SLOVENSKI STANDARD
SIST EN 14200:2004

01-junij-2004

Železniške naprave – Vzmetenje – Parabolične, jeklene vzmeti

Railway applications - Suspension components - Parabolic springs, steel

Bahnanwendungen - Federungselemente - Parabelfedern aus Stahl

Applications ferroviaires - Eléments de suspension - Ressorts paraboliques, en acier

Ta slovenski standard je istoveten z: **EN 14200:2004**

ICS:

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

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Railway applications - Suspension components - Parabolic springs, steel

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Contents

Foreword

This document (EN 14200:2004) 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of an identical text or by endorsement, at the latest by July 2004, and conflicting national standards shall be withdrawn at the latest by July 2004.

The work has been delegated by subcommitee 2 "Wheelsets and bogies" to Working Group 14 "Steel springs".

The annexes A, B, C and D are normative.

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

Introduction

Preparation of this European Standard was started at the beginning of 1998 with the aim of integrating the existing documents such as UIC leaflets (International Union of Railways), and the internal standards of the various railways into a comprehensive standard.

1 Scope

This European Standard applies to parabolic springs as spring elements for rail vehicles.

This European Standard is a guide to the following subjects:

— design;

— specification of technical and qualitative requirements;

— approval procedures and quality assurance of production methods;

— tests and inspections to be carried out;

— delivery conditions.

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 473, *Non-destructive testing – Qualification and certification of NDT personnel – General principles.*

EN 499, *Welding consumables – Covered electrodes for manual metal arc welding of non alloy and fine grain steels – Classification.*

EN 10002-1, *Metallic materials – Tensile testing – Part 1: Method of test at ambient temperature.*

EN 10025, *Hot rolled products of non-alloy structural steels – Part 1: Technical delivery conditions.*

EN 10045-1, *Metallic materials – Charpy impact test – Part 1: Test method.*

EN 10089:2002, *Hot-rolled steels for quenched and tempered springs – Technical delivery conditions.*

EN 10092-1, *Hot-rolled spring steel flat bars – Part 1: Flat bars – Dimensions and tolerances on shape and dimensions.*

EN 10142, *Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming – Technical delivery conditions.*

EN 22768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1:1989).*

EN 25817, *Arc-welded joints in steel – Guidance on quality levels for imperfections (ISO 5817:1992).*

ENV 10247, *Micrographic examination of the nonmetallic inclusion content of steels using standard pictures.*

EN ISO 2162-3, *Technical product documentation – Springs – Part 3: Vocabulary (ISO 2162-3:1993).*

EN ISO 3098-2, *Technical product documentation – Lettering – Part 2: Latin alphabet, numerals and marks (ISO 3098-2:2000).*

EN ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method (ISO 6506-1:1999).*

ISO 1101, *Technical drawings – Geometrical tolerancing – Tolerancing of form, orientation, location and run-out – Generalities, definitions, symbols, indications on drawings.*

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

ISO/TR 10108, *Steel – Conversion of hardness values to tensile strength values.*

EURONORM 103, *Microscopic determination of the ferrite or austenitic grain size of steels.*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 2162-3 together with the following apply.

3.1.1
parabolic springs
term "steel parabolic spring" relates to the finished product. For the sake of simplification, the term "spring" is used in this text regardless of its category for all types of steel parabolic compression springs

NOTE 1 Leaf spring of constant width with leaves of approximately equal length arranged one above the other, the thickness of which decreases from the middle towards the ends.

NOTE 2 In the mainly springy areas between the fixing point (spring buckle) at the centre of the spring and the bearing surfaces of the leaves at the ends, the thickness follows the function of a square parabola. The leaves in these areas are separated from each other by an air gap to avoid frictional corrosion.

3.1.2
air gap
space designed to be between the leaves of the spring

3.1.3
decarburization
reduction of carbon in the surface layer of metal

3.1.4
space requirements
volume taken up by the spring under the different operating conditions

3.1.5
double parablolic spring
spring comprising a main spring effective over the whole working range and an additional spring that comes into operation subsequently when a certain loading has been reached (see Figure 11)

3.1.6
single parabolic spring
spring with the same loading capacity over the whole working range (see Figure 12)

3.2 Symbols

Table 1 contains a list of the symbols used in this standard together with their meaning.

