

# Supplier Quality Manual

## INTRODUCTION

### Welcome to LG Chem Power, Inc..

LG Chem Power, Inc. (LGCPI) is bringing the power of Lithium-Ion Polymer Battery Technology to North America for Hybrid Electric Vehicle (HEV), Plug-In Electric (PHEV), and Electric Vehicle (EV) applications in the automotive, commercial, and military markets. LGCPI is leveraging its engineering talent, solid financial resources, and cutting edge technology to become the supplier of choice for advanced energy storage systems. LGCPI's solutions are safe, high-power/high-energy, compact, and lightweight.

### Introduction to Manual

In today's manufacturing environment, product that is found to be non-conforming at receiving, or during production, causes serious disruptions of the production and shipping schedules, resulting in high production costs. LGCPI expects that our suppliers will control the quality of material shipped to LGCPI, so LGCPI does not need to inspect the product when it is received. This manual's intent is to communicate LGCPI's expectations and requirements for its suppliers in order to ensure LGCPI receives quality product on time.

### Policy Statement

LG Chem Power Inc is committed to improving the environment and meeting the expectations of its customers, employees, and other stakeholders by adhering to and continually improving the LGCPI management system, processes and objectives for safety, quality, delivery, cost, morale and environment.

This will be achieved by:

- Compliance with applicable safety, customer, environmental, legal and other requirements;
- A commitment to prevention of injury and ill health;
- The safety, development , involvement and growth of our employees;
- Pursuit of pollution prevention and waste reduction in both our operations and products;
- Focused project management throughout the product lifecycle;
- Efficient and effective interdepartmental, supplier, and customer communication;
- Reuse of engineering designs along with the integration of lessons learned

***Supplying Tomorrow's Energy Storage Solutions Today***

**Rev 5**

## Table of Contents

Quality Management System .....	3
Supplier Qualification Process .....	3
Supplier Monitoring and Status .....	3
Supplier Kickoff Meeting .....	3
APQP Workbook .....	3
High Impact Suppliers .....	4
Part Qualification .....	4
International Material Data System – IMDS .....	5
Engineering Changes .....	5
Annual Dimensional Inspection .....	5
CQI-9 Special Process: Heat Treat System Assessment (AIAG) .....	5
Process Control .....	6
Customer Owned Tooling .....	6
Workmanship .....	6
Safety .....	6
Electrostatic Discharge (ESD) Controls .....	6
Wire Harness Requirements .....	6
Electronic Assembly Requirements .....	6
Packaging & Labeling .....	7
Traceability .....	7
Math Data/Drawing and Change Control .....	8
Process Changes, Engineering Changes .....	8
Supplier Deviation Request .....	8
Supplier Corrective Action Request .....	9
Delivery Requirements .....	10
Contingency Plan .....	10
Responsiveness .....	10
Cost Recovery .....	10
Supplier Monitoring .....	10
Review/Updating of the Supplier Quality Manual .....	11
Reference Documents .....	11

## **Quality Management System**

Unless otherwise permitted by LGCPI or our customers, each production supplier is required to be third party registered to ISO 9001 and/or TS 16949 by an accredited third-party certification body. In addition, the supplier must meet all other requirements of this manual. LGCPI can, for certain suppliers, waive this requirement by Purchasing in co-ordination with Quality.

## **Supplier Qualification Process**

All suppliers of production materials to LGCPI must be qualified suppliers. The qualification process generally includes an onsite visit where the completion of the LGCPI Supplier assessment (FN80-0004) is conducted, or alternatively the supplier performs a self evaluation utilizing the LGCPI Supplier assessment form (FN80-0004). The criteria used to evaluate the supplier are:

- Management Culture
- Manufacturing
- Engineering
- Quality
- Delivery
- Financial

## **Supplier Monitoring and Status**

LGCPI will monitor supplier's performance based on quality, delivery, and responsiveness. Any quality issues will be communicated to suppliers via the Supplier Corrective Action Request (SCAR) process. If there are concerns related to the number of SCARs being assigned to a supplier, late deliveries, repeat issues, or lack of responsiveness the supplier will be contacted by LGCPI Purchasing and/or Quality for further actions. These can include onsite meetings with supplier's management, formal response from supplier's management, and/or increased audits/visits. If the issues cannot be resolved to LGCPI's satisfaction the supplier may be placed on New Business Hold.

