



Technical specification  
**Cast permanent way parts**

**DBS**  
**918 126**

Supersedes DBS 918126 Edition 03/2016

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Edition	Date changed	Comments	Page
DBS 918 126 March 2016	July 30, 2019	Deleted: 3.1 Attachment of labeling until 2015	3
		Deleted: 3.2 Attachment of labeling until 2015	3
		Deleted: 3.3 Mechanical processing of plates	3
		<b>Plate flatness</b> Tolerance for convexity of plate underside was changed	10
		<b>Peak-to-valley height:</b> Switch plates: peak-to-valley height Rz 160 rail bed/un- derside Slide base plates: peak-to-valley height Rz 60 sliding sur- face Elimination of processing of track tie plates, if flatness is fulfilled	10
		Added: component-specific approval test for the coupling plate	12

## Foreword

This Deutsche Bahn Standard (DBS) was updated by the Engineering department of DB Netz AG in cooperation with Quality Assurance of Deutsche Bahn AG and represents the interests of Deutsche Bahn AG. It supersedes DBS 918 126, March 2016 edition.

## 1 Scope

This DB Standard governs the qualification and quality assurance of cast permanent way parts. It specifies and supplements the requirements of Deutsche Bahn AG regarding manufacturing and delivery on the basis of DIN EN 10293, DIN EN 1561 and DIN EN 1563 as well as the applicable European standards and national regulations.

## 2 Normative references

This Deutsche Bahn Standard contains dated and undated references and definitions from other publications. The normative references are cited at the respective areas in the text and the publications are listed below.

In the case of dated references, subsequent amendments or revisions to these publications only belong to this Deutsche Bahn 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 (including amendments) applies.

DIN EN 10293	Steel castings - Steel castings for general engineering uses
DIN EN 1559	Founding - Technical conditions of delivery
DIN EN 1561	Founding - Grey cast irons
DIN EN 1563	Founding - Spheroidal graphite cast irons
DIN EN ISO 8062	Geometrical product specifications (GPS) - Dimensional and geometrical tolerances for moulded parts - Part 1-3
DIN EN ISO 5579	Non-destructive testing - Radiographic testing of metallic materials using film and X- or gamma rays
DIN EN 1369	Founding - Magnetic particle testing
DIN EN 1371	Founding - Liquid penetrant testing Part 1: Sand, gravity die and low pressure die castings
DIN EN ISO 6892-1	Metallic materials - Tensile testing - Part 1: Method of test at room temperature
DIN EN 583-1	Non-destructive testing - Ultrasonic examination Part 1: General principles
EN ISO 9934-1	Non-destructive testing - Magnetic particle testing Part 1: General principles
EN 12680-1	Founding - Ultrasonic examination Part 1: Steel castings for general purposes
EN 12680-2	Founding - Ultrasonic examination Part 2: Steel castings for highly stressed components
EN 12680-3	Founding - Ultrasonic testing Part 3: Spheroidal graphite cast iron castings
EN 12681	Founding - Radiographic examination
EN ISO 6506-1	Metallic materials - Brinell hardness test

DIN EN ISO 14556	Metallic materials - Charpy V-notch pendulum impact test - Instrumented test method
DIN EN ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel

### **3 Technical Receivables**

#### **3.1 Materials**

For the manufacturing process, the chemical composition and the material characteristic values of the cast permanent way parts, the specifications defined in the standards applicable to the respective material apply. The materials used are defined in the drawings and/or the ordering documents.

Where the drawing specifications of the materials are not current, the recoding is governed by the standard.

#### **3.2 Label**

Each casting must be provided with the following labels at the locations specified in the drawings.

- Component designation as per drawing (e.g. FI 37, Rph 1, URp 215)
- Labeling of the casting material as per the standard, but at least the short ID without EN (e.g. GJS 600-3)
- Company sign of the foundry
- The last two digits of the year of manufacture
- Casting number to ensure traceability (batch number, casting day)
- Position in box or model location

The labeling must be agreed on between the Engineering department and the manufacturer in terms of its casting feasibility and must be permanently legible.

On tie plates, the labeling must only be executed on the upper side of the ribs or on the upper side of the plate, but not recessed or recessed and raised on the functional surfaces and not on the plate side.

#### **3.3 Quality**

The castings must meet the technical specification. All burrs that impair the fitness for use and work safety must be removed completely. Unless otherwise specified, bores in castings must be deburred.

