



# General Supplier Guideline March 2024

Management. Classification.  
Development. Requirements.



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# Introduction

*MAHLE is a leading international development partner and supplier to the automotive industry with customers in both passenger car and commercial vehicle sectors. Founded in 1920, the technology group is working on the climate-neutral mobility of tomorrow, with a focus on the strategic areas of electrification and thermal management as well as further technology fields to reduce CO<sub>2</sub> emissions, such as fuel cells or highly efficient combustion engines that also run on hydrogen or synthetic fuels. Today, one in every two vehicles globally is equipped with MAHLE components.*

Worldwide competition, changing customer expectations, and product requirements necessitate the continuous improvement of all products, processes, and corporate procedures. The quality and position of our products in the world market are also directly affected by the quality of our suppliers' products. Increasing customer requirements and highly dynamic global markets require a high degree of responsiveness, flexibility, and global orientation from us and our suppliers. The continuous improvement of products and processes as well as the sustained preservation of quality and costs affects the entire procurement network, in which you as a supplier are pivotal to MAHLE's success. These guidelines are intended to outline the

expectations, requirements, prerequisites, methods, and implementation examples necessary to achieve our common objectives. These guidelines are generally binding for all products and services provided by a supplier to MAHLE. Where exceptions from this guideline are accepted (e.g. certain machinery, tools, services & non-production material), it will be communicated separately through our organization upon request. Further guidelines may remain on regional/plant level.

**Michael Sohn**  
**Vice President Corporate Purchasing**  
**MAHLE Group**



# Requirements and benefits

*Our requirements placed on you as a MAHLE supplier or a provider interested in future collaboration, as outlined below, are an important pillar for an efficient and successful business relationship. Your fundamental willingness to accept the obligations is a prerequisite for our mutual business relations.*

**From you as a supplier we expect dedication to accept and implement the following requirements:**

- **Zero defect quality:** suppliers need to commit to zero defect quality targets
- **Cost performance:** year over year savings above market level
- **Logistic excellence:** fulfillment of MAHLE's logistic requirements
- **Drive innovation:** proactively initiate VAVE activities as a contribution to MAHLE's technological advancement
- **Global capability:** support of our global activities as and where required
- **Corporate social responsibility:** adherence to the MAHLE supplier code of conduct
- **Sustainability:** constantly improving the carbon footprint of the company and products

**We see you as a creative and innovative partner on the procurement market, who supports us with your experience in the expansion of our position as technology leaders. The benefits are as follows:**

- Easier access to additional business segments as a qualified MAHLE supplier
- Participation in the innovation and creativity potential of the MAHLE Group
- Potential sales and market share growth
- Integration in international development projects and access to new markets
- MAHLE as a reference in your customer list



The materials and products we procure from our suppliers have a crucial impact on the quality of our products. The extremely high requirements in the automotive industry challenge us and our suppliers to achieve excellence every day. **We accept this challenge.**

# Overview

## The main steps of the MAHLE Supplier Management System

During the supplier selection process, potential suppliers stand out by meeting our requirements for specifications, innovation, quality, and cost. Partnership and trust form the basis of our collaboration with suppliers. After being nominated, our suppliers assume responsibility to achieve challenging objectives. Crucial requirements include the production and delivery capabilities as well as the fulfillment of our quality expectations, starting on the first day of production all the way to the end of the product life cycle. A large portion of the purchased parts and the corresponding

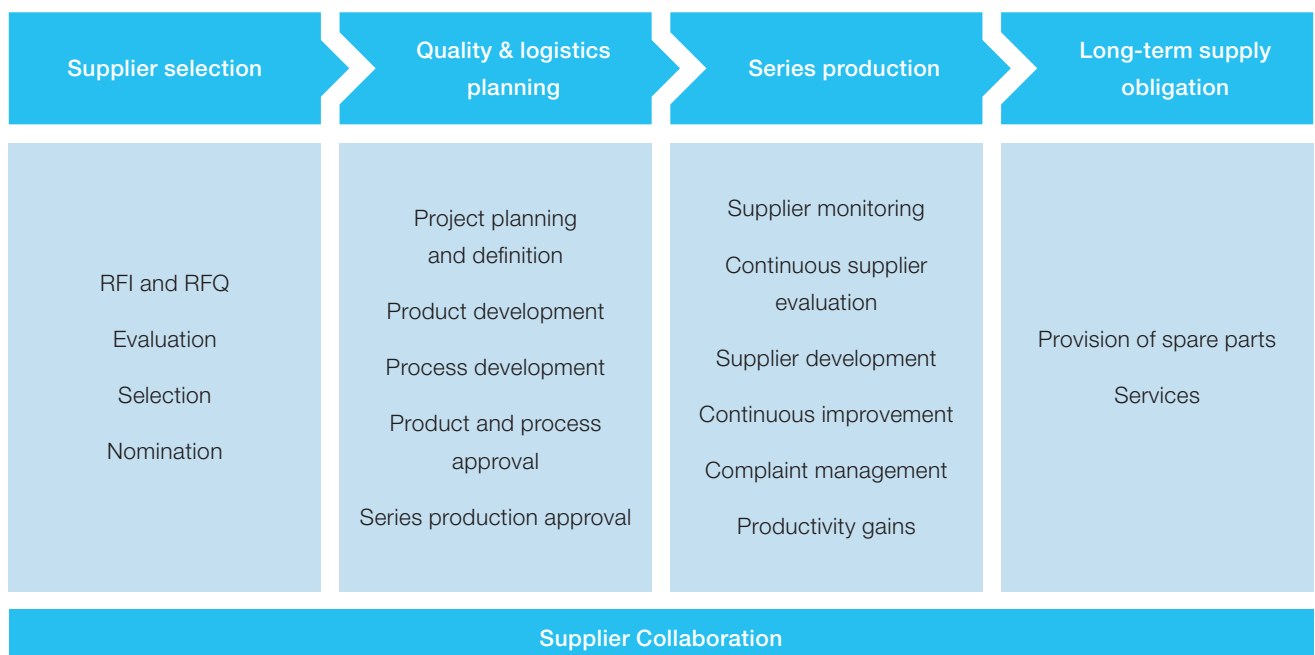
production processes are developed by our suppliers. This underlines the importance of and our high demands on development and procurement partners worldwide when it comes to the design of MAHLE products.

