BS EN 13146-5:2012

BSI Standards Publication

Railway applications — Track — Test methods for fastening systems

Part 5: Determination of electrical resistance

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National foreword

This British Standard is the UK implementation of EN 13146-5:2012. It supersedes BS EN 13146-5:2002 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/2, Railway Applications - Track.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Foreword

This document (EN 13146-5:2012) has been prepared by Technical Committee CEN/TC 256 "Railway applications ", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2012, and conflicting national standards shall be withdrawn at the latest by October 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13146-5:2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The main changes in this revision are as follows:

a) reference and alternative methods are now included;

b) the conductivity of the water used in the test is limited;

c) conditioning of the test specimens;

d) the correction factor for water conductivity is deleted.

In consequence of these changes, the measured resistance may be significantly different from that obtained by the previous method.

This European Standard is one of the series EN 13146 "*Railway applications — Track — Test methods for fastening systems*" which consists of the following parts:

— *Part 1: Determination of longitudinal rail restraint;*

— *Part 2: Determination of torsional resistance;*

— *Part 3: Determination of attenuation of impact loads;*

— *Part 4: Effect of repeated loading;*

— *Part 5: Determination of electrical resistance;*

— *Part 6: Effect of severe environmental conditions;*

— *Part 7: Determination of clamping force;*

— *Part 8: In service testing;*

— *Part 9: Determination of stiffness.*

These support the requirements in the series EN 13481 "*Railway applications — Track — Performance requirements for fastening systems*".

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies a laboratory test procedure for determining the electrical resistance, in wet conditions, between the running rails provided by a fastening system fitted to a steel or concrete sleeper, bearer or element of slab track.

It is also applicable to embedded rail.

This test procedure applies to a complete fastening assembly. It is relevant to signalling currents, not to traction currents.

A reference procedure and an alternative procedure are included.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 27888, *Water quality — Determination of electrical conductivity (ISO 7888)*

EN 13481-1:2012, *Railway applications — Track — Performance requirements for fastening systems — Part 1: Definitions*

3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13481-1:2012 apply.

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols apply.

$R\gamma$ measured resistance for each test, in Ω;

R arithmetic mean of test results, in Ω;

γ conductivity of water used, in mS/m.

4 Principle

The electrical resistance between two short lengths of rail fastened to the support is measured whilst the whole support and fastenings are sprayed with water at a controlled rate.

5 Apparatus

5.1 Rail

For surface mounted rail systems, two short lengths (approximately 0,5 m) of the section for which the fastening assembly under test is designed. For embedded rail systems the rail is included in the test specimen. The rail shall be unlaminated and have neither loose rust on the surface nor be polished on the foot.

5.2 Water

A supply of potable water supply with a conductivity of (50 ± 5) mS/m measured in accordance with EN 27888 at the temperature at the time of spraying and corrected to a temperature of 25 ºC.

NOTE 1 Correction factors for temperature are given in EN 27888.

NOTE 2 The conductivity of the water may be adjusted to the specified limits by the addition of sodium chloride or distilled water.

5.3 Spray equipment

A frame which can be moved parallel to the rails, incorporating four spray nozzles as shown in Figure 1. The nozzles shall have a diameter 3,6 mm and a spray cone of (100 to 125)º. The equipment shall include a means of controlling and measuring the flow of water to each nozzle.

5.4 Electricity supply

Alternating current supply of (30 ± 3) V RMS and (50 ± 15) Hz.

5.5 Instruments

Instruments to measure the applied voltage and resultant current flow between the rails with an accuracy of 1 % which permit the calculation of resistance over the range $1 \times 10^2\ \Omega$ to $1 \times 10^6\ \Omega$. The equipment shall have a capability to print out a record of calculated resistance against time.

The calibration of the instruments shall be verified with equipment having certified traceability to European or International Standards using the International System of units (SI).

6 Test specimens (reference method)

Three steel or concrete sleepers or bearers (with two rails only) or elements of slab track with cast-in fastening components or holes and rail seats as made without modification for this test.

For embedded rail with mechanical fastening assemblies the length of the test specimen shall be equal to the nominal sleeper spacing in EN 13481-1:2012, Table 1. For embedded rail with adhesive fastening systems the length of the test specimen shall be (500 to 750) mm. All test specimens shall include two running rails.

Each specimen is tested individually. The test specimens are described as sleepers in the test procedure.

7 Procedure (reference method)

The test shall be carried out under cover and protected from rain and draughts in a room which is ventilated and has an air temperature (15 to 30) ºC. Fit the rails to one sleeper using all the fastening components as assembled in track. Support the sleeper, which shall be surface dry, on two electrically insulating blocks, not less than 50 mm thick, as shown in Figure 1.

