

Solderless connections —

Part 5: Press-in connections — General requirements, test methods and practical guidance

The European Standard EN 60352-5:2001, with the incorporation of amendment A1:2003, has the status of a British Standard

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National foreword

This British Standard is the official English language version of EN 60352-5:2001, including amendment A1:2003. It is identical with IEC 60352-5:2001, Edition 2.1:2003 which comprises Edition 2:2001 consolidated by the incorporation of amendment 1:2003. It supersedes BS EN 60352-5:1995 which will be withdrawn on 2004-04-01.

The UK participation in its preparation was entrusted by Technical Committee EPL/48, Electromechanical components for electronic equipment, to Subcommittee EPL/48/2, Connectors for electronic equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible 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.

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Solderless connections

Part 5: Press-in connections — General requirements, test methods and practical guidance

(includes amendment A1:2003)
(IEC 60352-5:2001 + A1:2003)

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Partie 5: Connexions insérées à force —
Règles générales, méthodes d'essai et guide
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(CEI 60352-5:2001 + A1:2003)

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Teil 5: Einpressverbindungen —
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Anwendungshinweise
(enthält Änderung A1:2003)
(IEC 60352-5:2001 + A1:2003)

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Comité Européen de Normalisation Electrotechnique
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Foreword

The text of document 48B/978/FDIS, future edition 2 of IEC 60352-5, 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 EN 60352-5 on 2001-04-01.

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Annexes designated “normative” are part of the body of the standard.

In this standard, Annex A and Annex ZA are normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60352-5:2001 was approved by CENELEC as a European Standard without any modification.

In the official version, the following note has to be added for the standard indicated:

IEC 60249-2-1 NOTE Harmonized with A1:1989 as HD 313.2.1 S2:1990 (not modified).

Foreword to amendment A1

The text of document 48B/1367/FDIS, future amendment 1 to IEC 60352-5:2001, 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 60352-5:2001 on 2003-12-01.

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Endorsement notice

The text of amendment 1:2003 to the International Standard IEC 60352-5:2001 was approved by CENELEC as an amendment to the European Standard without any modification.

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INTRODUCTION

This part of IEC 60352 includes requirements, tests and practical guidance information.

Two test schedules are provided.

- a) The qualification test schedule applies to individual press-in connections (press-in zone).
They are tested to the specification provided by the manufacturer of the press-in zone (see 4.6) taking into account the requirements of clause 4.
The qualification is independent of the application of the press-in zone in a component.
- b) The application test schedule applies to press-in connections which are part of a component and are already qualified to the qualification test schedule.
Test sequences focus on the performance of the press-in connection which is affected by the implementation in a component.

As the manufacturer of the press-in zone has to provide the main part of the information needed for qualification, the use of the words "the manufacturer" is implemented throughout this standard for simplicity.

IEC Guide 109 advocates the need to minimise the impact of a product on the natural environment throughout the product life cycle.

It is understood that some of the materials permitted in this standard may have a negative environmental impact.

As technological advances lead to acceptable alternatives for these materials, they will be eliminated from the standard.

SOLDERLESS CONNECTIONS –

Part 5: Press-in connections – General requirements, test methods and practical guidance

1 Scope and object

This part of IEC 60352 is applicable to solderless press-in connections for use in telecommunication equipment and in electronic devices employing similar techniques.

The press-in connection consists of a termination having a suitable press-in zone which is inserted into a plated-through hole of a double-sided or multilayer printed board.

Information on materials and data from industrial experience is included in addition to the test procedures to provide electrically stable connections under prescribed environmental conditions.

The object of this part of IEC 60352 is to determine the suitability of press-in connections under specified mechanical, electrical and atmospheric conditions.

Only compliant press-in zones can be qualified according to this specification.

Solid press-in zones are in use. Information about these is given in annex A.

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.

