

Steel wire rope slings — Safety —

Part 3: Grommets and cable-laid slings

ICS 53.020.30

National foreword

This British Standard is the UK implementation of EN 13414-3:2003+A1:2008. It supersedes BS EN 13414-3:2003 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by E) (51 •

The UK participation in its preparation was entrusted to Technical Committee MHE/2, Wire ropes.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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This British Standard was published under the authority of the Standards Committee and comes into effect on 17 September 2003

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ISBN 978 0 580 60264 1

Amendments/corrigenda issued since publication

Date	Comments
30 April 2009	Implementation of CEN amendment A1:2008

English Version

Steel wire rope slings - Safety - Part 3: Grommets and cable-laid slings

Elingues en câbles d'acier - Sécurité - Partie 3: Estropes et élingues en grelin

Anschlagseile aus Stahldrahtseilen - Sicherheit - Teil 3: Grummets und Kabelschlag-Anschlagseile

This European Standard was approved by CEN on 25 March 2003 and includes Corrigendum 1 issued by CEN on 5 May 2004 and Amendment 1 approved by CEN on 18 September 2008.

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Contents

	Page
Foreword.....	3
Introduction	4
1 Scope	4
2 Normative references	4
3 Terms and Definitions	5
4 Hazards	6
5 Safety requirements and/or measures	6
6 Verification of the safety requirements and/or measures	10
7 Information for use	10
Annex A (normative) Combination of lay factors for grommets and cable-laid slings	11
Annex B (normative) Determination of the length of a grommet.....	12
Annex C (normative) Pin sizes for measurements of lengths	14
Annex D (normative) Hand splices	15
Annex E (normative) Certificate for grommets.....	16
Annex F (normative) Certificate for cable-laid slings	17
Annex G (informative) Tables of working load limits.....	18
Annex ZA (informative) ZA Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC ZA	26
Annex ZB (informative) ZA Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC ZA	27

Foreword

This document (EN 13414-3:2003+A1:2008) has been prepared by Technical Committee CEN/TC 168 “Chains, ropes, webbings, 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 supersedes EN 13414-3:2003.

This document includes Amendment 1, approved by CEN on 2008-09-18 and Corrigendum 1 issued by CEN on 2004-05-05.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A1}$ $\boxed{A1}$.

The modifications of the related CEN Corrigendum have been implemented at the appropriate places in the text and are indicated by the tags \boxed{AC} \boxed{AC} .

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).

$\boxed{A1}$ For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. $\boxed{A1}$

The other parts of this European Standard are:

Part 1 Slings for general lifting service

Part 2 Specification for information for use and maintenance \boxed{AC} to \boxed{AC} be provided by the manufacturer

Annexes A to F are normative. Annex G is 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 Part of the standard has been prepared to provide a means of complying with the essential safety requirements of the Machinery Directive and associated EFTA regulations.

Purchasers are advised to specify in their purchasing contract that the supplier operates a quality management system applicable to this standard (e.g. ISO EN 9001) to ensure that products claimed to comply consistently achieve the required level of quality.

The coefficient of utilization (Z_p) used in this standard for slings with a diameter greater than 60 mm is lower than that normally used for general service wire rope slings. This is justified for the following reasons.

- a) Slings over 60 mm diameter are not intended for general service and are subjected to special conditions relating to design, construction, frequency of use, service and discard.
- b) The mass of the load is generally calculated or measured with considerable accuracy and as such slings are usually specially manufactured for one or a limited number of special lifts.
- c) The lifting operation is controlled and supervised.
- d) The dynamic factors, e.g. shock loading, are limited.

These factors reduce the unknown aspects which dictate that slings in general service require a higher coefficient of utilization; lower coefficients have been and are used with confidence.

1 Scope

This European Standard specifies the construction requirements, calculation of WLL, testing and certification of steel wire rope grommets, cable-laid grommets and cable-laid slings using strand and wire rope conforming to EN 12385-4.

The hazards covered by this standard are identified in clause 4.

This standard covers ferrule-secured cable-laid slings up to 60mm.

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.

