

<b>REVISION HISTORY</b>		
<b>Rev.</b>	<b>Description of Change</b>	<b>Effective Date</b>
A	Initial Release	1/15/00
B	Updated to change the retention period to 7 years	10/03/07
C	Enhanced FAI requirements and added ESD Control	11/26/07
D	Added note for pure RoHS testing	10/14/10
E	Updated for Honeywell SPOC 165, 164 and 124 flow downs as applicable.	02/17/14
F	Updates to Section Q-1, Q-3, Q-6, Q-7, Q-9, Q-10, Q-11, Q-13, Q-14, Q-16	11/14/14
G	Updates to Section Q-11, Special/Controlled Processes	03/13/15
H	Updated Q-5 and Q-6	03/3/17
J	Added Q-Clause Q-17 for Key Characteristics Management	07/19/17

**APPROVAL SIGN OFF**

Name / Title	Date	Signature	Name / Title	Date	Signature
T. Yagnik - Qlty Sys Mgr/Mgmt Rep	/ /		J. Freeto – Materials Mgr.	/ /	
T. Yagnik - Qlty Sys Mgr/Mgmt Rep	/ /		D. KOSS – Engr. Mgr.	/ /	
J. Wood – QA Mgr.	/ /		K. Camello – Ins. Sales Mgr.	/ /	
Prod. Mgr.	/ /		General Mgr.	/ /	
EH&S	/ /			/ /	

The Quality Assurance Provisions 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. The Subcontractor/Service(s) must establish and maintain documented procedures necessary for ensuring the control and compliance of these provisions. The Subcontractor/Service(s) supplying material and/or service(s), are requested to review this document and establish and maintain, as required, documented procedures for ensuring the control and compliance of these specified provisions. 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 and Materials: Changes to Customer Control Drawings, Specifications, Processes, Special Process Materials and Procedures (Q-Clause "A" does not pertain to COT's or Vendor/Supplier Controlled Drawing components):** *(For any material, component or parts order against a Honeywell Controlled Drawing Number the latest revision on the SPOC manual and section 1.0 apply)* The Subcontractor's Quality System shall comply with ISO9001 and or AS9100, latest revision and 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, and shall not be changed without written approval from TTM Technologies and Prime Customer who's Source Drawing this change effects.

**No 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 and include a CofC and record of rework perform to bring component/part back to specification. Reference must be made to the TTM Technologies rejection document (DMR#) and objective evidence of root cause and corrective action available upon request.

**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.

- B. **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.
- C. **TTM Prohibited Material :** Prohibits certain materials during the manufacturing, service, assembly or testing of products supplied or shipped to TTM. Ozone depleting substance, European Material

Restriction for material or components that will be shipped to European locations shall understand and comply with REACH – Registration, Evaluation, Authorization and Restriction of Chemical.

- D. **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).
- E. **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.
- F. **Retention of Documentation:** The subcontractor shall maintain records substantiating material certification, inspection and test for a minimum period of ten (10) years from the close of the contract unless otherwise noted on purchase order (e.g., Flight Safety Parts – 40 Years, Manned Space Program Hardware – 30 Years) These records are subject to TTM Technologies review and must be available at the subcontractor's facility, upon request.
- G. **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 effectively 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 Vendors Listing.

**Q-2 Quality Program Requirements:** The subcontractor shall establish and maintain a documented Quality System Program in compliance to one of the following, International Standard ISO 9001 Quality Management Systems, latest revision or SAE AS9100, latest revision. Demonstrated adherence to the Quality System must be evident for the assurance of conformance to specified requirements. SAE AS9100 Certification is preferred for manufactures and SAE AS9120 for stockiest or pass-through distributors.

**Q-3 Calibration System Requirements:** The subcontractor shall establish and maintain a documented calibration program in compliance to the requirements of ANSI/ISO/IEC 17025 latest revision.

**Q-4 Order of Precedence:** In cases of conflicts that occur between the requirements of the purchase order, statement of work, drawing or referenced specification, 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 review all flow down from TTM and flow down all applicable requirements as well as the necessary documentation (i.e. drawings, referenced specifications, artworks, etc.) to insure contractual adherence, to your sub-tier suppliers.  
For UTAS controlled drawings or specifications, product is for *UTAS End Use Only*.

**Q-6 Deliverable Documentation, including Electronic Data:** The subcontractor and associated sub-tier supplier shall submit with each shipment, a Certificate of Compliance stating that the supplied material/product was processed, fabricated, inspected and tested and are in compliance with all drawing and specified requirements numbers in the purchasing contract. The certification shall confirm that the subcontractor has on file or readily available all data required to validating compliance to the specified requirements. This includes FULL traceability to the Original Component or manufacturing source. Data substantiating compliance must be assessable for examination by TTM Technologies and our associated customer upon request in reasonable amount of time not to exceed 10 days.

Certificate of Compliance must be able to provide upon request full traceability to the OCM if not shipped to TTM directly from OCM/OEM. There cannot be in break in this chain of Traceability when components are supplied not direct from the OCM/OEM.

