Life Energy Motion

LEM SUPPLIERS GENERAL REQUIREMENTS MANUAL

Life Energy Motion

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1. INTRODUCTION

1.1 Scope

This manual applies to all Suppliers - Direct and Indirect, Contractors and Vendors to LEM worldwide who may be Customer directed Suppliers, and who provide services, components, parts, assemblies, or sub-assemblies which are used to produce LEM product.

External services outside this scope remain on each contracting process owner and their management is not directed by this manual.

1.2 Expectations

All external suppliers (Direct and Indirect, Supply Chain and Tooling, Machinery & Equipment Suppliers) are expected to comply with all requirements and expectations documented in this manual.

Suppliers are responsible for reviewing new and revised LEM Requirements including Customer Requirements and determining the impact on their Quality Systems and promoting awareness of the LEM Supplier Manuel at their locations.

Each Direct and Indirect, Supply Chain and Tooling, Machinery & Equipment Supplier is expected to comply with all requirements and expectations documented in this manual.

2. GENERAL REQUIREMENTS

2.1 Corporate Social Responsibility (CSR)

The suppliers Commit to apply social responsibility complying with LEM CODE OF CONDUCT FOR BUSINESS PARTNERS CO.11.11.624.0.

2.2 Conflict minerals

Suppliers commit to align with Section 1502 of the US law H.R. 4173 (Dodd-Frank Wall Street Reform and Consumer Protection Act). Section 1502 imposes reporting requirements on manufacturers of products that contain metals derived from minerals that originate in the Democratic Republic of Congo or an adjoining country. These “conflict minerals” include tantalum, tin, gold and tungsten, or their derivatives.

To learn more, visit Web site:

http://www.responsiblemineralsinitiative.org/minerals-due-diligence/

In case of use of any metals derived from the minerals listed above, the Supplier is requested to complete the conflict minerals reporting template and return it to LEM. This template is referenced at the end of this manual or can be downloaded at:

http://www.responsiblemineralsinitiative.org/reporting-templates/cmrt/

Digitalized portal as IMDS© or equivalent might be also used (LEM code is 16011)

In other hand European regulation is also acting on same requirement, pushing LEM entire supply chain to commit to align with OECD Due Diligence Guidance within 2021, January 1st.

To learn more, visit Web site:

http://ec.europa.eu/trade/policy/in-focus/conflict-minerals-regulation/

2.3 Environmental policy

2.3.1 EHS: Environment (ISO 14001), health and safety (ISO 45001)

LEM and all companies in its supply chain must respect the environment and accept the appropriate responsibility for protecting it. Each Supplier should deploy and maintain an integrated EHS management system.

LEM requires a particular attention to environment and strongly recommends to its Suppliers to make it part of their integrated management system.

The review of environmentally relevant elements should be part of a survey/audit program.

2.3.2 European REACH regulation and RoHS

LEM Suppliers must comply with the European Union Regulation n°1907/2006 or latest in application concerning the **R**egistration, **E**valuation, **A**uthorization and Restriction of **C**hemicals and any/all amendments. This applies to Suppliers that provide substances on their own, in preparations or in articles.

Web site: *https://echa.europa.eu/regulations/reach/understanding-reach*

The Candidate list of Substances of Very High Concern for authorization (SVHC) is

regularly updated and available Web site: *https://echa.europa.eu/candidate-list-table*

The supplier must keep tracking of these updates. and shall send to LEM a new compliance commitment for all the delivered products according to this new list(twice a year).

The Supplier must prove that the concentration of the SVHC in the product delivered to LEM is under the maximum level (ppm) authorized by the REACH regulation, therefore the detailed material's composition has to be done by the Supplier and at disposal of LEM when required.

The Supplier must comply with the RoHS directive or latest in application on the **R**estriction **O**f the use of certain **H**azardous **S**ubstances in electrical and electronic equipment.

The Supplier must then anticipate and propose to LEM, as far as possible, products that already comply with the Latest RoHS requirement

Web site:
*http://ec.europa.eu/environment/waste/rohs_eee/*http://ec.europa.eu/environment/waste/rohs_eee/

2.4 Confidentiality/Intellectual Property – Non-Disclosure Agreement (NDA)

LEM has many innovative and highly technical products and processes. LEM is constantly working on new ideas, often with a Supplier as a partner. LEM expects its Suppliers to protect its intellectual property and LEM requires confidentiality for all its business relations. LEM intellectual property includes without limitation its patents, copyrights, trademarks, businesses processes, systems, manufacturing processes, technical and marketing information, and strategic planning. LEM will systematically propose the co-signature of an NDA.

3. MANAGEMENT SYSTEM REQUIREMENTS

3.1 Required management standards – Shall be done according to latest released versions

Application field	
ISO 9001	Quality Management System, for ANY ACTIVITY ➢ Mandatory, for every component supplier
IATF 16949	Quality Management System，for AUTOMOTIVE applications ➢ Mandatory for high complexity component supplier ➢ MAQMSR compliance for low complexity component supplier
ISO /TS 22163	Quality Management System, for RAILWAYS applications ➢ On request
ISO 14001	Environmental Management System ➢ Mandatory
ISO 45001	Occupational Health and Safety ➢ On request
ISO/IEC 17025 or National equivalent	General requirements for the competence of testing and calibration laboratories ➢ Mandatory accreditation for subcontracted calibration tests of current and voltage transducers ➢ The certificate of calibration, equipment under calibration and test report shall include the mark of a national accreditation body ➢ Approved second-party assessment that Laboratory meets the intent of ISO.IEC 17025 – or national equivalent – shall be performed if no prior assessment by a third-party
ISO 26262	General Functional Safety requirements to be applied to safety-related systems that include one or more electrical and/or electronic (E/E) systems and that are installed in series production road vehicles (passenger vehicle, trucks, buses, trailers, semi-trailers and motorcycles) ➢ On request

LEM will notify Suppliers about any additional management standards if needed.

3.2 Management of the Supplier's Subcontractors

1. Suppliers shall ensure that LEM and its Customers have access to the Supplier Subcontractor's facilities, working areas and records as applicable to enable verification that Subcontractors comply and when investigating concerns.

2. Suppliers shall ensure that the sub-Contractor's management system and process mastering are compliant with the standards defined in this manual (particularly in case of safety characteristics: §6.4 applies).

3. Suppliers will ask the Subcontractors to provide evidence related to the process and supply chain mastering on LEM request.

4. Suppliers will require their Subcontractors to provide all relevant certificates and the chemical composition of materials and components used to manufacture the part / product delivered to LEM. For relevant cases, the Supplier will require its Subcontractor to comply with REACH, RoHS and conflict minerals and fill in the relevant documents as described in §2.2 and §2.3 for the component, material or subassembly.

N.B.: This applies also in the case of a Subcontractor selected by LEM.

3.3 Supplier Request for Engineering Change / Supplier Part Change Notification (SPCN)

Prior to any Supplier changes being implemented, a notification for change must be submitted to LEM Purchasing representative and SQE for authorization 90 days* before the proposed first shipping date of the product.

