



# SLOVENSKI STANDARD

## SIST EN 13411-4:2011

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Nadomešča:

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### Zaključki jeklenih žičnih vrvi - Varnost - 4. del: Zalivke iz kovin in umetnih smol

Terminations for steel wire ropes - Safety - Part 4: Metal resin socketing

Endverbindungen für Drahtseile aus Stahldraht - Sicherheit - Teil 4: Vergießen mit Metall und Kunstharz

Terminaisons pour câbles en acier - Sécurité - Partie 4: Manchonnage à l'aide de métal ou résine

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EUROPEAN STANDARD

**EN 13411-4**

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## Terminations for steel wire ropes - Safety - Part 4: Metal and resin socketing

Terminaisons pour câbles en acier - Sécurité - Partie 4:  
Manchonnage à l'aide de métal et de résine

Endverbindungen für Drahtseile aus Stahldraht - Sicherheit  
- Teil 4: Vergießen mit Metall und Kunstharz

This European Standard was approved by CEN on 19 February 2011.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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**EN 13411-4:2011 (E)****Foreword**

This document (EN 13411-4:2011) has been prepared by Technical Committee CEN/TC 168 “Chains, ropes, webbing, slings and accessories - Safety”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by September 2011, and conflicting national standards shall be withdrawn at the latest by September 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13411-4:2002+A1:2008.

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(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This second edition incorporates both technical and editorial amendments, with the following main changes made with respect to the previous edition:

- enhance approved socket dimension criteria negating need for type testing and move data into informative Annex F;
- add definition for ‘socketing manufacturer’;
- re-draft hazards clause;
- re-draft standard in accordance with rules of ISO/IEC Directives, Part 2 and CEN Guide 414.

EN 13411, under the general title “Terminations for steel wire ropes — Safety”, consists of the following parts:

- Part 1: Thimbles for steel wire rope slings;
- Part 2: Splicing of eyes for wire rope slings;
- Part 3: Ferrules and ferrule-securing;
- Part 4: Metal and resin socketing;
- Part 5: U-bolt wire rope grips;
- Part 6: Asymmetric wedge socket;
- Part 7: Symmetric wedge socket;
- Part 8: Swage terminals and swaging.

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, Croatia, 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 the United Kingdom.

## Introduction

This European Standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

The methods of socketing described in this standard are based on established procedures and following them is considered to result in a rope termination having an efficiency of 100 % based on the minimum breaking force of the rope.

It is assumed that the socket is:

- suitable for heating without changing the characteristics of the socket material when the socketing medium is molten metal;
- strong enough for the rope; and
- suitable for the purpose for which it is intended.

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**EN 13411-4:2011 (E)****1 Scope**

This European Standard specifies the minimum requirements for the molten metal and resin socketing of steel wire ropes within the scopes of EN 12385-4:2002+A1:2008; EN 12385-5:2002; EN 12385-6:2004; EN 12385-7:2002; EN 12385-8:2002; EN 12385-9:2002 and EN 12385-10:2003+A1:2008.

The European Standard is applicable only to those requirements that ensure that the socketing is strong enough to withstand a force of at least 100 % of the minimum breaking force of the rope (i.e. socket termination efficiency factor  $K_T = 1,0$ ).

NOTE Rope terminations made by socketing in accordance with this European Standard can be used for determining the breaking force of wire ropes in accordance with EN 12385-1:2002+A1:2008, Annex A.

Socketing by the methods and materials described in this standard are for use within the temperature limits given in normative Annex E.

This European Standard deals with all significant hazards, hazardous situations and events relevant to metal and resin socket terminations, when they are used as intended and under conditions of misuse which are reasonably foreseeable (see Clause 4).

**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 59, *Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor*

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EN 1774:1997, *Zinc and zinc alloys — Alloys for foundry purposes — Ingot and liquid*

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EN 12385-1:2002+A1:2008, *Steel wire ropes — Safety — Part 1: General requirements*

EN 12385-2:2002+A1:2008, *Steel wire ropes — Safety — Part 2: Definitions, designation and classification*

EN ISO 75-2:2004, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics, ebonite and long-fibre-reinforced composites (ISO 75-2:2004)*

EN ISO 604, *Plastics — Determination of compressive properties (ISO 604:2002)*

EN ISO 3838, *Crude petroleum and liquid or solid petroleum products — Determination of density or relative density — Capillary-stoppered pycnometer and graduated bicapillary pycnometer methods (ISO 3838:2004)*

EN ISO 12100:2010 *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

**3 Terms and definitions**

For the purpose of this document, the terms and definitions given in EN ISO 12100, EN 12385-2:2002+A1:2008 and the following apply.

**3.1****socket**

type of wire rope termination incorporating a socket basket

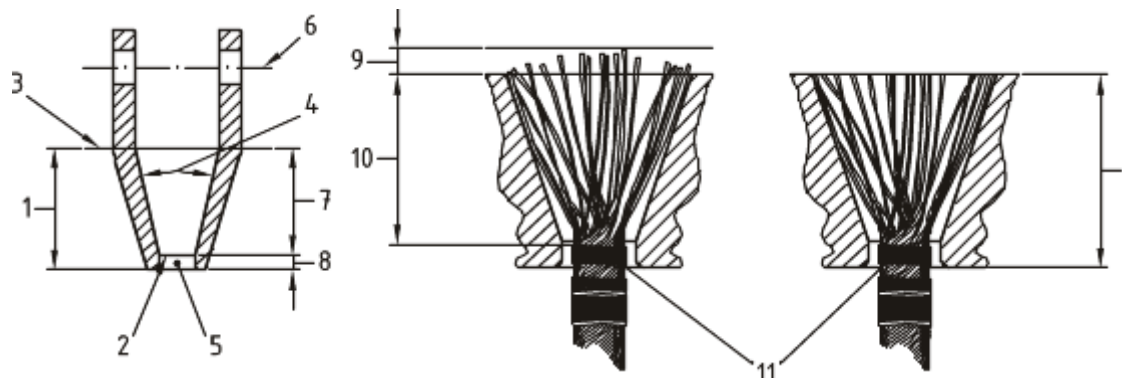


### 3.2

#### socket basket

area of a socket in which a brushed rope end is secured using a socketing medium

NOTE Descriptions of further elements of the socket geometry are shown in Figure 1.



