NOTE: This translation is for information purposes only.
The German version shall prevail above all others.

# Technical Component Requirement Specifications

# Tail lamp

## Model Series:
## C174 FV/FX/FC facelift,
## C178 FV/FX/FC facelift

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| 012 | | | |
| 013 | | | |
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| 015 | | | |

*Information on formatting used:*

- *Italics: The text is information*
- *Standard font: The text is a requirement*

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# 1 Introduction (STM-867451)

STM-867448 These component requirement specifications (CRS) describe the requirements for the provision of services within the framework of the development or series production of component parts, modules, software, or components (all hereinafter referred to as "component" or "scope of supply and services") by the supplier (hereinafter referred to as the "Contractor") to Mercedes-Benz AG or the respective subsidiary or other affiliated companies of Mercedes-Benz AG (hereinafter referred to as the "Client") to which the Contractor has contractually agreed to supply components or other content.

STM-4764956 In these requirement specifications, the gender neutral form is used. In terms of content, this refers to persons of any gender identity.

## 1.1 Documents Landscape (STM-867449)

STM-867450 Together with all other documents referenced here, these requirement specifications form the basis of the scope of supply to be provided by the contractor.

2831740 The German-language version of these requirement specifications shall be the sole binding version. Other language versions of the requirement specifications that are made available to suppliers shall not be binding.

STM-867452 *References to other documents are shown in square brackets, e.g. [LHV 310 001]. Documents referenced in this way can be found in the Chapter "Other Applicable Documents" (see STM-867662). The download options using the DocMaster system are also described there.*

### 1.1.1 Document Creation (STM-867456)

STM-867457 *This document was generated from a requirements management database. Maintenance and updating of this document are performed in this database.*

STM-867454 *In order to unambiguously identify the content, the database assigns identifiers (IDs). Depending on the formatting in the document, the identifier may be displayed in the following ways:*

- *ID left, text right (requirement)*
- *ID below the text (requirement)*
- *ID in brackets following a heading*

STM-867453 *The requirements contained in this document may be acquired by the contractor as a database export.*

### 1.1.2 Common Requirements (STM-867455)

STM-867458 The "Common Requirements Pertaining to the Component Requirement Specifications" [LHV 310 001] document contains requirements that are valid for all scopes of supply and services of the client.

STM-867462 In the case of deviations between the provisions of the requirement specifications and those in the Common Requirements [LHV 310 001], the provisions described in the requirement specifications shall apply.

STM-867459 Chapters or requirements in [LHV 310 001] are not referenced by chapter number, but instead by the corresponding Requirement ID, e.g. “Scheduling in the Project” CRCS-3339913.

STM-867460 *Section CRCS-3341616 of the Common Requirements contains the most important changes made to the versions of the standard Component Requirement Specifications template. This overview has descriptive character, in order to facilitate orientation in the document. It does not relieve the contractor of a detailed examination of the requirements.*

### 1.1.3 Logistic Component Requirement Specifications (STM-867465)

STM-867464 For each sourcing scope, the Contractor receives logistics component requirement specifications (LOG-CRS) via the “proSource” system, which also illustrate the logistics concept. The logistics concept will differ depending on the component part, the client plant, the form of delivery and the contractor's production and dispatch location. The Contractor shall fulfill the requirements of the logistics component requirement specifications (LOG-CRS).

STM-7750936 For each sourcing scope, the Contractor is provided with a logistics concept by the Client's purchasing department. This concept is specific to the particular component, contractor and delivery location.

### 1.1.4 Excerpt from the Process Master Plan for Suppliers (STM-867463)

STM-867467 *The document "Excerpt from the Process Master Plan for Suppliers" contains the most important skeleton schedule dates of the leading model series project for this scope of supply.*

STM-867466 *The contractor can obtain the "Excerpt from the Process Master Plan for Suppliers" via the "proSource" system.*

### 1.1.5 Other Documents Pertaining to These Requirement Specifications (STM-867468)

STM-867469 These requirement specifications and the other cited documents make reference to various types of documents, including:
- Implementation regulations (AV)
- Function specifications (FV)
- Drawings
- Standards or company standards (MBN)
- Supply specifications (DBL)
- Laws
- Additional component-specific specification documents.

These types of document are referred to in the following as “Other Applicable Documents” (MGUs) pertaining to the requirement specifications and to the other cited documents.

STM-867471 The documents referenced in Chapter "Other Applicable Documents" supplement the requirements described in the present document. The requirements set forth in these documents are hence likewise binding specifications for fulfilling the scope of supply and services.

STM-867470 If the present requirement specifications or the Common Requirements contain more stringent or less stringent specifications than are found in the Other Applicable Documents, the specifications contained in the requirement specifications and/or Common Requirements shall apply. No weakening of safety-relevant requirements or legal specifications is permitted.

STM-867472 If a company standard (MBN or DBL) is referenced in these requirement specifications or in the Common Requirements Pertaining to the Technical Component Requirement Specifications, the Contractor shall check whether an approval of procurement source (BQF) for this company standard exists. The indication of an approval of procurement source is documented on the cover sheet of the company standard. It shall be possible to retrieve the approval of procurement source under document number “BQF ...“ in DocMaster (example: MBN 12345 -> BQF 12345). The restrictions applied by the approval of procurement source shall be complied with in the context of the contract.

STM-867474 *An approval of procurement source is needed whenever the company standard makes specific requirements that can or may only be provided by one or more particular suppliers, that need to be verified by means of special tests, or that can only be satisfied by particular products (quoting a trade or brand name and their manufacturers).*

STM-880008 Supplier drawings with the associated 2D/3D data records are the intellectual property of the supplier who created them. The disclosure of external supplier drawings by the contractor to competitors of that contractor is only permitted with the written approval of the drawing owner (for example, in the context of supplier-bound parts).

STM-880010 The procurement of directed parts is, as with a BQF, only permitted through the supplier documented on the supplier drawings; otherwise there is a risk of violating competition and intellectual property laws.

STM-880009 In the case of drawings prepared by the client, there are no specifications governing the contractor for procurement.

## 1.2 General Specifications (STM-867476)

STM-867475 The contractor shall treat all information and documents pertaining to development as confidential.

STM-867473 If the cited documents do not define requirements or define these differently, and these requirements are required for the flawless and unimpeded function and quality of the scope of supply, then the contractor shall reveal this to the client in writing.

STM-867477 If, in the course of performance, the contractor wishes to deviate from the requirements described in the cited documents, the contractor shall require the written consent of the client.

STM-867479 If the contractor is familiar with quality- or reliability-enhancing or cost-reducing alternatives to the content of the cited documents, the contractor shall reveal these alternatives to the client in writing.

STM-867478 The contractor shall critically analyze the client's proposals and specifications and, if necessary, shall jointly develop improved solutions (shared responsibility).

STM-867481 The contractor shall ensure that the scope of supply meets all the requirements set forth in the requirement specifications. In particular, the contractor shall ensure that the planned tests and checks are suited to and sufficient for the development and delivery of a specification-compliant scope of supply, even in such cases where the type or number of tests and checks is proposed by the client. Should the contractor deem further tests and checks to be necessary, the contractor shall notify the client of this without delay and take appropriate action. Neither the performance of tests and checks by the contractor or client nor compliance with such tests and checks shall ever relieve the contractor of the obligation to fulfill the requirements of the requirement specifications. The contractor shall document fulfillment of the requirements in writing by means of test plans and reports.

STM-867480 The client is at all times authorized to demand changes and additions to the project description.

STM-867482 The contractor is obliged to propose to the client technical changes that the contractor deems necessary or practical. The contractor shall implement these changes after receiving the written approval of the client.

STM-867485 The contractor may reject changes or additions if these are deemed unreasonable, provided that notice of such rejection is immediately submitted to the client. The reasons for deeming them unreasonable shall be presented in writing.

STM-867487 To the extent that changes affect costs and/or deadlines, the contractor shall immediately upon receipt of the demand for changes or additions, or together with the contractor's proposal for changes, submit a cost estimate to the client with an itemized and justified listing of higher or lower costs as well as information on how deadlines may change. In such cases, the contractor shall not implement changes and additions until the parties to the contract have reached a written agreement. The written order to implement the changes may only be issued through the client's material supply process.

STM-867484 When designing the component, the contractor shall take all boundary conditions given by the overall vehicle into consideration. This refers in particular to space requirement investigations and associated tolerance considerations, assembly, feasibility of assembly, ease of servicing, visual matching with trim parts (inside and outside), environmental compatibility, country variants and the use of modular systems.

STM-867483 To meet the client's demand for functionality and quality at the lowest possible cost, the contractor should submit its own proposals, stating the risks and potential benefits.

STM-867488 *The client reserves the right to use the scope of supply in other vehicle/engine model series as well.*

STM-867492 The contractor shall not make changes to the scope of supply that limit the use of the scope of supply in the vehicle/engine model series.

STM-867490 Changes made by contractors of parts to both the contractor and the client shall be agreed between the client and the general contractor. They will be prioritized by the client.

STM-867489 The contractor shall coordinate the market-specific start-up curves with the market launch deadline in detail with the client.

STM-867491 Throughout the entire development period, the contractor shall analyze and reveal weight-reducing measures.

STM-867496 Weight figures shall be broken down by the contractor on the basis of the parts list. They serve as the basis for future optimizations and the documentation thereof. Note that the components/item numbers at interfaces to adjacent modules are to be given full consideration**.**

STM-867494 In addition, the contractor shall offer at least one lightweight design variant of the subject component, this variant weighing less than the specified maximum weight. Consideration shall here be given to alternative materials, manufacturing processes and weight-optimized design.

STM-7758499 For each sourcing scope, the target value for the weight, as defined and described in the CRS, shall be met as a minimum (tender phase). If the weight target agreed when the contract was awarded is not achieved (for the TVeh prototype phase before the start of series production tools), a malus amount is used as the basis (Euro/kg).

STM-867495 The contractor shall reveal the weight reduction potential and any additional costs of the lightweight solution versus the conventional manufacturing process to the client.

# 2 Scope of Supply and Services (STM-867493)

## 2.1 Component-Specific Requirements (STM-867946)

### 2.1.1 Short Description and Development Scope (STM-867945)

STM-867949 The component described in these requirement specifications is referred to as a “tail lamp combination”.

STM-867947 *TL has been defined as the mandatory abbreviation for the component.*

### 2.1.2 Project Specifications (STM-867948)

#### 2.1.2.1 Assignment of the Component (STM-867952)

##### 2.1.2.1.1 Assignment (STM-867950)

STM-867953 *The use of the components described in these specifications is planned for the C174 FV/FX/FC Mopf and C178 FV/FX/FC Mopf series.*

##### 2.1.2.1.2 Market Launch (STM-867951)

STM-867954 For the component described, no distinction is made between country variants. The component is used worldwide.

### 2.1.2.2 Part ID Number (STM-867959)

STM-867955 *The following part ID number is defined:*

STM-867957 **Mercedes-Benz Part ID No.:** "A1749061303"
Designation: REAR LED COMBINATION LAMP LH SIDEWALL
Quantity: 1

STM-867957 **Mercedes-Benz Part ID No.:** "A1749061403"
Designation: REAR LED COMBINATION LAMP RH SIDEWALL
Quantity: 1

STM-867957 **Mercedes-Benz Part ID No.:** »A1749061503«
Designation: REAR COMBINATION LAMP C-PART
Quantity: 1

STM-867957 **Mercedes-Benz Part ID No.:** »A1789061600«
Designation: REAR COMBINATION LAMP C-PART

Quantity: 1

### 2.1.2.3 Variants to Be Offered (STM-867956)

3214106 The variants to be offered can be found in the RFQ drawing, provided in the source package.

### 2.1.2.4 Installation Location in the Vehicle (STM-867958)

STM-867964 *The component is installed in the »rear end«.*

### 2.1.2.5 Supplier Development Costs for Engineering LEK-(E) – Payment Plan (STM-2912031)

STM-2912033 The Client shall pay for development services performed by the Contractor and described in these Component Requirement Specifications (LEK-E – Supplier Development Costs for Engineering) according to development progress. Invoicing or remuneration can only take place for development work already performed and accepted by the Client and is defined by the following payment plan.
The payment plan is based on the milestones from the Excerpt from the Process Master Plan (PMP) for Suppliers. If the Client has accepted the milestones described below, the Contractor can invoice the agreed proportion of the LEK-(E).

| Milestone | Deadline | Payment according to share of LEK-E | Development phase according to LEK (supplier development cost) scheme |
|---|---|---|---|
| DF ABEL | See “Data Provision and Release Deadlines for Documentation Maturity Levels” | 10% | B-Sample |
| VDMF | | 25% | C-Sample |
| “_” release | | 20% | C-Sample |
| ESWFT | | 15 % | D-Sample |
| Yellow PPAR | | 20% | D-Sample |
| Green PPAR | | 10% | D-Sample |

12965708 The Contractor shall allocate the development costs to the development phases in the LEK scheme (“Scheme Pertaining to the Request for Proposal for LEK-Engineering – MB Cars and MB Vans”) in accordance with the payment schedule specified here.

## 2.1.2.6 Supplier Development Communication Model (LEKM) (STM-5923661)

STM-6033791 If the production suppcontractor is not a micro or small enterprise as defined in [EU-Empfehlung 2003/361] (sales of at least€ 10 million or at least 50 employees), the following cooperation model rules shall apply.

STM-5923662 The parties are agreed that the agreed services shall be provided as a project assignment in the sense of series development project based on a contract for work (Werkvertrag) as made clear in the explanatory memorandum to the amendment to the German Temporary Employment Act and other laws.

STM-5923663 The parties are agreed that the contractor's performance obligation shall not be limited to the supply of personnel. The activities and deliverables are set out in detail in the work packages.

STM-5923664 The implementation of the project requires a flexible method of working as well as the exchange of specialist knowledge and that the contractor's personnel cooperate closely with the client's employees during the project. The purpose of communication between the employees of the contracting parties is to acquire information and to establish the facts for timely and implementable performance of the work by the contractor.

STM-5923665 The contracting parties assume that, in accordance with the case law of the Federal Labor Court, this specific cooperation does not change the fact that the personnel employed are working exclusively for their employer.

STM-5923666 Factual or results-oriented instructions providing concrete details on the agreed service performance are permissible. The contractor shall be responsible for choosing the personnel to be used in the project.

STM-5923667 The representatives of the contractor and the client shall advise the involved individuals of the requirement to strictly refrain from issuing labor-law instructions and shall guarantee compliance therewith.

STM-5923668 Communication between the contractor and the client shall basically take place through the representatives nominated by both parties for the provision of services on each assignment.

STM-5923669 Issue-specific communication between the experts of the contractor and client shall be allowed. Both parties shall strictly refrain from the reciprocal issuing of work instructions. In addition, no joint teams will be formed (either officially or de facto) and no integrations will be carried out.

STM-5923670 It is also permissible for this issue-specific communication to take place on the business premises of the respective other party to the contract, particularly in the facilities provided. As a general rule, however, the regular work of the respective parties to the contract should take place in separate spaces.

STM-5923671 If the contractor deems it absolutely necessary for the performance of its work in its interest, it can appoint an employee as a resident engineer to ensure the transfer of knowledge between the client and the contractor as well as the performance of work during the required on-site assignment on the premises of the client.

STM-5923672 In doing so, the employee of the contractor who is appointed resident engineer will act exclusively in the interest of his/her contractual employer (the contractor) during the development phase and will exclusively receive labor law instructions from the latter.

STM-5923673 Special compensation for the resident engineer is not permitted and is not agreed.

STM-5923674 Client communication with a resident appointed by the contractor occurs exclusively in the presence of a representative.

STM-5923675 The ban on joining the client's operational organization as well as the requirement of spatial separation also apply if a resident engineer is appointed.

STM-5923677 Prior to commencement of the performance of services, both contracting parties shall undertake to communicate an understanding of the character of professional communication in conformity with the work or service contract to all parties involved in the active project work (persons involved in the active, regular communication process). This shall also apply to the specifications for communication with a resident engineer deployed by the contractor.

### 2.1.3 System Context (STM-867962)

### 2.1.4 Functions (STM-867960)

#### 2.1.4.1 Basic Driving Functions (STM-868024)

STM-868026 For the confirmation of functionality in a set of combined components the contractor shall make the essential basic driving functions available with the first laboratory release. These include:

- The flashability as defined in [Mercedes-Benz Diagnostic Specifications] (see also CRCS-3339984) [LHV 310 001]
- Full implementation of secure diagnosis incl. secure coding and CCCv3
- On-board electrical system functions (see STM-868105 ff.)
- Basic driving functions for road approval

STM-868027 At the latest, the samples for the test vehicles in road operation (e.g. ATG-E/EF-Low) should comply with the EPDM quiescent current values:
- All components upstream of the on-board electrical system disconnect switch (currently EIS, KeylessGo and VTA) shall then comply with the respective maximum permitted quiescent current values as specified by EPDM.
- All components after the battery circuit breaker that consume a vehicle quiescent current taht is too high are subject to being switched off safely. Therefore, if necessary, a quiescent current that is too high can be accepted for a specific sample in arrangement with the client.

STM-7093423 The relevant basic driving functions for the component are as follows:

STM-868028
- Rear lamp
- Brake light
- Turn indicator
- Rear fog light
- Reversing light

### 2.1.5 Properties (STM-868051)

### 2.1.5.1 Target Weight Specification (STM-868050)

STM-868052 Weight of REAR LED COMBINATION LAMP LH SIDEWALL: max. 1.3 [kg]
Weight of REAR LED COMBINATION LAMP RH SIDEWALL: max. 1.3 [kg]
Weight of REAR LED COMBINATION LAMP C-PART: max. 1.4 [kg]

13789374 Note: No separate "lightweight construction variant/solution" is required.

### 2.1.5.2 Corrosion Protection (STM-868056)

STM-3800635 Following installation in the vehicle, the components will receive no further protection by means of preservation or painting. The materials and surfaces of the components shall be selected and designed for suita-bility to the installation location in the vehicle.

### 2.1.5.2.1 General Requirements Regarding the Definition of Corrosion Protection for the Overall Vehicle MBC (STM-3800636)

STM-3800637 During component development, the contractor shall observe the following requirements:

STM-3800638 The contractor shall ensure the corrosion-free state of new vehicles delivered anywhere in the world.

STM-3800639 No corrosion effects shall occur in areas visible to the customer within a period of three years.

STM-3800640 For a period of 7 years, there shall be no significant corrosion on attached parts.

STM-3800641 There shall be no corrosion on the painted body assembly for a period of 10 years.

STM-3800642 The corrosion protection for the body shall be designed to last for 15 years without perforation through corrosion.

STM-3800643 The corrosion protection for major units and components shall be designed to last for 15 years without functional failures due to corrosion (exception: compo-nents subject to wear).

STM-3800644 The corrosion protection and the material concept shall be documented on the drawing/3D data record in accordance with [MBN 10330] and [MBN 50300].

STM-3800697 The contractor shall define a corrosion protection-friendly design in consultation with the client's Overall Vehicle Corrosion Protection department.

STM-3800698 In corrosion-critical installation situations, only electrochemically compatible materials may be joined to one another in order to avoid contact corrosion.

STM-3800699 Where coupled materials are not electrochemically compatible, suitable coatings or design measures shall be taken to electrically decouple/insulate the different materials. When using plastics for decoupling, the material used shall have a low water absorbing capacity.

#### 2.1.5.2.1.1 Protection Against Constant Moisture/Dirt Traps (STM-3800649)

STM-3800650 Components shall be designed in such a way that no scoop-like areas form on the component itself and also when installed in the vehicle that can lead to water retention or dirt nests and permanent moisture. Large contact areas that avoid drying are not permitted. This especially applies under covers or insulation mats.
For this purpose, the contractor shall provide suitable water drainage options, distancing and corrosion protection measures.

STM-3800651 For components with water-draining function (e.g. water tank) water collecting points and retaining areas (i.e. ranges with standing water) are to be excluded with certainty. Drainage shall not be carried out via detachable parts (e.g. wiper system).

#### 2.1.5.2.1.2 Testing (STM-3800654)

STM-3800655 *To test corrosion protection, a dynamic or static Mercedes corrosion endurance test (MeKo) shall be carried out as part of the development process. On successful completion of the MeKo, development release, i.e. the release with regard to the corrosion protection of the overall vehicle, will be granted.*

STM-3800656 *With regard to the testing of the stone chip protection, dynamic testing shall be carried out as part of the MDS. On successful completion of testing, develop-ment release, i.e. the release with regard to the protec-tion against stone chipping of the overall vehicle, will be granted.*

STM-3817552 With regard to the leaktightness of the overall vehicle, various leak tests will be performed as part of the MDS (document no. 08.08.2006-LLMC-RSRK). On successful completion of these tests, the tightness requirements for the Overall Vehicle with regard to corrosion protection are met.

STM-3817652 The Contractor shall meet the leaktightness requirements for small parts [MBN 10355], closing elements [MBN 10353] and foam pieces in body construction [MBN 10497].

STM-3800657 For the applied material/corrosion protection, the Contractor shall ensure that the corrosion protection requirements of the specified DBL are met and confirmed in the MeKo.

### 2.1.5.2.1.3 Provision of Digital Data (STM-3817541)

STM-3817656 In order to be able to evaluate and define corrosion protection measures for component parts and components on time, the Contractor shall provide digital data in SMARAGD (2D and 3D) for the Overall Vehicle Corrosion Protection department, and incorporate them into the component development process at an early stage.
On the basis of this digital data, materials and coatings as well as types of sealing (e.g. liquid/solid), which are exposed to atmospheric corrosion, shall be described. The provision of this data shall take place by the B-sample or the DPT-E DPT-PVV), data provision stage I of the vehicle project.

### 2.1.5.2.2 Components Made From Ferrous Materials (STM-3800666)

STM-3800667 All parts made of ferrous materials in exterior areas shall be protected against corrosion. Bare metal areas are not permissible.

STM-3800668 For steel components with metallic coatings, the following product versions are permissible for [DBL 8451]: .19, .29, .62, .65, .66, .69, .72, .76, .79, .86, .96, as well as .15, following approval by the Client's "Overall Vehicle Corrosion Protection" department. For parts manufactured from ferrous materials with inorganic coating (zinc flake coatings) [DBL 8440]: .20, .30, .60 (as well as .21 and .31, following approval by the "Overall Vehicle Corrosion Protection" department).

STM-3800675 If a gap is formed due to the geometry of adjoining components, additional preservation measures (wax) may be required to fulfill the corrosion protection re-quirements. The contractor shall coordinate the addi-tional preservation measures with the client.

### 2.1.5.2.3 Component Part Identification (STM-3800676)

STM-3800677 An impairment of the corrosion resistance and/or the corrosion protection of metallic components by component identifications later applied is not permissible.

### 2.1.5.2.4 Small Parts and Fasteners (STM-3800678)

STM-3800679 For fasteners, the Contractor shall apply corrosion protection coatings that as a minimum meet the requirements of [DBL 9440] regular product version .40, .47, [DBL 9460] regular product version .95, .96 and [DBL 9441] product version .50.
Other corrosion protection coatings are only possible with the previous approval of the client's Overall Vehi-cle Corrosion Protection department

STM-3800681 For all nuts, the [DBL 9440] regular product version .47 is specified as the coating.

STM-3800683 When using thread-forming screws in aluminum components the following types are permissible in corrosion stress areas:

STM-3800684 Threaded connections shall comply with [MBN 50553]:[DBL 9440] product version .49.

STM-3800685 With other threaded connections (not according to [MBN 50553]) in bodyshell/body component parts made of aluminum:[DBL 9440] product version .49 with an additional measure for thread sealing. Omission of the thread sealing is only permissible in individual cases after approval by the Overall Vehicle Corrosion Protection department.

STM-3800686 For other threaded connections (not in accordance with [MBN 50553]) in major assembly component parts and components made of aluminum and located in blind holes fully sealed by the screw/bolt head: all product versions in accordance with STM-3800679.

STM-3800687 For other threaded connections (not in accordance with [MBN 50553]) in major assembly component parts and components made of aluminum in through holes, as well as blind holes that are NOT sealed by the screw/bolt head:[DBL 9440] product version .49 with an additional measure for thread sealing. Omission of the thread sealing is only permissible in individual cases after approval by the Overall Vehicle Corrosion Protection department.

STM-3800688 For direct screw connections in aluminum components without fully round screws, component-specific corrosion inspections are to be accomplished in coordination with the vehicle corrosion protection department in each case.

STM-3800689 Al screws are only permitted after consultation with and approval by the "Corrosion Protection Overall Vehicle" department.

STM-4229886 Access of corrosion medium into the thread area shall be excluded or avoided by suitable thread sealing measures.

#### 2.1.5.2.5 Detachable Parts/Assembly Parts (STM-3800690)

STM-3800693 The contractor shall always design the mounting for attached parts on coated and painted surfaces so that no chafing will occur during exposure to dynamic driving load.

STM-3800694 If chafing stress cannot be ruled out, the contractor shall provide for appropriate measures such as the application of chafe-protective films.

STM-3817673 Screw bushings or inserts made of brass or uncoated steels in plastic components are not permitted. The bushings shall be made of aluminum or steel with ZnNi coating according to [DBL 8451] product version .62.
Deviations are only permissible after prior consultation with and approval by the Overall Vehicle Corrosion Protection department.

#### 2.1.5.2.6 Trim Parts with Chrome-Plated Surfaces (STM-3800702)

STM-3800703 For decoration parts with chromium plating surfaces, only CR(III)-based chromium electrolytes are permitted.

STM-3800704 For trim parts with chrome-plated surfaces, the supply specifications [DBL 1665], [DBL 1659] apply.

STM-3800705 Vehicle release takes place during the final vehicle phase in the MeKo-D. If no component parts from the series production process are available at the time of overall vehicle release, these will not be assessed in the MeKo-D. In this case, the MeKo-D test for chrome-plated plastic parts will only be done as part of series production vehicle validation.

### 2.1.5.2.7 Avoidance of Contact Corrosion Between Metals and Plastics/Elastomers (STM-3800731)

STM-3800732 To avoid contact corrosion, plastics/elastomers that are in contact with aluminum, magnesium or metallic-coated steel components shall exhibit a low hygroscopicity as well as the following specific resistance values:

- In contact with aluminum: specific resistance greater than 10 MOhm*cm (= 1E7 Ohm*cm).
- In contact with magnesium: specific resistance greater than 1 GOhm*cm (= 1E9 Ohm*cm).
- In contact with metallic-coated steel components: specific resistance greater than 10 MOhm*cm (= 1E7 Ohm*cm).

In addition, the Contractor shall determine the electrical resistance in accordance with [EN ISO 2878].

STM-3800733 Inserts in rubber seals shall be completely glazed. If this is not possible, the insert materials shall be coordinated with the Overall Vehicle Corrosion Protection department with respect to application and material pairing.

### 2.1.5.2.8 Components Made of Carbon Fiber Reinforced Plastics (CFRP) (STM-3800734)

STM-3817681 Metals combined with CFRP present a high risk of contact corrosion. The contractor shall determine a corrosion protection-compatible design at an early stage with the Overall Vehicle Corrosion Protection department.

STM-3817683 Component parts made of CFRP shall be tested for corrosion behavior in an assembly/partial build at the earliest possible stage; this shall be done in consultation with the Overall Vehicle Corrosion Protection department. The contractor shall make its test results available to the Overall Vehicle Corrosion Protection department at an early stage. In order to validate the concepts, prototype test parts shall also be made available to the Overall Vehicle Corrosion Protection department in sufficient quantities for inspection/testing at the latest the blank release.

STM-3800737 To avoid contact corrosion only electrochemically compatible material combinations may come into operation in corrosion-critical installation situations. In the case of electrochemically incompatible material pairings, the metallic materials shall be completely isolated/decoupled from the CFRP component part through suitable design measures (e.g. glass fiber coverings on the CFRP, etc.). Here it shall be guaranteed, that corrosive media or dirt deposits cannot bridge these isolation measures. When using plastics for decoupling, the material used shall have a low water absorbing capacity.

STM-3800738 Exposed uninsulated carbon fibers are not permitted in combination with metallic materials. Carbon fibers exposed on CFRP component parts through mechanical processing shall be completely electrochemically isolated (e.g. by glued sleeves made of titanium or polymer materials or hard anodized aluminum DIN EN ISO 10074).

STM-3800739 When using adhesives and sealants, sufficient specific electrical resistance (see STM-3800731), adhesive strength, and compatibility with the surface of the CFRP shall be ensured (even when the adhesive ages).

STM-3817687 Thermal stresses between CFRP and metallic parts shall be taken into account when designing the connection.

STM-3817688 Component parts made of CFRP shall be suitably protected against impact (stone chipping). Impact results in uninsulated exposed carbon fibers

STM-3817690 Forces shall be applied to CFRP component parts over a large area (surface contact pressure lower than compression strength of the matrix resin). High local surface pressures are not permitted due to the risk of delamination. Delamination results in uninsulated exposed carbon fibers.

### 2.1.5.3 Material Selection/Material Specification (STM-868055)

STM-868059 In selecting materials, the contractor shall consider STM-3496469.

#### 2.1.5.3.1 Materials (13303984) (13789377)

13789378 The Contractor undertakes to meet the specific goals relating to sustainability (climate protection and conservation of resources) in the General Requirements [LHV 310 001] acc. to CRCS-3341059 (Chapter on Sustainability and environmental compatibility).

13789380 In anticipation of the planned EU legislation on comprehensive PFAS regulation, it is already necessary for the entire scope to comply with the current version of the EU restriction proposal in advance, or to be designed, manufactured and supplied PFAS-free.

### 2.1.5.4 Tolerance Requirements (STM-868070)

2831400 The binding tolerances for the component parts described here can be found in the source package as other applicable documents. The supplier shall comply with these tolerances.

STM-868072 General requirements on tolerances are found in Chapter STM-3496796, "Tolerances".

### 2.1.5.5 Purchased Part Dimension Audit (STM-3521077)

STM-3521078 There are requirements pertaining to the Purchased Part Dimension Audit for this component. These are to be carried out and documented as specified in document [LHV 310 001] under ID CRCS-3340053.

STM-3521082 The purchased part dimension audit for the component comprises approx. »30« to »80« measuring points.

STM-3521084 The actual number of measuring points may be adjusted in the course of the development process if necessary.

### 2.1.5.6 Component Identification (STM-868074)

STM-868076 *The identification of components is described in the document [LHV 310 001] in the Chapter “Parts Identification” under Requirement ID CRCS-3340543.*

## 2.1.6 Interfaces (STM-868075)

### 2.1.6.1 Mechanical Interfaces (Fixation Concept) (STM-868082)

STM-868089 General requirements on mechanical interfaces are found in the Chapter STM-3496713, "Mechanical System Assembly Requirements".

## 2.1.7 Mechanical Requirements for the Lamp (2123046)

### 2.1.7.1 General (2123050)

2123045 *Requirements and objectives for the components are described in detail in the following chapter. The components shall be designed by the Contractor in consideration of all boundary conditions given by the overall vehicle. This refers in particular to installation studies and associated tolerance considerations, assembly, feasibility of assembly, ease of servicing, visual matching with paneling (inside and outside), environmental compatibility, country variants and the use of modular systems.*

2123047 The development services consist of the redesign and its revision, creating drawings, PT tool design and the necessary supervision costs, development project management etc. for the project.

2123054 The Contractor shall reveal measures for the reduction of parts, costs and weight to the contact of the Client's development department.

2123056 In the case of contradictory requirements between the component requirement specifications and the [Anfragezeichnung], the requirement of [Anfragezeichnung] has priority and shall be fulfilled.

2123052 During the course of the contract award process, changes to these requirement specifications are provided in the source package by “Supplementary Component Requirement Specification Requirements”. The most recent version of these requirements at the time of the contract award is binding and shall be fulfilled.

2123055 If the Contractor makes changes to the technical description during the offer period, these shall be explicitly mentioned. An overview slide with change history shall be created. The template from the source package shall be used.

2123058 If objections to requirements are made, these shall be listed in a separate objection list. Documentation of the objections in another location is not permissible.

12999658 Objections must be agreed with the Client at least 2 weeks before the award deadline.

### 2.1.7.2 Overview of Variants (2123059)

2123062 The Contractor shall not create any further country-specific variants in addition to those variants defined in the drawing.

2123061 If there are different lamps for ECE and SAE, openings for LEDs and attachment openings need to be covered, for example.

2123065 If there are different lamps for ECE and SAE, all the country-specific characteristics may only be present in the affected country variants. This means that side reflectors, side marker lamps, illuminant openings (e.g. for USA side marker lamp), openings for LEDs, attachment openings, markings for interchangeable inserts/slides, etc. shall not be present and/or visible in the non-affected country variant.

2123347 If there are different lamps for ECE and SAE, the rear fog lamp function shall be implemented on one side, in line with the country variant.

2752448 If a global lamp is required, this means that the lamp shall be homologation-capable worldwide. In this variant, the rear fog light shall be installed on both sides.

2123202 If a distinction is made between a standard lamp and a special equipment lamp, what is referred to as a “functional brake light in LED design” is used for the standard variant(s). The term “functional brake light” means:
cost-effective design of the light function taking all technical and legal requirements of the requirement specifications into account, however without additional design elements such as additional optical lenses or chrome applications.

## 2.1.8 Mechanical System Functions (2123113)

### 2.1.8.1 Day Design (2123114)

2123123 The Contractor shall design the lamp so that no technology is visible in the lamp in the normal view of the lamp (0 degrees) up to 90 degrees from above. This includes, for example, the engagements, cables, connectors, connecting points, and threaded fasteners. The visibility of the light sources and PCBs shall be presented in Concept Review 1. Design measures for reducing the visibility of the PCBs and light sources shall be disclosed before Concept Review 1.

2123125 The Contractor shall design the lamp housing so that the visibility of the joint is concealed.

2123126 The Contractor shall design the lamp so that a uniform appearance of the joints to adjacent component parts is ensured.

2123129 The Contractor shall design the lamp so that reflections of the technology in visible areas are avoided. Design measures such as structured surfaces and laminations shall be provided. These shall be disclosed for Concept Review 1 and have been implemented and confirmed for Concept Review 2.

2123133 The Contractor shall design the lamp so that reflections of red areas of the lens in transparent/gray areas are not possible. Design measures shall be disclosed for Concept Review 1 and have been implemented and confirmed for Concept Review 2.

2123132 In the visible area (this also applies if the trunk lid or rear-end door is open), no manufacturer logo of the Contractor is permitted.
Exceptions are legally required identifications that must be applied in the visible area. Positioning in coordination with the Client (no later than Concept Review 2).

2123135 The Contractor shall design all lamp openings so that no “shadows” occur in the illuminated area.

2123140 A consistent appearance of left TL and right TL shall be ensured.

### 2.1.8.2 Night Design (2123141)

2123139 The Contractor shall design the lamp so that the interruption of the illuminating surfaces in the transition between the sidewall lamp and trunk lid lamp is max. 14 mm wide. This dimension does not apply if the lamp diagram (Client's design data) or the RFQ drawing specifies a different dimension.
Maximum refers to the expansion of the lamp compartments.

2123142 The Contractor shall design the lamp so that max. and homogeneous illumination is achieved in the lamp flank for every lamp function.
Maximum refers to the contour of the lamp and the expansion of the lamp compartments specified by the development/design departments.

2123144 The Contractor shall design the lamp so that no diffused light is visible through the joints/gaps to the body or adjacent component parts.

## 2.1.9 Mechanical System Characteristics (2123152)

### 2.1.9.1 Illuminants Used (General) (2123185)

2864715 The LED information included in the parts list of the [Anfragezeichnung] represents the minimum requirement and is used for comparing quotations. The potential Contractor is required to assess this information with regard to its technical intended use, taking into account the requirements described in these component requirement specifications. If the preparation of the offer shows that LEDs with greater or lesser luminous intensity are required, these shall be offered separately in the offer and in the price breakdown.

2123184 The Contractor shall take into account in the offer all information on the LEDs, e.g. number and power class. The feedback shall be realized in the following form with the submission of tender.

2123190 *Example:*

| Baureihe: | | | | Datum: | | | | | Bearbeiter Lichttechnik | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lieferant: | | | | Version: | | | | | Bearbeiter Elektronik: | | | |

| Leuchte | Platine | Funktion | Anzahl LED's | Strom [mA] / LED | Anzahl Stränge | Lichtstrom [lm] / LED kalt | Lichtstrom [lm] / LED warm | elektr. Leistung [W] / Fkt. auf | Platinen-fläche Netto [cm²] | Zulassungs-form | Dominante Wellenlänge (inkl. | Bemerkung |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWL | | | | | | | | | | | | |
| | SL Animation | | | | | | | | | | | |
| SWL | PCB1 | SL | 42 | 20 | 21 | 2 | 1,8 | 2,73 | | 1-Kammer | 633 | |
| SWL | PCB1 | Animation | 12 | 20 | 6 | 2 | 1,8 | 0,78 | | | 633 | |
| SWL | PCB1 | | | | | | | 0 | | | | |
| | | FRA RFS | | | | | | | | | | |
| SWL | PCB2 | FRA | 12 | 140 | 6 | 24 | 14,4 | 5,46 | | | 589 | |
| SWL | PCB2 | RFS | 4 | 350 | 2 | 134 | 120 | 8,96 | | | | |
| SWL | PCB2 | | | | | | | 0 | | | | |
| | | BL | | | | | | | | | | |
| SWL | PCB3 | BL | 10 | 40 | 5 | 6,08 | 5 | 1,3 | | | 625 | |
| SWL | PCB3 | | | | | | | 0 | | | | |
| SWL | PCB3 | | | | | | | 0 | | | | |
| | | BL | | | | | | | | | | |
| SWL | PCB4 | BL | 10 | 40 | 5 | 6,08 | 5 | 1,3 | | | 625 | |
| SWL | PCB4 | | | | | | | 0 | | | | |
| SWL | PCB4 | | | | | | | 0 | | | | |
| | | SL | | | | | | | | | | |
| HDL | PCB5 | SL | 6 | 50 | 3 | 6 | 4,8 | 0,975 | | | | |
| HDL | PCB5 | | | | | | | 0 | | | | |
| HDL | PCB5 | | | | | | | 0 | | | | |
| | | SL | | | | | | | | | | |
| HDL | PCB6 | SL | 4 | 50 | 2 | 6 | 4,8 | 0,65 | | | 633 | |
| HDL | PCB6 | | | | | | | 0 | | | | |
| HDL | PCB6 | | | | | | | 0 | | | | |
| | Animation | | | | | | | | | | | |
| HDL | PCB7 | Animation | 10 | 20 | 5 | 2 | 1,8 | 0,65 | | | 633 | |
| HDL | PCB7 | | | | | | | 0 | | | | |
| HDL | PCB7 | | | | | | | 0 | | | | |
| | | NSL | | | | | | | | | | |
| HDL | PCB8 | NSL | 2 | 300 | 1 | 53 | 42,5 | 1,95 | | | 624 | |
| HDL | PCB8 | | | | | | | 0 | | | | |
| HDL | PCB8 | | | | | | | 0 | | | | |

2123188 The feedback shall additionally be provided in the form of a standardized Excel file. The illuminant table is provided in the source package.

2123192 The Contractor shall disclose possible cost-saving potential with regard to the number of LEDs and LEDs used and report this as an optional integral part in the offer.

2123196 If light sources are **not** relevant from a technical light viewpoint, they shall be noted/listed separately in the tender.

2123199 The Contractor shall define all lamp functions precisely and explicitly and disclose the approval requirements.

### 2.1.9.2 Component-Specific Tolerance Data (2123207)

2123208 *The binding tolerance specifications for the component parts described here can be found in the source package as other applicable documents.*

2123214 In accordance with [MBN 51012-30], the following applies:
General surfaces: Tolerance class 1-m
Position of tool-related holes: Tolerance class 1-m
Tool-related material thickness 1-f
Tool-related edges: 1-m

2123215 The Contractor shall fully confirm all tolerance requirements indicated in the RFQ documents; this is a mandatory requirement for contract award by the Client.
This confirmation shall be made in the technical description. If explicit reference to the tolerance requirements is not made in the offer, the tolerance requirements are considered as confirmed by the Contractor.

2123216 The Contractor shall create a tolerance study for the entire lamp. This will be discussed with the Client at the Concept Review 1 and Concept Review 2 milestones. The tolerance study is a component of the release drawing.

### 2.1.9.3 Material Selection/Material Specification (2123220)

2123224 If the Contractor uses auxiliary materials (lubricants etc.) during production, the auxiliary materials shall not impair the function of the lamp.

2123226 The use of Mg, corrosion-resistant CrNi steels, and CFRP is permitted after consultation with the Corrosion Protection Development department.

2654493 The material specifications contained in the [Anfragezeichnung] are used for comparing quotations. The potential Contractor is required to assess this information with regard to its technical intended use, taking into account the requirements described in these component requirement specifications. If it is aware of quality-increasing and/or cost-reducing materials, these shall be indicated separately in the offer.

11069424 For KR2, a complete component bill of materials incl. complete material specifications, surface coatings, DBLs and QEV numbers according to the CAD material list, as well as the surface and coating list.

### 2.1.9.4 Thermal Management (2123244)

2123245 The Contractor shall perform temperature simulations on the overall system of the component part based on the requirements in Chapter Testing of the Rear. These shall be agreed on with the Client at the latest by Concept Review 1.

2123243 The Contractor shall determine the critical situations of the component part and implement corresponding design measures. These shall be agreed on with the Client at the latest by Concept Review 2.

2123246 The Contractor shall, if required, provide testworthy samples for temperature measuring drives and compare the results of the measuring drive with the simulation (test review 1).

## 2.1.10 Mechanical System Interfaces (2123297)

### 2.1.10.1 Overview of Mechanical System Interfaces (2123294)

2123295 The lamp interfaces shall be agreed on with the Overall Vehicle area:

2123298 · *Bodyshell*

2123296 · *Corrosion protection (body seam sealing)*

2123303 · *Interior trim*

2123302 · *Rear-end door/trunk lid*

2123304 · *Handle strip*

2123308 · *Inner fender skirts (trunk)*

2123307 · *Rear bumper*

2123310 · *Bumper bracket to lamp*

2123309 · *Wiring harness electrical components including connectors and fasteners*

2123314 · *Weld cover*

### 2.1.10.2 Mechanical Loads (2123322)

2123321 For the tool release, the Contractor shall confirm the strength of the attachment points to the vehicle via an FEM analysis. This shall be submitted to the Client for the Concept Review 2 milestone.

2123320 *The boundary conditions for FEM calculations are defined in the Chapter “Requirements from Testing”.*

2123323 The Contractor shall provide the simulation results to the Client's Development contact in an agreed-upon exchange format.

### 2.1.10.3 Lamp Ventilation (2123334)

2123335 *The lamp ventilation serves for pressure compensation between atmospheric pressure and the pressure in the lamp.*

2123336 The Contractor shall design the lamp so that an ingress of environmental influences (e.g. dust and dirt particles or insects) is effectively prevented.

2123338 The Contractor shall design the lamp so that no moisture (water, operating fluids, etc.) can accumulate.

2123337 The openings shall be designed for standard profiles and/or for the requirements and attachment of pressure compensation elements.

### 2.1.11 Component Design (2123340)

2123342 *The Contractor shall take the geometric specifications from the [Anfragezeichnung] The concept cross sections are used to present the structure of the lamp.*

#### 2.1.11.1 General Design Standards (2123348)

2123345 *This chapter contains supplementary requirements and information about the [Anfragezeichnung]*

2123349 The parts list of the [Anfragezeichnung] only includes the main component parts. Potentially necessary additional parts required for technical realization and implementation of the design shall be listed in the tender and in the price breakdown.

2123352 The Contractor shall design the lamp so that the minimum distance to all adjacent component parts (bodyshell/seam sealing/etc.) is 3 mm. An exception to this rule are fastening and reference points, as well as seals and edge strips.

2123354 If the distance is less than 3 mm, the constriction shall be documented by means of a measuring point in the measuring plan and subjected to a tolerance check. The measuring point shall be included in the release drawing.

2123356 The Contractor shall design the lamp so that no crazing points arise in the case of engagements/engaging lugs.

2123358 For lamps in the trunk lid/rear-end door, the Contractor shall provide water-guiding elements to prevent water from entering the trunk when opening the trunk lid/rear-end door.

#### 2.1.11.2 Alignment and Attachment (2123360)

##### 2.1.11.2.1 General (2123359)

2123361 Since this concerns the development of a tail lamp as part of a facelift project, the Contractor shall carry over the alignment and fastening concept from the current series production vehicle.

2123363 During the assembly process (joining of lamps in body), it shall be possible to precisely position the lamp without any intervention by the worker. The Contractor shall have available/develop a corresponding assembly concept.

2123367 All fastenings for installing the lamp assembly on the body shall have the same thread size.

2123364 The Contractor shall design the lamp so that the lamp fasteners do not exert excess pressure on the seal.

2123366 The connection to the body shall be coordinated with the Client's Overall Vehicle Corrosion Protection department depending on the material used on the body.

2123365 All coatings used on the individual parts of the components shall be included in the drawing in a table. The entry on the drawing for the assembly components test shall be agreed with the Client's Overall Vehicle Corrosion Protection department.

3097249 The binding definition of the alignment plan for the component parts described here can be found as another applicable document (tolerance sheet) in the source package.

13286924 The tool concept for the trunk lid light/rear-end door light shall incorporate exchangeable part inserts for the RPS contact points. The tool concept for the trunk lid light/rear-end door light at the RPS contact points shall allow for correction in the exchangeable insert by repositioning up to 1 mm. It shall also be possible to adjust the sealing bar in the tool by up to 1 mm.

13286925 The tool concept for the trunk lid light/rear-end door light shall allow the RPS contact points to be reduced by up to 1 mm by creating a new exchangeable part insert.

13286926 The Contractor shall disclose the technical concept for the implementation of the exchangeable part insert by Technical restrictions for the implementation of an exchangeable part insert due to the component part geometry shall be disclosed by the Contractor and agreed with the Client.

13286927 *The measures are used for the final coordination of the soft component with the bodyshell.*

### 2.1.11.2.2 Cross Pin (2123368)

3097251 *If the tolerance sheet requires an alignment of the lamps using a cross pin, the following requirements shall be complied with.*

2123372 The body opening in which the cross pin engages shall be sealed by a seal. The seal is an integral part of the tail lamp assembly. Additional bonding of separate seals to the vehicle is not permissible.

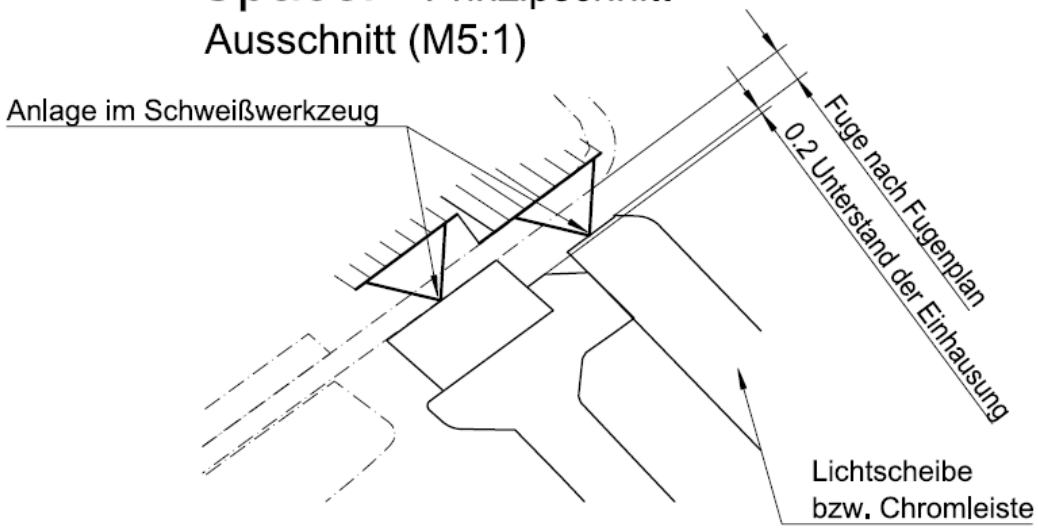
### 2.1.11.2.3 Spacers/Minimum Gap Limiters (2123370)

3097255 *If the tolerance sheet requires an alignment of the lamps using a spacers/min. gap limiters, the following requirements shall be complied with.*

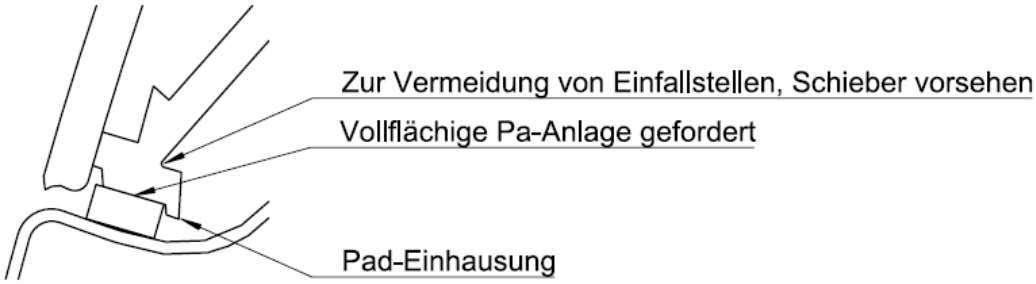
2123375 *Spacer means that the specified gap dimension is created by fitting a spacer on the body.*

2123376

## Spacer Prinzipschnitt
Ausschnitt (M5:1)

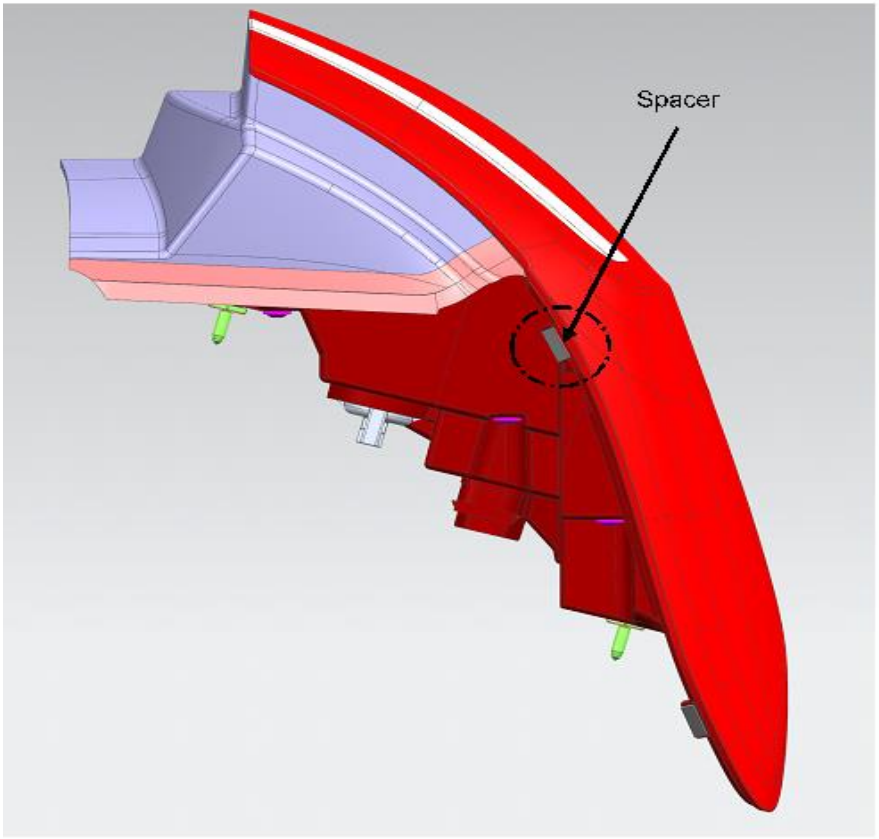


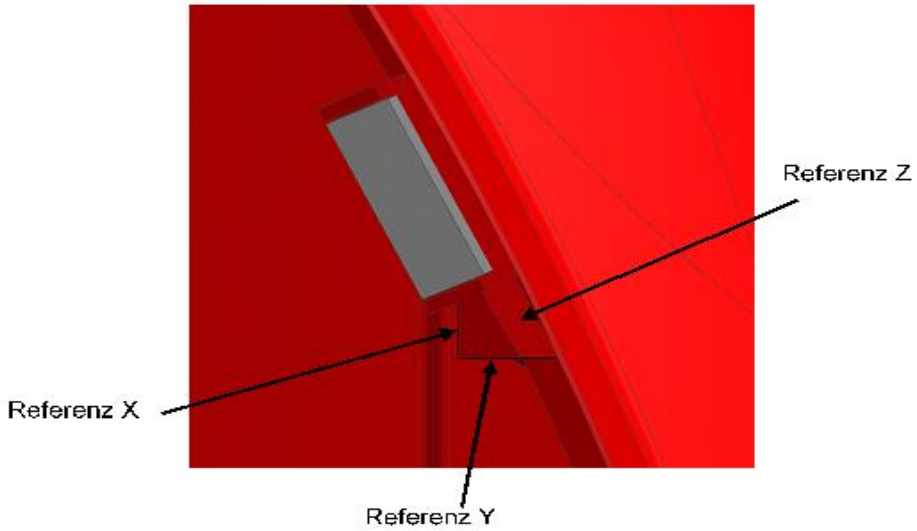

## Bsp. für Anschlag abgewand der Lichtscheibe
M 2:1



2123374 If spacer pads are envisaged for the positioning, additional surfaces with parallel alignment within the reference grid in accordance with the lower drawing shall be provided.

Ansicht Z

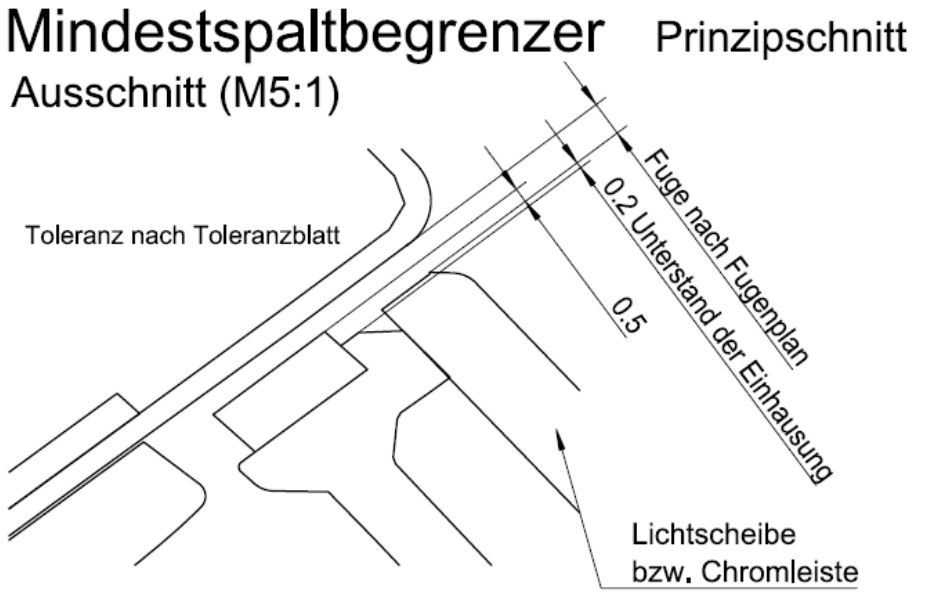


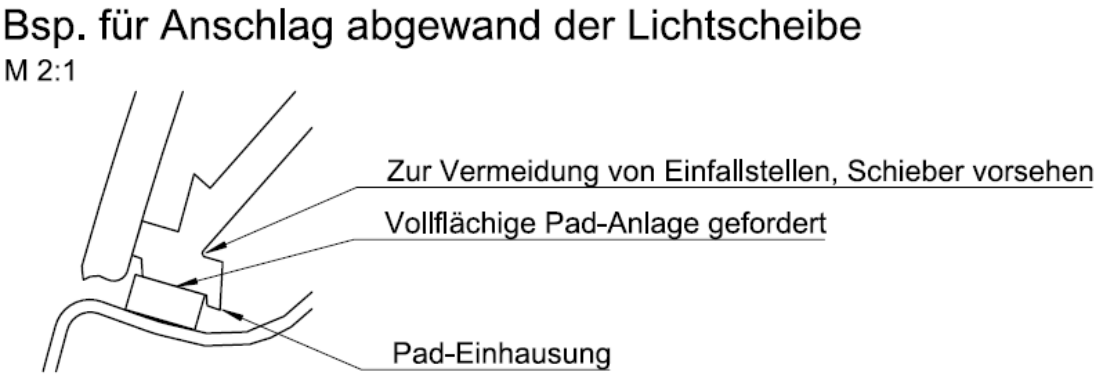




2123377 The housings for min. gap limiters and spacers that are aligned with the bodyshell shall not have a sharp-edged design

2123378 *Min. gap limit means that contact with the lens is prevented during the installation of the tail lamp. In the nominal installation, the min. gap limiters are not in contact with the bodyshell.*

2123381




The minimum gap of 0.5 mm shall be ensured by a minimum gap limiter.

2123383 The Contractor shall also take the spacers into account in the tolerance evaluation.

2123387 The Contractor shall design the lamp so that the min. gap limiters/spacers are positioned on the lamp housing.

2123384 Where chrome trims are used, it shall be checked whether the min. gap limiter/spacer can be attached to the lens (behind the chrome trim).

2123386 The Contractor shall design the lamp so that the min. gap limiter/spacer is fastened to the lamp across its entire surface area and secured against falling off.