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 1050:1996, *Safety of machinery – Principles for risk assessment*

EN 12385-4:2002 ^{AC}, *Steel wire ropes – Safety – Part 4: Stranded ropes for general lifting applications*

prEN 13411-3, *Terminations for steel wire ropes – Safety – Part 3: Ferrules and ferrule securing*

3 Terms and Definitions

For the purposes of this standard the following terms and definitions apply.

3.1

wire rope grommet

endless wire rope sling made from one continuous length of strand, formed to make a body composed of six strands around a strand core

NOTE The strand ends are tucked into the body forming the core, with the tuck position diametrically opposite to the core butt position.

3.2

cable-laid grommet

endless wire rope sling made from one or two continuous lengths of rope, formed to make a body composed of six ropes around a rope core

NOTE The rope ends are tucked into the body forming the core, with the tuck position(s) diametrically opposite to the core butt position(s).

3.3

cable-laid sling

sling formed from a wire rope constructed of six unit ropes laid as outers over one core unit rope, with a termination at each end, usually in the form of a spliced eye

3.4

working load limit (WLL)

maximum mass which a sling is authorized to sustain in general service

3.5

competent person

designated person, suitably trained, qualified by knowledge and practical experience, and in possession of the necessary instructions to enable the required calculation of WLL and examination to be carried out

3.6

nominal diameter of grommet or cable laid sling

dimension by which the sling is designated

4 Hazards

Accidental release of a load, or release of a load due to failure of a sling or a component puts at risk, either directly or indirectly, the safety or health of those persons within the danger zone.

These aspects of safe use associated with good practice are given in prEN 13414-2.

Table 1 contains all the hazards which require action to reduce risk identified by risk assessment as being specific and significant for slings and their components.

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/sub-clause of this Part of EN 13414
1.1.5	Mechanical hazard due to inadequacy of strength	4.1.2.3 4.1.2.5 4.1.2.4 4.3.2	5 and 6 5 and 6 7 7
10.4	Errors of fitting hazard	1.5.4	5

5 Safety requirements and/or measures

5.1 Grommets

5.1.1 Production of grommets

During the production of grommets a temporary rigid core shall be used. Grommets and cable-laid ropes shall be produced using a method which ensures that the rope or strand tensions are equalized and that the finished product is free from visible waviness.

5.1.2 Construction of wire rope grommet

The strand used to form the wire rope grommet shall be one of those used to form ropes specified in table 2, 4, 6, 8, 11, 12 and 13 of AC EN 12385-4:2002 AC.

The length of the circumference shall be at least five times the grommet lay length. The core butt position shall be clearly marked by red paint applied over any serving.

5.1.3 Construction of cable-laid grommet

Cable-laid grommets shall be constructed in accordance with A.1. The unit ropes shall be of 6- or 8-strand construction selected from those specified in tables 2, 3, 4, 5, 6, 7, 8, 11, 12 and 13 of AC EN 12385-4:2002 AC. Ropes over 60 mm diameter shall have steel rope cores.

The length of the circumference shall be at least five times the grommet lay length.

The core butt position shall be clearly marked by red paint applied over any servings.

NOTE The grommet should never be bent at this marked position.

5.1.4 Length of grommet

The length of a grommet shall be the length of its circumference, measured along its centreline (see fig 1).

For wire rope grommets the tolerance shall be $\pm 1d$ or 1% of the nominal length whichever is the greater.

For cable-laid grommets constructed from unit ropes with a fibre core of $24\text{mm} \leq d \leq 60\text{mm}$ the tolerance shall be $\pm 1d$ or 1% of the nominal length whichever is the greater.

For cable-laid grommets constructed from unit ropes with a steel core of $24\text{mm} \leq d \leq 60\text{mm}$ the tolerance shall be $\pm 1d$ or 1% of the nominal length whichever is the greater.

For cable-laid grommets constructed from unit ropes with a steel core of $66\text{mm} \leq d \leq 696\text{mm}$ the tolerance shall be $\pm 0,5d$ or 0,5% of the nominal length whichever is the greater.

NOTE Two methods of determination of the length of grommets, either by measuring the distance of the bearing points or, more accurately, by measurement of the circumference are described in annex B.

