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D to E	Removed detailed description of supplier approval and performance monitoring process and moved it into GS-0051. Also added a reference to the new supplier classification process but left the detail to GS-0051

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



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1 INTRODUCTION

Dear Supplier,

Sauer-Danfoss (SD) is pleased to present our Supplier Quality Manual (SQM). The SQM represents SD practices and philosophies. All suppliers of production components and assemblies must comply with the requirements contained within this manual. This also applies to suppliers of service parts unless a special agreement states otherwise. Our intention is that the SQM can be used as a tool to clarify communication and foster continuous improvement. SD expects our suppliers to embrace the contents of this manual and incorporate it into their everyday operations and product development activity to assure the highest possible quality is achieved.

After you have reviewed the enclosed information, if you still have questions, we invite you to contact your main contact in SD purchasing department.

1.1 Vision

Our vision for all SD suppliers is to implement and maintain a quality system that allows them to produce and deliver to SD globally competitive products and services clearly seen by our customers as superior in performance and value.

1.2 Goal

The goal of the SQM is to provide a uniform method for all SD units to communicate general requirements, expectations, and guidelines to the supply chain in an effective way. The SQM defines the fundamental quality system activities that SD units expect from suppliers to ensure on-going quality planning, control and improvement.

1.3 Approach

Suppliers are expected to discuss and understand the specific applicability of these requirements with their SD representatives in order to make effective business decisions.

Suppliers are welcome to use the SQM as an aid in further developing their own quality systems. SD is committed to integrate suppliers into its business processes to maximize the Genuine Value for all SD stakeholders: our customers, sales companies, shareholders, employees, suppliers, and communities. The SQM is a part of that commitment.

2 GENERAL REQUIREMENTS

2.1 Supplier Quality system

Many suppliers are registered or are currently pursuing registration/compliance to standards audited by third party registrars such as ISO 9001 and TS 16949. The SQM is based on SD Global Quality Standards, the AIAG Manuals and ISO 9001. SD encourages the supply chain to become compliant and certified to ISO 9001 at a minimum.

This SQM represents the minimum requirements for SD. To achieve continuous improvement, SD expects our suppliers to embrace a sound quality system and to work with us in a spirit of trust, cooperation, and teamwork. Many of the activities referenced in this manual are further explained in the AIAG (Automotive Industry Action Group) manuals, such as measurement systems analysis (MSA) and failure mode and effects

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analysis (FMEA), Statistical Process Control (SPC), and production part approval process (PPAP). SD recommends that the supplier obtain copies of the AIAG manuals. SD units will continue to move towards the requirements of TS 16949 along with our customers and further embrace the philosophies of continuous improvement. Through executing the proper quality planning activities, SD and our supply base will be able to install control measures to eliminate the issues that lead to customer dissatisfaction.

Suppliers should perform a self-evaluation to determine whether their Quality system aligns with the SQM.

2.2 Environmental Requirements

SD will strive to be the Environmental, Health & Safety leader wherever we do business.

The environment will be a parameter in supplier selection and evaluation.

We will encourage our suppliers to promote a sustainable development and strive to prevent undesirable impacts on the environment and to use applicable environmental management systems. It is SD's expectation that suppliers conform to ISO 14001.

Suppliers will be informed about our specific environmental demands, such as the Negative List for Substances and Materials (GS-0057), which has two lists:

- Banned substances, which under no circumstances shall be present in our products, or used in the processes used to manufacture SD products.
- Restricted substances, which are allowed, but should, if possible, be replaced with acceptable alternatives.

SD also strives to comply with the RoHS directive, 2002/95 EC.

2.3 Sauer-Danfoss safety requirements

At SD, safety is a major priority. It is up to each and every person to work safely and make sure others follow safe practices. Our facilities and processes involve heavy parts, various fabrication operations and frequent transportation of parts within our processes. To prevent any accidents, it is extremely important to follow all instructions given to you by your guide or contact. Always inquire about and follow all safety rules of any SD facility before entering any of the work environments. The following rules and safety practices are expected to be observed and followed while visiting or working within a SD facility:

- Be aware, that in some facilities safety glasses and hearing protection are required.
- Wear safety shoes (steel toed shoes) any time you are expecting to visit or work inside a production area.
- Exceptions, e.g. safety shoes, apply if you are touring and will stay within the main aisle ways of the production floor.
- Do not handle any parts that are a part of our production process unless approved by your guide, you have been advised of other applicable safety gear, e.g. gloves, sleeves, aprons etc. Watch for pinch or nip points, and use all machine guarding and safety devices.
- Stay clear of any processes unless you have been trained, approved or are otherwise closely attended by a SD employee.

