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SOLUTIONS



Littelfuse Technologies: Power Thyristors • Protection Arrays • Fuses • PTCs • Varistors • TVS Diodes • GDTs • ESD Suppressors • SIDACTor Devices

Supplier Quality Manual



Expertise Applied | Answers Delivered

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General Quality Expectations

Our expectations of suppliers and ourselves extend beyond the basic entry criteria that correspond to quality, delivery and cost to 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 incidents requirements established in our procedure of supplier rating system or QMP. With a goal of 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 you:

Quality products that fully meet specification

Environmental compliance

On-time delivery

Competitive costs

Adequate inventory

Technical knowledge

High quality service

Continuous improvement

Shared goals, and

Commitment to the business relationship

All of 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 for doing business with Littelfuse.

SUPPLIER REQUIREMENTS MATRIX					
Supplier Type	Risk Assessment	Environmental Testing	ISO/TS Required	Self Survey Required	LF Validation Testing Required
Direct	Yes ¹	Yes	Yes ²	Yes	Yes
Indirect	Yes	Yes	No ³	Yes	Yes
MRO (<i>Maintenance, Repair, and Operations</i>)	No	Optional	No	No	No
Distributor	Optional	Yes	No ³	Yes	Yes
Special Services (<i>Testing, Calibration, etc.</i>)	No	No	Yes	No	No

- Transportation and delivery suppliers are qualified and managed by the Global Logistics Department.
- In cases where a requirement is “Optional” depends on how that product interacts with the customer. For example, Distributors may require a risk assessment if they are considered Critical.

¹ Risk Assessments are required of all direct and critical suppliers as soon as practical. However, if a large, brand-name supplier (GE, DuPont, Lear, etc.) or the chemical supplier refuses to allow LF to assess them, the risk assessment can be skipped if there is consensus between the regional Purchasing Manager and the affected SBU Operations Manager.

² ASBU suppliers are required to have TS16949 or a plan to get certified to it within 1 year.

³ ISO certification is preferred.

Direct Supplier – Any supplier of materials that are used in the creation of Littelfuse products. This will also include suppliers of pass-through or private label products sold by Littelfuse. Examples include plastic resin, resistance wire, purchased fuse holders, etc.

Indirect Supplier – Any supplier of material that is included with a product sold by Littelfuse but not part of the actual product. Examples include boxes, labels, foam packaging, blister packages, bulk chemicals, etc.

MRO Supplier – Stands for Maintenance, Repair and Operations. MRO Suppliers provide items and/or equipment that are necessary to produce Littelfuse products. Examples include cleaning supplies, paper towels, machine oil, small tools, repair parts, etc.

Distribution Supplier – Any supplier that buys products from many manufacturers, stores the products, and then resells it to Littelfuse for production. 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 that have no direct interaction with the manufacture of Littelfuse products. Examples include outside testing laboratories, gage calibration services, major vehicle/equipment maintenance services, etc.

Transportation and delivery suppliers are qualified and managed by the Global Logistics Department.

Note: In cases where a requirement is “Maybe” depends on how that product interacts with the customer. For example, Indirect materials suppliers and Distributors may require a risk assessment if they are considered Critical.

Supplier Terms and Conditions

All goods and services procured by Littelfuse, Inc. shall be in accordance with the Littelfuse Supplier Terms and Conditions unless otherwise stated in writing. The Terms and Conditions will be available on the Littelfuse.com website. Where the Terms and Conditions are the document that covers all suppliers in general, the Cover Addendum (see Appendix A) will spell out all specific requirements for each part that a supplier will provide. Littelfuse supplier will be expected to adhere to all of the requirements as specified. If there are any questions about the Terms and Conditions document, please speak with your assigned Strategic Buyer.

Quality System Requirements

A current and recognized quality system is essential to start doing business with Littelfuse. In addition to being an overall good business practice, it also is a requirement of many of Littelfuse's customers. Documentation is a key element in providing all necessary proof that a supplier's quality system is being followed and that materials provided are within Littelfuse drawing specifications.

