

**Supplier Quality Manual**

1721 W. 10TH ST, TEMPE, Arizona 85281. Phone: 480-968-2453 Fax : 480-968-0300

**Introduction/Scope** This document is intended to define Quality related requirements for suppliers doing business with TSI and is supplemental to additional Purchase Order Terms and Conditions or the definitive agreement between TSI and Seller, as applicable ("Contract"). As used herein, "buyer" means Tube Specialties Inc., and "seller" means the seller (including its affiliates) identified in the Contract. All requirements within this document are applicable to all Goods provided to TSI unless otherwise specified and are hereby incorporated by reference into the Contract.

Applicable Supplier Quality Clauses (SQC's) will be invoked in the Contract.

TSI will monitor the sellers ability to meet contractual requirements through meeting the contractual due date on the face of PO or line item as appropriate. The expected OTD is  $\geq 95\%$  and product conformity through a PPM of less than 500.

<b>Definitions</b>	<b>Acronym</b>	<b>Definition</b>
	ATP	Acceptance Test Procedure
	CoA	Certificate of Analysis
	CoC	Certificate of Conformance
	FAIR	First Article Inspection Report
	FOD	Foreign Object Damage/Debris
	NOE	Notice of Escape
	NDT	Non-Destructive Testing
	SQC	Supplier Quality Clause
	SDR	Supplier Deviation Request

**General Requirements** Seller shall establish and maintain quality control processes acceptable to TSI in connection with the Goods purchased under this Contract. Seller shall permit TSI to review procedures, practices, processes and related documents to determine such acceptability when requested.

**Quality Management System** TSI recognizes Quality System certifications by accredited certification bodies (CB's) and may recognize the Industry Controlled Other Party (ICOP) process as evidence of compliance. In all cases TSI reserves the right to assess the supplier's quality management system. While certification to AS9100 or as appropriate AS9120 is preferred, at a minimum suppliers should maintain a Quality Management System compliant to ISO9001.

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<b>QMS Notification</b>	<p>The seller shall notify the buyer within 72 hours of any of the following:</p> <ul style="list-style-type: none"><li>• Major incidents affecting the organization that impact the organization's ability to meet customer commitments.</li><li>• Risks that could impact the continuity of the organization's business/operations, particularly single points of failure.</li><li>• Changes to third party or other party QMS Certification including, lapse/withdrawal/major audit findings.</li><li>• Change of the nominated quality representative, (usually the most senior Quality Leader within the organization).</li><li>• Significant change to the Quality Management System.</li><li>• Change in ownership or discontinuation of business activities.</li><li>• Significant issues of breaches of Information Technology (IT) security systems (Cyber Security).</li><li>• Risks with the supply of substances used in the production or physical make-up of products, due to laws and regulations concerning the control or use of such substances that may be published from time-to-time.</li></ul>
<b>Audit Rights/Right of Entry</b>	<p>TSI employees, TSI's customer, and regulatory authorities have the right of access to all applicable areas of all facility, at any level of the supply chain, involved in the order. This right of access extends to all applicable records to verify the contracted work, records and materials. The seller must include this clause in all sub-tier contracts issued.</p>
<b>ITAR/EAR</b>	<p>Product, including IP, may be ITAR and/or EAR controlled. The supplier shall hold a current registration with the Directorate of Defense Trade Controls (DDTC).</p>
<b>Safeguarding Covered Defense Information and Cyber Incident Reporting</b>	<p>The seller must ensure the organization is compliant with DFARS 252.204-7012 and the National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171.</p>
<b>Cybersecurity Maturity Model Certification</b>	<p>In December 2023, the Department of Defense (DoD) released the Proposed rule for Cybersecurity Maturity Model Certification (CMMC) 2.0. CMMC was developed to enhance the cybersecurity of the U.S. Defense Industrial Base (DIB) and ensures that the DoD supply chain has appropriate controls and processes in place to protect Controlled Unclassified Information (CUI) and Federal Contract Information (FCI) that is maintained on contractors' networks. CMMC 2.0 consists of a tiered model, levels 1-3, with varying requirements based on the sensitivity of information. TSI will operate on CMMC level 2, until further requirements change.</p> <p>If contractors and subcontractors to TSI are handling the same type of FCI and CUI, then the same CMMC level will apply. It is required that all TSI suppliers that support DoD contracts understand and abide by the CMMC initiative. Under the new requirements, Contractors will no longer self-attest to compliance with the Defense Federal Acquisition Regulation Supplement (DFARS) 252.204-7012 but will be subject to 3rd party assessors that will independently review internal systems and processes used for DoD work to ensure they have the required cybersecurity controls in place to comply with CMMC.</p>

