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## Purpose

This directive specifies the essential quality management and environmental management requirements of **LG Magna e-Powertrain Co. Ltd** and/or its Affiliates ("LG Magna") to be met by suppliers, starting with compliance to quality and environmental requirements, up to improvement in all business fields, in order to ensure customer satisfaction and business success.


This is the Global Manual for LG Magna. Suppliers are also responsible to meet the requirements defined in the LG Magna International document. If the requirements in these Guidelines are not met, the Supplier shall take full responsibility for any quality related issues arising from the non-conformance. The supplier is responsible to work with the division to meet their specific requirements. These documents are designed to work together, however if any requirement is in conflict with another, the most restrictive requirement will be requirement. The supplier is responsible to make sure they have the latest copies of these requirements and any applicable standards. Capitalized terms that are not defined in the Guidelines shall have the meaning ascribed to them in the Purchasing Terms and Conditions of LG Magna.

## Scope


This directive applies for all suppliers of prototype parts and components, production materials, serial and spare parts and components, heat treatment, painting, surface coatings, and every kind of machining, as well as for service suppliers such as development activities and similar services. Additionally, order-specific documents such as specifications, quality assurance agreements, LG Magna customer requests handed over to the supplier, as well as the following documents shall apply:

- ISO 9001:2015 (ISO 9001:2008 until recertification)
- ISO/TS 16949
- IATF 16949:2016
- ISO 14001
- VDA vol. „Quality Management in the Automotive Industry“
- PPAP Production Part Approval Process, AIAG
- MSA Measurement Systems Analysis, AIAG
- APQP , AIAG
- CQI-8 Process Layered Audit
- CQI-9 Heat Treat System Assessment
- CQI-11 Plating System Assessment
- CQI-12 Coating System Assessment
- CQI-15 Welding System Assessment
- CQI-17 Soldering System Assessment
- CQI-19 Sub-Teir Supplier Management Process Guidelines
- CQI-23 Molding System Assessment
- CQI-27 Casting System Assessment
- LG Magna Powertrain’s General Purchase Order Terms and Conditions.

Documents and applicable annual assessments must be on file and current with each LG Magna Division and available upon request to LG Magna within 24 hours.

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Quoted documents are to be according to the latest version, unless otherwise agreed. Please check with the LG Magna Powertrain division you are supplying for any specified documents and for some divisions a selection of documents is available

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## 1 General Terms / Scope


The following essential principles must be observed in order to satisfy the requirements:

- Establish cross-functional teams
- Encourage information flow and communication
- Targeted procedure in all fields
- Efficiency and effectiveness
- Prevention and defect avoidance
- Capable processes instead of controls for the detection of defects
- Cost-effective and prompt provision of services
- A minimal and constantly decreasing deviation from target values in all processes and business fields
- Endeavour to achieve continuous improvements
- Consideration of ecological aspects

## 2 Basic requirements

### 2.1 Quality/environmental management

LG Magna requires that its suppliers prove (a third party certification) that they have a Quality Management System ("QMS") functioning to ISO 9001:2008 or latest edition (minimum requirement), with a preference to have a quality management system to ISO/TS 16949:2009 latest edition as well as an environmental

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Management or system to ISO 14001 at their disposal. The supplier is obliged to continuously develop his management system in order to comply with ISO/TS 16949:2009. Suppliers who are not certified to ISO/TS 16949 must be certified to the latest ISO 9001 standard and comply with the “Minimum Automotive Quality Management System Requirements for Sub-Tier Suppliers”

(MAQMSR – available at [www.iatfglobaloversight.org](http://www.iatfglobaloversight.org) – OEM Customer-Specific Requirements).

LG Magna suppliers shall provide a plan to gain IATF16949:2016 certification or ISO 9001:2008 (or latest edition) certification and a plan to meet IATF16949:2016 requirements with a valid third party assessment to IATF16949:2016 requirements, unless otherwise approved by LG Magna Supplier Quality Development.

Proof must be furnished by submitting the relevant certificates. The supplier will otherwise be classified as uncertified.

LG Magna reserves the right to assess the supplier’s and sub-suppliers quality capability and environmental conformity by means of system audits and/or process audits in each case. The supplier must agree with LG Magna about remedies to be taken against any relevant objections on the basis of the audit results.

The supplier shall maintain the same level of quality systems and controls for Service parts. For suppliers to LG Magna divisions who supply components to GM, Chrysler and Ford you are required to have Auditing systems that include Layered Process audits.


## 2.2 Quality of delivery

LG Magna expects deliveries with zero defects from its suppliers. Any expenditure for the avoidance of defects must be included in the offer in each project phase (from the development to the end of the series). Any expenditure implemented at a later date must be borne by the supplier. Sufficient storage capacities for urgent needs are included in this expenditure (e.g. for unplanned sorting activities etc. because of product or process defects) (see also chapters 10.6 and 10.10).

