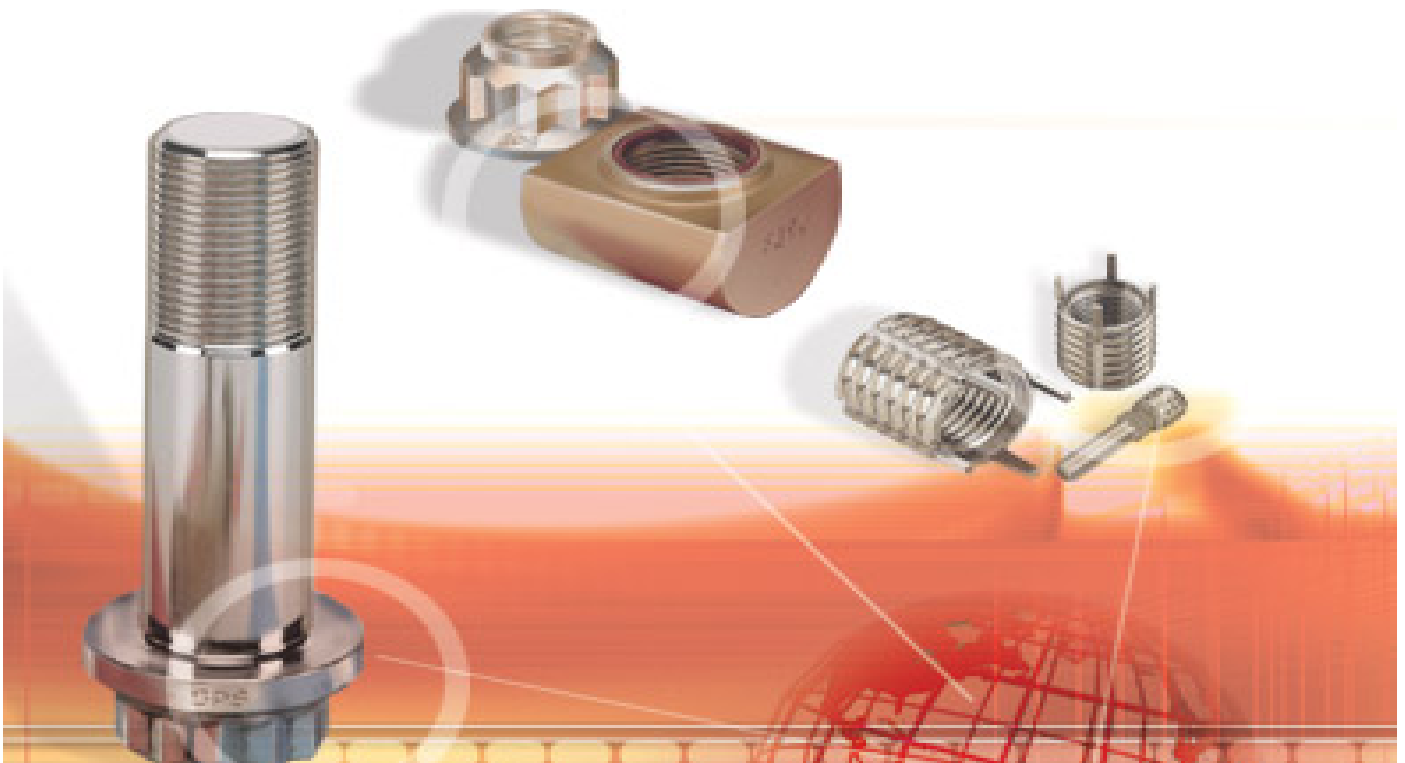




SQR-001

Supplier Quality Requirements




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Supplier Quality Requirements

1.0 Purpose

The purpose of this document is to provide our valuable suppliers, and members of their supply chain, with requirements for conducting business with SPS Technologies and its customers.

2.0 SCOPE

This document applies to all suppliers that provide SPS Technologies with raw material, parts, process, and special process services that are associated to SPS Technologies finished product. Exclusion may be taken for suppliers who provide material or product for engineering evaluation only.