The anti-twist safeguard for Skl 3 can be omitted on all tie plates.

#### **3.4 Weldings for fabricating purposes**

Weldings for fabricating purposes are impermissible.

#### **3.5 Heat treatment**

The material properties of a casting made of material EN-GIS-400-18LT can be achieved both without annealing (in the cast state) or with subsequent annealing (incl. the specimens).

#### **3.6 Corrosion protection**

Corrosion protection for permanent way parts must be arranged on a case-by-case basis.

### **3.7 Protection against mechanical damage during transport**

All parts must be packaged such that they are protected against damage during transport and that ensure they cannot slip on or in the transport container. Preferably, containers/pallets with Euro pallet dimensions are used.

## **4 Product approval procedure**

### **4.1 General requirements**

All cast permanent way parts are classified in test level II as per the "Permanent way product list" of the Deutsche Bahn AG. Before making the first delivery to Deutsche Bahn AG, the manufacturer must verify its ability to produce the castings to be delivered in the manner stipulated in the contract under the conditions of serial production in the form of a manufacturer-related product qualification (MPQ) (as per Corporate Guideline 120.0381 V15 "Products requiring quality inspection - permanent way material"). The MPQ is executed by the Procurement Quality Assurance department together with Engineering department of the DB Netz headquarters. The costs for the MPQ are borne by the manufacturer.

### **4.2 Type of approval**

The approval of castings for the permanent way must be performed:

- For the first time as part of the manufacturer-related product qualification (MPQ).
- For the first time when other material types are used, or
- For the first time when other production processes are applied

durchzuführen. The contents and scope of the approval tests are defined in section 5.

For the delivery of new parts to DB Netz AG, the required approval testing scope must be agreed upon with the Procurement Quality Assurance department of Deutsche Bahn AG and the Engineering department of the DB Netz headquarters.

### **4.3 Approval of products for delivery to Deutsche Bahn AG**

In the context of the manufacturer-related product qualification (MPQ), the following verifications and process instructions must be provided by the manufacturer:

- Compliance of the production technology with the applicable technical requirements for castings as per section 3 of this DBS and the geometric definitions as per the standard drawing
- Internal factory instructions for performing the quality testing

For the approval of the product, compliant results of the tests must be verified as per section 5.

The geometric, destructive and non-destructive testing as per section 5.2 for product approval must be performed using the testing equipment of Deutsche Bahn AG and, if applicable, in the presence of Quality Assurance of Deutsche Bahn AG.

Testing as per section 5 must be performed for product approval. All results must be documented in a first article inspection report.

Compliant results are the prerequisite for granting of the MPQ by Quality Assurance of Deutsche Bahn AG and, if applicable, for granting of a user approval at DB Netz headquarters, Engineering.

Destructive testing for product approval must be performed:

- a) By the manufacturer,
  - if the manufacturer has its own testing laboratory and the tests are performed in the presence of the responsible testing engineer of Quality Assurance of Deutsche Bahn AG,
- b) In an external testing laboratory,

- that is accredited as per DIN EN ISO/IEC 17025 or that has been recognized by the Quality Assurance department of Deutsche Bahn AG.

#### **4.4 Qualification of the manufacturer**

The manufacturer of permanent way parts made of cast steel, malleable cast iron, spheroidal cast iron or gray cast iron must have been qualified by the Quality Assurance department of the Deutsche Bahn AG.

##### **4.4.1 Requirements for the production technology**

The manufacturer must, on account of its technical equipment and personnel, be capable of manufacturing castings in accordance with the requirements of this DBS with consistent quality.

##### **4.4.2 Requirements for the test engineering**

To perform the testing, the manufacturer must have available the necessary technical equipment and personnel, and the testing personnel of the manufacturer must have the necessary qualifications.

### **5 Testing for product approval**

The manufacturer must verify the quality of the products based on the following tests for quality assurance of the component geometry and the material properties. If the sampling and the testing scope are not defined in a binding manner in a standard, this DBS shall govern all component-specific required testing (see section 6). Retesting must be performed according to the stipulations of the relevant standard.

