BRITISH STANDARD

BS EN
12385-7:2002

Steel wire ropes — Safety —

Part 7: Locked coil ropes for mine shafts

The European Standard EN 12385-7:2002 has the status of a British Standard

ICS 77.140.65

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 12385-7:2002.

The UK participation in its preparation was entrusted to Technical Committee MHE/2, Wire ropes, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 30 October 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 14, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

© BSI 30 October 2002

ISBN 0 580 40658 X

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12385-7

October 2002

ICS 77.140.65

English version

Steel wire ropes - Safety - Part 7: Locked coil ropes for mine shafts

Câbles en acier - Sécurité - Partie 7: Câbles clos d'extraction pour puits de mine

Drahtseile aus Stahldraht - Sicherheit - Teil 7: Verschlossene Spiralseile für Schachtförderanlagen des Bergbaus

This European Standard was approved by CEN on 28 March 2002.

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.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

© 2002 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 12385-7:2002 E

Contents

page

Foreword

This document (EN 12385-7:2002) 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 April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

The other Parts of EN 12385 are:

- Part 1: General requirements
- Part 2: Definitions, designation and classification
- Part 3: Information for use and maintenance
- Part 4: Stranded ropes for general lifting applications
- Part 5: Stranded ropes for lifts
- Part 6: Stranded ropes for mine shafts
- Part 8: Stranded hauling and carrying-hauling ropes for cableway installations designed to carry persons
- Part 9: Locked coil carrying ropes for cableway installations designed to carry persons
- Part 10: Spiral ropes for general structural applications

Part 1 provides the general requirements of Parts 4 to 10.

This is the first edition of this Part.

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.

Introduction

During the preparation of this standard, it was assumed that a negotiation would take place between the purchaser and the manufacturer concerning the intended purpose of the rope.

Specifiers, purchasers and users should recognise that locked coil ropes for mine shafts are, more often than not, specially designed by the rope manufacturer to meet particular shaft conditions and machinery requirements.

1 Scope

This Part of this European Standard specifies the particular materials, manufacturing and testing requirements for full-locked coil hoist and half-locked and full-locked coil guide ropes for mine shafts.

The particular hazards covered by this Part are identified in Clause 4.

For information only, typical breaking forces for both full-locked coil hoist ropes and half-locked and full-locked coil guide ropes, based on one particular combination of wire tensile strength grades in each case, are given in annex A (hoist ropes) and annex B (guide ropes) for some of the more common sizes.

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 292-2:1991/A1:1995, *Safety of machinery – Basic concepts – General principles for design – Part 2: Technical principles and specifications (Amendment 1).*

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

EN 10264-3, *Steel wire and wire products – Steel wire for ropes – Part 3: Cold drawn and cold shaped non-alloyed steel wire for heavy duty applications.*

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

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

ISO 4346, *Steel wire ropes for general purposes – Lubricants – Basic requirements.*

DIN 21258:1986, *Preservative compounds for koepe friction drive winding ropes in mining – Safety requirements and testing.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions in EN 12385-2 apply.

4 List of hazards

For the purposes of this Part the hazards identified in clause 4 of Part 1 apply.

5 Safety requirements and/or measures

5.1 General

In addition to the requirements given in 5.2 to 5.8, the requirements shall also conform to those given in Part 1 of this standard.

5.2 Materials

5.2.1 Wire

Wires before ropemaking shall conform to:

a) EN 10264-3 for full-locked coil hoist ropes and

b) annex A for locked coil guide ropes.

The tensile strength grades of shaped wires of full-locked coil hoist ropes shall be in accordance with Table 1, with the exception that the centre wire may be of a lower grade. In this case it shall have torsion and bend values not less than those given for 1570 grade:

Table 1 — Tensile strength grades of wires

Round wire N/mm^2	**Shaped wire** N/mm^2
1570	1270
1770	1370
1860	1470
1960	1570
—	1670
—	1770

The tensile strength grades of all wires of half-locked and full-locked coil guide rope shall be 780, 880, 980, 1080, 1180, 1270, 1370 or 1470 N/mm^2. The tensile strength tolerance for wire for guide ropes shall not exceed +250 N/mm^2.

5.2.2 Lubricant

The lubricant(s) shall comply with ISO 4346.