LG Magna requests that each individual failure or complaint be immediately and sustainably repaired. A repetition of the same defect is unacceptable, even if ppm values are low. The Supplier must immediately launch appropriate test and control measures (urgent measures), in order to avoid repeated deliveries of defective parts, until he can stop the cause of the problem in a sustainable manner.

In the event of complaints, the supplier must react immediately by sending to LG Magna a problem description and a report on the urgent measures taken within 24 hours after the complaint. Regular progress reports are required until the conclusion of problem handling. The following corrective action timing should be followed, unless LG Magna allows an extension of time:

- 24 Hours – Containment Breakpoint
- 7 Days – Root Cause Identified
- 14 Days – Corrective Action Implemented
  - Error Proof/Detection in place
  - Layered Process Audits update
- 34 Days – Corrective Action Verified
- 35 Days – PFMEA updated

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- Control Plan updated
- Standard Work updated
- Operator Instructions updated
- 40 Days – Lessons Learned (Institutionalized)

Suppliers are to complete Supplier Quality 8D Report. Customer or plant specific 8D forms may be requested by LG Magna. Supplier forms are acceptable with authorization from Supplier Quality Development or the Division’s Quality Department.

LG Magna reserves the right to take more extensive measures (coverage of the costs, notify the suppliers certification body, new business hold, etc.) in the event of failures & complaints, (see chapter 13 Escalation steps & classification as “special suppliers”).

Quality of the subcontracted delivery will be considered during the supplier assessment and is a “core” criterion for new business awards.

The suppliers will be rated by the LG Magna divisions at a minimum of quality and delivery. Supplier must be in good standing to gain new business.

### 2.3 Special product characteristics


LG Magna defines the special product characteristics regarding safety, function, further processing and assembly for LG Magna and communicates these to the suppliers. In order to ensure the safety and function of the products in an efficient and effective manner, the supplier must identify the product characteristics important for safety and functionality as “special product characteristics” per LG (46)-B-3122 LG Magna Process, Critical Product Characteristics, Critical, Process Characteristics, Customer Interface Characteristics or other process specific to receiving Division.

The supplier must also define the special product characteristics for the manufacturing processes so far as he is responsible for the production. Additionally, if these product characteristics are within the processes of sub-tier suppliers (Tier 2, 3, 4, etc.) then these requirements must rolled out to the respective sub-tier supplier. Finally while LG Magna expects all characteristics to be within print tolerance pass thru and interface characteristics (PTC) are desired to have error or mistake proofing in place.

As the marked characteristics are the basis for process FMEAs, process capability analyses, work scheduling and test scheduling, process control, Quality control management etc., they must be observed meticulously and be documented in an appropriate and reproducible manner.

### 2.4 Documentation of Traceability from procurement to Shipment

The supplier must ensure that his manufacture and assembly batches or lots as well as his goods in batches or lots are traceable from incoming material through production and manufacturing batches or lots through delivery to LG Magna. The supplier must ensure the same for his upstream suppliers. More extensive measures are defined if necessary (attribution to process parameters, marking of individual parts.) Coordination with the LG Magna receiving plant on traceability method is recommended!

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LG Magna requests that the supplier determines and records product and process data according to the control plan in order to reduce possible follow-up costs for the supplier. As the basis of this recorded data, the following must be ensured:

- The specification of divisions concerned
- The assignment of production conditions and special characteristics of the products (actual values) to production and incoming goods lots/batches
- The ability to reconstruct the causal chains if problems appear.

The supplier must determine appropriate batch or lot sizes, appropriate marking methods and data necessary for the documentation on the basis of his knowledge (know-how regarding the product and the processes). In consideration of possible follow-up cost he must maintain appropriate records.

Traceability includes all upstream process steps (also those of the sub-supplier) and must be defined as an approximate value derived from the daily LG Magna demand.

The supplier must be able to assign the delivery slip numbers of his deliveries to his job ticket and incoming goods numbers.

Reworked parts must be delivered separately from regular series parts and provided with a separate delivery slip (reworking must be noted and described on the delivery slip).

Prior to shipping reworked parts, an Engineering Change Request (ECR), Process Change Request (PCR) or Design Deviation Request (DDR) must be available with approval from LG Magna.


## **2.5 Production process and product release procedure (VDA 2), production part release (PPAP)**

The Supplier must carry out the production process and product release (PPF) according to VDA 2 and/or the production part release procedure according to AIAG PPAP Manual as commissioned by LG Magna. Supplier will pay particular attention to the prerequisites (stable and capable processes, finished process FMEAs incl. implementation of measures, released equipment and tools, series conditions, etc.).