3.0 NORMATIVE REFERENCE


It is the responsibility of the supplier to assure that they are working to the latest version of all required specifications, drawings, or other applicable documents.

All requests for required specifications, drawings, or other applicable documents shall be requested, in English, from SPS Technologies' purchasing department.

Suppliers shall refer to the revision date and revision levels noted on their purchase orders to determine applicable revisions of specifications, drawings, or other applicable documents.

In the event of conflict between this manual and other documents, the following order of precedence applies:

- 1st Contractual agreement or procurement document

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2nd Drawing

3rd Specifications

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4.0 ACCESS

The supplier shall grant access to SPS Technologies' duly authorized representatives or appropriate government authorities to any and all areas and records pertaining to work performed to meet SPS Technologies procurement or contractual documentation requirements.


5.0 BUSINESS CHANGES

Suppliers are required to notify SPS Technologies Purchasing Department in writing, within 30 business days, in the event of any significant changes to their business. Significant changes are defined as, but not limited to: acquisitions, changes in senior management and / or ownership, changes to key quality personnel, company name change, pending litigation, divestitures, and any other activity that might have impact to the financial stability of the company and product quality.

6.0 QUALITY REQUIREMENTS

6.1 MINIMUM REQUIREMENTS

Suppliers are fully responsible for the quality of their product or service. Therefore, as a condition to conducting business with SPS Technologies suppliers must be approved and incorporated into SPS Technologies' Approved Vendor List (AVL). Vendor approval may be assumed by the supplier once a purchase order has been issued by SPS Technologies.

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At a minimum, the supplier must provide evidence of an effective quality management system that meets the following requirements:

Raw Material Distributors –Should be certified to AS9100 quality system

Special Process Suppliers – Should be certified to: AS9100 quality system; be accredited to NADCAP AC7004; or have appropriate NADCAP certification. Calibration and testing suppliers shall be certified to ISO / IEC 17025.).

Material Suppliers – Should be certified to ISO9001 quality system requirements. All Other Suppliers – Suppliers (other than material suppliers, special process suppliers, or raw material distributors), whose product or service can have impact on SPS Technologies’ final product, should be certified to: AS9100 or ISO9001 quality system. Note that while it is not required for suppliers in this category to be certified to a quality standard, SPS Technologies prefers certified suppliers.


6.2 CRITICAL QUALITY SYSTEM ELEMENTS

While it is not SPS Technologies intent to dictate a supplier’s quality system format or content, SPS Technologies feels there are a set of critical elements within an effective quality system. To that extent, SPS Technologies does require the following set of elements as a condition for quality approval:

Quality Policy

A documented commitment by top management toward quality & continual improvement.

Document Control

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A written procedure that addresses control of SPS Technologies documents (prints and specifications), to include administration and revision level maintenance.

Record Control

A written procedure that addresses SPS Technologies' record requirements.

The supplier shall be able to provide objective evidence of compliance to all procurement document and contractual requirements. Objective evidence includes reports of:

- Inspection
- Testing
- Non-conforming Material Control
- Material
- Corrective & Preventive Action
- Engineering change control
- Incorporation
- Subcontractor management and approval
- Other quality assurance activities that provide evidence of conformance

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Records may be retained in any form of medium (e.g. electronic or copy) but supplier must maintain a provisional system to assure the legibility and retrieval of the records.

Records must be retained a minimum of seven (7) years after the completion and delivery of any material product, component, sub-component, or special process; unless otherwise specified. As a guideline the following types of records apply for retention:

- Audit records
- Corrective Action
- Inspection & Test Records
- Calibration Records
- Process Documentation (e.g. control plans, FMEAs, flow charts, routers)
- Production Part Approval (PPAP) Requests & Associated Records


Purchasing control

The supplier shall have a written procedure for purchasing control, to include quality and delivery expectations of sub-tier suppliers.

