

**Global Quality Management System Supplement for the
Automotive Industry Model, TS 16949: 2009**

1. SCOPE

1.1. Content

This specification defines the automotive industry Quality Management System requirements in accordance with ISO/TS 16949: 2009, Quality management systems - Particular requirements for the application of ISO 9001: 2008 for automotive production and relevant service part organizations. In addition, this document is a supplement to Quality Specification, TEC-1000 in providing criteria for compliance to automotive industry requirements.

Alignment to Quality Specification TEC-1000 is achieved through the ISO 9001: 2008, paragraph tables which address each additional ISO/TS 16949: 2009, requirement.

1.2. Application

This specification applies to all business units of Tyco Electronics. In recognition of the varying organizational structures and needs, Business units may develop and use supporting specifications and/or procedures. However, such supporting documentation shall not conflict with or supersede this specification.

2. APPLICABLE DOCUMENTS

The following documents constitute a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies.

2.1. Specifications

A. TEC-1000 Tyco Electronics Global Quality Management System

2.2. Industry Standards

- A. ISO/TS 16949: 2009 Quality management systems – Particular requirements for the application of ISO 9001: 2000 for automotive production and relevant service part organizations
- B. ISO 9001: 2008 Quality management systems – Requirements
- C. ISO 9004: 2000 Quality management systems – Guidelines for performance improvements
- D. ISO/IEC 17025: 2005 General requirements for the competence of testing and calibration laboratories

3. DEFINITIONS

Definitions contained in the above mentioned Specifications and Industry Standards are applicable herein.

NOTE *On all subsequent pages, **Bold Text** in the right hand column represents Tyco Electronics commentary.*

4. QUALITY MANAGEMENT SYSTEM (QMS)

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
4.1. QMS – General Requirements 4.2. Documentation Requirements 4.2.1. Documentation Requirements – General 4.2.2. Quality Manual	4.1.1 General requirements - Supplemental Ensuring control over outsourced processes shall not absolve the organization of the responsibility of conformity to all customer requirements. <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;">NOTE</div> <i>See also Paragraphs 7.4.1. and 7.4.1.3.</i> Regardless of the manufacturing location, Tyco Electronics is responsible for the quality of the product delivered to the customer. Tyco Electronics will represent the needs of the customer in internal functions in addressing ISO/TS 16949: 2002 requirements.
4.2.3. Document and Data Control 4.2.3.1. Initial Issue 4.2.3.2. Changes 4.2.3.3. Drawings, Standards, and Specifications	4.2.3.1. Engineering specifications The organization shall have a process to assure the timely review, distribution and implementation of all customer engineering standards/specifications and changes based on customer-required schedule. Timely review should be as soon as possible, and shall not exceed two working weeks. Documents shall be reviewed and changes implemented based on the customer required schedule. A record of the date on which each change is implemented in production shall be maintained. The organization shall maintain a record of the date on which each change is implemented in production. Implementation shall include updated documents. <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;">NOTE</div> <i>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 documents of production part approval process, such as control plan, FMEA'S, etc</i> A record of the date on which each change is implemented in production shall be maintained. Product Part Approval Process (PPAP) documents shall be updated when affected by changes to controlled documents.

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
4.2.4. Control of Quality Records	<p data-bbox="565 226 909 254">4.2.4.1. Records retention</p> <p data-bbox="696 258 1395 317">The control of records shall satisfy statutory, regulatory and customer requirements.</p> <p data-bbox="696 352 1433 470">It is the responsibility of the business unit to identify, collect, maintain, store, and dispose of quality records as specified by statutory and regulatory requirements and by customers.</p> <p data-bbox="696 506 1406 594">Records are maintained based upon legal requirements, Tyco Electronics' policies, and customer specific requirements; whichever is the longer retention period.</p>

5. MANAGEMENT RESPONSIBILITY

TEC-1000		SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS	
5.1.	Management Commitment Customer Focus Quality Policy	5.1.1.	Process efficiency Top management shall review the product realization processes and the support processes to assure their effectiveness and efficiency. Top management shall review the product realization processes and the support processes to assure their effectiveness and efficiency.
5.2.		5.4.1.1.	Quality objectives - Supplemental Top management shall define quality objectives and measurements that shall be included in the business plan and used to deploy the quality policy. <div style="border: 1px solid black; padding: 5px; display: inline-block;"> NOTE </div> <i>Quality objectives should address customer expectations and be achievable within a defined time period.</i> Top management shall establish quality objectives and performance measures that address customer expectations. These quality objectives and goals shall be included in the Business Plan and used to deploy the Quality Policy.
5.3.			
5.4.	Planning Quality Objectives QMS Planning	5.4.1.1.	Quality objectives - Supplemental Top management shall define quality objectives and measurements that shall be included in the business plan and used to deploy the quality policy. <div style="border: 1px solid black; padding: 5px; display: inline-block;"> NOTE </div> <i>Quality objectives should address customer expectations and be achievable within a defined time period.</i> Top management shall establish quality objectives and performance measures that address customer expectations. These quality objectives and goals shall be included in the Business Plan and used to deploy the Quality Policy.
5.4.1.			
5.4.2.			
5.5.	Responsibility, Authority and Communication Responsibility and Authority	5.5.1.1.	Responsibility for quality Managers with responsibility and authority for corrective action shall be promptly informed of product or processes which do not conform to requirements. Documented corrective action processes include notification of the applicable management. Management shall provide adequate resources to ensure the completion of appropriate activities. Personnel responsible for product quality shall have the authority to stop production to correct quality problems. All levels of personnel have the authority to halt nonconforming processes and initiate, recommend, or provide corrective / preventive solutions through designated channels. Production operations across all shifts shall be staffed with personnel in charge of, or delegated responsibility for, ensuring conformity to product requirements. Every Tyco Electronics associate is personally responsible for quality, continual improvement, and customer satisfaction.
5.5.1.			

TEC-1000		SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS	
5.5.2.	Management Representative	5.5.2.1.	Customer representative
5.5.3.	Internal Communication		<p>Top management shall designate personnel with responsibility and authority to ensure that customer requirements are addressed. This includes selection of special characteristics, setting quality objectives and related training, corrective and preventive actions, product design and development.</p> <p>Top management shall designate individual(s) to represent the needs of the customer in internal functions in addressing ISO/TS 16949 requirements (e.g. selection of special characteristics, setting quality objectives, training, corrective and preventive actions, product design and development).</p>
5.6.	Management Review	5.6.1.1.	Quality management system performance
5.6.1.	General		<p>These reviews shall include all requirements of the quality management system and its performance trends as an essential part of the continual improvement process.</p> <p>Part of the management review shall be the monitoring of quality objectives, and the regular reporting and evaluation of the cost of poor quality (see 8.4.1 and 8.5.1).</p> <p>These results shall be recorded to provide, as a minimum, evidence of the achievement of</p> <ul style="list-style-type: none"> • the quality objectives specified in the business plan, and • customer satisfaction with product supplied. <p>Management review shall include all elements of the quality management system, performance trends, monitoring the quality objectives and reporting and evaluation of the cost of poor quality. Results of the review shall address achievement of the objectives specified in the Quality Policy and Business Plan and customer satisfaction.</p>
5.6.2.	Review Input	5.6.2.1.	Review input - Supplemental
5.6.3.	Review Output		<p>Input to management review shall include an analysis of actual and potential field-failures and their impact on quality, safety or the environment.</p> <p>The input to management review shall include information on:</p> <ul style="list-style-type: none"> • Analysis of actual and potential field failures and their impact on quality, safety or the environment, and • Design and development project summary measurements.