#### **5.1 Tests and measurements of the component geometry**

##### **5.1.1 Dimensional tolerance grade of unprocessed castings**

For the dimensional stability of unprocessed castings, the tolerances that apply are stipulated in DIN EN ISO 8062-3 with the dimensional tolerance grade of DCTG 10 and divided symmetrical in two relative to the nominal dimension, unless otherwise specified in the DB drawing.

##### **5.1.2 Dimensional stability of processed castings**

For the dimensional stability of processed castings, the stipulations on the respective DB standard drawing apply.

##### **5.1.3 Quantity and selection of test pieces during first-time production**

When produced for the first time, all parts of the model plate (at least 4 castings) must be tested geometrically.

#### **5.2 Tests of casting for internal flaws**

When produced for the first time, at least one casting must be examined for internal flaws using ultrasonic testing as per EN 12680 or radiographic testing as per EN 12681. If internal flaws are identified during the test or if non-destructive testing is not possible, the casting must be examined every 2 cm in a saw-cut test.

##### **5.2.1 Cast steel (G/GE)**

###### **Testing of the mechanical material properties**

To verify that the properties of the cast steel components are compliant, the mechanical material properties must be determined. The results must fulfill the values stipulated in DIN EN 10293 Table 3.



### **Cast analysis**

A chemical analysis must be performed. The result must fulfill the values stipulated in DIN EN 10293 Table 1.

### **Surface crack inspection**

Cast steel parts must be subjected to surface crack inspection as per DIN EN 1369. The number of components to be inspected is at least 4 pieces.

In the result, the identified irregularities must not exceed the flaw sizes stipulated in DIN EN 1369:

- On machined surfaces, quality grades SM 1, LM 1 and AM 1
- On unprocessed surfaces, quality grades SM 3, LM 3 and AM 3.

## **5.2.2 Gray cast iron (GJL)**

### **Testing of tensile strengths**

The tensile strength of the cast must fulfill the values stipulated in DIN EN 1561 Table 1.

### **Hardness testing**

The Brinell hardness must be determined as per EN ISO 6506-1. The results must fulfill the values stipulated in DIN EN 1561 Table 2.

## **5.2.3 Spheroidal graphite cast iron (GJS)**

### **Testing of the mechanical material properties**

The mechanical properties of cast must fulfill the values stipulated in DIN EN 1563 Table 1.

### **Impact test**

If required by the standard, the impact energy must be determined by an impact test on three specimens. The results must fulfill the values stipulated in DIN EN 1563 Table 2.

### **Surface crack inspection**

The castings must be subjected to a surface crack inspection as per DIN EN 1369. At least 4 parts must be inspected.

In the result, the identified irregularities must not exceed the flaw sizes stipulated in DIN EN 1369:

- On machined surfaces, quality grades SM 1, LM 1 and AM 1
- On unprocessed surfaces, quality grades SM 3, LM 3 and AM 3.

## **6 Component-specific approval tests**

### **6.1 Tie plates, slide base plates and trestle plates**

Cast tie plates, slide base plates and trestle plates are made of the materials EN-GJS-600-3 (GGG 60) and EN-GJS-400-18-LT (GGG 40.3). The location of the testing dimensions on these parts can be seen in figures 1 to 4.

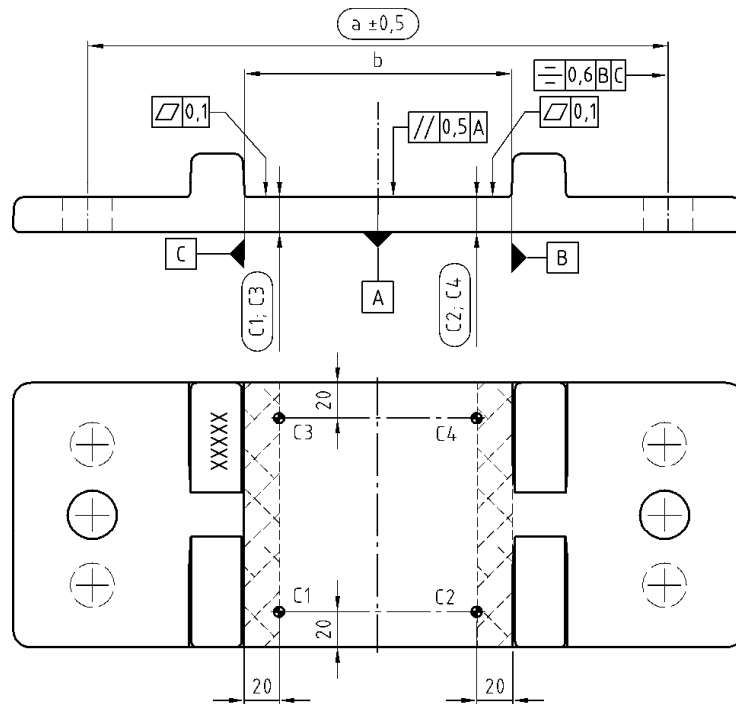


Figure 1: Measurement locations when testing symmetrical tie plates URp 206 and SRp 1

