BRITISH STANDARD

BS EN
60372:2004

Locking devices for ball and socket couplings of string insulator units — Dimensions and tests

The European Standard EN 60372:2004 has the status of a British Standard

ICS 17.220.99; 29.035.99

National foreword

This British Standard is the official English language version of EN 60372:2004. It is identical with IEC 60372:1984, including amendment 1:1991 and amendment 2:2003. It supersedes BS 3288-4:1989 which will be withdrawn on 2007-06-01.

The UK participation in its preparation was entrusted by Technical Committee PEL/36, Insulators for power systems, to Subcommittee PEL/36/2, Line insulators, 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 subcommittee can be obtained on request to its secretary.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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EUROPEAN STANDARD **EN 60372**

NORME EUROPÉENNE

EUROPÄISCHE NORM July 2004

ICS 17.220.99; 29.035.99

English version

Locking devices for ball and socket couplings of string insulator units – Dimensions and tests
(IEC 60372:1984 + A1:1991 + A2:2003)

Dispositifs de verrouillage pour les assemblages à rotule et logement de rotule des éléments de chaînes d'isolateurs – Dimensions et essais (CEI 60372:1984 + A1:1991 + A2:2003)

Sicherungsvorrichtungen für Klöppel- und Pfannen-Verbindungen von Kettenisolatoren – Maße und Prüfungen (IEC 60372:1984 + A1:1991 + A2:2003)

This European Standard was approved by CENELEC on 2004-06-01. CENELEC 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 Central Secretariat or to any CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60372:2004 E

Foreword

The text of the International Standard, IEC 60372:1984 + A1:1991 + A2:2003, prepared by SC 36B, Insulators for overhead lines, of IEC TC 36, Insulators, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60372 on 2004-06-01 without any modification.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-06-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2007-06-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60372:1984 + A1:1991 + A2:2003 was approved by CENELEC as a European Standard without any modification.

CONTENTS

LOCKING DEVICES FOR BALL AND SOCKET COUPLINGS OF STRING INSULATOR UNITS: DIMENSIONS AND TESTS

SECTION ONE – GENERAL

1. Scope

This standard is applicable to locking devices used with ball and socket couplings of string insulator units and used with the corresponding metal fittings standardized in IEC Publication 120: Dimensions of Ball and Socket Couplings of String Insulator Units, when they are supplied separately.

When these locking devices are supplied with an insulator or fitting, they shall be considered as an integral part of it. In this case, the relevant tests shall be included with those of insulators, as specified in IEC Publication 383: Tests on Insulators of Ceramic Material or Glass for Overhead Lines with a Nominal Voltage Greater than 1000 V. On request, a certificate shall be delivered confirming that the tests on locking devices as specified in this publication, have been carried out. The locking devices are usually supplied with the insulators or corresponding metal fittings.

2. Object

The object of this standard is:

- to define the shapes and some standard dimensions for locking devices;
- to define the test methods for locking devices;
- to state the acceptance conditions for supply;
- to give other dimensions for guidance of manufacturing only.

The object of this standard does not include the specification of the nature of the material, but it is recommended that this material does not have a surface coating for corrosion protection. Moreover, the material shall not give rise to significant contact corrosion (chemical reaction) between the locking device and the ball and socket coupling.

3. Plan of the standard

The main part of this standard consists of the two following sections:

3.1 *Section Two: Dimensions and general rules*

Two types of locking devices are standardized, one using a split-pin, the other a W-shaped clip.

The first type requires a circular hole and the second a rectangular hole.

Two split-pins are proposed:

– *standard split-pin:* this split-pin is a tight-fit in the socket-hole;

– *alternative split-pin:* this split-pin is a loose fit in the socket-hole.

Note. – This alternative may be used by agreement between the manufacturer and the purchaser when the problems of stress corrosion are possible for the split-pin metal due to the permanent stress in the tight-fit system, e.g. when certain types of stainless steel are used.

The socket-hole into which the locking device fits is the same for both the standard and alternative split-pins, so it is possible to use the alternative split-pin in a socket designed for the standard split-pin.

See Clauses 5 and 6 for dimensions concerning split-pins.

See Clause 7 for dimensions concerning W-clips.

3.2 *Section Three: Tests*

The tests for locking devices are:

– visual examination;
– checking of dimensions;
– verification of resistance to bending;
– hardness test;
– corrosion resistance test (in some cases).

Note. – The operation test is carried out only if the locking devices are supplied on insulators or fittings, which is usually the case (see IEC Publication 383).

