



**SLOVENSKI STANDARD**  
**SIST EN 60352-2:2002/A1:2002**  
**01-september-2002**

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**Solderless connections - General requirements, test methods and practical guidance (IEC 60352-2:1990/A1:1996)**

Solderless connections -- Part 2: Solderless crimped connections - General requirements, test methods and practical guidance

Lötfreie elektrische Verbindungen -- Teil 2: Crimpverbindungen - Allgemeine Anforderungen, Prüfverfahren und Anwendungshinweise

Connexions sans soudure -- Partie 2: Connexions serties sans soudure - Règles générales, méthodes d'essai et guide pratique

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**Ta slovenski standard je istoveten z: EN 60352-2:1994/A1:1997**

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**ICS:**

29.120.20      Spojni elementi      Connecting devices

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EUROPEAN STANDARD  
 NORME EUROPÉENNE  
 EUROPÄISCHE NORM

**EN 60352-2/A1**

January 1997

UDC 621.315.683:620.1  
 ICS 29.120.20

Descriptors: Solderless crimped connections, general requirements, test methods and practical guidance

English version

**Solderless connections**  
**Part 2: Solderless crimped connections - General requirements,**  
**test methods and practical guidance**  
 (IEC 352-2:1990/A1:1996)

Connexions sans soudure  
 Partie 2: Connexions serties sans  
 soudure - Règles générales,  
 méthodes d'essai et guide pratique  
 (CEI 352-2:1990/A1:1996)

Lötfreie elektrische Verbindungen  
 Teil 2: Crimpverbindungen  
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This amendment A1 modifies the European Standard EN 60352-2:1994; it was approved by CENELEC on 1996-12-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 amendment 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**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

### Foreword

The text of document 48B/493/FDIS, future amendment 1 to IEC 352-2:1990, prepared by SC 48B, Connectors, of IEC TC 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60352-2:1994 on 1996-12-09.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-09-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1997-09-01

Annexes designated "normative" are part of the body of the standard.  
In this standard, annex ZA is normative.  
Annex ZA has been added by CENELEC.

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### Endorsement notice

The text of amendment 1:1996 to the International Standard IEC 352-2:1990 was approved by CENELEC as an amendment to the European Standard without any modification.

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Replace Annex ZA of EN 60352-2:1994 by:

### Annex ZA (normative)

#### Normative references to international publications with their corresponding European publications

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

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 50(581)	1978	International Electrotechnical Vocabulary (IEV) Chapter 581: Electromechanical components for electronic equipment	-	-
IEC 68-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1 <sup>1)</sup>	1994
IEC 130-7	1971	Connectors for frequencies below 3 MHz Part 7: Circular multipole connectors with bayonet or push-pull coupling	-	-
IEC 189-3	1988	Low-frequency cables and wires with PVC insulation and PVC sheath Part 3: Equipment wires with solid or stranded conductor, PVC insulated, in singles, pairs and triples	-	-
A1	1989		-	-
IEC 203	1966	Dimensions of the crimp area of machined crimp type contacts	-	-
IEC 512-1	1994	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods Part 1: General	EN 60512-1	1994
IEC 512-2	1985	Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests	-	-

1) EN 60068-1 includes the corrigendum October 1988 and A1 to IEC 68-1.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 512-5	1992	Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests	-	-
IEC 512-6	1984	Part 6: Climatic tests and soldering tests	-	-
IEC 512-8	1993	Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations	-	-
IEC 512-9	1992	Part 9: Miscellaneous tests	-	-
IEC 673	1980	Low-frequency miniature equipment wires with solid or stranded conductor, fluorinated polyhydrocarbon type insulation, single	-	-
A3	1989		-	-
ISO 6507-1	1982	Metallic materials - Hardness test - Vickers test -- Part 1: HV 5 to HV 100	-	-

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**NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD**

**CEI  
IEC  
352-2**

1990

AMENDEMENT 1  
AMENDMENT 1

1996-11

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Amendement 1

**Connexions sans soudure –**

**Partie 2:**

**Connexions serties sans soudure –  
Règles générales, méthodes d'essai  
et guide pratique**

<https://standards.iteh.ai/catalog/standards/sist/f483654f-b967-4230-8585-bb2128da70c9/sist-en-60352-2-2002-a1-2002>

Amendment 1

**Solderless connections –**

**Part 2:**

**Solderless crimped connections –  
General requirements, test methods  
and practical guidance**

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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For price, see current catalogue

## FOREWORD

This amendment has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
48B/493/FDIS	48B/551/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting in the above table.

