GUIDE

Guide
on green public procurement

Buses

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Guide
on green public procurement

Buses

This guide is based on January 2018 edition of the Blue Angel ecolabel criteria for buses (DE-UZ 59b).

Contents

Abbreviations used in this document

BAJ	Battery Association of Japan
AAS	Atomic Absorption Spectroscopy
BattG	Batteriegesetz (German Battery Act)
BZ	Fuel cells
CO_2	Carbon dioxide
DIN	Deutsches Institut für Normung
EN	European standard
EPBA	European Portable Battery Association
GWB	Gesetz gegen Wettbewerbsbeschränkungen (Act Against Restraints on Competition)
GWP	Global Warming Potential
ICP-AES	Inductively coupled plasma atomic emission spectrometry
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
KBA	Kraftfahrt-Bundesamt (Federal Motor Transport Authority)
NEMA	National Electrical Manufactures Association (USA)
ODP	Ozone depleting substances
PEMS	Portable Emission Measurement System
SMT-Labor	Supervised manufacturer's testing laboratory
UBA	Umweltbundesamt (German environmental protection agency)
UVgO	Unterschwellenvergabeordnung (Regulation governing the award of government product and service contracts below EU thresholds)
VgV	Vergabeverordnung (Public Procurement Regulation)
VO	Regulation
VwVBU	Verwaltungsvorschrift Beschaffung und Umwelt Berlin (Berlin administrative rules for procurement and environmental matters)

1 Introduction

Environmental requirements in tendering procedures for buses are intended to reduce the significant pollutant, greenhouse gas and noise emissions occasioned by buses, particularly in urban environments and areas in need of protection. Hence the requirements recommended in this guide apply to buses used for urban transport, but can also be used for interurban and long-distance buses. These requirements apply to all buses with internal combustion engines (i.e. conventional buses), electric buses, and hybrid buses.

The noise requirements discussed in this guide are based on, and undercut, the statutory requirements for type- approval measurement procedures for motor vehicle noise levels (Directive 70/157/EEC or EU Regulation 540/2014) that are in force at the time the vehicle is registered.

This guide lays out the quality and safety requirements for the automotive batteries used in electric and hybrid buses. In order to ensure that bus service life is sufficiently long, it is crucial that the interchangeability and long-term availability of automotive batteries in electric and conventional buses be assured.

Given that heavy metals can be harmful to humans, animals and plants and can end up in the food chain and the environment upon being disposed of, maximum limits for the use of heavy metals in automotive batteries are indicated in this guide.

Given that the aim is to use ecofriendly halogen-free refrigerants in bus air conditioning, use of the previously used R134a refrigerant is to be avoided. A number of bus manufacturers have developed electric air conditioning based on carbon dioxide. Use of these systems is still in its infancy, but they are already commercially available.

It is also vital that (a) maximum limits for heavy metals in bus paints and other coatings be adhered to; and (b) solvent emissions during the coating process be lower than the statutory requirements.

The statutory requirements for green public procurement of vehicles exceeding Community thresholds can be found in Article 68 Procurement Regulation (VgV). It calls for vehicle calls for tenders to reasonably apply energy consumption and environmental impact factors as tender evaluation criteria. In such cases, the following factors, based on total vehicle mileage, should be taken into consideration:

1. Energy consumption
2. Carbon dioxide emissions
3. NO_x emissions
4. Non-methane carbon emissions
5. Particulate matter in exhaust

Contracting authorities are required to meet this obligation either by indicating vehicle energy/fuel consumption and environmen-

tal impact in the vehicle's performance specifications, or by classifying vehicle energy/fuel consumption and environmental impact as contract-award criteria. Given that it would make little sense to promulgate energy consumption requirements in a guide of this nature, tender evaluation recommendations are listed in section 6.2.