SECTION TWO – DIMENSIONS AND GENERAL RULES

4. **Shape of the locking device**

4.1 *Split-pin*

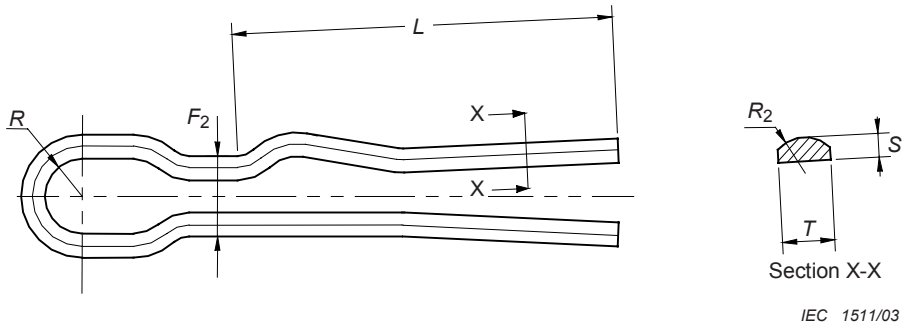
One of the legs of the split-pin has a hump and the free ends are bent outwards after insertion into the socket. These features provide two distinct positions for the split-pin when operated for locking and coupling, and complete withdrawal from the socket is effectively prevented (see Clause 8).

4.2 *W-clip*

The W-clip is so shaped that it will remain in two distinct positions when operated for coupling and locking. The shape of the W-clip is such that complete withdrawal from the socket when moving from the locking to the coupling position is prevented (see Clause 8).

5 Dimensions normalisées des goupilles (type normalisé et variante)

5 Standard dimensions of the split-pins (standard and alternative type)



Toutes les dimensions sont données en millimètres *All dimensions are given in millimetres*

Assemblages normalisés Standard couplings	Goupilles normalisées Standard split-pins						Variantes de goupilles [1] Alternative split-pins [1]
	S	T	R_2	$F_{2\,min}$	R_{min}	L_{min}	$F'_{2\,max}$
11	2,2 ±0,1	$4{,}8^{+0{,}2}_{0}$	3,3	8,2	2,5	29	7,3
16A	3,2 ±0,1	$5{,}5^{+0{,}2}_{0}$	3,8	10,3	3,0	43 [2]	9,2
16B	3,2 ±0,1	$7{,}9^{+0{,}2}_{0}$	4,8	10,7	3,0	38	9,7
20	3,2 ±0,1	$7{,}0^{+0{,}2}_{0}$	4,8	10,7	3,0	49	9,7
24	4,0 ±0,1	$8{,}7^{+0{,}2}_{0}$	5,7	12,8	3,5	60	11,7
28	4,5 ±0,1	$10{,}0^{+0{,}2}_{0}$	6,2	13,8	3,5	71	12,7
32	5,2 ±0,1	$11{,}5^{+0{,}2}_{0}$	7,2	15,8	3,5	81	14,7

[1] Toutes les dimensions sont identiques à celles des goupilles normalisées, sauf F_2 remplacée par F'_2.
All the dimensions are the same as for standard split-pins, except the value F_2 replaced by F'_2.

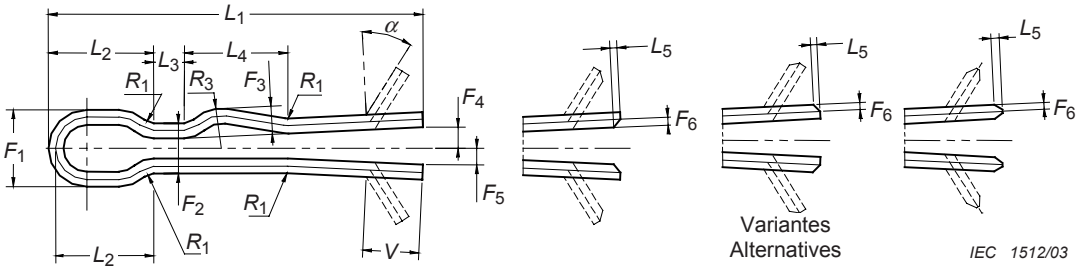
[2] Il y a beaucoup de conceptions existantes de l'intérieur du logement de rotule qui empêchent le déverrouillage avec des valeurs de L_{min} plus faibles. Dans ce cas, la valeur de L_{min} peut être réduite à 38 mm.
Many existing designs of the inside of the socket still prevent uncoupling with lower values of L_{min}. In this case L_{min} can be reduced to 38 mm.

La dimension L_{max} doit être spécifiée par l'acheteur de la goupille (voir 13.1.1).

The dimension L_{max} shall be specified by the purchaser of the split-pin (see 13.1.1).

6 Autres dimensions données seulement à titre indicatif pour la fabrication

6 Other dimensions given for guidance of manufacturing only



Toutes les dimensions sont données en millimètres *All dimensions are given in millimetres*

Assemblages normalisés Standard couplings	Goupilles normalisées Standard split-pins												Variantes de goupilles [1] Alternative split-pins [1]
	F_1	F_3	F_4	F_5	L_1	L_2	L_3	L_4	L_5 [2]	F_6 [2]	R_3	V [2]	F'_3
11	11,9	4,5	3,5	2,5	55	16,0	4,6	16	2	1,0	6,0	8	4,8
16A	14,5	5,5	4,5	3,0	70 [3]	19,0	5,2	18	3	1,5	6,5	12	5,7
16B	16,4	5,5	4,5	3,5	65	18,5	6,5	22	3	1,5	8,5	12	6,2
20	16,4	6,0	4,5	3,5	80	22,5	6,5	22	3	1,5	8,5	12	6,2
24	20,0	7,0	7,0	4,0	100	29,5	7,7	28	4	2,0	10,0	12	7,4
28	22,5	7,4	7,5	4,5	115	32,5	8,7	31	5	2,0	12,0	15	7,9
32	26,0	8,4	8,5	5,0	130	37,0	10,0	36	6	2,5	14,0	15	9,2

[1] Toutes les dimensions sont identiques à celles des goupilles normalisées, sauf F_3 remplacée par F'_3.
All the dimensions are the same as for standard split-pins, except the value F_3 replaced by F'_3.

