Quality System Requirements Document

WPQR-9102

Revision: 19

TITLE

WPQR-9102 Supplier PPAP Submission Content and Acceptance Requirements Specification

Stakeholder(s):

Purchasing
Product Family Leader
Quality Assurance

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PURPOSE

WPQR-9102 defines the Woodward requirements for production part approval. The purpose of PPAP submission is to determine if all governing engineering design record and specification requirements are properly understood by the organization and that the manufacturing process has the potential to produce product consistently meeting these requirements during an actual production run.

The WPQR-9102 specification is applicable for all Woodward locations.

REFERENCES

Reference documents:

WPQR-9100
4-OF-02555
3-OF-04182
SP-1143
SS-185
F27950
XLO-GP-1024
4-06-3421
4-06-3456
4-06-3461
3-06-2977

WISE Screens:

None

APPLICABLE SITES

All Woodward Plants

ACTIVE HYPERLINKS

1.0 PROCESS INTENT

WPQR-9100, (Quality System Requirements for Woodward Suppliers) requires the organization to perform the WPQR-9102 PPAP (Production Part Approval Process) activity.

1.1 Approach

The word "**shall**" indicates mandatory requirements.

The word "**should**" indicates a recommendation.

Paragraphs marked "**Note**" are for guidance in understanding or clarifying the associated requirement.

For the purposes of WPQR-9102, the terms and definitions in Section 3.0 Definitions apply.

1.2 Applicability

The WPQR-9102 specification and the PPAP requirements identified herein shall be applicable for all Woodward locations.

The PPAP submission requirements shall apply to any organization site supplying production parts, assemblies, service parts, or production materials intended for resale to a Woodward customer.

Note 1: If there is any question concerning the need for PPAP submission, contact Woodward Purchasing.

Requirements Flow Down:
Organizations are required to flow down the requirements of the current revision of this standard to their suppliers as necessary to obtain the required records to assure all item/product characteristics and PPAP submissions comply with Woodward requirements.

Catalog Items / Parts:
An organization supplying standard catalog production or service parts, as defined in Section 3.0 Definitions, is exempt from compliance with WPQR-9102 unless specified by Woodward Purchase Order (PO).

1.3 Element / Family Waivers

An element or family waiver (4-06-3421) may be requested by the organization and shall include justification. All formally approved waivers will be provided to the organization and shall be submitted in lieu of the actual PPAP elements as required by the PPAP PO. Element or family waivers shall be identified on the Part Submission Warrant (refer to 4.2.2.17 Part Submission Warrant).

Note 1: See Woodward PO for specific PPAP submission requirements. All questions about a PPAP submission shall be addressed to Woodward Purchasing.

Note 2: No verbal, e-mail, or otherwise communicated form of waiver will be accepted for PPAP approval.

Note 3: The organization shall retain all approved waivers as part of the PPAP record.

1.4 Non-Conformances

When requesting to ship non-conforming material, the organization shall use the SNCR process per WPQR-9100 for the review and disposition of any non-conformances prior to PPAP submission. Upon SNCR approval by Woodward, the organization shall note the SNCR number within the PSW (refer to Part Submission Warrant requirements regarding notation of approved SNCR) and include the SNCR record as part of the PPAP submission.

Note 1: No verbal, e-mail, or otherwise communicated deviation / non-conformance authorization without an accompanying SNCR number and record will be accepted for PPAP approval.

2.0 ADDITIONAL REFERENCE DOCUMENT NOTES

WPQR-9100	- Quality System Requirements for Woodward Suppliers
3-06-2977	- AS/ATS Supplier Process Change Notification (PCN)
3-OF-04182	- ICS Supplier Process Change Notification (PCN)
SP-1143	- Key Characteristics Control
SS-185	- Inspection Sampling Tables
F27950	- SNCR Notification Form
XLO-GP-1024	- Engineering Source Approval
DOC-9	- Engineering Controlled Special Processes
4-06-3421	- Supplier PPAP Element / Family Waiver Request Form
4-06-3456	- Part Family PPAP Matrix Template
4-06-3461	- Combined Supplier PPAP Forms Packet
4-OF-02555	- Supplier PPAP Creation / Submission Guidance

3.0 DEFINITIONS

The following terms, used in this Standard to describe the supply chain, have been changed to reflect the vocabulary used in the ISO 9000 International Standard and the AIAG manuals.

Supplier → Organization → Woodward

AIAG: Automotive Industry Action Group is a globally recognized forum founded to collaboratively work to develop and continuously improve business processes and practices throughout the supply chain. www.aiag.org.

CATALOG ITEMS: Refer to purchased materials or Commercial Off The Shelf (COTS) parts that are commonly available to the open market at the item level, and

- The organization or supplier manages and owns the drawing and specification for the item,
- The organization or supplier owns engineering and process control for the item,
- The item is typically controlled by a published industry standard,
- The item does **not** typically have a design record (drawing) within the Woodward system.

Examples of catalog items are common mechanical or industry standard hardware items (such as nuts, bolts, screws, washers) and common electronics components (resistors, capacitors, wire, connectors).

Note 1: In cases where the design record consists of a catalog item (as described above) that must then be modified or altered, the item is no longer considered to be a catalog item.

CHECKING AID: Checking aids can include functional fit fixtures, custom designed variable and attribute gages, models, comparative templates, or mylars specific for the purpose of product or process acceptance for the product being supplied.

CONTROL PLAN: Control plans document what the supplier will do on an ongoing basis to ensure that product delivered complies with all design record requirements and any specific requirements identified on the PO.

DESIGN RECORD: Design records are represented by the part drawing, specifications and or electronic (CAD) data used to convey information necessary to produce a product. Does not imply organization has authority for design.

FAMILY PARTS: Parts of similar construction with consistent tolerancing that are produced using the same basic process and tooling; may be combined into a family PPAP.

FAMILY PPAP: PPAP element requirements for all design record requirements on all parts within the family. Any part within the PPAP family shall meet / comply with the PPAP requirements of the family as a standalone PPAP with the inclusion of common family PPAP elements.

GAGE TYPES: A group of gages that are of the same style used to check similar feature types within a specific defined range (i.e., Type 1: 0" – 1" dial calipers checking outside linear dimensions, or Type 2: 1" - 2" depth gage checking depths, etc.,).

KEYS: Characteristics, features, or process parameters subject to additional attention in the design and manufacturing processes by virtue of being critical to quality, (CTQ), critical to reliability, (CTR) or critical to cost, (CTC); may also be referred to as a KCC (Key Control Characteristic).

