



SLOVENSKI STANDARD
SIST EN 13411-4:2002

01-november-2002

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

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

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

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ICS:

53.020.30	Pribor za dvigalno opremo	Accessories for lifting equipment
77.140.99	Drugi železni in jekleni izdelki	Other iron and steel products

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13411-4

February 2002

ICS 53.020.30; 77.140.99

English version

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

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

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

This European Standard was approved by CEN on 11 November 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document EN 13411-4:2002 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 August 2002, and conflicting national standards shall be withdrawn at the latest by August 2002.

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 EC Directive(s).

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

The other Parts of this European Standard are:

Part 1: General purpose steel thimbles

Part 2: Spliced eyes **iTeh STANDARD PREVIEW**

Part 3: Ferrule secured eyes **(standards.iteh.ai)**

Part 5: U-bolt wire rope gripped terminations

Part 6: Asymmetric wedge socket clevis
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Part 7: Symmetric wedge socket clevis

This is the first edition of this European Standard.

The annexes A, B, and C are normative. The annexes D, E and ZA 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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

EN 13411-4:2002 (E)**Introduction**

This European Standard has been prepared to provide a means of conforming with the essential safety requirements of the Machinery Directive and associated EFTA regulations.

The methods of socketing described in this standard are based on historical experience 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 included angle of the socket basket is not less than 9,5° nor greater than 18°.

It is also 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.

As the intended use of the rope should be known, resistance to fatigue loading is not covered.

While producing this standard it was assumed that negotiation occurs between the manufacturer and the user to decide which socketing medium is required.

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1 Scope

This European Standard specifies the minimum requirements for the molten metal and resin socketing of steel wire ropes conforming to EN 12385 parts 4 to 10.

The standard covers only 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.

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 annex A of EN 12385-1:2002.

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

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

EN 12385-1:2002, *Steel wire ropes – Safety – Part 1: General requirements.*

prEN 12385-2, *Steel wire ropes – Safety – Part 2: Definitions, designation and classification.*

ISO 75-2, *Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite.*

3 Terms and definitions

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For the purpose of this European Standard, the terms and definitions given in prEN 12385-2 together with the following apply. Further nomenclature is given in Figure 1.

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

3.3

serving

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

3.4

primary serving

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

3.5

secondary 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

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3.7

hooking

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

3.8

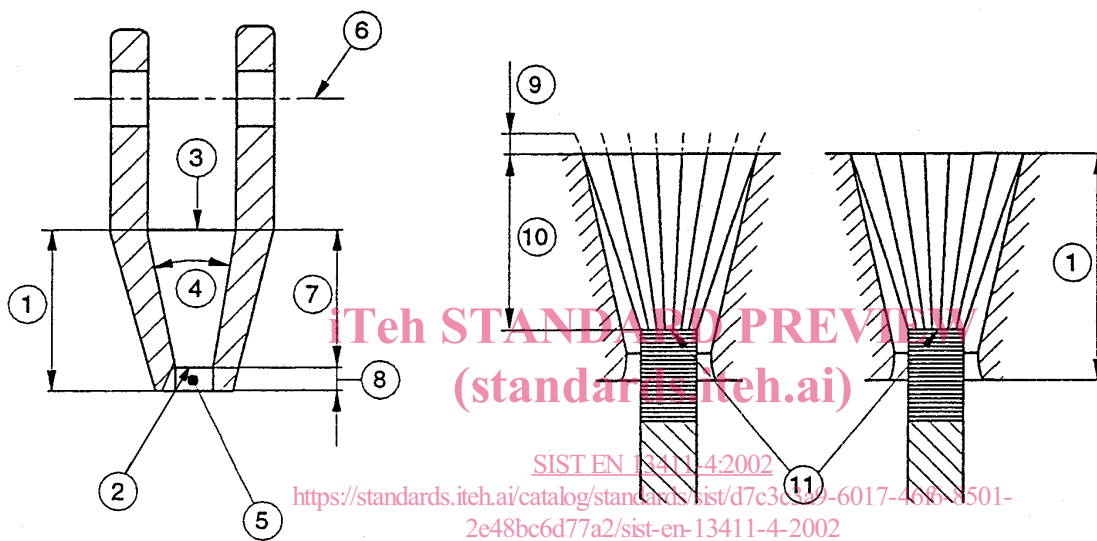
socketer

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

**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

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

3.10

resin socketing system

system comprising instructions and materials for the socketing of wire ropes using resin as the media

3.11

socketing system designer

person or organization that designs the socketing system and assumes responsibility for type testing

4 List of hazards

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.

5 Safety requirements and/or measures

5.1 General

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.

Oxyacetylene or similar cutting shall not be applied owing to risk of heat damage to the wires.

5.2.2 Marking

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.