2123388 The Contractor shall design the lamp so that the min. gap limiters/spacers do not detach during transport (e.g. in the load containers) to the installation location.

2123392 The Contractor shall design the lamp so that the min. gap limiters/spacers do not detach during assembly in the body.

2123389 Tolerance adjustment, e.g. at the attachment surfaces for min. gap limiters/spacers, (including multiple adjustments) is an integral part of the basic offer.

### 2.1.11.2.4 Preattachment of Lamp (2123390)

2123391 The lamp shall maintain its position on its own after insertion into the body (the lamp shall be secured against falling down prior to bolting).

2123393 *Background: The worker shall equip the tool with the fastener.*

### 2.1.11.2.5 Fasteners (2123394)

#### 2.1.11.2.5.1 General (2123397)

2123398 The Contractor shall design the lamp so that the fasteners do not detach from the lamp housing during lamp disassembly.

2123395 The Contractor shall design the lamp so that the openings in the bodyshell for the fasteners are closed with seals.

2123402 The seal of the fastener shall lose max. 5% of its thickness when the threaded connection is tightened with the rated torque.

2123399 The fasteners for the assembly of the lamp on the body shall be designed so that they have a collar that rests on the body panel (lamp mount in the bodyshell). The collar diameter shall be dimensioned so that the collar is in all-round contact with the panel in all tolerance and assembly positions.

2123401 The contact surface of the fastener shall be produced for the nominal dimension (see RPS system) via the bolt or a plastic collar.

2123403 The diameter of the fasteners is specified as d = M5.

2123404 To minimize the installation time, threaded bolts shall be designed to be as short as possible. The stud length shall be specified in coordination with the Client's Development department (by Concept Review 2 at the latest)

#### 2.1.11.2.5.2 Adjustment Controls (2123405)

2753562 *If the [Anfragezeichnung] calls for adjustability of the lamps, the following requirements shall be complied with.*

2123407 The adjusting mechanism of the lamp shall be designed so that the fasteners do not need to be fully disassembled for the adjustment process.

2123410 If an inline measuring system is planned, the adjusting element shall be set in the inline measuring system.

2123411 After adjustment at the Contractor's plant, the adjusting element shall be protected against twisting (e.g. mask).

2123409 The Contractor shall design the component in such a way that a minimum adjustment range of ±1 mm is ensured in the plant of the Client.

2123412 The Contractor shall design the component so that it does not need to be adjusted at the Client's plant. If the requirements necessitate an adjustment option in the opinion of the Contractor, the option shall be provided.

### 2.1.11.2.5.3 Double-Threaded Bolt (2123413)

2753576 *If the [Anfragezeichnung] calls for fastening of the lamps with double-threaded studs, the following requirements shall be complied with.*

2123415 The double-threaded pin shall be sealed off from the bodyshell with a sealing washer.

2123414 The diameter of the sealing washer and the retainer or the width across flats of the hexagon of the threaded pin shall be dimensioned so that the sealing function is maintained in the event of the maximum eccentric position of the threaded pin in the fastening hole.

3333715 The stud is made from steel with at least property class 10.9

### 2.1.11.2.5.4 Threaded Stud with Flat Guide (Slide-In Stud) (2123416)

2123419 *If the [Anfragezeichnung] calls for a fastening of the lamps with threaded pins with flat guide (slide-in stud), the following requirements shall be complied with.*

2123420 In combination with the housing, the threaded stud with flat guide shall ensure a tolerance compensation in a spatial direction (e.g. Y-direction).

2123422 Tolerance adjustment, e.g. at the attachment surfaces for threaded studs with flat guide (including multiple adjustments), is an integral part of the basic offer.

2123423 The stud is made from steel with at least property class 10.9

### 2.1.11.2.5.5 Clamping Claw (2123435)

2753579 *If the [Anfragezeichnung] calls for fastening of the lamps with a clamping claw, the following requirements shall be complied with.*

2123437 The Contractor shall design the clamping claw so that a homogeneous force distribution to the seal is ensured.

2123436 The lamp assigned to the trunk lid is secured to the body with a clamp.

2123438 If the clamping claw is used in combination with spacers and/or min. gap limiters, the clamping claw shall be designed so that the spacers and/or min. gap limiters independently come into contact with the body during lamp assembly.

2753583 *Independently come into contact with the body means that, for instance, the worker does not need to slide or push the lamp in a given direction.*

2123439 The clamping claw shall be designed so that all clamping claw arms engage audibly when inserting the lamp into the body.

2123441 The clamping claw shall be designed (geometry and material) so that all occurring forces (e.g. the sealing force) can be absorbed without impairing the function.

2123442 The mounting nut(s) shall not come loose from the clamping claw during installation of the lamps.

2123440 The clamping claw is preset to a specified dimension in the as-delivered condition.

2123443 This preset dimension shall not be adjusted in transit.

2123446 Determination of the preset dimension takes place based on the buildability validation in the confirmation vehicle phase.

2123445 The Contractor shall determine the dimensioning of the clamping claw using the FE method.

2123448 The result of the FE analysis shall be presented to the Client during Concept Review 2.

2123444 The elastic deformation in the body/clamping claw/lamp system shall be taken into account when designing the clamping claw.

2123447 As a result of the interplay of tolerance effect, intervention by the worker and elastic deformation, the final geometry of the clamping claw cannot be specified at the start of tool production.
The tool shall therefore be designed so that the function dimensions of the claw can be coordinated after first off-standard tool parts.
The modification effort for this (at least 3 iterations) is an integral part of the basic tender.

2123451 The seals of the fasteners shall meet the requirements of the tolerance concept (dimensional reference system).

2123453 The clamping claw(s) is (are) arranged at the bottom edge of the housing so that when the lamp is fitted into the body the lamp will be automatically pressed upward (vehicle Z coordinate) without action by the mechanic and the spacers will come to rest at the lamp aperture (body).

### 2.1.11.3 Design Lettering (2123452)

2123457 For general information about labeling (manufacturer's logo etc.), see the Chapter “After-Sales Requirements”.

### 2.1.11.4 Off-Standard-Tool Design Lettering (2753587)

2753594 *If the [Anfragezeichnung] calls for off-tool design lettering, the following requirements shall be complied with.*

2123454 The lettering shall be applied within the lamp on the reflector/cover frame or other covers.

2123459 The Client (MB Design) shall define the specifications for the labeling (font, type height, positioning) and provided these to the Contractor as a CAD data record (=data control model for interior lighting design).
When designing the tooling concept, a slide shall be taken into account for the labeling.

2123455 The dimension is stamped on with a minimum font height of 3 mm and 0.5 mm in depth.

2123456 The lettering surface shall be high-gloss; the surface around the lettering shall be matt.

### 2.1.11.5 Laser Design Lettering (2753589)

2753598 *If the [Anfragezeichnung] calls for laser design lettering, the following requirements shall be complied with.*

2753599 The Client (MB Design) shall define the specifications for the labeling (font, type height, positioning) and provided these to the Contractor as a CAD data record (=data control model for interior lighting design).

3214450 The details of the execution shall be definitively agreed upon with the Client (MB Design and component manager) by Concept Review 2.

### 2.1.11.6 Cover Lens (2123488)

2123491 *All lens colors have been specified based on the Evonik Röhm GmbH color numbers (see [Anfragezeichnung]) with a wall thickness of 2.5 mm.*

2123492 The Contractor shall design the lamp so that the cover lens can be created without an optical system.

2123493 Elements for geometric visibility are only permitted in the cover lens if proof has been provided in a simulation (Concept Review 1) and all measures in terms of reflectors or optical lenses have been exhausted. The max. permissible area for optical elements is 0.5 cm² per function. Enlargements are only allowed after the submission of photometric results. Elements for the fulfillment of the geometric visibility are an integral part of the basic offer.

2123495 The Contractor shall design the lamp so that the areas for concealing the welding area (outside and inside the lamp) can have a structured design.

2123497 The Contractor shall agree on the structure for the area for concealing the welding area with the Client's Development contact (by Concept Review 2 at the latest).

2123498 The structure for concealing the welding area shall be part of the basic offer.

2123501 The max. gate diameter of the needle shall be designed in accordance with the component part requirements. This shall be validated by means of filling simulations. The diameter shall be agreed on with the Client in Concept Review 2 at the latest with the objective of not exceeding 2.3 mm.

2123502 The Contractor shall design the cover lens so that the return of the die side is max. 0.2 mm. A protrusion of the die side extending to the nozzle side is not permitted.

2123504 Ejector marks on the lens are permitted in the edge area behind the welding rib to the outer edge. The positions shall be disclosed by the Concept Review 2 milestone. The ejector marks shall not be visible at a viewing distance of 1 m. Reference samples will be specified for the first off-standard-tool parts.

2123507 The Contractor shall design the outer edge of the lens so that dirt deposits are prevented.

2123506 The Contractor shall design the lamp so that the distance from the lens edge to the weld zone is max. 2 mm. Deviations shall be disclosed by Concept Review 1 and be agreed on in the development phase.

2123509 In the area of the flank-side “lens tip” (bodyshell contour/lamp wraparound area), the distance from the lens edge to the weld zone may be enlarged to up to 5 mm if this is necessitated for design reasons by the available installation space to the panel. Deviations shall be disclosed by Concept Review 1 and be agreed on in the development phase.

2123510

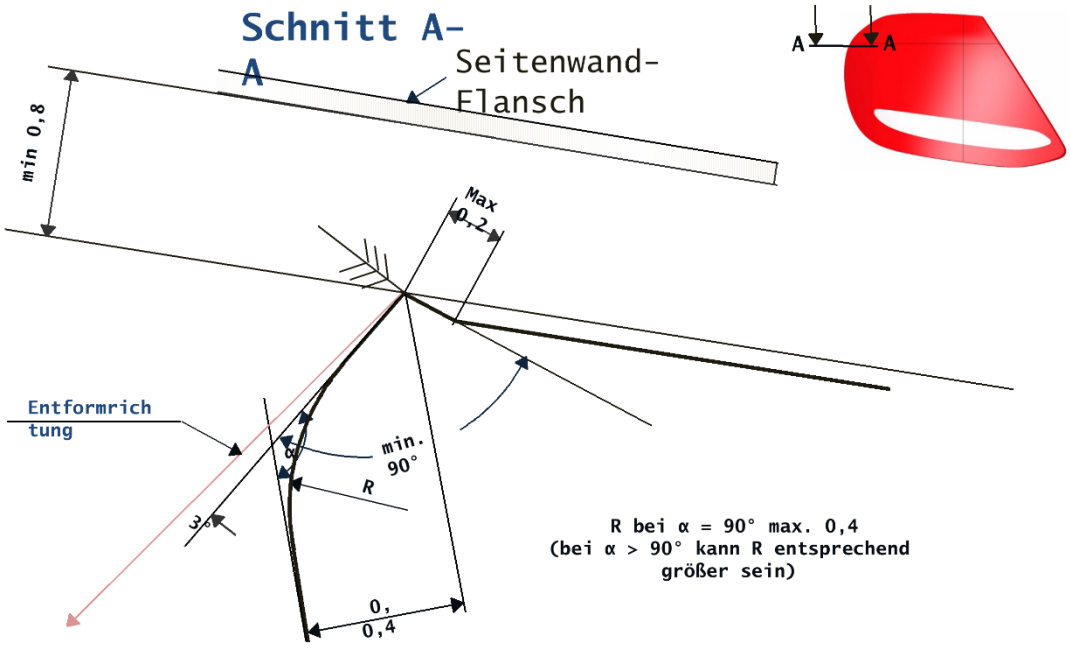
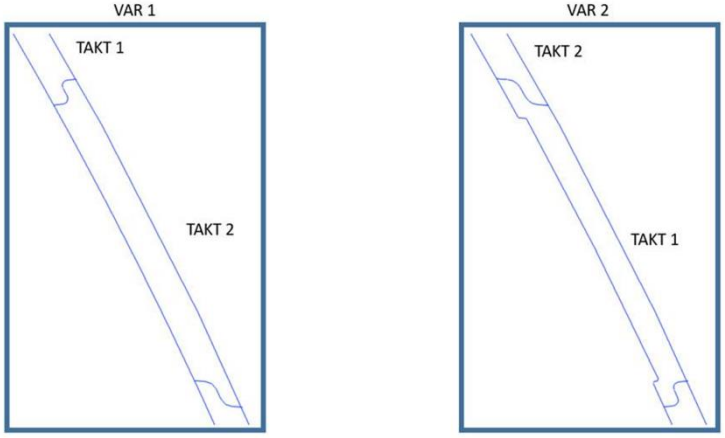



Figure: Guideline for implementing the lens edges.

2123511 The Contractor shall design the cover lens so that the angle between the parting plane and lens edge surface is min. 90° all-round.

2123514 The Contractor shall design the cover lens so that the color separations of the lens are engineered as per the diagram shown.




Illumination of protruding or recessed borders/edges shall be prevented. A uniform color impression shall be achieved at the color separation.

2123516 The Contractor shall design the lamp so that the color separations of the lens are homologation-capable and overshining is prevented.

2123518 The Contractor shall create the specifications for the color separation contour as a 3D data record based on the Client's design data and detailed section investigations incl. a depiction of the optical paths. The data for creation of the data control model (interior design of lamp) shall be provided 5 months before the data control model release for the lighting.

## 2.1.11.7 Lamp Housing (2123529)

### 2.1.11.7.1 General (2123526)

2123533 If reflectors are integrated, the Contractor shall design the lamp housing so that a decorative ribbing or grain is taken into account in the tooling costs for the reflector base and wall surfaces.

2123531 The Contractor shall minimize the volume of the housing and its subcomponents.

2123534 The Contractor shall design the lamp housing so that an ingress of foreign bodies (e.g. insects) into the lamp is not possible.

2123535 According to the tolerance concept, contact surfaces for the self-adhesive spacers/min. gap limiters shall be located on the lamp housing.

2123539 The Contractor shall design the lamp housing so that it contains a splash guard along the seal (protection of seal against direct exposure to water jet during high-pressure cleaning). The height shall be designed in line with all the tolerance positions occurring. The design shall be disclosed in Concept Review 2.

2123540 The Contractor shall design the lamp housing so that the clearance of all housing parts in the seal area is at least the seal thickness. Grouting of the seal is only permitted in the area around the sealing rib.

2123541 The Contractor shall design the lamp housing so that the sealing rib has a max. deviation of +/- 0.5 mm relative to the reference system.

2123543 The Contractor shall design the lamp housing so that all openings in the housing, as well as electric/electronic component parts, are protected against water ingress due to water possibly dripping onto the lamp (labyrinth, cover etc.).

### 2.1.11.7.2 Lettering and Label (2123590)

2123592 The supplier part number may only be applied in non-visible areas (in assembled vehicle condition).

2123594 The attachment of the supplier logo in the visible area (in installed condition) is not permitted. Except if legally required.

2123596 The Contractor may not incorporate any cp information on the housing.

2123595 The Contractor shall coordinate the label positioning in accordance with [MBN 50435] with the Client's Development department (by Concept Review 2 at the latest).

2123598 To fulfill the legal requirements, the Contractor shall incorporate the voltage data of the light functions on the rear of the lamp housing.

### 2.1.11.7.3 Connection for Bumper Bracket (2123619)

2123620 In a facelift project, the connection for the bumper bracket shall be carried over from the current series production vehicle.

2123624 The Contractor shall design the side wall lamp housing so that up to two integrated mounts for the Z-positioning of the bumper basic bracket can be integrated.

2123621 The Contractor shall design the side wall lamp housing so that a guide for the Y-positioning of the bumper basic bracket can be integrated.

2123623 The Contractor shall provide for these mounts and/or guides in the tooling concept.

4210289 The mounts shall be designed such that no forces are introduced into the lamp.

### 2.1.11.7.4 Color and Finish (2123622)

2123626 *Surfaces that deviate in color and structure are design elements of the inner design.*

2123625 *MB Design shall specify the surfaces with grain as part of the interior design data generation (DKM=data control model).*

2123627 *The final specification of the surface structures shall be realized by Concept Review 2. The lamps will be evaluated using first off-standard-tool parts.*

2123634 The Contractor shall design all visible surfaces so that they, unless otherwise described, have a high-gloss polished appearance for the subjective observer.

2123631 The final specification of the color shall be made in coordination with the Client's Design department (at the latest by Concept Review 2).

2123639 The Contractor shall design the housing, panels, and reflectors in an opaque color/surface (to be disclosed in Concept Review 2).

12999663 The Contractor shall implement graining in accordance with the [MGU00002849] implement.

2123636 The Contractor shall optimize the lamp design with regard to process-consistent vapor deposition.

### 2.1.11.7.5 Molded-On Load Compartment-Side Housing Panel (2123635)

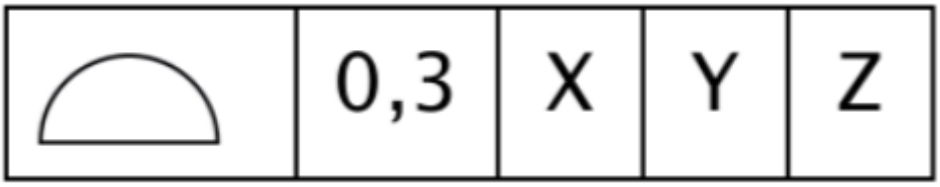
2123638 The Contractor shall mold the panel for concealing the load compartment onto the housing of the trunk lid/rear-end door lamp.

2123644 The Contractor shall provide a grain for the load compartment-side panel.

2123641 The Contractor shall agree on the grain of the panel for concealing the load compartment with the Client's Development contact and MB “Gray” Design (at the latest by Concept Review 2).

2123643 The nominal dimension from the lens to the molded-on panel (joint) shall be < 1 mm.

2123640 The form surface deviation of the lens from the molded-on panel is:




2123642 The Contractor shall apply the homologation lettering on the panel.

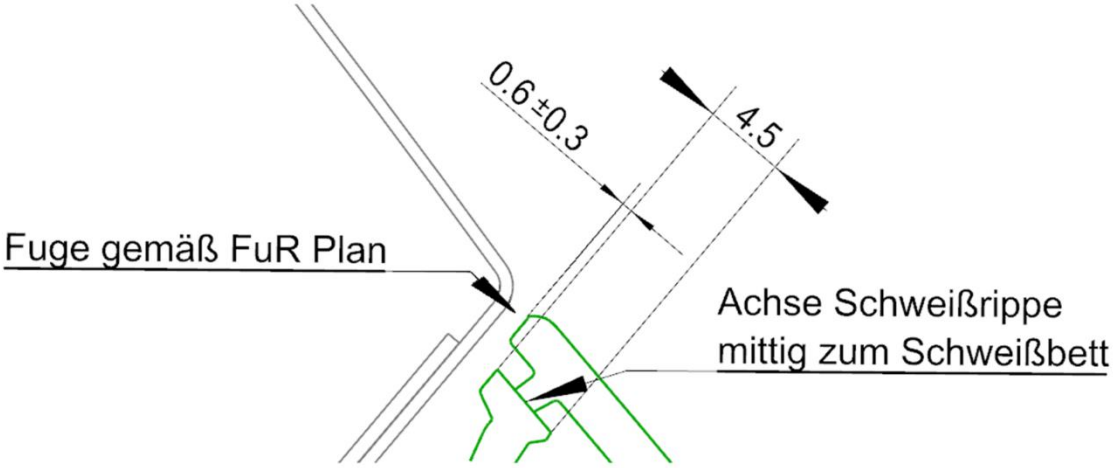
2123646 If the molded-on panel is not possible, the Contractor shall provide a separate housing panel (requirement ID 2123664 must be met) with corresponding attachment on the lamp housing and take this into account in the basic offer.

### 2.1.11.8 Lamp Housing/Cover Lens Connection (2123647)

2123650 The lamp housing shall be connected to the lens by means of laser welding. Welding burrs shall be minimized.

2123652 The welding shall be executed according to the state of the art.

2123656 The Contractor shall design the lamp so that the protrusion of the lens with respect to the lamp housing is uniform all around.




2123655 Protruding lens points that are not supported are not permissible as there is a risk of breakage.

2123660 The Contractor shall design the lamp so that the connection of the lens to the housing is free of tension.

2123661 The surfaces shall not be subjected to vapor deposition in areas that are welded.

### 2.1.11.9 Load Compartment-Side Panel on the Lamp (2123664)

3100762 *If the [Anfragezeichnung] calls for inside panels on the lamp, the following requirements shall be complied with.*

2123662 The Contractor shall provide a grain for the load compartment-side panel.

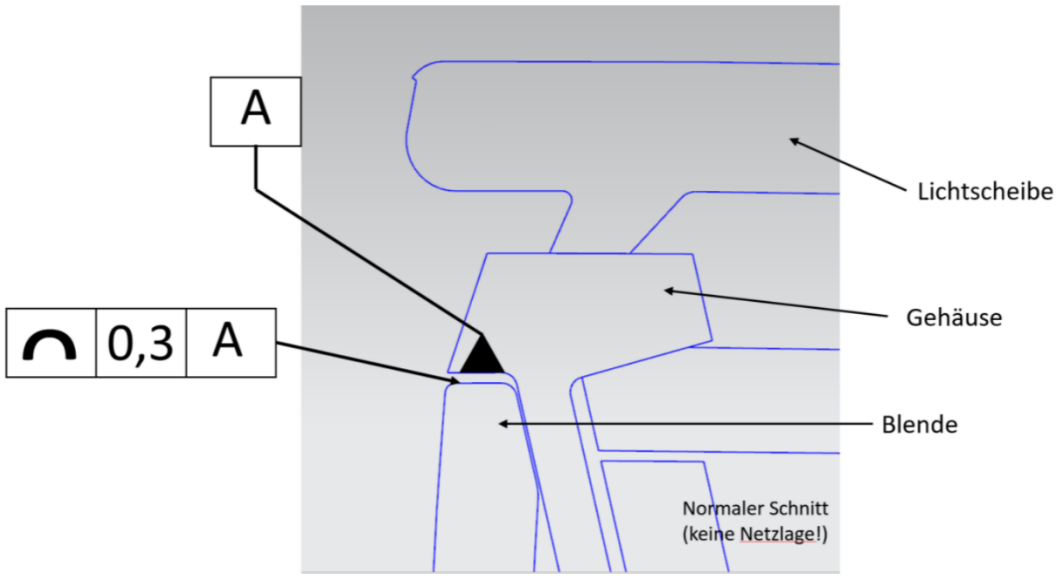
2123666 The Contractor shall realize the soft component using the same grain as the hard component.

2123669 The Contractor shall agree on the grain for the load compartment panel with the Client's contact from Development and “MB Gray Design”.

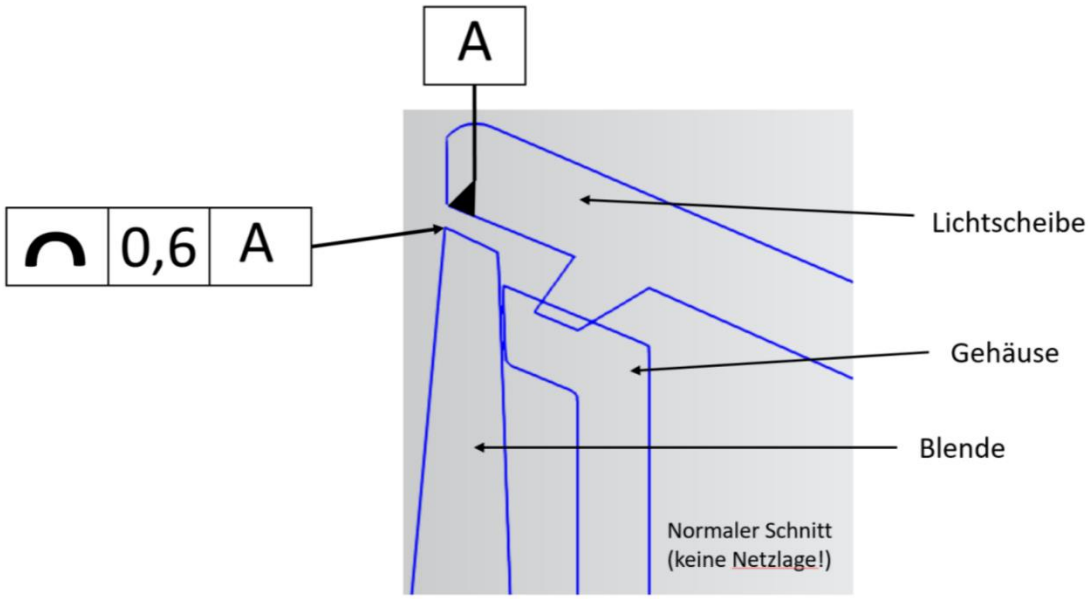
2123665 The shape of the panel shall be coordinated with the Client (MB Development, “MB Gray Design”) no later than 8 weeks prior to the start of tool production.

2123667 For the feasibility validation, the Contractor shall provide the Client at the latest 10 weeks before the start of tool production with the CAD data for the creation of samples. (The samples are created by the Client himself.)

2123678 The nominal dimension of the gap between the panel and the housing is 0.5 mm. Unless otherwise defined, the contour deviation of the panel in relation to the housing is:




2123679 The nominal dimension of the gap between the panel and the lens is 0.5 mm. Unless otherwise defined, the contour deviation of the panel in relation to the lens is:

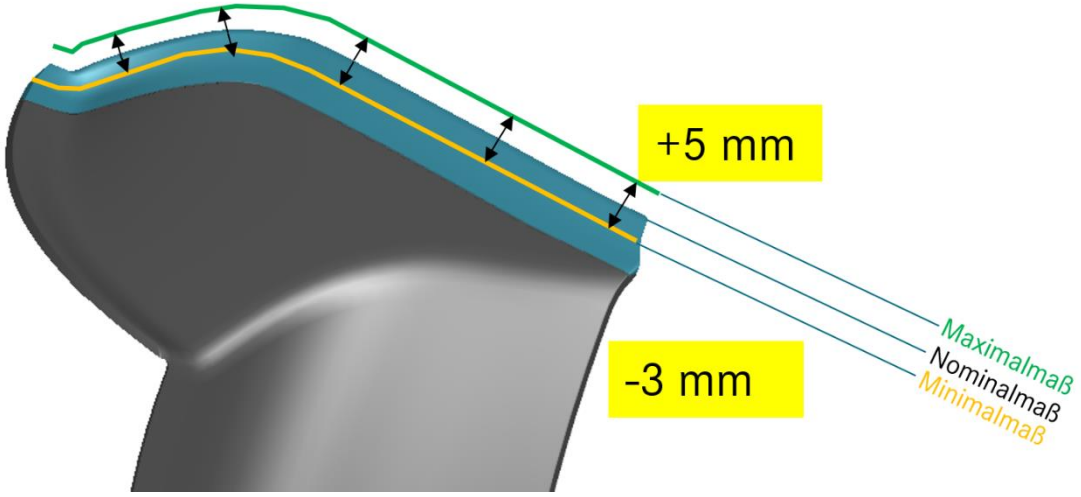



2123676 The Contractor shall design the side panel so that the soft component has a positive fit with the adjacent component parts.

2123681 The soft component of the 2C panel shall have full contact all round with the bodyshell and in all tolerance positions (incl. seal). Coordination with the Client shall take place by the time of Concept Review 2 at the latest.

2123684 The tooling concept of the 2C panel shall include an exchangeable insert for the soft component (see diagram). The nominal dimension of the contour of the soft component of the component part geometry is defined in coordination between the Contractor and the Client. The tooling concept of the exchangeable insert for the soft component shall enable a contour extension in the exchangeable insert of up to 5 mm through repositioning.

2905172




2905173 The tooling concept of the 2C panel shall enable a contour reduction of the soft component of up to 3 mm through recreation of the exchangeable insert.

2905175 The Contractor shall present the technical concept for implementation of the exchangeable insert at the Concept Review 2 milestone. Technical restrictions to the implementation of an exchangeable insert due to the component part geometry shall be disclosed by the Contractor and coordinated with the Client.

2905176 *The measures are used for the final coordination of the soft component with the bodyshell. The Client defines whether adjustment of the external geometry of the 2C panel is necessary after completion of the vehicle body of production test 1 at the latest.*

2123680 The load compartment-side panel on the lamp housing shall be permanently connected with the housing.

2123683 The Contractor shall apply the homologation lettering on the panel.

### 2.1.11.10 Additional Lamp Lenses/Optical Lenses (2123688)

2753656 *If the [Anfragezeichnung] calls for additional lamp lenses/optical lenses, the following requirements shall be complied with.*

2123685 The Contractor shall select and design the method of fastening the additional lamp lens(es)/optical lens(es) so that the connection points are not visible.

2123687 The Contractor shall implement the additional lamp lens(es)/optical lens(es) with an optical system.

2123686 The optical system shall be designed in coordination with the Client's Design department (at the latest by Concept Review 2).

2123689 The Contractor shall design the additional lamp lens(es)/optical lens(es) so that these have zero clearance and are firmly seated.

2123692 If the additional lamp lens(es)/optical lens(es) were subject to vapor deposition, emission of “diffused light” is not permitted (critical-parts overview).

2123691 Light may only be emitted in the areas of the additional lamp lens(es)/optical lens(es) defined as the lens aperture (to be disclosed in Concept Review 2).

### 2.1.11.11 Reflectors (Additional Reflectors)/Cover Frames (2123690)

2123694 The Contractor shall try to reduce the number of individual reflectors.

2123697 If the cover frames/reflectors are subject to vapor deposition, the covers/templates shall be included in the basic offer.

2123696 The Contractor shall provide a grain structure or rib look on the side boundary areas. Reason: Due to reflections, it can occur that LED spots are reflected multiple times.

2123695 The Contractor shall design the joints of all lamp component parts to be opaque (labyrinth). No diffused light may be emitted.

2123699 The Contractor shall design the lamp so that the fasteners of the additional reflectors/cover frames are not visible.

### 2.1.11.12 Fiber-Optic Cables/Thick-Wall Optics (2123698)

2753660 *If the [Anfragezeichnung] calls for fiber optics/thick-wall optics, the following requirements shall be complied with.*

2123702 The Contractor shall design the fiber-optic cables/thick-wall optics so that no spotlights are visible in the illuminated status.

2123703 The Contractor shall design the areas of the light feed so that the flash points of the LEDs are not visible.

2123700 The Contractor shall design the lamp so that the fasteners for securing the fiber-optic cables/thick-wall optics are not visible in the illuminated and non-illuminated status.

2123701 The Contractor shall design the fiber-optic cables/thick-wall optics so that the outlets and boundaries are precisely illuminated.

2123704 The Contractor shall design the fiber-optic cables/thick-wall optics so that the faces can be provided with an optical structure.

### 2.1.11.13 Rear Reflectors/Side Reflectors (2123707)

2753662 *If the [Anfragezeichnung] calls for reflectors/side reflectors, the following requirements shall be complied with.*

2123708 The Contractor shall agree on the photometric simulations of the reflector and side reflector with the electroforming manufacturer before the start of tool production.

2123705 The Contractor shall present the photometric simulations of the reflector and side reflector to the Client's Development contact (by Concept Review 1 at the latest).

2123709 If the rear and side reflector are not integrated in the lens, the fasteners of the rear and side reflector shall not be visible.

### 2.1.11.14 Seals (2123710)

2123712 The Contractor shall seal all openings in the bodyshell that are in the lamp engagement area against water, dust, and other foreign bodies.

2123714 The Contractor shall design the lamp so that a sealing surface with constant transitions is generated and complete covering of the seal is ensured.

2123718 The Contractor shall design the lamp so that a uniform sealing effect is achieved.

2123717 The Contractor shall take into account the unit pressure and bodyshell tolerances in the sealing with respect to the body.

2123716 The Contractor must not assume that the attachment surface for the lamp is ideally rigid. Reason: The bodyshell elasticity shall be taken into account for the seal design.

2123715 The Contractor shall submit the force simulation for the seal design to the Client's Development contact in Concept Review 2.

2123719 The Contractor shall design the seals so that they do not detach during transport in the load container.

2123723 The Contractor shall design the seals so that they do not detach, twist, or become stuck during assembly.

2123724 If the fastening holes on the bodyshell have been made using STF&P, the Contractor shall design the seals so that the leaktightness complies with the Chapter “Requirements from Testing”.

#### 2.1.11.14.1 Sponge Rubber/Plate Seals (2123722)

2753663 *If the [Anfragezeichnung] calls for a sponge rubber/plate seal, the following requirements shall be complied with.*

2123720 The Contractor shall design seals made out of closed-cell cellular rubber material.

2123721 The Contractor shall design the seals so that they are self-adhesive on one side.

2123725 The seal thickness for the rear-end door lamp shall be designed to be at least 6 mm

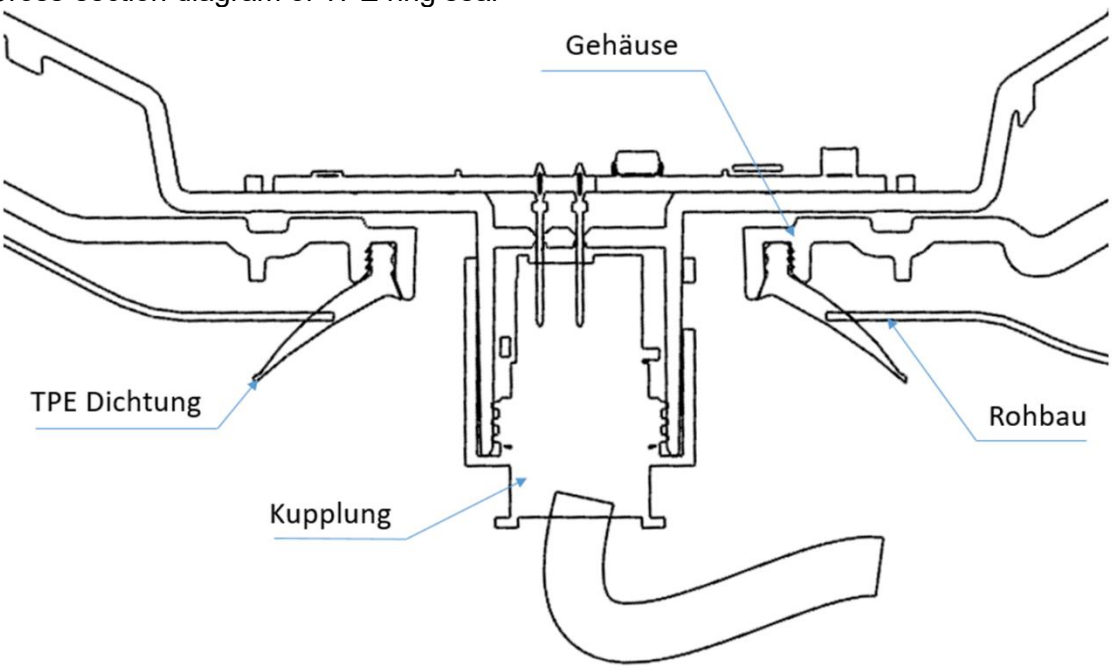
2123728 The Contractor shall design the seal compression to be 50% and ensure the system leak tightness as described in the Chapter “Requirements from Testing”.

2123726 The Contractor shall design the fastening concept of the lamp so that compaction of the seals used is possible up to 70% around the perimeter.

### 2.1.11.14.2 TPE Ring Seal (2123727)

2753666 *If the [Anfragezeichnung] calls for a TPE ring seal, the following requirements shall be complied with.*

2123732 Cross-section diagram of TPE ring seal



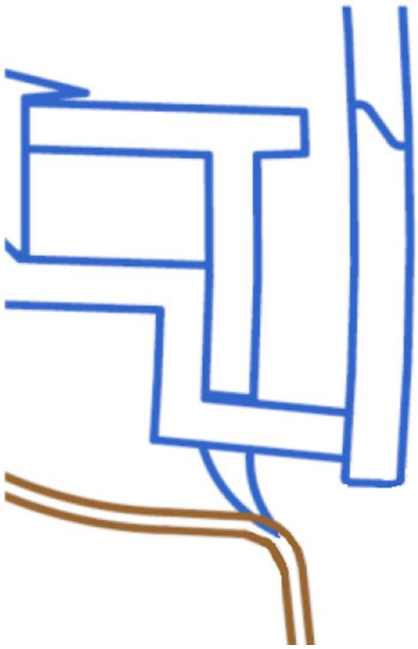

2123730 The Contractor shall design the seals so that a minimum compression of 2.6 mm is achieved.

2123733 The Contractor shall design the seals so that they are fastened to the housing and are secured against falling off.

### 2.1.11.14.3 TPE Edge Seal (2123734)

2753881 *If the [Anfragezeichnung] calls for a TPE beaded seal, the following requirements shall be complied with.*

2123739 The edge seal shall lie against the bodyshell and interrupts the open jet of the water jet test to the EPDM sealing plate.



3057336 The edge seal shall not be visible in the installed condition.

2123740 The edge seal shall be designed so that it complies with the requirements from Chapter “FI Testing of the Rear”. (Including manual high-pressure steam jet cleaning.)

### 2.1.11.15 LED PCBs (2123748)

2123746 The Contractor shall design the lamp so that the lettering on the PCBs is not visible in the installation position and under the standard viewing direction.

2123749 Normal direction of vision at close range means: direction of vision above a height of 1.5 m at a distance of 0 – 5 m from the lamp. If it is not possible for design reasons, coordination is required and a reference sample shall be constructed (at the latest by Concept Review 2).

2123745 The Contractor shall design the lamp so that the LED PCBs are permanently secured in a suitable manner with the reflector insert. While driving, there shall be no noise development or abrasion in visible areas.

2123747 The Contractor shall design the lamp so that cooling is provided if required for the LEDs. This shall be disclosed in the basic offer.

2123750 The Contractor shall design the lamp so that the LED PCBs are not under stress in the assembled status.

### 2.1.11.16 Molding on Lamp (2123751)

2123752 *If the [Anfragezeichnung] calls for an exterior molding, the following requirements shall be complied with.*

2123754 The molding shall have an adhesive anti-noise strip on one side.

2123753 The adhesive tape shall not be visible from the outside in the installed condition.

2123755 No noises (e.g. creaking) shall be caused by the molding.

2123759 The molding shall not rub on the tail lamp and shall not produce abrasion.

2123758 The molding shall be fixed and mounted with zero clearance on the tail lamp.

2123757 There shall be no quality defects, such as sunk spots, apparent on the visible side of the molding.

2123764 Should any adjacent moldings also have the same surface as the molding (e.g. chrome-plated), the choice of supplier for the surface manufacturer shall be agreed jointly with the Client.

2123761 If the trim strip is chrome-plated (see [Anfragezeichnung]), the surface shall comply with DBL1665.

3302537 The production locations for chrome-plated component parts shall be indicated. The use of laminated surfaces shall be evaluated and indicated accordingly.

3302538 The layer thickness shall be documented in the drawing.

3302539 The color codes for chrome shall be taken from the parts list.

14167503 If the molding is painted (see [Anfragezeichnung]), the surface must correspond to that of the [DBL 5425].

### 2.1.11.17 Self-Adhesive Component Parts (2123762)

2123763 All self-adhesive component parts shall comply with [DBL 7906].

2123765 If the bonded component has to be dismantled again, no adjacent component parts may be damaged.

2123768 It shall be possible to remove the adhesive residues for a re-bonding process without function impairment.

2123769 The bonding shall not permanently damage the bonding surface on the opposite side.

## 2.1.12 Mechanical System Testing and Validation (2123767)

### 2.1.12.1 In-Series Measurements (2123819)

2123818 The Contractor shall perform an automatic 100% function test (incl. current consumption of light sources) during lamp production.

2123817 The Contractor shall visibly mark the lamp after the successfully passed function test.

2123824 The Contractor shall perform an automatic 100% test for the presence of all parts during lamp production.

2123821 The Contractor shall perform a 100% leak test during lamp production and visibly mark the lamp after a successfully passed test.

2123828 The Contractor shall coordinate the number and location of the measuring points with the Client's Development contact. The number of measuring points can be found in the other applicable document “Process Requirement Specifications – Quality (PLH)”.
For analysis purposes, additional measuring points such as the spacer position or bumper holder position can be required in the CMM measurement. These shall be agreed on with the Client.

2123826 The supplier shall check and statistically evaluate the specified geometric measuring points “inline” during the production of the lamps.

2123827 *The in-line measurement represents the 100% inspection of all lamps during production.*

2123833 Manufacturing defects of any kind that adversely affect function and appearance are not permissible.

2123832 The Contractor shall automatically transfer out “not OK parts” during SMR production.

### 2.1.12.2 CIP (2123837)

2123839 The continuous acquisition and analysis of required values and actual values shall be performed, and the resulting improvements introduced.

### 2.1.12.3 Certification/Type Approval (2123840)

2123842 The Contractor shall fulfill the general requirements in the Chapter “Certification/Type Approval” in the Common Requirements [LHV 310 001].

10679006 In order to demonstrate compliance with the component requirements of the KMVSS regulation for the Korean market, the Contractor shall provide a self-explanatory test report it has prepared in English in CERTUS.

2123841 All homologation marks and approval markings shall be visible in or on the lamp and be disclosed by Concept Review 1.

13876378 If the tender drawing shows that this lamp has further, remote parts for the tail light, the following requirements apply. These remote parts are located in the area of the trunk lid/tailgate (e.g. illuminated panel or illuminated central star) and are not themselves part of the components covered by this specification.
The Contractor must obtain additional type approvals in connection with the rermote parts of the tail light, as part of the function of the light unit.
As part of the development process, the procedure for approval and safeguarding of approvability is agreed between the Contractor, Client and the third party.

13876392 Different combinations of illuminated elements are created depending on the equipment of the respective vehicle. Each combination must be taken into account by the Contractor in the approval and in the expenses required for this. In addition, as part of the series request, the Contractor must show the costs incurred for each additional approval variant if these are announced in good time before the general approvals are carried out or only later as an additional variant.

13876394 The number of lamp and certification combinations can be found in the tender drawing.

#### 2.1.12.3.1 Time Frame (2123847)

2123849 In addition to the milestones defined in the Common Requirements [LHV 310 001], all certification-relevant data, documents, and objective evidence shall be provided in accordance with the data requirements in the "CERTUS" system at the latest 4 weeks before the PPAR deadline.

### 2.1.13 Requirements Derived from Electronics (2124736)

#### 2.1.13.1 General (2124737)

2124734 *This chapter contains all information on the electrical and electronic requirements for the rear lamps.*

2124735 *Therefore, the focus is on the description of the properties, interfaces and components used.*

#### 2.1.13.1.1 Functional Safety (2124738)

2124740 The requirements for functional safety as set out in [ISO 26262] shall be fulfilled.

2124739 The functional reliability contact can be found in the Chapter “Contacts and Responsibilities”.

2124742 The supplier shall submit the self-disclosure form for functional safety in accordance with [ISO 26262]when submitting the offer.

2124741 The supplier shall appoint a FuSi manager with the submission of a tender.

2124743 The system requirements, including the diagnosis quality, are provided in a separate module.

2124745 The system requirements, including the diagnosis quality, are confirmed by the Contractor with the submission of an offer.

2124748 The Contractor shall submit an interface agreement (“DIA” – Development Interface Agreement) that is filled out and coordinated with the Client for Concept Review 1.

2124746 By Concept Review 2, the Contractor shall present the complete proof of compliance with the requirements (e.g. by FMEAs, error calculations etc.).

### 2.1.13.1.2 E-E Coordination Document (2124744)

2124747 The E-E coordination document is a binding document concerning the E-E requirements, which shall be used as a reciprocal document between the supplier and MB from the kick-off to the green approval.

2124750 The supplier is responsible for the up-to-datedness and content with regard to the lamp.

2124752 Every change has to be noted in the history with the date, description and page number.

2963014 Furthermore, the supplier shall include the current date and the supplier name in the file name.

2963015 The Client shall then be informed of the change immediately.

2124751 The following shall be maintained by the supplier in the E-E coordination:

2963017 Supplier contact (name, phone number email)

2963018 Central connector pinning

2963019 Type (implementation regulation) of plug connection (central connector) including coding and variant description.

2963021 Wiring concept (interconnection of the individual circuit boards) for each variant

2963066 Function description of every light function (electrical parameters, illuminants, registration type, wiring diagram, etc.)

2963067 Information on the dynamic light sequence (e.g. designation of the GUI file, dynamic light sequence duration etc.) if there is one.

### 2.1.13.1.3 E-E Drawing Content (2124763)

2124764 The E-E drawing (Sheet m) shall contain the items listed in the following:

2124766 Wiring concept (interconnection of the individual circuit boards) for each variant

2124765 Electric wiring diagrams of all functions, fully labeled with units

2963068 For all circuits that contain microcontrollers, the software statuses shall be documented (PCB numbers of µC, date, version number, supplier designation).

2124768 Image of the plug connection (central connector) including coding and variant description

2124770 Central connector pinning

2124771 Table with traffic variants (e.g. ECE/SAE; with rear fog lamp/without rear fog lamp)

2124769 Connections table (pins, coding, implementation regulation, connector numbers)

2124772 Table of electrical characteristics

#### 2.1.13.1.4 Service Life (2124773)

2124778 The component part shall be designed so that the full functionality is ensured for at least 9,000 operating hours.

2124775 The table covers a period of 15 years and is adjusted for the vehicle lights permanently on or where daytime running lamps are mandatory.
The respective function shall be designed for the service life listed in the table as a minimum.

| Name | Switch-on time [h] | Number of cycles |
|---|---|---|
| Terminal 15 ON, engine running | 9,000 | 54,000 |
| Tail light, left and right | 9,000 | 54,000 |
| Stop lamp, left and right | 1,467 | 1,800,000 |
| Turn indicator, left and right | 500 | 2,700,000 |
| Reversing light, left and right | 74 | 74,400 |
| Rear fog lights, left/right/center | 74 | 74,400 |
| Side markers, left and right | 9,000 | 54,000 |
| 3rd tail lamp | 1,467 | 1,800,000 |
| License plate lamp, left/right/center | 9,000 | 54,000 |

### 2.1.13.2 Electronics Characteristics (2124777)

#### 2.1.13.2.1 Contact System Features (2124776)

2124780 The test specification [MBN 10384] shall be met.

### 2.1.13.2.1.1 Mechanical/Design Features (2124783)

2124779 The supplier shall ensure that the contact systems are not damaged on delivery.

2124781 The supplier shall ensure that the contact systems are not soiled on delivery.

2124782 None of the plugs of plug connections may have any burrs.

2124784 Plugging reliability of the plugs shall be ensured at all times.

2124788 The form fitting of the connectors shall be ensured at all times.

2124785 Faulty or incorrect assembly shall be prevented.
If incorrect assembly or misuse occurs despite this, no electrical connection shall be established.

2124787 The contacting parts shall be engaged directly with each other (not via “third component parts”).
Reason: minimum clearance of the contact surfaces is to be achieved.

2124786 The supplier shall design the cable cross-section in the lamp according to the current consumption and coordinate this with the Client.

2124790 Internal connectors shall be secured in a positive-locking manner against twisting, tilting, detachment, etc. (Positive engagement arises via the interlocking of two components; in this connection, the components can also not detach without force application).

### 2.1.13.2.1.2 Contact Material Characteristics (2124789)

2124792 The supplier shall guarantee the same material pairing for the connections.

11202058 *The contact surface material for the contact sockets on the wiring harness is tin.*

2124791 *The contact support material for the contact sockets on the wiring harness is CuNiSi.*

### 2.1.13.2.1.3 Other Characteristics (2124801)

2124803 The connectors shall not char after an operating period of 15 years in the vehicle.

2124799 After 15 years of operation in the motor vehicle, plastics must not melt.

2124800 After 15 years of operation in the motor vehicle, there shall be no contact corrosion.

2124802 After 15 years of operation in the motor vehicle, there shall be no pitting at the contact surfaces.

2124805 After 15 years of operation in the motor vehicle, contacts not connected shall not be scorched or heated up under voltage.

## 2.1.13.2.2 Voltages and Currents (2124808)

### 2.1.13.2.2.1 Voltage Range (2124804)

2124807 *The voltage values are those values measured at the terminals of the lamp.*

2124806 The supplier shall coordinate the actual voltage values during the development process with the Client (E-E slides) and, after their final definition, or at the latest by the green release, document them on the drawing.

2124809 ***On-board voltage range***
*Voltage range within which the on-board electrical system of the component may fluctuate*

2124812 ***Operating voltage range***
*Voltage range at the component within which the function (recognizable signal pattern, no failure of individual areas) is ensured.*

6237481 ***Voltage for logical functions***
*Voltage range at the component in which the LEDs must illuminate visibly.*

2124810 ***Diagnostic voltage range***
*Voltage range at the component for which a diagnosis needs to be ensured.*

2124811 ***Test voltage***
*Voltage for the photometric type test at which the light values of the corresponding function need to be fulfilled.*
*If a voltage range is specified, the test voltage shall still be defined in coordination with the Client in order that the light values are complied with and the vehicle has a harmonious appearance.*

2124813 Standard voltage values 12V on-board electrical system:

| Designation | Symbol | Min. value | typ. Value | Max. value | Unit |
|---|---|---|---|---|---|
| On-board voltage range | $U_{Bat}$ | 6 | - | 17 | R |
| Operating voltage range | $U_B$ | 8 | - | 17 | R |
| Voltage of logical functions | UL | 8 | - | 17 | R |
| Diagnostic voltage range | $U_D$ | 10 | - | 17 | R |
| Test voltage of the light functions | $U_{Type}$ | - | 12.8 | - | R |

3559497 Exception is the reversing light with 3 LEDs in series:

| Designation | Symbol | Min. value | typ. Value | Max. value | Unit |
|---|---|---|---|---|---|
| On-board voltage range | $U_{Bat}$ | 6 | - | 17 | R |

| | | | | | |
|---|---|---|---|---|---|
| Operating voltage range | $U_B$ | 8 | - | 17 | R |
| Voltage of logical function | UL | 10 | - | 17 | R |
| Diagnostic voltage range | $U_D$ | 11 | - | 17 | R |
| Test voltage of light function | $U_{Type}$ | - | 12.8 | - | R |

2124815 If technical or certification-relevant reasons make it necessary to deviate from this test voltage, this shall be agreed on with the Client.

### 2.1.13.2.2.2 Current Consumption (2124814)

2124816 All current values apply for the diagnostic voltage range for temperatures between Tmin and Tmax (see E-E coordination slides)

#### 2.1.13.2.2.2.1 Current Consumption of the Supply Line (3037631)

3037635 The current consumption of the supply line in a sidewall lamp/trunk lid lamp/continuous reflector strip shall be below 5 A.

#### 2.1.13.2.2.2.2 Switch-On Currents (2124832)

2124833 To prevent too-high switch-on currents, the capacity at the power supply inputs of the lamp shall not exceed 100 µF.

#### 2.1.13.2.2.2.3 Leakage Currents from the Vehicle (2124838)

2124834 Leakage currents up to 200 µA shall not result in illumination/flashing of the function. They shall be absorbed within the lamp.

### 2.1.13.2.2.3 Documentation of Planning Data and Corresponding Documents (2124837)

2124835 The supplier shall maintain the voltages and currents for the light functions in the E-E slides and document the final status on the drawing.

2124836 The supplier shall maintain the cycle ratio (for PWM) for the light functions in the E-E slides and document the final status on the drawing.

2124843 The supplier shall make the electrical data of the component for the operating voltage range and the operating temperature available to the contact from the Client's development department.

2124842 The supplier shall make the fully labeled circuit diagram of the electronic lamp component available to the contact from the Client's development department.

2124840 The supplier shall make the fully labeled circuit board layout of the electronic lamp component available to the contact from the Client's development department.

### 2.1.13.2.2.4 In-Line Testing during Series Production (2124839)

2124841 The supplier shall check the light functions for individual light source failures using in-line testing.

2124848 The supplier shall use measurements/tests to ensure that all component parts are installed in line with the specifications and that all circuit parts are fulfilling their function.
The corresponding concept shall be made known to the Client.

2869740 The supplier shall check the communications interface (e.g. CRC check)

3079429 The supplier shall check the tail light emergency light. For this purpose, the communications interface shall be interrupted and the corresponding light sources shall light up when the power supply (terminal 30) is active.

2974521 The supplier shall check the memory content of the LED drivers with regard to its correctness.

2974522 The supplier shall check the function of the BL redundancy line. For this purpose, active actuation shall take place on the BL redundancy line after interruption of the communications interface and the corresponding light sources shall light up.

3079430 An inspection log shall be created for every checked light. The content of the inspection log shall be coordinated with the Client.

### 2.1.13.2.3 Thermal Management (3220562)

3220563 The Contractor shall perform temperature simulations on the electronics of the component part based on the requirements in Chapter “Requirements from Testing”.

3220565 These shall be agreed on with the Client by Concept Review 2 at the latest.

4231424 4 weeks after first off-standard-tool parts, the temperature simulations shall be confirmed based on measurements of real parts.

### 2.1.13.2.4 Routing of Lines (2124846)

2124849 All electrical lines shall fulfill the tests as per [MBN LV 112-1].

2124852 The supplier shall design the installation of the cables in such a way that any chafing of cables is not possible.

2124853 The lines shall be fastened mechanically.

2124850 Plastic clips shall be used for line attachment.

2124851 The use of splices is not permitted.

2124857 The lines shall not be visible through the lens.

2124856 The lines shall not be visible through the gap.

2124855 The lines shall not be visible when the trunk lid is open

2124854 The supplier shall combine cables with a length >= 10 cm with a suitable cable covering or secure them to a suitable component part. In this connection, it shall be ensured that the cable is neither damaged (e.g. chafing, kinking, etc.) nor slips.

2124858 The supplier shall optimally design the line routing with regard to EMC aspects.

### 2.1.13.2.5 Printed Circuit Board (2124861)

2124860 If fastened to the housing base, the PCB must not be positioned at the lowest point to be protected from stagnant moisture.

2124863 Moisture on the circuit board, e.g. as a result of condensation, shall not impair the circuit.

2124862 In the case of safety-relevant components, no signal conductors may be routed under ceramic capacitors.

### 2.1.13.2.6 Requirements Pertaining to Electronic Component Parts (2124859)

2124865 Electronic component parts shall be qualified according to AEC-Q (100/101/200).

2124864 In order to prevent the silver corrosion of LEDs, either LEDs with silver-lead frames + resin grouting or LEDs with gold-lead frames may be used.

2124866 Only those component elements may be used for which it has been ascertained that their use entails no risk in the vehicle as far as mission profile (component specification), workmanship (processing procedure and/or parameters), and service life are concerned and that they are suitable for vehicle use.

2124867 It shall be ensured that the failure of a component element cannot lead to irreparable thermal damage to the component.

2124868 Further development rules have been described in the Implementation Regulation: Design Rules for E/E Components, External Version [MBN 10463] and these shall be taken into consideration.

### 2.1.13.2.7 General ESD Requirements (3229632)

3229642 All vapor-deposited parts and reflectors within the lamp shall be connected with low resistance (< 10 ohms) to ground.

3229643 The PCB/electronics shall not be freely accessible/touchable in the installed condition.

3259555 The electronic components shall be designed such that ESD damage cannot occur.

3269876 If it becomes apparent over the course of development that the supplier does not fulfill one of the following requirements, the component is electrostatically sensitive and ESD load containers/packaging will be required

## 2.1.13.3 Electronic System Interfaces (2124869)

### 2.1.13.3.1 Lamp/Vehicle electrics Interface (Control Unit) (2124871)

2124870 *To ensure the function of the lamp/vehicle electrics interface and to adapt the electrical functions of the lamp to the control unit, the following measures are to be carried out by the supplier:*

2124872 The supplier shall coordinate the electronic interfaces of the lamp with the contact from the Client's development department.

2124873 Differing functions shall not interact, i.e. no feedback to other channels may occur during the internal interconnection of functions/channels.

2124875 The outputs actuated by the control unit shall not have specified capacitive loads at the input of the lamps, i.e. if special input circuits are used, the capacitive loads need to be adapted to the individual component parts/drivers of the control unit.

2124874 For prompt calibration of test benches, and for BC suppliers, E-E vehicles, component tests, the supplier shall provide electronics samples (board assemblies) with A-sample PCB status:
The lamp variants and the number shall be agreed with the contact person from the Client's Development department.

8943655 The supplier shall provide electronics samples (board assemblies) with a PCB status of 'first off-standard-tool parts' for test benches, BC suppliers, E-E vehicles, component tests:
The lamp variants and the number shall be agreed with the contact person from the Client's Development department.

3345436 The supplier shall provide first off-standard-tool part lamps for test benches, BC suppliers, E-E vehicles, component tests:
The lamp variants and the number shall be agreed with the contact person from the Client's Development department.

2124876 For the electronic samples (board assemblies), it is enough to just have the electronics (PCBs, component parts, wiring, original connector plugs, etc.) installed on a board (not wood) with spacers.

2963005 If failure detection is included in electronic samples (board assemblies) with first off-standard-tool part PCB version, it must be possible to simulate the failure with the help of a jumper.

2963006 It shall be possible to simulate the following fault types using a jumper:

2963007 Open load of an LED strand of the light function within a lamp element.

2963008 Short circuit of an LED strand of the light function within a lamp element. This is only necessary if the LEDs tend to fail due to short circuits.

8299821 Interruption of the communication interface (bus).

2124878 The delivery date of the electronic samples (board assemblies) with A-sample printed circuit board version must be coordinated with the Client and provided at least 6 months before off-standard-tool parts.

8944124 The delivery date of the electronic samples (board assemblies) with first off-standard-tool part PCB version shall be coordinated with the Client and provided at the latest by the E-vehicle deadline.