## **Supplier Kickoff Meeting**

Prior to kicking off any new tooling or parts or within one week of LGCPI's issuance of a purchase order, a Supplier Kickoff Meeting will be held. Attendees from LGCPI may include Purchasing, Engineering, Manufacturing, and Quality representatives. Supplier representatives, which include Engineering and Quality; and having authority to sign off on the requirements, will need to be in attendance. At times LGCPI's customer will also be in attendance in these meetings. A Supplier Kick Off Form (FN80-0002) will be provided and reviewed. This form will detail requirements specific to the part(s) in question including material requirements/specifications, finish requirement/specifications, key characteristics, high impact supplier status, and any additional requirements above and beyond the LGCPI Supplier Quality Manual. If all attendees agree to the requirements the Supplier Kick Off Form will be signed.

## **APQP Workbook**

Production suppliers are expected to update and submit the LGCPI APQP Workbook (QA80 - 0014) on a regular basis or as defined by the LGCPI Quality.

## High Impact Suppliers

Some of LGCPI's suppliers will be deemed High Impact Suppliers. There will be additional requirements for suppliers identified as such. A supplier's status will generally be indicated on the Supplier Tool Kickoff Form although other forms of communication might be utilized (i.e. email from purchasing). High impact supplier expectations include the following:

- High impact suppliers are to create a PFMEA during prototype stages (although we strongly recommend that all suppliers follow this best practice).
- High impact suppliers are to submit the APQP Workbook at an increased cadence (every two weeks or as communicated per the LGCPI Quality)
- All high impact suppliers are expected to be able to support onsite launch at LGCPI for each phase of the program (prototype and production) if requested.
- There will also likely be increased visits to the supplier's facility. The expectations will be communicated to suppliers based on current program/supplier status.
- LGCPI might conduct visits to a High Impact Supplier's Tier 3 supply base.
- Level 5 PPAP (onsite) is the expectation.

## Part Qualification

### ***Samples/Development Parts:***

There may be times when LGCPI orders/requests parts for sample or development purposes. In these cases part qualification is not necessary unless otherwise communicated to the supplier by LGCPI. For samples that are shipped to LGCPI instead of being directly provided to the requestor, the cartons must be labeled as "Samples" on at least two sides of the container as well as noting "Attn:XXX" information.

### ***Preproduction:***

The following documentation must be provided to the assigned LGCPI Quality:

1. Dimensional Inspection:
  - A minimum of (5) samples are to have full dimensional inspections provided either prior to or with the initial shipment (Attn: LGCPI Quality). However, if there are any dimensional discrepancies, dimensional data must be submitted to LGCPI Quality for review and approval with deviation **prior to shipment of parts**.
  - Any additional dimensional inspection requirements will be dictated in the RFQ or during the Supplier Kickoff Meeting.
  - Dimensional reports must include either a ballooned drawing or map of the part that is linked to the dimensional results on the report.
2. Material certification(s)
3. Any additional requirements as defined by LGCPI.

A Preproduction Process Flow and Control Plan may be required and made available at LGCPI's request. If a supplier is identified as a High Impact Supplier by LGCPI a PFMEA will also be required during prototype.

All pre-production parts are to be serialized (reference traceability section). The serialization identification should not interfere with the fit/function of the part.

### ***Production:***

For any production parts that are to be supplied to LGCPI, a Level 3 PPAP submission per the AIAG PPAP 4<sup>th</sup> Edition Manual is to be submitted by the agreed to PPAP date. The paperwork portion of the submission should be provided to the assigned LGCPI Quality.

Unless otherwise instructed, 300 PPAP part samples will be required. Boxes must be identified with "PPAP SAMPLES" on at least two sides.

