



# **General Supplier Quality Requirements**

**QCI 29-14-1**

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## Management Approvals

By signing this page, these individuals, as heads of their respective functions, signify review and approval of this revision of the General Supplier Quality Requirements manual.



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## Introduction

Hartwell designs, develops, and produces aerospace latches and latching systems for commercial and military applications. We have great pride in our commitment to excellence in quality products, field support and service to our customers. In the rapidly changing technology of today's environment, we constantly face new challenges. Today's customer expects high quality, high reliability and on-time deliveries. Meeting these goals requires the dedicated effort of Hartwell employees and suppliers, both individually and collectively.

This General Supplier Quality Requirements manual was designed and prepared to assist in the attainment of these goals. We expect our suppliers to review, understand and comply with the requirements invoked by the purchase order, and to participate in making improvements to our products and systems. As a supplier to Hartwell, we expect your dedication and commitment to the excellence that will assure product conformance to all contract requirements.

Any suggestions or comments regarding improvements or corrections to this manual are both welcomed and solicited. Please forward any comments through your assigned Hartwell Buyer or to either of the approvers on the previous page.

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**1.0 Purpose**

The purpose of this manual is to describe the quality requirements imposed, in whole or in part, on Hartwell suppliers by the Hartwell purchase order. These requirements are necessary to assure that materials, products, and services delivered to Hartwell are in conformance with the requirements imposed on the purchase order. In addition, general information considered to be of a helpful nature to Hartwell suppliers is included.

**2.0 Scope**

This manual identifies the general quality requirements that are imposed on all suppliers who provide materials, products, or services for incorporation on contract deliverable product to Hartwell. This manual is applicable on those Hartwell purchase orders that impose QCI 29-14-1 (this document).

**3.0 Responsibility**

As a supplier of aerospace products, Hartwell bears the responsibility of ensuring the quality of all products supplied to its customers. These products are subject to inspection by Hartwell commercial and military aerospace customers to verify compliance to all contractually identified quality requirements.

Hartwell’s quality program is based on AS9100, *Quality Management Systems – Requirements for Aviation, Space, and Defense Organizations*, as well as ISO-9001 and other industry standards. All of which require the establishment of procedures for the selection of suppliers, their periodic review and assessment, and the control of purchased materials and services furnished by suppliers. Based on this assessment, emphasis will be placed on using suppliers who deliver products or services that meet the Hartwell requirements outlined and described in this manual, which is directed at assisting Hartwell suppliers in meeting these performance goals.

The supplier has the primary responsibility to develop and maintain a quality system that meets Hartwell’s requirements. The supplier is responsible for notifying Hartwell when the requirements of this manual or the purchase order cannot be met. Should a conflict exist between this manual and the purchase order, the purchase order shall take precedence.

Suppliers are responsible for the quality of parts, processes or services supplied including those from approved sources. Verification by Hartwell does not absolve the supplier of providing acceptable product nor preclude subsequent rejection of product supplied.

**4.0 Definitions**

*Assemblies* – In this document the term shall refer to items built to a Hartwell or customer-controlled drawing consisting of multiple parts or components. The item is typically built with component parts manufactured or purchased by the supplier and assembled as a complete unit. For example: lock assemblies, cable assemblies, strut assemblies, etc.

*Calibration Service Providers* – Outside service providers that perform calibration services on Hartwell devices.

*Catalog Items* – Any item reflected on the purchase order which is controlled by the manufacturer. The materials, processing, dimensional and certification requirements are established by and controlled by the specific supplier base standard included in the manufacturer's catalog. The specific description of this item, including optional hardware requirements, will be specified in the line comments reflected on the purchase order.

*Consumables (Paints, Adhesives, Compounds, etc.)* – Items that are specifically manufactured per an industry standard specification or supplier-controlled formula. These items typically have a "shelf" or "mixed" life. Examples include: paints, primers, thinners, accelerators, sealants, adhesives, chemical bonding solutions, lubricants, etc.

*Hartwell-Controlled Items* – Any item reflected on the purchase order controlled by a Hartwell drawing, routing or material specification.

*Machined Parts* – In this document the term shall refer to detail component items and extrusions controlled by a Hartwell drawing that are not considered to be a raw material, casting, forging, or plastic/injection molded part.

*Raw Material* – Refers to raw sheet, coil, rod, bar or plate items purchased by Hartwell to produce machined parts. The Hartwell raw material item number is in an alpha numeric format (e.g. "A1234"). The purchase order should include the Hartwell raw material item number, a description of size, material type and material specification. Note: items with a specific requirement for grain direction will be identified by the presence of the letter "G" next to the dimension in which the grain direction is to flow.

*Standard Hardware* – Any item reflected on the purchase order which is controlled by an international standard or customer-specific drawing standard (i.e. MS, NAS, NASM, BAC, etc.). Note: items such as springs, nuts, bolts, washers, and screws that are controlled by a Hartwell drawing are considered to be "Machined Parts".

## **5.0 Requirements**

### **5.1 Commodity-Specific Requirements**

Special quality requirements are selectively imposed on suppliers by specific reference within the body of the Hartwell purchase order and this document. The purchase order will list each applicable quality requirement. Suppliers are advised to review these requirements to assure compliance can be attained prior to order acceptance. These requirements are in addition to, and do not substitute for, the requirements of this document.