IEC 60050(581):1978, *International Electrotechnical Vocabulary (IEV) – Chapter 581: Electromechanical components for electronic equipment*
Amendment 1 (1998)

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 60249-2-4:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 4: Epoxide woven glass fabric copper-clad laminated sheet, general purpose grade*
Amendment 3 (1993)

IEC 60249-2-5:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 5: Epoxide woven glass fabric copper-clad laminated sheet of defined flammability (vertical burning test)*

Amendment 3 (1993)

Amendment 4 (1994)

IEC 60249-2-11:1987, *Base materials for printed circuits – Part 2: Specifications -Specification No. 11: Thin epoxide woven glass fabric copper-clad laminated sheet, general purpose grade for use in the fabrication of multilayer printed boards*

Amendment 2 (1993)

Amendment 3 (1994)

IEC 60249-2-12:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 12: Thin epoxide woven glass fabric copper-clad laminated sheet of defined flammability, for use in the fabrication of multilayer printed boards*

Amendment 2 (1993)

Amendment 3 (1994)

IEC 60326-2:1990, *Printed boards – Part 2: Test methods*

Amendment 1 (1992)

IEC 60326-3:1991, *Printed boards – Part 3: Design and use of printed boards*

IEC 60326-5:1980, *Printed boards – Part 5: Specification for single and double sided printed boards with plated-through holes*

Amendment 1 (1989)

IEC 60352-1:1997, *Solderless connections – Part 1: Wrapped connections – General requirements, test methods and practical guidance*

IEC 60512-1:1994, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 1: General*

IEC 60512-2:1985, *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*

Amendment 1 (1994)

IEC 60512-4:1976, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 4: Dynamic stress tests*

IEC 60512-6:1984, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 6: Climatic tests and soldering tests*

IEC 60512-11-1:1995, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 11: Climatic tests – Section 1: Test 11a: Climatic sequence*

IEC 60512-11-7:1996, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 11: Climatic tests – Section 7: Test 11g: Flowing mixed gas corrosion test*

IEC 62326-4:1996, *Printed boards – Part 4: Rigid multilayer printed boards with interlayer connections – Sectional specification*

3 Definitions

For the purpose of this part of IEC 60352, the terms and definitions of IEC 60050(581) and IEC 60512-1 and the following additional terms and definitions apply.

3.1

press-in connection:

solderless connection made by inserting a press-in termination into a plated-through hole of a printed board

[IEV 581-03-46]

3.2

press-in termination (press-in post)

termination having a specially shaped zone suitable to provide for a solderless press-in connection

[IEV 581-03-39]

3.2.1

solid press-in termination

press-in termination having a solid press-in zone

[IEV 581-03-40]

3.2.2

compliant press-in termination

press-in termination having a compliant press-in zone

[IEV 581-03-41]

3.3

press-in zone

specially shaped section of a press-in termination which is suitable to provide for the press-in connection

[IEV 581-03-52]

3.4

termination insertion tool

device used to insert press-in terminations or components equipped with press-in terminations into a printed board

[IEV 581-05-22]

3.5

termination removal tool

device for removing a press-in termination from a printed board

[IEV 581-05-23]

3.6

part

press-in terminations and a printed board with plated-through holes. The press-in terminations are not inserted in the printed board.

3.7

specimen

printed board, or a part of a printed board, with an inserted press-in termination, with or without a component housing

4 Requirements

4.1 General

This clause is applicable to compliant press-in zones only. For solid press-in zones, see annex A.

The connections shall be processed in a careful and workmanlike manner, in accordance with good current practice.

4.2 Tools

Tools shall be used and inspected according to the instructions and dimensions provided by the manufacturer.

The tools shall be capable of making uniformly reliable connections during their useful life.

The tools shall be so designed that they do not damage the press-in termination or the printed board when correctly operated.

Tools are evaluated by testing press-in connections made with these tools.

4.3 Press-in terminations

4.3.1 Materials

Material used in the press-in zone shall be specified by the manufacturer.

For information on materials, see 6.3.3.

4.3.2 Dimensions of the press-in zone

The performance of a press-in connection depends on the dimensions of the specially shaped press-in zone and the materials used for the press-in termination together with the dimensions and materials of the plated-through hole in the printed board. The dimensions and shape including the tolerances of the press-in zone shall be specified by the manufacturer.

NOTE For dimensions of plated-through holes, see 4.4.3.2.

4.3.3 Surface finishes

The press-in zone of the press-in termination shall be either unplated or plated. The surface finish shall be specified by the manufacturer.

The surface shall be free of detrimental contamination or corrosion. For information on surface finishes, see 6.3.3.

4.3.4 Design features

For the shape of the press-in zone, a wide variety of designs can be used.

The press-in termination shall be so designed that a press-in connection is achieved by inserting the press-in zone to a predetermined depth in a specified plated-through hole in the board.