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Contents

*Replace the existing contents of section four by the following new contents:*

SECTION FOUR – PRACTICAL GUIDANCE

- 13 General
- 14 Tool information
- 15 Crimp barrel information
- 16 Wire information
- 17 Connection information
- 18 Crimping process
- 19 Correct crimped connections (additional information)
- 20 Faults with crimped contacts having open barrels
- 21 General information about crimp type contacts as part of a multipole connector
- 22 Final remarks

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*Replace the existing list of references by the following new text:*

Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 352. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 352 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.



IEC 50(581): 1978, *International Electrotechnical Vocabulary (IEV) – Chapter 581: Electro-mechanical components for electronic equipment*

IEC 68-1: 1988, *Environmental testing – Part 1: General and guidance*

IEC 130-7: 1971, *Connectors for frequencies below 3 MHz – Part 7: Circular multipole connectors with bayonet or push-pull coupling*

IEC 189-3: 1988, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 3: Equipment wires with solid or stranded conductor, PVC insulated, in singles, pairs and triples*  
Amendment No. 1 (1989)

IEC 203: 1966, *Dimensions of the crimp area of machined crimp type contacts*

IEC 512-1: 1994, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 1: General*

IEC 512-2: 1985, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests*

IEC 512-5: 1992, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests*

IEC 512-6: 1984, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 6: Climatic tests and soldering tests*

IEC 512-8: 1993, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations*

IEC 512-9: 1992, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 9: Miscellaneous tests*

IEC 673: 1980, *Low-frequency miniature equipment wires with solid or stranded conductor, fluorinated polyhydrocarbon type insulation, single*  
Amendment No. 3 (1989)

ISO 6507-1: 1982, *Metallic materials; Hardness test; Vickers test – Part 1: HV 5 to HV 100*

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## 11.2 Mechanical tests

Add the following new note:

NOTE – For crimped connections made with more than one wire, see 17.2.

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## 11.3 Electrical tests

Add the following new note:

NOTE – For crimped connections made with more than one wire, see 17.2.

Replace the existing text of section four by the following new text:

### 13 General

This practical guidance applies to crimped connections made with stranded copper conductors produced by crimping tools (fully-automatic, semi-automatic crimping machines or hand-operated crimping tools). Solid copper conductors or conductors made of other materials (aluminium, steel, etc.) often require special care regarding the contacts and the crimping tools, which should be agreed with the manufacturer.

#### 13.1 Advantages of crimped connections

A connection made by crimp technique is a non-releasable electrical connection between one or more conductors with a crimp contact of any shape. Good electrical connection is achieved by exact matching of crimping dies, crimp barrels and the conductors' cross-section by pressure deformation and reshaping of the barrel.

##### Advantages

- efficient processing of connections at each production level;
- processing by fully-automatic or semi-automatic crimping machines, or with hand-operated tools;
- no cold-soldered joints;
- no degradation of the spring characteristic of female contacts by the soldering temperature;
- no health risk from heavy metal and flux steam;
- preservation of conductor flexibility behind the crimped connection;
- no burnt, discoloured and overheated wire insulation;
- good connections with reproducible electrical and mechanical performances;
- easy production control.

#### 13.2 Current-carrying capacity

In general, the total area of contact between the conductor and the crimp barrel of a crimped connection made to this standard should result in a larger cross-section than that of the wire used.

It should be taken into account that the current-carrying capacity can be influenced by:

- ambient temperature;
- contact material;
- surface finish of the contact;
- cross-section of the conductor;
- surface finish of the conductor;
- number of positions in a multipole connector;
- pitch (spacing) of a multipole connector.

## 14 Tool information

- a) Crimping tools and contacts used should be delivered by the same manufacturer, otherwise the user is responsible for a good reliable crimped connection.
- b) Tools shall operate and correctly form the crimp without damaging the barrel or the component to be crimped.
- c) In order to achieve a good reliable crimped connection, usually a crimping tool having a full cycle crimping mechanism is necessary. On completion of the full crimping cycle, the handles and dies or indentors should automatically return to the fully open position. Fully-automatic and semi-automatic crimping machines complete the full crimping cycle automatically.
- d) In any case, the crimping operation should be made in one step. Rework in additional steps should be avoided.
- e) Removable parts of the tool, such as crimping dies and location devices, should be designed that they can only be fitted into the tool in the correct manner.
- f) Tools should be provided with means for the proper location of crimp barrels and wires during the crimping operation.
- g) Tools should be designed that only the necessary adjustments can be made.
- h) The action of the tool should be such that both the crimp barrel and the insulation grip (if any) are crimped or compressed, respectively, in one operation.
- i) The tool design should ensure that the dies for a particular tool are interchangeable in other tools of that type. Where they are not interchangeable, they should be marked to identify the tool for which they are suitable.
- j) Tools may be designed to produce a die marking or coding upon the crimp barrel, so that the inspection after crimping is possible to verify correct application.
- k) The tool design should allow gauging of the dies to assess wear. The gauging method should be as specified by the tool manufacturer.