*Table 1: Commodity listings, associated survey and certification requirements.*

Commodity	Hartwell Survey	Certification Needs	Description
Administrative Services / HR	None	None	Providers of non-production services such as consultants, recruiters, training services, etc.
Calibration Services	Lab Survey	ISO 17025 or equivalent	Providers of calibration services.
Engineering Services	Lab Survey	ISO 17025 or equivalent	Providers of engineering test services.
Finished Goods	Survey	ISO or AS Series (or equivalent)	Suppliers who provide “finished” manufactured items or assemblies (not including castings, forgings, or extrusions) and are the producers or distributors of consumable paints, adhesives and compounds. These suppliers typically provide the raw material and may sub-contract any special processing or secondary machining required to produce the finished item or assembly.
Inspection Services	Lab Survey	ISO 17025 or equivalent	Providers of product inspection services on behalf of Quality Assurance such as CMM, 3D laser scanning or other non-contact dimensional inspections.
Machining (2 <sup>nd</sup> Operations)	Survey	ISO or AS series certification is NOT required unless the supplier provides the raw materials	Providers of planned secondary manufacturing activities such as gun-drilling, grinding, or thread-rolling. This also includes suppliers which perform “farm-out” machining activities where Hartwell provides the raw materials for the order and the supplier provides the machining services. <i>Note: a Finished Goods supplier may also perform this type of work. Completion of a supplier survey is required. ISO or AS series certification are NOT required unless the supplier provides the raw materials.</i>
Non-production Supplies/Services	None	None	Providers of products or services not deliverable with production products such as consumable supplies, office equipment, and maintenance.
Non-conventional Machining	Survey	NADCAP	Providers of nonconventional machining require Hartwell’s approval of the processing plan and may require customer approval. Nonconventional machining includes but is not limited to: <ul style="list-style-type: none"> <li>• Electrochemical Machining (ECM)</li> <li>• Electrochemical Grinding (ECG)</li> <li>• Electrical Discharge Machining (EDM)</li> <li>• Laser Beam Machining (LBM)</li> <li>• Spark Erosion Grinding (SEG)</li> <li>• Abrasive Water Jet Machining (AWJM)</li> </ul>

Commodity	Hartwell Survey	Certification Needs	Description
Special Processors	Survey	NADCAP	Providers of special processing services. Providers of these services must be NADCAP approved for the process they are performing. In addition, the supplier may need to be approved by a specific customer.
Raw Materials	Survey	ISO or AS Series (or equivalent)	Providers of raw stock (such as sheet, bar, rod, and plate stock) and providers of castings, forgings, and extrusions.

## 5.2 Supplier Point of Contact

The supplier's primary point of contact at Hartwell is always the Buyer. All questions, problems, or requests for information should always be directed initially to the Buyer. Suppliers shall not accept any changes to the technical requirements, quantity, due dates, revision levels and/or quality requirements unless authorized in writing by the Hartwell Buyer (i.e., a revised purchase order).

## 5.3 Language

Supplier shall make specified quality data and/or approved design data available in the English language.

## 5.4 Distributors

Distributors, Brokers, and Manufacturer's Representatives accepting Hartwell purchase orders must recognize that all purchase order requirements apply to them as well as to the material manufacturer, it is your responsibility to assure that you, as well as your suppliers, meet all of the Hartwell purchase order requirements.

Parts produced to Boeing Aircraft Company (BAC) specifications must be packaged and labeled by the approved distributor listed in Boeing's D1-4426. The maintaining of inventory and the repackaging of these products by a Broker (a non D1-4426 listed distributor) is NOT allowed. Material delivered by a Broker must be in the original packaging from the approved manufacturer or distributor.

## 5.5 Supplier Performance Monitoring

Hartwell maintains a rating system to track supplier performance to the requirements of the purchase order. Any nonconformance with the purchase order requirements will affect your rating and possibly your approval status. In addition, a nonconformance may result in a Corrective Action Request (CAR) being issued to you from Hartwell. You are responsible to issue corrective action requests to your suppliers as applicable.

Supplier responses to a CAR must be complete, acceptable, and within the allotted time frame. Failure to meet any of these conditions may result in you being placed in a temporarily disqualified status. Suppliers placed on this status will be permitted to complete their existing purchase orders with no increase in quantities but will not be issued any new purchase orders pending resolution of the issues that caused the disqualification.



**5.6 Periodic Surveys and Audits**

The Hartwell quality program requires Hartwell's use and control of "approved suppliers". To meet this requirement, a list of suppliers and their status is prepared, used and updated regularly. New suppliers are added to the list based on reviews with acceptable results, while existing suppliers are subjected to periodic reviews to determine the need for any status change. Surveys and audits are performed by Hartwell personnel or their authorized agents. The guidelines for review include (but are not limited to) the following:

- Facilities
- Quality of inspection planning, controls, capability and management
- Product visibility and defect prevention program
- Product performance characteristics
- Past product experience
- Capability/condition of manufacturing equipment
- Control of drawing, specifications, and changes
- Control of inspection equipment and tools
- Personnel certification procedures
- Material storage and handling
- Control of NDT and special processes
- Control of nonconforming suppliers
- Corrective action program
- Shop floor discipline and employee aptitude
- Calibration capability

Upon completion of the review, the auditor will summarize the results noting Approved, Disapproved, Limited, etc. with any additional comments. The auditor and supplier then review and agree on any noted deficiencies and agree on the corrective action to be taken. A method of response (letter, resurvey, etc.) will also be discussed and agreed upon.

