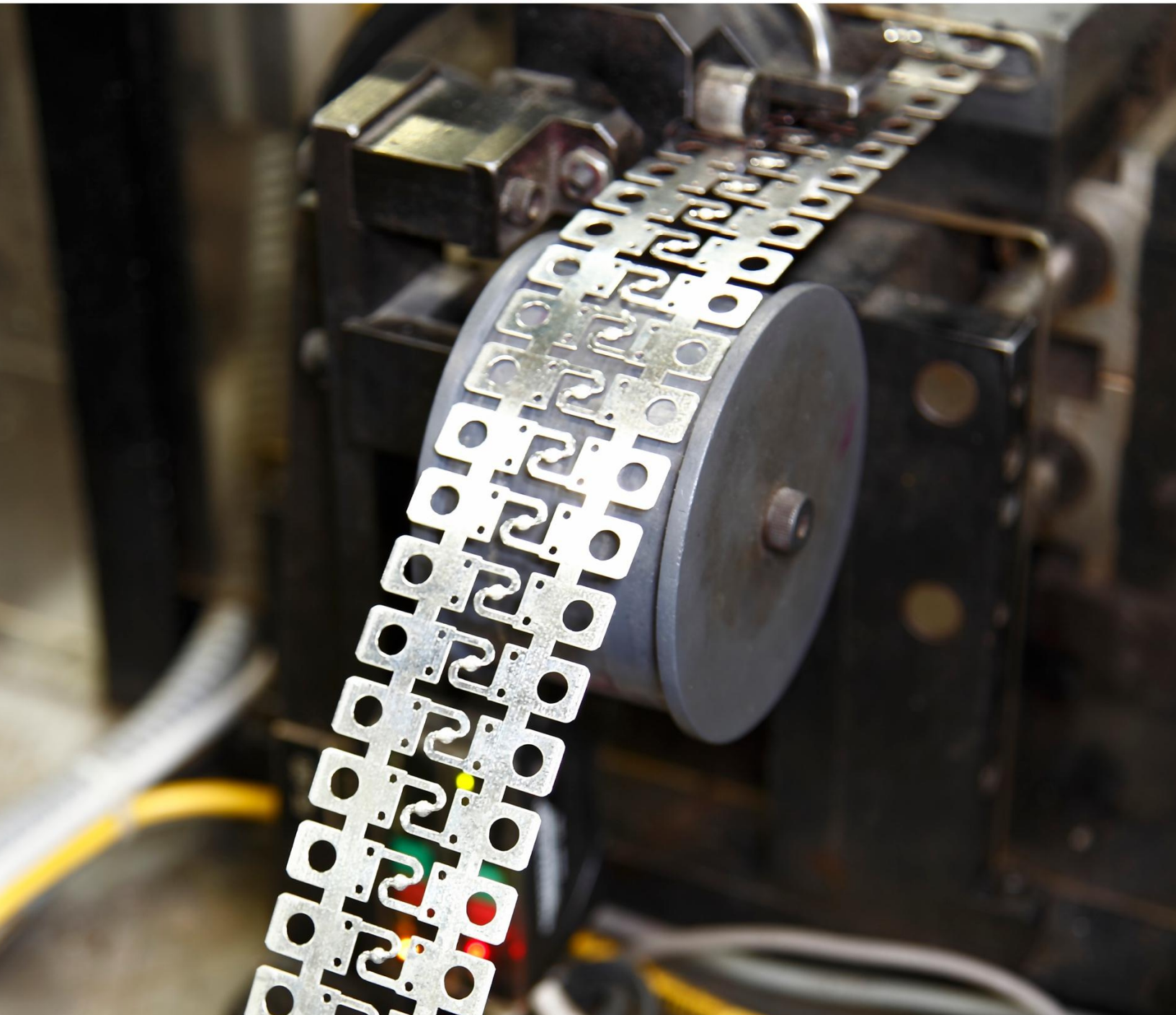
Littelfuse®

Expertise Applied | Answers Delivered

SUPPLIER QUALITY MANUAL

REVISION E



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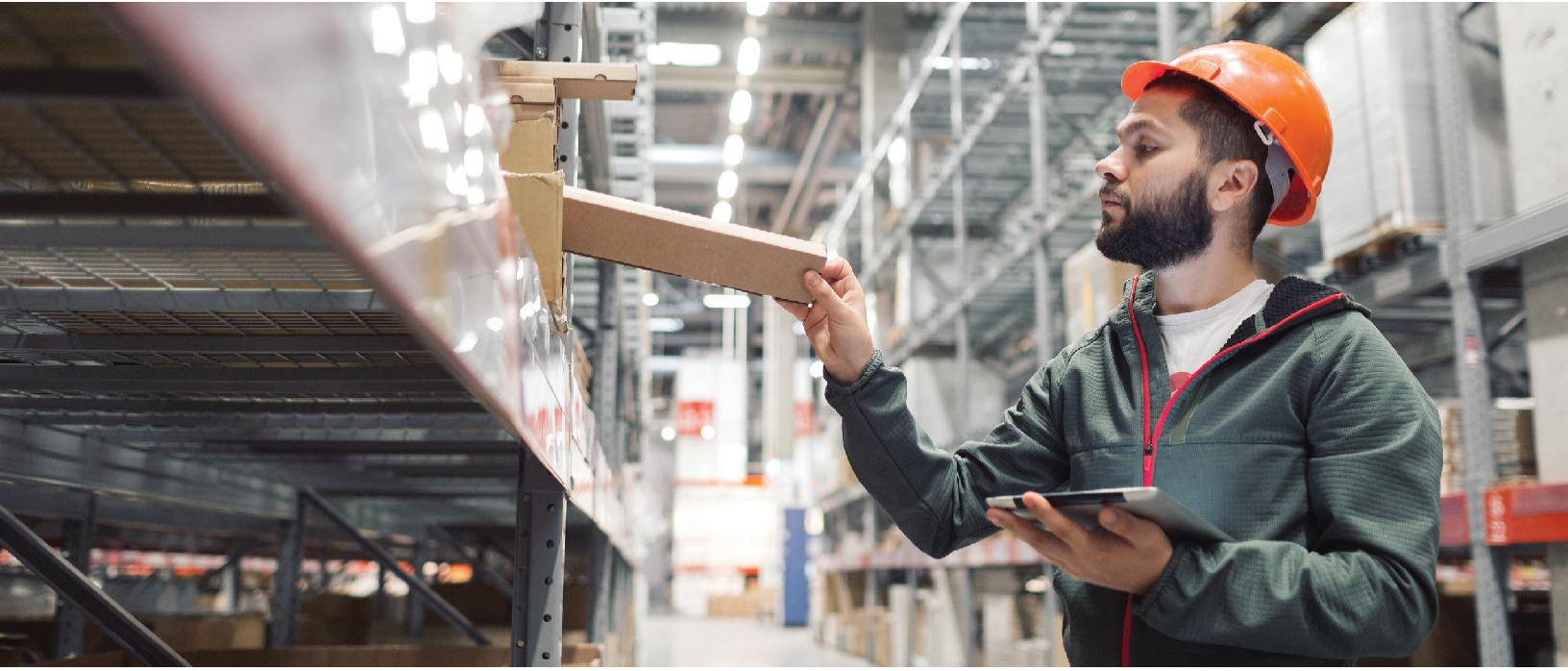

LITTELFUSE QUALITY POLICY

Littelfuse commits to exceptional customer value through our relentless pursuit of operational excellence and zero defects, driving continuous improvement in everything we do.

In support of this commitment Littelfuse will:

- Engage with our customers to deliver best-in-class service and support;
- Leverage our applications expertise to understand our Customers' needs and emerging opportunities;
- Deliver technology and products that provide innovative and reliable solutions to the market;
- Empower our people to create a data-driven and socially responsible culture that they are proud to be part of;
- Celebrate our individual and team successes.

Greg Henderson
President and Chief Executive Officer

PURPOSE

The purpose of this Supplier Quality Manual (SQM) is to specify Littelfuse quality system requirements for our Suppliers. These requirements extend from supplier qualification to new product development, to serial production, to service and Littelfuse Customer Specific Requirements.

As used in this manual, the word “shall” indicates mandatory requirements. The word “should” indicates a recommendation with a preferred approach. Suppliers to Littelfuse, Inc. divisions and Business Units choosing other approaches must be able to show that their approach meets the intent of this manual. Where the words “typically” and “examples” are used, an appropriate alternative for the process should be chosen. Paragraphs marked “**Note**” are for guidance.

SCOPE

This manual applies to all direct material/service external suppliers, MRO, distributors and directed Suppliers. For indirect material/service suppliers, this manual is applicable only when a Littelfuse Purchase Order requires it.

SUPPLIER’S RESPONSIBILITY

Suppliers are responsible to meet the requirements outlined in this manual. Failure to meet these requirements may result in the loss of existing and/or future Littelfuse business. Refer to page 34 for acknowledgement.

Suppliers shall adopt the Littelfuse Zero Defects Zero Excuses philosophy.

Suppliers shall understand that any established PPM target is not an Accepted Quality Level but represents an intermediate continuous improvement step towards shipment of components/materials meeting the Zero Defects Zero Excuses requirement.

It is mandatory that Suppliers adopt and implement processes and procedures to address the following Littelfuse essential requirements as part of an integral Quality culture within any one of your facilities/sites:

- Meet DPPM’s established target and strict On Time Delivery.
- Introduce Zero Defects Culture.
- Incorporate Supplier Product Process Change Notice System and communicate any change at least 180 days before it is implemented (refer to sPCN section for details).
- PPAP level 3 (or FAI for Aerospace Suppliers) is the expected default with IMDS submission against Littelfuse account 2426 unless otherwise specified by the SDE.
- If not called out by our Littelfuse drawing specification, Supplier is expected to define product/process critical characteristics and submit proposal for PPAP approval.
- Suppliers must immediately respond with initial containment in a period no longer than 24 hours when a Major Disruption/Line Shut Down incident is communicated.
- Littelfuse reserves the right to charge Suppliers the associated cost as a result of poor-quality justified incidents impacting Littelfuse or its Customers’ business continuity.
- To have a documented Business Continuity Plan in place.