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<b>Crisis Management</b>	The seller shall have a business continuity management plan that includes disaster recovery and preparedness. Any disruptions in the planned supply chain shall be reported to the buyer within 72 hours.
<b>Awareness</b>	The seller must ensure that persons performing work are aware of their contribution to product or service conformity; their contribution to product safety; and the importance of ethical behavior.
<b>External Providers</b>	Outsourced processes, off load of work, sub-tier subcontracting shall only be permitted with TSI approval of the external provider. All special process providers must be approved by the buyer and/or buyer's customer. The processing shall be performed to the approved specification, contact the buyers Quality department to determine the applicable specification if unsure. All special processing (e.g. brazing, chemical processing, coatings, heat treatment, material testing, non-conventional machining, NDT, shot peening, welding, etc.) shall be Nadcap certified.
<b>Certificate of Conformance</b>	A certification of conformance (C of C) is required for each shipment of products or services covered by this purchase order. The C of C shall be signed by an appropriate quality representative and shall state that the materials, processes and product meet the applicable requirements and specifications indicated on the purchase order. The C of C must denote: TSI purchase order and part numbers, revision, serial numbers, government contract numbers, and Nadcap certification numbers, when applicable.
<b>Customer Furnished Materials (CFM)</b>	Seller must have a process for controlling CFM. All tooling requiring calibration must be entered in the seller's calibration system, all calibrations shall be completed by TSI or to TSI provided instructions. The seller will return all supplied tools, fixtures, special packaging, and containers with the product produced. The seller will be subject to replacement charges if not returned.
<b>Falsification of Information</b>	The seller shall conform to the requirements of 14 CFR 21.2 (Falsification of applications, reports, or records.
<b>DPAS Rated Orders</b>	If this is a rated order certified for national defense use, seller is required to follow all the provisions of the Defense Priorities and Allocations System regulation (15 CFR part 700) in obtaining controlled materials and other products, services and materials needed to fill this order. If this is a DX rated order, seller must provide buyer with written acceptance or rejection of this order within ten (10) working days after receipt. If this is a DO rated order, seller must promptly provide buyer with written acceptance or rejection of this order within fifteen (15) working days after receipt. seller must include in any written rejection of a rated order the reasons for the rejection. Seller's written acknowledgement of this rated order shall constitute written acceptance of this DPAS rating.
<b>Nonconformance Management System</b>	Seller shall maintain a nonconformance management system that identifies, documents, controls, and segregates nonconforming Goods. Shipment of nonconforming Goods is not permitted until all disposition actions have been properly completed. Seller shall take prompt action to correct and prevent recurrence of all nonconformities.

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**Root Cause and  
Corrective Action  
Management**

Seller shall conduct thorough root cause analysis and corrective action as requested by the buyer. Seller may choose to use TSI's form or use their internal form. The corrective action is considered closed once all objective evidence(s) is received and approved by the buyer's representative.

Note: Seller is responsible to flow down the corrective action request to sub-tier if applicable.