- ***Woodward defined keys*** are officially identified / designated as features on the Woodward engineering design record, within a keys database, and/or within the PFMEA; that require the appropriate PPAP element analysis by the organization.
- ***Supplier keys*** *(as required, at least one process key to be identified by the supplier when a key has not been defined by Woodward)* are features / process indicators identified as critical to the organization's manufacturing process (e.g., datums, critical or tight tolerances, critical surface finishes, output of PFMEA activity, etc.) that are to be utilized to complete additional PPAP element analysis as required (i.e., used to fulfill requirements of Process Capability Studies and Measurement System Analysis as required per PPAP Class when Woodward has not defined any keys).

LABORATORY: A test facility that may include chemical, metallurgical, dimensional, physical, electrical, reliability testing or test validation (i.e., any area performing measurements and collecting data for the purpose of product evaluation and/or acceptance).

MATERIAL TEST RESULTS: A quality record submitted by the material source or certifying agency that identifies the physical and chemical or metallurgical properties of supplied material.

ORGANIZATION: Defined as any first tier supplier to Woodward.

PART FAMILY PPAP MATRIX: Matrix listing part numbers that represent a family PPAP. The Part family PPAP matrix identifies:

- The "primary part number" to be used to represent the family,
- All other "related part numbers" with any design, construction, and/or process delta's from the primary number.

PERFORMANCE TEST RESULTS: A quality record for acceptance testing that demonstrates compliance to the requirements of the Product Specification (PS-doc) or specific tests called out or referenced on the design record.

PROCESS FAILURE MODE and EFFECTS ANALYSIS (Process FMEA): A Process FMEA should be utilized on new processes or to improve current processes; it is a structured, qualitative, analytical framework that draws from the multi-disciplined experience of a team in brainstorming to address:

- How the process, function, or tooling can potentially fail?
- What effects will failures have on the product?
- How can potential failures be prevented or controlled?

QUALIFIED LABORATORY: A laboratory compliant with the AIAG PPAP requirements including a defined Laboratory scope that includes the capability to perform the required inspection, test or calibration and either evidence of customer approval or accreditation to ISO/IEC 17025 or National equivalent. Refer to Definitions section of the AIAG PPAP Manual and ISO/TS16949 Section 7.6.3 for specific definition and requirements for a Laboratory to be considered Qualified Laboratory.

SNCR: Supplier Non-Conformance Record used to notify and request acceptance by Woodward of non-compliance prior to delivery.

SUPPLIER: A second tier supplier to Woodward. First tier supplier to the organization.

WOODWARD PURCHASING: Unless otherwise instructed, the Supplier Quality Engineer listed in e-business should be the primary contact for WPQR-9102 topics. The Supplier Manager listed in e-business may be contacted as a secondary resource.

4.0 PROCESS REQUIREMENTS

Woodward reserves the right to require or perform additional functional / validation testing of PPAP parts as necessary to substantiate that all requirements have been met.

4.1 PPAP Submission

Every PPAP submission from an organization shall be complete with all required elements addressed as specified herein.

4.1.1 Item PPAP

The organization shall submit a complete PPAP for each individual item or part number unless an approved waiver has been obtained for a family PPAP.

The organization shall submit and obtain approval from Woodward for:

1. **A new part or product (i.e., a specific part, material, or configuration not previously supplied to Woodward).**

   Note 1: New development parts or products will typically require a Class C PPAP Submission as defined herein upon release to production and will be communicated accordingly via Woodward PPAP PO.

2. Correction of a discrepancy on a previously submitted PPAP.
3. Product modified by an engineering change to design records, specifications, or materials.
4. Any process change that is *required* by the Supplier Process Change Control procedure as defined in either 3-06-2977 (AS/ATS Supplier Process Change Notification) or 3-OF-04182

(ICS Supplier Process Change Notification); refer to those documents for details on supplier and Woodward plant applicability).

5. Woodward reserves the right to require a PPAP submission as part of a Corrective Action Request.
6. Validation required due to a lapse in production as required per WPQR-9100.

Note 2: If there is any question concerning the need for PPAP submission, contact Woodward Purchasing.

4.1.2 Family PPAP

A family PPAP shall include the PPAP element requirements for all design record requirements on all parts within the family or justification for representative similarity (refer to Section 3.0 Definitions).

All intended uses of family PPAP shall be submitted to and approved through a formal element / family waiver form (4-06-3421) by Woodward prior to submission.

A part family PPAP matrix (4-06-3456 or equivalent) shall be included in both the waiver request and any approved family PPAP waivers. The family matrix shall identify:

- The “primary part number” to be used to represent the family,
- All other “related part numbers” shall be listed on the matrix with any design, construction, and/or process delta’s from the primary number identified.
  For each delta, the matrix shall indicate one of three acceptable means of validation:
  - The delta included as additional content in primary part number PPAP,
  - The delta PPAP to be submitted, or
  - The delta is qualified by similarity to feature and process in primary part PPAP.

A complete stand-alone PPAP shall be submitted for the primary part number including the approved waiver and part family PPAP matrix.

Prior to the first delivery of each related part number, the organization shall submit the PSW, the approved waiver form authorizing family PPAP (4-06-3421), the part family matrix, and any submission element deltas identified on the part family matrix.

Regardless of family PPAP submission requirements, the organization is required to verify that all requirements are met on a representative item from production or when changes occur that may invalidate the original results. Unless otherwise specifically stated on the Woodward approved Family PPAP waiver, records of that verification shall be included in the PPAP submission.

4.2 PPAP Submission Process Requirements

4.2.1 Production Run

Production parts / products for PPAP submission shall be taken from a production run per the quantity specified on the PPAP PO. This production run shall be conducted at the production site, using the production tooling, production gaging, production process, production materials, and production operators. Parts from each unique production process, i.e., duplicate assembly line and or work cell, each position of a multiple cavity die, mold, tool, or pattern, shall be measured and representative parts tested.

4.2.2 PPAP Element Submission Requirements

The organization shall meet specified PPAP submission requirements as listed.

Woodward PPAP Class Matrix

Note: *C of C (manufacturer / distributor) submission required per WPQR-9100 or PO regardless of PPAP class.*		*Low Risk* **Class A**	*Medium Risk* **Class B**	*High Risk* **Class C**	*Unknown Risk* **Class D**
FAI Group	Part Submission Warrant	**S**	**S**	**S**	**S**
	Design Record / Balloon Drawing	**S**	**S**	**S**	**S**
	Material / Performance Test Results	**S**	**S**	**S**	**S**
	Dimensional (Inspection) Results	**S**	**S**	**S**	**S**
Woodward Special Group	Copy of Woodward PO	**S**	**S**	**S**	**S**
	Waivers – Family PPAP	**S**	**S**	**S**	**S**
	Woodward customer requirements (e.g., 5 pcs dim results), as applicable	**S**	**S**	**S**	**S**
Process Control Group	Process Capability Studies	N/A	**S** (Woodward defined keys only)	**S** (Supplier process keys or Woodward defined keys)	**S**
	Measurement Systems Analysis	**R**	**S** (Woodward defined keys only)	**S** (Supplier process keys or Woodward defined keys)	**S** (Test data for all test points.)
Process Quality Planning Group	Process Flow	**R**	**S**	**S**	**R**
	Process Control Plan	**R**	**S**	**S**	**R**
	Process FMEA	N/A	N/A	**S** (Supplier process keys or Woodward defined keys)	**R**
Design Risk Group	Design FMEA – Woodward / customer designed	N/A	N/A	**S – only if provided by Woodward.**	N/A
	Design FMEA – Supplier designed			N/A	**R – Reviewed at design review.**
	Comments:	***new submission definition***	***previous Base submission***	***previous Preferred submission***	***new submission definition***

Retained elements are subject to Woodward review upon request.