The lubricant(s) for friction hoist ropes shall comply with DIN 21258, taking account of:

a) the coefficient of friction between the rope and the drive sheave; and

b) the compatibility of the lubricant with the respective sheave linings.

NOTE The purchaser should specify any particular lubricant requirements (see introduction).

5.3 Rope manufacture

5.3.1 Wire finish

The finish of the wires shall be bright, zinc coated class D or a combination of both provided that in any one layer the finish is the same.

5.3.2 Lubrication

Ropes shall be lubricated at each closing operation except for full-locked coil friction hoist ropes.

NOTE The purchaser should specify any particular lubrication requirements (see Introduction).

5.3.3 Construction

5.3.3.1 Full-locked coil hoist rope

The rope shall consist of one outer layer of full-lock wires laid over an underlying layer of half-lock and round wires and a strand centre of round wires.

NOTE 1 For the larger sizes of rope there can be more than one layer of half-lock and round wires.

NOTE 2 For practical manufacturing reasons the actual number of wires in the outer layer can vary but should not do so by more than one wire from that specified by the manufacturer.

5.3.3.2 Half-locked coil guide rope

The rope shall consist of an outer layer of alternate half-lock and round wires laid over an inner layer or layers of round wires, all laid over a centre wire.

For rope sizes up to and including 41 mm in rope grades up to and including 1080, the outer wire size (i.e. the height of the shaped wire and the diameter of the round wire) shall not be less than 17,5 % of the nominal rope diameter.

For ropes in excess of 41 mm diameter in rope grades above 1080, the minimum height of the shaped wire shall be 7,6 mm.

The diameter of the round wire in the outer cover shall be within ± 10 % of the height of the shaped wire.

5.3.3.3 Full-locked coil guide ropes

The rope shall consist of an outer layer of full-lock wires laid over an underlaying layer of half-lock and round wires and a strand centre of round wires.

5.4 Diameter

5.4.1 Tolerances

When measured in accordance with 6.3.1 of EN 12385-1:2002 the measured diameter shall be within ± 2 % of the nominal diameter.

NOTE Specifiers, purchasers and users should recognize that locked coil ropes for mine shafts are, more often than not, specially designed by the rope manufacturer to meet particular shaft conditions and machinery requirements and particular attention should be given to the selection of the correct size of rope and associated diameter tolerance.

5.4.2 Difference between diameter measurements

The difference between any two of the four measurements taken in accordance with 6.3.1 of EN 12385-1:2002 shall not exceed 4 % of the nominal rope diameter.

5.5 Breaking force

Only the minimum breaking force shall be specified as the breaking force.

The specified minimum value for a given rope size, construction and combination of wire tensile strength grades shall be determined by the rope manufacturer.

NOTE Typical minimum values of breaking force for full-locked coil hoist ropes, half-locked and full-locked coil guide ropes with one particular combination of wire tensile strength grades are given in annex B. The combination for hoist ropes is based on an outer full-lock wire of tensile strength grade 1270, an inner half-lock wire of tensile strength grade 1470 and inner round wires of tensile strength grade 1860 and for guide ropes is based on an outer half-lock of tensile strength grade 780 and round wires of tensile strength grade 880. Depending on the manufacturer's actual rope design, higher or lower values than those given in annex B can be specified.

Unless stated otherwise by the manufacturer, the spinning loss factor used in the determination of minimum breaking force shall be 0,835 for full-locked coil hoist ropes and 0,925 for half-locked coil guide ropes.

The manufacturer shall carry out a breaking force test in accordance with Method 1 as described in 6.4.1 of EN 12385-1:2002 on a sample of rope from each production length.

5.6 Length

The actual length of rope shall not be less than the specified length, nor shall it exceed it by more than 2 %.

5.7 Length mass

The nominal length mass shall be specified by the manufacturer.

When measured in accordance with clause 6 the measured length mass shall be in accordance with the specified value, subject to a tolerance of ± 4 %.

5.8 Designation and classification

Rope designation and classification shall conform to EN 12385-2.

6 Verification of safety requirements and/or measures

6.1 General

Verification of safety requirements and/or measures shall be in accordance with that given in clause 6 of EN 12385-1 and the additional verification given in 6.2 to 6.5 below.