**Supplier Deviation  
Request (SDR)**

Seller shall notify TSI of any nonconforming Good(s) that have been identified at Seller's facility, specifically any deviation from drawing/Contract requirements. This is applicable to assembly and component level hardware. In this case, Seller shall notify the buyer with a Supplier Deviation Request. Seller shall not continue the process and/or ship the Good(s) until receipt of SDR disposition from TSI

Seller shall include the completed SDR request number when shipping the part(s) and reference the number on the CoC.

**Notice of Escape  
(NOE)**

Seller shall notify TSI of suspect or nonconforming material that has been shipped to the buyer within 72 hours. Minimum information required is part number, quantity, PO number, affected lot/serial number, and defect/suspect condition. Pursuant to Seller's quality management system, Seller shall make every attempt to contain potential escape and perform corrective action to prevent future escapes/nonconformances.

**FOD Prevention  
Program**

Seller shall establish and maintain a FOD Prevention Plan/Program for manufacturing areas and associated support function areas to ensure any item delivered under this Contract is free of FOD. It is recommended the seller use AS9146 or NAS412 as a guidance.

**Counterfeit Part  
Prevention**

Seller shall establish and maintain a counterfeit part prevention Plan/Program that is aligned with AS6174; Counterfeit Materiel to ensure any item delivered under contract is authentic. The seller shall develop a process to ensure the buyer and regulatory agencies are notified within 3 working days of any suspect counterfeit parts being confirmed as counterfeit.

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**Record Retention**

Seller shall maintain records that demonstrate conformance to requirements for a defined period after final payment of the line item in the Contract. Seller shall also make the records available in a timely manner to TSI upon request. All records shall be in the English language. Any corrections to documents shall be legibly recorded, dated, and signed/stamped in a permanent method.

Documents shall be retained for a minimum period as follows:

- **Indefinitely**  
Traceable Parts, Serialized Parts, Critical Parts, FAI Records, Flight Safety, Main Shaft Bearing support.
- **30 years**  
Manned Space Program Hardware
- **11 years**  
Radiographic, Digitized Radiographs, Non-Traceable/ Non-serialized parts, castings, and others except off the shelf standard parts (COTS)
- **10 Years**  
All Product Quality records that are not listed above.

Note: Once the record retention period has been met, the seller must obtain concurrence from TSI prior to performing any destruction processes.

**Calibration**

Seller shall perform all inspections and tests with calibrated equipment. The Supplier shall utilize/maintain a calibration system that complies with one of the following specifications (or an equivalent): ANSI Z540.1 or ISO/IEC 17025. This provision shall be applicable to all inspection, test and measuring equipment used by the supplier for inspection or test. All test equipment and gages used must be traceable to NIST standards. Certification of calibration shall be available to the TSI upon request.

**Eye Examinations**

Eye examination, including visual acuity and color vision are administered by medically qualified/trained person in intervals not to exceed one (1) year. Color perception testing is required one (1) time.

Records shall be retained for personnel performing the following:

- Visual inspection: Shall be compliant with Jaeger 1 or equivalent
- Visual Inspection on welds: Shall be compliant with AWS D17.1
- Non-Destruction Testing: Shall be compliant with AIA/NAS410 or Mil-STD-867

**Inspection /  
Surveillance**

TSI has right to perform inspection, surveillance, or testing at reasonable time of any Goods, at no additional cost. TSI shall perform inspections, surveillance, reviews, and tests so as not to unduly delay Seller's progress. TSI has the right, and Seller will ensure TSI has the right, to visit Seller's and Seller's subcontractors' locations during operating hours to inspect, review and assess progress and performance under the Contract, including, but not limited to, production, schedule, and quality.

In lieu of physical inspection, TSI may request Seller to furnish inspection results for review. TSI shall provide sufficient time for additional inspection results.

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**Traceability  
Requirements**

Seller shall serialize or lot control all produced units per designation on Purchase Order line item. Reference below requirements for proper trace control.

