Supplier Change Control Training Package

SCM100114





Date: Tuesday, August 26, 2025

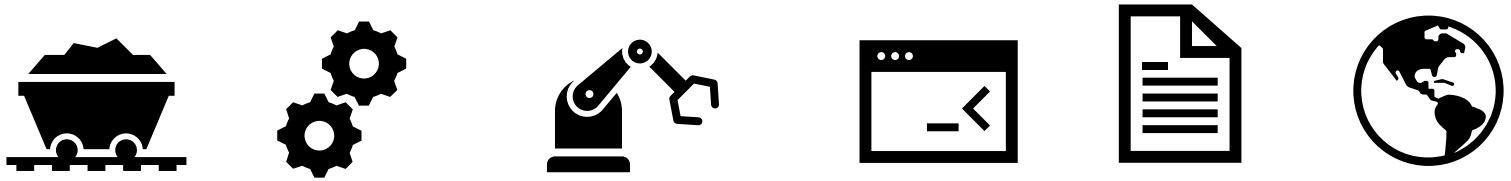
Change with Control
- Training Objectives

This Program is to help a Brooks Automation Supplier understand:

1. What is Change with Control
2. What is Copy Exact!
3. Why Copy Exact! is important to Brooks Customers
4. Decision Tree for Requesting Changes
5. Why Brooks needs 365 days notification for Copy Exact!
6. Copy Exact! Violations and how to avoid causing one
7. Change control vs Performance control
8. What is POR/PCP and critical parts, examples included plus case study
9. How to Request Changes
10. Next Steps for Suppliers
11. Frequently Asked Questions

Change with Control
- Change is anything that CAN affect form, fit, function, appearance or performance

Change is any modification to:



Raw Material | Parts | Machines/Equipment | Software | Procedure | Location

This includes all supplier and sub-tier supplier materials, processes, procedures, and equipment

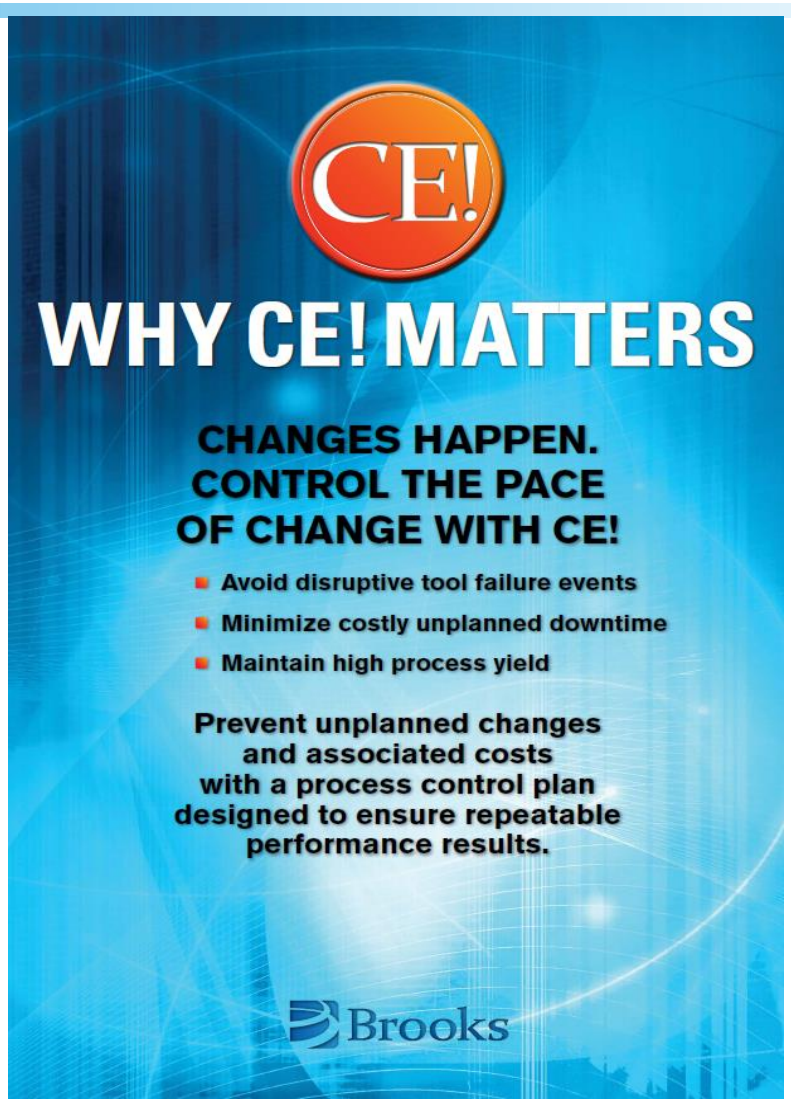
Change control applies to every aspect of the product and all Brooks parts should be treated by suppliers as being under strict change control