6.2 Lubricant

Compliance with the lubricant requirements shall be through a visual verification of the inspection documents supplied with the lubricant.

6.3 Lubrication

Compliance with the lubrication requirements shall be through a visual verification.

6.4 Construction

Compliance with the construction requirements shall be through a visual verification.

6.5 Length mass

The measured length mass shall be determined by one of the following methods:

a) the gross mass of rope, reel and ancillary items shall be measured. The mass of reel and ancillary items shall be subtracted from this value to give the rope mass. The rope mass shall be divided by the measured rope length on the closing machine; or,

b) a sample of rope shall be weighed and divided by the measured length of the rope sample.

7 Information for use

In addition to conforming to clause 7 of Part 1, the Certificate (see 7.2.2 of Part 1) shall also state the measured diameter; the measured breaking force; and the measured length mass.'

The reel dimensions (flange diameter, width and borehole) shall also be stated on the Certificate.

NOTE If the results of any post-spin testing (e.g. in respect of diameter, tensile strength, reverse bend, torsion or zinc coating) are required to be given, these can be included on the certificate.

Annex A
(normative)
Properties of wires for guide ropes before ropemaking

Table A.1 — Tolerance on diameter of bright and zinc coated round wires

Nominal diameter	Tolerances on diameter
mm	mm
$4,5 \leq \delta < 5,4$	$\pm$ 0,03
$5,4 \leq \delta < 7,0$	$\pm$ 0,04
$7,0 \leq \delta < 9,91$	$\pm$ 0,05

Table A.2 — Minimum number of reverse bends for bright and zinc coated round wires for half-locked and full-locked coil guide ropes

Nominal diameter	Bend radius	Minimum number of reverse bends			
		Tensile strength grade of wires N/mm^2			
		780, 880, 980, 1080		1180, 1270	
mm	mm	Bright	Zinc coated	Bright	Zinc coated
$4,50 \leq \delta < 5,11$	10	6	5	5	4
$5,11 \leq \delta < 5,71$	15	6	5	5	4
$5,71 \leq \delta < 6,61$	15	5	4	4	3
$6,61 \leq \delta < 8,11$	20	5	4	4	3
$8,11 \leq \delta < 8,71$	20	4	3	3	2
$8,71 \leq \delta < 9,21$	20	3	2	—	—
$9,21 \leq \delta < 9,91$	20	2	1	—	—

Table A.2 — Minimum number of reverse bends for half-lock wires

Nominal height of half-lock wire	**Bend radius**	**Minimum number of reverse bends**							
		Tensile strength grade of wire N/mm^2							
		780, 880, 980, 1080				**1180, 1270**			
mm	mm	**Bright**		**Zinc coated**		**Bright**		**Zinc coated**	
		Narrow	Broad	Narrow	Broad	Narrow	Broad	Narrow	Broad
$5{,}0 \leq h < 5{,}5$		7	6	6	5	6	5	5	4
$5{,}5 \leq h < 6{,}0$		7	6	6	5	6	4	5	3
$6{,}0 \leq h < 6{,}5$	15,0	6	5	5	4	5	4	4	3
$6{,}5 \leq h < 7{,}0$		5	4	4	3	4	3	3	2
$7{,}0 \leq h < 7{,}5$		3	2	2	1	3	2	2	1
$7{,}5 \leq h < 8{,}0$		5	4	4	3	4	3	3	2
$8{,}0 \leq h < 8{,}5$		5	4	4	3	3	2	2	1
$8{,}5 \leq h < 9{,}0$	20,0	4	3	3	2	-	-	-	-
$9{,}0 \leq h < 9{,}5$		4	3	3	2	-	-	-	-
$9{,}5 \leq h \leq 10{,}0$		4	3	3	2	-	-	-	-

NOTE When the ratio of nominal height to waist is not more than 1,9:1, the wire is described as "broad" section. When the ratio is greater, the wire is described as "narrow" section.