For level 3 PPAP's the supplier must confirm LG Magna's option to conduct an on-site assessment of process/product readiness prior to PPAP submission. The product delivered must correspond to the specification indicated in the order (design revision state, etc.). Serial (production) deliveries can only be made after release of the initial sample by LG Magna.

If the product and process release procedure fails (refusal or conditional release), the supplier is obliged to re-launch the product and process release procedure including all measures necessary for the new submission of regular initial samples (deadlines to be coordinated with LG Magna disposition, protection of all deliveries until the positive release, etc.). In case of repeated negative PPAP results caused by the Supplier, the costs need to be borne by the supplier.

Supplier is required to provide one re-qualification examination according to ISO/TS 16949 8.2.4.1 per year

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Unless otherwise specified by the LG Magna Division for all PPAP submission including re-qualifications, the Default PPAP is Level 3.

**2.6 Performance Test or Run@Rate (R@R)**

The supplier is obliged to prove the capability of his (qualitative and capacity-related) production processes. Upon the performance test, all production facilities, the staff and the support systems as well as the lengths of cycles must correspond to series conditions.

The quantity required is equivalent to LG Magna’s requirement for 3 days of production at the LG Magna Division as specified contractually, verified by all the necessary shifts to meet the requirement. The supplier’s actual time to complete this event may vary, but must meet the supplier’s capacity plan and any shared capacity utilization. Other intervals can be agreed according to the complexity of the products.

In general, an LG Magna staff member must be present during the performance test carried out at the supplier’s premises. In the case of repeated negative R@R results caused by the Supplier, all additional costs shall be borne by the supplier. Therefore, LG Magna encourages the supplier to complete a smaller internal R@R in preparation for the event.

**2.7 Incoming goods inspection LG Magna’s & notice of defects**


LG Magna expects from its supplier the delivery of products, which meet or exceed 100% to the requirements defined. LG Magna should be able to conduct our process without the inspection of incoming goods, with the exception of a logistics incoming goods inspection (consisting of an examination of the identity, visible exterior damages, quantity and completeness of the inspection document required). If required, the supplier shall submit ISO Standard -test certificates 3.1.

**2.8 Data exchange**

The supplier must schedule the exchange of data (CAD data, measuring values, other product data, logistics data, etc.) coordinated with LG Magna and on the basis of the LG Magna’s requirements and provide the necessary resources in due time.

**2.9 Procedure upon detection of problems that might concern LG Magna**

If the supplier detects a problem, which could have an impact on LG Magna or on LG Magna’s customers, which may not be known to LG Magna, the supplier is obliged to immediately inform the LG Magna manufacturing facility(s) to which the part are supplied. Notification shall be to both the Quality group and the Material Planning group within the LG Magna facility(s).

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The supplier must immediately start to solve the problem and prove that the cause of the problem has been resolved in a sustainable manner. LG Magna may require that the product and process release procedure and/or PPAP be resubmitted again (chapter 2.5).

### 2.10 Problem solution

The supplier is required to use a purposeful problem solution methods (8-D and similar methods) and to submit these to LG Magna. Unless otherwise specified all results must be communicated in the LG Magna 8D format.

Suggested problem solving methods are:

- 8D
- 3 Legged 5 Why
- Drill Deep and Wide
- Ishikawa (Fish bone)
- Shainin
- Kepner Tregoe

### 2.11 Continuous improvement:

In order to remain competitive in the future, it is necessary to improve operational processes in a continuous manner. This approach reaches beyond the solution of current problems. Its aim is to manage processes in such a manner that deviations from nominal values are continuously reduced.

Nominal values are references such as technical specifications and also comprise quality goals, costs, deadlines, etc. The supplier shall make improvements recognizable by communicating appropriate figures to all divisions.


Efficiency and profitability are important aspects of continuous improvements. LG Magna reserves the right to carry out improvement workshops at the supplier's premises (on quality improvement, cost reduction, etc.). These include but are not limited to Lean workshops, VA/VE workshops, Process Reviews, Technical Reviews

### 2.12 International material data system (IMDS)

The supplier is obliged to document the IMDS (or other applicable system such as CAMDS) entry for his products and for his sub-suppliers and to add the documentation to the product & process release (PPAP, PPF). In the event of IMDS-relevant changes (including the change of sub-suppliers), the supplier must provide the IMDS entry update automatically.

Should a due IMDS data set be detected as missing and despite LG Magna's summons not be transferred within due time, LG Magna reserves the right to have material and component indications determined with the appropriate analyses from a certified external laboratory. The LG Magna Division will in turn invoice the internal costs and the costs of the analyses.