It includes, but is not limited to, changes in manufacturing location (additions, closures, change of ownership, etc.), change of Subcontractors, change in manufacturing equipment/process, change of design, change of measurement techniques or devices, change in material.

The following is the minimum content of the SPCN:

- PCN tracking number
- Product Identification (e.g. affected Supplier part number(s), affected product lines including specific package types, product family)
- LEM part number(s)
- Detailed description of change(s)
- Method, if applicable, of identifying changed product
- Reason for change(s)
- Anticipated (positive and negative) impact on form, fit, function, quality or reliability.
- If the change impacts a critical safety characteristic: it shall be highlighted in the SPCN.
- Proposed first shipping date for change
- Supplier qualification plan schedule and/or results, where applicable
- Date when qualification samples are available
- Date when final qualification data are available
- Last date, if applicable, of manufacture of the unchanged product
- Name, address, telephone, email, and fax number of Supplier contact

Services contractors must release a SPCN in the following conditions:

- Certification / accreditation changes (e.g.: Scope and perimeter, Status, …)
- Any modification that might be considered by the organization as a risk for LEM business purpose.

As previously explained, LEM must be notified and must approve any process changes prior to implementation. For his change request, the Supplier shall use the LEM template CO.11.11.694.0 “LEM Group Supplier part change notification form” or any equivalent document.

In case the process change could impact any critical / safety characteristic, a specific notification must be done 6 months minimum prior to the change.

Depending on the level of change required, LEM may formalize a modification follow-up (MFU-CO.11.11.420.0), which is an evolution of the original IPQ in which the Supplier and LEM agree on the level and content of the qualification required.

N.B. Relocation or movement of any tool or manufacturing equipment is considered a significant process change therefore it needs a new approval from LEM. Any noncompliance with this requirement could result in serious actions from LEM including loss of business.

*NB: for the following cases, the Supplier must respect the deadlines as follows:

Type of change	Descriptions of change	Official SPCN to send to LEM
Change of manufacture site or manufacture line	Change or adding or manufacture line	6 months prior to change
	Close factory / change of site	12 months prior to change
Change of function, characteristics, design and material	Change of electrical characteristic	6 months prior to change
	Change of software, firmware, register setting	
	Change of mechanical characteristic	
	Change of thermal characteristic	
	Change of storage condition	
	Change of moisture level	
	Change of safety characteristic	
	Change of design	
	Change of material	
	Change of plating: material or thickness	
Product discontinuity	Product discontinuity	12 months prior to change

3.4 Traceability / FIFO / identification

Suppliers shall have a formal process to identify a product which enables tracking of the product throughout the process, beginning with incoming raw materials and subcomponents and continuing all along the supply chain to the LEM plant. The traceability system of the Supplier must enable the retrieval of the name of the Subcontractor sourced and the precise batches of the suspicious raw material, component, semi-finished and finished product.

The stock (finished, semi-finished, components, raw materials) must be managed according to the FIFO method to eradicate any risk of mixed batches.

In order to quickly identify any suspicious batches, the Supplier must respect the FIFO and must define the appropriate manufacturing batch sizes, the appropriate marking of the parts, the relevant information of the packaging labels and the expiry date if applicable.

The supplier shall be able to identify the suspicious raw material, sub-components, semi-finished or finished parts to be isolated, and to retrieve all related process data for analysis.

Concerning the identification, the supplier shall use the LEM label model (CO.60.03.001.0) for the packaging. In case the product contains critical safety / regulatory characteristics, the symbol shall be visible on each packing unit.

3.5 Archiving

Unless otherwise specified by LEM, the Supplier must retain records for at least 10 years. This applies to all documents and records that are linked to the product, process, tests and calibration activities and contract (non-exhaustive list includes: Customer orders, project documents, control plan, work instructions and task sheets, maintenance records, non-compliances, measurement equipment, PPAP / IS submission file, delivery notes / shipping documents, work orders, tested products).

4. SUPPLIER SELECTION

The following sections are applicable for the direct material supplier only.

4.1 Qualification of a new Supplier

According to LEM Process, the following steps might be required:

- Vendor Evaluation Questionnaire CO.11.11.470.0 to be completed by the Supplier.
- Purchasing Evaluation CO.11.11.258.0 to be completed by the LEM Purchasing department.
- Quality Risk Assessment CO.11.11.385.0 to be completed by the LEM Supplier Quality department.

Conclusion of the 3 steps qualification	
Qualified	The Supplier enters the LEM official Supplier list Awardable for potential projects
Improvement needed	Improvement plan requested to enter the LEM official Supplier list
Not qualified	Supplier rejected

In the case of products with safety characteristics, a specific “Safety Management Audit” will be performed by LEM prior to nomination.

4.2 Supplier selection for a new project

The Supplier must be part of the LEM official Suppliers list before being selected for a new project.

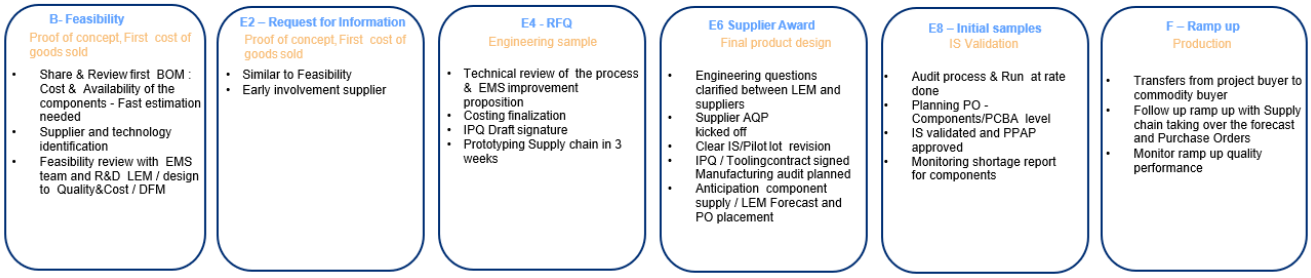
Once the multi-Suppliers answers have been received (answer to RFQ and/or IPQ draft signed), all financial-technical-quality-EHS proposals will be studied. Then, LEM will select the Supplier to be awarded.

5. PROJECT REQUIREMENTS

The following sections are applicable for the direct material supplier only.

LEM's Project development gates

Supplier involvement for each gate



5.1 Interactive Purchase Questionnaire (IPQ)

The technical, quality and logistic contract between LEM and its Supplier defines the mutual commitments and responsibilities related to the purchased product. It defines the content of the initial submission file to be submitted to LEM.

Both parties commit to respect the terms of this contract by signing it at the beginning of the project.

5.2 Quality commitment

The quality goal fixed by LEM in the IPQ, or equivalent contractual agreement is highly valuable data for the entire project lifecycle. This goal defines the level of efforts and methods required to guarantee the process quality level expected by LEM and its final Customer.