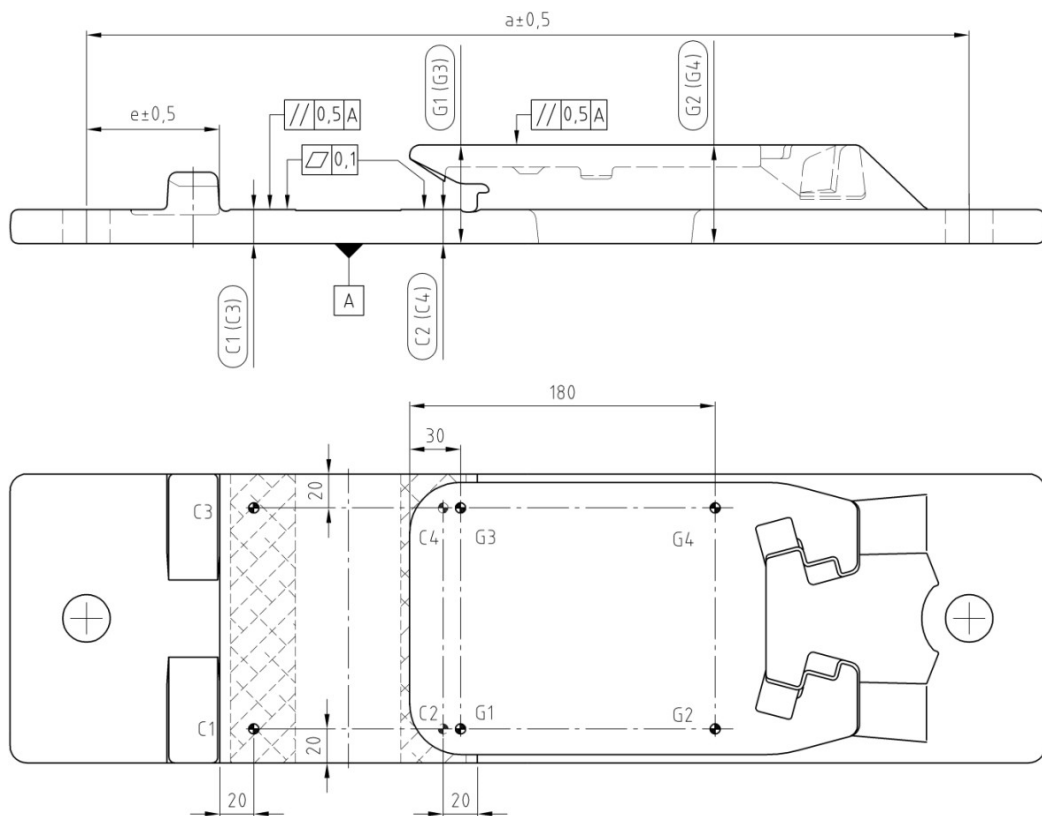


Figure 2: Measurement locations when testing tie plates, slide base plates and slide clamp plates

