

SENSORS & CONTROLS GLOBAL SUPPLIER QUALITY MANUAL GSQM



DOC TYPE: Global Supplier Management Process	DOC. NO. G-SM-01	REVISION: F
TITLE: Sensors & Controls Global Supplier Quality Manual	FOR REFERENCE ONLY Always check the latest revision before use	DOC. 1004255
APPROVED: <i>This document is approved via an electronic approval process.</i>		DATE: 03/30/2010

This document is edited and controlled by the Global Sensors & Controls Supplier Quality Organization.

It is the supplier's responsibility to assure that only the latest revision of this manual is used and all prior editions are identified as obsolete.

REVISION HISTORY

Revision	Date	Description of Revision	Revised by:
A	04/15/05	Initial New Release - Sensor Products Business	MDM
B	02/01/07	Revised entire document; incorporated Controls Business; aligned with Global Supplier Management Process; flowed down industry (auto/aerospace) requirements.	S&C SMP Team
C	03/12/08	As a result of corrective action related to 3 rd party audit conducted by DnV. Added: Section 4.1.1.3 statement to clarify requirements for TS compliance for those suppliers who are not registered; i.e. plan	S. Zhou & SMP Team
D	11/21/08	Updated Section 4.4 clarified the retention of Automotive [TS] records to ensure flow down of customer requirements in this area. Product Life + 1 year (minimum 15 years)	SMP Team
E	06/26/09	Blue Text notes changes made to document. Added: New section 1.1 Code of Conduct. Deleted: 1.2.2 "goals of zero defects, and" Added: 1.2.2 "< 2 ppm for automotive component". Added: New section 1.2.3. Deleted: 1.3 quality policy and renumbered following section. Added: 2.1 wording "reference in specifications and drawings. Added: 2.2.1 "Business". Revised: 3.2 SMP Life Cycle Diagram. Added: 4.1.1 "latest revision of ISO 9001. Deleted: 4.1.1 reference to December 2006 and ISO/TS 16949: 2000... Added: 4.1.1 "demonstrate compliance". Added: 4.1.1.1, 4.1.1.2, 4.1.2 reference to "latest revision". Added: 4.2.1 word "product" and sentence " this includes costs incurred by Sensata related to as a result of quality nonconformance incidents and delivery disruptions. (see Section 9.1)". Added: new section 4.2.2. Added: 4.3.5 Table CQI requirements (9-11-12) and REACH. Deleted: 4.4 Record Table - Master Production Samples; Added: 4.4 Record Table Master Sample to PPAP Record. Added: 7.1.2 new sentence " Information is defined as specifications, without prior written approval of Sensata Technologies Business Unit Management Representative. Added: 7.2.2 "driving process capability and measurement controls" Added: 7.3.4 "Design Engineering" Deleted: 7.3.5.1 sentence referencing Global ESH and G-SM 30. Added: 7.4.2.1 REACH requirement. Revised: 7.4.3 "conformity to compliance" Added: 7.4.2 see section 4.1.1.2 - 4.1.1.3. Added: 7.4.4 " supplier responsible for purchased product. Added: 7.5.2 "product and process characteristics". Added: 7.5.4 "Sensata owned tooling" and see section 7.5.9 Added: 7.5.4.1 new sub-section a) Added: new section 7.5.6 Storage and inventory. Revised: 7.6.1.1-7.6.1.7 with a - g. Added: 8.2.1.c NOTD Added: 8.5.2 new sentence "When requested the assigned SQE, the Supplier shall submit annual CpkSPC dimensions. Revised: 8.2.7 section. Deleted: 8.4.1 Annex B. Revised: 8.4.3.3.f. Deleted: 10 reference G-SM-30 Material Data Sheet. Added: new section 11 Supplier Portal.	SMP Team
F	03/30/10	Revisions noted in BLUE Text: Added: Section 7.3.5.2 requirements including process capability as noted in". Added: New section 7.5.3 work instructions and section 7.5.4 Verification of job set-ups. Renumbered following sections. Added: New section 7.5.7 production scheduling. Renumbered following sections. Added: Section 10 1006310 - G-SM-30 Supplier Material Content Reporting Worksheet	SMP Team

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1 INTRODUCTION

1.1 CODE OF CONDUCT

1.1.1 Sensata Technologies' corporate identity and partnerships are built upon a strong foundation of steadfast adherence to the highest of ethical standards. The Sensata name must bring to mind honesty, integrity and trust for all employees, customers, partners and vendors, globally. We strive to achieve the highest business and personal ethical standards as well as compliance with the laws that apply to our business. Accordingly, Sensata Technologies expects its Suppliers to maintain the fundamental values of fairness and integrity during our daily business interactions. Sensata Technologies' Code of Conduct reflects these values, and Sensata Technologies requires all Suppliers to adhere to these values in complying with the requirements documented within this Global Supplier Quality Manual. All Suppliers are encouraged to visit our website where our Code of Conduct is located (<http://www.sensata.com/terms.htm>). All sections of this manual are deemed significant to a positive, productive, rewarding Supplier Partnership. Therefore, a Supplier's nonconformance to the requirements contained within the scope of this Quality Manual may drive Supplier Management Review by Sensata's Business Management Team.

1.2 PERFORMANCE INDICATORS

1.2.1 In order for Sensata Technologies to be considered a preferred supplier to our customers, we must have a process in place that encourages, supports and ensures that our suppliers meet quality performance expectations. Our suppliers are considered partners in ensuring ongoing customer satisfaction in the key performance indicators: *quality, delivery* and *cost*.