- Remain aware of your surroundings and always look both ways before crossing an aisle way, thru doors or around a production line.
- Yield to plant vehicle traffic. Be careful when walking in or out of blind spots.
- Use convex mirrors mounted from the ceiling to avoid lift trucks.
- Walk, never run on the factory floor and never stand or walk under a suspended load.
- Never defeat or remove a safety device.
- Be advised that the line conveyors start and stop automatically, following floor markings.
- Comply with all warning signs and notices.

2.4 Supplier Facility Access

By prior notice, suppliers shall allow Sauer-Danfoss and SD customers access to both their facilities and those of their suppliers and sub-contractors, for the purpose of evaluating parts, processes, documents (i.e. FMEA, Control Plan, instructions, records...), methodologies and systems used in manufacturing Sauer-Danfoss products.

SD may, at its discretion, use third-party independent auditors. These individuals represent SD and will audit the supplier's processes to establish conformance to validated quality systems.

2.5 Contingency Plan

Suppliers shall develop a contingency plan for potential bankruptcy or catastrophes disrupting product flow to Sauer-Danfoss and advise Sauer-Danfoss at the earliest in the event of a bankruptcy or actual disaster. In a bankruptcy or actual catastrophe, suppliers shall provide Sauer-Danfoss access to Sauer-Danfoss' tools and/or their replacements.

2.6 Supporting Data for Quotations

SD requires the supplier to have a system to support the development of final quotes with documented data sources. The data sources must be able to prove predictive capability and Gage R&R for key characteristics.

3 SUPPLIER EVALUATION & SELECTION (GS-0051)

3.1 Purpose

To define the guidelines in the Supplier Evaluation & Selection process. Before a potential supplier can be an approved supplier, two evaluations have to be successfully passed with a minimum score. The evaluations are:

- Potential Supplier Assessment (PSA)
- Supplier Quality Assurance (SQA) Audit

These two evaluations are described in greater detail in [the global standard GS-0051, Approval, Classification, and Performance Monitoring of External Suppliers](#).

4 SUPPLIER **CLASSIFICATION AND PERFORMANCE MONITORING (GS-0051)**

4.1 Supplier Assessment

Existing suppliers to Sauer-Danfoss shall be evaluated on an ongoing basis via the monitoring of quality PPM level and delivery on time percent. **Based on how they fit into Sauer-Danfoss' overall sourcing strategy, suppliers will be placed into one of four classification levels: 'Preferred', 'Develop', 'Keep / Probation', and 'Phase Out'. Details on performance monitoring, the classification levels, and their implications for suppliers are explained further in global standard GS-0051.**

5 **ADVANCED PRODUCT QUALITY PLANNING (APQP)**

5.1 APQP

Suppliers with part design or manufacturing process design responsibility are expected to use the APQP process when launching a new product for SD. When requested, suppliers shall provide APQP status reports for a product with regard to meeting the program objectives of quality, cost performance, and timing.

5.2 **Special Characteristics (GS-0004)**

The “vital few” characteristics or features of the design that are closely associated with the most important safety and quality aspects of a product are marked on SD drawings with symbols according to the Customer Importance Table (CIT). The CIT specifies the minimum process capability/PPM requirements for each characteristic, specifically, $C_{pk} > 1.33$ for all key characteristics. In all cases, SD is expecting zero defects on supplied parts.

The special characteristics are classified as part of the SD quality planning process (D-FMEA) to ensure particular attention is paid during the design and process planning stages to establish process capability and control, and also to indicate to the process/ service operator the level of importance of the operation they are performing.

It is important that the supplier identifies the special characteristics in their FMEA and Control Plan and therefore ensures that the appropriate controls are in place. The existence of special characteristics will require more elements in the PPAP-process such as Capability Studies and Measurement Systems Analysis Studies (Gage R&R).

Note:

The CIT is still not implemented on all SD drawings. In these situations the identification of characteristics must be based on a specific agreement between the supplier and SD Quality/Purchasing.

5.3 **Cleanliness requirements**

Because of the nature of hydraulic components, the performance of SD products is sensitive to part cleanliness. Hydraulic components may also be very sensitive to burrs, so SD expects supplied parts to adhere to the specification for burrs defined in ISO 13715. The supplier shall be responsible for all product cleanliness which includes all packaging materials (including internal packaging and returnable dunnage). For some components SD has specific requirements for the cleanliness. In some cases the requirements include a

maximum permissible amount of particles per unit area and/or maximum permissible length (μm) of the largest particle and/or residual magnetism. Please contact the SD Quality/Purchasing representative for more specific information about definitions, methods and guidelines.