2 How to use this guide

This guide contains essential information and recommendations for contracting authorities concerning the incorporation of environmental considerations into calls for tenders and contractual documents. **The tenderer questionnaire concerning green public procurement of buses** (annexed hereto and available as a Microsoft Word document at www.beschaffung-info.de) is intended for use as an annex to the specifications. To this end, in terms of the environmental requirements for contractual deliverables, you need only include a reference in the description of the deliverables in order to meet the legal requirement that the deliverables be described clearly and completely.[1] Such a description could be worded as follows:

In order for a bid to be considered [the bus/buses (delete as appropriate)] is required to meet the minimum criteria set out in the annexed "Tenderer questionnaire on green public procurement of buses." The assessment criteria referred to in the questionnaire will be applied to the tender evaluation process. By way of proof, you are to submit a completed questionnaire for the bus/busses [delete as appropriate] being tendered, along with the required elements of proof. Insofar as the offered bus/busses [delete as appropriate] bear the Blue Angel ecolabel for buses (DE-UZ 59b, Edition January 2018), the elements of proof for the criteria listed in sections 2, 3.2–3.6 and 5 can be foregone. The elements of proof referred to in the aforementioned sections can likewise be foregone if the vehicles in question bear an equivalent ecolabel or quality seal and comply with all labelling related minimum criteria listed in the tenderer questionnaire. The information called for by sections 1, 3.1 and 4 is to be entered in the tenderer questionnaire, and the elements of proof referred to under "Comments" are to be added to your bid.

The suggested wording in square brackets ["delete as appropriate"] needs to be adapted or fleshed out by the contracting authority.

The tenderer questionnaire also makes it easier for contracting authorities to assess tenders.

1 Article 121(1) German Act on Unfair Competition (GWB).

3 Scope

This guide applies to buses used for passenger transport that fall into vehicle class M3 (pursuant to the German law known as StVZO), regardless of whether conventional, electric, or hybrid buses are involved.

This guide applies to buses that are used for urban, interurban or long-distance transport.

This guide does not apply to electric vehicles that are powered by fuel cells.

4 Definitions of terms

- **EURO VI:** An EU exhaust emissions standard that sets limits for vehicle exhaust emissions and pollutants. The limits mandated by Regulation No (EC) 582/2011b, as amended by Regulation No (EC) 2016/1718 (applies solely to the PEMS constituent of type approvals for the measurements of real emissions) are to be adhered to.

- **Global warming potential (GWP):** (also known as carbon equivalent) refers to the impact of a defined amount of greenhouse gas on the greenhouse effect, as measured using carbon dioxide as a comparative value. GWP is based on the warming potential of 1 kg of gas over a 100 year period, relative to the said potential for 1 kilogram of carbon dioxide.

- **Sound pressure level:** A logarithmic metric that characterizes the strength of an acoustic event. Sound pressure level, which is one of the sound field parameters, is expressed in decibels (dB(A)).

- **VwVBU:** Verwaltungsvorschrift Beschaffung und Umwelt aus Berlin (Berlin administrative rules for procurement and environmental matters)

5 Proof of compliance

When issuing calls for tenders, contracting authorities have the option to state that tenderers can demonstrate compliance with the relevant performance requirements by submitting certificates from a conformity assessment body pursuant to Article 33 Procurement Regulation (VgV)[2] or via quality seals pursuant to Article 34 VgV and Article 24 UVgO.[3]

5.1 Proving compliance via certification from a conformity assessment body

Pursuant to Article 33 Public Procurement Regulation (VgV), compliance with technical requirements can be substantiated by a conformity assessment body such as TÜV, or a certified test lab, or by a certificate of conformity issued by such a body. In cases where a contracting authority stipulates that certification is to be issued by a particular conformity assessment body, such authority is to also accept certificates of conformity issued by equivalent conformity assessment bodies (Article 33(1)(sentence 2) VgV). Contracting authorities are also required to accept other forms of proof such as manufacturers' technical documentation pursuant to Article 34(2) VgV. This presupposes the following:

- That the tenderer does not have access to the required certifications or to proof supplied by an equivalent body; or
- That the tenderer's inability to obtain proof from a conformity assessment body by the relevant bid submission deadline was due to circumstances beyond the tenderer's control.

In both such scenarios, the burden of proof rests on the tenderer – which means that if a tenderer is unable to prove that the proposed deliverables do not meet the mandated technical requirements, the attendant bid will be excluded from the contract award procedure.

2 Verordnung über die Vergabe öffentlicher Aufträge (Vergabeverordnung – VgV) vom 12. April 2016 (Procurement Regulation (VgV) (BGBl. I, p. 624).

3 German regulation known as the *Unterschwellenvergabeordnung (UVgO)*. Given that the UVgO sets forth procedural rules, its coming into effect will be contingent upon implementation of the provisions of the amended version of *Allgemeinen Verwaltungsvorschriften zu §55 der Bundeshaushaltsordnung bzw. für die Länder* in the relevant regional-state laws. At the federal level, the UVgO came into effect on 2 September 2017 (BMF-Rundschreiben vom 01.09.2017 – II A 3 - H 1012-6/16/10003:003). The regional-states amend their budgetary regulations to harmonize with the coming into force of the UVgO.