**5.7 Purchase Order**

The purchase order is a documented agreement (contract) between the buyer and seller that conveys what is to be supplied and the administrative, technical, and quality requirements to be met. Suppliers are advised to carefully read the Terms and Conditions imposed by the purchase order since they are responsible for complying with those requirements.

**5.8 Excess Inventory**

Hartwell controls all inventory of Hartwell proprietary product, including product defined by Hartwell customer technical data (e.g., "build-to-print"), that is in excess of the contractual quantity in order to prevent product from being sold to any third party without prior written authorization from Hartwell. Additionally, the Supplier shall not provide product from excess inventory that was previously rejected or returned by Hartwell without prior written authorization from Hartwell. When the Supplier fulfills an order with product from excess inventory, for which the Supplier was the original manufacturer, the Supplier shall be able

to demonstrate traceability to the original Hartwell purchase document that authorized manufacture of the product when requested by Hartwell.

## 5.9 Certified Supplier Program

In an effort to reduce costs to Hartwell and enhance the spirit of teamwork with its suppliers, Hartwell has developed a program of supplier certification that allows selected supplier's shipments to bypass the normal receiving inspection activity at Hartwell and be placed directly into stock for immediate use. This results in lower costs to Hartwell through the elimination of nonproductive inspection labor and accelerates the payment of invoices to the supplier because of the shorter cycle-time for shipment acceptance. Obviously, Hartwell prefers to do business with suppliers in this category, and participation in the program will be a factor in supplier selection during the procurement cycle. Suppliers who have been identified as likely candidates for this program will be contacted directly; other interested suppliers should contact their Hartwell Buyer for more information.

## 5.10 Deviations

When it is known by the supplier prior to the start of production that there is some product feature that may have a requirement that is desirable to deviate from, either because of manufacturing ease, lead-time or cost reduction, or some other benefit either to the supplier or to Hartwell, the supplier must obtain written approval for such deviation from the Hartwell Buyer prior to implementing any change. The request must be in writing and contain (as a minimum):

- a. Purchase order number
- b. Part number, revision level, revision date and description.
- c. Specification or drawing requirement (include page number or print location)
- d. Actual condition that is being processed.

## 5.11 Reporting of Nonconformances

Any departures from drawings, specifications, or other procurement requirements shall be submitted to Hartwell Purchasing department for review and consideration using the "Supplier Shipment Authorization" (SSA), Form QCI 29-14-3 (available from Hartwell's purchasing department). Disposition must be approved by Hartwell before shipment of the product, unless otherwise directed by Hartwell Purchasing. One reproducible copy of the approved SSA shall accompany each affected shipment and be referenced on the supplier's certificate of quality.

Submission of discrepant material on an SSA does not guarantee Hartwell acceptance or approval. Hartwell acceptance and approval of the SSA and authorization to ship is applicable only to discrepancies noted on the SSA and the applicable material lot(s) noted thereon and DOES NOT constitute acceptance or approval of additional lots of the material with same or other discrepancies.

If, after shipping product to Hartwell, the supplier becomes aware of defects not previously reported (i.e. latent defects), the supplier must contact both Hartwell Purchasing and

Quality departments in writing within 48 hours advising of the nonconformance and any other information that would identify the material (PO number, part number, quantity, etc.).

## **5.12 Change Approval**

For those items produced against a supplier-generated set of requirements (proprietary products and the like), the supplier shall obtain Hartwell approval, in writing, before making any changes in design material, or production processes that affect form, fit, function, interchangeability, or reliability. The baseline configuration is considered to be the configuration originally specified by Hartwell Engineering for procurement.

## **5.13 Traceability**

Materials and processes used must be traceable by record to the contractually imposed drawings and functional test configurations used during manufacture. Each product delivered must be uniquely identifiable to the supplier's traceability records.

If materials are provided by Hartwell to the supplier for the performance of work, the supplier, by acceptance of the material and subsequent delivery of product, warrants that no comingling of any such Hartwell-supplied material with other material (either acquired by the supplier or provided by other customers to the supplier, etc.) has occurred.

## **5.14 Surveillance at Source and Right of Entry**

All items specified by the purchase order are subject to surveillance by Hartwell, regulatory agencies, or Hartwell's customer representatives. This includes review, verification, examination, test, and/or analysis of manufacturing and associated systems, procedures and processes, and applicable documented information at any level of the supply chain. If necessary, such activity shall be coordinated by Hartwell personnel in advance of arrival.

## **5.15 Notification to Hartwell of Supplier Internal Changes**

The supplier shall notify Hartwell of significant changes within the supplier organizational system within 48 hours of the change. Reorganization of the management or key personnel structure, changes to previously existing certification, change of location or expansion of existing facility, reduction in production capacity or other significant changes shall be communicated to Hartwell's Purchasing and Quality Departments. Written media (i.e., e-mail, fax or regular mail) shall be used to relay changes.

## **5.16 Item Identification**

The supplier shall ensure that all items are legibly marked in accordance with the Hartwell engineering drawing and any applicable specification requirements. Identification requirements may include the following as specified by Purchasing or other Hartwell documents: part number and revision level; manufacturer's identification; lot or date code; serial number (if applicable); and quantity (if identifying the packaging). The following exceptions apply:

- a. Items too small or of a configuration or material prohibiting individual marking are packaged in suitable containers as stated above.

