



SLOVENSKI STANDARD
SIST-TS CEN/TS 15427-2-2:2023

01-december-2023

Nadomešča:

SIST-TS CEN/TS 15427-2-2:2021

Železniške naprave - Trenje na stiku kolo-tirnica - 2-2. del: Lastnosti in karakteristike - Materiali za zgornjo površino tirnic

Railway applications - Wheel/Rail friction management - Part 2-2: Properties and Characteristics - Top of Rail materials

Bahnanwendungen - Reibungsmanagement zwischen Rad und Schiene - Teil 2-2: Eigenschaften und Merkmale - Kraftschlussmodifikatoren

Applications ferroviaires - Gestion des frottements roue/rail - Partie 2-2 : Propriétés et caractéristiques - Lubrifiants de tête de rail

Ta slovenski standard je istoveten z: CEN/TS 15427-2-2:2023

ICS:

45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering
45.080	Tračnice in železniški deli	Rails and railway components

SIST-TS CEN/TS 15427-2-2:2023

en,fr,de

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN/TS 15427-2-2

October 2023

ICS 45.080; 45.120

Supersedes CEN/TS 15427-2-2:2021

English Version

**Railway applications - Wheel/rail friction management -
Part 2-2: Properties and characteristics - Top of rail
materials**

Applications ferroviaires - Gestion des frottements
roue/rail - Partie 2-2 : Propriétés et caractéristiques -
Lubrifiants de tête de rail

Bahnanwendungen - Reibungsmanagement zwischen
Rad und Schiene - Teil 2-2: Eigenschaften und
Merkmale - Kraftschlussmodifikatoren

This Technical Specification (CEN/TS) was approved by CEN on 9 July 2023 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

Document Preview

[SIST-TS CEN/TS 15427-2-2:2023](https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023)

<https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Design requirements	10
5 Technical specification and product approval	10
5.1 Introduction	10
5.2 Product specification	10
5.3 Technical file	11
6 Control and monitoring of product	11
6.1 Manufacturing process	11
6.2 Composition of material	11
6.3 Routine tests	11
6.4 Additional measures	11
7 Technical datasheet	11
7.1 General	11
7.2 Liquid based material characteristics	11
7.3 Solid based material characteristics	12
8 Packaging, labelling and storage	12
Annex A (normative) Requirements for top of rail materials and testing	13
A.1 Explanation of Annex A: Tables A.1 to A.3	13
A.2 Key to Annex A table columns	13
A.3 Key to Annex A table column ‘Use’	13
Annex B (informative) Determination of the volatile constituents in liquid Top of Rail Materials	19
B.1 Purpose	19
B.2 Short description	19
B.3 Conditions for testing	19
B.4 Test process	19
B.5 Recording of test results	20
Annex C (informative) Functional test on specific equipment	21
C.1 General	21
C.2 Sprayability of liquid top of rail materials	21
Annex D (informative) Twin-disc machine retentivity and coefficient of traction test	23
D.1 Purpose	23

D.2	Description	23
D.3	Conditions for test.....	23
Annex E	(informative) Twin-disc machine test for determining Creep force vs Creep rate curve (for solid sticks comparable to Mini Traction Machine (MTM) test)	27
E.1	Purpose	27
E.2	Description	28
E.3	Conditions for test.....	28
Annex F	(informative) Mini Traction Machine (MTM) creep curve test.....	32
F.1	General.....	32
F.2	Test equipment.....	32
F.3	Application of top of rail material to metal disk.....	33
F.4	Performance of the test.....	35
F.5	Evaluation of the test	36
Bibliography.....		37

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

[SIST-TS CEN/TS 15427-2-2:2023](https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023)

<https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023>

CEN/TS 15427-2-2:2023 (E)**European foreword**

This document (CEN/TS 15427-2-2:2023) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

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

This document supersedes CEN/TS 15427-2-2:2021.

CEN/TS 15427-2-2:2023 includes the following significant technical changes with respect to CEN/TS 15427-2-2:2021:

- document has been editorially updated based on the feedback received on the previous edition;
- corrections and clarifications have been introduced based on the feedback received on the previous edition;
- consistency with the other parts of the series has been improved.