5.4 Packaging / labeling / shipment requirements

SD and the supplier shall agree upon the packaging, labeling and shipping requirements. A description should be included in the PPAP submission. Suppliers providing product to multiple operating units, on a global scale, shall work with each of the locations to assure that the packaging is sufficiently robust to withstand shipment by sea and arrive on time, without damage.

6 PRODUCTION PART APPROVAL PROCESS (PPAP)

6.1 Purpose

To establish the method for performing the Part Approval process for a purchased component or assembly. This section applies to all direct suppliers for the submission of new parts and products or following a design or process change.

6.2 PPAP Requirements (GS-0008)

For the verification of purchased parts, SD requires the supplier to submit a completed PPAP-package for each new part & other special cases, as defined by SD. The required PPAP level is 4 as defined in AIAG PPAP Fourth Edition.

PPAP-parts shall be taken from a significant run. This production run shall total a minimum of 30 consecutive parts (unless specifically agreed otherwise with SD) and be manufactured at the production site, at the production rate, using the production tooling, gaging, process, materials, and operators. Parts from each unique production process stream shall be measured and representative parts tested.

Any results that are outside specification are cause for the supplier not to ship components. Every effort shall be made to correct the process so that all design record requirements are met. If the supplier is unable to meet any of these requirements, SD shall be contacted for determination of appropriate corrective action.

Note:

The supplier shall not ship production material that has not been PPAP approved unless the appropriate contact at the receiving plant provides approval to ship in writing. The material will be quarantined at the receiving inspection and not released for production until full PPAP or conditional approval is granted. Samples of products may be shipped without PPAP approval, but shall be appropriately labeled so that they are identified.

6.3 PPAP elements

A PPAP-package consists of the PPAP elements displayed below. All items or records may not necessarily apply to every part number. For example, some parts do not have appearance requirements or color requirements. The *SD PPAP Worksheet Template* provides a guideline for which PPAP elements need to be provided based on the type of reason for submission.

Note:

In cases where specifications & other requirements can not be met, this should be clearly noted both in the specific form and in the PSW (Part Submission Warrant). It will then be the decision of SD whether to reject the PPAP and require resubmittal with satisfactory results prior to production shipment or to grant conditional approval while the corrective action plan for the discrepant condition is performed.

- Design Record
- Engineering Change Documents
- Customer Engineering Approval
- Design FMEA (GS-0002)
- Process Flow Diagram (GS-0063)
- Process FMEA (GS-0006)
- Control Plan (GS-0012)
- Measurement Systems Analysis Studies (GS-0010)
- Dimensional Results (ISIR) (GS-0015)
- Material, Performance Test Results
- Initial Process Studies (Capability) (GS-0007)
- Appearance Approval Report (AAR)
- Sample Production Parts
- Master Sample
- Customer-Specific Requirements
- PSW

In the following, the requirements for each element will be briefly described. For additional detail, consult the corresponding SD Global Standard relative to each PPAP element.

Note:

SD encourages the suppliers that are not familiar or need more background knowledge about the listed PPAP elements to acquire the AIAG (AIAG - Automotive Industry Action Group) manuals and also refer to SD Global Standards.

The supplier should be capable to deliver the PPAP-package in English if requested.

Design Record

The supplier shall have the design record for the saleable product. In all cases, the official design record is the top-level SD drawing relating to the part / component under consideration along with any other drawings, specifications, or electronic files referenced therein. If SD does not have a top-level drawing for the part under consideration, SD must have approved the drawing to be used. Where the design record is in electronic format, a hard copy (e.g. pictorial, geometric dimensioning & tolerancing, drawing) should be included to identify measurements taken.

Engineering Change Documents

The supplier shall have any authorized engineering change documents, not yet recorded in the design record but incorporated in the product, part or tooling, in an engineering change management system.

Customer Engineering Approval

When required by SD, suppliers shall have evidence of SD engineering approval.

Design FMEA

The supplier shall have a Design FMEA for parts or materials for which they are design-responsible. Whether submitted or retained, it must be prepared prior to PPAP submittal and made available to the SD for review.

Process Flow Diagram

The supplier shall have a process flow diagram (schematic representation) that clearly describes the production process steps, streams, and sequence. Process flow diagrams for 'families' of similar parts are acceptable if the new parts have been reviewed for commonality.

Process FMEA

The supplier shall have a Process FMEA. A single Process FMEA may be applied to a manufacturing process for a family of similar parts or materials. SD expects its suppliers to utilize the PFMEA as a continuous improvement tool in addressing the highest RPN values with actions to reduce risk. As a general rule, an RPN value greater than 100 implies an unacceptable risk and requires action. Targeting actions towards reducing Severity (as applicable), Occurrence and Detection rankings should be considered in that order.

After the recommended action has been identified, make a preliminary evaluation of the changes to severity, occurrence and detection and the resulting RPN value.