## 15 Crimp barrel information

### 15.1 General

#### 15.1.1 Open crimp barrels, with or without insulation grip

These are crimp barrels of contacts which are U- or V-shaped before crimping. The contacts are usually delivered in strip form (length or side feed) on reels for fully- or semi-automatic crimping machines. During the crimping process, the crimped contact will be separated from the strip. For low production rates and repair these contacts can also be delivered in loose piece form for hand crimping tools. The characteristic of contacts with open crimp barrel and insulation grip is a second barrel, which is also reshaped during the crimping process and which secures the end of the wire insulation.

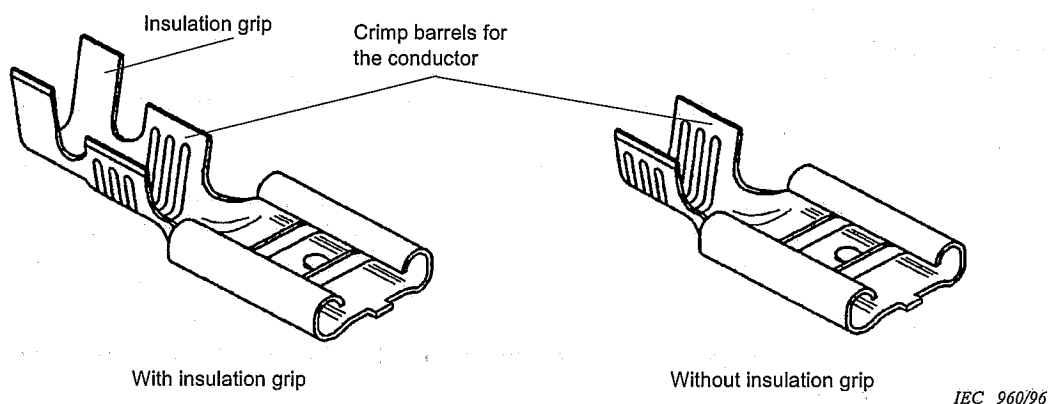


Figure 17 – Open crimp barrels

The basic function of the insulation grip is to absorb mechanical stress like vibration or bending from the crimped connection. Contacts with insulation grip are the most commonly used in practice.

15.1.2 *Closed crimp barrels, either uninsulated, with or without insulation grip, or pre-insulated, with or without insulation grip*

These are crimp barrels of terminals or contacts which are stamped and formed, deep-drawn, screw-machined or manufactured out of tubing. Pre-insulated barrels usually have an insulation sleeve made of polyvinyl chloride, polyamide, etc.

It is recommended that the barrel conductor entry be chamfered as to:

- avoid damage to the conductor;
- ease insertion of the conductor.

Terminals and contacts having closed crimp barrels usually are loose-piece products, but there are also products in strip form (tape-mounted, etc.) on the market.

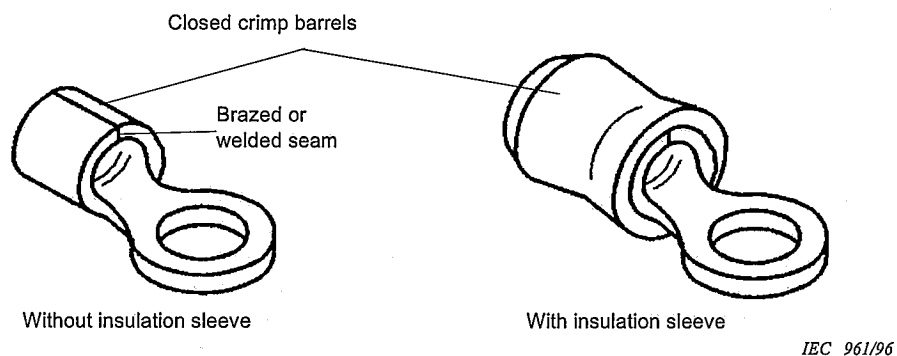


Figure 18 – Closed crimp barrels