SUPPLIER CODE OF CONDUCT

Littelfuse, Inc. is committed to conducting its business with integrity, providing quality products and services to its Customers and Suppliers, and serving the mutual interests of it associates, shareholders, and the communities in which the company does business.

Customers choose Littelfuse products to protect, control, and sense some of the most sensitive applications in the world because they expect the highest quality and reliability performance. We strive to earn each customer's trust by challenging ourselves to continuously deliver excellence in all our core values:

- Customer focus
- Teamwork
- Results-driven culture
- Integrity
- Innovation

Integrity is the foundation of the relationships we aim to build with our Customers and our Suppliers. Without integrity, the promise of honesty and high ethical conduct, our other values do not stand as replacements.

Just as Littelfuse is committed to the highest standards of social and environmental responsibility and ethical conduct, we expect our business partners to embrace the same requirements.

The Littelfuse Supplier Code of Conduct has been built on the high standards established by our customers across the business segments we serve and draws heavily from the Responsible Business Alliance (RBA – formerly EICC, Electronic Industry Citizenship Coalition) standards. When differences arise between standards and legal requirements, the stricter standard shall apply in compliance with applicable law.

The Littelfuse Supplier Code of Conduct is divided into sections similar to the RBA:

- Labor
- Health and Safety
- Environmental
- Ethics
- Management Systems

We expect every Littelfuse Supplier (and sub-tier Suppliers) to abide to our Supplier Code of Conduct. The latest version can be found in our webpage:

https://www.littelfuse.com/partner-portal/supplier

Thank you for your partnership with Littelfuse in our commitment to integrity.

LITTELFUSE EXPECTATIONS FOR SUPPLIERS

Our expectations for Suppliers and ourselves extend beyond the basic entry criteria related to quality, delivery and cost to also encompass service, technical knowledge, continuous improvement and more.

We set high standards that apply to Littelfuse and to our Suppliers. Our Suppliers are responsible for ensuring the quality of their products, meeting our DPPM & quality incident requirements established in our procedure of Supplier rating system and/or QMP. Our goal is zero defects, meeting delivery commitments, and keeping costs competitive.

All Suppliers are also expected to deliver high quality service, maintain appropriate inventory, demonstrate technical knowledge and make continuous improvements. We look for Suppliers who are flexible, committed to growing the relationship and focused on the end user. In return, we provide the support, information and resources needed to help our Suppliers meet these expectations, and to jointly achieve our goal of total customer satisfaction.

What we expect from Suppliers:

- Quality products that fully meet specification
- Environmental compliance
- On-time delivery
- Competitive costs
- Adequate inventory
- Technical knowledge
- High quality service
- Continuous improvement
- Compliance with import-export regulations and cooperation in meeting regulatory requirements
- Commitment to the business relationship, and
- Zero Defects Zero Excuses

All the sections in this manual describe the requirements and expectations for doing business with Littelfuse.

SUPPLIER REQUIREMENTS MATRIX

The following matrix describes the requirements for Supplier qualification when doing business with Littelfuse.

Supplier Type	Risk Assessment Required	Environmental Testing Required	ISO Required	IATF Required	AS/EN9100 Required	Self-Survey Required	LF Validation Testing Required
Direct	Yes[1]	Yes	Yes[2]	Yes[3]	Yes[5]	Yes	Yes
Indirect	Optional	Yes	Yes[2]	Optional	Optional	Yes	Yes
MRO (Maintenance, Repair, and Operations)	No	Optional	Optional	No	No	No	No
Distributor	Optional	Yes	Yes	No	No	Yes	Yes
Special Services (Testing, Calibration, etc.)	Optional	Optional	Yes[4]	Optional	Optional	Optional	Optional
Directed Suppliers	Optional	Yes	Optional	Optional	Optional	Optional	Optional

- Transportation and delivery carrier Suppliers are selected, qualified and managed by the Global Logistics Department.
- Requirements denoted as “Optional” can be re-assessed upon Littelfuse Specific Customer Requirements (SCR) needs and will be treated on an individual basis.
- All direct material suppliers delivering functional safety components for electrical and electronic systems in automotive programs are required to comply with the ISO 26262 standard.
- Suppliers must have their ISO 9001, IATF, ISO 14001, IATF, and/or Laboratory certificates registered under an Accreditation Board that is registered with GACI. Suppliers must notify Littelfuse immediately (via email) if there is any suspension, warning letters, scope changes, revocation status, etc. to their certificates.
- For some Automotive programs, suppliers may need to comply with VDA requirements, as communicated by the Littelfuse representative. Refer to appendix M for details and acknowledgement, as applicable.

1 Risk Assessments are required for all direct and critical Suppliers. Any exceptions must be waived/signed off by the SDE Manager, Procurement Director or Operations Manager.

2 For non-automotive direct and indirect Suppliers, ISO certification is mandatory starting in year 2017. Those Suppliers that are not ISO certified but already belong to the Littelfuse supply chain before that year will be considered approved Suppliers.

3 All Automotive direct Suppliers must be certified in IATF 16949. If not yet IATF 16949 certified, suppliers are expected to provide a plan with target completion date to obtain this accreditation. Non-Automotive Suppliers are not required to obtain IATF unless otherwise specified by Littelfuse.

4 Special services Suppliers that include testing and calibration must be ISO/EIC 17025 accredited.

5 All Aerospace direct Suppliers must be ISO9001 certified at minimum and are expected to provide a plan to obtain AS9100/EN9100 accreditation.

Direct Supplier – Any Supplier of components or materials that are used in the manufacturing of Littelfuse products. This also includes Suppliers of pass-through or private label products sold by Littelfuse or outside processing Suppliers. Examples include plastic resin, resistance wire, purchased fuse holders, plating, coating, painting, subassembly, etc.

Indirect Supplier – Any Supplier of components or material that are not directly incorporated into a product being manufactured by Littelfuse. Examples include boxes, labels, foam/blister packaging, bulk chemicals, etc.

MRO Supplier – Any Supplier of Maintenance, Repair and Operations products/services that are used within the production process, but that are not part of the final Littelfuse product. Examples of this includes cleaning supplies, paper towels, machine oil, small tools, repair parts, etc.

Distributor Supplier – Any Supplier that buys components or materials from many manufacturers and stores and resells them to Littelfuse as a raw material. Distributors can provide direct or indirect material for production but have little to no control over the quality of the materials they sell.

Special Services Supplier – Any Supplier that provides services to Littelfuse. Examples include outside testing laboratories, gage calibration services, major vehicle/equipment maintenance services, etc.

Directed Supplier – Any Supplier directed, appointed or required by any Littelfuse Customer with a proper official documentation request.

SUPPLIER PROCUREMENT AGREEMENT

All goods and services procured by Littelfuse Inc. shall be in accordance with the Littelfuse Supplier Procurement Agreement unless otherwise stated/specified in writing. Littelfuse Suppliers must adhere to all the requirements as specified in the agreement. If there are any questions about the Procurement Agreement document, please contact the respective Littelfuse Procurement Team.

QUALITY SYSTEM REQUIREMENTS

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Littelfuse strives for continuous improvement in our quality systems, processes and product technologies. Recognizing that we are one team with Suppliers, it is critically important to develop and foster strong business relationships to meet the expectations of our customers. Our continued mutual success depends on the execution of these improvements and ensuring materials comply to LF requirements and drawing specifications.

A) QUALITY PROGRAM

Suppliers providing direct and indirect material to Littelfuse are required to maintain Quality Management System [QMS] certification as indicated in the "Supplier Requirement Matrix" section. A copy of the certificate(s) must be submitted to the Supplier Development Engineer [SDE] upon initial receipt and upon each expiration date. Other regulatory requirements, such as but not limited to UL, will be set forth on the drawing as needed.

Existing Suppliers that do not meet the above-mentioned requirements will face the possibility of losing their business opportunity with Littelfuse. New Suppliers that do not meet the above-mentioned requirements will not be qualified as an approved Supplier.

B) NOTIFICATION OF QUALITY MANAGEMENT SYSTEM CHANGE [QMS]

Supplier shall notify the Littelfuse Supplier Development Engineer of any change in their QMS registration status via e-mail within 10 working days . Such changes include, but are not limited to:

- Initial Certification. *
- Recertification. *
- Transfer or certification to a new Certification Body. *
- Certificate withdrawal.
- Certificate cancellation without replacement.

* These changes require submitting proof of registration as described above.

If the Supplier has multiple facilities where Littelfuse products are made, one certificate with a scope covering all production facilities or each individual plant's certificate must be provided to the Supplier Development Engineer. If one certificate can't cover each plant, supplier needs to submit individual certificates for each plant to the Supplier Development Engineer.

C) MANAGEMENT RESPONSIBILITY

The Supplier's executive management must develop a company-wide quality policy. This policy will be deployed and understood by all employees. A management review system will be implemented. The Quality policy and system will be reviewed at prescribed intervals to assess the continuing

suitability and effectiveness of the quality system. This review will include the quality policy, internal audit results, product complaints/returns, process/product quality reports, and others as applicable. Executive management will appoint a management representative with the responsibility/authority to monitor compliance to the system, and to ensure corrective/ preventive measures are implemented.

D) ORGANIZATION

The Supplier must have an organization that supports, implements and maintains the quality system at all levels.

E) QUALITY POLICIES, PROCEDURES, AND WORK INSTRUCTIONS

The Supplier shall establish and maintain a documented quality program which ensures that product and/ or services comply with the requirements set forth in this standard. All work affecting the quality of products and/or services shall be documented in clear and concise policies, procedures, and work instructions. The Supplier shall ensure that these documents are deployed, effectively implemented and understood within the company.

