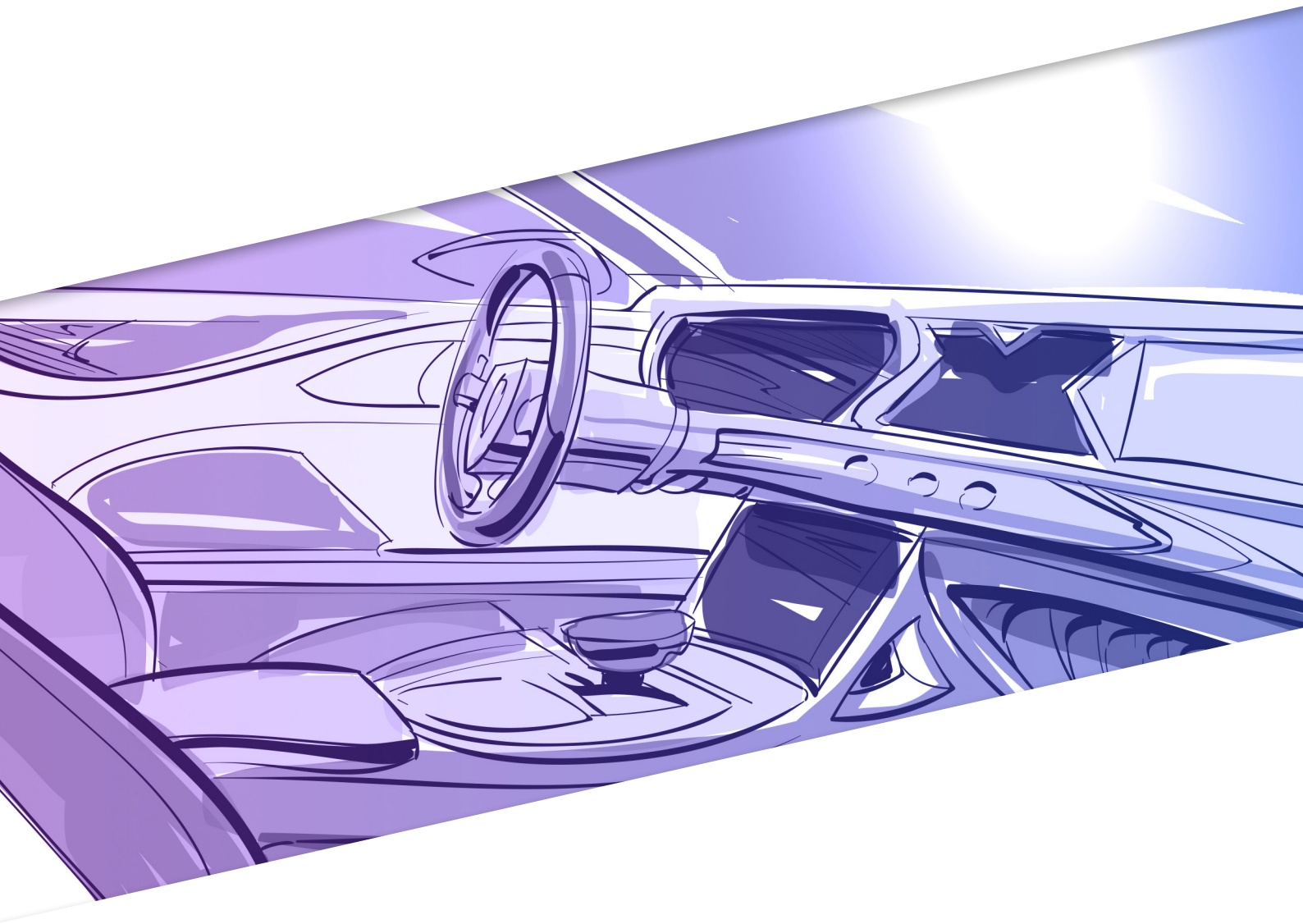

BHTC QUALITY REQUIREMENTS FOR SUPPLIERS

VERSION 5.0 /DECEMBER 2023/

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INTRODUCTION

A world of continuously changing customer expectations and worldwide competition requires continuous improvement of all products and services as well as business processes and corporate procedures.

Customer satisfaction through quality in all aspects is a crucial success factor for Behr-Hella Thermocontrol GmbH (termed "BHTC" hereafter), as a Supplier of complex products for the international automotive industry and consequently for you as our contractor (termed "SUPPLIER" hereafter), whose products are used in BHTC assemblies.

The achievement of zero-defects quality for all supplies is an absolute prerequisite which may only be achieved and secured through the common efforts of BHTC and its SUPPLIERS: Avoiding defects instead of discovering defects and continuous improvements in the entire supply chain, customer inquiry, offer, order, product development, start of production, volume deliveries and field operation are indispensable requirements which we must and want to fulfil with the active help of our SUPPLIERS.

This guideline highlights BHTC's basic requirements for SUPPLIERS and refers to the valid international standards, methods and implementation instructions (e.g., by VDA) which are necessary to achieve common objectives. Customer requirements may exceed BHTC's basic requirements and have to be followed as part of our customer's satisfaction policy.

PETER SCHMIDT

EXECUTIVE VICE PRESIDENT PURCHASING

ERDAL YAZICI

DIRECTOR SUPPLIER DEVELOPMENT

1 AREA OF APPLICATION

This guideline is an integral part of the "Framework Supply Agreement for the procurement of manufacturing materials" between the SUPPLIER and BHTC or, alternatively, comes into force upon an individual agreement with BHTC and/or any of its affiliated companies (as defined by Sec. 15 German Stock Companies Act). Deviations from this guideline require a corresponding express written agreement to become effective. For the case that this guideline applies between SUPPLIER and one of BHTC's affiliated companies, it is agreed that in addition BHTC (as holding company) may enforce any term of this Agreement towards SUPPLIER. If involved and in case of any doubt, it is in such cases to be assumed that towards SUPPLIER, BHTC acts on behalf of its affiliated company.

2 BHTC'S QUALITY AND ENVIRONMENTAL POLICIES

The following extracts from BHTC's quality and environmental policies should provide the SUPPLIER an orientation which focus has to be considered with regard to these subjects. The benchmarks for BHTC's actions are customer satisfaction through first-class quality of all products and services, as well as cooperative work and a high level of expertise. The strategy of zero defects quality of our products, actions, and services, combined with expertise, innovation, and internationality, will secure the satisfaction of all customers in the long term, and thus our competitiveness.