1.2.2 We expect our suppliers to monitor their own business processes and performance to drive continual improvement. Our suppliers shall have a "zero defect strategy" defined and meet a maximum requirement of <2 ppm for automotive component suppliers and <10 ppm for all other component suppliers, and for all suppliers 100% On-time Delivery and annual cost reductions.

1.2.3 When a supplier is not meeting the component ppm requirement noted in section 1.2.2, a written improvement roadmap must be established and communicated with the assigned MAKE SQE.

2 SCOPE

2.1 This document establishes Sensata Technologies' quality requirements for suppliers who design, manufacture and control respective components in accordance with Sensata Technologies' design and product requirements. The quality requirements apply to commodity manufactures and special processors providing parts/services to Sensata Technologies when this document is reference in purchase orders, contracts, specifications and drawings.

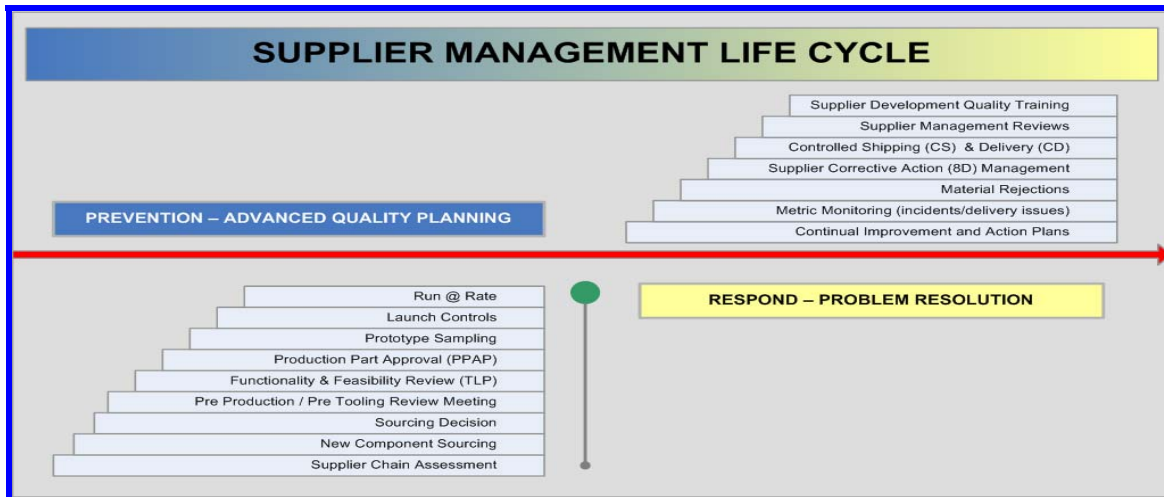
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- 2.2 All communication, notifications and questions regarding the following topics are to be reviewed and handled by the assigned Supplier Quality Engineer (SQE) and/or designated Procurement Manager:
- 2.2.1 status changes with the Supplier Management Representative and Business ownership,
 - 2.2.2 status changes with the existing quality management system (i.e., new certification, de-certification, reassessments, etc.),
 - 2.2.3 any deviation from the requirements defined within this document must be (formally documented and approved), and
 - 2.2.4 any request for quality requirements content clarification noted within this document.
- 2.3 The official business language for all documents referenced in this supplement shall be U.S. English. Other languages may be used with prior approval.
- 2.4 This document defines the following as:
- 2.4.1 The word '**shall**' indicates a mandatory requirement.
 - 2.4.2 The word '**should**' indicates a mandatory requirement with some flexibility allowed in compliance methodology. A Supplier choosing other approaches to satisfy a '**should**' must be able to show that their approach meets the quality requirements of this document, and must agreed upon prior to implementation.

3 SUPPLIER MANAGEMENT PROCESS

- 3.1 The Supplier Management Life Cycle demonstrates the Supplier's Partnership evolution using the Supplier Management Processes, Tools and Metrics.
- 3.2 Sensata Technologies Supplier Management Process maintains the following activities:
- a) Supplier Identification, Selection and Approval,
 - b) Supplier New Component Sourcing,
 - c) Supplier Performance Monitoring & Improvement,
 - d) Supplier Corrective Action & Escalation, and
 - e) Supplier Disengagement.

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- 3.3 The potential Supplier will be assessed to the requirements defined in the design, process and system documentation. Example: component print, process capabilities, quality system requirements. This is conducted via a Supplier survey questionnaire and/or an on-site audit.
- 3.4 Once the Supplier has completed the selection process and demonstrated compliance to the requirements, the selected Supplier must demonstrate ongoing performance compliance to the agreed upon requirements. Supplier performance will be monitored in key metrics areas such as, but not limited to: quality, delivery and cost, to demonstrate continual improvement and ongoing capability.
- 3.5 When the selected Supplier performance has an adverse affect on the key metric areas, the Corrective Action Process will be implemented, (see Section 8.4.2). If corrective and preventive actions are not effectively implemented and ongoing adverse affects continue demonstrating no improvement, the Escalation Process will be implemented, (see Section 8.4.4).
- 3.6 When the selected Supplier performance does not demonstrate an improvement after the Escalation Process has been implemented, the Disengagement Process may be considered using the New Business Hold status, (see Section 8.4.4.1).