Unless otherwise specified by LEM, due to specific Customer requirements, the quality goals are defined according to the production forecasts as follows:

SUPPLIER QUALITY COMMITMENT						
Minimum monthly quantity	Non-compliance detected					
	At LEM (I1, I2) *		At LEM Customer (I3) *		At LEM or at LEM Customer (I4) *	
	PPM Target	Incident target permitted	PPM Target	Incident target permitted	PPM Target	Incident target permitted
60 000 < Qty	5	⩽ 1 incident per year	1.5	⩽ 1 incident per year	0	0
30 000 < Qty ⩽ 60 000	10	⩽ 1 incident per year	2.5	⩽ 1 incident per year	0	0
5 000 < Qty ⩽ 30 000	60	⩽ 1 incident per year	30	⩽ 1 incident per year	0	0
Qty ⩽ 5 000	N/A	⩽ 1 incident per year	N/A	⩽ 1 incident per year	0	0

* I1: defective part detected at the incoming inspection

I2: defective part detected in the LEM production workshop

I3: defective part detected by a LEM Customer

I4: safety / regulation characteristic, or recurrent issue

5.3 SAFETY MANAGEMENT (if applicable)

Some of the components, parts, assemblies, or sub-assemblies provided to LEM by the Supplier may have special critical characteristics: SAFETY CHARACTERISTICS. In that case, the following specific requirements are applicable.

Product safety is the ability of a product to be safe for its intended use: it means that it is not likely to cause personal injury or property damage within its intended purpose and any reasonably foreseeable misuse.

A safe product is free of safety-related defects, compliant with applicable safety standards and regulations, and safe to use during its normal life cycle.

SAFETY MUST BE A PRIORITY AND AN OBLIGATION FOR EACH OF US.

The main objective is to develop products that assist in preventing accidents from occurring or, in the event an accident does occur, to minimize the consequences for the end user. The Supplier's contribution to safety lies in developing innovative solutions, implementing safety features and producing fully conforming products.

5.3.1 Safety characteristics

Safety critical related features are designed by the presence of the  symbol next to the feature on the drawing or in a specification. If any feature of a part is considered safety critical, the part is considered as a safety critical part. All the activities related to safety management are required if any feature of a part is identified as having an impact on safety, and the part is considered safety critical.

A safety characteristic is a product characteristic or manufacturing process parameters which can potentially affect safety of any end users (accident, injury…).

5.3.2 Responsibility

The delivery of safe, fully conforming products to LEM is the Supplier's responsibility and is part of the Supplier's contractual commitment. Any assistance provided by LEM does not in any way limit the Supplier's responsibility to supply parts that conform to all technical specifications, standards, regulatory, contractual and legal demands.

The Supplier is responsible to ensure that all sub-suppliers and contractors are aware of and comply with the requirements related safety requirements. The Supplier must have procedures and practices to ensure an adequate level of control and requirements at all sub-suppliers whose product or processes could influence safety related features.

The Supplier assumes all responsibility for the quality of considered safety critical parts, that are shipped directly to LEM by one of their chosen sub-suppliers.

LEM MUST BE NOTIFIED IMMEDIATELY IN THE EVENT A NON-CONFORMANCE OR POTENTIAL CUSTOMER RISK IS IDENTIFIED.

5.3.3 Deployment

Identification with the  symbol: safety critical characteristics must be clearly identified throughout the manufacturing process and in all associated documentation such as risks analysis (e.g. FMEA), control plans and working instructions (including incoming inspection if applicable). The machines and tools which have a direct or indirect influence on a safety feature must be identified

also. The packaging shall be identified with the symbol as well (could be directly printed in the packing label).

Production requirements: LEM shall define in the IPQ specific requirements related to the safety characteristics. In that case, these apply and supersede the general requirements. This could be (not limited to):

- Mandatory repeatability and reproducibility on safety characteristics (is measurable characteristic).
- Higher Cp and Cpk requirements.
- On-going Statistical Process Control.
- Electronic or automated poka yoke.
- Ppk analysis at a certain frequency.
- Yearly Requalification …

Data records resulting from SPC, automated checking and inspection results must be available upon request by LEM. The data must include identification of the production lot or serial number information.

NEITHER REWORK NOR DEVIATIONS ARE ALLOWED ON SAFETY CRITICAL FEATURES.

Training: The Supplier must train the personnel involved in the production of safety products or processes (operators, supervisors, including maintenance team…) (what are they for, consequences if they are not compliant, liability…).

Training status and authorization for all operators working on safety feature related workstation shall be available.

As systematic preventive action, the Supplier shall not employ temporary workers on workstations producing safety characteristics.

Traceability: in addition to the basic traceability requirements, the Supplier shall have an effective system of traceability that ensures that delivered product can be traced from a finished product in the customer application back to specific lots, sub-components, parts, blanks, and raw material.

The production history of a lot or serial number shall be available. This includes product or process safety characteristics, tests records, process parameters influencing conformance, machine settings influencing conformance, maintenance activity of machines, equipment, jigs, gauges and test equipment, and personnel qualification records for operators performing the work.

5.3.4 Audit

Suppliers of safety critical components or assemblies must have safety system requirements embedded in their quality management system and can demonstrate their ability to manage safety critical features.

A Supplier who is supplying a part containing safety characteristics will be required to participate in a specific **Safety Management Audit**. Potential Suppliers are required to achieve a passing score prior to the award of business.

5.4 Project management

5.4.1 Risks analysis

By signing the IPQ,

1. The supplier confirms the product feasibility commitment base on IPQ requirements.

2. the Supplier commits to do a risk analysis base on FMEA methodology or equivalent ensuring the evaluation of the three following topics:

- The special and important characteristics highlighted by LEM in the IPQ and their associated RPN (Risk Priority Number) regarding the customer effect.
- All “points raised to be handled by LEM and the Supplier” (technical, Purchasing, quality, etc...).
- All other critical points highlighted by the Supplier regarding its own process and the project.

5.4.2 LEM special characteristics: requirements and drawings

The special characteristics reported on the LEM product documentation (e.g., drawings) must be considered and managed as required by the subcontractors who will be in charge of producing them.

Different indicators of capability are used to characterize the short-term and long-term dispersions all along the production process that can be measured on Special Characteristics.

To achieve the requirements listed in the table below, some criteria must be fulfilled:

- Measurement system (R&R study) conform to LEM rules
- For bilateral tolerances, normality test must be confirmed.
- For unilateral tolerance, normality test is not relevant, however others tests are available to confirm a good distribution (e.g. Weibull). Indicators Cpk and Ppk will be the most important to verify.
- The sampling size for long-term period must consider the 5M variables.

In case of production tool with several cavities, the capability measurement will be performed on each of them.

