



9103 REVISION

KEY CHANGES, NEXT STEPS

VARIATION MANAGEMENT OF KEY CHARACTERISTICS

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Why To Change?

9103 Rev. A (2012)

The “IAQG 9103” needed to change, to:

- Align with 9100:2016 as well as with the newer 91xx standards such as 9138 (SPA) and 9145 (APQP)
- Assess all feedback, that were raised since the last review, and their dispositions
- Dispose those comments from 2011 remained open after the previous 9103 ballot

In addition, following the Kick-off Meeting April 2018, to:

- Consider the 9103 relationships with the AESQ standards 13002/13004/13006 for further alignments and to avoid divergence as far as possible, in particular 13002 (alternate inspection), 13004 (PFMEA, CP), 13006-draft (process control)

⇒ Close working together with AESQ representatives in the writing team!

AESQ: Aerospace Engine Quality Group
APQP: Advanced Product Quality Planning
CP: Control Plan
PFMEA: Process Failure Modes, Effects Analysis
SPA: Statistical Product Acceptance



9103 Writing Team

As of Dec-2019

- André LACROIX, ArianeGroup (**IDR 9103**)
- Steven R. CASTLE, Raytheon Missile Systems (**SDR 9103**)
- Tatsuya SHIRAI, KHI (**SDR 9103**)
- Philippe COSIO, Airbus Defence and Space (**SDR 9145**)
- Dan K. FITZSIMMONS, Boeing (**IDR 9138**)
- Jinfeng GENG, AVIC
- David D. GIBSON, Airbus
- Darren B. HUMPHREY, Lockheed Martin Aero
- Deborah OBERHAUSEN, UTC (**IDR 9145**) (**Liaison AESQ**)
- Li PING, AVIC
- Mani Rathinam RAJAMANI, Tata Adv. Sys.
- Olga RUD, UAC

Kept informed:

Jeff COPE, InspectionXpert
Alan W. DANIELS, Boeing
Richard J. DICKSON, Verify Europe
Robert HAARMANN, Hensoldt
*David M. KARR, USAF LCMC (**Liaison SAE AS6500**)*

25 meetings
since Apr-18

AESQ: Aerospace Engine Quality Group
AS6500: Manufacturing Management Program
IDR: IAQG Document Representative
SDR: Sector Document Representative

9103 CD Comments Disposition



- 184 received comments as of 12-May-2019 (16 members + editor)
- 26 additional comments from AVIC on 06-Jul-2019
- 176 comments accepted,
- 34 comments rejected

NOTE:

- The dispositions of comments as well as all minutes of meeting of the writing team are available on the IAQG server:
<https://www.sae.org/servlets/works/postDiscussion.do?comtID=TEAIAQG&docID=&resourceID=644791&inputPage=showAll>

IAQG Document Editor	18.03.2019
Airbus	29.03.2019
ArianeGroup	15.03.2019
Bharat Forge	01.04.2019
Boeing	11.05.2019
Collins Aerospace	29.03.2019
FACC	01.04.2019
GE Avio	28.03.2019
MBDA	01.04.2019
MHI	29.03.2019
MTU	21.03.2019
PFW	30.03.2019
Raytheon	26.03.2019
SACC	13.03.2019
Safran	27.03.2019
Turkish Aerospace	01.04.2019
Universal Alloy Corp.	01.04.2019
AVIC	06.07.2019

9103 Key Changes



- Introduction: relationship with the other relevant IAQG standards clarified
- §3 (terms and definitions) Notes added for “KC” and following new terms introduced:
 - Common cause
 - Containment Plan
 - Control Plan (CP) *replacing the process control document (PCD)*
 - Design characteristics
 - Design records
 - Process capability
 - Reaction Plan
- §4 (general requirements): introduction of the Control Plan, better alignment with 9138 and 9145
 - E.g. the expressions “product KC” and “process KC” are now used in order to align with 9145.
- §5 (process model): has become a requirement and has been restructured in process-approach manner. For better understanding of the requirements, clause titles have e.g. been added.
- New Appendix A (bibliography) with a list of international standards supporting implementation of 9103
- New Appendix C (Control Plan content requirements), adapted from 9145 Appendix C
 - In order to ensure also that 9103 can remain a self-standing document (usable with and without APQP)
- **New Appendix D (Reaction Plan content guidance)**

What are “Key Characteristics”?