Definitions:

S = submit

R = retain

N/A = not applicable

C of C = Certificate of Conformance

Note 1: Woodward reserves the right to request additional PPAP elements as necessary for submission and will be communicated on the PO.

Requirement of PPAP submission:

- Supplier PPAP submission is required when the following note appears on the Woodward PO:

  PPAP SUBMISSION REQUIRED PER WPQR-9102

- The Woodward designated PPAP class will be communicated on the PO as follows:

  When a PPAP is required, this item requires Woodward PPAP class X.
  - where X denotes the assigned PPAP class of A, B, C, or D

  (Note: Some items / parts may not require a PPAP as determined by Woodward. Those items / parts would not typically have a PPAP class designated.)

4.2.2.1 Design Record

The organization shall either obtain or create, (if the organization has design authority), and retain the design record, regardless of the Woodward PPAP PO submission requirements. Design records shall include the design records for components or details of the saleable product / part.

In cases where the organization is the design authority, there may be more than one top-level design record. All drawings shall be submitted as design records.

Where the design record is in electronic format and contains requirements that need to be measured, tested, or verified, (i.e., CAD/CAM math data) the organization shall produce a hard copy to identify requirements (i.e., pictorial, geometric dimensioning and tolerancing sheets, drawing).

Note 1: For any saleable product, part, or component, there will only be one governing design record per WPQR-9100, regardless of who has design-responsibility.

Note 2: For parts identified as catalog parts (refer to Section 3.0 Definitions), the design record may consist of only a functional specification or a reference to a recognized industry standard.

Note 3: Typical Design Record examples are, but not limited to:

- Engineering Drawings and reference specifications (i.e., SS-112).
- Process Drawing(s) for operational subcontracting.
- Bill of materials (BOM).
- Material Specifications.
- Test specifications (if testing is required).
- Product Design Specifications (i.e., Woodward supplied PS document for Organization Design responsibility) and compliance matrix.
- Electrical component attributes (i.e., Gerber files, PCB layouts, BOM, software logic, etc.).
- Specifications for purchased Software.

Note 4: A single design record can be a tabulation or represent multiple part or assembly configurations (i.e., a sub-frame assembly with various hole configurations for different applications).

4.2.2.2 Woodward Engineering Approval

Woodward Engineering Approval documentation is necessary when:

- XLO-GP-1024 is listed on the Woodward design record therefore requiring a dispositioned SNCR or ESA data sheet.
- The Woodward PO states “Additional Aerospace requirements apply.” Therefore, the organization shall submit Form F27761 in cases where special processes per DOC-9 are performed in the manufacturing process but are not listed on the design record. All special processes must be performed at approved sources per WPQR-9100.
- Or as otherwise noted on the Woodward PPAP PO.

Note 1: When Woodward PO does **NOT** state additional aerospace requirements apply, no Woodward Engineering Approval documentation is required if all requirements on the design record and PO are met.

4.2.2.3 Design Failure Mode and Effects Analysis (Design FMEA)

Not required.

4.2.2.4 Process Flow Diagrams

Process flow diagrams shall clearly describe the production process steps and sequence, as appropriate, and meet Woodward's needs, requirements, and expectations.

The process flow does not need to be a graphical description. Text only is acceptable, provided it meets the above criteria. A Router or Shop Traveler may also satisfy Process Flow Diagram requirements.

The process flow shall identify each process operation clearly (i.e., numbered, etc.) for ease of reviewing other PPAP elements. Process step numbering should be consistent throughout the Process Flow, Process FMEA, & Control Plan elements.

Note 1: Process flow diagrams for 'families' of similar parts are acceptable if the new parts have been reviewed for commonality by the organization.

4.2.2.5 Process Failure Mode and Effects Analysis (Process FMEA)

The organization shall develop a Process FMEA (PFMEA) in accordance to AIAG guidelines utilizing the "PFMEA" sheet within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent.

Note 1: A single Process FMEA may be applied to a process manufacturing family of similar parts or materials if reviewed for commonality by the organization.

The PFMEA shall cover all processes performed or subcontracted by the organization.

Keys shall be officially identified as features on the Woodward engineering design record, within a Woodward keys database, and/or on the PFMEA.

If Keys are **NOT** defined by Woodward within the engineering design record or key database then the organization / supplier shall define the Key(s). Supplier defined Keys are to be features or process indicators that are critical to the organization's manufacturing process (e.g., datums, critical or tight tolerances, critical surface finishes, etc.) or selected from the output of the PFMEA process. High RPN values indicated by the PFMEA results are prime candidates for Keys. Other considerations should be the features of a material, process, or part whose variation have a critical / significant influence on the product fit, performance, service life, or manufacturability. ***As required by PPAP Class, there shall be at least one key process or feature identified by the organization / supplier when a key has NOT been defined by Woodward to meet the PFMEA element requirements.***

Supplier defined Keys shall be clearly noted in the PSW comments section.

All Keys identified from Woodward requirements or by the organization / supplier shall be clearly identified / addressed in the PFMEA, as well as within the other PPAP elements as required (Process Capability Studies, Measurement System Analysis, and Control Plan).

Each process identified on the PFMEA should be consistent throughout the Process Flow, Process FMEA, & Control Plan elements.

For each identified potential failure mode, the following shall be clearly identified:

- Product or process step description.
- The corresponding operation from the process flow, where the product or process step is performed.
- A unique identifier (no duplicates permitted within an operation step).
- Description of the effect(s) of the failure used in establishing the Severity ranking.
- Description of the cause(s) for the failure for clarification of the effectiveness of the control method and establishment of the detection ranking.
- Description of the control method used.
- Occurrence, Severity, Detection ranking numbers.

Note 2: Tolerance limits are preferred, but not required.

Criteria for selecting Occurrence (OCC), Severity (SEV), and Detection (DET) should be based on the tables provided in Appendix 5.2. When any other basis for Occurrence, Severity, and Detection factors need to be used, it shall be reviewed and approved by Woodward Purchasing prior to submission and noted on the PSW.

