

Terminations for steel wire ropes — Safety —

Part 6: Asymmetric wedge socket

The European Standard EN 13411-6:2004 has the status of a
British Standard

ICS 53.020.30; 77.140.99

National foreword

This British Standard is the official English language version of EN 13411-6:2004. It supersedes BS 7166:1989 which is withdrawn.

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.

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This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 7 July 2004

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 23 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

English version

Terminations for steel wire ropes - Safety - Part 6: Asymmetric wedge socket

Terminaisons pour câbles en acier - Sécurité - Partie 6:
Boîte à coin asymétrique

Endverbindungen für Drahtseile aus Stahldraht - Sicherheit
- Teil 6: Asymmetrische Seilschlösser

This European Standard was approved by CEN on 24 March 2004.

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Foreword

This document (EN 13411-6:2004) 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of an identical text or by endorsement, at the latest by December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

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.

Annexes A, B and C are informative.

This document includes a Bibliography.

EN 13411 with the general title *Terminations for steel wire ropes – Safety*, consists of the following parts:

Part 1: Thimbles for steel wire rope slings

Part 2: Splicing of eyes for wire rope slings

Part 3: Ferrules and ferrule-securing

Part 4: Metal and resin socketing

Part 5: U-bolt wire rope grips

Part 6: Asymmetric wedge socket

Part 7: Symmetric wedge socket

This is the first edition of this Part of this European Standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This European Standard is a Type C Standard as stated in EN 1070.

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

Purchasers ordering to this standard are advised to specify in their purchasing contract that the supplier operates an independently verified quality assurance system to ensure themselves that products claimed to comply consistently achieve the required level of quality.

The wedge sockets concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this Type C standard are different from those which are stated in Type A or B standards, the provisions of this Type C standard take precedence over the provisions of the other standards, for asymmetric wedge sockets that have been designed and produced according to the provisions of this Type C standard.

1 Scope

This European Standard specifies the minimum requirements, for asymmetrical wedge socket terminations for stranded steel wire ropes.

Examples of the construction and sizes of two separate designs of asymmetric wedge sockets are given in informative annexes A and B.

The informative annex C gives recommendations for safe use and inspection.

This European Standard deals with all significant hazards, hazardous situations and events relevant to asymmetric wedge sockets for terminations for steel wire ropes, when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

This standard applies to terminations of steel wire ropes with asymmetrical wedge sockets which are manufactured after the date of its publication.

This standard does not cover rope fatigue.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 1369: 1996, *Founding - Magnetic particle inspection*.

EN 1371-1:1997, *Founding – Liquid penetrant inspection – Part 1: Sand, gravity die and low pressure die castings*.

EN 10045-1, *Metallic materials - Charpy impact test – Part 1: Test method*.

EN 12385-2:2002, *Steel wire ropes - Safety - Part 2: Definitions, designation and classification*.

EN 45012, *General requirements for bodies operating assessment and certification/registration of quality systems (ISO/IEC Guide 62:1996)*.

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines (ISO 7500-1:1999)*.

EN ISO 12100-2:2003, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles and specifications (ISO 12100-2:2003)*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12385-2:2002 and the following apply.

3.1

asymmetric wedge socket

assembly consisting of a socket body, wedge, and pin; when assembled the centre line of the pin is directly in line with the longitudinal axis of the live portion of the rope

3.2**socket body**

principal component of a wedge socket termination having an internal tapered form (see Figure 1) suitable for receiving a wedge (see 3.3) and the rope with which the wedge is associated

3.3**wedge**

flat tapered component with peripheral groove, suitable for fitting into a tapered socket body to accommodate a rope of matching nominal diameter, see Figure 1

3.4**pin**

removable component intended to facilitate connection of the socket body to its anchorage point

3.5**lot**

number of asymmetric wedge sockets from which samples are selected for testing purposes which are of the same type and dimension, each of their constituent components manufactured during the same production run from material of the same cast and subjected to the same heat treatment process

4 List of significant hazards

This standard contains all the significant hazards, hazardous situations and events, as far as they have been dealt with in this standard, identified by risk assessment as significant for this type of steel wire rope termination which require action to eliminate or reduce the risk.

In particular hazards caused by accidental release of a load, or release of a load due to failure of an asymmetric wedge socket puts at risk, either directly or indirectly, the safety or health of those persons within the hazard zone.

Errors in the fitting of accessories can also lead to premature failure and this standard contains dimensional requirements to allow correct fit.

Table 1 contains those hazards that require action to reduce risk identified by risk assessment as being specific and significant for asymmetric wedge sockets.