The purpose is to get an immediate impression of whether the suggested recommended action is adequate, or if further actions have to be implemented.

Control Plan

The supplier shall have a Control Plan that defines all controls used for process control. Control methods for key characteristics employ statistically valid methods. (Samples to print are unacceptable. 100% inspection is considered containment only and is not an acceptable method of long-term control.) Key characteristics that utilize a control of 100% inspection apply an inspection tolerance reduced by 50% of the total Gage R&R to both sides of the tolerance to negate the measurement system variation. Sub-supplier Control Plan information must be included for all external processes that influence special characteristics. Variable gages are expected to be used for all key characteristics, unless agreed to by SD.

Measurement Systems Analysis Studies (Gage R&R)

Gage Repeatability and Reproducibility (Gage R&R) studies are to be completed for all key characteristics. Raw data measurements, graphed analysis and results must be included in the submittal.

Dimensional Results (ISIR)

The supplier shall provide evidence that dimensional verifications required by the design record (Engineering Print requirements including all notes as specified in the SD top-level drawing) have been completed and results indicate compliance or noncompliance with specified requirements. SD's expectation is that all results are compliant. An ISIR shall be performed on all unique process streams (machines, moulds, dies, etc.) within the process flow.

Material, Performance Test Results

The supplier shall have records of material and/or performance test results for tests specified on the design record or Control Plan.

The supplier shall perform tests for all part(s) and product material(s), when chemical, physical, or metallurgical requirements are specified by the design record or control plan.

All tests required by the design record and related specifications should be listed in a convenient format along with the quantity tested and the actual results of each test. Also indicate any authorized engineering change documents that have not yet been incorporated in the design record.

Initial Process Studies (Capability)

The supplier shall perform initial process studies on all special characteristics. The level of initial process capability (Pp, Ppk=Short Term Capability) shall be determined to be acceptable prior to submission for all special characteristics. Although capability data is not required for non-special characteristics, all specified characteristics are expected to meet specifications. Raw data measurements, graphed analysis and results must be included in the submittal.

Appearance Approval Report (AAR)

A separate Appearance Approval Report (AAR) shall be completed for each part or series of parts for which a submission is required if the product/part has appearance requirements on the design record.

AAR typically applies only for parts with color, grain, or surface appearance requirements. AAR's are extremely rare for either parts supplied to Sauer-Danfoss or products supplied by Sauer-Danfoss to its customers. In general, AAR's will only be performed when specifically requested by a customer.

Sample Production Parts

The supplier shall provide a number of sample parts as requested by SD and as defined by the submission request.

Master Sample

Suppliers may retain a master sample for the same period as the production part approval records, or a) until a new master sample is produced for the same customer part number for customer approval, or b) where a master sample is required by the design record, Control Plan or inspection criteria, as a reference or standard to be used. The master sample shall be identified as such, and shall show the customer approval date on the sample. The supplier shall retain a master sample for each position of a multiple cavity die, mould, tool or pattern, or production process unless otherwise specified by the customer. The purpose of the master sample is to provide a reference point to the initial product / process status. This can be especially valuable where something changes some time after product introduction and the characteristics involved are not easily measurable.

Note:

Due to the difficulty of retaining master samples for multiple process streams, multiple product configurations, and multiple customers, the retention of master samples by the supplier shall only be performed on request.

Customer Specific Requirements

Sauer-Danfoss and its suppliers shall have records of compliance to all applicable customer-specific requirements. For bulk materials, any customer-specific requirements shall be documented.

Part Submission Warrant (PSW)

Upon satisfactory completion of all required measurements and tests, as indicated in the PPAP Worksheet template, the supplier shall record the required information on the PSW template.

A separate PSW shall be completed for each part number unless otherwise agreed to by SD.

The supplier shall verify that all of the measurement and test results show conformance with SD requirements (or note any discrepancies and request deviations if appropriate) and that all required documentation is available. The supplier's management representative shall approve the PSW and provide date, title, and telephone number.

6.4 Submission and notification to Sauer-Danfoss

Submission to Sauer-Danfoss

Suppliers shall submit for PPAP approval prior to the first production shipment in the following situations in the table below. Suppliers shall review and update, as necessary, all applicable items in the PPAP file to reflect the production process.

Requirement	Clarification or examples
1. A new part or product (i.e. a specific part, material, or color not previously supplied to the customer)	Submission is required for initial release of a new product (part). A new part/product or material added to a family may use appropriate PPAP documentation from a previously fully approved part within the same product family.
2. Correction of a discrepancy on a previously submitted part.	Submission is required to correct any discrepancies on previously submitted part. A “discrepancy” can be related to: The product performance against the customer requirement Dimensional, capability or GR&R issues Subcontractor issues Full approval of a part replacing an interim approval Testing, including material, performance, engineering validation issues
3. Engineering change to design records, specifications, or materials for production product/part number(s).	Submission is required on any engineering change to production product/part design records, specifications or materials.
Additionally, for bulk materials: 4. Process technology new to the organization, not previously used for this product.	