LEM SPECIAL CHARACTERISTICS CLASSIFICATION				
Symbol	Definition	Identification in Design Documentation	Identification in Process Documentation	*Identification in Supplier Documentation*
	**SAFETY** characteristic	Drawings, design FMEA, Process FMEA	Drawing, control plan, instruction sheet, working station/machine, incoming inspection sheet, shipment labelling	*IPQ, PPAP, Control plan, working instruction sheet, 8D report*
	**REGULATION** characteristic	Drawings, design FMEA, Process FMEA	Drawing, control plan, instruction sheet, working station/machine, incoming inspection sheet, shipment labelling	*IPQ, PPAP, Control plan, working instruction sheet, 8D report*
	**SATEFY & REGULATION** characteristic	Drawings, design FMEA, Process FMEA	Drawing, control plan, instruction sheet, working station/machine, incoming inspection sheet, shipment labelling	*IPQ, PPAP, Control plan, working instruction sheet, 8D report*
	**SIGNIFICANT** characteristic	Drawings, design FMEA, Process FMEA	Drawings, control plan, instruction sheet	*PPAP, Control plan*
	**Special Process** (1)	Process drawings, Process FMEA	Process drawings, control plan, instruction sheet	*PPAP, Control plan*

LEM Rules:

For Safety characteristics			Bilateral tolerance	Unilateral tolerance	Sampling size
Process Capability	Cp	Short-term dispersion	≥ 2	NA	N = 30 consecutive measures minimum taken from 1 production batch
	Cpk	Short-term dispersion & decentralization	≥ 2	≥ 2	N = 30 consecutive measures minimum taken from 1 production batch
Process Performance	Pp	Long-term dispersion	≥ 1.67	NA	N = minimum 125* measures taken from several batches of production and considering 5M variability
True Process Performance	Ppk	Long-term dispersion & decentralization	≥ 1.67	≥ 1.67	N = minimum 125* measures taken from several batches of production and considering 5M variability

*** : sampling size and frequency to be defined according to production**

For Significant characteristics			Bilateral tolerance	Unilateral tolerance	Sampling size
Process Capability	Cp	Short-term dispersion	≥ 2	NA	N = 30 consecutive measures minimum taken from 1 production batch
	Cpk	Short-term dispersion & decentralization	≥ 1.67	≥ 2	N = 30 consecutive measures minimum taken from 1 production batch
Process Performance	Pp	Long-term dispersion	≥ 1.67	NA	N = minimum 125* measures taken from several batches of production and considering 5M variability
True Process Performance	Ppk	Long-term dispersion & decentralization	≥ 1.33	≥ 1.33	N = minimum 125* measures taken from several batches of production and considering 5M variability

*** : sampling size and frequency to be defined according to production**

- Compliance with LEM-specified definitions and symbols or the organization's equivalent symbols or notations, as defined in a symbol conversion table. The symbol conversion table shall be submitted to LEM, if required
- In addition to these capability requirements, the processes must be under statistical control and the quality characteristics must be normally distributed.

In cases where the supplier does not meet these process capability requirements, the supplier shall implement corrective actions and containment to ensure that defective material does not escape the supplier's process. Containment must continue until capability is achieved. Exceptions to these process capability requirements will be communicated to the supplier by LEM in the IPQ.

Any exceptions to LEM process capability requirements will be handled on a case-by-case basis and must be approved by LEM.

5.4.3 Project schedule

The project schedule will have to consider the results of the risk analysis as well as the following topics:

- LEM project main deadlines and quality deliverables
- Internal product validation
- Internal process validation

- Subcontractor validation

N.B. the Supplier Advanced Quality Planning is agreed and signed according to LEM GROUP SUPPLIER ADVANCED QUALITY PLANNING REPORT-CO11.11.778.0

5.4.4 DFMEA (Design Failure Mode and Effects Analysis)

A Design FMEA can be asked for in the case where the Supplier is considered as the product designer or a co-designer.

If safety is concerned, actions will have to be considered with the highest priority.

5.4.5 PFMEA (Process Failure Mode and Effects Analysis)

The Supplier shall do a PFMEA study from the incoming inspection to the final delivery.

This PFMEA must include all specifications of the LEM product such as the special characteristics mentioned in the IPQ. In relevant cases, the LEM symbols, as explained in § 5.4.2, will be mentioned in the PFMEA study.

The PFMEA study will result in a general action plan which will be followed throughout the project until all actions are completed.

N.B. FMEA guidelines can be accessed on the AIAG website:

5.4.6 Control plan / Safe Launch Plan (SLP)

As a result of the risks analysis and/or the PFMEA, the Supplier will provide the control plan from the incoming inspection to the final delivery.

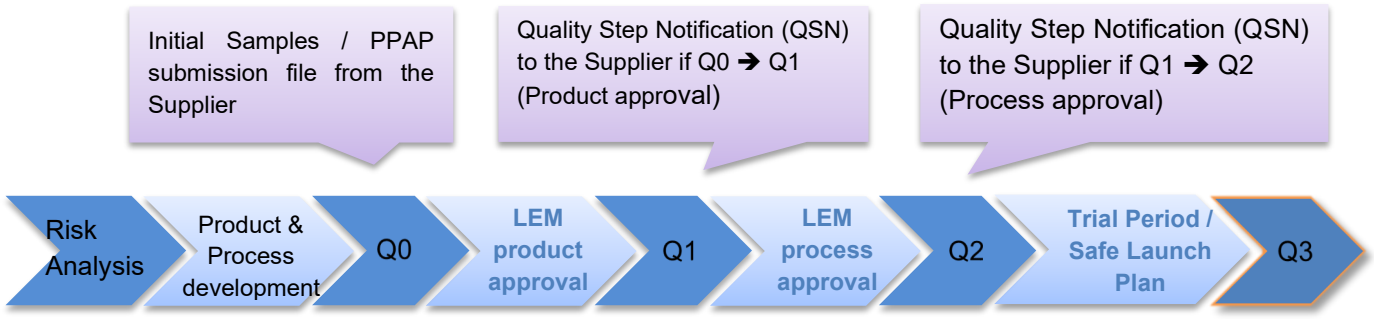
This control plan must include all specifications of the LEM product such as the special characteristics mentioned in the risk analysis. Characteristics will be identified with the LEM symbols as explained in § 5.4.2.

On LEM request, a strengthened control plan also called “Safe Launch Plan” could be required for a defined period (for instance 90 days) or until the exit criteria specified by LEM have been satisfied.

A Safe Launch Plan might be required in case of a Supplier Part Change Notification or any critical incident.

5.4.7 Product and Process qualification

5.4.7.1 Quality step validation by LEM



IS / PPAP submission file: the quality step of the product is Q0.

The Supplier submission file must contain all documents specified in the fields “Product Approval” and “Process Approval” of the IPQ.

N.B. Documents submitted must be electronic files (PDF) in English.

Initial samples must be identified “Initial samples” on the label used by the Supplier. The Supplier should use the LEM label CO.60.03.001.0 as mentioned in the IPQ.

- **LEM product approval:**

The product is validated and goes from Q0 to Q1 status if all the LEM requirements mentioned in the IPQ field “Product Approval” have been submitted by the Supplier and are compliant.

