# SLOVENSKI STANDARD
# SIST EN 13230-2:2016

**01-julij-2016**

**Nadomešča:**
**SIST EN 13230-2:2009**

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**Železniške naprave - Zgornji ustroj proge - Betonski pragi in kretniški betonski pragi - 2. del: Enodelni prednapeti betonski pragi**

Railway applications - Track - Concrete sleepers and bearers - Part 2: Prestressed monoblock sleepers

Bahnanwendungen - Oberbau - Gleis- und Weichenschwellen aus Beton - Teil 2: Spannbeton Monoblockschwellen



Applications ferroviaires - Voie - Traverses et supports en béton - Partie 2 : Traverses monoblocs précontraintes



**Ta slovenski standard je istoveten z:** **EN 13230-2:2016**

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**ICS:**

| | | |
|---|---|---|
| 45.080 | Tračnice in železniški deli | Rails and railway components |
| 91.100.30 | Beton in betonski izdelki | Concrete and concrete products |

**SIST EN 13230-2:2016** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 13230-2

May 2016

ICS 91.100.30; 93.100

Supersedes EN 13230-2:2009

English Version

# Railway applications - Track - Concrete sleepers and bearers - Part 2: Prestressed monoblock sleepers

Applications ferroviaires - Voie - Traverses et supports en béton - Partie 2 : Traverses monoblocs précontraintes

Bahnanwendungen - Oberbau - Gleis- und Weichenschwellen aus Beton - Teil 2: Spannbeton-Monoblockschwellen

This European Standard was approved by CEN on 4 March 2016.

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 CEN-CENELEC 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 CEN-CENELEC 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

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## European foreword

This document (EN 13230-2:2016) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document supersedes EN 13230-2:2009.

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 November 2016, and conflicting national standards shall be withdrawn at the latest by November 2016.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

This European Standard is one of the EN 13230 series “*Railway applications – Track – Concrete sleepers and bearers*”, which consist of the following parts:

— Part 1: General requirements;

— Part 2: Prestressed monoblock sleepers;

— Part 3: Twin-block reinforced sleepers;

— Part 4: Prestressed bearers for switches and crossings;

— Part 5: Special elements;

— Part 6: Design.



There is a change in the wording of the documents of EN 13230 (series) “design bending moment” is replaced by “characteristic bending moment” and “test bending moment”.

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

# Introduction

This part of the EN 13230 series defines the specific requirements dedicated to prestressed monoblock sleepers.

These are additional requirements to EN 13230-1 that are necessary to have a complete standard dealing with prestressed monoblock sleepers.

# 1 Scope

This part of the EN 13230 series defines additional technical criteria and control procedures related to the manufacturing and testing of prestressed monoblock sleepers.

# 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 206, *Concrete - Specification, performance, production and conformity*

EN 13230-1:2016, *Railway applications – Track – Concrete sleepers and bearers – Part 1: General requirements*

prEN 13230-6:2015, *Railway applications – Track – Concrete sleepers and bearers – Part 6: Design*

FprEN 10138 (all parts), *Prestressing steels*

# 3 Terms, definitions and symbols



## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13230-1:2016 and the following apply.



**3.1.1**
**Pre-tensioned monoblock sleeper**
sleeper manufactured using pre-tensioned tendons

**3.1.2**
**post-tensioned monoblock sleeper**
sleeper manufactured using post-tensioned tendons

## 3.2 Symbols

For the purpose of this document, the symbols listed in Table 1 apply.

**Table 1 — Symbols**

| Symbol | Description | Unit |
|---|---|---|
| $Fr_0$ | Positive initial reference test load for the rail seat section | kN |
| $Fr_r$ | Positive test load which produces first crack formation at the bottom of the rail seat section | kN |
| $Fr_{0,05}$ | Maximum test load for which a crack width of 0,05 mm at the bottom of rail seat section persists after removal of the load | kN |
| $Fr_{0,5}$ | Maximum test load for which a crack width of 0,5 mm at the bottom of the rail seat section persists after removal of the load | kN |
| $Fr_B$ | Maximum positive test load at the rail seat section which cannot be increased | kN |
| $Fr_u$ | Lower test load for the rail seat section dynamic test; $Fr_u$ = 50 kN | kN |
| $Fc_0$ | Positive initial reference test load at the centre section of the sleeper | kN |
| $Fc_{0n}$ | Negative initial reference test load at the centre section of the sleeper | kN |
| $Fc_r$ | Positive test load which produces first crack formation at the centre of the sleeper | kN |
| $Fc_{rn}$ | Negative test load which produces first crack formation at the centre of the sleeper | kN |
| $Fc_B$ | Maximum positive test load at the centre section which cannot be increased | kN |
| $Fc_{Bn}$ | Maximum negative test load at the centre section which cannot be increased | kN |
| $L_p$ | Design distance between the centre line of the rail seat to the edge of the sleeper at the bottom | m |
| $L_r$ | Design distance between the articulated supports centre lines for the test arrangement at the rail seat section | m |
| $L_c$ | Design distance between centre lines of the rail seat | m |
| $M_{k,r,pos}$ | Positive characteristic bending moment at rail seat, (see prEN 13230–6:2015) | kNm |
| $M_{k,c,neg}$ | Negative characteristic bending moment at centre section, (see prEN 13230–6:2015) | kNm |
| $M_{k,c,pos}$ | Positive characteristic bending moment at centre section, (see prEN 13230–6:2015) | kNm |
| $k_{1s}$ | Static coefficient to be used for calculation of $Fr_{0,05}$ test load | - |
| $k_{2s}$ | Static coefficient to be used for calculation of $Fr_{0,5}$ or $Fr_B$ test load | - |
| $k_{1d}$ | Dynamic coefficient to be used for calculation of $Fr_{0,05}$ test load | - |
| $k_{2d}$ | Dynamic coefficient to be used for calculation of $Fr_{0,5}$ or $Fr_B$ test load | - |
| $k_3$ | Static coefficient to be used for calculation of $Fr_B$ at the end of fatigue test | - |
| $k_t$ | Factor used for calculation of acceptance criteria for first crack formation in static tests | - |