6. RESOURCE MANAGEMENT

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
<p>6.1. Provision of Resources</p> <p>6.2. Human Resources</p> <p>6.2.1. General</p> <p>6.2.2. Competence, Training and Awareness</p> <p>6.2.2.1. Human Resources Function</p> <p>6.2.2.2. Qualification Training</p> <p>6.2.2.3. Training Effectiveness</p>	<p>6.2.2.1. Product design skills</p> <p>The organization shall ensure that personnel with product design responsibility are competent to achieve design requirements and are skilled in applicable tools and techniques. Applicable tools and techniques shall be identified by the organization.</p> <p>Personnel with product design responsibilities shall be qualified to achieve the design requirements and shall be skilled in applicable tools and techniques.</p>
	<p>6.2.2.2. Training</p> <p>The organization shall establish and maintain documented procedures for identifying training needs and achieving competence of all personnel performing activities affecting conformity to product requirements. Personnel performing specific assigned tasks shall be qualified, as required, with particular attention to the satisfaction of customer requirements.</p> <p>NOTE 1 <i>This applies to all employees having an effect on quality at all levels of the organization.</i></p> <p>NOTE 2 <i>An example of the customer specific requirements is the application of digitized mathematically based data.</i></p> <p>A documented procedure shall be established and maintained for identification of training needs and achievement of competency of all personnel performing activities affecting product quality. Attention shall be given to satisfy any customer specific requirements.</p>
	<p>6.2.2.3. Training on the job</p> <p>The organization shall provide on-the-job training for personnel in any new or modified job affecting conformity to product requirements, including contract or agency personnel. Personnel whose work can affect quality shall be informed about the consequences to the customer of nonconformity to quality requirements.</p> <p>Personnel whose work can affect quality shall be informed about the consequences to the customer when there is a nonconformance to specified quality requirements.</p>
	<p>6.2.2.4. Employee motivation and empowerment</p> <p>The organization shall have a process to motivate employees to achieve quality objectives, to make continual improvements, and to create an environment to promote innovation. The process shall include the promotion of quality and technological awareness throughout the whole organization.</p>

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	<p>A process for motivating employees to achieve quality objectives, to make continual improvements and to create an environment to promote innovation shall be established. The process shall include the promotion of quality and technological awareness throughout the organization.</p> <p>The organization shall have a process to measure the extent to which its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives [see 6.2.2 d)].</p> <p>A process shall be deployed to measure the extent to which employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.</p>
<p>6.3. Infrastructure 7.1.2. Disaster Recovery Planning</p>	<p>6.3.1. Plant, facility and equipment planning</p> <p>The organization shall use a multidisciplinary approach (see 7.3.1.1) for developing plant, facility and equipment plans. Plant layouts shall optimize material travel, handling and value-added use of floor space, and shall facilitate synchronous material flow. Methods shall be developed and implemented to evaluate and monitor the effectiveness of existing operations.</p> <p>NOTE <i>These requirements should focus on lean manufacturing principles and the link to the effectiveness of the quality management system.</i></p> <p>A methodology shall be utilized which uses a multi-disciplinary approach for developing facilities, processes and equipment plans. Plant layouts shall optimize travel, handling and value-added use of floor space and shall facilitate synchronous material flow. Methods shall be developed and implemented to evaluate and monitor the effectiveness of existing operations.</p> <hr/> <p>6.3.2. Contingency plans</p> <p>The organization shall prepare contingency plans to satisfy customer requirements in the event of an emergency such as utility interruptions, labor shortages, key equipment failure and field returns.</p> <p>Business recovery plans are developed and maintained at a facility level to ensure the ability to maintain product and service continuity in the event of a disaster. These plans shall include contingencies in the event of emergency such as utility interruptions, labor shortages, and key equipment failure and reasonably protect the customer's supply of product. (TEC-1000)</p>

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6.4. Work Environment	6.4.1. Personnel safety to achieve conformity to product requirements
	Product safety and means to minimize potential risks to employees shall be addressed by the organization, especially in the design and development process and in manufacturing process activities. The established requirements, as described in the Quality Policy, include addressing of product safety and means to minimize potential risks to employees. These requirements shall especially be addressed in design, development, and manufacturing process activities.
	6.4.2. Cleanliness of premises
The organization shall maintain its premises in a state of order, cleanliness and repair consistent with the product and manufacturing process needs. Facilities, including workstations and associated equipment, shall be maintained in a state of order, cleanliness, and repair such that they do not adversely affect product quality or personnel performance. All work areas must comply with established safety, regulatory and environmental standards and codes. (TEC-1000)	

7. PRODUCT REALIZATION

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
<p>7.1. Planning of Product Realization</p> <p>7.1.1. New Product Introduction</p> <p>7.1.2. Disaster Recovery Planning (see Paragraph 6.3.)</p>	<p>7.1.1. Planning of product realization - Supplemental</p>
	<p>Customer requirements and references to its technical specifications shall be included in the planning of product realization as a component of the quality plan.</p> <p>It is the responsibility of the business unit to identify and plan for the product realization processes necessary for product realization. These processes shall include customer requirements and references to applicable technical specifications as design inputs and quality plan components.</p>
	<p>7.1.2. Acceptance Criteria</p>
	<p>Acceptance criteria shall be defined by the organization and, where required, approved by the customer. For attribute data sampling, the acceptance level shall be zero defects (see 8.2.3.1).</p> <p>Material and product acceptance criteria shall be defined throughout the product realization process including design verification and validation; purchased product verification; first article examinations, process set-up, in-process, and final product inspections.</p> <p>Tyco Electronics endorses maximum uses of inspection strategies such as attribute and variables sampling plans to reduce inspection while maintaining a sound statistical basis for ensuring product compliance with specified requirements. Zero Acceptance Sampling Plans shall be utilized for all attribute data sampling.</p>
	<p>7.1.3. Confidentiality</p>
<p>The organization shall ensure the confidentiality of customer-contracted products and projects under development, and related product information.</p> <p>Confidentiality of customer-contracted products and projects shall be maintained in accordance with Tyco Electronics' policies. It is the responsibility of all employees, who by the nature of their position or work with customers, to ensure that an appropriate nondisclosure agreement is properly executed.</p>	
<p>7.1.4. Change control</p>	
<p>The organization shall have a process to control and react to changes that impact product realization. The effects of any change, including those changes caused by any supplier, shall be assessed, and verification and validation activities shall be defined, to ensure compliance with customer requirements. Changes shall be validated before implementation.</p>	