BHTC QUALITY POLICY

Quality is the no-compromise fulfillment of all product characteristics and work procedures agreed with the customers. The target is zero defects for delivered quality during the product life and for all BHTC services. To secure these aspirations and to provide customers consistently high quality in every respect, we plan quality down to the last detail during the development of product- and manufacturing process, using carefully chosen methods. This planning procedure is carried out independently of whether production is later to take place on BHTC premises or at the SUPPLIERS, and includes all substances and materials used, of course. After SOP, the serial quality of the product is assured and continually improved by means of accompanying quality observation and control. We also expect this procedure from our SUPPLIERS, and they have to demonstrate an effective, successful quality management system available.

BHTC ENVIRONMENTAL POLICY

BHTC is committed to protect the environment. In order to implement this environmental policy, BHTC has had its plants certified according to ISO 14001 (see [1] in chapter 8). We require our SUPPLIERS to meet the relevant valid environmental legislation. We expect an effective environmental management system from our SUPPLIERS which ensures compliance with regulations and improves the SUPPLIER's environment situation continuously and efficiently. On request, the SUPPLIER must be able to demonstrate appropriate waste-avoidance, recycling, and disposal concepts for both products and packaging. Proof is recommended in the form of a certified environmental management system.

3 QUALITY MANAGEMENT

A correlation between the SUPPLIER's organizational and technical prerequisites and BHTC's quality requirements is the basis for a successful business relationship. In detail, BHTC requires the following from SUPPLIERS:

3.1 QUALITY REQUIREMENT AS A CONDITION FOR DELIVERY

In order to meet the high expectations of the automotive and other industries, BHTC trusts the performance and commitment of its own employees to a large extent and expects the same attitude towards employees and partners from its SUPPLIERS. This is a major precondition for the quality capability the SUPPLIER has to perform and deliver thru the life of the program.

SUPPLIER activity | BHTC activity | Obligation of proof towards BHTC

Quality Requirement Levels	Actions / Prerequisites	Methods, Documents
Corporate culture	• Co-operative, target-oriented management	• Completion and follow-up of division-related target agreements
	• Promotion of initiative and creation of opportunities for personal development of the employees	• Delegation of responsibility and competence
	• Qualification of employees and promotion of quality consciousness	• Training in tools, methods and standards • Support in solving quality problems • Requirement-based employee assignment
Management system	• EN ISO 9001 • Implementation of a Quality Management system according to IATF 16949 requirements	• Certification by a third party
	• IATF 16949	• Training and application
	• ISO 14001	• Environment management activities or certification by a third party
	• Further development of an effective procedural organization	• Management Manual
	• Creation of organizational and technical requirements for collecting and evaluating quality information	• CAQ (Computer-aided quality) system

Quality assurance	• Avoiding faults • Systematic processing of faults • Avoiding repeat faults	• Small Q-control loops • Problem-solving techniques • Cause-effect analysis • Feedback to development and engineering change process
Audits	• Regular internal audits	• System • Process • Product
Continuous improvement process	• Introduction and maintenance for all products, processes, and services	• Employee training • Programs, targets, and reviews
SUPPLIER development	• Cooperation on partnership basis • Joint project work	• Exchange of information • Implementation of training sessions, providing methods • Performing cost improvement workshops

3.2 QUALITY PLANNING AND COOPERATION

Advanced quality planning carefully designed to avoid faults during product and process development ensures that only technically mature products are produced using capable production processes.

Quality Requirement Levels	Actions / Prerequisites	Methods, Documents
Definition phase	• Definition of requirements	• Requirement specification • Schedule and cost frame • Preparation of inquiry
Inquiry phase	• Selection of potential SUPPLIERS	• Meeting minimum SUPPLIER requirements • Perform Potential Audit • System audit, if appropriate • Evaluation of capability
	• Inquiry	• Inquiry documents
Concept preparation	• Determination of BHTC expectations	• Deep analysis of requirement specification
	• Check of specification, deadline, pricing, and timing	• Revision of contract • Feasibility study (including Tool concept, assembly concept, sub-supplier concept for tools & equipment and secondary processes) • QFD (Quality Function Deployment) • Benchmark analysis • Time schedule • Team chart • Capacity overview (staff, equipment, sub-SUPPLIER)

Quotation phase	• Selection of potential SUPPLIERS	• Performance specification (deadlines, prices, feasibility commitment)
Placing orders	• Analysis of quotation	• Checklists
	• Placing of orders with suitable SUPPLIERS	• Binding order documents, specifications, deadlines, prices
Implementation of concept	• Integration in BHTC project team	• Advanced quality planning • Control Plan
		• Process audit • Capacity review (staff, equipment, sub-SUPPLIER)
	• Estimation of quality risks	• Product/Design FMEA • Fault tree analysis/risks
Development	• Monitoring and evaluation of design drafts and prototypes	• Design review • Robust design • Design for manufacturing /Assembly • Design for reliability • Packaging and logistic
	• Checking manufacturability	• Trial planning
Production preparation	• Estimation of possible production risks	• Process FMEA
	• Optimization of production methods and operating equipment, packaging	• Operational test run • Trial planning • Test planning
Pre-series	• Checking and evaluating production reliability	• Analysis and proof of capability for testing equipment, machines, and processes • Full-Run test (R@R)/ process audit • Cleanness requirement according to specification
	• Minimization of probability of faults	• Plans of Action
Series production start-up phase	• Series production approval at SUPPLIERS	• Measurement sequence and SPC
		• Process release • Initial sample inspection report/ PPAP • Define limit samples

Release of supply phase	• Release by BHTC • SUPPLIER assessment	• Release report • Q-performance, flexibility, delivery reliability, cooperation

3.3 QUALITY CONTROL IN SUPPLIER'S SERIES PRODUCTION, CONDITIONS FOR DELIVERY

The quality assurance actions in the series production are based on knowledge gained during the development phase and observation of the field of comparable products and are used to consolidate and continuously improve the level of quality achieved.

Self-regulating processes and automated tests should be used wherever it makes technical and economic sense.

Employee quality responsibility must be further developed in line with technical progress and customer expectations.