The supplier is responsible for assuring that work and processes performed and material provided by subcontractors meet all applicable SPS Technologies requirements.

The supplier is also required to flow-down all SPS Technologies requirements and latest revision changes to requirements that affect the work and processes performed and material provided by subcontractors for SPS Technologies.

Suppliers of material product shall maintain test reports (e.g. certificate of tests or material certifications) and make them available for all material shipped to SPS Technologies.

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Providers of special process shall provide objective evidence of conformity to SPS Technologies specified purchase order requirements (e.g. certificate of tests or certificate of compliance).

Corrective Action

The supplier shall have a written procedure defining actions required to address product, process, and quality system deficiencies.


Control of Non-Conforming Product

The supplier shall have a written procedure for how they will control non-conforming product. At a minimum the procedure must include how non-conforming product will identified and contained to prevent its unintended use or delivery.

7.0 QUALITY

7.1 REFERENCE DOCUMENTS

AS/EN/JISQ 9100	Aerospace Basic Quality System Standard
ISO9001	International Organization for Standardization "Quality Management Systems - Requirements"
AC7004	NADCAP Audit Criteria for Inspection and Test Quality
ISO / IEC 17025	International Organization for Standardization "General Requirements for the Competence of Testing and Calibration Laboratories"

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ANSI/ISO/ASQ Q10012 Measurement management systems – Requirements for measurement processes and measurement equipment

7.2 QUALITY PLANNING & INSPECTION


7.2.1 First Article Inspection Requirements

Suppliers are required to perform First Article Inspection (FAI) when:

1. New component and / or sub-component is being processed
2. New supplier or new location of manufacture
3. Lapse in production > 24 months
4. Drawing Change/ Revision Change
5. Manufacturing Process Change: Including NC Programs, Material Change, Sub-tier Change
6. Change in Inspection Method or Inspection Plan.

Note: FAI must include: Verification of all design characteristics; Material and special process certifications; Manufacturing process validation (process capability, Gage R&R, router plan, inspection data)

The completed FAI report shall be included with the product shipment. Suppliers are expected to take ownership of executing FAI per the six

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prescribed requirements previously listed. The shipment container and shipping documentation shall be identified with the note "FIRST ARTICLE INSPECTION". Tags are suitable means for proper identification. If the FAI is for an assembly a report is required for each component of the assembly.

7.2.2 Production Part Approval Process (PPAP)

A production part approval package may be requested as determined by SPS Technologies' quality manager. The purpose of this requirement is to ensure that suppliers can consistently comply with design specifications without adverse affect to SPS Technologies.

All PPAP requirements will be clearly identified and flowed to suppliers on the SPS Technologies purchase order. Based upon the PPAP level requested any or all of the following elements may be required:

Requirements	Level 1	Level 2	Level 3	Level 4	Level 5
Design records of saleable product for proprietary components/details	R	S	S	*	R
Engineering Change Document if any	R	S	R	*	R
Customer Engineering approval if required	R	R	S	*	R
Design FMEA	R	R	S	*	R
Process Flow Diagram	R	R	S	*	R
Process FMEA	R	R	S	*	R
Dimensional Results	R	S	S	*	R
Material Performance Test Results	R	S	S	*	R
Initial Process Capability Study	R	R	S	*	R
Measure System Analysis	R	R	S	*	R
Qualified Laboratory Documentation	R	S	S	*	R
Control Plan	R	R	S	*	R
Part submission Warrant (PSW)	S	S	S	S	R
Appearance Approval Report (AAR)	S	S	S*	*	R
Sample Product	R	S	S	*	R
Master Sample	R	R	R	*	R
Checking Aids	R	R	R	*	R

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Records of Compliance | R | R | S | * | R |

S= The supplier shall submit to the designated Customer

R= The Supplier shall retain a record, at the appropriate location, and make readily available for the customer.

*= Shall remain at the appropriate location and submit to the customer upon request.


Suppliers may refer to the AIAG website www.aiag.org for additional information on PPAP.