5.2 Proof via quality seals

Contracting authorities have the option to require compliance with the technical specifications of a specific quality seal such as the Blue Angel ecolabel. In such cases, contracting authorities are required to accept quality seals that mandate equivalent requirements for the proposed deliverables (Articles 4 and 34(4) Procurement Regulation (VgV), Article 24(4) UVgO). This applies in particular to quality seals from other EU member states. In cases where the proposed deliverables do not need to meet the totality of the requirements mandated by a given quality seal, then the contracting authority in question is to specify which quality-seal requirements are to be met (Article 34(3) VgV; Article 24(3) UVgO).

In cases where a tenderer is unable to provide, by a reasonable deadline and for reasons beyond the tenderer's control, either the required quality seal or an equivalent thereof, the contracting authority is to accept other suitable forms of proof such as technical documentation or test reports from a recognized body (Article 34(5) VgV; Article 24(5) UVgO). In such cases it falls to the tenderer to prove that the alternative form of proof in question meets the requirements of the relevant quality seal.

5.3 Recommended evidential requirements

Requiring that proof that the proposed deliverables meet the mandated performance requirements be confined solely to a quality seal is only advisable in cases where there is already a sufficient number of products from various manufacturers that are endowed with the quality seal in question; for this is the only way to ensure that tenderers are genuinely in competition with each other. Hence when it comes to buses, contracting authorities should first check on the Blue Angel website (www.blauer-engel.de) whether a sufficient number of products (e.g. four or more) bear the Blue Angel eco-label and are commercially available. If this proves not to be the case, then in addition to the Blue Angel eco-label and equivalent eco-labels, individual elements of proof should also be accepted as proof of compliance with the performance specifications. Such proof can take the form of, for example, certificates from conformity assessment bodies (e.g. test-lab test results) or manufacturers' technical documentation.

The tenderer questionnaire that is annexed to this guide takes all three of these substantiation options into account, i.e. Blue Angel eco-label, equivalent quality seal and individual substantiations.

6 Environmental requirements

6.1 Environmental requirements pertaining to contractual deliverables

6.1.1 Noise emissions

Criterion: Minimum

Proof of compliance: Submission of a copy of the vehicle registration (Zulassungsbescheinigung Teil I) (field U.3 titled *Fahrgeräusch* (road noise)). For type approvals, submit type approval documentation.

Road noise tests are to be carried out in accordance with the Regulation No (EC) 540/2014 type-test measurement procedures that are in force when the vehicle is registered. The A-rated maximum road noise sound pressure is not to exceed the limits listed in the following table.

Table 1:

Maximum road noise limits

Rated engine power	Road noise
less than 150 kW	73 dB(A)
greater than 150 kW	76 dB(A)
greater than 250 kW	77 dB(A)

Table 1: Source: UBA

6.1.2 Pollutant emissions

Criterion: Minimum

Proof of compliance: Blue Angel ecolabel for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or type-test documentation from a Federal Motor Transport Authority (KBA)-accredited testing organization pursuant to Directive 715/2007/EC

Conventional or hybrid buses are required to meet the limits mandated by Regulation No (EC) 582/2011b, as amended by Regulation No (EC 2016/1718 (applies solely to the PEMS constituents of type approvals for measurements of real emissions).

Electric vehicles are exempt from this requirement.

6.1.3 Automotive batteries

The requirements listed in sections 6.1.3.1, 6.1.3.2 and 6.1.3.3 apply solely to traction (industrial) batteries, while the requirements listed in sections 6.1.3.4, 6.1.3.5 and 6.1.3.6 apply to all batteries that are installed in a given vehicle.

Traction (industrial)-battery requirements apply solely to the procurement of electric buses.

6.1.3.1 Testing of rated capacity for automotive batteries

Criterion: Assessment

Proof of compliance: Submission of a test report attesting that the battery meets the relevant capacity requirements. Such reports are to be issued by a test lab that meets the general requirements for the competence of testing and calibration laboratories pursuant to DIN EN ISO/IEC 17025. Tenderer test records are deemed the equivalent of the aforementioned test reports, provided that they are used by a test lab that has been granted SMT accreditation by an independent body.