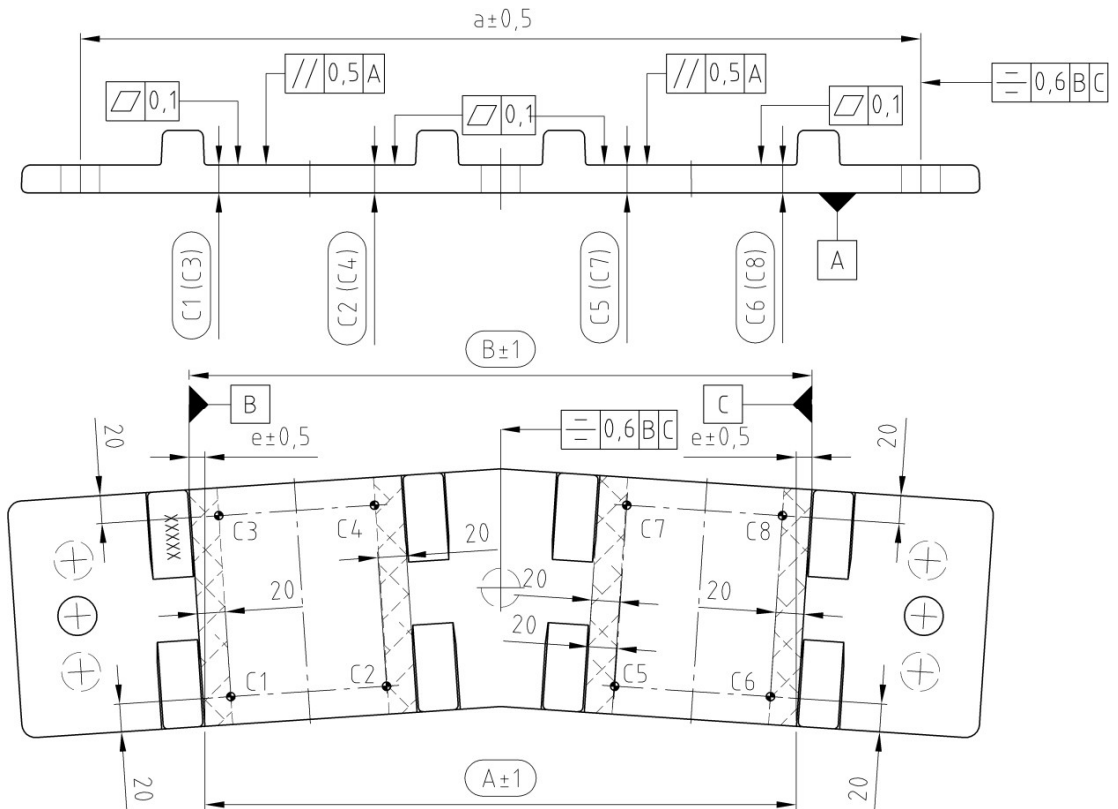


Figure 3: Measurement locations when testing symmetrical frog tie plates

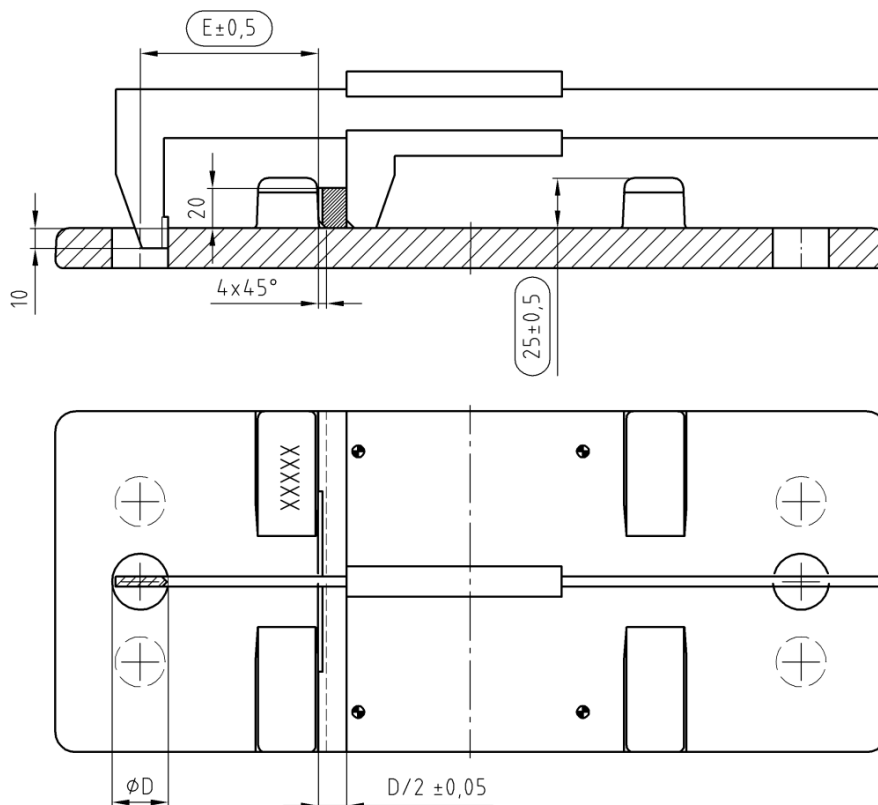


Figure 4: Measurement principle of distance between the bore and inside of the rib

Alternative measurement methods such as measuring the distance of the coach screw bore to the rib by means of a 3D measurement machine are permissible.

