



# SLOVENSKI STANDARD

## SIST EN 16028:2012

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**Železniške naprave - Trenje na stiku kolo/tirnica - Maziva za mazalke na vozilih in za tirne mazalke**

Railway applications - Wheel/rail friction management - Lubricants for trainborne and trackside applications

Bahnanwendungen - Spurkranzschmierung - Prüfung der Schmiermittel

Applications ferroviaires - Gestion des frottements roue/rail - Lubrifiants pour les applications embarquées et fixes de voie

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45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering
75.100	Maziva	Lubricants, industrial oils and related products

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EUROPEAN STANDARD

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## Railway applications - Wheel/rail friction management - Lubricants for trainborne and trackside applications

Applications ferroviaires - Gestion des frottements roue/rail  
- Lubrifiants pour les applications embarquées et fixes de  
voie

Bahnanwendungen - Spurkranzschmierung - Prüfung der  
Schmierstoffe

This European Standard was approved by CEN on 9 June 2012.

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## Contents

Page

Foreword.....	4
Introduction .....	5
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions.....	9
4 Legislative compliance.....	10
5 Approval procedure .....	10
6 Control and monitoring of product .....	11
6.1 Manufacturing process.....	11
6.2 Type tests .....	12
6.3 Routine tests .....	12
7 Technical datasheet.....	12
8 Tests.....	12
8.1 Explanation of Annex A: Tables A.1 to A.4 .....	12
8.2 Key to Annex A table columns 'Type', 'Routine' and 'Datasheet'.....	13
8.3 Key to Annex A table column 'Use'.....	13
9 Packaging, labelling and storage.....	13
<b>Annex A (normative) Requirements for lubricants and testing.....</b>	<b>15</b>
<b>Annex B (normative) Water wash-off test.....</b>	<b>27</b>
B.1 Purpose.....	27
B.2 Short description .....	27
B.3 Conditions for testing.....	27
B.4 Test process .....	27
<b>Annex C (informative) Corrosion test on steel .....</b>	<b>30</b>
C.1 Purpose.....	30
C.2 Short description .....	30
C.3 Conditions for testing.....	30
C.4 Test process .....	31
<b>Annex D (informative) Behaviour at an elevated temperature – Adhesion on steel sheet .....</b>	<b>32</b>
D.1 Purpose.....	32
D.2 Short description .....	32
D.3 Conditions for test .....	32
D.4 Test process .....	32
<b>Annex E (informative) Determination of the volatile constituents in greases.....</b>	<b>34</b>
E.1 Purpose.....	34
E.2 Short description .....	34
E.3 Conditions for testing.....	34
E.4 Test process .....	35
E.5 Recording of test results.....	35
<b>Annex F (informative) Peak forming and droop .....</b>	<b>36</b>
F.1 Purpose.....	36
F.2 Short description .....	36
F.3 Conditions for testing.....	36
F.4 Test process .....	36