3119237 The delivery date of the configuration file/parameterization file for the electronic samples shall be coordinated with the Client and provided two weeks before the test vehicle deadline at the latest.

3119229 The delivery date of the first off-standard-tool part lamps shall be coordinated with the Client and provided eight weeks before the application vehicle deadline at the latest.

3119242 The delivery date of the configuration file/parameterization file for the off-tool part samples shall be coordinated with the Client and provided ten weeks before the application vehicle deadline at the latest.

### 2.1.13.4 Component Design (2124889)

#### 2.1.13.4.1 Circuit Specifications - Integrated Taillamp Control (ITC) (2813892)

##### 2.1.13.4.1.1 General (2872112)

2872113 *The ITC (Integrated Tail Lamp Control) is the interface between a lamp/lamp combination and the superior control unit (e.g. Body Controller, Zone Controller). Communication takes place via a physical CAN bus system.*

2995786 *The number of CAN interfaces for lighting parts can be found in the chapter Exterior Light Control.*

2872114 *In addition to the bus system, this interface includes software elements, the transceivers in the superordinate control unit, and the LED drivers in the lamp.*

4093550 *To ensure smooth animation, a maximum of 2 LED strands may be actuated at a time. If required, the only exception is the reversing light.*

##### 2.1.13.4.1.2 Connection (2876783)

###### 2.1.13.4.1.2.1 Central Connector (2876784)

2876791 The exact design of the central connector is defined on the RFQ drawing.

2876789 If the central connector is not included in the RFQ drawing, it shall be coordinated with the E-E contact.

2876790 All connectors installed on the lamp shall be fastened in the housing with zero clearance: This is to prevent creating noise sources.

2876793 All connectors installed on the lamp shall be protected against accidental disconnection (strain-relief clamp). They shall withstand a pull of at least 40 N.

3079431 The permanent current at an MQS contact (0.63 x 0.63) shall not exceed 4.5 A.

3209977 The permanent current at an MLK contact (1.2 x 0.6) shall not exceed 6.5 A.

#### 2.1.13.4.1.2.2 Pin Assignment (2876786)

2876794 Pin 1 must be the ground pin.

2876795 The supplier shall label the pin assignment at the lamp, next to the plug.

2876796 The exact pin assignment is defined on the RFQ drawing.

2876797 If the pin assignment is not included in the RFQ drawing, it shall be coordinated with the E-E contact.

2876798 The plug pins shall be pressed into a carrier board.

2876799 The CAN conductor tracks (CAN-H/CAN-L) shall run parallel to each other.

2876800 The CAN conductor tracks (CAN-H/CAN-L) shall be designed to be as short as possible.

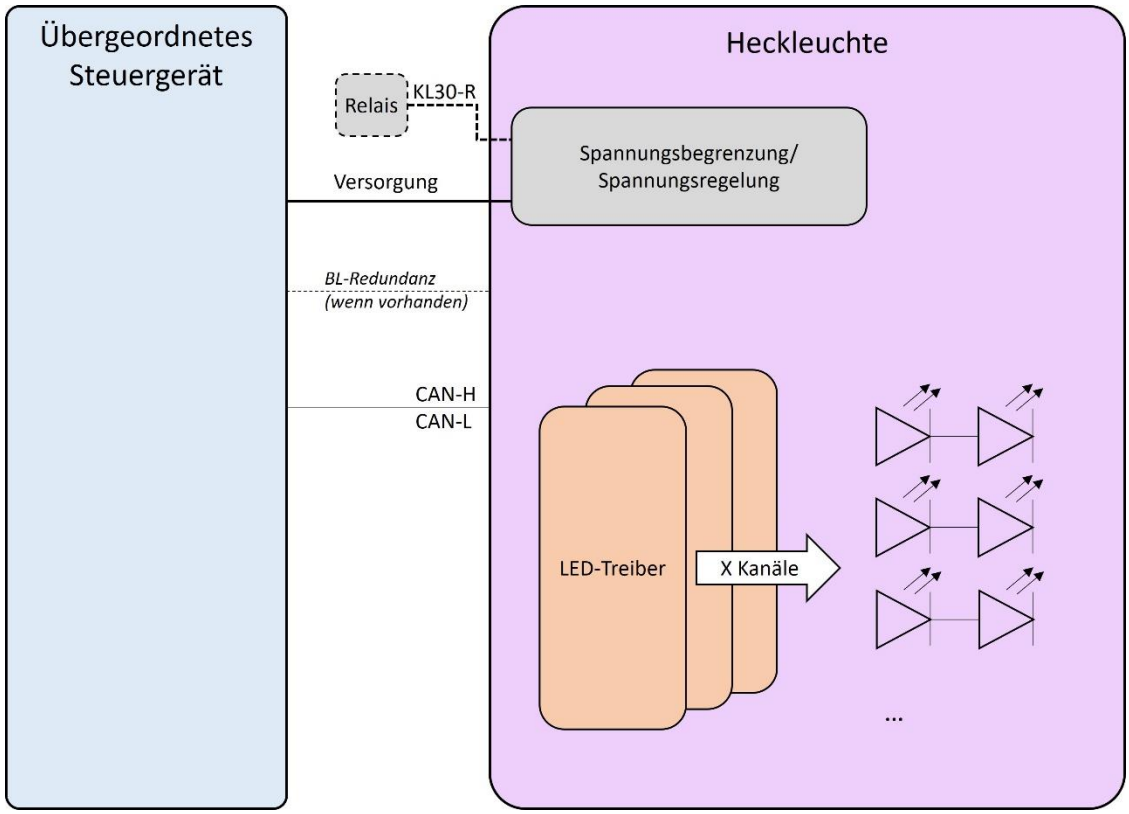
2876901 The CAN conductor tracks (CAN-H/CAN-L) shall be designed to have the same length.

2878542 Unless otherwise specified in the CRS, the requirements from the [MSS 20202] must be observed.

### 2.1.13.4.1.3 System Description (2872115)

#### 2.1.13.4.1.3.1 Basic Diagram (Software and Hardware Parts) (2872116)

2872117




2872124 *The higher-level control unit receives information on how to actuate the lamp via a configuration file and a parameterization file generated in the GUI.*

2872129 *If a brake light redundancy line is required from a functional safety perspective (see Chapter Exterior Light Control), it must take over actuation in the event of a fault.*

2872132 Voltage limitation/voltage regulation is done in the lamp and helps to protect the LED drivers or reduce the power in the LED drivers.

2872134 The actuation of the LED strands is done via LED drivers. If necessary (depending on the current), an LED strand can be divided between several driver channels. However, there may only ever be one LED strand connected to a driver channel.

2872137 Several LED strands can be combined to form a pixel via the GUI. A pixel can therefore comprise several different LED strands. However, a strand may only be assigned to one pixel.

#### 2.1.13.4.1.3.2 Wiring in the Vehicle (2872139)

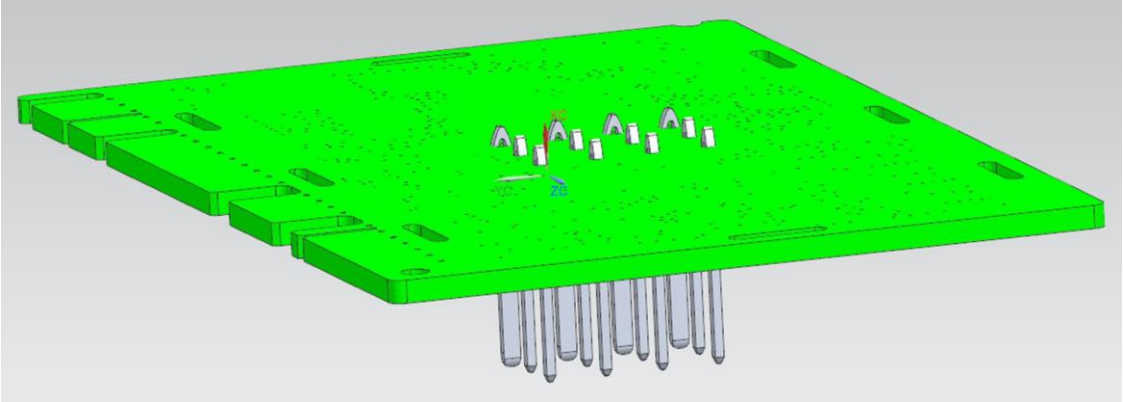
2872140 The wiring for the rear lamps in the vehicle can be found in the Chapter Exterior Light Control.

2872141 Cable splicing is not permissible in the lamp. The loop-through of the CAN line shall be done on the PCB.

### 2.1.13.4.1.4 Voltage Limitation/Voltage Regulation (2875300)

2905169 The electronic connection to the central connector is done via a connector module (SM) or a connector power module (SPM)

2905180



2905174 Both are PCBs with pressfit pins on the reverse that form the electrical connection to the vehicle wiring harness.

2905170 The only difference between an SM and an SPM is that the voltage limitation/voltage regulation for the SPM is located in whole or in part on the PCB, while the SM only routes the connections through.

2905167 The type (electronic circuit) of voltage limitation/voltage regulation depends on the concept and is the responsibility of the supplier.

2876317 If a DC/DC is used, the following requirements shall be complied with as minimum requirements:

2900686 - The PCB shall be designed to have at least four layers.

2900687 - An EMC protective cover for the electronic components shall be provided and connected to ground with low impedance during use.

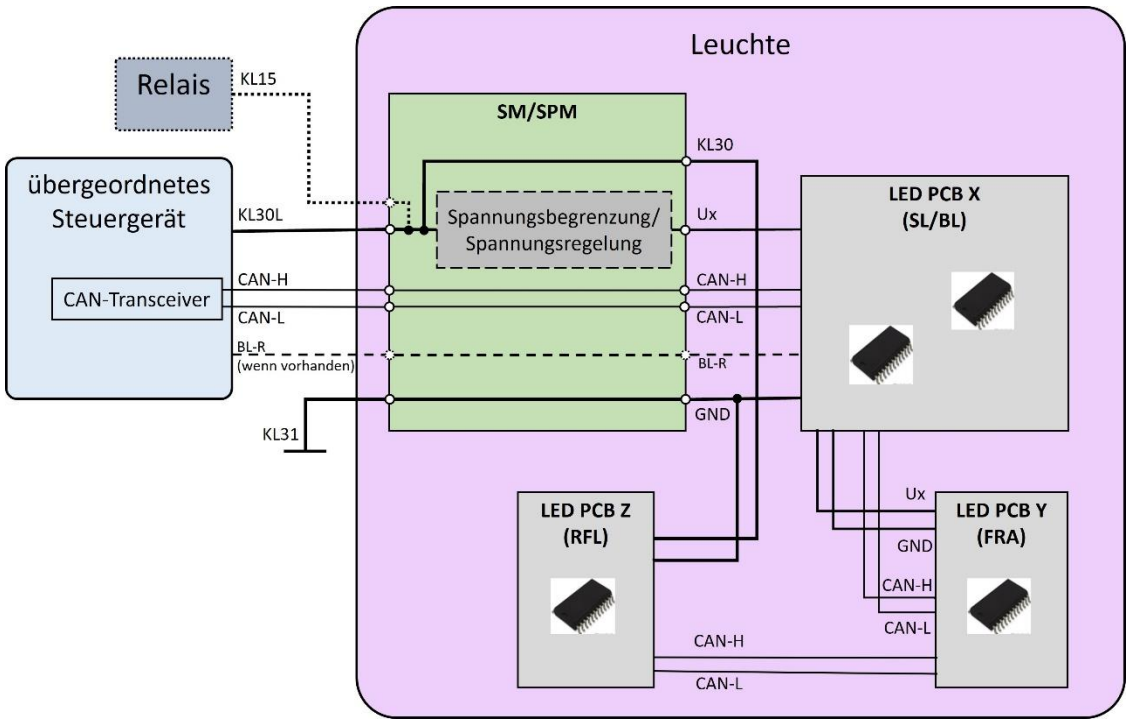
2900688 - The standard layout shall also be retained for further projects with DC/DC, to the extent that this is technically feasible.

2905309 - Interference emission measurement reports for the suggested layout shall be made available to the Client.

2900690 - The power dissipation shall be less than 10%.

2897180 Example of SPM integration in a lamp

2897191




2897192 The power supply can be provided via the Ux voltage stabilized/regulated by the supplier or via the routed-through terminal 30.

2901138 The CAN lines (CAN-H/CAN-L), the BL redundancy line (if present), and GND are directly routed through.

### 2.1.13.4.1.5 CAN (2887027)

#### 2.1.13.4.1.5.1 CAN Wiring (2887028)

2887030 A termination shall be provided in the layout for every CAN LED driver in its network.

2887034 A decentralized termination shall be preferred, using the longest path of the respective network (termination in the master ECU (superordinate control unit) and in the most remote LED driver in the respective network).

13960133 Care must be taken to ensure that the connection is on the left in the left side wall lamp and on the right in the right side wall lamp.

2887031 The determination of the termination will be made after checking the network physics and shall be coordinated with the client's Development contact.

2905310 Corresponding electronic components shall be provided in the layout for EMC debugging.

2887035 The CAN lines (CAN-H/CAN-L) in the rear lamp shall be twisted.

2887036 The CAN lines (CAN-H/CAN-L) and the CAN conductor tracks (CAN-H/CAN-L) shall have the same length.

2887038 The CAN conductor tracks (CAN-H/CAN-L) shall be routed parallel to each other.

### 2.1.13.4.1.6 LED Drivers (2888236)

2896345 The possible drivers and driver families can be found in Chapter Exterior Light Control.

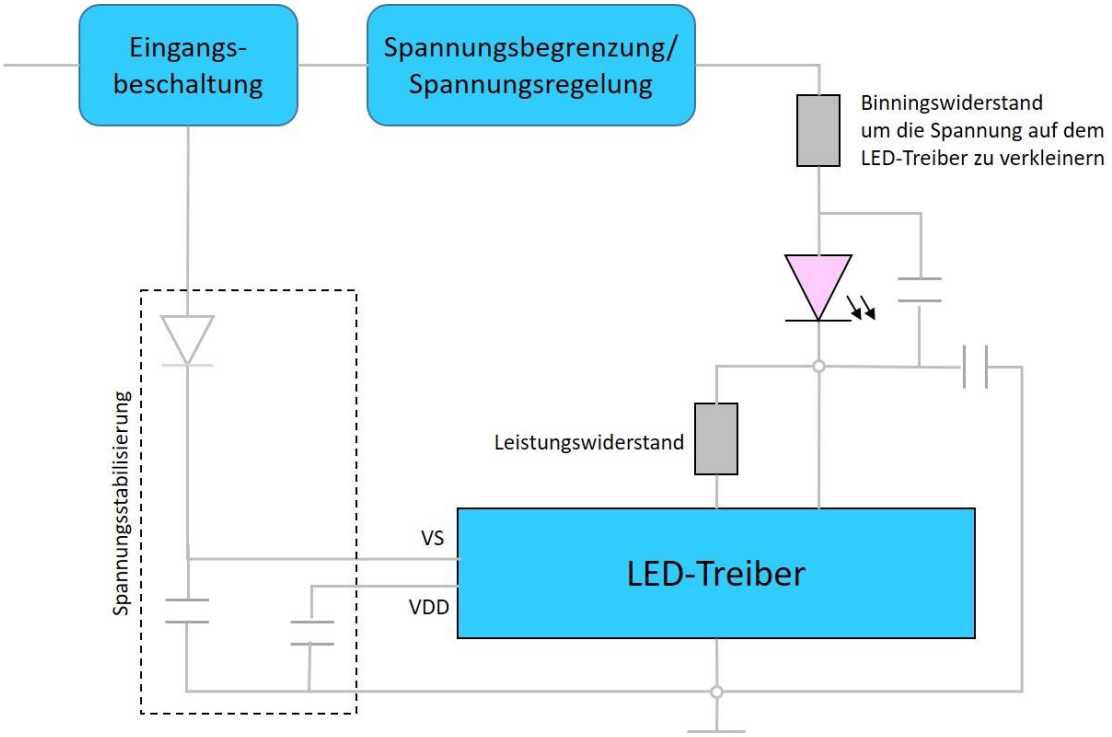
2896346 Only identical drivers may be used within a lamp.

13959960 In the case of several modular lamps operated via a shared bus, only drivers from one driver family may be used.

### 2.1.13.4.1.7 LED-PCB Circuit (2896347)

2896348 Example of wiring diagram

2896349




2945148 The current is adjusted (e.g. bin adjustment/thermal adjustment) in the lamp.

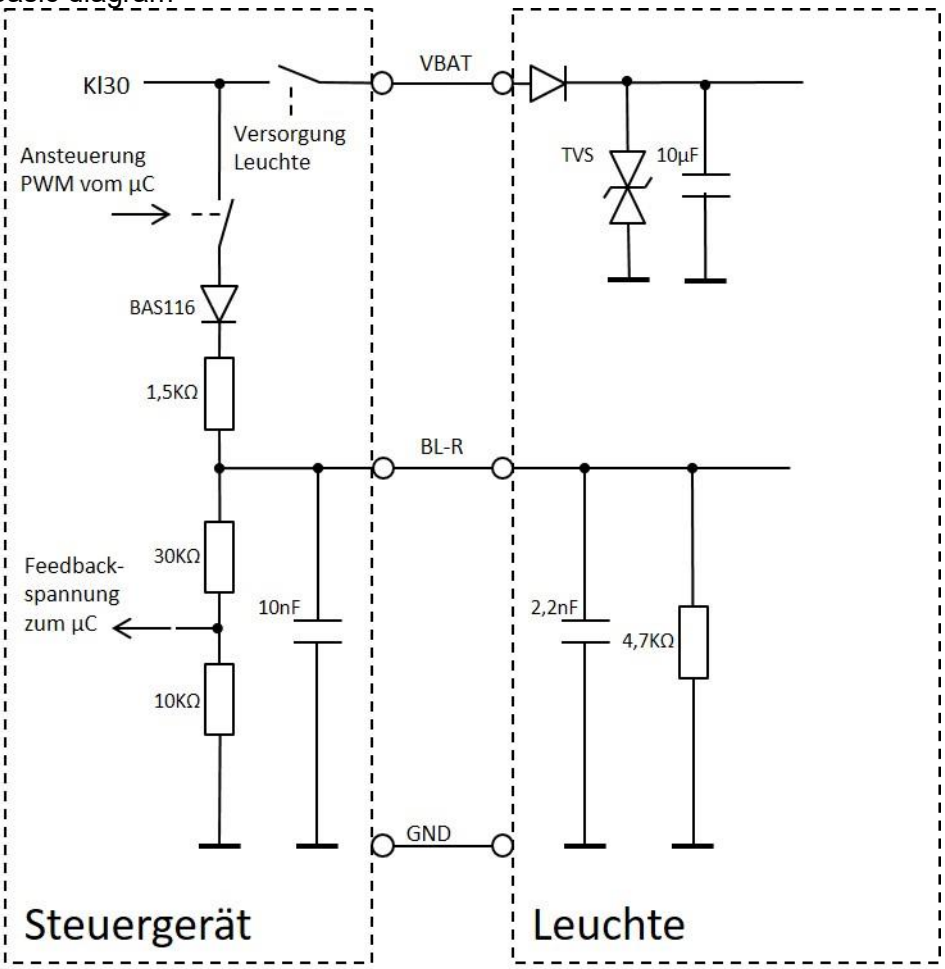
2896910 The variance of current adjustment between the LED driver channels of different drivers shall not exceed +/- 5%.

2905313 In the event of a thermally critical application, measures shall be taken in the circuit for thermal relief of the LED driver.

2905314 Electronic components for voltage stabilization shall be provided.

### 2.1.13.4.1.8 BL redundancy line (if available) (3010442)

3010443 Basic diagram




3010547 The BL-R function is designed to be active high. This means that, in the event of a brake light request, the voltage level is "high". If there is no brake light request, the switch in the BC is open and the voltage level is "low".

3069475 The input circuit of the BL-R line shall be coordinated with the Client.

### 2.1.13.4.1.9 Behavior over Time (2896912)

2896914 The timeline of every light function from the activation signal to the switching on of the LEDs shall be disclosed.

2995896 The light function shall be switched on within 20 ms of the corresponding message being present on the bus.

2896920 All tolerances and worst-case values shall be added to the timeline.

2896921 At a cycle frequency of 300 Hz, the LED drivers shall create the corresponding PWM at the LED output within 7 ms after receipt of the activation message.

2896922 In the event of simultaneous activation of a function/dynamic light sequence of different lamp elements (sidewall lamp, trunk lid lamp, continuous reflector strip), the difference shall be < 10 ms.

2904782 During the dynamic light sequence phase, in the event of simultaneous activation of the scenario, this shall run synchronously in the different lamp elements (sidewall lamp, trunk lid lamp, continuous reflector strip). The variance shall be max. 5 ms.

### 2.1.13.4.1.10 Diagnosis (2904807)

2925290 It shall be possible to read out the firmware status of the LED driver using a diagnostic command.

3073923 At least 1 byte shall be reserved in the memory of the LED drivers for this purpose.

2925297 During the selection of the LEDs and the LED drivers, it shall be ensured that typical LED failures match the diagnosis capabilities of the LED driver.

2925298 For instance, if LEDs are used that have a high probability of failing due to a short circuit, the driver shall also be capable of detecting the short circuit.

2925299 An open load and short circuit (to the positive terminal or to ground) of the LEDs shall be detected by the LED driver after 10 ms at the latest. In this context, partial failures (e.g. 2 LEDs in a strand) shall also be detected.

2925300 Note: Corresponding debouncing is carried out in the BC.

2925301 The status (ON/OFF) of the BL redundancy line (hardware line) shall be communicated to the BC via the bus.

2925302 Internal errors of the LED driver shall be sent to the BC. These include a faulty channel status or an interruption of communication.

2945150 The error behavior and the type of fault report to the BC shall be coordinated with the Client.

2925303 Relevant error statuses of the DC/DC (if available) shall be detected and sent to the BC.

2925304 Deviations in the power supply shall be detected. This can be done using output current monitoring, for instance.

2925305 Note: In the event of an error in the power supply of the LED driver, the BC detects a timeout in the communication.

2925306 All error statuses shall be sent to the BC via the bus.

2925308 For communication monitoring, see Chapter Functional Safety Requirements.

2925312 A temperature derating of the light functions is not permissible.

2974523 If it is necessary from a thermal perspective to adjust the RFL to a lower value after a certain period of time, this can be done via the BC.

3236594 To this end, all the legally required light values shall be complied with for this lower value.

3236604 This shall also be coordinated with the Client in advance.

2975188 If it is necessary to completely deactivate the function due to an excessively high LED driver temperature (fire hazard), an error shall be communicated to the BC.

2925313 For all error cases, the required diagnosis quality of Functional Safety shall be observed.

2925314 Limitations in error detection shall be communicated to the client.

### 2.1.13.4.1.11 GUI (Graphical User Interface) (2925315)

2925316 The maximum number of pixels that can be varied in brightness can be found in Chapter Exterior Light Control.

2945154 These pixels can randomly be assigned to the tail light, brake light, turn indicator, and rear fog light functions.

2945169 A pixel can include several light functions (e.g. combined tail light/brake light)

2945174 The maximum number of LED drivers per vehicle can be found in the Chapter Exterior Light Control.

### 2.1.13.4.1.12 EMC (2945188)

#### 2.1.13.4.1.12.1 Interference Emissions (2950979)

2950980 The supplier shall disclose its EMC concept at the time of contract award.

2950982 All frequencies of the system shall be presented. For instance, the PWM frequency, the DC/DC frequency, etc.

2950984 The maximum cycle frequency of the DC/DC shall not exceed 500 kHz. If technical reasons make it necessary to exceed 500 kHz, this shall be coordinated with the Client.

2950985 The edge steepness shall be disclosed and coordinated with the Client.

2950987 If electronic components are used that cause interference emissions, the EMC protective cover provided shall be installed.

2950988 If line-borne disturbances are to be expected, placeholders shall be reserved in the layout for ferrites and capacitances.

2951491 In the event of an unsuccessful EMC vehicle measurement, it shall be possible to correct this without layout adjustment.

2951492 It shall be possible to suppress interference on the CAN lines by means of appropriate measures.

### 2.1.13.4.1.12.2 Interference Resistance (2951496)

2951641 As a general rule, it is not permissible for the lamp to switch off autonomously. If this is necessary from a functional safety perspective, the number of reactivation attempts shall be programmable.

2951501 If technical reasons (e.g. interference creates a fault entry) make it necessary to switch the lamp off briefly, it shall subsequently switch back on autonomously (with no outside help).

### 2.1.13.4.1.13 Supplementary functional safety requirements for the ELC (Exterior Light Control) (2951644)

2951645 *Note: The lamp elements are powered by a terminal 30 (terminal 30L) controlled by the master control unit (superordinate control unit).*

2965035 *Note: All light functions of the lamp are actuated via the communications interface.*

2965036 The supplier shall comply with the functional safety requirements without the higher-level control unit transmitting intentional error messages with which the driver can check its fault mechanism.

2965048 The supplier shall comply with the functional safety requirements without an active reset of the superordinate control unit.

2965411 A mechanism shall be implemented that, in the event of active power supply of the lamp and defective/erroneous communication, activates the tail light (emergency light) after a timeout period.

2965420 In the event of defective or missing communication of the brake light, the brake light redundancy line (if available) takes over actuation.

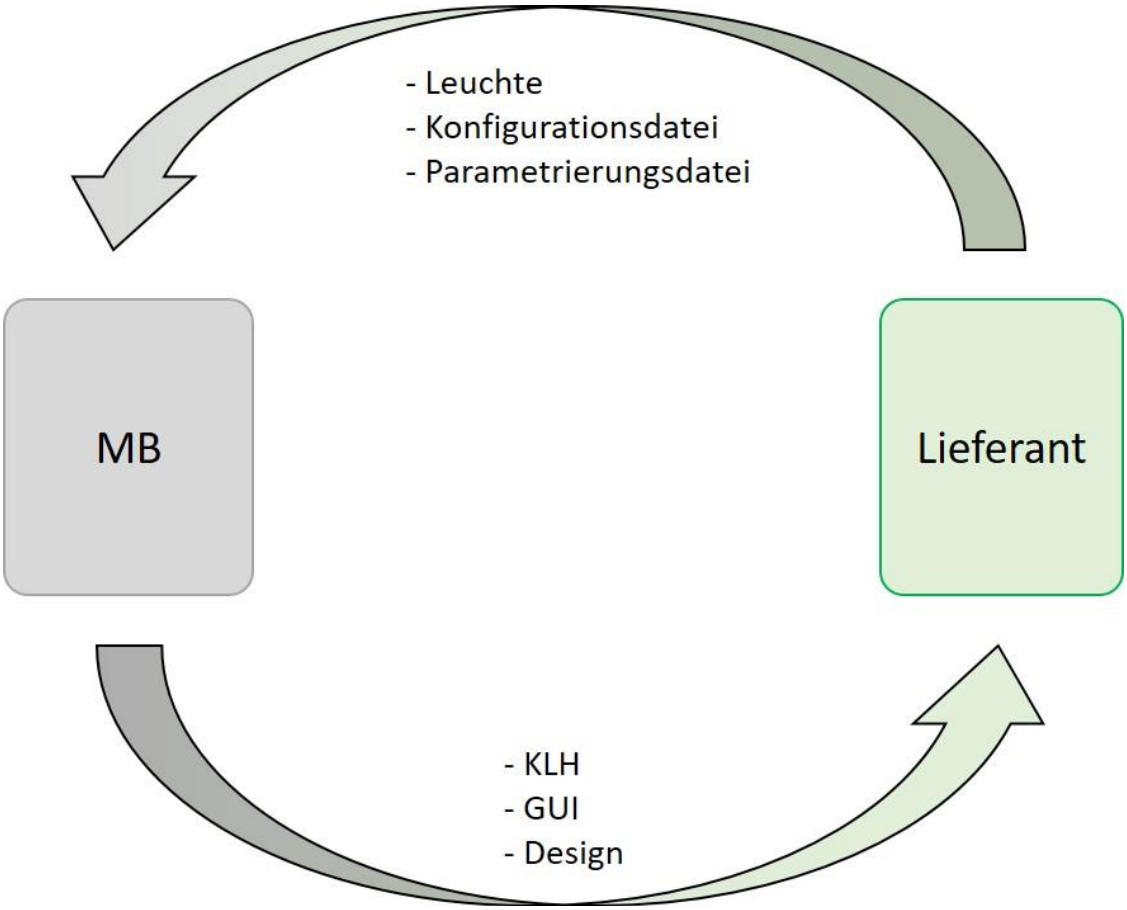
2965422 This brake light emergency light does not need to match the original brake light pattern 1:1 (e.g. for a BL element on the trunk lid); however, the legal requirements shall be complied with.

2965439 As soon as communication with the superordinate control unit is OK again, the original brake light pattern shall once again be actuated via the communications interface.

2965423 The brake light emergency function must be coordinated with the Client.

### 2.1.13.4.1.14 Cooperation Model (2962184)

2962187




### 2.1.13.4.1.15 Actuation and Diagnosis (2964951)

2964952 Actuation boxes

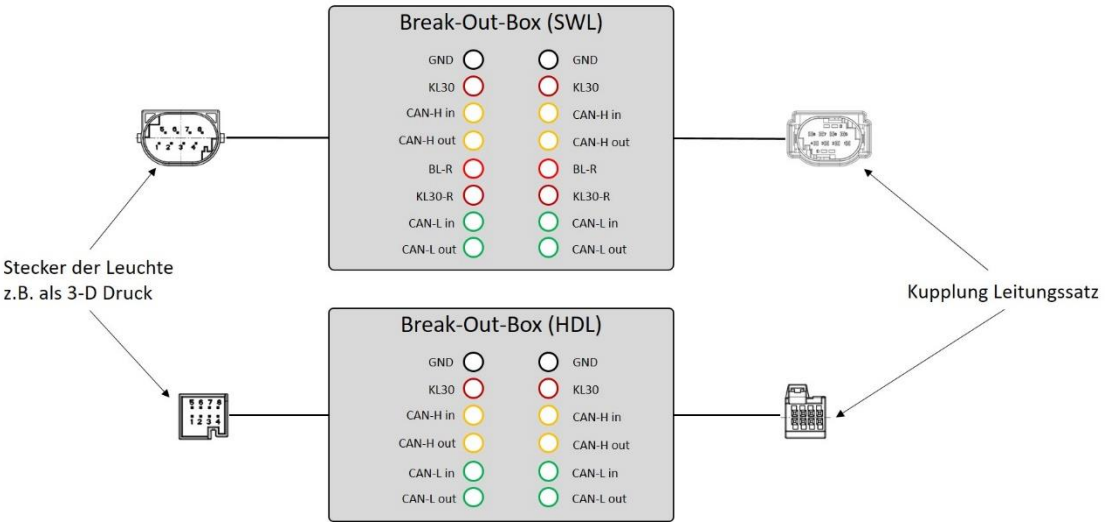
2964970 The supplier shall provide a means of actuation, configuration, and troubleshooting.

2964966 Break-out boxes

2964972 The supplier provides three sets of break-out boxes to interrupt the vehicle wiring harness. A break-out box comprises a light element.

2995770 Definition of 1 set of break-out boxes:
One-piece tail lamps: Left sidewall lamp + right sidewall lamp
Multi-part tail lamps: Left sidewall lamp + left trunk lid lamp/tailgate lamp + right sidewall lamp + right trunk lid lamp/tailgate lamp
Tail lamps with continuous reflector strip: Left sidewall lamp + right sidewall lamp + center continuous reflector strip

2964976 Illustration example of break-out box




12742480 Standard short circuit plugs shall be used to connect the respective sockets (see example illustration).



2995771 The corresponding connection can be found in the E-E slides

## 2.1.14 Illumination Engineering Requirements (2141313)

2141312 *This module contains all information on the photometric component requirements.*

### 2.1.14.1 General (2141311)

2141310 *The values defined below apply to the legally required minimum values, not to any permitted deviations in production (e.g. COP values).*

2141314 All photometric values of the lamp shall be at least 10% above the legal minimum values for the individual points or groups.

2141315 All photometric values of the lamp shall be at least 10% below the legal maximum values for the individual points or groups.

2141318 *Exceeding the Mercedes maximum value is permitted only in the case of two-piece light functions (via sidewall and trunk lid lamps) after consultation with the Client.*

### 2.1.14.2 Deadlines and Project Schedule (2141323)

2141325 A work status for all actuation values (PWM/effective voltage) of the individual signaling lights' functions and of combined functions (e.g. tail lamp/brake light) shall be provided for the parts provision of the confirmation vehicle.

2141329 The final status for all actuation values (PWM/effective voltage) of the individual signaling lights' functions and of combined functions (e.g. rear lamp/brake light) shall be provided to the Client before submission of the homologation.

3737180 For the rear lamps, brake lights and turn indicators, the maximum applicable PWM range with photometric measurements for the smallest and largest PWM values shall be taken into account in the homologation.

2141326 All technical light requirements shall be verified using simulations and light samples (photometric measurement results). All other requirements, e.g. homogeneity, shall be coordinated and confirmed with the Client using samples.

2141328 The approval document shall be maintained in the EE coordination document and the type of approval shall be communicated to the Client.

9932849 All necessary information/scopes shall be provided by the Contractor for possible re-measurements at approval institutes/authorities.

#### 2.1.14.2.1 Physical Lamp Sample (2141331)

2987210 *The following requirements only apply if a physical lamp sample has been requested by the Client.*

2141334 Requirements pertaining to a lamp sample:
1) It shall be possible to individually actuate all functions and areas separately from each other. (Coordination with the Client – also applies to side wall lamp, trunk lid lamp, tail lamp band)
2) Photometric measurement reports for all functions shall be available on handover.
3) Luminance images for all functions shall be available for handover (Simulation and warm samples with the same scaling per function)
4) A label with the following information shall be affixed on the lamp sample:
(A) Model series (B) Handover date (C) HV values in cd per function
(D) Installation height (mm) – lens (lowest point) above the roadway
(E) Tail lamp actuation module information: (I) Hardware version (II) Software version (III) GUI file name (IV) Tail lamp actuation module actuation parameters (..)
If a tail lamp actuation module is not used, the following information shall be indicated for (E) instead: PWM values (%@12.8 V) per function
5) If a tail lamp actuation module is used, it shall be possible to connect the lamp sample with the vehicle plug. If a tail lamp actuation module is not used, it shall be possible to connect the lamp sample via cables with legibly numbered banana plugs.

### 2.1.14.3 Simulations and Measurements (2141330)

2141332 *The following requirements apply for all measurements and simulations.*

2141333 The measuring distance between the test part/light function and luminance camera (sensor) shall be 3,083 mm.

2141339 The test part/light function shall be measured in the vehicle installation position. For this purpose, it shall be aligned by means of a suitable measuring frame, for example, on the photogoniometer.

2141335 A lens with the focal lengths f = 8 mm, f = 25 mm, f = 50 mm, or f = 100 mm shall be selected depending on the object size.

2141338 Where gray filters are used, a filter with the optical density 1, 2, or 3 shall be selected.

2141337 Measurements for all light functions shall be submitted for every hardware sample.

2141316 Each light function shall be measured with the test voltage and/or PWM timing defined in the EE coordination document.

2141317 The alignment points for the measurement of every light function shall be indicated by white markings on the cover lens. All lamp samples and ISIR lamp samples shall have this marking.

2141343 Results and evaluations shall be handed over to the Client as a technical document and in camera file format.

2141341 *The measuring/simulation results are used for the objective and reproducible evaluation and documentation of the light functions.*
*In particular, the luminance gradient course, the homogeneity, spots and diffused light, light leakage, color and color variation, dazzling, and the overall appearance are assessed and documented, as well as other factors.*

### 2.1.14.4 Appearance Requirements (2141348)

2141345 *The following requirements relate to all tail lamp functions.*

2141347 The lamps shall not emit any diffused light. If diffused light is used in a targeted manner to make use of photometric values of a light function, this light shall be specifically disclosed.

2141346 The edges of the illuminated surfaces of the lamp shall be illuminated precisely and correctly.

2141349 No white light must be visible in the red fields of the lamp. A clear compartment separation shall exist.

2141351 No colored light shall be visible in the white fields of the lamp. A clear compartment separation shall exist.

2141353 No light leakage shall be visible through the joints/gaps between the lamp and the body.

2141352 To minimize distortions in the light pattern due to an aerodynamics edge or similar structures, the lens contour in this area shall be parallel on the inside and outside and be designed in the same thickness. In addition, the inner radius shall be designed similar to the outer radius.

#### 2.1.14.4.1 Color Selection (2141350)

2141354 Only one color bin may be used within a light function of a lamp. In this regard, the tail light area and the brake light area are considered separately.

#### 2.1.14.4.2 Homogeneity (2141356)

2141358 *Homogeneity means that no spots and/or light/dark shadows are visible in the signal representation. This also means a uniform luminance level between the top and bottom, and left and right.*

2141355 The illumination of all light functions shall be homogeneous.

2141357 The illumination of all individual reflectors shall be homogeneous.

2141359 Only LEDs of the same brightness class may be used within a light function for a lamp. If a light function stretches across several PCBs, different brightness classes can be used. The brightness of the individual elements of the light function shall be adjusted so that a max. luminance difference of 30% exists in the light function of the lamp pair.

2141360 In general, it shall not be possible to see a visual difference in the brightness of the left- and right-hand lamps (e.g. via adjustment of the different brightness classes using series resistors).

2141362 Within a lamp pair, the brightness classes shall be coordinated so that a visual luminance difference is not discernible.

2141364 The optical systems of every light function shall be optimized with regard to the homogeneity under all viewing angles.

5432808 The following requirements in this chapter apply to all viewing angles within the rhombus in the coordinate system with the following corner points:
P1 (45° outside/0° vertical), P2 (0° horizontal/25° top), P3 (0° horizontal/5° bottom), P4 (45° inside/0° vertical)

5432809 For the tail lamp, a luminance gradient between two arbitrary points with a distance of 10 mm from a luminous surface less than or equal to 1:2 shall be complied with.

In addition, a gradient of a maximum of 1:3 shall be complied with for front surfaces (overall surface considered), and a maximum of 1:6 shall be complied with for side surfaces.

5432810 For the direction indicator lamp and brake light functions, a luminance gradient in an illuminating surface of less than or equal to 1:6 shall be adhered to.

8915827 For the reversing light function, a luminance gradient in an illuminated area of less than or equal to 1:12 must be maintained.

5432811 A max. luminance difference of the individual luminous surfaces of 30% applies where several luminous surfaces are involved in the light function (also in the case of multipiece lamps).

### 2.1.14.5 Function-Specific Requirements (2141376)

#### 2.1.14.5.1 Tail Lamp Requirements (2141378)

2141377 *The requirements described in this chapter also apply for the side marker lamp if this is implemented as a separate function.*

2141375 The dominant wavelength (color) of the LEDs shall be at least 635 nm (model).

2141379 The final waveband used shall be agreed with the Client.

13876480 If there is a corresponding note on the tender drawing, the Contractor shall take into account additional elements as part of the tail light for the approval of the rear lights. The external elements to be taken into account have photometric values of up to 6cd in HV0.

##### 2.1.14.5.1.1 Parking Lights Requirements (2141382)

2141381 In the event of two-part lamps (sidewall + trunk lid), the parking lamp shall only be approved with the sidewall.

## 2.1.14.5.2 Brake Light Requirements (5095146)

2141366 For the variants certified in accordance with the ECE standard or GB standards (vehicle and/or lamp is produced locally in China), a multi-level function shall be implemented for the brake light.

2141361 The multi-level function shall contain two levels that are set by the control unit.
The high level is used in day mode.
The low level is used in night mode.

2141365 *The light values indicated in this chapter relate to the sidewall.*

2141368 The following photometric values shall be implemented in HV:
Low level: 75 cd – 90 cd
High level: 121 cd – 180 cd

2141370 For country variants in which multi-level function will not be implemented, the photometric values of the indicated high levels shall be implemented.

2141372 To better adapt the lamps to the ambient conditions, the light intensity conditions between the HV values and the angle values need to be harmonized. For this purpose, the ratio between the HV values and the angle values is determined.

2141374 The following harmonization requirements shall be complied with:

| Prozentuale Mindestvorgabe bezogen auf den HV-Wert | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20L | 10L | 5L | V | 5R | 10R | 20R | |
| 15U | | | | | | | | % |
| 10U | | | 20 | | 20 | | | % |
| 5U | 10 | 20 | | 70 | | 20 | 10 | % |
| H | | 35 | 90 | 100 | 90 | 35 | | % |
| 5D | 10 | 20 | | 70 | | 20 | 10 | % |
| 10D | | | 20 | | 20 | | | % |
| 15D | | | | | | | | % |

5095152 The brake light shall be designed in such a way that an error message is sent to the body controller if an LED string fails and the entire remaining function is not switched off.

### 2.1.14.5.3 Turn Indicator Requirements (2141380)

5095216 *The light values indicated in this chapter relate to the sidewall.*

5095217 For yellow turn signal indicators, the following photometric values shall be implemented in HV: 75 cd – 90 cd

5095154 For variants that are certified according to FMVSS, the turn signal indicator shall fulfill the requirements for “red lamps”.

5098788 For red turn signal indicators, the following photometric values shall be implemented in HV: 121 cd – 180 cd.

5095218 To better adapt the lamps to the ambient conditions, the light intensity conditions between the HV values and the angle values need to be harmonized. For this purpose, the ratio between the HV values and the angle values is determined.

5095219 The following harmonization requirements shall be complied with:

| Prozentuale Mindestvorgabe bezogen auf den HV-Wert | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20L | 10L | 5L | V | 5R | 10R | 20R | |
| 15U | | | | | | | | % |
| 10U | | | 20 | | 20 | | | % |
| 5U | 10 | 20 | | 70 | | 20 | 10 | % |
| H | | 35 | 90 | 100 | 90 | 35 | | % |
| 5D | 10 | 20 | | 70 | | 20 | 10 | % |
| 10D | | | 20 | | 20 | | | % |
| 15D | | | | | | | | % |

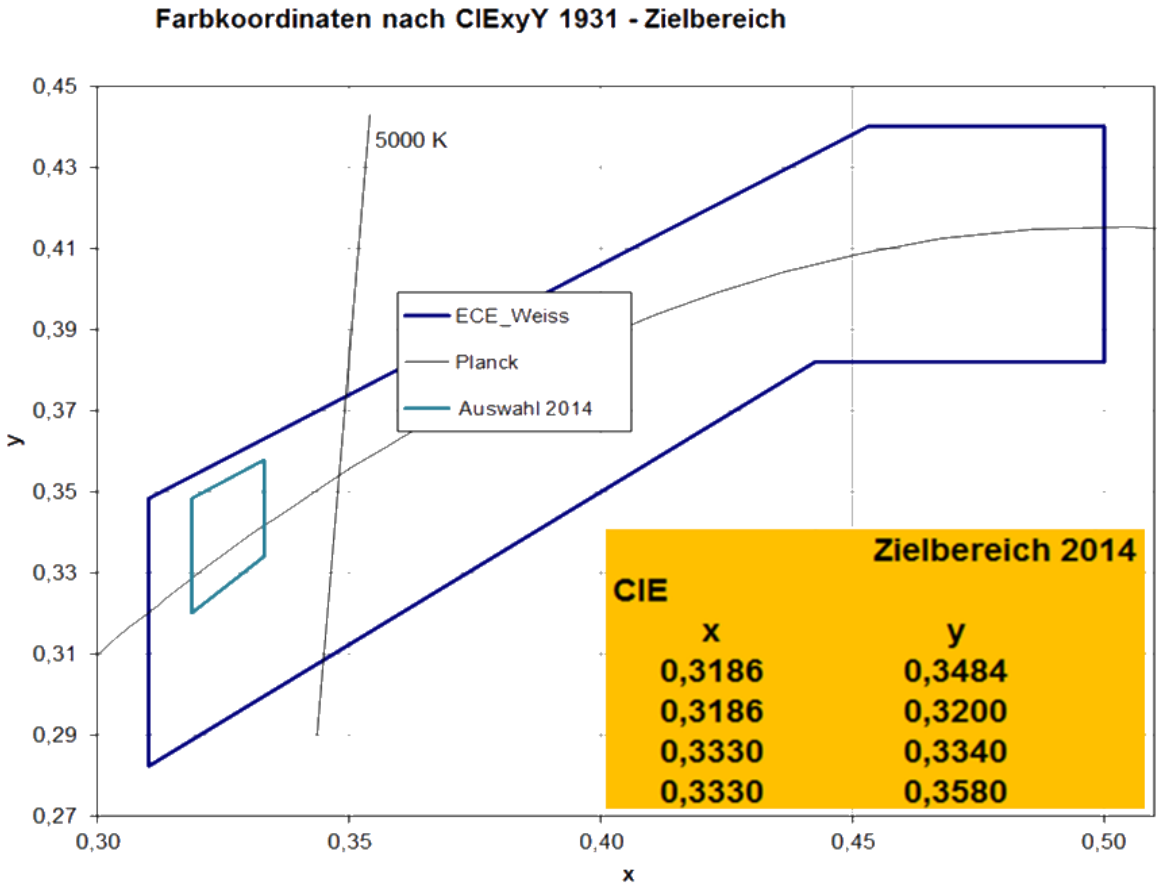
2141389 Yellow turn indicators shall be designed so that an error message is sent to the body controller if an LED string fails.

2141383 Red turn indicators shall be designed in such a way that an error message is sent to the body controller if an LED string fails and the entire remaining function is not switched off.

## 2.1.14.5.4 Reversing Light Requirements (2141386)

### 2.1.14.5.4.1 Color Selection (2141385)

2141387 The color coordinates of the reversing light shall lie in the target range described below. If the function is to be achieved with a filter combination, the color coordinates in HV shall be within the Client's target range. The color coordinates of all angle areas shall be within the “ECE white” range.




2141388 For functions with fiber-optic technology, optical lenses, or similar, the color influence of the material used shall be taken into account.

### 2.1.14.5.4.2 Technical Light Requirements (2141391)

2141394 *The following requirements are necessary for adequate and uniform illumination of the rear-view camera.*

2141390 In addition to all legal requirements, the following luminous intensity values shall be complied with for the reversing light:

Anforderungs-Bereich für die Rückfahrkamera

| | | Lichtstärke in cd | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 30 out | 20 out | 10 out | V | 10 in | 20 in | 30 in |
| 10 down | min | | 50 | 80 | 80 | 80 | 50 | |
| | max | | 300 | 300 | 300 | 300 | 300 | |
| 15 down | min | | 30 | | 30 | | 30 | |
| | max | | 300 | | 300 | | 300 | |
| 25 down | min | 12 | | | 12 | | | 12 |
| | max | 300 | | | 300 | | | 300 |

2141393 *For the calculation of the minimum light intensity (cd) of the tail lamp for the relevant range for the rear-view camera, a minimum illumination value of 3 lux is used as the basis at distances of 150 (25D), 300 (15D) and 500 cm (10D) behind the vehicle.*

2141392 The reversing light shall have a homogeneous appearance (no dot formation or striation), or feature color projections (e.g. red stripes) on the road behind the vehicle. In the case of a deviation due to the structure and design, the supplier shall submit and agree design optimization proposals with the Client.

### 2.1.14.5.5 Requirements Pertaining to the Reflector/Side Reflector (3127941)

3128619 All photometric values of the lamp shall be at least 30 % above the legal minimum values for the individual points or groups.

### 2.1.14.5.6 Requirements for the ADS (Automated Driving System) Marker Lamp (6591487)

13564638 *The following requirements shall be taken into account when realizing the "ADS Marker" function.*

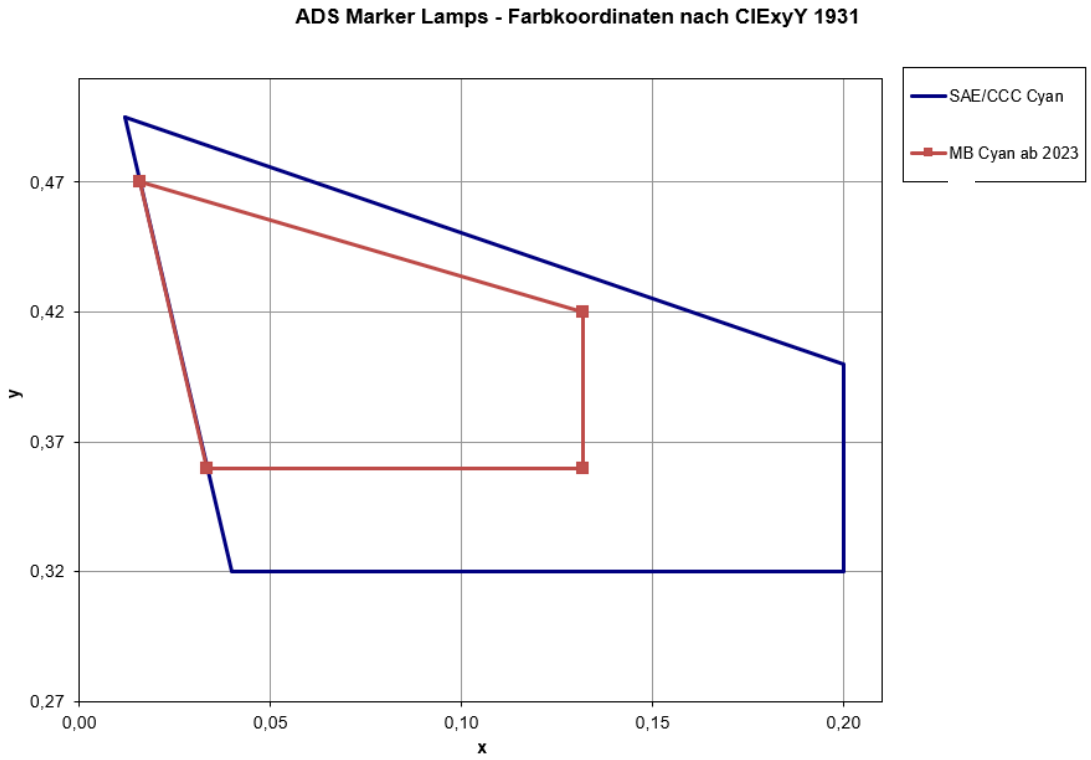
6591593 A multi-level function shall be implemented for the ADS marker lamp.

6591662 The multi-level function shall contain two levels that are set by the control unit.
The high level is used in day mode.
The low level is used in night mode.

6591664 The following photometric values shall be implemented in HV:
Low level: 11 – 18 cd
High level: 55 – 80 cd

6591667 For country variants in which multi-level function will not be implemented, the photometric values of the indicated high levels shall be implemented.

10995775 The color coordinates of the ADS marker lamps shall lie in the Client's target range described below. If the function is to be achieved with a filter combination, the color coordinates in HV shall be within the Client's target range. The color coordinates of all angle areas shall be within the “Cyan from 2023” range.




| Cyan from 2023 | | |
|---|---|---|
| | x | y |
| | 0.034 | 0.360 |
| | 0.016 | 0.470 |
| | 0.132 | 0.420 |
| | 0.132 | 0.360 |

10995776 For functions with fiber-optic technology, optical lenses, or similar, the color influence of the material used shall be taken into account.

## 2.1.14.5.7 Turn Indicator Requirements (13793595)

13793596 *The following requirements shall be taken into account when realizing the "Turn Indicator" function.*

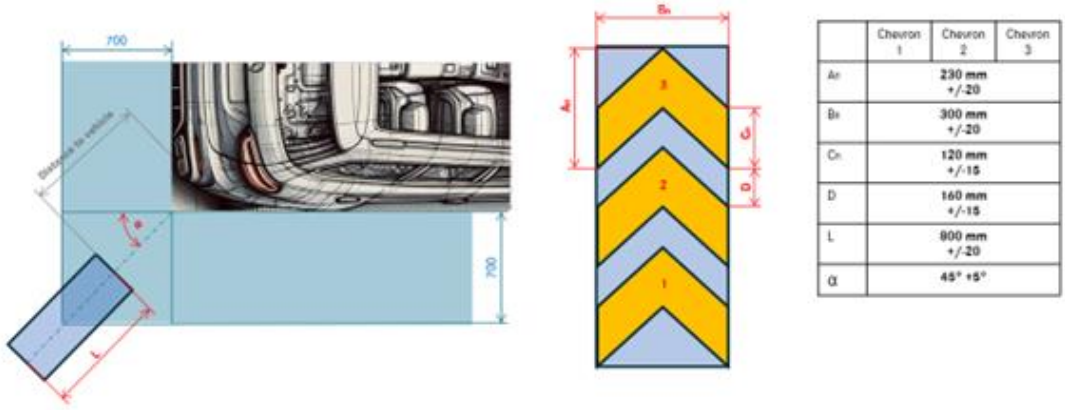
13793597 *The signal lamp projector is operated in combination with the turn indicator.*

13802449 The projection must be realized in such a way that all requirements of the globally applicable approval criteria are met. Specific versions for individual markets are not planned.

13802450 In the case of legal regulations that have not yet been finally published, the Contractor must take into account the latest published status of the corresponding draft law. If there are open questions or contradictions to the requirements described here, the Contractor must point these out to the Contractor.

13802451 The maximum aperture of the projector's light output must be 20 mm × 20 mm.

13802453 The projection must consist of three chevron elements. The geometric dimensions of the entire projection, as well as the positioning in relation to the vehicle, must be taken from the illustration below.
Figure: Geometric parameters of the projection:




13802454 The design of the projection must be based on the approval test track according to the DIN definition of roadworthiness (= configuration track). The road surface data will be provided to the Contractor by the Client as part of the development process.

13802455 The first touchdown point of the projection should be at a distance (distance to vehicle) of 700mm +50mm. If the specification for the first touchdown point of the projection cannot be met owing to influences of the headlight design, this must be pointed out by the Contractor and a new target value agreed with the Client. The vehicle dimensions and external geometries shall be made available to the Contractor by the Client as part of the development process.

13802456 The Contractor must also ensure that the legal requirements for the position of the projection relative to the vehicle are met for all other roadway positions relevant to approval and operation. The road surface data will be provided to the Contractor by the Client as part of the development process.

13802457 The color of the projection is yellow and must be within the color coordinates specified in the legal regulations.

13802458 The projection must be configured in such a way that the best possible homogeneity is achieved within each projected element. Irregular, visibly light or dark areas are not permitted.

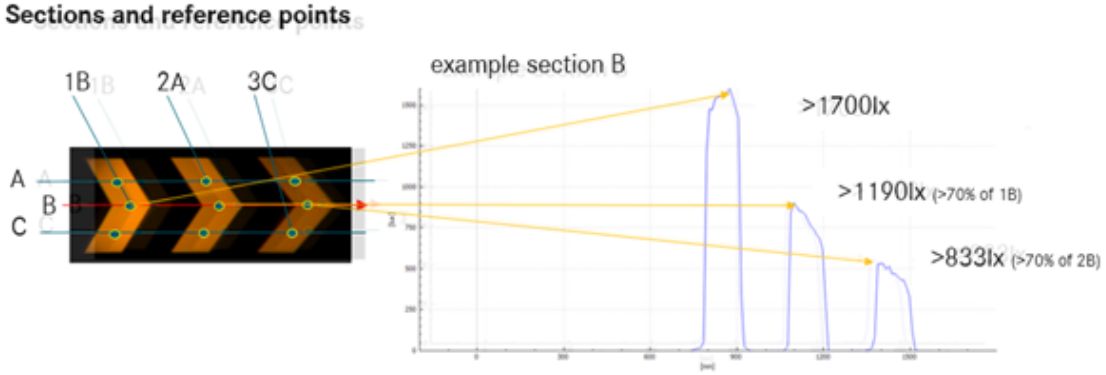
13802459 The projection of the first chevron must achieve an illuminance of 1700lx ±200lx on the track.

13802460 The illuminance of the second chevron must be >70% of the illuminance of the first chevron.

13802461 The illuminance of the third chevron must be >70% of the illuminance of the second chevron.

13802462 The illuminance within a chevron may decrease from the center outwards. The illuminance may be reduced by a maximum of 15% from the center to half of the respective arm of the chevron (see also positioning of the illuminance sections). This gradient must also be maintained in the further course of the arm.

13802463 The Contractor must demonstrate compliance with the requirements for illuminance and homogeneity of the projection with illuminance sections and true color representations (logarithmic scale). The positioning of the illuminance sections must be taken from the illustration below.




13802464 The maximum illuminance values of each chevron in each illuminance section form a reference value at a reference point. The values of the reference points must be shown in a comparison table. Deviations from the specified illuminance levels must be clearly marked.

### 2.1.14.6 Camouflage (2141401)

2141403 The supplier shall send a camouflage proposal, including lighting technology simulations, to the Client's lighting technology manager by no later than 8 weeks before the first off-standard-tool parts deadline.

2141402 The camouflage proposal shall have an optimized design with regard to the covering of design-relevant surfaces. Photometrically effective surfaces may only be concealed to the extent that all legal light values remain fulfilled. If the legal light values are not even fulfilled without camouflage at this point in time, these values shall not be negatively affected by the camouflage.

## 2.1.15 Requirements from Testing (4056733)

### 2.1.15.1 General (4056734)

4058497 *All knowledge documented in this context must not be passed onto third parties.*

#### 2.1.15.1.1 Deadlines and Project Schedule (4056742)

4058498 All tests shall be completed positively, at the latest for sampling, with a parts status that is fit for series production (series-production site, series production, series-production material, C-sample PCBs, etc.).