For the measurement process pin sizes shall conform to annex C.

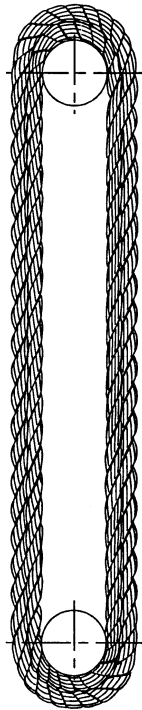


Figure 1 — Wire rope grommet

5.2 Cable-laid slings

5.2.1 Construction of cable-laid sling

Cable-laid slings shall be constructed in accordance with A.2.

The unit ropes used shall be of 6- or 8-strand construction selected from those specified in tables, 2, 3, 4, 5, 6, 7, 8, 11, 12 and 13 of [EN 12385-4:2002](#).

Cable-laid ropes over 60 mm diameter shall have steel rope cores.

If the turn-back loop system for terminations is used, it shall conform to prEN 13411-3. Only unit ropes with a steel core shall be used. Splices shall be made in accordance with annex D.

5.2.2 Length of cable-laid slings

The length, L , of a sling, shall be the internal length between the bearing points of each termination whether they are soft eyes, thimbles, or hooks or links, as appropriate (see figure 2).

NOTE 1 When measuring the actual length of a sling with soft eyes, dimension w should be approximately $\frac{1}{2}h$ (see figure 2) with h being approximately $15d$.

The tolerance of length of ferrule-secured and spliced cable-laid slings shall be $\pm 2d$ or $\pm 1\%$ of the nominal length, whichever is the greater. This applies for diameters $24\text{mm} \leq d \leq 696\text{mm}$.

When measuring length under load, for instance when two or more slings are required to be accurately matched for length, this shall be undertaken at 3 % of the calculated sling breaking force using pins having diameters conforming to Annex C.

NOTE 2 The dimensions of the eye should be selected so that h is approximately $15d$.

5.2.3 Length of matched sets

Where single leg cable-laid slings are intended to be used as matched sets, the difference in length shall not exceed $2d$.

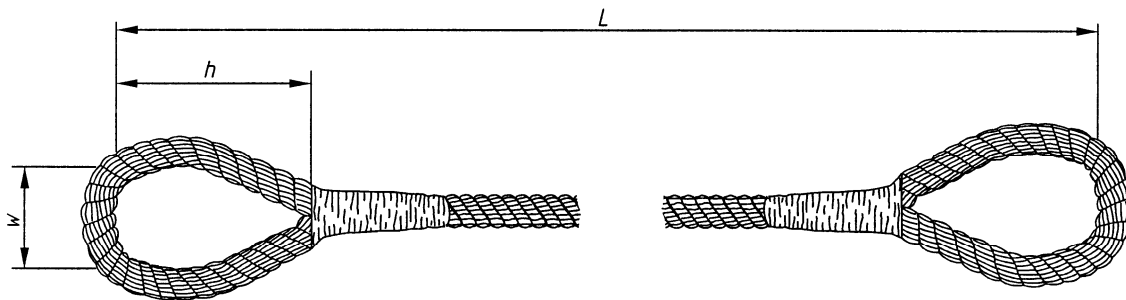


Figure 2 — Cable-laid sling

5.3 Rating

5.3.1 Grommet rating

The working load limit (WLL) of a wire rope grommet shall be calculated as follows:

$$WLL = \frac{2F_{\min_2}}{9,80665 \times Z_p}$$

The WLL of a cable-laid grommet shall be calculated as follows:

$$\boxed{\text{AC}} \ WLL = \frac{12F_{\min_1} \times k}{9,80665 \times Z_p} \ \boxed{\text{AC}}$$

where

F_{\min_1} is the minimum breaking force (in kiloNewtons) of the unit of rope, as specified in EN 12385-4, which is used to form a cable-laid grommet.

F_{\min_2} is the minimum breaking force (in kiloNewtons) of the fibre core rope from which the strand is used to form the wire rope grommet;

NOTE 1 9,806 65 is the constant which converts the force units (kiloNewtons) into the mass units (tonnes) used in lifting operations.