[2] Valeurs approximatives données quand les goupilles sont montées sur des isolateurs ou des accessoires métalliques. L'angle α peut varier de 35° à 50°.
Approximate values given when the split-pins are supplied on insulators or fittings. The angle α can vary from 35° to 50°.

[3] Si la valeur de L_{min} (Article 5) est réduite à 38 mm, alors la valeur de L_1 peut être réduite à 65 mm.
If the value of L_{min} (Clause 5) is reduced to 38 mm, then the value of L_1 can be reduced to 65 mm.

NOTE 1 La longueur L_2 peut être réduite pourvu que l'œil de la goupille sorte suffisamment pour permettre un accrochage facile de l'outil pour le travail sous tension et la manœuvre de la goupille. Dans ce cas, la longueur totale L_1 est réduite de façon correspondante.

NOTE 2 Les extrémités des branches des goupilles peuvent être à section droite ou chanfreinées sur un côté ou deux comme indiqué sur la figure.

NOTE 3 Le rayon R_1 indiqué sur la figure est à définir par accord entre le fabricant et l'acheteur.

NOTE 4 Une encoche destinée à faciliter le coudage des branches de la goupille peut être réalisée à la distance «*V*» de l'extrémité des branches.

NOTE 1 The length L_2 can be reduced provided that the eye of the split-pin protrudes sufficiently to allow easy use of a live-line working tool to operate the split-pin. In this case, the total length L_1 is reduced accordingly.

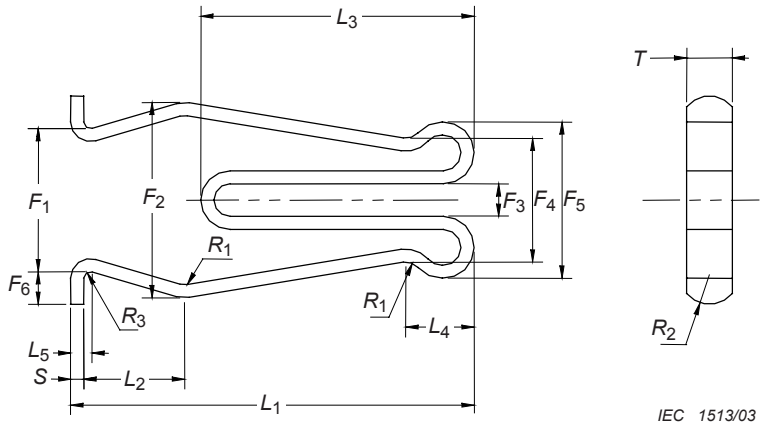
NOTE 2 The tips of the split pins may be cut straight or chamfered on one or both sides, as shown in the figure.

NOTE 3 The radius R_1 indicated in the figure is to be defined by agreement between the manufacturer and the purchaser.

NOTE 4 In order to make the bending of the split-pin legs easier, a notch can be made at a distance "*V*" from the tip of the legs.

7 Dimensions de l'agrafe

7 Dimensions of the W-clip



Toutes les dimensions sont données en millimètres *All dimensions are given in millimetres*

Assemblages normalisés **Standard couplings**	F_1	F_2	F_3	F_4	F_5	F_6	L_1	L_2	L_3	L_4	L_5	R_1	R_2	R_3 (max)	S	T
11	15	20	4	13	19	$4^{+0,6}_{0}$	37 ± 1,5	12,0	24 ± 1,5	8,0	3	2,5	3,0	1,5	$1,2^{+0,2}_{0}$	$4,8^{+0,2}_{0}$
16A	22	28	5	19	24	5^{+1}_{0}	50 ± 1,5	15,5	36 ± 1,5	10,5	3	2,5	3,0	2,5	$1,5^{+0,2}_{0}$	$5,5^{+0,2}_{0}$
16B	22	28	5	19	24	5^{+1}_{0}	50 ± 1,5	15,5	36 ± 1,5	10,5	3	2,5	4,5	2,5	$1,5^{+0,2}_{0}$	$7,9^{+0,2}_{0}$
20	22	30	5	19	24	5^{+1}_{0}	62 ± 1,5	15,5	42 ± 1,5	10,5	3	2,5	4,5	2,5	$2,0^{+0,2}_{0}$	$7,0^{+0,2}_{0}$
24	22	30	5	19	25	5^{+1}_{0}	72 ± 1,5	15,5	50 ± 1,5	10,5	3	2,5	5,0	2,5	$2,0^{+0,2}_{0}$	$8,7^{+0,2}_{0}$
28	32	32	6	21	28	6^{+1}_{0}	83 ± 1,5	16,0	62 ± 1,5	12,5	4	3,0	6,0	3,0	$2,2^{+0,2}_{0}$	$10,0^{+0,2}_{0}$
28B	22	30	5	19	25	5^{+1}_{0}	83 ± 1,5	15,5	53 ± 1,5	10,5	3	2,5	5,0	2,5	$2,0^{+0,2}_{0}$	$8,7^{+0,2}_{0}$
32	26	36	6	24	33	7^{+1}_{0}	96 ± 1,5	18,0	71 ± 1,5	16,0	4	3,0	7,0	3,0	$2,6^{+0,2}_{0}$	$11,5^{+0,2}_{0}$

