, shall be submitted to Rugged Science, LLC. All microsection reports shall include photographs of microsections in the "as-polished" condition, and the microetched condition. Microsection photographs of microetched coupons shall be of sufficient magnification and resolution for examination of foil and plating integrity. For mixed dielectric boards (Type 4 and Type 6 per IPC-6018) images shall include all copper layers between dissimilar dielectric types (e.g. low dielectric RF core and FR4 prepreg). In all cases, photographs of the smallest drilled hole diameter must be included in the report. (May 2020)

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## MATERIAL CODES

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### **M01 Material Subject to Shelf-Life Control:**

If material in this purchase order is subject to shelf-life control; all material shipped to Rugged Science shall have a minimum of 80% of its useful shelf life remaining, except with written authorization by the Rugged Science purchasing agent.

The following information shall be identified on each container or accompanying documentation:

- 1) Manufacturer's name
- 2) Product name/designation

3) Shelf life duration period (in months) and shelf life beginning and/or expiration date

### **M02 Preference for Domestic Specialty Metals:**

Any articles delivered against this purchase order must comply with the requirements of 48 CFR 252.225-7008. Per the requirement "Specialty Metals" means

- (i) Steel—
  - (A) With a maximum alloy content exceeding one or more of the following limits: manganese, 1.65 percent; silicon, 0.60 percent; or copper, 0.60 percent; or
  - (B) Containing more than 0.25 percent of any of the following elements: aluminum, chromium, cobalt, molybdenum, nickel, niobium (columbium), titanium, tungsten, or vanadium;
- (ii) Metal alloys consisting of—
  - (A) Nickel or iron-nickel alloys that contain a total of alloying metals other than nickel and iron in excess of 10 percent; or
  - (B) Cobalt alloys that contain a total of alloying metals other than cobalt and iron in excess of 10 percent;
- (iii) Titanium and titanium alloys; or
- (iv) Zirconium and zirconium alloys.

"Steel" means an iron alloy that includes between .02 and 2 percent carbon and may include other elements.

### **M03 Restriction on Acquisition of Certain Articles Containing Specialty Metals:**

DFAR clause 252.225-7009 applies to this purchase order. Any articles delivered against this purchase order must comply with the requirements of DFAR 252.225-7009.

### **M04.02 Workmanship of Electronic Assemblies:**

The product purchased must meet the soldering and workmanship requirements contained in the latest issue of IPC/ANSI J-STD-001, Class 2 and IPC-A-610 Class 2 unless otherwise specified on the purchase order/subcontract or drawing. In case of a conflict, IPC/ANSI J-STD-001 takes precedence.

### **M04.03 Workmanship of Electronic Assemblies:**

The product purchased must meet the soldering and workmanship requirements contained in the latest issue of IPC/ANSI J-STD-001, Class 3 and IPC-A-610 Class 3 unless otherwise specified on the purchase order/subcontract or drawing. In case of a conflict, IPC/ANSI J-STD-001 takes precedence.

### **M05.02 Workmanship of Cable and Wire Harness Assemblies:**

The product purchased must meet the soldering and workmanship requirements contained in the latest issue of IPC/WHMA-A-620, Class 2 unless otherwise specified on the purchase order/subcontract or drawing.

### **M05.03 Workmanship of Cable and Wire Harness Assemblies:**

The product purchased must meet the soldering and workmanship requirements contained in the latest issue of IPC/WHMA-A-620, Class 3 unless otherwise specified on the purchase order/subcontract or drawing.



## **M06 Conformance to Solderability Standards:**

All leads, pins, terminations or terminals on components/parts supplied shall comply with the solderability requirements of J-STD-002. The testing may be performed on leads, pins or packages which are from the same material lot as that used in production parts and which have been exposed to the same environments as the production parts.

## **M07 Gold Removal:**

Gold shall be removed from the solderable surfaces of electrical and electronic components according to J-STD-001. Tinning should be no closer than 0.020 inches to the component body on leaded components.

## **M08 Serialization:**

Serial numbering required on all items delivered under this purchase order.

