BRITISH STANDARD

BS EN
13889:2003
+A1:2008

Forged steel shackles for general lifting purposes — Dee shackles and bow shackles — Grade 6 — Safety

ICS 53.020.30

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The UK participation in its preparation was entrusted to Technical Committee MHE/1, Chains and fittings.

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

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EUROPEAN STANDARD

NORME EUROPÉENNE

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November 2008

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Forged steel shackles for general lifting purposes - Dee shackles and bow shackles - Grade 6 - Safety

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This European Standard was approved by CEN on 25 April 2003 and includes Amendment 1 approved by CEN on 9 September 2008.

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Foreword

This document (EN 13889:2003+A1:2008) has been prepared by Technical Committee CEN /TC 168, "Chains, ropes, webbing, slings and accessories - Safety" the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document supersedes EN 13889:2003.

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

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

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).

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

Annexes A and C are informative. Annex B is normative.

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Introduction

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

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

The designation system given in annex C for recording the identifying features of forged steel shackles has been included in this first edition of this standard as an informative annex. However, should its use become accepted then the status of the annex will need to be reviewed.

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1 Scope

This European Standard specifies requirements for forged steel Dee and bow shackles of grade 6 for general lifting purposes in a range of working load limits 0,5 t to 25 t maximum.

This standard applies only to those shackles with threaded pins.

Annex A gives information on the safe use of shackles, annex B gives information on types of pins, and annex C gives an example of a designation system for forged steel shackles.

The hazards covered are identified in clause 4.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 292-2: 1991, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications*

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

EN 10025: 1990, *Hot rolled products of non-alloy structural steels — Technical delivery conditions*

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

EN 10045-2, *Metallic materials — Charpy impact test — Part 2: Verification of the testing machine (pendulum impact)*

EN 10228-1, *Non-destructive testing of steel forgings — Part 1: Magnetic particle inspection*

EN 10228-2, *Non-destructive testing of steel forgings — Part 2: Penetrant testing*

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

EN ISO 7500-1: 1999, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system. (ISO 7500-1:1999)*

ISO 261, *ISO general-purpose metric screw threads — General plan*

ISO 263, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 inch*

ISO 643, *Steels — Micrographic determination of the apparent grain size*

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3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 10025: 1990 and the following apply:

3.1
shackle
a lifting accessory comprising a body and pin as shown in Figures 1 and 2 which are readily separable and can be used to connect a load to a lifting machine directly or in conjunction with other lifting accessories.

3.2
body
a part of the shackle formed to the shape of a dee or bow and terminating in eyes as shown in Figures 1 and 2.

3.3
pin
a component of circular section which passes through the eyes of the shackle, as shown in Figures 1, 2 and B.1 and which can be readily disassembled.

3.4
dee shackle
a shackle the crown of which forms a semicircle of internal radius half the width, *W*, between the eyes as shown in Figure 1.

3.5
bow shackle
a shackle the crown of which forms more than a semicircle of internal radius more than half the width, *W*, between the eyes as shown in Figure 2.

3.6
working load limit WLL
maximum mass that a shackle is authorized to sustain in general service

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

3.7
manufacturing proof force MPF
force applied to the shackle during the manufacturing proof test

3.8
breaking force BF
maximum force reached during the static tensile test of a shackle at which the shackle fails to retain the load

3.9
traceability code
series of letters and/or numbers marked on a shackle that enables its manufacturing history, including identity of the cast of steel used, to be traced

3.10
lot
number of shackles of the same type and dimensions, manufactured during the same production run from the same cast of steel and subjected to the same heat treatment process

3.11
type W pin
screwed pin with eye and collar and which screws into one eye of the shackle body

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3.12
type X pin
bolt type pin with hexagon head, hexagon nut and split cotter pin

3.13
competent person
designated person, suitably trained, qualified by knowledge and practical experience, and with the necessary instruction to enable the required test and examination to be carried out

NOTE EN ISO 9001 gives guidance on training.

4 Hazards

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

In order to provide the necessary strength and durability of shackles EN 13889 gives requirements for the design, manufacture and testing to ensure the specified levels of performance are met.

Since failure can be caused by the incorrect choice of grade and specification of shackle EN 13889 also gives the requirements for marking and the manufacturer's certificate.

Errors of fitting can also lead to failure and EN 13889 contains dimensional requirements to allow correct fit.

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

Those aspects of safe use associated with good practice are given in annex A.

Table 1 contains those hazards, which require action to reduce risk identified by risk assessment as being specific and significant for shackles.

Table 1 — Hazards and associated requirements

Hazards identified in annex A EN 1050: 1996,		Relevant clause of annex A of EN 292-2: 1991	Relevant clause/ subclause of EN 13889
1	Mechanical hazard due to inadequacy of strength	1.3.2 4.1.2.3 1.3.2 4.1.2.3 4.1.2.5 4.2.4 4.3.2 4.2.4 1.7.4	 5 5 5 6 7 8 9
1.3	Cutting hazard	1.3.4	5.3
1.8	Friction or abrasion hazard	1.3.4	5.3
15	Errors of fitting hazard	1.5.4	5.1