Upon receipt of the PPAP package, LGCPI will evaluate the submission to determine if approval can be granted. The status for PPAP submissions are defined as below:

Full Production Approval Status: Supplier has been granted full production approval and can begin shipping parts to LGCPI.

Interim Production Approval Status: Supplier *may* be granted an interim approval in certain instances. Prior to granting an interim approval LGCPI requires a corrective active plan for achieving fully approved status. A supplier can ship to LGCPI with an interim approval status.

Rejected Production Approval Status: Supplier submissions may be rejected if parts do not meet all design requirements and no corrective action plan is included with the submission. A supplier may not ship to LGCPI a part that has Rejected status without a deviation from LGCPI.

## **International Material Data System – IMDS**

The International Material Data System (IMDS) is a database created by the automobile industry to collect and report material composition data for components in a finished vehicle. IMDS enables vehicle manufacturers to meet national and international standards and laws, most notably the European End of Life Vehicles Directive.

IMDS collects material data via the internet on Material Data Sheets (MDSs). LGCPI requires suppliers of **production parts** (this includes all Tier level component parts) to submit IMDS data by the PPAP submission date (with IMDS information noted on the Submission Warrant). PPAP submissions will not be approved until IMDS data is received and accepted by LGCPI Quality. LGCPI's IMDS Company ID is 83999.

If a supplier is not familiar with this requirement, it is imperative that the supplier access the IMDS website at [www.mdssystem.com](http://www.mdssystem.com) to learn more about the system, access help files, and to obtain information regarding training in using the system.

## **Engineering Changes**

LGCPI Purchasing is the only department within LGCPI than can kick off a supplier on engineering changes. Any changes will demand that a supplier resubmit part qualification documentation (prototype submission or PPAP). However, during the prototype stages it is possible to request a documented deviation to this requirement for certain minor changes.

## **Annual Dimensional Inspection**

Some customers require that LGCPI conduct annual dimensional verifications. Additionally, at times LGCPI might require annual dimensional verification for certain high risk components. If this is required of a supplier for a particular program it will be communicated to the supplier through the RFQ process or through the Supplier Tool Kickoff form.

## **CQI-9 Special Process: Heat Treat System Assessment (AIAG)**

All LGCPI suppliers who provide Heat Treated components to LGCPI are required to submit annual self assessments per the CQI-9 guidelines. Submissions are to be provided to LGCPI Quality. Please note that LGCPI's suppliers are responsible for submission of any lower Tier's self assessments.

If suppliers are not familiar with the CQI-9 document they should order this from [www.aiag.org](http://www.aiag.org).

Some of LGCPPI's customers might have their own version of this CQI-9 assessment. In those instances this will be communicated to the supplier by LGCPPI Quality.

## **Process Control**

LGCPPI suppliers are required to control the manufacturing processes in accordance with the control plan submitted during the part qualification process.

## **Customer Owned Tooling**

All customer owned tools, manufacturing, test, inspection tooling and equipment must be *permanently and visibly* identified with ownership information. Tool identification tags will be provided by the LGCPPI Buyer to the supplier. Tag to be fixed to the tool or fixture, photographs to be taken and tool log to be completed. Photos and Tool log to be submitted to the LGCPPI Buyer. Tooling may be LGCPPI customer owned and so should be identified as follows: "*Property of <LGCPPI's Customer>*".

Under no circumstances is tooling to be scrapped without written authorization from LGCPPI Purchasing.

## **Workmanship**

When workmanship standards are not referenced on LGCPPI drawings or specifications, the supplier is expected to follow industry-accepted standards (e.g. ANSI, IPC). When in doubt, consult with LGCPPI for clarification.

## **Safety**

At no time should any customer, or person at a LGCPPI facility, be exposed to hazardous material or situations that are not inherent in a component's structure. Residues, films, out-gassing products and packaging materials should comply with OSHA (Occupational Safety & Health Association) standards. For items with inherent hazards, safety notices must be clearly observable. As applicable, MSDS sheets must be provided prior to the first shipment. Forward all MSDS sheets to:

Pam Frink  
248-307-1800 x 189  
[pfrink@compactpower.com](mailto:pfrink@compactpower.com)

## **Electrostatic Discharge (ESD) Controls**

If the supplier furnishes ESD-sensitive materials, the supplier must maintain an effective ESD program that meets all requirements for the material produced.