7.2.3 General Inspection & Sampling Requirements

For normal production the following sampling plan, as defined in Table 1 below, applies (Applies only after acceptable FAI has been completed):

TABLE 1

LOT SIZE	SAMPLE SIZE
1 – 90	20
91 – 280	32
281 – 500	50
501 – 1,200	80
1,201 – 3,200	125
3,201 – 10,000	200
10,001 – 35,000	315
35,001 – 150,000	500
150,001 – Over	800

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All dimensional and visual characteristics are inspected to customer drawing specifications per Table 1 above. All dimensional characteristics are considered defective when out of tolerance and rejected.

7.2.4 Visual Inspection Requirements

All parts shall be handled with care to protect them from nicks, dents, scratches, internal contamination and other damage that could result in subsequent rejection.

Parts shall be free from chips, foreign material, nicks, tool marks, burrs, sharp edges, blow holes, porosity, rust, stains, discoloration, missed operations and other non-conformances that can be detected visually. Tapped, drilled and reamed holes shall be free from dirt, chips and burrs before gauging. Edges and chamfers of such holes must be broken .003-.015 unless otherwise specified.

Transition of fillets and the blending of sharp edges shall be smooth and the intersection with adjacent surfaces shall be at the point of tangency. Sharp edges, unless otherwise specified, shall be broken (blended) .003-.015 and all corners to have fillets of .005-.020.


All internal passages must be free of chips, metal spirals, machining compounds and other foreign materials.

All blind holes, oil holes, internal intersections, etc., shall be probed or bore scoped for burrs and contamination.

Unless otherwise specified, maximum final machined surface roughness shall be as required per Table 2:

TABLE 2

Machined Area	AA value
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Surfaces other than holes	90
Holes diameters under 2" with a +/- 0.004" tolerance	63
Holes diameters under 2" with a +/- 0.001" tolerance	15
External roots & thread flanks before coating	32
Internal roots & thread flanks before coating	125

Parts shall be visually inspected for legible marking in accordance with the requirements of the customer's blueprint.


- A. Numbering
- B. Lettering
- C. Required Acceptance Symbols
- D. Part Number
- E. Change Letter
- F. Group Number
- G. Heat Codes
- H. Serial Numbers, Etc.

Magnification (3X) shall be used only to evaluate visual inspection non-conformances that are not readily discernible to the unaided eye.

For plated, painted and/or coated parts, the following items shall be inspected for conformance during visual inspection operations.

Optional plated areas, if plated, shall be inspected to the same visual requirements, unless otherwise specified, as mandatory plated areas. Parts shall be visually inspected according to the visual characteristics called out in the applicable plate, paint or coating specification.

Except as permitted by applicable specification, parts shall be free from peeling, flaking, chips, blisters, nodules, pits, pin holes, porosity and bare areas.

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Coatings shall be smooth, continuous, visually adherent and uniform in appearance. Slight staining or discoloration shall not be cause for rejection.

Specific areas of questionable parts discovered by visual inspection of plated, painted and/or coated parts shall be identified and the parts submitted to the Quality Control Materials Lab for disposition.

Precautions shall be used to assure that there is not contact between titanium or uncoated columbium parts and other objects composed of cadmium, gold, silver, lead, tin, bismuth or zinc. Personal articles such as, rings, watches, belt buckles, etc. shall be suitably covered or removed prior to handling parts with finished surfaces.


Indications of a metallurgical nature observed at the visual inspection shall be brought to the attention of the NDT Department for evaluation and disposition.

Inspection lots shall be screened 100% for missed operations, set-up pieces, gross defects and generally unacceptable conditions. Carbonated beverages, fruits, salted nuts or other substances that may cause corrosion or staining of parts are not permitted in the immediate area of inspection.

All articles shall be inspected prior to shipment to assure compliance with all required preservation and packaging requirements.

7.2.5 Control of Non-Conforming Material

Rejected or non-conforming material shall be immediately controlled, upon discovery, per the supplier's control of non-conforming product procedure.