This document is part of the following series:

- EN 15427-1-1, *Railway applications - Wheel/Rail friction management - Part 1-1: Equipment and Application - Flange lubrication;*
- CEN/TS 15427-1-2, *Railway applications - Wheel/rail friction management - Part 1-2: Equipment and application - Top of rail materials;*
- CEN/TS 15427-1-3, *Railway applications - Wheel/rail friction management - Part 1-3: Equipment and application - Adhesion materials;*
- EN 15427-2-1, *Railway applications - Wheel/Rail friction management - Part 2-1: Properties and Characteristics - Flange lubricants;*
- CEN/TS 15427-2-2, *Railway applications - Wheel/rail friction management - Part 2-2: Properties and characteristics - Top of rail materials;*
- CEN/TS 15427-2-3, *Railway applications - Wheel/Rail friction management - Part 2-3: Properties and Characteristics - Adhesion materials;*
- CEN/prTR 15427-3, *Railway applications - Wheel/Rail friction management - Part 3: Rationale for requirements and further background information.*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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

[SIST-TS CEN/TS 15427-2-2:2023](https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023)

<https://standards.iteh.ai/catalog/standards/sist/ef795a97-83f4-445f-89bc-b3d29b7af0e7/sist-ts-cen-ts-15427-2-2-2023>

CEN/TS 15427-2-2:2023 (E)**Introduction**

Friction management using solid or fluid (oil, grease, etc.) substances at the wheel-rail interface is a complex subject and includes the following aspects:

- lubrication of the wheel flange / rail gauge corner interface, commonly referred to as “flange or rail lubrication”;
- lubrication of the back of flange/ check rail interface; commonly referred to as “check rail lubrication”;
- controlling the level of friction at the interface between the top of rail and the wheel tread, commonly referred to as “top of rail friction management”;
- altering the level of adhesion at the interface between the top of rail and the wheel tread.

This document sets out requirements for the material to be used on the top of rail. It specifies requirements for the material, how to test it and how to approve it.

The material for top of rail should be tested to confirm there is:

- compatibility with top of rail material applicator equipment;
- no intolerable increased risk of fire;
- no harmful environmental effects;
- no incompatibility between the different materials/lubricants in use, particularly between solid and fluid systems;
- satisfactory and consistent product quality and performance;
- no degradation to the safety of the railway (braking, signalling, electrical traction return).

The main purpose of a top of rail material is to influence the interface between the wheel and rail (referred to as the third body layer) to control friction to a level where a reduction in noise or wear can be realized.

1 Scope

This document specifies the requirements of materials intended to be applied to the interface between the wheel tread and the rail crown (active interface). It can be applied either directly or indirectly to the wheel tread or rail.

It outlines the information required for most approval procedures, the method of testing and routine control/monitoring of the material.

This document does not deal with adhesion materials, for example:

- sand;
- adhesion enhancers.

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.

EN ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868)*

EN ISO 2160, *Petroleum products — Corrosiveness to copper — Copper strip test (ISO 2160)*

EN ISO 2592, *Petroleum and related products — Determination of flash and fire points - Cleveland open cup method (ISO 2592)*

EN ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104)*

EN ISO 3146, *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods (ISO 3146)*

EN ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (ISO 3675)*

EN ISO 4589-1, *Plastics — Determination of burning behaviour by oxygen index — Part 1: General requirements (ISO 4589-1)*

EN ISO 4589-2, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test (ISO 4589-2)*

EN ISO 5659-1, *Plastics — Smoke generation — Part 1: Guidance on optical-density testing (ISO 5659-1)*

EN ISO 5659-2, *Plastics — Smoke generation — Part 2: Determination of optical density by a single-chamber test (ISO 5659-2)*

EN ISO 9439, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Carbon dioxide evolution test (ISO 9439)*

EN ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method (ISO 12185)*

CEN/TS 15427-2-2:2023 (E)

ISO 2049, *Petroleum products — Determination of colour (ASTM scale)*

ISO 3016, *Petroleum and related products from natural or synthetic sources — Determination of pour point*

ISO 6072, *Rubber — Compatibility between hydraulic fluids and standard elastomeric materials*

ISO 7120, *Petroleum products and lubricants — Petroleum oils and other fluids — Determination of rust-preventing characteristics in the presence of water*