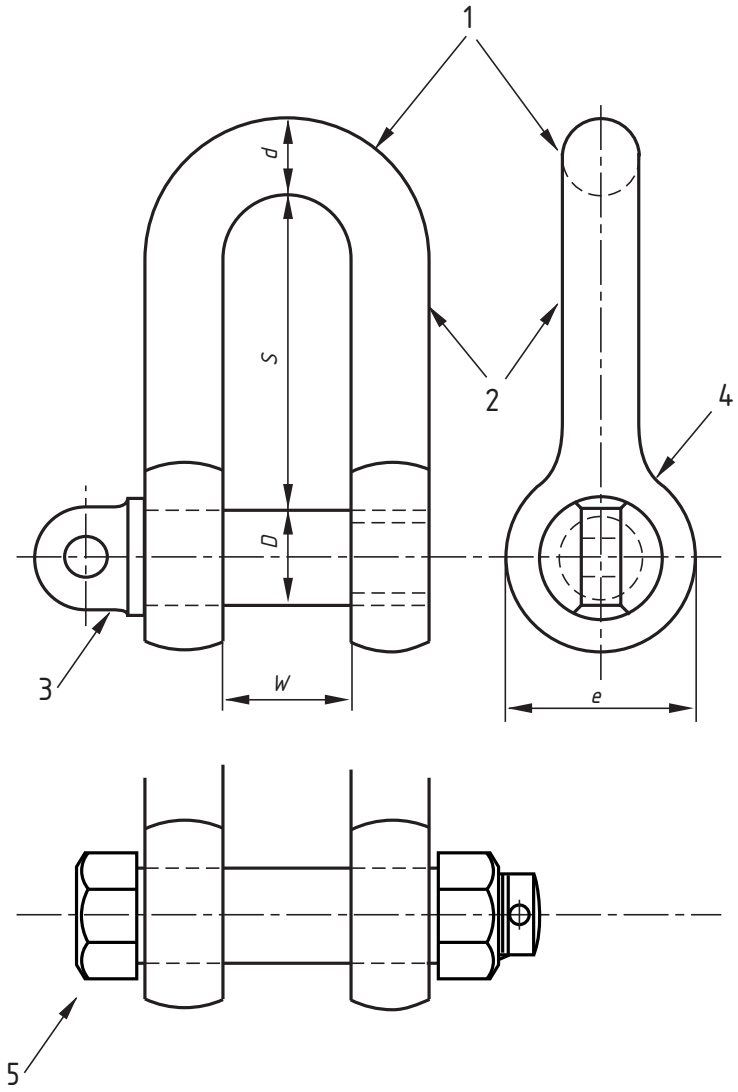
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5 Safety requirements

5.1 Dimensions

5.1.1 Dee shackles

The principal dimensions of the dee shackle shall conform to Table 2 in which the dimensions are related to the working load limit.



Key:

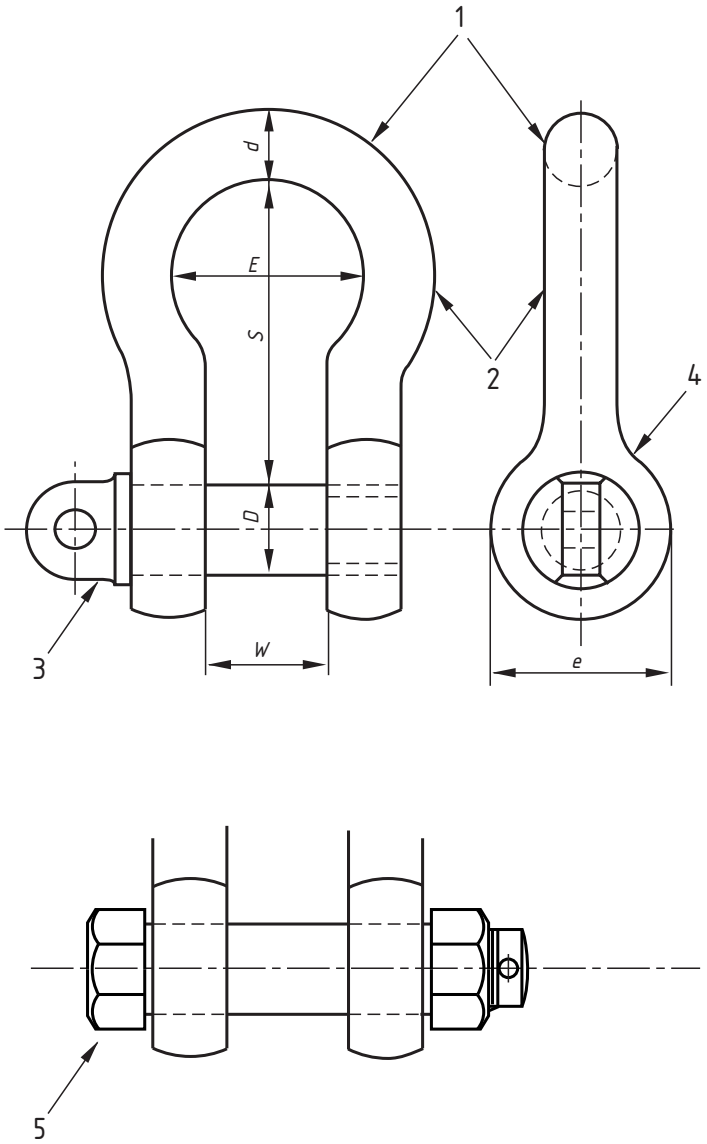
1 Crown
2 Body
3 Example of screwed pin with eye and collar – type W
4 Eye
5 Bolt type pin with hexagon head, hexagon nut and split cotter pin – type X

Figure 1 — Dimensions of dee shackles

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5.1.2 Bow shackles

The principal dimensions of the bow shackle shall conform to Table 2 in which the dimensions are related to the working load limit.



Key:

1 Crown
2 Body
3 Example of screwed pin with eye and collar – type W
4 Eye
5 Bolt type pin with hexagon head, hexagon nut and split cotter pin – type X

Figure 2 — Dimensions of Bow shackles

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Table 2 — Limiting values for Dee shackles and Bow shackles

WLL	Nominal bow diameter d_n	Nominal pin diameter D_n	Nominal inside width W_n at pin	Minimum eye diameter e_n	Dee shackle: minimum inside length S	Bow shackle: minimum inside length S	Minimum inside width of bow E_{min}
t	mm	mm	mm	mm	mm	mm	mm
0,5	6,50	8	12	15,5	20	27	19
0,75	8	9,5	13,5	18,5	25	29	20
1	10	11	16,5	22	27	32	24
1,5	11,2	12,2	19	25	33	39	27
2	13,5	16	21,5	29,5	38	44	30
3,25	16,5	19	27	38	47	57	39
4,75	20	22	31,5	44	52	65	48
6,5	23	25	36,5	50	65	76	55
8,5	25,5	28	43	56	74	88	64
9,5	29	32	46,5	64	83	101	70
12	33	35	51,5	70	87	108	78
13,5	36,5	38	57	76	104	126	85
17	39,5	42	60	84	115	139	94
25	46	51	74	100	139	168	119
NOTE: Tolerances: - Bow dia, d_n :0,5 t up to and including 2 t : +1,5/ - 1 mm 3,25 t up to and including 12 t : +/- 2,5 mm 13,5 t up to and including 25 t : +/- 3 mm Allow bow diameter d_n to be oval, + 10 % for sizes 3,25 t up to and including 17 t, + 25 % for size 25 t (same tolerances as above)							
- Pin dia, D_n : 0,5 t up to and including 2 t : +/- 1 mm 3,25 t up to and including 25 t : +/- 2 mm							
- Inside width at pin, W_n : 0,5 t up to and including 2 t : +/- 2,5 mm 3,25 t up to and including 9,5 t : +/- 3 mm 12 t up to and including 25 t : +/- 4 mm							

5.2 Design

5.2.1 Screw threads

Screw threads shall conform either to ISO 261 class 7H/8g or to ISO 263 class 1A/1B.