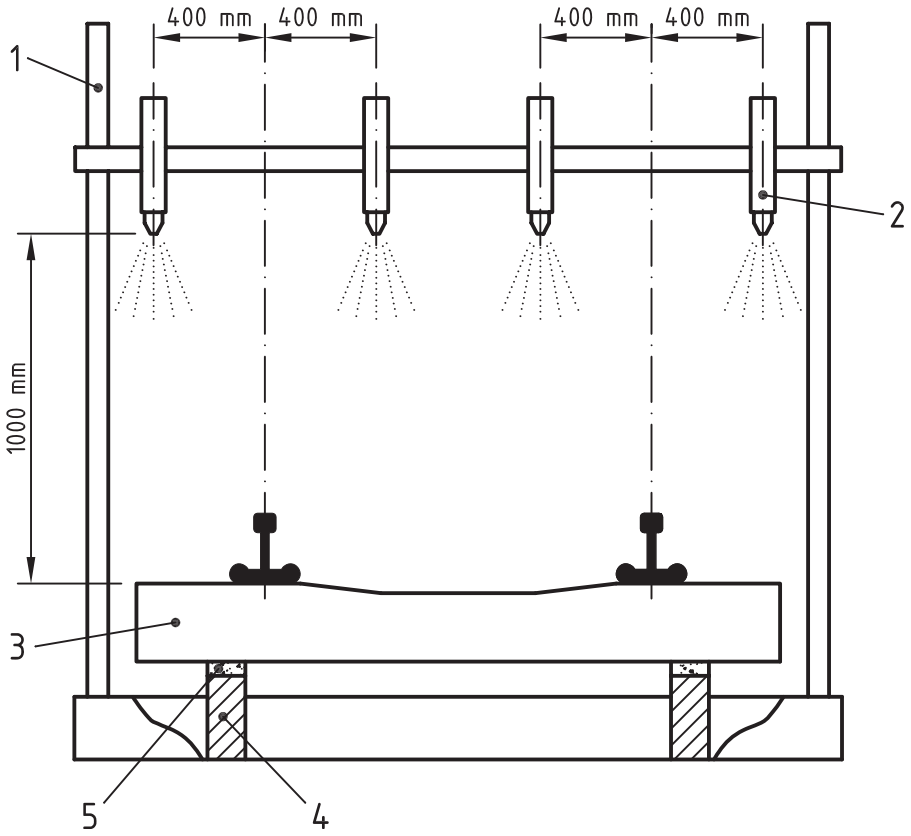
NOTE Suitable supports are wood blocks with plastics pads attached to provide insulation.

If the sleeper has not been used for this test before, carry out the spraying procedure and leave for no less than 24 h or until surface dry, whichever is longer, before performing the test.

Set up the measuring instruments as shown in Figure 2 and connect to the electrical supply. Move the spray equipment over the sleeper, anchor the equipment in position and spray with water at (10 to 20) ºC at a rate of (7 ± 1) l/min from each nozzle for 2 min. Record the voltage and current during spraying and for not less than 10 min after spraying has ceased.

Repeat the test twice more on the other two similar test specimens. If a specimen has been previously tested, allow no less than 120 h, or the time taken for the specimen to become surface dry, whichever is the longer, between tests.

A typical resistance/time plot is shown in Figure A.1.



Key

1 spray frame
2 spray nozzles as described in 5.3
3 test sleepers as described in Clause 6
4 wood blocks
5 plastics pads

Figure 1 — Test arrangement

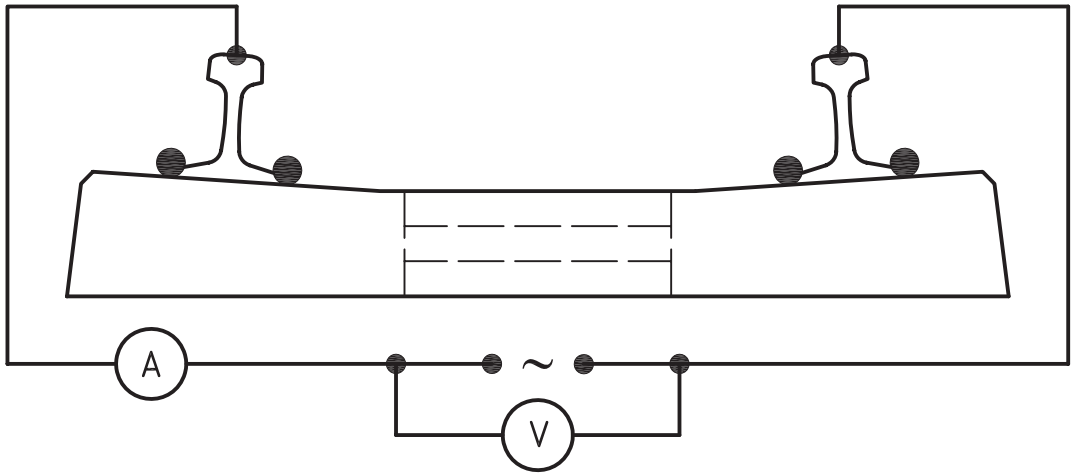


Figure 2 — Measurement circuit

8 Test specimens – Alternative method

One steel or concrete sleeper or bearer or embedded rail specimen in accordance with Clause 6. The test specimen is described as a sleeper in the test procedure.

