

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Connexions sans soudure –
Partie 5: Connexions insérées à force – Exigences générales, méthodes d'essai et guide pratique



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

FOREWORD

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International Standard IEC 60352-5 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

This fourth edition cancels and replaces the third edition published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Enhancement of Annex A and further application remarks are added.
- b) Editorial changes throughout the standard to prevent the document from being misunderstood as specification for establishing press-in connection in total.
- c) Deletion of all tables with hole dimensions. Historically the hole dimensions were constrained because of the dimensions of the wire wrap and clip connections posts. Since

these connection technologies are no longer commonly used, the design requirements are no longer practical.

- d) Inclusion of additional figures and one table in 4.4.4 to define tolerance ranges for holes in test-boards and to illustrate them.
- e) Inclusion of a requirement for the thickness of the test-board in 4.4.

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

FDIS	Report on voting
48B/2276/FDIS	48B/2286/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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The contents of the corrigendum of September 2014 have been included in this copy.

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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 termination (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 termination has to provide the main part of the information needed for qualification, the word "manufacturer" is used 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.

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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 mechanical, electrical and atmospheric conditions as specified by the manufacturer of the press-in termination and to provide a means of comparing test results when the tools used to make the connections are of different designs or manufacture.

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2 Normative references

[IEC 60352-5:2012](#)

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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):2008, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment*

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

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

IEC 60512 (all parts), *Connectors for electronic equipment – Tests and measurements*

IEC 60512-1-100, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

IEC 61188-5-1: *Printed boards and printed board assemblies – Design and use – Part 5-1: Attachment (land/joint) considerations – Generic requirements*

IEC 61249 (all parts), *Materials for printed boards and other interconnecting structures*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050(581) and IEC 60512-1 as well as the following apply.

3.1

press-in connection

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

[IEC 60050-581: 2008, 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

[IEC 60050-581: 2008, 581-03-39]

3.2.1

solid press-in termination

press-in termination having a solid press-in zone which behaves primarily rigid and induces a elastoplastic deflection of the through hole

[IEC 60050-581: 2008, 581-03-40]

3.2.2

compliant press-in termination

press-in termination having a compliant press-in zone which causes a limited elastoplastic deflection of the through hole and a elastoplastic deformation of the press-in zone

[IEC 60050-581: 2008, 581-03-41, modified]

3.3

press-in zone

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

[IEC 60050-581: 2008, 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

[IEC 60050-581: 2008, 581-05-22]

3.5

termination removal tool

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

[IEC 60050-581: 2008, 581-05-23]

3.6

set of parts

one press-in termination and a test-board with one or more plated-through holes. The press-in termination is not mounted in the printed board

3.7

specimen

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

3.8

manufacturer

manufacturer of the press-in termination, who performs the tests according to this standard using a test board

4 Requirements

4.1 General

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

4.2 Tools

4.2.1 General

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.

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

[IEC 60352-5:2012](https://standards.iteh.ai/catalog/standards/sist/4d8b28bf-e0db-4587-ad60-18fa227dca7/iec-60352-5-2012)

4.2.2 Tools evaluation

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Tools are evaluated for performance by testing the connections made by them and carrying out tests according to 4.5 and 5.1.2. They shall meet the requirements of 4.6d) and 5.2.1.3.

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 A.4.3.

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.

4.3.3 Dimensions of the plated through hole

The minimum thickness of copper plating of the printed circuit board shall be 25 µm. The shape and dimensions including the tolerances of the plated through hole shall be specified by the manufacturer.

4.3.4 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.

4.4 Test boards

4.4.1 General

For test purposes test boards according to IEC 61188-5-1 and IEC 62326-4 or to a specification given by the manufacturer shall be used.

Four layer printed circuit test boards shall be used for testing unless otherwise specified in the component specification or in the manufacturer's specification.

4.4.2 Materials

The manufacturer shall specify the types of base material for which the press-in zone is designed.

Examples of base materials may be found in IEC 61249.

4.4.3 Thickness of test boards

The thickness of the test-board shall be that for which the press-in connection is designed. When a press-in connection is designed to be used with different board thicknesses, the test board selected shall be of the thinnest nominal thickness for which the press-in connection is intended to be used.