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	<p>For proprietary designs, impact on form, fit and function (including performance and/or durability) shall be reviewed with the customer so that all effects can be properly evaluated. When required by the customer, additional verification/identification requirements, such as those required for new product introduction, shall be met.</p> <p>NOTE 1 <i>Any product realization change affecting customer requirements requires notification to, and agreement from, the customer.</i></p> <p>NOTE 2 <i>The above requirement applies to product and manufacturing process changes.</i></p> <p>Changes including design, material, product, process, system, software, inspection, and packaging shall be identified, documented, assessed, validated, and approved by authorized personnel before implementation.</p> <p>Changes to customer proprietary designs are reviewed with the applicable customer with any additional verification/identification requirements addressed and met. Records of changes during the development process shall be maintained. Tyco Electronics defines the responsibilities for monitoring and ensuring that the changes do not adversely affect product quality, performance or reliability.</p>
<p>7.2. Customer Related Processes</p> <p>7.2.1. Determination of Product Related Requirements</p> <p>7.2.2. Review of Product Related Requirements</p> <p>7.2.2.1. Customer Service</p> <p>7.2.2.2. Customer Specification Review</p> <p>7.2.3. Customer Communication</p>	<p>NOTE 1 <i>Post-delivery activities include any after-sales product service provided as part of the customer contract or purchase order.</i></p> <p>NOTE 2 <i>This requirement includes recycling, environmental impact and characteristics identified as a result of the organization's knowledge of the product and manufacturing processes (see 7.3.2.3).</i></p> <p>NOTE 3 <i>Compliance to item c) includes all applicable government, safety and environmental regulations, applied to acquisition, storage, handling, recycling, elimination or disposal of materials.</i></p> <hr/> <p>7.2.1.1. Customer-designated special characteristics</p> <p>The organization shall demonstrate conformity to customer requirements for designation, documentation and control of special characteristics.</p>

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	<p>A formal statement or outline of product requirements shall be developed which translates customer requirements and expectations into a preliminary set of specifications as the basis for subsequent design work. (TEC-1000)</p> <p>This document shall demonstrate conformity to customer requirements including designation, documentation, and the control of special characteristics.</p>
	<p>7.2.2.1. Review of requirements related to the product - Supplemental</p> <p>Waiving the requirement stated in 7.2.2 for a formal review (see note) shall require customer authorization.</p> <p>While formal product requirement reviews could involve a comparison to relevant published product information, a formal review shall be conducted and confirmed by the designated customer service function.</p> <p>In those cases where there is an established cross-reference between the customer part number and a Tyco Electronics part number, the customer service representative shall review the order to confirm the pricing and delivery requirements. If any discrepancies are observed, the order is reconciled within the business unit and transmitted to the customer service representative. Booking the order is confirmation that there are no known discrepancies between the customer request and the ability to meet the request. (TEC-1000)</p>
	<p>7.2.2.2. Organization manufacturing feasibility</p> <p>The organization shall investigate, confirm and document the manufacturing feasibility of the proposed products in the contract review process, including risk analysis.</p> <p>The Manufacturing Engineering function shall investigate, confirm and document the manufacturing feasibility of the proposed products, including risk analysis.</p>
	<p>7.2.3.1. Customer communication - Supplemental</p> <p>The organization shall have the ability to communicate necessary information, including data, in a customer specified language and format (e.g. computer-aided design data, electronic data exchange).</p> <p>Customer communications shall include the ability to exchange information and data in a customer-specified language and format as a two way interface with customer systems. Communication and information exchanges include CAD/CAE and EDI.</p>

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
<p>7.3. Design and Development</p> <p>7.3.1. Design and Development Planning</p> <p>7.3.1.1. Project Planning</p>	<p>7.3.1.1. Multidisciplinary approach</p> <p>The organization shall use a multidisciplinary approach to prepare for product realization, including</p> <ul style="list-style-type: none"> • development/finalization and monitoring of special characteristics, • development and review of FMEAs, including actions to reduce potential risks, and • the development and review of control plans. <p>NOTE <i>A multidisciplinary approach typically includes the organization's design, manufacturing, engineering, quality, production and other appropriate personnel.</i></p> <p>Project plans shall be prepared that identify the responsibility, budgets, staffing and schedules for each design and development activity. The plans shall involve a multidisciplinary approach and include the pertinent organizational and technical interfaces between the different internal and external disciplines.</p>
<p>7.3.2. Design and Development Inputs</p> <p>7.3.2.1. Customer Input</p>	<p>NOTE <i>Special characteristics (see 7.2.1.1.) are included in this requirement.</i></p> <p>7.3.2.1. Product design input</p> <p>The organization shall identify, document and review the product design inputs requirements, including the following:</p> <ul style="list-style-type: none"> • customer requirements (contract review) such as special characteristics (see 7.3.2.3), identification, traceability and packaging; • use of information: the organization shall have a process to deploy information gained from previous design projects, competitor analysis, supplier feedback, internal input, field data, and other relevant sources, for current and future projects of a similar nature; • targets for conformity to product requirements, life, reliability, durability, maintainability, timing and cost. <p>Design inputs shall consider customer special characteristic, identification, traceability, and packaging requirements; previous project histories, competitor analysis, field input, and supplier inputs; and the establishment of targets for conformity to product requirements, life, reliability, durability, maintainability, timing and cost.</p>

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	<p>7.3.2.2. Manufacturing process design input</p> <p>The organization shall identify, document and review the manufacturing process design input requirements, including</p> <ul style="list-style-type: none"> • product design output data; • targets for productivity, process capability and cost; • customers requirements, if any; • and experience from previous developments. <p>NOTE <i>The manufacturing process design includes the use of error-proofing methods to a degree appropriate to the magnitude of the problems and commensurate with the risks encountered.</i></p> <p>The manufacturing process design shall be identified, documented and reviewed. Design inputs shall include:</p> <ul style="list-style-type: none"> • Data from the output of the product design; • Targets for productivity, process capability and cost; • Applicable customer requirements; • Experience from similar products and previous process development.
	<p>7.3.2.3. Special characteristics</p> <p>The organization shall identify special characteristics [see 7.3.3 d)] and</p> <ul style="list-style-type: none"> • include all special characteristics in the control plan; • comply with customer-specified definitions and symbols, and; • identify process control documents including drawings, FMEAs, control plans, and operator instructions with the customer's special characteristic symbol or the organization's equivalent symbol or notation to include those process steps that affect special characteristics. <p>NOTE <i>Special characteristics can include product characteristics and process parameters.</i></p> <p>Special characteristics, including those designated by customers, shall be identified and included in control plans and FMEA's. Designations shall comply with customer specified definitions and symbols.</p> <p>Specific attention shall be paid to any designated special characteristics to ensure that excessive variation does not adversely affect a product's safety, compliance with customer specified characteristics, government regulations, fit, function, appearance or the quality of subsequent manufacturing operations.</p>

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
7.3.3. Design and Development Outputs	7.3.3.1. Product design outputs - Supplemental The product design output shall be expressed in terms that can be verified and validated against product design input requirements. The product design output shall include <ul style="list-style-type: none"> • design FMEA, reliability results; • product special characteristics and specifications; • product error-proofing, as appropriate; • product definition including drawings or mathematically based data; • product design reviews results; and • diagnostic guidelines where applicable. <p>The design output shall be documented and expressed in terms of design input requirements, calculations and analyses, and shall</p> <ul style="list-style-type: none"> • Identify special characteristics in the control plan; • Comply with customer specified definitions and symbols by providing these symbols or equivalent on control plans, drawings, FMEA's and operator instructions; and • Consider product error-proofing as appropriate.
	7.3.3.2. Manufacturing process design output The manufacturing process design output shall be expressed in terms that can be verified against manufacturing process design input requirements and validated. The manufacturing process design output shall include <ul style="list-style-type: none"> • specifications and drawings; • manufacturing process flow chart/layout; • manufacturing process FMEAs; • control plan (see 7.5.1.1); • work instructions; • process approval acceptance criteria; • data for quality, reliability, maintainability and measurability; • results of error-proofing activities, as appropriate; and • methods of rapid detection and feedback of product/manufacturing process nonconformities. <p>The manufacturing process design output shall include:</p> <ul style="list-style-type: none"> • Specifications and drawings; • Manufacturing process flow chart or layout; • Process FMEA'S; • Control plan; • Work instructions; • Process approval acceptance criteria; • Data for quality, reliability, maintainability and measurability; • Results of error-proofing activities as appropriate; • Identification of methods for rapid detection and feedback of product and process nonconformances.