4058500 For Concept Review 1 (KR1), the Contractor shall have provided all tests in DukE (Client tool) with the planned test dates.

4058501 For Test Review 1 (ER1), the following minimum scope shall be performed and documented in DukE.
- Tests in accordance with 10567
- Mechanical vibration test
- High-pressure cleaning test
- Photometric measurement
- Test for Sink Marks
- Push Test
- Ethanol test
- EMC component tests (see chapter Electromagnetic Compatibility (EMC))

4058502 The scope of testing for Test Review 2 (ER2) must be coordinated with the respective testing manager and documented in DukE.

#### 2.1.15.1.2 Test Documentation (4056746)

4058504 A test report shall be created and documented for each test performed. This test report shall contain at least one test date, the client item number, the E/Q status or sample status of the PCBs, photos of the component (before, during, and after the test, noticeable problems etc.), test results (explicit list of the required parameter tests, visual inspections etc.) and a final evaluation (red, yellow, green).

### 2.1.15.2 Performing the Tests (4056992)

4622567 All tests shall be performed in accordance with the corresponding test standards. Deviations have been described below.

4058527 Unless otherwise specified, all tests shall be performed on a fully assembled signal lamp.

4058528 One set of components shall be tested per variant.

4058529 The adoption of test results for signal lamps and country variants shall be agreed upon with the Client.

4058530 To ensure that the testing accuracy of the tests corresponds to the real requirements in the field, it shall be ensured that the installation location, screwdriving sequence, and screw-on torque of the component in the vehicle are in general reproduced when the tests are conducted.

### 2.1.15.2.1 General Specifications for Test Frames (4056994)

4058531 To obtain uniform test results, the Contractor and Client shall use the same test frames from the same manufacturer for the tests.

4058533 The Contractor and Client shall agree on the test frames before their production.

4058534 The base plate shall be made of aluminum.

4058535 The edges of the base plate shall be chamfered.

4058536 The grid lines shall be milled and marked on the base plate (X, Y) and on the DuT mount (Z).

4058537 A measurement report shall be compiled on the position deviation (X, Y, Z) of the bolting points for the lamp support relative to the data.

4058538 The base plate shall be at least 12 mm thick and max. 500 × 360 mm large (so that it matches the component part).

4058539 The side edges shall be at an exact right angle to the front edge and parallel to the vehicle network.

4058540 The model designation (e.g. 222), the installation side (left or right), and an installation height to be agreed on with the Client (measured from the base plate upper edge to the ground) shall be milled into the base plate.

4058541 The max. gross weight of a component frame shall not exceed 15 kg.

4058543 The max. gross weight of a continuous reflector strip shall not exceed 30 kg.

4058544 *The function of the test frame takes priority over the weight; if the weights are exceeded, the Client shall be consulted.*

4058545 Non-rusting screws shall be used.

4058546 In the case of plastic test frames, these shall be milled so that they have a single-piece design. Bonded joints are not permissible.

4058547 Threaded inserts made of stainless metal shall be used for plastic frames.

### 2.1.15.2.1.1 Specifications for the Environmental Test Frames (4056995)

4058549 A 45 mm × 45 mm borehole grid (bore 10 mm), starting from the left side and the front edge +5 mm, shall be incorporated in the base plate. This grid shall be continued in the case of multipiece test frames.

4058550 For the gap dimension, environmentally resistant milled markings shall be applied at the respective points (in coordination with the Client).

4058551 The test frame shall be designed so that the DuT lies in the center of gravity of the Z-center axis of the clamping plate. The position of the hole grid on the test frame base plate shall be adapted accordingly.

4058552 The test frame shall be designed such that natural vibrations do not negatively affect the frame or the DuT and/or the required load profile can be carried out without damaging the frame.

4058553 The DuT surroundings shall be mapped authentically (surrounding joint gap dimension, lamp surround incl. seam sealing etc.). Surfaces that come into contact with a seal shall have a surface quality of Rz=6.3 or finer.

4058554 The bolting points shall be represented using exchangeable inserts.

4058555 A cover shall be provided for exposed areas (e.g. plugs, fastening points).

4058556 A removable, circumferentially sealed Plexiglas pane shall seal off the rear area of the DuT mount from dust and water.

4058557 Washers (stainless) shall be used to attach the Plexiglas pane.

4058558 Ethanol-resistant Plexiglas shall be used.

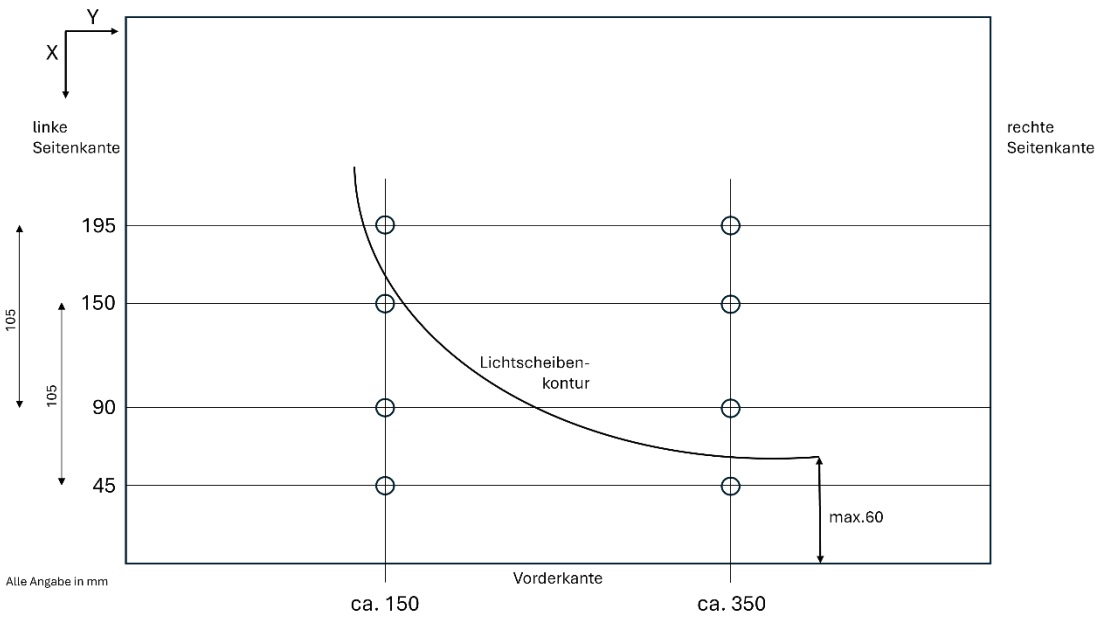
### 2.1.15.2.1.2 Specifications for Test Frames for Photometric Tests (4056997)

4058560 The bolting points shall be exact to ± 5/100 mm (relative to the data).

4058561 For two-piece tail lamps (e.g. sidewall lamp and rear-end door lamp/luminescent band), a clear presentation of the overall lamp in the original installation condition shall be possible.

4058562 The bore of the fastening holes for the goniometer mount shall be 10 mm and be designed in accordance with the following diagram.

4139533

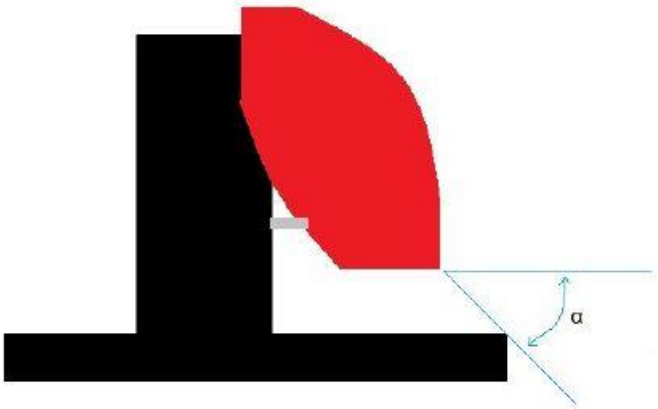



4058564 *If the mounting holes are covered up, this can then be shifted in the Y-direction.*

4058565 The bores shall have a minimum clearance of 25 mm with respect to the bodies.

4058566 So that the base plate does not impair the light functions, the tail lamp shall be vertically positioned in accordance with the following diagram. All angles α >=30° shall be possible. In this connection, the distance between the floor plate and the tail lamp lower edge shall be designed accordingly.

4139534




### 2.1.15.2.1.3 Specifications for Holders (4086208)

4086209 A bracket shall be able to accommodate the lamp at its bolting points in the installation position.

### 2.1.15.2.2 Function Classes (4057002)

4058572 Function class 2 (safety-relevant functions): Tail lamp, brake light, turn indicators, and rear fog lamp

4058573 Function class 3 (functions required for vehicle operation): Reversing light, license plate lamp, and high-mounted brake lamp

### 2.1.15.2.3 Functional States (4057003)

4062235 The following functional states apply for the component:

| Function state | Additional description |
|---|---|
| A | Resistor circuit:<br>it is permissible for the brightness to decrease/increase slightly for the duration of the test pulse. Light functions shall not fail in the operating voltage range.<br><br>Constant current switching:<br>10 V–15 V: no change in brightness permitted<br>8 V–10 V and 15 V–17 V: it is permissible for the brightness to decrease/increase slightly for the duration of the test pulse. The light functions shall not go out. A photometric evaluation is carried out together with the Client.<br><br>DC/DC:<br>8 V–17 V: no change in brightness permitted |
| C | - |

### 2.1.15.2.4 Operating Modes (4057004)

4058574 The “Drive” and “Off-Grid Parking” operating modes apply.

### 2.1.15.2.5 Operating Modes (4057005)

4058575 The Contractor shall define the relevant parameters (such as, e.g. operating current, supply voltages, input signals, etc.) specifying the tolerances for all operating modes; these shall be coordinated with the Client and documented.

6225953 If the light function is actuated via an effective value regulation, a corresponding replication is permissible. Details shall be coordinated with the Client.

4062237

| Operating mode (MBN50306) | Operating Mode (MBN 10567) | Additional description |
|---|---|---|

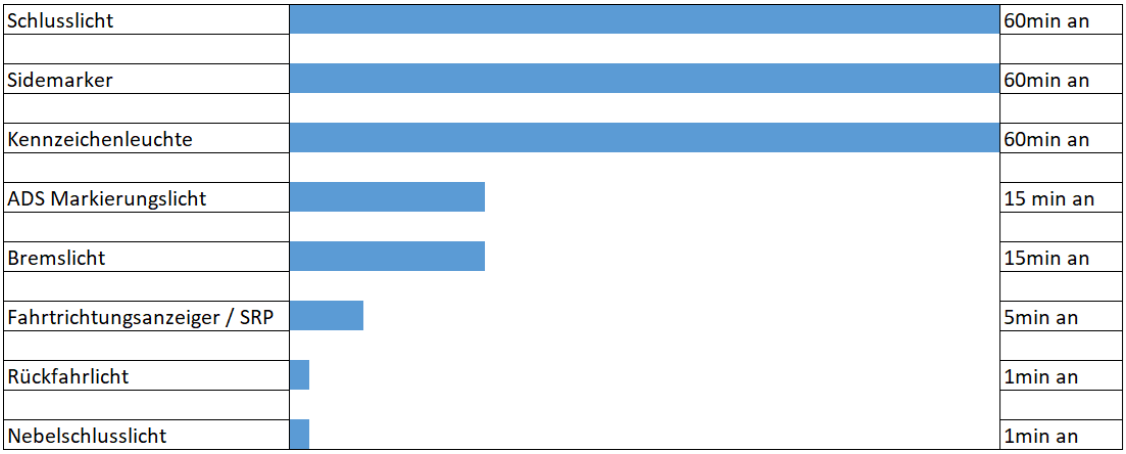
| | | |
|---|---|---|
| not installed | I.a | - |
| 'Vehicle assembly'<br>'Operation$_{min}$'<br>'Off-grid parking$_{min}$' | I.b | - |
| - | II.a | Terminal 30 supplied with power, without active light function |
| 'Drive$_{min}$' | II.b | Tail lamp active. Actuation in accordance with E/E slides |
| 'Operation$_{max}$'<br>'Drive$_{max}$' | II.c | All light functions active in accordance with the switching profile. Actuation in accordance with E/E slides. |

### 2.1.15.2.6 Switching Profiles (4057006)

4058576 The switching profile shall be drawn on for the operating statuses 'Operation$_{max}$' and 'Drive$_{max}$' or II.c.

4058577 *The profile repeats itself after a duty cycle of 60 min.*

4139536




### 2.1.15.2.7 Key Parameters of Parameter Tests (4057007)

4058579 Min./max. power consumption of individual light functions

4058581 The parameter test (large) shall be performed only at room temperature

### 2.1.15.2.8 Continuous Parameter Monitoring (4058586)

4198189 Fault messages on the bus

### 2.1.15.2.9 Leakproofness (4086263)

4086358 In addition to the requirements of MBN 50306, the leak test shall be performed as follows:

4086264 The limit leak rate shall be max. 1 mbar/s, at a test pressure of 60 mbar and a pressure-holding duration of 10 s. Possibly present sealing elements in the surroundings are not considered.

4086353 During the test, the electric lines shall be deflected to the left and right at the connector to the maximum possible extent and held for 5 s each.

### 2.1.15.2.10 Visual Inspection (4057008)

4058582 In addition to the visual inspection in accordance with DIN EN 13018, no deformations, cracks, deposit formations, blistering, iridescence, discolorations, cloudiness, condensation, abrasion, sunk spots, or other changes shall occur. Exceptions are the K-16 test and the sequence. After the test L-02, no shape changes or cracks are permissible.

### 2.1.15.2.11 Physical Analysis (4057009)

4058589 In addition to the requirements of MBN 50306, the physical analysis shall be performed as follows:

4058590 *Before opening the component:*

4058591 Applies only for non-approved plug contacts: An inspection of the entire connector connection (e.g. requirements/tolerances of implementation regulation, normal contact forces, volume resistance) shall be carried out

4058592 The lamps must form a homogeneous luminous image. There must be no perceptible differences in color and brightness of different LEDs. This shall be documented accordingly and evaluated with the Client.

4058593 No rattling, creaking or other noises shall occur.

5685548 The component shall not exhibit any fractures (including white fractures).

4058594 The contact surfaces of the electrical contact pairings shall not exhibit any traces of abrasion or wear nor any other impairments.

4058596 *After opening the component:*

4058597 The internal connecting cables, PCBs, and connections shall be checked for abrasion/damage.

4077942 It shall be checked whether an interaction occurred between any tapes used and the internal cables.

4058598 The conductor tracks, individual sockets and the plug connections shall not exhibit any signs of contact corrosion.

5685564 The component shall not exhibit any fractures (including white fractures).

### 2.1.15.3 Tests according to MBN 10567 – Electrical and Electronic Components in Motor Vehicles – 12 V On-Board Electrical System – Requirements and Tests (4057010)

4622562 Only the following tests from MBN 10567 shall be carried out.

4062248

| Test | Additional description |
|---|---|
| Operating voltage range test | - |
| Long-term overvoltage test | - |
| Transient overvoltage test | - |
| Transient undervoltage test | Severity level 2: Functional state C |
| Jump start test | - |
| Load dump test | - |
| Superimposed alternating voltage test | - |
| Slow decrease and increase of the supply voltage test | Only if ICs and/or transistors are used |
| Start pulses test | - |
| Reset behavior test | Only if ICs and/or transistors are used |
| Short interruptions test | - |
| Pin interruption test | - |
| Connector interruption test | - |
| Polarity reversal test | - |

### 2.1.15.4 Tests according to MBN 10384 – Automotive Plug Connectors (4084973)

4084974 Only the following tests from MBN 10384 shall be carried out.

4622560

| Test | | Additional description |
|---|---|---|
| PG 0 | Incoming test | Without E0.3 |
| PG 1 | Dimensions | - |

| | | |
|---|---|---|
| PG 2 | Material and surface analysis, contacts | - |
| PG 3 | Material and surface analysis, housings and single-wire seal | - |
| PG 7 | Handling and functional reliability of the housings | Without E7.3 |
| PG 12 | Current heating, derating | - |

13717482 The tests can be omitted in the case of Client-approved standard plugs (housing + pins).

### 2.1.15.5 Tests according to MBN 50306 – Electric and Electronic Components in Motor Vehicles – Environmental Requirements and Tests (4057016)

4293536 *Only the following tests from MBN 50306 shall be carried out.*

4062260

| Test | | Additional description | Installation situation |
|---|---|---|---|
| M-03 | Dust test | - | Environmental test frame |
| M-04 | Vibration Test | Profile D | Environmental test frame |
| M-05 | Mechanical shock | Peak acceleration: 300 $m/s^2$ | Environmental test frame |
| M-06 | Mechanical shock endurance | Shock axis for components in the tailgate: XShock axis for components in trunk lid: Z | Environmental test frame |
| K-01 | High/low temperature storage | - | - |
| K-02 | Temperature step test | - | Environmental test frame |
| K-03 | Low temperature operation | - | Environmental test frame |
| K-05 | Thermal shock (component) | - | Environmental test frame |
| K-06 | Salt spray test, operating, exterior | to be carried out in the case of lamps without opening to the vehicle interior | Environmental test frame |

| | | | |
|---|---|---|---|
| K-07 | Salt spray test, operating, interior | To be carried out with lamps open to the vehicle interior | Environmental frame without rear seal |
| K-09 | Damp heat, cyclic (with frost) | In addition, a test run (including upstream K-01) shall be performed outside the sequence test | Environmental test frame |
| K-10 | Water Protection – IPX0 to IPX6K | To be carried out with enclosed lamps | Environmental test frame |
| K-14 | Damp heat, steady state | Installation location outside the passenger compartment: for closed lamps<br>Installation location in the passenger compartment: for lamps open to the vehicle interior | Brackets |
| K-16 | Thermal Shock (without Housing) | - | PCBs with wiring harness |
| K-18 | Corrosion test with flow of mixed gas | - | Brackets |
| L-02 | High-temperature endurance test | - | Brackets |
| L-03 | Temperature cycle endurance test | - | Brackets |

6349826 The sequence shall be carried out with the tests required in this chapter as per MBN 50306. It is not permissible to remove the component between the tests. A leak test is only required at the beginning and end of the entire sequence.

### 2.1.15.5.1 Deviating Test Scopes (4057022)

#### 2.1.15.5.1.1 High-Pressure Cleaning Test (4057023)

4293542 The test replaces the “K-11 High-Pressure/Steam-Jet Cleaning” test and shall be carried out in accordance with the test sequence plan of MBN 50306.

4058614 *Purpose:*

4058615 *The test simulates the exposure of the component to water during vehicle cleaning. It is used to validate the component leaktightness, as well as the seal to adjacent component parts during high-pressure/steam jet cleaning.*

4058616 *Test:*

4058618 The test shall be performed on the environmental test frame. In addition to the nominal joint, a maximum joint (acc. to [Anfragezeichnung]) shall also be validated using a correspondingly modified DUT.

4058620 For the test, the nozzle shall be at a distance of 20 cm to the component parts (for better reproducibility, a spacer gage shall be used on the spray lance)

4058621 The DuT shall be exposed to water all around with a high-pressure lance with flat-spray nozzle positioned transverse to the gap (between tail lamp and bodyshell); this exposure shall be carried out as vertically as possible to the surface normal of the aimed-at lamp surface. In doing so, the gap shall be moved over with the center of the flat spray. A uniform movement of 20 cm +5 cm in 10 seconds shall be maintained. The test duration for a complete cycle shall be documented.

4058622 The DuT shall be exposed to water all around with a high-pressure lance with flat-spray nozzle positioned longitudinally to the gap (between tail lamp and bodyshell); this exposure shall be carried out as vertically as possible to the surface normal of the aimed-at lamp surface. A uniform movement of 20 cm +5 cm in 10 seconds shall be maintained. The test duration for a complete cycle shall be documented.

4058623 A total of three transverse passes each, then three longitudinal passes each shall be performed in succession.

4064655

| | |
|---|---|
| Operating mode | Off-Grid Parking$_{min}$ |
| Fuel quantity delivered | 1200 l/h |
| Water pressure | 100 bar (measured at nozzle outlet) |
| Air temperature in the lamp | Water temperature + min. 20 °C |

4058625 *Requirement:*

4058627 Water ingress between the bodyshell and seal or lamp and seal is not permitted. The verification is realized via a visual inspection.

4058628 Water ingress into the lamp is not permitted. The verification is realized via a visual inspection.

## 2.1.15.6 Additional Test Scopes (4057025)

### 2.1.15.6.1 Mechanical Vibration Test (5685471)

5685477 *The test shall be performed in accordance with MBN10438 “Mechanical Vibration Requirements (Broadband Noise) for Detachable Body Parts on Passenger Cars”.*

5685475 *Purpose:*

5685476 *The test simulates the vibration stress of the component during vehicle operation.*

5685478 *Test:*

5685474 The test shall be performed on the environmental test rig.
The following test spectra apply:
- PSD_horizontal_longitudinal_X
- PSD_horizontal_transverse_Y
- PSD_vertical_Z

A test duration of 16 h/axle applies.
In deviation from MBN10438, the temperature distribution profile defined for the component in MBN 50306 shall apply.

5685479 *Requirement:*

5685480 The DuT shall be fully operable before and after the test. Verification is carried out by means of a leak test and visual inspection, as well as a physical analysis.

### 2.1.15.6.2 Push Test (4057032)

4065948 *Purpose:*

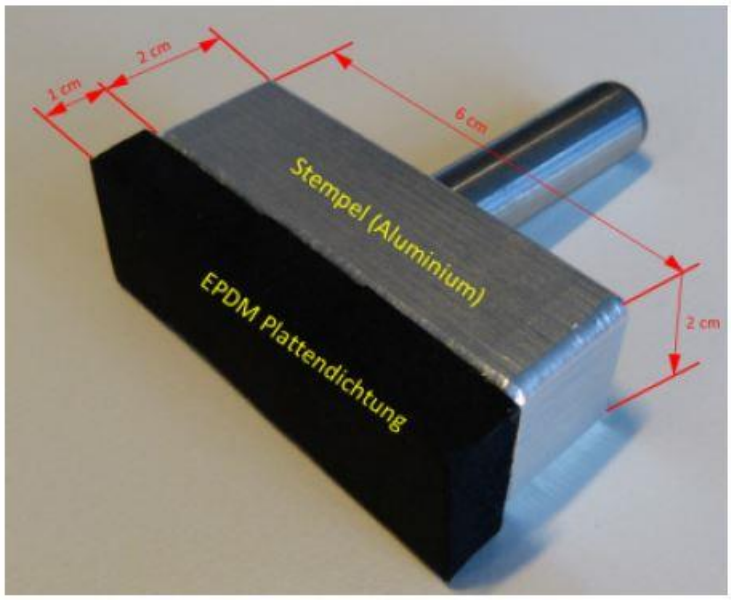
4065951 *The test is intended to ensure the resistance of the lens and weld seam to possible damage.*

4065952 *Test:*

4065953 Two complete sets of lamps per variant shall be tested in each case in the environmental frame. The test specimen presses on the lens with continuously increasing force until the required maximum is reached.

4231420 An indenter with the dimensions 6 cm × 2 cm × 2 cm (W × H × D) shall be used as the test specimen. A closed-cell EPDM plate seal with a Shore A hardness of 50 and the dimensions 6 cm × 2 cm × 1 cm shall be used on this.

4139543




4066251 *Requirement:*

4066311 Upon first application of a test force of <400 N, there shall not be any breaking of the lens or the welding rib or any other damage. This applies to application of force at any point on the scattering lens. Verification shall be provided via a visible inspection and a leak test

12454491 Any noise developing during the test shall be agreed with the Cient's contact person and requires further appropriate analysis.

### 2.1.15.6.3 Electrostatic Discharge – Handling Additional Test (ESDH/Z Test) (4057033)

4076456 *Purpose:*

4076457 *The test is intended to ensure the interference immunity of the component to electrostatic discharges during handling in accordance with ISO 10605.*

4076458 *Test:*

4076459 The test setup is described in ISO 10605:2008-07, Section 9. The DuT is to be placed directly on the HCP. A conductible mat shall not be used. The ground pin is to be electrically connected over the shortest route to the HPC.

4076460 The DuT shall be tested at all discharge points and at all test voltages with positive and negative polarity using the number of discharges specified in each case. The discharge points shall be documented accordingly.

4076461 Discharge type: Reflector discharge point (secured, e.g. by opening the lens).

4076462 Contact discharge: 5 discharges ±8 kV.

4076463 Discharge network: (ESDH/Z test): 150 pF/330 Ω.

4076464 *Requirement:*

4076465 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. The verification is realized via a P-02 parameter test (small)

### 2.1.15.6.4 Test for Sunk Spots (4057035)

4069375 *Purpose:*

4069465 *The test is to ensure the resistance of the component to high temperatures.*

4069489 *Test:*

4069509 The DuT shall be stored for 1 h following complete temperature adaptation, at a relative humidity of 15–25 %, in the bracket at the corresponding storage temperature.

4069526 Storage temperature of tail lamp, outboard additional lamp, license plate lamp, molding: T=102°C

4069571 *Requirement:*

4069577 The DuT shall not exhibit any visual changes during and after the test. The verification is realized via a visual inspection.

### 2.1.15.6.5 Ethanol Test (4057036)

4070048 *Purpose:*

4070073 *The test is to validate the resistance of the component to the ethanol/water mixture*

4070086 *Test:*

4070097 Tests 1 and 2 shall each be performed on separate DuTs.

4070108 *The test may be performed on a fully assembled signal lamp without electronics.*

4070161 Test 1
The DuT shall be immersed for 15 min, lying horizontally with the lens facing downwards in an ethanol-water mixture (ratio 90:10). Afterwards, the DuT is dried off in stationary air for 30 minutes (horizontally positioned, lens facing upwards).

4070449 Test 2
While installed in the environmental test frame, the DuT shall be completely wetted at least 3 times by spraying it with an ethanol-water mixture (ratio 90:10). After each wetting, wait until the ethanol/water mixture has fully dried. The DuT shall then be dried for 30 min in still air.

4070464 *Requirement:*

4070490 After 24 h, no crack formation and/or leaks may occur. Discolorations and dulling are permitted. The verification is realized via a visual inspection, as well as a leak test

### 2.1.15.6.6 Condensed Water Test for Metalized Components (4057037)

4072684 *Purpose:*

4072688 *The test is intended to ensure the resistance of metalized elements of the component to condensed water.*

4072686 *Test:*

4072687 The test is performed based on DIN EN ISO 6270 on a signal lamp without cover plate (i.e. with exposed, vapor-deposited or sputtered interior parts).

4072689 *The test can alternatively be carried out on the single part.*

4072690 The DuT shall be stored for 48 h at 40 °C and 98% relative humidity. The position shall be selected so that the largest possible vapor-deposited/sputtered surface to be tested is accordingly exposed to condensed water.

4072693 *Requirement:*

4072694 The DuT shall not exhibit any visual changes during and after the test. The verification is realized via a visual inspection.

### 2.1.15.6.7 Temperature Load Test (11085421)

11085424 *Purpose:*

11085426 The test is to ensure the function of the component to high temperatures.

11085428 *Test:*

11085494 The test shall be performed in the holder. The Contractor shall, in coordination with the Client, install temperature measuring points at thermally critical points.

11085429 The DUT shall be operated for 2 h following attainment of complete temperature equilibrium (as per MBN 50306) below 45 °C in accordance with the following switching cycle.

11085647 *Requirement:*

11085648 The DuT shall not exhibit any visual changes during and after the test. Verification is realized via a visual inspection and a physical analysis. All component parts used must not exceed their permissible maximum temperatures. Verification is realized via measurement protocols of the corresponding temperature measuring points.

## 2.1.16 Sample Deadlines and Delivery Dates (MGU-rm3-2785790)

MGU-rm3-2785788 The corresponding deadlines shall be taken from the MDS plan/PMP for suppliers and the provided “Overview of Product Maturity Level Stages of Component”.

### 2.1.16.1 Digital Warm Sample (MGU-rm3-2832920)

MGU-rm3-2832941 The supplier shall create renderings of the lamp over the course of the development process in order to validate the engineering design and lighting systems.

MGU-rm3_3961700 The digital warm samples are a central tool for the series production development of lamps. The expenditure for deriving the digital warm samples from the respective design status, as well as the design of the light functions for this purpose, shall be taken into account in the series production development costs and be reported separately.

MGU-rm3_3961397 What is known as a digital warm sample shall be created once on the basis of the DE-Freeze ABEL data and another time on the basis of the VDMF ABEL data.

MGU-rm3_3961697 The respective first provision of the digital warm sample shall take place 6 weeks after DE-Freeze ABEL and 4 weeks after VDMF ABEL.
In addition, the Contractor shall take into account a two-time revision of the digital warm samples. Their provision deadlines are 10 weeks or 12 weeks (second revision loop) after DE-Freeze ABEL and 6 weeks or 10 weeks (second revision loop) after VDMF ABEL, but no later than 2 weeks after Concept Review 2 (second revision loop).

MGU-rm3-2785811 The warm samples are used for the evaluation and approval of the engineering design/design for standard production of all the component parts visible when the component is viewed in the illuminated (warm) and non-illuminated (cold) status. In the digital warm samples, the Contractor shall implement the full scope of the engineering design/design for standard production for all directly and indirectly (due to reflections or joints) visible component parts.

MGU-rm3-2832933 The supplier shall ensure that the results of the digital warm sample are available in a quality that facilitates an evaluation of the light functions.

MGU-rm3-2832939 The supplier shall disclose the expected weak points of the lamp (e.g. non-homogeneous illumination, undesired reflections, mirrorings, etc.) by means of the digital warm sample.

MGU-rm3-2832927 *The rendering requirements are defined in the following.*

#### 2.1.16.1.1 Software (MGU-rm3-2832945)

MGU-rm3-2832951 The software used by the supplier for the technical renderings shall comply with the CIE 171:2006 standard.

MGU-rm3-2832929 The software used shall calculate all active light functions in accordance with the Monte Carlo algorithm.

MGU-rm3-2832911 Ray tracing is the only calculation method permitted for global illumination. Ambient occlusion, photon mapping, and other physically incorrect methods shall not be used.

MGU-rm3-2832928 The Contractor shall communicate the rendering software used to Client.

MGU-rm3-2832944 The Contractor shall disclose the rendering calculation method to the Client (tracing process used, algorithm, applied approximations, simulation parameters used)

### 2.1.16.1.2 CAD Data (MGU-rm3-2832910)

MGU-rm3-2832936 For warm sample renderings, the Contractor shall use the data status that is envisaged for the tool release.

MGU-rm3-2832934 The CAD data record used shall be provided to the Client including a complete description of all effective photometric materials used and their surfaces.

MGU-rm3-2832930 The Client will indicate in good time before the start of the preparation for rendering whether the left or right side of the lamp unit/tail lamp shall be rendered.

MGU-rm3-2832915 Wiring harnesses, plug pins, and the fastening concept do not need to be rendered if they are not located in the field of vision of the installed lamp and no photometric effects are expected.

MGU-rm3-2832908 The supplier shall also render the direct environment of the lamp unit/tail lamp (spline data curve, chrome trims etc.).

### 2.1.16.1.3 Material Documentation and Material Definition (MGU-rm3-2832917)

MGU-rm3-2832953 All parts of the object to be rendered shall be documented with the optical properties of the materials actually used.

MGU-rm3-2832914 Material properties may only be determined via the direct conversion of a measurement into the format of the software used. If the software used does not offer this option, it shall be ensured that the material properties are defined via the accurate simulation of measured optical properties. The responsibility for the material properties used rests with the supplier.

MGU-rm3-2832954 During the definition of optical material properties, all laws relating to geometrical beam optics shall be taken into account.

MGU-rm3-2832916 Surface roughnesses shall be defined in accordance with the VDI standard or via the goniometrically measured scattering properties of a material.

MGU-rm3-2832913 Photometrically effective surfaces, e.g. of reflectors, shall also be simulated with the roughness expected from the tool in addition to simulations regarding their reflectance.

### 2.1.16.1.4 Light Sources (MGU-rm3-2832921)

MGU-rm3-2832952 Three of the *.HDR files specified by the Client shall be used as the ambient illumination. These are provided and defined by the Client at the start of the simulation activities.

MGU-rm3-2832906 It shall as a result be possible to subsequently change the luminance of the ambient illumination.

MGU-rm3-2832947 All active light functions of the lamp unit/tail lamp shall be simulated.

MGU-rm3-2832937 All light sources shall either be simulated with ray files of the corresponding light source type or the light sources shall be calculated as surface sources that simulate the emission characteristics of the illuminant described in the data sheet. In all cases, the spectrum provided by the light source manufacturer shall be used.

MGU-rm3-2832949 All light sources shall be simulated with a light flux of 1 lumen. If the rendering software used does not permit a subsequent change/scaling of the light flux in the result, the light flux values for the rendering shall be selected by the supplier so that the light function in the result display is not wiped out. It shall nevertheless be set brightly enough to detect, where applicable, reflections etc. The Client reserves the right in this case to request that the rendering be performed again with adjusted light fluxes.

### 2.1.16.1.5 Sensors (MGU-rm3-2832946)

MGU-rm3-2832938 Each sensor shall render an image with a pixel resolution of 3840×2160 pixels.

MGU-rm3-2832932 The distance between the sensors and the object to be rendered shall be selected so that the resulting image can be shown in full screen mode with a scale of 1:1 with the real geometric object size on a 65″ monitor with a resolution of 3840×2160 pixels.

MGU-rm3-2832924 The sensors shall be positioned at the angles shown in Figure 1 for a left lamp unit/tail lamp. For a right light unit/tail light, the angles shall be mirrored accordingly on the vertical axis.
The Contractor shall simulate additional angles to the positions shown in Fig. 1 if it expects weak points of the lamp at other angles.

MGU-rm3-2832931

| Abbildung 1 | 90L | 45L | 20L | H0 | 20R |
|---|---|---|---|---|---|
| 25U | | | | X | |
| 15U | | X | | | X |
| V0 | | | | X | |

MGU-rm3-2832907 Every sensor shall have a resolution of ≤0.041 p/mm

MGU-rm3-2832948 The integration angle of the sensors shall be ≤ 3°

### 2.1.16.1.6 Simulation Parameters (MGU-rm3-2832925)

MGU-rm3-2832918 The simulation duration (number of beams used etc.) shall be selected by the supplier so that no improvement in the result is discernible with a longer simulation duration.

MGU-rm3-2832905 The number of beam interactions shall be selected so that a max. beam stop rate of 1% occurs for all lighting systems of the lamp unit/tail lamp

MGU-rm3-2832942 The meshing of the objects shall be selected to be so small that no artifacts are recognizable in the resulting image.

### 2.1.16.1.7 Results (MGU-rm3-2832923)

MGU-rm3-2832909 The supplier shall deliver the results in an uncompressed image format such as *.TIFF or as an uncompressed *.jpeg or *.png.

MGU-rm3-2832904 An image output with HDR shall correspond to the format HDR10 or HDR10+.

MGU-rm3-2832926 The Client reserves the right to request the rendering results in the native file format of the rendering software used.

MGU-rm3-2832950 From each rendered sensor, an image with all calculated ambient illuminations shall be delivered. An image per active light function shall also be delivered for each sensor.

MGU-rm3-2832940 A result for each individually activated light function shall be delivered from every perspective.

MGU-rm3-2832935 The shown light flux of the active light functions in the resulting images shall be jointly determined with the Client.

MGU-rm3-2832943 Active light functions shall be shown with a glare effect in accordance with VOS 1984. The intensity of this effect shall be coordinated with the Client.

MGU-rm3-2832919 The resulting images shall be created with a human vision simulation. The simulated adaptation luminous density of the human eye shall not be dynamically calculated. The adaptation parameters shall be jointly determined with the Client.

## 2.1.16.2 Specific Hardware, Exterior Lighting Development Samples (MGU-rm3-2785789)

MGU-rm3-2785791 *The sample statuses described in the following are envisaged in the development process of the exterior lighting components. These samples are created by the Contractor and will be separately ordered by the Client.*

MGU-rm3-2785818 The Contractor shall take into account the development activities for the derivation of samples from the series-production design, as well as the coordination activities for the sample development, creation, and presentation in the supplier development costs of the component, and report this separately.

MGU-rm3-2785795 The development samples for the exterior lighting are used to validate and confirm the envisaged concepts or the design for standard production, as well as the function development. The samples shall facilitate an evaluation and confirmation of the subsequent execution in the series-production parts for the illuminated (warm) and non-illuminated (cold) status or for the light distribution and the light functions.

### 2.1.16.2.1 Partial Range Samples (MGU-rm3_3924482)

MGU-rm3_3961692 Partial range samples are created based on an interim status of the component design data to be determined. The Contractor shall prepare the data from a functional aspect for photometric design and sample creation.

MGU-rm3_3961693 The delivery of the partial range sample(s) shall take place 2 weeks before DE-Freeze ABEL.

MGU-rm3-2785797 In the sub-area sample, the light functions that are visible when looking at the component shall be implemented for the illuminated state (warm state). Visible light functions can be: Signaling lights, floor lighting, illuminated lettering, module light stagings, lenses and lens expansions for the exterior lighting functions, illuminated trim lines, or similar.

### 2.1.16.2.2 Warm Samples for DE-Freeze ABEL (MGU-rm3_3924539)

MGU-rm3-2785799 The Contractor shall create the “warm sample for DE-Freeze ABEL” based on the approved design freeze ABEL data.

MGU-rm3-2785801 The “warm samples for DE-Freeze ABEL” are used to evaluate the series-production design of all the component parts visible when the component is viewed in the illuminated (warm) and non-illuminated (cold) state. In the “warm sample for DE-Freeze ABEL”, the Contractor shall implement the full scope of the series-production design for all directly and indirectly (due to reflections or joints) visible component parts in a high-quality sample version.

MGU-rm3-2785807 *The “warm samples for DE-Freeze ABEL” are used to assess the component with regard to undesired reflex reflections, hot spots, inhomogeneities, diffused light, visibility through joints and gaps, and reflections in the warm and cold state.*

MGU-rm3_3961694 *Delivery of the “warm sample(s) for DE-Freeze ABEL” shall take place at the latest 12 weeks after DE-Freeze ABEL.*

MGU-rm3-2785805 The Contractor shall produce the findings gained by means of the “warm sample for DE-Freeze ABEL” in the further course of the series-production design.

## 2.1.17 Tool Concept and Controlling (MGU-rm3-2785822)

MGU-rm3-2785821 The Contractor shall agree upon the tool concepts with the Client in good time before the planning specification.

MGU-rm3-2785819 The Contractor shall specify the tool supplier, as well as the tool creation and tracking (tool controlling), in coordination with the Client.

MGU-rm3-2785820 Tooling concepts and the region of origin of the tools will be agreed on, evaluated, and finally negotiated by the blank release between the Client's Tool Cost Planning and the supplier.

| | |
|---|---|
| MGU-rm3-2785826 | The Contractor shall maintain corresponding schedules for all tools and submit these to the Client at regular intervals and/or in the case of changes. |
| MGU-rm3-2785824 | Tools shall be designed in such a way that changes are possible at low cost. Examples: Layout of fastening points, introduction of radii, additional ribbing or stiffening measures, corrugation, etc. |
| MGU-rm3-2785827 | The tooling shall be designed for maximum consistency during series production!<br>The tooling concepts shall be agreed on by the blank release with the Client's Tool Cost Planning. |
| MGU-rm3-2785823 | All functional surfaces shall be rounded relative to each other using radii (prevention of notch effect).<br>Functional surfaces include all surfaces of the housing to the exclusion of the design surfaces. |
| MGU-rm3-2785825 | Possible deforming differences between the housing and installation parts shall be taken into account during the tool design (e.g. screw-on domes and sealing ribs). |
| MGU-rm3-2785832 | Different legal certification markings shall be provided (in tools and machinery and equipment) for ECE, SAE, CCC and shall be an integral part of the basic offer (laser system and/or exchangeable insert in the tool). |
| MGU-rm3-2785829 | Unless otherwise specified (e.g. in [Anfragezeichnung], data control model, or in the light sample acceptance), the surface structures shall only be incorporated in the tools after the joint appraisal of the parts by the Contractor and Client after the “first off-standard-tool parts” milestone. Photometrically effective surface structures are exempt; to ensure the light values, these shall already be incorporated in first off-standard-tool parts. |
| MGU-rm3-2785828 | As the grained areas have not yet been finally specified at the time of the contract award, the Contractor shall provide in the technical and commercial tender a possible grain with a minimum grain depth in accordance with [MBN 31030] Decor 000 179 for all visible surfaces on the finished vehicle. |
| MGU-rm3-2785831 | The Contractor shall ensure that self-adhesive component parts on the tail lamp are not bonded over component part/tool divisions. |
| MGU-rm3-2785833 | Housings with mounts, bolt domes, functional ribs, etc. shall, if necessary, only be shown in schematic diagram form and possibly not in the demolding direction. The Contractor shall provide mold-specific functions and/or gate valves and report these as an integral part of the basic offer. |
| MGU-rm3-2785837 | The main molds for the lighting system (housing, reflector, lens), as well as associated secondary molds, shall be provided with a shot counter during creation before use in production (e.g. Hasco, Strack, Männer). |

14310695 The following points must be observed when designing the tools. For design components and components of lighting technology that influence the reproduction and distribution of lighting functions, family tools are not permitted at the time of bid submission (this refers exclusively to FAMILY tools—not multi-cavity tools). If, during the development process after contract award and up to the Blank Release milestone, there is potential for the implementation of family tools, since geometric, process-related, and manufacturing-related conditions allow this without any impact on quality, these tool layouts must be presented at the KR1/2/Blank Release milestones. Any implementation under the aforementioned conditions shall take place following mutual agreement.

14310696 Meaningful family tool concepts that have been verified for technical feasibility must be presented during the RFQ phase by means of a conceptual tool layout including the gating system and may be approved following consultation and review with the Client.

### 2.1.18 General Requirements Pertaining to Injection-Molded Plastic Parts and Their Value Appeal (MGU-rm3-2785834)

MGU-rm3-2785835 The Contractor shall design and produce all visible component parts of the lamp so that no value appeal-reducing characteristics are visible in the installed status.

MGU-rm3-2785836 Value appeal-reducing characteristics include: Engagements, attachments, bolt domes, adhesive or welding beads, mounting brackets, imprecise template edges in the case of partial vapor depositions, flow hooks, flow lines, gate marks, slide mold lines, sloppy surface transitions, scratches, and marks. The list is not exhaustive. The Contractor shall, for this purpose, also take into account its own aspirations regarding the high quality of its products.

MGU-rm3-2785838 For all visible plastic parts, the Contractor shall perform mold flow tests and agree on the resulting position of weld lines, flow lines, or similar with the Client. In this connection, the Contractor shall, as a rule, take into account that an alternative design needs to be found for the injection-molded part if approval is not granted.

MGU-rm3-2785842 Over the course of development, the Contractor shall disclose all value appeal-reducing characteristics that arise in its opinion due to the visible component part design specified by the Client and cannot be prevented; however, at the latest in Concept Review 2 and have these confirmed by the Client. The Contractor shall document these characteristics in the release drawing.

MGU-rm3-2785841 The qualitative evaluation of the visible component parts of the component shall be performed in accordance with [MBN 10503].

MGU-rm3-2785839 If fluctuations arise due to the production process that can result in value appeal-reducing characteristics, the Contractor shall agree for this purpose with the Client on the permissible process window based on reference samples.

MGU-rm3-2785840 Production processes that result due to process fluctuations in increased rejects due to decorative defects may only be used by the Contractor with the approval of the Client. For the approval of such a process, the Contractor shall also initiate the specification of reference samples and subsequently provide the required proofs for the production of the required unit figures within the specified process window.

MGU-rm3-2785847 If visible surfaces are only partially metalized, the template technology shall be designed so that a precise separation between the metalized and non-metalized areas is realized. The step or groove required for this purpose shall be designed to be ≤ 1.0 mm. The Contractor shall present the planned implementation to the Client at the latest by Concept Review 2. The Contractor shall, as a rule, initiate the specification of reference samples for all partial metalizations.

MGU-rm3-2785844 The metalization or partial metalization of transparent parts shall be designed so that no emerging light can be perceived through the metalized surface. The Contractor shall present all the geometric or process-related measures required for this purpose to the Client at the latest by Concept Review 2.

MGU-rm3-2785843 The Contractor shall provide trim lines or “clio lines” in the lenses and these shall be part of the basic offer.

MGU-rm3-2785846 The Contractor shall provide design optics, microstructures, laser structures (trim lines can also be set against the demolding direction) for “glass bodies”/thick-wall optics/intermediate lenses. These shall be an integral part of the basic offer.

MGU-rm3-2785852 *“Glass bodies”/thick-wall optics/intermediate lenses shall be shown in schematic diagram form in the RFQ documents.*

MGU-rm3-2785848 Separation lines due to exchangeable inserts in areas visible from the outside shall be designed so that they are no longer visible in the finished vehicle at a distance of >1 m.

MGU-rm3-2785851 The course of the separation line shall be agreed on with the person responsible at the Client in the development phase by Concept Review 2 and documented.

MGU-rm3-2785849 All visible component part edges, delimitations, trimming edges, surface runouts and transitions shall be designed to be precise and burr-free. Trimming edges shall not be located in visible areas.

MGU-rm3-2785850 All visible areas shall be incorporated into the tool in a categorized manner (technical polish, gloss polish, high-gloss polish).
The Client will define visible areas that deviate from these (e.g. due to grains for decorative purposes) in the interior design surface specification.

MGU-rm3-2785855 The component shall be designed so that no ingress of splash water or operating fluids is possible.

MGU-rm3-2785854 All external component parts of the component shall be designed so that fluids (e.g. splash water) can drain out in the installed position. For this purpose, the Contractor shall take into account drain holes or corresponding geometric solutions.

MGU-rm3-2785853 Mold-flow analyses shall also be applied for weight optimization by reducing the wall thickness in addition to the validation of the production feasibility. These are to be presented to the Client as part of Concept Review 2.

MGU-rm3-2785857 All tools for design-relevant component parts, as well as photometric-relevant component parts, are subject to the retention of title of the Client. The creation is processed via the TTS process. Accordingly required tools shall be individually examined and taken into account per derivative.

## 2.1.19 Requirements Within the Context of Offer Creation, Contract Award, and Change Management (MGU-rm3-2785856)

MGU-rm3-2785858 As the basis for offer creation, the Contractor shall take into account the supplementary technical documents provided by the Client that describe the components.

MGU-rm3-2785859 The supplementary technical documents provided for order creation are:

MGU-rm3-2785862 - BOMs on single part and/or assembly level for all component variants

MGU-rm3-2785860 - 3D data with illustrations of the design of the component and, if applicable, relevant installation space restrictions

MGU-rm3-2785861 *The provided 3D data shows a design state that is still in the technical validation phase (model confirmation) and can therefore be considered only as orientation in the context of determining component part sizes.*

MGU-rm3-2785867 - 2D drawings

MGU-rm3-2785863 - Descriptions of surfaces of visible component parts

MGU-rm3-2785865 - Deviating descriptions in the event of parameterized contract award of multiple projects based on a single component requirement specification document and/or a single BOM

MGU-rm3-3005018 The provided representations (2D or 3D) of the design parts usually do not yet contain the wall thicknesses and also no geometries for the attachment of the component parts. The Contractor shall take into account the required geometries for the implementation of a subsequent attachment in the offer creation.

MGU-rm3-2785864 If not all the component description information for offer creation is available from the Contractor's perspective, the Contractor shall request this information in written and aggregated form from the Client. Questions shall be submitted one week before the first offer meeting. Any arising questions shall be subsequently submitted, also in aggregated form, at the latest one week after the offer presentation.

MGU-rm3-2785866 The Contractor shall indicate the quantity, manufacturer and type of envisaged LEDs in the offer and/or the PBDs.

MGU-rm3-2785868 The designations specified by the Client in the RFQ BOM shall be used in the PBDs, offer presentations, and other documents.

MGU-rm3-2833076 The Contractor shall indicate all changes to the component in comparison to the status shown in the PBD to the Client before the change is implemented and agree on this with the Client. This also applies for assemblies and parts of the component for which it has design responsibility.

MGU-rm3-2785869 The Contractor shall, upon request, provide the Client with photometric simulation data for the technical system and concept evaluation

## 2.1.20 Requirements for the System (-SB-44)

### 2.1.20.1 Functional Safety (-SB-993)

#### 2.1.20.1.1 Functions of the system considered as part of the Hazard and Risk Analysis (-SB-994)

-SB-995 *The customer-experienced functions from Chapter 2.5 were assessed as part of the Hazard and Risk Analysis as per [ ISO 26262 ]:*

-SB-1023 *All other functions of the system have been classified as not safety-relevant or QM in the Hazard & Risk Analysis.*

#### 2.1.20.1.2 Safety Goals from the Hazard Analysis and Risk Assessment (-SB-997)

-SB-1024 *The following safety goals have been taken from the Exterior Lighting Hazard Analysis and Risk Assessment (HARA).*

-SB-998 HARA-ID: [SZ_1-1] Prevent insufficient road illumination.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-5639 While driving in the dark, a previously active Low Beam must not fail for longer than 1 s. Failure is:

- Insufficient light output on both sides or
- on both sides, lighting range below 20 m or
- Insufficient light output on one side and lighting range below 20 m on the other side.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-305 Safe State: Low Beam at least on one side with sufficient light output and lighting range >= 20 m.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-3085 HARA-ID: [SZ_2-2] Prevent vehicle operation with front lighting defective on one side

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-5653 Vehicle operation (several driving cycles) in the dark with failure (complete) of a headlamp must be prevented.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-3712 Safe State: During vehicle operation: Active lighting on both sides with min. positioning light brightness

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-5958 HARA-ID: [SZ_3-1] Prevent complete loss of Brake Light.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-1566 Deceleration (Braking) must be indicated correctly and timely for following traffic.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-3141 Safe State:
(1) Brake Light is actuated when the vehicle decelerates; Not actuated if the vehicle doesn't decelerate.
(2) If the state (1) cannot be reached: Brake Light activated. Additionally: Fault display.

Note: A permanently activated Brake Light requires an additional reaction from the following traffic, as the actual deceleration is no longer signaled, but only that there is a problem with the Brake Light. Achieving state (1) should be prioritized.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-5102 HARA-ID: [SZ_3-2] Prevent complete loss of Brake Light.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-477 Deceleration (Braking) must be indicated correctly and timely for following traffic.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-2073 Safe State:
(1) Brake Light is actuated when the vehicle decelerates; Not actuated if the vehicle doesn't decelerate.
(2) If the state (1) cannot be reached: Brake Light activated. Additionally: Fault display.

Note: A permanently activated Brake Light requires an additional reaction from the following traffic, as the actual deceleration is no longer signaled, but only that there is a problem with the Brake Light. Achieving state (1) should be prioritized.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-3309 HARA-ID: [SZ_4-1] Prevent loss of Direction Indicator Lamp

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-22707 Failure of the direction indicator lamp function must be avoided or a failure must be indicated to the driver

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-2982 Safe State: failure of the directional indicator lamp must be indicated to the driver with double flashing frequency.

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-4199 HARA-ID: [SZ_4-2] Prevent unintended direction indicator lamp activation (front)

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-3042 Unintended activation of one or more directional indicator lamp for longer than one direction indicator lamp cycle must be prevented.

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-3571 Safe State: No direction indicator lamp, direction indicator deactivated or activated on both sides.

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-1808 HARA-ID: [SZ_4-3] Prevent activation of direction indicator lamp on the wrong side

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-3575 Direction indicator lamp activation on the wrong side, for longer than one direction indicator cycle, must be prevented.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-3322 Safe State: No direction indicator lamp, direction indicator deactivated or activated on both sides.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-3330 HARA-ID: [SZ_4-4] Prevent activation of direction indicator lamp on the wrong side

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-16 Direction indicator lamp activation on the wrong side, for longer than one direction indicator cycle, must be prevented.

| Attribute name | Value |
|---|---|
| ASIL | QM |

-PV_ELC-453 Safe State: No direction indicator lamp, direction indicator deactivated or activated on both sides.

| Attribute name | Value |
|---|---|
| ASIL | QM |

### 2.1.20.1.3 Safety Requirements (-SB-999)

-SB-1001 *The respective safety requirements (incl. requirements for communication monitoring) from the functional safety concept of the exterior lighting are defined in the respective sections for the components and systems involved.*

-PV_ELC-5800 *The relationship between safety goals and safety requirements is documented by corresponding information in the chapters on the systems and components involved. A chapter entitled "Functional Safety Requirements and Process Requirements" with a sub-chapter "Overview/Reference to Safety Goals" is available for each system and each component that has been placed on the safety requirements.*

-SB-1100 All safety-relevant signals must be validated according to the following specifications:

-SB-1101 - Specification of SW-C end-to-end communication protection library [AUTOSAR_SWS_E2ELibrary]

-SB-1102 - End-to-end communication protection [QEV111AES5MSS]

## 2.1.21 Requirements pertaining to Involved Components (-SB-910)

### 2.1.21.1 MB.OS 2.0 Components (-PV_ELC-26726)

#### 2.1.21.1.1 Component Rear Lamp left / right (-PV_ELC-29847)

##### 2.1.21.1.1.1 ITC (Integrated Taillight Control) (-PV_ELC-29971)

###### 2.1.21.1.1.1.1 ITC description (-PV_ELC-29972)

-PV_ELC-29973 *ITC (Integrated Taillight Control) describes the type of controlling the rear lamps via a physical CAN interface with UART or CAN communication protocol. The control is carried out from a commander control unit.*
*A total of 3 CAN interfaces (ITC-CAN Left, ITC-CAN Middle and ITC-CAN Right) are available in the vehicle for controlling all rear lamp parts.*

-PV_ELC-29974 *0XOac1b9001195fa17f48e532cf10P353cf47b1960ed482502f7187.pdf WrapperResource*

###### 2.1.21.1.1.1.2 Validation of bus physics of ITC CAN (-PV_ELC-29994)

-PV_ELC-29988 A signal integrity analysis (simulation) of the network physics with the selected LED driver and the data provided by the Client regarding the vehicle harness and CAN transceiver in the Commander control unit has to be performed.

-PV_ELC-30009 The simulation must take into account the communication from the Commander ECU to each LED driver and the communication from the LED drivers to the Commander ECU.

-PV_ELC-30008 The simulation shall be carried out at the baud rate determined after the bus load calculation.

-PV_ELC-30010 As a result, the following data must be presented:
- Examination of the feasibility of the network design
- Determination of sampling times.
- The Network Margin/Safety Margin for the selected settings and scheduling for the sending of the nodes and the commander.
- The longest delay of the respective transmitter must be sufficiently smaller than the network margin for that transmitter.
- Data settle time incl. ringing and signal symmetry between nodes

-PV_ELC-29998 To determine the scheduling, the simulation must be carried out with various options of termination.

-PV_ELC-29978 The termination of each CAN network is determined by a joint determination by the Contractor and the Client.

-PV_ELC-29979 The simulation results must be made available to the Client.

-PV_ELC-29999 The results of the simulation must be handed over with the offer presentation.
In the event of changes to the electronics within the tail lamp (PCB, driver, int. cabling), the simulation must be carried out again.

#### 2.1.21.1.1.1.3 Requirements for the communication interface (-PV_ELC-29996)

-PV_ELC-29976 The LED drivers must have a physical CAN/CAN-FD interface. Concepts with a remote CAN transceiver are also permitted. The influence of components in the Tx/Rx path must be taken into account in the signal integrity analysis (delay times).

-PV_ELC-29990 The requirements for the physical layer in the MSS 20202 "CAN Networking Performance Specification" must be met.

-PV_ELC-30006 A Common Mode choke in accordance with MSS20202 Chapter 10 shall be used.
A common mode choke on the input connection to the vehicle harness must be placed. If the CAN is routed to different PCB within the component there must be an option in the layout to place an additional common mode choke on each PCB. If the common mode choke must be placed is depending to the EMC measurement results.

-PV_ELC-29977 An UART protocol must be used as a communication protocol.

-PV_ELC-29975 The "Common oscillator requirements" according to MSS 20202 Chapter 8.6.1 must be complied with.
The requirements regarding Bit timing can also be ensured via additional mechanisms, e.g. synchronization of communication speeds.

-PV_ELC-29997 The maximum bus load on the communication interface, including the cyclic diagnostic queries, must not exceed 80%.

-PV_ELC-30011 The bus load calculation is to be handed over to the Client with the presentation of the offer.

-PV_ELC-30002 The requirements for electrical connection according to the MSS 20202 chapter "CAN Networking Performance Specification" must be complied with.

-PV_ELC-29984 LED driver families to choose from:
Driver Family 1: Elmos 522.94, Elmos 522.96, Elmos 522.98 UART over CAN (500-2MBit/s)
Driver Family 2: Infineon TLD7002-16, Infineon TLD7012-24/TLD7011-24, Infineon TLD7022-96/TLD7021-96. UART over CAN (500kBit/s - 4MBit/s).

-PV_ELC-29993 If a remote CAN transceiver is used, a CAN transceiver from the MSS20202 Chapter 9 must be used.

-PV_ELC-29981 The circuit path of CAN-H/-L on the PCB's must be adapted to 120Ohm (thickness and width of the traces).

-PV_ELC-29987 The settings of the used UART protocol must be aligned between the Contractor and the Client.

-PV_ELC-30001 The settings of the error debounce times within the LED driver must be aligned between the Contractor and the Client.