NOTE For hot dip galvanized or coated pins it is permissible for the threads to be undercut prior to galvanizing or coating.

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5.2.2 Pins

Pins shall be in accordance with annex B.

The collar diameter or width across the flats of the nut shall be at least 1,2D or D+ 3 mm whichever is greater.

The outside diameter of the thread shall be the same as the outside diameter of the pin taking into consideration any undercutting of the thread to allow for galvanising or coating.

The screwed portion of the pin shall be concentric with the main portion.

In the case of type W pins, when the pin is fully tightened the length of thread remaining visible between the jaws of the shackle shall not be greater than 1,5 thread pitch.

In the case of type X pins, when the pin is fully tightened there shall be no thread visible between the jaws of the shackle.

5.2.3 Hole diameter

The maximum diameter of the unthreaded hole or holes in the body of the shackle shall be either

1,1D or D + 1,5 mm, whichever is greater, where D is the actual pin diameter.

Holes in shackle bodies shall be central to the outside of the eyes.

5.3 Manufacturing methods and workmanship

5.3.1 Manufacture

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

Profiling of blanks other than by bending or forging shall not be used.

Shackle pins shall not be produced by a casting process.

No welding shall be carried out on any part of the shackle body or pin.

5.3.2 Surface finish

The finished condition of shackles shall include any surface finish.

NOTE Shackles are supplied in various surface finishes e.g. descaled, electroplated, hot dip galvanized or painted. If shackles are to be hot dip galvanized or subjected to similar processes, such processing should only be carried out under the control of the shackles manufacturer.

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5.4 Materials and heat treatment

5.4.1 Quality of material

5.4.1.1 Type of steel

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

5.4.1.2 Deoxidation

The steel shall be fully killed as defined in EN 10025, be stabilized against strain-age-embrittlement and have an austenitic grain size of 5 or finer when tested in accordance with ISO 643. This shall be accomplished, by ensuring that the steel contains sufficient aluminium (minimum 0,025 %) to permit the manufacture of shackles stabilized against strain-age-embrittlement during service.

Steels not susceptible to strain aging will only require a grain refining element to have an austenitic grain size of 5 or finer when tested in accordance with ISO 643. These elements can be aluminium, vanadium or niobium in the quantity of minimum 0,02%.

NOTE Medium carbon (steels containing more than 0,2% and less than 0,5% carbon), fine grain heat treated steels are not susceptible to strain aging.

5.4.1.3 Chemical composition

The sulfur and phosphorous content of the steel shall be in accordance with Table 3.

5.4.2 Heat treatment

Shackles shall be hardened from a temperature above the AC3 point and tempered before being subjected to the manufacturing proof force. The tempering temperature shall be at least 420 °C.

The tempering conditions shall be at least as effective as a temperature of 420 °C maintained for a period of 1 h. Sample shackles shall be tested after they have been reheated to and maintained for 1 h at 420 °C and then cooled to room temperature and shall conform to the requirements of 5.5.

5.5 Mechanical properties

5.5.1 Manufacturing proof force (MPF)

Shackles shall be able to withstand the manufacturing proof force specified in Table 4. Following removal of the force, the dimensions shall be within the tolerances specified on the shackle manufacturer's drawings.

Shackles are supplied in various surface finishes, (see 5.3.2). Where processes are used which involve the risk of shackle embrittlement e.g. acid cleaning or electroplating, the manufacturing proof force shall be applied in the finished condition.

5.5.2 Breaking force (BF)

Shackles in the finished condition shall have a breaking force at least equal to that specified in Table 4.

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5.5.3 Fatigue resistance

All shackles shall withstand at least 20 000 cycles of application of the force range specified in 6.2.4.

5.5.4 Impact value

Samples from shackle pins and bodies shall have a minimum average impact value of 27 J when tested in accordance with 6.2.5.

No individual test value shall be less than 2/3 of the specified minimum average value.

Table 3 — Sulfur and phosphorus content

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

Table 4 — Mechanical properties

Working load limit WLL	Manufacturing proof force MPF	Minimum breaking force BFmin
t	kN	kN
0,5	9,8	24,5
0,75	14,7	36,8
1	19,6	49,1
1,5	29,4	73,6
2	39,2	98,1
3,25	63,7	160
4,75	93,1	233
6,5	128	319
8,5	167	417
9,5	187	466
12	236	589
13,5	265	662
17	334	834
25	491	1226

NOTE The mechanical properties specified in Table 4 are calculated values. It is common practice for manufacturers to round MPF and BF up to higher values that may appear in their published catalogues.

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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

In order to prove the design, material, heat treatment and method of manufacture, each size of shackle in the finished condition shall be type tested to demonstrate that the shackles possess the mechanical properties specified in this European Standard.

Any change of design, specification of material, heat treatment, method of manufacture or in any dimension outside normal manufacturing tolerances that may lead to a modification of the mechanical properties defined in 5.5 shall require that the type tests specified in 6.2.2 to 6.2.5 are carried out on the modified shackles.

All shackles to be type tested shall conform to all the other relevant requirements laid down in this European Standard. The tests specified in 6.2.2 to 6.2.5 shall be carried out on three samples of each size of shackle of each design, material, heat treatment and method of manufacture.