4 QUALITY SYSTEM REQUIREMENTS

4.1 General Requirements

- 4.1.1 Sensata Technologies strongly prefers that the Supplier maintain 3rd party registration to the latest revision of ISO 9001 by an accredited third party certification body.
 - 4.1.1.1 Suppliers whose component is incorporated into Sensata Technologies automotive and aerospace finished parts must be registered to the latest revision of ISO 9001 at a minimum.

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- 4.1.1.2 Suppliers shipping to Sensata Technologies' sites that are registered to the latest revision of ISO/TS 16949 shall also demonstrate compliance to the latest revision of ISO/TS 16949. Compliance may be demonstrated by 2nd or 3rd party audit results, submitted to the assigned SQE and/or Procurement Manager.
- 4.1.1.3 For those suppliers who are unable to demonstrate 2nd or 3rd party audit results as defined above, a documented compliance plan must be submitted to the assigned SQE and/or Procurement Manager for agreement as part of the supplier's development process. At a minimum the plan must define the projected timeline, responsibilities and processes to ensure compliance to the latest revision of ISO/TS 16949.
- 4.1.2 The Supplier shall maintain an effective quality management system for deliverable components, demonstrating compliance to the latest revision of ISO 9001 requirements and all additional Sensata Technologies' requirements noted in the following sections of this document and prints.
- 4.1.2.1 For simplification, the ISO 9001:2000 requirements are not repeated within this document; see Section 4.3.5 to obtain a copy of the standard.
- 4.1.3 Sensata Technologies is required to flow down industry/customer requirements to Suppliers whose component is incorporated into Sensata Technologies' automotive or aerospace finished part. These are identified throughout this document as [A] for Aerospace or [T] for Automotive. If no [A] or [T] is noted, then the requirements are applicable to all Suppliers irrelevant of end component use.
- 4.2 General Requirements - Supplemental**
- 4.2.1 [A/T] The Supplier shall ensure control over outsourced processes; the control over such processes does not absolve the Supplier of the responsibility of product conformity to all of Sensata Technologies' requirements, this includes costs incurred by Sensata related to as a result of quality nonconformance incidents and delivery disruptions. (see Section 9.1)
- 4.2.2 The Supplier is expected to have the technical leadership to ensure all applicable requirements are met, as required, prior to releasing product or information to Sensata Technologies.
- 4.3 Documentation Requirements**
- 4.3.1 The Supplier shall maintain and conform to the latest revision level of the required or referenced Purchase Order and related documentation. Specific documentation related to component conformance may include, but is not limited to the following:
- a) purchase order,
 - b) drawings,
 - c) packaging requirements, and
 - d) other supporting specifications and/or documentation.

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- 4.3.2 [**A/T**] The Supplier shall have a process to assure the timely review, distribution and implementation of all Sensata Technologies' engineering standards/specification changes based upon the defined schedule. **Note:** a change in these standards/specifications requires an updated record of customer production part approval when these specifications are referenced on the design record or if they affect associated documentation, such as control plans, potential failure mode & effects analysis, etc.
- 4.3.3 [**A**] The Supplier shall clearly show the relationship between the requirements and the documented procedures in the quality management system.
- 4.3.4 [**A**] The Supplier shall coordinate and document changes with Sensata Technologies' SQE and/or Procurement Manager in accordance with contract requirements.
- 4.3.5 The Supplier shall refer to the latest revision of the documents of external origin noted below, as applicable.

ISO 9001	Quality management systems - Requirements	www.iso.org
ISO 10007	Quality management systems - Guidelines for configuration management	www.iso.org
ISO/TS 16949	IATF Technical Specification - Quality management systems - Particular requirement for the application of ISO 9001:2000 for automotive production and relevant service part organizations	www.iaob.org
AS 9100	Aerospace Standard - Quality Management System Requirement	www.sae.org
AS 9102	Aerospace Standard - First Article Inspection Requirements	www.sae.org
AS 9103	Aerospace Standard - Variation Management	www.sae.org
AS 9003	Aerospace Standard - Inspection and Testing	www.sae.org
AS 9006	Aerospace Standard - Software Supplement for AS 9100	www.sae.org
ECMP	Electronic Component Management Plan	www.sae.org
APQP	AIAG - Advanced Product Quality and Control Plan	www.AIAG.org
FMEA	AIAG - Potential Failure Modes and Effects Analysis	www.AIAG.org
PPAP	AIAG - Production Part Approval Process	www.AIAG.org
SPC	AIAG - Statistical Process Control	www.AIAG.org
MSA	AIAG - Measurement Systems Analysis	www.AIAG.org
CQI-9	Special Process: Heat Treating System Assessment	www.AIAG.org
CQI-11	Special Process: Plating System Assessment	www.AIAG.org
CQI-12	Special Process: Coating System Assessment	www.AIAG.org
ASME Y14.5M	ANSI - Dimensioning and Tolerancing	www.ansi.org
(ELVD)2000/53/EU	End of Life Vehicle - International Material Data System Directive (ELVD) 2000/53/EU	www.mdsystem.com/html/en/home_en.htm
EC 1907/2006 REACH	Regulation EC 1907/2006 on Registration, Evaluation, Authorisation (and Restriction) of Chemicals	http://ec.europa.eu/environment/policyreview.htm

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4.4 Record Retention

4.4.1 The Supplier shall maintain and retain the records below and provide review of those records as required by the assigned SQE and/or Procurement Manager.