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7.3.4. Design and Development Review	<p>NOTE <i>These reviews are normally coordinated with the design phases and include manufacturing process design and development.</i></p> <hr/> 7.3.4.1. Monitoring Measurements at specified stages of design and development shall be defined, analyzed and reported with summary results as an input to management review.
7.3.5. Design and Development Verification 7.3.6. Design and Development Validation 7.3.7. Control of Design and Development Changes	<p>NOTE 1 <i>The validation process normally includes an analysis of field reports for similar products.</i></p> <p>NOTE 2 <i>The requirements of 7.3.5. and 7.3.6. apply to both product and manufacturing processes.</i></p> <hr/> 7.3.6.1. Design and development validation - Supplemental Design and development validation shall be performed in accordance with customer requirements including program timing.
	<p>Design and development validation shall be conducted after the successful completion of design verification with product validated to ensure suitability for end use. Product validation shall include all design inputs including customer requirements and shall be performed in accordance with the established project plan. In addition, all customer requests for qualification or re-qualification shall be submitted to and coordinated by Tyco Electronics.</p>
	7.3.6.2. Prototype program When required by the customer, the organization shall have a prototype program and control plan. The organization shall use, wherever possible, the same suppliers, tooling and manufacturing processes as will be used in production.
	<p>All performance-testing activities shall be monitored for timely completion and conformity to requirements.</p>
	<p>While services may be outsourced, the organization shall be responsible for the outsourced services, including technical leadership.</p>

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
	<p>A validation test program shall be developed that will, when completed, provide evidence of successful product testing in accordance with</p> <ul style="list-style-type: none"> • internal requirements, • customer agreed upon requirements including customer certification criteria, • government agency certification requirements, and • commercial agency requirements. <p>Product used for qualification shall be made from the correct material, meet all product drawing requirements, and be manufactured by the same core manufacturing processes and technologies to be used for the production parts.</p> <p>When necessary, actual testing may be performed at other qualified test facilities, but shall be under the coordination and approval of the Tyco Electronics test laboratory or facility receiving the initial test request. (TEC-1000)</p>
	<p>7.3.6.3. Product approval process</p> <p>The organization shall conform to a product and manufacturing process approval procedure recognized by the customer.</p> <p>NOTE <i>Product approval should be subsequent to the verification of the manufacturing process.</i></p> <p>This product and manufacturing process approval procedure shall also be applied to suppliers.</p> <p>For products supplied to automotive customers, the PPAP methodology, or other customer recognized procedures, shall be utilized for production tool approval.</p> <p>At the appropriate point in the development cycle of the product, or as required by timing of the customers program, the Design / Quality function shall coordinate a product performance evaluation.</p> <p>NOTE <i>Design and development changes include all changes during the product program life (see 7.1.4.).</i></p>

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
<p>7.4. Purchasing 7.4.1. Purchasing Process 7.4.1.1. New Suppliers 7.4.1.2. Supplier Performance 7.4.2. Purchasing Information</p>	<p>NOTE 1 <i>Purchased products above include all products and services that affect customer requirements such as subassembly, sequencing, sorting, rework and calibration services.</i></p> <p>NOTE 2 <i>When there are mergers, acquisitions or affiliations associated with suppliers, the organization should verify the continuity of the supplier's quality management system and its effectiveness.</i></p>
	<p>7.4.1.1. Statutory and Regulatory conformity</p> <p>All purchased products or materials used in product shall conform to applicable statutory and regulatory requirements.</p> <p>Purchased product shall comply with all governmental, safety, and environmental requirements for the country of manufacture and sale. (TEC-1000)</p>
	<p>7.4.1.2. Supplier quality management system development</p> <p>The organization shall perform supplier quality management system development with the goal of supplier conformity with this Technical Specification. Conformity with ISO 9001: 2008 is the first step in achieving this goal.</p> <p>NOTE <i>The prioritization of suppliers for development depends upon, for example, the supplier's quality performance and the importance of the product supplied.</i></p> <p>Unless otherwise specified by the customer, suppliers to the organization shall be third party registered to ISO 9001: 2008 by an accredited third-party certification body.</p> <p>The goal for suppliers is conformity to ISO/TS 16949 with ISO 9001 conformity accepted as the first step towards achieving this goal. This may be demonstrated through third party registration to ISO 9001 or a second party audit process which includes annual audits. Small suppliers may be excluded from this registration or second party audit process when determined base upon established "small" supplier criteria.</p>
	<p>7.4.1.3. Customer-approved sources</p> <p>Where specified by the contract (e.g. customer engineering drawing, specification), the organization shall purchase products, materials or services from approved sources.</p> <p>The use of customer-designated sources, including tool/gauge suppliers, does not relieve the organization of the responsibility for ensuring the quality of purchased products.</p>

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	<p>In the event an external customer has an approved supplier list, the responsible business unit must coordinate with purchasing to make sure that those suppliers are included in the Tyco Electronics supply base. Tyco Electronics is responsible for products and services purchased from customer designated suppliers. Optionally, the business unit may work with the customer to have the Tyco Electronics supplier added to their list of approved suppliers. (TEC-1000)</p>
<p>7.4.3. Verification of Purchased Products</p>	<p>7.4.3.1. Incoming product conformity to requirements</p> <p>The organization shall have a process to assure the quality of purchased product (see 7.4.3) utilizing one or more of the following methods:</p> <ul style="list-style-type: none"> • receipt of, and evaluation of, statistical data by the organization; • receiving inspection and/or testing such as sampling based on performance; • second- or third-party assessments or audits of supplier sites, when coupled with records of acceptable delivered product conformity to requirements; • part evaluation by a designated laboratory; • another method agreed with the customer. <p>Under requirements of the purchase order, appropriate data may be requested from a supplier’s process control system, the receiving inspection function may sample incoming product based on past performance, or Tyco Electronics may verify, or designate verification, of product at the supplier’s site.</p>
	<p>7.4.3.2. Supplier monitoring</p> <p>Supplier performance shall be monitored through the following indicators:</p> <ul style="list-style-type: none"> • delivered product conformity to requirements; • customer disruptions including field returns; • delivery schedule performance (including incidents of premium freight); • special status customer notifications related to quality or delivery issues. <p>The organization shall promote supplier monitoring of the performance of their manufacturing processes.</p> <p>Supplier performance indicators shall be based on objective evidence data and include, but not be limited to:</p> <ul style="list-style-type: none"> • Delivered product conformity to requirements performance; • Customer disruptions, including returned material; • Delivery performance, including inbound and outbound premium freight charges; • Customer notifications related to quality or delivery issues.

