SLOVENSKI STANDARD
SIST EN 13913:2004

01-junij-2004

Železniške naprave - Vzmetni elementi iz elastomerov – Mehanski deli iz elastomerov

Railway applications - Rubber suspension components - Elastomer-based mechanical parts

Bahnanwendungen - Elastomer-Federungselemente - Mechanische Bauteile auf Elastomerbasis

Applications ferroviaires - Pieces de suspension a base d'élastomere - Pieces mécaniques a base d'élastomere

Ta slovenski standard je istoveten z: **EN 13913:2003**

ICS:

45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

SIST EN 13913:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13913

April 2003

ICS 45.040

English version

Railway applications - Rubber suspension components - Elastomer-based mechanical parts

Applications ferroviaires - Pièces de suspension à base d'élastomère - Pièces mécaniques à base d'élastomère

Bahnanwendungen - Elastomer-Federungselemente - Mechanische Bauteile auf Elastomerbasis

This European Standard was approved by CEN on 18 December 2002.

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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.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13913:2003 E

Contents

Foreword

This document (EN 13913:2003) 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.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 document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

— Council Directive 96/48/EEC of 23 July 1996 on interoperability of the European high-speed train network[1];

— Council Directive 93/38/EEC of 14 June 1993 co-ordinating the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors[2];

— Council Directive 91/440/EEC of 29 July 1991 on the development of the community's railways[3].

The annexes A, B, C, D and E are informative.

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] Official Journal of the European Communities N° L 235 of 17.09.96

[2] Official Journal of the European Communities N° L 199 of 09.08.93

[3] Official Journal of the European Communities N° L 237 of 24.08.91

Introduction

Designing an elastomer-based mechanical part requires knowledge of the mechanical system of which it forms part. Specific characteristics are therefore needed for each case, which only the customer can specify.

This European Standard is the result of the studies and research to improve the performances and quality of elastomer-based mechanical parts in order to meet the requirements of railway rolling stock.

This European Standard is designed for the railway operators, the manufacturers and equipment suppliers of the railway industry as well as for the suppliers of elastomer-based mechanical parts.

1 Scope

This European Standard defines:

— characteristics that elastomer-based mechanical parts shall achieve, together with applicable inspection and test methods to be carried out for verification;

— approval procedure to be implemented by the customer;

— guidelines for qualification of the product with specified requirements;

— quality monitoring of elastomer-based mechanical parts in manufacture.

This European Standard applies to elastomer-based mechanical parts designed to be fitted on railway vehicles and similar vehicles running on dedicated tracks with permanent guide systems, whatever the type of rail and the running surface.

Typical applications of elastomer-based mechanical parts include:

— vehicle suspension systems;

— equipment mounting systems;

— joints (e.g.: end-mountings of dampers, elastomer-based bearings, elastomer-based parts used on mechanical couplings);

— limit stops.

These parts can be:

— made entirely of elastomer, operating on their own or in combination with other elastic parts;

— made up of elastomer and other materials, adherent together or not.

This European Standard does not apply to:

— rubber diaphragms for pneumatic suspension springs;

— elastic parts of buffing and drawgear springs;

— diaphragms, bellows and seals;

— hoses and tubings;

— transmission belts.

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).

ISO 31-1, *Quantities and units – Part 1: Space and time.*

ISO 31-3, *Quantities and units – Part 3: Mechanics.*

ISO 188, *Rubber, vulcanized or thermoplastic – Accelerated ageing and heat-resistance tests.*

ISO 471, *Rubber – Temperatures, humidities and times for conditioning and testing.*

ISO 1382, *Rubber – Vocabulary.*

ISO 1817, *Rubber, vulcanised – Determination of the effect of liquids.*

ISO 2781, *Rubber, vulcanised – Determination of density.*

ISO 4649, *Rubber, vulcanized or thermoplastic – Determination of abrasion resistance using a rotating cylindrical drum device.*

ISO 9227, *Corrosion test in artificial atmospheres – Salt spray tests.*

ISO 10209-1, *Technical product documentation – Vocabulary – Part 1: Terms relating to technical drawings: general and types of drawings.*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this European Standard, the following terms and definitions and those given in ISO 1382 apply.