Battery capacity is to be determined pursuant to the currently valid versions of DIN EN 62660-1 and DIN EN 61982.

DIN EN 62660-1 testing of lithium-ion traction batteries is to be carried out as follows: The battery is to be discharged at a predefined constant ambient temperature (25 °C) until the relevant individual cut-off voltage is reached, and is then to be recharged using the manufacturer's specified charging method. The battery is then to be stabilized and discharged as per the manufacturer's instructions, using the mandated discharge current for the type of vehicle in question. Discharge time is to be measured until the specified cut-off voltage is reached, and is then to be calculated in Ah, carried out to three significant figures (see DIN EN 62660-1, section 7.2).

6.1.3.2 Battery life and warranty

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or product documentation

Tenderers should provide a warranty for the life (in conjunction with the intended use) of each battery amounting to at least five years, 200,000 kilometres, or 8,000 operating hours, whichever comes first. For the scenarios described above, residual battery capacity should equate to 70 % of rated capacity.

6.1.3.3 Safety check; protection against overcharging and deep discharge of automotive batteries

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or test record. The test lab is to be DIN ISO 17025/ IEC-certified. Tenderer test protocols are deemed the equivalent of the aforementioned test reports provided that they are used by a test lab that has been granted SMT (supervised manufacture's testing laboratory) accreditation by an independent body.

The safety of lithium-ion batteries for use in electric road vehicles is to be demonstrated via the tests referred to in section 6 of DIN EN 62660-3. Such testing also includes (among other things) battery performance during overcharging and deep discharge.

6.1.3.4 Fulfilment of the take-back and reporting obligation pursuant to the German Batteriegesetz (BattG)

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or submission of *Herstelleranzeige.pdf*. Explanation: Once a battery manufacturer's specifications have been entered in the UBA's *BattG-Melderegister* (Batteries Act registry), the manufacturer receives a PDF document containing the archived data for confirmation.

The tenderer is to verify fulfilment of the take-back and reporting obligation by the relevant battery manufacturer pursuant to Articles 4 and 5 BattGg (entering the manufacturer's specifications in the UBA BattG registry, especially concerning the exact procedure that is used to take back waste batteries).

6.1.3.5 Battery replacement

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, manufacturer declaration, or product documentation

It is vital to ensure that batteries and/or battery cells can be replaced by the user or a professional without the risk of damage.

Compatible replacement batteries and battery cells are to be available for ten years following the date of delivery of the relevant bus.

6.1.3.6 Heavy metal limits

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or test report. Test reports are to be prepared by a test lab that meets the general competence requirements for testing and calibration laboratories pursuant to DIN EN ISO/IEC 17025, or that is certified as an independent SMT lab. Such labs are to declare compliance with the requirements. Heavy-metal content is to be determined in accordance with the methods issued in September 2013 by the *Bundesanstalt für Materialforschung und -prüfung (BAM, Federal Institute for Materials Research and Testing)* in the following publication: *Überprüfung der Quecksilber-, Cadmium- und Blei-Gehalte in Batterien. Analyse von Proben handelsüblicher Batterien und in Geräten verkaufter Batterien. Erstellung eines Probenahmeplans, Probenbeschaffung und Analytik"*; or in accordance with the April 1998 version of *Industry Standard Analytical Method for the determination of Mercury, Cadmium and Lead in Alkaline Manganese Cells Using AAS, ICP-AES and Cold Vapour*. Publishers: The European Portable Battery Association (EPBA), the Battery Association of Japan (BAJ), the National Electrical Manufactures Association (NEMA; USA); or using equivalent methods.

The use of device, vehicle or traction (industrial) batteries whose heavy-metal content exceeds 0.0005 % mercury is prohibited under the German Batteries Act. In addition, there is a ban on cadmium in device batteries: cadmium content is not to exceed 0.002 weight per cent.

Table 2:

Heavy-metal limits for batteries, pursuant to Article 3 German Battery Act (BattG)

Heavy-metal limits	Traction (industrial) batteries	Vehicle batteries (for starters)	Device batteries (remote controls etc.)
Batteries with mercury content exceeding 5 ppm are prohibited	x	x	x
Batteries with cadmium content exceeding 20 PPM are prohibited			x

6.1.4 Air conditioning

Criterion: Minimum

Proof of compliance: Submission of suitable technical documents concerning the refrigerant used in vehicle air conditioning

In the interest of ensuring that bus air conditioning is eco-friendly, only a natural, non-halogenated refrigerant should be used for urban, interurban and long-distance transport buses, and for buses with electric, hybrid and internal-combustion engines.