F) INTERNAL AUDIT PROGRAM

Suppliers must implement an effective internal audit program that provides gap analysis, process audits and system audits. Only auditors with the required competence shall conduct audits and must be independent from the area being audited.

G) THIRD PARTY AUDIT/QMS CERTIFICATION

Littelfuse expects all Suppliers of materials and services affecting production material to demonstrate compliance to ISO 9001:2015, IATF 16949:2016 and/or AS/EN9100 as applicable. Suppliers shall also comply with Littelfuse Specific Requirements defined in this SQM Manual.

Note: AS-9100 or VDA 6.3 certifications do not replace the requirement for ISO 9001:2015 or /IATF 16949:2016 expected certifications.

H) TRAINING

The Supplier shall establish and maintain a program for the identification of training requirements for all personnel that affect the quality of a product during production and installation. Qualification to perform assigned tasks shall be based on individual education, training and/or experience as required. The Supplier shall also assure that a system exists for the qualification, re-qualification, and disqualification of personnel. As a minimum, training for applicable personnel shall consist of quality system training, auditing techniques, Supplier Quality Engineering processes, assembly techniques, workmanship standards, and inspection requirements.

Supervisors in the production area shall also have a working knowledge of quality systems and statistics. Records of all training shall be maintained and made available for the Littelfuse Supplier Development Engineer to review upon request.

ENVIROMENTAL, HEALTH, AND SAFETY (EHS) REGULATIONS

Littelfuse expects Suppliers to promote safe and healthy work environments for all employees, minimize environmental impacts, use resources economically, and affirm commitment to continual improvement.

All Littelfuse Suppliers are required to establish an EHS management system in compliance with International Standards, including specific requirements from Littelfuse Customers and all applicable local EHS laws and regulations.

- A valid ISO 14001 (Environmental Management Standard) certification is a recommended requirement for all Littelfuse Suppliers. Otherwise, we expect Suppliers to have a system in place to meet local regional government environmental regulations.
- Supplier is expected to document and implement a health and safety management system that is compliant with OHSAS 18001/ISO 45001.
- Supplier must recognize Littelfuse Customer specific EHS requirements as they apply to relevant service part organizations.

PRODUCT ENVIRONMENTAL COMPLIANCE

Littelfuse expects Suppliers to comply with the Littelfuse Supplier Environmental, Health and Safety Regulations and all applicable laws and regulations worldwide. The document covers most requirements in general regarding substances of concern, however, Littelfuse also values its customer requirements in restriction and monitoring of specific substances in products. Below is the product environmental compliance (PEC) documentation that Littelfuse requires among its Suppliers:

- **Compliance Declarations** are required for all materials, components and finished goods delivered to Littelfuse. Littelfuse Suppliers shall provide certificate of compliance (CoC) to specific regulations including but not limited to Restriction on Hazardous Substances (ROHS), Registration, Evaluation and Authorization of Chemicals (REACH) and California Proposition 65.
- **IMDS submissions** (International Material Data System) are required for all Automotive product Suppliers and/or as determined by the SDE. The data shall be submitted upon initial delivery of product or material. Creating an IMDS account is free of charge and can be done at www.mdsystem.com. Instructions for creating modules in IMDS are on the site. This is not a Littelfuse-maintained system, so any questions about the IMDS program or its operation should not be directed to Littelfuse. All IMDS submissions need to be directed to account number 2426. A third-party ELV (end of life vehicle) test report may also be required to an Automotive product Supplier.
- **Material Declarations (MD**) are required from all direct and indirect raw materials and finished goods Suppliers to Littelfuse. Every part number provided to Littelfuse must have a declaration, either individually or as a part family (if the family of parts contains the exact same material but only changes dimensional characteristics). Littelfuse has an excel template that Supplier can fill-up to complete the MD or Supplier can use the IPC-1752 template.

- **Third-party laboratory analysis/ RoHS or ICP Testing** is also a requirement especially for all electrical & electronic (EE) product Suppliers. Suppliers are required to send their own materials out to an independent lab (ISO17025 certified) for testing and submit the report to Littelfuse. Report validity is one year only thus annual renewal is required to verify the consistency of RoHS compliance. Suppliers shall bear the testing cost.

- **Safety Data Sheets (SDS)** must be submitted to Littelfuse for all raw materials used in the creation of all Littelfuse products. These are the documents that define all characteristics of a material from a safety perspective. Suppliers are responsible for collecting these documents from their own Suppliers or for the creation of their own material SDS.

- The PEC documentations mentioned are required upon delivery of a product to Littelfuse. Documents must be updated whenever there are changes in the material. If a product is found to have any substances of concern over acceptable limits as defined in the Littelfuse PEC Specification, or found to have a change in characteristics of the raw materials without prior notification, Supplier must notify Littelfuse SDE via email within 24 hours, and a corrective action shall be provided.

RESPONSIBLE BUSINESS ALLIANCE (RBA) COMPLIANCE

Littelfuse Suppliers, direct or indirect, are expected to act as responsible corporate citizens and take a positive, proactive stance regarding social and environmental issues. Littelfuse follows the Responsible Business Alliance (RBA) Code of Conduct, and this code may be voluntarily adopted by any business and subsequently applied by that business to its direct and indirect suppliers and subcontractors . Fundamental to adopting the Code is the understanding that a business, in all its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. The Code is made up of 5 sections below:

- Labor
- Health and Safety
- Environmental
- Ethics
- Management Systems

This total supply chain initiative requires Littelfuse Suppliers to provide a policy of continuous improvement and acknowledgement of the “Littelfuse Supplier Code of Conduct”.

Suppliers are expected to support Littelfuse and/or RBA request for Self-Assessment (SAQ) completion or on-site assessment. For more information about adopting the RBA or becoming a member of the Responsible Business Alliance Coalition visit the web site:

http://www.responsiblebusiness.org.

RESPONSIBLE SOURCING OF MATERIALS

We take allegations seriously that metals mined in conflict regions throughout the world, including the Democratic Republic of Congo, may be making their way into the supply chain and that profits from this illegal mining may be fueling human rights violations. We require our suppliers to identify the source of their Conflict Minerals as accurately as possible. Suppliers can help stop human rights abuses by choosing to source exclusively from “conflict-free mines”. Littelfuse actively works with customers and suppliers to increase supply chain transparency and to avoid procurement of Conflict Minerals from conflict regions.

Littelfuse expects its suppliers to support the Responsible Minerals Initiative (RMI), provided by the Responsible Business Alliance, that includes the verification of sourcing metals through the Responsible Minerals Assurance Process (RMAP) to only source materials from environmentally and socially responsible sub-suppliers. Similarly, We strive to operate a conflict-free supply chain and remove smelters from our supply chain that are not RMI compliant.

Littelfuse will show preference to suppliers that meet or exceed the expectations in our “Responsible Minerals Sourcing Statement”.

COMPLIANCE WITH IMPORT AND EXPORT LAW

Littelfuse expects Suppliers to comply with all applicable laws and regulations pertaining to import and export of products, and to cooperate with Littelfuse in meeting regulatory requirements. The specific requirements pertaining to compliance with international trade rules are set forth below:

- **Export controls.** Supplier shall ensure that it knows the export control classification of its products provided to Littelfuse and obtains any necessary licenses or authorizations, if needed, to supply its products to Littelfuse. In the event Supplier receives from Littelfuse items identified by Littelfuse as subject to export control, including software and technology, Supplier shall comply fully with all applicable export control restrictions, including license conditions.

- **Embargoes and sanctions.** Supplier shall not source products or any components incorporated into its products from Cuba, Iran, North Korea, Russia, Belarus, Donetsk People's Republic, Lugansk People's Republic, the Crimea region, Kherson region, Zaporizhzhia region or other occupied territories of Ukraine or embargoed countries, from any persons or entities named in the United Nations', United States', United Kingdom's, European Union's, or any other applicable sanctions lists.

- **Authorized Economic Operator Programs.** Supplier agrees to comply fully with the requirements of authorized economic operator ("AEO") programs, including, but not limited to, the U.S. Customs-Trade Partnership Against Terrorism ("C-TPAT"). Supplier shall provide access to its facilities, complete the requisite assessments at its expense, and share audit or inspection information as necessary for AEO compliance. As applicable, suppliers may be asked to send their proof or evidence of compliance to C-TPAT.

- **Regulatory Data.** Supplier shall furnish Littelfuse with accurate harmonized tariff schedule ("HTS") classification, export control classification number ("ECCN"), country of origin, and value of Supplier's goods, and other information, as required, through Littelfuse's KYG Trade Solutions system ("KYG system"). Supplier shall notify their Littelfuse procurement contact regarding any changes to the information provided and update information in the KYG System when prompted by Littelfuse without delay.

- **Duty drawback and trade credits.** Supplier shall provide Littelfuse or its agent with customs entry data and information that Littelfuse determines is necessary for Littelfuse to qualify for duty drawback.

- **Preferential trade programs.** Supplier shall provide Littelfuse with certificates of origin and make any necessary arrangements to enable Littelfuse to claim preferential duty treatment at the time of entry for products, tooling and equipment eligible under applicable trade preference regimes.

LITTELFUSE SUPPLIER AUDIT ASSESSMENT PROCESS

Littelfuse uses a documented Supplier Assessment Process to evaluate potential new and current approved Suppliers.