### 6.1.1 Surface testing

#### Flatness of the plate underside

The convexity of the plate underside of the tie plates, slide base plates and trestle plates is permitted to have the following values:

- Plate length L up to 330 mm max.  $a = 1 \text{ mm}$  (L = plate length in mm)
- Plate length L greater than 330 mm  $a \leq 0.003 L$

Concavity is not permitted.

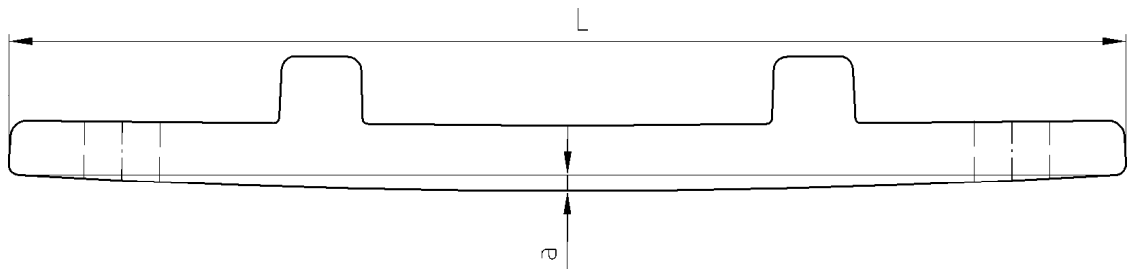


Figure 5: Measurement principle of convexity of the plate underside

#### Flatness of the rail pad

The support surface of the rail pad is permitted to have a concavity with a max. depth of 0.6 mm. Convexity is not permissible. A pad with a flatness of 0.1 mm must exist in an area in front of the ribs that is at least 20 mm wide (see Figures 1-3).

#### Parallelism

The deviation of parallelism of the rail pad relative to the plate underside must not exceed 0.5 mm. This also applies to all sliding surfaces.

The parallelism must be determined by measuring the plate thicknesses at a minimum of 4 locations and forming the difference between the measured values as per Figures 1-3.

#### Peak-to-valley height

For the mechanical processing of cast tie plates, the specifications in the drawings apply. If the drawing do not contain specifications, the plates for switches

- such as slide base plates, trestle plates, side clamp plates and track tie plates as well as check rail trestles must be milled flat on the underside and the rail pad surface with a peak-to-valley height Rz 160.
- The sliding surfaces of the slide base plates must be processed with a permissible peak-to-valley height of Rz 60.

Tie plates for tracks can remain unprocessed on the underside if the requirements for the flatness of the plate underside are fulfilled.

### 6.1.2 Testing the geometry

#### Distance between sliding surface/rail pad

The tolerance of the distance between the machined sliding surfaces and the rail pad for all slide base plates, slide chairs and slide clamp plates is defined at  $\pm 0.3 \text{ mm}$ .

#### Rib distance

The following applies to a rib distance for a rail base width of 125 mm:

- Lower limiting dimension 127 mm, upper limiting dimension 128 mm

The following applies to a rib distance for a rail base width of 150 mm:

- Lower limiting dimension 152 mm, upper limiting dimension 153 mm

### **Rib height**

The permissible deviation from the target rib height of 25 mm must not exceed 0.5 mm (see Figure 4).

### **Distance between coach screw bore and rib**

The distance between the coach screw bore and the rib must be measured with a contact measurement device. The contact measurement device must have a 4-mm chamfer at the bottom measurement edge and must be in contact with the inside of the rib along the entire plate width. The contact measurement device must have a thickness of 0.5 x bore diameter with a tolerance of 0.05 (see Figure 4). Deviating measurement methods must be agreed upon with the Quality Assurance department.

### **6.1.3 Tensile tests on specimen from the casting**

In addition to the tests of the mechanical properties on cast specimens, 2 further tensile tests must be performed on specimens taken from one casting. The position of the specimens in the casting are defined during the approval tests.