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In the event of escape the supplier shall immediately disclose all pertinent information to the appropriate SPS Technologies' purchasing agent.

Supplier must contact purchaser to receive disposition in the event customer supplied material, components, or sub-components are rejected. An exception is provided in the event the product can be reworked to the designed specifications.

In the case where a non-conformance escapes to SPS Technologies or one of its customers, the supplier may be requested to complete a corrective action request. At a minimum, the supplier is expected to provide: containment plan; root cause analysis; proposed corrective action; and completion date for implementation of corrective action. The supplier is free to use their own corrective action format as long as the prescribed required elements aforementioned are included.


7.2.5.1 Counterfeit Material shall be considered non-conforming. All suspect materials or parts will not be returned to supplier or supply chain.

All suppliers must adhere to AS6174-Counterfeit Material; Assuring Acquisition of Authentic and Conforming Material

7.2.6 Traceability

The supplier is required to establish a system for lot traceability in order to be able to trace material or product throughout the entire realization process. Material shall be clearly identified in a manner that provides traceability to a lot number or other manner that is compliant to associated specification or drawing requirements.

7.2.7 Measurement & Test Equipment

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All measurement and test equipment used to accept product shall be managed and calibrated in accordance with ANSI/ISO/ASQ Q10012.

All gauges are required to have a 10:1 resolution of the characteristic being evaluated (e.g. If characteristic is tolerance to 0.001, then the gage must be graduated to 0.0001”).

Gages must be evaluated and determined capable prior to use on SPS Technologies’ product. A gage reproducibility and repeatability (GR&R) study shall be the method for evaluating measurement system capability. Refer to Table 3 for gage acceptance criteria.

TABLE 3


GR&R Study Variation	Acceptance Criteria
> 30%	Not Allowed for Use *
10 – 30%	Questionable, Improvement Required**
< 10%	Acceptable for Use

* Use of gage must be approved by SPS Technologies Quality Manager

** Source of variation should be studied and eliminated if possible

7.2.8 Packaging & Shipping

All SPS Technologies product must be packaged in a manner that will prevent damage and preserve the product adequately. All shipping containers must be clearly marked with the PO number, SPS Technologies Part Number, Revision Level, and Quantity.

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7.2.9 Certificates – the guidelines below are to ensure that we are not receiving counterfeit material

7.2.9.1 Certificate of Conformance


Each shipment must include either the “original true” certificate or a “true copy” of the certificate of conformance for all materials and processes specified on the purchase order or contract. This document shall include a general statement of conformance and include a signature by the appropriate quality assurance designee or officer of the company. Signatures may be in electronic or stamp format.

7.2.9.1 Certificate of Test

Each shipment shall include either the “original true” certificate or a “true copy” of the certificate of test when required per the purchase order or contract. This document will contain at a minimum: specific processes performed; specification number; revision level of specification numbers; item number; lot size; sample size; and test results.

7.2.9.2 Material Certificates

Each shipment of raw material (including castings and forgings) shall include a “true copy” of the original mill certificate or material test report. The results must include

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chemical, physical, and mechanical properties as required per the drawing and/or material specification.


Unless otherwise approved by SPS Technologies' Quality Manager all material must comply with the material specification. Raw material certifications may not be altered or have any markings on them, other than inspection validation check marks.

7.3 Frozen Methods / Processes

SPS Technologies requires all suppliers and sub-tiers suppliers to freeze establish methods of manufacturing / processes. This is to prevent process variation and potential product / service related risks. Process changes / deviations include, but not be limited to:

- Material Changes (includes raw materials, chemicals, components, etc)
- Equipment / Tooling Changes
- Order of Operations / Processes
- Manufacturing Locations, to include outsourcing or farm-out decisions

7.4 Request for Drawing Change

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Suppliers are encouraged to partner with SPS Technologies by identifying opportunities for quality improvement or cost reductions. In the event a supplier feels that a drawing change may be warranted to achieve a quality improvement or cost reduction they may submit a request for a drawing change to the appropriate purchasing agent. The purchasing agent will then forward to the SPS Technologies Quality Manager for review with SPS Technologies' Product Engineering. Drawing changes may only be granted by the SPS Technologies Product Engineering Manager.