Annex B
(informative)
Minimum breaking forces

Table B.1 — Typical minimum breaking forces and nominal length masses for full-locked coil hoist ropes

Nominal diameter mm	**Nominal length mass** kg/100 m	**Minimum breaking force** kN
16	144	207
18	183	261
19	204	292
21	249	356
22	273	391
24	325	466
26	381	546
27	411	589
29	474	679
30	508	728
32	578	827
33	614	880
35	691	997
37	772	1 110
38	814	1 164
40	902	1 290
41	948	1 350
42	995	1 430
43	1 040	1 500
44	1 090	1 560
45	1 140	1 640
46	1 190	1 710
47	1 250	1 780
48	1 300	1 860
51	1 470	2 100
52	1 500	2 170
54	1 640	2 360
56	1 770	2 530
60	2 030	2 880
64	2 310	3 270

NOTE The breaking force values shown in the table are based on a combination of wire tensile strength grades as follows: full-lock wires – 1270; half-lock wires – 1470 and round wires – 1860. Different values to those shown in the tables are also possible.

Table B.2 — Typical minimum breaking forces and nominal length masses for half-locked coil guide ropes

Nominal diameter mm	**Nominal length mass** kg/100 m	**Minimum breaking force** kN
29	463	399
32	563	486
35	674	582
38	794	686
41	925	799
45	1 110	956
48	1 270	1 190
51	1 430	1 240

Table B.3 — Typical minimum breaking forces and nominal length masses for full-locked coil guide ropes

Nominal diameter mm	**Nominal length mass** kg/100 m	**Minimum breaking force** kN
32	608	767
34	687	866
36	770	971
38	858	1 082
40	950	1 198
42	1 048	1 321
44	1 150	1 450
45	1 203	1 517

Annex C
(informative)
Information which should be provided with an enquiry or order

At least the following information should be supplied with an enquiry or order:

C.1 Details of rope

a) Reference to this standard, i.e. EN 12385-7

b) Whether hoist rope or guide rope

c) If hoist rope, whether friction or drum

d) Quantity and length

e) Nominal diameter

f) Wire finish

g) Lay direction

NOTE Hoist ropes are normally manufactured right hand unless specified otherwise by the purchaser.

h) Any particular lubricant and lubrication requirements

i) Any particular wire joint requirements in the outer layer of wires in hoist ropes

NOTE The distance between wire joints in locked coil ropes is given in 5.2.1 of EN 12385-1:2002. The purchaser should specify any particular wire joint requirements.

j) Minimum breaking force

k) Nominal length mass and whether it is to be measured or calculated

l) Any limiting reel dimensions

m) Whether and how a guide rope is required to be tested

C.2 Details of installation

a) Particulars of the shaft:

1) depth - from lowest working level in shaft to bank, vertical distance from bank to head pulley;

2) whether upcast, downcast, or both;

3) whether wet or dry, and approximate range of temperature variation;

4) whether shaft water is known to be of injurious nature, its pH value and chloride content is available.

b) Particulars of hoist drum:

1) if parallel type, give diameter and width, and distance of first and last live turns from centre line of drum;

2) if conical type, give minimum and maximum diameters and distance of first and last working turns from centre line of drum;

3) if cylindro-conical type, give maximum and minimum diameters, distances of first and last live turns from centre line of drum, number of working turns on the minimum diameter, number of turns on the scroll, width of drum and width of scroll and width of parallel portion of drum;

4) nature and arrangement of drum-lagging or cladding material and particulars of any grooving;

5) whether coiling on drum is single or multi-layer and if latter, number of layers.

c) Particulars of friction hoist driving sheave:

1) diameter;

2) rope groove lining material.

d) Particulars of head pulleys and position with reference to the winding engine:

1) horizontal and vertical distances between centres of head pulleys and whether the vertical centre line of or between the pulleys coincides with the centre line of the drum or sheave;

2) diameter of head pulley at bottom of groove;

3) diameter of any guide sheave and its position with respect to the head pulley or driving sheave;

4) height of centre head pulley above centre of drum or ground type driving sheave;

5) horizontal distance between centre of drum or ground type driving sheave and rope hanging in shaft;

6) inside and outside fleet angles.

e) Maximum hoisting/winding speed;

f) Maximum acceleration when raising full load;

g) Maximum load and normal load suspended from winding rope termination including the weight of any balance ropes and their attachments;

h) Type of cage guides.

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright & Licensing Manager. Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553. Email: copyright@bsi-global.com.

BSI
389 Chiswick High Road
London
W4 4AL