OCC When the probability of occurrence is less than 3, mathematically the process capability should be 1.33 C_{pk} or better. The organization may be required to validate the frequency of occurrence and/or perform and submit a process capability study demonstrating that the process has at least a 1.33 C_{pk}.

SEV For any severity ranking greater than 7, the organization may be required to validate the overall RPN by performing and submitting either or both a capability study and/or a MSA (Gage R&R) study. This may be a good candidate for identification as a Key.

DET For any detection ranking less than 4, the organization may be required to validate the ability to detect. This may be accomplished by performing a MSA (Gage R&R) study or a description of how the control method cannot pass a discrepant condition.

Calculated Risk Priority Number (RPN): RPN = (OCC x SEV x DET)

NOTE 3: Typical PFMEA guidelines suggest a Pareto analysis of the RPN's to be addressed with an action plan. ***Woodward requires that the top 5 items reported on the PFMEA*** *(even if RPN's are less than 100)* ***and all items having an RPN greater than 100* shall have:***

- Planned action to reduce the RPN documented in the PFMEA or Control Plan

OR

- Justification for no action documented on the PFMEA & a sampling plan of 100% stipulated on the part or process Control Plan

OR

- Justification for no action documented on the PFMEA & a Woodward approved sampling plan.

***** If any basis other than the Process FMEA tables provided in Appendix 5.2 is approved for selecting Occurrence, Severity, and Detection factors, the RPN threshold shall be agreed upon with Woodward Purchasing.

After review of the submitted PFMEA document, Woodward reserves the right to request additional mitigation activity to cover specific risk to our products.

4.2.2.6 Control Plan

The organization shall develop a control plan utilizing the "Control Plan" sheet within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent.

Control Plan Requirements:

All balloon drawing identified features and requirements including additional requirements listed on the PPAP PO shall be identified by at least 1 control step or method in the control plan. Process or control step numbering should be consistent throughout the Process Flow, Process FMEA, & Control Plan elements.

All Keys shall be clearly identified and addressed in the control plan.
For Keys, the Control Plan shall indicate the method of maintaining process capability or control (i.e., ongoing SPC, periodic capability study verifications, etc.).

For each identified control step, the following shall be clearly identified:

- The corresponding operation from the process flow, where the product or process step is performed.
- Product or process step description.
- Product or process step characteristics.
- Identification of applicable special characteristic classification (Key or KCC symbol).
- Product or process specification and tolerance.
- Product or process step evaluation measurement technique.
- Sampling Plan (refer to Section 5.1).
    - Sample size.
    - Frequency of the Control Method (i.e., per batch, time period, etc.).

    Note 1: Unless otherwise specified on the PO, the use of a sampling plan does not require approval prior to PPAP submission.

- Description of the control method and/or gage used including the type of control (i.e., Setup verification, machine controlled, operator dependant, inspection, etc).
- Reaction Plan describing the steps to be taken if the control method detects an out of control or out of specification condition.

When PFMEA actions have not been implemented at the time of submission, the control plan shall identify the current control method(s).

Example: Action plan is to use a new tool, but the tool has not been received at the time of PPAP submission. Control plan would define the control / inspection for the current tool, 100% inspect with the new tool until C_{pk} has been demonstrated, if C_{pk} > 1.33 then sample inspect X parts per Y using gage Z.

4.2.2.7 Measurement System Analysis Studies (MSA)

The organization shall utilize the "MSA – Gage R&R Form" and "MSA – Gage R&R Data Entry" sheets within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent. Woodward retains the right to review and or audit the content of this element for any Woodward product.

The organization shall have Measurement System Analysis (MSA) studies for all gages, measurement, and test equipment types. MSA studies shall be performed utilizing production gaging. These measurement studies must be complete and available prior to PPAP submission regardless of the Woodward PPAP PO submission requirements. The organization shall provide any retained studies as requested.

The variable gage R&R study details shown below shall satisfy the requirements of this element. The use of other types of studies (i.e., Attribute Gage Study) shall be proposed by the organization and approved by Woodward Purchasing prior to PPAP submission.

MSA requirements for a variable gage R&R study:

- MSA study sample size.
  Recommended sample size for variable MSA studies:
  - n = 10 parts
  - k = 3 appraisers
  - r = 3 replications

  There are many other choices of n, k, and r that are also acceptable. Here are the minimum requirements for a standard sample size MSA:
  - $n \geq 2$
  - $k \geq 2$ (k = 1 is allowable for automated measurement systems)
  - $r \geq 2$
  - $n \times k \times (r-1) \geq 60$ [referred to as Degrees of Freedom (DoF)]
- Either Xbar-R or ANOVA methods of analysis may be used.
- Date that the study was performed.
- Name of the person completing the MSA study.
- Operator performing the measurements for the study is identified.
- Item number used for measurement data collected.
- Feature description used for measurement data collected.
- Tolerance range or limits used for determining the R&R% of tolerance.
- Identification of device (i.e., gage & serial number) used to perform the study.
- Description of the measurement equipment or method type.
- Measurement equipment name.
- Units that the data is reported in.
- Acknowledgement of bias, linearity, and stability of the measurement system has been considered and any notes or reference are included.
- Raw measurement data results identified by Operator, Sample#, and trial#.
- Off-the-shelf software package with version and parameters used, if applicable.
- Formulas and source of any factors used in calculations including table values (for D4, K1, and K2), calculations, or control charts of the data for Range and Xbar.
- The area under the curve used (i.e., 5.15 standard deviations for a 99% confidence interval or 6 standard deviations for a 99.73% confidence interval).
- Equipment Variation (EV) and the Appraiser Variation (AV) expressed as a % of tolerance.
- Repeatability and reproducibility (R&R) value in the units measured and as a % of tolerance.

For low-volume situations when achieving the required Degrees of Freedom (DoF) is problematic an MSA study performed on non-Woodward parts may be considered for the gage type. The alternate MSA study tolerance shall meet or exceed the Woodward specified tolerance requirements. The organization shall evaluate the MSA study tolerance prior to submission.

Acceptance Criteria:

MSA acceptance criteria for a variable gage R&R study:

- Range control chart or calculations - all points on the control point shall be within the control limits (LCL and UCL).
- Gage R&R as % of Tolerance.

Target:	**< 10%**
Acceptable:	**10% - 20%**
Marginal:	**> 20% - 30%**; organization shall document the % of tolerance on the PSW and provide improvement plan or technical justification why no further improvements can be made.
Unacceptable:	**> 30%**; will require organization to submit an SNCR per Section 1.4.

4.2.2.8 Dimensional (Inspection) Results

The organization should utilize the "Dimensional Results" sheet within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent. Woodward retains the right to review and or audit the content of this element for any Woodward product.

The organization shall identify each feature of the design record (i.e., dimensions, general and specific notes, material, etc.) with a unique identifier (i.e., balloon drawing or bubble print) that shall be submitted along with the dimensional results. The organization shall have actual results for each unique manufacturing process (i.e., cells or productions lines and all cavities, molds, patterns, or dies).