For all fabricated components that use a Special Process as defined and IAW Nadcap (e.g., plating, NDT, brazing, welding, etc), a Special Process CofC referencing the required process certification IAW the print or spec is required in addition to the product Conformance CofC.”

***SPECIAL FLOW DOWN REQUIRMENT FOR COMPONENT PROCURED TO A UTAS CONTORL PRINT or SPECIFICATION.*** UTAS ASQR-01 requirements apply and all Special Processes (IAW Report 80/85) require a separate CofC from the special process provider referencing the required process certification IAW the print or spec. This CofC is required in addition to the product Conformance CofC.”

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

1. Subcontractor name
2. Subcontractor address / cage code
3. Purchase Order number
4. Part Number
5. Lot identification or certificate number
6. List of serial / model numbers if applicable
7. Date Code if applicable
8. Quantity by Date Code, if applicable
9. Statement Certifying Compliance of material/product, including traceability to applicable specs.
10. **When special processes are required by drawing or specifications, specific Certificate of Compliance to applicable military and/or customer specifications including revision are required in addition to the Product conformance Certification.**
11. Date and signature of authorized company representative.

**Q-7 First Article Inspection:** *(For any material, component or parts order against a Honeywell Controlled Drawing Number the latest revision on the SPOC manual and SPOC I24 apply).* The First Article Report IAW AS9102 shall be performed and sent with the first lot shipped for special process and or fabricated parts, utilizing parts, materials and processes proposed for full production. Additionally, the manufacturing shall have occurred at the same location for

which production is proposed. First article inspection reports shall also be done for a lot shipped if there has been more than a 2 year break in shipments against that specific part number.

**The First Article report shall be submitted and will as a minimum, include the following:**

1. Part Number
2. Purchase Order number
3. Serial number of unit FAI report is being performed against.
4. Applicable drawing number and revision
5. Applicable specifications and revision
6. Dimensional and/or physical characteristics with tolerances listed
7. Actual measurements (raw data)
8. Associated test data
9. Documented evidence of all applicable drawings notes shall be recorded on the FAI Report.
10. The manufacturer must supply a copy of the drawing with all applicable drawing notes and dimensions ballooned on the print. The ballooning on the print must be numbered to correlate directly with the line items on the FAI report.
11. Date and signature of authorized company representative. The sample(s), certifications and First Article report will be sent to TTM Technologies. Unit used for first article inspection shall be identified and communicated to TTM purchasing agent.
12. When specifically flow down on PO that "AS9102 FAIR" is flowed down the FAI Report must be documented using the AS9102 format forms 1, 2, 3 and include all objective evidence including material/component certifications.

**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 Plans:** Manufacture and fabricators (This Q-Clause does not applied directly to Distributor, however is a required flow down to the OCM) is required to have internal inspection and test plan for materials processed that are delivered against this purchase order. If requested, a summary of these plans shall be made available to TTM Technologies including any associated QMS SOP or procedure controlling this and inspection or test plan. The inspection and test plan shall include the general manufacturing/processing sequences and associated product conformance checks points (e.g. in-process, final inspection or test points) in relation to procurement, manufacture and final acceptance.

**Q-10 Deleted**

**Q-11 Special and or Controlled Processing Specification:**

A SPECIAL PROCESS is a manufacturing process defined as; a process type controlled per NADCAP (Ref [www.pri-network.org](http://www.pri-network.org)), or as defined by TTM's customers requirements which will be flowed down on our purchase order. (e.g., plating, non-destructive testing, chemical processing, non-conventional machining and surface enhancement, coatings, composites, Heat Treating (including Brazing), Welding (including Torch and Induction Brazing)).

 <p>Time-to-Market Interconnect Solutions<sup>SM</sup></p> <p>Stafford Springs Division</p>	<p><b>Q-CLAUSES FOR STAFFORD SPRINGS</b></p>	<p><b>Document Number QAF-0040</b></p>	<p><b>Rev. J Page 6 of 8</b></p>
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NOTE 1: (For any material, component or parts order against a Honeywell Controlled Drawing Number the latest revision on the SPOC manual and SPOC 165 applies)

NOTE 2: (For any material, component or parts order against a UTAS Controlled Drawing or Specification, ASQR-01 requirements apply and all Special Processes sub-tier supplier SHALL be approved and listed on UTAS Report 80/85)

NOTE 3: (For any material, component or parts order against a Lockheed Controlled Drawing or Specification, all Special Processes SHALL be performed by an approved Special Processes supplier and listed on Lockheed's Special Process Approved Listed. Contact TTM Engineering to confirm Special Process Suppliers)

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.). These "special processes" documents and procedures must be revision controlled. Any changes to the controlled process will require a change to the supplier process documentation, and the revision will be changed.