In the tests specified in 6.2.2 to 6.2.4, the force shall be applied to the shackle axially without shock to the crown of the body, using a test machine fixture having a dimension not greater than 60 % of the maximum internal width of the shackle, and to the centre of the shackle pin, using a testing machine fixture having a width not exceeding the diameter of the pin.

The test machine used in the tests specified in 6.2.2 to 6.2.4 shall comply to EN ISO 7500-1 Class 1.

6.2.2 Test for deformation

Three samples shall be tested and each shall be capable of sustaining the manufacturing proof force listed in table 4 without permanent deformation in excess of 1,0% of the initial dimension after the manufacturing proof force has been applied.

After removal of the test force, the pin, when loosened, shall turn freely.

6.2.3 Static tensile test

Three samples shall be tested and each shall have a breaking force at least equal to the minimum value specified for the shackle in Table 4.

On completion of the static tensile test, the shackle shall show evidence of ductility by a minimum increase of 5 % of the measured inside length of dee shackles and a minimum increase of 10 % of the actual inside length of bow shackles.

If the pin breaks, it shall show a permanent bend of not less than 20 degrees. A shackle bow shall show a diameter reduction (contraction) after breaking and there shall be a fine grained structure to the fracture area.

NOTE 1 This test may be carried out on the same shackles that have been subjected to the deformation test.

NOTE 2 It is not necessary to test the shackle up to its actual breaking force for the mechanical properties specified to be demonstrated.

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6.2.4 Fatigue test

Three samples shall be tested and each shall be capable of sustaining at least 20 000 cycles of the force range.

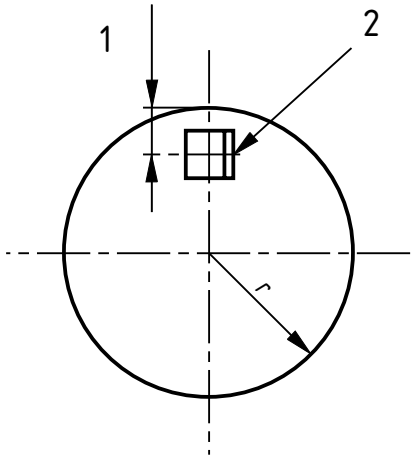
The force range applied during each cycle shall be equivalent to 1,5 times the working load limit specified in Table 4 for the shackle. The minimum force in each cycle shall be positive and less than or equal to 3 kN. The frequency of force applications shall be not greater than 25 Hz.

6.2.5 Charpy impact test

A charpy V-notch impact test shall be carried out in accordance with EN 10045-1 and EN 10045-2 on shackles of all sizes.

Three samples shall be tested at a temperature of -20 °C and shall have a minimum average impact value of 27J.

For tests where the size of shackle 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. The position of the notched specimen in the sample shall be as indicated in Figure 3.



Key:

1 Approx 1/3 r

2 Notch

Figure 3 — Position and orientation of the notched specimen in a sample

6.2.6 Acceptance criteria for type testing

6.2.6.1 Test for deformation

If any of the three samples fails the test for deformation, the shackle of the size submitted for type testing shall be deemed not to conform to this European Standard.

6.2.6.2 Static tensile test and fatigue test

If all three samples pass the static tensile test and fatigue test, the shackle of the size submitted for type testing shall be deemed to conform to this European Standard.

If one sample fails, two further samples shall be tested and both shall pass the test in order for the shackle of the size submitted for type testing to be deemed to conform to this European Standard.

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

6.2.6.3 Charpy impact test

If the average and individual test values of the three samples pass the Charpy test, the shackle of the size submitted for type testing shall be deemed to conform to this European Standard.

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 average value test in order for the shackle 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 shackle of the size submitted for type testing shall be deemed not to conform to this European Standard.

6.3 Manufacturing test

6.3.1 Manufacturing proof test

For the manufacturing proof force test, the equipment used shall apply a force at least equal to the manufacturing proof force specified.

After heat treatment and de-scaling, shackles shall sustain the appropriate manufacturing proof force as listed in Table 4. After removal of the force, there shall be no visible defect, and the dimensions shall be within the tolerances specified on the manufacture's drawings.

Where finishing processes are used that involve risk of shackle embrittlement, e.g. acid cleaning or electroplating, the manufacturing proof force shall only be applied in the finished condition.

6.3.2 Non-destructive test

After heat treatment and de-scaling, bodies and pins shall be subjected to magnetic particle or dye penetrant examination in accordance with EN 10228-1 or EN 10228-2 respectively.

Testing shall be carried out by a competent person and a distinction shall be made between indications parallel to the contour of the body or pin (see Figure 4 - labelled P) and indications transverse to the contour of the body or pin (see Figure 4 - labelled T)

Indications in the pin head in either direction are permitted.

Pins showing transverse indications shall be rejected and shall not be reworked.

Bodies showing transverse indications shall be rejected. Rework by grinding to remove such indications is permitted provided the depth of the indication extends less than 2.5% of the section depth and following such rework, the finished dimensions shall be within the manufacturer’s drawing dimensions and tolerances.

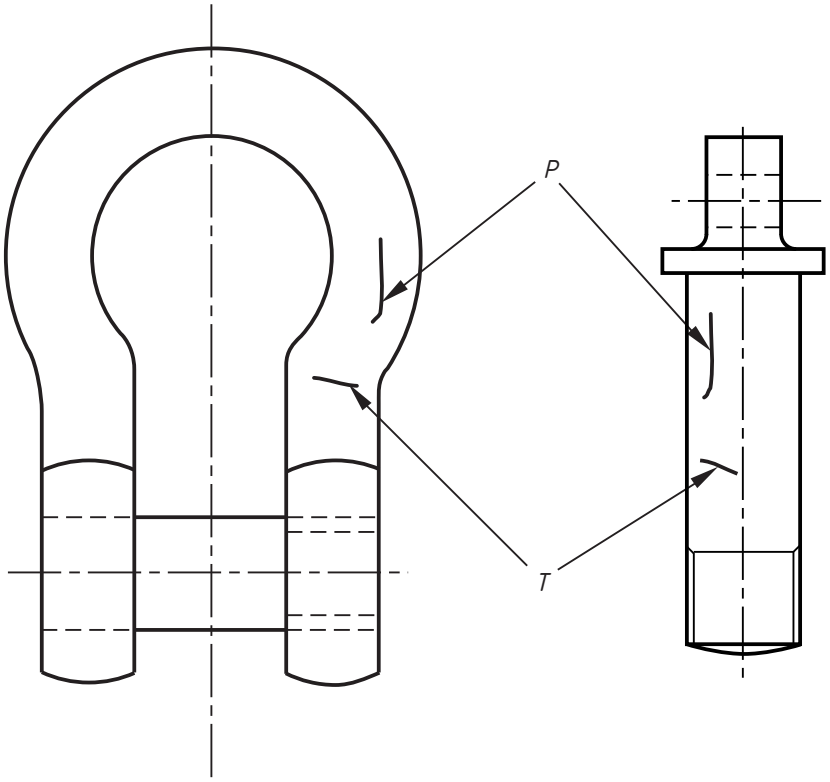
Pins or bodies showing parallel indications shall be rejected. Rework by grinding to remove such indications is permitted provided the depth of the indication extends less than 2.5% of the section depth and following such rework, the finished dimensions shall be within the manufacturer’s drawing dimensions and tolerances.