- **LEM process approval:**

The process is validated and goes from Q1 to Q2 status if all LEM requirements mentioned in the IPQ field “*Process Approval*” have been submitted by the Supplier and are compliant.

The initial samples submission file is validated by LEM when Q2 status is reached

- **Trial Period or Safe Launch Plan:**

This defines the number of deliveries mentioned in the IPQ (usually 3) for which LEM will perform an incoming inspection. At the end of this trial period, if no issue has been highlighted, the status of the product becomes Q3 (the final validation step).

- **Quality Step Notification (QSN) - CO.11.11.340.0:**

When the status of the product goes from Q0 to Q1, Q1 to Q2 or Q2 to Q3, the LEM Supplier quality assurance sends the quality step notification to the Supplier to inform him about the product status change.

N.B. Even if LEM has approved the PPAP file and the initial samples, the Supplier remains responsible for the product’s compliance with LEM specified requirements throughout the life cycle of the product. Therefore, in case of non-conformity, the Supplier must conduct the necessary corrective actions.

5.4.8 Deviation request

Whatever the product status is (Q1, Q2 or Q3), if any non-compliance is detected, the Supplier must submit a deviation request to LEM. After LEM formal acceptance, the Supplier will be allowed to deliver the parts with the relevant information of the deviation request on its label. The Supplier shall use the label CO.60.03.001.0 as mentioned in the IPQ.

The deviation must also be mentioned in the delivery note.

5.4.9 PPAP: Automotive request

This requirement is applicable to subcontracted material for automotive products as specified in the IPQ. The default PPAP level for all initial PPAP submissions shall be Level 3 unless otherwise directed by LEM.

N.B.: PPAP latest edition guidelines can be accessed on the AIAG website.

5.4.10 Statistical study for measurement and testing equipment – GR&R

The Supplier must perform a Gauge Repeatability and Reproducibility study to check the acceptability of all measurement and test equipment (e.g., gauges, fixtures).

N.B.: a GR&R will be systematically requested for the means that are checking safety characteristics.

This study shall follow the AIAG MSA rules, whether for the methodology (operators’ number, parts number…) or for the acceptance criteria (total R&R %, NDC).

The study results must be included in the PPAP / IS submission file.

Results	G R&R study acceptance
R&R < 10%	The gauge or test equipment is suitable for use
10% < R&R < 30%	May be acceptable depending on the feature being measured. (Requires LEM approval)
30% < R&R	Not acceptable for use on LEM products.

5.4.11 Statistical study for machine and process – capability – Cmk & Cpk

This requirement is applicable for any Capability study impacting a special or critical characteristic.

The C_{mk} or machine capability index is the machine's ability to repeat the same operation. Samples picked up for measurement are produced in the continuation production flow without any machine stop.

The C_{pk} or process capability index is the process ability to produce within customer's specification limits. Contrarily to the C_{mk}, it considers additional variables: material, means, men, methods, and environment. Indeed, samples to be measured must be taken from several production orders.

Results	C_{mk} / C_{pk} study acceptance	Part status
1.67 ≤ Cmk	The machine is qualified, Process qualification can be extended Process Approval can be given (subject to C_{pk} compliance in the serial life)	Q2
Cmk < 1.67	The process cannot be qualified, nor process approval given by LEM Supplier improvements needed.	Q1
1.33 ≤ *Cpk	The process is qualified during the trial period also called Safe Launch Plan	Q3
*Cpk < 1.33	The process cannot be qualified, nor process approval given by LEM Supplier Improvements needed.	Q2 or Q1

- For the initial samples' submission file, LEM may request only C_{mk} and C_m calculation in the IPQ.
- C_p and C_{pk} will be checked afterwards within the yearly requalification (§6.1).
- *Cpk: Capabilities requirements shall fit to customer specific requirement first otherwise LEM standards apply (refer to specific IPQ).

5.4.12 Statistical Process Control (SPC)

The use of SPC shall be requested by LEM if the capabilities of the PPAP / IS submission don't meet the quality level expected (see requested capabilities). When using SPC, the recording frequency of the measured values in the graph must be defined to prevent any deviation from specification.

N.B.: SPC guidelines can be accessed on the AIAG website.

5.4.13 Initial samples qualification of the subcontracted product

The Supplier will be responsible for the Subcontractor initial samples / PPAP qualification.

The Supplier will ask his Subcontractor to provide all the necessary documents (control plan, FMEA, process flow chart. etc.) in the PPAP / IS submission file to qualify the subcontracted part. The Supplier must include all these documents in the LEM PPAP submission file if requested by LEM.

N.B.: Suppliers must keep and archive evidence that any / all materials or sub-components fully comply with the specifications, industry or government regulations and standards, prior to use in production. This includes raw materials, coatings, treatments, sub-components, sub-assemblies etc.

All test reports will have to be done and included in the IS / PPAP file. All records of compliance must be archived and available at any time for LEM during the product life cycle.

The Supplier shall request to his Subcontractor the same PPAP level (at least) as the one LEM requests to him.

5.4.14 Qualification process audit

The Supplier is responsible for implementing a self-assessment audit to qualify its process.

Base on supplier impact assessment LEM can perform an audit to qualify the process. It could be done during the initial samples production.

LEM can also perform a Run@Rate audit to assess the production capacity of the Supplier to comply with LEM forecasted volumes.

5.4.15 Prototypes / Off tools

When prototypes are built, the Supplier must use a label that specifies “Prototypes / Off tools” to send the parts to LEM. The Supplier shall use the label CO.60.03.001.0 as mentioned in the IPQ.

The Supplier may be asked to provide relevant documents as agreed with the LEM project team.

5.4.16 Status of parts throughout a project

Part status	Functional	Final raw material	Definitive tool	Final process	Mass production
Engineering Samples/A Sample	✓	×	×	×	No
Prototypes/B Sample	✓	✓	×	×	No
Off Tools / First parts	✓	✓	✓	×	No
Initial Samples (IS)/C Sample	✓	✓	✓	✓	No
Trial period / Safe launch plan	✓	✓	✓	✓	Yes

✓ Mandatory × Not mandatory

N.B.:

A-Sample: Functional prototypes, usually with limited drivability and low degree of maturity.

B-Sample: functional, basic prototypes with full drivability and a high level of maturity, they may be created using pilot tools.

C-Sample: fully functional sample manufactured with series production tools.

5.4.17 Tooling

If LEM is the owner of the tool used by the Supplier to produce LEM specific parts:

- A tooling contract CO.11.11.272.0 is signed between LEM and the Supplier.
- LEM property must be permanently identified with a non-erasable marker means on the equipment concerned once its payment is completed. Specific plates can be provided by LEM Purchasing. Evidence of LEM property will be included in the IS / PPAP submission file by the Supplier.

- The tool maintenance remains the Supplier responsibility if not otherwise specified in the tooling contract.

