axcelis

Process Critical Item (PCI) & Copy Exact (CE)
Supplier Training Material 2026

Process Critical Item (PCI) & Copy Exact (CE) Training Material

- Pre-requisites:
  - Read and Understand:
    - Axcelis' Quality Business Requirements For Suppliers
    - Axcelis' PCI Specification for Suppliers (880001734).

- GOALS:
  - Understand the expectations for supplier compliance with Axcelis' PCI Processes.
    - Understand the impact of supplier non-compliance with Axcelis' PCI Processes.
  - Understand Copy Exact methodologies.
  - Know who to contact for questions, and support, regarding Axcelis' PCI Processes.

Standard Axcelis Supplier Requirements

Axcelis Quality & Business Requirements to Suppliers are found on the Supplier Portal
Copy Exact (CE)requirements for Process Critical Items (PCI) are additive

https://www.axcelis.com/supplier-portal/

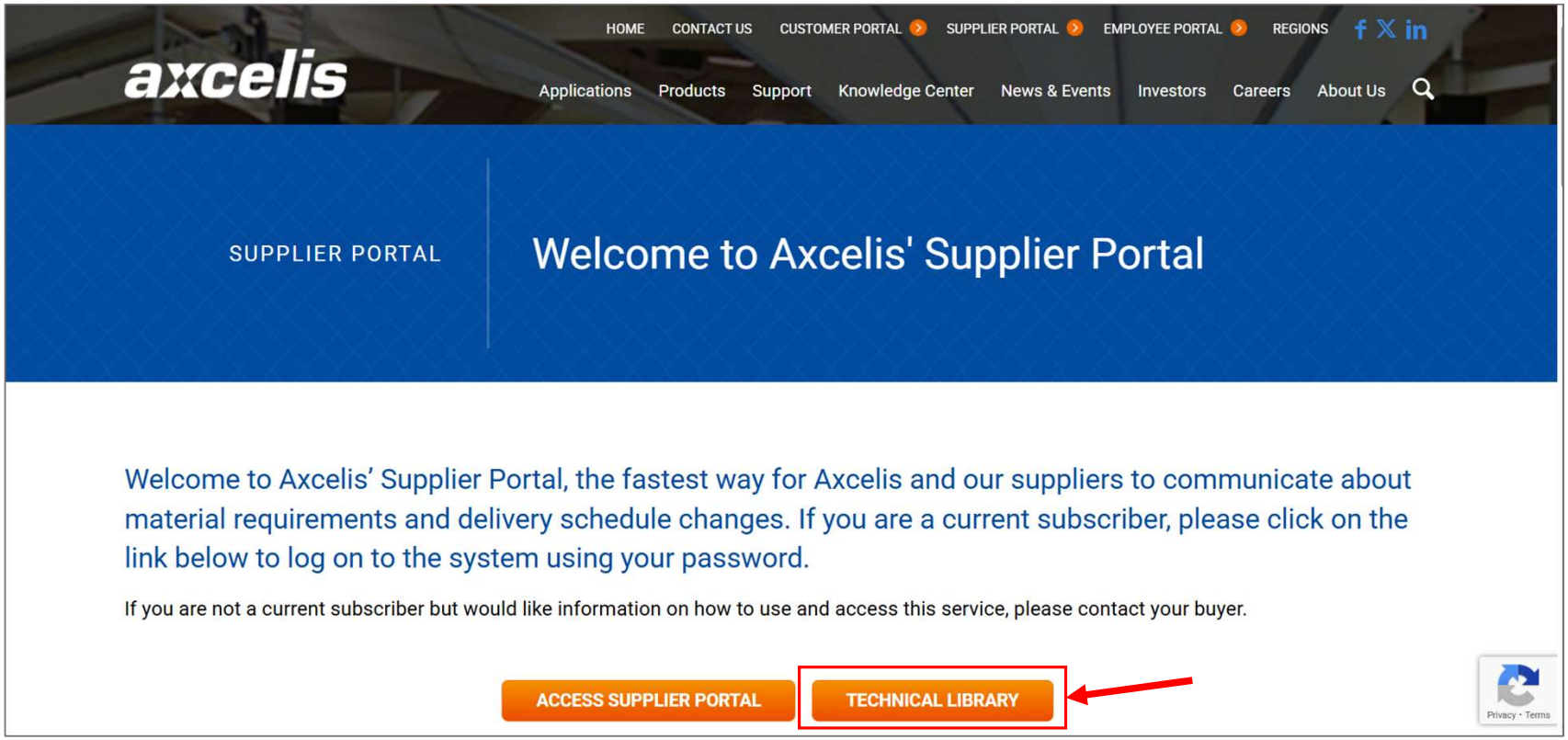
RESOURCES:

