

Technical terms and conditions of delivery - Identification and physical marking of parts and components

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1 Purpose of the document

Why identify and mark parts and components?

Identifying and physically marking parts and components allows them to be tracked specifically over their life cycle. This is useful to answer, among other things, questions on their quality (how often does a part fail in its life cycle), on their availability (where is a part located) and on their cost-effectiveness (how long does a part last).

Apart from these benefits, existing and, where necessary, newly applicable statutory requirements regarding monitoring can also be implemented efficiently for safety-related parts in particular.

DB AG premises

Deutsche Bahn AG and its affiliated companies (hereafter referred to jointly as DB AG) adopt the following premises with identification and marking:

1 Unique identification:

Parts shall be uniquely identifiable by means of their marking. By unique DB AG means that a number is not duplicated anywhere in the world.

2 Auto-ID-capable marking:

Markings shall be auto-ID-capable (i.e. machine-readable). In this respect, optical solutions such as barcode (1D barcode), Data Matrix (2D barcode) or non-optical solutions with RFID (radio-frequency identification) can be used as an alternative.

3 Identification and marking based on a standard:

Identification and marking shall be applied uniformly based on a standard, taking into account the applicable standards (state of the art). The standard shall provide rules regarding the following topic areas:

- Formation and issuance of unique identification numbers
- Data formats for using barcodes (1D/2D) and EPC/RFID
- Marking of parts and components

DB AG has opted for the GS1 standard (following the standard for the rail industry under development) to mark constituent parts. This means that parts that DB AG already owns will be marked according to this standard.

Requirements placed on DB AG contractors

The following applies to parts and components for which these technical terms and conditions of delivery are agreed:

- Unique identification is MANDATORY
- Auto-ID-capable marking is MANDATORY
- The use of a standard is MANDATORY (GS1 standard is recommended)

2 Other applicable documents

The document includes cross-references to other publications. In this respect, the latest version of the referenced publication (including valid amendments) shall apply. The following regulations and provisions shall be taken into account in their latest version:

| Norm/ Standard | Title |
|--------------------------|--|
| GS1 application standard | Identification of Components and Parts in the Rail Industry - Application Standard |
| GS1 GenSpecs | GS1 General Specifications |
| DIN EN 50125-1 | Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment |
| DIN EN 50125-2 | Railway applications - Environmental conditions for equipment - Part 2: Fixed electrical installations |
| DIN EN 50125-3 | Railway applications - Environmental conditions for equipment - Part 3: Equipment for signalling and telecommunications |
| ISO/IEC 15424 | Information technology - Automatic identification and data capture techniques - Data Carrier Identifiers (including Symbology Identifiers) |
| ISO/IEC 15434 | Information technology - Automatic identification and data capture techniques - Syntax for high-capacity ADC media |
| ISO/IEC 15418 | Information technology - Automatic identification and data capture techniques - GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance |
| ISO/IEC 15459-4 | Information technology - Automatic identification and data capture techniques - Unique identification - Part 4: Individual products and product packages |
| ISO/IEC 15415 | Information technology - Automatic identification and data capture techniques - Bar code symbol print quality test specification - Two-dimensional symbols |
| ISO/IEC 15416 | Information technology - Automatic identification and data capture techniques - Bar code print quality test |
| ISO/IEC TR 29158 | Information technology - Automatic identification and data capture techniques - Direct Part Mark (DPM) Quality Guideline |
| ISO/IEC 15417 | Information technology - Automatic identification and data capture techniques - Code 128 bar code symbology specifications |
| ISO/IEC 16022 | Information technology - Automatic identification and data capture techniques - Data Matrix bar code symbology specification |
| DIN 66401 | UIM - Unique Identification Mark - Application standard for very small items using matrix symbols |
| ISO/IEC TR 24720 | Information technology - Automatic identification and data capture techniques - Guidelines for direct part marking (DPM) |
| ISO/IEC 18000-63 | Information technology - Automatic identification and data capture techniques - Parameters for air interface communications at 860 MHz to 960 MHz Type C |

Other regulations and documents to which the aforementioned regulations refer shall also be taken into account.

3 Area of application

This document applies whenever it is agreed contractually. The parts and components that the contractor must identify and mark physically shall also be defined specifically in each contract.

For the contractor's composed parts/components which include other parts/components that must be marked, the contractor shall ensure that these are identified and marked physically in accordance with the applicable requirements.

4 DB-specific requirements regarding identification and physical marking

Identification and physical marking shall be performed in accordance with an overarching standard. For the rail industry this is referenced in this document to the GS1 application standard "*Identification of Components and Parts in the Rail Industry*". An equivalent standard may be applied.

This document covers DB AG's requirements that go beyond a standard or specifies content that cannot be regulated definitively at the level of a standard.

Note: At the start of each section, the applicable sections of the GS1 application standard are stated in a box to make it easier to work with this document in conjunction with the GS1 application standard.