NOTE 2 $\boxed{\text{AC}} \ k \ \boxed{\text{AC}}$ is a factor which allows for the spinning losses in cabling the ropes. Currently this is taken as 0,9. $\boxed{\text{AC}} \ Z_p \ \boxed{\text{AC}}$ is the coefficient of utilization.

For grommet rope diameters less than 60 mm, Z_p shall be not less than 5.

For grommet rope diameters (d) of 60 mm up to 150 mm, Z_p shall be calculated in accordance with the following equation:

$$Z_p = 6,33 - 0,022 d$$

For grommet rope diameters greater than 150 mm, Z_p shall be not less than 3.

5.3.2 Cable-laid sling rating

The WLL of a cable-laid sling shall be calculated as follows:

$$WLL = \frac{\sum F_{min} \times k \times K_T}{9,80665 \times Z_p}$$

where

$\sum F_{min}$ is the sum of the individual minimum breaking forces of the outer ropes (kiloNewtons), as specified in EN 12385-4.

k is a factor which allows for the spinning loss in cabling. Currently this is taken as 0,9.

K_T is a factor which allows for the efficiency of the termination.

9,80665 is the constant which converts the force units (kiloNewtons) into the mass units (tonnes) used in lifting operations.

Z_p is the coefficient of utilization.

For cable-laid sling diameters less than 60 mm, Z_p shall be 5.

For cable-laid sling diameters (d) 60 mm up to 150 mm, Z_p shall be in accordance with the following equation:

$$Z_p = 6,33 - 0,022d.$$

For cable-laid sling diameters greater than 150 mm, Z_p shall be not less than 3.

For the turn-back eye ferrule-secured termination conforming to prEN 13411-3 K_T shall be 0,9 and for spliced terminations K_T shall be 0,8.

6 Verification of the safety requirements and/or measures

6.1 Construction of grommet and cable-laid sling

The requirements of 5.1.2, 5.1.3, 5.2.1 and annexes A and D shall be confirmed by visual inspection, measurement and by examination of the rope supplier's records.

6.2 Length of grommet and cable-laid sling

The lengths defined in 5.1.4, 5.2.2 and 5.2.3 shall be measured with a steel tape graduated in increments of 1 mm.

The grommet length shall be verified in accordance with annex B.

6.3 Rating

The calculation of 5.3 shall be verified by a re-check and by examination of the rope supplier's records.

7 Information for use

7.1 Marking

Each sling or grommet shall be legibly and durably marked with at least the following information

- a) the manufacturer's identifying mark;
- b) numbers and/or letters identifying the sling or grommet with the certificate conforming to 7.2;
- c) the working load limit;
- d) any statutory marking.

NOTE Within the European Union this means CE marking

Each completed sling or grommet shall be permanently marked so that it can be identified with its Certificate (see annex E).

7.2 Certification

A certificate in accordance with annex E for a grommet sling or annex F for a cable-laid sling shall be completed for each sling or batch of slings.

Annex A (normative)

Combination of lay factors for grommets and cable-laid slings

A.1 Grommets

A.1.1 General

Grommets shall be manufactured in accordance with the following combinations of unit rope and grommet lay factors.

A.1.2 Lay factors

The unit rope lay factor shall be at least 6 times the nominal rope diameter and at most 7,5 times the nominal rope diameter.

The grommet shall be at least 6 times the nominal grommet diameter and at most 7,5 times the nominal grommet diameter.

A.2 Cable-laid slings

A.2.1 General

The cable-laid rope shall be manufactured in accordance with the following combinations of unit rope and cable-laid rope lay directions and lay factors.

A.2.2 Lay directions and type

The core unit rope shall be right- or left-hand ordinary lay or right- or left-hand Lang lay.

The diameter of the core rope shall be at least 10 %, but not greater than 15 %, larger than the diameter of the main rope.