-PV_ELC-29991 *The sleep functionality of the LED drivers will not be supported by the Commander ECU.*

-PV_ELC-29995 *The Commander ECU will use a configurable baud rate (500kBit/s, 1MBit/s, 2MBit/s, 4MBit/s).*

-PV_ELC-29985 *The baud rate shall be chosen so that the lowest possible rate is selected without violating the bus load requirement.*

-PV_ELC-30000 *Information regarding the communication sequence:*
*- Cyclic transmission of all brightness values every 10ms*
*- The brightness is controlled exclusively by adjusting the duty cycle between 0% and 100%.*
*- Simultaneous function of updating the output values will be used*
*- Cyclic diagnostic of each LED driver is performed every 100ms (several LED drivers in a 10ms cycle)*
*- There will be no current adjustment by the commander ECU via the CAN*
*- The status of each output will not be read back or interpreted by the commander ECU.*
*- For diagnostics the only error flags of the LED driver are used*
*- Diagnostic with external DiagPins or GPIO inputs is not used*
*- The communication startup does not contain any initializing cycle or mode change.*

-PV_ELC-30003 The supplier must be able to analyze the communication between the commander ECU and the Tail Light and be able to support the debugging of known issues.

-PV_ELC-29992 *For analyzing the in car measurements tools will mainly provide a preinterpreted UART over CAN Trace. In special cases logic analyzer traces can be provided.*

-PV_ELC-30007 *The maximum of supported LED drivers on each ITC-CAN is 15*

-PV_ELC-30004 *The maximum supported output channels on each ITC-CAN is 300*

### 2.1.21.1.1.4 Development/Production status of the Tail Light (-PV_ELC-29986)

-PV_ELC-29983 It must be possible to read out the development/production status of the Tail Light via a diagnostic command from the commander ECU. For this purpose, at least 1 byte shall be reserved in the memory of the LED driver.

-PV_ELC-29982 *When using an Infineon LED driver the command read register content - READ_REG will be used to read the information*

-PV_ELC-29980 When using an Infineon LED driver the development status must be stored at the following memory address in one LED driver in each part of the light:
Register "OTP_CUST_CFG11" address 0xAA

-PV_ELC-30005 *When using an Elmos LED driver the Read Frame format (4-Byte header) will be used to read the information*

-PV_ELC-29989 When using an Infineon LED driver the development status must be stored at the following memory address in one LED driver in each part of the light:
Register "OTP_CUST_CFG11" address 0xAA

### 2.1.21.1.2 Functional Safety and Process Requirements (-PV_ELC-29853)

#### 2.1.21.1.2.1 Overview/Reference to Safety Goals (-PV_ELC-29852)

-PV_ELC-29834 *The rear lamps (left/right) are part of the safety concept to achieve the following safety goals for ELC (Exterior Light Control):*

*SZ_3-1: Prevent complete loss of Brake Light (ASIL B)*
*SZ_4-3: Prevent activation of turn indicator on the wrong side (ASIL A)*

#### 2.1.21.1.2.2 Safety Requirements with regard to Brake Light (-PV_ELC-29841)

-PV_ELC-29840 *Functional safety contribution of the rear lamps to SZ_3-1:*

*The rear lamps receive the relevant requests to activate the brake lights from ZC Rear via ITC CAN.*
*Based on the activation requests, the rear lamps activate the brake lights. Pre-condition for the activation is the power supply provided by ZC Rear.*
*In case of detected errors, the rear lamps provide error information to ZC Rear on ITC CAN.*

*Rear lamp malfunctions with relevance to SZ_3-1:*
*- no or insufficient activation of brake lights while a request for brake light activation is present on the communication bus.*

-PV_ELC-29855 *Warning strategy on vehicle level:*
*Warning message in instrument cluster.*

-PV_ELC-29836 The rear lamp shall reliably detect data corruption in all end-to-end protected bus signals from ITC CAN to the LED drivers for brake lights.
Error reaction in the affected LED driver(s) in case of detected end-to-end error:
- activate the brake lights after max. [FHT_RL_2] while power supply from ZC Rear is activated.
- report end-to-end fault on ITC CAN
During fault confirmation time, the brake lights shall remain activated, if the last state before fault occurrence was activated.

Reset condition: valid signal available on the communication bus (without delay).

The end-to-end validation incl. parameters as specified in the datasheet of the individual LED drivers shall be used.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29839 The rear lamp shall detect the following faults with at least medium diagnostic coverage (90%):
- malfunction or failure of LED drivers
- malfunction or failure of LED modules

Error reaction in case of detected fault:
- provide fault information on ITC CAN

Fault handling time for detection and reaction: [FHT_RL_3]

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-29858 The rear lamp shall prevent erroneously reporting a partial failure of the brake light to ZC Rear on the communication bus. (I.e. false positives shall be prevented)

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29871 *For some variants, a partial failure of the brake light requires the deactivation of the complete brake light on the affected side.*

-PV_ELC-29823 While ZC Rear requests activation of a brake lamp channel, the rear lamp shall generate sufficient light output with the corresponding LED modules for brake light within [FHT_RL_1].

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29869 The rear lamp shall prevent systematic faults that could potentially lead to failure of the left and right brake lights in quick succession (within a few driving cycles). Potential fault causes (if any) shall be identified and reported to the Client.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29868 Fault Handling Time Interval (FHTI) regarding SZ_3-1:
[FHT_RL_1] max. 20 ms until brake light activated when requested;
[FHT_RL_2] max. 1 s until brake lights activated after fault occurs;
[FHT_RL_3] max. 2 s for reporting of detected faults.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29870 Safe states:
(1) Brake lights activated when brake light ON request is present; not activated when valid OFF request is present.
If safe state (1) cannot be achieved:
(2) Brake lights activated permanently (while fault present) and fault indicated on communication bus.
If safe state (2) cannot be achieved:
(3) Brake lights activated permanently (while fault present) and no communication.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

### 2.1.21.1.1.2.3 Safety Requirements with regard to Direction Indicator (-PV_ELC-29849)

-PV_ELC-29825 *Functional safety contribution of the rear lamps to SZ_4-3:*

*The rear lamps receive the relevant requests to activate the turn indicators from ZC Rear via ITC CAN.*
*Based on the activation requests, the rear lamps activate the turn indicators. Pre-condition for the activation is the power supply provided by ZC Rear.*
*In case of detected errors, the rear lamps provide error information to ZC Rear on ITC CAN.*

*Rear lamp malfunctions with relevance to SZ_4-3:*
*- unintended activation of turn indicators with perceivable light/dark phases while no request for activation of turn indicators is present on the communication bus.*
*Note: in the context of SZ_4-3, this is a multiple point fault.*

-PV_ELC-29835 *Warning strategy on vehicle level:*
*Warning message in instrument cluster.*

-PV_ELC-29824 While ZC Rear is not requesting activation of the turn indicator channel(s), the rear lamp shall prevent light output (worst case: with perceivable light/dark phases) with the relevant outputs for turn indicators.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-29812 The rear lamp shall reliably detect data corruption in all end-to-end protected bus signals from ITC CAN to the LED drivers for turn indicators.
Error reaction in the affected LED driver(s) in case of detected end-to-end error:
- deactivate the turn indicator after max. [FHT_RL_4].
- report end-to-end fault on ITC CAN

During fault confirmation time, the turn indicators shall remain deactivated, if the last state before fault occurrence was deactivated.

Reset condition: valid signal available on the communication bus (without delay).

The end-to-end validation incl. parameters as specified in the datasheet of the individual LED drivers shall be used.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-29821 The rear lamp shall prevent systematic faults that could potentially lead to activation of a turn indicator on the wrong side. Potential fault causes (if any) shall be identified and reported to the Client.

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-29828 Safe state: direction indicators deactivated

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

-PV_ELC-29820 Fault Handling Time Interval (FHTI) regarding SZ_4-3:
[FHT_RL_4] max. 800 ms

| Attribute name | Value |
|---|---|
| ASIL | ASIL A |

### 2.1.21.1.1.2.4 Cross-Functional Safety Requirements (-PV_ELC-29837)

-PV_ELC-29854 The responsibility of showing overall compliance with the safety requirements as specified at the interface to the exterior light system lies with rear lamp supplier.
All components of the rear lamps shall be covered by the rear lamp safety case. This includes the integration of all components.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29851 *As part of the overall responsibility, the rear lamp supplier needs to ensure the appropriate technical conditions (e.g. cooling concept, internal harness) required to meet the safety requirements when integrating the individual components.*

-PV_ELC-29829 *Depending on the selected technical safety concept (TSC), it is possible that functional portions from the TSC are also identified as required to fulfill the functional safety requirements. In this case, an identification as safety-relevant, possibly the assignment of an ASIL attribute, would have to take place at component level.*

-PV_ELC-29807 Electrical / electronic components (e.g. LED modules) shall meet the requirements from ISO 26262:2018 according to the allocated ASIL.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29848 For components of other technology (non-electrical / non-electronic, e.g. rear lamp housing, connectors) the applicable standards need to be met.
As a minimum, standard design measures to verify the component reliability shall be taken (e.g. design and process FMEA, analysis of field data, qualification).

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29843 As acceptance criteria for the safety requirements, the rear lamps shall generally use the tolerances (e.g. sufficient output, timing) specified in the functional requirements, as well as applicable legal requirements. If more suitable acceptance criteria are identified on the component side, these can be used after confirmation by the customer.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

-PV_ELC-29814 Any requirements to the vehicle system, which are potentially derived from the technical safety concept of the rear lamps shall be immediately communicated to and aligned with the customer.

| Attribute name | Value |
|---|---|
| ASIL | ASIL B |

#### 2.1.21.1.1.3 General Requirements (-PV_ELC-29819)

##### 2.1.21.1.1.3.1 Power Network Requirements (-PV_ELC-29845)

-PV_ELC-29859 *The requirements in this chapter are valid for all systems and components, which read relevant inputs for the exterior light control system, drive outputs for light functions or realize light functions in the vehicle.*

-PV_ELC-29857 The assigned operating voltage class for the exterior light is 2. This component must fulfill the according Requirements.

-PV_ELC-29838 Light function relevant outputs must be activated or kept active in an extended voltage range of 7 - 20V.

Outside of those thresholds, light relevant outputs must be kept active, as long as the hardware allows operation.

##### 2.1.21.1.1.3.2 Latency (-PV_ELC-29842)

-PV_ELC-29809 The maximum time between the received request via bus signal or hardware input and the activation or change of the output shall be 10ms.

#### 2.1.21.1.1.4 Hardware Requirements (-PV_ELC-29844)

-PV_ELC-29846 The working range / current of the rear lamp must fit to the outputs of the ECU. These values must be agreed during development and are defined in the KLH.

-PV_ELC-29856 Inductive and capacitive loads must be avoided and, if unavoidable, communicated to and agreed with the Client.

## 2.1.22 Requirements for the Process (Process Requirement Specifications – PLH) (3120440)

4622664 *This version of the process specifications (PLH) rear lamp is version V1.10 dated 30.01.2025*

3120442 *The process requirements described in the PLH represent a standard and support the supplier in looking for the ideal process in terms of costs, deadline (incl. cycle time), and the quality of the process and thus of the component. It especially takes into account problems/fault possibilities of the past, which are to be ruled out in the future. It thus has a significant practical relevance. This PLH does NOT release the supplier from its obligation to search for the best or better processes than those described in this PLH. If these deviate from this PLH, he shall present them to the quality management and the development department of the Client.*

3120443 During development of the production process, the supplier shall implement preventive maturity level monitoring in the form of preventive maturity level management, including the specification of the characteristic data (verification of process capability, inspections etc.).

3120453 The state of development of the production process shall be continuously documented on delivery of the documents mentioned in the Chapter 'Preventative Maturity Level Management', and be submitted to the Client's quality management and development departments at regular intervals (at least at every Product Gate as per MDS).

### 2.1.22.1 Preventive Maturity Level Management (3120450)

3120457 Preventative maturity level management is carried out in consultation with the Client's quality management department. All of the supplier's departments involved in the product creation process shall be subject to maturity level management.

3120516 The supplier is responsible for the maturity level management of the sub-suppliers. The status shall be submitted to the Client's quality management department at any time, on request. This requirement is independent of the applied directed part assignment matrix (A, B, C or D).

3157541 *The assessment of the maturity level is based on defined quality objectives and quality criteria along the product and process development process.*

3120524 The facilities and tools shall be commissioned, built, approved and run in within the context of the coordinated schedule.

3120525 For the case that several lines are set up, a pilot line shall be qualified in advance and validated before further lines are put into service. Deviations from this procedure shall be coordinated with the responsible Quality area.

3120527 All state-of-the-art preventative quality and technology assurance methods shall be used (e.g. simulating methods, such as filling studies for injection molding, tolerance simulations etc.)

### 2.1.22.1.1 Start of Preventive Maturity Level Management (3157542)

3157544 In consultation with the Client's quality management department, maturity level management shall begin immediately at the start of development, design, and the component production process. The maturity level progress shall be revealed to the Quality Management department at regular intervals at the product gates according to MDS. The requirements listed in the component requirement specifications and PLH are to be verified.

### 2.1.22.1.2 Scope (3157545)

3157546 *Preventive maturity level monitoring involves monitoring the degree of fulfillment of all requirements specified during the product creation process.*

3157547 *The requirements for the part (functional and non-functional) and for the process shall be taken into account.*

3157548 The assessment is performed based on the degree of implementation at the coordinated period. The maturity level is split up into four stages:

- The requirement is not implemented by the deadline
- The requirement is currently being implemented
- The requirement is implemented by the deadline
- The requirement is implemented by the deadline and tested successfully

### 2.1.22.1.3 Scheduling (3157549)

#### 2.1.22.1.3.1 Milestones (10625433)

10625484 The milestones listed in the following shall be taken into account in project planning. The dates attached to the component requirement specification regarding “Product Maturity Levels” are binding.

10625485

| Stand: 23.08.2023 | Heckleuchte | NPP* | Bemerkungen |
|---|---|---|---|
| Vorgabe Projekt<br>- zu SOP | "_" / Start Werkzeuge | | |
| Vorgabe Projekt / RD<br>- zu SOP | ESWFT | -16 | |
| | Serienprüfmittel vorhanden | -16 | |
| | Fertigungsequipment am Serienstandort | -12 | vor Baulos 1 |
| | Werkzeuge am Serienstandort (freigegeben / abgemustert) | -9 | |
| Vorgabe Projekt / RD<br>- zu SOP | PPFB Start | -6 | |
| Vorgabe Projekt / RD<br>- zu SOP | Gelb Freigabe PPFB | -5 | |
| Vorgabe Projekt / RD<br>- zu SOP | Grün Freigabe PPFB | -2 | |
| Vorgabe Projekt | SOP | 0 | |

*ausgenommen Überseeprojekte

### 2.1.22.1.3.2 Supplier Schedule (10625470)

10625486 In addition to the Client's milestones, the following industrialization milestones must be listed in the supplier schedule:

10625487 Tools:

- Tool commissioning (long-term tools, e.g. lens, housing, . . . shall be listed individually)
- Tool creation (start – end)
- If necessary, relocation activities and time frames to the series production site
- Tools at the series production site (approved/specimen delivery)

10625488 Equipment:

- Assignment of production equipment fully completed
- Creation of production equipment (start – end)
- If necessary, relocation activities and time frames to the series production site
- Production equipment at the series production site (start – end)

- Production of first parts using series equipment (series production site)

10625489 Test equipment:

- Commissioning of supplier test equipment (assembly/single parts/inline/parts master/functional testing equipment, e.g. EOL)
- Coordination with MB test equipment planning (measurement concept/measurement fixture)
- Creation of supplier test equipment, completed and available at the series production site
- Test equipment capability verified (procedure 1 + 2)
- Correlation of test equipment to each other, assembly measurement fixture 3D/inline measurement
- If necessary, comparison measurement of Contractor’s gage assembly/measurement fixture vs. MB gage assembly/measurement fixture

10625490 Load containers:

- Internal load containers/packaging materials
- Planned/commissioned/in use
- Assembly load container (responsibility of supplier)
- Planned/commissioned/in use

10625491 Purchased parts/directed parts:

- Assignment of purchased parts, incl. electronics
- Procurement of purchased parts
- Sampling of purchased parts

10625492 Testing and optimization loops: start – end

10625493 Build lot construction and process qualification:

- Manufacture of build lot 1-X (null series) incl. internal performance test
- Manufacture of PROs 1-X incl. internal performance tests
- Employee training start – end
- Supplier internal audits (production location)
- Proof of process capability (short-term/long-term capability)
- VDA 6.3 audits (part 1/2/3)/PFA/R@R by MB

10625494 Sampling:

- Establishment of PPA report sample
- Start PPA report (delivery of PPA report parts at DAI, documentation in PIA complete)
- Yellow approval PPA report
- Green approval PPA report

### 2.1.22.1.3.3 Prerequisites for Starting a Sampling (10625480)

10625497 In order to submit a sampling, the following prerequisites shall be fulfilled and the required verification shall be available:

- Certification documents uploaded in CERTUS and released
- IMDS released
- Self-reporting part/process at least yellow
- Geometry: Verification of 50 ZB measurement reports in tolerance (see chapter 3.1.4)
- Light technology: Verification 10 Light technology measurement reports (see Chapter 3.1.5)
- Performance test (see Chapter 3.3.3)
- Functional and material tests completed OK

All deviations from the specification part and process must be agreed and evaluated with the responsible developer and
quality engineer before the submission of samples. The documentation takes place in a standard form in the PIA system.

### 2.1.22.1.4 Documentation of Maturity Level up to SOP (3157871)

3157872 For verification of the development of the maturity level for the part and process, the following verification/documents shall be produced for each build lot of the null series (BL 1 – BL x) and the production trials (PROs) (1 – x):

3157873 During the null series:

- Measurement reports for all lights delivered to the Client (assignment of measurement report to light shall be ensured)
- Graphical assessment of the measurement reports and description of a control chart
- Updated fault identification chart (decorative characteristics)

- Self-disclosure for part and process
- Current parts history
- Updated “Process Reporting” form
- Updated form for manufacturability and tolerance achievement for PPA report

3157874 During the production trials:

- Measurement reports for all lights delivered to the Client (assignment of measurement report to light shall be ensured)
- Graphical assessment of the measurement reports and description of a control chart
- Updated fault identification chart (decorative characteristics)
- Self-disclosure for part and process (up to PPAR)
- Current parts history (up to PPAR)
- Result documentation of internal performance test with ramp-up curve for reaching the production peak (see chapter "Performance test")

10645303 The current component statuses shall always be used for the assembly of the batches. Deviations are to be coordinated in advance with RD and the Quality Engineer.

#### 2.1.22.1.5 Maturity Level Monitoring after the Start of Series Production (3157953)

3157954 *In special cases, further maturity level monitoring may be necessary during current series production.*

3157955 In accordance with MBST 13, consultation with the Client's quality management is necessary before any changes are made to an existing manufacturing process and product. The obligation to inform the supplier is according to the time frame specified in the MBST.

3157957 Moreover, the following time periods for providing preliminary information to the Client's quality management department regarding the components shall be complied with:

- Any type of **process and sub-process relocation**, including outsourcing of processes or sub-processes to subcontractors: Information to the Client min. six months before the planned change
- **Replacement or exchange of machines, systems** or other equipment: Information to the Client min. six months before the planned change
- **Change of sub-supplier** or manufacturer for sub-assemblies: Information to the Client min. six months before the planned change

3157958 In addition to the Client's quality management, the supplier must inform the following units of the Client in the above cases: Development, Purchasing and Logistics (in accordance with the currently valid MBST).

3157959 The documentation of changes shall be performed in coordination with the corresponding quality management department of the recipient plant.

3157960 The pending sampling and the necessary process acceptance procedures are to be coordinated with the responsible QM department in advance. The initiative shall be taken by the supplier.

### 2.1.22.2 Specific Production Process Requirements (3157961)

### 2.1.22.2.1 Requirements Pertaining to the Process Flow (3157962)

### 2.1.22.2.1.1 Implementation of the Procedure (3157963)

3157964 **Polishing:** For tail lamps with LED functions, the polishing process operation shall be carried out before the End of Line Test or a blowing off with ionized air or the use of ESD-compliant polishing disks is necessary.

3157965 **Assembly:** A process-consistent, perceptible and audible engagement of all connectors and adjustment elements internally and externally must be guaranteed in Assembly.

3157966 **Assembly:** Wiring harnesses shall be designed and routed so that process-consistent and damage-free assembly is guaranteed. Tension on cable connections during assembly is not permissible.

3157968 **Assembly:** The tempering process must be carried out prior to the inline measurement.

3158004 **Assembly:** To achieve the required tolerances, a drilling/milling process shall be provided. Alternative, subsequent processes shall be agreed with the Client's quality engineer.

3158077 **Adhesive bonding:** For bonded joints (labels/membrane/chromium-plated strips etc.), the bonding process must be designed and verified taking into account the specific bonding requirements (e.g.: pre-treatment / pressure forces / times / curing / pull-off forces etc.)

### 2.1.22.2.1.2 Rejects and Rework (3158079)

3158081 **Assembly:** With reworked parts, repeat testing of all functions in the series production system shall be carried out to ensure the function.

3158083 **Assembly:** All reworked parts shall be clearly marked and/or documented, and traceability shall be ensured.

3158086 **Assembly:** Dismantled electronic components (LED boards, control units) shall be subjected to final testing prior to reutilization at the component manufacturer's plant or with an identical test according to the test specification.

3158088 **Assembly:** The supplier shall create a concept for permissible reworking and coordinate it with the responsible quality department.

3158089 **Injection molding/assembly:** Rejects must be recorded and evaluated with the fault cause.

### 2.1.22.2.1.3 Testing Procedure, Testing Sequence, and Testing Frequency in the Process (3165793)

3166117 **High-gloss vapor deposition:** The process-accompanying test of the adhesion of high-gloss vapor depositions and protective coatings shall be carried out with a suitable examination workpiece in coordination with the Client (method open, e.g. caustic acid solution, cross cutting only for batch system). A correlation to the 48 h climatic chamber test shall be ensured.

3166119 **Vapor deposition:** All parts shall be tested 100% for faults and color following surface coating.

3166120 **Assembly:** Prior to the process approval of the assembly process, an ESD audit shall be carried out if relevant.

11261214 **Assembly:** During the production of the component, an automatic 100% function test of all components and illuminants shall be performed.

11261215 **Assembly:** At the end of production, the component shall be checked for 100% leaktightness according to the component requirement specifications requirement.

3166122 **Assembly**: All parts shall be subjected to a 100% visual inspection at the end of line. It may be necessary to specify higher inspection standards for the start-up with the quality contact person (e.g. dual control principle, second firewall etc.).

3166123 **Assembly**: The screwing processes shall be verified automatically and process-consistently (e.g. number of screws, torque, tightening angle). Pneumatic screwdrivers are not permissible.

3166125 **Assembly**: 100 % detection of completeness and correct assembly (Poka-Yoke, automatic inquiry, or reliable detection at following stations) shall be ensured.

3166126 **Assembly (Welding):** The welded joint shall be inspected through destructive testing and examination of the welding area for complete welds. The test shall be carried out at least once per shift and with a change in variants, if applicable, and shall be documented.

3166127 **Assembly**: To confirm the resistance to stress cracking, a test according to the currently valid function specification (section entitled “Ethanol Test – 4057036) shall be carried out on the annealed assembly or the annealed, welded shroud with a lens.

- For series production monitoring: once per shift test 1 (dip test).
- In the event of parameter changes in the process chain: Generally tests 1 and 2 (dip test and test in frame).

3166128 **Assembly:** An automated, process-consistent assignment of the country variant shall be ensured (e.g. camera system, laser method, ink jet printer, etc.). Additionally, all certification-relevant numbers and designations shall be checked for presence, completeness, and correctness in an automatic and process-consistent manner.

10645804 **Assembly:** Application of functional membrane
The manufacturer's application specifications must be observed (contact pressure / time / ...)
The correct fit of the membrane must be ensured automatically.

3166453 **LED**: The regular validation of the LED boards with a screening inspection shall be coordinated with RD/KEL (e.g. with heat and loading, taking into account the requirement from MBN 10447).

3166454 **Optical fiber inspection**: The light guides and lenses must not exhibit any surface defects (scratches, inclusions, damage, color deviations, fingerprints, etc.) in either the illuminated or non-illuminated condition.

3166455 **Annual requalification:** The requalification plan shall be coordinated with RD and MP and presented by the start of PPAR.

#### 2.1.22.2.1.4 Component Part Geometry (3166456)

3166457 The tolerance compliance of the lamp assembly shall be monitored by CMM measurement and inline measurement.

3166458 The measuring points (inline and CMM) shall be coordinated with the Client prior to the concept release.

3166459 Number of measuring points for inline measurement:

- Lights: Minimum number: 8 measuring points on the surface + 8 measuring points in the gap
- Continuous reflector strip: 12 measuring points on the surface + 12 measuring points in the gap

3166461 The results of the CMM measurement and the inline measurement shall be correlated. The target value of the correlation between the 3D measurement and inline is ± 0.1 mm. The verification shall also be submitted for the series supply release (PPAR).

##### 2.1.22.2.1.4.1 Start-up Phase (3166464)

3166465 In the start-up phase (confirmation vehicles and all production tests), the supplier shall carry out a 100% measurement (geometry) incl. measuring documentation.

3166466 In the event of failure to comply with the specified tolerance, a 100% measurement of the geometry-determining component parts shall be carried out in addition to the analysis and ensuring process reliability.

3166467 A 100% CMM measurement can be waived for the production tests if the correlation between the inline/CMM measurements is successfully completed.

13697548 The measurement reports must be made available to the Client BEFORE delivery of a batch.

### 2.1.22.2.1.4.2 Series Production (3166468)

3166469 In series production, the supplier shall check and statistically evaluate the specified geometric measuring points “inline”. The inline process monitoring represents a 100% inspection of all lamps during production.

3166470 In addition, at least one part shall be measured in comparison, according to the measuring specification on the CMM during series production. The documentation shall be carried out as a graphical statistical assessment and shall be made available to the Quality department upon request.

3166471 Furthermore, the CMM measurement results shall be made available to the respective production plant of the Client as part of the purchased parts dimensional audit.

3166472 **On the basis of the inline measurement results and the CMM measurement results, the process shall be regulated so that 100% tolerance compliance is ensured.**

3166473 **Not OK parts shall be sorted out.**

### 2.1.22.2.1.4.3 Sampling (3166474)

3166475 Prior to the start of PPAR, the supplier shall prove using 50 sets of lamps (depending on the geometric variant) that the parts can be produced in a process-consistent manner within the tolerance:

- The variants are determined by the different geometries of the housing or the lens.
- In this context, all cavities/tools shall be equally taken into account and separately identified in the assessment.
- The lamps shall be manufactured in a series production process.
- The verification is done in a control chart including process parameters.

3166481 Contour and gap measuring points*: The process capability shall be verified by a **CP** ≥ 1.0.

3166482 Other measuring points*: The process capability shall be verified by a **CPK** ≥ 1.0.

3166484

## Herleitung Vorgaben für Prozessfähigkeit und Messhäufigkeit

| Merkmal | Vorgabe KLH und Zeichnung bzgl. Prozessfähigkeit | Vorgabe Prozesslastenheft bzgl. Messhäufigkeit |
|---|---|---|
| Inline-Messpunkte | cp ≥1,0 | 100%-Inline + 1x pro Schicht 3D-Vermessung |
| Weitere Messpunkte auf der Lichtscheibe (Umriss/Oberfläche) | cp ≥ 1,0 | Stichprobe: 1x pro Schicht 3D-Vermessung |
| Mindestspaltbegrenzer / Spacer | Cpk ≥ 1,0* | Stichprobe: 1x pro Schicht 3D-Vermessung<br>• Händisch aufgeklebter Spacerpad als Mindestspaltbegrenzer: Vermessung mit/ohne Pad<br>• Händisch aufgeklebter Spacerpad als RPS – Vermessung ohne Pad<br>• Im Prozess verarbeiteter Spacerpad als RPS: Vermessung mit Pad |
| Z-Auflage Stoßfänger | Cpk ≥ 1,0* | Stichprobe: 1x pro Schicht 3D-Vermessung |
| Weitere Merkmale (z. B. Engstellen zum Rohbau) | Cpk ≥ 1,0* | Stichprobe: 1x pro Schicht 3D-Vermessung |

Zeichnungseintragung:
Tolerierung: MBN 11012-1 (I)
Allgemeintoleranz: MBN 11012-30_2

* Bei Nichterreichung erfolgt ein Review und eine neue Bewertung nach SOP + 6 Monate

### 2.1.22.2.1.5 Fulfillment of the Legal and MB-Specific Requirements Regarding Lighting Technology (3166536)

#### 2.1.22.2.1.5.1 Start-up Phase (3166650)

3166678 In the start-up phase, in the time between first off-standard-tool parts and PPAR, the supplier shall carry out for each pre-production test batch a measurement of the entire photometric scope of testing using a goniophotometer for basic type/SA1/SA2 and send the test report to the relevant developer and quality engineer.

3166679 Furthermore, at the start of PPAR, a total of ten other measurement reports shall be generated for basic type/SA1/SA2 respectively, across all country variants (ECE left-hand traffic | ECE right-hand traffic | SAE), depending on the installation rate, in order to be able to make statements about process reliability.

#### 2.1.22.2.1.5.2 Series Production Phase (3166680)

3166710 In series production, the supplier shall do a photometric measurement of 1× basic type, 1× SA1, and 1× SA2 each month for model series with a number of units exceeding 10,000 (testing of legal specifications). For model series with a number of units under 10,000 units per month, these measurements shall only be carried out every two months. Each country variant (ECE left-hand traffic | ECE right-hand traffic | SAE) shall be measured at least once every six months.

3167000 The photometric measurements include the entire scope of testing of the headlamp/tail lamp and shall be carried out with a goniophotometer (testing of legal specifications). Deviations from the specified measurement method shall be coordinated with MB Development.

3167152 The results shall be made available at the request of the Client.

3168510 *An example of such an annual overview can be seen in the following:*

Lieferant - Standort

| BR | Jan-20 | Feb-20 | Mar-20 | Apr-20 | May-20 | Jun-20 | Jul-20 | Aug-20 | Sep-20 |
|---|---|---|---|---|---|---|---|---|---|
| BR 1 | 12345678 | 638384656 | 45756868665 | 64739759065 | 243535434 | 24464686 | 25752245272 | 2752552272 | |
| BR 2 | 23567888 | 3758696048 | 124546785* | 534839744 | 343554325* | 6325547 | 252475648* | 2574222547* | |
| BR 3 | 54657868 | 456746788 | 34579021 | 343537242 | 35365657* | 247575277* | 487362261 | 272755757522 | |
| BR 4** | 24567897 | x | 64758935* | x | 35627557* | x | 61542757275* | x | |
| BR 5** | 24458975 | x | 53647895 | x | 6245555 | x | 22457527 | x | |

* Messbericht muss beigefügt werden

** BR < 10.000 stk / Monat --> Messung nur alle 2 Monate notwendig

3168990 **Bearbeitungshinweise:**
Die Jahresübersicht muss für den entsprechenden Monat mit der zugehörigen Prüfsberichtsnummer befüllt und der entsprechenden Farbe (siehe Bewertungsskala) bewertet werden.

3167153 **Bewertungsskala:**

| | | |
|---|---|---|
| | **grün (i.O.)** | innerhalb der MB-spezifischen Toleranz |
| | **gelb*** | außerhalb der MB-spezifischen Toleranz / innerhalb der gesetzlichen Toleranz |
| | **rot (n.i.O.)*** | außerhalb der gesetzlichen Toleranz |

*wenn gelb oder rot muss der entsprechende Messbericht beigefügt werden

3169066 If the results of these measurements show strong fluctuations or if the measurement results are outside of the MB-specific tolerance limit, additional weekly “minute measurements” regarding the critical light function shall be carried out and measures for process stabilization shall be implemented.

3169543 The brightness shall also be monitored during series production as part of the end-of-line test. The end-of-line test shall be verified 1× per shift with a “golden sample” (sample compared with a goniophotometer).

### 2.1.22.2.1.6 Cleanliness of the Component (3169665)

3169669 **Vapor deposition/assembly/painting:** Suitable protective agents and clothing (gloves, work clothing, belt protection, etc.) shall be used to avoid damage and dirt buildup.

3169802 Metalized components may only be touched with suitable gloves (for example, nitrile).

3169996 Gloves shall be replaced regularly.

3170069 To avoid dust and soiling on the component parts, a combination blow-extraction device shall be used.

3170138 Contamination because of the load container/external reusable packing shall be excluded (suitable materials, regular cleaning). Verification of cleaning shall be attached on selected packaging.

3170206 Only clean, external reusable packaging shall be in production.

3170224 Internal load containers shall be kept clean to prevent contamination and damage of individual components (suitable materials, regular cleaning).

3170225 Electronic component parts with ESD relevance shall be packed only in ESD protective packaging.

3170239 Surface-sensitive component parts (scattering lenses, vapor-coated parts, LED modules, lenses, fiber optics, etc.) shall be transported in special packaging (no bulk cargo/general cargo).

3170327 Cleanliness: Depending on the component, measures shall be taken to avoid the ingress of dust and dirt. At a minimum, the currently valid VDA Volume (technical cleanliness) shall be applied.

13697769 Workplaces must be kept clean and dust-free.

### 2.1.22.2.1.7 Storage, Material Flow, Continuous Production (3181279)

3181280 **Injection molding/assembly/handling**: Surface-sensitive or metalized parts may only be touched with suitable gloves. Storage and transportation must be carried out in suitable load carriers (to protect against damage and contamination).

3181282 **Injection molding:** Injection-molded parts shall be set down and stored distortion-free and protected against dirt.

3181283 **Injection molding/assembly:** Tools, jigs and fixtures shall be protected against damage (storage, process, handling).

3181284 **Assembly:** Damage and dirt buildup of components in the assembly process and logistics process shall be avoided (padding, shape-dependent fixtures and trays).

3181285 **Assembly**: In the event of breaks, interruptions and shift changes, each station shall complete the work step and the subsequent shift shall check this. Component parts with open adhesive strip shall be scrapped after a production interruption.

11261216 **Assembly:** Not OK Parts shall be locked, labeled and automatically discharged in production.

3181286 The transport, storage, and packaging provisions specified by the manufacturers and the law shall always be observed.

### 2.1.22.2.1.8 Machine Failure (3181287)

3181288 *In addition to the known specifications, there are no further specific requirements for the manufacturing process.*

3181289 Before resuming production following an interruption in production, all systems shall be checked for operational readiness (e.g. heating up of tempering oven, retention time for granulate for fiber-optic cables in the injection-molding machine).

### 2.1.22.2.1.9 Identification and Traceability (3181290)

3181291 **Assembly**: The Q-status approved in the PIA system or the current state of development with the drawing geometry technical level (ZGS) shall be documented on the component label. Deviation only after coordination with the responsible quality areas.

3181292 **Injection molding:** Traceability of design statuses of the component parts shall be ensured.

3181293 **Test documentation**: The performance of 100 % tests (leaktightness, function, inline measurement) shall be recognizable on the component part (e.g. center mark, connection to label printer, etc.). The type of marking must be documented on the drawing. Queries from MBC regarding the inspection status of a component must be answered within 24 hours.

3181294 **LED functions/electronic components:** The assignment and traceability of the LED modules and control units to the consecutive production number of the tail lamps shall be ensured (traceability).

### 2.1.22.2.2 Requirements Pertaining to Human Resources (3181295)

3181296 Backup solutions shall be devised for bottlenecks and turnovers related to personnel.

3181297 The availability of specialists shall be ensured.

3181298 The availability of a qualified “representative” of the supplier at the Client's target plant shall also be ensured, including for the null series.

### 2.1.22.2.3 Efficiency Requirements (3181299)

#### 2.1.22.2.3.1 Process Parameters and Process Monitoring (3181300)

3181301 **Injection molding/vapor deposition/assembly:**

- The parameters shall be secured against unauthorized access.
- The responsibility for parameter changes shall be regulated and parameter changes shall be documented.
- Specified processing information from the raw materials manufacturer shall be complied with (e.g. flash-off times, drying times etc.)

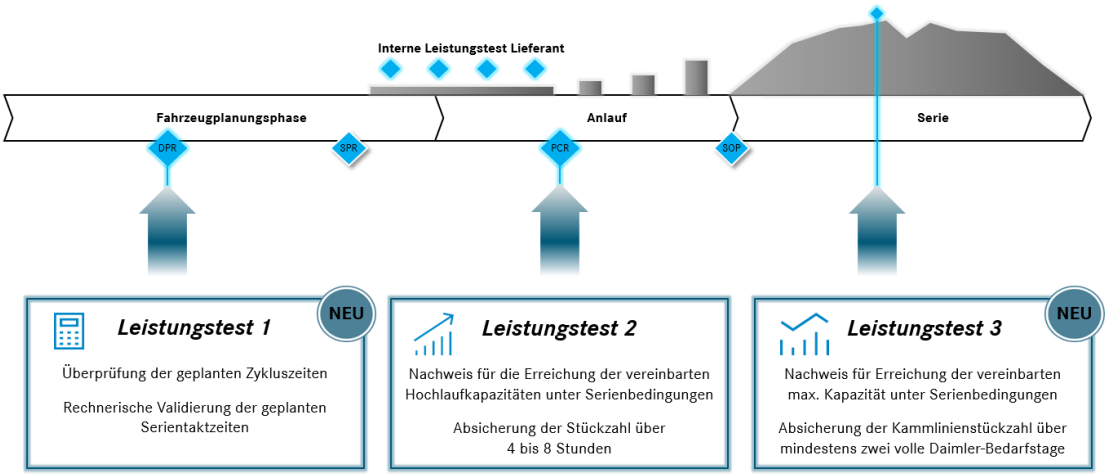
## 2.1.22.2.3.2 Capability Investigation (3181302)

3181303 **Injection molding:** Verification of the process capability of the geometry-determining component parts shall be carried out (lens/housing).

## 2.1.22.2.3.3 Performance Test (3181304)

4826996 *Three binding performance tests shall be carried out over the project phases up to series production.*

4826998 Der dreistufige Leistungstest in der Planungsphase, zum Anlauf und zur Kammlinienstückzahl




4827000 Bewertung der Stufen des Leistungstests

| Leistungstesttyp | Erklärung | Finale Bewertungs-möglichkeit |
|---|---|---|
| **Leistungstest 1**<br>Überprüfung der Kapazitätsplanung | Auf Basis der rechnerischen Kapazitätsbewertung wird automatisch ein Ergebnis ermittelt (grün/rot).<br>Die finale Bewertung kann „grün“ oder „rot“ sein.<br><br>Grün: Planerische Taktzeit zur Sicherstellung der Kammlinienstückzahl erreicht<br>Rot: Planerische Taktzeit zur Sicherstellung der Kammlinienstückzahl nicht erreicht | 🟢 🔴 |
| **Leistungstest 2**<br>Absicherung des Hochlaufs | Auf Basis des Produktionslaufs wird automatisch ein Ergebnis ermittelt (grün/rot).<br>Die finale Bewertung kann „grün“, „gelb“ oder „rot“ sein.<br><br>Grün: Bedarfe Kammlinienstückzahl abgedeckt<br>Gelb: Bedarfe Kammlinienstückzahl nicht abgedeckt. Absicherung SOP und Hochlauf (teilweise) vorhanden, Maßnahmen zur Erreichung Kammlinienstückzahl definiert. Überprüfung der implementierten Maßnahmen notwendig, ggf. durch zusätzliche Leistungstest absichern. Weitere Leistungstest müssen so geplant werden, dass ein Engpass durch nicht vorhandene Kapazitäten vermieden wird.<br>Rot: Bedarfe Kammlinienstückzahl nicht abgedeckt | 🟢 🟡 🔴 |
| **Leistungstest 3**<br>Absicherung der Kammlinie | Auf Basis des Produktionslaufs wird automatisch ein Ergebnis ermittelt (grün/rot).<br>Die finale Bewertung kann „grün“ oder „rot“ sein.<br><br>Grün: Bedarfe Kammlinienstückzahl erreicht<br>Rot: Bedarfe Kammlinienstückzahl nicht erreicht | 🟢 🔴 |

3181305 *As part of the performance test, the actual production output is recorded for a defined component part scope, compared to the “requirements” and “capacities” parameters, and assessed.*

### 2.1.22.2.3.3.1 Performance Test Objectives (3181308)

3181306 The performance test objectives are:

- Validation of availability from supplier, taking all general conditions and influencing parameters into consideration.
- Assessment of process performance and quality capability for complete production process under series-production conditions (tools, systems, cycle time, personnel at production location…)
- Check of ability to use the resources to produce the required quantity on time to meet customer requirements

#### 2.1.22.2.3.3.2 Internal Performance Test by the Supplier (3181309)

3181307 As part of the pre-production test batch manufacturing of the null series, the progress of process performance shall verified by an internal performance test.

3181310 The target/current cycle times shall be indicated (overall and station-related), elaboration of bottleneck.

#### 2.1.22.2.3.3.3 Evaluation of Performance Test Results (3181311)

3181312 The following minimum specifications apply for the performance test approach curve:

3181313 **For new product projects (NPP) with respect to full capacity production**:

- 50% to PPAR
- 70% to PRO1
- 90% to PRO2
- 100% to PRO3 and green

3181314 **For facelift with respect to full capacity production**:

- 70% to PPAR
- 90% to PRO1
- 100% to PRO2 (#1)

4827001 The results from the performance test are included in the sampling results (Appendix “Verification of Series Cycle Time” – Requirement from VDA Volume 2).

### 2.1.22.2.4 Machine Requirements (3181318)

#### 2.1.22.2.4.1 Special Requirements Pertaining to the System (3181319)

3181320 **LED function:** A process-consistent optical function inquiry shall be carried out for each individual LED.

3181321 **LED function:** A process-consistent color recognition for variants or assignment shall be carried out (e.g. ECE/SAE).

### 2.1.22.2.4.2 Manufacturing Plant and Facilities (3181322)

3181323 **Assembly**: For ESD-relevant component parts, effective ESD-protection with access regulation shall be ensured.

3181324 **Test stations:** Test stations shall be standard-compliant (VDA 16) and sufficiently illuminated.

### 2.1.22.2.4.3 Test Equipment and Calibration (3181325)

3181326 The supplier shall verify that the parts supplied are dimensionally accurate according to the customer's specifications. Therefore, to ensure the process reliability, component part test equipment and test equipment for the assembly (assembly test equipment) shall be created. The concept of the individual part test equipment must be matched to the CA test equipment (same, consistent concept) and the recording concepts and test characteristics must be agreed with the Client for the CA test equipment (same concepts for supplier and Client).

3181327 The test equipment capability shall be demonstrated for the PPAR, however at the latest for Pro1. A correlation between an inline measurement/gauge and the CMM test equipment (see chapter "Geometry of the component") must be verified and regularly monitored.

3181328 In justified cases, the Client shall optionally add additional analytical test equipment to the Supplier's obligatory process test equipment. If the supplier is provided with this optional analysis test equipment, then the supplier undertakes to determine the test equipment capability. If the result is negative, the test equipment planning department and the Client's Q-engineer must be informed immediately.

3181329 **Injection molding:** Component part gages for parts that determine the geometry shall be produced by the supplier. (Lenses, housings), incl. the verification of the test equipment capability.

3181330 **Assembly**: Suitable calibration parts for monitoring the geometry, function, leaktightness, and final test shall be produced and kept in stock. The test frequencies shall be agreed on with the Client and documented in the inspection plan.

### 2.1.22.2.4.4 Servicing (3181332)

3181333 Systems, jigs, fixtures and tools shall be serviced and cleaned on a regular basis. Planning and execution shall be documented. A plan for emergencies and critical replacement parts shall be available.

3181334 An emergency plan shall be submitted to the Client no later than VDA 6.3 Part 3/process acceptance.

3181335 A back up shall be created for software/testing software/process parameters/documentation/etc.

### 2.1.22.2.4.5 Aids, Tooling and Cleaning Agents (3181336)

3181337 **Assembly**: Only approved and tested auxiliary materials and operating fluids may be used (greases, cleaning agents, adhesives). The handling specifications and process times specified by the manufacturer shall be observed.

## 2.1.22.3 Change History (10645927)

10645928

| Versions-Nr. | Änderungsdatum | Inhalt |
|---|---|---|
| V 1.8 | 29.08.2023 | • 2.3 Terminplanung aktualisiert<br>- 2.3.1. MB-Meilensteine<br>- 2.3.2 Lieferantenterminplan<br>- 2.3.3 Bemusterungsvoraussetzungen<br>• 2.4 Dokumentation des Reifgrades bis SOP<br>- Ergänzung zum Aufbaustand<br>• 3.1.3 Prüfverfahren, Prüfablauf und Prüfhäufigkeit im Prozess ergänzt<br>- Absicherung Gore-Membrane<br>• 3.1.7 Lagerung, Materialfluss, Verkettung ergänzt<br>- Produktionsunterbrechung / offene Klebespur<br>• neues Kapitel 4. Änderungshistorie eingefügt |
| V 1.9 | 23.10.2023 | • 3.1.3 Prüfverfahren, Prüfablauf und Prüfhäufigkeit im Prozess<br>- 100% Funktionsprüfung, Dichtheit und korrekte Montage<br>• 3.1.7 Lagerung, Materialfluss, Verkettung<br>- Handhabung n.i.O Teile |
| V 1.10 | 30.01.2025 | • Allgemein: Änderung "Mercedes-Benz AG" in "Auftraggeber"<br>• Redaktionelle Änderungen wurden an folgenden Kapiteln vorgenommen:<br>2.3.3, 2.4, 3.1.1, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.1.9 |

## 2.1.23 Testing and Validation (STM-868096)

### 2.1.23.1 Use of the DukE Program (Continuous and Consistent Testing Process) (STM-3522665)

STM-3522666 *To fulfill and verify the specifications of the [LHV 310 001] "Technical Report" (CRCS-3339942) and "Testing, Validation, Release" (CRCS-3341163), the Contractor shall prepare a test plan and document the results of the tests. The Contractor shall use the DukE program for this.*

STM-3522667 *Access to DukE is provided using an external connection. The connection is set up by the client.*

STM-3522668 *DukE provides several modules (Test Library, Planning & Evaluation, Topics & Measures). At the start of the project, the contractor shall clarify with the client which of the modules will be used and which form of cooperation is desired in the individual modules.*

- *The "Test Library" module contains possible tests to validate the component to the individual requirements of the component specifications, which are assigned to the Planning & Evaluation module as part of the inspection plan creation.*
- *In the module "Planning & Evaluation", the scheduling, documentation and evaluation of the test runs are carried out. All components assigned in the test shall be evaluated.*
- *In the module "Topics & Measures", errors detected and measures initiated are created, tracked and documented.*

STM-3522669 *When documenting component test results and faults, the Contractor shall ensure that the associated item numbers, the drawing geometry status (ZGS) and the respective component maturity level/software version are entered in DukE. Additional information on the design status of the peripherals should be available.*

STM-3522670 *Service acceptance by the Client is carried out on an on-going basis, based on the results and verifications documented in DukE. Service acceptance is documented by a PVP&R (Product Verification Plan and Report) at the PPF (Production Process and Product Approval) and Job #1 (Technical Report) reporting points.*

#### 2.1.23.2 DukE Testing by Contractor (STM-4194848)

#### 2.1.23.3 DukE Testing by Client (STM-4194849)

#### 2.1.23.4 DukE Test Not Assigned (STM-4194850)

## 2.2 Service Life Design and Validation (STM-869019)

### 2.2.1 E/E Components (STM-869090)

#### 2.2.1.1 E/E Service Life Design (STM-869091)

##### 2.2.1.1.1 Service Life Design as per [MBN 50306] (STM-1207581)

STM-869094

Service life in the field: 15 years
Time in working condition Driving: 8,000 hours
Time in working condition (Off-Grid) Parking: 131,400 hours
Mileage over service life: 300,000 km

#### 2.2.1.2 Mission Profile (STM-869105)

STM-869106

The following application profile describes environmental influences and loads that can influence the component at its installation location. The contractor shall take these environmental influences and loads into account during the development of the component and derive the necessary consequence.

### 2.2.1.2.1 Climatic Condition (STM-869107)

#### 2.2.1.2.1.1 Operating Mode: Driving (STM-869104)

##### 2.2.1.2.1.1.1 Ambient Temperature of the Component at the Installation Location (STM-869108)

STM-869110 Temperature distribution profile 1a as per Appendix B of [MBN 50306]

Temperature/distribution
-40 °C / 6 %
23 °C / 20 %
40 °C / 65 %
75 °C / 8 %
80 °C / 1 %

Temperature delta: Average 35 K

##### 2.2.1.2.1.1.2 Number of Changes in Temperature (STM-869115)

STM-869116 10,950 temperature cycles over 15 years

##### 2.2.1.2.1.1.3 Humidity (STM-869122)

STM-1207587 Relative humidity up to 100 %, condensation and icing

#### 2.2.1.2.1.2 Operating Mode: Off-Grid Parking (STM-869157)

##### 2.2.1.2.1.2.1 Ambient Temperature of the Component at the Installation Location (STM-869154)

STM-869156 Minimum temperature: -40.0 °C

STM-869163 Maximum temperature: 80.0 °C

STM-869160 Typical temperature: 23 °C

##### 2.2.1.2.1.2.2 Humidity (STM-1207952)

STM-869164 Average 65 % relative humidity

STM-869165 Relative humidity up to 100 %, condensation and icing

#### 2.2.1.2.2 Protection against the Ingress of Solid Foreign Objects (Including Dust) (STM-869166)

STM-869176 Protection against ingress of dust as per requirement in Chapter 5, Table 2 of [ISO 20653] – degree of protection IP 6KX
Dust shall not penetrate the component.

#### 2.2.1.2.3 Protection Against the Ingress of Water/Fluids (STM-869174)

STM-869180 Protection against high-pressure water jets as per Chapter 6 of [ISO 20653] – Degrees of protection IP X6K
Water which is directed as a high-pressure jet against the housing from any direction shall not have any harmful effects or impair performance.

STM-869185 Protection against high-pressure/steam-jet cleaning as per Chapter 6 in [ISO 20653] – protection class IP X9K.
Water, which is directed against the housing in the case of steam jet cleaning from any direction, shall not have any detrimental effect and not impair performance.

STM-869184 The requirement for protection against ingress of water shall apply throughout the entire vehicle service life.

STM-869187 The component is exposed to water mainly during driving.

### 2.2.1.3 Environmental Testing for E/E Components (STM-869192)

#### 2.2.1.3.1 General Test Parameters (STM-869189)

STM-869190 *Some general test parameters are specified in the following list (see also [MBN 50306])*

##### 2.2.1.3.1.1 Test parameter $T_{min}$ (STM-1208014)

STM-869196 Value: -40.0 °C

STM-869193 *Meaning: Minimum operating temperature.*

##### 2.2.1.3.1.2 Test Parameter $T_{RT}$ (STM-1208031)

STM-869195 Value: (23 ± 5) °C

STM-1208032 *Meaning: Room temperature*

##### 2.2.1.3.1.3 Test Parameter $T_{max}$ (STM-1208068)

STM-869194 Value: 80.0 °C

STM-869197 *Meaning: Maximum operating temperature.*

#### 2.2.1.3.1.4 Test Parameter $T_{op,min}$ (STM-1208099)

STM-869200 Value: -40.0 °C

STM-869198 *Meaning: Minimum operating temperature for components with overload protection / low-temperature protection.*

#### 2.2.1.3.1.5 Test Parameter $T_{op,max}$ (STM-1208187)

STM-869199 Value: 80.0 °C

STM-869201 *Meaning: Maximum operating temperature for components with overload protection / over-temperature protection*

#### 2.2.1.3.1.6 Test Parameter $U_{Bmin}$ (STM-1209128)

STM-869218 Value: 8.0 V

STM-869214 *Meaning: Lower operating voltage limit*

#### 2.2.1.3.1.7 Test Parameter $U_B$ (STM-1212412)

STM-869222 Value: 12.8 V

STM-869217 *Meaning: Operating voltage*

#### 2.2.1.3.1.8 Test parameter $U_{Bmax}$ (STM-1212415)

STM-869220 Value: 17.0 V

STM-869221 *Meaning: Upper operating voltage limit*

### 2.2.1.3.2 Operating Modes (STM-869228)

STM-869231 During their service life, the electrical, electronic and mechatronic components and systems will be operated in various operating modes, and these shall be appropriately simulated in the tests. Details of the operating modes, operating loads (e.g. control signals, original sensors, original actuator or replacement circuits) and the necessary boundary conditions shall be agreed between the client and contractor and documented.

STM-869233 To this end, the contractor shall define all relevant parameters for the operating modes described below, including, for example, supply voltages, input signals and bus messages, time-dependently, where applicable, to include tolerance specifications. The contractor shall coordinate these parameters with the client and shall document them in the technical specifications or in the component test specifications.

#### 2.2.1.3.2.1 Operating Mode: Unplugged (STM-869229)

STM-869232 The DuT is not electrically connected, without plugs and wiring harness.

#### 2.2.1.3.2.2 Operating Mode: Vehicle Assembly (STM-869234)

STM-869235 The DuT is not electrically connected, but with connected plugs and wiring harness

#### 2.2.1.3.2.3 Operating Mode: Driving (STM-7756796)

STM-7756797 This operating mode is intended to simulate how the component actually operates in a moving vehicle. The device under test (DuT) shall be operated with a typical operating load in accordance with the design load profile (e.g. power user, 95 % customer, but no misuse case).
The power supply for all voltage levels relevant for the component (low-voltage on-board electrical system, HVAC and HVDC) and, if applicable, the bus activity shall be simulated according to the real situation in the vehicle.

#### 2.2.1.3.2.4 Operating mode: Charging (STM-7756799)

STM-7756800 This operating mode is intended to simulate how the component actually operates in the vehicle during the charging process in vehicles with HV storage systems. The DuT shall be operated with a typical operating load in accordance with the design load profile.
The power supply for all voltage levels relevant for the component (low-voltage on-board electrical system, HVAC and HVDC) and, if applicable, the bus activity shall be simulated according to the real situation in the vehicle.

#### 2.2.1.3.2.5 Operating mode: Preconditioning (STM-7756802)

STM-7756803 This operating mode is intended to simulate how the component actually operates in the vehicle during the preconditioning process in vehicles with HV storage systems. The DuT shall be operated with a typical operating load in accordance with the design load profile.
The power supply for all voltage levels relevant for the component (low-voltage on-board electrical system, HVAC and HVDC) and, if applicable, the bus activity shall be simulated according to the real situation in the vehicle.

#### 2.2.1.3.2.6 Operating mode: On-Grid Parking (STM-7756805)

STM-7756806 This operating mode is intended to simulate how the component actually operates in the vehicle during on-grid parking in vehicles with HV storage systems. The DUT shall be operated with a typical operating load in accordance with the design load profile. Operating modes such as vehicle-to-grid, vehicle-to-home etc. are to be modeled here.
The power supply for all voltage levels relevant to the component (low-voltage on-board electrical system, HV-AC and HV-DC) and, if applicable, the bus activity shall be simulated according to the real situation in the vehicle.

### 2.2.1.3.2.7 Off-Grid Parking Mode (STM-7756808)

STM-7756809 This operating mode is intended to simulate how the component actually operates in the vehicle during off-grid parking.
The power supply for all voltage levels relevant to the component (low-voltage on-board electrical system, HV-AC and HV-DC) and, if applicable, the bus activity shall be simulated according to the real situation in the vehicle.

### 2.2.1.3.2.8 Operating mode: Test Operation$_{min}$ (STM-7756811)

STM-7756812 In addition to the aforementioned operating modes, which simulate real operating situations in the vehicle, a synthetic test operating mode is required for individual tests in which voltage is applied to as many live parts and component elements of a component as possible during the test, but no significant self-heating occurs. The DUT shall here be operated in such a way that minimum power dissipation is generated (for example by reducing the continuous output power or by reducing external loads to the bare minimum). If energizing certain areas or voltage circuits leads to significant self-heating due to power dissipation, these areas shall, as an exception, not be energized in the 'Test operation$_{min}$' operating mode.
The power supply for all voltage levels relevant for the component (low-voltage on-board electrical system, HVAC and HVDC) shall be applied and, if applicable, the bus activity shall be simulated.

### 2.2.1.3.3 Parameter Test and Parameter Monitoring (STM-869248)

### 2.2.1.3.3.1 Parameter Test (STM-869247)

STM-869252 For a systematic and reproducible evaluation of the function of the DuTs, a set of sensitive parameters (so-called "key parameters") shall be defined. These are, for example, no-load current consumption, operating currents, output voltages, transition resistances, input impedances, signal rates (rise and fall times) and bus specifications.

STM-869249 The component specific key parameters, including their specification limits, shall be recommended by the contractor, coordinated with the client, and documented.

STM-869253 The parameter check shall be carried out immediately upon completion of the previously performed test.
The time between the end of the previous test and execution of the parameter test shall be documented in the test report.

#### 2.2.1.3.3.1.1 P-01 Parameter Test (Function Test) (STM-869250)

STM-869251 The key parameters shall be measured at one specified temperature and at each of the voltage levels $U_{Bmin}$, $U_B$ and $U_{Bmax}$. For components with HV supply, this parameter test shall be carried out at $U_{Bmin}$ with $U_{Bmin,HV}$, at $U_B$ with $U_{B,HV}$ and at $U_{Bmax}$ with $U_{Bmax,HV}$.
The basic functionalities of the DuTs shall be measured. For components with fault memory, the content of the fault memory shall be read out.

