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Master Document: **Control Plan Requirements**

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Revision	Description of Change
B to C	Updated process owners list Designated access to this standard as 'Unrestricted' Removed embedded templates. Added reference in Section 4. Replaced 'critical' characteristics with 'safety' characteristics to reflect changes to GS-0004

Changes in relation to previous issue are written with red, alternatively for figures and tables with a red frame around.

1 GENERAL

Sauer-Danfoss is committed to continually improving its products through the use of Advanced Quality Planning Tools. One of these tools is the Control Plan, which is the document describing the systems for controlling parts and processes. The Control Plan is a living document and should be updated to reflect the addition / deletion of controls based on experience gained by producing parts. This document is utilized to identify and document the part and process controls used for manufacturing, assembly, testing, painting, handling and shipping as necessary to make sure the internal or external customer receives a sustainable quality part/product according to the relevant prints and specifications. A Control Plan should be issued or reviewed:

- When a new system, product, option, part or process is designed
- When existing systems, products, options, parts or processes are about to change, regardless of the reason
- When new applications with new operating conditions are identified for existing systems, products, options, parts or processes

A Control Plan could be used during the early concept phase in the Product Development and Launch Process (PDLP), as well as the detailed phase (Pre-Launch Control Plan), to control the risk of not delivering a product to the customer with the intended functions.

2 PURPOSE

2.1 The philosophy behind the Control Plan

The purpose of the Control Plan is to aid in the production of quality products according to customer requirements. It does this by providing a structured approach for the design, selection and implementation of value-added control methods for the product.

A Control Plan provides a written summary description of the method used in minimizing process and product variation.

3 THE GUIDANCE FOR DEVELOPING A CONTROL PLAN

The intent of the Control Plan form displayed in this Global Standard is to provide an example of how this information can be documented. An alternate format can be used as long as it contains the same information as a minimum. The Control Plan does not replace the information contained in detailed operator instructions.

The Control Plan is applicable to a wide range of manufacturing processes and technologies. The Control Plan is an integral part of an overall quality process.

A single Control Plan may apply to a group or family of products that are produced by the same process at the same location/source/supplier.

One challenge in preparing a control plan is scope. There are many systems and processes in a factory that have to be working properly in order to guarantee quality (e.g. training, preventive maintenance, gage calibration, etc.). A process control plan for an assembly process can not also be the process control plan for these other processes and systems, or it will lose focus and become unusable. At the same time, there are some minimum checks

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that operators can do to ensure that the line is ready to produce quality products. These minimum checks of outside systems may be included in the process control plan. A good general rule in a control plan is only including checks that the operator and/or a process inspector in that area would perform.

Examples of what to and not to include in a production control plan:

Include:

- once per shift / week checks by the operator with a golden unit to ensure test stand stability
- verification by operator that TPM sign-offs on his equipment are current
- verification by cell lead that all operators are qualified at their operation

Don't include:

- calibration of torque guns by metrology lab personnel
- verification of oil cleanliness by maintenance department
- testing of operators to ensure skill proficiency

3.1 The Pre-Launch Control Plan

A Pre-Launch Control Plan is a description of the dimensional measurements (with emphasis on **Safety** and Key Characteristics) and material and functional tests that will occur after prototype and before full production. The Pre-Launch Control Plan should include additional product/process controls to be implemented until the production process is validated.

The purpose of the Pre-Launch Control Plan is to contain potential non-conformance during or prior to the initial production runs. Examples are:

- More frequent inspection
- More in process and final check points
- Statistical evaluations
- Increased audits

3.2 Production Control Plan

The Production Control Plan is a written description of the methods for controlling parts and processes. The Production Control Plan is a living document and should be updated to reflect the addition/deletion of controls based on experience gained by producing parts. (Approval by the purchasing organization of Sauer-Danfoss may be required for purchased products).

The Production Control Plan describes the actions that are required at each phase of the process including receiving, in-process, out-going and periodic requirements to assure that all process outputs will be in a state of control. During regular production runs, the Production Control Plan provides the product and process monitoring and control methods that will be used to control **Safety** and Key Characteristics (Features) as well as other product characteristics for which compliance to a specification is required.