6.1.5 Paint and coatings

Criterion: Minimum

Proof of compliance: Blue Angel eco-label for buses (DE-UZ 59b, Edition January 2018), equivalent quality seal, or manufacturer declaration

Coatings are to be used for bus primers and paints that (apart from impurities) are devoid of fillers, pigments or desiccants containing iron, chromium VI or cadmium.

Coating-process emissions are not to exceed the solvent emissions for an overall emission limit of 130 g/m^2.[4]

6.2 Tender evaluation

Tender evaluations may factor in contractual-deliverables related criteria such as environmental characteristics and life cycle costs.[5]

For buses, it is recommended that the requirements set forth in section 6.1.3.1 be used as assessment criteria, via a point system or the like.

In cases where the energy and/or fuel consumption and environmental impact of road vehicles are assessed from a financial standpoint (pursuant to Article 68(3) Public Procurement Regulation (VgV)), the method described in Annex 3 VgV is to be applied. Excel spreadsheets, can be used for the cal-

4 The emission limits are based on Regulation regarding the reduction of VOC emissions resulting from the use of organic solvents in specific installations – 31st BlmSchV.

5 See Article 43(6) 2 & 4 UVgO; Article 127 GWB, in conjunction with Article 58(2) VgV.

culations in such cases. See the following in this regard:

- VwVBU Annex 4: https://www.berlin.de/senuvk/service/gesetzestexte/de/beschaffung/

- Umweltleitfaden Hamburg: https://www.hamburg.de/umweltvertraegliche-beschaffung/

Note: Given that these tools only allow for the calculation of the life cycle costs of vehicles that have the same type of engine, the life cycle costs of vehicles with different types of engines cannot be compared using these tools.

It is advisable to deem the environmental requirements referred to in section 6.1 minimum criteria – which means that only those bids should be considered that meet all of these criteria.

Annex: Tenderer questionnaire concerning green public procurement of buses

General information

Product name	
Manufacturer	
Tenderer	
Tenderer's address	

Information on proof of compliance

Does the product have a Blue Angel eco-label?	
The product in question is certified by the January 2018 edition of the Blue Angel eco-label for buses (DE-UZ 59 b). This means that the criteria listed in the Requirements table in the following section for items 2, 3.2–3.6 and 5 are met – and thus the submission of documents (annexes) demonstrating compliance can be foregone. The information called for by sections 1 and 4 is to be entered in the tenderer questionnaire, and the elements of proof referred to under "Comments" are to be added to the bid. The figures requested for section number 3.1 are to be indicated truthfully. The required proof (see the "Requirements" column) is being submitted with this bid, for purposes of confirmation. Label use contract no.: __	☐ Yes

Does the product have an equivalent ecolabel?	
The product being offered bears an equivalent ecolabel, which is hereby submitted with this bid for the product being offered as an alternative to the Blue Angel ecolabel. Quality seal name and label use contract no.: __ In the table in the “Requirements” section below, the tenderer furthermore declares, by marking the checkboxes in the right-hand column of the table for items 1, 2, 3.2-3.6, 4 and 5, that the quality seal being submitted meets the requirements entailed by the minimum criteria set forth herein. The substantiating documents listed in the “Comments” column need not be submitted for these sections. However, the information requested for sections 1 and 4 are to be included in the vendor questionnaire. In the event the submitted quality seal fails to meet one or more requirements, compliance with such requirements is to be proven by marking the checkboxes in the “Requirements” section of the right-hand column of the table, and by submitting the relevant proof (“Comments” column) with this bid. The figures requested in the table in the “Requirements” section below (section 3.1) are truthful and accurate. The required proof (see the “Requirements” column) is being submitted with this bid, by way of confirmation.	☐ Yes

Does the product not have an equivalent quality seal?	
The product in question is certified neither by the January 2018 edition of the Blue Angel eco-label for buses (DE-UZ 59b) nor by an equivalent quality seal. In the table in the “Requirements” section below, check the box in the right-hand column of the table (items 1, 2, 3.2–3.6, 4 and 5) to confirm that the product meets the specified minimum criteria. The proof of compliance referred to in the “Comments” column have been included in the bid. The figures requested in the table in the “Requirements” section below (section 3.1) are truthful and accurate (assessment criterion). The required proof (see the “Requirements” column) is being submitted with this bid, by way of confirmation.	☐ Yes

Requirements

<table>
<tr><th>No.</th><th>Criterion</th><th>Comment</th><th>Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)</th></tr>
<tr><td>1</td><td>Noise emissions</td><td></td><td></td></tr>
<tr><td></td><td>Road noise tests are to be carried out in accordance with the Regulation No (EC) 540/2014 type-test measurement procedures that are in force when the vehicle is registered.

