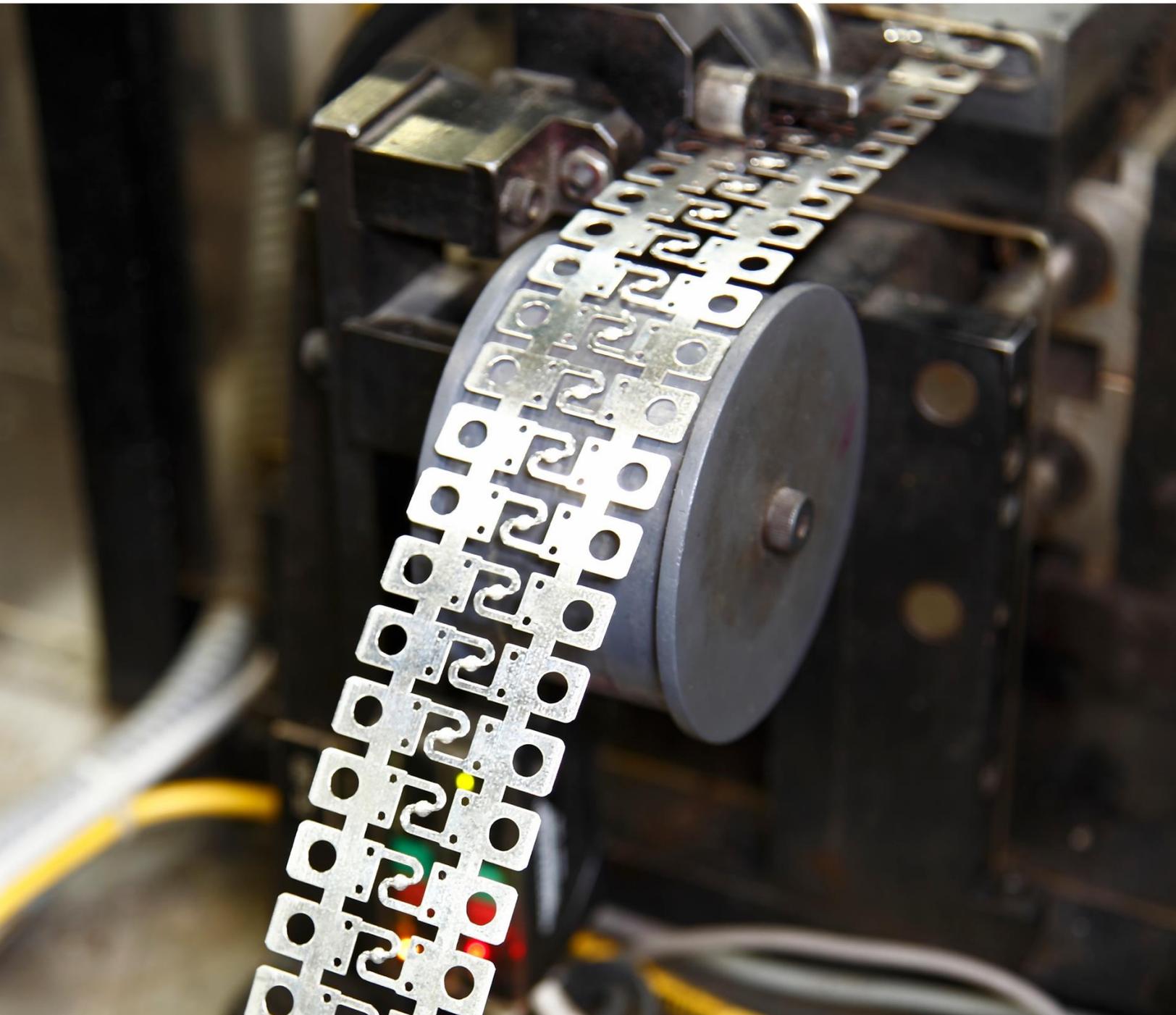




Expertise Applied | Answers Delivered

SUPPLIER QUALITY MANUAL

REVISION D

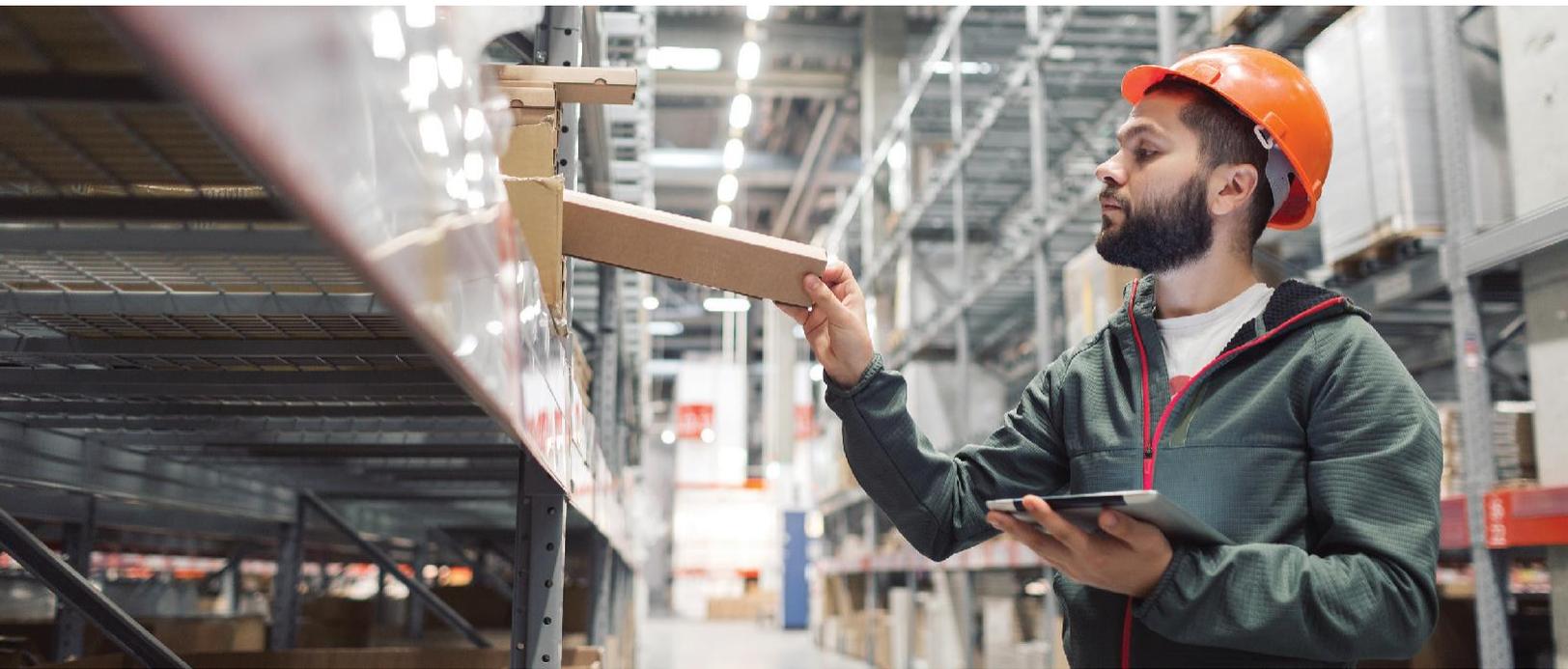


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LITTELFUSE QUALITY POLICY

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.

Dave Heinzmann
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, indirect, MRO, distributors, special services and directed Suppliers.

SUPPLIER'S RESPONSIBILITY

Suppliers are responsible for meeting the requirements of this manual. Failure to meet these requirements may result in the loss of existing and/or future Littelfuse business, in addition to reimbursement of the cost to Littelfuse resulting from those failures. Refer to page 31 for acknowledgement.

Suppliers shall adopt the Littelfuse Zero Defects Zero Excuses requirement and meet 100% On Time Delivery.

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 targets
- 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 additional requirements)
- 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 High Impact/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 its 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/about-us/supplier-resources.aspx>

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
- Shared goals
- Commitment to the business relationship, and
- Zero Defects Zero Excuses

All the sections in this manual describe the specific 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.

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

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.



ENVIRONMENTAL, 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. 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.mdssystem.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 EHS 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 a business in the electronics sector and subsequently applied by that business to the Suppliers. 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 below 5 sections:

- 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

Suppliers shall have a policy to reasonably assure that the tantalum, tin, tungsten and gold in the products they manufacture does not directly or indirectly finance or benefit armed groups that are perpetrators of serious human rights abuses in the Democratic Republic of the Congo or an adjoining country. Suppliers shall exercise due diligence on the source and chain of custody of these minerals and make their due diligence measures available to customers upon customer request.