During a Supplier audit assessment, Littelfuse will validate and confirm the supplier's Quality Management System capabilities, beyond the certification level. The primary focus areas are:

- General Requirements
- Design and Development of Products and Processes
- Sub-Supplier Management
- Process Analysis / Production
- Product Safety Management
- Customer Support/Customer Satisfaction/Service

Littelfuse will define the audit purpose and scope, based on:

- QMS and Process audit – to be used for any Supplier assessment. Or,
- Process audit per IATF/VDA6.3

For QMS and Process audit:

Result [%]	Classification	Description of the classification
score ≥ 85	A	Quality-capable
70 ≤ score < 85	B	Conditionally quality-capable
score < 70	C	Not quality-capable

For Process audit per VDA6.3:

Result [%]	Classification	Description
score ≥ 90	A	Quality-capable
80 ≤ score < 90	B	Conditionally quality-capable
score < 80	C	Not quality-capable

The Littelfuse lead auditor will release the audit report to the Supplier based on the team's decision. Suppliers that initially do not obtain an acceptable score may be allowed to develop action plans and timelines to correct any findings reported during the audit process which are expected to be implemented within one month. Verifying the effectiveness of the actions is also and expected deliverable.

The Littelfuse lead auditor will review Supplier's corrective action report and verify as well the effectiveness of actions through documented evidence and/or on-site re-audit.

The ultimate goal for Suppliers is to qualify as "A" – Quality capable. If so, new or extended business may be awarded.

Upon successful completion and closure of the Supplier audit assessment identified action items, approved Suppliers are added to the Littelfuse Approved Supplier List.

Prior to conducting an On-Site Supplier Assessment, Littelfuse may contact the Supplier and request a Self-Assessment (Littelfuse will provide the form found in Appendix B as the questionnaire to complete).

BUILT IN ZERO DEFECTS (BIZD)

- **BUILT IN ZERO DEFECTS** is an optional tool which provides a basic guideline for those quality management system requirements that our Supplier base is expected to implement in alignment with Littelfuse ***ZERO DEFECTS - ZERO EXCUSES*** initiative.
- By implementing the **BIZD elements**, our Supplier base will benefit from an overall improvement in performance which we can measure through our Supplier Scorecard (SC), Supplier Risk Management (SRM) and even on-site QMS audits.
- As required, Littelfuse reserves the right to use this additional tool to evaluate Supplier's compliance to requirements as defined in the BIZD assessment form.

Littelfuse BIZD assessment form is found in appendix L.

LITTELFUSE SUPPLIER SELF-ASSESSMENT SURVEY

The purpose of the initial survey and sourcing checklist is to provide Littelfuse with a broad view of a supplier's business capabilities, in general, including also Littelfuse specific requirements.

The Supplier Self-Assessment Survey is found in appendix C. Suppliers are expected to fill out the form with accurate and up-to-date information and submit to the respective Littelfuse representative.

An integral part of the Supplier Self-Assessment and Sourcing Checklist is the security and compliance to AEO Programs (Authorized Economic Operator) in reference to Littelfuse commitment to protect the safety of its supply chain from terrorism, trafficking of drugs and people, and smuggling of conventional weapons and weapons of mass destruction. Refer to section above titled: Compliance with Import and Export Law

ADVANCED PRODUCT QUALITY PLANNING (APQP)

The Littelfuse Advanced Product Quality Planning (APQP) 5 Phase Process is used to evaluate Supplier readiness at defined stages. These phases are aligned with program, customer milestones or build events.

Suppliers are required to generate an Advanced Product Quality Plan in accordance with the AIAG APQP reference manual for every new Littelfuse automotive component introduced.

At a minimum the plan should include the 5 Phases listed below:

Ph1: Plan and Define Program Phase Kick-off Meeting / Technical Review / Risk and Feasibility Assessment / Program Review.

Ph2: Product Design and Development Phase DFMEA / Design Review PAF.

Ph3: Process Design and Development Phase Prototype / Gage Review / Process Flow / PFMEA / Control Plan / Program Review.

Ph4: Product and Process Validation Phase Proactive Containment / PPAP / Run-at-rate study / Program final review.

Ph5: Feedback, Assessment and Corrective Action Phase Lessons Learned / Early Production Containment completed / Open Issues closed.

Littelfuse Suppliers are required to develop a project achievement plan with timeline specified. Littelfuse Procurement and Supplier Development Engineers will review the project schedule as necessary and/or required.

SOFTWARE QUALITY APPROVAL PROCESS

When products include custom-created software, the activities for engineering consist of software development via the APQP process. The software shall be developed according to organization-wide processes tailored to the product being developed via the APQP process. The maturity of the software development process is expected to demonstrate the characteristics for repeatable, managed and defined processes. At times, Littelfuse will request evidence of consistently achieving software process maturity. Littelfuse may require suppliers to be ASPICE Level 2 or 3 certified.

QUALITY MANAGEMENT PLAN (QMP)

As an alternative Supplier Management Tool, Littelfuse reserves the right to use Quality Management Plan Form (refer to Appendix F) to guide Supplier to continuously understand, anticipate, meet, and exceed the Littelfuse quality requirements. It also serves to define, measure, monitor, and tailor the Supplier's commitment to quality. This plan details the quality requirements for the specified products or commodity, and it covers all the quality activities that will be addressed from the design through the mass production phases. It is the responsibility of the Supplier to ensure that this document is effectively communicated to the appropriate functions, such as Quality and Manufacturing, and it shall govern all interaction between the two companies with respect to quality of product unless otherwise specified in the Purchase Order. This plan should be acknowledged and signed by Supplier's Quality Representative or the management team.

PRODUCTION PART APPROVAL PROCESS (PPAP)

Littelfuse uses the Production Part Approval Process to confirm that the Supplier understands the design specifications and has a process capable of producing products that meet these requirements, during an actual production run, at the quoted production rate. An industry requirement for all automotive Suppliers, PPAP is being expanded to include all our Suppliers. Note: For Aerospace suppliers, PPAP may be replaced by FAI (First Article Inspection Report, ref. EN9102.

PPAP requirements vary based on the submission level assigned to a Supplier and/or part number. The Littelfuse Supplier Development Engineer or representative is responsible for designating the submission level. The submission level is generally determined during the RFQ process. Suppliers are expected to apply these same PPAP requirements to all sub-suppliers.

If there is no signed off PSW, there is no approval from Littelfuse, thus, any parts cannot be shipped.

For all automotive programs, it is mandatory for Suppliers to submit the International Material Data System (IMDS) data against Littelfuse account 2426 and include it in PPAP submission. For non-automotive projects, IMDS requirement is determined by the SDE.

PPAP (or FAI) submission is also expected in those cases where manufacturing tools and processes have remained inactive for a period of over 12 months. Note: For Aerospace products, the inactive-tool period is 24 months for FAI submission.

Note 1: Standard catalog purchased components/off the shelf, i.e., electronic, mechanical and/or other component categories that do not go through the PPAP process, based on Product Management and SDE direction, are to be considered as approved components. Otherwise, PPAP standard requirements shall be followed.

Note 2: Littelfuse requires all PPAP submissions to be free of any costs and fees unless properly documented/negotiated during the original RFQ, Contract and/or Terms and Conditions agreements.

PRODUCTION PART APPROVAL PROCESS (PPAP)		PPAP Level				
		1	2	3	4	5
1	Design Record	R	S	S	*	R
2	Engineering Change Documents	R	S	S	*	R
3	Customer Engineering Approval	R	R	S	*	R
4	Design FMEA	R	R	S	*	R
5	Process Flow Diagram	R	R	S	*	R
6	Process FMEA	R	R	S	*	R
7	Control Plan	R	R	S	*	R
8	Measurement System Analysis Studies	R	R	S	*	R
9	Dimensional Results	R	S	S	*	R
10	Material, Performance Test Results	R	S	S	*	R
11	Initial Process Studies	R	R	S	*	R
12	Qualified Laboratory Documentation	R	S	S	*	R
13	Appearance Approval Report (AAR)	S	S	S	*	R
14	Sample Product	R	S	S	*	R
15	Master Sample	R	R	R	*	R
16	Checking Aids	R	R	R	*	R
17	Records of Compliance (Substance of Concern & Conflict Minerals)	R	R	R	*	R
18	Part Submission Warrant	S	S	S	S	R

Figure 1 - PPAP Submission Levels from PPAP latest edition by AIAG

S = The organization shall submit to the customer and retain a copy of records or documentation items at appropriate locations.

R = The organization shall retain at appropriate locations and make available to the customer upon request.

* = The organization shall retain at appropriate locations and submit to the customer upon request.

The requirements of this manual were drafted to be compliant with AIAG PPAP Standard. Littelfuse has specific requirements and additions to this standard that are expected to be submitted as part of the PPAP package as well. The Littelfuse specific requirements are a must for all Level 3 PPAP submission, unless otherwise specified by Littelfuse Supplier Development Engineer or representative.

Littelfuse Supplier Production Part Approval Process Manual (see Appendix D)

Littelfuse Supplier Production Part Approval Process Form (see Appendix E).

SAFE LAUNCH PLAN/EARLY CONTAINMENT IMPLEMENTATION

After the approval of the Production Part Approval Process (PPAP) package, and with the start of serial production, Suppliers may be required to implement a Safe Launch Plans when determined by the SDE or representative. The supplier is then expected to document an Early Containment as part of their Start Of Production (SOP) ramp-up, which includes enhanced inspection plans for product and process characteristics. Not only does a Safe Launch protects Littelfuse against potential quality defects during the early production stages (after PPAP is approved), but it is also a method for the supplier to verify that Product and Process Controls are effective and stable.

An additional objective of a Safe Launch plan is to drive continuous improvement as the findings must trigger a reaction plan that requires a corrective action at the source.

A Safe Launch plan is considered a temporary measure, and its duration may vary depending on a few factors such as: order quantities, volumes, product complexity, and production rates, among others. The supplier is expected to reach a written agreement with the Littelfuse SDE for the duration of the Safe Launch plan. As a default, the exit criteria is no defects or anomalies for a period of 6 months and/or 6 consecutive shipments to Littelfuse.

SPECIAL CHARACTERISTICS

Special Characteristics are any product or process characteristics that affect safety or compliance with regulations, fit, form or function performance and/or subsequent processing of product.

For Littelfuse, the special characteristics designation will encompass Key Product Characteristics (KPC) and/or Customer special KPC's.