If TSI furnishes hardware to Seller for a service or modification (e.g. assembly), Seller shall maintain the buyer's provided traceability throughout their internal processes via internal identification methods. In case of multiple lots, Seller shall maintain the individual lots and shall return the lots segregated to TSI. Seller is responsible for providing proof of traceability upon request.

**Serial Number  
Traceability**

When serialization requirements are imposed under the Contract, all Goods, including spares, test units, etc., with a single basic item number (including dash number) shall be assigned sequential numbers. Serial numbers assigned shall not contain duplicates and will not exceed twenty (20) characters. Seller may use its own serialization system/nomenclature within the requirements above unless otherwise specified by the buyer.

Unit(s) to be part marked in accordance with engineering drawing or applicable note and shall include the unique serial number. Units reworked to a new revision or configuration with the same basic item number shall retain the original serial number.

Seller shall indicate serial number(s) on all shipping documentation, label and certificate of conformance if applicable. Listing serial numbers by ranges is acceptable provided any breaks in the range are noted (e.g. SN001 through SN024, and SN026 for a total of 25 parts). Only the serial numbers of units in each shipment shall be listed on the shipping documentation for that shipment.

**Lot Traceability**

When lot control requirements are imposed under the Contract, all units produced in a single batch/run/method shall be assigned a unique lot code. Lots assigned shall contain no duplications within the same basic item number (including dash number) and will not exceed twenty (20) characters. Seller may use its own trace control system/nomenclature within the requirements specified here unless otherwise specified by TSI.

Unit(s) to be part marked in accordance with engineering drawing or PMI note and shall include the lot number. Rework or modification of an entire lot shall retain the original lot number; rework or modification of partial units within a single lot, Seller shall assign a new lot number.

Seller shall indicate lot number and quantity within each lot on all shipping documentation, label and certificate of conformance if applicable. Only the lot numbers of units in each shipment shall be listed on the shipping documentation for that shipment.

**Acceptance of the  
Contract**

By acceptance of this Purchase Order, the subcontractor certifies that they or their principals are not debarred, suspended, or proposed for debarment by the Federal Government.

**Contractual  
Changes**

Changes to the purchased requirements are not allowed unless communicated through a revision to the active purchase order.

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<b>Digital Product Definition</b>	When the buyer supplies the engineering data (models, stp files, etc.) to the seller electronically, the sellers QMS shall ensure that all uses of the electronic data is from the originating data only. It is the supplier's responsibility to verify electronic models meet drawing requirements prior to fabrication.
<b>Configuration Control</b>	All work shall be performed to the current revision of engineering drawings and specifications unless otherwise specified. The seller shall have a process to ensure any configuration/revision changes are incorporated and communicated at all levels of the supply chain.
<b>Packaging, Labelling and Shipping</b>	<p>Seller shall package all Goods to prevent damage and potential deterioration. Packaging should be durable, easy to handle, maintain cleanliness and be of the appropriate size. Unless otherwise specified in the Contract, all packaging and external labeling shall meet the requirements of ASTM D3951 Standard Practice for Commercial Packaging.</p> <p>The packaging label shall include part number, revision number, PO number, quantity and lot/serial number information (when applicable).</p>
<b>Hazardous Material Packaging</b>	<p>The Seller shall include a Material Safety Data Sheet (MSDS), OSHA Form 174 or equivalent prior to, or with each shipment of any Hazardous Material as defined at 29 CFR, Part 1910.1200.</p> <p>The Seller shall select materials and packaging based on the most appropriate hazard classification of a product and its physical attributes. The packaging of Hazardous Material must conform to the requirements of 49 CFR 173.24 and 49 CFR 178 Subpart M at all times while in transportation.</p>
<b>Packing Sheet Requirements</b>	It is the Seller's responsibility to furnish complete packing sheet/slip/list containing information pertinent to the shipment. At a minimum, the packing sheet shall include Seller information, ship to location, date of shipment, Purchase Order and Line Number, quantity shipped, Part Number, Revision (if applicable), and item traceability - lot and/or serial number(s).
<b>Raw Material/Test Report</b>	A certification report shall support all raw materials on PO for both the chemical and physical test reports. Each report shall list: Material Specification and Revision, Heat Number and Supplier, Chemical and Physical Test results, TSI part number, PO number and quantity. Material shall be supplied to the latest revision. A program to have independent periodic testing shall be utilized on raw material to the applicable specification.
<b>Special Process Certifications</b>	Supplier shall include one (1) copy of test results and/or inspection data for any special process performed.
<b>Personnel Qualifications</b>	When appropriate/applicable the seller must maintain a process for managing all required personnel qualifications/certifications.
<b>Prohibited Materials</b>	The use of lead, mercury, and cadmium is prohibited.