## **Wire Harness Requirements**

All wire harness assemblies must meet the latest version of EN60-0175 and IPC-A-620 Class 3.

## **Electronic Assembly Requirements**

All electronic assemblies must meet the latest version of IPC-A-610 Class 3.

The use of conformal coating is required by LGCPI based on the PWB assembly drawing contained as part of the release package with Gerbers, drill files, silkscreens, placement files etc.

All electronic assemblies must be lead free except for those materials and components exempted per the most recent version of Annex II of the EU ELV directive (e.g. electrical components which contain lead in a glass or ceramic matrix, lead in copper, etc.). Lead free is considered to be below 0.1% lead in any homogeneous material. This includes, but is not limited to:

- a) Lead in solder used to connect the components to the circuit board.
- b) Lead in coatings on connector terminals and “pre-solder” of wires and components prior to soldering.
- c) Lead in protective coatings on the circuit boards.
- d) Lead in the components in the circuit boards.

General design guidelines for lead-free materials are as follows:

- a) Tin-Silver-Copper (SAC) alloys should be used for soldering.
- b) Finishes shall be engineered to prevent copper migration into tin material.
- c) Assembly process should be compatible with lead free components and finishes.
- d) Lead-free vehicle components shall be identified with readable markings showing the stricken through chemical symbol for lead.

## Packaging & Labeling

The supplier must provide detailed packaging information and completed LGCPI packaging form (QA80-0098) prior to the time of the RFQ response. Packaging will be designed to provide protection from any damage that may occur. For static sensitive components, ESD packaging shall be provided. Packaging, labeling, and shipping materials must comply with the requirements of common carriers to secure the least transportation costs.

All containers/packaging are to have a linear barcode label that complies with the *AIAG B-4 Part Identification and Tracking Application Standard*. The following information is to be included on the label **at a minimum**:

P/N (utilize P data identifier)

Quantity (utilize Q data identifier)

At least one of the following: Mfg Date (D identifier), Serial Number (S identifier), or Lot Number (T identifier).

NOTE: The P/N MUST include the correct revision level information (example: ASM-XXXX-**AA**).

Preliminary signoff on packaging and labeling is required at supplier kick-off. Final signoff will be prior to PPAP submission.

## Traceability

The supplier must plan for traceability of components **in both preproduction and production**. Where possible, batch sizes should be minimized to aid in containment should quality problems be found. In prototype all tooled items are to have serialization (writing on the parts with permanent marker is acceptable for prototype).

See part drawings for Traceability and labeling requirement.

2D Serialization Barcodes per *AIAG B-4 Part Identification and Tracking Application Standard* are required per the drawing call out for both prototype and production.

2D Lot Barcodes per *AIAG B-4 Part Identification and Tracking Application Standard* are required per the drawing call out for production.

Note: If only linear barcode capability is available (as opposed to 2D) this can be reviewed on a case by case basis and would be documented by a deviation.

## **Math Data/Drawing and Change Control**

The supplier must have a documented system for assuring that the latest LGCPI math data/drawings are in effect at their facility. The supplier's quality management system must contain a documented procedure that describes the method used for the receipt, review, distribution, and implementation of all changes to math data, drawings, and specifications. In addition, the procedure must address control of obsolete drawings and specifications. A documented procedure should also detail the method used to contain new or modified parts until approved by the customer.

## **Process Changes, Engineering Changes**

After either Interim or Production PPAP Approval **suppliers may not make any changes to their process, location, material, sub-suppliers, or to the part without written approval from LGCPI.**

Any changes to process, location, material, sub-suppliers, or parts must follow the LGCPI documented SREA (Supplier request for Engineering approval QA80-0090) process.

## **Supplier Deviation Request**

A supplier is never permitted to ship product that deviates from the print, specification limits, or design intent without written authorization allowing the deviation from LGCPI. If such a condition exists, the supplier must submit a deviation request to LGCPI to allow shipment of the product.