Arias of Quality Control	Actions / Prerequisites	Methods, Documents
Procurement	• Securing of delivery quality	• Evaluation of quality performance
		• Acceptance material test certificates in compliance with DIN EN 10204 (Types of inspection documents) • Evaluation of supply reliability
Production	• Control of machine parameters	• Process data sheets • Self-regulating processes
Tests	• Continuous supervision of process capability	• SPC/control chart technique • Annual requalification
	• Rapid recognition and elimination of deviations	• Operator self-control
	• Recording and evaluating quality data	• Results using suitable IT programs • Pareto analysis
	• Securing machine availability	• Preventative maintenance
	• Ensuring proper packaging	• Packaging plan
	• Clear marking of all parts and packages	• ERP system

Complaint processing	• Cause-Effect analyses • Corrective and preventative measures • Avoiding repeat faults	• Problem-solving techniques such as e.g., DMAIC, 5-Why, Ishikawa ... • 8D Report
Storage and transport	• Correct and fault-free handling, storage, and transport	• Computer-supported forced workflows
	• Consideration of manufacturing data and expiry dates where applicable	• FIFO principle • 100% Traceability of parts

4 IMPLEMENTATION OF BASIC REQUIREMENTS

The most important BHTC requirements from the quality management process described which must be met and documented by the SUPPLIER before the beginning of the business relationship and/or during current business have been detailed out and will be described below:

4.1 QUALITY MANAGEMENT SYSTEM (QM-SYSTEM) AND QUALITY CAPABILITY

The SUPPLIER has effectively introduced a QM system in its company and thus proves its quality capability.

Supplier will provide Products and services in accordance with a quality management system which at a minimum meets the requirements of ISO 9001, and agrees to continually further develop this system in accordance with state-of-the-art technology in order to conform with IATF 16949 in the version valid at the date of delivery. Supplier's environmental management shall align with the requirements of ISO 14001 or EMAS in the version valid at the date of delivery and certified evidence thereof shall be provided upon request of BHTC.

Additional requirements may be defined according to VDA Volume 6, part 1{8} or the AIAG documents. Specific customer documents may also be needed.
The efficiency of the QM system is mirrored in:

- Continuous and provable improvement of all business and manufacturing processes and products,
- Delivery quality,
- Supply reliability,
- Continuous field observation of its products and commitment to provide customer information when requested,
- Efficiency and speed in implementing corrective actions,

- Communication on all levels,
- Processing of new products and changes to serial products professionally and in line with schedules.

At least 3 months before the expiry date of a certificate, BHTC must be informed in case no re-certification is planned. New certificates must be sent to the BHTC Purchasing contact without a separate request to be made. In case of a revocation of the certificate, BHTC must be informed immediately. BHTC reserves the right to carry out audits on quality management systems, processes, and products at short notice, with the customer (if appropriate), following prior announcement. The auditor must be granted access accordingly.

SUPPLIER shall nominate a PSCR (Product Safety and Conformity Representative) to be in charge of all related tasks described in IATF 16949 section 4.4.1.2 (see [11] in chapter 8).

The SUPPLIER must ensure that its sub-suppliers also meet the above-mentioned requirements. As proof, the SUPPLIER must be able to present the valid certificate issued by an accredited certifying company (3rd party audit). If the SUPPLIER places orders with sub-contractors, these must also meet the requirements of this guideline. BHTC must be informed in good time about the use of and change in sub-contractor and must approve this. A production process and product release must be carried out. BHTC reserves the right to audit the sub-contractor at short notice, with the customer (if appropriate), following prior announcement. This does not release the SUPPLIER from its responsibility towards the sub-contractor and BHTC, however.

4.2 FURTHER BASIC QUALITY PRINCIPLES

In addition to the standards listed in chapter 8, BHTC ordering documents are binding, e.g.:

- Order drawings including the requirements these specify such as DIN standards, BHTC standards, technical conditions of delivery, data sheets etc.,
- Agreed test instructions and testing equipment,
- Additional order details e.g., packaging regulations,
- Special legal requirements,
- Special requirements related to environmental protection and recycling.

4.3 DELIVERED QUALITY, REACH COMPLIANCE

The SUPPLIER must bring proof of composition of the materials used and their individual components as well as environment-related aspects.

For all products that are sampled, a material data sheet must be send to the BHTC Account in the IMDS (International Material Data System) or in other systems which must be used for specific markets, like CAMDS (Chinese Automotive Material Data System). In case of changes that affect the IMDS entry, it must be presented again.

Missing or incorrect material data sheets (MDS) lead to a rejection of the products.

The SUPPLIER assures that all substances for use in products delivered to BHTC (e.g., raw materials, process materials, components, assemblies) that require registration in line with REACH (EC directive 1907/2006: Registration, Evaluation and Authorization of Chemicals) have been pre-registered by the SUPPLIER or sub-SUPPLIER and then registered at BHTC for the purpose of application within the time window prescribed by REACH. If, contrary to expectations, this is not the case, BHTC must be informed immediately.

Caused by REACH every SUPPLIER of a product (including packaging) must declare to BHTC all SVHC-substances (Substances of Very High Concern) within the product, which are in a concentration bigger than 0.1 % by weight included. SVHC-substances are in an EU publication listed and this list is permanently enlarged. The SUPPLIER must keep itself informed at all times about the current candidate list status.

Regardless of legal prohibited substances and standards to substance restrictions in the automotive industry, additional substance restrictions and prohibitions are defined in the HELLA standard HN20103 (see [14] in chapter 8), e.g., for technical reasons.

A quality control report is used to inform SUPPLIERS about non-conforming deliveries. The costs incurred to BHTC for this report are to be borne by the SUPPLIER. Scrapping and reworking costs are recorded by BHTC and charged to the SUPPLIER.

Cost recovery will be communicated, if applicable, with each claim. The cost recovery process will include, but is not limited to, contaminated stock at BHTC affected plant, products in transit, OEM assembly plant, non-conforming received goods, assembly line downtime due to delivery or quality related issues, warranty returns, and costs required to analyze and rectify the effects of a quality, warranty, launch or delivery issue which result in a concern. Inspection costs, analysis costs, rectification costs, transit costs and costs to manage the implementation of a non-reversible corrective action may also be included. Level of cost recovery against concerns will be a significant factor in BHTC sourcing decisions.

The QM system introduced at the SUPPLIERS and the quality assurance process derived from this are the basis for the ability of the SUPPLIER to achieve freedom from defects in all the products and services delivered by the SUPPLIER or on its behalf (“zero-defect quality”).

The BHTC part number incl. revision status according to the BHTC drawing, must be quoted on the delivery note and the smallest packaging unit. If there is no revision status noted on the drawings, the issue level according to the delivery schedule or order must be quoted.