7.5 Supplier Performance

SPS Technologies expects each approved supplier to take ownership and responsibility for managing their performance. To assist suppliers in clearly understanding SPS Technologies' expectation for performance we have outlined performance status ratings below in Table 4.

TABLE 4

Status	Quality %	Delivery %	Action
Excellent	98 – 100	98 - 100	No Improvement Necessary
Good	95 – 97.9	85 – 97.9	Improvement Needed
Conditional	90-94.9	90-94.9	Improvement Goals Required
Unacceptable	<89.9	<89.9	Potential Disapproval

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SPS Technologies purchasing and quality groups review each supplier for performance each quarter and provides performance feedback to each supplier.

It is the expectation that each supplier strive to perform in the “good” or “excellent” status categories. Any supplier that is not rated “good” or “excellent” must take immediate corrective action to improve their performance.

In the event a supplier has been determined to be underperforming by either the SPS Technologies purchasing or quality group a review will be conducted to determine an appropriate course of action, up to and including disqualification of the supplier.

7.6 Foreign Raw Materials

Suppliers who utilize foreign raw material suppliers in their products are responsible for assuring the material conforms to all technical requirements specified on the contract, SPS Technologies drawings, or other associated specifications.


7.7 DFARS 252.225-7014- Preference for Domestic Specialty Metals (Berry Amendment)

All orders that reference DFARS on the purchase order or contract that incorporate specialty metals into articles delivered to SPS Technologies must be melted in the United States of America, one of its territories, Puerto Rico, or a qualifying country.

DFARS requirements must be flowed down to sub-tier suppliers.

7.9 New Supplier Selection & Qualification

8.0 Objective

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The objective of SPS Technologies' new supplier selection and qualification process is to implement a process to systematically screen suppliers to ensure they are capable of consistently meeting our quality, delivery, cost, and continuous improvement objectives.

8.1 Supplier Qualification Process

The process steps apply for supplier selection and qualification at SPS Technologies.

1. The purchasing agent solicits completion of SPS Technologies' Supplier Evaluation Questionnaire (form PR-050).
2. The purchasing agent forwards the completed PR-050 the quality organization at SPS Technologies.
3. The quality organization at SPS Technologies will review supplier capability and performance with input from SPS's material control laboratory, process engineering group, product engineering group, and purchasing agent. Note a review must include at a minimum one, but may include as many as all, of the following actions:
 - a. Customer approval(s)
 - b. Certification of QMS
 - c. Supplier Self-Assessment (PR-050 – valid for 3 years)

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- d. Supplier furnished technical data and / or certifications
- e. On-site review of supplier's capabilities and QMS documentations.
- 4. In the event the supplier has been reviewed and determined "approved", they will be added to SPS Technologies' AVL.

Appendix A

TERMS AND DEFINITIONS

Approved Vendor List (AVL) – SPS Technologies maintains a list of approved vendors. Vendors not listed on the AVL are not permitted for use without quality review and approval.

Component or Sub-component – Any product or element of a finished product.

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Control Plan – A document that addresses the potential failure modes identified in the PFMEA with the highest risk and methods for controlling / mitigating these risks.

End User – SPS Technologies' customer

First Article Inspection (FAI) – The process of inspecting and validating all design characteristics and processes.

Failure Reporting – Immediate communication of any test anomaly, failure or improper test procedure. Requires a detailed action plan to correct the malfunction and / or improper test procedure to the purchaser. In the event of a failure, a failure report will be generated including failure photos. The supplier shall include this failure report in the their test report.


Frozen Process / Method – is a requirement preventing suppliers or sub-tiers from changing established processes or methods of manufacturing. Changes to frozen processes / methods may not be made without first obtaining documented customer approval.