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<p>7.5. Production and Service Processes</p> <p>7.5.1. Control of Production and Service Processes</p>	<p>7.5.1.1. Control plan</p> <p>The organization shall</p> <ul style="list-style-type: none"> • develop control plans (see annex A) at the system, subsystem, component and/or material level for the product supplied, including those for processes producing bulk materials as well as parts, and • have a control plan for pre-launch and production that takes into account the design FMEA and manufacturing process FMEA outputs. <p>The control plan shall</p> <ul style="list-style-type: none"> • list the controls used for the manufacturing process control, • include methods for monitoring of control exercised over special characteristics (see 7.3.2.3) defined by both the customer and the organization, • include the customer-required information, if any, and • initiate the specified reaction plan (see 8.2.3.1) when the process becomes unstable or not statistically capable. <p>Control plans shall be reviewed and updated when any change occurs affecting product, manufacturing process, measurement, logistics, supply sources or FMEA (see 7.1.4).</p> <p>NOTE <i>Customer approval may be required after review or update of the control plan.</i></p> <p>Control plans shall be developed and maintained for pre-launch and production operations for raw materials, components and finished product in accordance with Annex A of ISO/TS 16949. Control plans shall consider the output from the design and process FMEA's. Control plans shall include:</p> <ul style="list-style-type: none"> • Controls for the manufacturing process; • Controls for special characteristics; • Applicable customer requirements; • The specified reaction plan when the process becomes unstable or not statistically capable. <p>Control plans shall be reviewed and updated whenever any change occurs affecting the product, manufacturing process, measurement technique, logistics, supplier or FMEA.</p>
	<p>7.5.1.2. Work instructions</p> <p>The organization shall prepare documented 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 station.</p> <p>These instructions shall be derived from sources such as the quality plan, the control plan and the product realization process.</p>

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	<p>Identification and planning of production and service processes that directly affect conformity to product requirements shall ensure that these processes are carried out under controlled conditions in accordance with documented procedures. Production functions shall ensure that needed work instructions are available for use at the work station.</p>
	<p>7.5.1.3. Verification of job set-ups</p> <p>Job set-ups shall be verified whenever performed, such as an initial run of a job, material changeover or job change.</p> <p>Work instructions shall be available for set-up personnel. The organization shall use statistical methods of verification where applicable.</p> <p>NOTE <i>Last-off-part comparisons are recommended.</i></p> <p>Process setups shall be verified for applicable manufacturing processes whenever a setup is performed (e.g., initial run of a job, material changeover, job change, significant time periods lapsed between runs, etc.). Verification shall include a critical inspection of the initial product produced after the setup is completed. Job instructions shall be available for setup personnel.</p>
	<p>7.5.1.4. Preventive and predictive maintenance</p> <p>The organization shall identify key process equipment and provide resources for machine/equipment maintenance and develop an effective planned total preventive maintenance system. As a minimum, this system shall include the following:</p> <ul style="list-style-type: none"> • planned maintenance activities; • packaging and preservation of equipment, tooling and gauging; • availability of replacement parts for key manufacturing equipment; • documenting, evaluating and improving maintenance objectives. <p>As a minimum, the preventive maintenance system shall include planned maintenance activities, packaging and preservation of equipment, tooling and gauging, availability of replacement parts for key manufacturing equipment and documenting, evaluating and improving maintenance activities.</p> <p>The organization shall utilize predictive maintenance methods to continually improve the effectiveness and the efficiency of production equipment.</p> <p>Predictive maintenance methods shall be used to continually improve the effectiveness and efficiency of production equipment.</p>

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	<p>7.5.1.5. Management of production tooling</p> <p>The organization shall provide resources for tool and gauge design, fabrication and verification activities.</p> <p>The organization shall establish and implement a system for production tooling management including:</p> <ul style="list-style-type: none"> • maintenance and repair facilities and personnel; • storage and recovery; • set-up; • tool-change programs for perishable tools; • tool design modification documentation, including engineering change level; • tool modification and revision to documentation; • tool identification, defining the status, such as production, repair or disposal. <p>The organization shall implement a system to monitor these activities if any work is outsourced.</p> <p>A tooling management system shall be implemented which includes:</p> <ul style="list-style-type: none"> • Maintenance and repair facilities and personnel; • Storage and recovery; • Setup; • Tool change programs for perishable tools; • Tool modification, including tool design documentation and engineering change level; • Tool identification and defining the status of the tool. <p>The business unit shall provide resources for tool and gauge design, fabrication and verification activities.</p> <p>The business unit is responsible for monitoring these activities when any of this work is completed by external suppliers.</p>
	<p>7.5.1.6. Production scheduling</p> <p>Production shall be scheduled in order to meet customer requirements, such as just-in-time supported by an information system that permits access to production information at key stages of the process and is order driven.</p> <p>Unless waived by the customer, a computerized system for on-line transmittal of advanced shipment notifications (ASNs), transmitted timely to shipments shall be maintained. A back-up method shall be in place in the event that the on-line system fails. In such an event it shall be verified that all ASNs match shipping documents and labels.</p>
	<p>7.5.1.7. Feedback of information from service</p> <p>A process for communication of information on service concerns to manufacturing, engineering and design activities shall be established and maintained.</p>

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	<p>NOTE <i>The intent of the addition of “service concerns” to this subclause is to ensure that the organization is aware of nonconformities that occur outside of its organization.</i></p> <p>Tyco Electronics does not provide an automotive industry service product subject to the requirements of ISO/TS 16949: 2009, clause 7.5.1.7.</p> <p>Relevant customer and OEM warranty data will be received and addressed through customer satisfaction monitoring processes associated with paragraph 8.2.1.</p>
	<p>7.5.1.8. Service agreement with customer</p> <p>When there is a service agreement with the customer, the organization shall verify the effectiveness of</p> <ul style="list-style-type: none"> • any organization service centers, • any special-purpose tools or measurement equipment, and • the training of service personnel. <p>Tyco Electronics does not provide an automotive industry service product subject to the requirements of ISO/TS 16949: 2009, clause 7.5.1.8.</p>
<p>7.5.2. Validation of Production and Service Processes</p> <p>7.5.2.1. Process Monitoring and Operator Instructions</p> <p>7.5.2.2. Verification of Process Setups and Operational Changes</p> <p>7.5.2.3. First Article Examination</p>	<p>7.5.2.1. Validation of processes for production and service provision - Supplemental</p> <p>The requirements of 7.5.2 shall apply to all processes for production and service provision.</p> <p>Process studies shall be completed on all new manufacturing processes to verify process capability and provide input for control of the process. Manufacturing process documentation shall include operating procedures, measurement, test and maintenance procedures. Objectives for manufacturing process capability, reliability, maintainability, capacity and acceptance criteria shall be documented.</p> <p>Process capability or performance shall be maintained as specified by the requirements of the customer part approval process and shall ensure implementation of the control plan and process flow diagram, including adherence to the specified measurements techniques, sampling plans, acceptance criteria and reaction plans.</p>

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	<p>Reaction plans for either unstable or non-capable processes should include containment of process output and 100% inspection. A corrective action plan shall then be completed indicating specific timing and assigned responsibilities to assure that the process becomes stable and capable. The plans are to be reviewed with and approved by the customer when so required.</p> <p>Where applicable, statistical methods of verification shall be utilized.</p> <p>Records of process change effective dates shall be maintained. Changes to promote continuous improvement are encouraged. The customer may be consulted for guidance on approval requirements for such changes.</p>
<p>7.5.3. Product Identification and Traceability</p> <p>7.5.3.1. Inspection and Test Status</p>	<p>NOTE <i>Inspection and test status is not indicated by the location of product in the production flow unless inherently obvious, such as material in an automated production transfer process. Alternatives are permitted, if the status is clearly identified, documented and achieves the designated purpose.</i></p> <hr/> <p>7.5.3.1. Identification and traceability - Supplemental</p> <p>The words "Where appropriate" in 7.5.3 shall not apply.</p> <p>All production materials in process and in inventory shall be identifiable as to part number, and shall be traceable to revision levels, and inspection status. A comparable identification methodology shall apply to sample / prototype / preproduction parts which must meet customer requirements. Configuration control shall be maintained for product and process change control.</p> <p>All product in final inventory shall be traceable to the date of manufacture. When date code identification is required, the date code shall identify the week of the manufacturing operation or inspection of the item.</p> <p>Specific traceability from raw material to final item is not required, with the following exception:</p> <p>Where lot traceability is required by customer contract and has been properly negotiated as to additional costs and requirements, then records shall be maintained for the unique identification of the individual product or lot. (TEC-1000)</p>
<p>7.5.4. Control of Customer Property</p>	<p>NOTE <i>Customer-owned returnable packaging is included in this clause.</i></p> <hr/> <p>7.5.4.1. Customer-owned production tooling</p>