<b>Annex G</b> (informative) <b>Low-temperature torque (rheometer measurement at -20 °C and -30 °C)</b> .....	<b>39</b>
<b>G.1 Purpose</b> .....	<b>39</b>
<b>G.2 Short description</b> .....	<b>39</b>
<b>G.3 Conditions for test</b> .....	<b>39</b>
<b>G.4 Test process</b> .....	<b>40</b>
<b>Annex H</b> (informative) <b>Miscibility with flange/rail lubricants in use – greases</b> .....	<b>43</b>
<b>H.1 Purpose</b> .....	<b>43</b>
<b>H.2 Short description</b> .....	<b>43</b>
<b>H.3 Conditions for testing</b> .....	<b>43</b>
<b>H.4 Test process</b> .....	<b>44</b>
<b>Annex I</b> (informative) <b>Miscibility with flange/rail lubricants in use – oils</b> .....	<b>45</b>
<b>I.1 Purpose</b> .....	<b>45</b>
<b>I.2 Short description</b> .....	<b>45</b>
<b>I.3 Conditions for testing</b> .....	<b>45</b>
<b>I.4 Test process</b> .....	<b>46</b>
<b>Annex J</b> (informative) <b>Determination of low temperature cone penetration of greases</b> .....	<b>47</b>
<b>J.1 Purpose</b> .....	<b>47</b>
<b>J.2 Short description</b> .....	<b>47</b>
<b>J.3 Conditions for test</b> .....	<b>47</b>
<b>J.4 Test process</b> .....	<b>47</b>
<b>Annex K</b> (informative) <b>Functional test on specific equipment</b> .....	<b>49</b>
<b>K.1 General</b> .....	<b>49</b>
<b>K.2 Flowing behaviour of wheel-flange greases</b> .....	<b>49</b>
<b>K.3 Test of spraying of oils at various temperatures</b> .....	<b>51</b>
<b>Annex L</b> (informative) <b>Solid stick testing on twin-disc machine</b> .....	<b>55</b>
<b>L.1 Purpose</b> .....	<b>55</b>
<b>L.2 Short description</b> .....	<b>55</b>
<b>L.3 Conditions for test</b> .....	<b>55</b>
<b>L.4 Test process</b> .....	<b>58</b>
<b>L.5 Test results</b> .....	<b>58</b>
<b>Annex M</b> (informative) <b>Lubricant product performance - Field assessment</b> .....	<b>60</b>
<b>M.1 General</b> .....	<b>60</b>
<b>M.2 Product performance assessment</b> .....	<b>60</b>
<b>Bibliography</b> .....	<b>61</b>

**EN 16028:2012 (E)****Foreword**

This document (EN 16028:2012) 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 January 2013, and conflicting national standards shall be withdrawn at the latest by January 2013.

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

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

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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 (active interface), commonly referred to as “flange or rail lubrication”;
- friction modification of the top of rail/wheel tread interface, commonly referred to as “top of rail friction management”.

This European Standard sets out requirements for the lubricant for flange or rail lubrication. It specifies requirements for the lubricant, how to test it and how to approve it.

Lubricants should be tested to confirm there is:

- compatibility with lubricating systems;
- no intolerable increased risk of fire;
- no harmful environmental effects;
- no incompatibility between the different lubricants in use, particularly between solid and fluid systems;
- satisfactory and consistent product quality and performance.

The main purpose of the lubricant is to reduce friction and wear, and keep them at an acceptable level.

The content is based on current experience and should not exclude developments that can be later incorporated at reissue.

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**EN 16028:2012 (E)****1 Scope**

This European Standard specifies the requirements of lubricants intended for lubrication of the wheel-rail interface between the wheel flange and the rail gauge corner (active interface) applied either directly or indirectly to the wheel flange or to the rail to achieve an acceptable level of friction and wear.

It covers the approval procedure, the method of testing and routine control/monitoring of the lubricant.

**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 10130, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

EN 15427, *Railway applications — Wheel/rail friction management — Flange lubrication*

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

EN ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1)*

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

EN ISO 2592, *Petroleum 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: Guidance (ISO 4589-1)*

EN ISO 4589-2, *Plastics — Determination of burning behaviour by oxygen index — 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 — 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 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method (ISO 12185)*



EN ISO 20623, *Petroleum and its products — Determination of the extreme-pressure and anti-wear properties of fluids — Four ball method (European conditions) (ISO 20623)*

ISO 760, *Determination of water — Karl Fischer method (General method)*

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

ISO 2137, *Petroleum products and lubricants — Determination of cone penetration of lubricating greases and petrolatum*

ISO 2176, *Petroleum products — Lubricating grease — Determination of dropping point*

ISO 3016, *Petroleum products — Determination of pour point*

ISO 3733, *Petroleum products and bituminous materials — Determination of water — Distillation method*

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 51350-4, *Testing of lubricants — Testing by the Shell four-ball tester — Determination of welding load of consistent lubricants*

DIN 51350-5, *Testing of lubricants — Testing by the Shell four-ball tester — Determination of wear data for consistent lubricants*

DIN 51398, *Testing of lubricants — Procedure for measurement of low temperature apparent viscosity by means of the Brookfield viscometer (liquid bath method)*

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 51631, *Mineral spirits — Special boiling point spirits — Requirements*

DIN 51777-2, *Testing of mineral oil-hydrocarbons and solvents — Determination of the water content according to Karl Fischer (indirect method)*