QUALITY PROGRAM

Suppliers providing direct and indirect materials to the non Automotive Business Units are required to maintain a minimum a current of ISO 9000 certification. A copy of this certificate must be given to the regional Supplier Development Engineer upon initial receipt and upon each expiration date. The UL requirements are established on the drawing as needed.

Suppliers providing direct and indirect materials to the Automotive Business Units are required to have a current ISO/TS16949 certification, or an ISO 9000 certification with the intent of achieving ISO/TS16949 certification within a 1-year period of starting business with Littelfuse. Those suppliers without either requirement will face the possibility of losing any automotive business to a supplier that does have these qualifications.

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 given to the regional Supplier Development Engineer.

MANAGEMENT RESPONSIBILITY

The Supplier's executive management will 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 they apply. 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.

ORGANIZATION

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

QUALITY POLICIES, PROCEDURES, AND WORK INSTRUCTIONS

The Supplier shall establish and maintain a documented quality program as a means of ensuring 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.

PRODUCT PROCESS CONTROL PACKAGE (Non- ASBU)

The Supplier shall submit a Product Process Control Package (see appendix B) to Littelfuse that describes the overall quality program used for the design, manufacture, test, and inspection of product delivered to Littelfuse. The Plan shall, at a minimum, describe the following: *first article requirement, process control techniques (statistical techniques will be used such as SPC, CP/CPK, etc.), manufacturing processes, PFMEA analysis, control plan identifications and package example identifications.*

INTERNAL AUDIT PROGRAM

The Supplier shall implement an effective internal audit program that provides for the following: gap analysis, process audits and system audits. Only qualified auditors will conduct audits and will be independent from the area being audited.

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 Regional Supplier Development Engineer to review upon request.

Environmental, Health, and Safety (EHS) Regulations

Compliance with the Littelfuse Supplier Environmental, Health and Safety Specification (see Appendix C) and all government and local regulations regarding environmental controls is mandatory for all Littelfuse suppliers. The EHS Policy is based on all Littelfuse customer requirements regarding substances of concern. Although this document covers most requirements in general, the parts that you provide might have special requirements that are above and beyond those listed in the EHS Policy. Please refer to the Supplier Terms and Conditions and your Cover Addendum documents for any special requirements. In general, Littelfuse is focusing on the reduction and elimination of:

- Lead
- Cadmium
- Specific forms of Chromium (Hexavalent Cr)
- Mercury
- Specific Brominated Flame retardants
- Perfluorinated chemicals (PFOS and PFOA)
- Substances in the current candidate list of the REACH Substances of Very High Concern

IMDS submissions (International Material Data System) are required of all Automotive SBU suppliers for every part they provide to the ASBU. 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 should be directed to account #2426.

IPC Declarations are required from all direct and indirect raw materials and finished goods suppliers to Littelfuse. Maintenance, Repair, and Operations items are generally excluded from this requirement, although there are exceptions. Your Cover Addendum document will highlight any MRO purchased items that will be subject to the IPC Declarations requirement. 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). This document must be resubmitted if there is any change to the raw material components or a change in supplier.

ICP Testing (Inductively Coupled Plasma Spectrometry) might also be a requirement highlighted on your Cover Addendum. Suppliers will be required to send their own materials out to an independent lab for testing and submit the results to Littelfuse, this test is required to be done every year to verify the consistence of RoHS compliance. Suppliers would bear the testing cost. Results of these tests are submitted to our customers upon request to prove compliance to customer substance of concern requirements. If a product is found to have any substances of concern over acceptable limits as defined in the EHS Policy, or found to have a significant change in characteristics to indicate a change in raw materials without prior notification, a corrective action will be requested. Note: XRF (X-Ray Fluorescence) testing is not an acceptable substitute for ICP Testing.

Material Safety Data Sheets (MSDS) 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 MSDS. All MSDS documents must be submitted to Littelfuse initially and anytime there is a change.

Littelfuse takes the safety of its workers and those of its suppliers very seriously. All suppliers must follow all applicable laws and regulations regarding worker safety.