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### 2.13 Ecology, recycling, hazardous materials

The supplier is obliged to abide by all the domestic and sector-specific current statutory requirements regarding environmental protection and recycling, as a minimum requirement.

The following must be noted in respect to ecology:

- Examination of environmental compliance of subcontracted materials, production processes and products.
- Minimize the consumption of resources.
- Environmental compatible packing, transport and logistics concepts
- Use of recycled materials
- Avoidance of hazardous waste
- Marking of working materials for an efficient recycling
- If possible, reprocessing of production and auxiliary production materials (e.g. refrigerants, lubricants and detergents), otherwise, disposal according to regulations.
- Provision of return logistics

### 2.14 General requirements regarding components

The supplier is obliged to perform his deliveries and services according to the state of the art. Reference is made in particular to the supplier's obligation according to ISO 9001:2008 or latest item 7.2.1.

## 3 Project Management

### 3.1 Project plans


The supplier will establish project schedules that ensure a project result corresponding to the requirements. Key deadlines important for LG Magna will be coordinated in due time. The supplier is responsible to understand the deliverables and their milestones in the respective documents delivered by LG Magna. The supplier will submit their timing plan per the requirements to the LG Magna Purchasing and Supplier Quality Development with their deliverables. In case of supplier caused deviations to the timing schedule all incremental costs will be borne by the Supplier

### 3.2 Product-related quality planning:

LG Magna requires its suppliers to provide a continuous plan of prevention and safety measures during project implementation and serial production (according to TS16949/ APQP). This Quality plan (with measures, responsibilities, deadlines) can be integrated in the project plan.

## 4 Order Acceptance

LG Magna requires that prior to accepting an order the supplier examines the documents received from LG Magna (product description, specifications, purchase conditions, etc.) regarding their completeness and the feasibility of the LG Magna requirements, and that the supplier must document their agreement.

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Should these documents be insufficient from the point of view of the supplier, he is requested to ask LG Magna for complements (according to ISO 9001.2008 7.2.1).

The supplier must also examine if the goods and services he offers are feasible. This examination includes the technical feasibility (produce ability of parts through serial production according to specifications, with the process capability required), such aspects including logistics, quality, deadlines, costs, staff, etc. This must be confirmed with a completely filled-in and Tech Review Activity form. Additionally, critical process themes must be documented in the feasibility study.

## 5 Product development

This chapter is addressed to suppliers with product development tasks. If tasks are distributed between the supplier and LG Magna, the roles and responsibilities must be precisely defined

### 5.1 Planning of development activities

The supplier must plan his development activities in an appropriate manner before their implementation (content, procedures, interfaces, deadlines, responsibilities, infrastructure, design and test standards, form of technical documentation, etc.), as defined in chapter 3 of this document.

### 5.2 Methods and techniques

The supplier must master the following methods, as required for the project:


- Geometric dimensioning and tolerancing
- Statistical tolerancing
- Design for manufacturing and assembly DFMA
- Value analysis
- Design of experiments DOE
- FMEA (failure mode and effects analysis)
- Finite elements method (FEM)
- Computer-aided design (CAD)
- Solid modeling
- Reliability techniques
- Simulation techniques

### 5.3 Technical documentation

The form of technical documentation to be used shall be agreed between the supplier and LG Magna before the commissioning (procedure, methods, distribution, EDI, etc.).

### 5.4 Examination of development requests and feasibility

The supplier must be in agreement that the requirements regarding the development outcome (performance characteristics, reliability, purpose, etc.) have been defined in a sufficient manner before accepting the order and before starting the development activities.

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- The supplier must examine whether the development tasks required can be fulfilled, are feasible, and must document the result of this examination.

## 5.5 Design Reviews

The supplier must carry out design reviews at specific intervals. The development result is systematically analyzed according to whether it meets the requirements defined in these design reviews (see 5.4). The design review procedure has to be agreed between the supplier and LG Magna. If necessary, LG Magna participates in the design reviews. LG Magna expects a short clear presentation of the design review results from the supplier.

## 5.6 Approval

If an approval procedure must be carried out, the respective responsibilities must be agreed and defined upon commissioning

## 5.7 Procedure in the event of a product or process change

All changes must be communicated to LG Magna well in advance of the need to change.

The impact of changes (on function and performance, service life, manufacturing and assembly, etc.) must be clarified together with LG Magna. All changes require approval by LG Magna unless a specific agreement is in place to the contrary.

Changes implemented must be documented and indicated according to the procedures defined (drawings, BOM, etc.). The same requirements must be communicated to the sub-suppliers.


## 5.8 Software development

Use of state-of-the-art SW engineering methods and compliance with ISO 15504 (SPICE) (Software Process Improvement and Capability Determination) is required for development projects containing software, whereby the processes identified by the HIS (manufacturer initiative software) should be focused. In principle, the supplier must justify a SPICE level 2 or CMMI level 2 which has been controlled by an independent organization accepted by LG Magna.

