



# SLOVENSKI STANDARD

## SIST EN 1677-4:2001

01-maj-2001

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Components for slings - Safety - Part 4: Links, Grade 8

Einzelteile für Anschlagmittel - Sicherheit - Teil 4: Einzelglieder, Güteklasse 8

Accessoires pour élingues - Sécurité - Partie 4: Mailles, Classe 8

Ta slovenski standard je istoveten z: **EN 1677-4:2000**

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**ICS:**

53.020.30	Pribor za dvigalno opremo	Accessories for lifting equipment
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**SIST EN 1677-4:2001**

**en**

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ICS 53.020.30

English version

## Components for slings - Safety - Part 4: Links, Grade 8

Accessoires pour élingues - Sécurité - Partie 4: Mailles,  
Classe 8

Einzelteile für Anschlagmittel - Sicherheit - Teil 4:  
Einzelglieder, Güteklasse 8

This European Standard was approved by CEN on 30 September 2000.

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 Central Secretariat 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 Central Secretariat 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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This European Standard 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of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

This European Standard 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 standard.

It is a Part of a products standard related to safety for components for slings.

The other Parts of EN 1677 for components for slings are:

- Part 1: Forged steel components - Grade 8
- Part 2: Forged steel lifting hooks with latch - Grade 8
- Part 3: Forged steel self-locking hooks - Grade 8
- Part 5: Forged steel lifting hooks with latch - Grade 4
- Part 6: Links - Grade 4

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 0 Introduction

This European standard has been prepared to be a harmonized standard providing one means of complying with the essential safety requirements of the Machinery Directive and associated EFTA regulations.

The links covered by this Part of EN 1677 are normally supplied to be part of a sling, but they may also be used for other applications. In such instances it is important that the link design is checked to ensure its fitness for the intended use.

The extent to which hazards are covered is indicated in the scope. In addition, lifting equipment shall conform as appropriate to EN 292 for hazards that are not covered by this standard.

## 1 Scope

This part of EN 1677 specifies requirements for forged or welded steel master links, intermediate master links, master link assemblies and lower terminal links of grade 8 up to 132 t WLL, mainly for use in:

- chain slings according to EN 818-4
- steel wire rope slings
- textile slings according to EN 1492-1:2000, EN 1492-2:2000 .

intended for lifting objects, materials or goods.

This Part of EN 1677 does not apply to hand forged links.

The hazards covered by this Part of EN 1677 are identified in clause 4.

Annex ZA gives the relationship with EU-Directives

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## 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 292-1	Safety of machinery - Basic concepts - General principles for design Part 1: Basic terminology, methodology
EN 292-2:1991/ A1:1995	Safety of machinery - Basic concepts - General principles for design Part 2: Technical principles and specifications (Amendment 1 : 1995)
EN 818-4:1996	Short link chain for lifting purposes - Safety Part 4: Chain slings - grade 8
EN 818-6:2000	Short link chain for lifting purposes - Safety Part 6: Chain slings - Specification for information for use and maintenance to be provided by the manufacturer.
EN 1050:1996	Safety of machinery - Principles of risk assessment.
EN 1492-1:2000	Textile slings - Safety Part 1: Flat woven webbing slings made of man-made fibres
EN 1492-2:2000	Textile slings - Safety Part 2: Round slings made of man-made fibres
EN ISO 9002:1994	Quality systems - Model for quality assurance in production, installation and servicing
EN 10002-2:1991	Metallic materials - Tensile test - Part 2: Verification of the force measuring system of the tensile testing machine
EN 10025:1990/A1:1993	Hot rolled products of non-alloy structural steels — Technical delivery conditions
EN 10228-1:1999	Non-destructive testing of steel forgings Part 1: Magnetic particle inspection
EN 10228-2:1998	Non-destructive testing of steel forgings Part 2: Penetrant testing
EN 45012	General criteria for certification bodies operating quality system certification
ISO 643	Steels - Micrographic determination of the ferritic or austenitic grain size

### 3 Terms and definitions

For the purposes of this Part of EN 1677, the following terms and definitions apply.

#### 3.1

##### **working load limit (WLL)**

maximum mass that a link is authorized to sustain in general lifting service.

NOTE: This term has the same meaning as the term maximum working load used in annex A of EN 292-2: 1991/A1: 1995.

#### 3.2

##### **manufacturing proof force (MPF)**

force applied to the link during the manufacturing proof test.

#### 3.3

##### **breaking force (BF)**

maximum force reached during the static tensile test of the link at the end of which the link fails to retain the load.

#### 3.4

##### **sling**

assembly consisting of chain, wire rope or textile joined to upper and lower terminals suitable for attaching loads to the hook of a crane or other lifting machine.

#### 3.5

##### **master link**

link forming the upper terminal of a sling by means of which the sling is attached to the hook of a crane or other lifting machine.

#### 3.6

##### **intermediate master link**

link used to connect one or two legs of a sling to a master link.

#### 3.7

##### **master link assembly**

assembly consisting of a master link together with two intermediate master links.

#### 3.8

##### **lower terminal**

link, hook or other device fitted at the end of a leg of a sling, remote from the master link or upper terminal.

#### 3.9

##### **traceability code**

series of letters and/or numbers marked on a link that enable its manufacturing history, including the identity of the cast of steel used, to be traced.

#### 3.10

##### **lot**

specified number of links from which samples are selected for testing purposes and that have been manufactured from the same cast of steel and subjected to the same heat treatment process.

#### 3.11

##### **integral joining device**

means of connection that does not depend on welding and is integrated with the link.

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### 3.12

#### total ultimate elongation

total extension at the point of fracture of the link expressed as a percentage of the internal length of the test sample.

