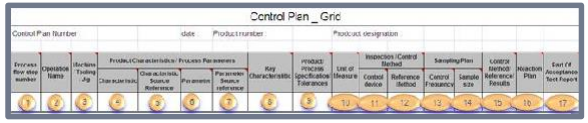
Control Plan

Control Plan

- **Why this requirement ?**
  - To have a summary description of the system used to minimize Process and Product variation (measurement, testing,...) and to control parts and processes (control and inspection...).
  - To have an harmonized template that contains the complete list of measurements, controls, tests, inspections, and standardized documents (e.g. specification tolerances, inspection/control method, control method/ref/results, reaction plan) that lead to ensure manufacturing of products on quality, on time and on cost.
  - To reduce wastes and improve quality of the product by value added measurement, testing and inspection (inspection strategy).
  - To provide a clear visibility that characteristics which are significant to the customer have been taken into account.
  - To avoid controls duplication.

Control Plan

- **How to meet this requirement ?**
  - A cross functional team shall develop the control plan by using all available information.
  - Inputs for control plan:
    - Customer Specifications (list of measurements including KCs and KPPs, list of tests / Controls, sample frequency, tolerance limits,...)
    - Suppliers Specifications (including list of internal KCs and KPPs, metrology specifications,...)
    - Test strategy,
    - Quality and measurement records,
    - ...
  - The control plan shall be formalize into a dedicated template



  - The Supplier shall verify that all measurements / test / control / inspection required by the Customer are included into the Control plan.
  - The Supplier shall ensure that all measurements / test / control / inspection defined by the control plan are implemented accordingly in production.
  - The Control Plan is a living document updated according to process improvements and will also be regularly reviewed to improve process performances.

Control Plan Template

Control Plan _ Grid

Control Plan Number :					date :	Product number :			Product designation :									
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1. Process step identification coming from the manufacturing flowchart (or traveller sheet).
2. Operation/Name (process step name) in the Manufacturing flowchart (or traveller sheet).
3. Give a precision of which equipment, machine, jig & tool inside the operation (process step) define in the column 2.
4. Fill in if the measurement, control, inspection is done on the product .
5. Origin of the Product Characteristic
6. Fill in if the measurement, control, inspection is done on the process.
7. Origin of the Process Characteristic
8. Put a cross if it is identified as a Key Characteristic.
9. Give the reference of the document which specify the tolerance for the characteristic.

10. Give the unit of the measurement, control, test, inspection.
11. Give the name of the measurement, control, test, inspection equipment.
12. Give the reference of the document which describe the measurement control, test, inspection method.
13. Give the frequency of the measurement, control, test, inspection.
14. Fill in the sample size necessary for measurement, control, test, inspection.
15. Give the method used to record the results and the reference of the document where it is recorded.
16. Give the reference of the Reaction plan in case of measurement out of authorized values.
17. Indicate if it is part of the Acceptance Test Report.

Control Plan detailed example

Control Plan _ Grid

Control Plan Number : | date : | Product number : | Product designation :

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		SPC loomspeed-1	Bronzemeshweaving-1	no
12	MEAS aperture	Aper 1,2,3	Wire mesh Aperture width	AIPI xxxx			Yes	Airbus ABS5327	µm	Aper 1,2,3	aperwidth-1		every roll	SPC aperwidth-1	Bronzemeshweaving-1	yes
13	Particle INSP		particles contamination	PFMEA			No	Bronzemesh weaving-1	particles count	Bright light 1,3	Bright light-2	every day	2 roll	SPC loomparticles-2	Bronzemeshweaving-2	no

Control Plan Template: Process flow step number

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
1																

- Identify the process step number with regards to the Manufacturing flowchart (or traveller sheet)
- Easy to retrieve at which manufacturing step the measurements, controls, tests, inspections takes place

Process flow step number
8

Control Plan Template: Operation/Name

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
	2															

- Identify the process step name:
  - Fill-in with Manufacturing process name if the measurements, controls, tests, inspections are included in the process step (in this case more details will be given in the column 4 and 6)
  - Fill-in with Measurements, controls, tests, inspections name if it is a separate process step in the manufacturing flow-chart

Process flow step number	Operation Name
8	Weaving

Control Plan Template: Machine / Tooling / Jig

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
		3														

- Provide on which Equipments, Machines, Jigs & Tools the Product Characteristic or Process Parameter to be measured, controlled, tested, inspected is run (a list could be provided or a reference to a document specifying the list)
- All Equipments, Machines, Jigs & Tools authorized in production to manufacture the products referenced in the control plan shall be listed (some equipments can be disqualified in production due to insufficient capability, so they will not be listed)

Process flow step number	Operation Name	Machine / Tooling / Jig
8	Weaving	Loom 1 to 8

Control Plan Template: Characteristic

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
			4	5	6	7										

- Indicate if the measurements, controls, tests, inspections is done on the Product Characteristic or on a Process Parameter → fill-in column 4 or 6.
- Define the name of the measurements, controls, tests, inspections
- Highlight the document reference (source) defining the Characteristic, could be from a Customer specification, after product or process risk analysis, etc ...