Throughout the product and process development and series production stages, all conceivable risks must be identified and minimized as early as possible. Our direct suppliers must assume responsibility for the entire supply chain of the ordered parts – starting from their initial interaction with the MAHLE Group to their own suppliers and beyond – which is evaluated during the risk assessment process.

Our suppliers must demonstrate their ability to manufacture and supply production parts that meet all relevant re-

quirements during the approval process. They must also demonstrate stable production and delivery processes and production tools at the agreed cost prior to the commencement of series production. The responsibility for performing all necessary steps lies with the supplier.

Suppliers must clearly identify and resolve any problems that occur during the product and process development or series production as effectively as possible. A defined escalation procedure will result in the efficient use of resources in the problem-solving process. The problem shall be addressed based on open communication, trust, and a functional partnership. The supplier will be responsible for the problem-solving process, while including the MAHLE Group where necessary.



# Supplier Portal

*To simplify and standardize communication processes between suppliers and MAHLE, we are rolling out the MAHLE supplier portal – a browser-based online solution that offers global, 24/7 accessibility, and is free of charge for suppliers.*



## **The following functions are available depending on the level of implementation:**

- Maintenance of supplier master data (e.g., contact persons)
- An automated request for quotation (RFQ) process that gives the supplier all information needed to quote properly
- Support of the advanced product quality planning (APQP) process or product part approval process (PPAP) during new product launches
- Feedback and complaints from suppliers on quality (8D reports)
- Access to supplier quality and logistics scorecards at any time

In order to prevent cross-media communication and accelerate quotation processes, it is mandatory for our suppliers to quote via the MAHLE supplier portal where available.

The MAHLE supplier portal consequently gives MAHLE the opportunity to create transparency worldwide and also creates new opportunities for our suppliers as a result.

Suppliers can find the login to the MAHLE supplier portal on **[www.mahle.com](http://www.mahle.com)**.

# Supplier Management

## Quality Management System

The supplier agrees to maintain a certified, process-oriented quality management system (QMS). The minimum requirement for this system is the latest version of DIN EN ISO 9001

plus fulfillment of „Minimum Automotive Quality Management System Requirements for Sub-Tier Suppliers“ (MAQMSR) or equivalent, with the ultimate objective of becoming certified to IATF 16949.

## Selection/assessment classification

New suppliers are evaluated by means of standardized selection processes to determine whether they are able to contribute to MAHLE's future success. Technical, economical, quality, and logistic aspects are assessed. After their initial registration – where available – via the MAHLE supplier portal new suppliers are asked to provide information about their company and conduct an initial quality self-assessment. Furthermore, suppliers shall upload or

submit their quality audit certificates to vouch for the eligibility of their provision of automotive parts. Afterwards, a physical audit is conducted at the supplier's site. Once the supplier has successfully passed the quality audit and accepted MAHLE's standard contracts, the supplier can be nominated for future business. This process is usually managed by the responsible buyer of the relevant material group.

## Supplier Evaluation

The suppliers of the MAHLE Group play a significant role in achieving our goal of zero-defect deliveries. Pursuing this target, supplier evaluation is an important element used to measure our supplier's performance, impacting also future sourcing decisions. We aim for close collaboration with our suppliers, building on best-in-class delivery per-

formance. The overall delivery performance is assessed on a monthly basis against the criteria of logistics and quality, influencing the supplier classification. If MAHLE's expectations regarding the aforementioned criteria are not fulfilled by the supplier, the supplier must implement measures to fulfill the MAHLE expectations.