## **M09 Printed Circuit Board Requirements:**

For purchase orders that require the manufacture of Printed Circuit Boards (PCB), the following requirements apply:

- 1) Performance and Quality Assurance Provisions (including Qualification Testing, Acceptance Testing and Frequency of Quality Conformance Testing) shall be in accordance with the appropriate IPC Specifications (IPC-6011, IPC-6012, IPC-6013, and IPC-A-600).
- 2) Unless otherwise specified the performance classification shall be Class 2.
- 3) Unless otherwise specified, thermal stress testing of coupons shall be according to IPC-TM-650, Method 2.6.8, Test Condition A (288°C), except for low temperature laminate material and bond ply (thermoplastics) which shall be tested according to IPC-TM-650, Method 2.6.8, Test Condition C (232°C). Optional thermal stress testing of Rigid Printed Boards per IPC-TM-650, Method 2.6.27 (260°C) is acceptable.
- 4) Unused test coupons for each lot of Printed Circuit Boards shipped against this purchase order shall be maintained by the manufacturer and available for review for a minimum of three (3) years after delivery.
- 5) Each shipment shall include the following lot acceptance documentation in supplier format:
  - Certificate of Compliance
  - Quality Assurance Report / Checklist
  - Micro-section Report
  - Plating Thickness Report

## **M10 No Pure Tin, Bismuth or SAC Alloyed Materials Allowed:**

No pure tin plating allowed. The use of pure unalloyed tin is prohibited in the construction and surface finish of goods required to be delivered under this Purchase Order. Construction and finish include solders and plating. Tin is considered to be pure if it contains less than 3% alloying elements. The critical concentration of bismuth begins in the range of 3 to 5%, so lead finishes with greater than 3% bismuth are not allowed. BGA's and CCGA's are not allowed with Tin-Silver-Copper (SAC) alloyed balls. Data / Certification to this requirement must be maintained by the OEM / OCM and is not required to be submitted with each shipment unless otherwise specified. These certifications must be provided upon request by Rugged Science.

## **M11 Prohibition on Pure Tin Plating:**

Pure Tin (Sn) plating is prohibited as a final finish or as an undercoat. Tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is three (3) percent.

## **M12 Mercury Exclusion:**

Mercury or mercury-containing compounds shall not be intentionally added or come in direct contact with hardware or supplies furnished under this purchase order.

## **M13 Certification on Prohibited Materials:**

Product on this order requires prohibition of certain materials: Tin, Cadmium, or Zinc plating, as a final finish or as an undercoat. Tin-Lead (Sn-Pb) finishes are acceptable provided the minimum lead content is three percent (3%) by weight. For all prohibited materials listed on this Purchase Order, supplier is required to submit a certificate attesting that all products provided comply with the exclusion clause. At a minimum, the certificate shall include the following information:

- (1) Supplier CAGE code;
- (2) Lot/heat/batch/date code and serial numbers (if applicable);
- (3) Rugged Science order number;
- (4) Part number of material;
- (5) Name and address of manufacturing location;
- (6) Quantity and unit of measure;
- (7) Statement of exclusion specific to the materials listed on the order's prohibited materials; and,
- (8) Signature of an authorized member of the supplier's Quality department.

If supplier to Rugged Science is not the original manufacturer, supplier is responsible for obtaining all necessary information from the original manufacturer.

## **M14 Prohibition on Pure Metal Plating:**

Pure metal plating of Tin (Sn), Cadmium (Cd), or Zinc (Zn) are prohibited as a final finish or as an undercoat. Tin-Lead (Sn-Pb) finishes are acceptable provided they have a minimum content of three percent (3%) Lead (Pb) by weight. Supplier shall flow down this requirement to their sub-tier suppliers.

## **M15 Prohibited Materials:**

Supplies furnished under this contract or purchase order shall not contain any of the following:

- (1) Pure Tin: Unalloyed tin or tin plate where tin is greater than 97% pure and the remainder is lead is prohibited. Tin with less than 97% tin and the remainder is lead is acceptable. Reflowed pure tin plating is not acceptable.
- (2) Cadmium: Pure Cadmium and high Cadmium alloys ( $\geq 15\%$  Cadmium) are prohibited.
- (3) Zinc: Pure zinc and high zinc alloys ( $\geq 15\%$  Zinc) are prohibited
- (4) Mercury: Pure mercury and high mercury alloys ( $\geq 15\%$  Mercury) are prohibited
- (5) Selenium: Pure selenium and high selenium alloys ( $\geq 15\%$  Selenium) are prohibited
- (6) Corrosive solder flux: Active rosin and organic acid fluxes are prohibited on "closed" surfaces such as a wire termination (stranded wire)
- (7) Magnesium: Pure magnesium or high magnesium alloys. Magnesium alloy may be acceptable with a maintained protective coating of Dow 17 or equivalent coating. Trace amounts of Mg are acceptable in material systems such as Aluminum and Steel alloys.