Controlled change requires planning, risk assessment, qualification and communication in time for Brooks to plan, assess risk, and qualify

Some of Brooks parts are under Copy Exact! which has additional requirements

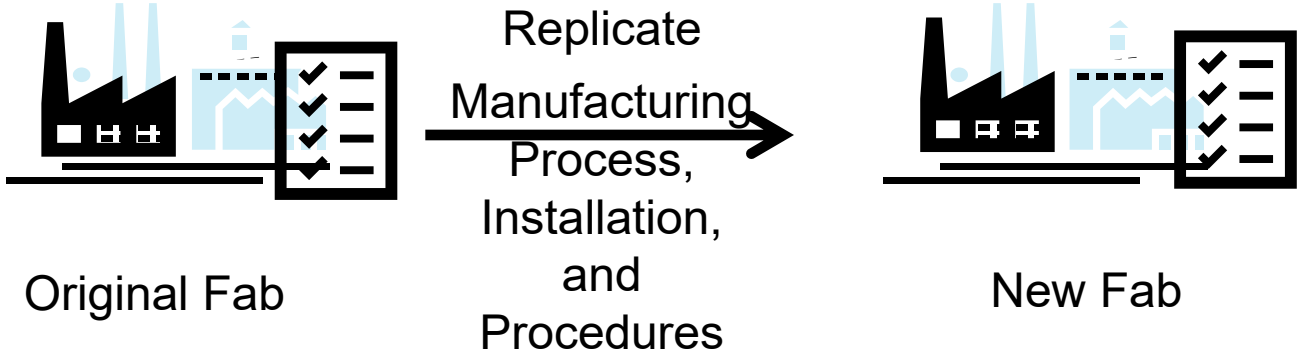
Change with Control
- What is Copy Exact?

- Copy Exact!, Copy Exactly!, CE! are all names for the same thing.
- Copy Exact! (CE!) is a business process for documenting and implementing **change with notice and approval**.
- CE! is a Semiconductor Industry term but it is the same as “Frozen Process”, “Process Lock” or “Configuration Controlled” which are used in other industries.
- For Brooks suppliers, requests for change requires **365 days** notice. This gives Brooks the time we need to evaluate and notify our Customers per their specified timeframes.



Change with Control
- Why Copy Exact?

CE! means identical inputs to identical equipment will produce identical results.