# 6 Design and dimensioning

## 6.1 Product FMEA

LG Magna requires that suppliers in charge of development tasks make a systematic and traceable analysis of the risks of product utilization and of possible dysfunctions over the lifetime of the product. To do so, product /design FMEAs must be carried out, in order to ensure that potential problems can be detected at an early stage and appropriate measures for their avoidance are taken.

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The product-specific agreement between LG Magna and the supplier, regarding FMEA subjects, evaluation of the importance of the impact of defects, information exchange, etc., takes place before starting design work. LG Magna expects its suppliers to provide a short retraceable presentation of the FMEA results (critical items, measures taken to mitigate risks).

## 6.2 Manufacturing, assembly and measuring aspects

LG Magna requires a targeted focus on all product requirements from the supplier in development work, such as:

- Producibility (implementation of production ability analyses involving manufacturing techniques)
- Assemblability (efficient design measures to be taken against assembly defects)
- Measurability (examination together with measurement technicians)
- Availability/ability to procure working materials
- Target price (regular determination of calculated production costs)

expected process spreads and impact on product functions, etc.

## 6.3 Technical calculation

If the supplier is design responsible, it is necessary to the suppliers process, or otherwise specified, the supplier must prove by calculation that the product fulfils the requirements defined (resistance, reliability, safety and operability, etc.). This can be done by means of CAD kinetic modeling, by service life analyses, deformation calculation, etc.

# 7 Prototype construction

## 7.1 Technology, processes, sub-suppliers


- The same technology, process and sub-suppliers should be used for prototype construction as for serial production. Differences from planned serial production must be documented. The documentation must be the same as is required for serial production (control plan, process flow, FMEA, working material reports, etc.).

## 7.2 Documentation of prototypes, prototype tests

Prototypes and Off-Tool-Samples (OTS) assemblies and aggregates to be tested must be documented in an appropriate manner (materials, dimensions, function, visual, mount ability, torques, etc.) over their entire production procedure (manufacture of components, assembly). Special LG Magna requirements are subject to a special agreement. Any re-work, repairs etc. of these prototype parts and aggregates have to be documented. The scope of documentation must be agreed between the supplier and LG Magna. The supplier shall fulfill the LG Magna organization instruction for all pre-production samples.

## 7.3 Test methods and procedures

Test methods and procedures (measuring base, reference points, documentation, analysis, etc.) are agreed between the supplier and LG Magna on time or according to the master timing schedule

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#### 7.4 Delivery of prototype

Questions regarding delivery of prototypes (e.g. packaging) are agreed separately between the supplier and the responsible LG Magna divisions.

## 8 Product trial

### 8.1 Test programs

Material requirements regarding the test program, i.e. test loads or complexity of loads acting on components, load cycles, reliability of conclusions, number of prototypes, etc., are agreed separately. The supplier must document product requirements (operation, durability, reliability).

### 8.2 Analysis of trials

The way in which test results are analyzed and reported at the supplier's premises (form and content of test reports, etc.) will be agreed separately with LG Magna.

### 8.3 Robustness test

The robustness of the product must also be determined in the course of the framework of testing, in order to detect manufacturing variations. In this context, it can be necessary to maintain actual characteristics of some prototypes deliberately outside the nominal values, and even in the threshold range or outside the limits of tolerance.

### 8.4 Verification of development


The supplier must verify the development (according to ISO 9001, TS16949). The goal is to prove that the product development complies with the requirements defined. The way and manner of carrying out and documenting the development verification must be agreed with LG Magna. The design verification must be documented in a design verification plan and report (DVP&R, Design Verification Plan and Report) and released by LG Magna.

## 9 Procurement by supplier

### 9.1 Sub supplier management

LG Magna requires that its suppliers exercise their procurement activities with care. This shall apply in particular to the following points:

- Control of procurement documents regarding their unambiguousness and completeness
- Definition and follow-up of the special product and process characteristics (see item 2.3)
- Marking and traceability
- Sampling of subcontracted supplier components
- Supplier selection
- Monitoring of subcontractors
- Support and encouragement of subcontractors

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- Continuous improvement of subcontractors
- Evidence that products procured comply with requirements
- One re-qualification examination according to ISO/TS 16949 8.2.4.1 per year. The Supplier is obliged to present a proposal in this regard during the project phase.

LG Magna preference is to have sub-tier supplier certified to ISO/TS16949:2009 or minimum ISO 9001:2008. In this case the supplier is ISO 9001:2008 certified only, the supplier is responsible to determine any deviations from TS 16949 and the LG Magna sub-tier supplier's quality system. Robust counter measures must be in place for any deviations from TS 16949 to source an LG Magna sub-tier supplier without TS 16949 certification.