The A-rated maximum road noise sound pressure is not to exceed the limits listed in table 1.

Table 1:
Maximum road noise limits
<table><tr><th>Nominal engine power</th><th>Road noise</th></tr><tr><td>less than 150 kW</td><td>73 dB(A)</td></tr><tr><td>greater than 150 kW</td><td>76 dB(A)</td></tr><tr><td>greater than 250 kW</td><td>77 dB(A)</td></tr></table>Table 1: Source: UBA
A-rated maximum road noise sound pressure: _____ dB(A)</td><td>Minimum criterion
Proof via submission of a copy of the vehicle registration (Zulassungsbescheinigung Teil I) (field U.3 titled Fahrgeräusch (road noise)). For type approvals, submit type approval documentation.</td><td>☐</td></tr>
</table>

6 Proof is to be submitted in the guise of the questionnaires in the documents listed under “Comments.”

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
2	**Pollutant emissions**		
	Conventional or hybrid vehicles are required to meet the limits mandated by Regulation No (EC) 582/2011b, as amended by Regulation No (EC 2016/1718 (applies solely to the PEMS constituents of type approvals for the measurements of real emissions). **Electric vehicles are exempt from this requirement.**	Minimum criterion Proof via submission of type-test documentation from a testing organization that is accredited by the Kraftfahrt-Bundesamt (KBA) for measurements pursuant to Directive 715/2007/EC.	☐
3	**Automotive Batteries**		
	The requirements listed in sections 3.1, 3.2 and 3.3 apply solely to traction (industrial) batteries, while the requirements listed in sections 3.4, 3.5 and 3.6 apply to all batteries in a given vehicle. **The traction-battery requirements apply solely to the procurement of electric buses.**		

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
3.1	Testing capacity of rechargeable batteries (rated capacity)		
	Battery capacity is to be tested pursuant to the currently valid versions of DIN EN 62660-1 and DIN EN 61982. Testing of lithium-ion batteries is to be carried out as follows (as per DIN EN 62660-1): The battery is to be discharged at a predefined constant ambient temperature (25 °C) until the relevant individual cut-off voltage is reached, and is then to be recharged using the manufacturer's specified charging method. The battery is then to be stabilized and discharged as per the manufacturer's instructions, using the mandated discharge current for the type of vehicle in question. Discharge time is to be measured until the specified discharge current is reached, and is then to be calculated in Ah, carried out to three significant figures (see DIN EN 62660-1, section 7.2). Battery capacity is expressed as follows: Ah = __	Assessment criterion Battery capacity is a bid assessment criterion. The battery with the highest capacity receives the highest point score. Proof via submission of a test report attesting that the battery meets the relevant capacity requirements. Such reports are to be issued by a test lab that meets the general requirements for test and calibration laboratories pursuant to DIN EN ISO/IEC 17025.	☐

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
		Vendor test protocols are deemed the equivalent of the aforementioned test reports provided that they are used by a test lab that has been granted SMT (supervised manufacture's testing laboratory) accreditation by an independent body.	
3.2	Battery life and warranty		
	Tenderers should provide a warranty for the life of each battery (in accordance with its intended use) amounting to at least five years, 200,000 kilometres, or 8,000 operating hours, whichever comes first. For the scenarios described above, residual battery capacity is to equate to 70 % of rated capacity.	Minimum criterion Proof of compliance: via product documentation	☐

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
3.3	Safety check; protection against overcharging and deep discharge of batteries		
	The safety of lithium-ion batteries for use in electric road vehicles is to be demonstrated by passing the tests referred to in section 6 of DIN EN 62660-3. Such testing also includes (among other things) battery performance during overcharging and deep discharge.	Minimum criterion Proof of compliance: via a test report. The test lab is to be DIN ISO 17025/ IEC-certified. Tenderer test protocols are deemed the equivalent of the aforementioned test reports provided that they are used by a test lab that has been granted SMT (supervised manufacture's testing laboratory) accreditation by an independent body.	☐