Table 1 — Hazards and associated requirements

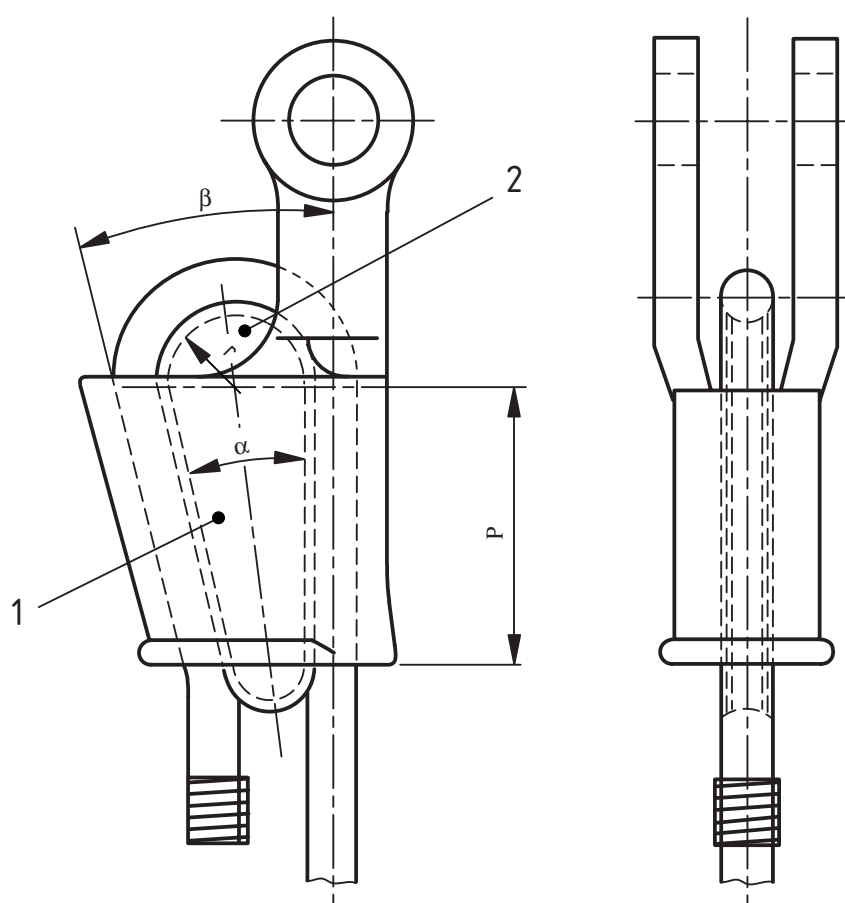
Hazards identified in annex A of EN 1050:1996		Relevant clause of annex A of EN ISO 12100-2:2003	Relevant clause/ subclause of this Part of EN
1.1.5	Mechanical hazard due to inadequacy of strength	1.3.1	5
		4.1.2.3	5
		4.1.2.4	5
		4.2.4	7
		4.3.2	7
1.3	Cutting or severing hazard	1.3.4	7
15	Errors of fitting	4.3.2	7

5 Safety requirements and/or measures

5.1 Geometry of wedge and socket body

Asymmetric wedge socket termination's for ropes shall conform to the following geometrical criteria (see Figure 1):

- The longitudinal axis of the live portion of the rope shall be perpendicular to the longitudinal axis of the pin.
- The difference between the wedge angle (α) and the socket angle (β) shall be not greater than 2° .
- The internal side surfaces of the socket body and the wedge in contact with the rope shall be straight.
- The clamping length between socket body and the wedge in contact with the live portion of the rope shall be a minimum length (P) equal to 4,3 times the nominal rope diameter.
- The rope groove in the socket body and the wedge shall not exhibit protrusions, marks or casting joints that would affect the intimate contact with the rope.



Key

- 1 Socket body
- 2 Wedge

Figure 1 – Functional dimensions (pin and securing means not shown)

5.2 Security of the pin

The pin shall be provided with a means for securing it in position when in operation.

5.3 Mechanical properties

5.3.1 Termination and wedge security

When tested in accordance with 6.2.2 the assembled and loaded termination, after initial settlement, shall during the noted two minute period exhibit no further movement between the rope and the termination, monitored either as movement of the tail of the rope, or as relative movement between the rope and the wedge.

After release of the specified load when tested in accordance with 6.2.2 no relative movement shall occur between the wedge and socket body.

5.3.2 Manufacturing proof force and deformation test

When tested in accordance with 6.2.3 and 6.3.1, the socket body arms and pin shall show no sign of permanent deformation.

5.3.3 Fatigue behaviour of the socket body and pin

When tested in accordance with 6.2.4 the socket body and pin shall not exhibit any indications of cracks after 75000 load cycles.

The socket shall also exhibit no sign of local permanent deformation in the pin eye holes.

5.3.4 Termination efficiency

When tested in accordance with 6.2.5 the efficiency of the assembled termination shall be at least 80% of the minimum breaking force of the rope.

5.3.5 Low temperature properties

The materials of the socket, body and pin when tested in accordance with 6.2.6 shall possess minimum low temperature ductility and toughness qualities at -20°C as follows:

- Steel socket body and/or pin:

Minimum average Charpy impact value of 27 J, with no individual value less than 18 J.

- Spheroidal graphite cast iron and any other cast irons: socket body:

Minimum average Charpy impact value of 12 J, with no individual value less than 9 J.