### **6.2 Rail anchor forks and pins, switch blade support**

Rail anchor forks/pins are made of the material EN-GJS-400-18-LT (GGG 40.3) and switch blade supports are made of the materials EN-GJS-400-15 (GGG 40) and EN-GJS-400-18-LT (GGG 40.3). All approval tests must be performed as per section 5 for the respective casting material. In addition to the tests of the mechanical properties on cast specimens, 2 further tensile tests must be performed on specimens taken from one casting. The creation and location of the specimens in the casting are defined in connection with the saw-cut test as part of the approval testing.

### **6.3 Rail supports and support plates**

Cast rail supports and support plates are made of material GE 240 (GS 45). All approval tests must be performed as per section 5 for the respective casting material. In addition to the tests of the mechanical properties on cast specimens, 2 further tensile tests must be performed on specimens taken from one casting. The creation and location of the specimens in the casting are defined in connection with the saw-cut test as part of the approval testing.

### **6.4 Distance blocks**

Cast distance blocks are manufactured from the materials EN-GJL-150 (GG 15) and EN-GJL-250 (GG 25) and from cast steel GE260 (GS 52). All approval tests must be performed as per section 5 for the respective casting material. In addition to the tests of the mechanical properties on cast specimens, 2 further tensile tests must be performed on specimens taken from one casting. The creation and location of the specimens in the casting are defined in connection with the saw-cut test as part of the approval testing.

### **6.5 Lashing and lashing cores**

Lashing and lashing cores are manufactured from the material GJS 600-3. All approval tests must be performed as per section 5 for the respective casting material. In addition to the tests of the mechanical properties on cast specimens, 2 further tensile tests must be performed on specimens taken from one casting. The creation and location of the specimens in the casting are defined in connection with the saw-cut test as part of the approval testing.

### 6.6 Hollow sleeper for point lock

Hollow sleepers for point locks are manufactured from the material EN-GJS-400-18-LT. Component-specific tests are not required.

### 6.7 Coupling plate

Coupling plates are manufactured from the material EN-GJS-400-18-LT. All approval tests must be performed as per section 5 for the respective casting material. In addition to the tests of the mechanical properties on cast specimens, further tensile tests must be performed on specimens taken from two cast coupling plates. The specimen is taken from the bottom lashing of each component (Figure 6).