# 4 Product testing

## 4.1 General

This section defines the testing regime and rules for the acceptance of concrete sleepers.

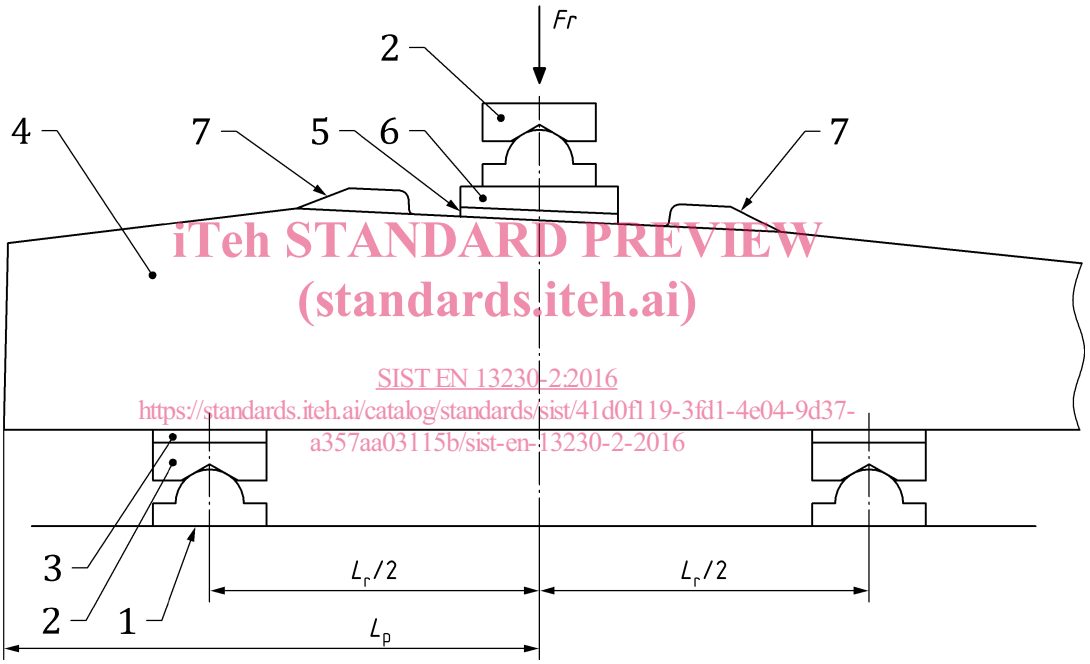
## 4.2 Test arrangements

### 4.2.1 Rail seat section

The arrangement for the rail seat positive load test is shown in Figure 1, the value of $L_r$ in relation to $L_p$ is detailed in Table 2.

The load *Fr* is applied perpendicularly to the base of the sleeper.

The end of the sleeper opposite to the end being tested shall be unsupported.






**Key**

1 rigid support
2 articulated support (see Annex A for details)
3 resilient pad (see Annex A for details)
4 prestressed monoblock sleeper
5 standard rail pad as defined by the purchaser
6 tapered packing (see Annex A for details)
7 lateral stop and base plate, only when required by the purchaser