4.4 INCIDENT PROCEDURE, 8D REPORT

The SUPPLIER must reply to every complaint using a significant 8D:

Within 24 hours (3D):

- → quick response for containment actions incl. cost acceptance to BHTC
- → containment actions fully implemented (3D completed and sent to BHTC)

Within 5 working days (5D) after receipt of the claimed parts:

- root cause analysis done for occurrence and non-detection
- permanent corrective actions defined

Within 20 working days (8D):

- effectiveness of permanent corrective actions proofed, and recurrence prevented
- permanent corrective actions implemented

Within 24 hours of notification, the SUPPLIER must authorize BHTC to sort, scrap, rework or return the non-conforming materials (at the SUPPLIERS' expense). If the SUPPLIER does not respond to the request within 24 hours, BHTC may make disposition at its own proper discretion at SUPPLIER's costs.

Upon BHTC's request, SUPPLIER shall send a decision-making representative to the assembly plants within 24 hours to coordinate and/or analyze the incidents on site.

Interim containment measures must be initiated immediately and reported:

- to guarantee delivery of defect free products,
- to keep costs for the SUPPLIER and BHTC as low as possible.

Interim reports must be presented on time if requested. BHTC has to be informed in writing in advance of any possible delays. The SUPPLIER must examine the products complained carefully (defect-cause analysis). It shall summarize the results and planned corrective actions including deadlines for their implementation in an 8D Report without delay (according to the 8D Report form on the BHTC website) and forward this to BHTC. Proof must be provided to BHTC of effective implementation of the corrective actions.

A root cause analysis always needs to be carried out using suitable problem-solving methods. Detailed analyses (such as Ishikawa, 5 why, error simulations) have to be provided.

Subsequent deliveries after a previous non-conformance must be marked accordingly until it has been proven that the fault has been remedied. The type of marking on the individual part needs to be agreed with the BHTC receiving plant. At least three standard deliveries must be delivered defect-free after the implementation of the permanent action.

BHTC reserves the right to carry out an audit at the SUPPLIER's premises, with prior announcement, in case of problems caused by the SUPPLIER and unacceptable reaction time, and to charge the costs incurred to the SUPPLIER. In case of insufficient immediate measures, BHTC may demand CSL 1 or CSL 2 at the SUPPLIER (see section 6.2).

BHTC is not responsible and will not manage SUPPLIER sorting actions. SUPPLIERS are fully self-responsible for any action and instruction of sub-suppliers and have to make all arrangements to ship parts between BHTC affected plant and outside source, accordingly. The SUPPLIER will also be responsible for inspecting and monitoring of the quality standards of sorted parts and the necessary documentation.

Reworked parts have to meet the agreed specifications. The rework of parts is not allowed without prior written authorization by BHTC.

4.5 SORTING ACTIVITY

For sorting activities SUPPLIERs will have the following two options:

Option 1: Sorting at SUPPLIER production site

The SUPPLIER picks-up non-confirming parts from the BHTC site to undertake sorting (Incident) activities at SUPPLIER's site. The SUPPLIER may NOT use a third-party sorting company which has not been released by BHTC.

Option 2: Sorting at third party, released by BHTC

BHTC releases and randomly checks third party companies to ensure high quality treatment of sorting activities at or near by BHTC production plant.

The SUPPLIER may contact BHTC's released sorting companies which carry out the sorting activities for the SUPPLIER's non-confirming parts. The quality of all sorting activities performed by the released company will be under the authorization of the SUPPLIER.

All SUPPLIERs must ensure that they contact and instruct a released sorting company directly and give written authorization for the activity. All costs occurring under and by the above-mentioned circumstances are at the SUPPLIER's expense. The SUPPLIER is therefore fully responsible for the instruction, the analysis, the action taken, documentation and the reporting. Even the disposal of material and parts and the occurring costs are under responsibility of the SUPPLIER and at the expense of the SUPPLIER (including escalation level process).

4.6 QUALITY DOCUMENTATION

Documents and records from the product and process development phase, as well as from the production phase of the delivered product, must be presented upon request. In particular, the results of the quality tests carried out at the SUPPLIERS' and their sub-suppliers and the audit results must be documented, including planned and effectively implemented corrective actions, and provided to BHTC or BHTC's customer upon request at any time. Any deviations from this procedure require the prior written consent of BHTC. For parts with special characteristics and increased documentation requirements (refer here also to VDA Volume 1 (see [4] in chapter 8) or IATF 16949), quality records must be stored at the SUPPLIERS' and its sub-contractors' for at least 30 years after EOP.

For all other characteristics, a sensible documentation system must be set up as described in VDA Volume 1 (proof methods) or IATF 16949. These specifications do not replace legal requirements. Longer storage times are recommended, bearing in mind the limitation periods for product liability claims.

4.7 QUALITY AGREEMENTS AND PPM MANAGEMENT

In the context of quality planning, the most important task for the SUPPLIER is to develop a "Zero-Defects Strategy" and take all necessary actions to achieve the "Zero Defect" quality target.

BHTC and SUPPLIER will, if necessary, jointly agree on individual quality targets in addition.

$$\text{Fault share [ppm]} = \frac{\text{Defective parts}}{\text{Number of delivered parts}} \cdot 1000000$$

(ppm = parts per million / maximum number of defective parts per million delivered)
Incident: Quantity of opened complaints towards SUPPLIER

The Q-Target results are recorded by BHTC, communicated to the SUPPLIER and are part of SUPPLIER evaluation. At the same time, they form the basis for specific actions for continuous improvement of quality.

The agreement on ppm and Incident values does not acknowledge a quality level accepted by BHTC. All purchased parts which are recognized as defective will not be accepted and will be charged to the SUPPLIER. The SUPPLIER has to be aware of the fact that producing and delivering non-conforming parts may be the reason for triggering the BHTC Supplier Escalation Level Process described under 6.1. All costs resulting from the procedure of the escalation process are as well at the expense of the SUPPLIER.

4.8 ENGINEERING CHANGE MANAGEMENT / Q-PROBLEMS

The SUPPLIER is obliged to inform BHTC about any quality problems or blocking of products or processes immediately and in writing, usually before the products are delivered, and to agree the necessary corrective actions with the Quality Assurance of the BHTC production plants.

The SUPPLIER must not carry out all the planned changes in products and processes, both before and after SOP (Start of Production) without BHTC's prior consent, e.g., in case of:

- Changes in design, specification and/or material,
- Use of new, modified or replacement tools,
- Changes in manufacturing methods or production processes,
- Relocation of production within a manufacturing location or to other locations,
- Changes in suppliers of products, components, materials, services or software,
- Restart of production equipment after closure of more than 12 months.