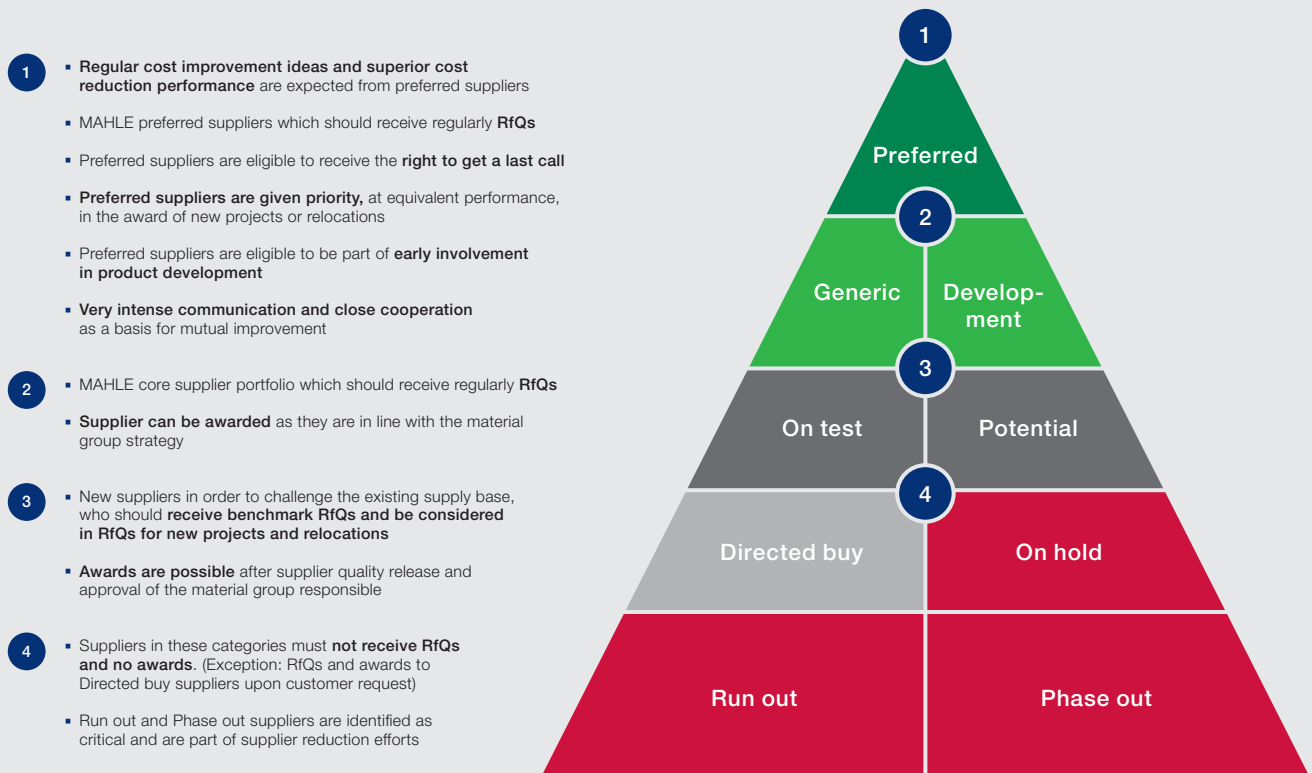


# Supplier Classification

*MAHLE classifies its suppliers into nine categories according to purchasing, quality, logistics, and technological performance, as well as general supplier strategies.*

## The following supplier classifications are used:

- **Quality**
  - **not satisfying**
  - **satisfying**
- **Purchasing**
  - **Preferred:** strategic supplier – offer complete transparency about costs and emissions
  - **Generic:** regular supplier – series supplier with good performance level
  - **Development:** regular supplier – supplying with good performance level and a development capability acc. to functional specifications
- **Potential:** new supplier – need to prove their capabilities
- **On test:** new suppliers who have passed or started the approval process
- **Directed Buy:** supplier set by a MAHLE customer
- **On hold:** regular supplier – currently not eligible for contract awarding
- **Run out:** supplier with poor performance – no future contract awarding
- **Phase out:** supplier with poor performance – short term de-source due to insufficient performance



# Supplier Development

Suppliers are eligible for two types of supplier development according to MAHLE's current need. Specialists from MAHLE with worldwide workshop experience provide technical and commercial expertise to facilitate supplier improvement in all areas. Suggestions to supplier self-improvement are always welcome at MAHLE.

Process value analysis (PVA) and value analysis/value engineering (VAVE) activities focus on base-cost and emission reduction and cost and emission improvement potential along the supplier's

entire supply chain. **Long-term partnerships are built around joint problem-solving and enhanced competitiveness.**

The MAHLE Supplier Improvement Program (MSIP) is the second form of supplier development focused on quality issues that MAHLE offers. Process-oriented analysis by MAHLE specialists, combined with implementing supplier suggestions concerning parts design, **aim to optimize the supplier's and MAHLE's overall product quality and production processes.**



