EESTI STANDARD

EVS-EN 14067-3:2003

Railway applications - Aerodynamics - Part 3: Aerodynamics in tunnels

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EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA	NATIONAL FOREWORD
Käesolev Eesti standard EVS-EN 14067-3:2003 sisaldab Euroopa standardi EN 14067-3:2003 ingliskeelset teksti. Käesolev dokument on jõustatud 16.05.2003 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 14067-3:2003 consists of the English text of the European standard EN 14067-3:2003. This document is endorsed on 16.05.2003 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This European Standard describes physical phenomena of railway-specific aerodynamics and gives recommendations for the documentation of tests	**Scope:** This European Standard describes physical phenomena of railway-specific aerodynamics and gives recommendations for the documentation of tests

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Railway applications - Aerodynamics - Part 3: Aerodynamics in tunnels

Applications ferroviaires - Aérodynamique - Partie 3: Aérodynamique en tunnel

Bahnanwendungen - Aerodynamik - Teil 3: Aerodynamik im Tunnel

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

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Foreword

This document EN 14067-3:2003 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

This European Standard is part of the series ”Railway applications — Aerodynamics” which consists of the following parts:

— Part 1: Symbols and units

— Part 2: Aerodynamics on open track

— Part 3: Aerodynamics in tunnels

— Part 4: Requirements and test procedures for aerodynamics on open track[1)]

— Part 5: Requirements and test procedures for aerodynamics in tunnels[1)]

This document includes a Bibliography.

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

1) in preparation

1 Scope

This European Standard describes physical phenomena of railway-specific aerodynamics and gives recommendations for the documentation of tests.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 14067-1, *Railway applications — Aerodynamics — Part 1: Symbols and units.*

3 Aerodynamic resistance

The symbols used in the present standard are explained in EN 14067-1.

3.1 General

As the drag may be drastically increased in a tunnel, it is also important to deal here with this additional source of resistance.

3.2 Resistance to motion formula

In a tunnel, the same resistance to motion formula as in the open air can be used under otherwise identical conditions (straight and level track, constant speed), the only modification is the introduction of a tunnel factor $\boldsymbol{T}_\mathrm{f}$ in the third term:

$$\boldsymbol{R} = \boldsymbol{C}_1 + \boldsymbol{C}_2 \boldsymbol{v}_{\mathbf{tr}} + \boldsymbol{T}_{\mathbf{f}} \boldsymbol{C}_3 \boldsymbol{v}_{\mathbf{tr}}^2 \quad (1)$$

$\boldsymbol{T}_\mathrm{f}$ is the ratio (≥ 1) of the tunnel drag by the open air drag. It varies during the train passage through the tunnel.

The increase of drag in a tunnel expressed by $\boldsymbol{T}_\mathrm{f}$ depends on many factors, the blockage ratio $\boldsymbol{B}$ of the train in the tunnel is by far the most important of them. But the type of the train and its length also have to be considered, as well as, at least for short tunnels (< 2000 m), the tunnel length and the train speed.

Examples of the variation of $\boldsymbol{T}_\mathrm{f}$ averaged over the whole passage through the tunnel, with the blockage ratio $\boldsymbol{B}$, the train length $\boldsymbol{L}_\mathrm{tr}$, the tunnel length $\boldsymbol{L}_\mathrm{tu}$, the train speed $\boldsymbol{v}_\mathrm{tr}$ and the type of train are given in Figures 1 and 2. A method to calculate the averaged tunnel factor $\boldsymbol{T}_\mathrm{f}$ is given in prEN (wi00256128).