The SUPPLIER undertakes to proceed accordingly if one of the above points is applicable to a sub-SUPPLIER.

In case of changes, which according to the latest IMDS Recommendation 001 require an update of the IMDS data sheet (respectively CAMDS or other national registration systems), those updates need to be provided immediately.

The SUPPLIER defines the scope of new approval tests (initial samples) with BHTC. It makes sure that serial production deliveries to BHTC are carried out only after the initial samples have been approved by BHTC (see section 5.10). The changes are to be documented in the part life cycle.

If products of the former status still exist at the time the change is carried-out, BHTC must be immediately informed of the quantities bound by purchasing obligation so that a decision may be taken about their use. However, SUPPLIER undertakes to already inform BHTC in the course of the change management about the presumed quantities of products of the former status to enable BHTC a proper planning as early as possible.

After changes, the first deliveries must be specially marked on the delivery note, containers and products themselves, if appropriate. Details of this must be agreed in writing between BHTC and the SUPPLIER before the products are delivered.

4.9 CONTINUOUS IMPROVEMENT PROCESS

The SUPPLIER has introduced a structured process of continuous improvement for all products, processes, workflows and services in its organization. It may prove that it is used for the products delivered to BHTC and the activities connected with this business relationship. Its effectiveness is proved by continuous improvement of the quality performance, prices, delivery performance, flexibility and cooperation. BHTC is shown the respective programs and actions for continuous improvement on request.

4.10 PREVENTIVE MAINTENANCE

The SUPPLIER shall employ a defined system for carrying out planned total preventive maintenance. This must include having replacement parts available for key manufacturing equipment. A maintenance plan must be established and documented which includes the maintenance intervals and the extent of the maintenance.

4.11 COMMUNICATION

BHTC's official language is English. Unless otherwise approved by BHTC SUPPLIER Quality and Purchasing departments, all official communications with BHTC will be done in English. Documents may display the native language when integrated with an English translation. If this is done, only the English translation is valid.

BHTC expects SUPPLIERS to be available for technical support within the context of discussions at customers, on their own premises, or at BHTC.

5 QUALITY IN THE TIME-TO-MARKET PROCESS

We have made it our task to involve our SUPPLIERS in the quality planning of a new project as early as possible. We always require our SUPPLIERS to carry out systematic quality planning within the context of project management. This planning includes both the parts manufactured by the SUPPLIER and its purchased parts.

The person responsible for the project at BHTC must be named. At least all the planning steps listed below must be carried out by the SUPPLIER for the respective part or project.

5.1 FEASIBILITY STUDY

Technical documents (e.g., drawings, specifications, environment requirements, packaging regulations, requirement specification etc.) prepared by BHTC must be analyzed and evaluated by the SUPPLIER in the context of checking the contract. This check provides the SUPPLIER with the possibility of submitting its experience and suggestions to the advantage of both sides. A feasibility study must be presented to BHTC Purchasing, together with the quotation, and is a prerequisite for order placement.

In addition, before SUPPLIER nomination, BHTC may carry out together with the SUPPLIER a detailed "Characteristic Based Feasibility Confirmation" (CBFC) with regard to every characteristic on the drawing and specifications.

5.2 ADVANCED QUALITY PLANNING

To ensure "zero-defects quality" in all phases of the cooperation, the SUPPLIER is obligated to draw up a binding advanced quality plan for prototypes, pre-serial samples and serial production deliveries, to document this in test sequence plans (Control Plan) and to coordinate it with BHTC. SUPPLIER agrees to participate in supplier-related portals provided by BHTC such as for the APQP document management.

The Control Plan is in accordance with the requirements of IATF 16949, annex A. It must be agreed in advance if the advance quality planning should meet the requirements of VDA, Volume 4, Part 3, or the AIAG documents (APQP/Advanced Product Quality Planning).

The commitment to "zero-defect-quality" and therewith to defect prevention as well as to continuous improvement is an essential part of SUPPLIERS obligations and valid without any exception.

5.3 PLANNING CONTENTS

Scheduling

The SUPPLIER draws up a project-related schedule on the basis of the deadlines presented by BHTC. The schedule is updated regularly by the SUPPLIER during the whole project phase and presented to BHTC if requested. Potential deviations from the schedule have to be indicated within 2 working days to BHTC.

Work/production flow chart

The SUPPLIER prepares a production flow chart for the whole process chain. Work plans have to be created for all component parts and components. These must contain complete information of process steps, internal and external transportation, means of transport as well as the machinery and equipment used. Manufacturing charts, drawings as well as process descriptions have to be created as required.

Reliability requirements

The reliability requirements contained in the requirement specification/drawing must be implemented with the aid of suitable methods of reliability management and validated on the basis of respective reliability tests and evaluations.

5.4 PRODUCT AND PROCESS FMEA

Taking the application of its products at BHTC and BHTC´s customers into account, the SUPPLIER carries out preventive risk analysis (FMEA) for all products delivered to BHTC and the processes linked with these, and updates the FMEA whenever deviations of product and/or process quality occur as well as when changes are made as described in section 4.8. All parameters affecting product safety must be integrated in the analysis. Points evaluated as critical must be improved in the short term by means of suitable corrective and preventive actions to enable specifications, properties and product safety as well as capable manufacturing to be guaranteed. To implement the actions, deadlines, and responsible persons have to be named and proved if required.

Independently of the product and process FMEAs prepared on its own responsibility, the SUPPLIER agrees to cooperate in the system or interface FMEAs initiated by BHTC. Results must be taken into account in the SUPPLIER's further development process.

The SUPPLIER shall make Process FMEA available for review on BHTC's request.
Details are defined in AIAG & VDA FMEA Handbook. Results must be recorded as described in section 4.6.

5.5 CONTROL PLAN

Within the Control Plan, the results of the Product-FMEA, Process-FMEA, experience with similar processes and products as well as the utilization of methods of improvement have to be considered. A detailed description of the procedure of drawing up a Control Plan is available in VDA and in the AIAG documentation (APQP).

Based on the Control Plan, the SUPPLIER assures compliance with all the routine tests, taking the agreed measurement and inspection equipment as well as the sampling scheme into consideration.

The Control Plan and all other related documents (records of part and process approvals as well as inspection results) have to be provided to BHTC on request.

