SLOVENSKI STANDARD
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Železniške naprave - Trenje na stiku kolo-tirnica - 2-1. del: Lastnosti in značilnosti - Maziva za prirobnice

Railway applications - Wheel/Rail friction management - Part 2-1: Properties and Characteristics - Flange lubricants

Bahnanwendungen - Reibungsmanagement zwischen Rad und Schiene - Teil 2-1 : Eigenschaften und Merkmale - Spurkranzschmierstoffe

Applications ferroviaires - Gestion des frottements roue/rail - Partie 2-1: Propriétés et caractéristiques - Lubrification des boudins de roues

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

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European foreword

This document (prEN 15427-2-1:2020) has been prepared by Technical Committee CEN/TC 256 “Railway Applciations”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16028:2012.

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 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;

— meets relevant environmental requirements;

— no incompatibility between the different 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 the lubricant is to reduce friction and wear and reduce the risk of flange climb derailment.

1 Scope

This document specifies the requirements of lubricants intended for lubrication of the wheel-rail interface between the wheel and the rail (active interface) applied either directly or indirectly to the wheel or to the rail.

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

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

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

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

EN ISO 20623, *Petroleum and related products - Determination of the extreme-pressure and anti-wear properties of lubricants - 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 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 13737, *Petroleum products and lubricants — Determination of low-temperature cone penetration of lubricating greases*

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

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

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

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

3 Terms and definitions

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 http://www.electropedia.org/

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 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 lubricant from the same manufacturing process

3.6
active interface
contact area between the wheel flange root and the rail gauge 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

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 equipment
system carried on the train that consists of one or more applicators, a storage unit and a means of control

3.12
trackside equipment
system installed on or adjacent to the track that consists of one or more applicators, storage containers and a means of control

3.13
operating temperature
temperature range in which the lubricant can be applied effectively

4 Lubricant requirements

The lubricant, when applied within the specified limits, shall not compromise the safety of the railway (i.e braking distances, signalling systems, etc.)

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

5 General requirements

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 include the following information:

a) purpose of lubricant;

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 (see Annex G - K);

   2) operating temperatures;

NOTE 1 The typical operating temperature range to take into account is from −25 °C to +80 °C.

e) additional validation tests (see Table A.4);

f) any previous relevant experience (i.e. use in other countries);

g) conditions for packaging and labelling (see Clause 8);

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 (biodegrability, 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 can affect the chemical composition, the new process 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 lubricant

If the composition of the lubricant 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 lubricant 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 lubricant, a description of the product's field of use and typical means of application. For each lubricant type, the information in the following subclauses 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 particulates 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 particulates 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.

The mass of any piece of debris should be no greater than 5 g.

8 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 will apply.

The following additional information shall be included if specified in the product specification:

— customer stock number;

— an indication that the batch has been accepted by the customer.

The storage conditions and, if necessary, the date limit of use of the lubricant shall be provided.

Annex A
(normative)

Requirements for lubricants and testing

A.1 Explanation of Annex A: Tables A.1 to A.4

The tables have two purposes:

1) Tests to show the product can be used in the railway environment

NOTE Values can vary depending on where the material is used.

2) Product consistency

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 type lubricants have not been included for trackside applications as the usage is low.

Table A.4 lists additional tests to check the performance characteristics of the lubricants and that the lubricant will operate correctly with the equipment it's to be used with.

A.2 Key to Annex A table columns 'Type', 'Routine' and 'Datasheet'

The key to the columns 'Type', 'Routine' and 'Technical 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 6.1 and 6.2).

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

— 'Technical 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:

— '**X**' indicates the test or piece of information is mandatory;

— '**O**' indicates the test or piece of information is optional;

A.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 using oil or grease type lubricants

— B = Trackside using grease type lubricants

— 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.