- b. Raw material is identified in accordance with the procuring specification (i.e. ASTM, AMS, Federal Specification, etc.) and meets any applicable industry standard color-coding.
- c. Material that the supplier receives from Hartwell is identified upon return to Hartwell with the Hartwell information supplied on the purchase order and the shipper that originally transferred the material to the supplier.

## 5.17 Packing and Packaging

The supplier shall ensure that all items are properly cleaned prior to being packed and packaged to prevent damage or contamination during the normal course of shipment and to assure acceptance by common carrier. Best commercial practice may be used unless otherwise specified in the Hartwell purchase order. The supplier shall also assure that any special packaging and preservation considerations contained within the product specification (such as for light sensitive, ESD sensitive, or "light oil" protection) are complied with. Newsprint shall not be used for wrapping of parts due to its acidic nature.

## 5.18 Special Process Requirements

Special processes performed on products for Hartwell purchase orders must be performed by sources holding a current NADCAP certification for the process. This includes not only processing performed in-house by the holder of the Hartwell purchase order, but also any processing sub-contracted by them to others.

Approval of special process sub-tier contractors does not relieve the supplier of the responsibility for exercising those control measures necessary to ensure that the work performed by sub-tier contractors is in accordance with the requirements. Sub-tier supplier approval records shall be maintained on file and available for review by Hartwell when requested. The supplier shall identify the sub-tier contractor(s) that perform special processes and include this information with each shipment (e.g., inclusion of the processing certification as part of the part documentation package).

If specified on the purchase order, the supplier or its sub-tier(s) may also be required to be approved by a specific Hartwell customer (e.g., "Boeing Approved" or "Collins Approved").

Special processes are defined as:

- Heat Treatment
- Shot Peen
- Surface Treatment (e.g., plating, passivation, chem-film, etc.)
- NDT (ultrasonic, magnetic particle, radiography, dye penetrant, etc.)
- Nonconventional Machining
- Metal joining (e.g., soldering to a MIL or customer-controlled specification, welding, and brazing). Specifically excluded is commercial grade electrical soldering.

Excluded from this requirement are special processes performed on:

- Supplier-designed items and materials produced to an industry standard (e.g., no Hartwell drawing is applicable, such as for catalog or other off-the-shelf items)

Note: the NADCAP listing of certified sources is currently available at [www.eauditnet.com](http://www.eauditnet.com). A username and password are required and procedures to obtain those are available on that site.

## **Special Processing and Finish Clarifications:**

### **Chemical Processing:**

#### Passivation and Electropolish:

1. Parts must be glass beaded prior to passivation to produce a “satin” or “bright” finish.
2. Unless otherwise specified, Hartwell products are to be inspected and tested as Class 1 parts.
3. Parts made of 300 series Stainless, or 440 series materials may be tested using any method authorized by AMS 2700 *Passivation of Corrosion Resistant Steels* or ASTM B912 *Passivation of Stainless Steels Using Electropolishing*.
4. All other material types MUST be tested AND certified for corrosion resistance using salt spray testing per ASTM B117 *Operating Salt Spray (Fog) Apparatus* only.

#### Anodize:

1. Hartwell authorizes the use of Type 1C as a suitable alternative to Type 1 and Type 1B coatings.
2. Unless otherwise specified, Class 1 (non-dyed) is to be used.
3. Unless otherwise specified, Type I and Type II are to be HOT water sealed.
4. Unless otherwise specified, Type III (hard anodize) parts shall NOT be sealed.

### **Thermal Processing:**

1. Hartwell prohibits the use of “Salt Baths” in the thermal processing of any carbon steels.
2. No Rockwell test impressions allowed on the visible top surface of the part or on the outer diameter of cylindrical rollers or bushings. No more than 3 impressions per square inch on other surfaces. (If needed, confirm the testing surface with your Hartwell Buyer).

## **5.19 Record Retention**

All records of test and inspection results, and administrative quality documentation required by contract or subordinate specifications (quality records) shall be retained by the supplier for a period of not less than ten (10) years after the creation of the record, unless a longer period is specified on the Hartwell purchase order. If the supplier subcontracts the record creation (for example: the supplier sending a part out for radiography), the supplier shall impose this same record retention period on their procuring document to their subcontractor.

The supplier shall contact Hartwell for record disposal approval (i.e., to either destroy or return the aged records) prior to disposing any records.

**5.20 Order of Precedence**

In the event of conflict in the definition of requirements, the order of precedence is:

- a. Procuring document (purchase order)
- b. Applicable engineering drawing
- c. Associated process specifications
- d. Other reference specifications

Contact your Hartwell Buyer for further information and to advise them that such a conflict exists.

**5.21 Inspection Sampling and “C=0”**

The supplier shall comply with the requirements of document AS9138 “Aerospace Series – Quality Management Systems Statistical Product Acceptance Requirements”, as may be amended from time to time, whenever applying statistical sampling methods as a means to ensure product, article, or service conformance. The supplier’s statistical sampling procedure/plan must include the following:

- Minimum protection levels as defined within AS9138 Table A1
- “C=0” criteria as defined within AS9138
- When applicable, sampling restrictions as contained within AS9138 (e.g., Safety/Critical Characteristics), and
- Sampling requirements and/or prohibitions contained within the approved part/product design

Hartwell reserves the right to disallow a supplier’s statistical methods for product acceptance for parts or characteristics, and to conduct surveillance at the Supplier’s facility to assess compliance to the requirements of AS9138 and/or part/product Design Data sampling requirements

Aerospace standards such as AS9138 can be obtained from SAE International at:  
<http://standards.sae.org>

**5.22 Statistical Process Control – When Mandatory**

Though Hartwell encourages all suppliers to use statistical process control (SPC) to better understand their processes, it is not normally a mandatory requirement. On those occasions when it becomes a mandatory requirement, such will be identified on the purchase order along with the identification of the particular product characteristics to be so controlled. If such is the case, suitable control charts shall be forwarded by the supplier with each shipment. The types of charts are to be first determined by the supplier who then submits the selection in writing as an “SPC” plan to Hartwell for approval prior to the start of production.