5.6 PLANNING SERIAL PRODUCTION

The planning of lines and operating equipment includes the planning and manufacturing/ procurement of all the operating equipment required to produce the component. The capability or suitability of operating equipment must be proved. Capabilities must be proved individually for jigs or molds. Care must be taken that operating equipment in sufficient capacity and function is available at the latest when off-tool parts are produced at the sampling date. Internal and external means of transport and packaging must also be taken into consideration.

Coordination of serial monitoring

All product and process characteristics are important and must be kept in a reliable process. Special characteristics require the proof of process capability. For this purpose, the SUPPLIER must use suitable methods e.g., quality control cards (SPC) to monitor these characteristics. If process capability may not be proven, a 100% test must be carried out. Characteristics that may not be measured or only measured in a destructive test must be monitored and documented using suitable methods.

Limit samples

Where necessary, limit samples must be agreed between BHTC and the SUPPLIER. In the case of decorative parts, this is mandatory.

5.7 CAPABILITY OF TESTING EQUIPMENT, MACHINES AND PROCESSES

By applying suitable statistical procedures, the SUPPLIER must ensure that the used machines, tools, measuring and test equipment as well as the processes in which these are introduced are suitable and capable for the production of products supplied to BHTC.

The characteristics for which capability studies have to be provided will be agreed between BHTC and the SUPPLIER. However, this does not release the SUPPLIER from its responsibility of defining further characteristics related to its processes or characteristics of the sub-SUPPLIERS.

Capability of testing equipment

For all characteristics, the SUPPLIER defines the testing method with the appropriate testing equipment. For the planned measuring equipment, a suitability of the test-process has to be proven. The measuring process and the tolerances of the characteristic to be measured has to be considered for this.

Proof has to be brought in accordance with the requirements of VDA Volume 5 [7] (test process suitability) or AIAG.

Proof of machine and process capability

The investigation of machine capability and process capability are basically described in VDA, Volume 4, Part 1, and must be performed according to this. The following capability indices may be agreed for special characteristics or process parameters.

Short-term/ machine capability index: **Cmk ≥ 2.0**

Note: here, a large number of random checks is taken and evaluated within a short period of time.

Preliminary process capability index: **Ppk ≥ 2.0**
Long-term process capability index: **Cpk ≥1.67**

Note: here, smaller numbers of samples are taken and evaluated over a longer period.

For all other agreed characteristics, the following capability indices are binding:

Short-term/ machine capability index: **Cmk ≥ 1.67**
Preliminary process capability index: **Ppk ≥ 1.67**
Long-term process capability index: **Cpk ≥ 1.33**

If these minimum requirements are not met, 100% tests must be carried out until the capability is achieved through corrective actions, unless agreed otherwise with BHTC in writing.

The requirements of the special characteristics are specified in HN 20037 (see [15] in chapter 8) (Guideline for the Uniform Marking of Special Characteristics and their Verification Requirements).

5.8 STATUS OF SUB-SUPPLIERS AND THEIR PRODUCTS

The use of sub-suppliers that meet the quality requirements has to be guaranteed for the project and is the responsibility of the SUPPLIER. In case of nonperformance, sub-supplier development programs have to be set up. Implementation must be guaranteed before the start of series deliveries at latest.

The status of quality planning for products must be reported regularly. The production process and product release of products from sub-suppliers has to be concluded before production process and product release of BHTC SUPPLIERS.

5.9 AUDITS

The SUPPLIER has to carry out internal planned audits (e.g., VDA Volume 6, Part 3 (see [9] in chapter 8) for all the products delivered to BHTC and all the processes linked with their development and production at regular intervals, planned annually in advance. This is based on contractually defined product specifications and properties as well as further agreements affecting the deliveries, e.g., logistics and packaging. In the event of deviations, the SUPPLIER initiates all the corrective actions necessary and ensures their effective and long-term implementation.

In addition, BHTC and its customers are authorized to carry out process, product or system audits with advance notice in order to check whether the SUPPLIER's quality assurance and environmental requirements meet the BHTC requirements.

Related to these audits, the SUPPLIER has to be aware of the fact, that audit results which are neither acceptable by BHTC or by customers of BHTC lead into after audit action and the costs resulting from the follow-up audits and activities stemming from these follow-up audits are at the SUPPLIER's expense and charged accordingly.

If quality problems occur which are caused by performance and/or deliveries of the SUPPLIER's sub-contractors, the SUPPLIER must carry out an audit at the sub-contractor if requested to do so by BHTC, with BHTC participation, if appropriate, and present the results to BHTC.

5.10 PRODUCT AND PROCESS RELEASE

For product release, the SUPPLIER is obligated to submit initial samples to BHTC before the start of serial production; these samples must comply with all the required specifications and properties, in particular, but not limited to:

- Dimensions,
- Materials and processing,
- Applications/functional interface,
- Limit samples.

Unless agreed otherwise, this proof must be brought on at least 5 parts/ cavity.

This allows any deviations to be corrected in good time, thereby preventing systematic errors in serial production.

Without part and process approval any series deliveries are forbidden and will be rejected upon SUPPLIER's costs. Initial samples and all component parts and materials used for their production, have to be produced under series conditions with series equipment without any exception. Reference samples from initial sampling must be kept by the SUPPLIER for at least 15 years after EOP, unless otherwise agreed in writing.

The content and complexity of necessary documents must be discussed with the BHTC Purchasing department for the specific project.

It has to be decided in advance which bases for initial sample reports have to be used: VDA, Volume 2 (see [5] in chapter 8) or AIAG documents. The scope of sampling is based on the specifications from the sampling discussion with the responsible SQE.

The alignment points given on the drawing must always be considered. If the BHTC drawing does not contain this information, the alignment points determined during measurement must be recorded by the SUPPLIER in the release documentation [ISIR].

The process release at the SUPPLIER's is granted when a process audit according to VDA Volume 6, Part 3, has been passed successfully with rating A, as well as after a full-run capacity test passed according to BHTC guidelines. A process release may also be granted in the case of a B rating. An improvement plan must be drawn up and processed for the open points.

BHTC reserves the right to carry out the process audit and full-run test, or request the results of the process release, at the SUPPLIER's and at the sub-SUPPLIER if necessary.

Standardized products and raw materials are released within the PPF process of the superior product (see VDA Volume 2).

5.11 SAFE LAUNCH PROCESS

After the release of the Production Part Approval Process (PPF/PPAP) package, or latest with the start of serial production (SAP orders after R@R), the SUPPLIERS should participate in Safe Launch Planning under the direction of their assigned SQE. Safe Launch activities shall always consider the final delivery condition of parts to BHTC. Sub-supplier further processing (where applicable) shall be taken into account.