4.4.2 [A] The Supplier shall make records available for review by the assigned SQE, Procurement Manager and/or End Customer.

Record Description	Retention Period
Management Review	3 years
Quality Performance Records (e.g. control charts, inspection and test results)	Current year + 1 year
	[T] Product Active Life + 1 year (minimum 15 years)
	[A] 15 years
Internal Quality System Audit	3 years
Purchase Orders and Amendments	Current year + 1 year
	[T] Product Active Life + 1 year (minimum 15 years)
	[A] 15 years
Purchase Orders for Customer Owned Tooling	Current year + 1 year
	[T] Product Active Life + 1 year (minimum 15 years)
	[A] 15 years
First Article Inspection Records	[A] 15 years
Production Part Approval Records - including Master Production Sample(s)	[T] Product Active Life + 1 year (minimum 15 years)
Tooling Preventive Maintenance Records	[T] Product Active Life + 1 year (minimum 15 years)
Engineering Changes	Current year + 1 year
	[T] Product Active Life + 1 year (minimum 15 years)
	[A] 15 years

4.5 Configuration Management

4.5.1 [A] The Supplier shall establish, document and maintain a configuration management process appropriate to the component. Guidance on configuration management is given in ISO 10007.

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5 MANAGEMENT RESPONSIBILITY

5.1 Customer Satisfaction

- 5.1.1 The Supplier shall ensure that Sensata Technologies' requirements are determined and met with the aim of enhancing customer satisfaction, monitoring trends within the processes, product and quality system to assure their effectiveness and efficiency.

6 RESOURCE MANAGEMENT

6.1 Contingency Plans

- 6.1.1 The Supplier shall maintain a contingency plan to satisfy Sensata Technologies' requirements in the event of an emergency, such as utility interruptions, labor shortages, key equipment failures and field returns.

7 PRODUCT REALIZATION

7.1 Product Realization Planning

- 7.1.1 [A/T] **Acceptance criteria** - The Supplier shall obtain approval for acceptance criteria, when defined by assigned SQE. For attribute data sampling, the acceptance level shall be zero defects.
- 7.1.2 [T] **Confidentiality** - The Supplier shall ensure the confidentiality of Sensata Technologies-contracted products and projects under development and related product information. Information is defined as specifications, technical data, gages, drawings, and similar information from Sensata Technologies or its Customers, provided for reference or development of the Suppliers' processes and controls as part of the contracted products and projects. As such, no information shall be disclosed with any external party, without prior written approval of Sensata Technologies Business Unit Management Representative.
- 7.1.3 [A/T] **Change control** - The Supplier shall have a process to control and react to changes that impact product realization, including product and manufacturing process changes. The effects of any change, including those changes caused by sub-suppliers, shall be assessed, verified and validated to ensure compliance with Sensata Technologies' requirements prior to implementation. Any product realization change affecting Sensata Technologies' requirements (product and/or process) require notification to and approval by the assigned SQE and/or Procurement Manager, prior to change implementation.
- 7.1.3.1 [T] Guidance on change notification requirements are given in the AIAG PPAP manual noted in section 4.3.5. The Supplier shall notify the assigned SQE of any change. The assigned SQE will determine and inform the Supplier when a Supplier Request for Engineering Approval (SREA) G-SM-24 (doc #:1006304) shall be submitted for review and approval.
- 7.1.3.2 [T] For proprietary design, impact on form, fit and function (including performance and/or durability) shall be reviewed with the assigned SQE and/or Procurement Manager so that the effect can be properly evaluated.

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7.2 **Customer Related Processes**

- 7.2.1 [A] **Risk assessment** - The Supplier shall review the associated risks with (e.g., new technology, short delivery time scale) when reviewing requirements related to the product.
- 7.2.2 [T] **Organization manufacturing feasibility** - The Supplier shall investigate, confirm and document the manufacturing feasibility of the proposed products in the contract/order review process, including risk analysis. The Supplier shall participate in evaluating the feasibility of characteristics in relation to their functionality, known as the **Traffic Light Procedure (TLP)**. This evaluation process takes place when discussing a design with the Supplier in order to create and agree on the most robust solution, driving process capability and measurement controls that meets the needs of Sensata Technologies Sensors and Controls.

7.3 **Design and Development Planning**

- 7.3.1 [T] The Supplier shall include the following requirements to the product and process design and development, and focus on error prevention rather than detection.
- 7.3.2 [T] **Multidisciplinary approach** - The Supplier shall utilize a Project Management Process or Advanced Product Quality Planning (APQP) process to achieve product realization. All elements of APQP should be incorporated into the planning process, unless agreed upon in writing by the SQE and/or Procurement Manager. APQP methodology includes concepts of error prevention and continual improvement versus error detection, and is based on a multidisciplinary approach. The preparing and planning for product realization, includes;
 - a) development/finalization and monitoring of special characteristics,
 - b) development and review of FMEAs, including actions to reduce potential risks,
 - c) development and review of control plans, and
 - d) establishing and maintaining a program open issues.

Guidance on the APQP and FMEA process is given in the AIAG reference manuals noted in Section 4.3.5.

- 7.3.3 [A/T] **Special characteristics** - The Supplier shall document and comply with the flow down of Sensata Technologies' designated special characteristics, throughout the process steps and control documents including drawings, FMEAs, control plan, and operator instructions with the Sensata Technologies' symbols or the Supplier equivalent symbol or notation. Special characteristic symbols may be obtained by contacting the assigned SQE.
- 7.3.4 [T] **Design and development validation** - The Supplier shall perform design and development validation in accordance to Sensata Technologies' program timing, as defined by the assigned Design Engineer along with the SQE and/or Procurement Manager.
- 7.3.5 [T] **Production part approval process** - The Supplier shall comply with all the requirements defined in the AIAG PPAP manual.