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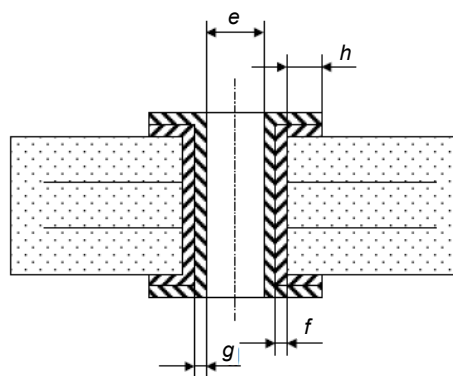
NOTE If a press-in connection is designed for board sizes of 1,6 mm to 2,4 mm, a test board with a nominal thickness of 1,6 mm (within tolerance range) is used.

4.4.4 Plated-through hole

IEC 60352-5:2012

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The minimum and the maximum plated hole diameter, the press-in connection is intended for shall be defined by the manufacturer. The tolerance range is then the range between the minimum and the maximum plated hole diameter.



IEC 162/12

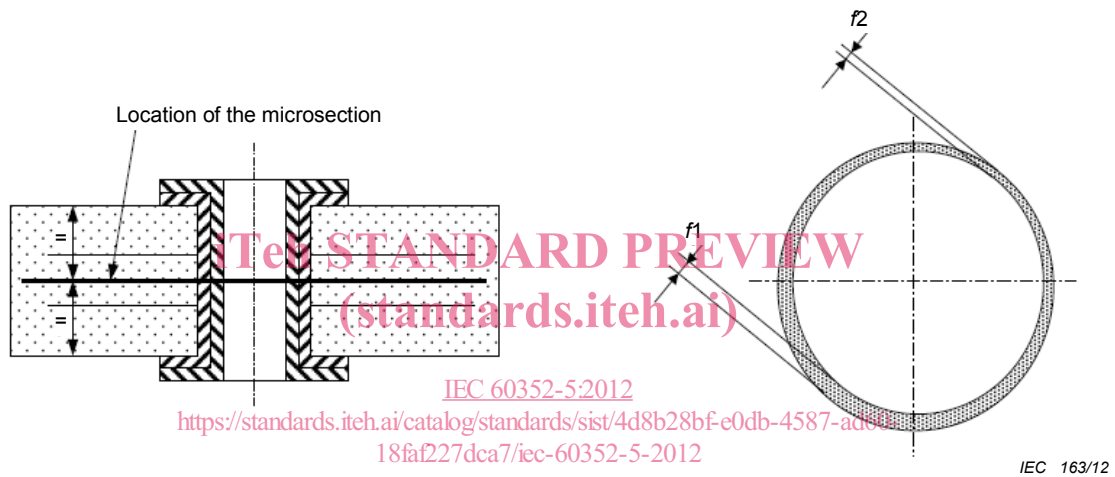
Figure 1 – Plated-through hole

The plated-through holes shall fulfil the requirements according to Table 1, where the item definition follows Figure 1.

Table 1 – Plated-through hole requirements for test boards

Item according to Figure 1	Description	Requirement
<i>e</i>	Min. hole tolerance range (range a)	lower 30 % of the tolerance range
	Max. hole tolerance range (range b)	upper 30 % of the tolerance range
<i>f</i>	copper thickness of the tube	min. 25 µm, max. 35 µm
<i>g</i>	final plating	for information see A.4.3
<i>h</i>	pad width	min. 0,15 mm

The thickness of the copper tube shall be measured by a transversal microsection through the hole according to Figure 2. The values of f_1 and f_2 shall be in the required range of f according to Table 1.