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
3.4	Proof of compliance: Fulfilment of take-back and reporting obligation pursuant to the German Batteriegesetz (BattG)		
	The tenderer should verify fulfilment of the take-back and reporting obligation by the relevant battery manufacturer pursuant to Articles 4 and 5 BattGg (entering the manufacturer's specifications in the UBA BattG registry, especially concerning the exact procedure that is used to take back spent waste batteries).	Minimum criterion Submission of the UBA *Herstellerанzeige.pdf*. Explanation: Once a battery manufacturer's information has been entered in the UBA's *BattG-Melderegister* registry, the manufacturer receives a PDF document containing the archived data, by way of confirmation.	☐
3.5	Battery replacement		
	It is vital to ensure that batteries and/or battery cells can be replaced by the user or a professional without the risk of damage. Compatible replacement batteries and battery cells are to be available for ten years following the date of delivery.	Minimum criterion Proof of compliance: via a manufacturer's declaration or product documentation	☐

<table>
<tr><th>No.</th><th>Criterion</th><th>Comment</th><th>Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)</th></tr>
<tr><td>3.6</td><td>Heavy metal limit values</td><td></td><td></td></tr>
<tr><td></td><td>The use of device, vehicle or traction (industrial) batteries whose heavy-metal content exceeds 0.0005 % mercury is prohibited under the German Batteries Act. In addition, there is a ban on cadmium in device batteries: cadmium content is not to exceed 0.002 weight per cent.

Table 2:

Heavy-metal limit values for batteries, pursuant to Article 3 German Battery Act (BattG)
<table>
<tr><th>Heavy metal-limits</th><th>Industrial battery (Traction battery)</th><th>Automotive battery (Starter battery)</th><th>Device battery (Batteries in handheld transmitters etc.)</th></tr>
<tr><td>Batteries with mercury content exceeding 5 PPM are prohibited</td><td>x</td><td>x</td><td>x</td></tr>
<tr><td>Use of batteries with cadmium content exceeding 20 PPM prohibited</td><td></td><td></td><td>x</td></tr>
</table></td><td>Minimum criterion
Proof of compliance: via a test report. Such reports are to be issued by a test lab that meets the general requirements for competence of testing and calibration laboratories pursuant to DIN EN ISO/IEC 17025, or that is certified as an independent SMT lab. Such labs are to duly declare that they meet the said requirement. Heavy-metal content is to be determined in accordance with the methods issued in September 2013 by the</td><td>☐</td></tr>
</table>

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
		Bundesanstalt für Materialforschung und -prüfung (BAM) in the following publication: Überprüfung der Quecksilber-, Cadmium- und Blei-Gehalte in Batterien. Analyse von Proben handelsüblicher Batterien und in Geräten verkaufter Batterien. Erstellung eines Probenahmeplans, Probenbeschaffung und Analytik; or in accordance with Industry Standard Analytical Method for the determination of Mercury, Cadmium and Lead in Alkaline Manganese Cells Using AAS, ICP-AES and Cold Vapour, which is published by the following entities:	

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
		The European Portable Battery Association (EPBA), the Battery Association of Japan (BAJ), the National Electrical Manufactures Association (NEMA; USA) April 1998; or comparable method.	
4	**Air conditioning**		
	In the interest of ensuring that bus passenger cabin air conditioning is eco-friendly, only a natural, non-halogenated refrigerant should be used for urban, interurban and long-distance transport buses, and for buses with electric, hybrid and internal-combustion engines. Refrigerant used: _____	Minimum criterion Submission of suitable technical documents concerning the refrigerant used for bus-cabin air conditioning	☐

No.	Criterion	Comment	Criterion met, proof of compliance: submitted[6] (to be completed by the tenderer)
5	**Paint and coatings**		
	Coatings are to be used for bus primers and paints that (apart from impurities) are devoid of fillers, pigments or desiccants containing iron, chromium VI or cadmium. Coating-process emissions are not to exceed the solvent emissions for an overall emission limit of 130 g/m^2 [7]	Minimum criterion Proof of compliance: via a manufacturer's declaration	☐

7 The emission limits are based on *Ordinance regarding the reduction of VOC emissions resulting from the use of organic solvents in specific installations – 31st BImSchV*.

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