5.2.3 Serving

The rope shall be served with a permanent serving as shown in Figure 1. 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 serving material shall be tinned or galvanized soft steel wire or strand.

5.2.4 Cleanliness of socket

The inside face of the socket basket shall not be contaminated.

NOTE This does not preclude the use of a releasing agent when socketing with resin.

5.2.5 Opening the brush

The rope (including any steel core where appropriate) shall be unlaid into its constituent wires to form an open brush (see Figure 1).

NOTE During this operation, care should be taken to avoid excessive bending of the wires, particularly at the root of the brush.

Any fibre core shall be removed from the whole length of the brush.

When socketing ropes with fibre cores with molten metal, the exposed end of the fibre core shall be protected from the effects of heat.

EN 13411-4:2002 (E)**5.2.6 Pre-treatment of the brush**

The brush shall be degreased to remove all traces of lubricant. Degreasing shall be by either liquid or vapour methods.

Care shall be taken to ensure that degreasing is confined to the brush.

The wire brush shall be completely dry before the socketing medium is poured into the socket.

NOTE When socketing with lead-based alloys the wires of a bright rope may be pre-treated for improved adhesion. An optional procedure is given in annex D.

5.2.7 Hooking

Where type testing shows that hooking is necessary, the dimensions of the hooked portion shall not be such that it impedes the flow of the molten metal or resin during socketing, nor reduces the embedded length of the brush in the socketing medium.

5.2.8 Positioning and alignment of brush, rope and socket

The socket shall be drawn over the brush until the root of the brush protrudes into the tapered portion at the small end by no more than $0,5 d$.

The wires shall be evenly distributed within the socket basket.

The distance between the end of the brush and the large end of the socket basket shall be no greater than 5 % of the length of the socket basket.

If the ends of the wires at the top of the brush do not protrude beyond the large end of the socket basket, the actual position of the wire ends in relation to the large end of the basket shall be measured and documented.

The rope axis shall be coincident with the socket axis for a sufficient length, typically three lay lengths, but may be reduced by the use of suitable clamps.

NOTE The concentricity of the rope in relation to the socket bore is part of the negotiation.

5.2.9 Sealing

After positioning and alignment of the brush, the small end of the socket shall be sealed. After positioning and aligning the brush, the area where the rope enters the socket shall be sealed.

NOTE Care should be taken to ensure that penetration of the socketing medium where the rope enters the socket is not impeded.

5.3 Socketing**5.3.1 General**

The medium used for socketing shall be either:

- molten metal conforming to annex A; or
- resin conforming to annex B.

Previously used socketing medium shall not be re-used.

5.3.2 Molten metal socketing

5.3.2.1 Pre-heating the socket

The socket shall be heated in accordance with socket manufacturer's instructions to ensure that the hot liquid socketing metal is able to fill the socket basket without solidifying prematurely. Any deviation from these instructions shall be documented. Unless specified otherwise by the socket manufacturer, the temperature of the socket shall be between 30 % and 50 % of the melting temperature of the socketing medium.

The pre-heat temperature shall be achieved gradually by applying heat evenly around the outer surface of the socket.

NOTE Care should be taken not to overheat any part of the socket.

The pre-heat temperature shall be checked immediately prior to pouring of the socketing medium.

5.3.2.2 Melting the metal

Sufficient metal shall be melted to ensure complete filling of the basket. Melting temperatures shall be in accordance with those given in annex A.

The containers used for melting and pouring the socketing metal shall be of a material that does not influence the molten metal.

Galvanized containers shall not be used with lead-based metals.

Containers used for the melting of one family of metals shall not be used for the melting of any other family of metal.

Lead-based alloys shall be kept molten for as short a time as possible to minimize oxidation and loss of antimony and tin.

5.3.2.3 Pouring

Immediately prior to pouring, the temperature of the molten metal socketing medium shall be checked and be within the limits given in annex A.

Before pouring, the molten metal shall be stirred to ensure even temperature distribution within the container. Any dross shall be removed from the surface of the molten metal.

The ladle shall be dry and pre-heated and the socket and brush shall be completely dry to avoid the explosive generation of steam.

NOTE 1 The wires of the brush can be fluxed by introducing a suitable fluxing compound to the socket basket before pouring in the molten metal.

The molten metal socketing medium shall be poured slowly to allow the escape of gases until the socket basket is completely filled.

If there is insufficient socketing medium in one container or ladle, any change of container or re-filling of the ladle shall not influence the natural solidification and cooling process of the metal as a whole.

NOTE 2 Shrinkage sometimes occurs in the metal at the large end of the basket. In such cases sufficient additional metal can be poured (topping up) to fill the depression. This should be carried out as the existing metal solidifies, and where necessary, the surface should be re-liquefied before pouring commences, e.g. by gentle heating at the large end of the basket.