3.1.1
component
elastomer-based mechanical part

NOTE Clause 1 describes them.

3.1.2
static creep
displacement increase, occurring after a specified period of time, of a component subjected to a constant static force

3.1.3
dynamic creep
displacement increase, occurring after a specified period of time, of a component subjected to a dynamic force oscillating about a constant static force

3.1.4
static relaxation
force decrease, occurring after a specified period of time, of a component subjected to a constant displacement

3.1.5
dynamic relaxation
force decrease, occurring after a specified period of time, of a component submitted to a dynamic displacement oscillating about a constant static displacement

3.1.6
phase angle
difference in phase between the transmitted force and the deformation at a specific sinusoidal amplitude and frequency

3.2 Symbols and abbreviations

The majority of the symbols, used in this standard and defined in this sub-clause, are in accordance with ISO 31-1 and ISO 31-3.

Decimal multiples and submultiples of units defined below can be used.

Table 1 — Symbols and abbreviations

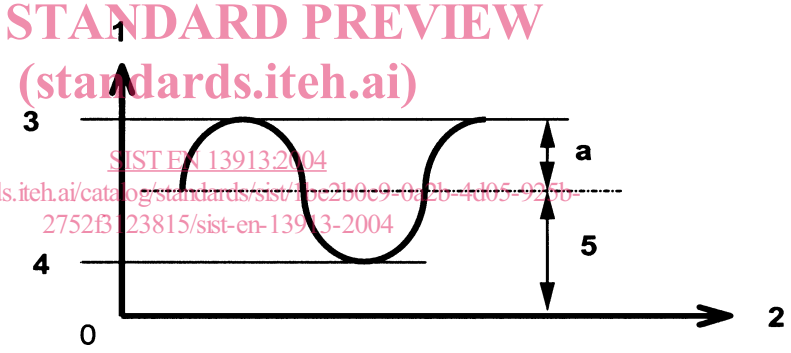
Symbol Abbreviation	Unit	Explanation
a	m or rad	Amplitude of the movement  **Key** 1 Displacement (***d*** or Θ) 2 Time (***t***) 3 d_{max} (or Θ_{max}) 4 d_{min} (or Θ_{min}) 5 d_P or Θ_P **Figure 1 — Amplitude of the movement**

Table 1 *(continued)*

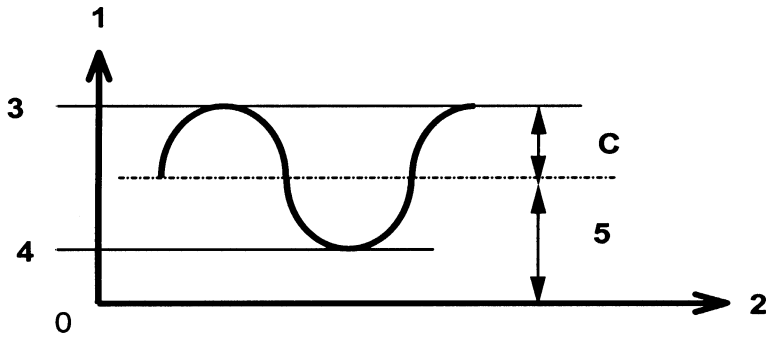
Symbol Abbreviation	Unit	Explanation
C	N or Nm	Amplitude of the force (or the moment)  **Key** 1 Force (***F***) or moment (***M***) 2 Time (***t***) 3 F_{max} (or M_{max}) 4 F_{min} (or M_{min}) 5 F_P (or M_P) **Figure 2 — Amplitude of the force (or the moment)**
d	m	Linear displacement, with: d_J : displacement (d_1; d_2; etc.) corresponding to a force F_J with $d_0<d_J<d_M$; d_0 : lower data limit for the definition of the stiffness characteristics; d_M : upper data limit for the definition of the stiffness characteristics; d_{min} : minimum displacement on a sinusoidal motion (see Figure 1); d_{max} : maximum displacement on a sinusoidal motion (see Figure 1); d_P : mean displacement (see Figure 1).
F	N	Static force, with: F_J : force (F_1; F_2; etc.) corresponding to a displacement d_J with $F_0<F_J<F_M$; F_0 : lower data limit for the definition of the stiffness characteristics; F_M : upper data limit for the definition of the stiffness characteristics; F_{min} : minimum force on a sinusoidal motion (see Figure 2); F_{max} : maximum force on a sinusoidal motion (see Figure 2); F_P : mean force (see Figure 2); F_C : reference force taken into account for the creep test (static and dynamic); F_L : reference force taken into account for the definition of the dimensions of the component under load.
f	Hz	Frequency.
kdyn	N/m	Stiffness under sinusoidal motion. Characteristic of the component measured along an axis, under a sinusoidal motion.