## 9.2 Communication of requirements to subcontractors

The supplier is obliged to communicate the quality and environmental management requirements as well as contract-specific requirements of LG Magna and any additional LG Magna customer requirements to his subcontractors and to ensure their commitment and conformance to fulfill these requirements.

## 9.3 Replacement of subcontractors

If the supplier plans the replacement of a subcontractor, he must inform the center indicated on the LG Magna delivery call in writing. After a common appraisal of the framework conditions, the measures required by LG Magna must be planned and implemented (see also TS16949 PPAP, VDA 2). A new product and process release procedure must at all events be carried out. The replacement of the supplier can only be implemented if LG Magna has submitted the release. In the event of sourcing multiple suppliers, all suppliers must be disclosed and shall be subject to sampling

# 10 Preparation of production and serial production


## 10.1 Process flow charts

The supplier must represent his production processes from the reception of goods up to dispatching in process flow charts. These process flow charts must show in an unambiguous and clear manner the different process steps, as well as the interfaces with his subcontractors and with LG Magna.

The supplier must update his process flow charts continuously during the entire term of the project. The History of Changes (scope of change) must also be updated and adjusted continuously.

## 10.2 Critical processes and technologies

The supplier must clearly identify critical processes and technologies in his production. For these items the supplier must take appropriate measures, in order to achieve the process capability required, as well as appropriate avoidance measures (detail planning, process analyses, identification and definition of special measures for the process, and of important process parameters, process release for serial production, process monitoring and control, urgent measures to be taken in the event of deviations, etc.). Additionally, if these critical process and technologies are within the processes of sub-tier suppliers (tier 2, 3, 4, etc...) then the requirements must be rolled out to the respective sub-tier supplier.

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### 10.3 Process FMEA

The supplier must analyze his production processes on time or according the master timing schedule, and hence carry out process FMEA.

In a process FMEA, the special product characteristics must be analyzed for conformance to the minimum requirements. The FMEA procedure will be agreed between the supplier and LG Magna. LG Magna expects a short traceable presentation of the FMEA results from the supplier. Basic requirements for a process FMEA:

- Definition of special product characteristics
- Identification and addition of pass through characteristics
- Definition of critical processes
- Detail analysis of manufacturability on the basis of single part drawings
- Definition of technologies, lay-out, process flow chart, clamping situations, machining reference surfaces, etc.
- Process control concepts, workflow and control plans, concepts for equipment and machines, information from similar processes
- machine capability values, process capabilities, etc. as already known
- specific product characteristics must be documented in PFMEAs

The FMEA must be submitted to LG Magna upon request. Please use the AIAG FMEA or VDA 4 manual as a reference guide unless instructed otherwise by the LG Magna divisions

### 10.4 Process analyses and process capability analyses, process capabilities required:

In order to achieve and prove a stable and/or capable process, process analyses and process capability surveys have to be carried out. It is the responsibility of the supplier to prove the noted capability to LG Magna's satisfaction. This applies in particular to specific product and process characteristics.

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#### Minimum process capabilities required: preliminary capability long-term process.

Type of characteristics:	capability Pp & Ppk	capability Cp & Cpk
<CC> (safety, official requirements)	1.67	1.33
<FC> (function)	1.67	1.33
<DR> (process)	1.33	1.00
<CIC> (Customer interface)	1.67	1.33

Special Customer requirements are communicated separately.

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As for attributive characteristics, requirements of the capability analyses must be met 100%. Appropriate measures must be provided in coordination with LG Magna for processes which demonstrably lack stability and capability to ensure that requirements are met (e.g. safeguarding by 100% control [marking as a special product characteristic with <CC> or <FC> or <DR>])

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### 10.5 Monitoring of products and processes, process control

Manufacturing process control must include a continuous monitoring of product characteristics and of parameters influencing the process. For this purpose statistical process control (SPC) methods must be applied if it is possible and useful. Process parameters and product characteristics subject to regulations must be documented in control plans (see ISO/TS16949:2000 appendix A).

The supplier will implement a Safe Launch Process as identified during APQP and verified by the Run at Rate to insure a flawless launch.

LG Magna requests proof of continuous stability and process capability during serial production as far as safety features and special product characteristics (marked with <CC> or <FC> or <DR> are concerned.

Annual requalification according to ISO/TS 16949 must be done and is subject to verification by LG Magna.

### 10.6 Tests

The supplier must turn his attention to achieving and proving capable processes, because ppm requirements (ppm = parts per million) can usually not be secured by tests in an economical manner.