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- 7.3.5.1 [T] Prior to PPAP submission, the Supplier shall enter all component Material and Substance Data using the International Material Data System (IMDS). When necessary, the Suppliers is to communicate with the assigned SQE any concerns related to the IMDS submitted entry. The SQE will coordinate with the respective Regional Environmental Safety and Health (ESH) Approver to resolve the Supplier’s concerns related to the IMDS entry status-
- 7.3.5.2 [T] The Supplier shall demonstrate that production process capacity meets Sensata Technologies’ program requirements including process capability as noted in Section 8.2.5 . Unless notified by the assigned SQE, the Supplier shall conduct a “Supplier Monitored” Run at Rate using Sensata Technologies’ Run at Rate Worksheet G-SM-29 (doc#: 1006309). Results shall be retained and made available upon request by the assigned SQE.
- 7.3.6 [A] **First article inspection** - The Supplier shall conduct a First Article Inspection (FAI) to the requirements defined in the AS9102 standard. The FAI report (FAIR) must be approved by Sensata Technologies Precision Products Material Review Board (MRB) on production samples on new or changes to, current production parts/processes. In addition to AS9102 standards, Sensata Technologies Precision Products requires a new FAIR, if no changes have occurred and the product has been in production for 3 years, to continue production.

7.4 **Purchasing**

- 7.4.1 **Purchasing process** - The Supplier shall use the organization and/or customer approved sources when specified on prints or purchase orders.
- 7.4.2 **Regulatory conformity** - The Supplier shall comply with the statutory and regulatory requirements, including recycling, environmental impact and characteristics identified as a result of the Supplier’s knowledge of the product and manufacturing processes. The Supplier shall provide the component material information as requested by the assigned SQE and/or Procurement Manager.
- 7.4.2.1 [T] Guidance on statutory and regulatory requirements is given in End of Life Vehicle - International Material Data System Directive (ELVD) 2000/53/EU and the Regulation EC 1907/2006 on Registration, Evaluation, Authorisation (and Restriction) of Chemicals (REACH).
- 7.4.3 [T] **Supplier quality management system development** - The Supplier shall be registered to the latest revision of ISO 9001 by an accredited 3rd party certification body. The Supplier shall demonstrate compliance to the latest revision of the ISO/TS 16949 Technical Specification. (see Section 4.1.1.2 - 4.1.1.3).
- 7.4.4 [A] **Verification of purchased product** - The Supplier has the responsibility for purchased product. Therefore the Supplier shall have a process to assure the quality of purchased product that may include, but is not limited to:
- a) obtaining objective evidence of quality of product from suppliers (e.g., accompanying documentation, certificate of conformity, test reports, statistical records, process control),
 - b) inspection and audit at supplier’s premises,
 - c) review of the required documentation,
 - d) inspection of products upon receipt, and
 - e) delegation of verification to the supplier, or supplier certification.

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7.4.5 [A / T] Purchased product shall not be used or processed until it has been verified as conforming to specified requirements, unless it is released under positive recall methods/procedures.

7.5 **Production and Service Provision**

7.5.1 [A] The Supplier shall comply with all requirements defined in Section 7.5.1 and sub-sections of AS 9100 for production and service provision.

7.5.2 [A / T] **Control Plan** - The Supplier shall develop control plans at the system, sub-system, component and/or material levels for the components supplied. The control plan shall include:

- a) a list of manufacturing process controls,
- b) methods for monitoring control over product and process characteristics, including special characteristics defined by both Sensata Technologies and the Supplier,
- c) Sensata Technologies' required information, as defined by the assigned SQE,
- d) Initiation of the specified reaction plan when the process becomes unstable or not statistically capable, and
- e) [A] provision for the prevention, detection and removal of foreign objects.

7.5.2.1 [A / T] The Supplier shall review and update the control plan when any change occurs affecting the component, manufacturing process, measurement, logistics, supply sources or FMEA.

7.5.2.2 [T] Guidance on control plans is given in the AIAG APQP and FMEA manuals noted in Section 4.3.5.

7.5.3 [T] **Work Instructions** - The Supplier shall document work instructions for all employees having responsibilities for the operation of processes that impact conformity to product requirements. These instructions shall be accessible for use at the work stations. These instructions shall be derived from sources such as quality plans, control plans and the product realization process.

7.5.4 [T] **Verification of job set-ups** - Job set ups shall be verified whenever performed, such as an initial run of a job, material change over or job change. Set up instructions shall be available for set-up personnel. Where applicable, verification activities shall use statistical methods.

7.5.5 [T] **Preventive and predictive maintenance** - The Supplier shall identify key process equipment, provide resources for machine/equipment maintenance, and develop an effective planned total preventive maintenance program system.

7.5.6 [T] **Management of production tooling** (including Sensata Owned Tooling) - The Supplier shall provide resources for tool and gage design, fabrication and verification activities. (see 7.5.9 Customer owned property)

7.5.6.1 [T] The Supplier shall establish and implement a system for production tooling management including:

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- a) Sensata Owned Tooling (tools, manufacturing, testing and inspection tooling and equipment) shall be permanently marked (visible to determine ownership)
- b) maintenance, and repair facilities and resources,
- c) storage, recovery,
- d) set-up, repair, and changes,
- e) tool-change programs for perishable tools,
- f) tool design modification documentation, including engineering change level,
- g) tool modification and revision of documentation, and
- h) defining tool identification status, such as production, repair and disposal.

