



PAC-ST006 – Additional Quality Requirements for Noncertified Machining Suppliers

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1 Policy

Precision Aerospace Corp. (PAC) will partner with machining suppliers who demonstrate a commitment to continual improvement of product quality, on time delivery, and responsiveness. It is our intent to develop mutually beneficial long-term alliances with these suppliers.

2 Scope

This document applies to contracts with PAC's aviation, space and defense part machining suppliers in addition to PAC-L100 Purchase Order Terms and Conditions, PAC's PO/Line, and PAC-ST003 – Supplier Quality Requirements Manual.

Unless otherwise specified in the body of PAC's PO/Line, as applicable to the product supplied, the requirements of the revision of this document that is current on the date of the PO applies to every PAC PO/Line issued to a machining supplier that states "Certifications Required". The current revision of this document is available at:

<http://www.precision-aerospace.com/supply-chain-management>

3 References

AS9003 – Inspection and Test Quality System
PAC-ST001 – Visual Inspection Standard
PAC-ST002 – Deburr Standard
PAC-ST003 – Supplier Quality Requirements Manual
PAC-L100 – Purchase Order Terms and Conditions
QA-F018 – Supplier Process Change Request (PCR) form

4 Acronyms and Definitions

FAI/PPAP First Article Inspection/Production Part Approval Process – report of verifications performed on an article from an initial production run IAW AS9102 or PAC's customer's requirements

IAW In accordance with

MRB Material review board – PAC Engineers and Quality Technicians who have authority and responsibility to review and disposition nonconforming product, and to determine subsequent actions to take

NC Nonconforming

PAC Precision Aerospace Corp.

PO Purchase Order

QMS Quality Management System

Contract – The Complete Agreement between PAC and the supplier as defined in PAC-L100

Hardware – Unless specified this includes both metal/alloy parts manufactured to a design authority's proprietary requirements (proprietary hardware) and hardware produced to a published specification (standard hardware).

Product – Any product, material, service, or process provided by supplier that is intended to be incorporated into parts and subassemblies PAC sells to Customers. This includes, but is not limited to raw material, proprietary and standard hardware, other materials such as grommets, paint, ink, and adhesive, etc., and special processes.

Special Process - the application of chemical, metallurgical, nondestructive or any other manufacturing, joining, or inspection process that is controlled by government, military, or industry specification, or any other specification called out on PAC's PO.

Shall Indicates a requirement

5 Quality Management System

IAW the PAC-ST003 section titled supplier Quality Management System Requirements, the supplier shall maintain a clearly documented Quality Management System (QMS) that complies with the requirements of AS9003 as detailed in following sections. The supplier's QMS

documentation shall be available to PAC Quality Assurance personnel for review or audit upon request IAW PAC-L100 Purchase Order Terms and Conditions.

6 Control of Information

6.1 Maintained and Retained Information

To the extent necessary for the supplier's scope of operations, the supplier shall ensure appropriate control of maintained and retained information to ensure:

- a) identification and description to ensure the information can be located when needed.
- b) review and approval for suitability and adequacy by authorized persons prior to use.
- c) availability and suitability for use, where and when needed.
- d) storage and protection from improper use, loss of integrity, or loss of confidentiality as required in nondisclosure agreements between the supplier and PAC.
- e) control of changes (i.e., version control) to ensure that only the latest versions of controlled documents are available where needed, and when obsolete or superseded, if kept for any purpose the documents are suitably identified or production access is removed to prevent unintentional use.
- f) retention and disposal of information retained as evidence of conformity (records) IAW PAC-L100 Purchase Order Terms and Conditions, and the PAC-ST003 section titled Information Retention.

The supplier's records shall be documented using permanent methods (e.g., handwritten records may not be in pencil). Paper records shall be properly stored and electronic records shall be maintained and backed up to prevent loss of information or legibility, and to safeguard against unintended alteration, corruption and physical damage.

Corrections to processing records must be legible and made indelibly, with one line through the error, so that the original data can still be read, or with an addendum. No white out is permitted on records. Changes to information on paper documents that are retained as records of production lot processing must signed and dated, and when applicable approved by an authorized person (see b above).

6.2 Non-deliverable Software

The machining supplier shall control non-deliverable software used in the manufacturing or inspection/testing of deliverable hardware. Examples of non-deliverable software are CNC programs and CMM programs.