In all other cases the pin or body shall be rejected and shall not be reworked.

NOTE Care should be taken to ensure that the direction and roughness of grinding does not create starting points for fatigue failure and cause excessive heating that may have a local effect on the heat treatment condition or cause cracks.

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Key:
P Contour of the body or pin
T Transverse contour of the body or pin

Figure 4 - Indications parallel and transverse to contour of body or pin

6.3.3 Manufacturing examination

All shackles shall be visually examined for conformity to the requirements of 5.2.2, 5.2.3 and 5.3.1.

NOTE This examination may be performed on the finished shackle or in stages at the most convenient points of the manufacturing process by one or more competent persons provided that all relevant features are examined.

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 system that conforms to EN ISO 9001 for the manufacture of shackles to this European Standard and certified by a certification body accredited to EN 45012.

If such a system is in place and operating the manufacturer's test regime shall comply with 6.4.2. If no such system is in place or operating the manufacturer's test regime shall comply with 6.4.3.

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6.4.2 Manufacturing test regime when a Quality Assurance system in accordance with 6.4.1 is in place and operating

The manufacturer shall carry out the following:

Visual examination of all shackles in accordance with 6.3.3 plus the application of the manufacturing proof test as specified in Table 5 in accordance with 6.3.1.

Any shackle failing the visual examination shall be deemed not to conform to this European Standard.

If any shackle fails the manufacturing proof test then the whole of the lot shall be subject to this test. Any shackle failing the manufacturing proof test shall be deemed not to conform to this European Standard.

Table 5 – Proof test sample size

Lot size	Proofload sample size
1 - 3000	3%
3001 - 5000	2%
> 5000	1%

Or 2% proofload testing, independent of the lot size

6.4.3 Manufacturing test regime when a Quality Assurance system to EN ISO 9001 is not in place or not operating

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 shackles. Any shackle failing the manufacturing proof test or the non-destructive test shall be deemed not to conform to this European Standard.

In addition, the manufacturer shall subject one sample per lot to the static tensile test as defined in 6.2.3 and three samples per lot to the Charpy impact test as defined in 6.2.5. If the samples meet the appropriate requirements then the lot shall be deemed to be satisfactory.

If the sample fails 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 to not conform to this European Standard.

If any one sample fails to meet the requirements of the Charpy impact test then two further samples shall be taken from the same lot. Both of these samples shall be subjected to the Charpy impact 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 European Standard.

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7 Marking

7.1 Shackle

Each shackle shall be legibly and indelibly marked in a manner which will not impair the mechanical properties of the shackle. This marking shall include at least the following information placed on the shackle by the manufacturer:

a) working load limit in tonnes e.g. WLL 4,75;

b) the grade number ‘6’;

c) the manufacturer's name, symbol or code;

d) traceability code.

7.2 Shackle pins

All shackle pins, 13 mm diameter and above, shall be legibly and indelibly marked with the relevant grade number traceability code and manufacturer's symbol in a manner which will not impair the mechanical properties of the pin.

Pins below 13 mm diameter shall be marked with at least either the grade number or the traceability code.

8 Manufacturer's certificate

After all the testing as specified in clause 6 has been carried out, with satisfactory results, the manufacturer shall issue a certificate for shackles of the same nominal dimensions, size, material, heat treatment and method of manufacture as the shackle tested.

The certificate shall include at least the following information:

a) name and address of the manufacturer or of the manufacturer’s authorized representative including the date of issue of the certificate and authentication;

b) the number of this European Standard;

c) traceability code;

d) quantity and description of the shackle;

e) the grade number “6”;

f) working load limit, in tonnes;

g) ▌A1⟩ the manufacturing proof force according to 5.5.1, in kilonewtons; ⟨A1▐

h) confirmation that the specified minimum breaking force was met or exceeded;

i) identification of the Quality system to EN ISO 9001, when in place and operating.

The manufacturer shall keep a record, for at least 10 years after the last certificate has been issued, of the material specification, heat treatment, dimensions, test results, Quality system in use and all relevant data concerning the shackles which have satisfied the type tests including records of samples. This record shall also include the manufacturing specifications that shall apply to subsequent production.

9 Instructions for use

Documented information shall be provided covering the subjects listed below. Informative annex A contains guidance to assist in the preparation of this information.

a) any restriction on altering the finished condition of the shackle;

b) any limitations on the use of the shackle due to temperature, adverse environmental conditions or other hazardous conditions;

c) selection of the correct shackle type and size for the particular application;

d) inspection of the shackle before use and rejection criteria;

e) replacement of a lost or damaged shackle pin;

f) correct alignment of the shackle with the line of loading;

g) correct fitting of the shackle pin;

h) use of shackles with multi-leg slings and the effect of leg angle on the loading of the shackle;

i) avoidance of applications where the load is unstable;

j) precautions to avoid the pin unscrewing;

k) periodic thorough examination by a competent person.