The outer unit ropes shall be left-hand ordinary lay or Lang lay, in which case the cable-laid rope shall be right-hand lay; or the outer unit ropes shall be right-hand ordinary lay or Lang lay, in which case the cable-laid rope shall be left-hand lay.

Core unit rope and the outer unit ropes shall have the same direction of lay.

A.2.3 Lay factors

The core unit and outer unit ropes shall have a lay factor which is a minimum of six times the nominal rope diameter and a maximum of 7.5 times the nominal rope diameter.

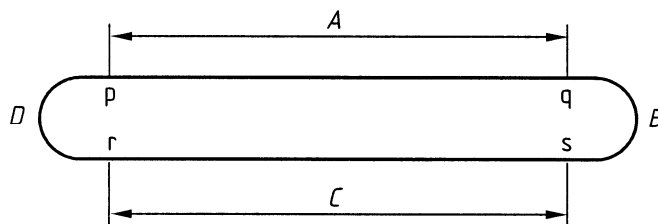
Cable-laid rope shall have a lay factor which is a minimum of 6 times the nominal cable-laid rope diameter and a maximum of 7,5 times the nominal cable-laid rope diameter.

Annex B (normative)

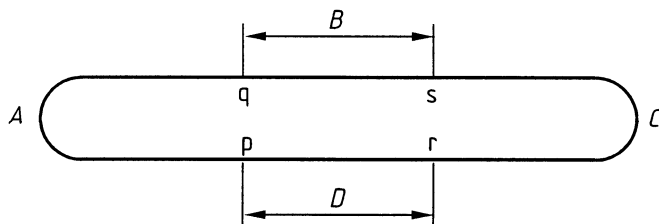
Determination of the length of a grommet

B.1 Method of measuring the actual length (circumference) of a grommet

Arrange the grommet as shown in figure B.1(a) and mark four spots on the centreline as at p, q, r and s. Measure portions A and C and then re-arrange the grommet so that portions B and D may be measured as in figure B.1(b). The length of the grommet will be the summation of A, B, C and D.



AC a) AC



AC b) AC

Figure B.1 — Method of measuring length (circumference) of a grommet .

B.2 Method of calculating the required length

The length of a grommet (see figure B.2) can be specified in the following ways depending on the required accuracy.

If the bending radii are known the following calculation can be done:

The length of the centreline around the bending radius is:

$$\pi \left(R_2 + \frac{d}{2} \right) \text{ and } \pi \left(R_3 + \frac{d}{2} \right)$$

where:

d is the nominal diameter of the sling

The total length of the centreline (AC L AC) will be:

$$\pi (R_2 + R_3 + d) + 2L_1$$

given that : $L_2 = L_1 + R_2 + R_3$

where L_2 is the bearing length;

the length of the centreline (\overline{AC} L \overline{AC}) can be defined as:

$$\pi(R_2 + R_3 + d) + 2(L_2 - R_2 - R_3)$$

NOTE 1

$$L_3 = L_2 + d$$

$$L_1 = L_2 - (R_2 + R_3)$$

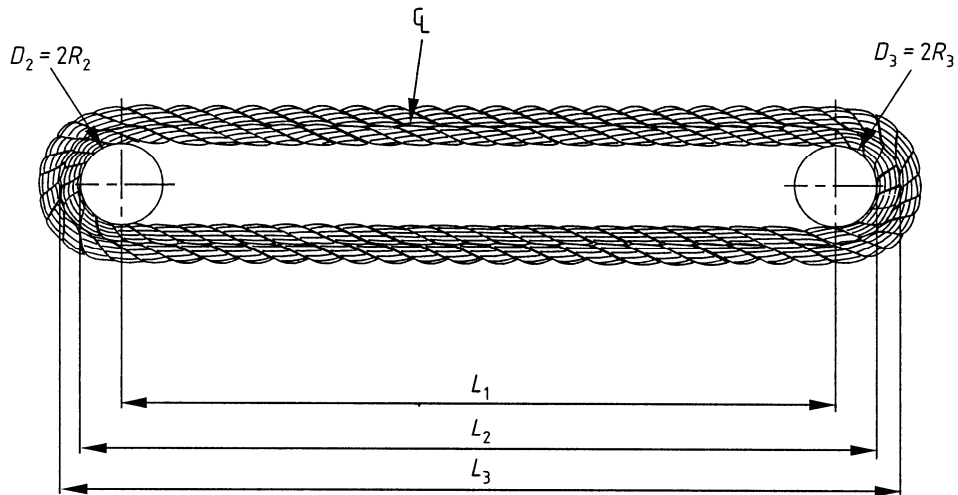


Figure B.2 — Length of a grommet.