8. Utilisation des dispositifs de verrouillage

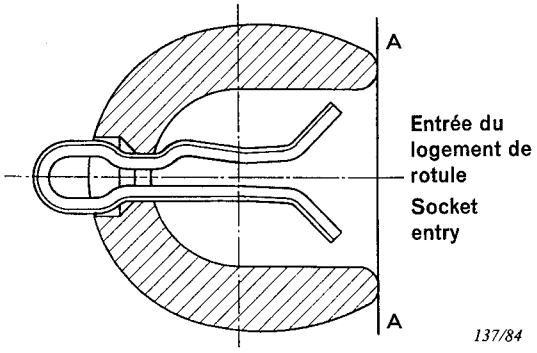
8. Method of using the locking devices

8.1 *Goupille*

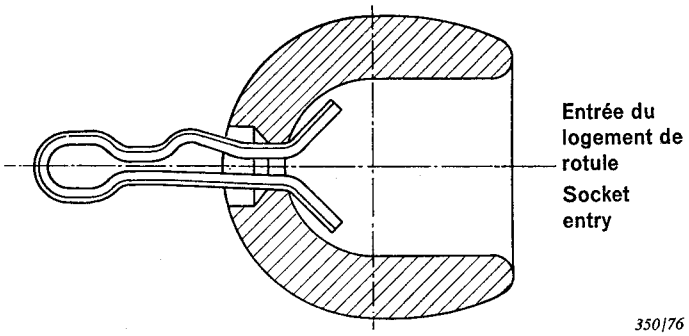
8.1 *Split-pin*

La goupille est introduite dans le trou, puis chaque branche est coudée comme indiqué à l'article 6. Elle peut alors être manœuvrée entre les positions de verrouillage et d'assemblage.

The split-pin is inserted through the hole and afterwards the legs are bent as shown in Clause 6. It can then be operated between the locking and coupling positions.



Goupille en position de verrouillage
Split-pin in locking position



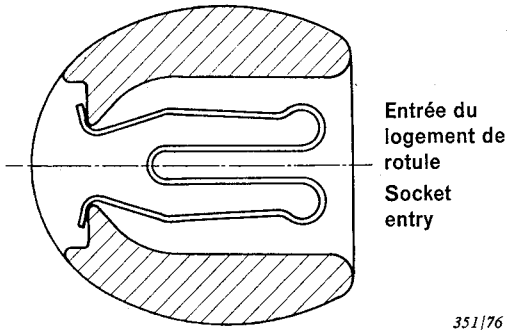
Goupille en position d'assemblage
Split-pin in coupling position

8.2 *Agrafe*

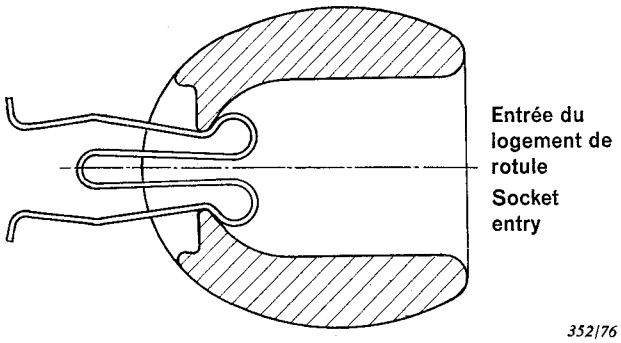
8.2 *W-clip*

L'agrafe est introduite par l'entrée du logement de rotule et peut alors être manœuvrée entre les positions de verrouillage et d'assemblage.

The W-clip is inserted through the socket entry and can be operated between the locking and coupling positions.



Agrafe en position de verrouillage
W-clip in locking position



Agrafe en position d'assemblage
W-clip in coupling position

Note. – Un dispositif de verrouillage ne doit jamais être séparé de son logement de rotule ni être remplacé par un dispositif de conception différente, même si la hauteur T_{min} prescrite par la Publication 120 de la CEI est respectée dans les deux cas.

