



SLOVENSKI STANDARD
oSIST prEN ISO 9466:2024
01-februar-2024

Železniške naprave - Barvanje železniških potniških vozil (ISO/DIS 9466:2023)

Railway Applications - Painting of passenger rail vehicles (ISO/DIS 9466:2023)

Bahnanwendungen - Lackierung von Schienenfahrzeugen für den Personenverkehr (ISO/DIS 9466:2023)

Applications ferroviaires - Peinturage des véhicules ferroviaires destinés au transport de passagers (ISO/DIS 9466:2023)

Ta slovenski standard je istoveten z: prEN ISO 9466

[oSIST prEN ISO 9466:2024](https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024)

<https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024>

ICS:

45.060.01	Železniška vozila na splošno	Railway rolling stock in general
87.020	Postopki za nanašanje barvnih premazov	Paint coating processes

oSIST prEN ISO 9466:2024

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 9466

ISO/TC 269/SC 2

Secretariat: **AFNOR**Voting begins on:
2023-12-15Voting terminates on:
2024-03-08

Railway Applications — Painting of passenger rail vehicles

Applications ferroviaires — Peinturage des véhicules ferroviaires à passagers

ICS: 45.060.01

iTeh Standards (<https://standards.iteh.ai>) Document Preview

[oSIST prEN ISO 9466:2024](https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024)<https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024>

This document is circulated as received from the committee secretariat.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ISO/CEN PARALLEL PROCESSING



Reference number
ISO/DIS 9466:2023(E)

© ISO 2023

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[oSIST prEN ISO 9466:2024](https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024)

<https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

	Page
Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	4
4 Painting systems, painting areas and environment and design recommendations	5
4.1 General.....	5
4.2 Types of area.....	5
4.3 Standard Support/Substrates.....	6
4.4 Painting system qualification.....	7
4.4.1 General.....	7
4.4.2 Chemical and physico-chemical characteristics of products - for every layer.....	7
4.4.3 Application properties.....	9
4.4.4 Physical characteristics.....	12
4.4.5 Decorative characteristics.....	16
4.4.6 Mechanical characteristics.....	18
4.4.7 Ageing characteristics.....	22
4.5 Design recommendations.....	30
4.5.1 General.....	30
4.5.2 Painted parts specifications.....	30
5 Process definition and qualification	30
5.1 General.....	30
5.2 Definition of the process.....	31
5.2.1 General.....	31
5.2.2 Ambient conditions.....	31
5.2.3 Cleaning and degreasing the surface.....	31
5.2.4 Pretreatment and surface preparation methods.....	31
5.2.5 Paint application.....	33
5.2.6 Drying.....	33
5.2.7 Inter-operation time.....	34
5.3 Process qualification.....	34
5.3.1 General.....	34
5.3.2 Minimum tests for process qualification.....	34
5.3.3 Qualification process report.....	35
5.4 Supplier process information.....	35
6 Serial production	36
6.1 General.....	36
6.2 First article inspection.....	36
6.3 Local work instruction document.....	36
6.3.1 Introduction.....	36
6.3.2 Preparation steps before application process.....	37
6.3.3 Application process (including single layer or multilayer painting).....	38
6.4 In-house testing of serial parts.....	38
6.4.1 General.....	38
6.4.2 Technical tests (valid for all areas).....	39
6.4.3 Decorative areas.....	40
6.4.4 Traceability requirements.....	41
6.5 Repair and maintenance.....	41
6.5.1 Repair.....	41
6.5.2 Maintenance.....	41
Annex A (informative) Definition of test substances	42
Annex B (informative) Test description: resistance to graffiti removal	43

ISO/DIS 9466:2023(E)

Annex C (normative) Catalogue of defects / acceptance criteria	48
Annex D (Informative) Level linked to the refurbishment time (corrosion, humidity, weathering)	51
Bibliography	53

iTeh Standards (<https://standards.iteh.ai>) Document Preview

[oSIST prEN ISO 9466:2024](https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024)

<https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024>

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*.

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](http://www.iso.org/members.html).

oSIST prEN ISO 9466:2024

<https://standards.iteh.ai/catalog/standards/sist/523f059b-cd98-4618-adb3-bb6710b59142/osist-pren-iso-9466-2024>

Railway Applications — Painting of passenger rail vehicles

1 Scope

This document defines the performance requirements and acceptance criteria for paint used for passenger rolling stock, locomotives and components.

It also provides guidance on the paint application processes, product selection, surface preparation, coating application, verification and inspection methods, repairs, refurbishment (refresh, etc.) and tests to obtain the minimum performance for the final product.

