



SLOVENSKI STANDARD

SIST EN 14067-1:2004

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Železniške naprave – Aerodinamika – 1. del: Oznake in enote

Railway applications - Aerodynamics - Part 1: Symbols and units

Bahnanwendungen - Aerodynamik - Teil 1: Formelzeichen und Einheiten

Applications ferroviaires - Aérodynamique - Partie 1: Symboles et unités

Ta slovenski standard je istoveten z: EN 14067-1:2003

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ICS:

01.075	Simboli za znake	Character symbols
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14067-1

April 2003

ICS 01.075; 45.060.01

English version

Railway applications - Aerodynamics - Part 1: Symbols and units

Applications ferroviaires - Aérodynamique - Partie 1:
Symboles et unités

Bahnwendungen - Aerodynamik - Teil 1: Formelzeichen
und Einheiten

This European Standard was approved by CEN on 2 January 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

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Contents

Foreword.....	3
1 Scope	3
2 Terms, definitions, symbols and abbreviations	4

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Foreword

This document EN 14067-1:2003 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 track¹⁾
- Part 5: Requirements and test procedures for aerodynamics in tunnels¹⁾

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 Scope

This European Standard applies to aerodynamics for railway applications.

It defines symbols and units used in formulae and calculations in the field of aerodynamics. The definitions given in this European Standard explain the symbols and classify the units.

Further to usual symbols, this document contains symbols which are used for calculations. It should be noted, however, that these symbols may not have the same significance in a different field of application.

Additional symbols should be defined according to the application.

1) in preparation

EN 14067-1:2003 (E)

2 Terms, definitions, symbols and abbreviations

All parameters are expressed as SI basic units and units derived from SI basic units.

Table/ Tableau/ Tabelle 1

Symbol Symboles Symbol	Unit Unité Einheit	Significance Signification Bedeutung	Explanation Explication Erläuterung	Remark Remarque Bemerkung
A	m^2	surface area section transversale Oberfläche		
a	m/s^2	acceleration accélération Beschleunigung		
B	-	train/tunnel blockage ratio rapport de blocage Versperrungsmaß		$B = \frac{S_{tr}}{S_{tu}}$
b	m	width of vehicle largeur du véhicule Fahrzeugbreite		
c	m/s	speed of sound vitesse du son Schallgeschwindigkeit		
C_1	N	rolling resistance in the resistance to motion formula résistance au roulement (dans la formule de résistance à l'avancement) Rollwiderstand in der Laufwiderstandsformel		
$C_{2V_{tr}}$	N	momentum resistance in the resistance to motion formula résistance due aux systèmes de ventilation (dans la formule de résistance à l'avancement) Impuls widerstand in der Laufwiderstandsformel		$C_2 = Q\rho,$
$C_{3V_{tr}^2}$	N	aerodynamic drag in the resistance to motion formula traînée aérodynamique (dans la formule de résistance à l'avancement) Aerodynamischer Widerstand in der Laufwiderstandsformel		
C_B	-	gust coefficient coefficient de rafale Böenkoeffizient		$C_B = \frac{v_B}{v_W}$
C_F	-	coefficient of aerodynamic force coefficient de la force aérodynamique Koeffizient der Luftkraft		$C_F = \frac{2F}{S\rho v_{tr}^2}$
C_f	-	coefficient of skin-friction drag coefficient de frottement aérodynamique Koeffizient des Luftreibungswiderstandes		$C_f = \frac{R_f}{qA}$
C_p	-	coefficient of pressure amplitude coefficient de l'amplitude de pression Koeffizient der Druckamplitude		$C_p = \frac{p - p_o}{q}$
ΔC_p	-	pressure coefficient coefficient de pression Druckkoeffizient		$\Delta C_p = \frac{2(p_{max} - p_{min})}{\rho v_{tr}^2}$

Table/ Tableau/ Tabelle 1 (continued/ suite/ fortgesetzt)