Note. – A locking device shall never be separated from its socket and replaced by a locking device of different design even if, in both cases, the locking devices are in agreement with the height T_{min} prescribed in IEC Publication 120.

SECTION THREE – TESTS

9. Classification of tests

The tests are divided into two groups:

– *Group I: qualification tests*
The qualification tests are made in order to verify the suitability of the type of material to be used in the manufacture of a locking device.

– *Group II: sample tests*
Sample tests are made in order to verify the quality of a manufacture; they are made on samples taken at random from each batch.

10. Tests in Group I (qualification tests)

Qualification tests consist of:

– hardness test;
– verification of resistance to bending (for split-pins only);
– corrosion resistance test.

They are each made on five samples of material. It shall not be necessary to repeat these tests if a certificate of the qualification test is available and if the locking-device manufacturer gives proof that the profiled material used is the same.

10.1 *Hardness test*

The hardness test shall be carried out according to the ISO Standard 6507/1-1982 (Vickers test) for copper alloy locking devices and for steel locking devices. It shall be carried out on one of the flat surfaces of the locking device (the side opposite the rounding in the case of split-pin types). A series of three measurements shall be effected on each locking device. The average of the three measurements shall be greater than or equal to 150.

Note. – Upon agreement between the purchaser and the manufacturer, other methods may be used for the measurement of hardness: ISO Standard 6506-1981 (Brinell test) or ISO Standard 2713-1973 (Rockwell test). In this case, the values shall be agreed.

10.2 *Verification of resistance to bending*

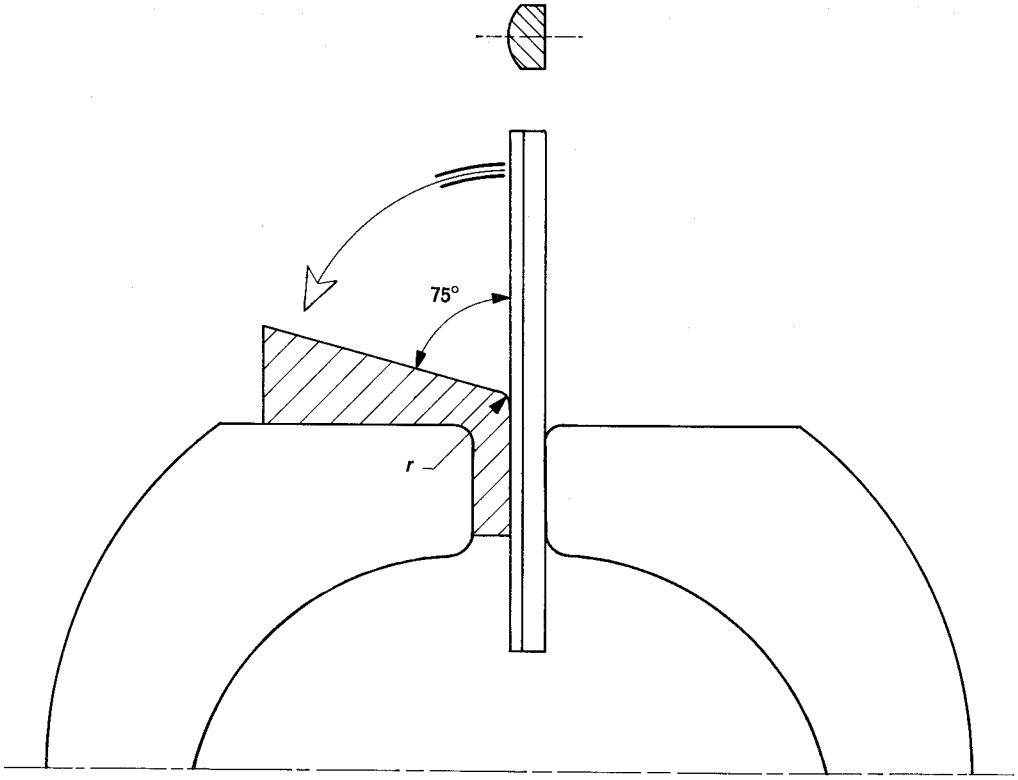
a) Split-pins

The test shall be carried out on a piece taken from the straight part of a leg of the split-pin, or on a sample selected from the profiled material from which the pins have been manufactured.

The test consists in bending the test piece around a specified radius, as shown in the figure hereinafter.

One end of the test piece is inserted into a vice, one of the jaws of which is covered with a lining piece made of steel with its surface at about 75° from the vertical position. By means of a wooden mallet, the test piece is bent against the inclined surface.

After this bending, no splits or cracks must appear.



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Standard couplings	11	16A	16B	20	24	28	32
r (mm)	2	3	4	4	5	6	7

b) W-clips

In this case, the bending test shall not be carried out. The visual examination indicated in sample tests is considered sufficient to check that bending in manufacture has not caused any cracks or incipient cracks, particularly in the region of the extremity F_6.

10.3 *Corrosion resistance test*

This test concerns stress corrosion cracking. This corrosion can only appear if there is, simultaneously, a mechanical stress associated with a corrosive atmosphere.