For all production steps, the supplier must provide and carry out appropriate tests, unless he can prove that such tests are not necessary (e.g. because the minimum process capability required is proven in a continuous manner). Special product characteristics must be particularly considered upon test planning and must be monitored continuously in serial production. The tests planned must be documented in control plans (AIAG/APQP) manuals. The general goal, must be to reduce tests to a minimum as a result of capable processes. Tests should only be used for evidence and documentation purposes, and to show that requirements are met and not for the detection of deviations.

The supplier must agree on test procedures and methods (measuring base, reference points, test equipment, documentation, analysis, urgent measures in the event of deviations, etc.) with LG Magna on time or according the master timing schedule.

### 10.7 Capability of test equipment and test systems


The supplier ensures and documents the capability, functionality & appropriateness of the test and measuring systems. The supplier must use the methods of the automotive industry, such as defined in the MSA AIAG Manual, VDA 5 and other applicable customer standards.

The following minimum requirements shall apply to measuring systems:

- Capability characteristics  $C_p$  &  $C_{pk}$  each  $\geq 1,33$
- Reproducibility & repeatability (R&R) < 10% of the tolerance to be measured
- The capability analysis procedure is defined by the AIAG MSA Manual.

The signal detection procedure according to MSA is acceptable for the capability analysis of gauges. The aim is an uncertainty range of a maximum of 10% of the tolerance.



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### 10.8 Maintenance

The supplier shall ensure that the equipment and plant remain operative and capable through a preventive maintenance program. In the event of unpredictable failures, LG Magna must be notified immediately, and an action plan for ensuring the deliveries must be submitted.

### 10.9 Changes in the production process

Changes in the production processes, lay-out or as specified in the AIAG PPAP manual or VDA 2 as applicable at the supplier which can cause changes of the product characteristics (regarding its geometry, mechanical characteristics, resistance, service life, machine ability, etc., or machines, manufacturing processes), must be communicated to LG Magna before they are implemented. The actions requested by LG Magna (e.g. carrying-out of one of the activities described in chapter 2.5, safeguarding by tests or similar) must be planned and carried out by the supplier after a joint agreement of conditions, (see also AIAG PPAP manual and/or VDA 2, or last sentence of item 2.5 ). All changes must be initiated in sufficient time, in order to carry out a PPAP or PPF and build up a buffer, if necessary. This includes changes at sub-suppliers.

### 10.10 Safeguarding of production and supply capability

The supplier defines appropriate measures for safeguarding 100% of his production and supply capability according to the contractual volume. This comprises also the safety stocks, capacities and capacity reserves.

### 10.11 Changes in product specifications


Changes of the product or its specifications (drawings, inter alia) must not be implemented by the supplier unless approved in writing by LG Magna. The supplier can apply for technical changes to be carried out with the LG Magna procurement division.

### 10.12 Deviation approval

The supplier's deliveries must comply with the drawings and specifications. Should he not be able to fulfill this requirement for a temporary period of time because of deviations, he can submit to LG Magna a written request for a deviation approval. Deviations can only be approved, if safety, operability, durability, machinability and mount-ability of the parts are not affected. Deviation approvals by LG Magna are only valid in writing, and are limited to a certain number of parts or a certain delivery time.

In order to process the deviation request as fast as possible, the following information must be indicated on the deviation application:

- Description of the deviation;
- Cause of deviation (enclose drawing detail, or material analyses in the event of a change of material);
- Duration of deviation approval (period of time and/or range of progressive delivery number from LAB);
- Essential data: number of parts measured, max. excesses, estimated distribution;
- Operability / endurance test, if any;
- Indication of reference products with equal function and load

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- Safety measures & control steps planned, in order to avoid any further-reaching non-compliance with the specifications than the deviation for which a request has been submitted;
- Measures planned or implemented, for excluding the same deviation in the future (including cause analysis)
- Documentation of further conditions indicated in the deviation approval released by LG Magna, if any. Since any approval of a deviation request is exclusively for the benefit of the supplier (avoidance of scrap and or failure costs), LG Magna reserves the right to reduce the amount invoiced by 15%, in order to cover in-house LG Magna administration work.
- 8D Report

The approval of a deviation by LG Magna explicitly does not mean that the supplier is no longer bound by the quality and warranty requirements, as specified in the Purchase Order terms and conditions. Goods delivered must be indicated separately on the delivery slip and on the package; the request for the deviation approval and the number of the deviation approval must be indicated.

## 11 Sales and dispatching logistics

The supplier defines a concept (including the logistics procedures requested by LG Magna, such as delivery frequency, packing, etc.) for his distribution logistics. This concept must be agreed with LG Magna and be adapted by the supplier according to the progress of the project. The logistics concept must be analyzed systematically in order to detect potential risks (e.g. with a logistics FMEA).