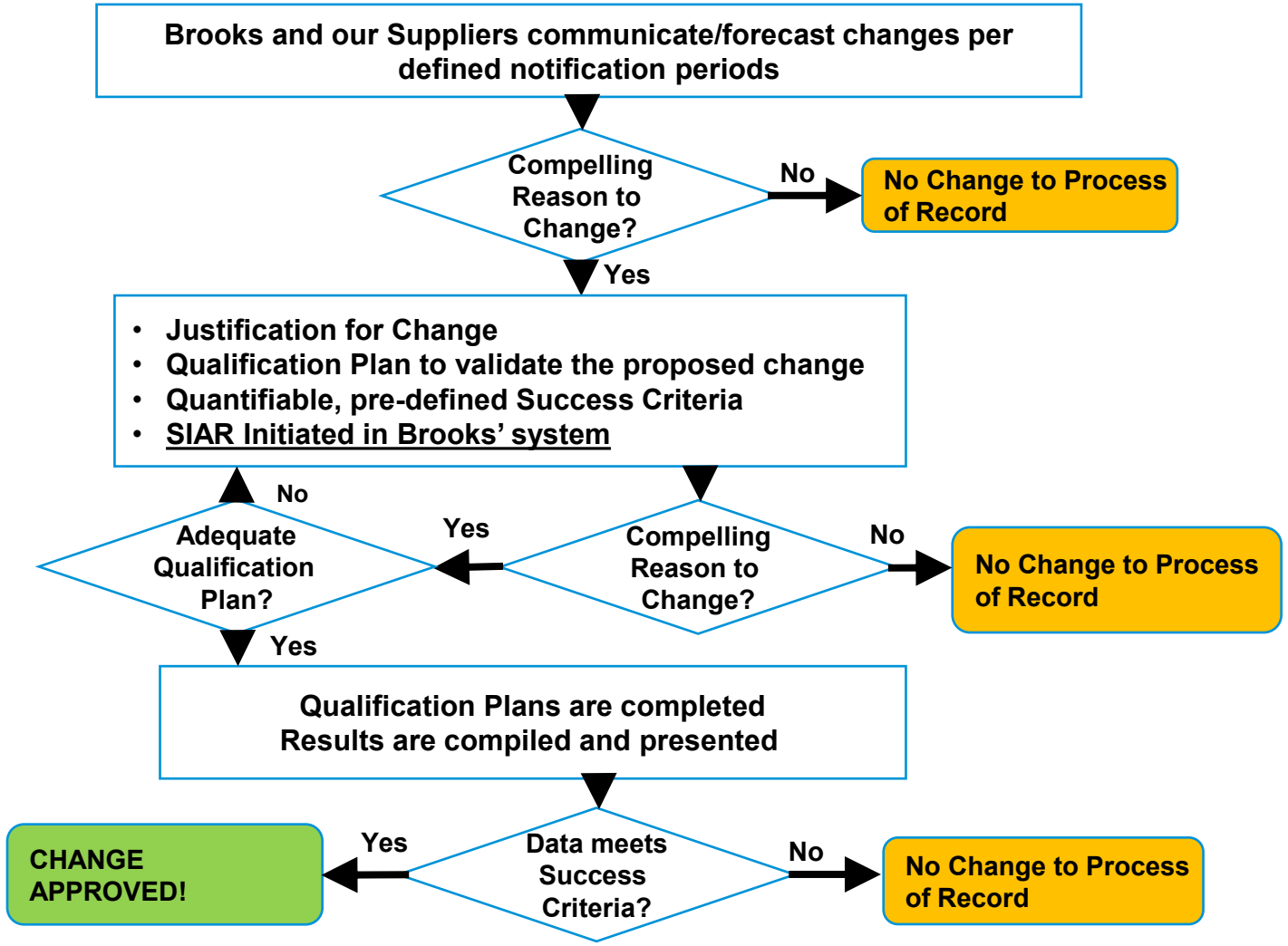


Goal: Identical Output!

Seemingly unimportant differences in equipment inputs can result in yield, reliability and/or performance differences.

- **A finished 300mm wafer can be worth $100,000 to >$1,000,000.**
- If an inadvertent part change causes a production wafer yield loss of only 0.1%, the customer can lose up to **$3,000,000 per month!**
- Changes can introduce variation which can cause a change in output.
  - Changes in output can be extremely costly.
- Changes must be planned, justified, and approved.

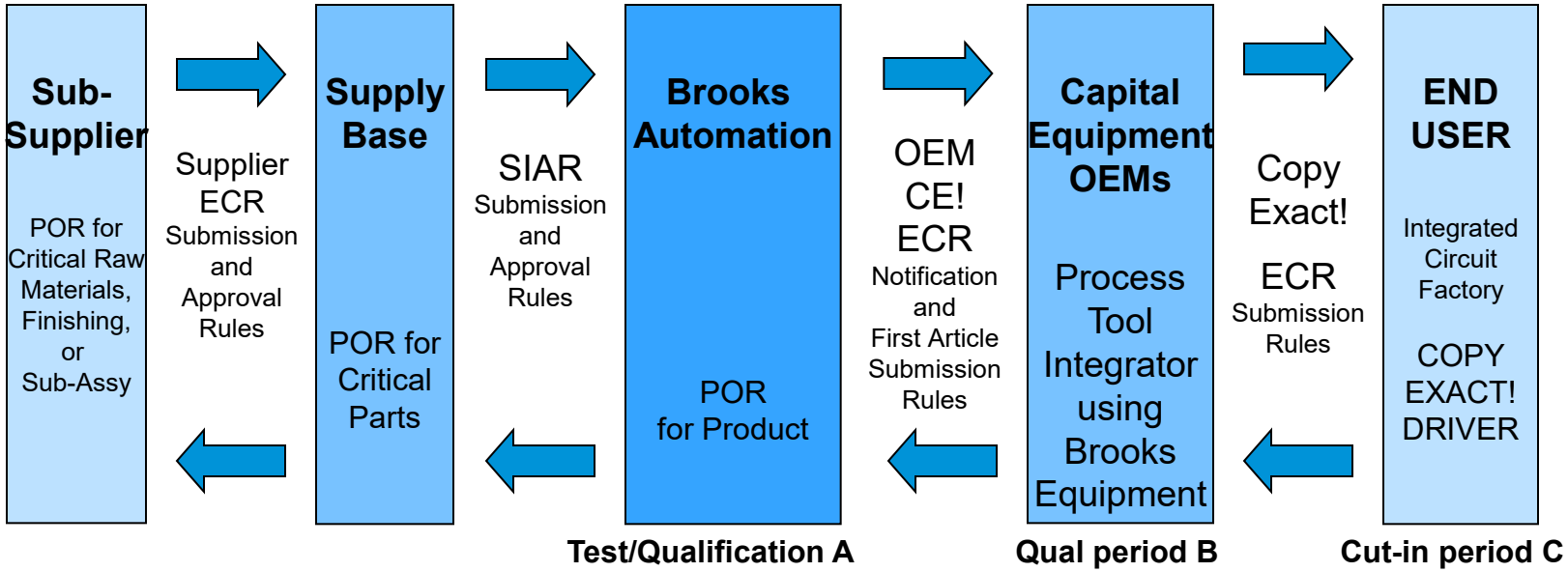
Change with Control
- Decision Tree for Requesting Changes



Takeaway:
If Brooks does not find the reason for change to be compelling, then the requested change will likely be rejected.