The full GS1 application standard "*Identification of Components and Parts in the Rail Industry*" is published on the GS1 website.

4.1 Identification of parts and components

Relevant section as per GS1 application standard "Identification of Components and Parts in the Rail Industry": section 5.1

Unless explicitly stated otherwise in the contract, a part or a component must always be identified at the serialized level (globally unique number/serial ID). The identification number shall always be physically affixed to the part/component. In addition, the primary packaging material shall be marked physically with the identification number.

A part/component may also basically (in addition) be identified at the level of the object class (item number) or of the lot.

4.2 Physical marking of parts and components

Relevant sections as per GS1 application standard "Identification of Components and Parts in the Rail Industry": sections 8.2 and 9.4

Parts and components may be marked physically in various ways. Basically the following is permissible:

- Marking directly on the part/component, e.g. via Direct Part Marking - DPM
- Indirect marking, e.g. with a durable label or a plate
- The (additional) affixing of an EPC/RFID tag

The physical marking of the parts/components always includes the encryption of the identification number in an optical data carrier. A Data Matrix or a QR code shall be used for the selection of the optical data carrier. Use of the GS1 Data Matrix is recommended.

DB AG may also request in the statement of work that the identification number is encrypted in an EPC/RFID data carrier and the data carrier affixed to the part/component.

In addition to auto-ID-capable marking, the identification number shall always be affixed in HRI format as a fallback level on the part. Marking in non-HRI format is not permitted.

4.3 Marking requirements

The following requirements shall be taken into account when affixing the physical marking:

- Marking shall never affect any function of the part/component on which it is affixed.
- Markings shall be affixed to the part/component so that they are quickly visible even if the identified parts/components are being used/operated. Markings shall not be located either on loose, easily removable or highly reflective (e.g. relay group cover) subcomponents.
- Markings shall be affixed in such a way that they are protected against mechanical damage (for instance by placing them in the wind shadow of the objects).
- Readers (such as smartphones, tablets, hand-held scanners or similar devices) shall be able to read data from the marking (label/(type) plate) from the frontal view.
- Markings with barcode symbols should not be affixed in shaded corners to prevent reduced contrast and hence difficulties with scanning.
- Markings should, whenever possible, be affixed to smooth surfaces. Curved surfaces may impair the readability of barcodes or RFID and also make it more difficult to stick on labels.
- The markings should, wherever possible, be affixed at a 45° angle so that water can drain and minimal dust accumulate. In addition, this affixation reduces the risk of damage caused by flying debris.
- The Data Matrix or QR code shall not be less than the X module size 20 mil (1 mil = 1/1,000 inch = 0.0254 mm). If a smaller module size is required, this is only allowed in consultation and agreement with DB AG.
- The font size is at least 6 pt (2.1 mm) for the application identifier and at least 8 pt (2.8 mm) for the data field. The identification number shall be written without spaces. If a smaller font size is required, this is only allowed in consultation and agreement with DB AG.
- The marking shall be affixed permanently on the part/component in an appropriate way, i.e. the durability should be equivalent to the object's service life. Marking carriers and fastening technologies shall be tailored to the respective part/component. The product-specific requirements by the DB AG design managers shall be taken into account in this respect. The durability of the carrier and the readability of the data carrier shall be given at all times as specified in the standards DIN EN 50125-1, DIN EN 50125-2 and DIN EN 50125-3 and under the loads expected in rail operations.
- The type plate should be used wherever possible to affix data carrier and identification number in plain text. If this is not possible, the marking carrier should be affixed near to the type plate.

4.4 Identification and physical marking of composed parts and components

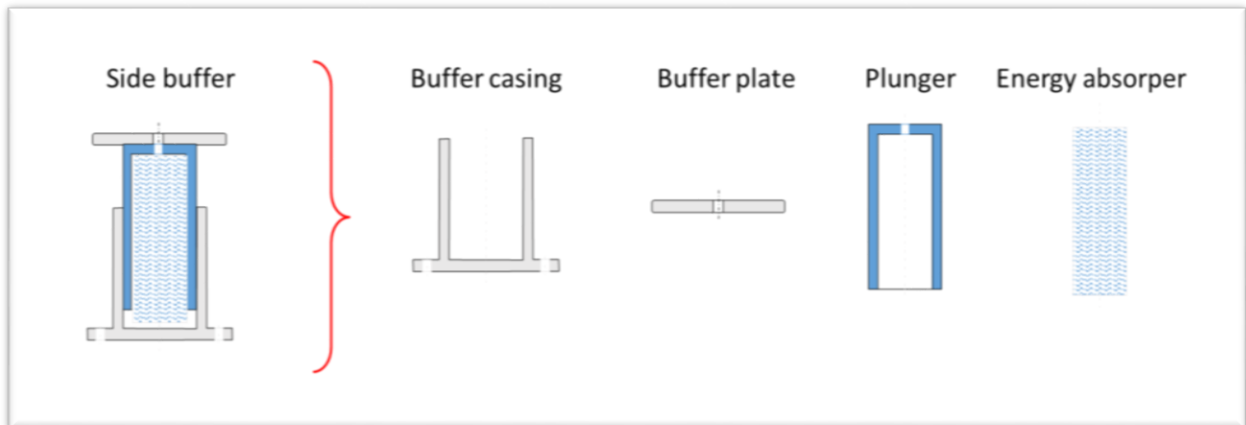
Relevant sections as per GS1 application standard "Identification of Components and Parts in the Rail Industry": section 5.4