According to IATF 16949, Special Characteristics shall be identified and specifically addressed in the Design-FMEA, Process-FMEA, Control Plans, Process Flows, Work Instructions and other associated documents. Suppliers are responsible to fully understand the usage of their product and identify Special Characteristics, as appropriate.

Littelfuse expects Suppliers to improve quality by systematically reducing variation of the special characteristics.

Control Plans need to document relevant information about the process to be followed and to address sources of variation until a key characteristic is in a statistical control and capable of meeting product design specifications.

Key characteristics are typically identified by Littelfuse and are noted in the design record. For each of the key characteristics, the Supplier is expected to identify where in the process the characteristic will be monitored, control charts used, sample size and frequency of collection, maintenance of control charts and initial Cpk.

A gage variation study is performed, and results are documented, potential sources of variation are identified, and controls are established to ensure that process parameters and settings do not change. This is documented in the key characteristic control plan. Suppliers are also responsible for ensuring that relevant Special Characteristics are explained, understood and controlled by their sub-suppliers.

Note: Minimum expected Cpk for critical characteristics is greater than, or equal to, 1.33. For automotive component application the minimum required Cpk is equal or greater than 1.67 with ongoing production process Ppk $\geq$ 1.33 (unless otherwise specified by the Littelfuse SDE).

PRODUCT SAFETY MANAGEMENT

Littelfuse is committed to product safety. For those applications identified as safety critical, product safety will always be the primary consideration during the product design life cycle, manufacture, marketing, and sales of Littelfuse's products. This principle applies globally to all suppliers and any agents acting on behalf of Littelfuse.

Safety Management is applicable to a component, function or product feature when a non-conformance could cause safety product related issues.

Suppliers must comply with Littelfuse Customer Requirements and any other regional/local product safety regulations. In the event a Supplier determines or suspects of a product safety non-conformance situation, the Littelfuse Buyer/SDE needs to be contacted and the issue resolved.

For safety/critical product characteristics, Supplier is responsible to maintain and retain lot traceability records.

Definition: A safety requirement is determined based on the potential of a feature, product or system to create a personal harm caused by the product.

Safety critical characteristics may be designated by the presence of the symbol <S> next to the feature on the drawing or in a specification **(A Cpk ≥ 1.67 is the minimum requirement and data must be available upon request)**.

A safety-critical characteristic is identified when non-compliance with the requirement has the potential to lead to a Customer Safety effect.

Responsibility: It is mandatory that Suppliers conduct the product design features analysis and production process that could result in a safety effect. Suppliers with design responsibility must clearly identify safety related characteristics within their design drawings/specifications, product/process verification/validation plans and technical documentation and implement the respective countermeasures either by design or process to eliminate any potential safety related issue.

If during the FMEA analysis the severity score is identified as a 9 or 10, Littelfuse must be notified to review/understand the potential safety issues along with the countermeasures identified to eliminate these potentials. Safety critical characteristics must be clearly identified throughout the manufacturing process and in all documents such as Process FMEA, control plans and work instructions.

Suppliers are also responsible to communicate and ensure to all their Supplier base and/or contractors the awareness and compliance of these Safety Management requirements.

STATISTICAL PROCESS CONTROL AND ANALYSIS

Suppliers are required to meet the process capability requirements as defined in the AIAG PPAP and SPC reference manuals. The Supplier is responsible to ensure process capability and control requirements are documented in their control plan and that capability indices are achieved and improved throughout production.

Also, the Supplier is required to continuously improve by reducing part-to-part variation and eliminating all waste. The organization shall monitor process performance utilizing the appropriate statistical techniques (i.e. First-pass yield, SPC, etc.) in accordance with the most current edition of the AIAG Statistical Process Control Manual.

Additional areas in which statistical techniques may be applied are as follows: predictive maintenance, GR&R studies, defect analysis and continuous improvement. The results of the statistical techniques shall be documented and retained at the organization's location. This information shall be made available upon request by the Littelfuse team.

The Control chart indicates that the process:	ACTIONS ON THE PROCESS OUTPUT Based on Process Capability (Cpk)		
	Less than 1.33	Equal to or greater	
		Automotive	Non-Automotive
		1.67	1.33
Is in control	100% inspect	Accept product, continue to reduce product variation	
Has gone out of control	100% inspect all product since the last in-control sample (identify the cause)		

Requirements as defined in the AIAG PPAP latest edition.

APPROVED SUPPLIERS

Definition:

- A supplier of direct/indirect materials, equipment and/or services who has been approved by Littelfuse with respect to quality and procurement standards.
- Suppliers of standard catalog purchased components/off the shelf.

After a QMS assessment, Littelfuse Suppliers can be either Approved, Conditionally Approved or Not Quality-Capable.

Only Suppliers with Approved status are classified and retained under the Littelfuse Approved Supplier List.

When selecting Suppliers there are four major considerations: robust Quality Management System, technical capability, capacity and business stability.

The Supplier Self Survey in Appendix C, to be filled out by the Supplier, will serve as the basis for understanding the Supplier's ability to meet requirements.

Littelfuse requires all Suppliers to be approved prior to the issuance of purchase orders. Littelfuse must approve all Suppliers, regardless of approvals by customer or other entities.

Note: Any Supplier who Littelfuse has been doing business with before January 1st, 2003, and who has not had a risk assessment performed since then, shall be considered an Approved Supplier.

SUPPLIER e-BUSINESS CAPABILITIES

The Supplier shall implement and maintain appropriate measures to protect all information received from or on behalf of Littelfuse, ensuring such protection is commensurate with the prevailing industry standards for confidentiality, security, and data protection as defined and adopted by leading global companies (such as ISO/IEC 27001, NIST 800-171 or AICPA SOC 2 for information security management). The Supplier must maintain appropriate documentation of the security and availability controls implemented to protect Littelfuse information and systems, and must provide regular reports or attestations upon request, demonstrating the effectiveness of these controls and compliance with this requirement. Any such documentation must be retained by Supplier for a reasonable period of time following the conclusion of the Supplier's relationship with Littelfuse, which shall in no event be less than any period required by applicable law.

Suppliers shall have fax, email, Internet access and Internet browser as a minimum for eBusiness capability.

Suppliers are responsible for maintaining current key contact information to their respective buyers. These contacts include the top management representatives, and the required information includes phone numbers and email addresses.

SUPPLIER PRODUCT PROCESS CHANGE NOTICE (SPCN)

Suppliers and sub-suppliers to Littelfuse shall not implement a change to a product and /or process that was previously approved without first receiving written authorization by Littelfuse. Examples of such changes include, but are not limited to: tool moves, changes to manufacturing process / shipping location / plant move, material changes (sub-suppliers changes), changes that impact the logistics and deliveries such as ERP and carriers, and others.

Suppliers are also required to submit all supporting validation data including necessary dimensional reports, performance testing, before/after process parameters, updated APQP documentation (PFMEA/Control Plan) and a detailed timeline demonstrating proper change control that identifies necessary safety stock/bank requirements including timing for Littelfuse/Customer validation timing and designated resources to manage the change.

To request approval, Supplier can use the Supplier Product Process Change Notice Form (refer to Appendix G) and communicate to Littelfuse through the Supplier Development Engineer and/or Procurement Team contact.

The sPCN disposition (approval/denial) and/or other additional requirements will be communicated once the change is reviewed by the Littelfuse assigned representative. Littelfuse requires a minimum 180-day advanced notice for these types of changes unless otherwise specified by the Littelfuse Product Line and/or Customer Specific Requirements which in this case will supersede the priority and sPCN notice may need to be submitted even earlier.

No changes shall be made/implemented until written approval is received from Littelfuse.

Any Supplier who does not adhere to this requirement will be held responsible for all damages, losses and liabilities attributable to any unapproved change made by Supplier or its sub-suppliers (e. g. customer rejections, customer line stoppage penalty fees, field failure costs, warranty expenses).

Suppliers who implement unauthorized product and/or process changes will be placed immediately on product containment and/or New Business Hold.

Initial shipments of new or revised material will be labeled per Littelfuse receiving Plant Quality or Logistics for a duration determined by the receiving Plant. Suppliers are responsible to ensure all superseded materials have been cleared from the supply chain.

Product Safety – Modification of Product: All changes including modification (rework & repair) that may affect the integrity of the product characteristics, contents, traceability, visual attributes for product safety class product are not allowed without prior authorization from Littelfuse Quality/Engineering department.

Repair – Action on a non-conforming product or service to make it acceptable for the intended use.

Rework – Action on a non-conforming product or service to make it conform to the requirements

BUSINESS CONTINUITY/CONTINGENCY PLAN

Suppliers shall develop a documented continuity/contingency plan for potential catastrophes disrupting product flow to Littelfuse and advise the Littelfuse Buyer or Supplier Development Engineer representative (within 24 hours) in the event of an actual disaster. Supplier shall communicate the nature of the problem to Littelfuse and take immediate actions to assure supply of product to Littelfuse.

In an actual catastrophe, Suppliers shall provide access to Littelfuse tools and/or their replacements to reasonably protect Littelfuse' s supply of product if a Supplier's facility cannot continue to operate.

Please refer to the Littelfuse Terms and Conditions document for further guidance regarding Force Majeure or acts of God. Plans should be reviewed on an annual basis to ensure that the contingencies listed are still valid.

A Business Continuity Plan should not be confused with internal Health and Safety plans.

Note: production interruption is defined as an inability to meet the Littelfuse specified capacity volume and orders.

SUPPLIER SCORECARD PERFORMANCE

The Supplier performance is measured considering four (4) key elements:

- On Time Delivery (OTD)
- Quality
- Responsiveness
- Commercial Performance

Each element is weighted according to supplier performance expectations. The Supplier rating and scorecard is based on a weighted average of all elements. Suppliers shall target to score a 100. For the scoring calculation criteria, see the figure 2 below.