Table 1 — Symbols

Symbol	Unit	Explanation	Applies to type
B_A	mm	Leaf width in the spring eye area	A, B
C_a	mm/kN	Specific compliance of the single spring	B
C_{a1}	mm/kN	Specific compliance of the main spring measured in the wagon carrier truck	A
C_{a2}	mm/kN	Specific compliance of the whole spring measured in the wagon carrier truck	A
D	mm	Diameter of the spring eye	A, B
F_1	N	Force for determining the height H_1	A, B
F_2	N	Force for determining the height H_2	A
F_3	N	End force for checking the heights H and the specific compliance	A, B
F_{s1} - F_{sm}	N	Load for calculation of specific compliance	A, B
F_{ER}	N	Force on operation of the additional spring in the wagon carrier truck	A
h	mm	Mean leaf thickness	A, B
h_H	mm	Mean leaf thickness of the main spring	B
h_Z	mm	Mean leaf thickness of the additional spring	A
h_{ZW}	mm	Thickness of the pad	A
H'_E/H''_E	mm	Gap between the main spring and additional spring in the unloaded condition	A
H_0	mm	Height of the unloaded spring from the bottom edge of the spring buckle to the middle of the spring eye	A, B
H_1	mm	Height of the spring loaded with force F_1 from the bottom edge of the spring buckle to the middle of the spring eye	A, B
H_2	mm	Height of the spring loaded with force F_2 from the bottom edge of the spring buckle to the middle of the spring eye	A
H_{1c}, H_{1d}	mm	Spring height measured	A, B
H_B	mm	Spring buckle height of the spring ready for installation	A, B
J	mm	Spring eye gap	A, B
L_R	mm	Distance between the middle of the spring and the middle of the rib	A, B
L_S	mm	Distance between the middles of the eyes with the main spring leaf extended	A, B
L_0	mm	Distance between the middles of the eyes with the middle unloaded	A, B
S_{ER}	mm	Deflection of the main spring up to operation of the additional spring in the wagon carrier truck	A, B
σ_S	N/mm²	Bending stress of the single spring per kN of force	B
σ_{SH}	N/mm²	Bending stress of the main spring per kN of force	A
σ_{SZ}	N/mm²	Bending stress of the additional spring per kN of force	A
$2Q$	t	Wheelset load	A, B

4 Dimensions, characteristics, designation

4.1 General

Details not specified here shall be selected as appropriate:

— for general tolerances, accuracy grade c as specified in EN 22768-1 shall apply (only for mechanically produced characteristics);

— for tolerances on form and position, ISO 1101 shall apply.

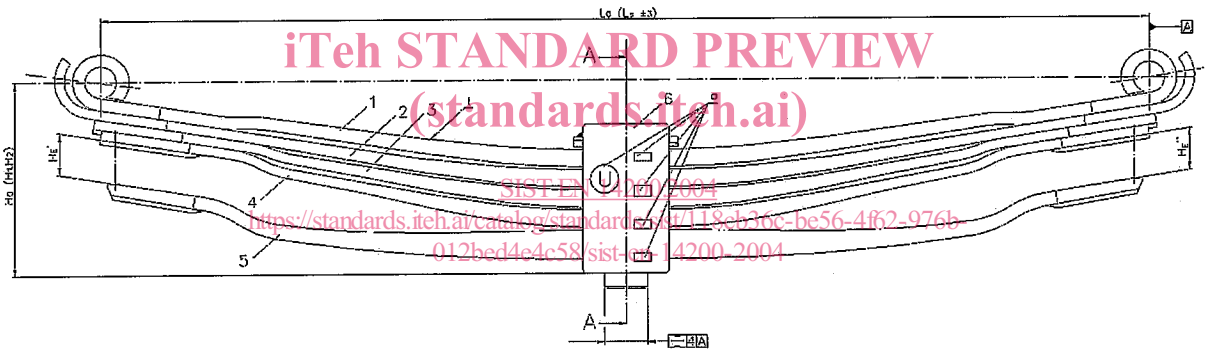
The air gap designed to be between the spring leaves is at least 1 mm under all loading conditions.

4.2 Complete spring, form A

4.2.1 Double spring, form A

Figures 1a to 1g contain details of the double spring, form A.