EICC Compliance

Littelfuse expects our product material suppliers to act as responsible corporate citizens and take a positive, proactive stance regarding social and environmental issues. Suppliers are **REQUIRED** to provide a policy of continuous improvement and acknowledgement of EICC compliance to us. Littelfuse will provide self-assessment questionnaire or training material upon supplier's request. The Electronic Industry Code of Conduct 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 of 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
- Management System
- Ethic

For more information about adopting the EICC or becoming a member of the Electronic Industry Citizenship Coalition visit the web site: <http://www.eicc.info>

Conflict Minerals Requirements

Based on the U.S. Securities and Exchange Commission (SEC) final rule on Conflict Minerals, US Federal Law section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, the rule requires

publicly-traded companies to disclose annually whether tin, tantalum, tungsten or gold in their products originated in the Democratic Republic of the Congo (DRC) or adjoining countries.

We require our suppliers commit to a socially responsible supply chain that supports the humanitarian goal of ending the violent conflict in the DRC. In order to create a transparent supply chain, we are collecting and disclosing sourcing information related to conflict minerals via EICC-GeSI Conflict Minerals Report. It is imperative that our suppliers need provide the required smelter information. In case it is not available, it is expected to contact sub suppliers, or trickle down to their sub-tier suppliers, to obtain what is needed.

Littelfuse Risk Assessment Process

Littelfuse uses a documented Risk Assessment process to evaluate suppliers on a regular basis. The Risk Assessment is an onsite visit of your facility that assesses:

- Management Philosophy
- Manufacturing Process Audit
- New Product/Process Development
- Supplier Quality
- Logistics
- Continuous Improvement
- Cost Analysis
- Environmental Systems
- Ethics
- Company Security

Littelfuse risk assessment criteria are based off of the ISO/TS 16949 standard, but the risk assessment also includes other sections not covered in that standard. It should be emphasized to suppliers that although it is based off of the TS standard, this is not a TS audit. This is a Littelfuse risk assessment, and the auditors assign findings based on the risk to Littelfuse, not strictly to TS guidelines.

A formal risk assessment report will be provided to suppliers within 2 weeks by Littelfuse Lead Auditor. Littelfuse will consider if a “corrective action verification” visit if necessary.

The outcome of the Risk Assessment is discussed with the regional Purchasing Manager, and the supplier's status on the Littelfuse Approved Supplier List is decided. Supplier status is one of the following:

Approved – Supplier successfully meets the requirements of the risk assessment and is approved for all purchasing activities

Conditionally Approved – The Risk Assessment has identified issues that must be corrected. For new suppliers who got assessment result as “Conditional Approval”, no business is allowed with those suppliers until a follow up audit is performed and their corrective actions are verified as effective and assessment result meeting “Approved”. For existing suppliers who got assessment result as “Conditional Approval”, follow up audit will be arranged or conditional approved supplier is proved to supply consistent quality products to Littelfuse. If the follow up audit result is still as “Conditional Approval”, the Purchasing team shall hold all new business opportunities. No RFQ (Request for Quotation) activity with this supplier until the next assessment result meets “Approved”. Suppliers on Conditional Approval will be reviewed in 6 months.

Not Approval – For new supplier, the supplier is not approved to do business with Littelfuse. For existing suppliers who got assessment result as “Not Approval”, the Purchasing team shall hold all new business opportunities. No RFQ activity with this supplier until the follow up assessment result meets “Approved”. If the follow up audit result is still as “Not Approval”, the Purchasing team shall plan for de-sourcing and stop

purchasing from this supplier, or state the reasons for keeping using this supplier. It is possible for a supplier to become approved again once they have been disqualified, but it will take another Risk Assessment and it will require proof that any problems have been addressed and are effective.

Upon successful completion of the risk assessment, approved suppliers are added to the Littelfuse Approved Supplier List.

Qualified existing suppliers that the Global Purchasing Team identifies as having potential to advance to a partner or alliance relationship may also undergo one or more Periodically Product and/or Process audits to ensure that their quality practices are aligned with our global supply base strategy.