[T] The Supplier shall implement a system to monitor these activities if any work is outsourced.

7.5.7 [T] **Production scheduling** - Production shall be scheduled in order to meet Sensata requirements, such as just-in-time supported by an information systems that permits access to production information at key stages of the process and is order driven. (see 8.2.5 Monitoring and measurement of processes).

7.5.8 [A] **Preservation of product** - Where applicable, the Supplier shall provide provisions for preservation of product in accordance with component specifications and/or applicable regulations, for:

- a) cleaning,
- b) prevention, detection and removal of foreign object,
- c) special handling for sensitive product,
- d) marking and labeling including safety warnings,
- e) shelf life control and stock rotation,
- f) special handling for hazardous materials, and
- g) ensuring that documentation required by the contract/order to accompany the product is present at delivery and is protected against loss and deterioration.

7.5.9 [T] **Storage and inventory** - The Supplier shall have a process to assess the condition of product in stock to at appropriate planned intervals to detect deterioration. The Supplier shall utilize an inventory management system to optimize inventory turns over time and assure stock rotation, such as “first-in-first-out” (FIFO). Obsolete product shall be controlled in a manner similar to the nonconforming product process.

7.5.10 [A] **Validation of processes for production and service provision** - The Supplier shall document, maintain and, if required, submit (as specified on the drawing) a certificate of conformance containing the following items as a minimum:

- a) Sensata part number,
- b) revision of part number,
- c) standards listed with revisions per the print, when applicable,
- d) lot or batch ID or certification number,
- e) age control, when applicable, and
- f) supplier part number or COTS item with revision, when applicable.

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7.5.11 [T] **Identification and traceability** - The Supplier shall identify the manufacturing lot information as part of the standard component and/or container packaging. For non-production trial samples (i.e., prototypes, etc.) shipments shall be identified in a manner to clearly identify content and shipped separately from production intent material. This includes raw material component traceability through a sub-supplier.

7.5.11.1 [A] The Supplier shall maintain accountability for all product during manufacture (e.g., part quantities, split orders, nonconforming product).

7.5.12 [A / T] **Customer property - customer-owned tooling** - The Supplier shall establish and maintain process for permanently marking Sensata Technologies' owned tooling, which may include: tools, manufacturing, test, inspection tooling and equipment. Ownership of each item must be visible and able to be determined.

7.6 Control of Monitoring and Measuring Devices

7.6.1 [A / T] **Calibration/verification records** - The Supplier shall maintain a record/register of the calibration/verification activity for all gages, measuring and test equipment needed to provide evidence of conformity of product to determined requirements, including employee- and customer-owned equipment. The record/register shall include:

- a) unique equipment identification,
- b) the measurement standard against which the equipment is calibrated,
- c) revisions following engineering changes,
- d) any out-of-specification readings as received for calibration/verification,
- e) an assessment of the impact of out-of-specification condition,
- f) statements of conformity to specification after calibration/verification, and
- g) notification if suspect product or material has been shipped.

7.6.2 [T] **Internal - Laboratory Requirements** - The Supplier's internal laboratory facility shall have a defined scope that includes its capability to perform the required inspection, test or calibration services. The scope shall be included as part of the quality management system. The laboratory shall specify and implement, at a minimum, technical requirements for:

- a) adequacy of laboratory procedures,
- b) competency of laboratory personnel,
- c) testing of the product, capability to perform these services correctly, traceability to the relevant process standards (such as ASTM, EN, etc.), and
- d) review of related records.

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- 7.6.3 [T] **External - Laboratory Requirements** - External/commercial/independent laboratory facilities used for inspection, test or calibration services by the Supplier shall have a defined laboratory scope that includes the capability to perform the required inspection, test or calibration, and either:
- a) there shall be evidence that the external laboratory is acceptable by Sensata Technologies' assigned SQE, or
 - b) the laboratory shall be accredited to ISO/IEC 17025 or national equivalent.
 - c) evidence of acceptance may be demonstrated by: Supplier approved 2nd party assessment that the laboratory meets the intent of ISO/IEC 17025 or national equivalent.

8 Measurement, Analysis and Improvement

- 8.1 [A/T] **Identification of statistical tools** - According to the nature of the component and depending on the specified requirements, the appropriate statistical tools/techniques for each process shall be identified during the advanced quality planning and product realization processes, and documented in the control plan.
- 8.2 **Monitoring and Measurement**
- 8.2.1 [T] **Customer satisfaction** - The Supplier shall ensure that Sensata Technologies' requirements are determined and met with the aim of enhancing customer satisfaction, monitoring trends within the processes, product and quality system to assure their effectiveness and efficiency. Performance indicators shall be based on objective evidence data and includes, but is not limited to:
- a) delivered part quality performance (ppm, quality incidents, and quality spills)
 - b) Sensata Technologies' disruptions including field returns and spills
 - c) delivery schedule performance (including incidents of premium freight and NOTD not-on-time-delivery), and
 - d) customer notifications related to quality and delivery issues, including Sensata line shut-downs and disruptions.
- 8.2.2 [A / T] **Internal audits** - The Supplier shall audit its quality management system to verify compliance to ISO/TS 16949:2002 and any additional quality system and customer requirements.
- 8.2.2.1 [A / T] The Supplier audit process shall utilize tools and techniques such as check sheets, process approach tools, flow charts or any similar methods to support audits of the quality management system requirements.
- 8.2.3 [T] **Manufacturing process audit** - The Supplier shall audit each manufacturing process to determine its effectiveness.
- 8.2.4 [T] **Product audit** - The Supplier shall audit products at appropriate stages of production and delivery to verify conformity to all specified requirements, such as product dimensions, functionality, packaging and labeling, at a minimum of once per year.

