

## QUALITY ASSURANCE PROVISIONS

The Quality Assurance Provisions (QAPs) as specified herein, shall become an integral part of the Purchase Agreement when indicated by the provision number(s) on the Purchase Order. These provisions supplement the presently existing terms and conditions of the Purchasing Agreement. Subcontractor/Service(s) identified on the Approved Vendor List (AVL) shall access this document via the TTM website, per instructions on the purchase order.

The Subcontractor/Service(s) supplying material and/or service(s) is required to review this document and establish and maintain, as required, documented procedures for ensuring the control and compliance of these specified provisions. The applicable provision(s) shall be specified on the purchase order. A Subcontractor/Service(s) who is unable to access the TTM website to review the QAPs must contact the TTM Technologies Purchasing Department.

A Subcontractor/Service(s) requiring exception(s) to specified provisions must submit a written request to the TTM Technologies Purchasing Agent.

### **Q-1 General Quality Practices**

#### **A. Prohibited Practices: Changes to Drawings, Specifications, Processes, Materials and Procedures:**

The Subcontractor's Quality system shall provide for procedures assuring the latest applicable drawings and specifications are utilized. Subcontractor shall remove from use all obsolete drawings and specifications with the receipt of new and/or amended documentation. Special processes, materials and procedures, previously approved, utilized by the subcontractor to become a qualified source, shall not be changed without written approval from TTM Technologies.

TTM requires a 180 day notice of discontinuation of material or a last buy option in the event raw materials or key components of raw material processing go obsolete.

Material review authority is not permitted on this purchase order. Subcontractors may submit a written request for deviation. However, formal authorization from the buyer is required prior to shipping the material.

Unauthorized Repair: Authority is not granted on this purchase order for the repair of nonconforming material.

Re-submittal of Nonconforming Material: Material rejected by TTM Technologies, which has been returned to conformance and subsequently resubmitted to TTM Technologies for evaluation, shall be clearly identified as such on the shipping documents. Reference must be made to the TTM Technologies rejection document (QCMR#) and objective evidence of root cause and corrective action available.

Unauthorized Production Submittal: Subcontractor shall not submit material from a production lot without initial acceptance of a "First Article" inspection when specified by the purchase order.

Notification of Facility Change: The subcontractor shall not utilize or relocate any production, manufacturing and/or processing facility during the performance of this Purchasing Agreement from those which have been previously qualified, without promptly notifying TTM Technologies, and affording the opportunity for examination of such facilities to the applicable Quality requirements.

**B. On-Site Survey/Inspection:** TTM Technologies reserves the right to conduct on-site survey/inspection(s), for the evaluation of processing capabilities, adequate quality systems, and assurance of continuous compliance to the requirements of the Purchasing Agreement. This survey/inspection may include representatives from TTM Technologies customer base and encompass visiting the subcontractor's sub-tier supplier(s).

**C. Conformance to Contractual Requirements:** On-site survey/inspection(s), conducted by TTM Technologies or a customer representative, as well as first article and receiving inspections, shall not relieve the subcontractor of the responsibility for furnishing items in compliance to the contractual requirements of the Purchase Order. The Subcontractor is responsible and shall control sub-tier supplier procurement to the extent necessary for ensuring specified quality requirements are satisfied. Documented evidence shall be maintained as validation of this control.

**D. Retention of Documentation:** The subcontractor shall maintain records substantiating material certification, inspection and test for a minimum period of three (3) years from the close of the contract. These records are subject to TTM Technologies review, and must be available at the Subcontractor's facility, upon request.

**E. Corrective Action:** TTM Technologies may request corrective action for quality related issues surfacing from received material, deliverable documentation discrepancies and/or problems associated with material detected further in the process which can be attributed to the Subcontractor's manufacturing practices. At a minimum, the Subcontractor's response must include: analysis of root cause, action taken to prevent a reoccurrence, the date of effectivity, and signature of an authorized representative. Failure to respond within the allocated time, or evidence of inadequate corrective action, may result in the removal of the subcontractor from the TTM Technologies Approved Vendor List (AVL).