Since processes are expected to be continually updated and improved, the Control Plan reflects a strategy that is responsive to the changing process conditions.

The Control Plan is maintained and used throughout the product life cycle. Early in the product life cycle its primary purpose is to document and communicate the initial plan for process control. Subsequently it guides production in how to control the process and ensure product quality.

3.3 Guidance for Developing a Control Plan

For process control and improvements to be effective, a basic understanding of the process must be obtained. A multi-disciplined team is established to develop the Control Plan by utilizing all the available information to gain a better understanding of the process, such as

- Process Flow Diagram
- System/Design/Process FMEA
- **Safety/Key/Process**/Standard Characteristics (Features)
- Lessons learned from similar parts
- Team's knowledge of the process
- Design reviews
- Optimization methods (e.g. QFD, DOE, etc)

The benefits of developing and implementing a Control Plan include:

Quality: The Control Plan reduces waste and improves the quality of products during design manufacturing and assembly. Control Plans help to identify the sources of variation (input variables), which cause variation in product characteristics (output variables).

Customer satisfaction: The Control Plan focuses resources on processes and products related to characteristics that are important to the customer. This helps to reduce costs without sacrificing quality.

Communication: As a living document the Control Plan identifies and communicates changes in the product/process characteristics, control method and measurement methodology.

4 CONTROL PLAN FIELD DESCRIPTIONS

(See Appendix A)

This Control Plan form is also available as a Quality Template.

1. Part Number:

Part number of the part or assembly being controlled.

2. Part/Assembly Description:

Name and description of the product or process being controlled.

3. Supplier Name:

Name of supplier responsible for producing the part or assembly, along with his/her phone number.

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4. **Preparer:**
Name(s) of the individual(s) responsible for preparing the control plan or the primary contact responsible for the Control Plan.
5. **Responsible:**
Indicates who is responsible for completing the control method.
6. **Revision Level:**
Latest engineering design level and/or issue date from the drawing specification.
7. **Decision/Engineering Change Number:**
Number assigned to the engineering change.
8. **Date:**
Date the original Control Plan was compiled.
9. **Revision Date:**
Date the latest Control Plan was updated.
10. **Process/Operation Description:**
Description of the generating process/operation which produces the characteristic. The processes listed in the control plan should agree with the process flow diagram and the process FMEA.
11. **Characteristics:**
There are four columns in a control plan form which describe the characteristic being measured.
 - a. The first column, No., is just an identifier column which will allow the team to link a characteristic between the D/PFMEA, Process Flow Diagram, Control Plan, and part drawing documents.
 - b. The Product Characteristic column indicates the part or product features that are being affected and monitored at each process step. All **safety**, key, and identified process characteristics must be listed on the control plan with a method for controlling. In addition, other features for which compliance to a specification is mandatory should also be included in the control plan.
 - c. The Process Characteristic column is intended for those input variables that affect important product characteristics, and the idea is that most often it is more effective to control the output by controlling the input. In general, each row of the Control Plan should have either the Product or a Process Characteristic in it but not both. There could be one or more process characteristics listed for each product characteristic.
 - d. **Special** characteristics are those product or process parameters for which variation is likely to significantly affect **safe operation or** customer satisfaction with the product, such as fit, form, function, or appearance. This designation should come from either the system, design, or process FMEA.

12. Evaluation/Measurement Technique:

The measurement system being used. This could include gages, fixtures, tools and/or test equipment required to measure the part or process. Gage Repeatability & Reproducibility analysis should be performed and the results documented.

13. Sample Size/Sample Frequency:

When sampling is required, list the sample size and frequency.

14. Control Method:

A brief description of how the operation will be controlled (e.g. SPC, sampling or 100% inspection, audit, mistake-proofing, etc.).

15. Reaction Plan:

The corrective actions necessary to avoid producing non-conforming products or operating out of control.

CHANGE HISTORY:

Revision	Date	Description of Changes
A to B	2006-12-06	Process owners changed to Quality Leaders More clarifying text added to Guidance section More clear instructions on some fields of the form
B to C	2010-01-04	Updated process owners list Designated access to this standard as 'Unrestricted' Removed embedded templates. Added ref. in section 4. Replaced 'critical' characteristics with 'safety' characteristics to reflect changes to GS-0004