ON-TIME DELIVERY – 25%

Metric	Explanation	Resultant Score
OTD (On-time Delivery)	OTD: Actual on-time received items (Received lines) / Committed or Planned items received (Total lines)	Received lines / Total lines x 100. Direct resultant score as a %
Premium Freight	The incidents of premium freight with supplier responsibility, not planned or controlled by LF (No matter of the freight value)	No premium freight incidents, no impact to OTD score PF incident = 1, OTD score is penalized by 17 points (17%) PF incidents ≥ 2, OTD score is penalized by 33 points (33%)

QUALITY – 25%

Metric	Explanation	Resultant Score
Quality Incident	Justified event that impacts the quality of a component or material	No Quality Incident = 100% (A) One Quality Incident = 90% (B) Quality Incidents ≥ 2 = 60% (C)
DPPM	Defective Parts per Million. Quality incident reject rate based on lot size, sample and defective units	DPPM < Defined target, no penalty (Quality Score same as Quality Incident) DPPM ≥ Defined target, Quality Score penalized/reduced by 10 points (10%)
Disruptions	High Impact / Major Incident: causing downtime, impacting a Customer, reoccurrence or repetitive incident and /or other, based on magnitude and severity of the issue	No Disruption, no penalty One Disruption, Quality Score penalized/reduced by 40 points (40%) Disruptions ≥ 2, Quality Score penalized/reduced by 50 points (50%)

RESPONSIVENESS & CUSTOMER SERVICE – 25%

Metric	Explanation	Resultant Score
Customer Service	Responsiveness by Suppliers in terms of On-time response to a Littelfuse requests (Q, C, T). Quality: Compliance to Standard Quality requirements (PPAP, PCN, Supplier Quality Manual, caWeb, etc.) Commercial: Requests such as Contracts, T&Cs, PAF, … Technical: New Product / Material alternatives, processing, testing, raw materials information, …	On-time response, score = 100% Delay/unresponsive in 1 category, score is 80% Delay/unresponsive in 2 categories, score is 60% Delay/unresponsive in all 3 categories, score is 0%

COMMERCIAL PERFORMANCE – 25%

Metric	Explanation	Resultant Score
Cost Reduction	Support to LF on Cost Reduction targets	CR percentage ≥ target, score = 50% CR percentage < target, score penalized by 50 points (50%)
Payment Terms	Support to LF on Standard Payment Term requirements	Payment Terms ≥ target, score = 50% Payment Terms < target, score penalized by 50 points (50%)

Figure 2 - Supplier Scorecard Criteria

Scorecard Downgrading Rules

If at least one element has a B grade, the overall scorecard is downgraded to B

If at least one element has a C grade, the overall scorecard is downgraded to C

There is a 6-month downgrading rule that affects the 12-month grade: e.g. if there is one month with a C grade within the last 6 months, the 12-month grade is downgraded to a C (or lowest score)

Supplier Scorecard Result Assessment

A request for Improvement Plan (Corrective Action) is triggered under in any of the following conditions:

1. Three (3) Consecutive B Grade
2. Two (2) Consecutive C Grade
3. Two (2) C Grade within Three (3) Consecutive Months
4. Two (2) B Grade + One (1) C Grade within Three (3) Consecutive Months

Littelfuse shall periodically review Suppliers' Scorecard performance to determine if an Improvement Plan is needed, such as but not limited to:

1. Supplier's Corrective Actions and Improvement
2. Weekly Meetings with supplier's management staff
3. On-site review or audit
4. Provide training to Supplier, if necessary

Note 1: In the event of 3 months with a C grade within a period of 6 consecutive months, the Procurement team may hold all new business opportunities. No RFQ activity with Supplier.

Note 2: If a supplier's performance is a C grade for 6 months within a period of 12 consecutive months, the Procurement team may implement a plan for de-sourcing and stop purchasing from such Supplier.

The overall rating score is determined as below:

WEIGHTED SCORE:

The Weighted Overall score is determined as follows:

Above 90%	A
70% - 90%	B
Below 70%	C

CONTROL OF NONCONFORMING PRODUCT

The Supplier's Quality Management System must be robust enough for controlling nonconforming product. The system shall provide for the identification, documentation, evaluation, segregation, and timely disposition of nonconforming material. The Supplier's system shall include controls for product returned from Littelfuse.

Suppliers are expected to immediately notify Littelfuse upon discovery that they might have shipped nonconforming or suspect product to any of the Littelfuse facilities. Notification shall go to the Plant Quality and Materials Managers, or in their absence, the Operations Manager of the impacted Littelfuse facility. Suppliers are responsible to notify all Littelfuse facilities using the same or similar affected product.

REVIEW AND DISPOSITION OF NONCONFORMING PRODUCTS

Criteria for the nonconforming products disposition includes the following actions:

- Use as is - no actions taken on product, product does not meet specified requirements but does not affect fit, form or function.
- Use reworked or sorted product - use of reworked product that does not compromise the product quality and integrity and meet specified requirements. Supplier is responsible to determine and implement, when feasible, a robust rework process or sorting method. Littelfuse reserves the right to implement their own rework/sorting process criteria if continuity of production is put at risk. The supplier will be responsible to absorb the cost associated to any of these practices.
- Product rejection or replacement - Littelfuse reserves the right to reject any nonconforming material expecting immediate product replacement with a lot of new material and that meets Littelfuse drawing requirements. The Supplier must provide RMA (Return Material Authorization) for any material replacement within the first 24 hours of notification.

In the event of a justified quality incident, Littelfuse will communicate with the supplier to determine responsibility for any associated costs as a result of the usage of nonconforming material causing to conduct internal sorting, rework, repair, scrap, production downtime, customer charges and product recall including shipping/transportation fees of moving material out of the standard process.

SUPPLIER CORRECTIVE AND PREVENTIVE ACTIONS – (CaPA)

Supplier CaPA is the Littelfuse Global Supply Chain on- line Corrective and Preventive Action System. This system provides our global supply base with easy access to respond and communicate/document containment and corrective actions when an issue is reported by Littelfuse. It provides a structured and methodical approach to document permanent corrective actions by Suppliers. It also provides a history log background in case the Supplier's solution was not effective and new actions are required to permanently resolve the issue. The Littelfuse regional Supplier Development Engineer will grant access to the Supplier as required.

The Supplier Corrective and Preventive Action platform system is used any time a Supplier quality or delivery issue arises. Issues requiring corrective actions include, but are not limited to, late deliveries, non-conforming material, incorrect labeling, environmental testing issues, quantity discrepancies, and production line shutdowns.

This centralized system is accessible to all our plants around the world and uses the 8D format for problem solution management. Suppliers are responsible for managing their own responses and entering them into Supplier Corrective and Preventive Action platform by or before the expected due date.

Timetable below illustrates the standard timing for Supplier problem notification and corrective action implementation in calendar days. When Littelfuse classifies a Supplier CaPA as a "High Impact" or Major Disruption incident, immediate action and priority is expected from our Supplier base due to impact of potential Littelfuse or Littelfuse customer production line down situation and/or potential reliability risk, safety incidents or customer recall due to inoperative component.

Upon request, Supplier Top Management support will be needed as part of the 8D core team to expedite analysis, countermeasures and corrective action.

Littelfuse reserves the right to request additional actions if 8D CaPA response is not robust enough to resolve the reported incident. Closure and approval will be granted when Littelfuse is confident that the corrective action is effective proving a final and permanent resolution of issue reported.

Timetable:

8D disciplines	Priority (High Impact) Major Disruption	Standard
D1: Establish Team D2: Problem Description D3: Interim Containment Actions	Released within 24h	Released within 24h
D4: Identify root cause(s)	Released within 24h	Released within 3 days
D5: Identify the permanent corrective action D6: Validate the corrective action	Released within 7 days	Released within 14 days
D7: Prevention of Repetition D8: Congratulate the Team	Per agreed plan	Per agreed plan

Supplier CaPA Instructions (see Appendix H)

