Technical delivery conditions

# Forgings for use in permanent way

DBS 918 125

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## Foreword

This Deutsche Bahn standard (DBS) was drawn up by the Technology department of DB Netz AG in collaboration with the Deutsche Bahn AG Quality Assurance department. It represents the interests of Deutsche Bahn AG. It replaces the provisional edition of DBS 918125 "Forged parts for use in permanent way" dated June 2014.

## 1 Scope of application

The purpose of this DB standard is to set out rules for qualification and quality assurance with respect to forged parts for use in permanent way. It details and complements Deutsche Bahn AG's requirements regarding manufacture and supply on the basis of DIN EN 10293, DIN EN 1561 and DIN EN 1563 as well as the requirements of the European standards and national rules that also apply.

## 2 Normative references

This DB standard contains dated and undated references and stipulations from other publications. These normative references are quoted in the respective positions in the text and the names of the publications are stated thereafter.

In the case of dated references, subsequent amendments or revisions to this publication only belong to this DB standard if they have been incorporated by means of amendment or revision. In the case of undated references, the latest version of the referenced publication applies (including amendments).

| | |
|---|---|
| DIN EN 10025 | Hot rolled products of structural steels |
| DIN EN 10083 | Steels for quenching and tempering |
| DIN EN 10204 | Metallic products –Types of inspection documents |
| DIN EN 10254 | Steel closed die forgings - General technical delivery conditions |
| DIN EN 10243-1 | Die forgings - Tolerances on dimensions - Part 1: Drop and vertical press forgings |
| DIN EN 10243-2 | Steel die forgings - Tolerances on dimensions - Part 2: Upset forgings made on horizontal forging machines |
| DIN EN 6892 | Metallic materials – Tensile testing<br>Part 1: Method of test at room temperature[1)] |
| EN ISO 6506-1 | Brinell hardness test |
| EN 10045-1 | Charpy impact test |
| DIN EN 10228-1 | Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection |
| DIN EN 10228-2 | Non-destructive testing of steel forgings - Part 2: Penetrant testing |
| DIN EN 10228-3 | Non-destructive testing of steel forgings - Part 3: Ultrasonic testing of ferritic or martensitic steel forgings |
| DIN EN ISO 9712 | Non-destructive testing: examination and certification of non destructive testing personnel |
| VDA 2 | Qualitätsmanagement in der Automobilindustrie, Sicherung der Qualität von Lieferungen Produktionsprozess und Produktfreigabe (PPF) – (Quality management in the automotive industry, safeguarding of quality of deliveries, production process and product release) |

# 3 Technical requirements

## 3.1 Materials

The stipulations of the respective standards for the material concerned are to be applied regarding the manufacturing process, the chemical composition and the material characteristics of the forged parts for use in permanent way. The materials used are specified in the drawings and/or the order documents. The use of unfinished continuous casting is fundamentally not permissible. When using continuous casting, a minimum degree of deformation of 6 is necessary and must be verified.

If material details noted on the drawing are no longer up to date, the codes are to be updated on the basis of the relevant standard. However, the new material marking is to be entered in the system by the time the drawing is changed or when the casting is revised, but no later than the end of 2018.

## 3.2 Marking

Each forged part must bear the following markings in the places specified on the drawings:

- Component designation according to drawing
- Foundry logo (according to manufacturer-related product qualification certificate)
- The last two figures of the year of manufacture
- Batch number or letter that guarantees traceability

The forged marking must remain permanently readable.

On ribbed plates, raised or indented marking shall be placed on the top of the rib or the top of the plate but not on surfaces that perform a function. In special cases, approval must be obtained from the Technology department.

## 3.3 Physical condition

The forgings shall comply with the technical specification. The corresponding standards of the manufacturing process shall apply here. All parts must be free from burrs.

## 3.4 Machining of ribbed plates for rail fastening

The undersides of the plates and the rail bed surfaces are to be machined with Ra 60.

## 3.5 Welds

Welds are not permissible.

## 3.6 Heat treatment

The forgings shall be subjected to controlled cooling following the forging production process. If the required material properties are not guaranteed, the forgings shall be subjected to subsequent heat treatment.

## 3.7 Corrosion protection

Corrosion protection for permanent way components shall be agreed on a case-by-case basis.

## 3.8 Protection against mechanical damage during transport

All parts shall be packed so that they are protected against transport damage and slipping on or in the transport container can be reliably prevented. Preferably, containers/pallets with Euro-pallet dimensions should be used.

# 4 Product approval procedure

## 4.1 General requirements

All forged permanent way components are categorised in Test Level II according to Deutsche Bahn AG's "List of permanent-way products". Prior to the first delivery to DB Netz AG, the manufacturer shall verify its capability to manufacture the forgings to be supplied as specified in the contract. This condition shall be met under serial production conditions and verification shall take the form of a manufacturer-related product qualification (according to the Group guideline **120.0381 V15,** List of permanent-way products subject to quality inspection). The manufacturer-related product qualification shall be conducted by the Quality Assurance in Procurement department in collaboration with the Technology department at DB Netz head office. The manufacturer shall bear the cost of the manufacturer-related product qualification.

## 4.2 Type of approval

Forgings for use in permanent way are to be initially approved

- in the context of the manufacturer-related product qualification
- if different types of material are used or
- if different production processes are used.

The content and scope of approval tests shall be based on the stipulations under Point 5.