6 Verification of safety requirements

6.1 Qualifications of personnel

All testing and examination shall be carried out by a competent person.

6.2 Type testing

6.2.1 General

Two type tests shall be carried out for each requirement, in accordance with 6.2.2 to 6.2.5, on assembled terminations of each design, material and method of manufacture, using the highest minimum breaking force of rope for which the socket is designed.

If the four requirements tests are carried out using the same socket body, wedge and pin, they shall be conducted in the order of termination and wedge security, deformation, fatigue and tensile efficiency testing, renewing the rope as necessary.

The testing machine shall conform to the requirements of EN ISO 7500-1.

If the dimensional criteria or the chemical composition, or heat treatment of the socket body and pin are subsequently varied outside the usual manufacturing tolerances, the type tests shall be repeated.

6.2.2 Termination and wedge security test

Subject the assembled termination to a load of 20% of the minimum breaking force of the rope, sustain this load for an initial period to allow settlement of the termination, then continue to sustain for a further 2 min before removing the load.

6.2.3 Deformation test

The termination shall be further loaded until this load reaches a value equal to 40% of the minimum breaking force of the rope. The load shall then be removed, the termination dismantled and the socket body and pin examined for permanent deformation.

6.2.4 Fatigue test

The test shall be carried out on an in-line tensile fatigue machine. The termination shall be prevented from rotating and the test shall consist of the application of the cycle force from 15% to 30% of the minimum breaking force of the rope along the rope axis for 75000 cycles.

The frequency of the force shall not exceed 5 Hz.

The component parts shall be submitted to either dye penetrant or magnetic particle inspection in accordance with EN 1369 or EN 1371-1 both before and after the fatigue test to enable any crack initiation and propagation as a result of fatigue to be readily identified.

NOTE More than one rope may be required to enable the socket body to achieve 75000 cycles.

6.2.5 Tensile efficiency test

Subject the assembled termination to an initial load of 60% of the minimum breaking force of the rope, then increasing this load at a rate of not more than 0,5% of the breaking force per second. The test shall be continued until either rope slip or breakage occurs.

If terminations are tested in pairs, the distance between the inner faces of the socket bodies shall be at least 30 d.

6.2.6 Charpy impact test

Charpy V-notch impact tests shall be carried out in accordance with EN 10045-1 on materials of socket bodies and pins of all sizes.

Three samples shall be tested at a temperature of -20 °C.

For tests where the size of socket body is too small to provide a suitable test piece, tests may be carried out on sample material which shall be of the same specification and heat treatment.

6.2.7 Acceptance criteria for type testing

6.2.7.1 Termination and wedge security, deformation, fatigue and efficiency tests

Should one sample fail these tests, and on examination it is found to be due to a material defect in the socket body or pin, the manufacturing process shall be re-examined and amended to eliminate such defects. After which a further two terminations of the same size, design and material content shall be tested. If these pass, then the termination shall be deemed to have passed the type test.

If one or both fail the re-test, or one or both terminations fail the original tests due to its design, the terminations shall be deemed to have failed the type test.

6.2.7.2 Charpy impact tests

If the average of the three test values and the three individual test values are equal to or greater than the values specified in 5.3.5 the wedge socket of the size submitted for type testing shall be deemed to conform to this European Standard.

If one sample fails to meet the specified individual value or if the average of the three individual values fails to meet the specified average value, two further samples shall be taken and both shall pass the individual value test and the average of the five samples shall pass the average test in order for the respective component of the size submitted for type testing to be deemed to conform to this European Standard.

If two or three samples fail to meet the specified individual value, the respective component of the size submitted for type testing shall be deemed not to conform to this European Standard.

6.3 Manufacturing tests

6.3.1 Manufacturing proof test

The socket body and pin shall be subjected to the manufacturing proof force equal to a load of 40% of the highest minimum breaking force of rope for which the socket is designed. This shall be sustained without deviating from the dimensions of the manufacturer's drawings, and without visible defect after removal of the load.

6.3.2 Non-destructive test

The cast surfaces of the socket body shall be subjected to a magnetic particle examination in accordance with EN 1369 or a dye penetrant examination in accordance with EN 1371-1.

If grinding is required to remove unacceptable indications, then after grinding, the socket body shall conform to the dimensions and tolerances specified by the manufacturer. A final examination shall show that the socket body conforms with EN 1369:1996 SM2, Table 2 and LM2/AM2, Table 3 or EN 1371-1:1997 SP2/CP2, Table 2 and LP2/AP2, Table 3.

NOTE Care should be taken to ensure that the direction and roughness of grinding does not create initiation points for fatigue failure.

6.3.3 Visual examination

The components of the termination shall be subjected to visual examination by a competent person. The visual examination shall cover at least the following features:

- a) faults arising from the casting process including flaws and cracks;
- b) faults arising from the machining process;
- c) distortion and/or cracks arising from the heat treatment process;
- d) faults arising from the surface finish or the finishing process;
- e) any indications which might be cracks.