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Annex A
(informative)

Safe use of shackles

A.1 Assembly

A.1.1 General

Shackles should be inspected before use to ensure that:

a) the body and the pin of the shackle are both identifiable as being of the same size, type and make;

b) all markings are readable;

c) the threads of the pin and the body are undamaged;

d) the body and pin are not distorted;

e) the body and pin are not unduly worn;

f) the body and pin are free from nicks, gouges, cracks and corrosion.

A.1.2 Ensure, where appropriate, that the pin is correctly screwed into the shackle eye, i.e tighten finger tight, then lock using a small tommy bar or suitable tool so that the collar of the pin is seated on the shackle eye. Ensure that the pin is of the correct length so that it penetrates the full depth of the screwed eye and allows the collar of the pin to bed on the surface of the drilled eye.

In all cases, when the pin is correctly fitted in the body of the shackle, the jaw width W should not be significantly reduced.

A.1.3 Incorrect seating of the pin may be due to a bent pin, the thread fitting too tightly or misalignment of pin holes. Do not use the shackle under these circumstances.

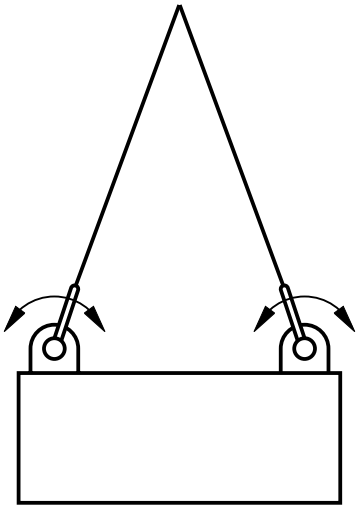
A.1.4 Never replace a shackle pin except with one of the same size type and make as it may not be suitable for the loads imposed.

A.2 Usage

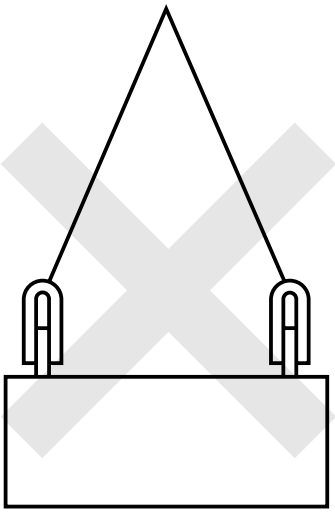
A.2.1 Select the correct type of shackle for a particular application from the information given in A.2.2 to A.2.8 inclusive.

A.2.2 Shackles should not be used in a manner that imposes a side loading unless specifically permitted by the manufacturer. In general this means that the shackle body should take the load along the axis of its centreline. (See Figure A.1.).

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1



2

Key:
1 Correct
2 Incorrect

Figure A.1 — Correct and incorrect use of shackles

A.2.3 When using shackles in conjunction with multi-leg slings, due consideration should be given to the effect of the angle between the legs of the sling. As the angle increases so does the load in the sling leg and consequently in any shackle attached to the leg.

A.2.4 When a shackle is used to connect two slings to the hook of a lifting machine, it should be a Bow type shackle assembled with the slings in the shackle body and the hook engaged with the shackle pin. The included angle between the slings should not exceed 120°.

A.2.5 To avoid eccentric loading of the shackle a loose spacer may be used on either end of the shackle pin (see Figure A.2). Do not reduce the width between the shackle jaws by welding washers or spacers to the inside faces of the eyes or by closing the jaws, as this will have an adverse effect on the properties of the shackle.

A.2.6 When a shackle is used to secure the top block of a set of rope blocks the load on this shackle is increased by the value of the hoisting effect.

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A.2.7 Avoid applications where due to movement (e.g. of the load or the rope) the shackle pin can roll and possibly unscrew. (See Figures A.3 and A.4).

A.2.8 In applications where the shackle is to be left in place for a prolonged period or where maximum pin security is required, use a type X pin.

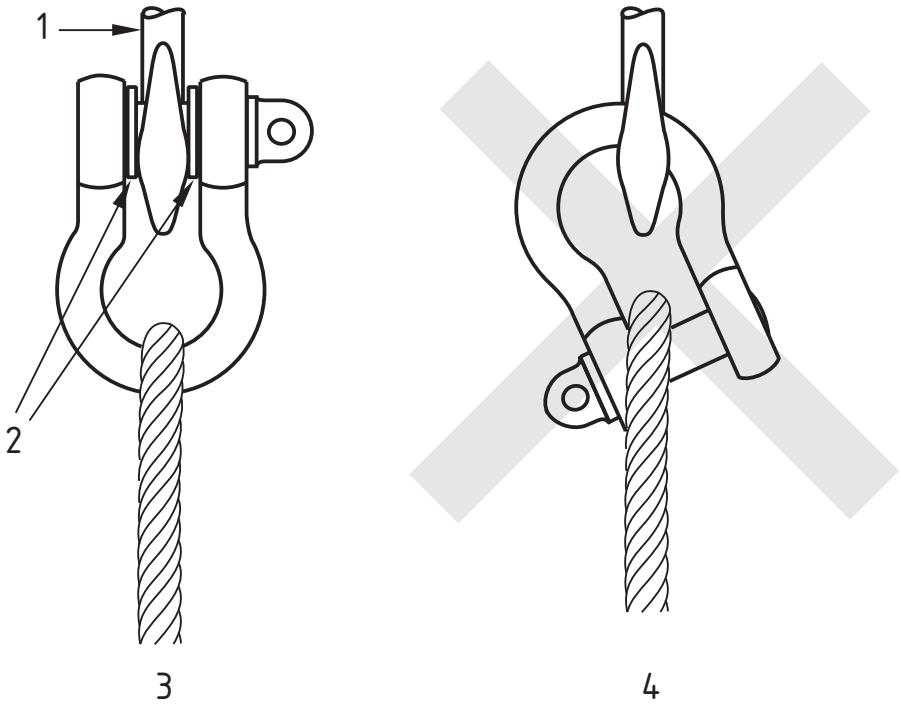
A.2.9 Avoid applications where the load is unstable (See Figure A.4).

A.2.10 Shackles should not be modified, heat treated, galvanised or subject to any plating process without the approval of the manufacturer.

A.2.11 Do not use a shackle outside the temperature range of - 20 °C to 200 °C without consulting the manufacturer.