6. MANUFACTURING REQUIREMENTS

6.1 Yearly Re-qualification

Suppliers are expected to maintain the same process and quality level approved during the original PPAP / IS submission throughout the life cycle of the product. Suppliers must be able to provide evidence.

When requested by LEM in the original IPQ, the Supplier will have to perform a yearly process requalification (sometimes restricted to a yearly capability study C_{pk} on relevant characteristics) and will have to transmit the results to LEM.

For automotive and in accordance with the AIAG PPAP manual, a yearly requalification *Level 1* **(**Warrant Only), *Level 4* **(**Warrant and other documents as defined by LEM), or *Level 3* (Full submission) might be required.

This will be especially the case if safety characteristics on the products.

6.2 Product / Process improvement

Suppliers should constantly review FMEA (or another appropriate tool to integrate the lessons learned) and include all issues and related solutions met in serial life or in project to avoid recurrent mistakes on future developments.

6.3 General continuous improvement

The Supplier must continuously improve its organization and may work on relevant topics such as reduction of rejects / rework, reduction of downtime / improved equipment utilization, improved process capabilities, reduction of lead times, delivery times, improved measurement technologies. The Six Sigma methodology should be applied to all areas of the business.

The Supplier must implement an internal scraps analysis throughout the entire cycle life of the product.

The Supplier must promote a continuous improvement mindset to its Subcontractors.

All risks and opportunities identified during the business relationship shall be included in the continuous improvement program of the Supplier.

7. SUPPLIER NON-CONFORMITY MANAGEMENT PROCESS (SNCR)

7.1 Notification

LEM will notify the Supplier about an issue by email in the case of a minimal risk.

If a Supplier causes major quality issues or delivery issue, LEM will send a non-conformity report to the Supplier and will ask him to fill in the LEM Group Supplier 8D report CO.11.11.659.0 or any relevant for services.

N.B. The quantity mentioned in the report is the number of non-conforming parts found by LEM. The Supplier must confirm the right number of non-compliant parts that are currently affected. Without any feedback from the Supplier, the original quantity is reliable and is considered for PPM calculation.

NB. Any part returned by LEM to the Supplier cannot be scrapped without LEM agreement.

7.2 Response to SNCR: Timing requirements

The Supplier shall master the 8D problem solving method and associated tools and respond to the SNCR on the LEM model CO.11.11.659.0.

Within 24 hours – The Supplier must acknowledge receipt of the SNCR by mail and initiate containment and the corrective action process.

Within 48 hours – The Supplier must complete the first 3 steps (D1 to D3 included), which define the containment plan and interim actions in place until action plans have been defined. The date of D3 receipt by LEM will be part of the Supplier quality performance.

NB. If LEM needs ready-for-use parts immediately, a securing sorting of the LEM stock might be necessary and initiated either by LEM at the Supplier's expense, or by the Supplier, who sends someone to LEM to do the sorting.

The Supplier must decide who will be responsible for the secure sorting within 24 hours of submission. After this time, if no return from the Supplier, LEM will organize the sorting at Supplier cost.

Within 10 working days – The Supplier must complete the first 5 steps (D1 to D5 included), which includes:

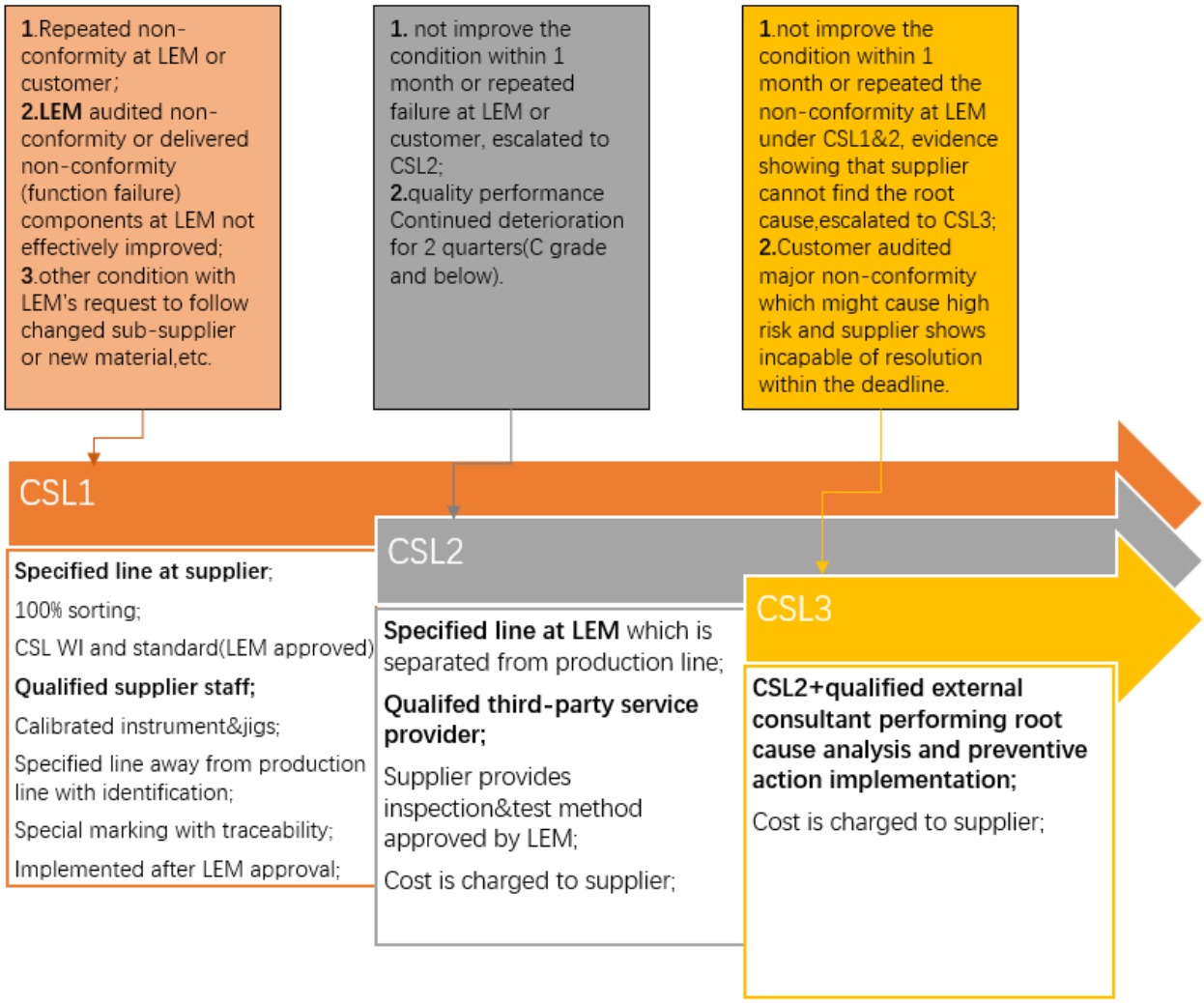
the root cause(s) for non-detection and the root cause(s) for occurrence

corrective actions identified and planned for occurrence and non-detection root causes.