The following controls must be defined within the supplier's QMS documentation, and maintained:

- a process for proving with objective evidence that the software performs its required function,
- a process for controlling revisions to the software,
- a process for verifying correct revision of software is being used prior to running parts, and
- a defined method for the safe back up of software.

7 Management Responsibility:

The supplier shall have a clearly defined quality policy that is understood, implemented and maintained at all levels of the organization. A management representative shall be designated with the responsibility for Quality.

8 Personnel Competency and Qualification

8.1 Competency

Records of personnel training and competency shall be maintained in accordance with the Control of Information paragraph of this document, and the section of PAC-ST003 titled Information Retention.

8.2 Inspector Vision Qualification

Personnel performing part inspection shall be capable of meeting the following vision requirements:

- Near vision: Jaeger Type 1 or equivalent
- Color: Ability to distinguish red, green, blue and yellow as determined by Standard Color Plates.
- Color vision shall be performed once and near vision testing shall be performed annually. Vision test records shall be retained by the supplier. If near vision correction is prescribed, the person shall use the required corrective lenses when performing production work and visual inspections.

9 Work Environment

The supplier shall maintain the work environment for production and inspection processes that is needed to verify conformity of product to requirements.

9.1 Temperature

The supplier shall determine and maintain adequate temperature stability, or stabilizing periods for holding parts and gaging as needed to ensure accuracy of measurements.

9.2 Lighting

Lighting level at the point of inspection shall be 100 foot-candles minimum.

10 Contract Review

In addition to contract review requirements IAW the PAC-ST003 section titled Contract Review, PAC requires machining suppliers to acknowledge each PO/Line received, including revisions. The supplier shall email PO acknowledgements to the following address:
productioncontrol@precision-aerospace.com

11 Control of Procurement from External Sources

11.1 Approval of External Sources

For purchase of the supplier's processing equipment, supplies and materials that can affect PAC part conformity or the supplier's on-time delivery, the supplier shall use approved sources that have been evaluated and selected based on their ability to meet the supplier's specified requirements. A listing of these approved sources, including the scope of their approval, shall be maintained and kept current by the supplier. The supplier shall have documented process in place for inspection of received product.

11.2 Information for External Sources

The machining supplier's purchasing documents to approved sources shall clearly state the following:

- relevant drawings, specifications and standards and their revisions, and quality requirements that apply to each purchase.
- for any raw material procured by the machining supplier, DFAR compliance must be required.

11.3 Special Processes Prohibited Without Prior Permission from PAC

Under no circumstances shall the machining supplier use any special process during manufacturing without prior permission in writing from PAC Engineering. Request for permission shall be done by submitting a QA-F018 Supplier Process Change Request (PCR) form. When permitted, the supplier shall subcontract IAW the PAC-ST003 section titled Subcontracting. Samples or test coupons will be specified by PAC when required for a permitted special process.

12 Planning Manufacturing Processes

The supplier shall plan and document the sequence of operations to be used in the machining and inspection processes (routings, travelers, etc.).

12.1 Manufacturing Process Changes

The supplier shall document any significant changes between the planned process and the actual process used for each production lot. Changes shall be properly marked up and approved by an authorized person and retained in the production lot's processing records (see section 6.1). The supplier shall notify PAC for approval prior to implementation of any significant changes in material or processes, including inspection, that may affect product quality, and when the FAI/PPAP requirement has been invoked for the part number a Delta-FAI/PPAP may be required (see the PAC-ST003 subsection titled Delta/FAI/PPAP). Request for permission to change shall be done by submitting a QA-F018 Supplier Process Change Request (PCR) form.

12.2 Prohibited Processing Materials

Aluminum Oxide in any form is not allowed in processing machined parts made from ferrous materials. Coolant that contains sulfur cannot be used on any non-ferrous parts.

13 Part Conformance Verification Inspection

Suppliers shall have formal, documented processes plans in place for in-process and final inspections, which verify and record product conformance to all specified requirements. Plans shall include at least one documented 100% visual inspection IAW PAC-ST001 – Visual Inspection Standard and PAC-ST002 – Deburr Standard, included in the final machining or deburring operation, or in the final inspection. All inspections and verifications shall be performed and the results recorded prior to the shipment of product to PAC.