Supplier On-site Evaluation Template (see Appendix D)

Littelfuse Self-Survey Form

Prior to doing an On-Site Risk Assessment of a supplier, we send a Supplier Self-Survey. This survey gives us some basic information about the supplier and their capabilities, and allows Littelfuse auditors some familiarization with the supplier before visiting. The last section of the survey has to do with Company Security, which is part of a requirement by U.S. Customs to maintain Littelfuse's C-TPAT (Customs-Trade Partnership Against Terrorism) certification. To maintain our certification and our ability to ship product across the border quickly and efficiently, we must ask every supplier about what security measures they have taken in their own facilities. The answers given in this survey are used in the Risk Assessment; 11 random "Yes" responses on the survey are chosen to be verified during the On-Site Risk Assessment. The Self-Survey must be returned within 5 days of the Risk Assessment to allow us time to review the responses and choose the questions Littelfuse auditors will verify.

Supplier Self Survey Template (see Appendix E)

Advanced Product Quality Planning (APQP)

Suppliers are required to generate an Advanced Product Quality Plan in accordance with the AIAG APQP reference manual for every new Littelfuse automotive part. At a minimum the plan should include the five phases and listed contents below:

Plan and Define Program Phase

Kick-off Meeting

Technical Review

Risk and Feasibility Assessment

Program Review

Product Design and Development Phase

DFMEA

Design Review

Process Design and Development Phase

Gage Review

Process Flow

PFMEA

Control Plan

Prototype

Program Review

Product and Process Validation Phase

Proactive Containment

PPAP

Run-at-rate study

Program final review

Feedback, Assessment and Corrective Action Phase

Lessons Learned

Early Production Containment completed

Open Issues closed

Suppliers for Littelfuse automotive parts are required to develop a project management timeline. Littelfuse Strategic Buyers and regional Supplier Development Engineers will review the project schedule as necessary or at requested intervals.

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 product to 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 of our suppliers.

The supplier shall use level 3 as the default for all submissions unless otherwise specified by Littelfuse. Production part approval records, regardless of the submission level, shall be maintained for the length of time the part is active plus one calendar year.

<u>Requirement</u>	Submission Level				
	<u>Level 1</u>	<u>Level 2</u>	<u>Level 3</u>	<u>Level 4</u>	<u>Level 5</u>
1. Design Record	R	S	S	*	R
- for proprietary components/details	R	R	R	*	R
- for all other components/details	R	S	S	*	R
2. Engineering Change Documents, if any	R	S	S	*	R
3. Customer Engineering approval, if required	R	R	S	*	R
4. Design FMEA	R	R	S	*	R
5. Process Flow Diagrams	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), if applicable	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 With Customer-Specific Requirements	R	R	S	*	R
18. Part Submission Warrant (PSW)	S	S	S	S	R
Bulk Material Checklist (see 4.1 above)	S	S	S	S	R

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.

Figure 1 - PPAP Submission Levels from PPAP 4th Ed. by AIAG

The PSW is reviewed by the Supplier Development Engineer or other Quality Department personnel and disposition is given, as follows:

- **Approval:** Indicates the part meets all specifications and requirements, and the supplier is authorized to ship production quantities.
- **Interim Approval:** Permits shipment of material for production requirements on a limited time or piece quantity basis, when supplier has clearly defined the root cause of the non-conformities preventing production approval and has prepared an interim approval action plan agreed upon by Littelfuse. For those parts with disposition “Interim Approval”, supplier should issue another PSW once the non-conformities have been corrected

- **Rejected:** Prevents production quantities from being shipped because the submission, the production lot from which it was taken and the accompanying documentation do not meet customer requirements.

If there is no signed PSW, there is no approval from Littelfuse and parts cannot be shipped.

In addition, automotive OEM suppliers are required to provide an annual update to their PPAP, regardless of whether changes have occurred.

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

Quality Management Plan (QMP)

Littelfuse uses Quality Management Plan (see Appendix G) to guide supplier to continuously understand, anticipate, meet, and exceed the Littelfuse quality requirements, it also serves supplier to define, measure, monitor, and tailor the 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, function, performance or subsequent processing of product.