Symbol Symboles Symbol	Unit Unité Einheit	Significance Signification Bedeutung	Explanation Explication Erläuterung	Remark Remarque Bemerkung
C_{F_x} C_{F_y} C_{F_z}	-	coefficients of aerodynamic forces F_x, F_y, F_z coefficients de force aérodynamique F_x, F_y, F_z Koeffizienten der Luftkräfte F_x, F_y, F_z		$C_{F_x} = \frac{F_x}{q S}; C_{F_y} = \frac{F_y}{q S}; C_{F_z} = \frac{F_z}{q S}$
C_{M_x} C_{M_y} C_{M_z}	-	coefficients of the moments M_x, M_y, M_z coefficients de moment M_x, M_y, M_z Koeffizienten der Momente M_x, M_y, M_z		$C_{M_x} = \frac{M_x}{q S D_h}; C_{M_y} = \frac{M_y}{q S D_h}$ $C_{M_z} = \frac{M_z}{q S D_h}$
C_x	-	coefficient of the aerodynamic drag for the whole train coefficient de traînée aérodynamique pour le train entier Koeffizient des aerodynamischen Widerstands für den gesamten Zug		
C_{x1}	-	coefficient of the aerodynamic drag of the leading vehicle coefficient de traînée aérodynamique du véhicule de tête Koeffizient des aerodynamischen Widerstands des führenden Fahrzeugs		
C_{x2}	-	coefficient of the aerodynamic drag of the train without leading vehicle and tail coefficient de traînée aérodynamique de la partie du train hors véhicules de tête et de queue Koeffizient des aerodynamischen Widerstands des Zuges ohne führendes Fahrzeug und ohne Heck		
C_{x3}	-	coefficient of the aerodynamic drag of the tail vehicle coefficient de traînée aérodynamique du véhicule de queue Koeffizient des aerodynamischen Widerstands des Endfahrzeugs		
c_p	-	specific heat at constant pressure chaleur spécifique à pression constante Spezifische Wärme bei konstantem Druck		
c_v	-	specific heat at constant volume chaleur spécifique à volume constant Spezifische Wärme bei konstantem Volumen		
D	m	diameter diamètre Durchmesser		$D = 2r$
D_h	m	hydraulic diameter (European definition) diamètre hydraulique (définition européenne) hydraulischer Durchmesser (europäische Definition)		$D_h = \frac{4S}{Pe}$
d	m	characteristic dimension longueur caractéristique charakteristische Länge		
F	N	aerodynamic force force aérodynamique Luftkraft		

EN 14067-1:2003 (E)

Table/ Tableau/ Tabelle 1 (continued/ suite/ fortgesetzt)

Symbol Symboles Symbol	Unit Unité Einheit	Significance Signification Bedeutung	Explanation Explication Erläuterung	Remark Remarque Bemerkung
F_x F_y F_z	N	aerodynamic forces in the directions of coordinates composantes de la force aérodynamique dans le repère cartésien Luftkräfte in Richtung der Koordinatenachsen	Figure/ Figure/ Bild 1	
f	Hz	frequency fréquence Frequenz		
g	m/s ²	acceleration due to gravity accélération due à la gravité Erdbeschleunigung		
h	m	height hauteur Höhe		
i	‰	gradient of track gradient de la voie (pente, rampe) Steigung, Neigung der Strecke		
k	-	pressure loss coefficient coefficient de perte de charge Druckverlustkoeffizient		
K_s	m	equivalent sand roughness rugosité équivalente du sable Äquivalente Sandrauigkeit		
L_{loco}	m	length of the locomotive longueur de la locomotive Länge der Lokomotive		
L_p	dB	sound pressure level niveau de pression acoustique Schalldruckpegel		
L_n	m	length of the non-cylindrical part of the leading car, (nose length) longueur de la partie à section non constante du véhicule de tête, (longueur de la tête) Länge des nicht-zylindrischen Teils des führenden Fahrzeugs, (Kopflänge)		
L_{tr}	m	length of train longueur du train Zuglänge		
L_{tu}	m	length of tunnel longueur du tunnel Tunnellänge		
Ma	-	Mach number nombre de Mach Machzahl		
M_x	Nm	aerodynamic rolling moment moment de roulis aérodynamique Aerodynamisches Rollmoment	Figure/ Figure/ Bild 1	
M_y	Nm	aerodynamic pitching moment moment de tangage aérodynamique Aerodynamisches Nickmoment	Figure/ Figure/ Bild 1	

Table/ Tableau/ Tabelle 1 (continued/ suite/ fortgesetzt)

Symbol Symboles Symbol	Unit Unité Einheit	Significance Signification Bedeutung	Explanation Explication Erläuterung	Remark Remarque Bemerkung
M_z	Nm	aerodynamic yawing moment moment de lacet aerodynamisches Giermoment	Figure/ Figure/ Bild 1	
m	kg	mass masse Masse		
N	-	number of trailer cars nombre de véhicules Anzahl der Fahrzeuge		
P	W	power puissance Leistung		
Pe	m	perimeter périmètre Umfang		
p	Pa	pressure pression Druck		
p_o	Pa	reference static pressure pression statique de référence statischer Bezugsdruck		
p_{max}	Pa	maximum pressure pression maximale Höchstdruck		
p_{min}	Pa	minimum pressure pression minimale Mindestdruck		
p_t	Pa	total pressure pression totale Gesamtdruck		
Q	m ³ /s	volume flow rate débit volumétrique Volumenstrom		
Q_m	kg/s	mass flow rate débit massique Durchflußmenge		
q	Pa	dynamic pressure pression dynamique Staudruck (dynamischer Druck)		$q = \frac{\rho U^2}{2}$
R	N	running resistance résistance à l'avancement Laufwiderstand		
R_a	N	aerodynamic drag traînée aérodynamique aerodynamischer Widerstand (Luftwiderstand)		$R_a = -F_x$
Re	-	Reynolds number nombre de Reynolds Reynoldszahl		$Re = \frac{U d}{\nu}$