Dimensions in millimetres



H'_E/H''_E = Distance between $|H'_E - H''_E| \leq 4$ mm

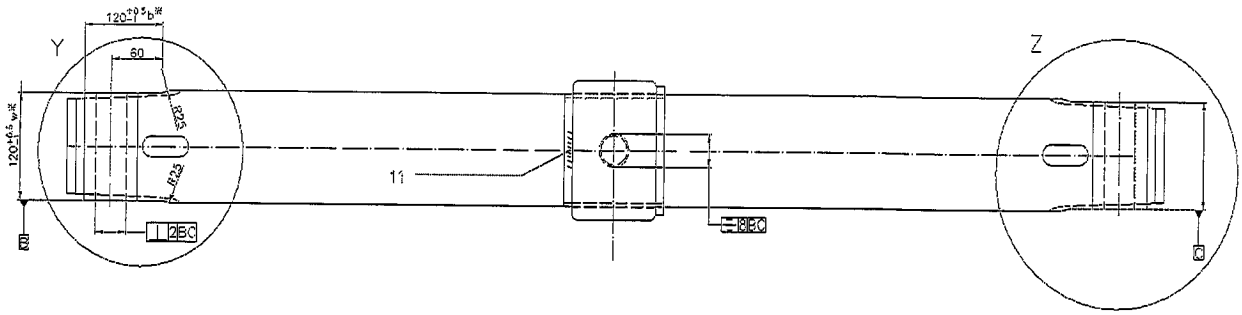
Key

1 Spring leaf 1 (Main spring)
2 Spring leaf 2
3 Spring leaf 3
4 Spring leaf 4
5 Spring leaf 5 (additional spring)
6 Spring buckle
a area for marking (see 8)
t Tension side

(See also Table 4 – "Parts list")

Figure 1a — Side view, type A
(Example)

Dimensions in millimetres



Key

11 Filled weld
a3 ◺ 15 wedge, item 9, secured after insertion

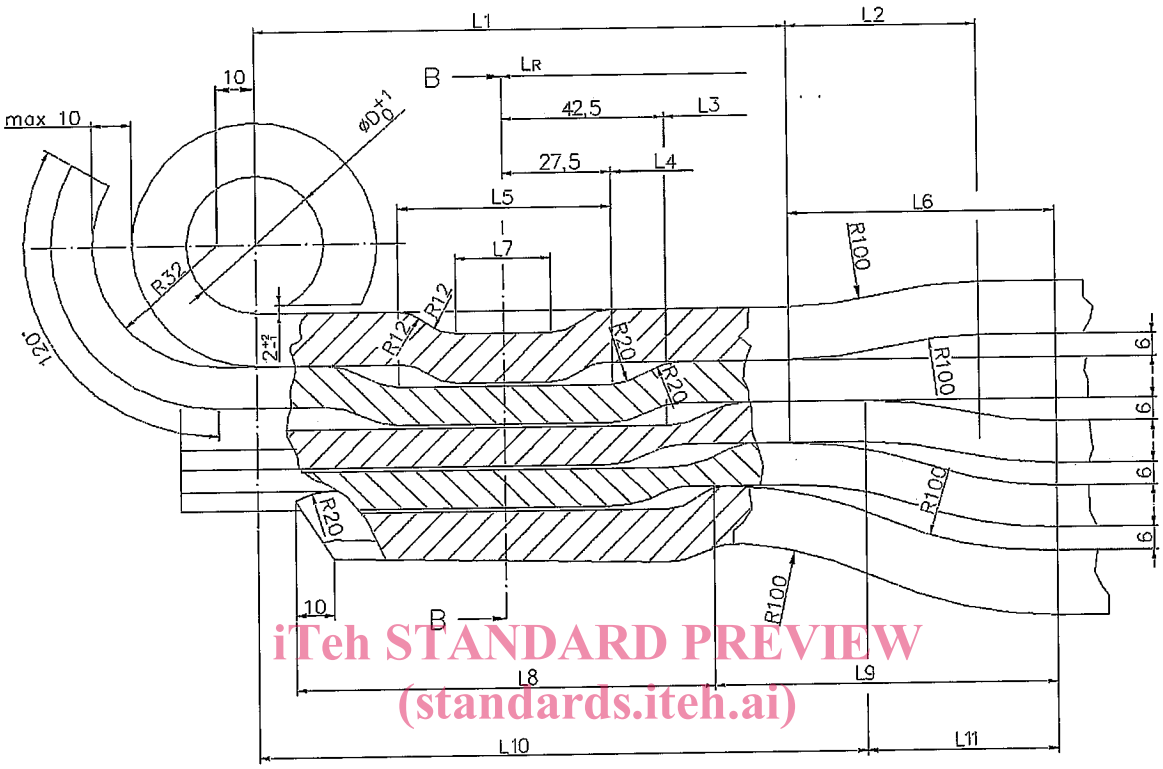
(See also Table 4 – "Parts list")