The Woodward drawing that defines the item number listed on the PO shall be used as the top-level design record for the PPAP submission unless otherwise specified. If Woodward subcontracts operations, the organization shall use the Woodward provided routed operations and referenced process drawings.

The organization shall provide evidence that each feature of the design record has been verified and are in compliance with the specified requirements. The actual dimensional results shall be submitted for 10% of the PPAP PO quantity. If the PPAP PO quantity is less than 30 pieces, dimensional results shall be submitted for a minimum of three parts. Order quantities of 3 or less pieces require 100% dimensional results submission.

PPAP PO Quantity:	Dimensional (Inspection) Results Submission Requirement:
30+ pieces	10% of PPAP PO quantity
3 to 30 pieces	minimum of 3 pieces
less than 3 pieces	100% of PPAP PO quantity

Note 1: Where a drawing requirement indicates multiple occurrences of a requirement (i.e., 4 x 0.250 wide), the dimensional (inspection) results need to include the actual results for each occurrence of the requirement. This also applies to basic dimensions where one basic dimension applies to multiple features with independent feature control frames (i.e., a basic dimension defines the location for an ID and counter-bore while the ID and counter-bore have independent feature control frames).

The organization shall identify each feature of the design record (i.e., dimensions, general and specific notes, material, etc.) with a unique identifier (i.e., Balloon Drawing).

The organization shall have actual results for each unique manufacturing process (i.e., cells or production lines and all cavities, molds, patterns, or dies).

The organization shall record with the actual results and unique identifier: all dimensions (except reference dimensions), feature control frames, characteristics, notes, and specifications. Actual results from dimensional verifications shall be expressed in the same units as presented on the design record and within the control plan (i.e., metric, standard).

Basic dimensions: All features on the drawing including basic dimensions shall be ballooned and listed on the Dimensional results report. Record the actual value of the Basic dimension as a dimensional result as appropriate.

> ***Castings & Forgings Exception -*** Basic dimensions used to define the cast datum structure shall be ballooned and listed on the Dimensional results report. No actual values are required to be recorded. Acknowledge in the comments field that the dimension is related to the cast datum structure.

Note 2: It is preferred that all basic dimensions are grouped with related feature results.

Feature Control Frame(s): All applicable Geometric Dimensioning and Tolerancing (GD&T) feature control frames shall be listed on the Dimensional results report. Record the actual feature values as dimensional results.

For each identified feature or design record requirement, the following shall be clearly identified:

- A unique identifier corresponding to the balloon drawing feature(s) / requirement(s) results reported.
- Feature location (i.e., sheet, drawing zone), as applicable.
- Feature or design record requirements description.
- Tolerance limits including those derived or described in referenced specifications (see Design Record).
- Identification of Keys.
- Control method and/or gage used to gather the reported data.
- Identification of the person that prepared the dimensional results.
- Actual results of each balloon drawing identifier (attribute results are acceptable where no variable data can be obtained due to the nature of the requirement or the gage).

  Note 3: Threads, splines, hexes, and serrations can be evaluated by appropriate mechanical gages and recorded as attribute data.

- Statement of compliance for each note or attribute design record requirement (including specifications listed in drawing title block or on the PPAP PO).
- Clear indication of any out of tolerance condition and applicable SNCR number.
- For castings that have been CT-scanned, the CT scan data files shall be submitted along with the CT scanned material. The CT scan data file must be positively traceable to the CT scanned material, i.e., serial number, batch code, etc.

4.2.2.9 Records of Material / Performance Test Results

The organization shall complete and submit detailed records of material / performance test results. Woodward retains the right to review and or audit the content of this element for any Woodward product (reference WPQR-9100 4.2.4).

Material Test Results: When materials are specified on the design record, the organization shall submit a copy of the material certification from a qualified laboratory or mill indicating that the material used complies to the design record.

The test results shall be reported on the laboratory letterhead or normal laboratory report form. Material test results shall indicate and include:

- The Material technical name or item number.
- Revision date, and/or change level of the specifications to which the material was tested (i.e., ASTM spec, AMS, Spec, etc).
- The specific tolerance from the standard or specification for the submitted results (or provide a copy of the applicable section of the standard/specification).
- The date on which the testing took place.
- The quantity tested.
- The actual results.
- The material supplier's name or the name of the qualified laboratory performing the third party test.

The organization shall also submit test results for any additional chemical, physical, or metallurgical requirements required by the design record or control plan (i.e., heat treat hardness & depth, plating hardness, thickness, weld penetration, EDM recast layer, braze coverage or any other test results for special processes described in DOC-9, etc.).

Performance Test Results: The organization shall submit records of performance or functional test results for tests specified on the design record. Refer to 4.2.2.7 Measurement System Analysis Studies for test equipment MSA requirements.

Performance test results shall indicate and include (unless otherwise specified):

- The design record change level of the parts tested.
- The number, date, and change level of the specifications to which the part has been tested.
- The date on which the testing took place.
- The quantity tested.
- The actual results.

Non-dimensional performance test results such as a leak check, voltage or resistance checks may be included in the dimensional results documentation or included as part of the certification of conformance (CoC).

The organization shall provide documentation for performance testing content in support of, but not specified on the design record (i.e., control plan content, test spec). Documentation is not required when the organization is the design authority and is using a proprietary process for the performance test. Instead, a statement of conformance and a statement why the test results are not included shall be provided as a substitute for the actual results via waiver (refer to Section 1.3).

4.2.2.10 Process Studies

The organization shall utilize the "Process Capability" sheet within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent. Woodward retains the right to review and or audit the content of this element for any Woodward product.

The organization shall perform process capability studies on features or processes that have been identified as Key as designated by Woodward or by the organization within the PFMEA (refer to Section 4.2.2.5). A process study shall be conducted utilizing a population that consists of a minimum of **30 pieces**; otherwise 100% inspection is required for the production run until the minimum population of 30 pieces has been established. If 100% inspection is utilized, then it shall be clearly noted within the PSW (refer to Section 4.2.2.17).

The organization shall obtain approval from Woodward Purchasing where attribute data will be used for a process study. A minimum of 50 inspections with zero rejects in pass/fail data are required to demonstrate acceptable attribute capability.

For any process study required for PPAP, the organization shall notify Woodward Purchasing prior to any PPAP submission of any *unacceptable* processes where a corrective action to make the process stable has not been identified.

