



**SLOVENSKI STANDARD**  
**kSIST-TS FprCEN/TS 15427-2-2:2020**

**01-oktober-2020**

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**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 - Behandlung der Schienenoberfläche

Applications ferroviaires - Gestion de la friction rail/roue - Partie 2-2 : Propriétés et caractéristiques - Matériaux de la surface du rail

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**Ta slovenski standard je istoveten z: FprCEN/TS 15427-2-2**

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**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

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

Applications ferroviaires - Gestion de la friction  
rail/roue - Partie 2-2 : Propriétés et caractéristiques -  
Matériaux de la surface du rail

Bahnanwendungen - Reibungsmanagement zwischen  
Rad und Schiene - Teil 2-2: Eigenschaften und  
Merkmale - Behandlung der Schienenoberfläche

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

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

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## European foreword

This document (FprCEN/TS 15427-2-2:2020) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the vote.

This document is part of the series EN 15427, Railway applications - Wheel/Rail friction management, which consists of the following parts:

- Part 1-1: Equipment and Application - Flange Lubrication
- Part 1-2: Equipment and Application - Top of Rail materials
- Part 1-3: Equipment and Application - Adhesion materials
- Part 2-1: Properties and Characteristics - Flange lubricants
- Part 2-2: Properties and Characteristics - Top of Rail materials
- Part 2-3: Properties and Characteristics - Adhesion materials
- Part 3: Rationale for requirements and further background information

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## 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”;
- altering 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).

The main purpose of a top of rail material is to influence the third layer to reduce friction to a level where a reduction in noise or wear can be realized.

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## 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)*

ISO/TR 5659-3, *Plastics — Smoke generation — Part 3: Determination of optical density by a dynamic-flow method*



EN ISO 7827, *Water quality - Evaluation of the "ready", "ultimate" aerobic biodegradability of organic compounds in an aqueous medium - Method by analysis of dissolved organic carbon (DOC) (ISO 7827)*

EN ISO 9408, *Water quality - Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium by determination of oxygen demand in a closed respirometer (ISO 9408)*

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

EN ISO 10707, *Water quality - Evaluation in an aqueous medium of the "ultimate" aerobic biodegradability of organic compounds - Method by analysis of biochemical oxygen demand (closed bottle test) (ISO 10707)*

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

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 6743-99, *Lubricants, industrial oils and related products (class L) — Classification — Part 99: General*

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*

ISO 11007, *Petroleum products and lubricants — Determination of rust-prevention characteristics of lubricating greases*

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 51817, *Testing of lubricants — Determination of oil separation from greases under static conditions*

DIN 51820-1, *Testing of lubricants — Analysis of greases by infrared spectrometry — Taking and evaluating an infrared spectrum*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15085-1, EN 17018 and in EN 13306 as well as the following apply.

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

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

#### 3.1

##### **top of rail (TOR) material**

substance that influences the rheology of the third layer body

#### 3.2

##### **liquid lubricant**

oil, water or emulsion-based products

Note 1 to entry: Oil can be mineral, natural or synthetic in origin and can have additives included.

#### 3.3

##### **grease**

semi-solid lubricant

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Note 1 to entry: Grease consists of a thickener and additives integrated in a lubricating oil.

#### 3.4

##### **stick**

encapsulated solid lubricant

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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 flange; the polymeric binder has a sufficiently high melting point such that it does not melt but rather wears when in contact with the wheel flange to ensure dimensional stability.

#### 3.5

##### **batch**

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

#### 3.6

##### **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.

#### 3.7

##### **rail lubrication**

lubrication of the active interface by applying a lubricant to the rail gauge side face

**3.8****Lubricant Application Unit (LAU)**

component of the lubrication system (trainborne or trackside) that delivers lubricant to the active interface

Note 1 to entry: This includes spray nozzles, trackside grease distribution units/blades, stick applicators, etc.

**3.9****lubrication system**

components required to apply lubricant to the active interface

Note 1 to entry: A lubrication system can include one or more Lubricant Application Units, a reservoir unit, pump and/or a control device.

**3.10****trainborne equipment**

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

**3.11****trackside**

type of lubrication system installed on or adjacent to the track

**3.12****customer**

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

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**3.13****supplier**

supplier of lubricants

Note 1 to entry: A supplier might also be the manufacturer of the product.

**3.14****product specification**

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

**3.15****Coefficient of friction (COF)**

relationship between the [force](#) of [friction](#) and the multi- vector reaction between the wheel and rail

Note 1 to entry: Used between the flange and gauge corner of the rail.

**3.16****Coefficient of Adhesion (COA)**

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

**3.17****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

**4 Material 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 before use of material.

**5 General requirements****5.1 Introduction** iTeh STANDARD PREVIEW

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

**5.2 Product specification** [kSIST-TS FprCEN/TS 15427-2-2:2020](https://standards.iteh.ai/catalog/standards/sist/a468cbb9-663f-4b73-9f78-c3a36925e3bc/ksist-ts-fprcen-ts-15427-2-2-2020)

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

- a) purpose of material;
- b) conformity to the applicable type tests as set out in Tables A.1 to A.3;
- 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;

NOTE 1 The typical operating temperature range to take into account is from  $-25\text{ °C}$  to  $+80\text{ °C}$ .

- e) additional validation tests (see Table A.4);
- f) any previous relevant experience (i.e. use in other countries);
- g) conditions for packaging, storage and labelling (see Clause 9);
- h) environmental tests are defined in Tables A.1 to A.3.

NOTE 2 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.

### 5.3 Technical file

A file of technical data showing compliance with the requirements in the product specification and the results of type tests and trials shall be provided. A technical datasheet shall also be provided (see Clause 7).

A material safety data sheet (MSDS) for the product in the language of the interested customer or country shall be included.

## 6 Control and monitoring of product

### 6.1 Manufacturing process

If the manufacturing process is changed in a way that may affect the chemical composition, it shall be documented and the customer shall be notified.

NOTE In some cases, this leads to a new approval being required.

### 6.2 Composition of material

If the composition of the material is changed in any way, it shall be documented and the customer shall be notified.

NOTE In some cases, this leads to a new approval being required.

### 6.3 Routine tests

Routine tests ensure product consistency from batch to batch.

The routine tests are listed in Tables A1 to A3. If additional tests are required (such as those not included in the tables or a type test) this and the frequency can be agreed between the client and supplier.

The sample of material assessed for quality testing shall have been manufactured in a regular production batch. The entire sample of material used for the approval tests shall be taken from the same production batch and delivered in a single consignment.

The results of the routine tests shall be recorded.

### 6.4 Additional measures

Retention of test records and samples, witnessing of tests, calibration of test equipment shall be considered.

## 7 Technical datasheet

### 7.1 General

The technical datasheet shall include the individual identifying code or name of the material, a description of the product's field of use and typical means of application. For each material type, the information in the following subclauses shall also be included.

### 7.2 Grease type material characteristics

The product shall be described by its consistency, its temperature range, the type of thickener and type of base oil used. Where solid particulates are used, the type and content shall be