If permanent corrective action is not implemented, interim containment action must be implemented, approved by LEM, and kept in place until the permanent corrective action plan is completed. The date of D5 receipt by LEM will be part of the Supplier quality performance.

Within 20 working days – Unless otherwise agreed with LEM, the 8D report is completed. The efficiency of actions defined in D5 has been checked. Lessons learned have been formalized in the PFMEA. Any relevant document linked to the process / product has been updated. Actions have been standardized to similar processes and products.

7.3 Controlled Shipment Level (CSL)



To revoke CSL, all the following conditions must be met:

- Preventative measures must be implemented, and their effectiveness proved.
- At least four weeks of defect-free additional 100% test.
- or at least as many as defect-free parts of 5 delivery batches. during the additional 100% testing.

7.4 Non-compliance costs

After the non-compliance has been analyzed, if the Supplier is responsible, the costs involved will be charged back to him. This may include but is not limited to the cost of reworking, sorting of suspect and non-conforming products, premium freight, down time / over time / line speed reduction, increased inspection, late delivery, shipping errors, additional manpower, product or equipment damage, replacement materials / costs, reimbursement of all charges from LEM Customers, warranty costs and any other related costs.

8. SUPPLIER EVALUATION

Services: LEM applies another evaluation process, proportional to the risk identified by the internal contracting process owner.

8.1 Biannual global performance rating

Every 6 months, the LEM site Purchasing department officially informs the Key Suppliers about their current rating based on quality, logistic and commercial performance. It is calculated as follows:

Global Supplier Performance Index = IP (%) = 0.4*Q + 0.3*D + 0.3*R

Q: Quality performance D: Logistic performance R: Vendor performance

This calculation is detailed in the "LEM Group Supplier Performance Rating" CO.20.00.369.0

Depending on his performance, the Supplier is classified as follows:

IP (%)	Supplier classification	Consequences / LEM expectations
90 ≤ IP	**Good**	OK for production
75 ≤ IP < 90	**Acceptable**	OK for production
50 ≤ IP < 75	**Insufficient**	OK for production with interim action. The Supplier must provide a general improvement plan to the Purchasing department
< 50	**Unacceptable**	Immediate action and securement agreed by LEM mandatory prior to production. The Supplier must provide a general improvement plan to the Purchasing department.

8.2 Quarterly quality performance rating

This is the quality part of the global performance based on the quality performance during the time period, it includes the non-conformity (SNCR) quality, Number of batch return, SPPM, Supplier Audit and Critical Incident.

Depending on his performance, the Supplier is classified as follows:

QP (%)	Supplier classification	Grade	Consequences
95 ≤ QP 90 ≤QP (Plastic & Metal)	**Good**	A	Preferred for project selection
80 ≤ QP < 90/95	**Acceptable**	B	Accepted for production and project selection
80 ≤ QP < 60	**Insufficient**	C	The Supplier must improve in the following months
QP < 60	**Unacceptable**	D	Supplier Improvement Program is triggered, the supplier must provide an improvement plan to the supplier quality department.

8.3 Process audit

Supplier and Subcontractor must assess their process based on industrial best practices and state of the art technologies and international standards such as the following:

- CQI-9 - Heat Treating
- CQI-11- Plating
- CQI-12 - Coatings
- CQI-15 - Welding Process Assessment
- CQI-17- Soldering Process Assessment
- CQI-23 - Molding Process Assessment

LEM may perform a manufacturing process audit and a Run@Rate evaluation at any time in the entire life cycle of the product at the Supplier facility or at a Subcontractor facility under supplier agreement.

In the case of products with safety characteristics, a specific “Safety Management Audit” will be performed by LEM.

The audit result will be as in the following table:

IC = Index of Conformity (ref: process audit)

Risk	Rating	Result
NO RISK	IC ≥ 90% ☺	**Immediate qualification**. "Medium risk" deviation(s) must be recovered by an action plan with evidence.
LOW RISK	89% ≥ IC ≥ 80% ☺	**Qualification under reserve of an action plan**. "Medium and Low risk" deviations must be recovered by an action plan with evidence. Re-audit no necessary if evidence is robust.
MEDIUM RISK	79% ≥ IC ≥ 70% 😐	**Qualification under reserve of an action plan.** "Medium, low and high risk" deviations must be recovered by an action plan with evidence. Re-audit mandatory for any "high risk" deviation
HIGH RISK	69% ≥ IC ≥ 60% ☹	**No qualification possible** (if both system audit **&** manufacturing audit are assessed within that range) New audit not authorized before 1 year. **Qualification under reserve of an action plan** (if system audit **or** manufacturing audit is assessed within that range) Follow-up audit mandatory
HIGH RISK	IC ≤ 59% ☹	**No qualification possible** (if system audit or manufacturing audit is assessed within that range) Re audit not authorized

- Action plan should be provided to LEM within 2 weeks after audit report released.

8.4 Supplier status

There are several possible status levels attributed to a Supplier after taking the 3 steps assessment explained in §4.1:

Supplier status	Meaning
Qualification in progress	New potential Supplier in the validation workflow (§4.1).
Qualified	In the LEM official Supplier list. Mass prod OK. Business allocation OK (§4.1).
New business hold	Mass Prod OK for existing products. Business allocation NOK
Phasing out	Mass prod OK (phase out plan in progress). Business allocation NOK.
No longer qualified	Mass prod NOK. Business allocation NOK.

New Business Hold decision

Any Supplier on NBH status will not be consulted by LEM nor awarded a new development with LEM.

That decision might be the consequence of:

- Poor global and/or quality performance rating (§8.1-8.2)
- Poor audit result (§8.3)
- Bankruptcy, financial risk, top management risks, geopolitical factors, etc.

The buyer in charge of the Supplier informs him about the new status and fixes the criteria for recovering status.

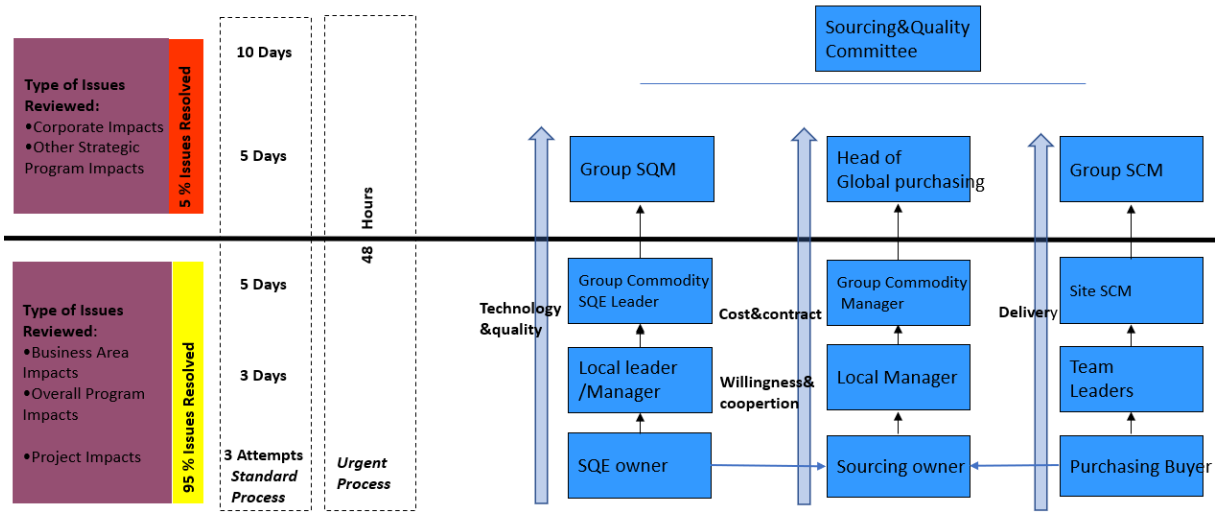
Once the Supplier action plan is completed and satisfies the LEM recovering status criteria, he will recover “Qualified” status.