Notification to Sauer-Danfoss

Suppliers shall notify Sauer-Danfoss of any design and process changes as indicated in the table below. Upon approval of the change, PPAP submittal and approval is required prior to shipment of the modified product or product from the modified process.

Requirement	Clarification or examples
1. Use of other construction or material than was used in the previously approved part or product.	For example, other construction as documented on a deviation (permit) or included as a note on the design record and not covered by an engineering change.
2. Production from new or modified tools (except perishable tools of the same grade and type), dies, moulds, patterns, etc., including additional or replacement tooling.	This requirement only applies to tools, which due to their unique form or function can be expected to influence the integrity of the final product. It is not meant to describe standard tools (new or repaired of same make and type), such as standard measuring devices, drivers (manual or power), etc.
3. Production following upgrade or rearrangement of existing tooling or equipment.	<p>Upgrade means the reconstruction and/or modification of a tool or machine or to increase the capacity, performance, or change its existing function. This is not meant to be confused with normal maintenance, repair or replacement of parts, etc., for which no change in performance is to be expected and post repair verification methods have been established.</p> <p>Rearrangement is defined as activity that changes the sequence of product/process flow from that documented in the process flow diagram (including the addition of a new process).</p> <p>Minor adjustments of production equipment may be required to meet safety requirements such as, installation of protective covers, elimination of potential ESD risks, etc. These changes can be made without customer approval unless the process flow is changed as a result of this adjustment.</p>
4. Production from tooling and equipment transferred to a different plant site or from an additional plant site.	Production process tooling and/or equipment transferred between buildings or facilities in one or more sites.
5. Change of subcontractor for parts, non-equivalent materials, or services (e.g.: heat-treating, plating).	Sauer-Danfoss and its suppliers are responsible for approval of subcontracted material and services.

Requirement	Clarification or examples
6. Product produced after the tooling has been inactive for volume production for twelve months or more.	For product that has been produced after tooling has been inactive for twelve months or more: Notification is required when the part has had no active purchase order and the existing tooling has been inactive for volume production for twelve months or more. The only exception is when the part has low volume, e.g. service or specialty vehicles. However, a customer may specify certain PPAP requirements for service parts.
7. Product and process changes related to components of the production product manufactured internally or manufactured by subcontractors. Additionally, Sauer-Danfoss and its suppliers shall concur with any requests by a subcontractor before submission to the customer.	Any change that affects customer requirements for fit, form, function, performance, and/or durability requires notification to the customer. Note: The fit, form function, performance, and/or durability requirements should be part of customer specifications as agreed on during contract review.
8. Change in test/inspection method, equipment, or new technique (no effect on acceptance criteria)	Sauer-Danfoss and its suppliers should have evidence that the new method or equipment provides results equivalent to the previous method or equipment.
Additionally, for bulk materials: 9. New source of raw material from new or existing supplier 10. Change in product appearance attributes	These changes would normally be expected to have an effect on the performance of the product.
11. Change in equipment.	Examples are new equipment, alternate or additional equipment, replacement, or change in size.
12. Tooling or equipment moved to a different location within the same plant (unless designed to be mobile).	Based on lean manufacturing initiatives, some equipment is designed for mobility, i.e. on wheels with quick disconnects. Equipment of this type generally does not require disassembly, or special preparation prior to movement, nor activities such as re-leveling or realignment, subsequent to a move.

6.5 PSW procedure & guidelines

To assist the supplier in the preparation of these PPAP steps, SD provides the suppliers with the appropriate PPAP forms. The supplier is required to use these forms, unless the supplier's forms and resulting field information are equivalent to the forms provided by SD.

Supplier notification of a PSW

The assigned SD Quality/Purchasing representative will complete the following steps of the PSW prior to supplier submission of the PPAP package:

- Part identification information
- Engineering and design specific information
- Supplier manufacturing information
- Submission information
- Reason for submission
- Requested submission level

The supplier shall then submit the PPAP package and complete the remaining fields on the PSW:

- Submission Results
- Declaration (including production rate)

The supplier must authorize the PSW by signing and dating the PSW. A manager level signature is required.

SD receipt of the PSW

The assigned SD Quality/Purchasing representative will coordinate the review of the supplier PSW and samples.

The SD Quality/Purchasing representative will work with the supplier to verify that proper corrective actions are in place for each non-conforming category requirement prior to start of production.