9100 §3.3 & Notes 9103 §3.8

- The definition of “Key Characteristic” (KC) as defined in 9100 is applicable to 9103.

3.3 Key Characteristic

An attribute or feature whose variation has a significant effect on product fit, form, function, performance, service life, or producibility, that requires specific actions for the purpose of controlling variation.

- 9103 provides additional information, clarifying e.g. the meaning of “KC attributes”, “product KC”, “process KC” and “substitute KC”.
- The 9103 standard is however not introducing the following wording as of today:
 - “Candidate KC” at PDR (preliminary design review)
 - “Firmed KC” at CDR (critical design review)
 - “safety/critical KC” (design risk analyses)

What is 9103? What not?

Variation Management of Key Characteristics

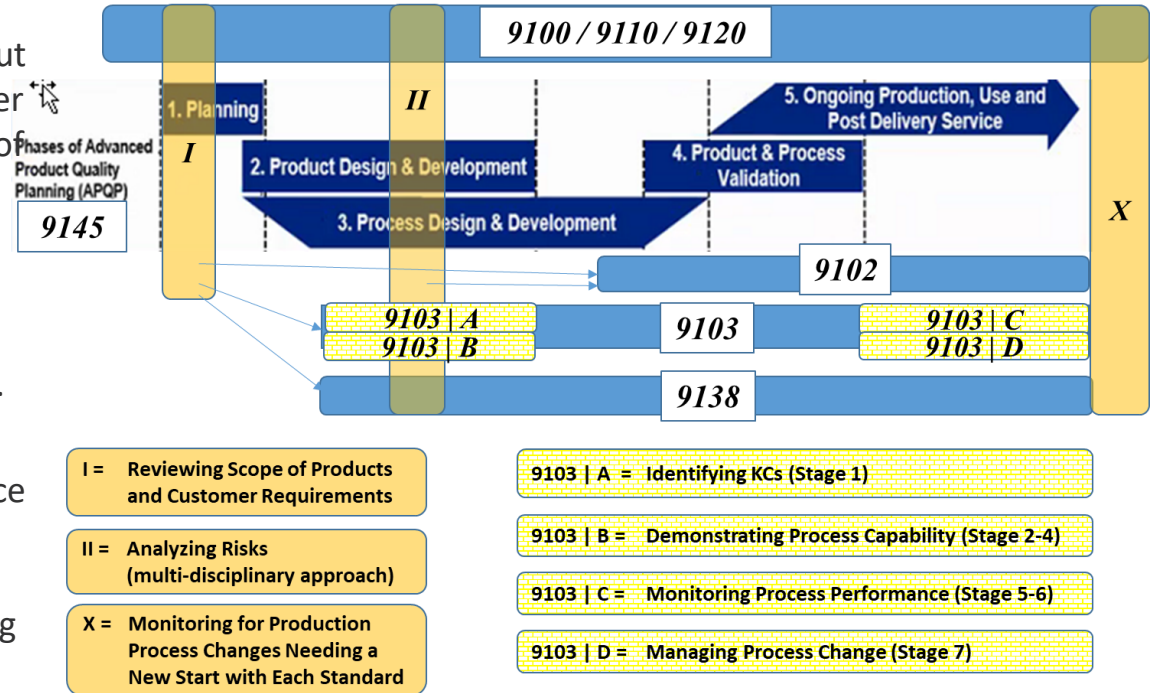
- The management of “critical items” (e.g. 100% inspection mandatory) as well as the identification of “product KCs” are out of scope of 9103.
 - Those are addressed in the frame of design risk analyses (e.g. DFMEA) and declared by the Design Authority
- Scope of 9103 is variation management, not risk mitigation nor control of nonconformities
 - E.g. containment is already addressed in 9100 and not scope of 9103.
 - The focus of 9103 is more on performance, tolerance variation, less on customer satisfaction
 - Outside the approved perimeter, process capability is product assurance activity.
- 9103 addresses both “Control chart” and “process capability study”. Both are needed, should not be mixed and nobody should replace the one with the other
 - variation management begins with managing the amount of production between out-of-control points, since so very much of the scrap, rework, repair, and fleet impact from quality issues is caused by out-of-control conditions.