Change with Control
- Why 365 days noticed is needed

Communicating change throughout the supply chain



Changes may require Brooks and Brook's Customer qualification. Thus, requests are often grouped together for what is called block changes. Block changes minimize the disruption and qualification efforts.

A 365 day prior notice is requested for planned changes to allow for notification and ECR (Engineering Change Request) approval cycles. Suppliers need to create CE! communication rules with their sub-suppliers and ensure parts/process availability beyond a 365 day forecast.

Change with Control
- What is a Copy Exact Violation?

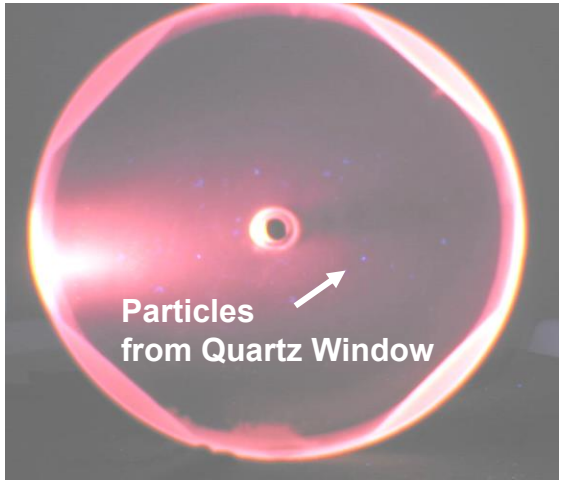
A CE! violation occurs if Brooks, our suppliers, or sub-tier suppliers make an uncontrolled change impacting fit, form, function, appearance, performance or reliability without notification to the CE! Customer.

<u>Actual CE! Violation Example</u>:

❑Problem statement: High particle count within a Customer's vacuum chamber.

❑Root cause determined to be sub-tier supplier switched to a 'higher grade' material quartz window due to shortage of specified material. New material was not resistant to process gas erosion.

❑Containment and corrective action took significant $$$$ from both sub-tier and supplier to implement.



Change with Control
- Do Not Cause a Copy Exact Violation

Goal: ***ZERO*** Copy Exact! Violations

- **Provide ample time for a change transition**
  - Changes to CE! parts need 365days notice
- **Justify the change with adequate benefits**
- **Validate the change with adequate testing data**
- **Train your employees on Change Control and CE!**
- **Ensure that all sub-tier suppliers are trained and compliant with Brooks change with control and CE! policy**
- **Insist upon controls for your material and special process sub-suppliers. (Anodizing, welding, specialty coating, electro polish, painting, etc..)**

Change with Control
- Change Control vs Performance Control

CHANGE CONTROL

Copy Exact Designation Agile and Purchase Orders

POR
Process is documented and followed

Change with Control
SIAR Process

Brooks Critical Parts
Supply Chain Control

Critical status due to process complexity, customization, reliability or performance requirements

Process Control Plans
Supplier Material and Manufacturing Controls

Mitigate all of ways things can go 'wrong' including with **post secondary and sub-tier suppliers**

Variation Reduction
SOP and SPC

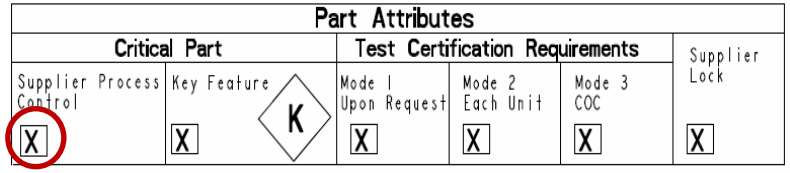
Key, critical, and inspection dimensions should be capable and maintained/optimized with tools like SPC

PERFORMANCE CONTROL

Measuring, reducing, and controlling variation is the key to continuous and breakthrough improvement

Change with Control
- What is Process of Record and Process Control Plan?

- A Process of Record (POR) is a series of defined steps that will repeatedly produce a part to an agreed specification.
- A Process Control Plan (PCP) links defined steps in the POR with product characteristics and how the associated process variables are controlled.
  - POR and PCP are approved through acceptance of the First Article.
    - Once approved, it is then considered ‘Locked In’.
  - An example of a PCP is included in the next slide
- Brooks defined Critical Parts require a PCP regardless of CE! status
  - Critical part status can be found in the parts attribute table on the drawing and will be noted with an “X” next to Supplier Process Control. It will also be noted on the Brooks purchase order.