## QUALITY ASSURANCE PROVISIONS

**Q-2 Quality Program Requirements:** The subcontractor shall establish and maintain a documented Quality System Program in compliance to International Standard ISO 9001 Quality Management Systems – Requirements **and Aerospace Standard SAE AS9100 Quality Management Systems – Requirements for Aviation, Space and Defense Organizations.** Demonstrated adherence to the Quality System must be evident for the assurance of conformance to specified requirements. The subcontractor’s Quality System shall include documented procedures for control of nonconforming product, including identification, segregation, and recall after delivery. The Subcontractor shall establish a documented Foreign Object Detection (FOD) program.

**Q-3 Calibration System Requirements:** The Subcontractor shall establish and maintain a documented calibration program in compliance to the requirements of ANSI NCSL Z540-3, reference Q6, minimum required 1, 3, 4, 6, 9-11, 13, and 14.

**Q-4 Order of Precedence:** In case conflicts occur between the requirements of the purchase order, drawing, referenced specification, statement of work and the enclosed QAP, the purchase order will take precedence. Formal changes to the purchase order require written approval from the TTM Technologies buyer. Original purchase order requirements not modified by the change must be met in full, unless otherwise specified.

**Q-5 Purchase Order Flow Down:** The Subcontractor is responsible to flow down all applicable requirements as well as the necessary documentation (i.e. drawings, referenced specifications, artworks, etc.) to insure contractual adherence, to sub-tier suppliers.

**Q-6 Deliverable Documentation, including Electronic Data:** The Subcontractor and associated sub-tier supplier shall submit, with each shipment, a Certificate of Compliance (C of C) stating that the supplied material/product was processed, fabricated, inspected and tested and is in compliance with all specified requirements of the purchasing contract. The certification shall state that the Subcontractor has on file all data validating compliance to the specified requirements. Data substantiating compliance must be accessible for examination by TTM Technologies and associated customer.

The preferred format is electronic for C’s of C for laminate and prepreg materials.

*The Certificate of Compliance must include as a minimum, the following:*

1. Subcontractor name
2. Purchase Order number
3. Part / Tool Number
4. Lot identification or certificate number
5. Part / Tool name or description
6. List of serial / model numbers if applicable
7. Date Code if applicable
8. Quantity by Date Code, if applicable
9. Standards and the traceable NIST numbers, when applicable.
10. The date the calibration was performed and the next due date, when applicable.
11. Statement certifying Compliance of material/product, including traceability to applicable specs.
12. When special processes are required by drawing or specifications, specific Certificate of Compliance to applicable military and/or customer specifications are required, including revision.
13. Date and signature of authorized company representative.
14. When applicable, “Status of the instrument upon receipt from customer” to be indicated on the C of C indicating:
  - A: Tool in Tolerance or
  - B: Tool out of Tolerance

## QUALITY ASSURANCE PROVISIONS

**Q-7 First Article Inspection:** First Article Inspections shall be performed per the requirements of SAE AS9102. The First Article sample(s) shall be fabricated utilizing parts, materials, and processes proposed for full production. Additionally, the manufacturing shall have occurred at the same location for which production is proposed.

**Q-8 Age Control:** Materials with defined characteristics, which over time are susceptible to quality degradation through use or storage, shall be clearly identified on the lowest level of unit packaging. The package shall be marked to indicate the critical date the shelf life was initiated and date of expiration. As a minimum, materials shall be marked with the date of manufacture, expiration date, storage temperature and humidity requirements, special handling conditions, in addition to the standard identification requirements. Materials at the date of receipt by TTM Technologies shall have a minimum of seventy-five (75) percent of the usable shelf life remaining.

**Q-9 Inspection and Test Plan:** The Subcontractor shall prepare an inspection and test plan for materials processed and delivered against this purchase order. A copy shall be sent to TTM Technologies accompanied by any referenced documentation. Production may not commence on this purchase order until the subcontractor receives formal written approval from TTM Technologies. The inspection and test plan shall include the manufacturing/processing sequences, in-process, and final inspection points in relation to procurement, manufacture, and final acceptance, the method of inspection that will be utilized, measuring and test equipment, and system of delivery. All applicable procedures, specifications, and work instructions shall be referenced by number at the appropriate points. TTM Technologies may elect to establish its own inspection points, consistent with the Subcontractor's plan.