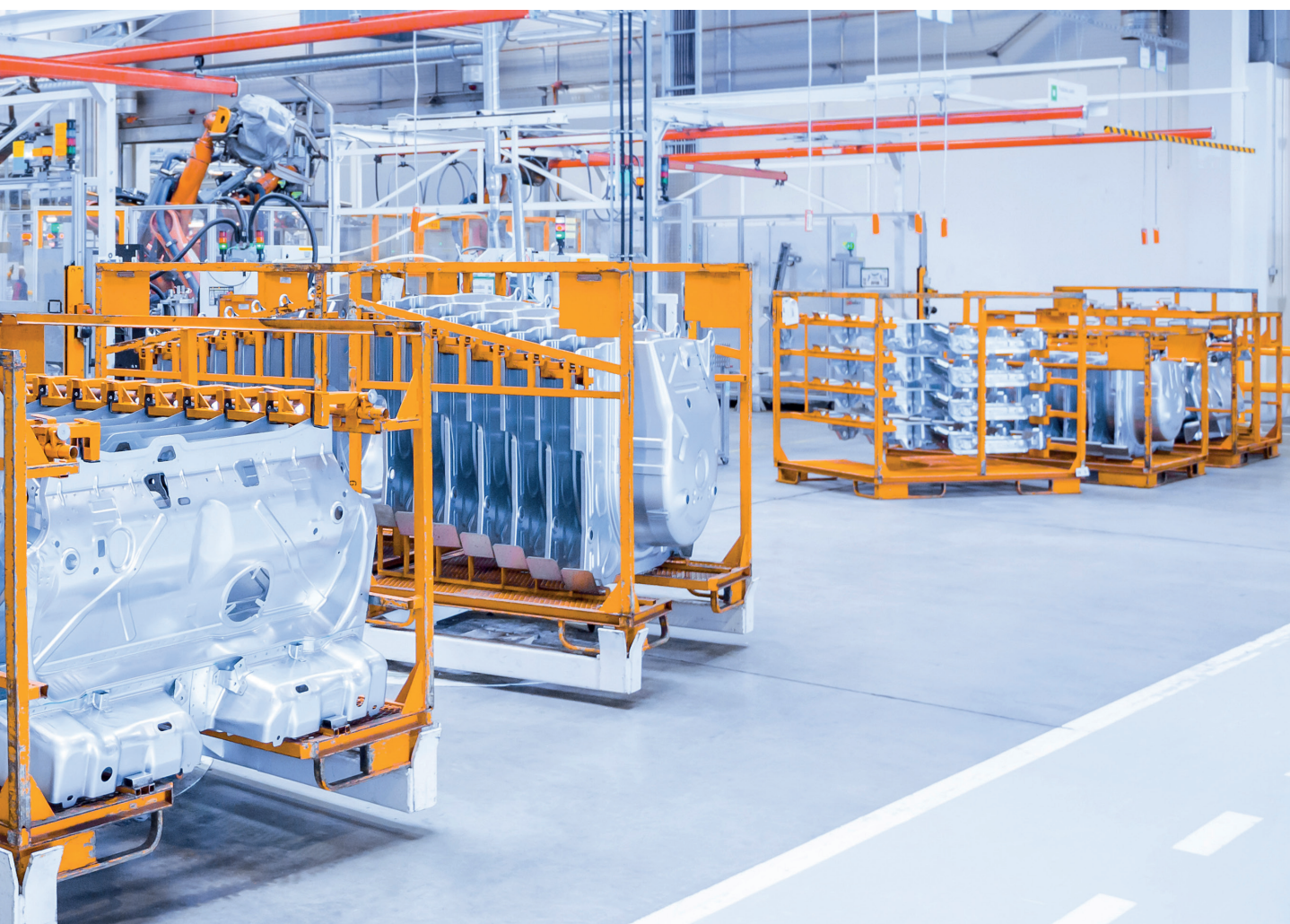
# Logistics

Flexible and reliable delivery concepts have become critical for efficient production performance in all lines of business, but especially in the automotive industry. Suppliers must ensure availability of specific volumes of stock at predefined times and locations. MAHLE requires suppliers to accept innovative delivery concepts from their respective suppliers. Meeting the zero defect requirement and delivery deadlines, as well as taking responsibility from day one of production until the end of the product life cycle, should be self-evident.

MAHLE uses tools like EDI, WebEDI, ASNs, labeling, and Supplier Kanban to track deliveries in order to synchronize pro-

cesses and minimize inventory, and expects the same from suppliers. Globally synchronized cooperation and communication with suppliers is important to achieve our goals from an economic, production, quality, and ecological point of view. Alongside innovative delivery concepts MAHLE suppliers must be able to perform classic concepts like consignment stock, JIT/JIS, and Kanban.

**Further detailed information regarding delivery standards can be reviewed in the Logistics Policy provided on the MAHLE website [www.mahle.com](http://www.mahle.com).**



# Supplier Code of Conduct

*As a global player, MAHLE is fully aware of its legal and social responsibility. To ensure compliance with legal requirements within the MAHLE Group, we have developed a global compliance structure.*

MAHLE's approach to doing business reflects its continuous pursuit of excellence. Employees as well as interacting external parties are held to the same high standards compliant with prohibition of corruption and bribery, fair competition, social responsibility and principles of law. It is imperative to prevent false behavior and every employee is expected to uphold the company's public reputation. Compliance with national and international antitrust legislation as well as anti-corruption legislation is a fundamental principle of our business at all levels of the company. Moreover, all suppliers shall respect the laws in effect and any other applicable provisions. This includes, for example, following compliance issues:

#### **Respect for internationally recognized human rights**

Any form of forced or illegal underage labor, slavery or human trafficking is prohibited, not to be practiced and is not tolerated at businesses supplying MAHLE. Fair and healthy working conditions as well as adherence to principles of diversity, anti-harassment and freedom of association have to be ensured.

#### **Export control and sanctions law**

National and international laws and regulations regulate import, export, trading or financing transactions, the provision of services and the transfer of goods (goods, software and technology).

MAHLE requires its suppliers to use appropriate processes to ensure that transactions and activities with third parties as well as with the MAHLE Group do not violate export control and sanctions law. Any necessary evidence and information is to be provided immediately if required.

#### **Antitrust law**

MAHLE and all its suppliers will conduct their business in line with fair competition and in accordance with all applicable antitrust laws.

To clarify the specific compliance expectations towards suppliers, a Supplier Code of Conduct has been developed and published on the MAHLE website. All suppliers have to comply with this Supplier Code of Conduct.

# MAHLE Supplier Requirements

## General Requirements

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Capability to comply with automotive standards</b>	<ul style="list-style-type: none"> <li>Familiarity with and use of distinct specifications and production methods relating to the automotive industry</li> </ul>	<ul style="list-style-type: none"> <li>List of references</li> </ul>
<b>Supplier Code of Conduct</b>	<ul style="list-style-type: none"> <li>Acceptance of MAHLE's Supplier Code of Conduct available on the MAHLE website</li> </ul>	<ul style="list-style-type: none"> <li>Supplier Code of Conduct</li> </ul>
<b>Global presence</b>	<ul style="list-style-type: none"> <li>Global availability to support MAHLE as a worldwide manufacturer</li> <li>Global market presence</li> <li>Capable of supplying all international MAHLE locations</li> </ul>	<ul style="list-style-type: none"> <li>International support as key account</li> <li>Global delivery capability</li> <li>Balanced best-cost country share</li> </ul>
<b>Project implementation</b>	<ul style="list-style-type: none"> <li>Availability of appropriate resources/contact persons to meet MAHLE's expectations</li> <li>Establishment and implementation of a project management system</li> </ul>	<ul style="list-style-type: none"> <li>Project organization</li> <li>Milestone planning</li> <li>Quality gates</li> </ul>
<b>Development planning</b>	<ul style="list-style-type: none"> <li>Definition of the development objectives, development planning, development testing and evaluation, development release</li> </ul>	<ul style="list-style-type: none"> <li>Development objectives</li> <li>Development plan</li> <li>Specifications</li> <li>Specification sheet</li> <li>Product data</li> <li>Testing and validation</li> <li>Functional Analysis</li> </ul>
<b>Manufacturing concept</b>	<ul style="list-style-type: none"> <li>Design of a concept that ensures that the supplier can meet MAHLE's planned quality and quantity requirements during series production</li> </ul>	<ul style="list-style-type: none"> <li>Process flow chart</li> <li>Process layout</li> <li>Capacity planning for pre-series and series production</li> </ul>
<b>Traceability</b>	<ul style="list-style-type: none"> <li>Assurance of complete and comprehensive traceability of all products from the end user to your subcontractors</li> </ul>	<ul style="list-style-type: none"> <li>Batch documentation</li> <li>Batch separation</li> <li>Product and container identification</li> <li>Compliance with FIFO principle</li> <li>Shipping documents</li> </ul>