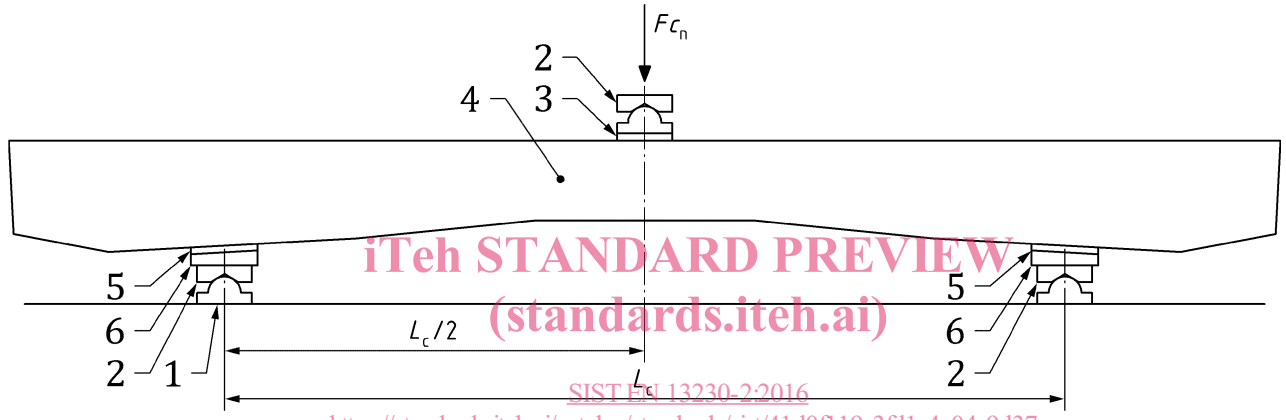
**Figure 1 — Test arrangement at the rail seat section for the positive load test**

**Table 2 — Value of $L_r$ in relation to $L_p$**

| $L_p$ in m | $L_r$ in m |
|---|---|
| $L_p < 0{,}349$ | 0,3 |
| $0{,}350 \leq L_p < 0{,}399$ | 0,4 |
| $0{,}400 \leq L_p < 0{,}449$ | 0,5 |
| $L_p \geq 0{,}450$ | 0,6 |

### 4.2.2 Centre section

The arrangement for the negative centre load test is shown in Figure 2.



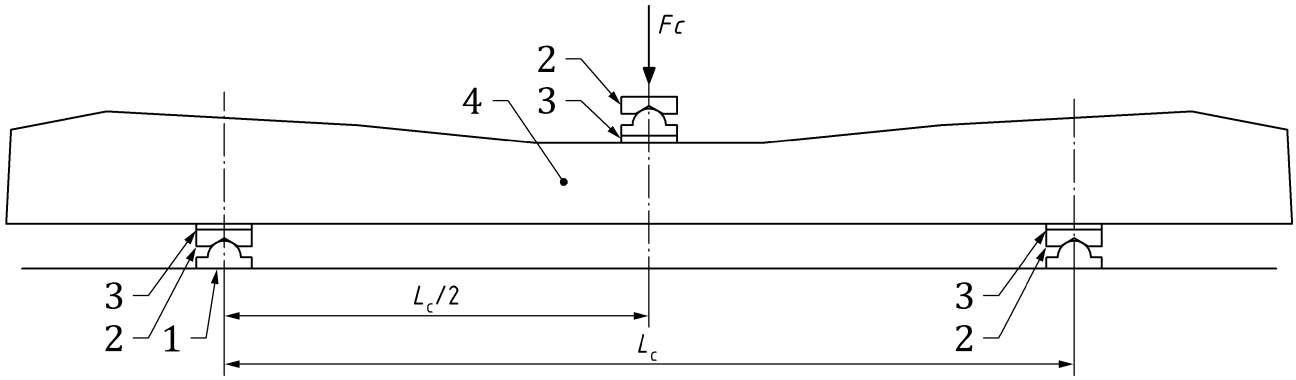



**Key**

1 rigid support
2 articulated support (see Annex A for details)
3 resilient pad (see Annex A for details)
4 prestressed monoblock sleeper
5 standard rail pad as defined by the purchaser
6 tapered packing (see Annex A for details)

**Figure 2 — Test arrangement at the centre section for the negative load test**

The test arrangement for the positive centre load test is shown in Figure 3.




**Key**

1 rigid support
2 articulated support (see Annex A for details)
3 resilient pad (see Annex A for details)
4 prestressed monoblock sleeper

**Figure 3 — Test arrangement at the centre section for the positive load test**

## 4.3 Test procedures



### 4.3.1 Test loads



$Fr_0$ is calculated from the geometry given in Figure 1 and values from Table 3 using Formula (1):

$$Fr_0 = \frac{4\,M_{k,r,pos}}{L_r - 0{,}1} \text{ in kN} \quad (1)$$

**Table 3 — Value of $Fr_0$ in relation to $L_r$**

| $L_r$ in m | 0,3 | 0,4 | 0,5 | 0,6 |
|---|---|---|---|---|
| $Fr_0$ in kN | 20 $M_{k,r,pos}$ | 13 $M_{k,r,pos}$ | 10 $M_{k,r,pos}$ | 8 $M_{k,r,pos}$ |

$Fc_0$ and $Fc_{0n}$ are calculated from the geometry given in Figures 2 and 3 using Formula (2) and Formula (3):

$$Fc_0 = \frac{4\,M_{k,c,pos}}{L_c - 0{,}1} \text{ in kN} \quad (2)$$

$$Fc_{0n} = \frac{4\,M_{k,c,neg}}{L_c - 0{,}1} \text{ in kN} \quad (3)$$