Part Attributes					
Critical Part		Test Certification Requirements			Supplier Lock
Supplier Process Control	Key Feature	Mode 1 Upon Request	Mode 2 Each Unit	Mode 3 COC	
X	X K	X	X	X	X

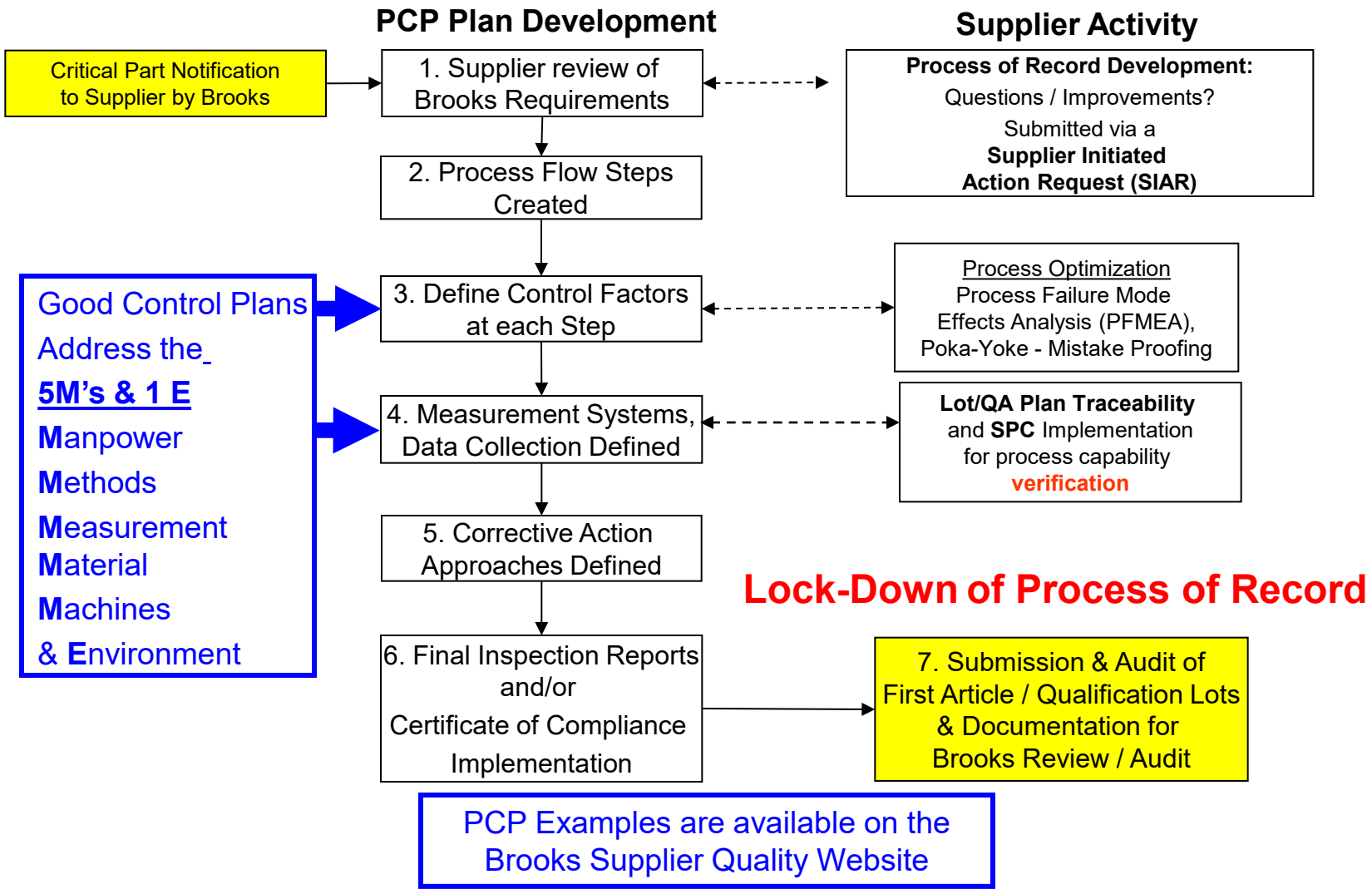
- With a Critical Part, there is no such thing as an overly controlled process or a small change to the process.
- Brooks expects our critical parts suppliers to establish reliable PCPs with no unapproved deviation from the established POR.

Change with Control
- Example of a Process Control Plan

Process Control Plan	PCP Revision #:	A
	Part Number:	8185078G001
	Supplier:	XYZ Machine