- All inspection records shall be retained by the supplier IAW the PAC-ST003 section titled Information Retention, and section 6 of this document.
- The supplier shall provide each processing lot's In Process Inspection (IPI) data (see section 13.1 below) with the first shipment of hardware from the lot to PAC. Subsequent shipments from the same processing lot shipped from stores need only identify the lot's traceability number.
- If parts are received at PAC with incomplete, incorrect or missing IPI data, traceability or certification documents (see PAC-ST003 section titled Counterfeit Material Risk Mitigation including subsections), then IAW PAC-L100 Purchase Order Terms and Conditions, at the discretion of PAC's SQE or Quality Manager the shipment may be returned to the supplier, and a Quality Administration Fee may be charged.

13.1 In Process Inspection (IPI)

Unless provided by PAC, the machining supplier shall make an In Process Inspection (IPI) plan for each part number that includes all of the part's characteristics. At minimum, each characteristic's inspection frequency shall be based on its tolerance per the table on the following page. More frequent sampling may be done at the supplier's discretion, at no additional charge to PAC. Less frequent sampling is not allowed unless written authorization is obtained from PAC.

When the IPI specifies a feature as multiple times, actual results shall be recorded for each measurement taken.

Example:

Linear Dimension: .060 +/- .010 in 2 places

(feature's may also be listed as 2x)

Two results are required. If a second result is exactly the same as the first, it may be recorded as .063, 2x, for example.

**Reference Copy Only If Printed – Print Date: 19-Dec-19
 VERIFY REVISION TO CONTROLLED DOCUMENT BEFORE USE**

IPI's that do not contain the number of recorded results per feature will be considered incomplete and will be subject to rejection, up to and including the return of part(s) to the supplier. The supplier shall complete the inspection requirements at no additional cost to PAC.

Results shall be recorded with variable data for features of size when a design characteristic is expressed by numerical limits. Attribute data (pass/fail) may be used in lieu of variable data only when:

- No inspection technique resulting in variable data is feasible; or
- When the design characteristic does not specify numerical limits (e.g., break all sharp edges).

Results shall be recorded as a minimum of three decimal places (.xxx) when the total feature tolerance is greater than .005. Features with a total tolerance of less than .005, shall have results recorded as four decimal places (.xxxx).

IPI's that do not contain the proper number of decimal places in the results will be considered incomplete and will be subject to rejection, up to and including the return of part(s) to the supplier. The supplier shall complete the inspection requirements at no additional cost to PAC.

Table of IPI Sampling Frequency by Characteristic Tolerance

	Total Tolerance	Quantity Inspect	Quantity Document		
			Order Qty ≤ 100	Order Qty >100 ≤ 500	Order Qty > 500
Dimensional (in)	< .001	100%	1 of 5	1 of 10	1 of 50
	.001 to .003	1 of 5	1 of 5	1 of 10	1 of 50
	>.003 to .005	1 of 5	1 of 10	1 of 20	1 of 50
	>.005 to .010	1 of 10	1 of 10	1 of 20	1 of 50
	>.010 to .020	1 of 10	1 of 20	1 of 20	1 of 50
	>.020 to .030	1 of 20	1 of 20	1 of 20	1 of 50
	> .030	1 of 20	1 of 20	1 of 20	1 of 50
Angular (deg)	< .5°	1 of 5	1 of 5	1 of 10	1 of 50
	.5° to 1.0°	1 of 5	1 of 10	1 of 20	1 of 50
	> 1° to 2°	1 of 10	1 of 10	1 of 20	1 of 50
	> 2°	1 of 10	1 of 20	1 of 20	1 of 50
Micro Finish (Ra)	< 16	1 of 5	1 of 10	1 of 20	1 of 50
	16 to 32	1 of 10	1 of 10	1 of 20	1 of 50
	> 32 to 64	1 of 10	1 of 20	1 of 20	1 of 50
	> 64 to 125	1 of 20	1 of 20	1 of 20	1 of 50
	> 125	1 of 20	1 of 20	1 of 20	1 of 50

13.2 Final Inspection

The supplier's final inspection shall include review of IPI data for the processing lot, review of required traceability and certification documents to be provided to PAC, and over inspection sampling of the tightest tolerance characteristic created by each tool used in the part process's CNC program, at AQL 1.0 per the table on the following page.

When the supplier has determined that the product lot meets all requirements of the contract, a person authorized by the supplier to release the shipment to PAC shall enter the conforming quantity being shipped, their title, signature and date of release on the C of C for the shipment.

