

**Järnvägar – Fjädringskomponenter –  
Torsionsstav, stål**

**Railway applications – Suspension components –  
Torsion bar, steel**

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## Railway applications - Suspension components - Torsion bar, steel

Applications ferroviaires - Éléments de suspension - Barre  
de torsion, en acier

Bahnanwendungen - Federungselemente - Drehstabfedern  
aus Stahl

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## **Foreword**

This document (EN 15049:2007) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2008 and conflicting national standards shall be withdrawn at the latest by February 2008.

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

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### Introduction

Work on this European Standard started at the beginning of 2002 with the aim of incorporating the existing documents, such as UIC leaflets (International Union of Railways) and the internal standards of the various railways as well as national standards into one standard.

### 1 Scope

This European Standard applies to torsion bars made of steel for anti-roll bar systems used on railway vehicles.

This European Standard includes straight and bended torsion bars, but does not detail the other components of the anti-roll bar systems such as levers, bearings, bushes etc.

This European Standard constitutes guidelines on the following topics:

- design;
- specification of technical requirements;
- production requirements;
- tests;
- supply conditions.

### 2 Normative references

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

EN 473, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

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

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

EN 10089, *Hot-rolled steels for quenched and tempered springs — Technical delivery conditions*

EN 10204, *Metallic products — Types of inspection documents*

EN 10228-1, *Non-destructive testing of steel forgings — Part 1: Magnetic particle inspection*

EN 10247, *Micrographic examination of the non-metallic inclusion content of steels using standard pictures*

EN 13925-2, *Non-destructive testing — X-ray diffraction from polycrystalline and amorphous materials — Part 2: Procedures*

EN ISO 643, *Steels — Micrographic determination of the apparent grain size (ISO 643:2003)*



EN ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation (ISO 1302:2002)*

EN ISO 2162-3:1996, *Technical product documentation — Springs — Part 3: Vocabulary (ISO 2162-3:1993)*

EN ISO 3887, *Steel — Determination of depth of decarburization (ISO 3887:2003)*

EN ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture (ISO 4288:1996)*

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:2005)*

EN ISO 9934-1, *Non-destructive testing — Magnetic particle testing — Part 1: General principles (ISO 9934-1:2001)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

EN ISO 18265, *Metallic materials — Conversion of hardness values (ISO 18265:2003)*

DIN 50602, *Metallographic examination — microscopic examination of special steels using standard diagrams to assess the content of non-metallic inclusions*

NF A04-106, *Iron and steel. Methods of determination of content of non metallic inclusions in wrought steel. Part II: micrographic method using standards diagrams*

SS 111116, *Steel — Method for estimation of the content of non-metallic inclusions — Microscopic methods — Jernkontoret's inclusion chart II for the assessment of non-metallic inclusions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 2162-3:1996 and the following apply.

#### 3.1

##### **anti-roll bar system**

suspension system having an influence on the rolling behaviour of the vehicle. Generally, it includes the torsion bar and any other components

#### 3.2

##### **anti-roll bar**

spring bar which is mainly stressed by a torsional moment. It can either be produced as bended bar or a straight torsion bar with levers

#### 3.3

##### **straight torsion bar**

straight spring bar which is mainly stressed by a torsional moment

NOTE The term "torsion bar made of steel" refers to the finished end product. For the purpose of simplification, the term "torsion bar" is used in the wording of this European Standard for anti-roll bars with torsion bars of round cross section and made of steel.

#### 3.4

##### **bended torsion bar**

mainly U-shaped and manufactured out of round spring material

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**4 Symbols and abbreviations**

The symbols and abbreviations used in this standard are listed in table 1. All parameters are expressed as SI basic units and units derived from SI basic units. Decimal multiples and submultiples of units defined in Table 1 can be used.

**Table 1 — Symbols and definitions**

<b>Symbols</b>	<b>Units</b>	<b>Definitions</b>
$A$	%	Elongation at rupture
$d$	m	Outer diameter of the middle part of the torsion bar
$d_a$	m	Outer diameter of the torsion bar in the area of bearing
$d_f$	m	Root diameter of the head profile
$d_p$	m	Diameter of shrink fit
$e$	m	Area to take test pieces
$F$	N	Applied load at the lever
$l$	m	Distance between load application and middle of torsion bar
$L_f$	m	Distance between the two load application points
$L_a$	m	Length between the centre of the two bearings
$L_s$	m	Length between the centre of the two levers
$l_x$	m	Crank depth in the middle part of the torsion bar
$l_z$	m	Distance between load application and centre of the bearing
$M_t$	Nm	Torsional moment
$M_{tmax}$	Nm	Max. torsional moment
$\Delta M_t$	Nm	Difference of torsional moments
$r$	M	Bending radius of bended torsion bar

Table 1 (concluded)

Symbols	Units	Definitions
$R_m$	Pa	Material strength
$R_{p0,2}$	Pa	Yield strength
$R_t$	Nm/degree	Torsional spring rate
$Z$	%	Percentage reduction of area after fracture
$\delta$	-	Depth of residual stress
$\sigma_D$	Pa	Residual stress
$\vartheta$	degree	Angle of twist
$\vartheta_{max}$	degree	Max. angle of twist
$\vartheta_A$	degree	Angle of twist at the beginning of stress
$\Delta\vartheta$	degree	Difference of angles of twist
$\tau_{zul}$	Pa	Permissible shear stress

## 5 Requirements

### 5.1 Introduction

The component shall be defined in a technical specification which consists of the following documents (see 5.2 and 5.3).

The definition of type of drawing is given in ISO 10209-1.

### 5.2 Documents to be provided by the customer

The customer shall provide a technical specification including:

An interface drawing (possibly, a general assembly drawing of the mechanical system or a sub-assembly drawing) defining at least:

- the space envelope;
- the functional dimensions and their tolerances;
- the application points of the forces;
- a technical specification detailing at least:
  - the conditions of utilisation (forces, movements, temperatures, assembly, environment, maintenance, storage etc.);
  - the requirements (characteristics of the product, tolerances and expected service life);
  - the approval procedure and type test requirements (e.g. characteristics to be checked and tests to be carried out, order of tests and checks).