The press-in terminations and their press-in zones shall be so designed and manufactured such that damage to the plated-through hole in the printed board is avoided (see also 4.5).

Press-in terminations shall have insert features, for example a shoulder or suitable surface, to facilitate the insertion operation.

4.4 Printed boards

Printed boards according to IEC 60326-3, IEC 60326-5 and IEC 62326-4 or to a specification given by the manufacturer shall be used.

The manufacturer shall define the type(s) of printed board for which the press-in zone is designed to (see 4.4.1).

4.4.1 Materials

Printed boards shall be made of base material according to the following relevant standards:

- a) for double sided printed boards:
 - IEC 60249-2-4 – Type 60249-2-4-IEC-EP-GC-Cu
 - IEC 60249-2-5 – Type 60249-2-5-IEC-EP-GC-Cu
- b) for multilayer printed boards:
 - IEC 60249-2-11 – Type 60249-2-11-IEC-EP-GC-Cu
 - IEC 60249-2-12 – Type 60249-2-12-IEC-EP-GC-Cu
- c) other printed circuit board material according to the specification given by the manufacturer.

4.4.2 Thickness of printed boards

The manufacturer shall specify for which range of board thicknesses the press-in zone is designed.

4.4.3 Plated-through hole

4.4.3.1 Plating of the plated-through hole

The thickness of the plating of the plated-through hole shall be: copper $\geq 25 \mu\text{m}$.

Further plating requirements shall be specified by the manufacturer.

4.4.3.2 Hole dimensions

The hole diameter prior to plating is of great importance in determining the reliability of a press-in connection.

The tolerances on the hole diameters prior to and after plating are given in table 1.

Table 1 – Finished plated-through holes

All dimensions are in millimetres

Nominal hole diameter	Diameter of the finished plated-through hole	Diameter of the hole prior to plating
0,50	$0,50 \pm 0,05$	$0,60 \pm 0,01$
0,55	$0,55 \pm 0,05$	$0,64 \pm 0,01$
0,60	$0,60 \pm 0,05$	$0,70 \pm 0,02$
0,65	$0,65 \begin{smallmatrix} +0,07 \\ -0,04 \end{smallmatrix}$	$0,80 \begin{smallmatrix} +0 \\ -0,03 \end{smallmatrix}$
0,70	$0,70 \begin{smallmatrix} +0,07 \\ -0,05 \end{smallmatrix}$	$0,80 \begin{smallmatrix} +0,03 \\ -0,02 \end{smallmatrix}$
0,75	$0,75 \begin{smallmatrix} +0,05 \\ -0,07 \end{smallmatrix}$	$0,85 \begin{smallmatrix} +0,01 \\ -0,04 \end{smallmatrix}$
0,80	$0,80 \begin{smallmatrix} +0,09 \\ -0,03 \end{smallmatrix}$	$0,90 \pm 0,025$
0,85	$0,85 \begin{smallmatrix} +0,10 \\ -0,05 \end{smallmatrix}$	$1,00 \begin{smallmatrix} +0,01 \\ -0,04 \end{smallmatrix}$
0,90	$0,90 \pm 0,07$	$1,00 \pm 0,025$
1	$1,00 \begin{smallmatrix} +0,09 \\ -0,06 \end{smallmatrix}$	$1,15 \pm 0,025$
1,45	$1,45 \begin{smallmatrix} +0,09 \\ -0,06 \end{smallmatrix}$	$1,60 \pm 0,025$
1,60	$1,60 \begin{smallmatrix} +0,09 \\ -0,06 \end{smallmatrix}$	$1,75 \pm 0,025$
NOTE If molded interconnection devices are used, the values of the 2nd column shall be applied. The diameters indicated in the 3rd column are the commonly used drill diameters for FR4 printed boards and are not necessarily relevant for other board materials and molded interconnection devices.		

4.5 Press-in connections

- The combination of press-in termination, printed board and termination insertion tool shall be compatible and specified by the manufacturer.
- The press-in termination shall be correctly mounted in the plated-through hole of the printed board as specified in the specification of the manufacturer of the press-in zone.
- The press-in operation may result in deformation of the plated-through hole (visible by microsectioning).
- The press-in termination shall not be damaged (e.g. cracked or bent).
- There shall be no deformation of the printed conductor and/or the plating of the plated-through hole caused by the termination insertion tool or device.
- There shall be no lands fractured or lifted.