Table of Final Inspection Sample Size by Processing Lot Size

Lot size	(Associated AQLs)						
	0.010	0.40	0.65	1.0	1.5	2.5	4.0
	Sample size						
2 to 8	*	*	*	*	*	5	3
9 to 15	*	*	*	13	8	5	3
16 to 25	*	*	20	13	8	5	3
26 to 50	*	32	20	13	8	5	5
51 to 90	*	32	20	13	8	7	6
91 to 150	*	32	20	13	12	11	7
151 to 280	*	32	20	20	19	13	10
281 to 500	*	48	47	29	21	16	11
501 to 1,200	*	73	47	34	27	19	15
1,201 to 3,200	1,250	73	53	42	35	23	18
3,201 to 10,000	1,250	86	68	50	38	29	22
10,001 to 35,000	1,250	108	77	60	46	35	29
35,001 to 150,000	1,250	123	96	74	56	40	29
150,001 to 500,000	1,250	156	119	90	64	40	29
500,001 and over	1,250	189	143	102	64	40	29

*Indicates entire lot must be inspected (100%)

↑ Use AQL 1.0 sample size

NOTE: The Final Inspection acceptance number in all cases is ZERO – meaning, if any nonconformity is detected in the sample lot, then the NC characteristic(s) shall be inspected on all parts in the entire processing lot. NC parts shall be removed from the lot. (Refer to section 16.)

14 Control of PAC Supplied Material

Upon receipt of PAC supplied material, the supplier shall verify the material to PAC's PO/Line, by checking that traceability numbers match between the PO/Line and the material tag. The supplier is responsible for maintaining complete traceability of the entire material lot from receipt through all stages of processing, storage, packaging and shipment.

The supplier does not have MRB authority on any PAC supplied material dispositions. The supplier shall handle any nonconforming or suspected nonconforming material or product IAW the PAC-

ST003 sections titled Nonconforming (NC) Product and Waivers, and Nonconforming (NC) Product. If returned material is dispositioned scrap by PAC MRB, the supplier shall be responsible for the cost of replacement material, but under no circumstances shall any replacement material be procured by the supplier without specific written authorization and purchase order approval from PAC.

15 Lot Segregation, Traceability, and Inspection Status

In addition to the counterfeit material risk mitigation activities in the section of PAC-ST003 titled Counterfeit Material Risk Mitigation including subsections, at all internal handling stages from receiving through processing and shipping the machining supplier shall keep all raw material/ product lots clearly segregated, labeled and/or identified to maintain traceability to the appropriate Mill Certification, and to the processing lot's inspection status. Separate heat lots of material shall not be mixed in product processing lots or shipped together.

When the machining supplier procures the raw material used for PAC product, they are also responsible for verifying the actual test data on the Mill Certification to the appropriate material specification's requirements, recording the results of the verification, and providing a legible copy of the verified Mill Certification with each shipment of product made from the material lot.

16 Control of Nonconforming (NC) Product

In addition to NC product requirements in the PAC-ST003 sections title Nonconforming (NC) Product and Waivers, and Nonconforming (NC) Product, the machining supplier's internal control of NC product shall include the following:

- a) NC product made from material procured by the supplier that has been internally dispositioned as scrap must be recorded, permanently disfigured so as to be unusable for its intended purpose, and removed from the production area promptly, except when a scrap piece is kept for use in setting up a downstream process. The set up piece must be permanently disfigured and permanently identified as scrap. This is to ensure that it is clearly identifiable, should it be mixed back in with acceptable product by mistake.
- b) 100% of product reworked by the supplier shall be re-inspected for all possibly affected features, and the inspection results shall be documented and retained.

17 Internal Audits

Internal audits of the supplier's conformance to the requirements of this document, PAC-ST003 Supplier Quality Requirements Manual, and PAC-L100 Purchase Order Terms and Conditions shall be scheduled and performed by the supplier to determine the effectiveness of their quality management system. Timely and effective corrective actions must be taken to correct any findings identified by the audits. Evidence of internal audit and the results of actions taken to correct audit findings shall be retained in accordance with section 6.1 of this document.

Revisions and Approvals			
Section	Description	Approved	Date
All	New	NM	22-Mar-18
11.3	Added reference to QA-F018 form for requesting permission.	WA/cw, gls	18-Dec-19
12	Added planning of inspection processes.		
12.1	Added pre-approval requirement and reference to QA-F018 form to use for change approval submission.		
13	Added requirement for one documented visual inspection IAW PAC-ST001 and PAC-ST002.		
13.1	Revised with minimum inspection requirements, allowing additional sampling at no charge to PAC, and clarifications of results recording requirements.		