### 3.13

#### competent person

designated person, suitably trained, qualified by knowledge and practical experience, and with the necessary instruction to enable the required test and examination to be carried out.

NOTE: 4.18 of EN ISO 9002:1994 gives guidance on training.

## 4 Hazards

Accidental release of a load or, release of a load due to failure of a link 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 and durability of links, this Part of EN 1677 gives requirements for the design, manufacture and testing to ensure that specified levels of performance are met.

Since failure can be caused by the incorrect choice of grade and specification of link, this Part of EN 1677 also gives requirements for marking and the manufacturer's certificate.

Errors in fitting can also lead to failure and this Part of EN 1677 contains dimensional requirements to allow correct fit.

Risk of injury due to sharp edges, sharp angles or rough surfaces when handling is also covered by this standard.

Those aspects of safe use associated with good practice are given in prEN 818-6:1999.

Table 1 contains those hazards which require action to reduce risk identified by risk assessment as being specific and significant for links of grade 8.

**Table 1 - Hazards and associated requirements**

Hazards identified in annex A of EN 1050: 1996		Relevant clause of annex A of EN 292-2: 1991/A1: 1995	Relevant clause/subclause of this Part of EN 1677
1	Mechanical hazard due to inadequacy of strength	1.3.2	5
		4.1.2.3	5
		4.1.2.5	5
		4.2.4	5
		1.7.3	7
		1.7.4	9
1.3	Cutting hazard	1.3.4	5.4
1.8	Friction or abrasion hazard	1.3.4	5.4
15	Error of fitting hazard	1.5.4	9 5.2

## 5 Safety requirements

### 5.1 Design

Links shall be either:

- a) parallel-sided links produced by forging or welding;

NOTE 1: Forged links may be with or without integral joining devices.

- b) pear shaped links with integral joining devices (i.e. links with unequal radii at either end) produced by forging.

Parts of integral joining devices, such as pins and their securing elements, shall be so designed and manufactured that, after assembly, no unintended displacement can occur.

NOTE 2: The effects of wear, corrosion of securing elements or rough usage should be considered.

## 5.2 Dimensions

The internal dimensions of links covered by this part of EN 1677 shall be such as to ensure articulation so that the force imposed is transmitted in the intended direction.

The cross-section of links shall be so as to conform to 5.5.

NOTE : This requirement permits a varying shape and area of cross-section.

The internal length and internal width of parallel sided master links shall be as in table 2.

The internal length of pear shaped master links shall be  $53\sqrt{WLL}$  minimum (in mm) and the internal width at the widest point  $27\sqrt{WLL}$  minimum (in mm) where the WLL is given in tonnes.

**Table 2 - Internal length and width  
of parallel sided master links**

WLL	minimum internal length	minimum internal width
$\leq 25$ t	$58 \sqrt{WLL}$	$31,5 \sqrt{WLL}$
$> 25$ t	$45 \sqrt{WLL}$	$25 \sqrt{WLL}$

## 5.3 Materials and heat treatment

### 5.3.1 Quality of material

#### 5.3.1.1 General

Within the limitations given in 5.3.1.2 to 5.3.1.4, the manufacturer shall select the type of steel to be used so that the finished links, when suitably heat-treated, conform to the mechanical properties specified in this Part of EN 1677. (standards.iteh.ai)

#### 5.3.1.2 Type of steel

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The steel shall be produced by an electric process or by an oxygen blown process. <https://standards.iteh.ai/catalog/standards/sist/1d22417e-5993-4aca-bd9a-310f8c32bc37/sist-en-1677-4-2001>

#### 5.3.1.3 Deoxidation

The steel shall be fully killed as defined in EN 10025:1990/A1:1993, stabilized against strain-age embrittlement, and have an austenitic grain size of 5 or finer when tested in accordance with ISO 643.

This shall be accomplished by ensuring that the steel contains sufficient aluminium (minimum 0,025 %) to permit the manufacture of links stabilized against strain age embrittlement during service.

### 5.3.1.4 Chemical composition

#### 5.3.1.4.1 General

The steel shall contain alloying elements in sufficient quantities so that the finished link, when heat treated in accordance with 5.3.2 not only conforms to the mechanical properties specified in this Part of EN 1677, but also possesses adequate low temperature ductility in order to work satisfactorily in the temperature range -40 °C to 400 °C.

The steel shall contain no more sulfur and phosphorus than the limits given in table 3.

**Table 3 - Sulfur and phosphorus content**

Element	Maximum mass content as determined by	
	Cast analysis %	Check analysis %
Sulfur	0,025	0,030
Phosphorus	0,025	0,030

#### 5.3.1.4.2 Forged links

The steel shall contain at least two of the three alloying elements, in the minimum percentages shown in table 4.

**Table 4 - Chemical composition - alloying elements**

Element	Minimum mass content as determined by cast analysis % (m/m)
Nickel	0,40
Chromium	0,40
Molybdenum	0,15

#### 5.3.1.4.3 Welded links

The steel shall contain nickel and at least one of the other elements in the minimum percentage shown in table 4.

### 5.3.2 Heat treatment

Each link shall be hardened from a temperature above the AC3 point and tempered before being subjected to the manufacturing proof force. The tempering temperature shall be a minimum of 400 °C.

The tempering conditions shall be at least as effective as a temperature of 400 °C maintained for a period of 1 h.

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NOTE: A method of verification is as follows. After the links have been reheated to and maintained for 1 h at 400 °C and then cooled to room temperature; they should conform in the finished condition to 5.5.2 and 5.5.3.

Surface hardening shall not be used.