- (8) Polyvinyl Chloride (PVC): No forms of PVC are acceptable.
- (9) Potting or foam formulations that are prone to reversion.
- (10) Polyurethane or silicone compounds that is prone to reversion.
- (11) Silicones that release acetic acid or other corrosive products during the cure process.
- (12) Cyanoacrylate bonding as primary adhesives. In-process bonding is acceptable provided an approved adhesive provides the primary bond support.
- (13) Graphite as filler for lubricants or grease.
- (14) Elastomeric materials that contact hydrazine except for F-E-332 for diaphragms and AF-E-411 for soft valve seats. Materials that have known compatibility by test, usage, or similarity are acceptable.
- (15) Silicone greases intended for thermal bonding for end-item design (not test)
- (16) Flammable materials that are not packaged to preclude accidental fire.
- (17) Honeycomb, metallic or non-metallic, except when perforated or vented.
- (18) Radioactive materials.
- (19) Silver-plated copper wire with less than 40 micro inches of silver plating.
- (20) Polyimide (Kapton) insulated copper/copper alloy wire used in applications where the voltage is greater than 18 volts and where flexure, tight bend radii, physical or chemical damage, or abrasion could crack the insulation.
- (21) Teflon (tetrafluoroethylene-TFE) insulated hookup wire when not routed or protected to prevent cold flow.
- (22) Fluorinated Ethylene Propylene (FEP) tubing where it provides the sole insulation for a wire conductor and is routed or contacts adjacent metal conductors.

If any of these requirements are not met, please provide the specific material and its percentage as applicable.

### **M16 Circuit Card Assemblies:**

If the subject materiel of this purchase order is Circuit Card Assemblies (a.k.a. Printed Circuit Board Assemblies), then the following shall apply unless otherwise specified:

- (1) Solder stencil files (included solder stencil, solder paste layer, etc.) provided by Rugged Science are provided as an initial guide only. The contract manufacturer may modify the solder stencil and paste layers as necessary to achieve the desired yield, initial quality and reliability for the finished assembly. Rugged Science shall be notified of any change to the solder stencil design. Records of solder layer design by purchase order, lot number, date code, and/or serial number as appropriate, shall be maintained for a minimum of seven (7) years, and shall be available to Rugged Science upon request.
- (2) Assembly workmanship shall be in accordance with IPC-A-610, Class 2
- (3) All solder processes shall be in accordance with J-STD-001, Class 2
- (4) Solder shall be in accordance with J-STD-006
- (5) Solder Paste shall conform to J-STD-005
- (6) Solder Flux shall conform to J-STD-004
- (7) Solderability tests for components and printed circuit boards shall conform to J-STD-002 and J-STD-003 respectively
- (8) Rework of assemblies shall be accomplished in accordance with IPC-7711 with Buyer approval
- (9) Temperature Profiling for Mass Soldering shall follow the guidance of IPC-7530
- (10) Assembly process implementation for bottom termination components shall follow the guidance of IPC-7093

(11) Assembly process implementation for BGAs shall follow the guidance of IPC-7095

### **M17 Acceptability of Final Protective Finish:**

Acceptance criteria for items with paint or powder coat as final protective finish shall be in accordance with the applicable drawing, or Rugged Science document SOP-ASY-001.01 if not specified on the drawing.

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## **PACKAGING CODES**

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### **P01 ESD Protective Packaging:**

The product(s) to be furnished under this order line that are susceptible to damage from Electrostatic Discharge (ESD) and must be packaged to prevent damage through all phases of production, transport, and storage according to ANSI/ESD S541-2019.

### **P02 Antistatic Packaging:**

The product(s) to be furnished under this order line are not susceptible to damage from Electrostatic Discharge (ESD); however, they are intended for use in close proximity to ESD sensitive devices and assemblies. Therefore, all piece part level packaging of the product(s) furnished under this order line shall be Antistatic (i.e., Low Charging) according to ANSI/ESD S541-2019.

### **P03 Packaging of Printed Circuit Boards:**

All Printed Circuit Boards furnished under this purchase order for delivery to Rugged Science shall be packaged according to IPC-1601A. Moisture content of the PCB prior to packaging should not exceed 0.2% by weight. All PCBs shall be dry packed in heat-sealed Moisture Barrier Bags (MBB) with desiccant and Humidity Indicator Card (HIC). The HIC should have 3 color spots with sensitivity values of 5%, 10% and 60% and should be sulfur-free in accordance with IPC/JEDEC J-STD-033. Separation sheets used between printed boards shall be sulfur and chlorine free and pH neutral. Immersion Silver printed boards shall include protective sulfur absorbing paper (such as Silver Saver™ paper) in the package, covering all exposed silver surfaces. Each MBB shall be marked with the part number, part revision, date code and quantity of PCBs enclosed. Each MBB should be large enough to cut open and re-seal twice. Sealable edges of MBB shall not be taped or have labels that would interfere with heat sealing.

