SLOVENSKI STANDARD
SIST EN 15427:2008

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Železniške naprave - Trenje na stiku kolo-tirnica - Mazanje kolesnega venca

Railway applications - Wheel/rail friction management - Flange lubrication

Bahnanwendung - Behandlung der Reibung zwischen Rad und Schienen - Spurkranzschmierung

Applications ferroviaires - Gestion des frottements roue/rail - Lubrification des boudins de roues

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21.260	Mazalni sistemi	Lubrication systems
45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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Railway applications - Wheel/rail friction management - Flange lubrication

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Foreword

This document (EN 15427:2008) 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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to support Essential Requirements of EU Directive 96/48/EC[1)], as modified by EU Directive 2004/50[2)] of 29 April 2004.

For relationship with EU Directives, see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1) Official Journal of the European Communities No L 235 of 17.09.96.

2) Official Journal of the European Communities No. L 220 of 21.6.04.

Introduction

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

— lubrication of the wheel flange / rail gauge corner 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 document sets out requirements for the lubrication of the wheel flange / rail gauge corner only. It describes systems fitted on board trains and on the track, as both systems may need to be employed to achieve effective lubrication of the wheel-rail interface.

Managing the wheel-rail interface effectively will reduce wear of both wheel and rail. When friction is managed effectively, noise levels, energy consumption and the risk of flange climbing are reduced. Conversely where not managed effectively, assets may require replacement prematurely before reaching their full economic potential.

There needs to be control in the application of lubrication such that there is no:

— loss of traction or braking performance;

— adverse effect on signalling systems or track circuits;

— intolerable increased risk of fire;

— harmful environmental effect;

— incompatibility between the different lubricants in use, particularly, between solid and fluid systems.

1 Scope

This document is limited to specifying the requirements when applying lubricants to the wheel-rail interface between the wheel flange and the rail gauge corner (active interface) either directly or indirectly to the wheel flange or to the rail, and includes both trainborne and trackside solutions.

This document defines:

— the characteristics that systems of lubrication of the wheel-rail interface shall achieve, together with applicable inspection and test methods to be carried out for verification;

— all relevant terminology which is specific to the lubrication of the wheel-rail interface.

2 Normative references

The following referenced documents are indispensable for the application 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 13749, *Railway applications — Wheelsets and bogies — Method of specifying the structural requirements of bogie frames*

EN 50121-1, *Railway applications — Electromagnetic compatibility — Part 1: General*

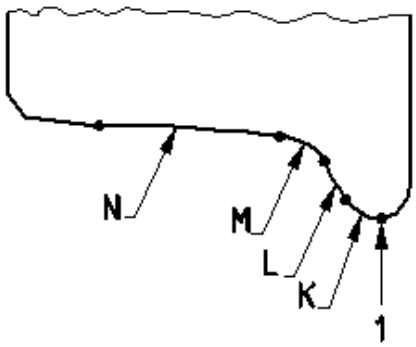
EN 50125-1, *Railway applications — Environmental conditions for equipment — Part 1: Equipment on board rolling stock*

EN 61373, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373:1999)*

3 Terms and definitions

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

Figures 1 and 2 show the areas on the wheel and rail that are referred to in this standard.

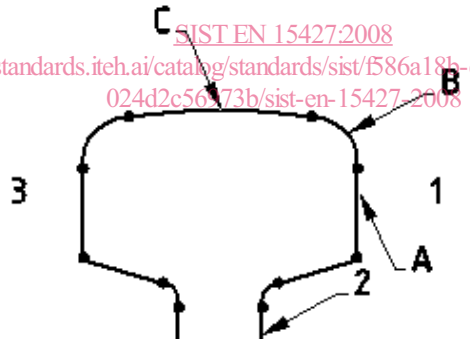


Key

1	flange tip	Flange
K	flange toe	
L	flange face	
M	flange root/fillet	
N	tread/running surface	

NOTE This terminology is specific to this document.