- Axcelis Quality Business Requirements to Suppliers Rev E
- Problem Resolution Process Step by Step Using 8 Disciplines
- Guidelines for Self Assessment of Supplier Corrective Actions Effectiveness
- Process Control Plan
- Process Failure Modes and Effects Analysis
- PRP Supplier 8D Template Rev D
- Part Submission Warrant Form

axcelis

Axcelis' Technical Library

- Where can I find the latest copy of Axcelis specifications?
  - When copies of specifications are not flowed down with POs, Suppliers should use Axcelis' Supplier Portal, found at www.Axcelis.com, to access our Technical Library; where you may search for applicable drawings, specifications, and documentation.



NOTE: Please notify your Axcelis Buyer, or SQE, if assistance is needed accessing information within the Supplier Portal.

What are PCI Parts (Process Critical Items)?

- **Process Critical Items (or PCI Parts) at Axcelis:**
  - PCI Parts are a sub-set of Axcelis parts and assemblies that directly impact key operations, and performance, of Axcelis' final product(s). For PCI parts and assemblies, Axcelis controls business and product risk through implementation of additional manufacturing controls, including detailed records, for PCI Parts.

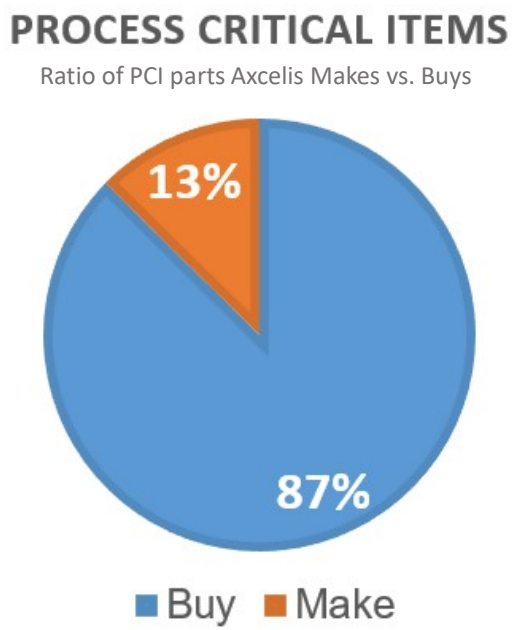
- **How do Axcelis suppliers know if a part or assembly is classified as PCI?**
  - Axcelis issues "GH" POs which include PCI identifiers for applicable line items, and/or the drawing(s) submitted for RFQ will contain PCI watermarks:

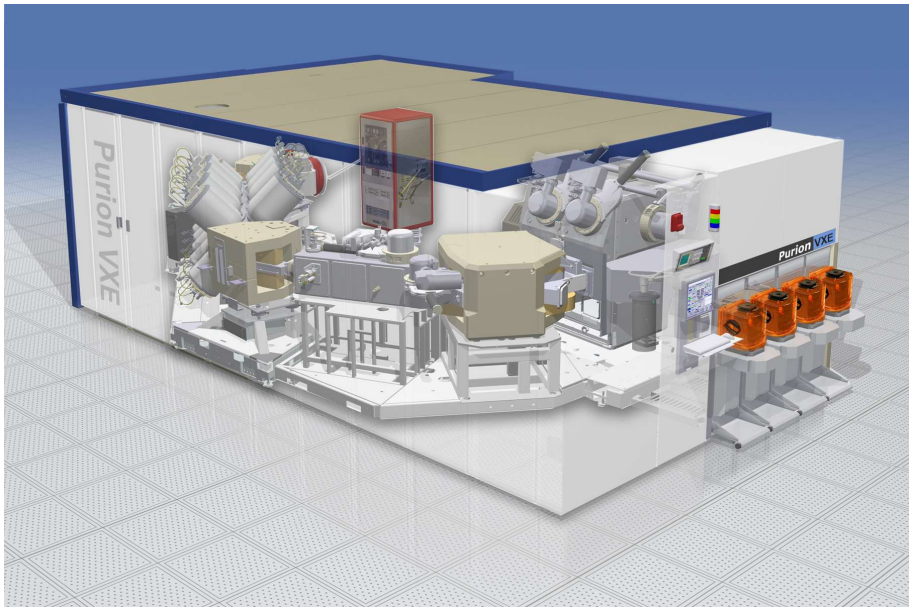
LATEST WATERMARK

OLD WATERMARK

axcelis

How many Process Critical items are purchased?