Table 1 *(continued)*

Symbol Abbreviation	Unit	Explanation
ks	N/m	Characteristic ″force as a function of linear displacement″ at constant velocity. Characteristic of the component measured along an axis, at constant velocity.
kΘdyn	Nm/rad	Rotational stiffness under sinusoidal motion. Characteristic of the component measured around an axis, under a sinusoidal motion.
kΘs	Nm/rad	Characteristic ″moment as a function of rotational displacement″ at constant velocity. Characteristic of the component measured around an axis, at constant velocity.
L	m	Dimension of the component, with: L_J : dimension (L_1; L_2; etc.) under a static force F_J ; L_0 : dimension at F_0 (or M_0); L_D : reference dimension taken into account for the definition of the force given by the component under deformation ; L_M : dimension at F_M (or M_M); L_R : reference dimension taken into account for the relaxation test (static and dynamic).
M	Nm	Moment applied around an axis of the component, with: M_J : moment (M_1; M_2; etc.) corresponding to an angle of displacement Θ_J with $M_0<M_J<M_M$; M_0 : lower limit value for the definition of the stiffness characteristics; M_M : upper limit value for the definition of the stiffness characteristics; M_{min} : minimum moment on a sinusoidal motion (see Figure 2); M_{max} : maximum moment on a sinusoidal motion (see Figure 2); M_P : mean moment (see Figure 2).
R_C	m/decade	Creep rate NOTE It is permissible to use % / decade instead of m/decade.
Te	°C	Ambient temperature (temperature of the air surrounding the component) in extreme and exceptional situation, with: Te_{min} : lower temperature; Te_{max} : higher temperature.
To	°C	Ambient temperature (temperature of the air surrounding the component) for normal vehicle operation, with: To_{min} : lower limit of the range of normal operating temperatures; To_{max} : higher limit of the range of normal operating temperatures.

Table 1 *(concluded)*

Symbol Abbreviation	Unit	Explanation
Θ	rad	Angle of displacement in a plane around an axis of the component, with: Θ_J : angle of displacement (Θ_1; Θ_2; etc.) corresponding to a moment M_J with $\Theta_0<\Theta_J<\Theta_M$; Θ_0 : lower limit value for the definition of the stiffness characteristics; Θ_M : upper limit value for the definition of the stiffness characteristics; Θ_{min} : minimum angle of displacement on a sinusoidal motion (see Figure 1); Θ_{max} : maximum angle of displacement on a sinusoidal motion (see Figure 1); Θ_P : mean angular displacement (see Figure 1); NOTE It is permissible to use angular units of degrees instead of radians.
β		Coefficient for the definition of the dynamic creep and the dynamic relaxation.
δ	rad unit	Phase angle

3.3 Three dimensional definition of characteristics

In the absence of any reference system and specific co-ordinates in the definition documents, the following arrangements shall be made.