- Special processing suppliers are required to be either an Approved Special Process Supplier for the specific customer for which the Customer or Source Controlled drawing and specification pertains too. Otherwise, Special processing suppliers that perform Special Processes controlled by NADCAP must be NADCAP certified for that process. If not, special approval must be obtained to allow use of that special process supplier.
- The subcontractor shall notify TTM Technologies in writing of changes and are required to perform a delta FAIR for the change. Changes are defined as changes to the process, equipment, sub-tier supplier, inspection/test methods or change in site location.
- Exempt from the Special Processing Suppliers Approvals:
  - Supplier with design responsibility may use their own approved process supplier provided that design and development is an element in their Quality Management System (Ref AS9100 or ISO9001) and Sub-tier supplier control must be an element in their Quality Management System.
  - Industry Standard Parts such as AN, NAS, MS, etc.
  - Special processes used in the fabrication of catalog or commercial off-the-shelf (COTS) components, parts/commodities.

A Certificate of Compliance is required for each shipment by lot or date code in which material was produced utilizing a special process. Stated in this document shall be the special process used, applicable military and/or customer specification and associated revision.

**Q-12 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".

**Q-13 Non-Conforming Product:** The subcontractor shall establish and maintain a documented system for the control of nonconforming material and or product. The system shall be designed to prevent the escape of nonconforming product being shipped. Included in the system will be provisions for notification if nonconforming product is discovered to have been shipped whereby TTM is notified within 48 hours of detection.



**Q-14 Continuous Improvement:** The subcontractor is required to establish and maintain a system for the application and implementation of continuous improvement including monitoring, and control of the manufacturing process that affect product quality and conformance. The subcontractor should identify internally key process characteristics, monitor and take corrective action when these processes are not in control. Supplier upon request shall be able to provide objective evidence of monitoring the performance of these indicators. Evidence may include but are not limited to; identification of key characteristic, method of measuring performance, SPC Charts, CPK level, etc.

**Q-15 ESD Control Program:** TTM Technologies requires suppliers who are performing a process on partially loaded assemblies supplied by TTM to be in compliance with ANSI/ESD-S-20.20 requirements. Compliance to this requirement can be verified by a TTM Quality Representative during a site audit, if a site audit is not conducted the supplier must submit a copy of their ESD program procedure along objective evidence that training has been conducted. When TTM product is being worked on at the supplier's facility it must in an ESD controlled area prior to removing it from its static shielding bag. Whenever TTM's products are not being worked on by the supplier or being transported, the units shall remain in their static shielding bags.

**Q-16 Pure Tin/ RoHS Testing:** Electronic or electrical component and or assemblies, including the internal fabrication of hardware, delivered SHALL NOT have pure tin finishes (Tin Whisker Avoidance Program) . Additionally, any tin-lead (SnPb) plating or solder process/processing shall result in a finish of no less than 3% lead composition. If any Electronic or electrical component and or assemblies cannot meet this requirement; then supplier is to formally notify TTM. Note: This applies to component leads and terminations, carriers, bodies, cages, brackets, housings, mechanical items, hardware (nuts, screws, and bolts), etc. This does not apply to MIL-SPEC Parts, Customer Controlled Drawings or TTM Drawings that allow the use of Tin (Sn) with less than 3% Lead (Pb).

Seller Certificate of Conformance (C of C) with each shipment shall mean that the Seller or Seller's agent has verified that delivered product meets the above listed composition requirements, or the material meets at least one of the following provisions:

- a. Seller or Seller's agent has contacted the Original Equipment Manufacturer (OEM) or Original Component Manufacturer and verified that the specific Mfr / Lot Date Code of delivered product meets the specified minimum lead (Pb) requirement if Tin (Sn) is present in the product.
- b. Seller or Seller's Subcontractor has verified and can provide objective evidence that components or part delivery have a minimum of 3% lead (Pb) is present in any process that uses tin (Sn).

**Q-17 Suppliers' Key Characteristics (KCs) Management:** *(For any material, component or parts order against a Honeywell Controlled Drawing Number the latest revision on the SPOC manual and SPOC 154 apply).* Supplier shall be responsible to review all TTM released drawings to identify, review and comply with the Key Characteristics. KCs are identified on the drawings with a special symbol (such as an asterisk \*) or have the text "Key Characteristic" next to the requirements. Supplier shall have a process and production control in place to ensure that the KC requirements are being met within tolerance. All key characteristics shall be identified by engineering and quality and incorporated into the work instructions or flown down to the sub tier supplier as applicable. Supplier shall take Key Characteristics measurements on an approved sample plan but at a maximum 5 samples. Key characteristics shall be recorded in the online key characteristics database for each date code for each PO delivery. In cases when results fall outside the requirements, supplier shall contact TTM for disposition of the material on each lot

Key Characteristics database can be accessed through <https://medieval.ttmtech.com/KeyChar>  
Login using the special login credentials obtained from TTM purchasing agent.

Click the *Key Characteristics Data* button to enter data.

Select the part number with the key characteristic.

If part does not show up in system, contact TTM purchasing to load the part number.

Enter the PO that the delivery is being made against.

Enter the date code in the *Date Code* field.

Record the actual measured value.

Note – Numerical values to be entered in inches. Pass/Fail values shall be recorded as such.

**Q-30 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.