Disposition of the Supplier PSW

By signing and dating the PSW form, the assigned SD Quality/Purchasing representative will provide one of the following dispositions:

- **Approved for production**

Approval will be granted if all applicable requirements are met and permanent corrective actions are implemented for all non-conforming category requirements. Samples must meet all form, fit, function, visual, and any reliability test requirements.

- **Conditional approval**

In the event that a dimensional specification, test result, material specification, or any other PPAP requirement has not been met, "Conditional Approval" may be granted as long as samples meet minimum form, fit, function and reliability requirements.

Conditional approval cannot be granted unless temporary corrective actions are in place for all nonconforming category requirements or SD Design Engineering agrees that the non-conformance will not create a customer complaint or safety concern. A conditional approval expiration date must be given to notify the supplier that a resubmission for final approval must be complete to finalize “Approval” of the part.

- **Rejected**

A rejection will be issued to the supplier if samples do not meet all form, fit, function and applicable reliability requirements. Temporary and / or permanent corrective actions for non-conformances must be submitted to the assigned Quality/Purchasing representative to gain either Conditional or Full Part Approval.

Communicate PSW Disposition

The assigned SD Quality/Purchasing representative will use the PSW to communicate to the supplier one of the 3 noted dispositions:

- **Approved for production** - The PSW will be routed directly to the supplier.
- **Conditional approval for production** - The PSW will be given an expiration date for the conditional approval and routed directly to the supplier. The supplier must re-submit the PSW for a final approval prior to the expiration date of the conditional approval.
- **Rejected** - The PSW will be routed directly to the supplier. The supplier must resubmit the PSW for a final approval.

7 SUPPLIER NON-CONFORMANCE

7.1 Purpose

Directs the actions of SD and supplier personnel in the coordination of corrective actions for supplier responsible non-conformances. This section applies to any non-conformance, found on production parts, suspected to be the responsibility of the supplier.

7.2 Supplier management requirements

The supplier must have a system in place that requires formal deviation reports for significant internal and external issues. The system must provide for identification, location, documentation, evaluation, isolation, disposition of nonconforming parts and for notification to the departments concerned (both internal and external). Supplier management must have a high focus on root cause finding (both at hardware and at system/process level) and must have a system, for routing customer corrective action responses to management review. SD expects management to require the organization to get at the process/system level root cause, and coach the organization if corrective actions do not identify process/system level root cause.

7.3 8-D problem solving method (GS-0024)

Depending on the type, extent and severity of the supplier quality problem, SD will request from the supplier to document actions in a formal deviation report. SD uses the 8-D problem solving method to investigate, eliminate and communicate the hardware and process/system level root causes of non-conformities and corrective actions. Suppliers are expected to use the 8-D problem solving method or an equivalent problem solving method. One of the objectives of the 8-D report should be, to ensure an effective exchange of information between the 8-D team members. SD expects the process/system level root cause to be identified by corrective actions. Definitions for hardware and process/system level root causes are:

- **Hardware Level Root Cause:**
The cause of the failure from which the defect occurred based on the immediate series of actions which impacted the problem during the manufacturing of the product. (I.e. fixture, die, machine, operator, etc.)
- **Process/System Level Root Cause:**
The cause of the failure based on the corporate system that allowed the hardware failure to occur. (I.e. APQP Process, Launch Process, Training Process, FMEA Process, Human Resources, etc.)

The 8-D disciplines are:

- 1-D: Use the team approach, select a team
- 2-D: Describe the problem
- 3-D: Implement and verify interim action, containment effort
- 4-D: Define and verify the root cause(s)
 - Identify potential cause(s)
 - Analyze potential cause(s)
 - Validate the root cause, repeat the fault by intention
 - Identify alternative solutions
- 5-D: Choose and verify the effectiveness of the permanent corrective action
- 6-D: Implement permanent corrective action
- 7-D: Prevent recurrence of the problem
- 8-D: Congratulate your team.

Note:

For more information about the 8-D method, please contact the SD Quality/Purchasing representative and request GS-0024.

7.4 Expectations

To protect SD and prevent further defective material from leaving the supplier facility, it is imperative that the supplier takes immediate action and initiates containment (step 3 in 8-D). The supplier is responsible for both containing non-conforming material at their location, as well as material in-transit, at sub-suppliers, or other lots already delivered to SD. If the supplier fails to initiate immediate action and containment or it is determined to be ineffective, SD may use a third party service at supplier's expense.

If the supplier suspects non-conforming parts have been shipped to a SD facility or finds nonconforming parts within the suppliers finished goods inventory, SD expects the supplier to immediately notify SD of the problem. SD will look positively on a supplier that takes the initiative to inform SD about a potential defect.