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 Supplier capability, beyond the certification level.

The primary focus areas are:

- General Requirements
- Design and Development of Products and Processes
- 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 \geq 85	A	Quality-capable
70 \leq score < 85	B	Conditionally quality-capable
score < 70	C	Not quality-capable

For Process audit per VDA6.3:

	Classification	Description of the classification
score \geq 90	A	Quality-capable
80 \leq 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 score acceptably may be allowed to develop action plans and timelines to correct any deficiencies reported during the audit process. They are then expected to present an action plan and verify the effectiveness of the actions being implemented within one month.

The Littelfuse lead auditor will review Supplier's corrective action report to ensure the effectiveness, through documented evidence and/or on-site verification/re-audit if needed.

The ultimate goal for Suppliers is to qualify as "A" – Quality capable, if so, a new or continuity of business award may be possible to negotiate.

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

BUILT IN ZERO DEFECTS (BIZD)

- **BUILT IN ZERO DEFECTS** tools provide 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

Prior to conducting an On-Site Supplier Assessment, Littelfuse will contact the Supplier and request a Self-Assessment Survey with at least 2 weeks' notice (Littelfuse will provide the form found in Appendix B as the guideline to complete).

The purpose of the initial survey is for Littelfuse to review/understand the Supplier capabilities against Littelfuse requirements to allow the auditor to become familiar ahead of the official audit.

Security is also covered in this assessment and part of the requirements established by the U.S. Customs to maintain Littelfuse C-TPAP (Customs Trade Partnership Against Terrorism) certification. To maintain our certification and our ability to ship product across the border in a quickly and efficient manner we must evaluate every Supplier facility security measure in place.

Note: C-TPAT security practices apply only to Suppliers

providing goods to the United States. Littelfuse requires Suppliers and carriers to become C-TPAT certified or local country equivalent. Suppliers can do this on the following website: www.cbp.gov/border-security/ports-entry/cargo-security/ctpat.

Suppliers are required to send their proof of compliance to Littelfusepcl@Littelfuseproducts.com. If proof of compliance is not provided to Littelfuse then a C-TPAT security profile form IPF-106 will need to be completed annually. Suppliers will be assessed for their compliance with C-TPAT supply chain security standards.

The complete self-assessment must be returned within 5 working days prior to the official on-site audit to allow the Littelfuse auditor to review the responses and choose the areas/questions to verify during the audit.

The Supplier self-assessment checklist is found in appendix C.

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.



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.

It is mandatory for Suppliers to submit the International Material Data System (IMDS) data against Littelfuse account 2426 as soon as possible upon award of new business, but in any case, prior to the PPAP submission. IMDS is a mandatory Littelfuse requirement.

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, as determined by the SDE or representative, shall participate in Safe Launch. For a pre-determined period of time or number of components, the Supplier is expected to add Early Containment Implementation activities as part of their Start Of Production (SOP) ramp-up plan that includes expanded inspection process on key characteristics that will be typically designated as part of the design review process and/or as identified by the Supplier as critical. The Supplier shall continue to use the validated process once the program transitions from Launch into Production.

If changes to this process are desired, Littelfuse approval is required; please refer to Littelfuse Supplier Product Process Change Notice (SPCN) requirements before implementing any changes to the initially validated process. The Supplier is responsible to contact their assigned SDE or buyer if any doubts persist about requirements to avoid any potential misunderstanding.

Should the Supplier's performance not meet agreed upon goals and metrics during the serial production phase the Supplier will be subject to provide an improvement plan, on site quality reviews and quality reviews at the assigned Littelfuse facility.

QUALITY MANAGEMENT PLAN (QMP)

As an alternative Supplier Management Tool, Littelfuse reserves the right to use Quality Management Plan (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.

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

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 safety potential 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 associated documentation 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 to 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 programs, GR&R studies, defect analysis and continuous improvement processes. 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
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.

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

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 Supplier Product Process Change Notice Form (refer to Appendix G), initiating the sPCN through the Littelfuse Supplier Quality portal: <http://www.littelfuse.com/suppliers>, or by contacting 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.