Any surface defect that breaks the edge of the pin hole shall result in the socket being rejected.

6.4 Manufacturing test regimes and acceptance criteria

6.4.1 General

The manufacturing test regime shall depend on whether the manufacturer has a quality assurance system which conforms for example to EN ISO 9001 and is certified by a certification body accredited to EN 45012. If such a system is in place and operating the manufacturer shall comply with 6.4.2. If no such system is in place or operating the manufacturer shall comply with 6.4.3.

6.4.2 Manufacturing test regime and acceptance criteria when a quality system conforming for example to EN ISO 9001 is in place and operating

The manufacturer shall have the choice of either of the following:

- a) Visual examination of all terminations in accordance with 6.3.3 plus the application of the manufacturing proof test to 3% of the lot of socket bodies and pins in accordance with 6.3.1.

Any socket body or pin failing the visual examination shall be deemed not to conform to this part of EN 13411.

If any socket body or pin fails the manufacturing proof test then the whole of the lot shall be subject to this test.

Any socket body and pin failing the manufacturing proof test shall be deemed not to conform to this part of EN 13411.

OR

- b) Application of the non-destructive test to all socket bodies and pins in accordance with 6.3.2 plus the application of the manufacturing proof test to 3% of the lot of socket bodies and pins in accordance with 6.3.1.

Any socket body and pin failing the non-destructive test shall be deemed not to conform to this part of EN 13411.

If any socket body and pin fails the manufacturing proof test then the whole of the lot shall be subjected to this test.

Any termination failing the manufacturing proof test shall be deemed not to conform to this part of EN 13411.

6.4.3 Manufacturing test regime and acceptance criteria when a quality system conforming for example to EN ISO 9001 is not in place or not operating

6.4.3.1 Individual value test

The manufacturer shall carry out full manufacturing proof testing in accordance with 6.3.1 and non-destructive testing in accordance with 6.3.2 on all appropriate termination components. Any component failing the manufacturing proof test or the non-destructive test shall be deemed not to conform to this part of EN 13411.

6.4.3.2 Average value test

In addition, the manufacturer shall subject one sample socket body and pin per lot to the tensile efficiency test in accordance with 6.2.5 and three samples per lot to the Charpy impact test as defined in 6.2.6. If the tensile sample withstands a load, without breakage, equal to at least 80% of the minimum breaking force of the rope for which the termination is designed and Charpy impact test requirements of 5.3.5, the lot shall be deemed to be satisfactory.

If the samples fail to meet the requirements of the static tensile test then two further samples shall be taken from the same lot. Both of these samples shall be subjected to the static tensile test.

If one or both of these samples fail to meet the appropriate requirements the entire lot shall be deemed not to conform to this part of EN 13411.

If one sample fails the individual value test, or the three samples fail the average value test, two further samples shall be taken and both shall pass the individual value test and the average of the five samples shall pass the average test in order for the respective component of the size submitted for type testing to be deemed to conform to this European Standard.

If two or three samples fail the individual value test, the respective component of the size submitted for type testing shall be deemed not to conform to this European Standard.

7 Information for use

7.1 Marking

As an aid to correct matching of component parts, they shall be marked with raised or indented lettering in accordance with Table 2.

Table 2 — Marking of components

Component	Marking
Socket body	Manufacturer's mark Nominal size or size range
Wedge	Manufacturer's mark Nominal size or size range
Pin	Manufacturer's mark ^a
^a Where pins can be interchanged between sizes of socket for a given manufacturer, they shall also be marked with the size or size range.	

7.2 Instructions

The manufacturer of the socket body shall provide instructions which shall include advice on the diameter, class and grade of rope for which the socket is designed, method of assembly, inspection in use and re-terminating if the rope is shortened.

The manufacturer's instructions shall include information on the temperature range of use.

7.3 Manufacturer's certificate

The manufacturer shall supply a certificate with each wedge socket termination stating the following:

- that the terminations are identical, within manufacturing tolerances, with those that have passed the type tests;
- that the terminations comply with this European Standard;
- details of the rope grade, class and type for which the termination is suitable.

Annex A (informative)

Asymmetric wedge socket with cast socket body – Design 1

A.1 Material

The material for the socket bodies should be spheroidal graphite cast iron having mechanical properties that are at least equivalent to those given for EN-GJS-400-18LT conforming to EN 1563.

The material for wedges should be malleable cast iron EN-GJMW-400-5 conforming to EN 1562.

The material for the pins should be quenched and tempered steel conforming to EN 10083.

A.2 Dimensions

Dimensions, in millimetres, should be in accordance with Figure A.1 and Table A.1. The socket angle in the body (β) should be $(14 \pm 0,5)^\circ$. The wedge groove angle (α) should be $(14^{+0}_{-2})^\circ$.

The pin should have h11 limits conforming to EN 20286-2.

A.3 Finish

The rope groove in both the wedge and the socket body should not exhibit marks or joints in the clamping area.