SD expects the supplier to confirm the receipt of the problem/issue by telephone or mail within 24 hours. Quicker response may be required based on the severity of the situation. SD expects the supplier to define, implement and document the containment in the 8-D report within 48 hours. In some situations SD may decide to visit the supplier or subcontractor in order to participate in the mutual problem solving.

The supplier must formally report the cause of the non-conformance and the corrective action identified to prevent recurrence to SD within 2 weeks of being notified of the issue using the 8-D report. The supplier must respond with the 8-D by the due date even if the permanent corrective action has not yet been determined. In this instance the supplier is expected to provide an expected follow-up date, and upon completion, re-submit the reply.

No rework of material is authorized without prior SD approval. Rework must be supported by operating and inspection instructions. SD may require special identification and segregation of the reworked product.

7.5 Supplier request for deviation

The supplier must always request, in writing, a formal deviation (or concession) before shipping non-conforming material to SD. A supplier request for deviation must inform about agreed quantity and a date. The supplier must fill out a supplier request for deviation form and return it for approval. If the deviation is approved by SD, a copy of the signed request for deviation must be placed in each pack being delivered to SD. Otherwise parts will not be accepted. A plan to return to normal production and the time required to do so shall be submitted at same time as the written request.

8 PERFORMANCE EVALUATION GUIDELINES

8.1 Purpose

To define the rules for counting PPM against the supplier. As mentioned in section 4 SD monitors the supplier performance on part quality and on time delivery. SD expects suppliers to monitor and review quality system metrics for their own operations also. The metrics must include at the least, on-time-delivery, internal quality (scrap, PPM or FPY) and external quality (PPM). The supplier's internal metric calculations must meet the intent of effectively evaluating the supplier's system vs. customer expectations. Furthermore, the supplier must take action and focus on their system when the metrics do not meet the targets set.

8.2 PPM rating (GS-0028)

The quality performance rating is measured in rejected Parts Per Million (PPM) for each supplier. The rating gives evidence of part quality and rates all non-conformities found on the SD production line or in incoming inspection.

$$\text{Rate} = \frac{\text{Rejected parts}}{\text{Received parts}} \times 1,000,000 \text{ [PPM]}$$

$$= \frac{\text{Quantity returned} + \text{Quantity scrapped} + \text{Quantity reworked}}{\text{Quantity received}} \times 1,000,000 \text{ [PPM]}$$

The supplier PPM number will be calculated each month in a monthly value and a 12-months rolling value.

8.3 PPM definitions

Received parts (including sub-assemblies):

Rating only incorporates the parts released for series production.

Note: Prototypes, parts used for testing or unreleased parts are not included.

Rejected parts:

Non-conformance discovered at the SD location. Non-conformities include faults in manufacture, assembly, specifications and shipping errors (incorrect quantity, incorrect part number, etc.)

Rejects are non-conforming parts returned to the supplier, parts scrapped at SD, and parts reworked by SD personnel.

8.4 Counting PPM rejects:

The criteria of rejects and the number of non-conformities counted are specified in the table below.

	<u>Found by</u>	<u>Counting</u>	
		<u>Reject</u>	<u>Quantity</u>
At Sauer-Danfoss location:			
1. Non-conforming part found			
1.1 – on SD production line or in incoming inspection	SD	Yes	all parts
	Supplier	Yes	all parts
1.2 – SD inventory	SD	Yes	all parts
	Supplier	Yes	all parts
1.3 – Supplier stock	SD	No	none
2. Shipment error received by SD			
2.1 – Non-conformities found in receiving area			
2.1.1 - incorrect quantity (ex. documented 10 received 5)	SD	Yes	Δ parts *
* difference between actually received and documented (pack list)			
2.1.2 - incorrect part number - single-pack, multi-pack, pallet	SD	Yes	all parts
2.2 – Non-conformities found after acceptance in receiving area	SD	Yes	see 1.1 or 1.2
At Supplier facility:			
– Non-conforming part found in stock	Supplier	No	none

If a returned part meets stated part specifications and SD agrees, the registered parts shall not be counted.

8.5 On-Time-Delivery Rating

The delivery performance rating is measured based on expected delivery to the SD facility per the agreed to purchasing agreement.

9 RETURN AND CHARGEBACK PROCEDURES

9.1 Return of non-conforming parts

When SD returns non-conforming parts to the supplier, a debit note will be created. This debit note will be deducted in future payments to the supplier. The supplier will be informed by mail or email about the debit note. The supplier should not send any credit note to SD accounts department. If it turns out that returned parts meet specification and SD agrees, the registered parts will not be counted in PPM. If agreed, the supplier has the possibility to send parts back on a new order.