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	<p>Customer-owned tools, manufacturing, test, inspection tooling and equipment shall be permanently marked so that the ownership of each item is visible, and can be determined.</p> <p>The processes for the control of verification, storage, and maintenance of customer-supplied product, including customer-owned packaging, for incorporation into the supplies or for related activities shall be established and maintained. Any customer-owned tools, manufacturing, test, inspection tooling and equipment shall be permanently marked so that the ownership of each item is visible, and can be determined.</p>
<p>7.5.5. Product Preservation 7.5.5.1. Shelf-Life</p>	<p>7.5.5.1. Storage and inventory In order to detect deterioration, the condition of product in stock shall be assessed at appropriate planned intervals.</p> <p>Each stocking location shall apply appropriate methods for preservation and segregation of product to ensure that material or product will remain undamaged pending use or delivery. In order to detect deterioration, each stocking area shall, at appropriate intervals, assess the condition of the product. (TEC-1000)</p> <p>The organization shall use 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 similar manner to nonconforming product.</p> <p>Inventory systems to optimize inventory turns over time, assure stock rotation, and minimize inventory levels shall be used. (TEC-1000)</p>
<p>7.6. Control of Inspection, Measuring, and Testing Equipment</p>	<p>7.6.1. Measurement system analysis Statistical studies shall be conducted to analyze the variation present in the results of each type of measuring and test equipment system. This requirement shall apply to measurement systems referenced in the control plan. The analytical methods and acceptance criteria used shall conform to those in customer reference manuals on measurement systems analysis. Other analytical methods and acceptance criteria may be used if approved by the customer.</p> <p>The variation of measuring and test equipment referenced in the control plan must be analyzed through the completion of appropriate statistical studies.</p>

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	<p data-bbox="565 228 1055 254">7.6.2. Calibration/verification records</p> <p data-bbox="695 260 1429 373">Records of the calibration/verification activity for all gauges, measuring and test equipment, needed to provide evidence of conformity of product to determined requirements, including employee- and customer-owned equipment, shall include:</p> <ul data-bbox="743 380 1458 720" style="list-style-type: none"> • equipment identification, including the measurement standard against which the equipment is calibrated, • revisions following engineering changes, • any out-of-specification readings as received for calibration/verification, • an assessment of the impact of out-of-specification condition, • statements of conformity to specification after calibration/verification, and • notification to the customer if suspect product or material has been shipped. <p data-bbox="695 753 1438 903">Each piece of equipment shall be appropriately identified and supported by records documenting the calibration history. Records for all pieces of measurement and test equipment shall be maintained. These records shall attest to the:</p> <ul data-bbox="743 909 1463 1440" style="list-style-type: none"> • Description or identification of the item. • Identification of the calibration service or source. • Calibration standard(s) used and procedure followed. • Calibration date. • Actual measured or assigned values (both “As Received” and “Final” values are required only when adjustments or repairs are made; one set of data indicates no adjustments or repairs were made). • Statement of conformity to specification and a description of any corrections applied. • Environmental or other conditions under which the calibration results were obtained. • Name of the person performing the calibration service. • Statement of traceability, and if available, the actual NIST trace number(s).
	7.6.3. Laboratory requirements
	7.6.3.1. Internal laboratory

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	<p>An organization's internal laboratory facility shall have a defined scope that includes its capability to perform the required inspection, test or calibration services. This laboratory scope shall be included in the quality management system documentation. The laboratory shall specify and implement, as a minimum, technical requirements for</p> <ul style="list-style-type: none"> • adequacy of the laboratory procedures, • competency of the laboratory personnel, • testing of the product, • capability to perform these services correctly, traceable to the relevant process standard (such as ASTM, EN, etc.), and • review of the related records. <p>NOTE <i>Accreditation to ISO/IEC 17025 may be used to demonstrate the organization's in-house laboratory conformity to this requirement but is not mandatory.</i></p> <p>Tyco Electronics laboratories shall have a defined scope and documented laboratory procedures that are analogous or traceable to the applicable industry standard. Laboratory personnel shall be qualified to conduct testing. Records of test results shall be maintained.</p>
	<p>7.6.3.2. External laboratory</p> <p>External/commercial/independent laboratory facilities used for inspection, test or calibration services by the organization shall have a defined laboratory scope that includes the capability to perform the required inspection, test or calibration, and either</p> <ul style="list-style-type: none"> • there shall be evidence that the external laboratory is acceptable to the customer, or • the laboratory shall be accredited to ISO/IEC 17025 or national equivalent. <p>NOTE 1 <i>Such evidence may be demonstrated by customer assessment, for example, or by customer-approved second-party assessment that the laboratory meets the intent of ISO/IEC 17025 or national equivalent.</i></p> <p>NOTE 2 <i>When a qualified laboratory is not available for a given piece of equipment, calibration services may be performed by the equipment manufacturer. In such cases, the organization should ensure that the requirements listed in 7.6.3.1 have been met.</i></p>

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	<p>External laboratories that are utilized for inspection, test or calibration services shall have a defined scope and shall be accredited to ISO / IEC 17025 or national equivalent or there shall be evidence that the external laboratory is acceptable to the customer.</p>

8. MEASUREMENT, ANALYSIS AND IMPROVEMENT

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
8.1. Measurement, Analysis, and improvement – General 8.1.1. Statistical Techniques	8.1.1. Identification of statistical Tools Appropriate statistical tools for each process shall be determined during advance quality planning and included in the control plan. Appropriate statistical tools for each process shall be determined during the advanced quality planning process and included in the control plan.
	8.1.2. Knowledge of basic statistical concepts Basic statistical concepts, such as variation, control (stability), process capability and over-adjustment shall be understood and utilized throughout the organization. A comprehension of basic statistical concepts will be demonstrated through the implementation of statistical tools as determined through the advanced quality planning process and included in control plans.
	<div style="background-color: black; color: white; padding: 2px; display: inline-block;">NOTE</div> <i>Consideration should be given to both internal and external customers.</i>
8.2. Monitoring and Measurement 8.2.1. Customer Satisfaction	8.2.1.1. Customer satisfaction - Supplemental Customer satisfaction with the organization shall be monitored through continual evaluation of performance of the realization processes. Performance indicators shall be based on objective data and include, but not be limited to: <ul style="list-style-type: none"> • delivered part quality performance, • customer disruptions including field returns, • delivery schedule performance (including incidents of premium freight), and • customer notifications related to quality or delivery issues. The organization shall monitor the performance of manufacturing processes to demonstrate compliance with customer requirements for product quality and efficiency of the process. Performance indicators for customer satisfaction shall be based on objective data and include, but not be limited to: <ul style="list-style-type: none"> • Delivered product quality performance; • Customer disruptions, including return material; • Delivery performance, including premium freight; • Customer notifications related to quality or delivery issues.

