



Technical delivery condition
Spring steel washers
 for railways

DBS
918 006

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Foreword

This Deutsche Bahn standard (DBS) was drawn up by DB Netz AG - I.NVT 41 - Permanent Way Technology in collaboration with the Quality Assurance department (TEI 2) on the basis of DBS 918 006 published in May 2000. It represents the interests of Deutsche Bahn AG. The following revisions have been made:

- Editorial and structural revision
- Reference made in the technical requirements to international standards
- Requirements from UIC Leaflet 864-3V added

Introduction

The purpose of this DBS is to set out rules for qualification and quality assurance with respect to spring steel washers. It takes account of UIC Leaflet 864-3 V and complements the performance requirements for rail fastening systems described in DIN EN 13481.

1. Scope

This DB standard applies to spring steel washers under the field conditions encountered at DB AG. It is to be applied in connection with the qualification of new spring washers for DB AG (qualification test) and in the context of quality assurance.

2. Normative references

This DB standard contains stipulations from other publications in the form of dated or undated references. 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 these publications only belong to this 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).

UIC 864-3 V	Technical specification for the supply of spring steel washers for use in permanent way
DIN EN 13481	Railway applications - Track - Performance requirements for fastening systems.
DIN EN 10089	Hot-rolled steel for quenched and tempered springs - Technical delivery conditions
ISO 6507-1	Vickers hardness test
ISO 6508-1	Rockwell hardness test
DIN EN ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests

3. Technical requirements

3.1. Material

The material must correspond to the steel grade 38 Si 7 according to DIN EN 10089.

Each individual melt must be marked of the wire coils intended for the manufacture of the spring washers.

3.2. Manufacturing process

The spring washers are manufactured by helical winding of a sectional steel whose cross-section is stated in the DB AG standard drawing. The pitch must be even.

Spring washers made of sectional steel from the same melt must be manufactured in a completely identical manner. If necessary, the sectional steel must be annealed in the normal manner. During this procedure, all necessary measures must be taken to prevent decarburisation and scaling.

The inner and outer sides of the spring washers with a rectangular cross-section must be parallel to the rolling axis when the spring washer is compressed. The cross-section must have an even thickness and be somewhat rounded at the edges.

The coils of multiple spring washers must lie vertically above one another when tensed.

The front surfaces must be in a plane running through the screw axis.

The spring washers shall be hardened and tempered.

The furnaces must allow controllable and even introduction of heat. Monitoring of this process must be possible. The temperature management in the furnaces and hardening baths must be documented.

3.3. Quality of execution

The spring washers shall be produced in accordance with the DB AG standard drawings.

They must have a clean surface and be free of incipient cracks, slivers, burrs, material imperfections, seams and other defects.

The spring washers may not become entangled in one another.

3.4. Torsion

The torsion test is to be carried out in accordance with Section 5.2. The test pieces may not display any cracks following the torsion test.

3.5. Structure

The test piece is to be scored and broken. The fracture surface should have an even, fine, velvety appearance and may not display any cracks. The assessment is carried out with the naked eye.

3.6. Hardness

According to Vickers (HV 30) the hardness must be between 430 and 515 and according to Rockwell (HRC) between 43 and 49. The test shall be conducted according to ISO 6507-1 (Vickers hardness test) or ISO 6508-1 (Rockwell hardness test).

3.7. Deflection upon load removal

The deflection upon load removal may not be less than the minimum value stated in the standard drawing. The deflection upon load removal is to be determined in accordance with Section 5.1. The standing height of the spring washer upon complete removal of the load may not be less than the minimum value stated in the respective standard drawing.

3.8. Form and dimensions

See the corresponding DB AG standard drawings for the form and dimensions of the spring washers.

3.9. Corrosion protection

Unless otherwise agreed, products are not supplied with corrosion protection. Any corrosion protection to be applied shall be stated in the order documents. The spring washers may only have a coating if it is guaranteed that the requirements placed on the spring washer according to DBS 918 006 are not impaired during production of the coating and no hydrogen embrittlement occurs on the surface.

The effectiveness of the corrosion protection process is to be verified one time according to DIN EN ISO 9227 over a period of 300 hours. Following testing, the corrosion protection may display a maximum degree of rusting of 3% during certification testing.

4. Qualification and quality assurance

4.1. Qualification of the product

Each of the requirements described in Section 3 must be verified on three products in this qualification test. The test results for each single tested product must meet the requirements.

The unit responsible for technical aspects at DB AG (see cover sheet) may determine additional requirements and tests. DB AG may waive tests if, for example, product properties do not require certain tests or if material properties are already well known.

Qualification tests may only be carried out by testing organisations recognised by DB AG. The manufacturer shall bear the cost of qualification testing.

4.2. Qualification of the manufacturer

For certain products (cf. List of permanent-way products subject to quality inspection), the manufacturer's capability to manufacture a product as specified in the contract shall be verified prior to the first delivery to DB AG. This shall take the form of a "manufacturer-related product qualification". One component of the manufacturer-related product qualification is the qualification testing according to Section 4.1. The manufacturer-related product qualification shall be carried out by DB AG's Quality Assurance department. The manufacturer/supplier shall bear the cost of the manufacturer-related product qualification.

4.3. Quality assurance at the manufacturer's site

The manufacturer shall ensure the quality of the products on the basis of appropriate statistical process control. The tests and scope of testing listed in Table 1 are minimum requirements – notwithstanding this provision, every product shall comply with the technical requirements according to Section 3. The unit responsible for technical aspects at DB AG may determine additional tests.

Table 1: Minimum requirements placed on tests and scope of testing relating to quality assurance

Test	Minimum scope of testing
Dimensions and quality of execution (cf. Sections 3.3 and 3.8).	One test specimen per 1,000 products, at least 10 test specimens per production batch ¹⁾
Torsion and deflection upon load removal (cf. Sections 3.4 and 3.7).	One test specimen per 10,000 products, at least 3 test specimens per production batch ¹⁾
Hardness testing	3 hardness measurements per furnace batch ²⁾

¹⁾ The test specimens are to be taken from the beginning, middle and end of a production batch.

²⁾ Each hardness measurement consists of 3 hardness indentations. When using multi-purpose batch furnaces, the test specimens are to be taken from the middle and from the edge of the furnace batch. When using continuous or pusher furnaces, the test specimens are to be taken from the beginning, middle and end of the furnace batch.

Compliance with the requirements demanded by this DB standard shall be assured by means of test schedules and/or test plans and presented to DB AG upon request.

5. Test method

5.1. Deflection upon load removal

Each spring washer shall be compressed between two parallel, hardened plates at 40 kN. After being kept in this state for 10 seconds, the load is to be slowly removed down to 10 kN. During removal of the load, the resulting deflection shall be measured. The load on the spring washer shall then be removed completely. The standing height of the spring washer shall then be measured.

5.2. Torsion

In a cold state, the test piece shall be bent up so that a half coil is standing perpendicular to the plane of the adjacent coil. When testing multiple-coil spring washers, the bent up half coil shall then be twisted 90° inwards. These two deformations are to be performed slowly and steadily.

6. Marking

Spring washers are to be marked with the manufacturer's mark and the last two figures of the year of manufacture. See the standard drawings for the position of the marking and the font to be used.