#### 2.2.1.3.3.1.2 P-02 Parameter Test (Small) (STM-869254)

STM-869255 The key parameters shall be measured and the functional behavior of the DUTs checked at $T_{RT}$ and $U_B$.
For components with fault memory, the content of the fault memory shall be read out.
For components connected to a coolant circuit, this parameter test shall be carried out at $T_{RT}$ with $T_{cool,nom}$.
For components with a HV power supply, this parameter test shall be performed at $U_B$ with $U_{B,HV}$.
In addition, the components shall be checked for external damage/changes such as cracks, chipping/peeling, discoloration, deformation etc. by visual testing according to DIN EN 13018 and without opening the DuT.
All results shall be documented in the test report.

#### 2.2.1.3.3.1.3 P-03 Parameter Test (Large) (STM-869258)

STM-869256 The key parameters shall be measured and the functional behavior of the components measured at temperatures $T_{max}$, $T_{RT}$ and $T_{min}$ at each of the voltages $U_{Bmin}$, $U_B$ and $U_{Bmax}$. In addition, a leak test shall be performed at $T_{RT}$ as per Chapter "Leak Test" of [MBN 50306].
For components with fault memory, the content of the fault memory shall be read out.
For components connected to a coolant circuit, this parameter test shall be performed at $T_{RT}$ with $T_{cool,nom,}$ at $T_{max}$ with $T_{cool,max}$ and at $T_{min}$ with $T_{cool,min}$.
For components with HV supply, this parameter test shall be carried out at $U_{Bmin}$ with $U_{Bmin,HV}$, at $U_B$ with $U_{B,HV}$ and at $U_{Bmax}$ with $U_{Bmax,HV}$.
In addition, the DUTs shall be checked for external damage/changes such as cracks, chipping/peeling, discoloration, deformation, etc. by visual inspection in accordance with DIN EN 13018 and without opening the DUTs.
The DUTs shall be manually shaken to check for loose internal parts.
All results shall be documented in the test report.

### 2.2.1.3.3.2 Continuous Parameter Monitoring with Drift Analysis (STM-869257)

STM-869263 A set of key parameters to be monitored continuously throughout the entire tests, e.g. by computer-controlled data acquisition system, shall be defined by the contractor. The necessary sampling rates and resolutions of measured values therefore shall be adapted to the signal alteration rate of the respective measured value and shall be chosen in a way that functional deviations are detected. For components with fault memory, the fault memory shall be monitored continuously and all entries shall be documented.
The data acquired from continuous parameter monitoring shall be examined for trends and drifting to detect abnormalities, aging or malfunctions. Detected abnormalities, aging effects or malfunctions shall be documented in the test report and evaluated

### 2.2.1.3.3.3 Sampling Rates and Measured Value Resolutions (STM-869260)

STM-869259 The sampling rate and bandwidth of the measuring system shall be adapted to the respective test.
It shall be ensured that functionally relevant peaks (temporary positive/negative deviation) are detected and recorded.
The resolution of the measured values shall be adapted to the respective test.

### 2.2.1.3.3.4 Leak Test (STM-869261)

STM-869262 A leak test is used to verify adherence to the limit leak rate for a component's electronics compartment that was specifically defined for the component.
During the measurement on the DuT, the air leak rate is to be determined by means of usual measuring methods (e.g. absolute pressure-, differential pressure-, mass flow- or volumetric flow rate measurement).

STM-869264 Therefore, the component is exposed to a defined test pressure using an access (e.g. DAE); after a settling time, the air leak rate is recorded.

STM-869265 Component-specific leak rate limit: 1 $cm^3$ / min at 0,5 $bar_{rel}$

STM-869268 As design and application determine the pressure of a medium the component is exposed to in the field, the test pressure shall be selected in such a way that it corresponds to the most stringent application in the field. This may also be a vacuum. If it is to be assumed that the sealing system behaves differently at overpressure and vacuum (e.g. pressing on sealing lips), the test shall be performed with overpressure and vacuum. The test pressure to be applied (typically 0.5 $bar_{rel}$) shall be agreed between contractor and client and then documented.

STM-869273 The leak test shall be conducted as part of the P-03 parameter test (large) at $T_{RT}$. During the measurement, the DuT shall not be exposed to temperature fluctuations. The measured air leakage rate shall not exceed the component-specific limit leakage rate, and shall be documented in the test report. Changes in the air leak rate shall be evaluated and documented in the test report.

### 2.2.1.3.3.5 Physical Analysis (STM-869269)

STM-869271 After all test sequences have been carried out, a physical analysis shall be performed on all DUTs. For this purpose, all DuTs shall be opened and subjected to a visual inspection in accordance with DIN EN 13018.
Further inspection methods required for the physical analysis as per Annex H shall be agreed between the Client and the Contractor and documented.
If a DuT reveals abnormalities, subsequent analysis using additional analysis methods shall be agreed with the Client.
All results of the physical analysis shall be documented and evaluated in the test report.

STM-7841346 The Contractor shall carry out and document a systematic risk evaluation in a suitable form, e.g. by means of a design FMEA, for all anomalies that occur during the entire environmental qualification process.
This also applies to anomalies that have not yet led to functional faults during the environmental tests (e.g. cracks in solder joints, infiltration of seals, incipient electrocorrosion or electromigration, etc.).
The Contractor shall confirm with the risk evaluation that the component can withstand the stresses encountered in the field both reliably and without faults, taking into account the use profile. Failing this, the Contractor shall propose measures and agree on them with the Client.

### 2.2.1.3.4 Tests (STM-869270)

STM-869272 The following environmental tests define a minimum scope of tests, the result of which is necessary for the client's approval decision. They serve to verify the basic automotive suitability of the component. This minimum scope of tests does not release the contractor from developing and validating the component with regard to the application profile, so that it withstands the load in the field without any failure.

STM-869274 The details described in the other applicable document [MBN 50306] shall be taken into account during the execution of the tests.

STM-869276 If the present Component Requirement Specifications describe several variants of a component, the following tests shall be carried out for each variant using the number of DuTs required for each. Deviations from this requirement shall be agreed between contractor and client prior to contract award and documented in the tender.

STM-869278 The tests shall be carried out in the order specified in the Chapter "Test Sequence Plan". Tests that are not described below and are therefore not required for the component do not have to be carried out.

STM-869275 The standards cited in the following tests are referenced as Other Applicable Documents in [MBN 50306].

#### 2.2.1.3.4.1 M-03 Dust Test (STM-869308)

##### 2.2.1.3.4.1.1 Test (STM-869309)

STM-869311 The test shall be conducted in accordance with Chapter "M-03 Dust Test" in [MBN 50306] with the following parameters:

STM-869312 Operating mode of the DUT: Vehicle assembly

STM-869316 Protection class to be achieved: IP X6K

STM-869315 Number of DuTs: 6

STM-869317 Note: When performing the test, the installation position of the component in the vehicle shall be simulated. The test setup (installation position, covers, trim, situation during operation) shall be recommended by the contractor, coordinated with the client, and documented.

##### 2.2.1.3.4.1.2 Requirement (STM-869314)

STM-869318 The protection class required by [ISO 20653] shall be achieved.

STM-869323 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is done by means of a P-02 parameter test (small) as per the Chapter “Parameter Test” in [MBN 50306].

STM-869321 In addition, the DuT shall be evaluated visually with the naked eye.

STM-869320 Changes/damage shall be documented in the test report and evaluated with the client.

### 2.2.1.3.4.2 M-04 Vibration Test (STM-869319)

#### 2.2.1.3.4.2.1 Test (STM-869324)

STM-869328 Operating mode of the DuT:
Test operation$_{min}$ & Driving (see Fig.)

STM-869326 Superimposed temperature profile: Repeating as per the following figure

STM-869327

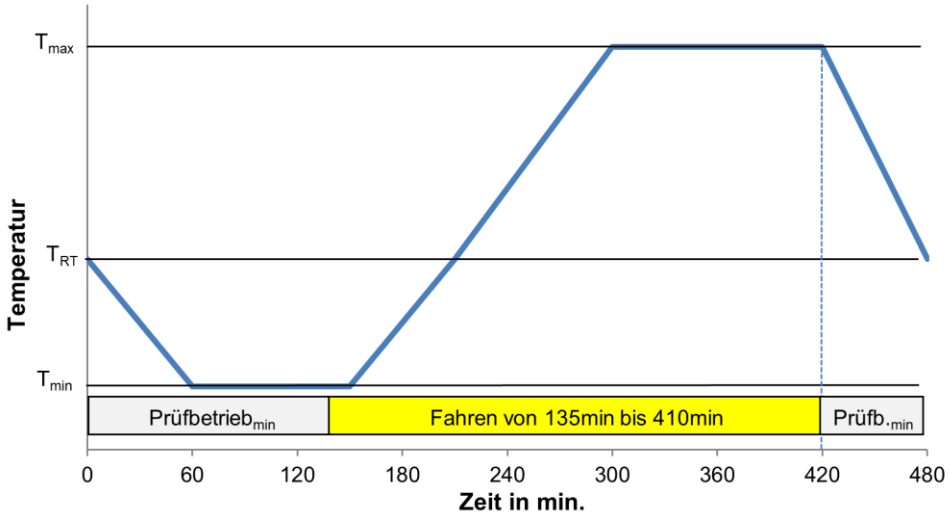



Figure: Temperature profile – vibration

STM-869333 Frequency sweep time for sinusoidal excitation:
0.5 octave/min, logarithmic

STM-869339 The test shall be carried out without brackets or attached parts.
For connected lines (e.g. electrical lines, coolant hoses, hydraulic lines, etc.), the first attachment point shall be simulated on the test set-up as per the installation situation in the vehicle.

STM-869343 Any additional tests that include brackets/attached parts shall be coordinated with the client as required.

STM-869348 The sampling rate shall be selected such that open circuits and short circuits will be detected with absolute certainty.

STM-869331 Number of DuTs: 6

STM-869340 Components which are mounted on an electrical machine shall be tested according to vibration profile F as a minimum. However, this test profile does not include specific vibration loads generated by an electrical machine. Such specific vibration loads may, however, occur in practice and place stress on the component. Therefore, the specific vibration loads originating from an electrical machine shall be included in the test. Measurements on the respective electrical machine are necessary for this purpose.

STM-869325 The test shall be applied in accordance with the Chapter “M-04 Vibration Test” of [MBN 50306] with the following parameters:

#### 2.2.1.3.4.2.2 Vibration Profile D (Components Mounted on Sprung Masses (Body)) (STM-7699960)

#### 2.2.1.3.4.2.2.1 Vibration Profile D.1 (Components <= 1 kg, Which are Installed on Sprung Masses (Body)) (STM-869390)

STM-869400 Vibration excitation: Broadband random vibration

STM-869402 Test duration for each dimensional axis: 8 h

STM-869403 RMS acceleration: 31.3 m/s²

STM-869401 Vibration profile:
Frequency (Hz) / Power spectral density ((m/s²)²/Hz)
5 / 0.884
10 / 30
400 / 0.2
2000 / 0.2

#### 2.2.1.3.4.2.2.2 Vibration Profile D.2 (Components > 1 kg, Which are Installed on Sprung Masses (Body)) (STM-7671131)

STM-7671132 Vibration excitation: Broadband random vibration

STM-7671133 Test duration for each spatial axis: 27 h

STM-7671134 RMS acceleration: 31.3 m/s²

STM-7671135 Vibration profile:
X-axis - RMS=18.9 m/s$^2$:
Frequency (Hz)/power density spectrum ((m/s²)²/Hz)
5/0.884
10/10
400/10
400/0.001
2000/0.001
Y-axis - RMS=13.7 m/s$^2$:
Frequency (Hz)/power density spectrum ((m/s²)²/Hz)
5/0.884
10/5
400/5
400/0.001
2000/0.001
Z-axis - RMS=28.7 m/s$^2$:
Frequency (Hz) / power density spectrum ((m/s²)²/Hz)
5/0.884
10/10
400/10
400/0.003
2000/0.003

#### 2.2.1.3.4.2.3 Requirement (STM-869345)

STM-869344 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is by means of continuous parameter monitoring and a P-03 parameter test (large) as per the chapter "Parameter Test" in [MBN 50306].

STM-869346 In addition, the DuT shall be visually inspected with the naked eye and by shaking for loose or rattling parts.

### 2.2.1.3.4.3 M-05 Mechanical Shock (STM-869429)

#### 2.2.1.3.4.3.1 Test (STM-869431)

STM-869432 The test shall be carried out in accordance with the Chapter “M-05 Mechanical Shock” in [MBN 50306] using the following parameters:

STM-869433 Operating mode of DUT: Driving

STM-869437 Peak acceleration: 500 m/s²

STM-869438 Duration of pulse: 6 ms

STM-869434 Pulse shape: Half-sinusoidal

STM-869435 Number of shocks per direction (±X, ±Y, ±Z): 10

STM-869436 Number of DuTs: 6

#### 2.2.1.3.4.3.2 Requirement (STM-869443)

STM-869440 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is done by means of continuous parameter monitoring and a P-02 parameter test (small) as per the chapter "Parameter Test" in [MBN 50306].

STM-869439 In addition, the DuT shall be visually inspected with the naked eye and by shaking for loose or rattling parts.

### 2.2.1.3.4.4 M-06 Mechanical Shock Endurance (STM-869441)

#### 2.2.1.3.4.4.1 Test (STM-869442)

STM-869446 The test shall be applied in accordance with the Chapter “M-06 Mechanical Shock Endurance” of [MBN 50306] with the following parameters:

STM-869445 Operating mode of DUT: Driving

STM-869447 Peak acceleration: 300 m/s²

STM-869444 Duration of pulse: 6 ms

STM-869448 Pulse shape: Half-sinusoidal

STM-869450 Number of shocks: 55,000
(Installation area: boot lid/tailgate)

STM-869453 Installation position: The DuT shall be located in the appropriate installation position in the vehicle.

STM-869454 Number of DuTs: 6

#### 2.2.1.3.4.4.2 Requirement (STM-869457)

STM-869456 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. The verification is provided via continuous parameter monitoring and a P-02 parameter test (small) as per the Chapter “Parameter Test” of [MBN 50306].

STM-869455 In addition, the DuT shall be visually inspected with the naked eye and by shaking for loose or rattling parts.

### 2.2.1.3.4.5 K-01 High-/Low-Temperature Storage (STM-869466)

#### 2.2.1.3.4.5.1 Test (STM-869467)

STM-869472 The test shall be carried out in accordance with the Chapter “K-01 High/Low Temperature Storage” in [MBN 50306] using the following parameters:

STM-869471 Operating mode of the DuT: Unplugged

STM-869469 Test duration and test temperature: 2 cycles of 24 h (consisting of 12 h storage at $T_{min}$ and 12 h storage at $T_{max}$)

STM-869470 Number of DuTs: see Test Sequence Plan

#### 2.2.1.3.4.5.2 Requirement (STM-869473)

STM-869477 The DuT shall be fully functional before and after the test and all parameters shall meet the specifications. Verification is provided via a P-03 parameter test (large) as per the Chapter “Parameter Test” in [MBN 50306].

STM-869475 In addition, the DuT shall be visually inspected with the naked eye and by shaking for loose or rattling parts.

### 2.2.1.3.4.6 K-02 Multi-Stage Temperature Test (STM-869476)

#### 2.2.1.3.4.6.1 Test (STM-869474)

STM-869478 The test shall be carried out in accordance with the Chapter “K-02 Temperature Step Test” in [MBN 50306] with the following parameters:

STM-869480 Operating mode of DUT: Off-grid parking except during parameter test P-01 (function test)

STM-869482 Test temperature: The DuTs shall be subjected to the temperature profile shown in the following figure. Temperature change of 5°C for each stage.

STM-869481 Test sequence: The specimen shall be kept at each temperature stage until complete thermal stability is attained (see Chapter “Attainment of Complete Thermal Stability” in [MBN 50306]).
This shall be followed by a P-01 parameter test (function test) as per Chapter "Parameter Test" in [MBN 50306].

For the basic temperatures $T_{min}$, $T_{RT}$ and $T_{max}$, as well as for liquid cooled components with the temperatures $T_{cool,\ min}$, $T_{RT}$ and $T_{cool,\ max}$ the P-01 parameter test (function test) shall be carried out with the three voltages $U_{Bmin}$, $U_B$ and $U_{Bmax}$ in line with the P-03 parameter test (large).

STM-869479 Number of DuTs: see Test Sequence Plan

STM-869483

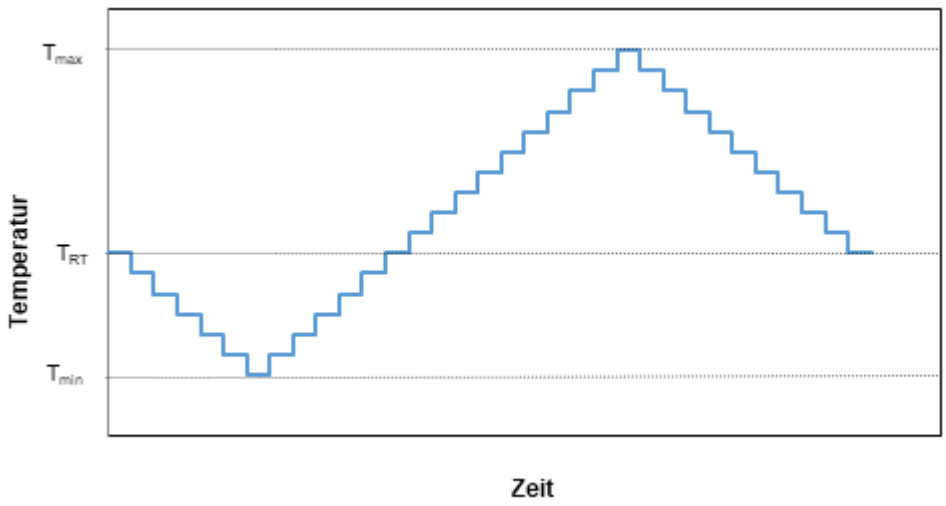



Figure: Temperature profile – Temperature step test

### 2.2.1.3.4.6.2 Requirement (STM-869484)

STM-869485 Each P-01 parameter test (function test) for the DuT shall show that all parameters lie within specification.

### 2.2.1.3.4.7 K-03 Low-Temperature Operation (STM-869488)

### 2.2.1.3.4.7.1 Test (STM-869487)

STM-869491 The test shall be conducted in accordance with the Chapter “K-03 Low Temperature Operation” in [MBN 50306] with the following parameters:

STM-869489 Operating mode of DuT:
12 h Off-grid parking (for terminal 30 components at $U_{Bmin}$)
12 h operating mode with highest functionality/typical load at $U_{Bmin}$
12 h Off-grid parking (for terminal 30 components at UB)
12 h operating mode with the highest functionality/typical load at $U_B$

STM-869490 Test duration: 48 h

STM-869492 Test temperature: $T_{min}$

STM-869493 For components with high power dissipation, a rise in the test chamber temperature due to self-heating above $T_{min}$ is allowed for this test in operating mode $Operating_{max}$ if agreed between contractor and client.

STM-869498 Number of DuTs: 6

#### 2.2.1.3.4.7.2 Requirement (STM-869494)

STM-869495 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. The verification is provided via continuous parameter monitoring and a P-02 parameter test (small) as per the Chapter “Parameter Test” of [MBN 50306].

### 2.2.1.3.4.8 K-05 Thermal Shock (Component) (STM-869507)

#### 2.2.1.3.4.8.1 Test (Air–Air, as per [DIN EN 60068-2-14] Na) (STM-869506)

STM-869513 The test shall be conducted in accordance with the Chapter “K-05 Thermal Shock (Component)” in [MBN 50306] using the following parameters:

STM-869509 Operating mode of the DuT: Vehicle assembly

STM-869510 Lower temperature: $T_{min}$

STM-869511 Upper temperature: $T_{max}$

STM-869512 Holding time at upper/lower temperature: 15 min after attainment of complete thermal stability (see Chapter “Attainment of Complete Thermal Stability” in [MBN 50306])

STM-869515 Transition time : ≤ 30 s

STM-869518 Test: As per [DIN EN 60068-2-14] Na

STM-869517 Number of cycles: 100

STM-869514 Number of DuTs: 6

##### 2.2.1.3.4.8.1.1 Requirement (STM-869516)

STM-869521 The DuT shall be fully functional before and after the test and all parameters shall meet the specifications. Verification is provided via a P-03 parameter test (large) as per the Chapter “Parameter Test” in [MBN 50306].

### 2.2.1.3.4.9 K-06 Salt Spray Test, Operating, Exterior (STM-869537)

#### 2.2.1.3.4.9.1 Test (STM-869534)

STM-869538 The test shall be conducted in accordance with Chapter "K-06 Salt Spray Testing, Operating, Exterior" in [MBN 50306] with the following parameters:

STM-869535 Operating mode of DUT:
During the spraying phase: Intermittent 1 h Off-grid parking and 1 h Driving
For components that are not actively operated when driving, the Charging operating mode shall be used instead of the Driving operating mode.
During the rest phase: Off-grid parking
If necessary for occupational safety reasons, the test may be carried out on HV components without HV voltage applied.

STM-869536 Test temperature: 35°C

STM-869540 Test cycle: Each test cycle consists of an 8 h spray phase and a 4 h rest phase as per the following figure.

STM-869542 Number of test cycles:
12 cycles

STM-869543 Number of DuTs: 6

STM-869541 When performing the test, the installation position of the component in the vehicle shall be simulated.

STM-869547

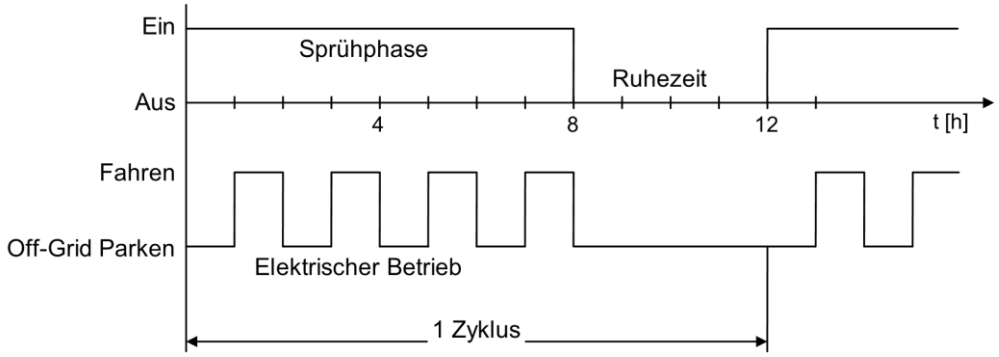



Figure : Salt spray test, operating, exterior - spray phases

### 2.2.1.3.4.9.2 Requirement (STM-869544)

STM-869548 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. The verification is provided via continuous parameter monitoring and a P-02 parameter test (small) as per the Chapter “Parameter Test” of [MBN 50306].

### 2.2.1.3.4.10 K-09 Damp Heat, Cyclic (with Frost) and Condensation (STM-869574)

### 2.2.1.3.4.10.1 Test (STM-869577)

STM-869575 The test shall be performed as per the Chapter “K-09 Damp Heat, Cyclic (with Frost)” in [MBN 50306] using the following parameters:

STM-869576 1) Moist heat, cyclic test 2 as per ISO 16750-4
Operating mode:
Intermittent, 40 min Off-grid parking and 10 min Test operation$_{min}$.
A P-01 parameter test (function test) shall be carried out at the start of the operating phase with Test operation$_{min}$ .

STM-869578 2) Moist heat, cyclic test 3 as per ISO 16750-4
Operating mode:
Test operation$_{min}$, except during the P-01 parameter test (function test) at $U_B$ after reaching the maximum temperature

STM-869579 3) Condensation type B as per ISO 16750-4
Operating mode:
Test operation$_{min}$, except during the P-01 parameter test (function test) at $U_B$ after reaching maximum temperature and humidity

STM-869580 The three partial tests shall be carried out immediately after each other in the stated sequence.
The function test shall be carried out for the shortest possible duration and with the lowest possible power dissipation in order to avoid self-heating of the DUT.

STM-869583 When performing the test, the installation position of the component in the vehicle shall be simulated.

STM-869582 Number of DuTs: 6

#### 2.2.1.3.4.10.2 Requirement (STM-869584)

STM-869587 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is by means of continuous parameter monitoring and a P-03 parameter test (large) as per the chapter "Parameter Test" in [MBN 50306].

### 2.2.1.3.4.11 K-10 Water Protection – IPX0 to IPX6K (STM-869585)

#### 2.2.1.3.4.11.1 Test (STM-869588)

STM-869586 The test shall be conducted in accordance with Chapter "K-10 Water Protection – IPX0 to IPX6K" in [MBN 50306] using the following parameters:

STM-869591 Operating mode of DuT: Intermittent, 1 min Test operation$_{min}$ and 1 min Driving mode
If necessary for occupational safety reasons, the test may be carried out on HV components without HV voltage applied.

STM-869589 Required protection class: IP X6k

STM-869592 When performing the test, the installation position of the component in the vehicle shall be simulated.

STM-869590 Number of DuTs: 6

#### 2.2.1.3.4.11.2 Requirement (STM-869593)

STM-869596 The protection class required by [ISO 20653] shall be achieved.

STM-869595 There shall be no water ingress into the component. The DuT shall not be opened until completion of the entire test sequence.

STM-869597 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is done by means of continuous parameter monitoring and a P-02 parameter test (small) as per the chapter "Parameter Test" in [MBN 50306].

### 2.2.1.3.4.12 K-11 High-Pressure/Steam Jet Cleaning (STM-869594)

#### 2.2.1.3.4.12.1 Test (STM-869598)

STM-869600 The test shall be conducted in accordance with Chapter "K-11 High-Pressure/Steam-Jet Cleaning" in [MBN 50306] using the following parameters:

STM-869601 Operating mode of DUT: Off-grid parking

STM-869602 Required protection class: IP X9K

STM-869599 Water pressure: The steam jet shall have a minimum pressure 10,000 kPa (100 bar) as measured directly at the nozzle.

STM-869603 Water temperature: 80 °C

STM-869607 Procedure: During the test, the installation position of the component in the vehicle shall be simulated. The DuT shall be sprayed from every freely accessible direction around the vehicle.

STM-869605 Number of DuTs: 6

#### 2.2.1.3.4.12.2 Requirement (STM-869604)

STM-869606 The required degree of protection IP X9K as per ISO 20653 [ISO 20653] shall be achieved.

STM-869608 There shall be no water ingress into the component. The DuT shall not be opened until completion of the entire test sequence.

STM-869610 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. The verification is provided via continuous parameter monitoring and a P-02 parameter test (small) as per the Chapter “Parameter Test” of [MBN 50306].

### 2.2.1.3.4.13 K-14 Damp Heat, Steady State (STM-869647)

#### 2.2.1.3.4.13.1 Test (STM-869649)

STM-869652 The test shall be carried out in accordance with the Chapter “K-14 Damp Heat, Steady State” in [MBN 50306] with the following parameters:

### 2.2.1.3.4.13.2 Standard Test Sequence (STM-869651)

STM-869650 Operating mode of DuT: Intermittent operation, 47 h 'off-grid parking' and 1 h 'test $mode_{min}$' repeated for entire duration of test.
A parameter test P-01 (function test) shall be carried out half way through the 1 h 'test $mode_{min}$' phase.

STM-869653 Test duration: 1596.0 h

STM-869655 Test temperature: 65° C

STM-869657 Test humidity: 93% relative humidity

STM-869654 Number of DuTs: 6

STM-869658 Prior to the execution of this service life test, a check shall be conducted to ascertain whether the high test acceleration using the test parameters of 65 °C and 93 % r.h. exceeds the physical limits of the materials used in the component (e.g. hydrolysis of plastics). Where applicable, the contractor and client shall agree to changes in the test temperature and test humidity (e.g. to 55 °C and 93 % relative humidity) while increasing the test duration as per the Lawson model such that the physical limits of the materials used are not exceeded during the test. The overall severity of the testing shall, however, remain unchanged. The test humidity shall not exceed the level of 93 % relative humidity.

STM-869662 It shall be ensured that no condensation occurs on the DuT during the test (including local condensation).

### 2.2.1.3.4.13.3 Requirement (STM-869669)

STM-869672 The DuT shall be fully functional before, during and after the test and all parameters shall meet the specifications. Verification is by means of continuous parameter monitoring and a P-03 parameter test (large) as per the chapter "Parameter Test" in [MBN 50306].

### 2.2.1.3.4.14 K-16 Thermal Shock (without Housing) (STM-869717)

### 2.2.1.3.4.14.1 Test (STM-869718)

STM-869720 The test shall be conducted in accordance with Chapter "K-16 Thermal Shock (Without Housing)" in [MBN 50306] with the following parameters:

STM-869719 Operating mode of the DuT: Unplugged

STM-869722 Lower temperature: $T_{min}$

STM-869721 Upper temperature: $T_{max}$

STM-869723 Holding time at upper and lower temperature: 15 min following attainment of complete thermal equilibrium (see Chapter "Attainment of Complete Thermal Equilibrium" in Annex A of [MBN 50306])

STM-869727 Transition time: ≤ 10 s

STM-869724 Number of cycles: 300

STM-869726 Number of DuTs: 6 electronic assemblies

#### 2.2.1.3.4.14.2 Requirement (STM-869725)

STM-869728 The DuT shall be fully functional before and after the test and all parameters shall meet the specifications. Verification is provided via a P-03 parameter test (large) as per the Chapter “Parameter Test” in [MBN 50306].

### 2.2.1.3.4.15 K-18 Harmful Gas Test (STM-869743)

#### 2.2.1.3.4.15.1 Test (STM-869744)

STM-869747 The test shall be carried out in accordance with Chapter “K-18 Harmful Gas Test” of [MBN 50306] with the following parameters:

STM-869745 Operating mode of the DuT: Vehicle assembly

STM-869746 Temperature: $T_{RT}$

STM-869748 Humidity: 75 %

STM-869753 Corrosive gas concentration:
Sulfur dioxide $SO_2$: 0.2 ppm
Hydrogen sulfide $H_2S$: 0.01 ppm
Nitrogen dioxide $NO_2$: 0.2 ppm
Chlorine $Cl_2$: 0.01 ppm

STM-869749 Test duration: 21 days

STM-869752 Number of DuTs: 6

#### 2.2.1.3.4.15.2 Requirement (STM-869750)

STM-869751 The DuT shall be fully functional before and after the test and all parameters shall meet the specifications. Verification is provided via a P-03 parameter test (large) as per Chapter 5.5 of Annex A of [MBN 50306].

STM-869756 In addition, the contact resistance of switches and contacts shall be measured. The measured values shall meet the specifications.

### 2.2.1.3.4.16 C-01 Chemical Requirements and Tests (STM-869755)

#### 2.2.1.3.4.16.1 Test (STM-869754)

STM-869758 The chemical tests shall be carried out as per the requirements of the section “Resistance to Substances”.

STM-869757 The number of DUTs required to test all necessary chemicals shall be proposed by the Contractor, agreed with the Client and documented.

STM-869761 If the component is not designed to be watertight and chemicals can penetrate, the test shall be carried out on the complete and operating component.
If the component is designed to be watertight, the test can be conducted purely in the form of a material test. Proof of resistance shall be provided for all materials and surface features, such as labeling, that may come into contact with the chemicals.

STM-869759 If the Resistance to Substances section is not included in these component requirement specifications, the chemical test as per ISO 16750-5 shall be carried out. In this case, the scope and execution of the test shall be proposed by the Contractor, agreed with the Client and documented.

#### 2.2.1.3.4.16.2 Requirement (STM-869799)

STM-869802 When testing the complete (non-watertight) component, the DUT shall be fully functional before and after the test and all parameters shall be within the specification. Verification shall be carried out by means of a P-03 parameter test (Large) as per the chapter "Parameter Test" in [MBN 50306].
When carried out as a material test, all material properties relevant to the function of the component shall remain within the specification.
Changes to labels and markings shall be documented in the test report and coordinated with the client.

### 2.2.1.3.4.17 L-02 Durability Test: High-Temperature Endurance Test (STM-869823)

STM-869820 The test shall be carried out in accordance with the Chapter “L-02 Durability Test: High-Temperature Endurance Test” in [MBN 50306] with the following parameters:

#### 2.2.1.3.4.17.1 Test Sequence for Components Not Connected to a Coolant Circuit and Without Reduced Performance at High Temperatures (STM-869822)

STM-869824 Operating mode of DuT: Intermittent, 1 h 'off-grid parking' and 47 h operation as per the operating mode to be validated in each case ('drive', 'charging', 'preconditioning', 'on-grid parking')
During operation, the component shall be operated intermittently in all operating modes relevant to the component ('driving', 'charging', 'preconditioning', 'on-grid parking'). The ratio of the time portions of these operating modes shall correspond to the ratio of the respective partial test durations.

STM-869828 Total test duration: 1477.0 h

The total test duration is the sum of the following partial test durations:

STM-869827 **Duration of Partial Test and Test Temperature for simulating the Driving operating mode:**
Operating mode: 1 h Off-grid parking and 47 h Driving

(Partial test duration/test temperature)

1477.0 h/ 80.0 °C

STM-869836 Number of DuTs: 6

### 2.2.1.3.4.17.2 Requirement (STM-869879)

STM-869880 The DuT shall be fully functional before, during and after the test and all key parameters shall meet the specifications. Verification shall be provided using continuous parameter monitoring. Intermediate measurements at 25%, 50% and 75% of the test duration and parameter tests as per the test sequence plan shall only be carried out if the functions of the component cannot be sufficiently monitored during the test.

STM-869881 The intermediate measurements shall be performed as a P-03 parameter test (large) as per the Chapter “Parameter Test” in [MBN 50306].

STM-869883 The data acquired from continuous parameter monitoring shall be assessed for drifts, trends and conspicuous behavior or anomalies.

### 2.2.1.3.4.18 L-03 Life Test: Temperature Cycle Endurance Test (STM-869887)

STM-869884 The test shall be carried out in accordance with the Chapter “L-03 Life Test: Temperature Cycle Endurance Test” in [MBN 50306] with the following parameters:

#### 2.2.1.3.4.18.1 Test Sequence for Components Not Connected to the Coolant Circuit and without Reduced Performance at Low or High Temperatures (STM-869886)

STM-869893 Operating mode of DuT: Intermittent, operation as per the operating mode to be validated in each case ('drive', 'charging', 'preconditioning', 'on-grid parking') and 'off-grid parking' as per the following figure.

STM-869889 Temperature profile: As per the following figure.

STM-869890 Temperature gradient: 4 °C/min
If the temperature gradient cannot be realized in the test equipment, it can be reduced to a minimum of 2 °C/min in coordination with the client.

STM-869892 Holding times at $T_{min}$, $T_{max}$, $T_{op,min}$ and $T_{op,max}$: 15 min following attainment of complete thermal stability (see Chapter “Attainment of Complete Thermal Stability” in [MBN 50306])

STM-869891 Total number of test cycles: 540.0
The total number of cycles consists of the following partial numbers of cycles:

STM-869898 **Number of partial cycles for simulating the 'Driving' operating mode:**
Operating mode: Intermittent 'off-grid parking' and 'driving'
Number of test cycles: 540.0

$T_{min}$: -40.0 °C
$T_{max}$: 80.0 °C

STM-869903 Number of DuTs: 6

STM-869906

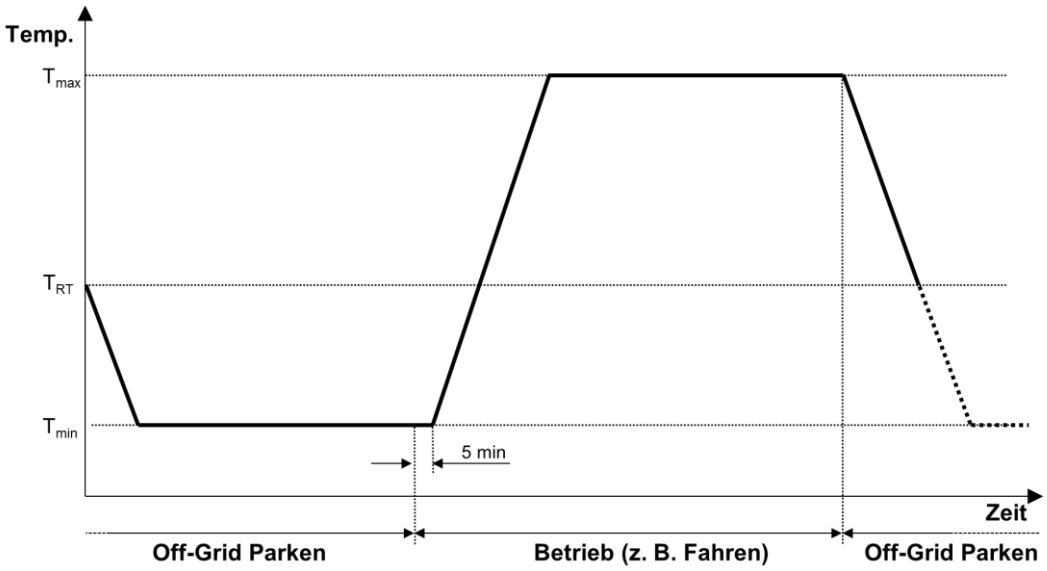



Figure: Temperature profile L-03 Life test: temperature cycle endurance test for components not connected to the coolant circuit and without reduced performance at low or high temperatures

### 2.2.1.3.4.18.2 Requirement (STM-869944)

STM-869945 The DuT shall be fully functional before, during and after the test and all key parameters shall meet the specifications. Verification shall be provided using continuous parameter monitoring. Intermediate measurements at 25%, 50% and 75% of the test duration and parameter tests as per the test sequence plan shall only be carried out if the functions of the component cannot be sufficiently monitored during the test.

STM-869947 The intermediate measurements shall be performed as a P-03 parameter test (large) as per the Chapter “Parameter Test” in [MBN 50306].

STM-869946 The data acquired from continuous parameter monitoring shall be assessed for drifts, trends and conspicuous behavior or anomalies.

### 2.2.1.3.5 Test Sequence Plan (STM-869950)

STM-7841345 The tests shall be carried out in a fixed, prescribed order.
Tests that are not described in the Chapter “Tests” do not have to be carried out.

STM-7785069 All components are tested using new, original contact systems.
Original plugs/cables shall be connected to the DUT before starting a test. These may be disconnected for the physical analysis of a component only after carrying out all tests that are required for the respective components. Tests with Uninstalled operating mode are excluded from this.
The wiring harness used with the contact system shall be designed in such a way that it extends out of the test chamber without the need for any additional intermediate connections.

## 2.2.1.3.5.1 Sequence Tests (STM-869949)

STM-869952

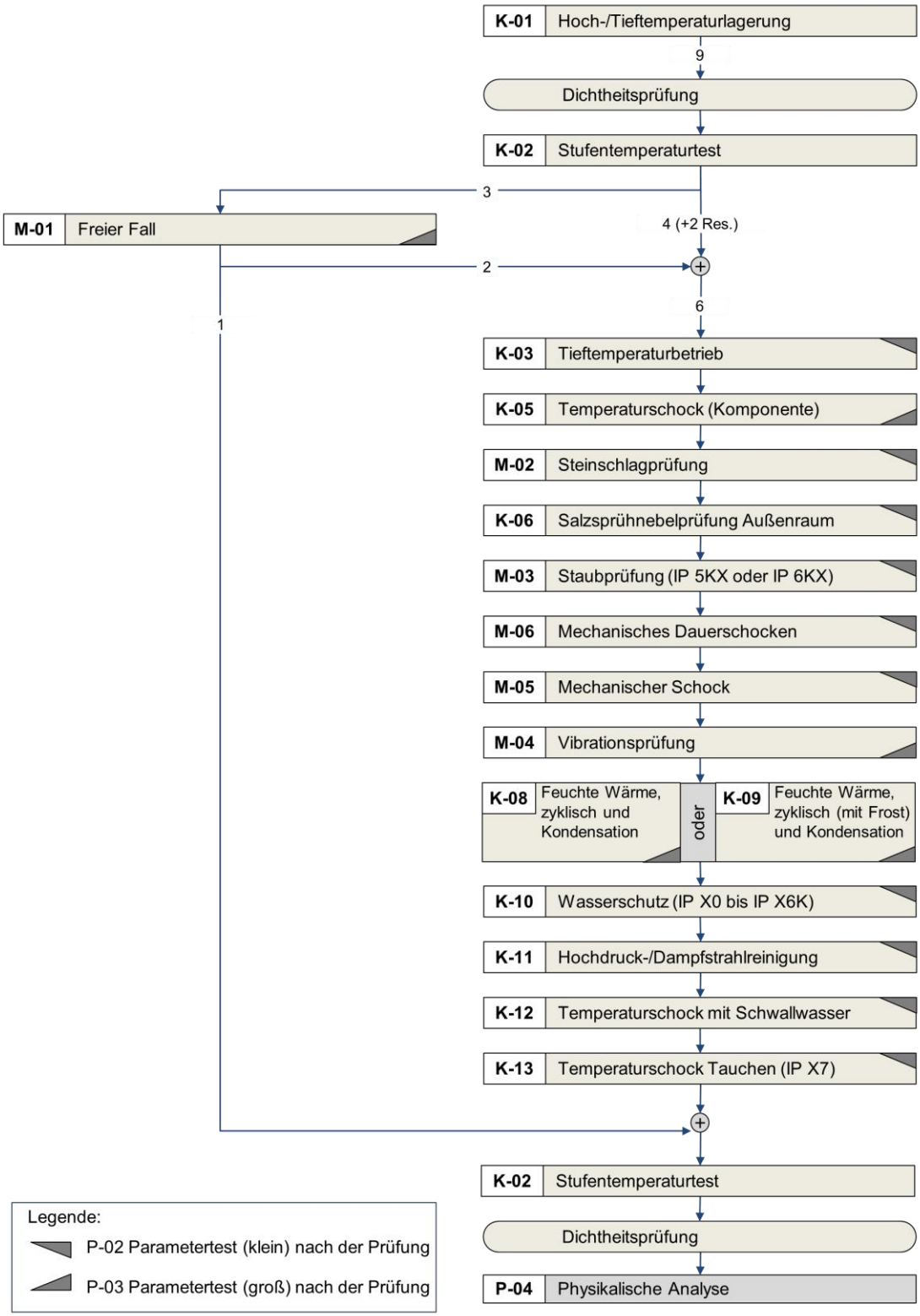



Figure: Test Sequence Plan – Sequential tests

STM-869953 If the DuT is not damaged from the "Free Fall" test M-01, two DuTs shall be used in the further sequence test. Otherwise, the replacement DuTs shall be used.

STM-869951 As of the test M- 01 "Free Fall", all components are tested with original connector or adapter.

### 2.2.1.3.5.2 Tests Outside the Sequence (Parallel Tests) (STM-869954)

STM-869955

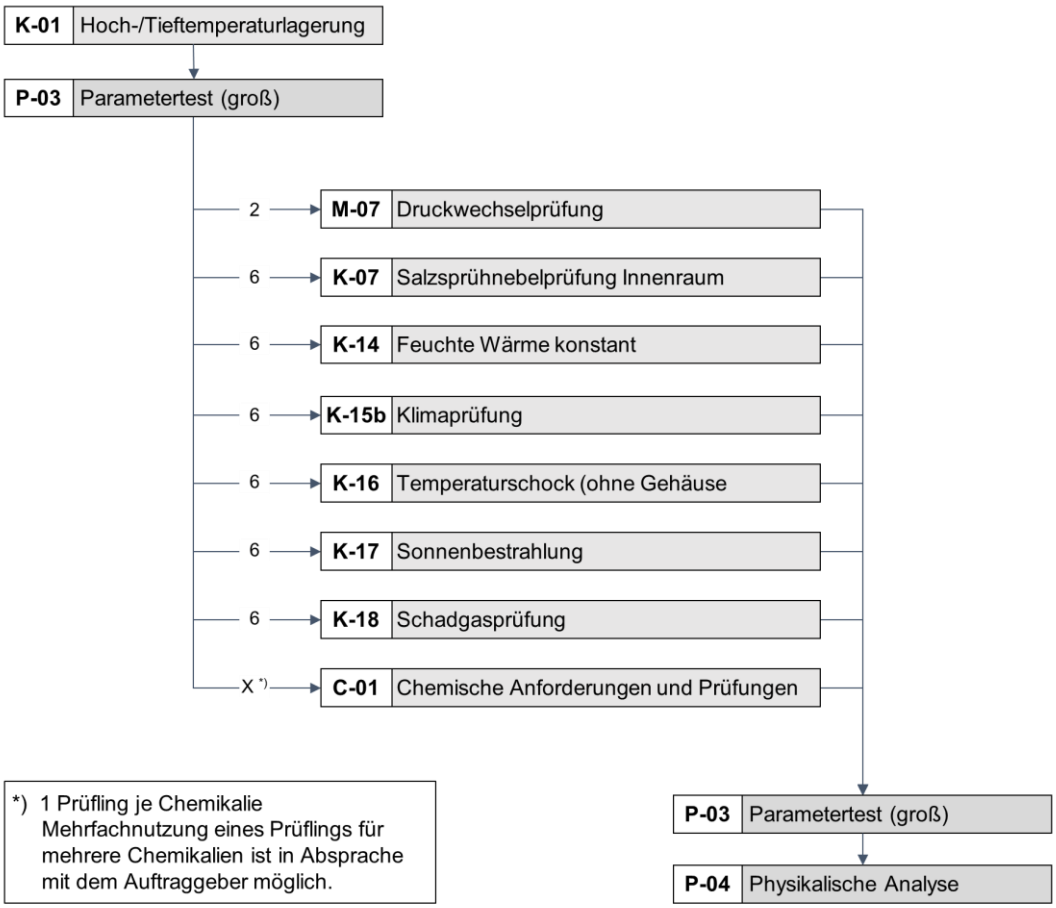



Figure: Test sequence plan – parallel tests

### 2.2.1.3.5.3 Durability Tests (STM-869957)

STM-869956

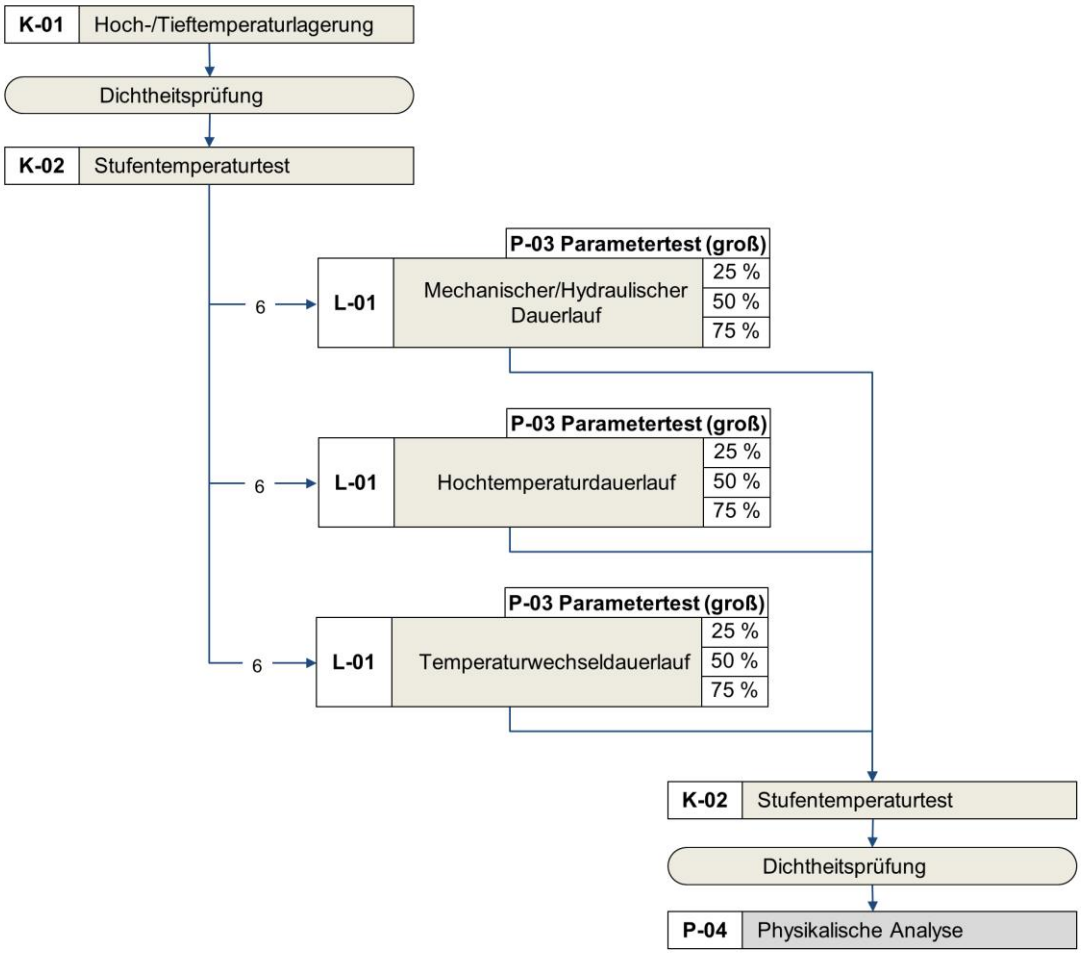



Figure: Test sequence plan – service life

## 2.3 General Requirements for the Component (STM-3496298)

### 2.3.1 Small Parts Optimization (KTO) (STM-3496306)

STM-3496307 To limit the variety of small parts and to safeguard the quality of fastening technologies, the Contractor shall use KTO-approved fasteners.

STM-3496308 The Small Parts Optimization process applies to all fasteners listed by the Client in the product groups in the passenger car KTO catalog and which

STM-3496302 · are identified as fasteners for attaching the component to the body or

STM-3496304 · are designated as spare parts in the event of damage.

STM-3496305 The Contractor is obliged to take all fasteners described in STM-3496306 et seq. from the Client's KTO catalog. Approval by the Client's component manager and KTO is required for fasteners which are not contained in the KTO catalog. This approval shall be issued in written form.

STM-3496300 The KTO catalog is provided as a binding online document through the Client's Supplier Portal. The contractor must gain access to the online document. The KTO catalog for passenger cars shall be used.
See CRCS-334042.

STM-3496301 The Contractor shall ensure that the scope of supply and services fulfills all the common and binding requirements of [MBN 10029] "Characteristics of Fasteners Subject to Verification" for the standard and standard-like fasteners and small parts such as bolts, nuts and similar items described therein. The Contractor shall ensure that its subcontractors (tier-2, tier-3 etc.) are also aware of and comply with [MBN 10029].

### 2.3.2 Specific Material Requirements (STM-3496509)

#### 2.3.2.1 Plastic Parts in Direct Physical Contact with the Customer (STM-3496481)

STM-3496433 The material to be defined shall comply with [DBL 1224].

#### 2.3.2.2 Material Selection for Exterior Components Made of Thermoplastics (STM-3496517)

STM-3496503 When selecting materials for exterior components made of thermoplastics, the Contractor shall select the materials such that the requirements of [DBL 1232] are met.

STM-3496475 When selecting materials for exterior components made of thermoplastics with a metallic coating, the Contractor shall select the materials such that the requirements of [DBL 1665] are met.

#### 2.3.2.3 Verification/Compliance with Substance Bans (STM-3496469)

STM-3496504 Substances that are restricted or prohibited by law may only be contained in the supplied materials or parts if in accordance with applicable regulations (e.g. Prohibited Chemicals Ordinance, End-of-life Vehicle Regulation, REACH Regulation [EG 1907/2006]). The client assumes that the contractor will know and fulfill the obligations according to these regulations. The contractor shall therefore ensure the following:

STM-3496510 The provision of correct and fully completed IMDS Material Data Sheets for components and for all substructure parts identified as replacement parts in the replacement parts system and/or for operating fluids contained therein shall be done free of charge; for new and modified part sampling this shall be done no later than 2 months after the blank release. Incorrect Material Data Sheets (MDBs) will be rejected and shall be corrected by 3 months after the Blank release. For basic release requirements, see IMDS FAQ – IMDS Supplier Information for MDB Test: www.mdsystem.com. Material Data Sheets not yet provided can be subsequently requested. Although in the case of carryover parts, standard parts and KTO parts used in new model series, sampling is not usually required, an MDB for these parts shall be provided upon request.

STM-3496454 Registration, notification and non-approval of substances: The Contractor shall ensure that substances, substances in preparations and substances in products which require registration or approval are only delivered to the Client if they are registered for use by the Client according to Article 5 and Article 6 or Article 7 para. 1 of Regulation [EG 1907/2006], or are approved in accordance with Article 55 et. seq. The Contractor similarly ensures that for substances in products delivered that are subject to a duty of notification in accordance with Article 7 para. 2, the notification is undertaken by themselves or – if the article was not produced or imported by the Contractor – by an upstream supplier, or alternatively, that the substance is registered for the intended usage (Article 7 para. 6). Should substances subject to mandatory registration not be registered, or if substances contained in Annex XIV of Regulation [EG 1907/2006] are not approved for the contractually planned applications at the time of delivery, or if notification according to Article 7 para. 2 has not been provided, the contractor shall be obligated to contact the REACH contact of the client directly at: reach-kontakt@mercedes-benz.com.

STM-3496495 General rule for substances listed in Annex XIV of the REACH Regulation: During initial development of a component part, the substances listed in Annex XIV of Regulation [EG 1907/2006] shall not be used. Should the use of such substances be unavoidable, then this is only permissible if it has been authorized beforehand in writing or in a text provided by the component manager (in coordination with the client's responsible materials department if necessary). By the “sunset date” at the latest, the Contractor shall provide proof to the component manager that the specifications of the REACH regulation have been adhered to, e.g. through proof of application-based approval by the ECHA (European Chemicals Agency) for relevant substances. The list of candidate substances should also be avoided for new developments as a precautionary measure if alternatives exist under technical and economic boundary conditions. Current overview of the candidate list and of Annex XIV are available at the homepage of the ECHA:

- http://echa.europa.eu/web/guest/candidate-list-table and
- https://echa.europa.eu/de/authorisation-list

If a component part contains a substance listed in Annex XIV of Regulation [EG 1907/2006], the Contractor shall immediately inform the component manager or the supplier management contact in order to initiate planning for substitution or for other activities required to achieve compliance with the REACH specifications (e.g. approval of the relevant constituents). Spare parts contractors should contact the corresponding contact in the After-Sales sector on this subject.

STM-3496435 Substances of very high concern (SVHC) in component parts, replacement parts, accessories and packaging: If the delivered parts contain more than 0.1% by weight of substances of very high concern (SVHC) published in what is referred to as the 'candidate list' in accordance with Art. 59 Section 1 of Regulation [EG 1907/2006], the Contractor shall, without specific request, include with delivery all the information required under Art. 33 Section 1 of Regulation [EG 1907/2006]. This also applies if a substance of this kind is first added to the candidate list during the ongoing contractor relationship. The information shall be reported in writing, preferably via the IMDS.

STM-3496518 The contractor shall verify and comply with substance bans under the directive on end-of-life vehicles (e.g. chrome VI-free) in accordance with the agreed transition scenarios.

STM-3496429 The Contractor is responsible for complying with the negative substance list in accordance with [DBL 8585] “Supply Specification – General Requirements – Environmental Protection, Hazardous Substances, Dangerous Goods – Negative Substance List for the Selection of Materials”.

STM-3496513 The contractor shall give recommendations for further reducing interior compartment emissions

### 2.3.2.4 Lead-Free Soldering (STM-3496487)

STM-3496426 For lead and lead compounds in components, the substance prohibition as per End-of-Life Vehicle Directive [2000/53/EG], including all current exemptions, shall be fulfilled.

STM-3496417 In the event of detection of technical risks during development of components, these risks shall be indicated immediately by the contractor.

STM-3496525 The contractor shall provide proof of additional activities for technological validation of lead-free soldering technology.

STM-3496502 In the event of switching later on to lead-free soldering, the contractor is obliged to requalify the component. The contractor shall define the requalification scopes and have them approved by the client. Approval shall only be issued on fulfillment of the component requirement according to the component requirement specifications.

### 2.3.2.5 Life Cycle Assessment to Continuously Improve Products and Production (STM-3496490)

STM-3496445 The Client shall perform life cycle assessments based on [DIN EN ISO 14040] to determine and improve on their overall environmental profile. The contractor shall therefore provide the client on request with information on the relevant products, materials and processes.

STM-3496500 The client ensures that this information will be handled as confidential and will only be used to prepare overall assessments.

STM-3496461 The contractor will do everything possible to obtain such information from sub-contractors (producers of raw materials and semi-finished products, energy suppliers, recyclers of residual materials etc.) The confidentiality declaration shall apply accordingly.

STM-3496456 To ensure a standardized, methodical flow of information, the client offers an introduction to the technique of life cycle assessment. This could allow the parties to perform analyses jointly.

STM-3496483 The data shall be provided in the specified documentation format (VDA data collection format for life cycle assessments). The client and contractor shall reach agreement on the timeframe and on the quality of the data.

### 2.3.3 Avoidance of Unexpected Noises (STM-3496590)

STM-3496589 No unexpected noise may be emitted under any circumstances regardless of the various atmospheric influences.

STM-3496591 Noise reduction measures, such as material coupling, anti-creak grain, buffer, or 2-component contact surfaces/strips, shall be taken into consideration with regard to both design and cost. Such measures shall be implemented as required to prevent disturbing noises both within and between the components. Appropriate measures shall be provided for in the basic concept. The concepts shall be coordinated with the client.

