SLOVENSKI STANDARD
SIST EN 1677-1:2001+A1:2009

01-januar-2009

Sestavni deli obes - Varnost - 1. del: Kovani jekleni deli, kakovostni razred 8

Components for slings - Safety - Part 1: Forged steel components, Grade 8

Einzelteile für Anschlagmittel - Sicherheit - Teil 1: Geschmiedete Einzelteile, Güteklasse 8

Accessoires pour élingues - Sécurité - Partie 1: Accessoires en acier forgé, Classe 8

Ta slovenski standard je istoveten z: **EN 1677-1:2000+A1:2008**

ICS:

53.020.30	Pribor za dvigalno opremo	Accessories for lifting equipment

SIST EN 1677-1:2001+A1:2009 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1677-1:2000+A1

November 2008

ICS 53.020.30

Supersedes EN 1677-1:2000

English Version

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Ref. No. EN 1677-1:2000+A1:2008: E

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Foreword

This document (EN 1677-1:2000+A1:2008) 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of an identical text or by endorsement, at the latest by May 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-09-09.

This document supersedes EN 1677-1:2000.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟩A1⟨ ⟨A1⟩.

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).

⟩A1⟨ For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. ⟨A1⟩

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

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

Annexes A and B of this European standard 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, 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.

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 components 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 component 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 general requirements for forged steel components of grade 8 up to 63 t WLL, mainly for use in:

— chain slings according to EN 818-4;

— steel wire rope slings according to prEN 13414-1:1999;

— textile slings according to EN 1492-1:2000, EN 1492-2:2000

intended for lifting objects, materials or goods.

This standard does not apply to hand forged components and welded links, nor to other welded components.

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

Annex A is informative, and gives the bases for calculation of tabulated values of mechanical properties.

Annex B is informative, and gives an example of a designation system for forged steel lifting components of grade 8.

〚A1〛 Annexes ZA and ZB give the relationship with EU-Directives. 〚A1〛

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at 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.

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, 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

prEN 13414-1:1999, Steel wire rope slings – Safety - Part 1:Wire rope slings

EN ISO 9001, Quality systems - Model for quality assurance in design/development, production, installation and servicing

EN ISO 9002:1994, Quality systems - Model for quality assurance in production, installation and servicing

EN 10002-2:1991, Metallic materials - Tensile testing – Part 2: Verification of the force measuring system of the tensile testing machine

EN 10025:1993, 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 purpose of this Part of EN 1677 the following definitions apply.

3.1
working load limit (WLL)
Maximum mass that a component is authorized to sustain in general lifting service, expressed as a code.

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 component during the manufacturing proof test.

3.3
breaking force (BF)
Maximum force reached during the static tensile test of the component, at which the component fails to retain the load.

3.4
traceability code
Series of letters and/or numbers marked on a component that enables its manufacturing history, including the identity of the cast of steel used, to be traced.

3.5
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 Clause 4.18 of EN ISO 9002:1994 gives guidance on training.

3.6
lot
Specified number of components 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.

4 Hazards

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

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

Risk of injury due to sharp edges, sharp angles or rough surfaces when handling is also covered by this Part of EN 1677.

Those aspects of safe use associated with good practice are given in EN 818-6:2000.

Table 1 contains those hazards which require action to reduce risk identified by risk assessment as being specific and significant for forged steel components, 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	5.3
1.8	Friction or abrasion hazard	1.3.4	5.3

5 Safety requirements

5.1 General

5.1.1 Articulation

The dimensions of the forged steel components 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.

5.1.2 Relative movement

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

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

5.2 Materials and heat treatment

5.2.1 Quality of material

5.2.1.1 General

Within the limitations given in 5.2.1.2 to 5.2.1.4 the manufacturer shall select the type of steel, to be used so that the finished component, when suitably heat-treated conforms to the mechanical properties specified in this Part of EN 1677.

5.2.1.2 Type of steel

The steel shall be produced by an electric process or by an oxygen blown process.

5.2.1.3 Deoxidation

The steel shall be fully killed as defined in EN 10025: 1993, be 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 components stabilized against strain age embrittlement during service.

5.2.1.4 Chemical composition

The steel shall contain alloying elements in sufficient quantities so that the finished component, when heat treated in accordance with 5.2.2, 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 at least two of the three alloying elements, in the minimum percentages shown in table 2.

Table 2 — Chemical composition - Alloying elements

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

The steel shall contain no more sulphur and phosphorous than the limits given in table 3.

Table 3 — Sulfur and phosphorous content

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

5.2.2 Heat treatment

Each component 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.

NOTE A method of verification is as follows. After the components 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 columns 3 and 4 of table 4.

Surface hardening shall not be permitted for load bearing parts of the component.

5.3 Manufacturing methods and workmanship

5.3.1 Manufacture

Each forged part of a component shall be forged hot in one piece. Excess metal from the forging operation shall be removed cleanly leaving the surface free from sharp edges. After heat-treatment, furnace scale shall be removed.

Edges of machined surfaces shall be rounded to eliminate cutting edges and to ensure attainment of mechanical properties of the component.

Welding shall not be used during the manufacture of components unless:

a) none of the parts to be welded are load bearing; or

b) the area affected by the weld is not to be subjected to load under normal operating conditions or under any foreseeable misuse of the component, and the welding is completed before heat treatment.

NOTE Care should be taken during welding to ensure that the mechanical properties of any load bearing parts of the finished component are not affected.

All welds shall be smoothly finished.

5.3.2 Surface finish

The ‘finished condition of components’ shall include any surface finish.

NOTE Components are supplied in various surface finishes, e.g. descaled, electroplated or painted.

5.4 Mechanical properties

5.4.1 Manufacturing proof force (MPF)

Components, including load-bearing pins, if used, shall be able to withstand the manufacturing proof force specified in table 4. Following removal of the force, the dimensions shall be within the tolerances specified on the component manufacturer's drawings.

5.4.2 Breaking force (BF)

Components, including load-bearing pins, if used, shall have a breaking force at least equal to that specified in table 4.

On completion of the static tensile test, components shall show evidence of deformation.

5.4.3 Fatigue resistance

Components, including load-bearing pins, if used, with a working load limit up to 32 t, shall withstand, without breaking, at least 20 000 cycles of application of the force range specified in 6.2.5.