axcelis

Supplier PCI Workflow

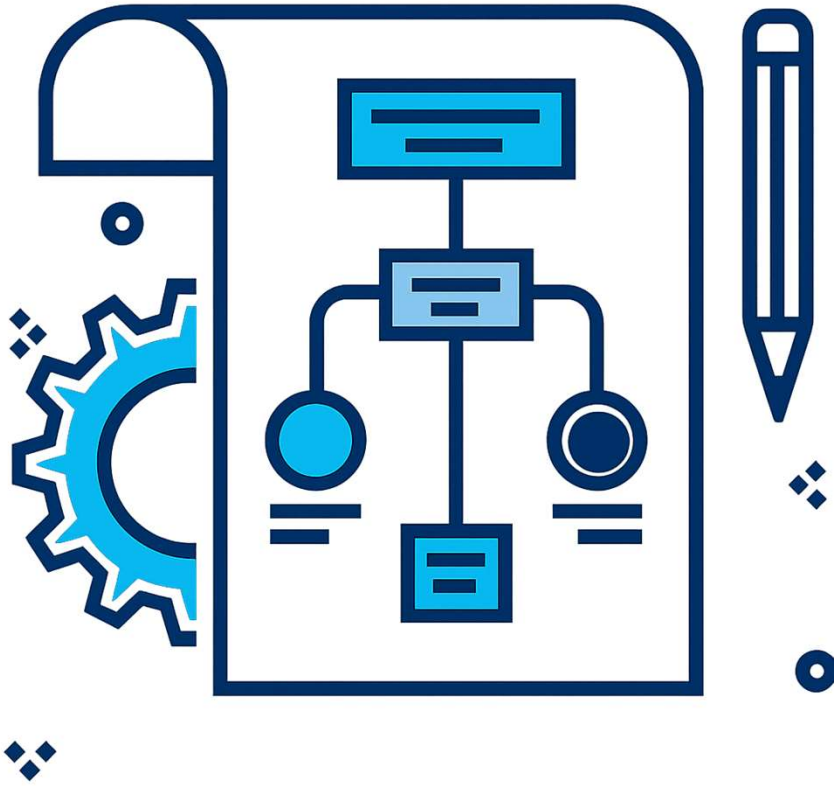
RFQ & PO Placement	
Axcelis issues a "GH" PO to supplier for PCI part(s)	**Supplier** acknowledges: Quality Business Requirements For Suppliers & PCI Specification for Suppliers (880001734).

PCI Production Planning and Approval Process			
Supplier Generates PCP and submits to Axcelis for Approval with a PSW.	**Axcelis** SQE works with supplier to review/edit/approve the PCP. (PFMEA by request only)	**Supplier** manufactures, inspects, and delivers the First Article lot. (Reference Axcelis spec 999001218)	**Axcelis** receives, inspects, & tests FAIR lot to complete the qualification process.

COPY EXACT		
Axcelis notifies supplier of successful qualification via PSW acceptance.	**Supplier** freezes their production processes for the qualified PCI product.	**Supplier** adheres to Copy Exact principles for the qualified PCI product.

Process Control Plans (PCP)

- A process control plan is intended to define how process characteristics will be monitored and controlled to ensure products consistently meet quality standards and reduce variation in manufacturing.
- A process control plan (PCP) for the PCI part is required before production begins.
  - Reference Axcelis PCP Template 999000954
- The PCP is submitted to Axcelis for review and approval.
  - The Axcelis SQE may require clarifications, or provide feedback/suggestions, before approving the PCP.
  - PCPs are submitted via email to PCI@axcelis.com with the Buyer on CC.
- Accepted PCPs may be referred to as the “Process of Record” (POR)



Axcelis has internal ***Work Instructions*** for generating *Process Control Plans*: **Reference 9990016088**

Process Control Plan Example

axcelis

QUAL PROCESS CONTROL PLAN FORM

Proto-Type ☐	Pre-Launch ☐	Production ☑	Key Contact / Phone	Date of Origination	Date of Latest Revision – ref.
Control Plan Number		PCP-12000xxxx	978-787-4000	4/23/21	4/30/2021 Rev A
Part Number / Latest Revision Change			Core Team	Customer Engineering Approval / Date (If Required)	
12000xxxx Rev B			John Smith & John Doe	Russell Newman / 5/24/2021	
Part Name / Description			Supplier / Plant Approval / Date (If Required)	Customer Quality Approval / Date (If Required)	
POWER SUPPLY XYZ			5/24/21	William Rogers / 5/24/2021	
Supplier / Plant		Supplier Code	Other Approval / Date (If Required)	Other Approval / Date (If Required)	
Supplier ABC		1234567	N/A	N/A	