Also required with each shipment is evidence of process capability (Cpk) of greater than 1.33 for the processes producing those characteristics. If Cpk of 1.33 or greater is not achieved, then the supplier shall show documented evidence of their current investigation to achieve this or rationale acceptable to Hartwell that justifies the continued use of an

incapable process. Cpk evidence shall be required for each lot produced, and for each shipment made (in those cases where a lot is split among more than one shipment).

Production of part features which are identified as key characteristics by the applicable purchase order documentation shall be controlled by SPC and shall not be subcontracted without the express written permission of Hartwell, and then only when this requirement is also flowed down to the manufacturing organization.

### **5.23 Technical Support**

If there are technical aspects of the contract that exceed the capabilities of the supplier, there may be technical support that can be provided by Hartwell. This may include engineering expertise, clerical support, manufacturing and administrative liaisons, etc. In addition, training may be provided to help your personnel understand and carry out their responsibilities under Hartwell contracts. This can include statistical process controls, etc. Your Hartwell Buyer can provide more information.

### **5.24 Digital Product Definition (DPD)**

When design Digital Product Definition (DPD) data is utilized in manufacturing or inspection, the supplier shall have a quality system to control design DPD data to the extent necessary to fulfill purchaser order requirements.

### **5.25 Document Revision Levels**

Unless otherwise specified in the purchase order, drawings and specifications or an authorized change order shall be of the latest revision in effect as of the date of the purchase order.

Hartwell purchase orders and drawings may refer to obsolete specifications. In these instances, suppliers are required to perform work to the current specification or its superseding document.

For example: a Hartwell drawing may request a passivation process per QQ-P-35, however, QQ-P-35 is obsolete and replaced by AMS2700. The supplier shall perform work to AMS2700.

### **5.26 Source Control Drawings (SCDs)**

SCDs, often identified as such in the title block of the drawing, are Hartwell Engineering's way of controlling the identity of the manufacturer and restricting permission to manufacture the SCD item to those entities specifically authorized by Hartwell Engineering. Other entities receiving a purchase order for such an item must ensure through their procurement that the actual manufacturer of the item was authorized by the SCD and must maintain records supporting such proof. Only those entities named in the SCD may manufacture the

SCD item unless explicit written exception is granted by Hartwell Engineering through the Hartwell Buyer and such exception noted within the body of the Hartwell Purchase order.

## 5.27 Certifications (Statements of Quality)

When certifications of compliance (“certs”, certificates of conformance, etc.) are required by the Hartwell purchase order, they must display, as a minimum, the following elements:

- a. *Lot Specific* – the certificate must make a specific reference to the part number (or process number if a process), part revision level (or process revision if a process), the Hartwell purchase order number, and the quantity of units so that it cannot be confused with another lot of parts. While it’s preferred to have a unique shipper or certificate number, it’s not required.
- b. *Statement of Quality* – a statement to the effect that the parts are of the required configuration, have been manufactured or processed to meet the requirements of the referenced order, specification, etc. must be present. This can take many forms using various words, but the essence of the statement must be that the parts do conform to the applicable requirements. Where tests are required to be performed in accordance with the purchase order, simply stating test values or results is not sufficient.
- c. *Dated Signature* – the certificate must be signed (a reproduction, stamp, or printed facsimile of a specific individual’s signature is acceptable), and the signature dated. Often the date will appear elsewhere on the page, which is acceptable. Certifications that do not display a signature with a date are unacceptable.
- d. *Control Records* – process or control records, raw material certificates, charts, data sheets, etc., identifiable with the processes and materials to which they apply and showing evidence of acceptance by the supplier’s quality control organization, shall be submitted with each shipment. All documents submitted to Hartwell and/or retained by the supplier shall maintain traceability to the items delivered.



**Commodity-Specific Certification Deliverables**

Governing Technical Data	Commodity	Manufacturer/ Distributor Certificate	Raw Material Certificate	Special Processing Certificate
Hartwell Controlled Drawings/ Specs	Machine Parts	X	X	X
	Castings/ Forgings	X	X	X
	Plastic/ Injection Molded Parts	X	X	Not Required
	Assemblies	X	Not Required <sup>1</sup>	Not Required <sup>1</sup>
	Outside Processing Services	X	Not Applicable	X
	Raw Materials	X	X	X
Non-Hartwell Controlled Drawings/ Specs	Standard Hardware (International, BAC, etc.)	X	Not Required <sup>1</sup>	Not Required <sup>1</sup>
	Catalog Items	X	Not Required <sup>1</sup>	Not Required <sup>1</sup>
	Consumables	X	X	Not Applicable
Services	Calibration	See Section 5.35		
	Inspection or Test	Certified test reports as required by the purchase order including test method used and test standard revision level.		

<sup>1</sup> Not required unless otherwise specified on the purchase order.