In accordance with the requirements of ISO/TS 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 also identify Special Characteristics, as appropriate.

Littelfuse expects suppliers to improve quality by systematically reducing variation of the special characteristics. Control plans document relevant information about the process followed to address sources of variation until a key characteristic is in statistical control and capable of meeting engineering specifications.

Key characteristics are typically identified by Littelfuse, and are noted on the design drawings. For each of the key characteristics, the supplier identifies: where in the process the characteristic is measured, control charts used, sample size and frequency of collection, maintenance of control charts and initial C_{pk}

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.

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 programs, gage R&R studies, defect analysis and continual 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.

Approved Supplier List

There are 3 possible status outcomes for suppliers: Approved, Conditionally Approved and Disqualified. Only suppliers with Approved can be on the Approved Supplier List. The regional SDE and Strategic Buyers will meet minimally on a semi-annually to review the performance of Conditionally Approved suppliers whose status is ready to change.

Any supplier who Littelfuse has been doing business with before January 1st, 2003 and have not had a risk assessment since that date are considered to be Approved, but should be scheduled for a risk assessment by Littelfuse when practical.

Notification of Changes

Any change to the product FORM, FIT, MATERIAL or COMPONENT, FUNCTION, LOCATION, PRODUCTION PROCESS or SUB SUPPLIER must be approved in advance by Littelfuse. Any of these type changes to previously approved parts or materials cannot be made without prior approval. This approval will be given upon review of the change documents (PCN) submitted to Littelfuse (explanation of the change, product validation and dimensional documentation). Littelfuse requires 90 days advanced notice of changes. In some cases, Littelfuse plants will decide if they need sample parts to test to confirm there is no impact to our process. If that is required, Littelfuse will coordinate with supplier teams to accomplish that in a mutually satisfactory manner. In the case of materials change updated ICP data and IPC declarations may be required. To request approval, the supplier must email or fax with Supplier Product Process Change Notice Form (see Appendix H) to regional Supplier Development Engineer or Strategic Buyer.

Performance Measurement – Supplier Scorecard

The Supplier performance is measured based on four (4) categories: On-time Delivery (delivery based on goods receipt), Quality incidents (Justified issues in supplier caWeb), Defective Parts Per Million (Littelfuse production and customer rejects), and Responsiveness (corrective action response time). For an explanation of the scoring calculations, see the Figure below.

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

Suppliers who have an overall rating of B are considered marginal. These suppliers will have to be monitored to make sure the B rating doesn't stay the same or get worse. Suppliers who have an overall rating of C may be considered unacceptable. If a plan for improvement is not formalized to improve the overall rating, Littelfuse may elect to shift business to other suppliers.

On-time Delivery is calculated through an import into a Supplier Scorecard database from SAP data. Quality incidents, DPPM, and Responsiveness, are imported into the Supplier Scorecard database from Supplier caWeb data.

All Littelfuse suppliers will be expected to follow the same performance criteria. All vendor scorecards for each month in the current calendar year will be emailed or communicated via internet to the supplier's management.