This document applies to all types of paints (liquid, powder, etc.) used on:

- railway vehicle bodies;
- on-board equipment and constituent parts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1518-1:2023, *Paints and varnishes — Determination of scratch resistance — Part 1: Constant-loading method*

ISO 11890-1:2007, *Paints and varnishes — Determination of volatile organic compound (VOC) content — Part 1: Difference method*

ISO 11890-2:2013, *Paints and varnishes — Determination of volatile organic compound (VOC) content — Part 2: Gas-chromatographic method*

<https://standards.iteh.ai> ISO 13076:2019, *Paints and varnishes — Lighting and procedure for visual assessments of coatings*

ISO 13565-1:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties — Part 1: Filtering and general measurement conditions*

ISO 1519:2011, *Paints and varnishes — Bend test (cylindrical mandrel)*

ISO 16276-2:2007, *Corrosion protection of steel structures by protective paint systems — Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating — Part 2: Cross-cut testing and X-cut testing*

ISO 16474-2:2013/Amd 1:2022, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps — Amendment 1: Classification of daylight filters*

ISO 16862:2003, *Paints and varnishes — Evaluation of sag resistance*

ISO 17872:2019, *Paints and varnishes — Guidelines for the introduction of scribe marks through coatings on metallic panels for corrosion testing*

ISO 18768-1:2022, *Organic coatings on aluminium and its alloys — Methods for specifying decorative and protective organic coatings on aluminium — Part 1: Powder coatings*

ISO 19840:2012, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces*

ISO/DIS 9466:2023(E)

ISO 20567-1:2017, *Paints and varnishes — Determination of stone-chip resistance of coatings — Part 1: Multi-impact testing*

ISO 21920-2:2021, *Geometrical product specifications (GPS) — Surface texture: Profile — Part 2: Terms, definitions and surface texture parameters*

ISO 22163:2023, *Railway applications — Railway quality management system — ISO 9001:2015 and specific requirements for application in the railway sector*

ISO 2409:2020, *Paints and varnishes — Cross-cut test*

ISO 2431:2019, *Paints and varnishes — Determination of flow time by use of flow cups*

ISO 2555:2018, *Plastics — Resins in the liquid state or as emulsions or dispersions — Determination of apparent viscosity using a single cylinder type rotational viscometer method*

ISO 2808:2019, *Paints and varnishes — Determination of film thickness*

ISO 2811-1:2023, *Paints and varnishes — Determination of density — Part 1: Pycnometer method*

ISO 2812-3:2019, *Paints and varnishes — Determination of resistance to liquids — Part 3: Method using an absorbent medium*

ISO 2813:2014, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ISO 3233-3:2015, *Paints and varnishes — Determination of the percentage volume of non-volatile matter — Part 3: Determination by calculation from the non-volatile-matter content determined in accordance with ISO 3251, the density of the coating material and the density of the solvent in the coating material*

ISO 3251:2019, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

ISO 3668:2017, *Paints and varnishes — Visual comparison of colour of paints*

ISO 4287:1997/Amd 1:2009, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters — Amendment 1: Peak count number*

ISO 4618:2023, *Paints and varnishes — Vocabulary*

ISO 4624:2023, *Paints and varnishes — Pull-off test for adhesion*

ISO 4628-2:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-3:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*

ISO 4628-4:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4628-5:2022, *Paints and varnishes — Evaluation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

ISO 4628-8:2012, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 8: Assessment of degree of delamination and corrosion around a scribe or other artificial defect*

ISO 6270-2:2017, *Paints and varnishes — Determination of resistance to humidity — Part 2: Condensation (in-cabinet exposure with heated water reservoir)*

ISO 6272-1:2011, *Paints and varnishes — Rapid-deformation (impact resistance) tests — Part 1: Falling-weight test, large-area indenter*

ISO 6344-1:1998, *Coated abrasives — Grain size analysis — Part 1: Grain size distribution test*

ISO 6344-2:2021, *Coated abrasives — Determination and designation of grain size distribution — Part 2: Macrogrit sizes P12 to P220*

ISO 6344-3:2021, *Coated abrasives — Determination and designation of grain size distribution — Part 3: Microgrit sizes P240 to P5000*

ISO 6504-3:2019, *Paints and varnishes — Determination of hiding power — Part 3: Determination of hiding power of paints for masonry, concrete and interior use*

ISO 6507-1:2018, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 7784-1:2023, *Paints and varnishes — Determination of resistance to abrasion — Part 1: Method with abrasive-paper covered wheels and rotating test specimen*

ISO 8130-1:2019, *Coating powders — Part 1: Determination of particle size distribution by sieving*

ISO 8130-13:2019, *Coating powders — Part 13: Particle size analysis by laser diffraction*

ISO 8130-8:2021, *Coating powders — Part 8: Assessment of the storage stability of thermosetting powders*

ISO 8501-1:2007, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 8502-3:2017, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)*

ISO 8503-1:2012, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*

ISO 8503-2:2012, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*

ISO 8503-4:2012, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Stylus instrument procedure*

ISO 8503-5:2017, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 5: Replica tape method for the determination of the surface profile*

ISO 9117-3:2010, *Paints and varnishes — Drying tests — Part 3: Surface-drying test using ballotini*

ISO 9117-5:2012, *Paints and varnishes — Drying tests — Part 5: Modified Bandow-Wolff test*

ISO 9142:2003, *Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints*

ISO 9227:2022, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 9514:2019, *Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing*

ISO/CIE 11664-1:2019, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO/DIS 9466:2023(E)