**5.28 Forms and Referenced Documents**

Forms and technical documents that are referenced within this document may be obtained by contacting your Hartwell Buyer.

**5.29 First Article Inspection Reports (FAIRs)**

First article inspection reports (FAIRs) are to be performed in accordance with the latest version of *AS9102, First Article Inspection Requirements* and must be submitted to Hartwell with the first shipment. It is recommended that the supplier identify the FAI article with nondestructive labeling for Hartwell's identification upon receipt (e.g., "FAI Piece"). It may be in the supplier's best interest to coordinate FAIR review activities prior additional production, in which case coordination of the FAIR review will need to be arranged with the Hartwell Buyer.

*Exception:* industry standard hardware and catalogue items do not require a FAIR.

It is the supplier's responsibility to assure that a Hartwell-approved FAIR has been received and retained on file for the configuration level of the part being provided. Production of additional units without the FAIR approval will be at the supplier's risk.

Final acceptance of production tooling (e.g., castings, forgings, extrusions, injection molded parts, etc.) is contingent upon the acceptance of first article inspection of the applicable characteristics on completed parts or materials. Preliminary acceptance of pre-production parts used to check general tooling configuration does not constitute acceptance of the first article. Final acceptance of the production tooling and FAI will occur on products that have been fully processed to all purchase order requirements. Production of additional units without the FAIR approval will be at the supplier's risk.

*Note: Suppliers of Hartwell Assemblies, unless otherwise specified on the purchase order, are not required to provide copies of raw material or process certifications used to produce the assembly. The supplier must, however, state on the manufacturer's certificate of conformance that the materials used to produce the product comply with the requirements reflected in the Hartwell drawing. In addition, the supplier must retain the raw material and/or special process certifications in accordance with this procedure.*

### **5.30 General Drawing and Inspection Guidelines**

#### Machined Parts and Assemblies

Unless otherwise specified on the drawing or purchase order articles shall meet the following:

- a. Dimensions apply after finish (plating, electro-polish, paint, etc.) and before dry film/solid lubricant.
- b. Machined surfaces shall have a 125 micro-finish or better. All surfaces shall be free of tool marks (chatter), rings, grooves, etc.
- c. Sharp corners shall be broken with a 0.005" to 0.015" radius.
- d. Unspecified fillet radii shall be 0.005" to 0.015".
- e. Parts shall be completely free of burrs.
- f. Features shown in-line shall be within  $\pm 0.010$ ".
  - i. Features shown in-line through multiple walls shall be in-line within  $\pm 0.002$ ".
- g. Features shown concentric shall be concentric within 0.010" total indicator reading (TIR).
- h. Hole diameter tolerances shall be as follows:
  - i. 0.0010" thru 0.1499" = +0.002" / -0.000"
  - ii. 0.1500" thru 0.2499" = +0.003" / -0.000"
  - iii. 0.2500" thru 0.5000" = +0.004" / -0.000"
  - iv. 0.5001" and above = +0.005" / -0.001"For any letter, fraction, or number drill callout refer to Hartwell HSP151 (Available from your Buyer)
- i. Springs made from "Music Wire" must meet the wire size diameter within  $\pm 0.0002$ ".
- j. Springs made from other materials must meet the wire size diameter within  $\pm 0.002$ ".
- k. Unless otherwise specified, surface engravings (e.g., "Retract", "Extend", "Stow", etc.) shall be 0.005" – 0.015" in depth.

## Extrusions

Unless otherwise specified on the drawing or purchase order articles shall meet the following:

- a. Surfaces shall have a 125 micro-finish or better.
- b. Tolerances shall be per the stated material specification "standard" extrusion tolerances.

## Castings and Forgings

Unless otherwise specified on the drawing or purchase order articles shall meet the following:

- a. Cast surfaces shall be a C-12 (125 micro-finish) or better.
- b. Forged surfaces shall be a C-25 (250 micro-finish) or better.
- c. Each article shall be cleaned and uniform in quality, condition, and appearance.
- d. Gated areas shall be smooth and blended evenly to the existing cast surface. They shall be free of tooling or sanding marks.
- e. Flash shall be removed flush to +0.050" to adjacent surfaces.
- f. Features shown in-line shall be within  $\pm 0.010$ ".
  - i. Features shown in-line through multiple walls shall be in-line within  $\pm 0.002$ ".
- g. Features shown concentric shall be concentric within 0.010" total indicator reading (TIR).
- h. Homogenization as appropriate prior to solution anneal.
- i. Cosmetically critical surfaces may be specified and must follow Hartwell specification HSP255 (Available from your Buyer).

## Plastic/Injection Molded Items

Unless otherwise specified on the drawing or purchase order articles shall meet the following:

- a. Components shall have a 125 micro-finish or better with surfaces free of flash, surface defects, tool marks, rings, grooves, etc.
  - i. Attention shall be given to the presence of discontinuities such as cracks, evidence of shrinkage, potential stress risers, recesses or inadequate filling, sharp corners, etc.
- b. Sharp corners shall be broken to a 0.005R to 0.015R
- c. Molded fillet radii shall be 0.005" to 0.015".
- d. Features shown in-line shall be within  $\pm 0.010$ ".
  - i. Features shown in-line through multiple walls shall be in-line within  $\pm 0.002$ ".
- e. Features shown concentric shall be concentric within 0.010" total indicator reading (TIR).
- f. Gating marks should be smoothly blended to the surface or contour with no sanding marks present.