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 three (3) key elements:

- Quality
- Responsiveness
- On Time Delivery (OTD)

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

QUALITY ELEMENT- RATIO OF ENTIRE SUPPLIER RATING SCORE – 50'

Metric	Explanation	Score Method	Score
Quality Incident	Justified Quality Incident detected at Incoming Quality, Littelfuse process or end Customer	2 or more incidents, score = 0, 1 incident, score = 5. Zero Quality Incidents, score = 25	25 (50%)
DPPM	Defective Parts per Million. Reject Rate from supplier	DPPM by Category (contact LF rep for specific targets). For example, Ceramics target = 5000. DPPM>5000, Score=0. DPPM<5000, the score will be 0 to 10 in proportion	10 (20%)
Disruptions	Major Disruptions and High Impact Incidents causing downtime and/or impacting a Littelfuse customer	Qty of MDs on a given month ≥ 2 , =1, =0, then score is 0, 5, 15, respectively	15 (30%)

RESPONSIVENESS ELEMENT-RATIO OF ENTIRE SUPPLIER RATING SCORE – 20'

Metric	Explanation	Score Method	Score
On-time PPAP	Requested PPAP submitted on time (based on promise date by supplier)	PPAP 100% on-time, score is 10 Late PPAP submission, score = 0	10 (50%)
SQI (caWeb / 8D) Others	Responsiveness of Suppliers in terms of: 1. On-time response for 3D (containment) and full 8D 2. Timely response to LF feedback 3. Other specific requests by Littelfuse (as a measure of Customer Service)	3D/8D response 100% on-time, then score is 10, score is 0 if late or no response. Score = 0 if no response from supplier on other specific requests by Littelfuse	10 (50%)

DELIVERY-ELEMENT RATIO OF ENTIRE SUPPLIER RATING SCORE - 30'

Metric	Explanation	Score Method	Score
OTD (On-time Delivery)	Actual items received on time divided by Committed or Planned items received (Date and quantity)	OTD Score = (On-time Received / Total) x 100 If have Premium Freight = (OTD% - Premium Freight%)	20 (67%)
Premium Freight	Incidents of premium freight not planned or controlled by Littelfuse	2 or more incidents, OTD score reduced by 33%. 1 incident, score reduced by 16.5%. No incident, the Delivery Score is same as OTD score.	10 (33%)

Figure 2 - Supplier Scorecard Criteria

Scorecard Downgrading Rules

If at least one element is below 70%, then the overall monthly score will be automatically downgraded to a “C”.

Supplier Scorecard Result Assessment

Suppliers who maintain an overall rating of A are considered good.

Suppliers who have an overall rating of B are considered marginally acceptable.

Suppliers who have an overall rating of C will be considered unacceptable.

The reaction plan and/or corrective actions shall be taken 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

The Procurement, Supplier Development and Quality departments shall review Suppliers' performance on a monthly basis and determine if a reaction plan is needed, such as but not limited to:

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

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.

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 meets 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. 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 and expects immediate product replacement with new lot of material by Supplier that meets specified Littelfuse drawing requirements. Supplier must provide RMA (Return Material Authorization) for any material replacement within the first calendar days. When Littelfuse classifies a Supplier CaWeb

24 hours of notification.

Littelfuse reserves the right to charge the Supplier for any associated cost 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 ACTIONS – SUPPLIER CaWeb

Supplier CaWeb is the Littelfuse Global Supply Chain on-line Corrective and Preventative 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 CaWeb 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 CaWeb by or before the expected due date.

Timetable below illustrates the standard timing for Supplier problem notification and corrective action implementation in 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 CaWeb 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 probing 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 CaWeb 4 Instructions (see Appendix H)