Annex C
(normative)

Pin sizes for measurements of lengths

The diameters of pins used in measurements of actual lengths shall either be in accordance with table C.1 or as agreed between supplier and purchaser.

Table C.1 — Pin diameters for length measurements

Rope diameter mm	Pin diameter mm
60 to 150	300
151 to 250	500
251 to 375	750
376 to 500	1000

Annex D (normative)

Hand splices

Hand splices shall be made by either of the following methods.

- a) A cross tuck splice which consists of at least five tucks (not including the start) consisting of at least three tucks with the complete outer unit ropes. These tucks shall be over one and under two against the lay of the rope, except that the first tuck only of any one unit rope may be with the lay.
- b) At least six tucks (not including the start) consisting of five tucks with the complete outer unit rope with the lay of the rope, and one tuck with the complete outer unit rope against the lay of the rope. The sixth tuck shall be made with one half of the strands from the outer unit ropes or with half of the outer unit ropes. All tucks shall be over one and under two.

The core shall be split and shall be worked in with the splice and not cut out. A length of tail at least three times the diameter of the cable-laid rope shall be left after the last tuck and seized to the main body of the rope.

The minimum length between the last tucks of the splices shall, in all cases, be at least $15d$, where d is the nominal diameter of the cable-laid rope forming the sling. If the sling body is to be doubled, then this minimum length shall be agreed by the interested parties but not be less than $20d$.

Annex E (normative)

Certificate for grommets

A certificate shall be supplied with each grommet or batch of grommets. This shall identify the grommet(s) with the certificate and include a statement that the grommet conforms to this European standard.

The certificate shall contain at least the following information.

- a) Name and address of maker or $\overline{A_1}$ where applicable the authorized representative $\overline{A_1}$ of grommet
- b) Identification number of grommet
- c) WLL
- d) Nominal diameter
- e) Direction of lay of grommet
- f) Nominal mass of grommet
- g) Nominal length or circumference \overline{AC} (L) \overline{AC}
- h) Description of the grommet including all components parts
 \overline{AC} *deleted text* \overline{AC}
- i) \overline{AC} Actual length or circumference (L_m) \overline{AC}
- j) Actual diameter \overline{AC} (d_m) \overline{AC}
 \overline{AC} *deleted text* \overline{AC}
- k) Pin diameter \overline{AC} (D) \overline{AC} (if specified by purchaser)
- l) Measuring load (if specified by purchaser)

Annex F (normative)

Certificate for cable-laid slings

A certificate shall be supplied with each sling or batch of slings. This shall identify the sling(s) with the certificate and include a statement that the sling conforms to this European standard.



The certificate shall contain at least the following information.

- a) Name and address of maker or $\boxed{A_1}$ where applicable the authorized representative $\boxed{A_1}$ of sling
- b) Identification number of sling
- c) WLL
- d) Nominal diameter
- e) Direction of lay of sling
- f) Nominal mass of sling
- g) Nominal length or circumference \boxed{AC} (L) \boxed{AC}
- h) Description of the sling including all components parts
 \boxed{AC} *deleted text* \boxed{AC}
- i) Actual length \boxed{AC} (L_m) \boxed{AC} . (State whether under load or no load)
- j) Actual diameter \boxed{AC} (d_m) \boxed{AC}
- k) Eye length \boxed{AC} (h_1) \boxed{AC}
- l) Eye length \boxed{AC} (h_2) \boxed{AC}
- m) \boxed{AC} Approximate splice length from beginning of eye to last tuck – splice 1 \boxed{AC}
- n) \boxed{AC} Approximate splice length from beginning of eye to last tuck – splice 2 \boxed{AC}
- o) \boxed{AC} Tail length – splice 1
Tail length – splice 2 \boxed{AC}
- p) Length between last tucks \boxed{AC} *deleted text* \boxed{AC}
- q) Pin diameter \boxed{AC} (D) \boxed{AC} (if specified by purchaser)
- r) Measuring load (if specified by purchaser)