The process study shall include:

- Date that the study was performed.
- Gage number(s) of gage(s) used in the study.
- Raw measurement data shall be recorded and analyzed in the sequence it was created by the process.
- Sample size used for analysis of the process capability shall be statistically viable (i.e., at least 30 data points or approved by Woodward Purchasing; it may be necessary for more than one production run to reach a viable sample size).
- Statistical data analysis technique demonstrating the performance of the process. (i.e., run chart and Xbar & R chart or calculations resulting in measure of process performance, etc.).
    - The analysis technique shall include a method of determining that the process is stable (i.e., calculation of control limits and analysis of the data against those control limits). See requirement above regarding unstable processes.
    - For processes with one-sided or non-normal data distributions, the organization shall determine with Woodward if alternative acceptance criteria are applicable.
- Item number used for measurement data collected in this study.
- Feature description used for measurement data collected in this study.
- Tolerance range or limits used for the measured feature.
- Formulas and source of any factors used in calculations or software used to analyze the data.
- Calculated process capability index value(s) and type(s).
    - At a minimum, the C_{pk} index for a stable process is required for comparison to the acceptance criteria below.
    - It may be appropriate and permitted to use an alternative index with prior Woodward approval.

Note 1: The purpose of this requirement is to determine if the production process is likely to produce product that will meet Woodward's requirements. The process study is focused on variables (not attribute data). When analyzing the output of a process, consider assembly errors, test failures, surface defects as examples of attribute data. These attributes are important to understand, but do not typically satisfy the process study requirements. Attribute data requires significantly larger sample sizes to

statistically demonstrate capability. If possible, a variable data measurement should be used to quantify the attribute.

Note 2: Process studies are short term and will not predict the effects of time and variation in people, materials, methods, equipment, measurement systems, and environment. Even in these studies, it is important to collect and analyze the data in the order produced using control charts.

Note 3: For those characteristics that can be studied using Xbar and R charts, a short-term study should be based on a minimum of at least 30 readings from consecutive parts of the production run or 100% of parts from the production run if the part is low volume. The process study data requirements may be replaced by longer-term historical data from the same or similar processes, with Woodward concurrence. Alternative analytical tools may be appropriate and permitted with prior Woodward approval.

Note 4: For Process Studies involving more than one process stream additional appropriate statistical methods or approaches may be required.

Note 5: An unstable process may not meet Woodward's requirements depending on the nature of the instability. The organization should identify, evaluate, and whenever possible eliminate special causes of variation prior to PPAP submission.

The organization should utilize process capability studies for on-going process management.

Acceptance Criteria:
The organization shall use the following as acceptance criteria for evaluating process study results for processes that appear stable:

Target:	**> 1.67**
Acceptance:	**min. 1.33**
Unacceptable:	**< 1.33**; will require organization to perform 100% inspection of parts and provide notation on PSW per Section 4.2.2.17; (organization should continue to strive to meet the acceptance criteria).

4.2.2.11 Qualified Laboratory Documentation
Not required.

4.2.2.12 Appearance Approval Report (AAR)
Not required.

4.2.2.13 Production Parts
The organization shall provide the parts or products used to perform the PPAP submission activities.

4.2.2.14 Master Sample
Not required.

4.2.2.15 Checking Aids
Not required.

4.2.2.16 Woodward Specific Requirements

The organization shall complete, retain, and submit any additional requirements identified per the Woodward PPAP PO submission requirements. Woodward retains the right to review and or audit the content within this element for any Woodward product.

The organization shall have records of compliance to all of these applicable Woodward-specific requirements (i.e., SP-1159 Cleanliness Requirements, packaging plan, Design FMEA if the organization is the design authority, etc.).

PPAP submission may be recorded in Dimensional Results, the Part Submission Warrant, Material / Performance Test Results, or submitted under this element.

Copy of Woodward PPAP PO:
The organization shall submit a copy of the Woodward PPAP PO as part of each PPAP submission. Requirements listed on the PPAP PO should be noted with a unique identifier (i.e., ballooned or bubbled similar to features on the design record, see 4.2.2.8 Dimensional Results) and addressed within the control plan.

4.2.2.17 Part PPAP Submission Warrant (PSW)

Upon completion of the PPAP submission requirements, the organization shall complete and submit the PPAP Part Submission Warrant (PSW).

The organization should utilize the “PSW” sheet within the Woodward Combined Supplier PPAP Forms Packet (4-06-3461) or a Woodward approved equivalent PSW form. A separate PSW shall be completed for each Woodward part number.

The organization shall verify that all of the measurement and test results show conformance with Woodward requirements, that all required documentation is available, and that all documentation is included in the PPAP submission package as appropriate. A responsible official of the organization shall approve the PSW and provide contact information.

Comments and Explanations section shall include, as applicable:

- Blank fields / entries that are not applicable shall be noted as “N/A”.
- Listing of waivers granted by Woodward for any element or portion of an element or family PPAP waiver.
- SNCR number and brief description of Woodward approved PPAP deviation or non-conformance.
- Information regarding any method other than the provided tables in Appendix 5.2 for establishing the PFMEA factors.
- Any RPN threshold other than 100 as agreed by Woodward Purchasing.
- Notice if any RPN thresholds are exceeded on the PFMEA regardless of defined actions.
- Unique MSA study method and/or acceptance Criteria for studies other than specified in Section 4.2.2.7.
- Disclosure of performance test results not provided due to design authority or proprietary process reasons.
- The specific cavities, molds, line etc., identified as “Mold/Cavity/Production Process,” when production parts are produced from more than one cavity, mold, tool, die, pattern, or production process.
- Notation that 100% inspection was utilized (i.e., 30 piece sample not available for process study).

- Disclosure statement for any permitted material substitutions not specifically listed on design record indicating the design record material, the actual material used as well as reference to the standard authorizing the substitution.

4.3 Woodward PPAP Submission

The organization shall submit the PPAP submission packet in an electronic format (e-mail or fax) for completeness review prior to the shipment of any PPAP parts or products unless otherwise noted on the PPAP PO. Woodward Purchasing shall notify the organization that PPAP parts or products are cleared for shipment upon finalized completeness review. Once cleared for shipment, the organization shall include a hard copy of the PPAP submission packet with the first production shipment.

The organization shall review and update, as necessary, all applicable items in the PPAP submission packet or file to reflect the production process, regardless of whether or not Woodward requests a formal PPAP submission.

Where granted, the PPAP submission packet or file shall contain a copy of any deviations / non-conformances or waivers granted by Woodward:

- Deviation / Non-Conformance shall include:
  - SNCR number.
  - SNCR deviation / non-conformance details.
  - SNCR Notification Form (F27950).
- Waivers shall include:
  - Woodward approved Element / Family Waiver Request Form (4-06-3421).