In order to assure a high-quality level of supplied parts during the start-up phase after the SOP the following rules apply:

Process for CSL:

- ppm and Incidents agreement between BHTC and SUPPLIER,
- at least 3 months CSL1 at SUPPLIER site,

- Target: 0 ppm at BHTC, 0 Incidents,
- 3 months after SOP and without discovery of defective parts at BHTC and the CSL 1/2 at the SUPPLIER site, additional testing may be discontinued after approval by the SQE.

Escalation process for CSL:

- ppm and Incidents agreement between BHTC and SUPPLIER at least 3 months CSL1 on SUPPLIER site,
- Target: 0 ppm at BHTC, 0 Incidents,
- Detecting a defect part under CSL 1 - BHTC insists on installing CSL 2 with third party SUPPLIER released by BHTC,
- After at least four weeks of defect-free additional 100% test CSL 2 go back to CSL 1 - proofed by sorting company report (during 3 months Safe launch period),
- After three months and at least four weeks of defect-free at control shipping, CSL 1/2 may be stopped on SUPPLIER site – according to a BHTC written approval.

Process for R@R:

- At each production lot after official full-run capacity test passed according BHTC guide lines the SUPPLIER leads an internal R@R and provide the data on defined frequency to BHTC,
- After three months reaching the required output the SUPPLIER may stop after agreement with BHTC the R@R self-evaluations,
- BHTC have the right to lead the R@R during the ramp up phase when they are on site.

Process for SPC dimension:

- At each production lot after official full-run capacity test passed according BHTC the SUPPLIER sends on defined frequency the SPC result for all P-Dimensions together with the other Safe launch process document to BHTC,
- After three months reaching the required cpk/cmk results the SUPPLIER may stop to provide the documents to BHTC,
- If capability results are out of Specification an additional 100% control of the dimensions need to be implemented.

5.12 TRACEABILITY

The SUPPLIER is obliged to guarantee the traceability of the products it supplies.

The products must be marked or other suitable method chosen to ensure that in the event of a defect being discovered, all other products which could be defective may be identified and blocked until subsequent measures have been agreed between the SUPPLIER and BHTC. These requirements must be cascaded down to the complete supply chain.

Product specific traceability requirements will be detailed out in additional documents.

5.13 RE-QUALIFICATION TEST

Contents, complexity and intervals are agreed between BHTC and the SUPPLIER before the start of series production and documented within the Control Plan. Unless agreed otherwise with BHTC in writing, re-qualification tests have to be carried out at least once a year. Higher frequencies may be implemented in case of target deviations (e.g. exceeding ppm action limits) with impact at BHTC or end customer. In the event of non-conforming test results, the reason for the defect must be determined, corrective actions initiated and the Quality Assurance staff in the Incoming Goods department of the plant to be supplied must be informed immediately.

Unless otherwise agreed, the respective requirements from IATF 16949 or the AIAG documents are valid. All products are subject to a complete dimensional and functional test, in accordance with the Control Plan, taking the customer's specifications for material and function into account. The SUPPLIER provides BHTC with the regular re-qualification documentation within three working days on request. In case BHTC provides a supplier-related portal the annual documentation such as the requalification shall be uploaded by the SUPPLIER.

After previous agreement with BHTC, for parts that are similar for BHTC, the requalification may be carried out per product group ("family"). Re-qualification tests may be accompanied by BHTC employees and customer, where applicable. Supplier is responsible to carry out re-qualification in accordance with customer specific requirements in supply chain.

5.14 FUNCTIONAL SAFETY

As far as the scope of the SUPPLIER's product development tasks for electronic components, assemblies and complete devices include software development, the SUPPLIER shall in particular comply with the requirements of "Functional Safety" according to ISO 26262 (see [12] in chapter 8) (FuSa). The services to be provided by the SUPPLIER shall be performed on time as required and in a professional manner by qualified personnel in accordance with the relevant requirements of FuSa.

The FuSa-Organization of the SUPPLIER shall constantly be further developed and adjusted to the actual requirements of FuSa and be staffed with sufficient qualified personnel (e.g., Safety Managers). Any releases required by FuSa shall be made in writing by responsible FuSa managers. On BHTC's request FuSa organization and -qualification shall bedemonstrated at any time in writing in a standard form as applicable.

5.15 QUALITY REQUIREMENTS FOR DEVELOPMENT OF EMBEDDED SOFTWARE

Embedded software developed and delivered to BHTC either as a work product or a product delivered which contains embedded software shall satisfy Automotive SPICE Level 2 (HIS scope – Hersteller Initiative Software) unless otherwise specified by BHTC.

It is a requirement of BHTC that:

- the SUPPLIER produces and provides evidence of a self-assessment and/or
- the SUPPLIER agrees to be audited by BHTC assessors upon request or
- upon BHTC request, a third-party assessment is conducted (by certified Automotive Spice Assessor) on SUPPLIER costs.

If the SUPPLIER does not meet the above requirements at start of an awarded project, an improvement program must be established to meet BHTC requirements before start of serial production. A regular progress reporting of the improvement project to BHTC is requested.

More details are defined in HELLA Norm HN20146 (see [16] in chapter 8).

6 METHODS OF SUPPLIER ESCALATION
6.1 SEP (SUPPLIER ESCALATION PROCESS)

BHTC reserves the right to start the Supplier Escalation Process (SEP) if the requirement set for BHTC-SUPLIER Management are not met.

In order to meet the high-quality standards of BHTC and the automotive industry, as well as the zero-defect target, effective methods for error detection, elimination and prevention are required throughout the supply chain. Our SUPPLIER escalation process is a central component of our SUPPLIER management and supports our partners in meeting the requirements with regard to the project/pre-series phase, delivery quality and logistics in series production as well as in spare parts supply. The successful use of escalation is strived for by the fact that measures, consequences and responsibilities are intensified with increasing escalation level as well as our demands on methodology and resources for problem solving. Through four SEP-levels, which are divided as follows, the escalation process ensures efficient cooperation between BHTC and its SUPPLIER:

- BHTC-SEP 0: Notification Letter
  SUPPLIER is informed about insufficient quality performance with warning about possible escalation.
- BHTC-SEP 1: “Improvement Action Plan”
  SUPPLIER is asked to provide a root cause analysis and an action plan to improve quality performance.
- BHTC-SEP 2: “Focus Supplier Program”
  In addition to BHTC-SEP 1, establishment of a task force and deployment of internal/external personnel at the expense of the SUPPLIER.
- BHTC-SEP 3: “Not Sourceable”
  In addition to BHTC-SEP 2: Supplier is not sourceable for new projects.
  Block in nomination process (BHTC internal New Business Hold).
- BHTC-SEP 4: “New Business on Hold”
  In addition to BHTC-SEP 2: Supplier is not sourceable for new projects. Block in nomination process (official New Business Hold).