ISO/CIE 11664-2:2022, *Colorimetry — Part 2: CIE standard illuminants*

ISO/CIE 11664-3:2019, *Colorimetry — Part 3: CIE tristimulus values*

ISO/CIE 11664-4:2019, *Colorimetry — Part 4: CIE 1976 L*a*b* colour space*

ISO/CIE 11664-5:2016, *Colorimetry — Part 5: CIE 1976 L*u*v* colour space and u', v' uniform chromaticity scale diagram*

ISO/CIE 11664-6:2022, *Colorimetry — Part 6: CIEDE2000 colour-difference formula*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 4618:2023 and the following apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

coater

paint applicator

company which applies the paint

3.2

paint

pigmented or not pigmented coating material which, when applied to a substrate, forms an opaque dried film having protective, decorative or specific technical properties

[SOURCE: ISO 4618:2023, 3.183, modified: "or not pigmented" was added]

3.3

paint datasheet

document released by the paint supplier which details all the technical parameters to fulfil to prepare and apply the paint

3.4

painting system

combination of all layers of coating materials which are to be applied or which have been applied to a substrate

Note 1 to entry: The actual system can be characterized by the number of layers involved.

Note 2 to entry: "All layers" also include monolayer.

[SOURCE: ISO 4618:2023, 2.54 modified: "Coating system" replaced by "Painting system", and "coats" replaced by "layers" in the definition and in notes 1 and 2.]

3.5

qualification

process that proves that a set of technical requirements are fulfilled

3.6

refurbishment time

expected duration of use not linked to warranty time

3.7

work sample

representative part (same material, same pretreatment) which is produced under qualified production conditions

4 Painting systems, painting areas and environment and design recommendations

4.1 General

The painting system shall be qualified based on its location within the vehicle.

4.2 Types of area

The areas are defined in [Table 1](#).

Table 1 — Types of area

Number	Type	Decorative (visible)	Non-decorative (non-visible)
1	Interior (walls and ceilings) and equipment	Ceiling Side ceiling Side walls Grab-handles Cab desk Luggage racks Etc.	Carbody side walls and ceiling Parts behind ceilings and side walls (C-rail, hooks, etc.)
2	Interior needing higher resistance to corrosion (floor and elements mounted on the floor)	Seating (pedestal) Mounting of seats Mounting of support bars Bottom of side of walls Vestibule	Carbody floor Toilet walls Mounting parts Interior of equipment boxes on the roof
3	Exterior (direct UV exposure ^a)	Carbody side Exterior doors Fairings/roof fin Carbody roof (rounded) Carbody ends (if decorative) Cab front/front end Equipment (outside window frames, door gutters, etc.) Devices, cameras, speakers, etc.) Etc.	Carbody roof (tube) Carbody ends Equipment boxes Fairings (for HVAC unit, pantograph, insulator head, etc.) Handrail (for inspection of the roof) Drain pipe/Gutter Fresh air duct Intercar barrier bracket Etc.
4	Exterior (indirect or no UV exposure)	Non	Carbody underframe Equipment mounted on the underframe Coupler Buffer Bogie frame and bogie components

^a Including underground trains (such as metros).

ISO/DIS 9466:2023(E)

Table 1 (continued)

Number	Type	Decorative (visible)	Non-decorative (non-visible)
5	Axles		Axles, Wheelsets
^a Including underground trains (such as metros).			

4.3 Standard Support/Substrates

Table 2 lists the supports and substrates to be used for the tests described in Table 3, Table 4, Table 5, Table 6, Table 7 and Table 8.

For the chemical pretreatments described in Table 2, each product name of the active bathes should be included in the qualification report.

Table 2 — Standard Support/Substrates

Type	Standard Support (S2)	Support for elasticity tests (S1)
Steel	<p>S2</p> <p>Material: cold rolled steel (DC01/SPCC-SD)</p> <p>Thickness: 2mm</p> <p>Size:</p> <ul style="list-style-type: none"> — depending on the test machine; — for corrosion tests minimum 150×200mm. <p>Pretreatment:</p> <ul style="list-style-type: none"> — powder: zinc phosphate pretreatment and/or abrasive blast cleaning (surface quality: Sa 2,5; roughness Rz value between 25 and 40 µm) — liquid : abrasive blast cleaning (surface quality: Sa 2,5; roughness fine G in accordance with ISO 8503-1) 	<p>S1</p> <p>material: steel</p> <p>thickness: 1mm</p> <p>size: depending test machine</p> <p>pretreatment: zinc phosphated and/or bare surface</p>
Aluminium	<p>A2</p> <p>Material: AlMg3 (Al5754), AlMg2.5(A5052) or AlMg1SiCu (A6061/Al6061T6)</p> <p>Thickness: 2mm</p> <p>Size:</p> <ul style="list-style-type: none"> — depending on the test machine; — for corrosion tests minimum 150×200mm. <p>Pretreatment:</p> <ul style="list-style-type: none"> — powder: chemical treatment in accordance with ISO 18768-1, 5.2.5 and/or abrasive blast cleaning (surface quality: Sa 2,5; roughness Rz value between 25 and 40 µm) — liquid : abrasive blast cleaning; roughness fine G as defined ISO 8503-1:2012 	not required