Using the **X**-**Y**-**Z** axes to orientate the vehicle in space, a Cartesian reference point $\mathbf{O}_{xyz}$, related to the vehicle and with a supposedly fixed point within the mechanical system to which the component belongs as origin, is established as follows:

— axis $\mathbf{O}_x$ parallel to the longitudinal axis of vehicle **X**;

— axis $\mathbf{O}_y$ parallel to the transverse axis of vehicle **Y**;

— axis $\mathbf{O}_z$ parallel to the vertical axis of vehicle (or normal axis) **Z**.

The displacements corresponding to the degrees of freedom are:

— displacement parallel to axis $\mathbf{O}_x$: d_x

— displacement parallel to axis $\mathbf{O}_y$: d_y

— displacement parallel to axis $\mathbf{O}_z$: d_z

— rotation around axis $\mathbf{O}_x$: Θ_x

— rotation around axis $\mathbf{O}_y$: Θ_y

— rotation around axis $\mathbf{O}_z$: Θ_z

The positive direction of rotation is clockwise looking from the origin.

The mechanical characteristics associated with the displacements are:

— for d_x : stiffnesses ks_x and $kdyn_x$; force F_x

— for d_y : stiffnesses ks_y and $kdyn_y$; force F_y

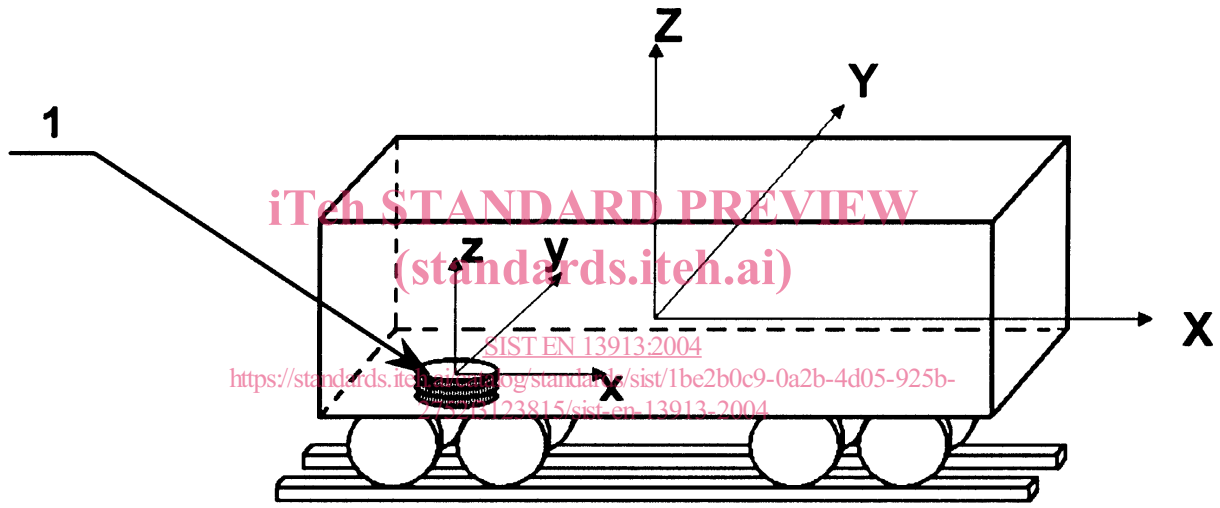
— for d_z : stiffnesses ks_z and $kdyn_z$; force F_z

— for Θ_x : stiffnesses $k\Theta s_x$ and $k\Theta dyn_x$; moment M_x

— for Θ_y : stiffnesses $k\Theta s_y$ and $k\Theta dyn_y$; moment M_y

— for Θ_z : stiffnesses $k\Theta s_z$ and $k\Theta dyn_z$; moment M_z

These provisions are illustrated by Figure 3.



Key

1 Component

Figure 3 — Three dimensional definition of characteristics