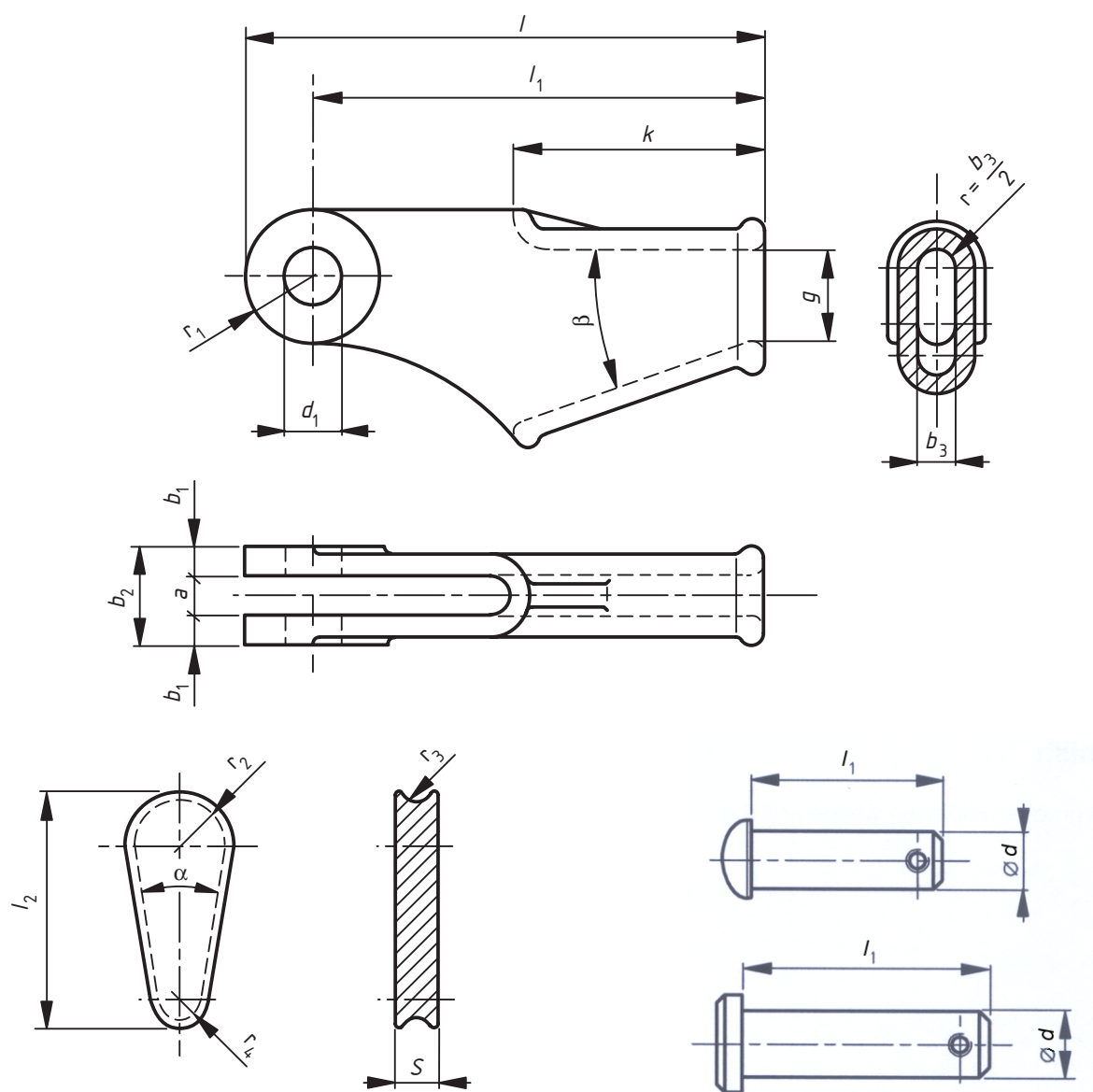


Figure A.1 – Socket body, wedge and pin details for asymmetric wedge socket – Design 1

Table A1 — Dimensions in millimetres for asymmetric wedge socket with cast socket body – Design 1 (see Figure A.1)

Nominal size of the wedge socket (mm)	Socket body									Wedge			Pin		
	a	b ₁	b ₂	b ₃	d ₁	g	k	l ₁	l	r ₁	r _{2min}	r ₃	s	l ₁	d
6 to 7	14	6	26	14	14	25	75	130	150	18,5	9,5	6	12	40	13
8	14	6	26	14	14	25	75	130	150	18,5	10,5	6	13	40	13
9 to 10	14	6	26	14	14	31	75	130	150	18,5	13	7,5	13	40	13
11	17	7	31	16	17	35	75	140	164,5	22	14,5	7,5	13	45	16
12	17	7	31	16	17	42	75	140	164,5	22	16	7,5	13	45	16
13 to 15	20	10	40	17	20	43	115	190	220	27	19,5	8	16	50	19
16 to 17	23	14	51	23	25,5	60	146	237	275	38	22,5	9	21	68	25
18	23	14	51	23	25,5	60	146	237	275	38	23,5	10	22	68	25
19 to 20	29	16,5	62	29	25,5	60	146	237	275	38	26	10	26	78	25
21	30	18	66	30	33,5	85	200	325	370	42	29	13	26	88	33
22 to 25	30	18	66	30	33,5	85	200	325	370	42	32,5	13	26	88	33
26 to 32	38	27	92	38	48,5	95	224	425	486	56	42	16	32	119	48
NOTE The nominal wedge socket sizes in Table A.1 are equivalent to the nominal rope diameters for which the wedge sockets are designed.															