Woodward PPAP Submission Required

1. A new part, product, or service (i.e., a specific part, material, or service not previously supplied to Woodward).	PPAP submission is required for a new product (initial release), a product or part number not previously supplied to Woodward, a previously approved product that has a new or revised product or part number assigned to it, or from a new Woodward source. A new product, part, or material added to a family may use appropriate PPAP submission documentation from a previously approved part within the same product family.
2. Modifications to catalog items.	PPAP submission is required for modifications to catalog items, but not for the base catalog item. Examples of modifications to a catalog item that would require a PPAP include lock patch applied to catalog screws, lock wire holes in catalog screws, custom identification marking on catalog components like o-rings, catalog cabinets with additional cutouts or terminal blocks, etc.
3. Correction of a discrepancy on a previously submitted PPAP.	The organization shall submit updated documentation and a revised PSW to correct a discrepancy on a previously submitted PPAP.
4. Engineering change to design records, specifications, or materials for product or part number(s).	PPAP submission is required on any engineering change to the production part design record.
5. As required due to a process change.	Refer to proper Supplier Process Change Control procedure to determine if the process change will require a PPAP submission prior to implementation. See 4.1.1-4 above for more details.
6. As a result and response to a Corrective Action.	PPAP submission may be requested or required as part of a Corrective Action Request.
7. Lapse in production.	PPAP submission is required due to lapse in production per WPQR-9100. Refer to proper Supplier Process Change Control procedure and coordinate with Woodward Purchasing regarding requirements. See 4.1.1-4 above for more details.

Proprietary Processes and Documentation:
Processes or documentation deemed proprietary by the organization shall be appropriately identified and referenced within the PPAP package Control Plan and made available for Woodward review in accordance with the governing proprietary / non-disclosure agreement.

4.4 Part PPAP Submission Status

Upon approval of the PPAP submission, the organization shall assure that **all** future production continues to meet all Woodward requirements. Refer to the proper Supplier Process Change Control procedure for authorized changes and validation requirements; see 4.1.1-4 above for more details.

Approved:
Approved indicates that the PPAP submission and parts, materials, or processes including all sub-components, meet all Woodward requirements. A copy of the Woodward signed PSW indicating that the PPAP submission has been *APPROVED* will be provided to the organization. The organization is therefore authorized to ship production quantities of the product, subject to releases from Woodward.

Rejected:
Rejected means the PPAP submission does **not** meet Woodward requirements. A copy of the Woodward signed PSW indicating that the PPAP submission has been *REJECTED* will be provided to the organization. The PPAP submission and or process, as appropriate, shall be corrected to meet Woodward requirements and resubmitted accordingly. Any PPAP submission shall be approved by Woodward before production quantities may be shipped by the organization.

4.5 "Delta" PPAP Submission

When a PPAP submission is required as a result of an EC, process change, or to address the differences that may exist between the primary part within a family PPAP, a "Delta" PPAP submission is allowed.

A "Delta" PPAP shall consist of a PSW with comments explaining the "Delta" submission along with any other PPAP elements impacted by the part or process change. The organization shall review all PPAP elements to determine the impact of change prior to submission of a "Delta" PPAP.

4.6 Record Retention

Unless otherwise specified, the PPAP submission file is a quality record and must be maintained per WPQR-9100. All previous versions of the PPAP submission file must be retained to maintain a clear quality record for all changes, which have occurred during the production life of the part, product, or service.

5.0 APPENDIX

5.1 Sampling Plans

The organization shall meet or exceed the sampling table requirements as defined within SS-185, Inspection Sampling Tables, unless otherwise approved by Woodward Purchasing.

Customer specific sampling plans may be flowed down as required.

5.2 Process FMEA Criteria

Process FMEA criteria based on AIAG FMEA Manual (third edition).

5.2.1 Process FMEA Occurrence Evaluation Criteria:

Probability of Failure	Likely Failure Rates	RANK
Very High: Persistent failures; failures almost inevitable.	≥ 100 per thousand pieces	**10**
	50 per thousand pieces	**9**
High: Frequent or repeated failures.	20 per thousand pieces	**8**
	10 per thousand pieces	**7**
Moderate: Occasional failures.	5 per thousand pieces	**6**
	2 per thousand pieces	**5**
	1 per thousand pieces	**4**
Low: Relatively few failures.	0.5 per thousand pieces	**3**
	0.1 per thousand pieces	**2**
Remote: Failure is unlikely.	≤ 0.01 per thousand pieces	**1**

Resource utilized (with modifications): Quality Associates International, Inc., 3rd Edition, www.quality-one.com

5.2.2 Process FMEA Severity Evaluation Criteria:

EFFECT	CRITERIA: Severity of Effect *This ranking results when a potential failure mode results in a final customer and/or a manufacturing / assembly plant defect. The final customer should always be considered first. If both occur, use the higher of the two severities.*		RANK
	Customer Effect	**Manufacturing / Assembly Effect**	
Hazardous – without warning	Very high severity ranking when a potential failure mode effects operational safety and/or involves noncompliance with government regulation ***without*** warning.	Or may endanger operator (machine or assembly) without warning.	**10**
Hazardous – with warning	Very high severity ranking when a potential failure mode effects operational safety and/or involves noncompliance with government regulation ***with*** warning.	Or may endanger operator (machine or assembly) with warning.	**9**
Very High	Item / product inoperable (loss of primary function)	Or 100% of items / products may have to be scrapped, or item repaired with a repair time greater than one hour.	**8**
High	Item / product operable but at a reduced level of performance. Customer very dissatisfied.	Or items / products may have to be sorted and a portion (< 100%) scrapped or items / products repaired with a repair time between half an hour and an hour.	**7**
Moderate	Item / product operable but Comfort / Convenience item(s) inoperable. Customer dissatisfied.	Or a portion (< 100%) of the items / products may have to be scrapped with no sorting, or items / products repaired with a repair time less than half an hour.	**6**
Low	Item / product operable but Comfort / Convenience items operable at a reduced level of performance. Customer somewhat dissatisfied.	Or 100% of items / products may have to be reworked, or items / products repaired off-line.	**5**
Very Low	Item / product does not conform to Fit & Finish. Defect noticed by most customers (> 75%).	Or the items / products may have to be sorted with no scrap, and a portion (< 100%) reworked.	**4**
Minor	Item / product does not conform to Fit & Finish. Defect noticed by 50% of customers.	Or a portion (< 100%) of the items / products may have to be reworked with no scrap, on-line but out-of-station.	**3**
Very Minor	Item / product does not conform to Fit & Finish. Defect noticed by discriminating customers (< 25%).	Or a portion (< 100%) of the items / products may have to be reworked with no scrap, on-line but in-station.	**2**
None	No discernible effect.	Or slight inconvenience to operation or operator, or no effect.	**1**

Resource utilized (with modifications): Quality Associates International, Inc., 3rd Edition, www.quality-one.com