Gage Repeatability & Reproducibility Study (GR&R) – A study used to determine measurement system variation to include variation by the appraiser and measurement equipment.

Identification & Traceability – The supplier shall ensure the complete identification and traceability of all related products and documentation. The supplier shall identify / mark product in accordance with the specification drawing or product standard.

(Appendix A Continued)

Key Quality Characteristic / Critical to Quality Characteristic – A product characteristic or process parameter which can have an effect on safety, compliance, fit, form, function, or processing of the product.

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Material Products – Raw materials used for the production of an SPS Technologies provided product.

Original True – Refers to an original certificate of test, material, or process.

Process Failure Modes & Effects Analysis – Tool used to identify all potential failure modes of a process as well as identification of opportunities for improvement to reduce risk.

Production Part Approval Process (PPAP) – A process used to ensure suppliers can comply with the design specifications consistently without affecting SPS Technologies' operation. For more information on PPAP requirements suppliers may refer to the AIAG's web site at www.aiag.org.

Purchaser – Company who has the contractual agreement with the supplier.


Special Processes – Processes that cause of product to undergo a chemical, metallurgical, or physical change. Examples of special process include, but are not limited to: welding, painting, plating, heat treating. Special processes also include testing and inspection methods such as: mechanical testing, non-destructive testing, and calibration.

Subcontractor – The supplier's supplier or collaborative firm.

Supplier – The holder of the purchaser's contract

True Copy – Means a complete copy (front and back) of the original including all terms, signature, and dates, to which is attached a signed statement that the copy has been compared with the original and that it is a true copy. The copy must be legible, reproducible, and printed on paper permanent in nature.


Appendix B

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Supplier Quality Requirements

SPS Technologies Customer Imposed Requirements for Flow-Down to Suppliers

End User (SPS Technologies Customer)	Applicable Documents and Other Special Requirements
Airbus	GRAMS (General Requirements for Aerostructure & Material Suppliers) applies
Bell Helicopter	1.SQRM-001 Supplier Quality Requirements Manual 2. Must be approved Bell Source.
Boeing	1. AQS D1-9000 (Boeing Quality System Requirements) applies 2. Must be an approved Boeing source
Electric Boat	EB Spec. 2678 (Electric Boat Quality System Requirements)
GE Aviation	1. S-1000 (GE - Aviation Quality System Requirements for Suppliers) applies 2. Must be an approved GE source
Hanilton Sundstrand	ASQR-01 (UTC Aerospace Supplier Quality Requirements) applies
Hartzell	SQ001 (Supplier Requirements Manual) applies
Honeywell	1. SPOC (Supplemental Purchase Order Conditions) manual applies 2. Must be an approved Honeywell source
Lockheed	1. Quality Assurance Provisions of Purchase Order Clauses A through P 2. Must be an approved Lockheed source
Messier-Bugatti	1. 1.GRP-0087 (Safran Requirements to Supplier)


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	2. Must be an approved Messier-Bugatti source

Appendix B (Continued)

End User (SPS Technologies Customer)	Applicable Documents and Other Special Requirements
Northrop Grumman	1. SQAR (Supplier Quality Assurance Requirements) applies
	2. Must be an approved Northrop Grumman source
Pratt & Whitney	1. ASQR-01 (UTC Aerospace Supplier Quality Requirements) applies
	2. Must be Pratt and Whitney approved source
Pratt & Whitney Rocketdyne	1. ASQR-01 (UTC Aerospace Supplier Quality Requirements) applies
	2. Must be Rocketdyne approved source
Rolls Royce	1. SABRe Protection, Packaging, and Labeling
	2. Must be an approved Rolls Royce source
Sikorsy Aircraft	1. ASQR-01 (UTC Aerospace Supplier Quality Requirements) applies
	2. Must be an approved Sikorsy Aircraft source
Solar Turbines	1. Solar's Purchasing Standard Notes apply
	2. Solar's Quality Notes apply

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