The supplier ensures 100% fulfillment of his delivery commitment.


Supplier should discuss the packing conditions with LG Magna in advance. Unless otherwise agreed with LG Magna, parts must be delivered dry and preserved to prevent rust and damage (VCI materials, if necessary). Every change of the surface (e.g. strong corrosion-inhibiting additives to detergents) must be agreed with LG Magna before implementation.

## 12 Complaint management

Complaints by LG Magna to the supplier are usually forwarded via Internet (Non Conformance Report: NCR, or other supplier quality management system) and by an automatically generated information e-mail. The supplier documents his problem solution and actions on the system. Check with the LG Magna plant that you supply product to for specifics concerning complaint management.

The supplier must initiate immediate containment actions at their facility, the LG Magna Facility, the customer, and any third party warehouse if necessary. LG Magna reserves the right to request the sorting of the defected part in order to avoid a production line stop. The Supplier should implement the sorting in order to continue production. If the supplier cannot implement the sorting immediately, they can choose a 3rd party according to LG Magna's requirements. (see Section 2.2)

The supplier at the request of the Division may be placed on Controlled Shipping 1 (CS1), a redundant inspection of features determined by LG Magna to be non-conforming, critical, major disruption, or the supplier lacks sufficient controls to provide quality product.

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The supplier at the request of the Division may be placed on Control Shipping 2 (CS2), a redundant inspection by a third party approved by LG Magna will be initiated for a breach of CS1 or Safe Launch, repeated non-conformance, major disruption, or the supplier lacks sufficient controls to provide quality product.

These activities are to be managed by the supplier and reported on a First Time Quality Trend Chart (Defect Pareto by day or I-Chart) daily. The inspection needs to have work instructions, process flow, control plan, and visual aids approved by LG Magna. Exit criteria shall be no non-conforming parts for 60 days or other period defined by the Division. If the supplier is unable to demonstrate a stable and capable process within 60 days, the inspection will become part of the process and Re-PPAP, All cost associated with these activities are the responsibility of the supplier.

The supplier is obliged to stay informed in the NCR, or other system, about the quality status (number of complaint reports, evolution of ppm values) and to introduce actions, in order to comply with the zero defect requirement (see chapter 2.2).


The supplier must grant LG Magna access at any time necessary to manage any issue for quality, short shipment, or any other issue deemed necessary by LG Magna. The supplier will also provide support as required, management support as required, and hourly reports upon request. The supplier must also assure that LG Magna has the same access to the sub-tier suppliers.

Each complaint causes administrative costs to LG Magna (see box below), which LG Magna invoices to its suppliers in the form of a flat rate as determined by the LG Magna plant effected per complaint. Any other costs (e.g. re-work, sorting, testing, measuring, etc.) will be invoiced separately to the suppliers according to LG Magna's terms.

NOTE: Some LG Magna divisions may only complete one invoice for "all costs" associated with a complaint. It is our goal that the supplier repairs their defects themselves. If the supplier is unable to repair them, a re-work company approved by LG Magna may be assigned to repair the defect according to LG Magna terms.

### 13 Escalation steps and classification of "special suppliers"

<i>Level</i>	<i>Definition</i>	<i>Possible Actions</i>	<i>Supplier Actions</i>	<i>Responsible</i>	<i>Support</i>
Level - 0	Normal (Day-to-Day)		8-D Submitted on time and of acceptable quality	Plant	LG Magna - SQD Informed
Level - 1	Immediate Corrective action not effective		Controlled Shipping Level 1 is initiated.	Plant	LG Magna - SQD  Support (Validate corrective actions at

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					supplier location if required)
Level - 2	Supplier is <u>unable</u> to remedy the problem	This could trigger the STA (Supplier-Turn-Around) Process. Usually triggered by the number of NCR's or the severity of concerns	Controlled Shipping Level 2 is initiated	LG Magna – SQD & Purchasing	Plant - Informed
Level - 3	Supplier is unwilling to solve problem, or has no resources	New Business Hold/Resourcing		LG Magna – SQD & Purchasing	Plant - Informed

## 14 Revision Records

Ver	Date	Author	Description of Change
1.0	2021-10-20	JS. Lee	Initial release
1.1	2022-01-21	JS. Lee	Modify LGMagna process and change team name
1.2	2022-04-14	JS. Lee	Update complaint management
1.3	2023-06-01	Michelle Lee (Risk Management 실 이승연 책임)	Update contracting party to include affiliates. Add definition of affiliates
1.4	2023-12-21	JS. Lee	Update Section 12 complaint management requirement (immediate sorting of defected parts)
1.5	2024-11-18	JS. Lee	Remove GQS requirements Add CIC (Customer Interface Characteristic) requirement