STM-3496592 Noises by relative motions of adjoining components shall not arise. If risks exist in the development process due to material combinations or tolerance overstepping or the original dimensioning with consideration of manufacturing tolerances, these are to be pointed out and clarified with the client. If it should come to a customer-relevant noise creation after component release/approval in the vehicle, the contractor shall verify the technical conformity of its component as well as coordinate and introduce safeguarding measures.

### 2.3.4 Tolerances (STM-3496796)

STM-3496820 The contractor shall take the following general tolerance requirements into consideration.

STM-3496830 *The client specifies the tolerance concept by means of the mounting concept and the tolerance specification.*

STM-3496790 The Contractor shall evaluate the tolerance concept for the component with respect to feasibility. The tolerance concept shall be coordinated with the Client prior to completion of awarding the contract.

STM-3496817 The Contractor shall validate all components with regard to single part and assembly tolerances using suitable 3D tolerance
simulations. The Contractor shall coordinate with the Client on the simulation assumptions.

STM-3496828 All explicitly toleranced geometry elements are, in the sense of the tolerance specification and the [ALD00001275] (MBST Section 13/19), the characteristics for verifying process capability.
The target of each optimization loop is that a mean value calculated on a basis of at least 5 measured parts is at the tolerance center.

STM-3496810 Prior to submitting the tender, the Contractor shall consult with the Client's component manager in relation to any deviations. (discussing the issue only with the Purchasing department is not enough).

STM-3496819 During the manufacturing of components, the contractor shall observe the tolerance specifications in accordance with MB standards.

STM-3496815 The contractor shall document the tolerance specification in the drawing or the data record.

### 2.3.4.1 Body Assembly/Joining Process (STM-3496799)

STM-3496802 The Contractor shall provide suitable tolerance compensation geometries for single parts and assemblies. Tension-free assembly/installation shall be ensured.

### 2.3.4.2 Reference Points for Single Parts and Assemblies (STM-3496818)

STM-3496801 A datum system with at least six reference points according to the 3-2-1 principle shall be implemented for dimensionally stable component parts. More than six reference points can be used for component parts that are not dimensionally stable. The clamping forces that occur shall be measured and the clamping conditions documented on the drawing.

STM-3496827 The alignment plan (mounting and centering) of components in the vehicle shall be used for mounting in the measuring devices.
The Contractor shall agree on a deviating alignment plan with the Client's component manager

STM-3496807 The reference points shall be identical in the tool, in the installation process and in the measuring equipment in terms of location and direction.

STM-3496814 The Contractor shall execute the alignment geometry in line with the datum system such that positioning precision along the process chain is guaranteed through the avoidance of reference point changes in assembly production.

### 2.3.4.3 Tolerancing and General Tolerance (STM-3496809)

STM-3496826 Tolerancing of single parts and assemblies shall be carried out in accordance with the applicable MB standards:

STM-3496812 · [MBN 51012-1] Geometric Product Specification (GPS)

STM-3496825 · [MBN 51012-30] Plastic Parts

STM-3496804 This list only covers the most common MB standards. In individual cases, agreement between Client and Contractor is required.

STM-3496792 The final decision is made by the client. The standards shall be documented in the master data and on the drawing.

### 2.3.5 Tool Management (STM-3496833)

STM-3496838 When selecting the tool concept, the contractor shall give consideration to technical and scheduling factors as well as to the quantities involved and to economic optimization.

STM-3496839 The contractor shall coordinate the selected tool concepts with the client. To this end, technical documentation and data, e.g. tool design, mold flow simulations, drawing simulations, operations plans etc., shall be made available on request to the client's experts.

STM-3496834 Furthermore, the contractor shall check whether the use of innovative tool system technologies and the associated formation of parts families via changing systems is possible and coordinate usage with the client.

STM-3496841 Tool supplier definition, tool production and tracking (tool controlling) are coordinated with the client.

STM-3496832 The corresponding schedules (see chapter "Scheduling in the Project" CRCS-3339913) shall be maintained by the contractor and shall be submitted to the client at regular intervals or in the event of changes.

STM-3496831 The contractor shall design the tools in such a way that modifications are possible inexpensively.

STM-3496835 Examples: layout of fastening points, introduction of wheel, additional ribbing or stiffening measures, corrugation etc.

STM-3496837 The requirements of [MBST] Part “31: Tools for Series Production Part and Replacement Part Delivery” (see Chapter “Common Requirements”) additionally apply.

STM-3496840 Tool configuration and design, as well as the process steps required to manufacture the components, shall be 100% identical at all locations around the world. Any deviations from the specified tool and process requirements shall require the approval of the client's Development, Purchasing and Quality departments.

## 2.4 Electromagnetic Compatibility (EMC) (STM-867664)

STM-867665 **Contact for EMC**
Passenger Cars: Email: emv-team@mercedes-benz.com
VAN: Email: van-emc@mercedes-benz.com

### 2.4.1 General EMC Requirements (STM-867667)

STM-867668 The overall scope of the measuring methods and measurement setups, as well as limit values, are described in [MBN 50284-1] and [MBN 50284-2]. The severity levels and test parameters shall be coordinated with the Client's Development and EMC departments.

STM-867666 A test plan shall be created by the contractor. The test plan shall be approved by the Client's EMC department prior to component testing.

STM-3680865 A template for the test plan and component test report can be requested from the Client's EMC department.

STM-867669 On completion of the tests, the component test report shall be sent to the persons responsible in the Client's Development and EMC departments.

STM-3680867 The component test report shall be approved by the Client's EMC department prior to vehicle testing.

STM-3680868 Initial EMC component tests shall be carried out with B-samples.

STM-3680869 The results are to be made available to the client.

STM-3680870 The details shall be agreed between the contractor and the client, at the latest by the submission date for the agreed test plan.

STM-867670 Due date for the agreed test plan: » Deadline is set for Concept Review 1 «

STM-867673 Due date for component test report: »15 months before SOP«

STM-867671 The final approval of the component is based on the vehicle measurement results.

STM-867675 *For further questions, please contact the Client's EMC department.*

### 2.4.2 Components with Bus Systems (CAN, LIN, FlexRay, Ethernet ...) (STM-867676)

STM-867677 To ensure the operability of the bus systems, the buses shall not be impaired or even blocked during any of the interference resistance tests.

### 2.4.3 ESD Requirements (STM-867674)

#### 2.4.3.1 General (STM-867678)

STM-867681 For ESD-compliant production/assembly of ESD-sensitive components, verification in the form of an ESD audit shall be provided (specified in [MBN 10447]).

STM-867683 ESD-sensitive components (for classification, see Chapter “Classification Regarding Electrostatic Sensitivity” under STM-867680) shall be handled and packaged so as to protect against ESD.

STM-867679 The ESD requirements for the packaging of series production parts and replacement parts are described in STM-867505 Chapter “Storage Life, Packaging and Transportation”.

#### 2.4.3.2 Classification of Electrostatic Sensitivity (STM-867680)

STM-867682 The component is electrostatically sensitive
»Yes«

## 2.4.4 Test Conditions (STM-867685)

### 2.4.4.1 Operating States (STM-867686)

STM-867688 The component shall be tested under the following operating states:

STM-867684

| Name of the operating state | Description of the operating state |
|---|---|
| LIGHT FUNCTIONS ON | System test "HAM + rear lamps"<br>All light functions active in accordance with EE coordination document DUT electrically connected to wiring harness - Normal operation |
| LIGHT FUNCTIONS OFF | System test ITC + rear lamps:<br>All light functions inactive – DUT electrically connected to the wiring harness<br>and CAN communication active |

In general, each lamp variant shall be checked individually!«

STM-867687 Note: The detailed descriptions of the operating state(s) can be matched in the test plan. Changes and additions must be agreed with the client.

### 2.4.4.2 Test Criteria (STM-867689)

STM-867693 The client categorizes possible effects or functional deviations during the test into three different categories (1, 2 and 3) based on their impact on the client.

STM-867691 All effects or functional deviations not specified are automatically classed as category 3.

3021755 ESD test only:
Operating state: LIGHT FUNCTIONS ON (all light functions active) + LIGHT FUNCTIONS OFF (PLUGGED: all light functions not active)
Possible effect:»During the ESD discharge event, a brief deactivation/flashing of the light functions is permissible, however, after the test, each light function shall again be within the specified requirements «
Category: »1«

STM-867692 Note: Other possible effects and the corresponding categories can be added in the test plan. Changes and additions must be agreed with the client.

### 2.4.5 EMC Requirements – Component Tests (STM-867695)

#### 2.4.5.1 RF Emissions – AN test: Artificial Network Measurements (STM-867694)

STM-867697 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON, Light function OFF«

STM-867698 Further details: see [MBN 50284-2] Chapter 6.

#### 2.4.5.2 RF Emissions – RE Test: Measurement with Antennas (STM-867696)

STM-867700 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON, Light function OFF«

STM-867703 Further details: see [MBN 50284-2] Chapter 9.

#### 2.4.5.3 RF Emissions – NFA Test: Antenna Near Field (STM-867699)

STM-867701 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON, Light function OFF«

STM-867702 The following services or bands shall be tested: »AM, FM, DAB, TV«

STM-867706 Test distance of antenna structure to wiring harness: »50 mm, 100 mm and DUT: >>300 mm«

STM-867707 Further details: see [MBN 50284-2] Chapter 10.

#### 2.4.5.4 Transient Emissions – CTE Test: Supply Lines (STM-867713)

STM-867710 The transient emissions shall be measured during the following switching events in the DuT: switch on, switch off, switching of connected actuators.

STM-867711 Further details: see [MBN 50284-2] Chapter 13.

#### 2.4.5.5 RF Immunity – BCI Test: Bulk Current Injection (STM-867712)

STM-867715 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867714 Further details: see [MBN 50284-2] Chapter 15.

### 2.4.5.6 RF Immunity; OPTION 1 – ALSE Test: Antenna Irradiation; OPTION 2 – CRC Test: Reverberation Chamber (STM-867716)

STM-867718 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867717 Additional details can be found in [MBN 50284-2], Chapter 16 (ALSE Test) and Chapter 17 (CRC Test) respectively.

### 2.4.5.7 Transient Immunity – TSUP Test: Supply Lines (STM-867719)

STM-867722 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON«

STM-867725 Further details: see [MBN 50284-2] Chapter 19.

### 2.4.5.8 Transient Immunity – TOL Test: Other Cables (STM-867727)

STM-867726 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON«

STM-867724 Further details: see [MBN 50284-2] Chapter 20.

### 2.4.5.9 Electrostatic Discharge – ESDH Test: Handling Test (STM-867728)

STM-867730 Test Condition of the DuT: power off, DUT disconnected

STM-867733 Discharge Network (ESDH-Test): 150 pF / 330 Ω

STM-867732 Further details: see [MBN 50284-2] Chapter 21.

### 2.4.5.10 Electrostatic Discharge – ESDD Test: Direct Discharge (Powered Up) (STM-867729)

STM-867731 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON«

STM-867735 Discharge Network (ESDD-Test): 330 pF / 330 Ω

STM-867736 Further details, including on discharge points, can be found in , [MBN 50284-2] Chapter 22.

### 2.4.5.11 Electrostatic Discharge – ESDI Test: Indirect Discharge (Powered Up) (STM-867734)

STM-867737 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON«

STM-867738 Discharge Network (ESDI-Test): 330 pF / 330 Ω

STM-867741 Further details, including on discharge points, can be found in [MBN 50284-2] Chapter 23.

### 2.4.6 EMC Performance Requirements – Vehicle Tests (STM-867739)

STM-867740 *The vehicle tests are performed by the client.*

### 2.4.6.1 RF Emissions – CISPR25 Test: Measurement on Vehicle Antennas (STM-867743)

STM-867742 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON, Light function OFF«

STM-867745 Further details: see [MBN 50284-1] Chapter 5.

### 2.4.6.2 RF Emissions – REF Test: Reference Receiver Measurement (STM-1235373)

STM-1235381 Operating states of the DuT during the test (defined in the Chapter “Operating States”): “Light function ON”

STM-1235385 Further details: see [MBN 50284-1] Chapter 6.

### 2.4.6.3 RF Emissions – CISPR12 Test: Measurement with External Antenna (STM-867747)

STM-867746 The operating states of the vehicle during the test are defined in CISPR12:

- With battery on but engine off
- With engine on (running)

3021784 Light function ON

STM-867744 Further details: see [MBN 50284-1] Chapter 7.

### 2.4.6.4 Magnetic Field Emissions – MFE Test (STM-867748)

STM-867752 The vehicle operating states during the test are defined in Chapter 8 of [MBN 50284-1].

STM-867753 Further details: see [MBN 50284-1] Chapter 8.

### 2.4.6.5 HF Immunity; OPTION 1 – OVRS Test: External Transmitters; OPTION 2 – RC Test: Reverberation Chamber (STM-867749)

STM-867751 Operating states of the vehicle/DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867754 Additional details can be found in [MBN 50284-1], Chapter 9 (OVRS Test) and Chapter 10 (RC Test) respectively.

### 2.4.6.6 RF Immunity – OBT Test: Transmitters installed in the Vehicle by the Customer (STM-867755)

STM-867758 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867756 Further details: see [MBN 50284-1] Chapter 11.

### 2.4.6.7 RF Immunity – OBT2 Test: Fixed Transmitters Installed in the Vehicle (STM-867757)

STM-867762 Operating states of the vehicle/DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867760 Further details: see [MBN 50284-1] Chapter 12.

### 2.4.6.8 RF Immunity – PT Test: Portable Transmitters (STM-867759)

STM-867761 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867763 Further details: see [MBN 50284-1] Chapter 13.

### 2.4.6.9 Electrostatic Discharge – ESD Test (STM-867764)

STM-867765 Operating states of the DuT during the test (defined in the Chapter “Operating States”): »Light function ON + Light function OFF«

STM-867766 Discharge network (ESD test): “150 pF/330 Ω ”

STM-867768 *Note: The indirect discharge on metallic structures at the entry/exit-areas (e.g. A-pillars, door), will be performed in general (Discharge Network 330 pF / 330 Ω).*

STM-867767 Further details, including on discharge points, can be found in [MBN 50284-1], Chapter 14.

## 2.5 General E/E Requirements (STM-868102)

### 2.5.1 E/E Properties (STM-868101)

#### 2.5.1.1 Electrical Requirements (STM-868105)

##### 2.5.1.1.1 12 V On-Board Electrical System Requirements (STM-868104)

STM-868103 ***Contact for 12V on-board electrical system***
*Email: bordnetz@mercedes-benz.com*

STM-6810545 The overall scope of measuring methods, measurement setups and limit values is described in [MBN 10567].

STM-6810548 The application of [MBN 10567] is obligatory for the component.

STM-868108 The test shall be performed for all sample phases.

STM-868107 Function classes:
The following function classes are required for the component.

STM-868110 » See requirements from testing «

STM-6810558 [MSS Powernet V2.1] defines model-series-specific requirements and additional boundary conditions for E/E components that are defined differently or not at all in [MBN 10567]. The MSS Powernet V2.1] is binding before the [MBN 10567] binding.

##### 2.5.1.1.2 Electrical Energy Efficiency in the Low-Voltage On-Board Electrical System (STM-868130)

STM-868126 ***Contact for energy efficiency in the low-voltage on-board electrical system***
*Email: ee-energieeffizienz@mercedes-benz.com*

STM-868127 The Contractor shall implement all measures specified by the Client to reduce the electrical power requirement.

STM-868128 The contractor shall indicate the electrical power requirements of the component to the client. The contractor shall submit to the client, without specific request, any further ideas for electrical power requirements.

STM-880512 Upon request by the Client, the Contractor shall respond to inquiries about electrical power requirements within two working days.

STM-880510 The Contractor undertakes to notify the Client, without being prompted to do so, of any changes to the electrical power requirements of its own components and changes to the electrical power requirements of controlled components.

STM-868129 The Contractor shall show the Client those specifications of the Client that prevent or complicate a more energy-efficient design of the component.

STM-868133 For each sourcing scope, the target value for energy efficiency, as specified in the CRS, shall be achieved (tender phase).
If the agreed value is not achieved (at SOP), a civil penalty amount based on the settlement value (to be requested from the specialist purchasing department) is applied.

#### 2.5.1.1.3 Reduction of the Basic Electrical Power Requirements in the Low-Voltage On-Board Electrical System (STM-868132)

STM-3908922 The electrical power consumption of the component shall not exceed the following values during driving with the on-board vehicle voltage applied, including supply of the peripherals included in this scope of supply:
P_GL_Mean* = see [Anfragezeichnung]

STM-7750918 ** = The value P_GL_Mean includes the average consumption value under the specified framework conditions and in compliance with the valid guidelines and laws for certification for this sourcing scope.*

STM-3908925 If this scope of award consists of a combination of control unit and directly supplied connected peripherals (actuators, sensors), then the sum total of all consumption values shall be broken down into the corresponding constituent parts and communicated to the Client.

STM-868137 If the performance values referred to in this section cannot be achieved due to technical limitations, these limitations and the achievable electrical power requirements shall be indicated in the product specification and an exemption shall be requested from the Client.

STM-3908927 If the component is to be switched off on an active CAN bus by means of subnetwork operation, then CAN transceivers with selective wake-up functionality shall be used to ensure energy efficiency for the vehicle as a whole in accordance with the specifications for the hardware base layer [MSS 10742].

### 2.5.2 E/E Interfaces (STM-868203)

#### 2.5.2.1 Electrical Interfaces (STM-868201)

STM-868202 Electrical interfaces should always be designed so that there is no loss or falsification of information.

STM-868205 Electrical interfaces shall be designed to prevent irreparable damage to the component, including damage caused by electrostatic discharge (ESD), during adaptation to integrated sensors/actuators, or to other control units.

STM-868209 Electrical interfaces shall be designed to prevent irreparable damage due to any short circuiting that may occur during adaptation or when handling components under voltage.

STM-2100448 Control unit electronics and connectors shall be designed so that they can be connected and disconnected when voltage (12V) is being applied in production.

STM-868206 General requirements on electrical interfaces are found in the chapter "E/E Assembly Requirements" at the requirements ID STM-3496620.

### 2.5.2.2 General Connection Requirements (STM-868207)

STM-868211 The connection systems shall be qualified as per [DIN TS 70214].

STM-868212 The suitability of crimp contacts on all internal and external lines of the E/E component shall be verified as per [DIN TS 70214].
This also applies to cables with a cross-section greater than 4mm². The test conditions are to be coordinated with the responsible persons of the Client.
For the manufacture and series production of high-current and high-voltage cables of the E/E component, the Contractor shall use [MBN 50499].

STM-868213 The requirements for the electrical interfaces and components arise from the chapter Fire Prevention Criteria, shall be implemented additionally.

STM-868215 The forces produced during plugging shall be absorbed within the component.

STM-868214 In the event of changes to the component connections during series production (e.g. tool wear, duplication, etc.), the Contractor shall check whether the relevant implementation regulation AV still corresponds to the current status.

STM-868217 If a modified AV exists, the Client shall determine with the Contractor which AV is to be used.

STM-868220 The pins shall be designed such that the maximum possible currents cannot cause irreparable damage to the connection system. This is, for instance, to be taken into account in the protection concepts (selection of fuses), or when selecting the driver output stages.

STM-868218 The pin assignment for all connections shall be documented on the release drawing.

STM-868216 When inserting and removing the component during the manufacturing process (e.g. during testing), the requirements described in [MBN 10447] shall be fulfilled.

STM-868219 For connector systems carrying Ethernet signals, the specific requirements and design rules set out in [MSS 20208] shall also be taken into account.

### 2.5.2.3 Communication Interfaces (STM-868221)

STM-868225 The general requirements for communication interfaces for the CAN/LIN/FlexRay/Ethernet bus systems are described in [MSS 20200].

The specific requirements for the different bus systems are found in separate documents:

STM-868223 CAN: [MSS 20202]

STM-868229 Ethernet: [MSS 20208]

STM-868226 The contractor shall use a test suite to verify the conformity of the respective communications interface at each release. To this end, the contractor shall submit the test suite report to the client with each E/E release. The requirements relating to the test suite are contained in document [MSS 20220].

STM-1221378 In the event of the component to be developed contains an Ethernet interface, the contractor shall have sufficient Ethernet and AUTOSAR professionals who are already suitably qualified at the time of inquiry. The proof of competence shall be attested by submission of certificates of attendance with content of appropriate training events. Persons who are involved directly in the development of the Ethernet component shall have completed a training course.
The training shall cover the following:
- Ethernet as per IEEE802.x
- 100BASE-T1/TX
- Switches & virtual LANs
- Testability & logging interfaces (mirroring, taps)
- Layer 3+ protocols (IP, UDP, TCP, DoIP, PTP)
- AUTOSAR as per [MSS 10730].
Appropriate proof of qualification shall be provided unprompted by the contractor at the latest within 3 months after award of contract.

STM-1221379 In the event that the component to be developed contains an CANFD interface, the contractor shall have sufficient CANFD and AUTOSAR professionals that are suitably qualified already at the time of inquiry. The proof of competence shall be attested by submission of certificates of attendance with content of appropriate training events. Persons who are involved directly in the development of the CANFD component shall have completed a training course.
The training shall cover the following:
- CANFD MAC layer as per ISO 11898-1:2015-12
- AUTOSAR as per [MSS 10730]
- Differentiation of CANFD and classic CAN
The Contractor shall provide an appropriate proof of qualification unprompted within 3 months of award of contract.

#### 2.5.2.3.1 Operational Reliability in the Event of Communication Failure (STM-1207555)

STM-1207561 In general, the malfunction or failure of the communication shall not bring the control unit to an undefined state.

STM-1207564 *The malfunction or failure of the communication can also be caused by measuring technology in the vehicle (e.g. data loggers, looping in of Ethernet TAPs).*

STM-1207565 If communication requirements still exist after a malfunction or failure of communication, communication shall be promptly established again according to the specifications of the respective bus system.

STM-1207567 If the behavior in the event of communication problems is not explicitly defined, the contractor shall inform the client accordingly and request a definition of the required behavior.

STM-1207568 If certain communication problems are not intercepted in the respective status (e.g. early sample statuses), this shall be explicitly mentioned in the respective release notes.

STM-5711786 If a system requires ASIL-standard availability on a network (CAN, LIN, FlexRay, Ethernet), the Contractor shall submit at a minimum one hardware evaluation in accordance with the associated standard in case a QM module (transceiver, phy, switch) is used in that network. For example, for ASIL-B (D) availability, at least one hardware evaluation as per [ISO 26262]-8:2018 is required. Further required verification evidence shall be aligned with the client ECU department.

#### 2.5.2.4 Handling of Standard Essential Patents (STM-880547)

STM-880548 If and to the extent that parts/ scope of service/ scope of performance/ components of the contractor are suitable for communication or data transfer or coding/decoding of audio, video or image files possibly affecting a standardized technology, the contractor shall inform the responsible buyer and developer of the client immediately of the use of such technologies. The contractor shall also inform the responsible buyer and developer of the client of any changes to these technologies as well as their effects during product developing process and product life cycle.

### 2.5.3 E/E Component Elements (STM-868250)

#### 2.5.3.1 Component Element Selection (STM-868249)

STM-868252 For the design of the devices, the contractor shall only use elements that, under consideration of the component design, are verifiably suitable and qualified for achieving the application profile required for the component. Corresponding proofs shall be provided by the client at the request of the client.

#### 2.5.3.2 Risk Component Elements (STM-868251)

STM-868254 The contractor is obliged to provide the data and information required for risk component element evaluation.

STM-868253 The contractor shall classify as risk component elements such new component elements/component element technologies that are used for the first time in a vehicle application by the client.

STM-868255 *In addition, known component elements used in new or modified operating conditions (e.g. in another installation zone in the vehicle) shall be deemed to be risk component elements.*

STM-868257 When analyzing risk component elements, the Contractor shall:
- determine the limits of the component elements
- evaluate the technology as regards the application profile
- eliminate the risks by means of preventative measures

### 2.5.3.3 Selection of Semiconductors (STM-868256)

STM-868259 The Contractor shall use only semiconductor component parts (in particular microcontrollers) that fulfill the requirements of [MBN 10326].

STM-868260 The Contractor shall use only semiconductor component parts (in particular microcontrollers) that fulfill the requirements of [MBN 10527-1] and [MBN 10527-2].

### 2.5.3.4 Semiconductor Component Elements for FlexRay, CAN, LIN and Ethernet (STM-868261)

STM-868264 For the selection of transceivers/SBCs (system basis chips), or integrated semiconductor component elements with network interface, the document [MSS 20202] shall be observed for CAN.

STM-1215289 The Contractor shall ensure that the CAN controller (in the microcontroller) is implemented according to [ISO 11898-1] (2015-12 or later) and conformity is verified as per [ISO 16845] (2016-11 or later).

STM-868265 For the selection of transceivers/SBCs (system basis chips), or integrated semiconductor component elements with a network interface, the document [MSS 20208] shall be taken into account for Ethernet.

STM-1215302 Microcontrollers with integrated Ethernet interface shall be certified at least to the standards [IEEE 802.3], [IEEE 802.1x], [IEEE 802.1Q] and [IEEE 802.1AS]. If a switch is integrated in the microcontroller, the requirements in [OPEN TC11] shall also be fulfilled.

### 2.5.3.5 Rare Earths (STM-868271)

STM-868272 With the use of rare earths, the contractor shall disclose the composition (e.g. magnets), in particular the specific parts by weight of dysprosium and terbium as well as neodymium. The sourcing concept for these materials over the lifecycle is to be represented by the contractor by the submission of tender. Alternative concepts without and/or with lowest possible use of rare earths are to be offered.

### 2.5.3.6 Printed Circuit Boards (STM-868273)

STM-868274 Due to the relatively high tendency to migration and corrosion, the use of printed circuit boards with surfaces containing chemical silver (chem. Ag), is not permitted in control units and other electronic assemblies.

### 2.5.4 E/E Design Rules and Lessons Learned (STM-868278)

STM-868277 During product design and the manufacturing process, the contractor shall implement the "lessons learned" from the client's predecessor projects and from the contractor's own projects and processes.

STM-868280 The client takes the knowledge gained from further technological developments and from customer complaint analyses and summarizes this knowledge to form design rules. The design rules for E/E components are documented in [MBN 10463] and shall be taken into account during the development of the component.

## 2.6 Fire Prevention Criteria (STM-867313)

STM-3496849 *Fire prevention is an important issue in connection with the operation of motor vehicles. To meet safety demands, preventive measures shall be implemented to engineer parts to be flame-retardant and to prevent fires from starting.*

STM-3496843 As a rule, the Contractor shall comply with legislative measures from [FMVSS301-R], [UN ECE R34], of the individual states at market launch. In addition, the contractor shall be responsible for defining and applying more extensive methods for identifying fire prevention criteria.

STM-3496842 The contractor shall inform its subcontractors about fire prevention aspects and the resulting requirements pertaining to the validation and shall obligate them to comply with these requirements. The contractor shall additionally ensure that the subcontractor supplies products according to the requirements.

STM-3496847 Should further fire prevention criteria become apparent at a later date, how and when these are to be implemented shall be coordinated among the parties and documented in writing.

### 2.6.1 Electrics/Electronics (STM-867321)

#### 2.6.1.1 Wiring Harness and Components with Cable End (STM-867320)

##### 2.6.1.1.1 Basic Rules for Laying Electric Cables in Vehicles (STM-867326)

STM-867324 To ensure the reproducibility of wiring harness installation during assembly, routing aids shall be provided as guides.

STM-867322 Electric cables shall be permanently fixed to prevent unwanted displacement during assembling or driving, which could lead to abrasion.

STM-867323 The length of the cables shall be selected so that assembly personnel can install the wiring harness without tension placed and without unwanted excess length.

STM-867325 Assembly personnel shall ensure that the wiring harness is installed without tension on it.

STM-867330 Electrical cables shall not be routed over sharp edges, bodyshell pins, welding residues or bolt/screw points as they can be damaged at these "points", e.g. by vibrations during operation or other stresses (chafing, cracks etc.). Otherwise suitable protective measures shall be implemented.

STM-867328 It shall be ensured that electrical cables cannot be squeezed during assembly. It shall also be ensured that, when used predictably by the customer, they cannot be pinched or otherwise damaged.

STM-867327 Terminals that are potentially exposed to moisture and are connected on the opposite side to a vacuum-generating component shall be sealed (capillary effect). See [A0090008399].

STM-867331 Adequate clearance between moving component parts and heat-generating components shall be maintained at all times in order to prevent thermal and mechanical damage to the cables (e.g. steering column adjustment, hood hinges, exhaust system, transmission housing, heat sink for hydraulic pump, etc.).

STM-867329 Electric lines and their insulation shall be designed to withstand mechanical and environmental stresses.

STM-867333 The cable selection and - routing shall be selected in such a way that no cable breaks can occur as a result of movements. This applies in particular where voltages are greater than 20 V.

STM-867335 Cable routings on welding flanges are to be avoided; otherwise protective measures (e.g. edge protection profiles or cable channels) shall be used.

STM-867332 Impermissible temperature influences on the fuel tank shall be prevented. Therefore high-voltage cables may not be used in the immediate environment of the fuel tank without special protective measures.

#### 2.6.1.1.2 Connectors/Separating Points for Distributor Rails (STM-867337)

STM-6458089 Live connections (e.g. plug connections, threaded connections), which could lead to a thermal event if a fault occurs, shall, if necessary, be documented in the development process with corresponding safety features (see CRCS-3340235 in [LHV 310 001]).

STM-867340 Connection housings shall be designed to rule out the risk of confusion (for control units with multiple connectors, coding by color and geometry.

STM-867338 Live contacts (e.g. exposed cable shoes on prefuse boxes) shall be designed in such a way that no contact with ground potential is possible when the vehicle is in the ready-to-drive state. Cable insulation shall always be designed to go all the way into the contact housing. If this is not possible, this condition shall be prevented by suitable measures, e.g. heat-shrinkable tubing.

STM-867339 When cables are laid the minimal bending radius in the coupling/feed line areas on both sides of the connection are to be taken into account and tension-free routing is to be ensured. In the case of watertight plug-connections in particular it is also necessary to ensure that these are routed axially out of the connector housing without tension (no strong bending directly on contact housing, e.g. risk of leaks).

STM-867341 Plug connections in wet areas shall be made watertight in accordance with [MBN 11215] .

STM-867343 Connector coupling in the underbody area shall be avoided; otherwise they should be suitable for protecting against e.g. damage or moisture (e.g. by an underbody cladding, etc.).

STM-867344 The plug connections (also on cable ends) shall meet the test conditions of the testing guideline (see Electrics/Electronics Requirements for Plug Connectors [MBN 11215]).

STM-867346 The electrical contact shall be ensured permanently (for example, via the appropriate mechanical connecting line by tightening instructions, cable lug equipment on the contact surface, no impurities on the contact surface, …)

### 2.6.1.2 Control Units (All Voltage Levels) (STM-867342)

STM-867345 For ECUs, the connection pins of the supply (+) and the ground pins (-) (e.g. terminal 30 / terminal 40) in the area of the plug basket should be arranged as far away from each other as possible.

STM-867347 In the case of control units which, for example, are built up with punched grid technology and which are permanently connected to the power supply (e.g. terminal 30 / terminal 40), the webs of the (+) supply and the ground (-) shall not be guided directly next to each other. In the immediate vicinity of the bridges, a sufficiently strong partition wall shall be inserted.

STM-867354 For control units, the Mercedes-Benz Quality Management Standard: Electrics/Electronics for Mercedes-Benz Cars [MBN 10447] and Design Rules for E/E Components [MBN 10463] shall be taken into account.

STM-867353 For printed circuit boards, the IPC requirements in accordance with [IPC 2221], Generic Standard on Printed Board Design, shall be taken into account.

STM-867356 Control units installed in areas where occasional contact with moisture, water or liquid can be expected (e.g. in potential stowage areas for drinks or in areas where water can penetrate through a door or flap opening) shall be arranged or designed in such a way that no water can collect in the plug connection and migrate into the control unit. To evaluate the action to be taken, the results of suitable tests shall be considered.

## 2.7 Assembly (STM-867504)

2788868 The assembly sequence is the same as the series.

2788869 The Contractor shall design the component taking into account the production cycle times so that assembly methods are used in the Client's plant that are as cost and time-saving as possible.

2788870 The Contractor shall design the lamp so that the assembly and disassembly of the component can be performed with commercially available tools.

2788871 The Contractor shall design the lamp so that no additional safety devices are required during assembly and disassembly.

2788872 The Contractor shall design the lamp so that the peripheral parts cannot be damaged in the case of the correct assembly and disassembly of the lamp and/or fasteners.

2788873 The Contractor shall design the lamp so that the tightening torque is 5 Nm +/- 0.5 Nm.

2788874 The non-destructive removal/installation of the lamps in <10 min without the removal/installation of adjacent component parts shall be ensured.

### 2.7.1 Mechanical System Assembly Requirements (STM-3496713)

STM-3496618 *The aim is to develop a product that is suitable for production and service.*

#### 2.7.1.1 Component Design (STM-3496771)

##### 2.7.1.1.1 No Adjustment and Alignment Work (STM-3496689)

STM-3496686 The Contractor shall ensure that adjustment and alignment work is minimized by designing the component parts with a locating hole or fixing bolt and a tolerance-compensating elongated hole or larger drilled hole. (Unmistakable component part position).

##### 2.7.1.1.2 Standardization of Fasteners (STM-3496652)

STM-3496688 The contractor shall standardize fasteners, torques and widths across flats.

STM-3496700 Torque tolerances are to be set with at least +/- 10%.

##### 2.7.1.1.3 Hard Joints (STM-3496766)

STM-3496613 The contractor shall ensure that the use of threaded connections does not result in settling effects within the joint.

#### 2.7.1.2 Interface Design (Poka-Yoke System) (STM-3496694)

STM-3496736 The contractor shall implement design-for-manufacturing features to rule out confusion, incorrect assembly (right/left, rotated by 180°, parts with similar geometry etc.).

STM-3496726 In designing the component, the contractor shall apply the poka-yoke principle strictly and universally (ruling out mix-ups of parts or installation positions).

STM-3496604 The contractor shall ensure zero-defect quality in manufacturing by designing a key-lock or poka-yoke system for all attachments/components of an assembly.

STM-3496670 The contractor shall take account of both the components provided by the assembly's supplier (component parts such as setup parts for machines) as well as any additional (carryover) components (e.g. warning and ambient lights, grilles etc.) subsequently assembled during final assembly at the client's facilities or exchanged by the client at a later date.

### 2.7.1.3 Assembly Premises for Installation (STM-3496718)

### 2.7.1.3.1 General Assembly Objectives (STM-3496663)

### 2.7.1.3.1.1 Threaded Fasteners with Locating Tips (STM-3496759)

STM-3496754 The contractor shall ensure that MAThread or Direct Fire threaded fasteners are used for the installation of parts and components.

### 2.7.1.3.1.2 Fasteners on Component Parts (STM-3496595)

STM-3496744 The contractor shall ensure that fasteners (e.g. screws, bolts, clips) are secured on the component such that they cannot be lost.

### 2.7.1.3.2 Ergonomic Location of Fasteners (STM-3496654)

STM-3496729 Fasteners are to be located such as to be ergonomically accessible from outside the vehicle (avoiding the need to enter and exit the vehicle).

### 2.7.1.3.2.1 Tools (STM-3496709)

STM-3496615 The contractor shall ensure that installation of the assembly part or component is possible using a commercially available tool (avoidance of special tools).

### 2.7.1.3.2.2 Disassembly (STM-3496624)

STM-3496676 The contractor shall ensure that the components can be disassembled easily. It shall be possible to install and remove the component several times (at least 5 times) during assembly and operation (exception: clips, bondings).

### 2.7.1.3.2.3 Assembly Aids (STM-3496597)

STM-3496778 Assembly aids, such as sliding compounds, press-in and auxiliary tools, are not permissible.

### 2.7.1.3.2.4 Ergonomics (STM-3496635)

#### 2.7.1.3.2.4.1 Joining Force (STM-3496723)

STM-3496672 The contractor shall guarantee that the following joining force limits are not exceeded for the three most common handholds in assembly:

Ball of the thumb: 90N
Thumb: 65N
Thumb & forefinger: 40N

#### 2.7.1.3.2.4.2 Minimum Pressure Area (STM-3496642)

STM-3496593 The minimum contact surface for the assembly with one finger is ≥100mm², for two fingers ≥150mm². The shortest edge shall be ≥6mm. The measured force value is multiplied with a factor if the minimum contact surface undercuts the requirements. The percentage value refers to the above data:
≥50% – <100%: 1.5 × measured force value
≥25% - <50%: 2 × measured force value
<25%: 3 × measured force value
If the maximum permissible joining force is exceeded as a result of the factorization, the fastener shall be adapted accordingly.

### 2.7.1.3.2.5 Reduction of Component Parts (STM-3496717)

STM-3496603 The Contractor shall ensure that a minimum number of components goes into the formation of delivery scopes (LU) or assemblies (ZB).

### 2.7.1.3.3 Component-Specific Installation (STM-3496614)

#### 2.7.1.3.3.1 Joining and Insertion Aids (STM-3496769)

STM-3496711 The contractor shall ensure that joining and insertion aids are provided on the component (no additional separate insertion aids).

#### 2.7.1.3.3.2 Risk of Damage (STM-3496645)

STM-3496607 The contractor shall ensure that the component will not damage any other components in the vehicle (e.g. no sharp edges which might damage wiring harnesses).

#### 2.7.1.3.3.3 Effects on Health (STM-3496662)

STM-3496727 The contractor shall ensure that the installation of parts and components poses no risk of injury. Parts and components shall not have a sensitizing effect. Hypersensitivity in individuals shall be ruled out in case of inhalation or absorption through the skin.

#### 2.7.1.4 Design of Jigs, Fixtures and Aids (STM-3496740)

##### 2.7.1.4.1 Clamping and Mounting Concept (STM-3496680)

STM-3496669 The contractor shall ensure that a consistent clamping and mounting concept is applied.

STM-867507 The assembly sequence is the same as in series production.

## 2.8 Storage Life, Packaging, and Transportation (STM-867505)

STM-867506 The Contractor shall adhere to the standardized After-Sales requirements given in the Chapter “Storage Life, Packaging, and Transportation” of document [LHV 310 001] under Requirement ID CRCS-3341426.

STM-1249332 The component is a visible part for the customer and shall be especially packaged, transported and assembled. (See Logistics Component Requirement Specifications).

## 2.9 After-Sales (STM-867511)

STM-867512 The Contractor shall comply with the standardized After-Sales requirements in the Chapter “Aftersales and Service” of document [LHV 310 001] under Requirement ID CRCS-3341453.

STM-867515 For CCC certification (see Requirement ID CRCS-3341105 in document [LHV 310 001]), note that certification is required for all variants and sub-components (substructure parts) defined as replacement parts of these components.

STM-867513 After-Sales relevant sub-structure parts (replacement parts) may have DS/DZ relevance. STM-867628, STM-2100464 and CRCS-3340234 in document [LHV 310 001] shall be implemented for this purpose.

2831775 In the context of certification, the supplier shall ensure that all substructure components specific to replacement parts are also certified.

STM-867517 The requirements listed below define supplements and modifications to the standardized requirements from the previous chapter taking into consideration the special properties of the target vehicle model series.

STM-867514 If special and standardized requirements cannot be implemented simultaneously, the contractor shall coordinate with the client's responsible department on the design of the component with regard to critical points.

STM-867518 In addition, the following requirements shall be fulfilled:

2788876 The main tools for the lighting (housing, reflector, lens) as well as the associated secondary tools shall be produced with a shot counter before the start of production. The final definition of the tools to be equipped with shot counters shall take place in consultation with the Technology After-Sales department (GCSP). The shot counters, like the tools, must be marked with the client's inventory numbers and documented in the tool tracking sheet under the corresponding tool.

2788877 The light equipment is identified on the inside with the "Mercedes-Benz" logo in consultation with the relevant design department. The light unit lens is countersunk as per [MBN 50435]-C-A-8; the rear light lenses are countersunk with a Mercedes-Benz star as per [MBN 50435]-C-B-6.

2788878 All single parts of the lighting system shall be identified as off-standard-tool parts as per [MBN 50435]. Deviation is permissible if there is limited space available or if the component part is used for different item numbers. All deviations from this marking must be agreed with the respective person responsible for the design of the component and the after-sales technology (GCSP), and approved by them.

2788880 The manufacturer's trademark may be applied on request; the manufacturer's trademark shall not be larger than the Mercedes-Benz trademark. The defined protection zones of the Mercedes-Benz trademarks shall be complied with in this context. Other additional manufacturer specifications, in particular the manufacturer's item number, are not permitted. Legally required identification has priority over other information. In limited space conditions, the Mercedes-Benz trademark and item number take priority over other information. It is not permitted for the manufacturer's trademark to be solely visible in the installed status.

2995668 An identification with the supplier part number is not permitted. Identification of the part with the supplier's trademark is only permitted if the part shall be certified using the trademark of the supplier. This supplier brand identification takes place once and only in the area that is not visible after installation, independent of the certification number. It is not larger than the Mercedes-Benz brand logo and not made of off-standard-tool parts. All deviations from this marking must be agreed with the respective person responsible for the design of the component and the after-sales technology (GCSP), and approved by them. Standard labels that do not comply with the described specifications are not permitted.

2788881 Adhesive labels on the headlamps/tail lamps that do not comply with the specifications contained in [MBN 50435] are not permitted and where applicable shall be adapted retrospectively free of charge.

14310697 The full LED rear lamp is divided into the following interchangeable, approved spare parts: rear lamp assembly and seals.

# 3 Contacts and Responsibilities (STM-867520)

## 3.1 Client's Contacts (STM-867521)

STM-867523 The contact persons for the client are listed in the following section.

| | |
|---|---|
| STM-867525 | **Component Manager**<br><br>Email: stefan.langer@mercedes-benz.com |
| 3411506 | **Illumination engineering**<br>Email: sebastian.woehrstein@mercedes-benz.com |
| 3411509 | **E/E Interface**<br>Email: sebastian.woehrstein@mercedes-benz.com |
| STM-867524 | **After-Sales**<br><br>Email: simone.lesch@mercedes-benz.com |
| STM-867526 | **Product Cost Engineering**<br><br>Email: michael.m.haag@mercedes-benz.com |
| STM-867527 | **Small Parts Optimization (KTO)**<br><br>Email: tobias.raible@mercedes-benz.com |
| STM-867531 | **Logistics**<br>Email: ilias.stergiou@mercedes-benz.com |
| STM-867529 | **Materials Purchasing**<br><br>Email: florian.goegelein@mercedes-benz.com |
| STM-867528 | **Assembly**<br><br>Email: stefan.s.janson@mercedes-benz.com |
| 3411510 | **Vehicle E/E Wiring Harness Interface**<br><br>Email: paul.krieger@mercedes-benz.com |
| 3411514 | **E/E Body Controller Interface**<br><br>Email: juergen.knaupp@mercedes-benz.com |
| 3411515 | **Exterior Lights Control Interface**<br><br>Email: juergen.knaupp@mercedes-benz.com |
| STM-867534 | **Quality Management**<br><br>Email: klaus.s.sautter@mercedes-benz.com |
| 3411516 | **Tolerance Management**<br><br>Email: matthias.wacker@mercedes-benz.com |
| 3411518 | **EMC Interface** |

Email: hakan.uluc@mercedes-benz.com

STM-867535 **Tool Specification for Prototype Parts**

Email: marcel.brenner@mercedes-benz.com

STM-867537 **Functional Safety**

Email: juergen.knaupp@mercedes-benz.com

## 3.2 Project Responsibilities (STM-867533)

STM-867536 The contractor shall maintain an "open points" list, to include a measure tracking system. On request, the contractor shall allow the client to inspect the open points list and the measure tracking system. On request, the contractor shall provide the scopes relevant to the client once or at intervals to be defined (e.g. weekly) to the client in electronic form.

STM-867542 The contractor shall designate a project manager for the project who shall coordinate and monitor the processes within the contractor's organization and act as the interface to the client.

STM-867540 *Which project partner assumes which responsibilities in the project is defined in the following list.*

STM-867538 *The following designations are used in the responsibilities list.*

| *Abbreviation* | *Description* |
|---|---|
| *I = information* | *It is absolutely essential that the partner concerned be informed by the party responsible about any changes or new results* |
| *C = cooperation* | *Provision of appropriate support for the party responsible on request by one or more of the companies involved in the project* |
| *A = acceptance* | *The partner concerned shall accept the result or decision-making basis* |
| *C/A = check & approve* | *Checking/approval of results or decision-making bases* |
| *R = responsibility / execution* | *Is responsible for the provision of the services for providing results or the facts of the decision* |

STM-867541 **Parts history**

Client: A, I
Contractor: R

STM-867543 **Process FMEA**
Client: C/A, I
Contractor: R

STM-867546

**Product FMEA**
Client: C/A, I
Contractor: R

STM-867547

**Functional Safety**
Client: C/A, A
Contractor: R

STM-2855896

The following rules apply for development cooperation in the event of a system breakup (tier-n is specified by the Client).
A,C,K = Directed part type as per directed part identifier according to the system agreement from the Source Package (A = standard)

| Item | Description | Client | | | Tier 1 | | | Tier n | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **A** | **C** | **K** | **A** | **C** | **K** | **A** | **C** | **K** |
| 1 | Creation and release of deadlines, milestones, target corridors, functional scopes, quality standards, dimensional specifications, data records for the tier-n scope | R | R | R | I | I | I | C | C | C |
| 2 | Design engineering responsibility for the overall tier-1 function (incl. tier-n scope) | A | A | A, C | R | R | R | C | C | I |
| 3 | Design engineering responsibility for the function of the tier-n scope (= directed part) | A | A | R | C | C | C | R | R | C |
| 4 | Creation and approval of specifications and requirement specifications for tier-n scope | R | R | R | C | C | I | C | C | C |
| 5 | Responsibility for tier-n component, functional properties in accordance with the stipulations of the requirement specifications | - | - | R | - | - | I | R | R | C |
| 6 | Responsibility for achieved performance: Integration (installability) of tier-n scope into tier-1 scope | C | A | A, C | R | R | R | C | C | I |
| 7 | Function testing of tier-n scope in accordance with the stipulations of the requirement specifications | A | A | R | R | I | I | C | R | C |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Tier-1 responsibility for the tier-n scope regarding quality characteristics (e.g. gap dimensions) | A | A | R | R | R | I | C | C | C |
| 9 | Responsibility for the tier-1 scope (incl. overall tolerances and interaction with vehicle) | C/ A, A | C/ A, A | A | R | R | R | I | I | I |
| 10 | Commissioning and payment of prototype parts & tools for the client incl. tier-n scopes<br><br>The criterion is the receipt of tier-n scope goods at the client | R | R | R | - | - | - | I | I | I |
| 11 | Provision of trial parts, tools, and fixtures for meeting the component requirement specifications & function specifications (LEK-E content) incl. tier-n scope (in line with DC Calc)<br><br>The criterion is no receipt of tier-n scope goods at the client | A | A | A | R | R | R | I | I | C |
| 12 | Change management for the tier-n scope. Caution: Changes may also be required in the Tier-1 scope. | A | A | R | R | C | C, I | C | R | C |
| 13 | Change management for tier-1 scope | A | A | A | R | R | R | I | I | I |
| 14 | Performance of design FMEA for tier-n scope (if required) | I | A | R | A | I | I | R | R | C |
| 15 | Performance of design FMEA for tier-1 scope incl. tier-n scope | A | A | A | R | R | R | - | - | C |
| 16 | Execution of the issue resolution process for tier 1 including tier-n scope (= component part) in the case of flaws in design engineering | A | A | A, C | R | R | R | C | C | I |
| 17 | Execution of the issue resolution process for tier-n scope in the case of flaws in design engineering | A | A | R | R | I | I | C | R | I |

## 3.3 Requirements on Development-Related Services (STM-867548)

STM-867551 Requirements pertaining to the deployment of contractor staff at the client's operations for work that is not specifically related to the contract are void. The costs thereof shall not be included in the quotation submitted by the contractor. The contractor shall explicitly reject such requirements.

STM-867550 The following section describes tasks that shall be performed by the contractor as part of the development of the scope specified in these requirement specifications.

STM-867549 Specification of a response time means that the contractor, following receipt of the facts of the situation from the client, shall be able to carry out the described task or to begin processing by no later than the end of the required response time.

STM-867552 Specification of a processing time means that the contractor, following receipt of the facts of the situation from the client, shall have fully completed the given task within the given processing time.

STM-867555 In cases where a processing time is given but the contractor is not able to complete the task within the requirement processing period, the contractor shall provide prompt notification of this to the client.

STM-867553 The communication of problems or feedback on results shall often be done using vehicle parts or measuring equipment located on the premises of the client. For the following tasks, it shall be ensured that communication can take place on the premises of the client.

STM-867554 The Contractor shall conduct fault analyses (e.g. vehicle measurements).
Response time: »One workday«

STM-867557 The Contractor shall troubleshoot and eliminate faults in the overall system (as part of the system integration hardware-in-the-loop and/or in the vehicle).
Response time: »One workday«

STM-867556 The Contractor shall identify faulty components that are part of the overall system.
Response time: »One workday«

STM-867558 The Contractor shall participate in/carry out the detection and description of faulty performance, in particular in cases of failures in the field, in such a way that the fault can be processed in an optimum manner using the Contractor's procedures.
Response time: »One workday«

STM-867561 The Contractor shall participate in/carry out the execution of vehicle recall campaigns/vehicle updates aimed at the elimination of identified faults by the Client's workshops.
Response time: »One workday«

STM-867559 The Contractor shall participate in and/or perform board tests and system/vehicle integration tests, including EMC vehicle tests.
Response time: »One workday«

STM-867562 In cases where the expertise of the Contractor is absolutely essential as part of a test drive, the Contractor shall provide a contact to participate in such a test drive.
Response time: »One workday«

STM-867560 The Contractor shall carry out the flash programming and coding of development samples on the Client's premises.
Response time: »One workday«

STM-867563 For scopes under the contractor's charge, the contractor shall perform data input for the client's data systems. The following systems shall be considered in detail:

- Certus
- DuKe
- PIA
- START
- ProCure
- ProSource

STM-867566 Coding for EPDM (for component data, especially pinning).
Response time: »One workday«

## 3.4 Protection Requirements When Handling Vehicles and/or Components Before Press Announcement Day (STM-2855915)

STM-2855916 If the services described in these specifications require the handling of vehicles and/or components by the Contractor and/or subcontractor of the Contractor before the respective Press Announcement Day, the Contractor shall comply with the “minimum requirements for prototype protection for third parties (incl. contractors)” or provide a TISAX certification with the additional “prototype protection” module.
The current version can be obtained via the Supplier Portal: https://supplier.mercedes-benz.com > General Supplier Documents

# 4 Deadlines, Tools, and Components in the Development Process (STM-867573)

## 4.1 Deadlines and Milestones for MBCS Scopes (13303998) (13789385)

13789386 *This chapter is not relevant.*

## 4.2 Data Provision Deadlines and Documentation Maturity Levels Release Deadlines (STM-867577)

STM-867579 Within the product creation process, adherence to the following data provision deadlines and documentation maturity level releases is required. The contractor shall deliver the data records in appropriate quality by the provision dates specified in the Excerpt from the Process Master Plan for Suppliers. For requirements pertaining the to the data format to be used, see the chapter "Documentation" STM-867624.

STM-867581 The Contractor shall have handed over the design, functional and weight data (mass, center of gravity and moments of inertia) for the respective DPT phases (digital prototype) to the Client in an initial engineering status by the MDS milestone “Data Provision Stage I”.

STM-867578 The Contractor shall have handed over the necessary design, functional and weight data (mass, center of gravity and moments of inertia) for the respective DPT phases (digital prototype) to the Client in a fully constructed state by the MDS milestone “Data Provision Stage II” (data freeze).

STM-867580 The contractor shall archive data statuses regularly during the order relationship so that continuous maturity level progress is achieved. Validation-relevant changes (e.g. position, 3D geometry, material) shall be provided digitally no later than two weeks after the change order.

STM-3622731 Change scopes that cannot be developed within two weeks shall be indicated to the client by the contractor and the subsequent delivery coordinated. The contractor shall ensure the provision of intermediate statuses of the change scope to be processed every two weeks.

STM-867582 The contractor shall have transferred the required data records on the "P" (only for vehicle projects), "W" and "_" releases 20 working days prior to the respective component-specific deadlines for "Start Workflow" (P, W, _). The deadlines shall be taken from the component schedule.

STM-2101326 All data records provided shall contain correct weights and center-of-gravity information according to the current state of development.

STM-867585 *A detailed definition of the data provision deadlines and documentation maturity levels can be found in the Chapter “Product Data Management” in document [LHV 310 001] under Requirement ID CRCS-3340422.*

STM-867584 *If necessary, the deadlines will be updated by the client during plan scheduling.*

## 4.3 Tools and Components in the Development Process (RD Requirements) (STM-867583)

### 4.3.1 General Requirements (STM-867587)

STM-867586 Following receipt of an order, the contractor shall supply all components to the client on the agreed delivery dates.

STM-867592 Regarding the requirements pertaining to the components and their implementation, the contractor shall coordinate with the client's development manager in a timely manner. For general requirements related to the sample statuses, see Chapter “Sample Statuses” in document [LHV 310 001] under Requirement ID CRCS-333996.

STM-867589 If concrete unit numbers are specified in this chapter, the stated quantities are to be understood as guideline values and apply subject to further additions and/or separate orders. The demand assessment shall apply. The Contractor will be informed by the Client's development engineer in good time of the delivery date and version of the component (HW version, SW release etc.) and, if not otherwise agreed, the FINAS number assigned to the sample part (for tracing the sample part on the Client's premises during the development phase). FINAS is the Client's vehicle and test parts information and administration system.

STM-867590 Prices for parts and tools apply only to scopes meeting all requirements with regard to function and feasibility. In case of non-adherence, the contractor shall immediately supply a free replacement. This applies until the part has been shown to comply.

STM-867588 The contractor shall coordinate with the client's development manager as regards the requirements pertaining to the parts for validating the testworthiness during the respective development phases.

STM-867591 The commissioning of components as part of the development process is usually performed by the RD Logistics department and may deviate from the series production ordering process. The exact quantity per ordering window is also defined here.

STM-867594 If ordered through the RD Logistics department, the Contractor shall always deliver with a delivery note and complete parts labeling in accordance with [MTCSPEC] via the unloading area specified in the order.

STM-867595 With regard to electronic ordering and supply agreements, corresponding preparations shall be made by the contractor. More detailed information can be found at: https://supplier.mercedes-benz.com or via email to befo_info@mercedes-benz.com.

### 4.3.2 Tool Concept and Controlling (2831619)

### 4.3.3 Delimitation of Sample Parts (STM-867593)

STM-867596 In the development process, sample parts produced by means of prototype tools or processes (prototype parts) are usually required before the S-batch 0 or confirmation vehicle (CVeh) phase (vehicles) or null series (powertrain). As of the S-Lot 0/ CVeh phase/null series (powertrain), components from series production tools (where applicable first off-standard tool parts) shall be used (cf. [ALD00001275]).
The maturity level dependent definition of the sample statuses is stored, among other things, in the premises concerning RD hardware requirements MG15 [MGU00002648].

STM-2101327 For components made with the series production tool, the measured weights of the single parts and the assembly delivered to the Client shall match the weights documented in SMARAGD / DIALOG.

STM-2101328 The following deviations between measured and calculated weights are permissible:
Weight --> Maximum deviation in %
X < 1 g --> 100%
1 g ≤ X < 100 g --> 10%
100 g ≤ X < 1 kg --> 5%
1 kg ≤ X < 10 kg --> 2%
10 kg ≤ X < 100 kg --> 1%
X ≥ 100 kg --> 0.5%

### 4.3.4 Sample Parts in the Development Process (STM-867597)

STM-867599 In general, the highest possible maturity level available shall always be provided. If first off-standard-tool parts are not available prior to the AVeh phase, the requirements shall be presented as prototypes for these scopes, following consultation with the Client's specialist unit.

#### 4.3.4.1 Samples and Delivery Dates (2831621)

STM-7756263 In general, the highest possible maturity level available shall always be provided. The requirements are presented as a prototype for these scopes after coordination with the Client's specialist department.

#### 4.3.4.2 Tool Specification for Sample Parts (STM-867598)

STM-867600 Sample parts from prototype tools shall generally be manufactured using series production material. Potential benefits of using alternative materials, or of applying rapid prototyping or rapid tooling processes, shall be taken into consideration in coordination with the client.

STM-867601 Prototype tools shall be of simple design and suited to the Client's quantity requirements. A tool technology of maximum possible cost efficiency shall always be offered.

STM-867602 For the construction of prototype tools and jigs and fixtures, the contractor shall wherever possible use existing, standard elements (e.g. master molds, standard profiles, etc.) that remain the contractor's property.

STM-867605 The contractor shall check the possibility of bringing the series production tool forwards. In the event of changes, additional costs shall be covered through the change management system and the contractor shall account for and include these costs in the quotation early on at the time of the change request assessment.

STM-867604 In line with the above-mentioned component requirements and the extract from the project master plan, (first)off-standard-tool parts shall be provided by the Contractor in good time. The specification for this corresponds to the series production specification as per [ALD00001275].
Deviations from these are only permitted in coordination with the Client and with the explicit approval of the Client's QM.