5.2.3 Process FMEA Detection Evaluation Criteria:

DETECTION	CRITERIA	A	B	C	Suggested Range of Detection Methods	RANK
Almost Impossible	Absolute certainty of Non - Detection	n/a	n/a		Cannot detect, is not checked, or is impossible to measure.	**10**
Very Remote	Controls will probably not detect.	n/a	n/a		Control is achieved with indirect or random checks only (post-production sample audit).	**9**
Remote	Controls have poor chance of detection.	n/a	n/a		Control is achieved with visual inspection only.	**8**
Very Low	Controls have poor chance of detection.	n/a	n/a		Control is achieved with double visual inspection only.	**7**
Low	Controls may detect.	n/a			Control is achieved with charting methods, such as SPC (Statistical Process Control).	**6**
Moderate	Controls may detect.	n/a		n/a	Control is based on variable gauging after parts have left the station, OR Go/No Go gauging performed on 100% of the parts after parts have left the station.	**5**
Moderately High	Controls have a good chance to detect.			n/a	Error Detection in subsequent operations, OR gauging performed on set-up and first-piece check (for set-up Causes only).	**4**
High	Controls have a good chance to detect.			n/a	Error Detection in -station, OR error Detection in subsequent operations by multiple layers of acceptance; supply, select, install, verify. Cannot accept discrepant part.	**3**
Very High	Controls almost certain to detect.			n/a	Error Detection in -station (automatic gauging with automatic stop feature). Cannot pass discrepant part.	**2**
Very High	Controls certain to detect.		n/a	n/a	Discrepant parts cannot be made because item has been error proofed by progress / product design.	**1**

Inspection Types: A = Error Proofed
B = Gauging
C = Manual Inspection

NOTE: The ranking value of 1 is reserved for “Almost Certain.”

Resource utilized (with modifications): Quality Associates International, Inc., 3rd Edition, www.quality-one.com

6.0 REVISION RECORD

Current revision changes will be indicated by change bars in the right margin of the document.

Effective Date	Revision Level	Approval	Description
16-Jan-2009	10	John Heilman	Specification rewritten to clearly communicate Woodward's PPAP expectations and to comply with documentation format requirements.
22-Jan-2010	11	Rick Proctor	Added applicability statement to document Purpose; Updated Reference Document lists (page 2 & Section 2.0); Minor corrections, additions, & clarifications.
17-Jan-2011	12	Rick Proctor	Extended Preferred PPAP Submission effectivity date; Removed FAA reference in Catalog Items definition in Section 3.0; Clarified special process requirements in Section 4.2.2.2; Highlighted Woodward requirement regarding top 5 PFMEA items and all RPN's over 100 in Note 3 of Section 4.2.2.5; Added basic dimensions castings / forgings statement in Section 4.2.2.8; Clarified second paragraph regarding keys in Section 4.2.2.10; Added lapse in production PPAP submission requirement to table in Section 4.3.
1-Oct-2011	13	Rick Proctor	***Updates noted by change bars on the right side of the text.*** • Added Sofia and Zurich to the list of Applicable Sites. • Replaced Woodward Sourcing with Woodward Purchasing and other minor format adjustments throughout. • PPAP Element Submission Requirements text box removed from Sections 1.0 and 4.3; replaced text box in Section 4.2.2 with PPAP Class Matrix. • Updated Section 3.0 Definitions – Catalog Items, Keys. • Text box in Section 4.1.1 modified to indicate Class C submission. • Added lapse in production requirement as #6 to Section 4.1.1. • Clarification added in Section 4.2.2.5 Process FMEA regarding keys. • Updated Section 4.2.2.5 Process FMEA Note 3 regarding top 5 RPN's less than 100 and planned action documented to reduce RPN's. • Updated Section 4.2.2.7 MSA studies requirements. • Added PO Quantity Submission Requirements table in Section 4.2.2.8 Dimensional Results. • Simplified requirements text in Section 4.2.2.10 Process Studies. • Modified wording in Section 4.3 Woodward PPAP Submission. • Updated 5.2.3 Detection Criteria table – applicability clarifications added.
1-Feb-2012	14	Rick Proctor	• 4.0 – Updated section title and added validation testing note. • 4.2.2 – Corrected PPAP Class Matrix, added color within matrix, and provided PO text details when a PPAP submission is required and how PPAP class is to be communicated. • 4.3 – Modified explanation within PPAP Submission table for #7 to add reference to Supplier Process Change Control procedure. • 6.0 – Insert revision change statement regarding change bars.
27-Aug-2012	15	Rick Proctor	• 1.0 & 2.0 – Updated WPQR-9100 title. • 4.1.1 Bullet #6 – Updated WPQR-9100 section reference to 7.5.1.1. • 4.2.2 PPAP Class table – Corrected Process Quality Planning Group name and updated Class C keys matrix note. • 4.3 PPAP Submission Table #7 - Updated WPQR-9100 section reference to 7.5.1.1.

Effective Date	Revision Level	Approval	Description
8-Apr-2014	16	Rick Proctor	• Applicable Sites – removed Pacoima and added Duarte. • 1.2 – added assemblies to the list of items requiring PPAP submission. • 3.0 – adjusted ISO reference regarding vocabulary used in standards. • 4.1.2 – added paragraph to the end of the section. • 4.2.1 – clarified production parts / products wording. • 4.2.2 – updated PPAP Class Matrix: added "(Inspection)" to the Dimensional Results element heading, removed Class 0 column, changed Class A Measurement System Analysis requirement to "R" (retain) to align with element requirements detail, and updated PPAP class designation note. • 4.2.2.6 – added sampling plan section reference. • 4.2.2.8 – inserted "(Inspection)" in element title, submission requirements table, and in Note 1. • 4.2.2.17 – added "N/A" requirement for blank fields / entries. • 4.3 – revised PPAP submission requirements description for submission requirement 1.
1-Oct-2015	17	Rick Proctor	• References / 2.0 – removed F27776 and added 4-OF-02555. • Applicable Sites – updated to "All Woodward Plants". • 3.0 – clarification added for Keys definition. • 4.2.2.5 – PFMEA keys clarification updates and added requirement that Supplier defined Keys be noted in PSW Comments section. • 4.2.2.8 – updated to identify Feature Control Frame(s) requirements.
6-Feb-2018	18	John Stencel	• References – added 3-OF-04182. • 2.0 – added "AS/ATS" to title of 3-06-2977; added doc 3-OF-04182. • 4.1.1-4 – added reference to new doc 3-OF-04182 and re-worded paragraph for clarity • 4.3, Line Items 5 and 7 – deleted specific reference to document 3-06-2977 and directed reader para 4.1.1 for details. • 4.4 -- deleted specific reference to document 3-06-2977 and directed reader para 4.1.1 for details.
2-Oct-2018	19	John Stencel	• 4.1.1.6 – Deleted reference to specific paragraph in WPQR-9100 • 4.3, Line Item 7 – Deleted reference to specific paragraph in WPQR-9100 • 5.2.3 Table – Corrected misnomer under "Moderately High" category to read "first piece".