part info and contact information

Download “Process Control Plan” form at Supplier Portal Page

Process Control Plan Example

Part / Process Number	Process Name Operation Description	Machine, Device, Jig, Tools for Mfg.	No.	Characteristics: Product	Characteristics: Process	Special Char. Class	Methods: Product / Process Specification / Tolerance	Methods: Measurement Technique	Methods: Sample Size	Methods: Sample Freq.	Methods: Control Method	Reaction Plan
Back Panel	Back Panel Assembly	Manual	1	Line Filter	Insert Fuses into Line Filter	Sig.	Exactly 2 Fuses installed in Line Filter PROCEDURE 1234	Visual	100%	100%	Visual check of Line Filter installation by Operator	Rework in Cell to ensure correct assembly
			2	Line Filter	Attach power cord lock to Line Filter	Sig.	Exactly 1 power cord lock installed with 2 screws with spacers and 1 dust cap to Line Filter PROCEDURE 1234	Visual	100%	100%	Visual check of power cord lock installation by Operator	Rework in Cell to ensure correct assembly
				Ground Harness #2	Attach wire harness #2 to back panel with hardware stack	Sig.	Ensure proper hardware stack order and is secure PROCEDURE 1234	Visual	100%	100%	Visual check of harness #15 and hardware installation by Operator	Rework in Cell to ensure correct assembly
			10			Sig.	Ensure proper orientation of fans and finger guard presence with tight hardware according to procedure PROCEDURE 1234	Visual	100%	100%	Visual check of fan (orientation) and finger guard installation by Operator	Rework in Cell to ensure correct assembly
			14	Ethernet PCB	Mount ethernet PCB to back panel with hardware	Sig.	Ensure ethernet PCB is secure to back panel with hardware PR	Visual	100%	100%	Visual check of ethernet PCB and back panel	Rework in Cell to ensure correct
Front Panel	Front Panel Assembly	Manual	1	Display PCB	Solder wire harness 1 to the PCB	Sig.	Ensure harne conections are PR					
			2	Display PCB	Solder display screen to PCB	Crit.	Ensure dis conections are made according to procedure PROCEDURE 1234	Visual	100%	100%	solder connection	ensure correct assembly
			3	Dust caps	Attach exactly 8 Dust caps, 2 per screw	NA	Ensure dust caps are attached according to procedure PROCEDURE 1234	Visual	100%	100%	Visual inspection of dust cap install	Rework in Cell to ensure correct assembly
			4	Bezel	Attach Bezel	NA	Ensure bezel is attached according to procedure PROCEDURE 1234	Visual	100%	100%	Visual inspection of bezel	Rework in Cell to ensure correct assembly
Final Assembly	Final Assembly	Manual	1	Tape crossbar	Apply tape	NA	Apply tape as shown PROCEDURE 1234	Visual	100%	100%	Visual inspection of tape	Rework in Cell to ensure correct assembly