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Production planning and control</b>	<ul style="list-style-type: none"> <li>▪ Translation of the MAHLE requirements into production orders, capacity planning, order control</li> <li>▪ Provision of suitable and capable production tools to safeguard controlled production</li> <li>▪ Provision of all necessary instructions</li> <li>▪ Unless individual arrangements apply, the minimum requirement of MAHLE is that the released quantities can be changed as follows:               <ul style="list-style-type: none"> <li>▪ Planned quantities can be modified by <math>\pm 30\%</math> up to four weeks prior to the delivery date</li> <li>▪ Planned quantities can be modified by <math>\pm 20\%</math> up to three weeks prior to the delivery date</li> <li>▪ Planned quantities can be modified by <math>\pm 10\%</math> up to two weeks prior to the delivery date</li> <li>▪ Planned quantities can be modified by <math>\pm 5\%</math> up to one week prior to the delivery date</li> <li>▪ Planned quantities are fixed the week before the delivery date</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Emergency management</li> <li>▪ Capable manufacturing processes</li> <li>▪ Further processing of the supply orders without systems breakdowns</li> <li>▪ Application of PPS/ERP systems</li> </ul>
<b>Logistics</b>	<ul style="list-style-type: none"> <li>▪ Acceptance and implementation of innovative delivery concepts</li> <li>▪ Correct and compliant handling, storage, and transportation of products</li> <li>▪ Adherence to delivery date and quantity targets</li> <li>▪ Ongoing inspection and realignment of logistics processes and their continuous improvement with the participation of subcontractors</li> <li>▪ Compliance with MAHLE shipping and packaging instructions</li> <li>▪ Adherence to the identification instructions</li> <li>▪ Observation of the manufacturing dates and expiration dates</li> <li>▪ Use of qualified transport services providers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Consignment stock</li> <li>▪ JIT/JIS</li> <li>▪ Kanban</li> <li>▪ Adherence to storage and transportation instructions</li> <li>▪ 100% compliance with delivery and quantity terms</li> <li>▪ Application of FIFO principle</li> <li>▪ Selection of packaging based on qualitative, economic, and ecological criteria</li> <li>▪ Labeling according to the agreed EDI standard</li> <li>▪ ASNs according to the MAHLE standard</li> </ul>
<b>Provision of spare parts</b>	<ul style="list-style-type: none"> <li>▪ Guarantee the provision of spare parts for the stipulated lifetime of the end products for which the products are to be used               <ul style="list-style-type: none"> <li>▪ Minimum period: 15 years after the end of the series production of the products</li> </ul> </li> <li>▪ Granting MAHLE the option to place a concluding all-time order in good time before the expiry of the minimum period</li> </ul>	<ul style="list-style-type: none"> <li>▪ Terms &amp; Conditions</li> <li>▪ Confirmation on project level</li> </ul>

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Inspection certificates</b>	<ul style="list-style-type: none"> <li>▪ Guarantee of batch traceability</li> <li>▪ Assurance of compliance with required material specifications and required delivery quality</li> </ul>	<ul style="list-style-type: none"> <li>▪ Acceptance certificate according to DIN EN 10204 for commodities and materials</li> </ul>
<b>Qualified employees</b>	<ul style="list-style-type: none"> <li>▪ Informed and qualified employees</li> <li>▪ Prompt implementation of qualification activities on the basis of a systematically determined qualification need</li> <li>▪ On-the-job training</li> <li>▪ Promotion and determination of quality awareness</li> </ul>	<ul style="list-style-type: none"> <li>▪ Qualification matrix</li> <li>▪ Qualification verification</li> <li>▪ Verification of introduction and training</li> <li>▪ Layered audits</li> <li>▪ Proxy regulations</li> </ul>
<b>Contingency planning</b>	<ul style="list-style-type: none"> <li>▪ Protection processes or emergency preparedness for installations, equipment, safety buffers, and EDP</li> <li>▪ 100% guarantee of MAHLE supply</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contingency plan</li> <li>▪ Hotline</li> <li>▪ Contact persons</li> <li>▪ Service and maintenance agreements</li> <li>▪ Flow charts listing responsible parties</li> </ul>
<b>Communication and data exchange</b>	<ul style="list-style-type: none"> <li>▪ Close collaboration in the development phase</li> <li>▪ Compatibility of data exchange</li> <li>▪ Processing of native data and EDI/WebEDI</li> <li>▪ Willingness to actively collaborate on innovative development projects</li> <li>▪ Protection of the confidentially transmitted information</li> </ul>	<ul style="list-style-type: none"> <li>▪ Resident engineer for joint development projects</li> <li>▪ IT-supported exchange of information (e.g., remote data transmission/EDI)</li> <li>▪ Processing of native CAD data among others, such as CATIA V4, CATIA V5, ProEngineer 2001</li> <li>▪ Processing of standard VDA formats (e.g., 4905, 4915 or EDIFACT, ANSI)</li> </ul>
<b>IT security</b>	<ul style="list-style-type: none"> <li>▪ Established IT security and data privacy concept</li> <li>▪ Compliance with IT regulations and international IT standards</li> </ul>	<ul style="list-style-type: none"> <li>▪ Proof of IT security and data privacy concept</li> </ul>
<b>Information Security Management System (ISMS)</b>	<ul style="list-style-type: none"> <li>▪ Effective implementation and maintenance of Information Security Management System (ISMS)</li> <li>▪ Compliance with TISAX automotive standard (current valid version)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Proof of Information Security Management System (ISMS) model</li> <li>▪ Valid TISAX Label for development suppliers</li> </ul>