DIN 51805, *Testing of lubricants — Determination of flow pressure of lubricating greases — Kesternich method*

DIN 51807-1, *Testing of lubricants — Test of the behaviour of lubricating greases in the presence of water — Static test*

**EN 16028:2012 (E)**

DIN 51810-1, *Testing of lubricants — Determination of shear viscosity of lubricating greases by the rotational viscosimeter – Part 1: System of cone / plate*

DIN 51811, *Testing of lubricants — Testing of corrosiveness to copper of greases — Copper strip tarnish test*

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*

ASTM D1831, *Standard Test Method for Roll Stability of Lubricating Grease*

ASTM D4049, *Standard Test Method for Determining the Resistance of Lubricating Grease to Water Spray*

IP 396, *Determination of dropping point of lubricating grease — Automatic apparatus method*

OECD 301 suite

OECD Document      Equivalent Standard

301a      EN ISO 7827, *Water quality — Evaluation in an aqueous medium of the 'ultimate' aerobic biodegradability of organic compounds — Method by analysis of dissolved organic carbon (DOC) (ISO 7827)*

301b      EN ISO 9439, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Carbon dioxide evolution test (ISO 9439)*

301c      Nil      <https://standards.iteh.ai/catalog/standards/sist/df58a5e-cc6e-43f9-987c-b9ed9a08b46f/sist-en-16028-2012>

301d      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)*

301e      EN ISO 7827, *Water quality — Evaluation in an aqueous medium of the 'ultimate' aerobic biodegradability of organic compounds — Method by analysis of dissolved organic carbon (DOC) (ISO 7827)*

301f      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)*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **lubricant**

substance that is designed to lower friction and wear

#### 3.2

##### **oil**

liquid lubricant

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

#### 3.3

##### **grease**

semi-solid lubricant

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

#### 3.4

##### **stick**

encapsulated solid lubricant

Note 1 to entry: Typically, the stick is comprised of 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 lubricant from the same manufacturing process

#### 3.6

##### **active interface**

contact area between the wheel flange root and the rail gauge side corner

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

#### 3.7

##### **flange lubrication**

lubrication of the active interface by applying a lubricant to the wheel flange

#### 3.8

##### **rail lubrication**

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

#### 3.9

##### **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.

#### 3.10

##### **lubrication system**

components required to apply lubricant to the active interface

**EN 16028:2012 (E)**

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

**3.11****trainborne**

type of lubrication system installed on a train

**3.12****trackside**

type of lubrication system installed on or adjacent to the track

**3.13****customer**

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

**3.14****supplier**

supplier of lubricants

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

**3.15****product specification**

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

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**4 Legislative compliance**

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.

The lubricant should be non hazardous and/or non-toxic and should not contain, for example, solvents, lead or any other noxious material.

The product should preferably be bio-degradable, as defined in Tables A.1 to A.3.

**5 Approval procedure****5.1 General**

The approval process is undertaken in four stages.

Approval given by another customer may be applied during any or all of this approval process.

If after any stage the requirements are not met, a decision shall be made to decide whether or not to cease with the approval process.

**5.2 Stage 1 – Product specification**

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

- a) relevant application data, including equipment types, operating temperatures, route information etc.;

NOTE The typical operating temperature range to take into account is from -25 °C to +80 °C.

- b) type tests for approval of the lubricant (see Clause 6 and Tables A.1 to A.3);
- c) additional validation tests (see Table A.4);
- d) conditions for delivery, packaging and marking (see Clause 9);
- e) routine tests for production batches (see Clause 8 and Tables A.1 to A.4) and their frequency.

Additional requirements may be included such as access to test records, retention of samples, witnessing of tests etc.

### 5.3 Stage 2 – Presentation of technical data 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 presented.

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

Refer to European Directive EC1907/2006 (REACH).

### 5.4 Stage 3 – Validation tests

If required by the product specification, the functional characteristics of the lubricant shall be verified by type tests and inspections, usually in a laboratory situation. The results shall be recorded.

If required by the product specification, specific in-service or field trials shall be carried out to verify that the lubricant complies with the requirements in the product specification. The results shall be recorded.

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For specific tests the lubricant is tested on a specified piece of equipment, usually in the laboratory.