Annex B (informative)

Asymmetric wedge socket with cast socket body – Design 2

B.1 Material

The material for socket bodies should conform to ASTM A-148 90/60 and ASTM A-220, 60004 alternatively ASTM A-27, grade 65-35 for the wedges.

The material for the pin should conform to SAE 1035.

B.2 Dimensions

Dimensions, in millimetres, should be in accordance with Figure B.1 and Table B.1. The socket angle in the body (β) should be $(15 \pm 1)^\circ$. The wedge groove angle (α) should be $(15 \pm 1)^\circ$ (see also 5.1).

B.3 Finish

The inner edges of the basket should be rounded at the bottom to prevent damaging the rope.

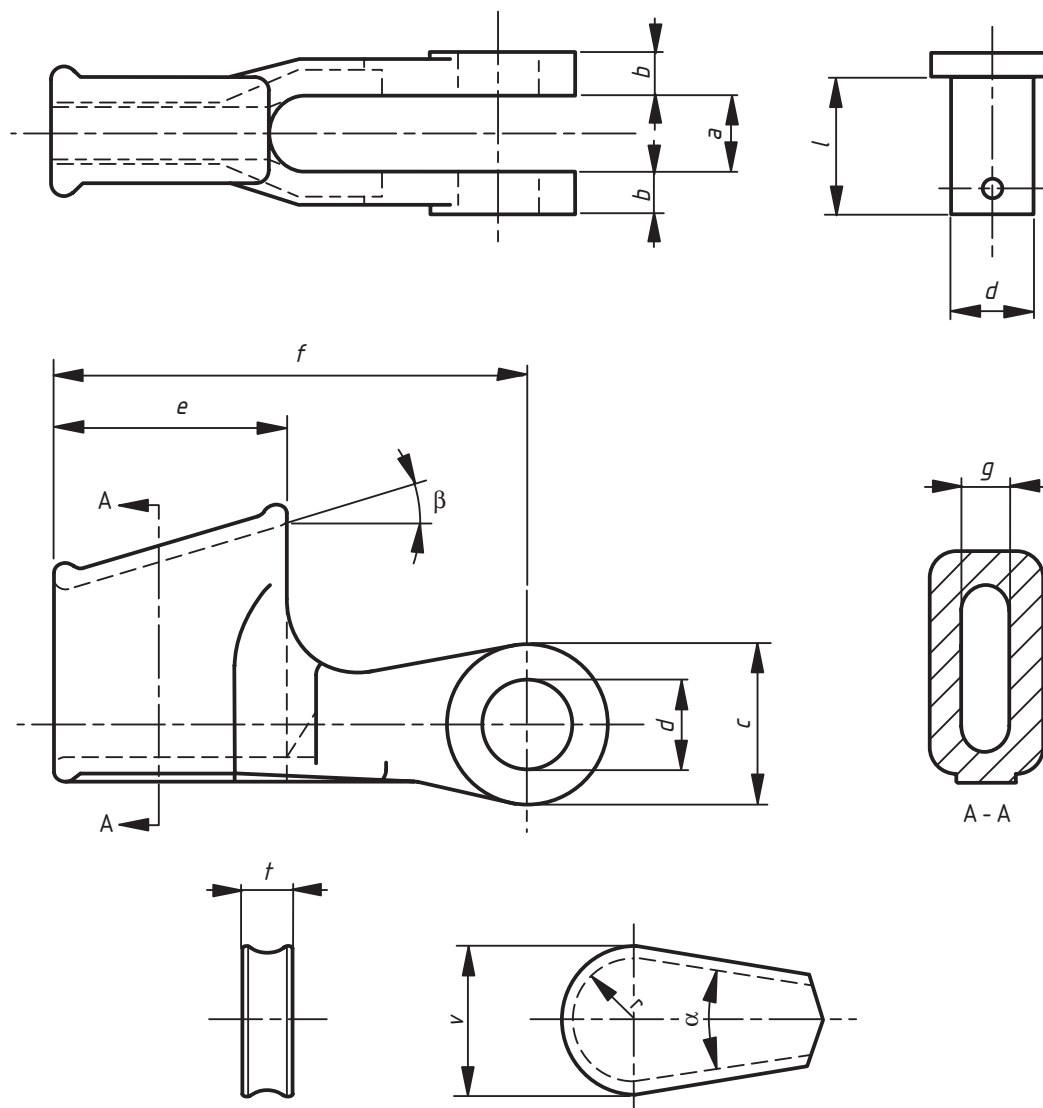


Figure B.1 – Socket body, wedge and pin details for asymmetric wedge socket – Design 2