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters			
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference
8	Weaving	Loom 1 to 8			speed	PFMEA

Control Plan Template: Key Characteristic

Control Plan _ Grid																		
Control Plan Number :					date :	Product number :			Product designation :									
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
							8									

- Highlight if the Product Characteristic / Process Parameter is defined as a Key Product or Process characteristic

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference	
8	Weaving	Loom 1 to 8			speed	PFMEA	No

Control Plan Template: Product / Process Specification / Tolerances

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
								9								

- Indicate the reference of the document where the tolerance / acceptance criteria for measurements, controls, tests, inspections are specified.
- This document shall be available at work-station for production use

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference		
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1

Control Plan Template: Unit of Measure

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
									10							

- Give the unit of the measurement, control, test, inspection (°C, μm,…)

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference			
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour

Control Plan Template: Control Device

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
										11						

- Indicate the name of equipments / devices authorized in production to perform the measurement, control, test, inspection (a list could be provided or a reference to a document specifying the list)

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method	
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	

Control Plan Template: Reference Method

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
											12					

- Mention the reference of the document which describe the measurement control, test, inspection method to be applied to perform the control.
- This document shall be available at work-station for production use

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method	
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1

Control Plan Template: Control Frequency

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
												13				

- Define how often the measurement, control, test, inspection shall be done.
- This control frequency would be challenged regularly in accordance to the Test Strategy and the Continuous Improvement to lead to quality improvement and cost reduction.

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan	
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day	

Control Plan Template: Sample Size

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
													14			

- Indicate the size of the sample taken to perform the measurement, control, test, inspection.
- This Sample Size would be challenged regularly in accordance to the Test Strategy and the Continuous Improvement to lead to quality improvement and cost reduction.

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan	
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day	

Control Plan Template: Control Method / Reference / Results

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
														15		

- Give the name of the File / document where the results are recorded (e.g. SPC charts name, data file, …)
- This File / document shall be available at work-station for production use

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size	
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		SPC loomspeed-1

Control Plan Template: Reaction Plan

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
															16	

- For each measurement, control, test, inspection, give the reference of the Reaction plan which describes the activities to be done in case of Out of Control / Out of tolerance limit / Out Of Acceptance criteria, …
- This document shall be available at work-station for production use

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size		
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		SPC loomspeed-1	Bronzemeshweaving-1