9. SUPPLIER ISSUE ESCALATION

The escalation path at suppliers is the equivalent role to LEM’s organizations.

The escalation path at supplier should be documented, updated, and communicated to relative interface at LEM once there is any change.

Supplier Issue Escalation Path



Remark: As the condition differs, the lead-time is just for reference.

Urgent Process: Production stop, customer recall etc...

10. USEFUL DOCUMENTS

10.1 List of LEM applicable documents

The Supplier shall understand and apply all documents cited in this manual and listed below. In the case of a new project, the current version of the manual and documents will be sent to the Supplier.He will then sign the IPQ as evidence of understanding and possessing all updated LEM documentation to comply with this LEM Group Supplier General Requirements Manual.

LEM Code of Conduct for Business Partners	CO.11.11.624.0
LEM Group Non-Disclosure Agreement	CO.11.11.303.0
Tooling contract	CO.11.11.272.0
Interactive Purchase Questionnaire (IPQ)	CO.11.11.217.0
Vendor Evaluation Questionnaire	CO.11.11.470.0
Quality Risk Assessment (Qualification audit)	CO.11.11.385.0
LEM Group Commodity Process Audit Checklist	CO.11.11.822.0
LEM Group Supplier Advanced Quality Planning Report	CO.11.11.778.0
LEM Group Supplier Initial Sample Report for PCB & PCBA	CO.11.11.537.0
LEM Group Supplier Initial Sample Report	CO.11.11.535.0
LEM Quality Step Notification (QSN)	CO.11.11.340.0
LEM Group Supplier Packing Label Specification	CO.60.03.001.0
LEM Group Supplier Part Change Notification Form (SPCN)	CO.11.11.694.0
LEM Group Modification Follow Up (MFU)	CO.11.11.420.0
LEM Group Supplier 8D report (*Supplier Non-Conformity Report)*	CO.11.11.659.0

10.2 External links and documents

Conflict minerals template	http://www.responsiblemineralsinitiative.org/reporting-templates/cmrt/
Reach SVHC candidate list	*http://echa.europa.eu/fr/candidate-list-table*
AIAG Guidelines:	*https://www.aiag.org/*

11. GLOSSARY / ACRONYMS

8D / The 8 Discipline Problem Solving Report is a corrective action process typical to the Automotive Industry that requires a specific process and 8 specific steps be followed.

AIAG / The Automotive Industry Action Group is an organization of component Suppliers and automotive manufacturers which looks at ways to standardize processes and procedures for the industry and between groups.

APQP / The Advanced Product Quality Planning is a quality tool used for product planning and defining controls.

Cpk / The Process Capability Index is a **s**tatistical tool used to estimate/calculate the capability of a process to meet drawing requirements or specifications.

D-FFMEA / The Design / Process Failure Mode and Effects Analysis is an analytical method for evaluating the risks associated with the design / process of a product and for measuring the effectiveness of improvement actions.

FIFO / First In, First Out, is an abstraction related to ways of organizing and handling data relative to time and prioritization. This expression describes the principle of a queue processing technique: The first part entering a storage area will also be the first to leave it so as to comply with the traceability standards.

GR&R / The Gauge Repeatability and Reliability is a statistical tool used to verify the effectiveness of a gauge to accurately and consistently measure a product. It also defines the variability of the gauge in relation to the tolerance of the feature.

IPQ / The Interactive Purchase Questionnaire is the technical and quality contract between LEM and its Supplier that defines the mutual commitments and responsibilities related to the purchased product. It defines the content of the initial submission file to be submitted to LEM. Both parties commit to respect the terms of this contract by signing it at the beginning of the project.

MSA / The Measurement Systems Analysis is a specially designed experiment that seeks to identify the components of variation in the measurement.

OEM / The Original Equipment Manufacturers are the global manufacturers of original equipment supplied to LEM.

PFMEA / The Process Failure Mode and Effects Analysis is an analytical method for evaluating the risks associated with the process used to produce a product and for measuring the effectiveness of improvement actions.

PPAP / The Production Part Approval Process also means initial samples submission file for automotive industry. Refer to AIAG guidelines and ISO IATF 16949 standards to check the content.

Ppk / The Potential Process Capability Index is a statistical tool used to estimate/calculate the “provisional” capability of a process to meet drawing requirements or specifications.

RFQ / A request for quotation is a standard business process whose purpose is to invite Suppliers into a bidding process to bid on specific products or services.

RPN / The Risk Priority Number is a measure used when assessing risk to help identify critical failure modes associated with your design or process.

SNCR / The Supplier Non-Conformance Report is a notification that contains information defining the problem, the suspect quantities and other relevant information needed to conduct problem solving. The SNCR is also the format used by LEM Automotive for tracking and recording Supplier concerns.

SPC / The Statistical Process Control is the application of statistical methods to the monitoring and control of a process to ensure that it operates at its full potential to produce conforming products.

SLP / A Safe Launch Plan is a strengthened control plan used for a temporary period to ensure the compliance of the product and the stability of the process until the final control plan for mass production is approved.

12. DOCUMENT HISTORY

Date	History	Version	Writer
November 7th, 2013	Creation	0	N. Cortesi
May 20th, 2017	Modification	1	N. Cortesi
October 1st, 2020	Modification	2	Xiaoyan (Sophie) Zheng
January 1st, 2023	1. Update 3.1QMS requirement for automotive application. 2. Update 5 LEM's project development gate. 3. Add 7.3 CSL 4. Add 9 Supplier issue escalation 5. Update 5.4.2 LEM Special Characteristics requirement.	3	Xiaoyan (Sophie) Zheng

13. SUPPLIER AGREEMENT

The Supplier commits to comply with the most current version of LEM Group Suppliers General Requirements Manual available on *www.lem.com*. as specified in the General Conditions of Purchase mentioned in the purchase orders. Any deviation to this manual must be specified in the IPQ or reported to the contracting owner for services

End of document