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
	<p>Manufacturing process performance shall be monitored to demonstrate compliance with customer requirements for product quality and process efficiency.</p> <p>When provided, customer satisfaction scorecards shall be utilized to monitor quality performance.</p>
<p>8.2.2. Internal Assessments and Audits</p> <p>8.2.2.1. Manufacturing Process Audits</p> <p>8.2.2.2. External Assessments</p>	<p>8.2.2.1. Quality management system audit</p>
	<p>The organization shall audit its quality management system to verify compliance with this Technical Specification and any additional quality management system requirements.</p> <p>Internal audits shall cover all the quality management system, activities and shifts and shall be completed in accordance with an annual plan. When nonconformities (internal and external) or customer complaints occur, the audit frequency shall be appropriately increased.</p>
	<p>8.2.2.2. Manufacturing process audit</p>
	<p>The organization shall audit each manufacturing process to determine its effectiveness.</p> <p>Business units shall implement a program of manufacturing process audits to monitor the ability of manufacturing processes to achieve planned results. This program shall be established in accordance with a documented procedure and involve all Tyco Electronics production locations. These audits will ensure that product characteristic information, needed work instructions, suitable equipment and tools, and monitoring and measuring devices are available and used. (TEC-1000)</p>
	<p>8.2.2.3. Product audit</p>
<p>The organization 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 defined frequency.</p> <p>Product audits are designed and deployed to evaluate the conformance of product that has been manufactured and accepted by operations personnel. The information obtained from product audits will be used by management to evaluate the effectiveness of manufacturing controls.</p>	
<p>8.2.2.4. Internal audit plans</p>	
<p>Internal audits shall cover all quality management related processes, activities and shifts, and shall be scheduled according to an annual plan.</p> <p>When internal/external nonconformities or customer complaints occur, the audit frequency shall be appropriately increased.</p> <p>NOTE <i>Specific checklists should be used for each audit.</i></p>	

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
	<p>QMS assessments shall be conducted at least annually to verify compliance with planned arrangements and to determine the adequacy, effectiveness, and suitability of the QMS to meet the objectives of the Tyco Electronics QMS and the pertinent international and industry related QMS standards. Results of these assessments shall be reviewed by management as feedback for continual improvement and verification of conformance to QMS requirements. Records of such assessments and reviews shall be maintained. Each business unit shall conduct assessments of the QMS in accordance with documented procedures at regular intervals based on the status and importance of the activity. Follow-up assessment activities shall verify and record the implementation and effectiveness of the corrections and corrective actions taken. (TEC-1000)</p> <hr/> <p>8.2.2.5. Internal auditor qualification</p> <p>The organization shall have internal auditors who are qualified to audit the requirements of this Technical Specification (see 6.2.2.2).</p> <p>Assessments of the QMS shall be carried out by personnel that are qualified to audit to the ISO/TS 16949: 2009 Standard and who are independent of those having direct responsibility for the area being assessed.</p>
<p>8.2.3. Process Monitoring and Measurement</p>	<p>8.2.3.1. Monitoring and measurement of manufacturing processes</p> <p>The organization 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 with 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.</p> <p>As required by customers, initial process capability and performance studies shall be conducted to determine whether determined manufacturing processes are suitably controlled and capable of producing acceptable product.</p> <p>The organization shall maintain manufacturing process capability or performance as specified by the customer part approval process requirements. The organization shall ensure that the control plan and process flow diagram are implemented, including adherence to the specified</p> <ul style="list-style-type: none"> • measurement techniques, • sampling plans, • acceptance criteria, and • reaction plans when acceptance criteria are not met.

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	<p>A process flow diagram shall be developed that clearly describes the production process steps and sequence and meets customer specified needs, requirements, and expectations. Control plans shall define the methods used for process control.</p> <p>Significant process events, such as tool change or machine repair, shall be recorded.</p> <p>Process setups shall involve a critical examination of the initial products manufactured during an initial production run, material change-overs, operator changes, tooling changes, machine repairs, or when significant time periods lapsed between production runs. Documented verification shall include a critical inspection of the initial product produced after the setup is completed.</p> <p>The organization shall initiate a reaction plan from the control plan for characteristics that are either not statistically capable or are unstable. These reaction plans shall include containment of product and 100% inspection as appropriate. A corrective action plan shall then be completed by the organization, 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 customer when so required. The organization shall maintain records of effective dates of process changes.</p> <p>Reaction plans shall be initiated for control plan characteristics that are statistically incapable or unstable. Reaction plans shall include the containment of nonconforming or suspect product and be followed by a corrective action plan that aims to assure the subject processes are capable and stable. As required, these plans shall be reviewed and approved by the customer with records of process changes and effective dates maintained.</p>
<p>8.2.4. Monitoring and Measurement of Product</p> <p>8.2.4.1. In-Process Inspection</p> <p>8.2.4.2. Final Inspection</p>	<p>NOTE <i>When selecting product parameters to monitor compliance to specified internal and external requirements, the organization determines the types of product characteristics, leading to</i></p> <ul style="list-style-type: none"> • <i>the types of measurement,</i> • <i>suitable measurement means, and</i> • <i>the capability and skills required.</i>
	<p>8.2.4.1. Layout inspection and functional testing</p> <p>A layout inspection and a functional verification to applicable customer engineering material and performance standards shall be performed for each product as specified in the control plans. Results shall be available for customer review.</p> <p>NOTE <i>Layout inspection is the complete measurement of all product dimensions shown on the design records.</i></p>

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	<p>Quality or its designee shall coordinate the activity of layout inspection and functional verification at a frequency as negotiated with the customer. (TEC-1000)</p> <p>8.2.4.2. Appearance items</p> <p>For organizations manufacturing parts designated by the customer as “appearance items”, the organization shall provide</p> <ul style="list-style-type: none"> • appropriate resources including lighting for evaluation; • masters for color, grain, gloss, metallic brilliance, texture, distinctness of image (DOI), as appropriate; • maintenance and control of appearance masters and evaluation equipment; and • verification that personnel making appearance evaluations are competent and qualified to do so. <p>When customer-designated, product “appearance items” characteristics shall be monitored, measured, and verified in accordance with planned arrangements. These planned arrangements may include specified lighting, master samples, and inspection personnel qualifications.</p>
<p>8.3. Control of Nonconforming Product and Materials</p>	<p>8.3.1. Control of nonconforming product - Supplemental</p> <p>Product with unidentified or suspect status shall be classified as nonconforming product (see 7.5.3).</p> <p>Nonconforming or suspected nonconforming material (including unidentified material), shall be immediately identified as nonconforming and shall be prevented from inadvertent further processing, where practicable, by storage in an area that is visually identified and segregated for this purpose. (TEC-1000)</p> <p>8.3.2. Control of reworked product</p> <p>Instructions for rework, including re-inspection requirements, shall be accessible to and utilized by the appropriate personnel.</p> <p>If the nonconforming material is dispositioned for rework or repair, rework instructions shall be provided and the material shall be re-inspected before it returns to the process. Authority to dispose of defective material shall be defined by the business unit. (TEC-1000)</p> <p>8.3.3. Customer information</p> <p>Customers shall be informed promptly in the event that nonconforming product has been shipped.</p> <p>Tyco Electronics’ customers will be notified if it is suspected or confirmed that unacceptable product has been shipped. This process shall include defined authorities and responsibilities for customer notification, discussion of disposition, and problem resolution.</p>