**Q-10 Raw Material Certification:** Chemical and physical analysis (Certificate of Analysis, or C of A) of raw materials furnished under this purchase order is required. Certification substantiating the raw material adherence to the specifications and requirements imposed by the purchase order shall be stated. Test reports must indicate the key characteristic analysis, specification or drawing requirements, actual measured results and acceptance. Documented report shall include as a minimum, the following information:

1. Purchase Order number
2. Part Number
3. Lot Identification number
4. Sample Size
5. Complete chemical and physical test data
6. Date and Signature of Authorized Company Representative

*The test report and raw material certification shall be enclosed with any other required shipping document.*

**Q-11 TTM Technologies Source Inspection:** TTM Technologies will perform source inspection to the requirements of the purchase order at the Subcontractor's facility, prior to the shipment of material. The Subcontractor shall provide reasonable inspection facilities and measuring equipment necessary to validate the compliance to contractual requirements. TTM Technologies reserves the right, should the need present itself, to verify processing methods with the exception of proprietary processes. This includes those processes of the Subcontractor's sub-tier supplier. Subcontractor shall have available all documentation, shop order and/or rout sheet, drawings and specifications, inspection and test results, purchase order, test samples and material for inspection. The Subcontractor shall notify the TTM Technologies buyer not less than five (5) working days prior to the time in which the material will be complete for source inspection. Source inspection acceptance by TTM Technologies does not relieve the Subcontractor from the responsibility of providing acceptable product.

## QUALITY ASSURANCE PROVISIONS

**Q-12 Special Processing:** The Subcontractor and sub-tier suppliers shall establish and document procedures for the control of all special processes (i.e. plating, heat treat, brazing, welding, bonding, coating, etc.). Special processing utilized in the manufacturing of materials for this purchase order requires prior approval, as well as the methods of verifying compliance. This approval does not relieve the Subcontractor of responsibility for delivering compliant material to the stated requirements. The Subcontractor shall notify TTM Technologies in writing of changes to the process or inspection/test methods. A Certificate of Compliance is required for each shipment in which material was produced utilizing a special process. Stated on this document shall be the special process, applicable military and/or customer specification and associated revision.

**Q-13 Packaging Requirements, including Bar Coding of Boxes, Bags and Packing Slips:** The Subcontractor shall establish and maintain a documented system for the control and monitoring of its packaging and shipping practices. Included will be provisions for handling, preservation, storage, packaging, and final shipment. The system must be designed to insure the quality of deliverable material through prevention of damage, deterioration and degradation. Packaging requirements are as stated on the purchase order. When not specified, the method used will be "best commercial practices".

All Laminate, Prepreg, and Flex materials are to have individual boxes/bags identified with readable bar codes. Information required includes; TTM Part #, Qty of pieces, and Lot #. All Laminate, Prepreg, and Flex materials require packing slips with readable bar codes. Information required includes TTM PO #, TTM Part #, and total Qty of pieces for the specific part #. The order of these bar codes is important as the receiving and issuing programs flow in this order. The use of bar codes for other materials/supplies, although not required, is encouraged for boxes and/or packing slips.

**Q-14 Qualification Lot:** Proposed Subcontractor, as an alternative method for placement onto the Approved Vendor List (AVL), shall manufacture, inspect, and test a qualification lot of material and/or service(s). The qualification lot shall be produced with the processes, materials, and equipment planned for production orders. The requirements of the qualification lot shall be documented and flowed down to the proposed Subcontractor through the purchasing document. An inspection and test plan shall be prepared by the Quality department for verification of the qualification lot upon receipt. Results of this verification will be forwarded to the Subcontractor through the purchasing department.

**Q-15 Statistical Process Control/Improvement:** The Subcontractor shall establish and maintain a documented system for the application and implementation of Statistical Techniques for the qualification, measurement, monitoring, control, and continuous improvement of critical processes, where appropriate. The Subcontractor shall identify key process characteristics and as required, provide objective evidence as to the performance of these indicators. Evidence shall include but is not limited to: identification of key characteristic, method of measuring performance, distribution values, CPK level, etc.

**Q-16 Dielectric Thickness:** The dielectric thickness minimum requirement .0035 to be measured peak to peak, measured using 50x, referee 100x.

**Q-17 Nadcap Accreditation:** Nadcap accreditation is required for all Subcontractors.

**Q-18 UTAS End Product Conditions:** If the product provided or the part being processed for TTM is for a UTAS member end use, as shown by a provided drawing released by UTAS/Hamilton/Kidde design authority, or an Out-Sourcing Process Sheet referencing UTAS or Hamilton, the following conditions apply: This PO is subject to the requirements of ASQR-01, HSM17, HSM19, Hamilton end item use. Ten (10) year record retention requirement.