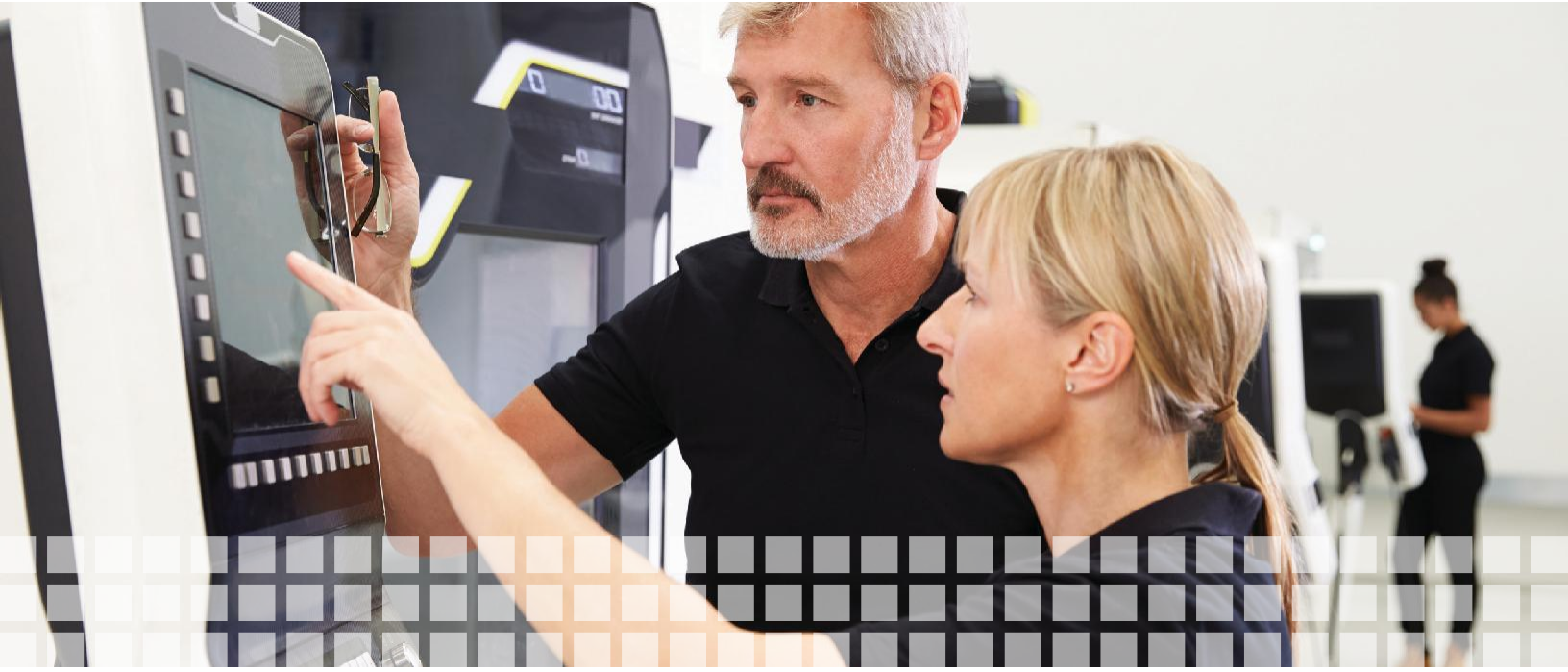
SUPPLIER RISK MANAGEMENT

Supplier Risk Management and Improvement Process is the program that defines a methodology to identify risk with the whole purpose of maintaining a reliable supplier base. With the foundation of a Business Continuity Plan, the Supplier Development team coordinates the efforts to mitigate the risks identified and prioritize the necessary course of action.

In the risk model calculation, a selected group of Suppliers are evaluated in three main categories: Business risk and impact, Performance Measurement and Quality Management system. The following elements are included as part of the assessment: Product Supply Risk, Financial Risk, ESG Reports, Scorecard Performance, Responsiveness, and Quality Competence.

Based on the Supplier performance and identified areas of risk, the SDE along with the Procurement organization will determine the action needed, which may include Supplier Resourcing, a Continuous Improvement Plan, On-site Assessment, and others.

Suppliers are expected to fully cooperate with this Risk Management initiative in the best interest of maintaining a healthy business relationship with Littelfuse.



MATERIAL TEST RESULTS REPORTING

The Material Test Report must contain the actual results of physical testing, measurements and/or analysis specified by the contract confirming compliance with all identified requirements. Blanket statements of material conformance without data to support it will not be accepted.

Suppliers must submit the material testing report in electronic format or paper format with the packing slip of each shipment sent to a Littelfuse location.

The Supplier should have a system capable of retrieving and submitting the requested Material Test Report or any characteristic data in the approved control plan within 24 hours of Littelfuse request.

CoC (Certificate of Conformance) is required to be attached for each shipment to Littelfuse or keep in Supplier's quality document system for audit upon Littelfuse request. Suppliers can use own form for CoC or contact respective Supplier Development Engineer or representative for Littelfuse form.

The supplier is responsible for conducting and submitting all material and performance testing as specified on the print with the PPAP package. If the supplier is not capable of performing all tests, they shall contract the service with a qualified source, such as a sub-supplier, third-party laboratory, or test facility. Littelfuse recommends that the contracted source is an accredited facility (A2LA, ISO 17025).

SUB-SUPPLIER MANAGEMENT

Sub-tier Suppliers have a tremendous impact on the quality of the final component. Whether they provide raw materials, services or sub-components their influence is so profound that it is critical for Littelfuse Suppliers to have a Supplier management system in place. This system shall include a function that tracks and reports on their supply base quality and delivery performance. Supplier must be able to demonstrate that they manage their Suppliers' issues through documented corrective actions and verification activities.

Littelfuse Suppliers are required to manage/monitor their Supplier base capabilities including but not limited to APQP compliance and Supplier overall performance. It is also required to have a process for auditing the sub-tier Supplier critical processes to assure proper controls are in place throughout the entire supply chain.

Suppliers are responsible for providing disposition of defective parts in the event of a sub-supplier poor performance condition (such as plating and other secondary operations), this also includes consigned material.

Requirements for sub-suppliers (sub-tier Suppliers) management:

- Suppliers are recommended to have a Quality Systems Management in place to develop their own Supplier base in conformance to ISO9001 and other requirements (such as RoHS or similar).
- In the event of a significant Quality Incident, the Littelfuse Supplier Development Engineer or representative reserves the right to audit the Quality Management System of a sub-supplier and request the resourcing of the business to a different vendor if needed.
- Suppliers are required to keep lot control (for traceability) and component data of key sub-supplier materials.
- Cascade and communicate down Littelfuse Specific Requirements throughout the organization supply chain.
- Conduct an on-site process audit (or equivalent) for all critical materials, parts and processes as required.
- Develop and maintain a list of approved Suppliers for each sub-component, raw material, commodity, technology or purchased service. The Supplier shall have a documented process and use assigned personnel to monitor and manage sub-suppliers' performance.
- A Business Continuity/Contingency Plan throughout the supply chain.

Note: Sub-tier Suppliers are defined as organizations that are providers of but not limited to: a) production materials, b) services, accessory parts and/or c) heat treating, plating, painting or other finishing services, directly to an organization who is a Supplier of Littelfuse.

CONTINUOUS IMPROVEMENT

Supplier continuous improvement is an integral part of the overall Quality Management System Continuous Improvement Process.

Considering that Continuous Improvement is also an essential part of ISO standards, at a minimum, Littelfuse Suppliers must develop and present plans when requested that improve internal systems which address and support flawless new program launches, value enhancements and cost competitiveness, and achievement of agreed upon quality targets in order to achieve zero defects zero excuses expectation in support of the Littelfuse Operating System.

Continuous Improvement plan shall include Lessons Learned from previous launches, cost and quality issues. Suppliers should also be prepared to discuss these plans when requested.

Littelfuse recommends Suppliers use the fundamentals outlined in ISO/IATF/VDA requirements as the guideline for organizing continuous improvement plans.

Upon discretion, Littelfuse may visit any Supplier site to assess its continuous improvement programs and lean manufacturing practices. In addition, Littelfuse may deploy personnel to focus on a specific improvement project when required. Littelfuse will also select Suppliers to develop for key project initiatives with big potential improvement impact to quality, cost and or delivery to the organization. Once a Supplier has been selected, a cross-functional team consisting of Littelfuse and Supplier members will be formed to work together to ensure that established targets are achieved. Littelfuse may choose to provide training to Suppliers on quality tools skills, 6 sigma or Lean production for process improvement as required.

Some common examples of Continuous Improvement programs are:

- Cost reduction projects (examples include use of Six Sigma, Lean Enterprise, Value Analysis/Value Engineering).
- Waste reduction projects (examples include use of Kaizen events, Setup Reduction, Value Stream Mapping, Standardized Work, Process Flow).
- Variation reduction projects (examples include use of Six Sigma, Standardized Work, Statistical Process Control).
- Factory Reorganization projects (examples include use of 5S Program, Single Unit or Cellular Manufacturing, Focused Factory, Kaizen events).
- Inventory reduction projects (examples include use of Kanban system, Single Unit or Cellular Manufacturing, Supermarket Pull).
- Yield improvement projects (examples include improvements to Equipment Uptime/Downtime, First Pass Yield, Rework reduction, Scrap improvement, On-Time Delivery).
- Non-manufacturing Process Improvement projects (examples include Customer Service, Accounting, Purchasing, Warranty returns, Quality control).

LOT TRACEABILITY AND IDENTIFICATION

All Littelfuse Suppliers shall have an effective traceability and identification procedure in place. The aim of traceability shall be to minimize the impact and consequences of quality concerns.

For all Littelfuse products, the Supplier shall establish and maintain procedures for identifying the product during all stages of production including receipt, work in process, storage, and delivery. In addition, lot traceability of all sub- components, raw materials and process inspection data shall be maintained. Each production lot shall be identified with a lot number.

Identification shall permit traceability back to the specific Supplier raw material lot numbers, as well as the manufacturing, inspection and test records. The Supplier shall also be able to trace where products were made under similar conditions (same raw material lot, same manufacturing line/batch, etc.). Sequence of batches must be identified on the packaging label by either a date code or batch/lot number.

Lot traceability records must be kept on-hand and be available to Littelfuse upon request for a period equal to 15 years from the end of production or as indicated by Littelfuse.

PACKAGING AND LABELING

PACKAGING

- All Suppliers are responsible for the design and development of packaging, unless otherwise specified from Littelfuse Plant. Suppliers must ensure that all parts arrive at Littelfuse Plant in satisfactory quality condition. Any damages due to packaging will be the responsibility of the Supplier.
- Suppliers are responsible also for recommendations in the packaging based on their knowledge and possibilities, unless otherwise specified from Littelfuse Plant.
- The Supplier is responsible for maintaining part quality standards within the Littelfuse Plant's determined container type. The Supplier must provide packaging that can protect the parts through its methods of transportation as applicable (air, truck and/or sea) and types of handling planned for its final destination and intended point of use (end user).
- Due to the significant importance to our operations, the adherence to the Supplier packaging requirements is mandatory and will be continuously monitored.
- Littelfuse strives for continuous improvement from a packaging and supply chain perspective. Requests for changes of approved packaging may be made by the Supplier, the receiving warehouse,

the Littelfuse SDE and/or SQE. Suppliers are required to have a single packaging point of contact to respond quickly to any change requests.

- No change shall be allowed for handling, packing, packaging or storage without written permission of Littelfuse.
- Goods shall be packaged in a method to preserve and protect from damage and/or degradation.
- All goods are to be suitably prepared for shipment by suppliers in accordance with acceptable commercial practices.
- Supplier shall pack, label, handle and ship in conformance to all requirements of federal, state and local laws, including, without limitation, the product country of manufacture marking, in a conspicuous place as legible, indelible and permanent as the nature of the article (or container) will permit.
- Supplier shall identify Littelfuse purchase order number on the invoice, packing list, bill of lading or any packages.
- Supplier shall attach an invoice to all shipments, in addition to forwarding a copy of such invoice to Littelfuse.