Figure 1 — Areas of a wheel tread



Key

A	gauge side face
B	gauge side corner
C	rail head
1	inside of rail
2	web
3	outside of rail

Figure 2 — Areas of a rail

3.1
active interface
contact area between wheel flange root and rail gauge side corner

NOTE Contact also occurs between the wheel tread and the rail head but this interface is not within the scope of this document.

3.2
lubricant
oil, grease, solid stick or other substance that lowers the friction level

3.3
flange lubrication
lubrication of the active interface by applying a lubricant to the wheel flange

3.4
rail lubrication
lubrication of the active interface by applying a lubricant to the rail gauge side face

3.5
lubricant application unit (LAU)
component of the lubrication system (trainborne or trackside) that delivers the lubricant to the active interface

NOTE This includes stick applicators, spray nozzles, trackside GDUs/blades, etc. See Annex A for more systems.

3.6
lubrication system
components required to apply lubricant to the active interface that may include one or more Lubricant Application Units, a reservoir unit, pump and/or a control device

3.7
trainborne equipment
lubrication system installed on the train

3.8
trackside equipment
lubrication system installed on or adjacent to the track

4 Requirements for trainborne equipment

4.1 General

4.1.1 The trainborne equipment shall apply lubricant to take effect in the active interface as described in 4.5. It is generally used to apply lubricant to the wheel. The most effective use of lubricant is achieved by installation of lubricating equipment on wheelsets close to the leading end of a train. This ensures that all the subsequent active interfaces between train wheels and rails are lubricated. The optimum position for this equipment is on the leading wheelset, but space limitations may preclude this. The area of implementation and the lubrication system shall be defined and agreed by the customer.

NOTE If required, further wheelsets may be equipped with trainborne equipment.

4.1.2 The trainborne equipment shall be designed to optimize lubrication of the active interface and limit contamination of any other part of the train or infrastructure. Build up of excess lubricant on the train should be avoided to reduce the risk of fire.

4.1.3 Solid lubricants that are used in the form of, for example stick application on to the flange, may eject part of the stick as debris. The size of any piece of debris should be kept to a minimum.

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

4.2 Selection of trainborne equipment

4.2.1 In selecting the trainborne equipment, the following shall be taken into account as a minimum:

— ambient temperature range and climatic conditions (see EN 50125-1);

— equipment positioning;

— space constraints;

— availability of pneumatic and electrical supplies;

— speed;

— options for system control and lubricant regulation;

— interface with other on-board systems;

— the type of lubricant;

— compatibility between different lubricants used by the Railway Undertaking;

— total life cycle cost and maintainability.

4.2.2 A technical file shall be compiled setting out verification criteria and compliance.

4.2.3 A description of types of Lubricant Application Unit currently available is given in Annex A. A list of reasons for fitting trainborne equipment is given in C.1.

4.3 Design of trainborne equipment

4.3.1 The position and alignment of each Lubricant Application Unit shall take into account suspension movements to ensure application of lubricant to the active interface (see 4.5), at all conditions within the train's operational limits, and the need to gain access for maintenance. See C.2 for some positioning and alignment information.

4.3.2 The trainborne equipment shall be designed to meet the vibration and shock loads requirements of EN 61373 and EN 13749 relevant to the position on the vehicle.

4.3.3 The design shall:

— incorporate a stated fatigue load case appropriate for the intended service life of the equipment;

— provide protection to the equipment from flying objects e.g. track ballast and snow and ice;

— ensure the security of fixing against vibration.

NOTE Account should be taken of the effects of turbulence of surrounding airflow at service speeds on the performance of the application system.

4.3.4 The Lubricant Application Unit shall be adjustable such that it can be returned to its correct working position (see 4.5) following wheel reprofiling or other maintenance changes.

4.3.5 The capacity of the system shall take into account the intervals between maintenance opportunities. Consideration may be given to providing a means to determine when refilling is required.

4.4 Control system

4.4.1 The control system chosen shall ensure that the rate of application of the lubricant is correctly maintained under all conditions during service.