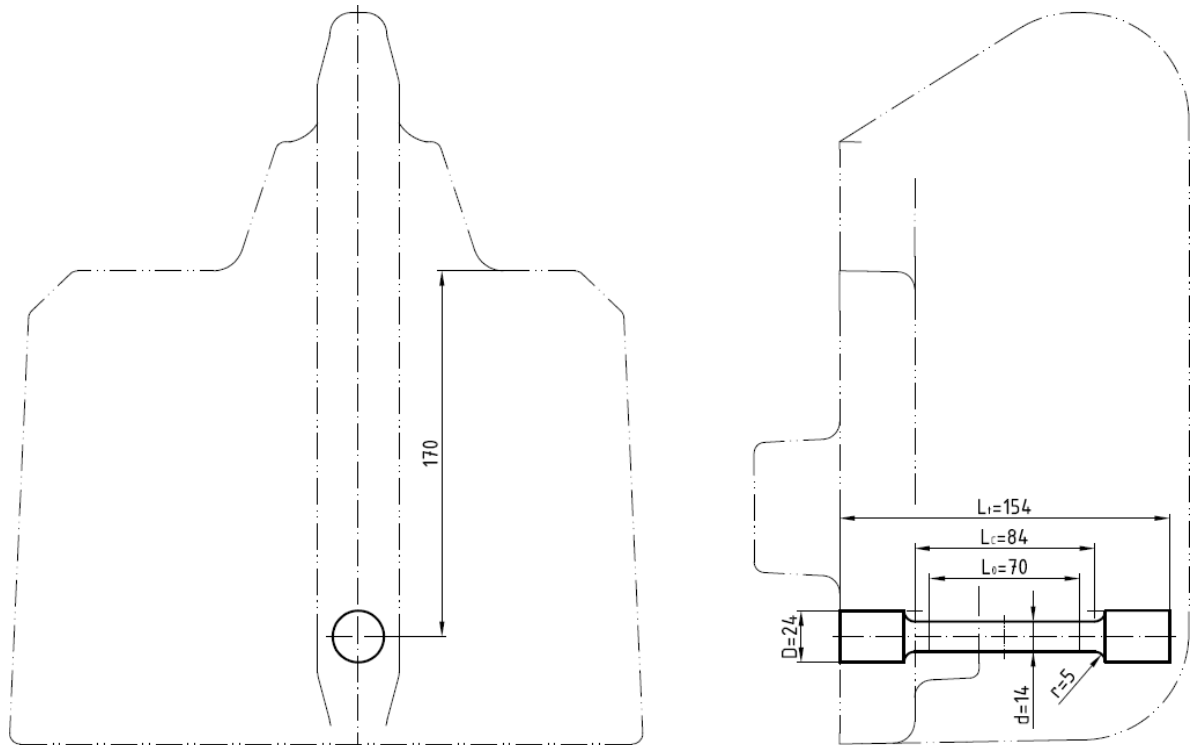


Figure 6: Tensile test specimen taken from the lashing of the coupling plate

The inside quality must be tested as per table 1. The test must be performed on at least 4 coupling plates.

Test	Documentation/test certificate	Performed as per	Target values/assessment/permissibility	Comments
Radiographic testing	3.1.B	DIN EN ISO 5579	DIN EN 12681 Quality class 2 for error codes A, B, C Error codes D, E, F, G are impermissible	
Ultrasonic testing	3.1.B	DIN EN ISO 16810	DIN EN 12680-1/-3 Quality grade 2	Can be performed as an alternative to radiographic testing

Table 1: Tests of the inside quality of the coupling plate

## 7 Production tests

The manufacturer must provide verification of the compliant properties of the manufactured castings on the basis of the following tests with the testing frequency stipulated in the respective standard and following specification by the manufacturer. The results of all tests must meet the requirements and be documented in an acceptance certificate 3.1.

In case of direct deliveries to Deutsche Bahn AG, a 3.1 certificate can be omitted if all verifications regarding the required tests exist with the manufacturer and can be requested. In this case, the delivery must be accompanied by the U-EBA reference. This reference can be found on the delivery note, on the part or on the packaging.

### 7.1 Production tests

The results of table 2 are required for the castings:

Name of test	Frequency of test	Stipulated results
Geometry of all castings	All functional dimensions with a frequency that ensures a reliable process and dimensional stability	5.1
Cast steel		
Surface crack inspection	At least 20% of production	5.2.1
Material properties	Per cast	5.2.1
Chemical analysis	Per cast	5.2.1
Gray cast iron		
Material properties	Per cast (Brinell hardness, tensile strength)	5.2.2
Spheroidal graphite cast iron		
Surface crack inspection	As necessary, as agreed with the Quality Assurance department of the De	5.2.3
Material properties	Per cast (Brinell hardness, 0.2% elastic limit, tensile strength, elongation at break, notch impact energy (only for EN-GJS-400-18-LT))	5.2.3
Chemical analysis	Per cast	5.2.3

#### Table 2 Production tests

All specimens for testing of material properties must be cast in or after the last box of the casting batch.

The specimens must be taken from the castings as per 6.1 to 6.5 once a year to test the mechanical properties.

### 7.2 Component-specific testing during production

#### 7.2.1 Coupling plate

##### Surface crack inspection

At least 20% of production must be tested. The results must meet the requirements as per 5.2.3.

**Internal quality**

Results as per table 3 are required from the internal quality.

Test	Test scope	Documentation/test certificate	Performed as per	Target values/assessment/missibility	Comments
Radio-graphic testing	At least 1 piece per batch	3.1.B	DIN EN ISO 5579	DIN EN 12681 Quality class 2 for error codes A, B, C Error codes D, E, F, G are impermissible	
Ultrasonic testing	At least 1 piece per batch	3.1.B	DIN EN ISO 16810	DIN EN 12680-1/-3 Quality grade 2	Can be performed as an alternative to radiographic testing

**Table 3: Testing of the internal quality during production**

**7.3 Verification for quality assurance**

Adherence to the technical requirements and tests stipulated in this DBS must be verified to the Quality Assurance department of Deutsche Bahn AG through submission of the continuous recordings and records as per the quality and testing plans.

This documentation must be retained by the manufacturer for at least 10 years.