9 Procedure – Alternative method

Follow the procedure in Clause 7. When the test on the single sleeper is complete, leave the sleeper to dry for at least 120 h and then repeat the procedure. After the second test, leave the sleeper to dry for at least 120 h and then repeat the procedure.

10 Calculations

For each test, find the minimum resistance $R\gamma$ from the resistance-time plot.

The result of the test R is the arithmetic mean of the three values of $R\gamma$ obtained.

11 Test report

The test report shall include at least the following information:

a) number, date of issue and title of this European Standard;

b) name and address of laboratory performing the test;

c) date test performed;

d) test procedure used (reference or alternative method);

e) name, designation and description of fastening assembly, including individual components, tested;

f) origin of test specimens;

g) rail section used in test;

h) details of the sleeper, bearer or element of slab track used;

i) conductivity of water used and the temperature of the water at the time of measurement;

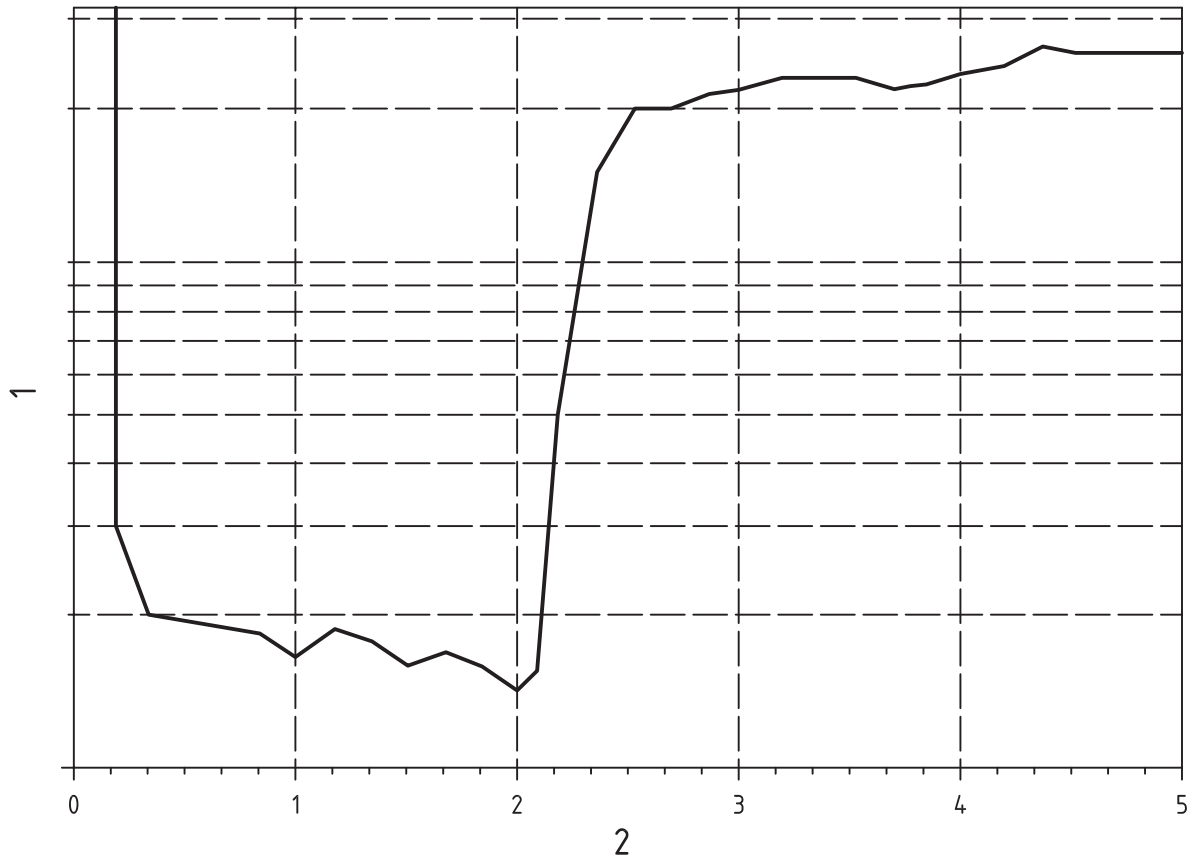
j) resistance-time plot for each test and value of R_γ;

k) result of the test, R in Ω.

Annex A
(informative)

Resistance/time plot

Figure A.1 shows a typical resistance/time plot as described in Clause 7.



Key

1 resistance R_{γ}, in Ω
2 time, in min

Figure A.1 — Typical resistance – Time plot

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