If directed by LGCPI, the supplier must send samples of non-conforming items to LGCPI for evaluation. The cost of any testing required in order to determine the acceptability of the product will be charged to the supplier. LGCPI will determine the item's acceptability and what corrective actions (if any) are required beyond the deviation. If approved, LGCPI will send a ***signed deviation approval*** to the supplier.

The deviation is only intended to be an interim action and **is not** to be construed as an engineering change. The supplier must begin work immediately on a corrective action plan and implementation for the condition in question. This must be accomplished within the time frame stated on the deviation.

In all cases, the supplier must fully contain all product suspected of being non-conforming at their facility. In addition, the supplier may be required to sort any suspect product at LGCPI or alternatively will incur the costs for any sorting completed by LGCPI or a third party.

**Any parts shipped/delivered to LGCPI under the authority of a deviation must be labeled as follows:**



All parts reworked at a supplier's facility (or at LGCPI by a supplier representative) under authority of a deviation, must be processed as follows:

- Reworked parts **MUST** be returned to LGCPI Receiving for re-introduction into inventory with a "R" designation on the part with a paint pen/marker or other visible means of identification that does not interfere with fit/form/function.
- In addition, all shipping documents **MUST** reference the deviation number and the part number with the "R" as a suffix (i.e. "ASM-xxxx-AA R")

All parts shipped under authority of a deviation that were not reworked must be processed as follows:

- Parts must be marked with a "DEV-000XXX" designation on the part with a paint pen/marker or other visible means of identification that does not interfere with fit/form/function.
- In addition, all shipping documents **MUST** reference the deviation number and the part number with the "D" as a suffix.

## **Supplier Corrective Action Request**

LGCPI or their manufacturing contract agent (MCA); issues a Supplier Corrective Action Request (SCAR) to a supplier when non-conforming parts are found at incoming inspection, in production, in test, or by a LGCPI customer. They can also be issued as a result of a supplier audit. The supplier is required to respond by returning the 8D with steps D1-D3 filled out within 24 hours. The following provides a brief outline of the SCAR procedure that suppliers to LGCPI should comply with:

- LGCPI requires that the supplier take immediate containment action upon notification of the nonconformance. The supplier must submit a written response to LGCPI or MCA, reporting the Supplier's initial observation and defining the interim containment plan within 24 hours of notification. Where applicable an RMA number must be provided at this time.
- The initial response containment plan must clearly define the containment actions at the supplier's facility to assure that no nonconforming product is shipped to LGCPI or MCA. If suspect product has already been shipped, the supplier must address all suspect stock in transit and any stock at LGCPI or MCA. The supplier will assist LGCPI or MCA in identifying customer risk by identifying all suspect lot numbers and associated quantities involved.
- A sort at LGCPI or MCA may be required if replacement stock is not available or there is an immediate need for parts. On site sorting needs will be communicated by LGCPI or MCA. If LGCPI or MCA sorts supplier product, the supplier shall be billed at \$125/hour. A supplier may contract a local sorting facility to perform the sort at LGCPI or MCA at their own cost. If a customer requires a third party sort to be conducted due to a supplier issue, the supplier will be responsible for the total cost of the third party sorting. In all cases a \$250 administrative fee may be charged at LGCPI or MCA's discretion.
- All shipments to LGCPI or MCA of the part in question **MUST** be 100% inspected and identified in some manner as "Certified" until permanent corrective action is implemented and verified.
- The supplier shall be held responsible for all costs incurred in sorting, reworking, or other corrective action steps taken due to supplier quality spills.
- Within 2 weeks after the original notification, the supplier must submit the completed SCAR, or 8D if requested. If the corrective action was not yet taken the expected implementation

date should be noted and thereafter supplier is required to keep LGCPI or MCA informed of the progress toward implementing and verifying the corrective action.

- If LGCPI experiences repeated quality disruptions with a particular part, LGCPI or MCA may require that the supplier contract with an outside source to provide Level II containment to ensure LGCPI or MCA receives defect free parts.