### **P04 Special Packaging for Silver Material:**

Silver or silver-plated parts are to be wrapped in tarnish-retardant paper (such as "silver saver") or sealed in a suitable non-sulfur-bearing container prior to final packaging for shipment. Where part size or quantity preclude individual wrap (e.g., terminals), non-damaging bulk wrap techniques will be acceptable. Packing list or other prominent package marking should identify material as silver or silver-plated.

### **P06 Special Packaging for Housings and Covers:**

Covers and Housings must be separately packaged in individual Antistatic bags (i.e. Low Charging) according to ANSI/ESD S541-2008. Identification labels must be placed on the shipping container and each individual Antistatic bag. The labels must note the part number, drawing revision, and quantity enclosed within the package/container.

### **P07 Packaging and Handling of Moisture Sensitive Devices**

Surface Mount Devices (SMD) classified as Moisture Sensitive Devices (MSD) in accordance with J-STD-020 shall be packaged and handled in accordance with J-STD-033. MSDs originally shipped to or returned to Rugged Science under consignment shall be sealed in Moisture Barrier Bags (MBB) in accordance with J-STD-033. MSDs that have exceeded the applicable floor life limit shall be dried in accordance with J-STD-033 prior to sealing or resealing in MBB. When storage of MSD cannot be confirmed to be in accordance with J-STD-033, or the humidity limit indicated by the Humidity Indicator Card (HIC) is exceeded, MSD shall be dried in accordance with J-STD-033 prior to reflow processing or resealing.

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## QUALITY SYSTEM CODES

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### **Q01 Supplier Quality Management System:**

Rugged Science, LLC operates under a Quality Management System (QMS) certified to AS9100. We evaluate our suppliers to the requirements of this international standard. Suppliers to Rugged Science should operate under a suitable QMS. AS9100, AS9110, AS9120 or ISO 9001 are the preferred international standards, and should have third-party certification by a certification body listed with the International Aerospace Quality Group (IAQG), or accredited by ANSI National Accreditation Board (ANAB) or other International Accreditation Forum (IAF) affiliated accreditation body. Supplier Quality Management Systems that do not meet the preferred conditions may be subject to audit by Rugged Science or their customers. Rugged Science reserves the right to review and approve the supplier's manufacturing processes, controls, and records associated with the manufacture of subject material.

### **Q02 Counterfeit Electronic Part Detection and Avoidance System:**

Supplier shall maintain a counterfeit electronic parts detection and avoidance system internally and with its suppliers that is consistent with the requirements of 48 CFR 252.246-7007 and SAE AS5553. Supplier shall immediately notify Rugged Science with the pertinent facts if supplier becomes aware or suspects that items delivered in accordance with the Rugged Science purchase order contain counterfeit parts. When requested by Rugged Science, supplier shall provide OCM/OEM documentation that authenticates traceability of electronic parts to the applicable OCM/OEM.

### **Q03 Supplier ESD Control Program:**

Supplier shall maintain an Electrostatic Discharge (ESD) Control Program that complies with ANSI/ESD-S20.20. The supplier's ESD Control Program shall be subject to review and audit by the Rugged Science, its customers, and/or government representative.

### **Q04 Foreign Object Damage (FOD) Prevention Program:**

Supplier shall maintain an effective Foreign Object Damage (FOD) Prevention Program. The supplier's program shall utilize effective FOD prevention practices. The program shall be proportional to the sensitivity of the design of the product(s) to FOD, as well as, to the FOD generating potential of the manufacturing methods. AS9146 may serve as a guideline. The supplier's FOD Prevention Program shall be subject to review and audit by the Rugged Science, its customers, and/or government representative.

### **Q05 Supplier Calibration System Compliance Requirements:**

Supplier shall have a calibration system which complies with the requirements of ISO/IEC 17025 and ANSI/NCSL Z540-1. The supplier's calibration system is subject to review and audit by the Rugged Science, its customers, and/or government representative.

## **Q06 GIDEP Participation:**

The supplier shall participate in the Government Industry Data Exchange Program (GIDEP) and review product related alerts and advisories to determine if they affect the products/services provided. If affected, the supplier shall take action to notify the buyer and mitigate any negative effect agreed upon by supplier and buyer.