9103 Relationship Among 91xx Standards



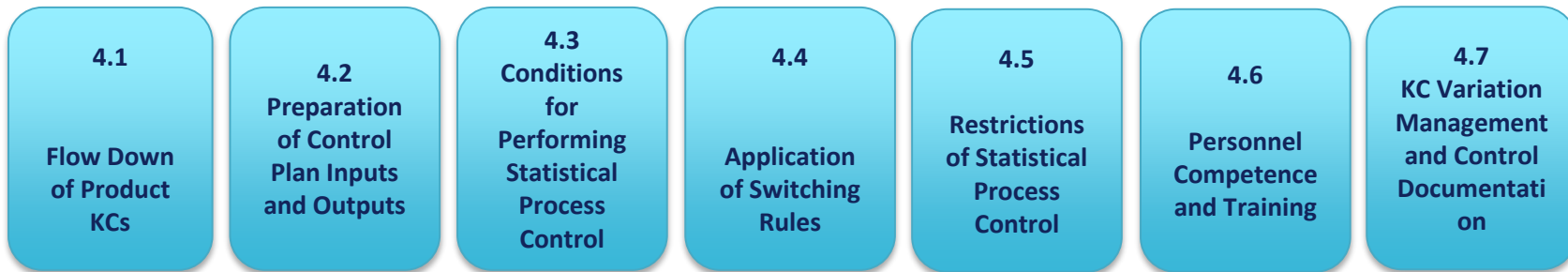
9103 §0.2 Figure 1

- Phase 3: The sooner Key Characteristics are identified and put under production control, the sooner the capitalization and optimization of the processes can start.
- Phase 4: 9103 methods are used to validate and demonstrate the capability of the production processes prior to serial production.
- Phase 5: 9103 focus is to further improve the process maturity, reduce the cost of variation, and increase the probability of conformance rate in delivered product while remaining under the cost-effectiveness limit.



General Requirements

9103 §4



9103 scope:

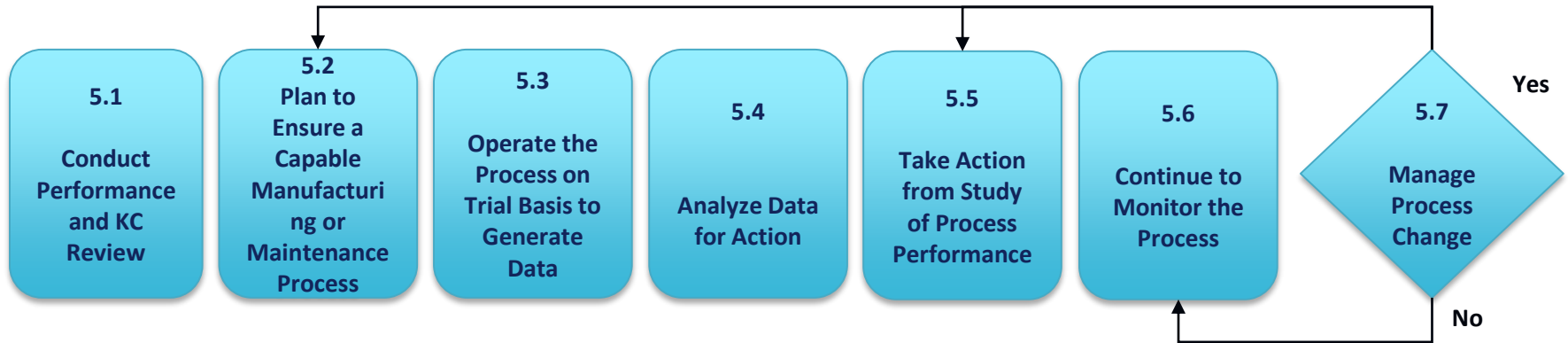
- Process KC identification
- Control Plan
- Measurement Systems Analysis (MSA)
- Statistical Process Control (SPC)
- Variation reduction
- Process Performance Monitoring and Control