Scorecard Rating Method

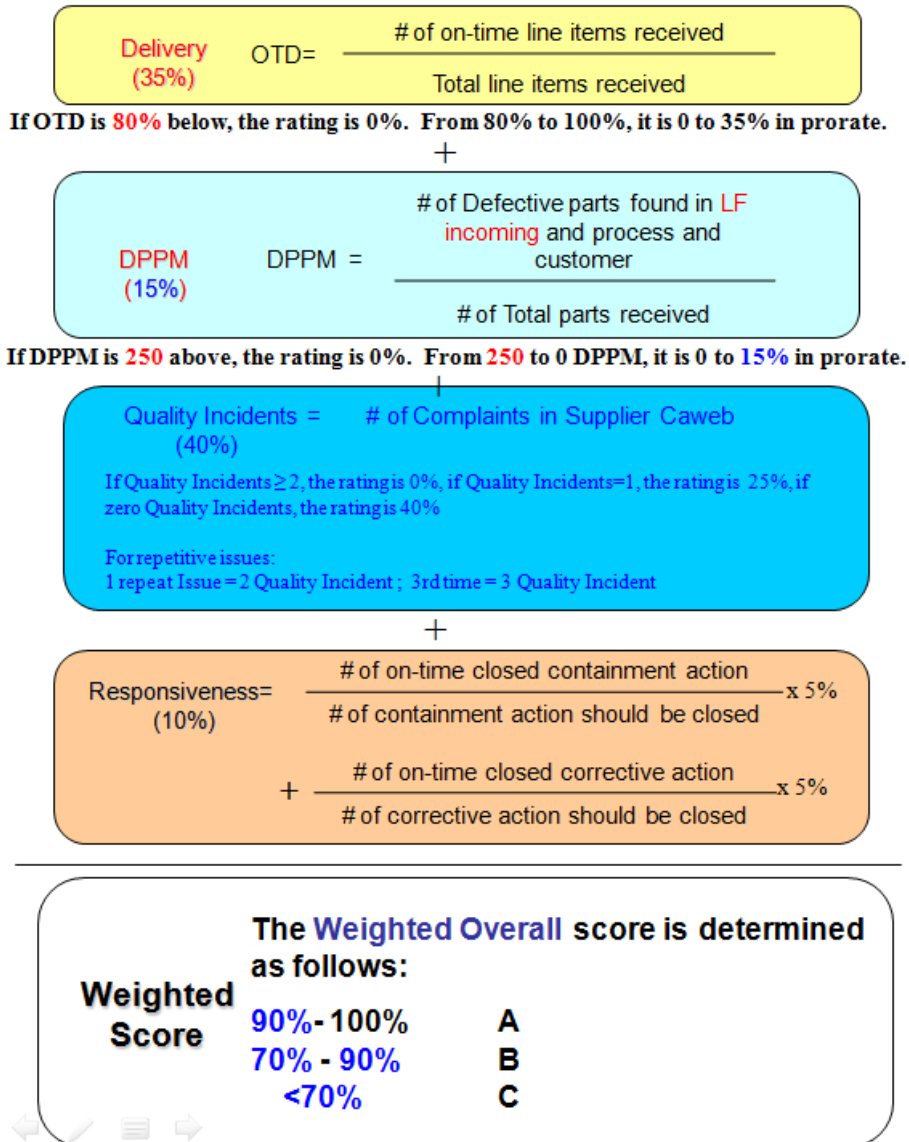


Figure 2 - Supplier Scorecard Criteria

Disaster Recovery Plan

Littelfuse requires our suppliers to prepare contingency plans (e.g. utility interruptions, fire, flood, storm damage, temporary or limited data loss, chemical spills, air/water contamination, earthquakes, tornados, hurricanes, storm surges, complete data loss) to reasonably protect Littelfuse's supply of product in the event that a supplier's facility cannot continue to operate. Please refer to the Terms and Conditions document for further guidance regarding Force Majeure or acts of God. Plans should be reviewed on a frequent basis to ensure that the contingencies listed are still valid. Disaster Recovery Plans should not be confused with internal Health and Safety plans.

Control of Nonconforming Product

The Supplier's quality program shall have an effective system for controlling nonconforming product. The system shall provide for the identification, documentation, evaluation, segregation, and timely disposition of nonconforming products. The Supplier's system shall include controls for product returned from Littelfuse.

Review and Disposition of Nonconforming Products

The nonconforming products will be including the following dispositions:

- Use as is: no actions taken on product, product does not meet specified requirements, but is functional
- Rework or sorting: product reworked or additional product test/inspection to meet specified requirements. Supplier shall assign capable rework or sorting person to Littelfuse to do rework and sorting or Littelfuse assigns at supplier's cost.
- Reject or replace: product returned or replaced with new lot by supplier to meet specified requirements. Supplier shall assign RMA(Return Material Authorization) for this particular rejection or replacement within 24 hours.