A.2.12 Shackles should not be immersed in acidic solutions or exposed to acid fumes or other chemicals without the approval of the manufacturer. Attention is drawn to the fact that certain production processes involve acidic solutions, fumes etc and in these circumstances the manufacturer's advice should be sought.

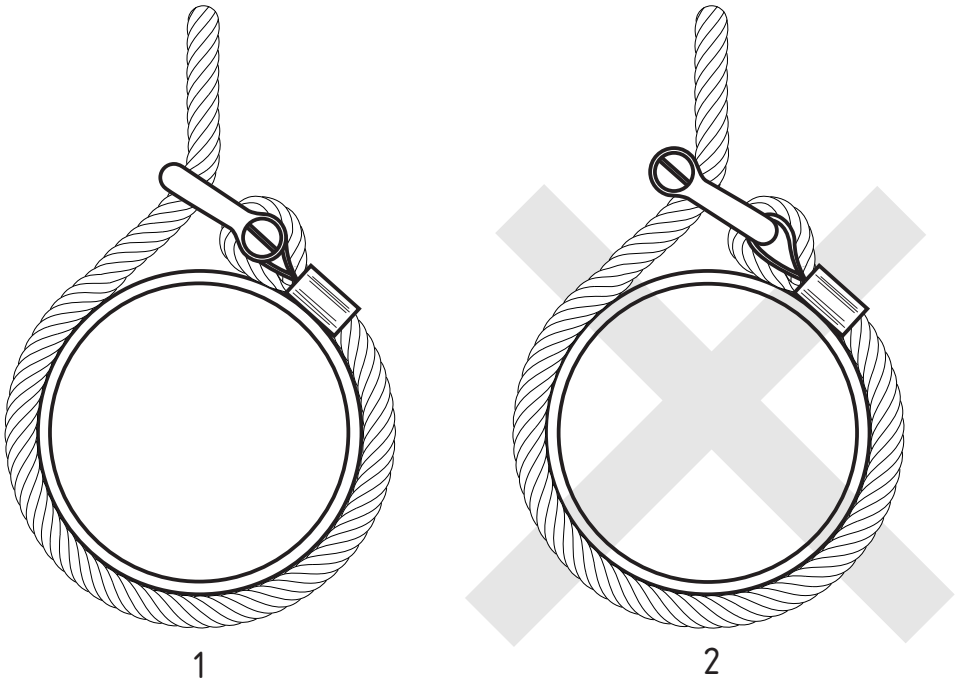
A.2.13 The rating of shackles to EN 13889 assumes the absence of exceptionally hazardous conditions. Exceptionally hazardous conditions include offshore activities, the lifting of persons and lifting of potentially dangerous loads such as molten metals, corrosive materials or fissile materials. In such cases the degree of hazard should be assessed by a competent person and the safe working load reduced accordingly from the working load limit.



Key:

1 Hook
2 Spacers
3 Correct
4 Incorrect

Figure A.2 —Use of loose spacers on shackle pin



Key:

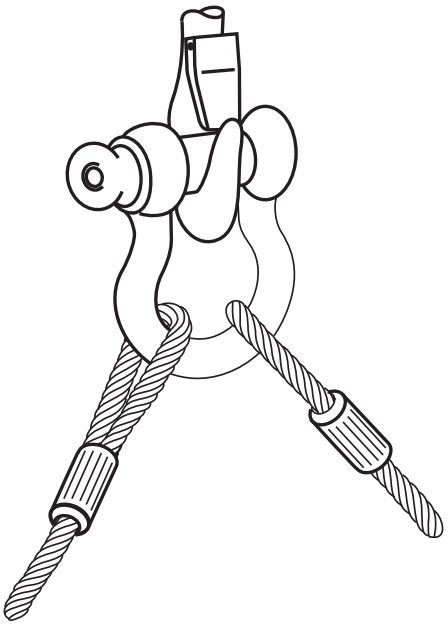
1 Correct - shackle pin cannot turn

2 Incorrect - shackle pin bearing on running line can work loose

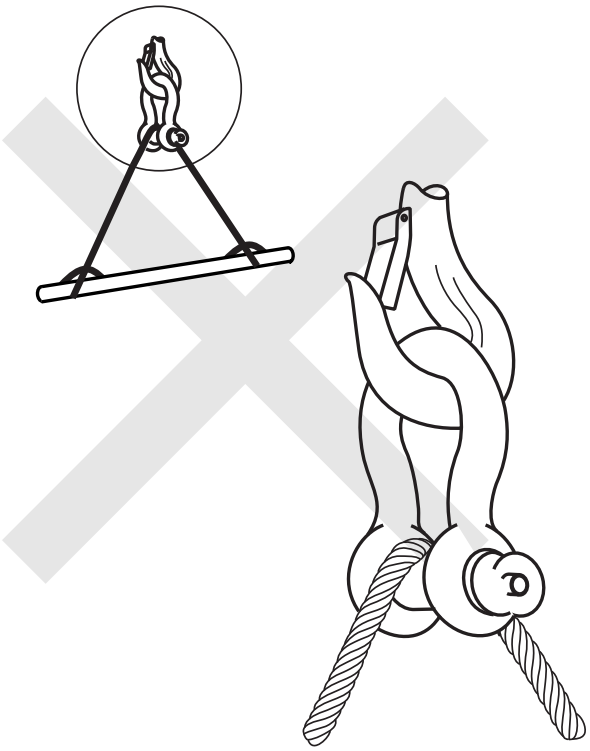
Figure A.3 — Use of shackles to avoid pin unscrewing: example 1

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1



2

Key:

1 Correct - use two ropes with eyes.

2 Incorrect –the load is unstable and if the load shifts the sling will unscrew the shackle pin

Figure A.4 — Use of shackles to avoid pin unscrewing: example 2

A.3 Inspection

Shackles in use should be subject to periodic thorough examination by a competent person. The period between such examinations will depend upon the amount of use but should not exceed six months.