Process and equipment References

Drawing References

Specification, tolerance, measurement and non-conformance countermeasure

Download “Process Control Plan” form at Supplier Portal Page

axcelis

Process Control Plan Example

Part / Process Number	Process Name Operation Description	Machine, Device, Jig, Tools for Mfg.	Characteristics			Special Char. Class	Methods				Control Method	Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Measurement Technique	Sample Size	Sample Freq.		
Final Test	Programming	Test Computer & Test Fixture	2	Programming	Program unit	Sig.	Follow Programing instructions per procedure CAL PROCEDURE 5678	Visual	100%	100%	Test Procedure instructions	Rework in Cell to ensure correct programming
	High Voltage Linearity	Test Computer & Test Fixture	6	High Voltage Linearity	Initial High Volatge test	Crit.	Perform High Voltage linearity test per procedure CAL PROCEDURE 5678	High Voltage Divider	100%	100%	Contol software	Troubleshoot and rework in Cell
	External Amplitude control	Test Computer & Test Fixture	12	External Amplitude control	Verify External Amplitude Control	Crit.	Verify External Amplitude is controlled per instruction CAL PROCEDURE 5678	Digital Multimeter & Test Fixture	100%	100%	Control Software	Troubleshoot and rework in Cell
	Record	Manual	2	Records	Record information	Sig.	Verify test record has been completed per instruction CAL PROCEDURE 5678	Visual	100%	100%	Test Records	Troubleshoot and rework in Cell
Final Inspection	External Connector Covers	Manual	1	Covers	Check installation	Sig.	Verify all covers are uniformly oriented and tightly installed	Manual	100%	100%	Manual operation	Orient correctly and tighten
	hardware											
	Check for debris			XYZ			CAL PROCEDURE 5678					and return to cell fo rewrok
	Data Review	Visual	7	POWER SUPPLY XYZ	Review test data	Sig.	Review test data to ensure all data is in spec and stamp Certificate of Calibration CAL PROCEDURE 5678	Visual	1	1	Visual	Document nonconformance and return to test
Shipping	Packaging	Q-Form-INV-001	1	Packaging Checklist	Obtain Packaging Checklist INVOICE FORM #123	Sig.	INVOICE FORM #123; Enter Job Order # onto form; Enter data as completed	Visual	100%	100%	Visual	Notify Supervision
	Ship Loose	Shop Floor Traveler	3	Ship Loose	Pick Ship Loose Materials	Crit.	Pick Ship Loose Materials according to the Shop Floor Traveler (ICR/BOM) and place in appropriate bag(s)	Visual	100%	100%	Visual	Notify Supervision
		Packaging Film dispenser	4	Lined Box	Line Box with Packing Film	Sig.	Line box with sufficient packing film to cover the bottom and sides of the box;	Visual	100%	100%	Visual	Rework as needed
	Foam Packaging	Instapak foam gun	7	Packaging	Apply foam into the carton in a sweeping motion	Crit.	Ensure foam has reached edges and corners and adequate foam is added to fill box approximately half full	Visual	100%	100%	Visual	Rework as needed
			8	Packaging	Enclose Foam	Sig.	Fold Packing Film flaps over foam to enclose the foam	Visual	100%	100%	Visual	Rework as needed
			9	Packaging	Insert Unit	Crit.	Insert the bagged unit into the center of the box and press down until the unit is recessed into the film covered foam, covering approximately half its depth;	Visual	100%	100%	Visual	Rework as needed
			11	Certificates	Certificates	Sig.	Ensure Certificates are enclosed as	Visual	100%	100%	Visual	Rework as needed
		Tape & Tape gun	16	Packaging	Seal the container	NA	Seal the container with packing tape	Visual	100%	100%	Visual	Rework as needed

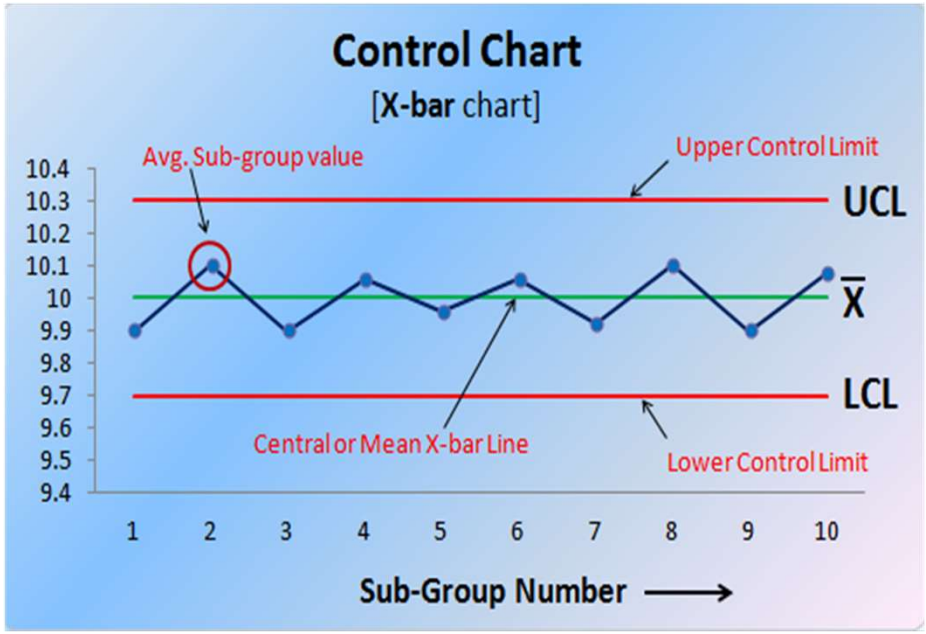
Process Control plan should describe process controls for everything; from raw material verification, to when final product is packaged for delivery.