In the event the non-conforming part or material results in costs to Littelfuse (costs may include charges related to sort, rework, repair, scrap, production downtime, customer charges, products recall and shipping costs), Littelfuse reserves the right to charge the supplier costs associated with the non-conformance.

Supplier Corrective Actions – Supplier CaWeb

Supplier caWeb is the Littelfuse Global Supply Chain's on-line Corrective and Preventative Action System. This system provides our global supply base with easy access to their concerns in real time and the ability to quickly respond and communicate containment actions with Littelfuse. It provides a structured and methodical approach to document permanent corrective actions by suppliers. It also provides a history in case the supplier's solution was not effective and needs to be reviewed. Every supplier has access to the system as long as supplier requests from regional Supplier Development Engineer.

The Supplier caWeb system is used any time a supplier quality 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 of our plants around the world and uses the 8D format for problem management. Suppliers are responsible for managing their own responses and entering them into caWeb by the due date.

The respective reaction time period as defined in the table below ("Time table") shall begin with the initial notification to the Supplier by Littelfuse that a problem exists. The instance level shall be set to "priority" in case of potential Littelfuse or Littelfuse customer line stop, reliability risk, components in safety applications and customer recall. Upon request the Supplier shall provide top management support in the 8D team as part of an adequate escalation process.

Provide 8D report up to 4D - with Potential Root Cause indicated and be supported with investigation action plan. If defective sample is needed for potential cause verification [e.g.: electrical / function failure], while waiting for sample arrival, the team to provide comprehensive containment action plan, ensuring the interim production is being protected and able to screen out the defect.

Final Report submission - Root cause analysis completed, supported with Corrective Action Plan and Preventive Action Plan

At times, Littelfuse may have tighter or more stringent requirement on response time for specific critical issue, and we need suppliers to comply with such requirements.

Time Table:

8D disciplines	Priority	Standard
D1: Establish Team D2: Problem Description D3: Interim Containment Actions	Released within 24h	Released within 5 calendar days
D4: Identify root cause(s)	Released within 3 calendar days	
D5: Identify the permanent corrective action D6: Validate the corrective action D7: Prevention of Repetition D8: Congratulate the Team	Released within 10 calendar days	Released within 15 calendar days

Supplier caWeb 4 Instructions (see Appendix I)

Supplier caWeb Address – <http://caweb4.hqinet.com/LFSupplyBase>

Escalation Process

For suppliers with chronic or repetitive quality issues, Littelfuse reserve the right to impose additional containment measures (at supplier expense) to ensure conforming product is received at Littelfuse plants.

CS1 (Controlled Shipment Level 1):

The supplier is required to perform a 100% certification of all products prior to shipment through an additional, off-line inspection process. This measure would be in addition to any existing controls and containment measures previously implemented. This level is imposed on suppliers who have failed to contain or correct quality issues effectively, and immediately.

CS2 (Controlled Shipment Level 2):

The supplier is required to subcontract a third party product certification contractor to independently 100% certify all products prior to shipment to Littelfuse. This level is imposed on suppliers who fail to contain or correct quality issues through the Level 1 Containment program.

Suppliers required to implement either Level 1 or 2 Containment will be notified by Littelfuse Strategic Buyer or Supplier Development Engineer. These additional containment measures are intended to be interim steps to ensure conforming product is shipped to Littelfuse. Permanent actions to prevent recurrence are expected to be implemented in conjunction with these containment programs. Once permanent actions are implemented and verified effective for 30 days, containment may cease with the approval of Littelfuse Strategic Buyer or Supplier Development Engineer. Each container of certified material must be clearly identified with a listing of all conditions for which the material has been certified.

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 attach for each shipment to Littelfuse or keep in supplier's quality document system for audit upon Littelfuse's request. Suppliers can use own form for CoC or contact respective Supplier Development Engineer for Littelfuse's form.