**First Article Inspection**

A First Article is required in accordance with AS9102 for all first-time purchases, if the supplier has moved its location, or if there has been a break in production/delivery for 2 years or more. A FAIR is required for all products except for the following:

- Standard catalog items (ref. AS9102 Standard Catalog Hardware, FAR 2.101 Commercial Item definitions)
- Raw material
- Product covered by a military/industry standard or specification.

**DFARs Materiel**

Seller may only provide product the utilized raw material from domestic/DFARs compliant countries.

- Compliance options include:
- A statement of “conformity per DFAR 252.225-7009” on the Certificate of Compliance or associated paperwork.
- Certification to the Country of Melt
- Copy of original mill certification to validate Country of Melt

**Conflict Minerals**

Seller shall comply with the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act, section 1502. TSI will not accept material containing Tin, Tantalum, Tungsten and/or Gold from prohibited countries. Under Section 1502 of the Dodd-Frank Act, U.S. publicly traded companies must conduct due diligence on their supply chains for 3TG minerals (tin, tungsten, tantalum, and gold) and disclose their use and sourcing to the Securities and Exchange Commission (SEC) annually via Form SD. A copy of the report shall be made available if requested by TSI.

**REACH Compliance**

If applicable the seller shall notify TSI of parts/products that contain SVHC substances. The list can be viewed at: <https://echa.europa.eu/substances-restricted-under-reach>.

**Time and Temperature Sensitive Materials**

Certification for age sensitive material on this purchase order shall include: actual shelf life of the material, date of manufacture and expiration date. No material with less than 75% of its usable shelf life will be accepted without written approval.

**Inspection Sampling**

Sampling plans must be compliant to an industry accepted methodology, and all sampling shall be based on C=0 results. Sampling is not allowed for safety of flight characteristics, key characteristics, critical features, etc.

**Drop Shipping**

If TSI authorizes drop shipping, the Seller shall allow access to the buyer’s representative for source inspection activities.



## Supplier Quality Clauses (SQC)

**Note:** Supplier Quality Clauses (SQC) are intended to define specific Quality related requirements for Sellers doing business with TSI. SQCs are only applicable if invoked in the Contract.