Download “Process Control Plan” form at Supplier Portal Page

axcelis

Special Characteristics & Statistical Process Control (SPC)

- Axcelis sometimes identifies critical attributes of parts and assemblies, called "**Special Characteristics**".
  - Definition: Classification of a product characteristic, or manufacturing process parameter, that can affect safety or compliance with regulations, fit, function, performance, requirements, or subsequent processing of product. May also be referred to as a "Critical Feature", "Critical to Quality (CTQ)", "Key", "Safety", or "Significant". These characteristics/features are identified with the following symbol: 
- When Special Characteristics are present on drawings and/or specification, Axcelis **may ask** for documented **control charts** to monitor feature variation during the manufacturing process at some frequency.



axcelis

Process Failure Mode Effects Analysis (PFMEA)

- Process FMEA is not a standard requirement for Axcelis' PCI Part production planning approval process but may be requested by Axcelis SQE team on an as-needed basis. (Most likely used to assess risk with process change activities.)
  - Axcelis does not have a required PFMEA template.
  - Suppliers may use their own PFMEA template or Axcelis' PFMEA Template 9990015926.
  - Axcelis can provide guidelines for PFMEA deliverables upon requests from the supplier.

axcelis

Product Development
PFMEA Template

Process Description:		**Date of FMEA Origination**	
Part Number / Rev.:		**FMEA Number / Revision:**	
Part Description		**Prepared By:**	
Design Responsibility:		**FMEA Core Team:**	
Supplier Involvement:		**FMEA Revision Date & Description:**	

Step	Input	Potential Failure Mode	Potential Failure Effects	S E V	Potential Causes	O C C	Current Controls		D E T	R P N	Actions Recommended	Resp.	Actions Taken	S E V	O C C	D E T	R. e R N v P
Process Step Identifier	What is the process step/ Input under investigation?	In what ways does the Input Variable go wrong?	What is the impact on the Output Variables (Customer Requirements) or internal requirements?	Severity of the Effect on the Process	What causes the Input Variable to go wrong?	How often does cause or FM occur?	What are the existing controls and procedures that **PREVENT** either the cause or the Failure Mode from moving forward? **Should be applying MISTAKE-PROOFING concepts here**	What are the existing controls and procedures (inspection and test) that **DETECT** either the cause or the Failure Mode? **Should include an SOP number.**	How well can you detect cause or FM?		What are the actions for reducing the occurrence of the Cause, or improving detection? **Should have actions only on high RPN's or easy fixes.**	Whose Responsible for the recommended action?	What are the completed actions taken with the recalculated RPN? **Be sure to include completion month/year**	Severity of the Effect on the Process	How often does cause or FM occur?	How well can you detect cause or FM?	
										0							0
										0							0
										0							0
										0							0

Axcelis has internal ***Work Instructions*** for generating *PFMEAs*: **Reference 9990016078**

axcelis

Part Submission Warrant (PSW)

- PSWs are used to summarize the PPAP, formally declare part compliance, certify production-intent manufacturing, and provide the basis for customer approval. They are essential for ensuring clarity, traceability, and agreement between supplier and customer on part readiness.
- PSW forms are used to document transitions through the production planning process, or subsequent changes to an existing process.
- Axcelis use the PSW to communicate approvals, rejections, or conditional approval decision for a part's production status.
- Axcelis' PSW form can be found through the supplier portal, and are submitted via email to PCI@axcelis.com with the Buyer on CC.

Part Submission Warrant – PSW

Completed by Axcelis SQE in collaboration with Supplier

axcelis

Part Submission Warrant

Manufacturer Part Name	POWER SUPPLY XYZ	Axcelis Part Number & Revision	12000xxxx rev B
Manufacturer Drawing Number	ZDT-54321	Manufacturer Part #	ZDT-54321
Manufacturer Revision Level	D	Dated	4/23/2021

Safety and/or Government Regulation ☐ Yes ☐ No ☑ n/a | Purchase Order No. PO98765 | Serial Number 1356

Inspection or Test Document No. INSP-1234 | Inspection or Test Document Revision Level B | Dated 20-Feb-21

MANUFACTURER INFORMATION

Supplier ABC
Organization Name & Supplier/Vendor Code

123 Innovation Way
Street Address

Torrance | CA | 90248 | U.S.A
City | Region | Postal Code | Country

CUSTOMER INFORMATION

Axcelis Technologies
Customer Name

Jane Smith
Axcelis Buyer Name/Contact Information

Purion XE
Application/ Tool Family (if applicable)

MATERIALS REPORTING

Has customer-required Substances of Concern information been reported? ☐ Yes ☐ No ☑ n/a

Submitted by IMDS or other customer format:

Are polymeric parts identified with appropriate ISO marking codes? ☐ Yes ☐ No ☑ n/a

part and contact information

(Reference Axcelis PSW Template 999002039)

axcelis

Part Submission Warrant – PSW

REASON FOR SUBMISSION (Check at least one)