**5.31 Restricted Manufacturing****5.31.1 Non-Conventional Machining**

The use of non-conventional machining on Hartwell-designed products is NOT ALLOWED unless specifically approved by Hartwell Engineering and the approval is reflected on the purchase order. This includes, but is not limited to:

- a. Electromechanical Machining (ECM)
- b. Electrochemical Grinding (EGM)
- c. Electrical Discharge Machining (EDM)
- d. Laser Beam Machining (LBM),
  - i. Including laser etching and laser engraving,
- e. Spark Erosion Grinding (SEG)
- f. Abrasive Water Jet Machining (AWJM)

Use of any of these methods to perform “rough” profile cutting of materials in preparation for final machining of the features may be used if the rough-cut process and final machining process are reviewed and approved by Hartwell Engineering and Quality.

**5.31.2 Weld Repair**

The use of any type of “weld repair” (e.g., cosmetic repair of a casting) is prohibited unless a documented, and order specific, approval allowing such repair is provided by a Hartwell Engineering representative.

**5.32 Age Controlled Items**

All age-controlled items are to be delivered with a minimum of 80% shelf life remaining on the product at the time of receipt at Hartwell. The provided certifications shall include mix or cure date (expressed in an alphanumeric format Ex. “1Q16”) and expiration date (expressed in an alphanumeric format Ex. “1Q16”, calendar date, or amount of remaining time).

**5.33 Resubmission of Lots**

The supplier must note on the shipping documents any applicable Discrepant Material Report (DMR) numbers against which parts may have been rejected and returned to the supplier (for rework, replacement, etc.), as well as the applicable purchase order number.

**5.34 Procurement of Raw Material for Hartwell Designed Product**

Suppliers who purchase raw metallic materials for the manufacture of parts to Hartwell designs or source control drawings must comply with one of the following requirements:

- a. Purchase raw metallic materials from a Hartwell approved source. Approved sources are listed on the Hartwell website: ([www.hartwellcorp.com](http://www.hartwellcorp.com))
- b. Purchase raw metallic materials from a supplier of choice and comply with the following conditions to periodically validate the raw material source’s Certificates of Conformance:

- Unless otherwise specified, a single test piece shall be cut which nominally measures:
  - i. Bar/Rod: one linear foot
  - ii. Sheet/Plate: one square foot
- Sample test reports to be supplied to Hartwell upon request and shall contain:
  - i. The original material procurement documentation.
  - ii. Numerical values for the test data used as the basis for the determination (i.e. quantitative values for mechanical properties and chemical analysis).
- Notify Hartwell within 24 hours of a reject determination if parts have been delivered or are in process.
- A single test sample of any grade material procured for Hartwell products shall be validated for each non-approved raw material supplier utilized. Validation shall be at the supplier's discretion, but not longer than two years.

If grain direction is specified, the material should be clearly marked to identify the direction of the grain. Bar stock cut plate shall be squared and meet a +0.125" / -0.000" tolerance to size specified on the purchase order.

Raw materials purchased to a Hartwell controlled raw material number or products (castings, forgings, or extrusions) produced to a Hartwell or customer-controlled drawing shall require one copy of the mill certification to accompany the order. Mill certifications shall include at a minimum: material manufacturer, "heat lot", size, type, specifications, all chemical and physical analysis required by the specification and original melt country of origin.

**Restriction: No material is allowed to be procured from China, Russia, or Belarus.**

## 5.35 Supplier Flow-Down

If the supplier subcontracts any portion of the Hartwell purchase order, the requirements of this document, in addition to any other Hartwell requirements shown on the purchase order, must be in turn flowed down to the performing subcontractor. The supplier shown on the Hartwell purchase order always retains the responsibility for supplying conforming product.

## 5.36 Supplier Foreign Object Debris / Foreign Object Damage Prevention

The supplier shall have established methods, cautions, and practices, compliant with AS9146 or NAS412, to prevent foreign object damage (FOD) to products being designed, developed, manufactured, assembled, operated, repaired, refurbished and maintained. There shall be documented evidence of internal audits conducted by the supplier for their FOD activities.

## 5.37 Supplier Counterfeit Parts Prevention

The supplier shall have a mechanism(s), in accordance with AS6174, that deal with the subject of preventing the introduction of counterfeit materials into the product stream. There shall be documented evidence of the mechanism(s) or plan to prevent the introduction of counterfeit materials.

**5.38 Supplier Corrective Action Response**

Rejections for non-conforming hardware determined to be the liability of the supplier will be recorded and forwarded to the supplier on a supplier corrective action request. The supplier shall provide a written response, which includes the subsequent elements, within the allotted timeframe.

Immediate Corrective Action (containment) – actions taken immediately upon discovering the nonconformance has occurred. Typical actions entail segregation of unit from conforming stream and identifying product as nonconforming awaiting disposition. Stock and WIP (work in process) should also be reviewed.

Identify/Correct other Similar Product/Process Affected – actions taken to examine overall products/processes for potential nonconformance based previous discovery. If any processes/products are found in adjacent areas, appropriate immediate corrective actions are to be taken.

Root Cause of Nonconformance – original event, action(s), and/or conditions directly or indirectly contributing to the nonconformance. Multiple causes can be identified by a “Chain of Events” which singly would not cause a nonconformance but together make up the root cause.