Operation #	Operation Description	Product / Process Requirements	Control Method / Measurement		
			Method	Frequency	Record
10	Raw Material Inspection Certification Req.	.750 Dia. (+/- .005) 303 SST Cert. of Mat. Verification	Dial Caliper Visual – Verify Cert for Chromium content	1.0 AQL Each Lot	Pass/Fail on router Attach to router
20	Turning / Cut Off Op Hardinge – Machining Center 16A No program – Manual Set-up	Turn OD .630 +.005 -.000 Full Length Cut-Off @1.090 – 1.100 Chamfer both ends approx.015	0 – 1" Micrometer Dial Caliper Visual	First and Last Piece First and Last Piece First and Last Piece	First / Last Piece on router First / Last Piece on router First / Last Piece on router
30	Turning Complete Op Matsuura CNC – Machining Center 19A Program # 11567 - Rev C – 257893 Bytes	.281 - .283 Dia. .244 - .246 Dia. .093 - .098 Dia. .140 - .145 Dia. .126 - .127 Dia. .005 - .010 Radius	Gage pins Gage pins Gage pins Gage pins Gage Pins (.1260, .1265, .1270) Comparator	1.0 AQL 1.0 AQL 1.0 AQL 1.0 AQL 0.4 AQL 1.0 AQL	Pass / Fail on router Record variable data on router Pass / Fail on router
40	Drilling Op Drill Press – Manual Set-up	.187 +/- .010 .005 - .010 Radius	Gage Pins – Keep drill sharp and hold burrs to a minimum. Comparator	1.0 AQL 1.0 AQL	Pass / Fail on router Pass / Fail on router
50	Deburring Op Buffing Wheel - Wire	No Burrs at all diameters	Visual Inspect – 10X Loop	100%	First / Last Piece on router
60	Plating (Outside Source – Plate for U)	Type II Dull Finish per Brooks 3544095 Plating thickness	Certificate of Analysis with each lot processed by Plating House Visual Inspect against CTI Plating coupon Polish / Etch cross section – measure with Tool Makers Mic.	Cert. for each lot 1.0 AQL Initial Qual	Inspection Report Form
70	Final Inspection	All dimensions per spec / print	Per Brooks Blueprint / Specifications– Verify revision level to PO.	1.0 AQL	Inspection Report Form

Change with Control
- Creation of Process Control Plan



Change with Control
- Critical parts, can you find your product?

Brooks Critical Part Examples:

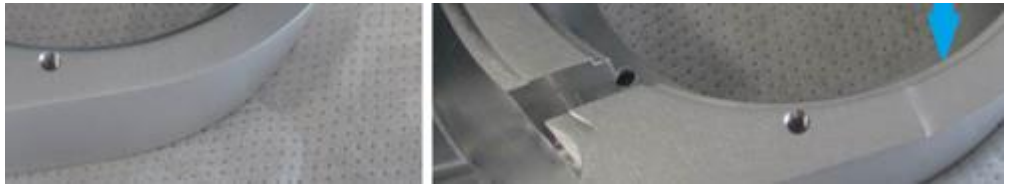
- End Effectors, Atmospheric and Vacuum
- Substrate Supports, i.e. wafer pads
- Vacuum System Single Wafer Load Lock wafer supports, i.e.
- Vacuum System Cooling Module cool down pedestals
- Vacuum System Safety Node
- Load Lock Assemblies
- Load Lock Indexer, i.e. z-lifts and spider, assemblies
- Vacuum System Transfer Chamber Lids, Clear and Metal
- Vacuum System Facet Adapter Plates (FAPs)
- Slit (slot) Valves
- Vacuum System Lid Lifters
- Vacuum System Single Wafer Load Lock hoops
- Wrist Assemblies, Atmospheric and Vacuum Robots
- Arm Assemblies, Atmospheric and Vacuum Robots
- Belt Drives
- Shafts
- Slip Rings
- Drive Assemblies, Atmospheric and Vacuum
- Vacuum System Isolation Valves
- Traversers

- Pneumatic Manifolds, i.e. EV's
- Bellows Assemblies
- Vacuum Forelines
- Vent Lines
- Inert Gas Regulators
- Inert Gas Valves
- Vent Diffusers
- Inline Filters
- Fan Filter Units
- Vent Valves
- Vacuum System Control Assemblies, including the:
- Encoder
- Motors
- Bearings
- Seals

The supplier **must not** deviate from the **PCP/POR** without **prior notification** to and **approval** by Brooks Automation.

Change with Control
- Case Study on Risk with POR changes

- The process of record may not align to the drawing or model.
- Standard program adjustments for process optimization/product conformance may cause unintended changes.
- Example: A machining supplier changed their program to eliminate manual deburring. When comparing to the model, a feature was inadvertently added to the part program even though it had not previously been there.



  - ➢ Lesson learned: Compare parts before and after to ensure no impact to FFF or appearance.
  - ➢ If a difference between POR, model, or print, is identified, notify Brooks via SIAR but keep building to the process of record.

➢ Be aware of any unintended changes!

➢ Remember no program code changes that will impact FFF or appearance without Brooks approval!

Change with Control
- Requesting Change

Change is anything that affects form, fit, function, appearance, performance, or reliability.

Brooks expects that suppliers change with control ensuring Brooks is asked to approve changes to impacting fit, form, function, appearance, performance, or reliability.

- For requesting changes or informing Brooks of part obsolescence, please use this web-based form. If you have questions, please reference the instructions for submitting a SIAR.
  - If response time is slow…contact your Buyer and/or SQE.
- For suppliers who have access to Agile, please contact us if you need instructions for submitting a SIAR
- If you have any questions or issues please contact SIARsubmittals@brooks.com
- Brooks needs 365 days notice because we have Copy Exact! Customers who also require 365 days notification.