## Purchasing-related Requirements

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Procurement and supplier management</b>	<ul style="list-style-type: none"> <li>Systematic selection and evaluation of subcontractors</li> <li>Assignment of MAHLE requirements to subcontractors</li> <li>Implementation of qualification activities with subcontractors</li> <li>Procurement only from certified subcontractors</li> <li>Minimum requirement placed on subcontractors is a valid certificate according to DIN ISO 9001 plus fulfillment of Minimum Automotive Quality Management System Requirements for Sub-Tier Suppliers or equivalent</li> </ul>	<ul style="list-style-type: none"> <li>Subcontractor selection, development, optimization, and evaluation system</li> <li>Scheduling and procurement from released and certified subcontractors</li> <li>Valid certificates</li> <li>Advanced product quality planning (APQP) at subcontractors</li> </ul>
<b>Contractual partnership</b>	<ul style="list-style-type: none"> <li>Acceptance of the Supply Agreements, Warranty Agreement, Supplier Code of Conduct, Tooling Agreements, Non-Disclosure Agreement, Quality Assurance Agreement, Special Logistics Agreement, Consignment Contract, GTCs of Purchase, and further relevant contracts</li> <li>Willingness to reduce the incoming inspection at MAHLE</li> </ul>	<ul style="list-style-type: none"> <li>Conclusion of the contract(s)</li> </ul>
<b>Cost structures and emission</b>	<ul style="list-style-type: none"> <li>Transparency and disclosure of the cost structures, the emissions and pricing throughout the entire process chain</li> <li>Determination of target prices and optimization of cost structures</li> <li>Detailed breakdown of the prices and the emissions of parts and tool costs</li> </ul>	<ul style="list-style-type: none"> <li>Transparent calculation</li> <li>Target costing</li> </ul>
<b>Cost- and emission reduction potentials</b>	<ul style="list-style-type: none"> <li>Implementation of cost and emission reduction projects</li> <li>Utilization of product potentials</li> <li>Supplier cost reduction suggestion program</li> </ul>	<ul style="list-style-type: none"> <li>Value engineering projects together with MAHLE and with subcontractors</li> </ul>
<b>Continuous improvement</b>	<ul style="list-style-type: none"> <li>Continuous improvement process for cost optimization and annual productivity increases</li> <li>High competitiveness at a world market level with respect to price, quality, faithfulness to deadlines and flexibility</li> </ul>	<ul style="list-style-type: none"> <li>CIP organization</li> <li>CIP projects</li> <li>Supplier suggestion program</li> <li>VAVE projects</li> </ul>
<b>Payment terms</b>	<ul style="list-style-type: none"> <li>Acceptance of standard MAHLE payment terms</li> <li>Acceptance of MAHLE's Conditions of Purchase</li> </ul>	<ul style="list-style-type: none"> <li>Agreement on automotive-specific payment terms and conditions</li> </ul>
<b>Handling of payments</b>	<ul style="list-style-type: none"> <li>All customary payment methods</li> <li>Willingness to settle deliveries/services through credit notes</li> </ul>	<ul style="list-style-type: none"> <li>Credit note method according to VDA</li> </ul>



Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Digital invoicing</b>	<ul style="list-style-type: none"> <li>Where available, suppliers are obliged to submit their invoices digitally</li> </ul>	<ul style="list-style-type: none"> <li>Usage of relevant platforms (e.g. ePAID)</li> <li>Paper-based invoices may be rejected where digital solutions exist</li> </ul>
<b>E-business activities</b>	<ul style="list-style-type: none"> <li>Participation in auctions and online bids</li> <li>Quote via MAHLE supplier portal where available</li> </ul>	
<b>Provisions and insurance</b>	<ul style="list-style-type: none"> <li>Insurance coverage for damages caused by plant failures</li> <li>Property insurance for company capital goods</li> <li>Product liability and product recall insurance</li> </ul>	<ul style="list-style-type: none"> <li>Business and product liability insurance policy</li> <li>Recall cost insurance policy</li> <li>Backup plan for production disruptions</li> </ul>

## Quality-related Requirements

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Quality and environmental management system</b>	<ul style="list-style-type: none"> <li>Effective implementation of a quality and environmental management system</li> <li>Valid certification according to DIN ISO 9001 (last valid version) plus fulfillment of Minimum Automotive Quality Management System Requirements for Sub-Tier Suppliers or equivalent</li> <li>Compliance with IATF 16949 automotive standards (last valid version)</li> <li>Certification according to IATF 16949 must be planned and implemented</li> <li>Compliance with DIN EN ISO 14001 or EMAS</li> </ul>	<ul style="list-style-type: none"> <li>Valid certificate based on DIN ISO 9001 (minimum) or IATF 16949</li> <li>Implementation of DIN EN ISO 14001</li> </ul>
<b>Cybersecurity relevant products</b>	<ul style="list-style-type: none"> <li>Implementation of a Cybersecurity Management System (CSMS)</li> </ul>	<ul style="list-style-type: none"> <li>Valid certificate based on ISO/SAE 21434 or accepted Supplier Cybersecurity Engineering Self-Assessment Template (only if component is Cybersecurity relevant)</li> </ul>
<b>Software related to automotive products and automotive products with embedded software</b>	<ul style="list-style-type: none"> <li>Implementation and maintenance of a process for software quality assurance for the products of the supplier</li> <li>Automotive SPICE according to ISO/IEC min Level2</li> </ul>	<ul style="list-style-type: none"> <li>Documented software development capability self-assessment</li> </ul>