- Q-01** The supplier of the product must submit a detailed inspection plan (DIP) applicable to the manufactured lot provided. Format is supplier option, but it shall be compliant to AS9102, FORM 3 Characteristic and Accountability. As a quality document, it shall remain available upon request.
- Q-02** Products delivered and processes performed on this purchase order are intended for Honeywell; SPOC 002 applies to this contract
- Q-03** Products delivered and processes performed on this purchase order are to be produced in accordance with the requirements for Aero Engine Design and Production Organizations; AS13100 applies to this contract
- Q-04** Products delivered and processes performed on this purchase order are intended for Rolls-Royce; SABRe 4.1 applies to this contract
- Q-05** Customer/Government Source  
Source Inspection by the TSI customer or Government Inspector will be required. It is up to the seller to coordinate the inspections with the buyer to ensure all identified inspection activities are completed as planned.
- Q-06** Products delivered and processes performed on this purchase order are intended for Parker end use product.  
GE approved laboratory required for all raw materials. Supplier shall not use tap water, silicon dioxide, glass bead/silica oxide material, aluminum oxide, aluminum zirconia, garnet, almandite, and nitrides.
- Q-10** Products delivered and processes performed on this purchase order are intended for Ducommun and Quality note Q10 applies as a pass-through requirement.
- Q-20** **APQP/ PPAP**  
The documents in this Quality Clause need to be submitted and approved by TSI Supplier Quality Engineer prior to the start of manufacture to be effective. These documents are related and support each other but may be selected separately by TSI. Still the supplier is encouraged to complete these to reduce their own risk. These documents must be in alignment with each other. Such as the same operations will be listed in the same sequence across these documents.  
**NOTE:** These are “living” documents that need to be in use and fully implemented to be beneficial. When the Supplier’s process changes or if there is a non-conformance, the appropriate documents need to be updated as appropriate.  
**PROCESS FLOW DIAGRAM (PFD):** The supplier template/format may be used when sequence, flow and process owner of all steps in the process are clearly identified.  
**PROCESS POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (PFMEA):** All process and production and verification points for all Key Characteristics will be accounted for on the PFMEA.

**CONTROL PLAN:** Each process step must be addressed in the control plan. Elements shall include monitoring of process output, controls in place and what to do with non-conformances or unwanted conditions.

**WORK INSTRUCTION:** This could be the shop router or traveler with proper level of detail for the Operator. It is acceptable to identify other reference documents within the Control Plan.

**MEASUREMENT SYSTEM ANALYSIS (MSA)/GAGE R&R:** Measurement system analysis is an important tool in understanding accuracy of the Supplier's measurement equipment. This activity will provide a numerical value to the accuracy, validity or trustworthiness of the measurement and needs to take place prior to production manufacturing for items specified on the purchase order. The Supplier shall submit the MSA for review and approval. The MSA report shall have a result as percentage (%) of repeatability and reproducibility of the gage with the following acceptance criteria.

Supplier shall follow AIAG style of MSA. Contact the buyer SQE for guidance.

<10% is considered acceptable and preferred

10% to 30% may be acceptable for some application

>30% not acceptable for determining good parts from out of specification

**KEY CHARACTERISTICS and PROCESS CONTROL:** Once a Key Characteristic is identified on a drawing or by other means, compliance shall be IAW AS9103 and this Quality Clause. If Key Characteristics are not identified, contact the buyer Quality department for clarification. Items identified from the Supplier's PFMEA (high RPN) or other Critical to Quality (CTQ) features must be considered. Prior to manufacturing, the Supplier shall submit for approval a Process Control Plan detailing how Key Characteristics and/or Critical to Quality (CTQ) and the applicable processes will be controlled. TSI approval of this plan is required. Process Capability Study / Statistical Process Control (SPC) artifacts shall be in accordance with AS9103, "Variation Management of Key Characteristics". TSI approval of the studies and/or artifacts is required. This (study or artifact) can be submitted during or after manufacturing or processing.

The use of "trial" parts may not be utilized for calculating capability without prior approval.

The applicable process is considered capable once a Cpk => 1.33 is achieved. Characteristics identified as "Safety Critical" shall meet Cpk => 1.67.

100% inspection can be used in place of calculating Cpk. When Cpk is less than 1.33, or 1.67 for Safety Critical contact the TSI SQE for guidance.

Recalculation should occur using the following guidelines:

- Any change in the Key Characteristic as defined on the print
- There is greater than 6 months since last production run
- There is a NCR or SCAR issued for the applicable item number
- A significant process change(s) has occurred such as:
  - Different/alterd/repared machine
  - Different/alterd process
  - Different/alterd fixtures
  - Different/alterd controlling program (CNC or other)
  - Change in material (type)
  - Different measurement method
  - Change in the operator training/certification requirement.



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All APQP Documentation is required prior to shipment.

**Note:** It is recommended the seller utilize the latest version of Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP) within Aerospace Reference Manual provided by AESQ (RM13145).