LABELING

- The Littelfuse Global Container Label Requirements Standard provides written requirements for the printing and application of container labels.
- Littelfuse provides specific data formats and barcode structure to our Suppliers and communicate the acceptable labeling standards expected from our trading partners.
- Suppliers must use the standard label formats when shipping to all Littelfuse facilities.
- Littelfuse recommends the use of bar-coding software and hardware, which allows for flexibility in label generation. Printers shall produce labels that meet AIAG specifications and tolerances, if applicable. Thermal printers and laser printers are strongly recommended. Dot matrix printers shall not be used as bar-coded because data can become skewed.

Some examples of mislabeling are, but not limited to:

- Wrong part number
- Partial container
- Wrong destination
- Wrong engineering level
- Unreadable bar code
- Missing label
- Wrong sequence
- Incorrect quantity
- Mixed containers on pallet

Please refer to Appendix J for additional requirements.

SANITIZATION REQUIREMENTS

We also require our suppliers to ensure that carriers they use are compliant with all sanitization laws and any pallets used are compliant with International Standards For Phytosanitary Measures No. 15 (ISPM-15), in accordance with local/regional regulations.

RECORD RETENTION

Suppliers must establish a system to manage record retention. The system shall fulfill and comply with Supplier internal requirements as well as Littelfuse requirements. Unless otherwise indicated, all Littelfuse Suppliers are required to maintain record retention for minimum of 15 years.

Please contact a Littelfuse representative for specific record retention requirements based on the supply chain program. For Suppliers that supply to automotive industry, minimum record retention is Production and service requirement plus 1 year. Whenever there are overlapping requirements, the more stringent requirements will apply.

Documents to be retained in such a manner that they can be made available to Littelfuse within 48 hours of request include:

- Statistical Quality Data
- Inspection and Test Results Data
- All Initial sample data
- Corrective action reports
- Receiving inspection information
- Control Plans / PFMEA / DFMEA / Flowcharts
- Quality procedures and system descriptions
- Written instructions, Test and Lab Instructions
- Test Procedures

CUSTOMER SPECIFIC REQUIREMENTS

From time to time, Littelfuse may receive additional customer specific requirements from its direct customer or end customer, which are applicable to the entire supply chain as well. Upon receiving such requirement from Littelfuse, the Supplier is expected to implement the requirement and ensure full compliance. Supplier is expected to share technical confidential or proprietary information with Littelfuse if required as long as we have signed a Non-Disclosure Agreement (NDA). Any exception must be brought up to Littelfuse attention for further discussion and agreement.

SUPPLIER ROLES, RESPONSIBILITIES AND AUTHORITIES – SUPPLEMENTAL

The Supplier shall notify the Littelfuse Supplier Development Engineer Representative via e-mail within 10 working days of any change to senior management responsible for product quality or company ownership.

SPECIAL PROCESS ASSESSMENTS

For those vendors in a supply chain associated with a Littelfuse automotive Business Unit, the Supplier and its sub- tier Suppliers shall audit specific manufacturing processes (see list below) annually to determine its effectiveness.

Applicability and effectiveness of these processes shall be determined utilizing the most current version CQI standard. The effectiveness evaluation shall include the organization's self-assessment, actions taken, and those records are maintained.

- Heat Treating – CQI-9 Special Process: Heat Treat System Assessment.
- Plating – CQI-11 Special Process: Plating System Assessment.
- Coating – CQI-12 Special Process: Coating System Assessment.
- Welding – CQI-15 Special Process: Welding System Assessment.
- Soldering – CQI-17 Special Process: Soldering System Assessment.
- Molding – CQI-23 Special Process: Molding System Assessment.

- Casting – CQI-27 Addresses common failure modes in casting processes.
- Brazing – CQI-29 Focuses on brazing management systems.
- Rubber – CQI-30 Focuses on rubber management systems.

The latest edition of the reference documents listed above applies unless otherwise specified by Littelfuse. Copies of all reference documents except those specific to Littelfuse are available from the AIAG at the following link: www.aiag.org.

Internal audits and 2nd party assessments must be conducted by a competent auditor. The auditor is competent if they meet the following requirements:

- They shall be a qualified ISO lead auditor, or a qualified intern auditor with evidence of their successful completion training, and minimum of five internal ISO 9001:2015 and/or IATF 16949:2016 under the supervision of a qualified auditor.
- They shall have a minimum of five years' experience working with the process that is being audited or a combination of experience and education in the specific process.

Note 1: If the organization does not have a competent auditor, the audit shall be conducted by a 3rd party competent auditor.

Note 2: Suppliers and its sub- tier Suppliers shall send annually the results of the specific manufacturing process audit via e-mail to its Supplier Development Engineer representative.

ANNUAL RE-QUALIFICATION

As required, the Supplier Development Engineer will determine if annual PPAP re-qualification is applicable based on Customer Specific Requirements to be defined during APQP, PAF (Print Acceptance Form) and/or PPAP stages.

This re-qualification element is also applicable to Special Processes (i.e. Plating, Heat Treatment, …) as per AS/EN9100 standard and other specific requirements.

Annual re-qualification documents may include:

- Full dimensional layout
- Material testing or certifications (such as flammability compliance)
- Environmental requirements
- Reliability testing

Note: No additional Supplier costs or fees and charges associated with this requirement are allowed.

COUNTERFEIT AND FRAUDULENT PARTS AUDIT PROGRAM

The supplier is required to develop and maintain a sub-supplier Counterfeit and Fraudulent parts verification program. Parts and components from gray market are not allowed. Suppliers are expected to perform due care in preventing the purchase and use of counterfeit and fraudulent components as to avoid, detect and mitigate any potential risk for such parts from entering the supply chain. This requirement is mainly applicable to manufacturers and distributors in the electronic component industry. Littelfuse all electronic parts will only be procured directly from the original manufacturer or through a franchised distributor.

SUPPLIER ACKNOWLEDGEMENT

Supplier is required to acknowledge the acceptance of Littelfuse Supplier Quality Manual. If there is any exception / deviation requested, Supplier should indicate the details in the Appendix K - Supplier Quality Manual Acknowledgement and Acceptance Form and submit it to Littelfuse for review and approval.

The latest version of the Littelfuse SQM is published in the following link:
https://www.littelfuse.com/partner-portal/Suppliers

Important, the Supplier will be deemed to have accepted the Littelfuse Supplier Quality Manual requirements in their entirety unless we are notified otherwise in writing within thirty (30) days after receiving communication of this manual and/or during a purchase order Terms and Conditions acceptance process.

APPENDICES

Appendix A – Supplier Environmental, Health and Safety Specification (Obsolete – eliminated)

Appendix B – Supplier On-site Evaluation Template

Appendix C – Supplier Self Survey Template

Appendix D – Littelfuse Supplier Production Part Approval Process (PPAP) Manual

Appendix E – Supplier Production Part Approval Process (PPAP) Form

Appendix F – Quality Management Plan Form

Appendix G – Supplier Product Process Change Notice Form

Appendix H – Supplier Corrective and Preventive Action platform Instructions

Appendix I – Supplier Risk Management Process (Obsolete – eliminated)

Appendix J – Littelfuse Barcode Standards

Appendix K – Supplier Quality Manual Acceptance Form

Appendix L- Littelfuse Built In Zero Defects (BIZD) Assessment Form

Appendix M – Supplier VDA Requirements Acknowledgement Form

CHANGES / DOCUMENT HISTORY

Revision	Originator	Changes / Description	Date
A	Sam Peng	Initial document number CHI-10SDE-001-A and reset the revision from I to A Add critical risk Supplier program, annual re-qualification, Supplier acknowledgement. Updated Supplier requirements matrix, PCN notice, Scorecard, caWeb timetable and some appendices.	Jul.15, 2017
B	Yoshisumi K	Update Supplier requirement matrix Update score for Littelfuse risk assessment process. Update section of performance measurement – Supplier scorecard.	Oct.9, 2017
C	Ruben L	Updated SQM content Added new requirements: Supplier Code of Conduct Built In Zero Defects (BIZD) Safe Launch Plan Product Safety Management Supplier e-Business Capability Appendix A became obsolete – N/A Appendix I revised Appendix L - New	Jun. 30, 2020
D	Alfredo H	Added references to AS/EN9100 for suppliers in Aerospace programs. Code of Conduct expected by sub-tier suppliers. Emphasized the requirement of a documented Business Continuity Plan, needed also throughout the supply chain. Clarification on Supplier Scorecard elements and criteria. Clarification on requirements for statistical process control and Cpk. Added requirement for Counterfeit Parts Audit Program and Functional Safety (Ref ISO 26262)	Nov 2023
E	Ruben L Alfredo H	Updated name of CEO, C-TPAT requirements added to the Supplier Self-Assessment Survey", Software Quality added to the APQP, Repair and Rework added to the sPCN section, Scorecard section updated, Removed references to caWeb and the wording just mentions a supplier CaPA, "Supplier Risk Management" section reworded to reflect the current practice, "Lot Traceability" added a 15 years requirement, added "Sanitization Requirements", added list of documents as a reference under Record Retention section, Updated link to web site, obsolete Appendix I: the SRM or Critical Risk supplier process, Renamed Appendix H to "Supplier Corrective and Preventive Actions", more general and not tied to caWeb, Safe Launch Plan section re-defined. Reworded section related to "Responsible Sourcing of Materials" to be in line with current LF policies. Added requirement about electronic information protection (e-business Capabilities). Added new section for Compliance with Import and Export Law. Rephrased and restructured the Supplier Audit Assessment Process and the Self-Assessment Survey (sourcing checklist). Added appendix M and note in reference to VDA requirements.	May 2026