This test concerns neither external corrosion due to corrosive atmospheric conditions nor contact corrosion which can occur between different metals.

The need for a test for resistance to stress corrosion cracking depends on the material used for the manufacture of the locking devices.

For the following materials, no test is required:
- bronze and phosphor-bronze;
- copper alloys with not more than 15% zinc content having undergone a suitable stabilizing annealing treatment;
- austenitic stainless steels having undergone the standard thermal treatment on the original profile material.

For other materials, such as other types of stainless steels and copper alloys with more than 15% zinc content, a suitable test shall be agreed upon in advance by the manufacturer and the purchaser, avoiding, for copper alloys, methods requiring the use of mercury nitrate.

11. Tests in Group II (sample tests)

Sample tests are:

a) visual examination;

b) verification of dimensions;

c) hardness test;

d) verification of resistance to bending.

12. General rules for the visual examination *a)*

The inspection shall be made by attributes. The following control method shall be applied:

- single sampling;
- size of the sample as given in Table I;
- acceptable quality level (AQL):
  1.5% for the faults described in Item *a)* of Sub-clause 12.1,
  6.5% for the faults described in Item *b)* of Sub-clause 12.1;
- acceptance number K as given in Table I.

TABLE I

Number of locking devices in the lot N	Size of the sample n	Acceptance number K	
		AQL = 1.5%	AQL = 6.5%
$< N \leqslant 500$	50	$K = 2$	$K = 7$
$500 < N \leqslant 1200$	80	$K = 3$	$K = 10$
$1200 < N \leqslant 3200$	125	$K = 5$	$K = 14$
$3200 < N \leqslant 10000$	200	$K = 7$	$K = 21$
$10000 < N \leqslant 35000$	315	$K = 10$	$K = 21$
$35000 < N \leqslant 150000$	500	$K = 14$	$K = 21$

The lot shall be considered as complying with this standard if the number of defectives is less than or equal to the acceptance number K.

If the lot does not comply, it may be withdrawn and re-examined by the manufacturer. Following this, it may be submitted again for inspection.

Note. – A lot is the quantity of locking devices manufactured or produced under conditions which are presumed uniform and offered for acceptance. A batch, as defined in IEC Publication 383, may be divided into several lots to meet the above definition.

12.1 *Visual examination*

The locking device shall not have any defects prejudicial to satisfactory behaviour in service:

a) defects to which an AQL of 1.5% applies are surface cracking or incipient cracks;

b) defects to which an AQL of 6.5% applies are rough surface (orange-peel surface), blisters.

13. General rules and tests for *b), c)* and *d)*

The rules concern:

- verification of dimensions (see Sub-clause 13.1);
- hardness test (see Sub-clause 13.2);
- verification of bending resistance (see Sub-clause 13.3).

The number p of locking devices selected for testing shall be the nearest whole number greater than the one given by the following formulae (N being the number of locking devices in the lot):

$N < 500$	p shall be subject of agreement between the parties
$500 \leq N \leq 20000$	$p = 2 + \frac{0.75\,N}{1000}$
$N > 20000$	$p = 10 + \frac{0.35\,N}{1000}$

The group of selected samples is submitted to the verification of dimensions test *b)*. Then it is divided into two equal parts, the first being used for the hardness test *c)*, the second for the bending test *d)*.

In the event of a sample failing to pass one of the above tests, a re-test procedure according to Clause 14 is permissible.

13.1 *Verification of dimensions*

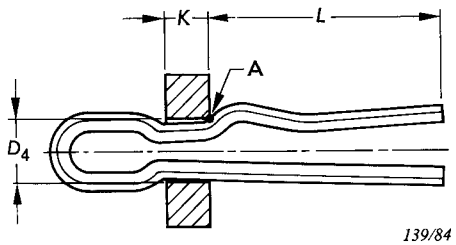
The dimensions of the locking devices shall conform to the requirements of Section Two of this publication.

13.1.1 *Split-pins*

For split-pins, the following dimensions shall be checked: S, T, F_2, R, L.

Verification of dimension L.

To check the dimensions L_{min} and L_{max}, the split-pin is placed in a jig as shown in the figure, the split-pin being in contact with A. The values for K and D_4 are given in the following table:



Standard coupling	11	16A	16B	20	24	28	32
K (mm)	3.5±0.6	4±0.7	5±1	5±1	6±1	7±1.2	8±1.4
D_4 (mm)	7.5±0.4	9.5±0.5	10±0.5	10±0.5	12±0.5	13±0.5	15±0.5

The split-pin, when in the locking position, shall not extend beyond the face AA of the socket entry, as shown in the figure of Sub-clause 8.1.

Note. – For 11 standard coupling, it is permitted that the split-pin can extend beyond the socket entry by no more than 5 mm.

13.1.2 *W-clips*

For W-clips, all dimensions shall be checked.

It is important that, in forming the W-clips, extremity F_6 is approximately perpendicular to the axis when the clip is in the locking position.

The Appendix A shows the gauges which may be used to check the dimensions for W-clips.