Where in-service or field trials are carried out they should be over a time period that will determine the lubricant's performance in as close to normal service conditions as possible. This should also be over at least a hot and cold season and for a typical range of weather.

### 5.5 Stage 4 – Decision

The approval of the product can be granted by the customer only if all the stages of the procedure and the following are satisfied:

- technical documents have been approved;
- characteristics conform with the requirements laid down in this European Standard and in the product specification;
- functional and in-service trials have been satisfactory.

## 6 Control and monitoring of product

### 6.1 Manufacturing process

The manufacturing process of the standard production of the lubricant shall be the same as that applied for the product submitted for approval. If the manufacturing process 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.

**EN 16028:2012 (E)****6.2 Type tests**

The purpose of these tests is to check the parameters and to determine if the lubricant meets them for the purpose of approval testing.

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

Lubricants shall be submitted to the required type tests shown in the 'Type' column in Tables A.1, A.2 and A.3 and, if applicable, to the optional ones as defined in the product specification. The results of the type tests shall be recorded.

**6.3 Routine tests**

The purpose of these tests is to verify consistent characteristics from batch to batch to assure continued conformity with the approved type test sample. The tests are made on samples taken from mass produced batches.

Lubricants shall be submitted to the required routine tests shown in the 'Routine' column in Tables A.1, A.2 and A.3 and, if applicable, to the optional ones as defined in the product specification. The results of the routine tests shall be recorded.

**7 Technical datasheet****7.1 General**

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

**7.2 Grease type lubricant characteristics**

The product shall be described by its consistency, its temperature range, the type of thickener and type of base oil used. Where solid lubricants are used, the type and content shall be reported. Further technical data shall be provided as listed under the 'datasheet' column in Table A.1.

**7.3 Oil type lubricant characteristics**

The product shall be described by its viscosity, its temperature range and by the type of oil used. Where solid lubricants are used the type and content shall be reported. Further technical data shall be provided as listed under the 'datasheet' column in Table A.2.

**7.4 Solid type lubricant characteristics**

The product shall be described by its melting point, hardness, dimensions and its temperature range. Further technical data shall be provided as listed under the 'datasheet' column in Table A.3.

The product shall be designed to minimize stick debris on the ballast.

It is suggested that the mass of any piece of debris should be no greater than 5 g.

**8 Tests****8.1 Explanation of Annex A: Tables A.1 to A.4**

For each required property of the lubricants, Tables A.1, A.2 and A.3 list the mandatory and optional tests for grease, oil and sticks respectively, and parameters for trainborne and trackside applications.

The optional tests required by the customer shall be listed in the product specification. Although used, oil based lubricants have not been included for trackside applications as the usage is low.

Table A.4 lists additional tests to check that the lubricant will operate correctly in typical equipment or specific lubrication systems used in service.

## 8.2 Key to Annex A table columns 'Type', 'Routine' and 'Datasheet'

The key to the columns 'Type', 'Routine' and 'Datasheet' in Tables A.1 to A.4 is as follows:

'Type' = This indicates the type tests required for the purpose of approval testing (see 5.4 and 6.2).

'Routine' = This indicates the routine tests required for testing from approved mass produced batches (see 6.3).

'Datasheet' = This indicates the characteristics to be listed in the product documentation.

In each column, a symbol is used to indicate the required test or information:

■ indicates a mandatory test or piece of information is required;

□ indicates an optional test or piece of information is required;

where it is blank there is no requirement.

## 8.3 Key to Annex A table column 'Use'

Tables A.1 to A.4 include a column headed 'Use' and the letters used mean the following:

- A – Trainborne
- B – Trackside
- C – Trainborne using a solid lubricant

This column identifies the most common systems in current use. Most trainborne equipment sprays the lubricant in the form of a free-flowing grease or thin oil and most trackside equipment pumps it in the form of a thicker grease. However, where alternatives exist, careful consideration to the tests required is needed.

## 9 Packaging, labelling and storage

The packaging shall protect the contents from contamination and damage.

The labelling shall include at least the following:

- supplier's name;
- brand name and/or code of the lubricant;
- batch number and date of manufacture, uncoded or coded;
- net mass/quantity/volume;

NOTE Local regulatory requirements might also apply.