Annex G
(informative)

Tables of working load limits

AC Table G.1 – Working load limits for cable-laid grommet slings made of wire ropes with steel cores of classes 6 x 19 and 6 x 36 **AC**

	AC Endless sling (Cable-laid grommet) AC	
Angle to vertical	0°	0°
	direct	choke hitch
AC Nominal diameter of cable-laid grommet AC		
mm	t	t
24	9,00	7,00
27	11,5	9,00
30	14,0	11,0
33	17,0	13,5
36	20,0	16,0
39	23,5	19,0
42	27,0	21,5
48	35,5	28,5
54	45,0	36,0
60	55,5	44,5
AC Rating factor AC	AC 1 AC	AC 0,8 AC

AC Table G.2 – Working load limits for cable-laid grommet slings made of wire ropes with steel cores of class 6 x 36 **AC**


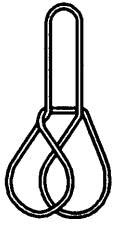

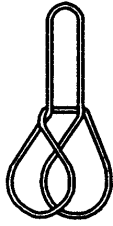
	AC Endless sling (Cable-laid grommet) AC	
Angle to vertical	0°	0°
	direct	choke hitch
Working load limits (WLL)		
AC Nominal diameter of cable-laid grommet AC		
mm	t	t
66	69,0	55,0
72	84,0	68,0
78	102	81,0
84	121	97,0
90	144	115
96	168	135
102	196	157
108	227	182
114	262	210
120	300	240
126	344	275
132	392	314
144	505	404
AC Rating factor AC	AC 1 AC	AC 0,8 AC

Table G.3 – Working load limits for cable-laid grommet slings made of wire ropes with steel cores of class 6 x 36 and large diameter ropes

	Endless sling (Cable-laid grommet)	
Angle to vertical	0°	0°
	direct	choke hitch
Working load limits (WLL)		
Nominal diameter of cable-laid grommet		
mm	t	t
156	700	-
162	750	-
168	800	-
174	850	-
180	900	-
192	1 000	-
216	1 250	-
240	1 500	-
258	1 750	-
282	2 000	-
300	2 250	-
318	2 500	-
354	3 000	-
384	3 500	-
414	4 000	-
444	4 500	-
474	5 000	-
504	5 500	-
528	6 000	-
552	6 500	-
576	7 000	-
600	7 500	-
624	8 000	-
648	8 500	-
672	9 000	-
696	9 500	-
Rating factor	1	0,8

AC Table G.4 – Working load limits for cable-laid grommet slings made of wire ropes with fibre cores of classes 6 x 19 and 6 x 36 **AC**


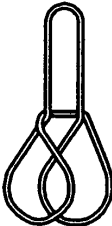
	AC Endless sling (Cable-laid grommet) AC	
Angle to vertical	0°	0°
	direct	choke hitch
Working load limits (WLL)		
AC Nominal diameter of cable-laid grommet AC		
mm	t	t
24	8,25	6,50
27	10,5	8,50
30	11,5	9,00
33	14,0	11,0
36	16,5	13,0
39	19,5	15,5
42	22,5	18,0
48	30,0	23,5
54	37,5	30,0
60	46,0	37,0
AC Rating factor AC	AC 1 AC	AC 0,8 AC

Table G.5 — Working load limits for cable-laid slings made of wire ropes with steel core of classes 6 x 19 and 6 x 36 with ferrule secured eye terminations