**Key**

f_1 maximal measured value of the copper thickness

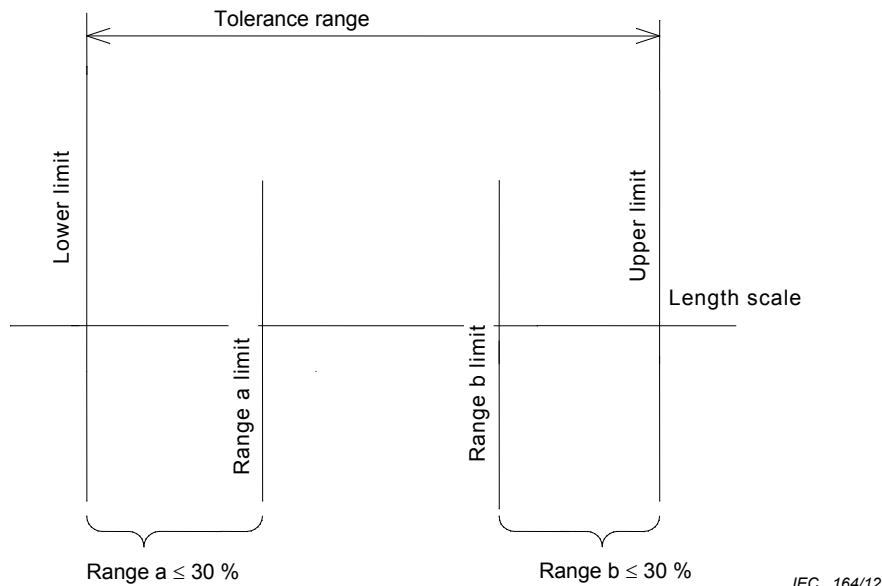
f_2 minimal measured value of the copper thickness

Figure 2 – Location and example of the transversal microsection for measuring the copper thickness

NOTE It is important that all holes of a test board have the same thickness of copper plating. The difference of diameters has therefore to be made via different diameters of the drill tools respective holes in injection moulded boards. It is recommended to manufacture test boards having both minimal and maximal holes on it, because then it can be excluded that the holes have different thicknesses of the copper plating under ordinary manufacturing conditions.

The plated hole tolerance range is the difference between the minimum and the maximum diameter of the plated hole. For testing of the quality of the termination itself, it is necessary to perform tests of the contact close to the maximal hole and close to the minimal hole as well. Measure the holes in the test board and identify which hole diameters are within range a and also the hole diameters within range b of Figure 3.

The hole diameter ranging is shown in Figure 3.



Dimensions in millimetres

NOTE not to scale

Figure 3 – Example of hole ranges

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Further plating requirements shall be specified by the manufacturer.

4.5 Press-in connections

- a) The combination of press-in termination, printed board and termination insertion tool shall be compatible and specified by the manufacturer.
- b) 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.
- c) The press-in operation may result in deformation of the plated-through hole. The limits of deformation shall be according to 5.2.2.5.
- d) The press-in termination shall not be damaged (e.g. cracked or bent).
- e) 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.
- f) There shall be no lands fractured or lifted.
- g) There shall be no delamination, blistering or cracking of layers.
- h) After the press-in operation, no detrimental plating particle chips shall be visible.
- i) At the opposite side of the press-in direction, no plating of the plated-through hole shall be loosened.

4.6 Manufacturer's specification

The following information shall be supplied by the manufacturer of the press-in zone and/or the component:

- a) Printed board and hole information
 - printed board material;
 - maximum number of conductive layers;
 - printed board minimum and maximum thickness;
 - printed board plating materials;
 - finished plated-through hole dimensions, including tolerances;

- hole dimension prior to plating.
- b) Press-in zone information
 - material of the press-in termination;
 - plating.
- c) Information on the application
 - straight or right angle termination;
 - rear plug up;
 - wrapped connection;
 - individual press-in termination;
 - connector with pre-assembled press-in terminations.
- d) Instructions and tools for the press-in operation
 - tools to be used;
 - number of replacements with a new press-in termination.
- e) Forces
 - maximum press-in force per termination;
 - minimum push-out force per termination after tests.
- f) Any other significant information.

5 Tests

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5.1 General remarks

5.1.1 General

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As explained in the introduction, there are two test schedules which shall be applied according to the following conditions.

- a) Press-in connections, according to the requirements in Clause 4 and the requirements in the manufacturer's specification, shall be tested in accordance with the qualification test schedule in 5.3.2.

This test schedule is intended to be applied on individual press-in terminations without component housing.

- b) Press-in connections which are part of a component and already qualified to the qualification test schedule shall be tested in accordance with the application test schedule in 5.3.4.

This test schedule is intended to be applied on complete components consisting of multiple press-in terminations mounted in a component housing.

The application test schedule shall be implemented in the detail standard of the component in such a way that the duplication of tests may be avoided.

Therefore, the test phases in test group D (see 5.3.4.1) may be inserted in any test group of the component specification, as long as the sequence, conditioning and environment comply with the requirements of this standard.

5.1.2 Standard conditions for testing

5.1.2.1 General

Unless otherwise specified, all tests shall be carried out under standard conditions for testing as specified in IEC 60512-1.