Supplier CaWeb Address – <http://caweb4.hginet.com/LFSupplyBase>

SUPPLIER RISK MANAGEMENT

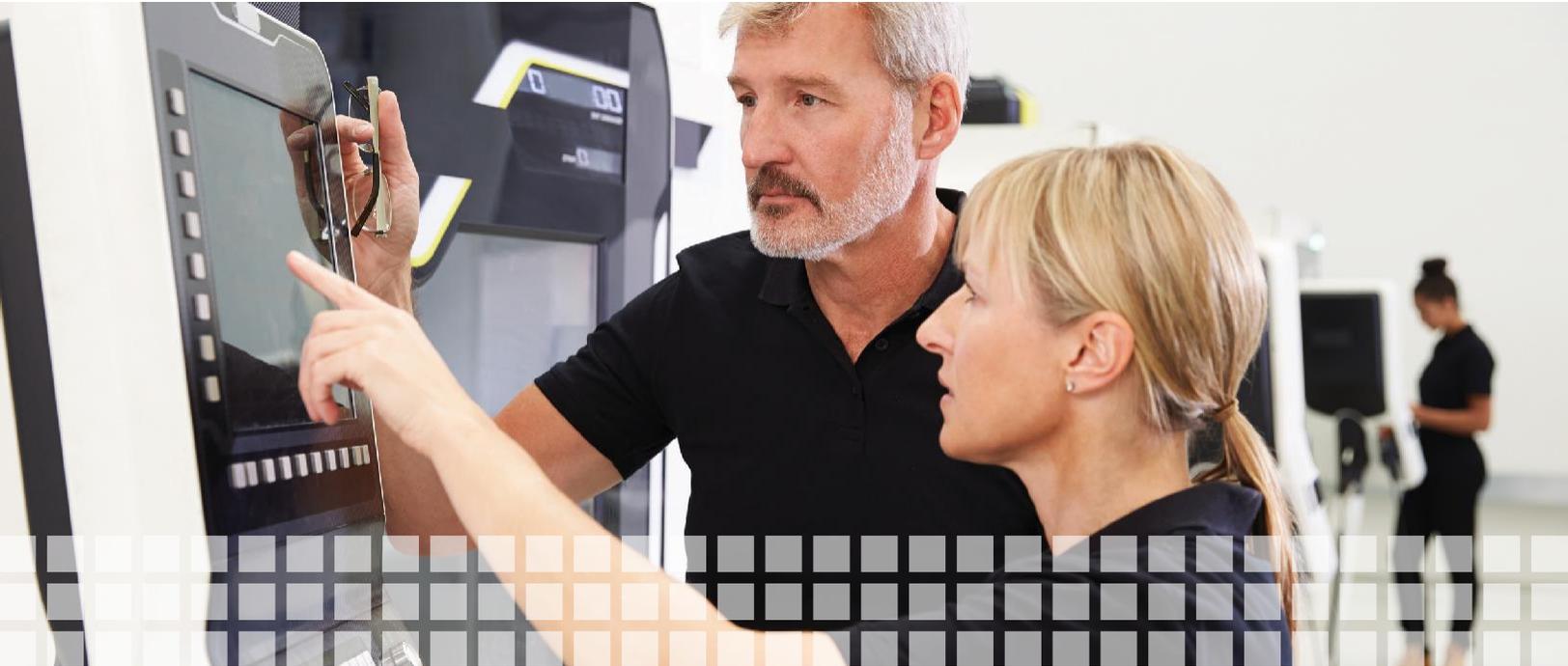
Supplier Risk Management and Improvement Process is the program that defines a methodology to identify the risk in the supplier base and determine the actions needed based on priorities. Using tools such as Continuous Improvement Programs, Business Continuity Plan and others, the Supplier Development team efforts ensure that identified suppliers are capable of delivering product that meets Littelfuse requirements and expectations.

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.

Based on the Supplier performance and identified areas of concern, the SDE will determine if a Proactive Containment is the correct tool to protect Littelfuse against nonconforming material.

New Business Hold is another measure that can be taken by Littelfuse against a Critical Risk Supplier that misses the opportunity to take the necessary actions and improve performance. The Littelfuse Procurement organization shall formally notify a Supplier entering NBH.

The Supplier risk assessment will be reviewed at least once per year. Refer Supplier Risk Management Process in Appendix I.



MATERIAL TEST 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.

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 by a Supplier 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.

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

marking of manufacture of the product, in a conspicuous place as legibly, indelibly and permanently 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 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.

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 LF

representative for specific record retention requirements based on 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.

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 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.

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 assessment must be conducted by a competent auditor. An 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 PARTS AUDIT PROGRAM

The supplier is required to develop and maintain a sub-supplier counterfeit 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 components as to 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.

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/about-us/supplier-resources.aspx>

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) Format

Appendix F – Quality Management Plan Form

Appendix G – Supplier Product Process Change Notice Form

Appendix H – Supplier CaWeb 4 Instructions

Appendix I – Supplier Risk Management Process

Appendix J – Littelfuse Barcode Standards

Appendix K – Supplier Quality Manual Acceptance Form

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