Composed objects can basically be identified and physically marked using two options:

1. The composed object does not have its own identification number.

The identification number of the "leading part" within the composed object is at the same time the identification number of the composed object. The leading part is therefore marked physically with one identification number only.

2. The composed object has its own identification number.
The identification number of the part itself as well as the identification number of the composed object are physically affixed to the "leading part". The leading part is therefore marked physically with two identification numbers.



Example: A side buffer consisting of four parts:

*Re. option 1: The side buffer does not have its own identification number. The buffer casing is the "leading part". The identification number of the buffer casing is at the same time the identification number of the entire side buffer. As such, there is only **1** identification number on the buffer casing!*

*Re. option 2: The side buffer has one own identification number. The buffer casing is the "leading part". The identification number of the buffer casing is not at the same time the identification number of the entire side buffer; a separate identification number is affixed for the side buffer. As such, there are **2** identification numbers on the buffer casing!*

DB AG uses the first option as a general rule. The composed objects delivered to DB AG shall therefore be identified and physically marked as follows:

- An additional identification number and physical marking for the composed object is not the desired solution. Every part that needs to be physically marked as per the statement of work receives just one identification number.
- If the manufacturer or supplier affixes on a part an additional marking for the composed object (e.g. to use in-house processes), this shall be differentiated clearly from the contractually required marking.

Note: Under GS1 application standard "Identification of Components and Parts in the Rail Industry" the defined GIAI with the application identifier (7023) shall be used to this end.

5 Appendices to the delivery documents

The contractor shall enclose an appendix "Identification numbers" with the delivery documents. The appendix shall list the identification numbers of the parts/components. The following requirements apply in this regard:

- The identification numbers shall be shown as a barcode and as a line of plain text
- The identification numbers shall be structured as per order lines
- In the case of a delivery relating to multiple purchase orders, additional structuring based on purchase order numbers is required
- The identification numbers shall be assigned to the DB material number

If a delivery includes both marked and unmarked items in accordance with these terms and conditions of delivery, only the identification numbers of the marked items shall be shown in the appendix.

Additional requirements for composed parts/components

- In the case of composed objects, only the identification number of the leading part shall be shown as the identification number of the composed object.
- The identification numbers of the subcomponents of the composed object shall be shown in an additional appendix "part bill of materials". The listing includes for each identified subcomponent: the material designation, the DB material number, the installation position and the identification number. The identification number shall be shown as a barcode and line of plain text.

6 Quality inspection

The contractor shall perform a symbol check taking into account standards ISO/IEC 15415, ISO/IEC 15416, ISO/IEC TR 29158 for all marking solutions of a part/component used by it (exceptions include marking solutions for packaging and shipping units). The check shall be conducted for the used marking solutions, irrespective of how many parts/components this solution uses. Subcontractors shall also be requested to complete a symbol check.

The symbol check shall be repeated unsolicited in the event of technical or process modifications. Examples of these kinds of modifications include:

- Modification of the label manufacturer, metal plate manufacturer, etc.
- Modification of the size of the encoding
- Modification of the label printer, the laser device, etc. or technical elements of the devices
- Modification of the printer software

The inspection reports shall be submitted on request to DB AG without delay.

7 Terms

The following terms apply to the usage of this document:

Application identifier (AI):

Defined string of digits (e.g. from GS1) at the start of a data element, which clearly stipulates the format and the significance of the subsequent data field.

Data field:

The data field follows the application identifier and defines the content, e.g. product number, serial number, production date.

Data carrier:

Encryption of the identification number in an electronically readable font (Data Matrix, RFID).

Leading part:

A composed part/component comprises multiple individual parts/components. The part/component is referred to as the leading part which represents the entire composed part.

Identification level:

Level on which a part/component can be identified. Under the GS1 application standard "*Identification of Components and Parts in the Rail Industry*" the levels object class, lot and serialized (instance) are possible.

Identification number:

Number relating to the identification of the part in accordance with the regulations of the GS1 application standard "*Identification of Components and Parts in the Rail Industry*".

Marking carrier:

Medium for physically marking a part, e.g. label or metal plate. This also includes the invasive marking of the part (Direct Part Marking).

Physical marking:

Affixing of the identification number (data carrier and plain text) on the associated part.