Out of scope:

- Special requirements
- Critical Items
- Product KC identification (Design Authority)
- Nonconformity Control

Process Model

9103 §5



- 5.1: identify the process KCs with an appropriate Multi-Functional Team (MFT): Program Management, Engineering, Production (manufacturing and maintenance), Quality, etc.
- 5.2: Prepare the Control Plan, generate the process flow diagram (PFD), perform process risk analysis (e.g. PFMEA)
- 5.3: Plan the data collection method, produce trial parts to achieve minimum variation, conduct gage R&R study
- 5.4: Review control chart to monitor process performance, ensure on-going process capability, investigate out-of-control conditions and sources of variation
- 5.5: Deploy reaction plan to deal with unstable process or failure, perform measurement systems analysis to deal with incapable process, implement containment plan
- 5.6: Verify regularly process performance, review regularly business indicators
- 5.7: Document planned process changes
- 5.8: Maintain records of compliance

9103 Next Steps (1)



- To progress in little steps...
 - Step 1 (now): to finalize 9103 update with focus on the alignment with 9100:2016, 9138 and 9145 as first priority (= initial mission of the writing team)
 - Step 2 (started): Start discussion to review the interrelations between 9102/9103/9138/9145 and establish a proposal for a future revised documentation structure (IDRs working group).
- After the ballot step, Cpk/Ppk/R&R terms will be reviewed with the 9138 team (e.g. distinctive sources of variation, out of Control Plan frequency...)
- After the ballot step, the SCMH section 3.1 will to be reviewed / aligned. In addition:
 - 9103 application example(s) could be added in the SCMH section
 - 9103 recommends the use of PFMEA, however in some cases other process risk analyses approaches may be relevant for the organization. Templates such as those defined in AS13004 Appendix H could be defined in the SCMH section related to 9103.
 - review of 9138/9145 related SCMH deployment support material to verify alignment
 - Consideration of AS13006 Appendix D guidance material

9103 Next Steps (2)



- After the ballot step, **change requests** to other IAQG standards will be submitted to the IAQG Requirements Team for ensuring alignment with the revised 9103, In particular:
 - “control plan” definition and content (9145 appendix C)
 - “critical item” definition reference (9145) – reference to 9100:2016 (definition now deleted in 9103)
 - “design characteristics” definition (9102)
 - “design records / design documentation” definition (9145)
 - “FMEA” definition (9145)
 - “Multi-Functional Team” wording (9145 is using today “multidisciplinary project team”)
 - “process capability” (IAQG Dictionary) – alignment with the term “capability”

9103 Next Steps (3)



- For future update, a specific “9100, 9102, 9103, 9138, 9145 Coordination WG” has started to work.
 - E.g. to clarify the way forward on the harmonization of IAQG definitions/requirements related to process control across 91xx standards.
 - Scope is to align/restructure/complement the standards 9100, 9102, 9103, 9138, 9145 and related SCMH guidance material to ensure full consistency
 - When technical experts have agreed on what and how to change, the teams will see how this can be done in a coordinated approach in order to avoid different definitions in different standards.
 - Way forward on the cooperation with AESQ (alignment of 91xx/SCMH and 1300x standards/guidance) for better harmonization...