#### Key

- 1 length of tapered basket plus any parallel portion(s) including any radius at rope entry
- 2 small end of tapered basket
- 3 large end of tapered basket
- 4 included angle of tapered basket
- 5 bore (internal diameter at rope entry)
- 6 pin hole centre line
- 7 length of tapered basket
- 8 length of parallel portion including any radius at rope entry
- 9 protruding wires
- 10 length of brush
- 11 root of brush

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NOTE Some sockets can have baskets with an extended parallel portion at the large end of the tapered basket.

**Figure 1 — Nomenclature of typical parts of socket and brush**

### 3.3

#### serving

wrapping, usually of wire or strand, for the purpose of securing a rope end to prevent its unlaying

### 3.4

#### permanent serving

serving applied prior to socketing and remaining in place at least until the socketing operation has been completed

### 3.5

#### temporary serving

serving applied and subsequently removed at various stages of the socketing operation

### 3.6

#### gelling

change in condition of resin from liquid to a semi-solid, jelly-like composition

### 3.7

#### hooking

procedure whereby the end of a wire forming part of a brush is bent backwards to form a hook

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- 3.8 socketer**  
competent person carrying out the socketing
- 3.9 competent person**  
designated person, suitably trained, qualified by knowledge and experience and with the necessary instructions to ensure that the required operations are correctly carried out
- 3.10 socketing system**  
method of attachment comprising instructions and materials for the socketing of wire ropes with molten metal or resin
- 3.11 socketing system designer**  
person or organization that designs the socketing system and assumes responsibility for type testing
- 3.12 socketing manufacturer**  
person or organization that manufactures socketed terminations in accordance with the socketing system designer's instructions

**4 List of significant hazards**

This clause contains all the significant hazards, hazardous situations and events for the molten metal and resin socketing of steel wire ropes within the scopes of EN 12385-4:2002+A1:2008; EN 12385-5:2002; EN 12385-6:2004; EN 12385-7:2002; EN 12385-8:2002; EN 12385-9:2002 and EN 12385-10:2003+A1:2008, as far as these hazards are dealt with in this European Standard, identified by risk assessment as significant for socket terminations that require action to eliminate or reduce risk.

In particular, the hazard caused by accidental release of a load due to failure of the socketed portion of a socketed rope termination puts at risk, either directly or indirectly, the safety or health of those persons within the danger zone.

In order to provide the necessary strength of the socketed portion of a socketed termination, this European Standard gives requirements for the method of socketing to ensure specified levels of performance are met.

Table 1 contains those hazards that require action to reduce risk identified by risk assessment as being specific and significant for socketed termination assemblies.

**Table 1 — Hazards identified EN ISO 14121-1:2007, A.1 and A.4**

Type or group	Origin	Potential consequences
<b>Mechanical hazards</b>	<ul style="list-style-type: none"> <li>- Acceleration, deceleration (kinetic energy)</li> <li>- Falling objects</li> <li>- Moving elements</li> </ul>	<ul style="list-style-type: none"> <li>- Impact</li> <li>- Crushing</li> </ul>
<b>Hazardous events</b>	<ul style="list-style-type: none"> <li>- Stability of the machine and/or parts of the machine</li> <li>- Mechanical strength of parts of</li> </ul>	<ul style="list-style-type: none"> <li>- Loss of stability</li> <li>- Break-up during</li> </ul>

	the machine	operation
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## 5 Safety requirements and/or protective measures

### 5.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause.

In addition, the machine (rope assembly terminated in accordance with this European Standard and which is designated for lifting purposes) shall be designed in accordance with the principles of EN ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

Socketing shall be carried out by a person trained in socketing.

### 5.2 Preparation of rope and socket

#### 5.2.1 General

The position of the wires and strands of the non-socketed portion of rope shall remain undisturbed during the socketing operation. Temporary servings or, alternatively, a mechanical device e.g. clamp(s), may be used for this purpose.

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#### 5.2.2 Length marking of rope (standards.iteh.ai)

The rope shall be marked with the required length taking into account the length of the socket basket, the length of the brush to be formed, any additional brush length for the hooking of wires and, if used, the depth of any centralizing clamp.

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#### 5.2.3 Serving

Temporary servings shall be used to hold the strands and wires in position during the cutting operation.

Temporary servings shall also be used, when required by nature of the rope construction e.g. spiral rope, to maintain the lay of the rope etc. beyond the portion being socketed.

The rope shall be served with a permanent serving as shown in Figure 2. The permanent serving shall be in position before cutting the rope. Unless specified otherwise by the socket manufacturer, the serving shall allow for penetration of the socketing medium between the served rope and the bore of the socket.

The material used for the permanent serving shall be tinned or galvanised soft wire or strand for zinc/zinc alloy coated wire rope, and uncoated (bright), tinned or galvanised soft wire or strand for uncoated (bright) wire rope.

#### 5.2.4 Cutting of rope

The wire rope shall be cut by abrasive wheel, percussive or shearing methods, paying particular attention not to disturb the position of wires and/or strands below the permanent serving

If oxyacetylene or cutting methods that fuse the wire rope end – i.e. fuse & taper machine – are used, then the rope shall be trimmed back with a disc cutter to remove the heat affected zone.