4.4.2 Any trainborne equipment using a liquid spray Lubricant Application Unit shall have a low speed cut out. The speed at which the cut-out takes place shall be agreed between the relevant parties.

4.4.3 The control system should take account of the direction of travel of the train, where applicable.

4.5 Application

When applying to the wheel, lubricant shall be applied in areas “L” and/or “M” of the wheel (as shown in Figure 1), or when applying to the rail, lubricant shall be applied in areas “A” and/or “B” of the rail (as shown in Figure 2) as defined by the Railway Undertaking according to service experience.

4.6 Verification

The application of lubricant to the active interface shall be verified by the following means in Table 1.

Table 1 - Verification

Requirement	**Check**	**When carried out**
System fitted to train	Yes/no	Documentation check
Near front of train	Yes/no	Documentation check
Design check – Lubricant Application Unit shown applying lubricant to active interface	Yes/no	Documentation check
Physical check – Lubricant Application Unit applies lubricant to active interface	Yes/no	By static test and inspection
Check of control equipment as required: — distance; — time; — angle; — cant; — curve.	To operate in accordance with customer requirement.	During train testing

This does not exclude other requirements referenced in Clause 4, or specified by the customer.

As the effectiveness of the system cannot be verified immediately, 4.7 is to be used to optimize the effectiveness of the system.

4.7 Operation, inspection and maintenance

4.7.1 Adjustments may need to be made to the trainborne system to establish the most effective application of the lubricant. The testing method chosen will depend on the type of lubrication system and will be relevant to the application. The method of testing shall be agreed between the relevant parties.

NOTE Annex B sets out typical methods for making these adjustments.

4.7.2 When checking for the effective performance of trainborne equipment, a trace of lubricant shall be evident on the outer rail of curved track after the train has passed. The results of the tests shall be validated by assessment of the application of the lubricant on to the active interface of both the wheel and the rail.

NOTE On straight track, generally the wheel flange root does not touch the rail, so it is not expected that a trace should be seen in this circumstance.

4.7.3 After the passage of the train over a section of track, traces of lubricant shall be verified as described below:

i) As set out in 4.5 and in Figure 1, lubricant shall be evident in areas “L” and “M” and shall be permitted in area “K”. Traces of migrated lubricant are permissible into area “N”, close to the border with “M” with the agreement of the relevant parties.

ii) As set out in 4.5 and Figure 2, lubricant shall be evident in area “B” and shall be permitted in area “A”. Traces of migrated lubricant are permissible into area “C” close to the border with “B” with the agreement of the relevant parties.

4.7.4 The lubrication system shall be adjusted in accordance with the manufacturer’s instructions to ensure that the performance is optimized to deliver the requirements set out above.

4.7.5 The supplier of the trainborne equipment shall provide maintenance instructions for the equipment. These shall include a method for fault diagnosis to check that the trainborne equipment is not partially or fully blocked or misaligned, see C.3.

4.7.6 The railway undertaking shall have a maintenance plan for the lubrication system. These documents shall regulate the in-service performance of the lubrication system and shall ensure that all components are securely attached to their mountings.

4.7.7 This maintenance plan should include monitoring of lubricant usage as a method of checking effective delivery. The maintenance plan shall be reviewed and amended according to service experience.

4.7.8 After wheelset change or reprofiling, or other adjustments to the trainborne equipment, the Lubricant Application Unit shall be checked to ensure correct alignment (see 4.5 and 4.7.3) in accordance with the supplier’s instructions.

5 Requirements for trackside equipment

5.1 General

5.1.1 The trackside equipment shall apply lubricant to take effect in the active interface as described in 5.5. The trackside equipment shall ensure that all active interfaces between the train wheels and rails are lubricated throughout the intended length of the rail to be lubricated.

5.1.2 The trackside equipment shall be designed, installed and maintained to optimize lubrication of the active interface and limit contamination of any other part of the train or infrastructure. Build up of excess lubricant on the Lubricant Application Unit, trackbed or trains shall be avoided to reduce the risk of fire. It may also lead to problems with maintenance.