#### 4.3.4.3 Sourcing of Prototype Tools and Sample Parts (STM-867603)

STM-867607 The prices of prototype tools and sample parts shall be defined between the contractor and the client in separate agreements.

STM-867606 The Premises RD Hardware Requirements MG15 [MGU00002648] apply to the sourcing of sample component parts and prototype tools and of the associated jigs and fixtures within the framework of the requested sourcing scope. These shall be verified by the Contractor's signature and provided to the Client.
If STM-867612 contains no specific requirements pertaining to sample part prices and, where applicable, prototype tool and jig/fixture costs, the contractor shall present the detailed specifications and costs (see table "Cost Overview Sheet for Prototype Tools and Sample Parts"; the MS Excel template is to be obtained through the "proSource" system). Deviations from these specifications shall be coordinated by the contractor with the client and shall be offered as options.

STM-867610 For the sourcing of prototype tools and sample parts, the relevant contents of the general RFQ documents apply as described in the following. Extract from the general RFQ documents:
“… Test tools are all jigs, fixtures and tools required to create test parts. This term also includes all auxiliary and prototype tools plus preproduction tools. The costs for test tools will be remunerated directly by the client. The client reserves the right to negotiate test tool and part costs directly with the prototype manufacturer (tier 2, …) and also to pay this party directly. The system/development contractor (tier 1) is obliged to provide logistical and technical support for the test tools/parts. As part of the development order, the client grants the development supplier the right of access to the tools and the related expertise at any time. …”
Further information on direct sourcing can be found in [MGU00002648].

### 4.3.4.4 Pricing of Sample Parts (STM-867612)

STM-867609 All sample component parts shall as a rule be offered on a graduated scale according to maturity level. For details, see the specifications in [MGU00002648].
The sample parts prices negotiated shall become binding with the award of the contract. They shall apply for all orders placed by the Client regardless of the intended purpose and place of delivery.
In the event that parts from other model series or projects are used which already have a higher maturity level or development status (e.g. (first) off-standard-tool parts), the conditions agreed for the original model series or original project shall apply. During the S-batch or CVeh project phase or null series, the series production prices (total prices) valid at this point in time shall apply to off-standard-tool parts at the latest. This shall apply for all orders placed by the client in these project phases regardless of the intended purpose and place of delivery.

STM-867608 All costs (e.g. setup, measuring, packaging, shipping, handling, etc.) incurred up to and including delivery to the receiving locations specified by the client shall be covered by the cost of the sample parts as negotiated.

STM-867611 If the "Fixed prices" table specifies such sample prices or factor rates for the series production price and, where applicable, the required prototype tool costs, the contractor shall include these in its quotation and enter the corresponding validity periods.

STM-867614 Table: Fixed prices

STM-867616

| **Name** | **From first off-standard-tool parts** | **From off-standard-tool parts** |
|---|---|---|
| Tail lamp | 1 times series production price | |
| **Name** | **Variant** | **Fixed price (if necessary)** |
| Lighting technology test fixture for rear lamps | 1 set of sidewall lamps (LH/RH) | **€2,300** |
| Lighting technology test fixture for rear lamps | 1 × Trunk lid lamp (continuous reflector strip) | **€3,500** |
| Lighting technology test fixture for rear lamps | 1 set Trunk lid lamp (LH/RH) | **€3,000** |
| Test fixture for rear shaker lamps | 1 set of sidewall lamps (LH/RH) | **€5,000** |
| Test fixture for rear shaker lamps | 1 × Trunk lid lamp (continuous reflector strip) | **€7,000** |
| Test fixture for rear shaker lamps | 1 set Trunk lid lamp (LH/RH) | **€4,000** |

| | | |
|---|---|---|
| Test fixture for rear shaker lamps | 1 set Trim strip | **€3,400** |
| Rear electronics sample (board assembly) | 1 × Sidewall lamp | **€ 1,150** |
| Rear electronics sample (board assembly) | 1 × Trunk lid light | **€ 1,150** |
| Rear electronics sample (board assembly) | 1 × Continuous reflector strip | **€ 2,300** |

#### 4.3.4.5 Quantities for Components (STM-867613)

STM-867615 The quantities given here are to be interpreted as guideline values and apply subject to further additions and/or separate orders. The demand assessment shall apply. For general deadlines, see "Excerpt from the Process Master Plan for Suppliers".

STM-867617 Quantity forecast:

STM-867621

| **Musterstand** ***Sample status*** | **Anzahl** ***Quantity*** | **Einsatzzweck / -phase** ***Purpose / Phase*** |
|---|---|---|
| CVeh Sample | 200 | CVeh phase |
| A vehicle Sample | 120 | AVeh phase |
| A-Sample | 20 | A-Sample |

### 4.3.5 PPA Sampling (STM-867618)

STM-867620 The Contractor shall submit the samples together with a PPA report (PPAR) for sampling at the Client's as per [MBST] by the following deadline: 8 weeks before the MDS milestone “Delivery of assembly parts for S-batch 5 or PRO1 or PT (Powertrain)” (see: “Excerpt from the Process Master Plan for Suppliers”)

STM-867619 *The PPAR deadline may be updated by the Client as part of plan scheduling.*

STM-867622 The Contractor shall report back the PPAR deadlines in the “start” system (see [LHV 310 001] under Requirement ID CRCS-3340474). Before reporting back, the contractor shall coordinate the deadlines with the client's responsible quality engineer.

STM-867626 The contractor shall take part in sampling coordination talks in a timely manner prior to the scheduled deadline. Here, the cornerstones of the sampling process will be defined.

## 4.4 Parts Delivery and Commissioning of E/E Scopes (STM-1207727)

### 4.4.1 Delivery for HIL and Initial Startup (STM-1207992)

STM-1207996 Three months prior to the first lab release, the contractor shall provide a preliminary release with the software called for by the release plan implemented in it. The underlying control unit hardware of this HIL release may deviate from the B-sample hardware (e.g. A-sample).

STM-1207998 *The HIL release is used for the initial startup and initial validation of the software on the Client's HIL test stand.*

STM-1208001 The success of an E/E component delivery also encompasses initial startup capability, for example during system integration, in vehicles or in the pilot plant.

STM-1208004 Should problems occur during the initial startup of supplied parts, the contractor shall provide technical startup support as required to rectify any problems with a response time of no more than ½ workday after initial startup problems are reported.

STM-1208006 The completion of the initial startup of supplied parts is reported by the client to the contractor. The parts delivery of the E/E component is then deemed successfully completed. If the client fails to report completion, the parts delivery of the E/E component will be considered successful at the latest three weeks after the commencement of startup. The contractor can inquire with the client as to the date of startup commencement.

## 4.5 Delivery and Commissioning of Mechanical Components (STM-2103522)

STM-2103524 For the delivery of mechanical components that contain E/E components, the corresponding requirements for their commissioning shall be taken into account.
These requirements can be found in this document or the corresponding component specifications of the E/E component.
These are, in particular, chapters STM-1207727 for EE commissioning and STM-2100464 for security scopes and other requirements of the documents.

## 4.6 E/E Maturity Level Management (STM-2100431)

14198021 Not relevant.

# 5 Documentation (STM-867623)

STM-867624 The contractor shall continuously document the development status of the scope of supply as specified in the requirements given here. On request, the contractor shall allow the client to inspect this documentation.

STM-867627 The contractor shall prepare thorough and comprehensive documentation of the scope of supply and services described in these requirement specifications. This shall comply with all legislation, regulations and technical standards applicable to the full performance or partial performances.

STM-867625 The contractor shall deliver the technical documentation at the latest upon acceptance by the client of the supplies and services. If requested to do so prior to acceptance, the contractor shall deliver completed sections of the technical documentation covering both the full performance or individual performance units.

STM-867631 Prior to acceptance of the full performance or of any one performance unit, the client can demand to examine the methods, systematics and internal processes that the contractor used or will use to produce the technical documentation.

STM-867632 For this component, requirements with integrity levels exist. These shall be developed and documented as per the specification in document [LHV 310 001] under Requirement ID CRCS-3340251.

## 5.1 Special characteristics (Part 1) - safety-relevant characteristics (DS) (STM-867628)

STM-867629 As it currently stands, DS identification on the drawings or in the documentation systems is not compulsory for this component. If DS characteristics prove to be relevant for documentation for the Client or the Contractor during the course of development, the type and time of identification shall be agreed on and documented in a written agreement – more detailed instructions will be issued in this respect if required.

## 5.2 Special Features (Part 2) – Certification-Relevant Features (DZ) (STM-2100464)

### 5.2.1 Implementation of Certification-Relevant Characteristics (STM-2100466)

STM-2100467 This component is subject to obligatory identification and documentation with regard to certification relevance (including emissions relevance) with DZ at drawing level and in the documentation systems as per the Chapter “Certification-Relevant Characteristics (DZ)” in document [LHV 310 001] under Requirement ID CRCS-3340241.

STM-867634 Furthermore, the Contractor shall take into account the general certification requirements (e.g. CCC = China Compulsory Certification, Voluntary Certification or Self Declaration) set out in the Chapter “Laws, Standards and Regulations” of document [LHV 310 001] under Requirement CRCS-3341065.

STM-2100468 The following list contains further subdivisions and the corresponding DZ characteristics to be marked for the Client as per [MBN 50317-1] (temporarily still [MBN 10317-0]). Multiple items may be named.

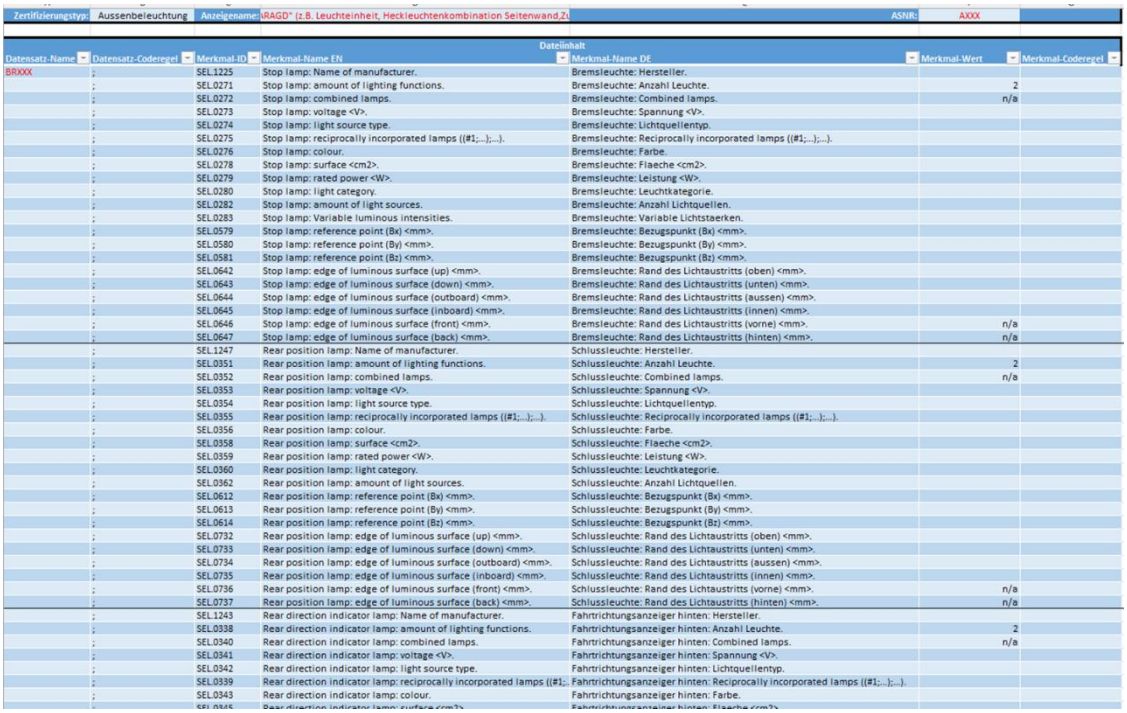
3128873

| SAM ID | Discipline | SAM NameDE |
|---|---|---|
| SEL.1296 | Beleuchtung: | ADS Marker Lamps (hinten): Authorisation letter. |
| SEL.1288 | Beleuchtung: | ADS Marker Lamps (hinten): CCC-Genehmigungszeichen (CCC im Ovalkreis). |
| SEL.1294 | Beleuchtung: | ADS Marker Lamps (hinten): DOT-/SAE-Markierung |
| SEL.1293 | Beleuchtung: | ADS Marker Lamps (hinten): ECE-Genehmigungsnummer (#1;...). |
| SEL.1292 | Beleuchtung: | ADS Marker Lamps (hinten): EG-Genehmigungsnummer (#1;...). |
| SEL.1290 | Beleuchtung: | ADS Marker Lamps (hinten): Self Declaration Nummer. |
| SEL.1295 | Beleuchtung: | ADS Marker Lamps (hinten): Taiwan Examination Report. |
| SEL.1314 | Beleuchtung: | ADS Marker Lamps (hinten): Typbezeichnung China;ECE |
| SEL.1291 | Beleuchtung: | ADS Marker Lamps (hinten): Voluntary Certificate Nummer. |
| SEL.0001 | Beleuchtung: | Beleuchtung: Zertifizierungsrelevante Daten siehe Zertifizierungs-XML |
| SEL.0478 | Beleuchtung: | Bremsleuchte: Authorisation letter. |
| SEL.0281 | Beleuchtung: | Bremsleuchte: CCC-Genehmigungszeichen (CCC im Ovalkreis). |
| SEL.0476 | Beleuchtung: | Bremsleuchte: DOT/SAE-Markierung |
| SEL.0475 | Beleuchtung: | Bremsleuchte: ECE-Genehmigungsnummer (#1;...). |
| SEL.0474 | Beleuchtung: | Bremsleuchte: EG-Genehmigungsnummer (#1;...). |
| SEL.0472 | Beleuchtung: | Bremsleuchte: Self declaration Nummer. |
| SEL.0477 | Beleuchtung: | Bremsleuchte: Taiwan Examination Report. |
| SEL.1226 | Beleuchtung: | Bremsleuchte: Typbezeichnung China;ECE |
| SEL.1229 | Beleuchtung: | Bremsleuchte: Variable Lichtstaerke |
| SEL.0473 | Beleuchtung: | Bremsleuchte: Voluntary Certificate Nummer. |
| SEL.0513 | Beleuchtung: | Fahrtrichtungsanzeiger hinten: Authorisation letter. |
| SEL.0348 | Beleuchtung: | Fahrtrichtungsanzeiger hinten: CCC-Genehmigungszeichen (CCC im Ovalkreis). |
| SEL.0511 | Beleuchtung: | Fahrtrichtungsanzeiger hinten: DOT/SAE-Markierung |
| SEL.0510 | Beleuchtung: | Fahrtrichtungsanzeiger hinten: ECE-Genehmigungsnummer (#1;...). |
| SEL.0509 | Beleuchtung: | Fahrtrichtungsanzeiger hinten: EG-Genehmigungsnummer (#1;...). |

14135212 *Example illustration (excerpt)*
*The current version of the document is provided by the contact person from the Client’s development department for the preparation of the blank release drawing*

14135215 *The extended document for DZ characteristic SEL.0001 “Certification-relevant data” (certification XML) must be completed by the Contractor.*

14135217



| Zertifizierungstyp: | Aussenbeleuchtung | Anzeigename: | \RAGD" (z.B. Leuchteinheit, Heckleuchtenkombination Seitenwand,Z | ASNR: | AXXX | |
|---|---|---|---|---|---|---|
| Dateiinhalt | | | | | | |
| Datensatz-Name | Datensatz-Coderegel | Merkmal-ID | Merkmal-Name EN | Merkmal-Name DE | Merkmal-Wert | Merkmal-Coderegel |
| BRXXX | ; | SEL1225 | Stop lamp: Name of manufacturer. | Bremsleuchte: Hersteller. | | |
| | ; | SEL0271 | Stop lamp: amount of lighting functions. | Bremsleuchte: Anzahl Leuchte. | 2 | |
| | ; | SEL0272 | Stop lamp: combined lamps. | Bremsleuchte: Combined lamps. | n/a | |
| | ; | SEL0273 | Stop lamp: voltage <V>. | Bremsleuchte: Spannung <V>. | | |
| | ; | SEL0274 | Stop lamp: light source type. | Bremsleuchte: Lichtquellentyp. | | |
| | ; | SEL0275 | Stop lamp: reciprocally incorporated lamps ((#1;...);...). | Bremsleuchte: Reciprocally incorporated lamps ((#1;...);...). | | |
| | ; | SEL0276 | Stop lamp: colour. | Bremsleuchte: Farbe. | | |
| | ; | SEL0278 | Stop lamp: surface <cm2>. | Bremsleuchte: Flaeche <cm2>. | | |
| | ; | SEL0279 | Stop lamp: rated power <W>. | Bremsleuchte: Leistung <W>. | | |
| | ; | SEL0280 | Stop lamp: light category. | Bremsleuchte: Leuchtkategorie. | | |
| | ; | SEL0282 | Stop lamp: amount of light sources. | Bremsleuchte: Anzahl Lichtquellen. | | |
| | ; | SEL0283 | Stop lamp: Variable luminous intensities. | Bremsleuchte: Variable Lichtstaerken. | | |
| | ; | SEL0579 | Stop lamp: reference point (Bx) <mm>. | Bremsleuchte: Bezugspunkt (Bx) <mm>. | | |
| | ; | SEL0580 | Stop lamp: reference point (By) <mm>. | Bremsleuchte: Bezugspunkt (By) <mm>. | | |
| | ; | SEL0581 | Stop lamp: reference point (Bz) <mm>. | Bremsleuchte: Bezugspunkt (Bz) <mm>. | | |
| | ; | SEL0642 | Stop lamp: edge of luminous surface (up) <mm>. | Bremsleuchte: Rand des Lichtaustritts (oben) <mm>. | | |
| | ; | SEL0643 | Stop lamp: edge of luminous surface (down) <mm>. | Bremsleuchte: Rand des Lichtaustritts (unten) <mm>. | | |
| | ; | SEL0644 | Stop lamp: edge of luminous surface (outboard) <mm>. | Bremsleuchte: Rand des Lichtaustritts (aussen) <mm>. | | |
| | ; | SEL0645 | Stop lamp: edge of luminous surface (inboard) <mm>. | Bremsleuchte: Rand des Lichtaustritts (innen) <mm>. | | |
| | ; | SEL0646 | Stop lamp: edge of luminous surface (front) <mm>. | Bremsleuchte: Rand des Lichtaustritts (vorne) <mm>. | n/a | |
| | ; | SEL0647 | Stop lamp: edge of luminous surface (back) <mm>. | Bremsleuchte: Rand des Lichtaustritts (hinten) <mm>. | n/a | |
| | ; | SEL1247 | Rear position lamp: Name of manufacturer. | Schlussleuchte: Hersteller. | | |
| | ; | SEL0351 | Rear position lamp: amount of lighting functions. | Schlussleuchte: Anzahl Leuchte. | 2 | |
| | ; | SEL0352 | Rear position lamp: combined lamps. | Schlussleuchte: Combined lamps. | n/a | |
| | ; | SEL0353 | Rear position lamp: voltage <V>. | Schlussleuchte: Spannung <V>. | | |
| | ; | SEL0354 | Rear position lamp: light source type. | Schlussleuchte: Lichtquellentyp. | | |
| | ; | SEL0355 | Rear position lamp: reciprocally incorporated lamps ((#1;...);...). | Schlussleuchte: Reciprocally incorporated lamps ((#1;...);...). | | |
| | ; | SEL0356 | Rear position lamp: colour. | Schlussleuchte: Farbe. | | |
| | ; | SEL0358 | Rear position lamp: surface <cm2>. | Schlussleuchte: Flaeche <cm2>. | | |
| | ; | SEL0359 | Rear position lamp: rated power <W>. | Schlussleuchte: Leistung <W>. | | |
| | ; | SEL0360 | Rear position lamp: light category. | Schlussleuchte: Leuchtkategorie. | | |
| | ; | SEL0362 | Rear position lamp: amount of light sources. | Schlussleuchte: Anzahl Lichtquellen. | | |
| | ; | SEL0612 | Rear position lamp: reference point (Bx) <mm>. | Schlussleuchte: Bezugspunkt (Bx) <mm>. | | |
| | ; | SEL0613 | Rear position lamp: reference point (By) <mm>. | Schlussleuchte: Bezugspunkt (By) <mm>. | | |
| | ; | SEL0614 | Rear position lamp: reference point (Bz) <mm>. | Schlussleuchte: Bezugspunkt (Bz) <mm>. | | |
| | ; | SEL0732 | Rear position lamp: edge of luminous surface (up) <mm>. | Schlussleuchte: Rand des Lichtaustritts (oben) <mm>. | | |
| | ; | SEL0733 | Rear position lamp: edge of luminous surface (down) <mm>. | Schlussleuchte: Rand des Lichtaustritts (unten) <mm>. | | |
| | ; | SEL0734 | Rear position lamp: edge of luminous surface (outboard) <mm>. | Schlussleuchte: Rand des Lichtaustritts (aussen) <mm>. | | |
| | ; | SEL0735 | Rear position lamp: edge of luminous surface (inboard) <mm>. | Schlussleuchte: Rand des Lichtaustritts (innen) <mm>. | | |
| | ; | SEL0736 | Rear position lamp: edge of luminous surface (front) <mm>. | Schlussleuchte: Rand des Lichtaustritts (vorne) <mm>. | n/a | |
| | ; | SEL0737 | Rear position lamp: edge of luminous surface (back) <mm>. | Schlussleuchte: Rand des Lichtaustritts (hinten) <mm>. | n/a | |
| | ; | SEL1243 | Rear direction indicator lamp: Name of manufacturer. | Fahrtrichtungsanzeiger hinten: Hersteller. | | |
| | ; | SEL0338 | Rear direction indicator lamp: amount of lighting functions. | Fahrtrichtungsanzeiger hinten: Anzahl Leuchte. | 2 | |
| | ; | SEL0340 | Rear direction indicator lamp: combined lamps. | Fahrtrichtungsanzeiger hinten: Combined lamps. | n/a | |
| | ; | SEL0341 | Rear direction indicator lamp: voltage <V>. | Fahrtrichtungsanzeiger hinten: Spannung <V>. | | |
| | ; | SEL0342 | Rear direction indicator lamp: light source type. | Fahrtrichtungsanzeiger hinten: Lichtquellentyp. | | |
| | ; | SEL0339 | Rear direction indicator lamp: reciprocally incorporated lamps ((#1;... | Fahrtrichtungsanzeiger hinten: Reciprocally incorporated lamps ((#1;...);...). | | |
| | ; | SEL0343 | Rear direction indicator lamp: colour. | Fahrtrichtungsanzeiger hinten: Farbe. | | |

14135219 *Example illustration (excerpt)*
*The current version of the document is provided by the contact person from the Client's development department for the preparation of the blank release drawing*

STM-2100471 The required standards are as follows:

STM-2100472 [MBN 50317-1] (temporarily still [MBN 10317-0]): CAD Drawing/3D CAD Models – Identification of Parts, Assemblies and Special Characteristics – Principles – Obligation to Component/Assembly Documentation

STM-2100470 If, in the course of the development (incl. further development in the series production phase), further DZ characteristics are shown to be relevant for identification and documentation for the Client or Contractor, the type and time of the identification shall be agreed on and documented in a written agreement.

## 5.3 Vehicle Documentation in VeDoc for Passenger Cars (STM-867645)

STM-867643 No data subject to compulsory documentation needs to be recorded for this component for traceability at the part level. If data subject to compulsory documentation in this sense arises during the course of development for the client or the contractor, the contractor shall coordinate the type and time of identification with the client and shall document these in writing in an agreement.

## 5.4 CAD Product Data and Prerequisites for IT Connection (STM-867387)

STM-867383 General requirements concerning CAD product data are described in document [LHV 310 001] pertaining to these requirement specifications.

STM-867385 The current version of the Client's "CAD Handbook for Product Description Data" [CAD-Handbuch] serves as the content-related basis for requirements pertaining to the documentation of CAD product data.

STM-867384 For the development of components, the Client generally accepts the CAD data formats NX and JT/SVG.
If the NX data built in the NX version specified by Mercedes-Benz can be delivered with a complete engineering design history, this format shall be preferred to JT data. If parametrics are not explicitly required, both non-parametric NX and JT/SVG can be provided.
The following sections describe the basic requirements for the CAD data format used.

STM-867386 If both the JT/SVG and NX data formats are requested simultaneously for "CAD models without design history", then the Contractor has the choice, in consultation with the Client, as to which data format to deliver.
Once selected, the data format may not be changed over the term of the contract.

STM-2100474 The 3D geometry is provided as a solid. This is a prerequisite for using the 3D data in the Client's follow-up and validation processes.

STM-7757228 When creating drawings and 3D data records (2D/3D), the Contractor shall take [MGU ZU AA 0000027] into account 8 weeks before the start of the release workflow. At the request of the Contractor, an agreement can be reached with representatives of the Client's drawing review department with regard to the GDQ standard testing matrix. Contact is made via the Client's developer responsible for the component (component manager).
.
Alternatively, the Contractor can find the same checklist "Standard testing matrix for drawing verification" on the Push.ED platform (Pushed/Supplier Basics/GDQ page)

STM-867389 All CAD models for visible parts in the interior and exterior shall have texturing of the visible surfaces in accordance with the surface groups set out in module CS136 "Digital Color Documentation" of the "CAD Handbook".[CAD-Handbuch]
"Digital Color Documentation" Contact:
CAx Support Suppliers
Email: cax-support-suppliers@mercedes-benz.com

### 5.4.1 NX Data Format (STM-867388)

#### 5.4.1.1 Generation of Data (STM-867392)

STM-867390 CAD models without design history meet all the requirements for release at the Client's operations. They contain information such as mass properties, center of gravity, etc.

#### 5.4.1.2 Prescribed Design Methodology (STM-867393)

STM-867397 Module CS082 of [CAD-Handbuch] describes general procedures for working with NX. It contains references to the relevant NX design methods.

#### 5.4.1.3 Scope of Data to Be Delivered (STM-867394)

STM-867404 Assembly drawing

STM-867403 Additional requirements on the data to be supplied:

2831816 One CAD model for environment-forming parts (housing, lens, fastening components, etc.) and one CAD model for design-forming parts (panels, reflectors incl. photometric surfaces and electronic components, etc.).

#### 5.4.1.4 Datum System of the CAD Models (STM-867406)

STM-867405 If a change is made to the component part, it is not permitted to change the reference system.

STM-867407 The CAD models are described with reference to a base coordinate system (engineering design in the installation position).

### 5.4.2 JT and SVG Data Format (STM-867409)

#### 5.4.2.1 Prescribed Preparation Methodology (STM-867411)

STM-867410 Module CS059 in [CAD-Handbuch] describes general procedures for working with JT and SVG

STM-7757128 The [MBN 10060] describes the Client's specific requirements for component-descriptive JTs

#### 5.4.2.2 Scope of Data to Be Delivered (STM-867412)

STM-867416 JT single part

STM-867415 SVG assembly drawing

STM-867417 Additional requirements for data to be supplied:
ENX, IP-Sec, MPLS

11213253 One CAD model for environment-forming parts (housing, lens, fastening components, etc.) and one CAD model for design-forming parts (panels, reflectors incl. photometric surfaces and electronic components, etc.).

### 5.4.2.3 Datum System of the CAD Models (STM-867420)

STM-867419 If a change is made to the component part, it is not permitted to change the reference system.

STM-867418 The CAD models are described with reference to a base coordinate system (engineering design in the installation position).

## 5.4.3 Provided Installation Space Environment (STM-867422)

STM-867425 The client provides the contractor with CAD product description data. The Contractor shall take account of the provided data when producing CAD models.

STM-867424 The Contractor shall take account of the installation space and interfering geometries when producing CAD models.

STM-867426 The datum systems (coordinate systems) of the supplied CAD models shall not be changed.

## 5.4.4 CAD Qualification (STM-867423)

STM-867427 Prior to the initial data exchange, the Contractor shall provide evidence of their CAD qualifications for the required CAD data format (NX or JT/SVG). The process is specified in [CAD-Handbuch], module CV001. Regular productive data interchange with the Client may only take place once the Contractor has verified his CAD qualification for the respective format.

## 5.4.5 Requirements for IT Connection (STM-867431)

STM-2100558 To the extent that a connection to the Client's IT environment is necessary in order to externally render the contracted service, the Contractor undertakes to fully satisfy all prerequisites and conditions associated with this connection in a timely manner prior to the first use of this connection and to maintain these prerequisites and conditions without interruption throughout the entire period of service provision.

STM-2100576 In the following, the minimum prerequisites and conditions of such an IT connection are described. Additional agreements between client and contractor are only valid in those aspects that do not lower these minimum prerequisites and conditions. Other written agreements between the client and the contractor, which increase the requirements for the contractor defined here, are also valid.

### 5.4.5.1 Qualification (STM-2100588)

STM-2100594 The contractor shall assure for all required applications that every user has the required skill to use them as required by the contract. The required skill for each application is defined by the general qualification demands of the client extended by the contract-specific qualification demands of the contracting department.

STM-2100595 This regulation also applies to applications that, in addition to the list below, may be otherwise agreed in writing between the client and the contractor as well as for applications that are additionally requested by the contractor.

### 5.4.5.2 Contractual Regulations and Protection Requirements (STM-867436)

STM-2100610 The Contractor undertakes to comply with the Complementary Requirements for IT Information Security in the Development Environment as per [ALD00001354].

STM-2100611 The contractor is obliged to completely fulfill those requirements for the information classification that is communicated by the contracting department. The minimum requirement is in any case the information classification “Internal”.

### 5.4.5.3 Network Connection to Client's IT Network (STM-867438)

STM-2100632 If a connection to the IT network of the client (business partner connection) is necessary for the fulfillment of the contract, the contractor shall ensure that such a connection is available in an appropriate and sufficient form and is fully operational and functional on the contractor’s side for the complete period of the contract.

STM-2100633 The contractor shall ensure that the free and available bandwidth of the business partner connection is at any time sufficient for the fulfillment of the contract.

### 5.4.5.4 Reporting of Users (STM-867441)

STM-867442 For all users who need access to the IT resources of the Client as part of the service provision described in these requirement specifications, the Contractor shall communicate the following information to the Client at least one calendar month prior to the start of their service provision:

1. For users for whom all required user IDs already exist:
   - User ID (Corporate or Active Directory User ID, “EMEA ID”)
   - Supplier Portal UserID (if any)
   - Other relevant UserIDs Exact designation of the employing company including legal form
2. For those users for whom not all necessary user IDs already exist:
   - First name
   - Last name
   - Business email address and telephone number
   - Exact designation of the employing company including legal form

#### 5.4.5.5 Reference Points for Better Evaluation of the Above Requirements (STM-2100946)

STM-2100947 The following information is a preliminary estimation based on initial assumptions and can be used to evaluate the requirements that have been defined in the former sections. The binding definition of the data mentioned below shall be agreed separately in writing between the Client and the Contractor, usually following the award of the contract. Specific IT access variants or solutions may neither be implicitly presumed or required by the supplier, nor bindingly agreed upon with the contracting department during the offering phase. Possible effects of different IT access variants and solutions on the offering conditions shall be explicitly indicated in the offer. Otherwise, the offered conditions cover all possible IT access variants and solutions.

STM-867428 The following IT connection concept forms the basis of the subsequent specifications:

- Connect ID for connection: 210120_059_106
- Version of IT connection concept: 01

The following reference points are derived from the aforementioned IT connection concept:

- Protection requirement class to be complied with: Internal
- Possible network connections: ENX, IP-Sec, MPLS
- Bandwidth requirement per user: 1 Mbit/s
- List of applications in the Client's IT landscape that are used via the IT connection: DukE

## 5.5 Documentation of Material and Surface Selection (STM-2102104)

STM-4222085 *The material, coating and surface specifications are essential, among other things, to ensure the compatibility of the materials with environmental materials, the permissibility of the materials, the requirements for resource conservation and the safeguarding in sampling.*

STM-4222082 This data shall be documented in full in the corresponding 3D/2D data record and in the master data released by the Client as per [MBN 50300] and [MBN 10330].

STM-7757242 Any information provided on the drawing and in the 3D data record with regard to materials, coatings and surfaces shall be consistent. If materials have been documented in full in the 3D data, the redundant information on the drawing can be dispensed with as per [MBN 50300].

STM-4222083 In doing so, the specifications of [MBN 31020] (all parts) and [MBN 10549] shall be complied with.

STM-4222084 Deviations from these specifications are only permissible after consultation with the component manager and shall be documented in accordance with [MBN 31020]-1 Supplement 1.

STM-2102109 It is necessary to ensure that the relevant specifications (including standards and regulations) are applied according to the current state of science and technology for all materials, joints and surfaces used.

STM-4222086 It is not permitted to use contractor specifications to fulfill this goal, as the client does not have access to the change management of these.

STM-2102110 The client has the right to request all development documents and production-accompanying documentation along the supply chain for inspection and archiving in order to ensure the quality of the components and thus the evidence.

## 5.6 Digital Development (STM-867648)

STM-867650 The general requirements for the provision of simulation data are provided under CRCS-3340488 in document [LHV 310 001].

## 5.7 Bill of Materials (BoM) (STM-4222215)

STM-4222216 *For estimating the Client's dependencies on sub-suppliers, it is necessary to have a complete bill of materials available at given times.*
*Information required for list of risky parts queries can be found in [MBN 10527-2].*

STM-4222217 A bill of materials for all components used by subcontractors shall be submitted in a format specified by the client.

STM-4222276 The BoM contains all components from which the respective part number is composed.

STM-4222277 Completeness and correctness are to be ensured by the contractor.

STM-4222278 Deviations from the scope of the listed components or the file format are only permitted after consultation with client.

STM-4222272 The BoM template can be obtained from the contact person listed at STM-867534.

STM-4222219 The BoM contains at least the following content:

STM-4222222
- Name of the component
- Component position/hierarchy
- Installed number of components per part number
- Manufacturer of the component
- If available, but for all electronic components: Unique component manufacturer number (MPN)

STM-4222275 The first BoM shall be submitted at the time of delivery of the C-samples.

STM-4222311 The second BoM shall be submitted at the time of delivery of PPA samples, provided that individual components have changed compared to the BoM of the C-sample delivery.

STM-4222313 The BoM shall be transferred to the Client via the data transmission system SWAN or "OFTP2" and each change is followed by an update of the BoM as part of the sampling.

STM-4222314 The destination address is specified to the contractor by the client.

# 6 Supplementary Information (STM-867651)

13789360 *Not relevant*

# 7 List of Abbreviations (STM-867656)

| Abbreviation | Description | English Text |
|---|---|---|
| 2D | zweidimensional | Two-dimensional |
| 3D | dreidimensional | Three-dimensional |
| AFzg. | Applikationsfahrzeug | Application vehicle (AVeh) |
| AG | Aktiengesellschaft | Public Limited Company |
| ASIL | Automotive Safety Integrity Level (Klassifikation bezüglich ISO26262) | Automotive Safety Integrity Level (classification for ISO26262) |
| AV | Ausführungsvorschrift | Implementation regulation |
| CVeh | Confirmation vehicle | Confirmation vehicle (CVeh) |
| BQF | Bezugsquellenfreigabe | Approval of procurement source |
| BTV | Component Manager | Component Manager |
| CAD | Computer Aided Design | Computer Aided Design |
| CAN | Controller Area Network | Controller Area Network |
| CCC | China Compulsory Certification | China Compulsory Certification |
| CFK | Kohlefaserverstärkte Kunststoffe | Carbon Fiber Reinforced Plastics (CFRP) |
| DBL | Daimler-Benz Liefervorschrift | Daimler-Benz Supply Specification |
| DIALOG | Produkt Dokumentations System | Product documentation system |
| DPT | Digitaler Prototyp | Digital prototype |
| DS | Kennzeichnung und Dokumentation der Sicherheitsrelevanz | Identification and documentation of safety relevance |
| DZ | Kennzeichnung und Dokumentation der Zertifizierungsrelevanz inkl. Emissionsrelevanz | Identification and documentation of certification relevance incl. emission relevance |
| DukE | IT-System Durchgängiger und konsequenter Erprobungsprozess | IT System for Continuous and Consistent Testing Process |
| ECHA | Europäische Chemikalienagentur | European Chemicals Agency |
| TVeh | Test vehicle | Test vehicle |
| EMC | Elektromagnetische Verträglichkeit | Electromagnetic compatibility (EMC) |
| EPDM | E/E-Produktdatenmanagement | E/E product data management system |
| ESD | Elektrostatische Aufladung | Electrostatic discharge |
| FiNAS | Fahrzeug und Versuchsteile Informations- und Administrations-System | Vehicle and test part information system |
| FMEA | Fehlermöglichkeiten- und Einflussanalyse | Failure Mode and Effects Analysis |
| FV | Funktionsvorschrift | Function specification |
| HF | Hochfrequenz | High frequency (RF) |
| HIL | Hardware in the Loop | Hardware in the Loop |
| HV | High voltage | High voltage |
| HW | Hardware | Hardware |
| ID | Identifier | Identifier |
| IMDS | Internationales Materialdatensystem | International Material Data System |
| IP | Ingress Protection – Schutz vor Eindringen von Fremdkörpern | Ingress protection – protection against ingress of foreign objects |
| ISO | International Organization for Standardization | International Organization for Standardization |

| | | |
|---|---|---|
| CRS | Komponentenlastenheft (KLH) | Component requirement specifications (CRS) |
| KTO | Kleinteileoptimierung | Small parts optimization |
| LEK-(E) | Lieferantenentwicklungskosten (für Engineering) | Supplier development costs (for engineering) |
| LIN | Local Interconnect Network | Local Interconnect Network |
| LOG | Logistics | Logistics |
| MB | Mercedes-Benz | Mercedes-Benz |
| MBN | Mercedes-Benz Norm | Mercedes-Benz standard |
| MDB | Materialdatenblatt | Material data sheet |
| MDS | Mercedes-Benz Development System | Mercedes-Benz Development System |
| MGU | Other applicable document | Other applicable document |
| MeKo | Mercedes-Benz Korrosionsdauerlauf | Mercedes-Benz Corrosion Endurance Test |
| PMP | Prozessmasterplan | Process Master Plan |
| PPA | Production Process and Product Approval | Production Process and Product Approval (PPA) |
| PPFB | Produktionsprozess- und Produktfreigabe-Bericht | Production Process and Product Approval Report (PPAR) |
| QM | Quality Management | Quality Management |
| RD | Research & Development | Research & Development |
| SMARAGD | SysteM for the ARchiving of tAsks and Geometric Data | SysteM for the ARchiving of tAsks and Geometric Data |
| STLH | Standard-Lastenheft (standard requirement specifications) | Standard component requirement specification |
| SW | Software | Software |
| SWFT | Serienwerkzeugfallende Teile | Off-standard-tool parts |
| VDA | Verband der Automobilindustrie | German Association of the Automotive Industry |
| VeDoc | Fahrzeugdokumentation Online PKW (IT-System des Vertriebs) | Vehicle Documentation Online – Passenger Cars (IT system at GSP) |
| ZB | Assembly | Assembly |
| ZGS | Zeichnungsgeometriestand | Drawing and geometry status |

# 8 Other Applicable Documents (STM-867662)

STM-867658 The following list contains documents created by the client or external bodies. If a version or issue date is specified for a document, this version applies.
If no version or issue date is specified for a document, the following regulation applies:

- If the document is an external or company standard (namely MBN, DBL, software manual [SW-HB] or function specification FV), the latest version shall apply in order to ensure that the subject of the standard corresponds to the acknowledged state of the art at the time it is brought to market and following revision of the standard.
- If it is another document, the version of the document that was current at the time of signing the development contract belonging to the requirement specifications applies.

STM-867660 The contractor shall check that the referenced standards are up-to-date and take them into account in the tender. Should these standards change during the course of development, the contractor shall reveal the significance of such changes in terms of scheduling and costs.

STM-867659 *Documents, standards and other applicable documents referenced in the KLH created by the client are made available to the contractor in the Standards Information System (DocMaster). Externally created standards (e.g. ISO, DIN, VDA, etc.) shall not be provided by the client to the contractor for copyright reasons. Externally created standards shall be independently obtained by the contractor.*

STM-867661 *The system can be accessed via the online supplier portal at the following link:https://docmaster.supplier.mercedes-benz.com/DocMaster*

STM-867663 *List of Other Applicable Documents:*

| DocRef | Titel | English Text | Release Date | Version |
|---|---|---|---|---|
| [2000/53/EG] | Richtlinie 2000/53/EG des Europäischen Parlaments und des Rates vom 18. September 2000 über Altfahrzeuge | Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles | | |
| [70/221/EWG] | GSO-Dokument: Kraftstoffbehälter und Unterfahrschutz von Kraftfahrzeugen und Kraftfahrzeuganhängern | Fuel system: Fuel system integrity | | |
| [ALD00001275] | MBST - Mercedes-Benz Special Terms | MBST - Mercedes-Benz Special Terms | | |
| [ALD00001354] | Ergänzende Anforderungen zur IT-Informationssicherheit im Entwicklungsumfeld | Complementary requirements for IT information security in the development environment | 2020-07 | |
| [Anfragezeichnung] | Anfragezeichnung | | | |
| [CAD-Handbuch] | CAD-Handbuch | CAD Handbook | | |
| [DBL 1224] | Anforderungen an thermoplastische Kunststoffe für Anwendungen im Interieur | Requirements for Thermoplastic Synthetic Materials for Applications in the Interior | | |
| [DBL 1232] | Thermoplastische Kunststoffe für Anwendungen im Exterieur | Thermoplastics for Exterior Applications | | |

| DocRef | Titel | English Text | Release Date | Version |
|---|---|---|---|---|
| [DBL 1659] | Galvanisierte Metallteile mit Überzügen von Nickel, Nickel-Chrom oder Kupfer-Nickel-Chrom | Electroplated metal parts with nickel, nickelchromium or copper-nickel-chromium coatings | | |
| [DBL 1665] | Galvanisierte Teile aus Kunststoffen mit metallischen Überzügen und Zusatzbeschichtungen | Electroplated Parts Manufactured from Plastics with Metallic and Additional Coatings | | |
| [DBL 5425] | Beschichtung/Lackierung von Kunststoffteilen im Fahrzeug-Exterieur | Coating / Paintwork of Plastic Parts in the Vehicle Exterior | | |
| [DBL 8440] | Teile aus Eisenwerkstoffen mit anorganischer Beschichtung | Parts manufactured from ferrous materials with inorganic coating (zinc flake coatings) | | |
| [DBL 8451] | Galvanisch abgeschiedene Zink- oder Zinklegierungsschichten für Bauteile aus Eisenwerkstoffen | Electrodeposited zinc or zinc alloy coating | | |
| [DBL 8585] | Allgemeine Anforderungen – Umweltschutz, Gefahrstoffe, Gefahrgüter – Stoffnegativliste für die Werkstoffauswahl | General Requirements – Environmental protection, hazardous substances, dangerous goods – Negative substance list for the selection of materials | | |
| [DBL 9440] | Verbindungselemente mit metrischem Gewinde, Oberflächenschutz und ergänzende Technische Lieferbedingungen | Fasteners with metric thread; Surface protection and supplementary technical delivery conditions | | |
| [DBL 9441] | Oberflächenschutz von Verbindungselementen zur Direktverschraubung in Blech und Kunststoff | Surface protection of fasteners for direct screw connection in sheet metal and plastic | | |
| [DBL 9460] | Verbindungselemente mit Gewinde und mikroverkapseltem Klebstoff | Fasteners with thread and micro-encapsulated adhesive | Ersetzt durch DBL 1762; replaced by DBL 1762 | |
| [DIN EN 13018] | Zerstörungsfreie Prüfung – Sichtprüfung – Allgemeine Grundlagen | Nondestructive testing – Visual testing – General principles | | |
| [DIN EN 60068-2-14] | Umgebungseinflüsse – Teil 2-14: Prüfverfahren – Prüfung N: Temperaturwechsel | Environmental testing - Part 2-14: Tests - Test N: Change of temperature | | |
| [DIN EN 60512-5-1] | Steckverbinder für elektronische Einrichtungen - Mess- und Prüfverfahren - Teil 5-1: Prüfungen der Strombelastbarkeit; Prüfung 5a: Temperaturerhöhung | Connectors for electronic equipment - Tests and measurements - Part 5-1: Current-carrying capacity tests; Test 5a: Temperature rise | | |
| [DIN EN ISO 14040] | Umweltmanagement – Ökobilanz – Grundsätze und Rahmenbedingungen (ISO 14040:2006) | Environmental management – Life cycle assessment – Principles and framework (ISO 14040:2006) | | |
| [EG 1907/2006] | Verordnung (EG) Nr. 1907/2006 des Europäischen Parlaments und des Rates vom 18. Dezember 2006 zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe (REACH), zur Schaffung einer Europäischen Chemikalienagentur, zur Änderung der Richtlinie 1999/45/EG und zur Aufhebung der Verordnung (EWG) Nr. 793/93 des Rates, der Verordnung (EG) Nr. 1488/94 der Kommission, der Richtlinie 76/769/EWG des Rates sowie der Richtlinien 91/155/EWG, 93/67/EWG, 93/105/EG und 2000/21/EG der Kommission | Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67 | | |

| DocRef | Titel | English Text | Release Date | Version |
|---|---|---|---|---|
| [EN ISO 10074] | Anodisieren von Aluminium und Aluminiumlegierungen - Spezifikation für hartanodisierte Oxidschichten auf Aluminium und seinen Legierungen | Anodizing of aluminium and its alloys — Specification for hard anodic oxidation coatings on aluminium and its alloys | | |
| [EN ISO 2878] | Antistatische und leitende Erzeugnisse - Bestimmung des elektrischen Widerstandes | Rubber, vulcanized or thermoplastic - Antistatic and conductive products - Determination of electrical resistance | | |
| [FMVSS301] | 301 Fuel System Integrity / U.S. | 301 Fuel System Integrity / U.S. | 2004-05-19 | |
| [IEEE 802.1AS] | IEEE Standard for Local and Metropolitan Area Networks - Timing and Synchronization for Time-Sensitive Applications | IEEE Standard for Local and Metropolitan Area Networks - Timing and Synchronization for Time-Sensitive Applications | | |
| [IEEE 802.1Q] | IEEE Standard for Local and Metropolitan Area Networks — Bridges and Bridged Networks | IEEE Standard for Local and Metropolitan Area Networks - Bridges and Bridged Networks | | |
| [IEEE 802.1x] | IEEE Standard for Local and metropolitan area networks — Port-Based Network Access Control | IEEE Standard for Local and metropolitan area networks - Port-Based Network Access Control | | |
| [IEEE 802.3] | IEEE Standard for Ethernet | IEEE Standard for Ethernet | | |
| [IPC 2221 C] | Grundrichtlinie für das Design von Leiterplatten | Generic Standard on Printed Board Design | | |
| [ISO 11898-1] | Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling | Road vehicles - Controller area network (CAN) - Part 1: Data link layer and physical coding sublayer | | |
| [ISO 16845-2] | Straßenfahrzeuge - Contoller Area Network (CAN) Konformitätsprüfungsplan - Teil 2: Buszugriffseinheit im Hochgeschwindigkeitsbereich - Konformitätsprüfungsplan | Road vehicles - Controller area network (CAN) conformance test plan - Part 2: High-speed medium access unit - Conformance test plan | | |
| [ISO 20653] | Straßenfahrzeuge - Schutzarten (IP-Code) - Schutz der elektrischen Ausrüstung gegen Fremdkörper, Wasser und Berühren | Road vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access | | |
| [ISO 26262] | Road vehicles - Functional safety | Road vehicles - Functional safety | | |
| [LHV 310 001] | Übergreifende Anforderungen zum Komponentenlastenheft für E/E-, SW- und Mechanik-Umfänge | Common requirements pertaining to the component requirement specifications for EE, software and mechanical components | 2024-07 | V7.2 |
| [MBN 10029] | Nachweispflichtige Merkmale von Verbindungselementen | Fastener properties subject to mandatory confirming documentation | | |
| [MBN 10215] | Elektrik/Elektronik Anforderungen an HV-Steckverbinder | Elektrik/Elektronik Anforderungen an HV-Steckverbinder | | |
| [MBN 10300] | Normbezeichnung von Werkstoffen in der Dokumentation für Mercedes Benz AG | Standard Designation of Materials for Technical Documentation | | |
| [MBN 10317-0] | CAD-Zeichnung / 3D-CAD-Modelle – Kennzeichnung von Merkmalen zur Besonderen Nachweisführung – Grundlagen – Dokumentationspflicht von Bauteilen / Baugruppen | CAD Drawings/3D CAD Models – Documentation Requirement – Identification of Parts, Assemblies, and Special Characteristics Principles – Obligation to Component/Assembly Documentation | | |

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| [MBN 10317-2] | CAD-Zeichnung / 3D-CAD-Modelle – Kennzeichnung von Merkmalen zur Besonderen Nachweisführung – Spezifische Vorgaben und Anwendungsfälle (MBC, VAN und Buses) | CAD Drawings/3D CAD Models – Documentation Requirement – Identification of Parts, Assemblies, and Special Characteristics – Instructions and Use Cases for Characteristics Created by Special Processes (MBC, VAN and Buses) | | |
| [MBN 10326] | Elektrische und elektronische Komponenten in Kraftfahrzeugen – Halbleiterbauelemente – Zuverlässigkeitsrelevante Anforderungen | Electrical and Electrical Component in Motor Vehicle - Semiconductor Elements - Reliability Relevant Requirement | | |
| [MBN 10330] | Beschichtungen und Oberflächen in der Dokumentation (Mercede s- Benz AG) | Documentation of Coatings and Surfaces (Mercedes-Benz AG) | | |
| [MBN 10355] | Dichtheitsanforderung an Kleinteile | Tightness Requirement for Small Parts | ersetzt durch MBN 50355; replaced by MBN 50355 | |
| [MBN 10384-1] | Kfz-Steckverbinder – Prüfmatrix | Automotive Connectors Test Matrix | NFN; Nachfolger wird DIN TS 70214<br>NFN: Successor will be DIN TS 70214 | |
| [MBN 10384-2] | Straßenfahrzeuge – Kfz-Kontaktierungen – Slow-Motion-Prüfung | Straßenfahrzeuge – Kfz-Kontaktierungen – Slow-Motion-Prüfung | NFN; Nachfolger wird DIN TS 70214<br>NFN: Successor will be DIN TS 70214 | |
| [MBN 10384-3] | Kfz-Steckverbinder – Prüfabläufe | Automotive Connectors Test Procedures | NFN; Nachfolger wird DIN TS 70214<br>NFN: Successor will be DIN TS 70214 | |
| [MBN 10384] | Kfz-Steckverbinder – Prüfvorschrift | Automotive Connectors Test Specification | NFN; Nachfolger wird DIN TS 70214<br>NFN: Successor will be DIN TS 70214 | |
| [MBN 10447] | Qualitätsmanagement-Norm Elektrik / Elektronik | Quality Management Standard Electrics / Electronics | | |
| [MBN 10463] | Design Rules für E/E-Komponenten | Design Rules for E/E Components | | |
| [MBN 10497] | Schäumlinge im Karosseriebau | Foam Parts for Use in the Car Body | ersetzt durch / replaced by MBN 50497 | |
| [MBN 10503] | Maßstabsfestlegung<br><br>Oberflächenunvollkommenheiten- Anbauteile bei Kraftfahrzeugen | | | |
| [MBN 10527-1] | Elektrische und elektronische Komponenten in Kraftfahrzeugen – Halbleiterbauelemente – Allgemeine Qualitätsanforderungen | Electrical and electronic components in motor vehicles – semiconductor devices – general requirements | ersetzt durch MBN 50527-1; replaced by MBN 50527-1 | |
| [MBN 10527-2] | Elektrische und elektronische Komponenten in Kraftfahrzeugen – Halbleiterbauelemente – Spezifische Anforderungen | Electric and electronic components in Mercedes-Benz Cars – semiconductor devices – specific requirements | ersetzt durch MBN 50527-2; replaced by MBN 50527-2 | |
| [MBN 10549] | Strukturierung Mehrblattzeichnung | Structuring of a Multi-Sheet Drawing | ersetzt durch MBN 51020-5. replaced by MBN 51020-5. | |
| [MBN 10567] | Elektrische und elektronische Komponenten im Kraftfahrzeug – 12 V Bordnetz – Anforderungen und Prüfungen | Electric and Electronic Components in Motor Vehicles – 12 V On-Board Electrical System – Requirements and Tests | | |
| [MBN 11215] | Kfz-Hochvolt-Kontaktierung | Motor Vehicle High-Voltage Connection<br>Test Specification | | |
| [MBN 31020] | Schriftfelder in Zeichnungen Aufbau und Eintrag | Title Blocks in Drawings Layout and Entry | ersetzt durch MBN 51020; replaced by MBN 51020 | |
| [MBN 50284-1] | EMV-Anforderungen – Fahrzeugprüfung | EMC Requirements – Vehicle Tests | | |
| [MBN 50284-2] | EMV-Anforderungen – Komponentenprüfung | EMC Requirements – Component Tests | | |

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| [MBN 50306] | Elektrische und elektronische Komponenten in Kraftfahrzeugen – Umweltanforderungen und Prüfungen | Electric and Electronic Components in Motor Vehicles – Environmental Requirements and Tests | | |
| [MBN 50353] | Verschlusselemente aus Polymerwerkstoffen | Polymer Sealing Materials | | |
| [MBN 50435] | Kennzeichnung von Teilen mit Mercedes-Benz-Warenzeichen, Sachnummer und Identmerkmalen | Marking of Parts with Mercedes-Benz Trade Mark, Item Number and Identification Characteristics | | |
| [MBN 50499] | Qualitätsmanagement HV-Leitungssatz/-Ladekabel | Quality Management HV Wiring Harnesses/Charging Cables | | |
| [MBN 50553] | Vollrunde gewindefurchende Schrauben Mechanische und funktionelle Anforderungen | Fully Round Thread Forming Screws Mechanical and Functional Requirements | | |
| [MBN 50569] | Elektrische und elektronische Komponenten im ausschließlich elektrisch angetriebenen Kraftfahrzeug – 16 V Bordnetz – Anforderungen und Prüfungen | Electric and electronic components in all-electric motor vehicles – 16 V on-board electrical system – Requirements and tests | | |
| [MBN 51012-1] | Geometrische Produktspezifikation (GPS) - Geometrische Tolerierung | Geometrical Product Specifications (GPS) - Geometrical tolerancing | | |
| [MBN 51012-30] | Geometrische Produktspezifikation (GPS) - Kunststoffteile im Fahrzeugbau - Allgemeintoleranzen | Geometrical Product Specification (GPS) - Plastic parts in automobile industry - General tolerances | | |
| [MBN 51030] | Dekorative Oberflächentexturen - Begriffe, Konstruktionshinweise | Decorative surface textures - terms, design notes | | |
| [MBN 8839] | Technische Eigenschaften von Aluminium-Verbindungselementen; Schrauben aus AL 9 | Technical Properties of Aluminum Fasteners; Screws made of AL 9 | | |
| [MBN LV 112-1] | Elektrische Leitungen für Kraftfahrzeuge; Kupferleitung; einadrig, ungeschirmt | Electrical Cables for Motor Vehicles. Copper Conductor Cables; Single-Core; Unscreened | | |
| [MGU00002648] | RD-Hardwarebedarf Prämissen MG15 | RD Hardware Requirements Premises MG15 | 2023-08 | |
| [MGU00002849] | Leitfaden zur Definition und Umsetzung von Narbungen in RD/KE | Guidelines for the definition and implementation of grains in RD/KE | 2024-01 | |
| [MSS 10730] | Electric and electronic (E/E) components – Standard software for electronic control units (ECU) | Electric and electronic (E/E) components – Standard software for electronic control units (ECU) | 2020-01 | |
| [MSS 10742] | Mercedes-Benz Hardware Base Layer | Mercedes-Benz Hardware Base Layer | 2023-09 | 2.1 |
| [MSS 20200] | General Networking Performance Specification | General Networking Performance Specification | 2020-01 | 3 |
| [MSS 20202] | CAN Networking Performance Specification | CAN Networking Performance Specification | 2024-05 | 3.8 |
| [MSS 20208] | Ethernet Networking Performance Specification | Ethernet Networking Performance Specification | 2022-10 | 3.6.1 |
| [MSS 20220] | Networking Test Suite Requirements | Networking Test Suite Requirements | 2022-07 | 3.2 |
| [MSS Powernet V2.0] | Ausführungsvorschrift Bordnetz, Model Specific Specification (MSS) Powernet V2.0 | Model-Specific Specification (MSS) Powernet V2.0 | 2023-07 | |
| [MTC - SPEZIFIKATION 1/2] | MTC-Spezifikation 1/2 | MTC Specification 1/2 | 2024-12 | |
| [OPEN TC11] | Requirements for Ethernet Switch Semiconductors OPEN Alliance Specification | Requirements for Ethernet Switch Semiconductors OPEN Alliance Specification | 2016-09-28 | |
| [SW-HB] | Handbuch für SW-Bereitstellung und -Dokumentation im MB.OS Portal | Manual for SW provisioning and documentation in MB.OS Portal | 2025-04 | 4.0 |

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| [UN ECE R34] | Regelung Nr. 34 der Wirtschaftskommission der Vereinten Nationen für Europa (UN/ECE) - Einheitliche Bedingungen für die Genehmigung von Fahrzeugen hinsichtlich der Verhütung von Brandgefahren | Regulation No 34 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of vehicles with regard to the prevention of fire risks | | |