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Failure-prevention methods</b>	<ul style="list-style-type: none"> <li>▪ Failure prevention before failure detection</li> <li>▪ Obligation to follow the zero-defect strategy</li> <li>▪ Product and performance responsibility throughout the entire process chain, from the development to the end customer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Risk analysis tools (FTA, FMEA, QFD, etc.)</li> <li>▪ APQP</li> <li>▪ Poka-yoke</li> <li>▪ Design for Six Sigma</li> </ul>
<b>Change management</b>	<ul style="list-style-type: none"> <li>▪ Request MAHLE's approval of any change by the supplier (including your subcontractors) to the design, process, or materials, as well as other changes that affect the functionality and reliability of the products to ensure perfect quality</li> <li>▪ The supplier has to inform MAHLE at least six months in advance and will require prior written approval from MAHLE</li> <li>▪ For approved changes sample submission prior to series production approval, followed by a written approval according to the requirements of PPF/PPAP, unless otherwise agreed upon between the supplier and MAHLE</li> <li>▪ Documentation of all changes to the product and all product-relevant changes to the process chain in a product life cycle</li> <li>▪ After implementation of a change, the packaging units must be properly labeled/marked and aligned with the recipient plant before they are shipped for the first time</li> </ul>	<ul style="list-style-type: none"> <li>▪ Timely written notice of planned changes</li> <li>▪ MAHLE's written approval of changes</li> <li>▪ Compliance with VDA Volume 2 (PPA) and AIAG (PPAP)</li> <li>▪ Product and process life cycle</li> <li>▪ Trigger matrix according to VDA Volume 2</li> <li>▪ Described change management process</li> </ul>
<b>Feasibility studies</b>	<ul style="list-style-type: none"> <li>▪ Technical and scientific know-how</li> <li>▪ Definition of significant and critical characteristics</li> <li>▪ Creation of specifications and product data</li> <li>▪ Development testing – ability to produce prototypes</li> <li>▪ Review of feasibility regarding function and production capability</li> </ul>	<ul style="list-style-type: none"> <li>▪ Product data</li> <li>▪ Tests</li> <li>▪ Simulations</li> <li>▪ Lab tests</li> <li>▪ Prototypes</li> <li>▪ Development validation</li> </ul>
<b>Advanced quality planning</b>	<ul style="list-style-type: none"> <li>▪ Ability to implement automotive standards</li> <li>▪ Incorporation and application of failure prevention methods and processes aimed at preventive quality assurance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Advanced product and quality planning (APQP)</li> </ul>
<b>Risk analyses</b>	<ul style="list-style-type: none"> <li>▪ Estimation of quality risks</li> <li>▪ Preventive use of systems FMEAs at product and process levels for the timely detection and prevention of defects</li> <li>▪ Definition and evaluation of significant and critical features</li> </ul>	<ul style="list-style-type: none"> <li>▪ Systems FMEA – product</li> <li>▪ System FMEA – process</li> <li>▪ Systems FMEA – logistics</li> <li>▪ Significant and critical characteristics</li> </ul>

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Statistical methods</b>	<ul style="list-style-type: none"> <li>▪ Determination of required statistical methods for all stages of product implementation and within the scope of product and process development</li> </ul>	<ul style="list-style-type: none"> <li>▪ Validation test planning</li> <li>▪ Simulations</li> <li>▪ Capability studies</li> <li>▪ Statistical process control (SPC)</li> <li>▪ Measurement system analysis (MSA)</li> <li>▪ Quality control charts</li> </ul>
<b>Inspection planning</b>	<ul style="list-style-type: none"> <li>▪ Ability to compile the inspection specifications based on automotive standards as well as performing measurement system analyses</li> </ul>	<ul style="list-style-type: none"> <li>▪ Control plans for Prototypes, pre-series, series</li> <li>▪ Inspection plans and instructions</li> <li>▪ Capable measurement systems</li> </ul>
<b>Capability studies</b>	<ul style="list-style-type: none"> <li>▪ Determination and evaluation of short-term process and machine capability quality characteristics as well as long-term process capability characteristics of the manufacturing processes</li> <li>▪ Adherence to the required capabilities for production and testing equipment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Minimum requirements for capability indices are generally the following: <ul style="list-style-type: none"> <li>▪ <math>C_m, C_{mk} \geq 1.67</math></li> <li>▪ <math>P_p, P_{pk} \geq 1.67</math></li> </ul> </li> <li>▪ Compliance with MAHLE and customer-defined specifications is always required, even if higher than the minimum requirements</li> </ul>
<b>Product and production process approval</b>	<ul style="list-style-type: none"> <li>▪ Initial sample management according to automotive standards</li> <li>▪ Data maintenance in the International Material Data System (IMDS/CDX)</li> <li>▪ Production process approval</li> <li>▪ Internal process approval and approval of series production/inspection equipment and tools</li> <li>▪ Conducting production trials under mass production conditions for series production approval, which is carried out within the scope of the preseries, during which a defined quantity must be produced under mass production conditions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Internal tool acceptance test</li> <li>▪ Results of the production trials</li> <li>▪ Internal process approval</li> <li>▪ Maintenance and repair instructions</li> <li>▪ Production-ready tools and equipment</li> <li>▪ Staff qualification</li> <li>▪ Introduction/training at the workplace</li> <li>▪ Work/inspection instructions</li> <li>▪ Workplace/inspection station layout</li> <li>▪ Execution according to the latest valid version of PPAP (AIAG) or PPF (VDA Volume 2)</li> <li>▪ Process approval according to VDA 6.3 by MAHLE, including performance test (Run@Rate)</li> </ul>
<b>Requalification testing</b>	<ul style="list-style-type: none"> <li>▪ Planning and conducting of periodic requalification tests</li> </ul>	<ul style="list-style-type: none"> <li>▪ Minimum requirement is a complete dimensional and functional inspection according to IATF16949 (requalification testing)</li> </ul>