13.2 *Hardness test*

The test shall be carried out as described in Sub-clause 10.1.

13.3 *Verification of resistance to bending (for split-pins only)*

The test shall be carried out as described in Sub-clause 10.2.

14. Re-test procedure

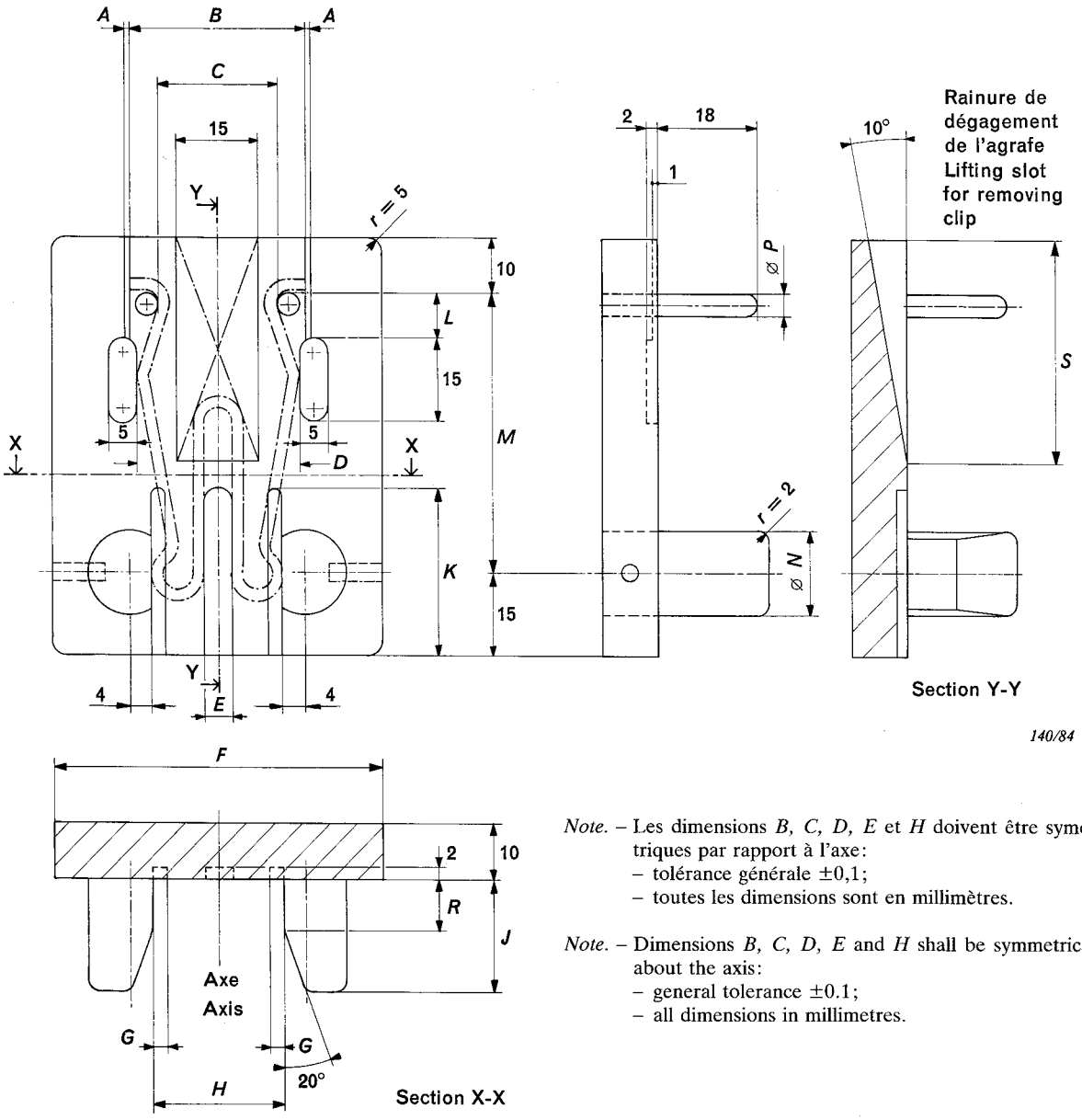
In the case of failure to meet the requirements of Sub-clause 13.1, agreement may be reached to withdraw the batch for further examination by the manufacturer. The tests of Sub-clause 13.1 may then be repeated, taking three times the number of samples originally submitted to these tests.

If only one locking device fails to comply with one of the tests given in Sub-clauses 13.2 and 13.3, a re-test concerning this test may be carried out, taking twice the number of samples originally submitted to this test.

If two or more locking devices fail to comply with one of the tests given in the above clauses, or if the result of the re-test is not satisfactory, the complete batch is considered as not complying with this standard.