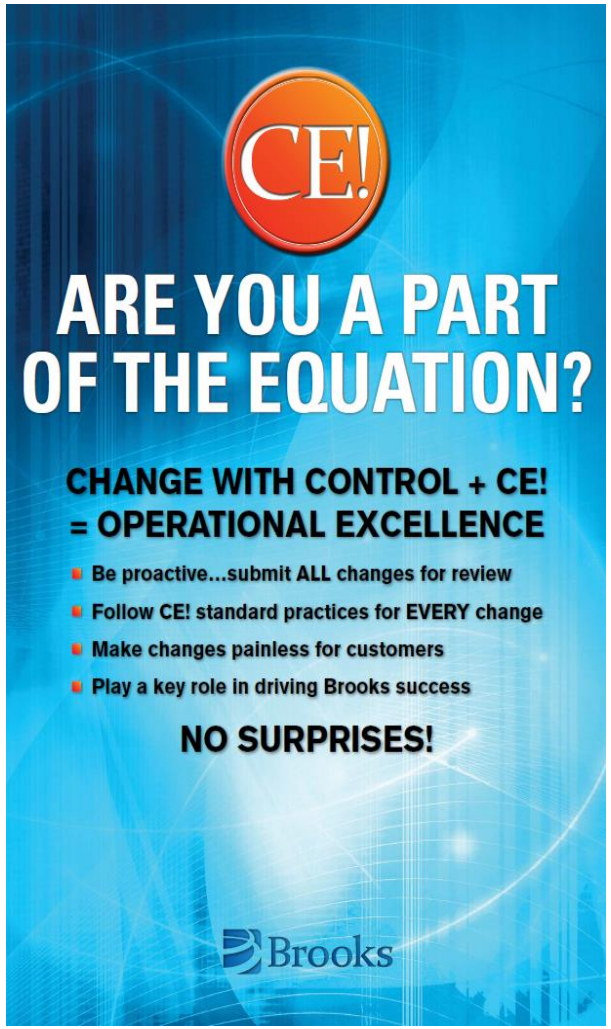
Change with Control - Summary

Continuous improvement is everyone's goal, however…

- There is no such thing as a small change, even if the 'product response' or 'final test response' seems to be within specification.
- Brooks Automation expects notification of **POR** changes to **M**anpower, **M**aterials, **M**ethods, **M**easurement, **M**achines or **E**nvironment.
  (We prefer you to be overly conservative with **POR** changes and engage us appropriately.)
- Changes are allowed with sufficient data to convince Brooks and our customers.
- 365 days minimum advance notice is required prior to approval and cut-in.
- An unapproved change in a **POR** is not allowed.