ISO 9772, *Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame*

DIN 51418-1, *X-ray spectrometry — X-ray emissions and X-ray fluorescence analysis (XRF) — Part 1: Definitions and principles*

DIN 51418-2, *X-ray spectrometry — X-ray emissions and X-ray fluorescence analysis (XRF) — Part 2: Definitions and basic principles for measurements, calibration and evaluation of results*

DIN 51451, *Testing of petroleum products and related products — Analysis by infrared spectrometry — General working principles*

DIN 51820, *Testing of lubricants — Analysis of greases by infrared spectrometry — Taking and evaluating an infrared spectrum*

3 Terms and definitions iTeh Standards

For the purposes of this document, the following terms and definitions 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 <https://www.electropedia.org/>

3.1

top of rail (TOR) material

substance that controls the coefficient of friction of the wheel / rail interface

3.2

liquid top of rail material

oil, water or emulsion-based friction modifiers

Note 1 to entry: Oil can be mineral, natural or synthetic in origin and can have additives included. Products can have a range of viscosity levels from highly fluid to semi-solid materials.

3.3

stick

encapsulated solid top of rail material

Note 1 to entry: Typically, the stick comprises a solid lubricant which is encapsulated in a polymeric binder/carrier. The product is designed for direct contact with a rotating wheel tread; the polymeric binder has a sufficiently high melting point such that it does not melt but rather wears when in contact with the wheel tread to ensure dimensional stability.

3.4**batch**

entire content of a single identified production of material from the same manufacturing process

3.5**active interface**

contact area between the wheel tread and the crown of the rail

Note 1 to entry: For more information on this definition, see EN 15427-1-2.

3.6**application system**

components required to apply top of rail materials to the active interface

3.7**trainborne equipment**

type of equipment that delivers product to the active interface installed on a train

3.8**trackside equipment**

type of equipment that delivers product to the active interface installed on or adjacent to the track

3.9**customer**

railway undertaking, infrastructure manager, manufacturer or buyer of railway products or subassemblies, or their representative

3.10**supplier**

provider of equipment, material and/or support services

3.11**product specification**

document prepared by the customer that describes the conditions and requirements for the lubricant to meet and the tests to validate it

3.12**Coefficient of friction (COF)**

relationship between the friction force of the wheel and the wheel load on the rail independent of the direction

3.13**Coefficient of Traction (COT)**

ratio of the tangential force at the wheel-rail interface and the force at this interface acting perpendicular to the surface of the rail

3.14**creep**

slip

measure of the relative displacement or motion of the wheel against the rail, usually caused by imperfect steering of a bogie in a curve

Note 1 to entry: Creep is usually expressed as a percentage of the rolling displacement.

Note 2 to entry: Creep can be longitudinal, lateral or in a spin direction relative to the rail.

CEN/TS 15427-2-2:2023 (E)**4 Design requirements**

The material shall be designed to meet at least one of the following:

- reduction in noise and vibration;
- reduction in the rate of wear;
- reduction of the rate of corrugation growth;
- reduction in the number of wheel and rail defects.

When applied within the specified limits to the active interface the material shall not compromise the safety of the railway (i.e. braking distances, signalling systems).

NOTE Specified limits are normally understood and agreed between relevant parties before use of material.

5 Technical specification and product approval**5.1 Introduction**

This clause outlines the information required to gain approval on most railway networks. It does not cover its performance on the railway.

5.2 Product specification

The product specification shall be fully documented and shall consider the following information:

- a) purpose of top of rail material;
- b) conformity to the applicable type tests as set out in Tables A.1 to A.2;
- c) conformance with other relevant local requirements (such as environmental, fire, toxicity, etc.);
- d) application data:
 - 1) including equipment, it can be used with;
 - 2) operating temperatures;
- e) additional validation tests (see Table A.3);
- f) any previous relevant experience;
- g) conditions for packaging, storage and labelling (see Clause 8);
- h) environmental tests are defined in Tables A.1 to A.2.

NOTE Where legislation and regulations (European, national or local) concerning ecological and environmental compatibility of lubricants (biodegradability, toxicity, etc.) are applicable, consideration will need to be given to the relevant requirements.