Table B.1 — Dimensions in millimetres for asymmetric wedge socket with cast socket body – Design 2 (see Figure B.1)

Nominal size of the wedge socket		Socket body								Wedge			Pin	
mm	inch	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	β	<i>t</i>	<i>r</i>	<i>v</i>	<i>d</i>	<i>l</i>
9-10	3/8"	20,6	11,2	39,6	22,6	57,2	121	14,2	15°	11,2	15,9	35,0	20,6	54
11-13	1/2"	25,4	12,7	49,3	27,4	76,2	146	17,5	15°	13,5	22,3	48,0	25,4	61
14-16	5/8"	31,8	14,2	57,2	32,5	93,7	176	22,4	15°	17,5	25,5	55,5	30,2	76
18-19	3/4"	38,1	16,8	66,5	37,3	111	212	25,4	15°	19,8	29,5	65,0	35,0	87
20-22	7/8"	44,5	19,1	79,5	43,7	127	241	28,4	15°	22,4	34,2	74,5	41,3	103
24-26	1"	50,8	22,4	95,3	53,6	146	273	33,3	15°	26,2	36,5	83,5	50,8	116
28	1 1/8"	57,2	25,4	108	60,5	165	308	38,1	15°	30,2	39,8	90,5	57,2	127
30-32	1 1/4"	63,5	28,7	121	66,8	184	343	41,4	15°	33,3	43,0	97,0	63,5	143

NOTE 1 The nominal wedge socket sizes in Table B.1 are equivalent to the nominal rope diameters for which the wedge sockets are designed.

NOTE 2 For intermediate wire rope sizes, it is recommended to use next larger size socket.

Annex C (informative)

Recommendations for safe use and inspection

C.1 General

This annex gives recommendations for safe usage and inspection of wedge socket terminations.

C.2 Method of assembly

C.2.1 Prior to assembly the socket body and the pin should be examined to ensure they are free from any defect that will effect the performance of the assembly.

C.2.2 It is essential to use only a wedge and a socket body of the correct dimensions and strength for the particular steel wire rope. Failure to do so may result in the rope pulling through the fitting, or in failure of the wire rope, or the termination. No attempt should be made to modify the socket body or wedge in any way.

C.2.3 Socket bodies and wedges from different manufacturers should not be assembled together, even though they may be designed for the same size of rope. Components of different designs should not be mixed and the manufacturer's marks and the fit of the wedge (with the rope) in the socket body should always be checked at the time of the assembly.

An oversize wedge, or a wedge of incorrect taper, will not enter the socket body sufficiently to give a secure termination; too small a wedge will protrude too far through the socket body and the high localised loading may cause the socket body to crack and open out, allowing the wedge to pull through.

To reduce the risk of confusion of a body and wedge of different sizes or manufacture, the socket body, pin and wedge should be secured together during storage and transport of the termination.

C.2.4 When a rope is to be re-terminated with a wedge socket assembly this can only be achieved by shortening the rope.

No part of any previous flattening and/or damaged rope should be on the standing part of the rope or within the clamping area between either side of the socket body and the wedge.

C.2.5 The rope should be fitted so that the standing part is not kinked where it leaves the socket body, but pulls directly in line with the point of attachment of the socket. Incorrect fitting will result in premature failure of the rope.

C.2.6 When the termination is made up, the tail-end of the rope left protruding should be long enough for whatever securing method is to be used (see C.2.10).

C.2.7 Rotation resistant ropes tend to show distortion when they are bent around small radii and may require temporary serving, e.g. with tape during fitting of the socket body. As much as possible of the serving should subsequently be removed to allow for inspection of the rope.

C.2.8 After a termination has been made or re-made, it is essential that the wedge and the rope are properly seated in the socket body before the equipment is put into service. Failure to do so may allow the rope to pull through the fitting or, particularly when the rope is new, the wedge may be sprung out of the socket body.

C.2.9 Tension should be applied to the two parts of the rope to pull the rope and wedge into the socket body and the wedge hammered home using a wooden packer to protect the fitting and rope against damage. A load (at least equivalent to 10 % of the minimum breaking force of the rope) should be applied and maintained, but not left unattended, to seat the wedge and rope firmly into the socket body. The wedge should be properly seated before the assembly is put into service.

C.2.10 Different methods are recommended for dealing with the tail-end length of rope protruding from the socket, depending on the circumstances of use.

The objective of these methods is to prevent the rope being pulled through when making the rope termination or in the event of accidental loosening of the wedge during operation.