- ☐ Initial Submission
- ☑ Engineering Change(s)
- ☐ Tooling: Transfer, Replacement, Refurbishment, or additional
- ☐ Correction of Discrepancy
- ☐ Tooling Inactive > than 1 year
- ☐ Change to Optional Construction or Material
- ☐ Supplier or Material Source Change
- ☐ Change in Part Processing
- ☐ Parts Produced at Additional Location
- ☐ Other - please specify below

Details of change: Replacing obsolete sub-component in power supply (circuit breaker G replaced with circuit breaker M)

REQUESTED SUBMISSION LEVEL (Check one)

- ☐ Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to Axcelis.
- ☐ Level 2 - Warrant with limited supporting data submitted to Axcelis
- ☑ Level 3 - Warrant with complete supporting data submitted to Axcelis
- ☐ Level 4 - Warrant and other requirements as defined by Axcelis
- ☐ Level 5 - Warrant with complete supporting data and (if required) viewed at organization's manufacturing location.

Reason for request and details of the change

(Reference Axcelis PSW Template 999002039)

axcelis

Part Submission Warrant - PSW

SUBMISSION RESULTS

The results for ☑ dimensional measurements ☑ material and functional tests ☐ appearance criteria ☐ statistical process package

These results meet all drawing and specification requirements: ☑ Yes ☐ No (If "NO" - Explanation Required)

Mold / Cavity / Production Process PROCEDURE 1234 ☑ n/a

DECLARATION

I hereby affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all Axcelis Quality & Business Requirements to Suppliers. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below.

EXPLANATION / COMMENTS: No deviations to declare

Manufacturer Authorized Signature	Chris Jones of Supplier ABC	Date	5/7/2021
Print Name	Chris Jones	Phone #	978-123-1234
Title	Quality Manager	E-mail	chris.jones@supplierabc.com

Declaration that parts meet customer requirements

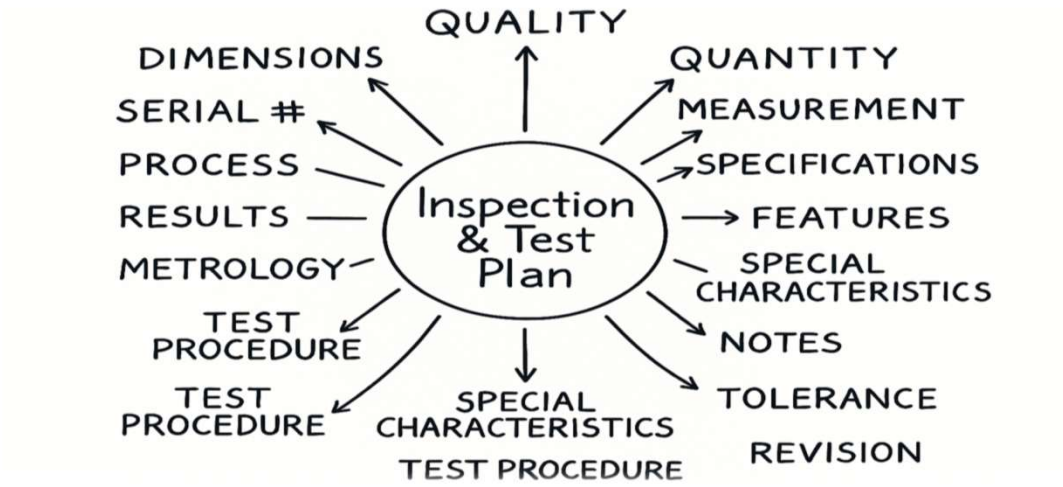
(Reference Axcelis PSW Template 999002039)

axcelis

First Article Inspection Reporting (FAIR)

- Supplier First Article Inspection & testing activities shall be completed and submitted per Axcelis Specification 999001218.
  - Axcelis does not have a required FAIR template, suppliers may use their own template.
  - Email PCI FAIR submittals to FA@axcelis.com and CC the assigned Buyer & SQE.

    NOTE: FAIRs for PCI parts cannot be shipped until SQE approval is acquired.
- For complex assemblies and systems, Axcelis may request suppliers to use the AS9102 style FAIR template found in the supplier portal.



Internal basic FAIR template is available if supplier does not have one: ***Reference 999001219***

axcelis

Common FAIR Misses: Spec Breakdown

- A spec breakdown is the step in the First Article Inspection (FAI) process where all requirements for a part—drawings, specifications, notes, standards, and customer documents—are decomposed into individual, measurable, and verifiable characteristics.
- This ensures that every product requirement is identified, understood, assigned an inspection method, and verified during the First Article run.