Root Cause Corrective Action Plan – is noted for the use of objective evidence to support and validate the Corrective Action Plan. Examples of objective evidence are formal documents such as engineering drawings, procedures or training records. Corrective Action Plan(s) always have an expected completion date.

Root Cause Corrective Action Plan Verification – always has an expected completion date with specific actions to be taken to ensure the Root Cause has been adequately identified. Examples of this would be verification at intervals confirming the original event is not present or any secondary event generated by implementation of the Corrective Action Plan.

**5.39 Calibrated Equipment Documentation**

Calibration sources must provide documentation on all items that have been calibrated with before and after data required. Non-calibration sources are only required to keep a record which is available upon request. The documentation for calibration and non-calibration sources must show numerical data to demonstrate equipment was calibrated over the range of usage for the equipment. The standards used to perform the calibration (device name, identification number, and due date) must be traceable to NIST or equivalent and included on the calibration certificate.

**5.40 Proprietary Products and Obsolescence**

Manufacturers and distributors of proprietary products or processors which perform a proprietary process not controlled by a recognized international standard are obligated to inform Hartwell of any known activity to:

- a. Discontinue the manufacturing of the ordered item. The supplier shall make procurement of “end of life” quantities available to Hartwell.
- b. Discontinue the processing of the service requested. The supplier shall coordinate the identification of a suitable replacement.
- c. Change the design or processing characteristics (e.g., materials, special processing, dimensional features, or formulation) of the ordered item or service that will affect the previously advertised or reported performance of the item or service. The supplier shall coordinate and facilitate activities with Hartwell Engineering to validate the changes and assess the impact on approved Hartwell designs.

**5.41 Training, Competence, and Awareness**

The supplier shall have established methods in place to ensure all personnel performing work affecting product conformity have been provided the appropriate level of training to maintain the necessary skills and experience for the work being performed. The training performed shall ensure that personnel are aware of their contribution to product conformity, safety, and the importance of ethical behavior.

*Application of Acceptance Authority Media (AAM)*

Suppliers are advised that the products and services they provide to Hartwell are used in aerospace applications for which our customers and the general public rely on their safe and reliable performance. This performance is assured by the supplier's commitment to product/service conformity and ethical practices. The use of AAM must be considered as a personal warranty of compliance and conformity.

Suppliers who utilize AAM to record the status and verification of product or as entries on product conformance records shall comply with AS9100 and 14 CFR Part 21.2. Suppliers shall, upon request, be able to demonstrate defined controls within their Quality Management System (QMS), including periodic auditing, as well as evidence of the communication of those controls and safeguards to its employees and supply chain.

**5.42 Operator Self-Verification Program**

If the Supplier uses an Operator Self-Verification (OSV) program, the Supplier shall comply with the requirements set forth in SAE industry standard AS9162, “Aerospace Operator Self Verification Programs”, as may be amended from time to time. Hartwell reserves the right to conduct surveillance at the Supplier's facility to determine that the Supplier is compliant to the requirements of AS9162.

## **6.0 Notes**

*This section contains items of an informational nature only, and do not constitute any mandatory requirements.*

There are no entries in this section.



## REVISION HISTORY

Rev.	Date	Description	Prepared By
A	8/25/23	Rewritten in its entirety. Consider a new revision for review purposes. Revision structure revised from a date to an alpha character format (starting at "A"). See archive files for previous revision histories.	S. Ricordati
B	12/21/23	Section 5.16, Anodize item 3 – WAS: "...Type 1 and Type II parts to be HOT water sealed." IS: "...Type I and Type II are to be sealed in accordance with MIL-PRF-8625. <u>Note</u> : In some Hartwell configurations specific sealing requirements may be defined (e.g., Hot DI Water)."	S. Ricordati
C	4/3/24	Section 5.16, Anodize item 3 – WAS: "...Type I and Type II are to be sealed in accordance with MIL-PRF-8625. <u>Note</u> : In some Hartwell configurations specific sealing requirements may be defined (e.g., Hot DI Water)." IS: "...Type 1 and Type II parts to be HOT water sealed."	S. Ricordati
D	6/28/24	Table of Contents – corrected a formatting error. Section 5.26 – added item "k" to document surface engravings. Section 5.27.d.i – added in its entirety, "including laser etching and laser engraving".	S. Ricordati
E	1/21/25	Section 5.16, Added statement prohibiting the use of salt baths in the thermal processing of carbon steels. Other minor formatting changes.	S. Ricordati
F	3/17/25	Section 5.27: Title WAS: "Non-Conventional Machining" IS: "Restricted Manufacturing". Previous 5.27 content was relabeled as 5.27.1. Added 5.27.2, "Weld Repair" in its entirety.	S. Ricordati
G	5/12/25	Section 5.3, <i>Language</i> : added in its entirety. Section 5.8, <i>Excess Inventory</i> : added in its entirety. Subsequent sections renumbered as a result. Section 5.21 <i>Inspection Sampling and "C=0"</i> added in its entirety. Subsequent sections renumbered as a result. Section 5.24, <i>Digital Product Definition</i> : added in its entirety. Subsequent sections renumbered as a result. Section 5.31.1, added "...on Hartwell-designed products..." Section 5.34, Procurement of Raw Material for Hartwell Designed Product: added "Belarus" to restricted procurement locations. Section 5.41, first paragraph: Added "AAM personal warranty" statement. Section 5.42, <i>Operator Self-Verification Program</i> : added in its entirety.	S. Ricordati