ANNEXE A
CALIBRES POUR AGRAFES

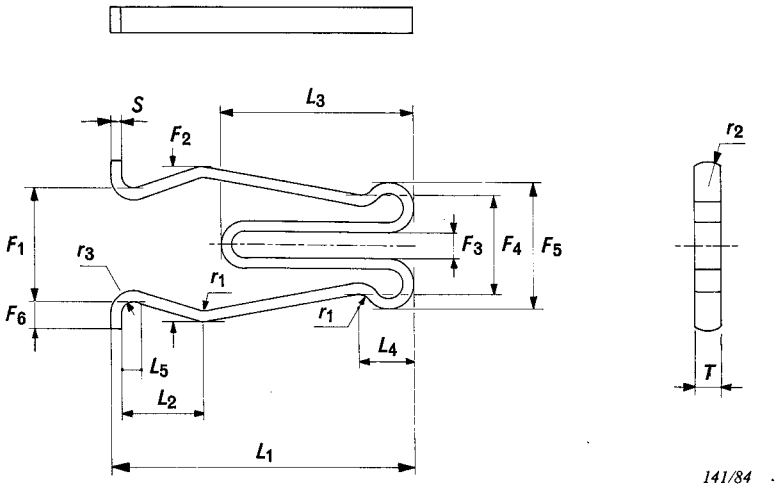
APPENDIX A
GAUGES FOR W-CLIPS



Note. – Les dimensions *B, C, D, E* et *H* doivent être symétriques par rapport à l'axe:
- tolérance générale ±0,1;
- toutes les dimensions sont en millimètres.

Note. – Dimensions *B, C, D, E* and *H* shall be symmetrical about the axis:
- general tolerance ±0.1;
- all dimensions in millimetres.

Agrafe W-clip	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*J*	*K*	*L*	*M*	*N*	*P*	*R*	*S*
11	0,6	23	15	20	4	50	3	19	18	24	4,5	32	12	3	9	32
16A	1	32	22	28	5	60	2,5	24	20	30	8	44	15	4	9	32
16B	1	32	22	28	5	60	2,5	24	20	30	8	44	15	4	9	32
20	1	32	22	30	5	60	2,5	24	20	30	8	55	15	4	9	40
24	1	32	22	30	5	60	3	25	20	30	8	65	15	4	9	42
28	1	36	24	32	6	65	3,5	28	22	30	8	75	15	5	12	42
32	1	40	26	36	6	70	4,5	33	22	35	10	85	15	5	12	45



Notes pour l'emploi des calibres d'agrafes

1. L'agrafe est placée dans le calibre suivant la position indiquée, de façon que les dimensions nominales F_1 et F_5 soient maintenues par les chevilles et bossages prévus à cet effet.
2. Les rainures de largeur A correspondent aux tolérances autorisées sur la dimension F_6. Les extrémités des «oreilles» de l'agrafe doivent reposer à l'intérieur de la zone définie par ces rainures.
3. La dimension D correspond à la largeur nominale hors tout F_2 de l'agrafe. Les deux évidements permettent la comparaison entre l'agrafe et la dimension nominale.
4. La dimension E correspond à la largeur nominale F_3 de la bride intérieure. L'évidement permet la comparaison entre l'agrafe et la dimension nominale.
5. Les évidements de largeur G correspondent à la différence entre les dimensions nominales F_4 et F_5. Les lisières intérieures de ces évidements permettent la comparaison entre l'agrafe et la dimension nominale F_4.
6. La comparaison de l'agrafe avec les dimensions nominales L_1, L_2, L_3 et L_4 est faite par mesure directe.
7. Les dimensions S et T de l'agrafe sont vérifiées par mesure directe.

Notes on the use of gauges for W-clips

1. The clip is mounted in the gauge in the position shown so that the nominal dimensions F_1 and F_5 are maintained by the pegs and stops respectively.
2. The grooves of width A correspond to the allowed tolerances of dimension F_6. The ends of the "ears" of the clip must lie within the zone defined by these grooves.
3. Dimension D corresponds to the nominal overall width F_2 of the clip. The two recesses allow comparison between the clip and the nominal dimension.
4. Dimension E corresponds to the nominal width F_3 of the internal loop. The recess allows comparison between the clip and the nominal dimension.
5. The recesses of width G correspond to the difference between the nominal dimensions F_4 and F_5. The internal edges of these recesses allow comparison between the clip and the nominal dimension F_4.
6. Comparison of the clip with the nominal dimensions L_1, L_2, L_3 and L_4 is made by direct measurement.
7. Dimensions S and T on the clip are verified by direct measurement.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60120	1984	Dimensions of ball and socket couplings of string insulator units	HD 474 S1	1986
IEC 60383	1983 [1)]	Test on insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1 kV	-	-
ISO 2713	1973	Copper and copper alloys - Rockwell hardness test (B, F and G scales)	-	-
ISO 6506	1981	Metallic materials - Hardness test - Brinell test	-	-
ISO 6507-1	1982	Metallic materials - Hardness test - Vickers test Part 1: HV 5 to HV 100	-	-

[1)] IEC 60383:1983 is superseded by IEC 60383-1:1993 and IEC 60383-2:1993 which are respectively harmonized as EN 60383-1:1996 and EN 60383-2:1995.

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