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	<p>8.3.4. Customer waiver</p> <p>The organization shall obtain a customer concession or deviation permit prior to further processing whenever the product or manufacturing process is different from that which is currently approved.</p> <p>The organization shall maintain a record of the expiration date or quantity authorized. The organization shall also ensure compliance with the original or superseding specifications and requirements when the authorization expires. Material shipped on an authorization shall be properly identified on each shipping container.</p> <p>This applies equally to purchased product. The organization shall approve any requests from suppliers before submission to the customer.</p> <p>Discussions between Tyco Electronics and the customer may result in a customer concession and the issuance of a customer initiated deviation allowing for the continued manufacture of product that does not meet, or is manufactured under processes that do not meet, customer specifications. Under these circumstances, product shall not be shipped beyond the time or quantity limits documented in the deviation permit. When required by the customer, all product shipped under such deviations shall be suitably identified.</p>
<p>8.4. Measurement and Analysis of Organizational Performance</p>	<p>8.4.1. Analysis and use of data</p> <p>Trends in quality and operational performance shall be compared with progress toward objectives and lead to action to support the following:</p> <ul style="list-style-type: none"> • development of priorities for prompt solutions to customer-related problems; • determination of key customer-related trends and correlation for status review, decision-making and longer term planning; • an information system for the timely reporting of product information arising from usage. <p>NOTE <i>Data should be compared with those of competitors and/or appropriate benchmarks.</i></p> <p>The business unit Quality Leader shall have the responsibility to maintain performance data including ISO/TS 16949 measurements and trends in quality, customer satisfaction, and/or dissatisfaction, and operational performance.</p>
<p>8.5. Improvement 8.5.1. Continual Improvement</p>	<p>8.5.1.1. Continual improvement of the organization</p> <p>The organization shall define a process for continual improvement.</p>

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
	<p>The business units shall promote and manage continual improvement in quality, productivity, service, and value. Improvement projects shall include, as appropriate, external customer, corporate, supplier, safety, and regulatory requirements. Continual improvement shall be measured against goals and objectives. One or more of the following techniques may assist with achieving the goals and objectives:</p> <ul style="list-style-type: none"> • Application of statistical sciences such as the use of the engineering for quality tools, including statistical process control (SPC), design of experiments (DOE), regression analysis, and analysis of variance (ANOVA). • LEAN: A series of tools and techniques that focus on process optimization through cycle time reduction and the elimination of waste. • Management Methods: Self assessment and gap analysis (SAGA), ISO/TS 16949, benchmarking, suggestion systems, taskforce teams, cross functional teams, organization and leadership review (OLR), performance reviews, training, apprentice programs, bonus programs and business planning. • Manufacturing Resource Planning (MRP): A process for integrating and controlling all business planning processes for the purpose of balancing supply and demand in the most effective and efficient way. • QOS Review: A regular management review to demonstrate that processes are meeting customer requirements and internal continual improvement goals; utilizing trend chart(s), goal(s), Pareto analysis, problem summary chart(s), and verification chart(s). • Six Sigma Lean: A process improvement methodology that uses a series of tools and techniques to identify, optimize, and control the key process variables that affect the key output variables. • Best Demonstrated Practices (BDP): A total employee involvement technique focused on identifying a superior or innovative method that has proven to have contributed towards improved performance of a process in one location and implementing the method into other locations. • Tyco Electronics Operating Advantage (TEOA): Operating advantage is the umbrella for continual improvement programs that provide employees a toolset that supports improvement solutions to help achieve the company's goals and provides a common platform and standard for driving improvement throughout Tyco Electronics. It covers improvement tools, Six Sigma, Lean, Kaizen, etc. (TEC-1000)

TEC-1000		SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS	
		8.5.1.2.	<p>Manufacturing process improvement</p> <p>Manufacturing process improvement shall continually focus upon control and reduction of variation in product characteristics and manufacturing process parameters.</p> <p>Continual improvement shall focus upon control and reduction of variation in product characteristics and manufacturing process parameters.</p> <p>NOTE 1 <i>Controlled characteristics are documented in the control plan.</i></p> <p>NOTE 2 <i>Continual improvement is implemented once manufacturing processes are capable and stable, or product characteristics are predictable and meet customer requirements.</i></p>
		8.5.2.1.	<p>Problem solving</p> <p>The organization shall have a defined process for problem solving leading to root cause identification and elimination. If a customer-prescribed problem-solving format exists, the organization shall use the prescribed format.</p> <p>Where a nonconformance is identified, the responsible business unit shall implement corrective action according to documented procedures. Unless there is a specific format required by the customer, the Eight Discipline (8-D) process for problem solving and corrective action shall be used.</p>
		8.5.2.2.	<p>Error-proofing</p> <p>The organization shall use error-proofing methods in their corrective action process.</p> <p>Where a nonconformance is identified or where analysis indicates a nonconformance, the responsible function shall use disciplined problem solving and mistake-proofing methodologies.</p> <p>Error-proofing methodologies may also be utilized proactively as a preventive action.</p>
8.5.2.	<p>Corrective Action</p> <p>Preventive Action</p>	8.5.2.3.	<p>Corrective action impact</p> <p>The organization shall apply to other similar processes and products the corrective action, and controls implemented, in order to eliminate the cause of a nonconformity.</p> <p>The corrective action process includes analyzing corrective action impact and the elimination of potential failure modes when information indicates that the same nonconformity may occur in other similar processes and products.</p>
8.5.3.			

TEC-1000	SUPPLEMENTARY ISO/TS 16949: 2009 REQUIREMENTS
	<p data-bbox="553 222 1052 254">8.5.2.4. Rejected product test/analysis</p> <p data-bbox="695 254 1476 436">The organization shall analyze parts rejected by the customer's manufacturing plants, engineering facilities and dealerships. The organization shall minimize the cycle time of this process. Records of these analyses shall be kept and made available upon request. The organization shall perform analysis and initiate corrective action to prevent recurrence.</p> <div data-bbox="699 485 820 548" style="background-color: black; color: white; padding: 2px; display: inline-block;">NOTE</div> <p data-bbox="857 499 1393 646"><i>Cycle time related to rejected product analysis should be consistent with the determination of root cause, corrective action and monitoring the effectiveness of implementation.</i></p> <p data-bbox="695 684 1442 867">Customer complaint investigation is conducted in conjunction with the Tyco Electronics 8D methodology. In cases where, by contractual agreement, customers require additional complaint analysis methods, the business unit may create and use supplementary processes that meet or exceed the established and defined 8D methodologies.</p>

05/21/2009 15:06 IFAX htscan@Lr.org

→ Ashley Davis

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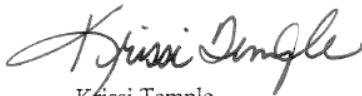
May 21, 2009

Dear Mr. Arbogast:

A special assessment document review was undertaken by LRQA to examine Tyco Electronics Corporation's Global Quality Management System Process (quality manual) TEC-1020. After verifying correction of non-conformances and associated revision of the document, LRQA has determined that TEC-1020 conforms to the quality manual requirements of ISO/TS 16949:2002.

This statement of conformance is limited, applying only to Tyco Electronics Corporation's top level quality management document and as such does not meet the requirements for a full Stage 1 assessment as described in ISO/IEC 17021 or LRQA assessment procedures.

Sincerely,



Krissi Temple
QMS Technical Manager

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