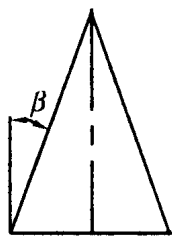
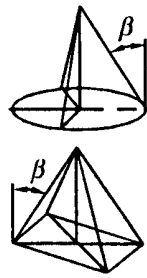
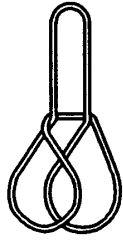
	One-leg sling	AC Two-leg-sling AC		AC Three- and four-leg-sling AC		Endless sling
Angle to vertical	AC 0°	0° to 45°	over 45° to 60°	0° to 45°	over 45° to 60°	0° AC
	direct	direct	direct	direct	direct	choke hitch
Working load limits (WLL)						
AC Nominal diameter of cable-laid sling AC						
mm	t	t	t	t	t	t
24	3,75	5,25	3,75	8,00	5,50	6,00
27	4,75	6,65	4,75	10,0	7,00	7,50
30	6,50	9,00	6,50	13,0	9,50	10,0
33	7,50	10,5	7,50	16,0	11,5	12,0
36	9,00	12,5	9,00	19,0	13,5	14,5
39	10,5	15,0	10,5	22,5	16,0	17,0
42	12,5	17,5	12,5	25,0	18,5	20,0
48	16,0	22,5	16,0	34,0	24,0	26,0
54	20,5	28,5	20,5	43,0	30,5	32,5
60	25,0	35,5	25,0	53,0	38,0	40,0
AC Rating factor AC	1	1,4	1	2,1	1,5	1,6

Table G.6 — Working load limits for cable-laid slings made of wire ropes with steel core of classes 6 x 19 and 6 x 36 with spliced eye terminations


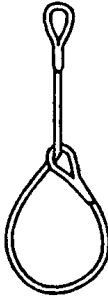

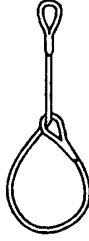

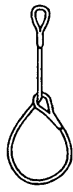
	One-leg sling	
	0°	0°
Angle to vertical	direct	choke hitch
Working load limits (WLL)		
^{AC} Nominal diameter of cable-laid sling ^{AC}		
mm	t	t
24	3,35	2,65
27	4,25	3,50
30	5,50	4,50
33	7,00	5,50
36	8,00	6,50
39	9,50	7,50
42	11,0	9,00
48	14,5	11,5
54	18,0	14,5
60	22,5	18,0
^{AC} Rating factor ^{AC}	1	0,8

Table G.7 — Working load limits for cable-laid slings made of wire ropes with steel core of class 6 x 36 with spliced eye terminations

	One-leg sling	
	0°	0°
	direct	choke hitch
	Working load limits (WLL)	
^{AC} Nominal diameter of cable-laid sling ^{AC}		
mm	t	t
66	28,0	22,0
72	34,0	27,0
78	41,0	33,0
84	49,0	39,0
90	58,0	47,0
96	68,0	55,0
102	79,0	64,0
108	92,0	74,0
114	106	85,0
120	122	97,0
126	139	111
132	158	127
144	204	163
^{AC} Rating factor ^{AC}	1	0,8

AC Table G.8 – Working load limits for cable-laid slings made of wire ropes with steel core of class 6 x 36 and large diameter ropes with spliced eye terminations **AC**

Angle to vertical	One-leg sling	
	0°	0°
	direct	choke hitch
Working load limits (WLL)		
AC Nominal diameter of cable-laid sling AC		
mm	t	t
150	230	185
156	250	200
162	270	220
168	290	235
174	315	250
180	335	270
192	410	330
204	460	365
216	510	405
228	555	445
240	610	490
252	665	530
264	720	580
276	780	625
288	840	675
300	900	725
312	970	775
336	1 100	885
360	1 250	1 000
384	1 400	1 100
408	1 550	1 250
432	1 700	1 400
456	1 880	1 500
480	2 050	1 650
504	2 250	1 800
528	2 450	1 950
552	2 600	2 100
576	2 800	2 250
600	3 000	2 400
624	3 200	2 550
648	3 400	2 750
672	3 650	2 900
696	3 850	3 100
AC Rating factor AC	1	0,8

Annex ZA
(informative)

Ⓐ Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC amended by 98/79/CE on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING - Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. Ⓐ

Annex ZB (informative)

A1 Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING - Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. **A1**

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