Two recommended methods are:

- a) The tail-end may be looped back on itself and secured by a U-bolt wire rope grip conforming to EN 13411-5. The loop should then be lashed to the standing part of the rope by suitable means, such as soft binding (serving) wire, to prevent flexing of the rope in service, see Figure C.1 – method a).
- b) Where there is a possibility of the loop in the method a) interfering with an obstruction (such as the working structure) which might cause the wedge to loosen and the rope run free, the tail-end length of the rope should not be looped back, but should be laid parallel to the standing part of the rope. A distance piece or short length of rope of the same diameter and a U-bolt wire rope grip conforming to EN 13411-5 will be necessary to ensure that the tail-end is adequately secured, see Figure C.1 – method b). If necessary the tail-end may be secured to the standing part with soft binding (serving) wire.

The wire rope grip is used to ensure that the rope cannot slip through the socket body before the wedge has had a chance to seat adequately. The clamp or wire rope grip should not be allowed to encroach on the fused end of the rope. A gap should be maintained between the end of the tail end in method a) or end of the distance piece in method b) and the end of the socket body.

C.2.11 Special care is necessary when tension may be completely removed from the rope, e.g. when a load is set down and where there is a possibility that the wedge may become loosened.

C.2.12 The pin should be secured in such a way that it cannot move from its position during operation.

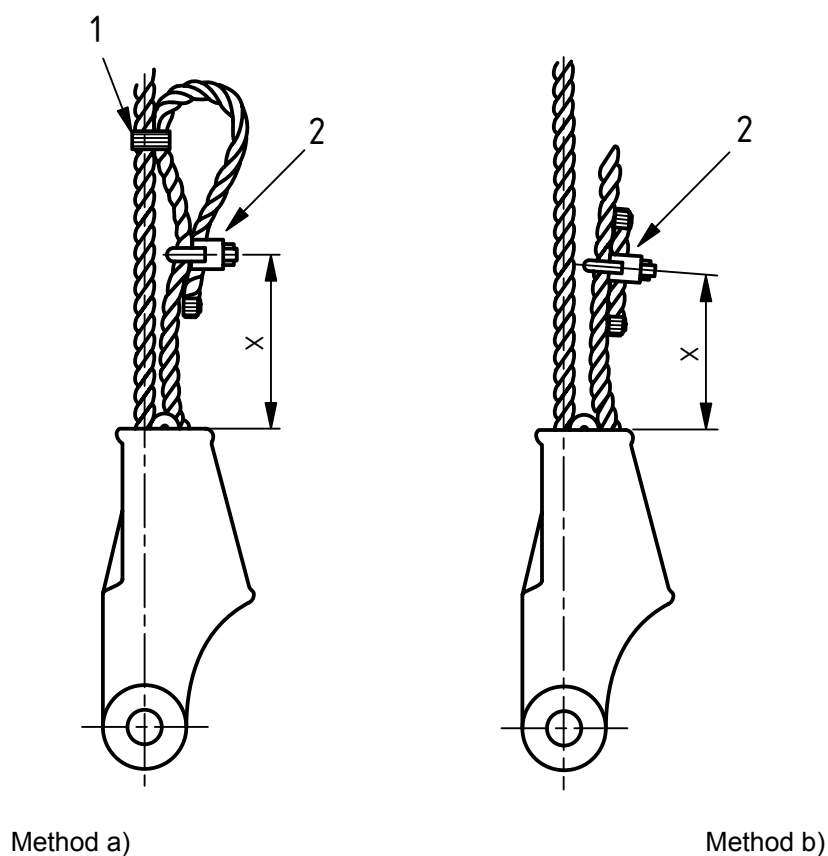
C.3 Inspection in use

C.3.1 Wedge socket terminations should be inspected at the time of rope inspection.

C.3.2 Particular attention should be paid to the following:

- a) rope damage, e.g. broken wires, or deformation of the rope where it emerges from the socket body;
- b) the conditions of the socket body, e.g. cracks, particularly if the wedge is seen to protrude excessively. The lugs of the socket body should be examined for possible deformation, cracks or other defects;
- c) the security and tightness of the wedge fitting;
- d) condition of the pin including any screw thread and the presence of the split cotter pin correctly positioned and locked in.

C.3.3 The socket body and the wedge and the part of the rope lying inside the fitting should be examined each time the assembly is dismantled. A wedge or socket body found to be damaged should be replaced.



Key

- 1 Soft wire
- 2 U-bolt wire rope grip

Figure C.1 – Two methods of dealing with the rope tail-end

NOTE The measurement X in Figure C.1, being the distance of the grip from the nearest part of the socket body, should be no more than 75% of the overall length of the wedge in order to avoid deforming the rope if X is too small and prevent the wedge from exiting the socket body if the rope becomes slack and X is too great.

Annex ZA (informative)

Relationship of this document with EC Directives

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 :

Machinery Directive 98/37/EC, amended by Directive 98/79/EC

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 EC Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

- [1] EN 1562, *Founding – Malleable cast irons.*
- [2] EN 10083, *Quenched and tempered steels..*
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- [6] SAE J 1035; *Technical publications for Agricultural Equipment.'*
- [7] ASTM A 148 *Standard specification for steel castings, high strength, for structural purposes.*
- [8] ASTM A 220 *Standard specification Pearlitic Malleable Iron.*
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- [11] EN 1070, *Safety of machinery – Terminology.*

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