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Railway infrastructure — Rail fastening systems —

Part 5: Test method for electrical resistance

Infrastructure ferroviaire — Systèmes de fixation du rail —

Partie 5: Méthode d'essai pour la détermination de résistance électrique

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 01, *Infrastructure*.

A list of all parts in the ISO 22074 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This test procedure is used to assess the rail-to-rail electrical resistance relevant to rail fastenings used in locations where track circuit signalling systems are used.

Railway infrastructure — Rail fastening systems —

Part 5:
Test method for electrical resistance

1 Scope

This document 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 ballastless 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.

ISO 7888, *Water quality — Determination of electrical conductivity*

ISO 22074-1, *Railway applications — Infrastructure — Rail 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 ISO 22074-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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

5.2.1 Standard "wet" conditions

A supply of potable water with a conductivity of (50 ± 5) mS/m measured in accordance with ISO 7888 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 ISO 7888.

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

5.2.2 Optional additional test conditions

For some applications, additional tests in other conditions may be required e.g. for dry conditions, and/or for "polluted" wet conditions. For such tests supply of water may be required containing sodium chloride with a conductivity specified by the authority requesting the test and measured in accordance with ISO 7888 at the temperature at the time of spraying and corrected to a temperature of 25 ºC.

NOTE 3 Correction factors for temperature are given in ISO 7888.

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 representative of the proposed operational conditions. If the supply characteristics are not specified by the authority commissioning the tests then a supply of (30 ± 3) V RMS and (50 ± 15) Hz shall be used.

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 1×10^2 Ω to 1×10^6 Ω. 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).

5.6 Water collection and re-cycling equipment

Water sprayed onto the sleeper and fastening assemblies may be collected and re-cycled through the test rig, provided that the conductivity and temperature are maintained within the limits set out in 5.2. If such a procedure is used it is important to ensure that the entire water circulation system is designed to prevent collection of stagnant water and that the system is flushed through with clean water regularly. Failure to do this can lead to the creation of conditions in which harmful bacteria (e.g. Legionella) collect and breed in the test rig.

NOTE 4 Guidance on the control of Legionella in cold water systems is available at: https://osha.europa.eu/en/tools-and-publications/publications/factsheets/100

6 Test specimens (reference method)

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

For elements of ballastless track, including embedded rail assemblies, the length of the test specimen shall be equal to the typical support spacing in track.

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.

The use of wood blocks was recommended in some standards but wood in a wet environment may harbour harmful bacteria (e.g. Legionella) and therefore shall not be used in this application.

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 3.