b* Area for dimension $120^{+0,5}_{-1}$ both side

w* Width of both spring eyes

Figure 1b — Top view, type A
(Example)

Dimensions in millimetres

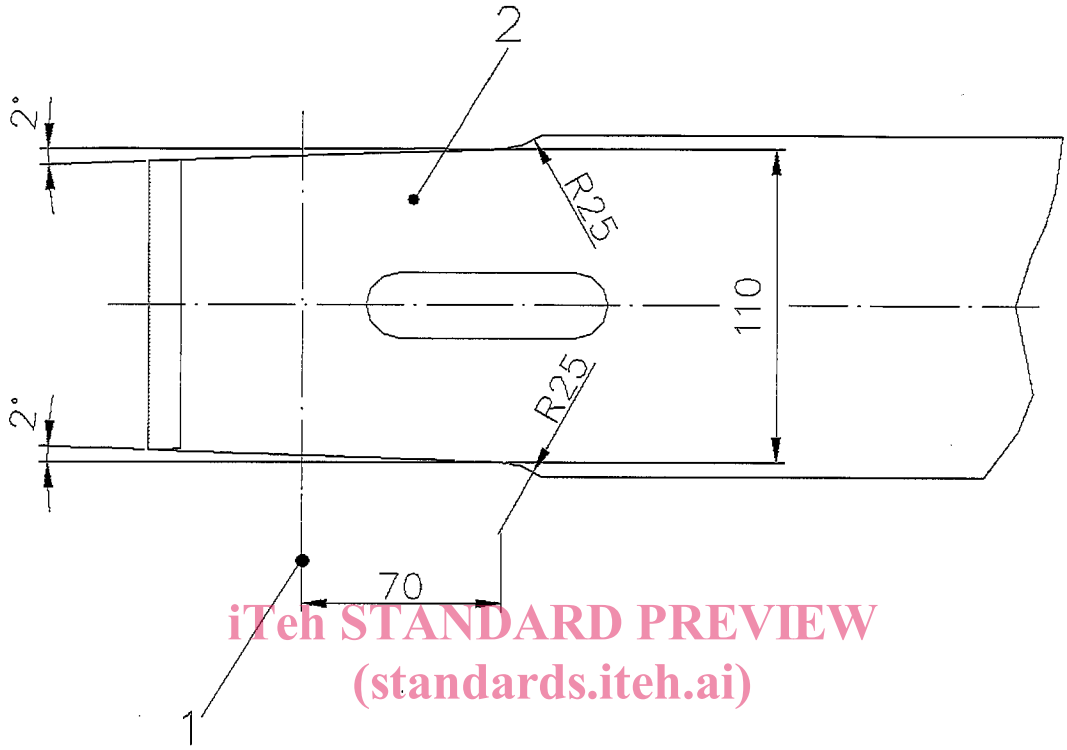


Key

L1		140 mm	Leaf 1 and 4
L2	roughly	50 mm	Leaf 1
L3			Leaf 3 and 4 impression
			Leaf 5 expression
L4			Leaf 3 and 4 expression
L5		55 mm	Leaf 2
L6	roughly	70 mm	Leaf 4
L7		25 mm	Leaf 1
L8		110 mm	Leaf 5
L9	roughly	90 mm	Leaf 5
L10		160 mm	Leaf 3
L11	roughly	50 mm	Leaf 3
L_R			Distance between the middle of the spring and the middle of the rib

Figure 1c —Spring end, type A
(Example)

Dimensions in millimetres



Key

1 Spring eye centre
2 Execution of spring end leaf 2 (both sides)

Figure 1d — Detail Y, type A
(Example)