Criteria	MAHLE requirements for suppliers	Implementation and verification
<b>Supplier audits</b>	<ul style="list-style-type: none"> <li>Effective implementation of robust and controlled production processes</li> <li>Compliance with VDA 6.3 standard</li> <li>Applied for Supplier Approval, Process approval, Regular surveillance and Complaints &amp; escalations</li> </ul>	<ul style="list-style-type: none"> <li>Onsite audit</li> <li>Action plan in case audit result <math>\neq</math> A (Process Audit) or Green (Potential Analysis)</li> <li>An audit result = C directly results in a NBoH condition (New Business on Hold)</li> </ul>
<b>In-process quality assurance steps</b>	<ul style="list-style-type: none"> <li>Planning and implementation of product and process inspection and testing</li> </ul>	<ul style="list-style-type: none"> <li>In-process inspection and testing</li> <li>Statistical process control (SPC)</li> <li>Documentation of inspection and test results</li> <li>First-piece/last-piece inspection</li> <li>Reaction plan to control defective parts</li> </ul>
<b>Handling of defective parts</b>	<ul style="list-style-type: none"> <li>Assurance that no defective parts are forwarded</li> <li>Identification and control systems</li> <li>Determination of failure root causes according to VDA Field Failure Analysis or CQI-14 (AIAG)</li> </ul>	<ul style="list-style-type: none"> <li>Reaction plan</li> <li>Containment actions</li> <li>Root-cause analyses</li> <li>Corrective actions</li> <li>8D method</li> </ul>
<b>Inspection equipment management</b>	<ul style="list-style-type: none"> <li>Assurance of capable inspection procedures</li> <li>Periodic calibration of used testing and measuring equipment</li> <li>Gauge monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Inspection equipment monitoring system</li> <li>Calibration verification</li> <li>Accredited external service providers</li> <li>Measurement system analysis (MSA)</li> <li>Qualified inspection operators</li> </ul>
<b>Process Capability</b>	<ul style="list-style-type: none"> <li>Regular process capability studies and evaluations</li> <li>Observation of significant and critical characteristics</li> <li>Adherence to required capabilities</li> <li>Reaction plans for out-of-spec processes</li> </ul>	<ul style="list-style-type: none"> <li>Minimum requirements for capability indices are generally the following: <math>C_p, C_{pk} \geq 1.33</math></li> <li>Compliance with MAHLE and customer-defined specifications is always required, even if higher than the minimum requirements</li> </ul>
<b>Complaint management</b>	<ul style="list-style-type: none"> <li>Systematic implementation of corrective action and preventive measures in a team approach</li> <li>Avoidance of recurring defects</li> <li>Application of problem-solving techniques</li> </ul>	<ul style="list-style-type: none"> <li>8D method</li> <li>Pareto analyses</li> <li>Root cause analyses</li> <li>Cause-and-effect diagram</li> <li>Read across</li> <li>Lessons learned</li> </ul>
<b>Document control</b>	<ul style="list-style-type: none"> <li>Regulating the control and archiving of specification and verification documents (record)</li> </ul>	<ul style="list-style-type: none"> <li>Control matrix for documents and records</li> <li>Minimum 15-year retention</li> <li>Observation of VDA Volume 2</li> </ul>

# Problem-solving Path and Escalation Processes

Escalation level	Cause	Action
0	Product and service quality comply with the agreements and requirements	In case of complaints problem solving by 8D
1	Product and service quality do not comply with the agreements and requirements: <ul style="list-style-type: none"> <li>Severe deviations and complaints</li> <li>Recurring complaints</li> <li>Adherence to quantities and due dates unsatisfactory</li> <li>Line stops</li> <li>Insufficient reaction to complaints</li> </ul>	<ul style="list-style-type: none"> <li>Escalation meetings with supplier to clarify and define further action</li> <li>Initiation and implementation of measures on-site at supplier's facility (audit, logistics process analysis, risk assessment, etc.)</li> <li>Controlled Shipment Level 1 (CSL1) in case of recurring issues</li> </ul>
2	Product and service quality do not comply with the agreements and requirements: <ul style="list-style-type: none"> <li>Insufficient ability and/or willingness to solve the problem</li> </ul>	<ul style="list-style-type: none"> <li>New Business on Hold (NBOH)</li> <li>Decision regarding the execution of MAHLE Supplier Improvement Program (MSIP)</li> <li>Controlled Shipment Level 2 (CSL2) in case of recurring issues</li> </ul>
3	Product and service quality do not comply with the agreements and requirements: <ul style="list-style-type: none"> <li>Ongoing insufficient ability and/or willingness to solve the problem</li> </ul>	<ul style="list-style-type: none"> <li>New Business on Hold (NBOH)</li> <li>Decision regarding change of supplier</li> <li>Qualified or immediate supplier phase-out</li> <li>CSL2 ongoing to final delivery stop</li> </ul>

## Course of the escalation process

**MAHLE's escalation process is broken down into three escalation levels, each of which basically follows the procedure outlined below:**

- Analysis of escalation causes and problem
- Decision regarding measures to be implemented (e.g., 8D report, audit)
- Agreement on an action plan to eliminate the escalation causes
- Implementation of the action plan by the supplier
- Monitoring of the implementation process by MAHLE, followed by escalation to the next level or de-escalation, depending on outcome

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