9.2 Chargeback guidelines

Costs associated with supplier part quality issues and discovered in our factories, in the field, or in customers' machines within the specified warranty period, that are deemed the supplier's responsibility may be charged back to the supplier. Other costs that are associated with lost production due to supplier quality issues and PPAP rejection issues may also be charged back to the supplier.

Factory defects:

SD will debit the supplier all costs associated with the repair (incl. labor), replacement, segregation, and lost production.

Field defects:

Sauer-Danfoss may debit the supplier all costs associated with parts and labor for repair. The warranty period is outlined in SD's Warranty Policy that is mentioned in the Purchase order.

The supplier may visit SD upon receipt of an 8-D or problem solving report to review the issue and accept or refute responsibility prior to being charged. The supplier, if found responsible, will pay the costs associated with the quality issue at the prevailing SD rate.

10 CONTINUOUS IMPROVEMENT

The supplier shall demonstrate a top management commitment to continuous improvement. A comprehensive philosophy of continuous improvement must be identifiable throughout the entire supplier organization. Suppliers must endeavor to make continuous improvements to the quality, deliveries, schedules and prices, to the supplier's and SD's benefit. The philosophy of continuous improvement should be extended to all business processes. Specified plans must be drawn up for those processes that are considered important. SD encourages the supplier to work on:

- Error proofing/Mistake proofing techniques (POKA – YOKE)
- Six Sigma
- Lean manufacturing
- SPC
- SMED (Single digit Minute Exchange of Die)
- TPM (Total Productive Maintenance)
- The "Five S" philosophy
- Visual systems

11 REFERENCE DOCUMENTS

SD Global standards

The Global Standards relevant for suppliers are:

GS-0002: Design Failure Mode and Effects Analysis

GS-0004: Special Characteristics

GS-0006: Process Failure Mode and Effects Analysis

GS-0007: Capability Studies

GS-0008: Production Part Approval Process (PPAP)

GS-0010: Gage R & R (Measurement Systems Analysis)

GS-0012: Control Plan Requirements

GS-0015: Initial Sample Inspection Report (ISIR)

GS-0024: 8-D Problem Solving

GS-0028: Rating of External Supplier Quality

GS-0051: Approval, Classification and Performance Monitoring of External Suppliers

GS-0057: Negative List for Substances and Materials

GS-0062: Global Heat Treat

GS-0063: Process Flow Diagram

Note: Forms/global standards can be obtained from www.sauer-danfoss.com or by contact to the SD Quality/Purchasing representative.

AIAG manuals

- AIAG Manual "Production Part Approval Process" (PPAP)
- AIAG Manual "Measurement System Analysis" (MSA)
- AIAG Manual "Potential the Failure Mode and Effects Analysis" (FMEA)
- AIAG Manual "Statistical Process Control" (SPC)
- AIAG Manual "Advanced Product Quality Planning (APQP) and Control Plan"

Note: AIAG manuals may be obtained from www.aiag.org.

12 SAUER-DANFOSS FORMS

- Control Plan
- Design FMEA
- Gage R&R
- PFMEA Process Flow
- Process FMEA Template
- PSW - Part Submission Warrant Template
- 8-D Problem Solving Process
- Capability
- PPAP Review Checklist
- PPAP Worksheet Template
- Pre-Control Chart Uni-lateral
- Pre-Control Chart Bi-Lateral

Note: Forms/global standards can be obtained from www.sauer-danfoss.com or by contact to the SD Quality/Purchasing representative.

13 SAUER-DANFOSS TOOLS

- Potential Supplier Assessment (PSA)
- Supplier Financial Assessment (SFA)
- Supplier Quality Assurance (SQA) Audit
- **Supplier Assessment Summary - Radar Chart**

14 SUPPLIER LETTER

[Link to letter](#)

15 CHANGE HISTORY

Date	Revision	Description
2008-10-02	A to B	Added section 2.6 for Supporting Data for Quotations Section 3 modified to refer to Potential Supplier Assessment, which replaced the Supplier Selection Scorecard Section 3 modified to reflect 6 levels of supplier ratings Section 5.2 (Special Characteristics) modified to reflect changes to GS-0004 Supplier Letter added at end to provide a system for obtaining supplier acceptance of the requirements Other miscellaneous changes
2009-01-30	B to C	Clarified what is included as rejected parts in section 8.2 to match GS-0028 rev E. Cleaned up supplier letter on page 28
2009-02-11	C to D	Removed “(Parts from SD inventory sorted bad and then reworked at SD location by supplier or a third party, under the guidance of and at the expense of the supplier, in a timely manner do not count.)” in Section 8.3, Rejected parts, and asterisk in table for counting rejects.
2009-06-02	D to E	Updated to reflect the new Supplier Classification Levels and to transfer all detail of supplier evaluation and monitoring to GS-0051.