COPY EXACT (CE)

- Copy Exact (CE) is generally defined as a manufacturing change-control philosophy where **no element of the process** that could affect form, fit, function, appearance, or performance may be changed without formal approval.
  - Axcelis strives to ensure production processes are documented, frozen, and maintained consistently across all manufacturing sites.
    - In short: same inputs → same process → same outputs.
- When Axcelis is satisfied with delivered PCP and FAIR, and has successfully completed any additional testing, Axcelis notifies the supplier that their process is qualified and that they may begin production using Copy Exact principles.
  - Suppliers shall maintain complete traceability of materials, lots, process steps, and equipment configurations, and provide evidence of compliance upon request (audit support).
- Primary suppliers are responsible for ensuring their employees and **all sub-tier partners** comply with CE principles, and do not make unapproved changes.

Better isn't better, **the same is better!**

axcelis

COPY EXACT (CE) – Change Requests

- Change Request (CR) via PSW submission must include:
  - Justification for change
  - Risk assessment
  - Qualification / validation plan
  - Success criteria
  - Proposed timeline
- Supplier changes may only be implemented after Axcelis provides:
  - Completion, and acceptance, of verification/qualification data.
  - Written approval via PSW.
- Communicate changes via PSW as early as possible to obtain approval before delivering product with any change.
  - Axcelis may need up to 12 months to fully review and approve any change submitted on PSW.
- In addition to the PSW submittal, CRs typically result in the need to:
  - Up-rev & re-submit PCP documentation as applicable
  - Repeat (delta) FAIR review & approval process

axcelis

Changes That Require PSW Submittals

- Any modification, by Supplier or Sub-Tier, to any of the following require PSW review & approval from Axcelis:
  - Design
    - Physical Dimensions, material properties, Structural features, Finish/Coating, Software/Firmware
  - Manufacturing process
    - Documentation including Procedures, Work Instructions, Inspection or Test Plans, PCPs
    - Process Parameters (time, temperature, pressure, flow, etc.)
    - Manufacturing sequence (order of operations)
    - Automation/PLC programs
    - Environmental Conditions (cleanliness, temperature, humidity, natural disaster, etc.)
  - Equipment, Machines, & Tooling
    - Use of alternate equipment, machines, tooling, fixtures, or configurations.
    - Machine model, configuration, software, firmware, & calibration.
  - Raw materials (some material is intended to be sole sourced)
    - Change in material manufacturer or supplier
    - Use of alternate materials (Raw stock, chemicals, coatings, etc.)
  - Parts (some parts are intended to be sole-sourced)
    - Part obsolescence and/or use of alternate parts (even if they appear to be form/fit/function alternatives, i.e., commercial parts)
  - Facility & Manufacturing location
    - Change in location, or re-arranging facilities

axcelis

COPY EXACT (CE) – Change Controls

- Any changes to a process of record after it has been approved/qualified/frozen can have unforeseen consequences to our end users and requires Axcelis review & approvals; as Suppliers cannot test the criticality of changes.
- Even the smallest change in materials, equipment, process parameters, or supplier inputs can create significant unintended impacts for the end user. A small change may appear benign at the supplier level, yet at high-value production scales, even a 0.1% performance shift can have massive downstream consequences.
- Suppliers shall Immediately notify Axcelis if any unplanned deviation occurs, along with containment and corrective actions.
  - Any change , or deviation, executed without approval constitutes a Copy Exact violation.
- Violations, or failure to comply with CE, may result in:
  - Rejection, and return, of any impacted material.
  - Corrective action requirements (SCAR).
  - Removal from Axcelis' approved supplier list.
  - Other commercial penalties as defined in supplier agreements.

axcelis

FAQ - Q & A

- If I am a supplier trained to Axcelis' PCI Processes and have made PCI parts in the past; Does this automatically qualify me to manufacture & deliver orders for other PCI parts that we have not made in the past?
  - NO. Axcelis does not have "PCI Approved Suppliers" that qualify them to make any PCI part.
  - All suppliers approved to do business with Axcelis require part specific PCI qualification activities per 880001734.
- Are there any POR changes that can be made by suppliers or sub-tiers without Axcelis Approvals?
  - NO, any change to the POR requires PSW review and approval.
- Axcelis is flowing down a design change to the primary supplier, can we continue to deliver previous product revisions until new production is qualified for the latest revision?
  - This is subjective to Axcelis' ECO Disposition for procured parts and will need to be discussed on a case-by-case basis with your Axcelis Buyer & SQE.

Thank You