Sub-supplier Control

Supplier may not engage any sub-supplier without the prior written authorization of Littelfuse. Suppliers are required to monitor their sub-suppliers performance and to assure the quality of purchased parts and the management system of their sub-suppliers. Suppliers are responsible for providing disposition of defective parts due to their sub-suppliers poor control. This is including consigned supplier like plating supplier unless the supplier is billed by Littelfuse.

Suppliers are also recommended to perform their sub-suppliers quality management system development with the goal of the continuous improvement. Conformity with ISO9001:2000 and the RoHS Directive is the first step in achieving this goal. For Automotive suppliers, it is expected that suppliers will try to get their sub-suppliers in compliance with or certified to the ISO/TS16949 standard.

Continuous Improvement

Continuous improvement is fundamental to our business. At a minimum we require that our suppliers manage their quality systems to the same ISO/TS16949 or ISO 9000 standards that guide Littelfuse's quality efforts, and to demonstrate continuous improvement in areas that benefit the customer with regards to quality, price and service.

The supplier shall continually improve quality, delivery, cost and other services provided. To aid in fulfillment of this requirement the supplier's organization shall establish, monitor, prioritize, and act upon key performance objectives and targets. The objectives and targets should be established based upon (at a minimum) business plans, management systems, product quality, process capability, and customer satisfaction goals. Actions taken to regain previously sustained levels of performance are corrective actions, not continuous improvement.

Littelfuse may visit any supplier site to assess its continuous improvement programs and lean manufacturing practices, and make recommendations for improvement. In addition, Littelfuse may deploy personnel to focus on specific improvement issues. Littelfuse will also select key suppliers for development who present the big opportunity for improvement and who present the great potential impact to the organization. Once a supplier has been selected, a cross-functional team consisting of Littelfuse and supplier will be formed to work together to ensure that certain targets are achieved. Littelfuse may choose to provide training to suppliers on quality tools skills, 6 sigma or Lean production for process improvement.

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)

Identification and Traceability

The aim of traceability shall be to minimize the impact and consequences of quality concerns. The Suppliers shall maintain an appropriate traceability system.

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. The supplier lot traceability system must provide for the following situations:

- Permit isolation of suspect product on a precise basis based upon lot number on each container.
- Barcode identification of supplier lot number on each container. This lot number must be the key to all traceability in the supplier's system.
- Localize causes of failure and take corrective action at minimal cost to supplier and Littelfuse.
- Determine traceability to component lot numbers and production / quality data specific to the lot number identified on the container (backward traceability).
- Determine supplier finished product lot number(s) produced with a given lot of components or on a given shift of production (forward traceability).
- Each lot of die colorant for plastics

Packaging and Labeling

Suppliers must comply with all import/export and customs regulations for their home countries. The Supplier shall ensure provide for secure storage areas or stock rooms to prevent damage or deterioration of product prior to consumption and/or delivery to Littelfuse. The Supplier shall implement a First In First Out (FIFO) system for disbursement of product from storage. The Supplier shall ensure all parts/products are packed, marked and preserved as defined in specifications. Parts/products shall be packaged to prevent damage and/or deterioration while facilitating usage requirements on the Littelfuse plants and during shipping. Littelfuse requires the Supplier to be responsible for product delivery quality until point of issue to Littelfuse plants or distribution center.

Littelfuse standardizes the label format and requirement for all purchased materials to eliminate data entry errors, ensure accurate use of logos, and maintain lot traceability. The Supplier shall comply with the labeling requirement for inner and outer pack which is defined in Littelfuse Bar Code Labeling Spec. (see Appendix J)

Appendices

- Appendix A – Supplier Terms and Conditions Cover Addendum
- Appendix B – Product Process Control Package
- Appendix C – Supplier Environmental, Health and Safety Specification
- Appendix D – Supplier On-site Evaluation Template
- Appendix E – Supplier Self Survey Template
- Appendix F – Supplier Production Part Approval Process (PPAP) Manual
- Appendix G – Supplier Quality Management Plan Template
- Appendix H – Supplier Product Process Change Notice Form
- Appendix I – Supplier caWeb 4 Instructions
- Appendix J – Littelfuse Bar Code Labeling Specs

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	Oct.30, 2014