## **Delivery Requirements**

LGCPI expects 100% on time delivery. Suppliers that meet delivery schedules and provide high ongoing quality performance are preferred suppliers. Preferred suppliers are given first opportunity to quote for new business and are given preference for increased volumes when consolidating suppliers for multiple-source items. Suppliers delivering less than 100% on time delivery may be required to submit a corrective action plan to improve and meet the delivery requirements.

Suppliers will be responsible for all costs incurred by LGCPI as a result of late shipments. This may include LGCPI overtime costs, expediting costs, and costs incurred by LGCPI from our customers.

## **Contingency Plan**

Suppliers shall have a contingency plan to ensure that LGCPI deliveries and other requirements are met in the event of an emergency such as utility interruptions, labor shortages, key equipment failure and field returns.

## **Responsiveness**

LGCPI suppliers are expected to provide timely responses LGCPI including SCAR responses and part submissions. Suppliers that consistently fail to provide timely responses may have their status changed to New Business Hold.

## **Cost Recovery**

The supplier will be held responsible for all costs incurred as a result of nonconforming product and/or late shipments to LGCPI. These costs include, but are not limited to:

- Labor costs: total costs to sort, rework, repair, etc.
- Overtime
- Scrap costs: For parts and/or assemblies
- Premium transportation costs: inbound and outbound
- Outside services: Third party sorting
- Customer Costs: Costs incurred by LGCPI from our customers, including travel costs to customer facilities

If a supplier believes that they should not be responsible for part or all of the costs per the Vendor Debit Memo, they have 5 working days to notify the LGCPI Purchasing Manager that a review is requested.

## **Supplier Monitoring**

LGCPI continually monitors its suppliers to ensure they continue to meet LGCPI's requirements, and to ensure that the supplier continues to ship acceptable parts. This may consist of:

- A quality management system surveillance audit at the supplier's facility
- An on-site audit of the supplier's control plan
- A random incoming inspection audit of a batch of product

- Source inspection of product at the supplier's facility
- Review of supplier data
- A supplier progress review meeting conducted periodically at the supplier's site or LGCPI to review supplier performance and progress

### Review/Updating of the Supplier Quality Manual

LGCPPI will ensure that the latest version of the Supplier Quality Manual is available on LGCPPI's FTP site. The supplier is encouraged to provide feedback to LGCPPI regarding the content of the manual for the purpose of continuous improvement and to ensure an effective working document.

### Reference Documents

The following is a list of document referenced in this manual. Refer to the latest version:

AIAG B-4 Parts Identification and Tracking Application Standard

Revision History:	Revision Date:	Changes:
1	06OCT08	Initial Release
2	04FEB09	Changed product submissions to be sent to "CPI Supplier Quality" instead of to specific individuals. Revised miscellaneous language for clarity. Added Electronic Assembly Requirements.
3	02JUN10	Added table of contents; Added "latest revision" to IPC-A-610 requirements; interim corrective action required within 24 hours; added reference to conformal coating review; added deviation and rework identification on parts and paperwork; expanded on labeling requirement (removed requirement for lot or serial number by including mfg. date as an option); added note that the container labels are to include the revision level of the part; added note that packaging plan is to be submitted with the RFQ response; added specific requirements for traceability labeling by commodity; added policy statement and slogan; added reference document list; a PFMEA is required during prototype if identified as a High Impact Supplier; added requirement for Contingency Plan; added note regarding some suppliers requiring IPC-A-610Class 3. Updated supplier qualification process criteria to reflect updated Supply Chain Potential Supplier Survey/Supplier Analysis Scorecard FN80-0004. Added barcode requirements for shipping containers. Added section on Engineering Changes. Added section on APQP workbook. Added additional details requiring marking of parts that are shipped under deviation. Minor formatting/word choice updates.
4	28SEP10	Added CQI-9 requirement. Addition of High Impact Supplier requirements. Updated to new company name.
5	05JAN12	Replaced LGCMI to LGCPPI. Added MCA wherever necessary. Added form numbers for various forms associated with supplier engagement. Revised sorting costs and administrative costs. Changed advanced quality engineer to Quality engineer. Added packaging form and form number.