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## **SOURCE INSPECTION CODES**

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### **S01 Source Inspection, Final:**

Final Source Inspection is required on all shipments against this purchase order or line item at the supplier's facility prior to shipment. The supplier shall provide the necessary facilities, equipment, qualified personnel, and documentation to demonstrate conformance to the order requirements during this inspection, including final testing. At the time of source inspection, a copy of the Rugged Science PO, latest Drawing & PL, latest Change Notices, and other applicable specifications shall be presented. The parts or devices shall be ready for shipment except for any packaging that may interfere with the inspection/test. The supplier shall provide notice to Rugged Science seven (7) business days in advance of inspection readiness in advance thereof. After completion of successful and accepted source inspection, a copy of the completed Source Inspection Report and all other required data shall be packaged and shipped with the parts.

### **S02 Source Inspection, Pre-Cap:**

Pre-closure (a.k.a. pre-cap) Source Inspection is required on all shipments against this purchase order or line item at the supplier's facility prior to shipment. The supplier shall provide the necessary facilities, equipment, qualified personnel, and documentation to demonstrate conformance to the order requirements during this inspection, including final testing. At the time of source inspection, a copy of the Rugged Science PO, latest Drawing & PL, latest Change Notices, and other applicable specifications shall be presented. The parts or devices shall be ready for final internal visual inspection without the final cover or closure. The supplier shall provide notice to Rugged Science seven (7) business days in advance of inspection readiness in advance thereof. After completion of successful and accepted source inspection, a copy of the completed Source Inspection Report and all other required data shall be packaged and shipped with the parts.

### **S03 Source Inspection, Final, Limited:**

Final Source Inspection is required on the initial shipments against this purchase order or line item at the supplier's facility prior to shipment. Quantity for inspection to be agreed upon between Rugged Science and supplier. The supplier shall provide the necessary facilities, equipment, qualified personnel, and documentation to demonstrate conformance to the order requirements during this inspection, including final testing. At the time of source inspection, a copy of the Rugged Science PO, latest Drawing & PL, latest Change Notices, and other applicable specifications shall be presented. The parts or devices shall be ready for shipment except for any packaging that may interfere with the inspection/test. The supplier shall provide notice to Rugged Science seven (7) business days in advance of inspection readiness in advance thereof. After completion of successful and accepted source inspection, a copy of the completed Source Inspection Report and all other required data shall be packaged and shipped with the parts.

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**S04 Source Inspection, Pre-Cap, Limited:**

Pre-closure (a.k.a. pre-cap) Source Inspection is required on the initial shipments against this purchase order or line item at the supplier’s facility prior to shipment. Quantity for inspection to be agreed upon between Rugged Science and supplier. The supplier shall provide the necessary facilities, equipment, qualified personnel, and documentation to demonstrate conformance to the order requirements during this inspection, including final testing. At the time of source inspection, a copy of the Rugged Science PO, latest Drawing & PL, latest Change Notices, and other applicable specifications shall be presented. The parts or devices shall be ready for final internal visual inspection without the final cover or closure. The supplier shall provide notice to Rugged Science seven (7) business days in advance of inspection readiness in advance thereof. After completion of successful and accepted source inspection, a copy of the completed Source Inspection Report and all other required data shall be packaged and shipped with the parts.

**S05 Supplier Audit, Reserved Right:**

Rugged Science reserves the right to audit the seller's facility. Products and/or services procured under this purchase order are subject to buyer's, and/or buyer's customer(s), audit of the seller's facility. Buyer's representative shall notify seller's quality organization at least seven (7) working days in advance of any required audit(s) of seller's facility. Seller shall make available all records, facilities, equipment, personnel, and assistance necessary to complete the audit of the supplier's facility.

## MISCELLANEOUS CODES

**X01 Additional Quality Notes:**

Additional quality requirements as specified in the Statement of Work, or Purchase Order apply.

## REVISIONS

DATE	DESCRIPTION OF CHANGE
14 Oct 2021	Initial Release
13 Jan 2022	Revised D25 Critical Item, Raw Material Test Report and Certification
14 Feb 2022	Correction to D21 DPAS Rated Order
28 Feb 2022	Revision to D11, M01, M13, M16, Q01, and Q04.
22 Sept 2022	Revision to P01 and P02
15 Feb 2024	Revision to Q01 and Q03
22 Nov 2024	Revision to D11, M02, M09
14 Jan 2025	Added P07