

TITLE
Process Certification Requirements
WARNING

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INTRODUCTION

Process Certification is the variation management strategy utilized within United Technologies Corporation (UTC). This specification defines the requirements for process certification as agreed upon by the following business entities herein referred to as "Members".

Aerospace Members	
UTC Aerospace Systems	UTAS
Pratt & Whitney	PW
Pratt & Whitney Canada	PWC
Commercial Members	
Otis Elevator	OE
UTC Climate, Controls and Security	CCS

The terms and provisions of the SAE Aerospace Standard, AS9103 – Variation Management of Key Characteristics, as such document may hereafter be revised from time to time, are hereby incorporated by reference. Where a conflict arises between AS9103 and this UTCQR-09.1, this UTCQR-09.1 shall take precedence. Each UTC Member, and each supplier thereto, shall integrate the requirements of this specification into their respective Quality Management Systems.

In an effort to standardize the use and application of the common quality system requirements, the SAE AS9103 paragraph numbering scheme has been used.

For any given section, if the wording "No Additional Requirements" appears, only the requirements of AS9103 apply for that section number or equivalent requirements per AIAG documents for Commercial Members. If additional requirements to the AS9103 section are required, those requirements are noted in the corresponding paragraph.

Each Member shall develop procedures that implement the requirements consistent with this specification both internally and within their respective supply chains.

Members reserve the right to flow down additional requirements to their respective supply chains to satisfy specific customer and/or business requirements that apply only to the Member.

REVISION SUMMARY

- Updated wording to align with AS9103
- Added introductory paragraph to General Requirements
- Clarified paragraph 4.1.2 regarding producer self-audits
- Combined paragraphs 4.3.1, 4.3.2 and 4.3.3 into 4.3.1 and 4.3.2 to simplify and clarify requirements
- Modified language in paragraph 4.4.1 to reflect control plans and changed PCD to control plan throughout document
- Added ASQR-01 to paragraph 4.4.1.3
- Added note to paragraph 4.4.1.4 for short run SPC



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1 SCOPE:

All processes inclusive of manufacturing, maintenance, assembly and test are potential candidates for process control and certification.

This requirement applies to any product feature, process, or key process input that influences the ability of the producer to meet or exceed customer variation management requirements.

Key Characteristics (KCs) include product features and their associated process elements deemed critical to quality.

It is the responsibility of all organizations to identify KCs in addition to those flowed down by Member drawing or specification.

1.1 Purpose: No Additional Requirements

1.2 Convention: No Additional Requirements

2 APPLICABLE DOCUMENTS:

The producer may contact its responsible Member for reference material. Member-specific requirements and necessary product specifications that shall be requested from the applicable Member's procurement department.

It is the responsibility of the producer to obtain the current revision of non-Member documents specified by this UTCQR. These documents include, but may not be limited to, the following:

SPECIFICATIONS REFERENCED IN THIS DOCUMENT

Document	Title
SAE AS 9103	Variation Management of Key Characteristics
SAE J1739	Potential Failure Modes Effects Analysis (FMEA)
AIAG FMEA Manual	Potential Failure Modes Effects Analysis Manual
ASQR-01	Supplier Quality System Requirements
ASQR-20.1	Supplier Sampling Requirements

FORMS REFERENCED

Form	Title
ASQR-01 Form 3	Supplier Communication
UTCQR Form 2	Process Certification Requirements Assessment Form

2.1 SAE Publications: No Additional Requirements

2.2 ISO Publications: No Additional Requirements

2.3 Related Publications:

Document	Title
AIAG APQP MANUAL	Advanced Product Quality Planning (APQP)
AIAG PPAP Manual	Production Part Approval Process (PPAP)
AIAG SPC Reference	Statistical Process Control (SPC)
AIAG MSA Manual	Measurement Systems Analysis (MSA)
SAE AS13003	Measurement Systems Analysis Requirements for the Aero Engine Supply Base
ASQR-09.2	UTC Production Part Approval Process (UPPAP)

3 TERMS AND DEFINITIONS:

- 3.1 **Critical Item(CI):** No Additional Requirements
- 3.2 **Customer:** No Additional Requirements
- 3.3 **Key Characteristic (KC):** No Additional Requirements
- 3.4 **Key Characteristic (KC) Owner:** No Additional Requirements
- 3.5 **Key Characteristic (KC) Process Owner:** No Additional Requirements
- 3.6 **Process Control Document (PCD):** No Additional Requirements
- 3.7 **Producer:** No Additional Requirements
- 3.8 **Special Cause:** No Additional Requirements
- 3.9 **Key Process Input (KPI):** Any process element that has a significant effect on KCs (e.g., upstream process monitoring of locating datums, process parameters, required for downstream manufacturing processes, measurement variation, set up, tool wear, coolant concentration, preventive maintenance, temperature, humidity).