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8.2.5 [T] **Monitoring and measurement of processes** - The Supplier shall perform process studies on all new manufacturing (including assembly or sequencing) processes to verify process capability and to provide additional input for process control. The results of process studies shall be documented in specifications, where applicable, for means of production, measurement and test, and maintenance instructions. These documents shall include objectives for manufacturing process capability, reliability, maintainability, and availability, as well as acceptance criteria.

8.2.5.1 [T] The Supplier shall maintain manufacturing process capability or performance as specified in the production approval process requirements noted in Section 7.3.5 of this manual. The Supplier shall ensure that the control plan and process flow diagram are implemented, including adherence to the specified:

- a) measurement techniques,
- b) sampling plans,
- c) acceptance criteria, and
- d) reaction plans when acceptance criteria are not met.
- e) Significant process events, such as tool changes or machine repairs, shall be recorded.

8.2.5.2 [T] The Supplier shall initiate a reaction plan from the control plan for characteristics that are either not statistically capable or are unstable. The reaction plans shall include containment of the product and 100% inspection, as appropriate. A corrective action plan shall then be completed by the Supplier, indicating specific timing and assigned responsibilities to assure that the process becomes stable and capable. The plans shall be reviewed with, and approved by, the assigned SQE. The Supplier shall maintain records of effective dates of process changes, as noted in Section 7.1.3 of this manual. When requested the assigned SQE, the Supplier shall submit annual Cpk data on significant/critical characteristics and other SPC dimensions.

8.2.5.3 [A] In the event of process nonconformity, the Supplier shall:

8.2.5.4 take appropriate action to correct the process nonconformity,

8.2.5.5 evaluate whether the process nonconformity resulted in a product nonconformity, and

8.2.5.6 identify and control the nonconforming product as noted in Section 8.3 of this manual.

8.2.6 [A] **Monitoring and measurement of product** - When key characteristics have been identified, they shall be monitored and controlled. When the Supplier uses sampling inspection as a means of product acceptance, the plan shall be statistically valid and appropriate for use. When required, the plan shall be submitted to the assigned SQE for approval. Product shall not be used until it has been inspected or otherwise verified as conforming to specified requirements, except when product is released under positive-recall procedures pending completion of all required measurements and monitoring activities.

8.2.7 [T] **Layout inspection** - The Supplier shall perform annual dimensional and functional testing for each component and results submitted to the assigned SQE. Layout inspection is the complete measurement of all product dimensions shown on the design records.

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8.2.8 [A] **Inspection Documentation** - The Supplier shall maintain documentation demonstrating measurement requirements for product acceptance. When required to demonstrate product qualification, the Supplier shall ensure that the records provide evidence that the product meets the defined requirements. This documentation may be part of the production documentation, but shall include:

- a) criteria for acceptance and/or rejection,
- b) where in the sequence measurement and testing operations are performed,
- c) a record of the measurement results, including the actual test results data when required by the specification or acceptance plan, and
- d) the type of measurement instruments required and any specific instructions associated with their use.

8.3 **Control of Nonconforming Product**

8.3.1 [A] The Supplier shall have a process for timely reporting of delivered nonconforming product that may affect reliability or safety. Notification shall include a clear description of the nonconformity, which includes, as necessary, parts affected, part numbers, quantity and date(s) delivered.

8.3.2 [T] **Control of nonconforming product - supplemental** - The Supplier shall classify product with unidentified or suspect status as nonconforming product.

8.3.3 [T] **Control of reworked product** - The Supplier shall make accessible to the appropriate personnel instructions for rework, including re-inspection requirements.

8.3.4 [T] **Customer waiver** - The Supplier shall notify and obtain from the assigned SQE written concession or deviation permission by using the Supplier Request for Deviation Form G-SM-26 (doc #: 1006306), prior to further processing whenever the product or manufacturing process is different from that which is currently approved.

8.3.4.1 [T] The Supplier shall maintain a record of the expiration date or quantity authorized. The Supplier shall ensure compliance with the original or superseding specification and requirements when the authorization expires. Material shipped on an authorization shall be properly identified on each shipping container, as defined by the assigned SQE. This section also applies equally to the Supplier’s purchased products before submission to Sensata Technologies.

8.4 **Improvement**

8.4.1 [T] **Manufacturing process improvement** - The Supplier shall define a process for continual improvement utilizing the guidelines set forth in latest revision of ISO 9004. Continual improvements within the manufacturing process shall focus upon control and reduction of variation of product characteristics and manufacturing process parameters, as documented on the control plan.