With regard to the supply of new parts to DB Netz, the Quality Assurance in Procurement department at Deutsche Bahn AG as well as the Technology department at DB Netz head office are to be consulted concerning the required scope of testing for approval.

The destructive tests in connection with product approval shall be conducted:

a) at the manufacturer's site

- if the manufacturer has a test laboratory and the tests are conducted in the presence of Deutsche Bahn AG's quality assurance test engineer

b) at an external test laboratory

- that is accredited to DIN EN ISO/IEC 17025 or is recognised by the Deutsche Bahn AG Quality Assurance department.

## 4.3 Approval of products for supply to Deutsche Bahn AG

The manufacturer shall furnish the following verifications and process instructions in connection with the manufacturer-related product qualification:

- Conformity of the production equipment with the applicable technical requirements for forgings in accordance with Section 3 of this DBS and with the geometrical specifications according to the standard drawing
- The factory's internal instructions for conducting the quality tests

Results of the tests in line with the conditions according to Section 5 shall be verified for approval of the products.

The geometrical, destructive and non-destructive tests in connection with product approval according to Section 5 shall be conducted using certified testing equipment.

The product and process quality shall be documented relative to the parts in a first article inspection report by the manufacturer. The first article inspection procedure should be performed in line with the VDA 2 standard. The first article inspection shall be performed internally and, if necessary, submitted to DB AG.

Results in line with the conditions must be achieved before manufacturer-related product qualification can be granted by the Deutsche Bahn AG Quality Assurance department and before user approval can be granted by the Technology department at DB Netz head office.

### 4.4 Qualification of the manufacturer

The manufacturer of forgings for use in permanent way must be qualified by the Deutsche Bahn AG Quality Assurance department.

#### 4.4.1 Requirements placed on production equipment

The manufacturer must have the technical and personnel resources to be able to manufacture forgings that comply with the demands of this DBS in a consistent quality.

#### 4.4.2 Requirements placed on testing equipment

The manufacturer shall maintain the required technical and personnel resources to conduct the tests, whereby the manufacturer's test personnel must be appropriately qualified.

## 5 Product approval tests

The manufacturer shall verify the quality of the products on the basis of the following quality assurance tests regarding component geometry and material properties. If there are no mandatory stipulations provided by a standard regarding the taking of test specimens and the scope of testing, this DBS sets out all necessary component-specific tests (see Section 6). Retesting shall be conducted according to the stipulations of the application standard.

### 5.1 Requirements for melt or product analysis of primary material

The manufacturer shall meet the requirements for the primary material as specified in the drawing. The verification of the chemical composition shall be confirmed by the primary material supplier in a 3.1 Certificate according to EN 10204.

### 5.2 Tests and measurements concerning component geometry

The requirements for testing finished parts, e.g. tolerances, surface finishes and so on, are to be obtained from the respective standard drawings or the standards listed in Section 2.

### 5.3 Surface crack inspection of forged parts

The forgings shall be subjected to a surface crack inspection (see Section 2) that ensures that a representative cross section of the production volume is considered. At least 10% of the production batch shall be tested, unless a wider scope of testing is stipulated. The surface crack inspection shall either accompany the production process or be performed as a final inspection. Indications of cracks on machined surfaces are not permissible.

Indications of cracks on the unfinished part are permissible:

- within 2/3 of the machining allowance
- for the unfinished part surface max. 0.3 mm

These rules shall apply, unless more restrictive specifications exist in the standard drawings.

### 5.4 Testing tensile strength/mechanical properties

The mechanical properties (tensile strength, notch impact energy) of the forgings shall be verified if this is required in the standard drawings or the material specifications. At least once per primary material batch.

### 5.5 Hardness testing

The Brinell hardness is to be determined in accordance with EN ISO 6506-1. The results must comply with the values of the standard drawings or the material specifications. At least 1% of the finished parts shall be tested. The test shall either accompany the production process or be performed as a final inspection.

## 6 Tests during production

To verify that the forgings produced fulfil the properties specified in the conditions, the manufacturer shall conduct the following tests with the test frequency specified by this DBS, in the respective standard and as stipulated by the manufacturer. The results of all tests must meet the requirements and must be documented in an inspection certificate 3.1 according to EN 10204.

In the case of direct deliveries to DB Netz AG, a 3.1 certificate is not necessary if all verifications regarding the demanded tests are available and accessible at the manufacturer's company. Shipments must then bear a conformity marking from the Federal Railway Authority (U-EBA mark). This can be placed on the delivery note, on the part or on the packing.

The results stated in Table 1 are demanded for forgings:

| **Name of test** | **Test frequency** |
|---|---|
| Geometry of the forgings | All functional dimensions in a frequency that ensures a reliable process and dimensional accuracy |
| Chemical analysis | Per melt |
| Material properties | Per melt (tensile strength $R_m$, yield strength $R_{p0.2}$, elongation at break A, notch impact energy) |
| Brinell hardness test | At least 1% of the production volume is subjected to Brinell hardness testing |
| Surface crack testing | At least 10% of the production volume (wider scope subject to stipulation) |

**Table 1: Tests during production**

## 7 Verification of quality assurance

Compliance with the technical demands and tests specified in this DBS shall be verified to the Quality Assurance department at Deutsche Bahn AG by submitting the permanent records and documentation in accordance with the quality plans, test schedules or sequence plans.

These documents shall be retained by the manufacturer for a period of at least 10 years, unless otherwise specified.

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