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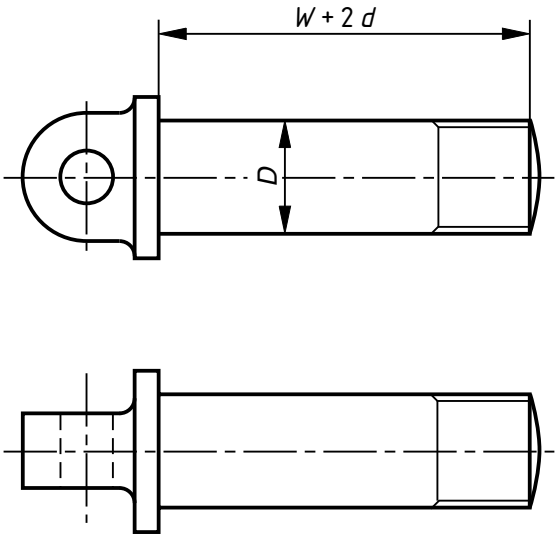
Annex B
(normative)

Shackle pins

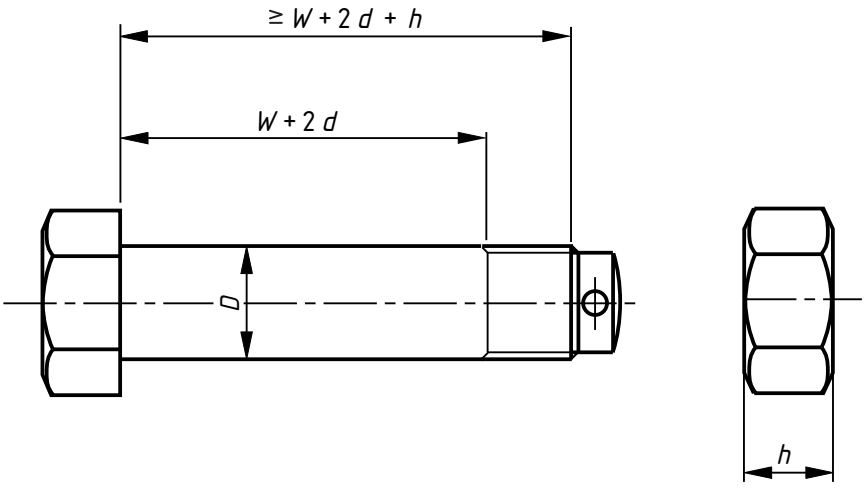
The threaded shackle pins shall be as shown in Figure B.1. Other suitable forms of pin head are acceptable.

— Type W: screwed with eye and collar.

— Type X: bolt with hexagon head, hexagon nut and split cotter pin.



a) Type W: screwed with eye and collar

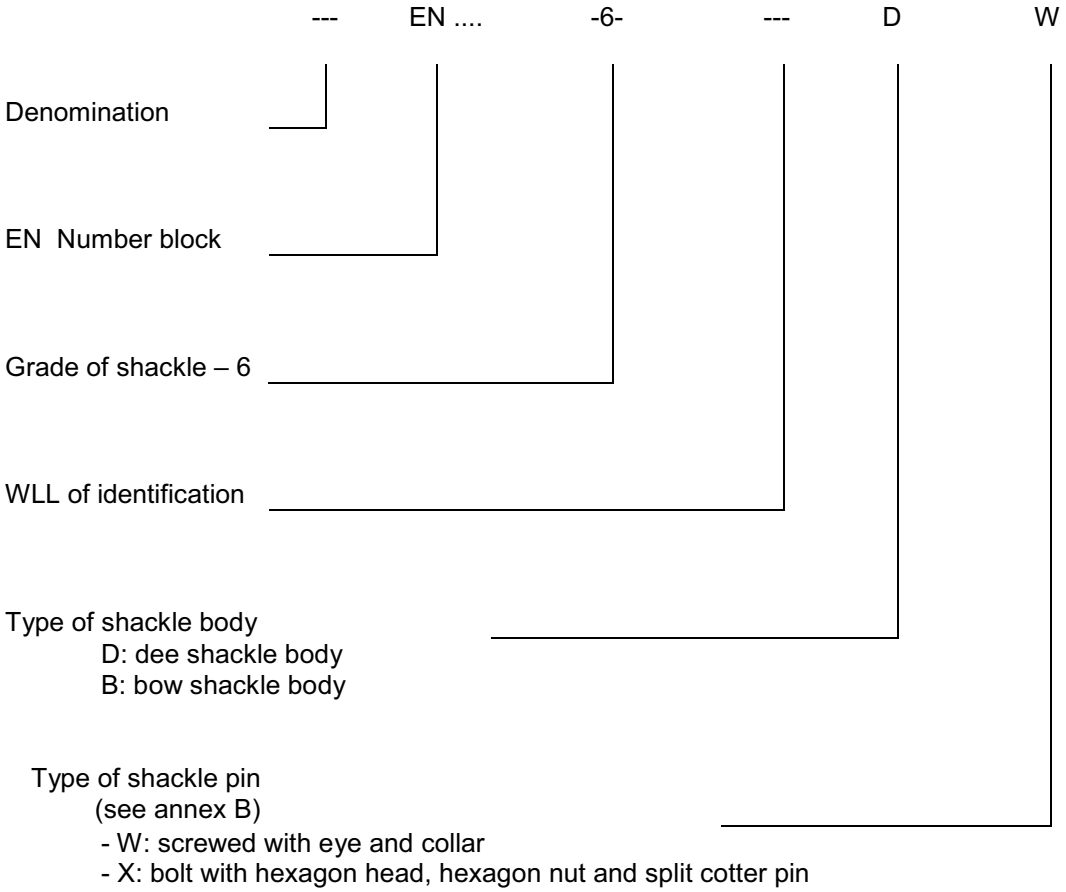


b) Type X: bolt with hexagon head, hexagon nut and split cotter pin

Figure B.1 — Dimensions of typical examples of shackle pin types

Annex C
(informative)

Designation system for forged steel shackles



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Annex ZA
(informative)

A1 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/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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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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[2] EN 818-6; 2000, *Short link chain for lifting purposes - Safety - Part 6: Chain slings - Specification for information for use and maintenance to be provided by the manufacturer*

[3] EN ISO 9000: 2000, *Quality management systems — Fundamentals and Vocabulary (ISO 9000:2000)*

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