4 GENERAL REQUIREMENTS:

- 4.1 Process Certification is intended to ensure all processes are assessed for risk, KCs and key process parameters are identified, control plans are created, process and tool capability data is acquired, process outputs are continuously monitored, and appropriate reaction plans are followed. A process where these tools have been adopted and the outputs are demonstrably stable and capable is considered certified. The general requirements for certifying a process are described below.
 - 4.1.1 The producer shall develop and document a process control system in compliance with the guidelines within AS9103 Appendix A. Alternate process control systems that satisfy the requirements herein shall be considered acceptable when approved by the Member.
 - 4.1.2 The producer shall perform periodic self-audits of its process control system using UTCQR Form 2 or equivalent. Audits shall be completed at least once every 12 months and the producer shall maintain the documentation, including compliance to its process control plans, for Member review.

Note: *More frequent audits may be necessary depending on the ability of the producer to consistently meet the requirements of this document.*

- 4.2 **KC Variation Management Compliance**
 - 4.2.1 Identified KCs used to manufacture, assemble, or otherwise produce Member product shall meet the variation management and certification requirements per paragraph 4.4 or 4.5. If this requirement cannot be met within the timeframe agreed with the Member, the producer shall notify the responsible Member using ASQR-01 Form 3, or equivalent for Commercial Members
- 4.3 **KC Definition and PCD Compliance**
 - 4.3.1 On all processes used to manufacture, assemble, or otherwise produce Member product, the producer shall perform an industry recognized risk assessment such as

Design and/or Process Failure Modes and Effects Analysis to determine KCs and KPIs (reference SAE J1739 and/or AIAG FMEA Manual). KCs shall be addressed with priority based on the Member's requirements, high risk areas, quality defects and escapes, and poorly performing process capabilities.

- 4.3.2 All documentation associated with risk assessments and KCs, including control charts, control plans, MSA, process control and capability data, and UTCQR Form 2 or equivalent audit results, shall be maintained and made available to the Member upon request.

4.4 Statistical Process Control

4.4.1 When using SPC to certify a process, the producer shall:

1. Document KCs and KPIs in a process control plan that shall also include the methods and frequencies for their monitoring and control, and a reaction plan to define actions for out of control situations (e.g., manufacturing engineering and/or production management communications, containment activities, procedures for stopping or correcting the process).

Note: *The PCD defined in AS9103 Appendix B or equivalent method (e.g., an AIAG compliant format) of documentation is acceptable. If all the elements of the control plan are available in the documentation associated with the process operation (e.g., work instructions, manuals, standard work), they do not need to be documented in a stand-alone control plan.*

2. Demonstrate the process is stable and in statistical control, using appropriate statistical methods and/or appropriate control charts before calculating process capability.
3. Use a recognized industry method to perform a Measurement Systems Analysis (MSA) to ensure adequacy of the measurement systems used to control KCs (reference AIAG MSA Manual and/or AS13003). MSA results shall meet the requirements of ASQR-01.
4. For variable characteristics, use a minimum of 25 consecutive observations over sufficient time to capture variability associated with piece to piece, set up to set up, time to time, and lot to lot variation with no nonconformances and achieve a $Cpk \geq 1.33$. Member companies may require measures of process capability other than Cpk (e.g., Cp , Cpu , Cpl , Ppk , Ppl , Ppu).

Note: *The use of short run SPC techniques (e.g., target, group, part family charts) may be allowed to meet the 25 part minimum requirement when a full production run is less than 25 parts or 25 parts will take an unreasonable amount of time.*

5. For attribute characteristics, use a minimum of 45 consecutive observations over sufficient time to capture variability associated with piece to piece, set up to set up, time to time, and lot to lot variation, with no nonconformances detected.
6. Establish inspection frequency in the control plan for all KCs as per ASQR-20.1.



4.5 No Additional Requirements

4.6 No Additional Requirements

4.7 No Additional Requirements

5 **PROCESS MODEL:** No Additional Requirements

6 **NOTES:** No Additional Requirements

*** * * End of Document * * ***