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- 8.4.2 [**A**] **Corrective action** - The Supplier shall flow down corrective action requirements to the Supplier's supply chain when it is determined that the supply chain is responsible for the root cause, and specific actions, where timely and/or effective corrective actions are not achieved.
- 8.4.3 [**A/T**] **Corrective action** - The Supplier shall define a corrective action process which maintains the following steps:
- 8.4.3.1 [**A / T**] **Initial notification & containment** shall be implemented within 1 business day or 24 hours from the notification from the assigned Sensata SQE. Containment actions shall include all affected material within the Supplier's control (inventory, in transit, finished product shipped to Sensata Technologies). Notify the assigned SQE of the containment actions and coordination of replacement material and its availability.
- 8.4.3.2 [**T**] **Initial response** shall be written and submitted to the assigned SQE within 24 hours. The corrective action report shall use the Sensata Technologies Corrective Action Request Form (8D) G-SM-21 (doc #: 1006298). The initial response shall contain at a minimum:
- a) tracking number - Supplier's and/or Sensata Technologies',
 - b) names of the Supplier's corrective action team members with primary contact information,
 - c) name of the Sensata Technologies' SQE,
 - d) problem description,
 - e) containment action description (including implementation date and assigned name),
 - f) containment action verification (quantitative results),
 - g) certified material shipment dates and identification.
- Effective containment actions shall be maintained until the effectiveness of the permanent corrective action is proven and implemented with agreement from the assigned SQE.
- 8.4.3.3 [**A / T**] **Final response** shall be submitted to the assigned SQE within 14 days (calendar days) from Sensata's SQE notification (see section 8.4.3.1). A formal corrective action report (8D) shall contain implementation/effective dates, assigned responsibilities and at a minimum:
- a) description of the concern and the Sensata's tracking number,
 - b) containment action(s),
 - c) root Cause of the concern,
 - d) corrective action(s),
 - e) verification of containment and corrective action(s) (this is a measure of the action's effectiveness utilizing appropriate statistical or process performance analysis methods),
 - f) preventive measures ('Lessons Learned') as applicable to similar products and processes, (these are actions shall be systemic with a proactive and predictive approach with the focus on avoiding any further occurrences), and
 - g) verification of updates made to Process Flow Diagrams, FMEAs, and Process Control Plans, as appropriate.

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- 8.4.3.4 [A / T] Changes to the product, processes or documentation (i.e., drawings, specifications, Control Plans, FMEAs, Flow Charts, etc.) due to corrective action implementation shall be identified through revision levels and dates. Supporting documentation (i.e., laboratory analysis, statistical results, etc.) may be requested by the assigned SQE. In those situations when such changes are required, PPAP submission may be required by the assigned SQE.
- 8.4.3.5 [A / T] **Certified shipments** - All shipments of affected material shall be 'certified' (i.e., in compliance with the containment actions) until corrective action issues are formally closed by the assigned SQE. All material shall be shipped per approved methods and identified per Sensata Technologies' instructions. Individual component identification may be required.
- 8.4.4 [A / T] **Escalation process** - The Supplier will be placed on Controlled Shipping, when the implemented corrective action does not adequately protect Sensata Technologies. Controlled Shipping notification is initiated in writing by the assigned SQE and/or Procurement Manager. The notification will contain written instructions applicable to Control Shipping Level (CS I or CS II).
- 8.4.4.1 Control Shipping I (CS-I) - requires the supplier to add at a minimum an additional 100% inspection and containment at their facility using their own personnel for the quality incident.
- 8.4.4.2 Control Shipping II (CS-2) - requires that the supplier add an additional 100% inspection using an independent 3rd party inspection operation as defined and approved by the SQE.
- 8.4.4.3 [A / T] The Supplier may be placed on New Business Hold (NBH) until the Supplier successfully exits all (CS and 8D) activities, as determined by the respective Material Review Board Team (consisting of SQE, Make Site Purchasing Manager, and Commodity Purchasing Team & Manager). NBH is defined as the complete cessation of new business awards.
- 8.4.5 [T] **Problem solving, error-proofing and impact** - The Supplier corrective action process shall:
- a) utilize problem solving techniques which lead to root cause identification and elimination,
 - b) evaluate and utilize error-proofing methodologies to prevent recurrence, and
 - c) evaluate and implement corrective action controls on similar processes and products.
- 8.4.6 [T] **Rejected product test/analysis** - The Supplier shall have a process which minimizes the cycle time of parts returned by Sensata Technologies' MAKE Sites and Business Centers. The Supplier shall maintain test/analysis records to be made available when requested by the assigned SQE. The cycle time should be consistent with the determination of the root cause, corrective action and monitoring of the effectiveness of the implementation.

9 Cost Incurred

- 9.1 **Any costs** incurred by Sensata Technologies resulting from the Supplier nonconformance issue related to material shortages, downtime, tooling damage, inspections/certifications may be charged to the Supplier. Such costs may result from resources and measures implemented by Sensata Technologies to prevent customer disruptions, such as continuity of production requirements and quality requirements.

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10 **Sensata Technologies Reference Forms** - contact assigned SQE for latest revision:

Document #	Category	Description
1006298	G-SM-21	Supplier Corrective Action (8D) Form
1006304	G-SM-24	Supplier Request for Engineering Approval (SREA) Form
1006306	G-SM-26	Supplier Request for Deviation Form
1006309	G-SM-29	Run at Rate Worksheet
1006310	G-SM-30	Supplier Material Content Reporting Worksheet

11 **Sensata Technologies Portal**

11.1 Sensata Technologies has made available a Supplier Portal which can be accessed to obtain the latest communication on requirements. <http://supplier.ext.sensata.com/> .

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