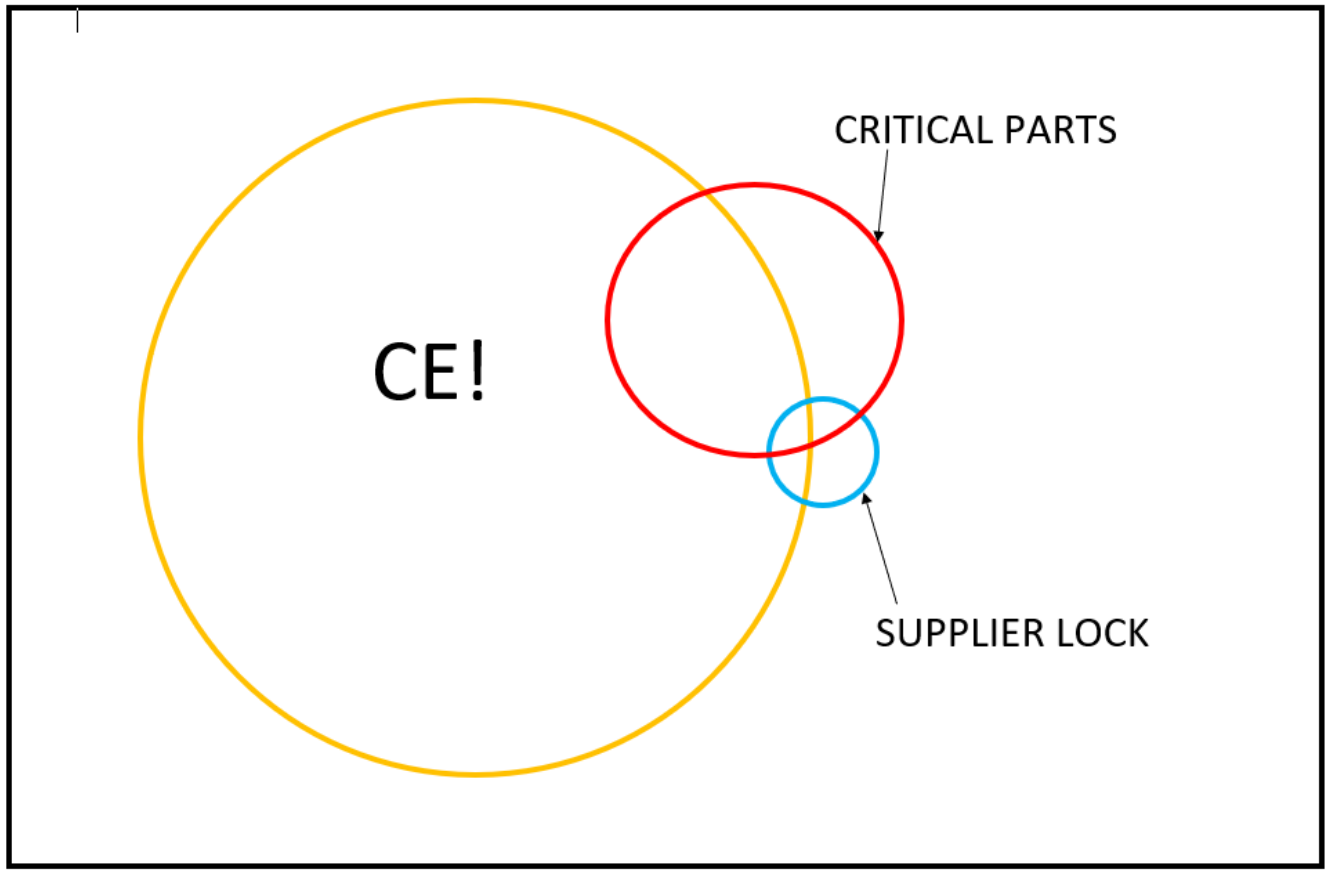
Change with control is necessary

- Our customers expect it.
- Brooks expects it from our suppliers and from the sub-tier suppliers.



Change with Control
- Summary of CE! vs Critical Parts

All Parts are subject to CHANGE CONTROL!



For Brooks, CE! part changes include customer approval and notification.

Changes to critical or supplier lock parts have **heightened evaluation** due to impact to Brooks product performance.

Change with Control
- Next Step for Suppliers

Thank you for completing this training, you should now understand:

- What is Change with Control and Copy Exact!
- Why Brooks requires Copy Exact! and 365 day notification
- Basic information on POR, PCP, and Critical Parts
- How to request a change via a SIAR

Next Steps:

We request that a representative from (4) departments, Quality, Engineering, Manufacturing and Account Management be trained and take the Brooks Change Control Test. Supplier Change Control Training

Change with Control
- Frequently Asked Questions

- Are all Brooks parts Copy Exact!?
  - ➢No, not all Brooks parts are Copy Exact!. However, Brooks still needs notification of all changes impacting fit, form, function, appearance, or performance. Request for changes on CE! parts will take longer. Copy Exact! status is noted on purchase orders.
- Are all Critical parts also under Copy Exact!?
  - ➢No, critical parts are based upon Brooks design. CE! status is related to which Customers buy Brooks products.
- How long does a SIAR response take?
  - ➢ It varies by the type of request, impact to either CE!, critical part or supplier lock, and if an engineering change is needed.
- Who can I ask if I have other questions?
  - ➢Ask your buyer or SQE.
- How do I implement Change with Control and CE! in my company?
  - ➢See next slide on suggestions
- How do I submit a SIAR?
  - ➢Please use this web-based form

Change with Control
- Suggestions on Implementation

Change Control

Update your Process to be CE! compatible

1) Be able to Identify CE! parts / assemblies in your BOM / Materials / Process Control system and ID Process / QA documents as CE!
2) Supplier Change Process Approvals need to incorporate Brooks SIAR Notification & Approval.
3) Change Process must consider re-qualification and testing time prior to implementation (Early notification at concept).
4) SIAR process incorporated in change process
5) Record unique Process of Record ID/Revision independent of Part Number/Revision.
6) Establish method for sub-supplier POR recording.

CE! Training – Employees

1) Engineering Change Control personnel trained.
2) Process Engineers trained.
3) Buyers / Supplier Engineering trained, to enforce and support CE! with critical sub-suppliers.
4) Manufacturing personnel trained to follow POR.

CE! Training – Sub-Suppliers

1) General advisement of CE! to all sub-suppliers.
2) Schedule training for critical and/or special process sub-suppliers.
3) Records of sub-supplier training.
4) Verify Critical Sub-Supplier CE! change control Process implementation.

BOM / Sub-Supplier Control

1) Have parts / material visibility > 365 days to allow for End-of-Life SIAR Notification.
2) Have Spec sheets available for materials and components for baseline CE! Reference.
3) Are your sub-supplier capable for > 365 days part/ material visibility for CE! (> 365 preferred).
4) Special Process Suppliers are actively managed.

Process Yield / Critical Part SPC notification

1) Update internal process to make Brooks aware of internal yield or SPC out-of-control issues.

Verification Audits

1) Conduct regular internal audits, sub-supplier audits and 2nd tier sub-supplier audits for POR verification.