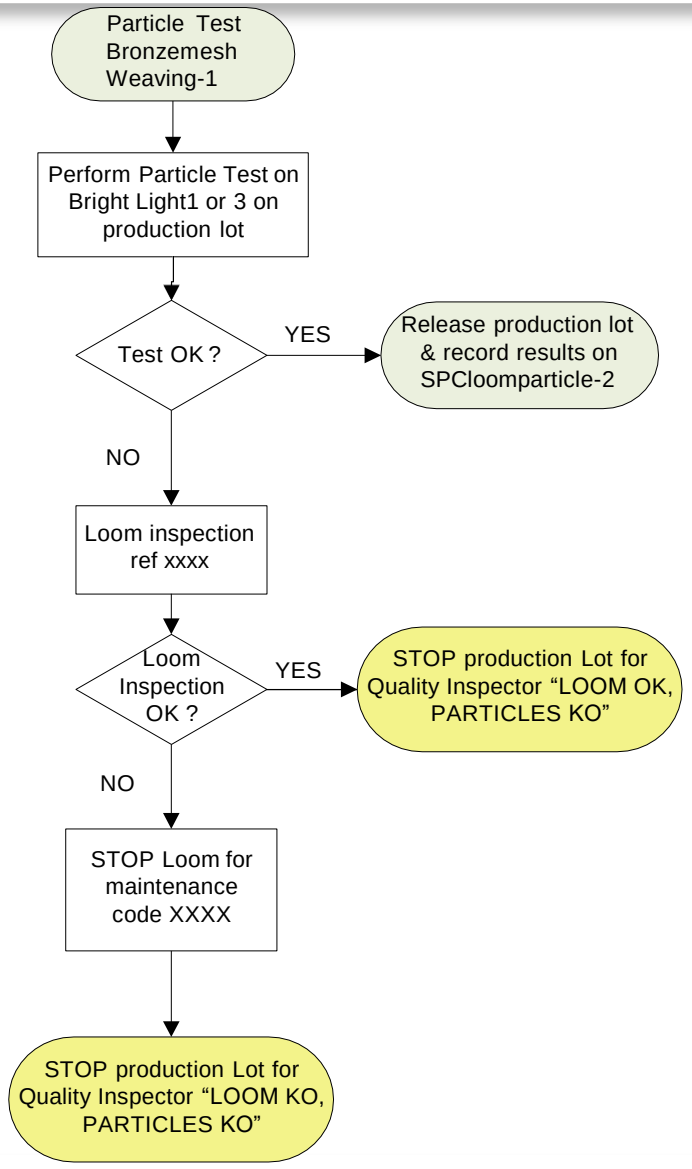
Reaction Plan Example

Control Plan _ Grid

Control Plan Number : | date : | Product number : | Product designation :

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters			Key Characteristic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method Reference / Results	Reaction Plan	Part Of acceptance test Report
			Characteristic	Characteristic Source Reference	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
8	Weaving	Loom 1 to 8		speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		SPC loomspeed-1	Bronzemesh weaving-1	no
12	MEAS aperture	Aper 1,2,3	Wire mesh Aperture width	API xxxx		Yes	Airbus AIDS5327	µm	Aper 1,2,3	aperwidth-1		every roll	SPC aperwidth-1	Bronzemesh weaving-1	yes
13	Particle INSP		particles contamination	PFMEA		No	Bronzemesh weaving-1	particles count	Bright light 1,3	Bright light-2	every day	2 roll	SPC loomparticles-2	Bronzemesh weaving-2	no

- The Reaction Plan (Out Of Control Action Plan) is performed for each measurement, control, test, inspection to describe the activities to perform in case of Out of Control results.
- This Reaction Plan is part of the Standard Operating Instruction (SOI) available at workstation.



Control Plan Template: Part of Acceptance Test Report

Control Plan _ Grid																	
Control Plan Number :					date :	Product number :			Product designation :								
Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			

17

- Indicate if it is part of the Acceptance Test Report

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters				Key Characteristitic	Product/ Process Specification/ Tolerances	Unit of Measure	Inspection / Control Method		Sampling Plan		Control Method/ Reference/ Results	Reaction Plan	Part Of Acceptance Test Report
			Characteristic	Characteristic Source Reference	Parameter	Parameter Source reference				Control device	Reference Method	Control Frequency	Sample size			
8	Weaving	Loom 1 to 8			speed	PFMEA	No	Bronzemesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		SPC loomspeed-1	Bronzemeshweaving-1	no

How DFMEA/PFMEA, KEY CHARACTERISTICS and CONTROL PLAN are linked?

Process Function / Requirements	Potential Failure Mode	Potential Effect(s) of Failure	SEVERITY	Class	Potential Cause(s) / Mechanism(s) of Failure	OCCURRENCE	*Current Design / Process Controls* **Prevention**	*Current Design / Process Controls* **Detection**	DETECTION	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action results: Actions Taken & Effective Date	Action results: SEVERITY	Action results: OCCURRENCE	Action results: DETECTION	Action results: RPN
										0							0
										0							0
										0							0
										0							0

Potential causes/mechanism of failure analysis (associated with high RPN) is one of the major input for KEY CHARACTERISTICS identification

AIRBUS

Control Plan _ Grid

Control Plan Number : | Issue : | date : | Product number : | Proccuct designation : | Point of embodiment

Process flow step number	Operation Name	Machine / Tooling / Jig	Product Characteristics / Process Parameters: Characteristic	N°	Characteristic Source Reference	Parameter	N°	Parameter Source reference	Critical Item	Acceptance criteria	Unit of Measure	Inspection / Control Method: Control device	Reference Method	Sampling Plan: Control Frequency	Sample size	Delegation Level	Recording / check sheet	Attestation Requirement	Reaction Plan
....																			
8	MEAS speed	Loom 1 to 8				speed	5	FMEA	no	Bronzamesh weaving-1	linear meter /hour	speed meter	speedmeter-1	every day		operator	SPC loomspeed-1	no	Bronzamesh weaving-1
12	MEAS * aperture	Aper 1,2,3	Wire mesh Aperture width	4	API xxxx				yes	Airbus ABS6327	µm	Aper 1,2,3	aperwidth-1		every roll	operator	SPC aperwidth-1	yes	Bronzamesh weaving-1
13	INSP		particles contamination	6	PFMEA				no	Bronzamesh weaving-1	particles count	Bright light 1,3	Bright light-2	every day	2 roll	operator	SPC comparticles-2	no	Bronzamesh weaving-2
....																			

The Feedback Loop process flow