6.2 CONTROL SHIPPING LEVEL

The "Control Shipping Level" is an additional inspection of purchased parts. The purpose of this process is to implement a filter which avoids defective purchased parts caused by poor SUPPLIER quality performance arriving at BHTC production lines.

CSL 1 (Control Shipping Level 1):

CSL 1 requires an additional 100% inspection of the products to be provided by the SUPPLIER. The appropriate testing station must be separated from production (minimum distance 10 m). The test results must be documented every day at the testing station. The marking of the purchased parts checked by the SUPPLIER must be agreed between BHTC and the SUPPLIER.

The SUPPLIER must report the inspection results to BHTC on defined frequency.

CSL 2 (Control Shipping Level 2):

CSL 2 requires an additional inspection of the purchased parts by an independent service provider representing BHTC interests. The SUPPLIER pays the costs incurred for this inspection. The selection of the service provider must be agreed with BHTC, since customer requirements (OEM) must be taken into account.

A report of the inspection results must be sent to BHTC by the service provider on defined frequency.

To revoke CSL 1 / CSL 2, 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 defect-free parts during the additional 100% testing as would make up 5 delivery batches, and
- Written acceptance by BHTC.

7 SPECIFIC REQUIREMENTS FOR ELECTRONIC COMPONENTS

7.1 RELEASE OF ELECTRONIC COMPONENTS

The following proofs are to be provided by the SUPPLIER for all new electronic components to be introduced at BHTC:

- Successful implementation of the release test according to the qualification guidelines of AEC-Q100/101/200 (more detailed tests must be carried out in addition if required), and
- Complete proof methods according to PPAP Level 3.

Furthermore, all the requirements documented in "BHTC Requirements for Electronic Components" HELLA Norm HN-67500 (see [13] in chapter 8) must be met.

7.2 PROOF OF PROCESS CAPABILITY

Process capabilities, in accordance with chapter 5, must be proven for electronic components for all functional, safety and quality-related processes. In addition, the use of statistical methods such as Part Average Test and Statistical Bin Analysis are a pre-requisite to support the zero-defects strategy.

8 APPLICABLE DOCUMENTS, LITERATURE

Details on the standards and methods of Quality Management specified in this guideline may be found in the respectively latest version of the following documents.

Source for standards:
Beuth Verlag GmbH
Postfach 11 45
D-10772 Berlin
www.beuth.de

[1] ISO 14001 Environmental Management Systems

[2] EN ISO 9001 Quality Management Systems- Requirements

[3] Verband der Automobilindustrie e.V. (VDA) - German Association of the Automotive Industry

VDA source:
Verband der Automobilindustrie e. V. (VDA)
Quality Management Center (QMC)
An den Drei Hasen 31
D-64110 Oberursel
www.vda-qmc.de

[4] Volume 1 Documentation and Archiving - Code of Practice for the Documentation and Archiving of Quality Requirements and Quality Records

[5] Volume 2 Quality Assurance for Supplies Production Process and Product Approval PPA

[6] Volume 4 Quality Assurance in the Process Landscape

[7] Volume 5 Capability of Measurement Processes; Capability of Measuring Systems

[8] Volume 6 (Part 1) QM System Audit

[9] Volume 6 (Part 3) Process Audit

[10] Volume 6 (Part 5) Product Audit

[11] IATF 16949 Quality Management Systems
Special Requirements when EN ISO 9001 is used for Series and Service Parts Production in the Automotive Industry.

[12] ISO 26262 Road Vehicles – Functional Safety

National Legislation

2000/53/EC (ELV)	EU-Directive on End-of-Life Vehicles
2011/65/EU (RoHS)	EU-Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
(EC) No. 1907/2006 (REACH)	EU Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemicals
AEC-Q100	Failure Mechanism Based Stress Test Qualification for Integrated Circuits

HELLA Regulations

[13] HELLA Regulation HN67500:	HELLA Requirements for Electronic Components
[14] HELLA Regulation HN 20103:	Restrictions and Prohibitions of Substances
[15] HELLA Regulation HN 20037:	Guideline for the Uniform Marking of Special Characteristics and their Verification Requirements
[16] HELLA Regulation HN 20146:	Guidelines for Software Suppliers

The before listed HELLA documents referenced throughout this Manual will be provided upon explicit request by the SUPPLIER. In case the SUPPLIER did not ask for said HELLA document(s) and/or did not submit its rejection by providing the justified reasons thereof within a period of four (4) weeks following the date the Framework Supply Agreement is concluded by and between SUPPPLIER and BHTC or date signature of this quality guideline, whatever is the earlier, said HELLA Regulation(s) not requested and/or not rejected accordingly will be deemed to be accepted by the SUPPLIER in its respective current version.

[17] OEM:	Customer Specific Requirements

www.iatfglobaloversight.org/oem-requirements/customer-specific-requirements/

ABBREVIATIONS

Term	Definition
8D Report	Eight Disciplines Problem Solving
AIAG	Automotive Industry Action Group
CAMDS	Chinese Automotive Material Data System

CAQ	Computer-Aided Quality
CBFS	Characteristic Based Feasibility Study
Cmk	Short-term machine capability
Cpk	Long-term machine capability
CSL	Control Shipping Level
DIN Standards	Deutsches Institut für Normung (German Institute for Standardization)
DMAIC	Define, Measure, Analyze, Improve and Control
EOP	End Of Production
ERP	Enterprise Resource Planning
FIFO	First-in, First-out
FMEA	Failure Modes Effects Analysis
FuSa	Functional Safety
HIS	Hersteller Initiative Software
IMDS	International Material Data System
MDS	Material Data System
OEM	Original Equipment Manufacturer
PPAP	Production Part Approval Process
Ppk	Preliminary process capability
PPM	Parts-per-Million
QM	Quality Management
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
SEP	Supplier Escalation Process
SOP	Start Of Production
SPC	Statistical Process Control
SQA	Supplier Quality Assurance
SVHC	Substance of Very High Concern

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