

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**

IEC 60352-5:2008

<https://standards.iteh.ai/catalog/standards/iec/64c54dde-1374-49d5-a9ce-d7c9fe03f156/iec-60352-5-2008>

WITLIB.COM



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2008 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00

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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

W

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope and object.....	7
2 Normative references.....	7
3 Terms and definitions	8
4 Requirements	9
4.1 General.....	9
4.2 Tools.....	9
4.2.1 Tools evaluation	9
4.3 Press-in terminations.....	9
4.3.1 Materials.....	9
4.3.2 Dimensions of the press-in zone	9
4.3.3 Surface finishes	9
4.3.4 Design features	10
4.4 Printed boards.....	10
4.4.1 General	10
4.4.2 Materials.....	10
4.4.3 Thickness of printed boards.....	10
4.4.4 Plated-through hole.....	10
4.5 Press-in connections.....	11
4.6 Manufacturer's specification.....	11
5 Tests.....	12
5.1 General.....	12
5.1.1 General remarks.....	12
5.1.2 Standard conditions for testing.....	13
5.1.3 Mounting of specimens/sets of parts	13
5.2 Test and measuring methods.....	13
5.2.1 General examination.....	13
5.2.2 Mechanical tests.....	14
5.2.3 Electrical tests.....	18
5.2.4 Climatic tests.....	18
5.3 Test schedules	19
5.3.1 General	19
5.3.2 Qualification test schedule	19
5.3.3 Application test schedule	21
5.3.4 Flow chart.....	23
5.4 Test report.....	24
5.4.1 Qualification test report.....	24
5.4.2 Application test report.....	24
6 Practical guidance	25
6.1 Current-carrying capacity.....	25
6.2 Tool information.....	25
6.2.1 Termination insertion tool.....	25
6.2.2 Support block	25
6.2.3 Termination removal tool.....	26

6.3	Termination information	26
6.3.1	General	26
6.3.2	Design features	26
6.3.3	Materials and surface finishes	26
6.3.4	Press-in termination with wrap post	27
6.3.5	Press-in terminations with connector contact elements	27
6.4	Printed board information	28
6.4.1	General	28
6.4.2	Plated-through hole	28
6.5	Connection information	29
6.5.1	General	29
6.5.2	Repair of press-in connections	30
6.5.3	Combination of press-in connections and soldered connections	31
6.5.4	Bimetallic electrolytic corrosion effects	31
	Annex A (normative) Solid press-in terminations	32
	Annex B (informative) Plated through hole tolerance range	34
	Bibliography	36
	Figure 1 – Test arrangement, bending	14
	Figure 2 – Test arrangement – push-out force	15
	Figure 3 – Transverse section of a press-in connection	17
	Figure 4 – Longitudinal section of a press-in connection	17
	Figure 5 – Test arrangement for contact resistance	18
	Figure 6 – Qualification test schedule	23
	Figure 7 – Press-in connection made with a press-in termination, application level a)	29
	Figure 8 – Press-in connection made with a press-in termination, application level b)	30
	Figure 9 – Example of a termination-removal tool	31
	Figure A.1 – Parallelism of a solid press-in zone	33
	Figure B.1 – Example of hole ranges	34
	Table 1 – Finished plated-through holes	11
	Table 2 – Vibration, preferred test severities	16
	Table 3 – Push-out force for application level b)	29
	Table A.1 – Plated-through holes for solid press-in zones	32

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 third edition cancels and replaces the second edition published in 2001 and its amendment 1 (2003). This edition constitutes a technical revision.

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

- 1) A recommendation to use four layer test boards in 5.1.
- 2) Removal of sample tolerance range requirements in 5.3.2.1; they have been moved to Annex B.
- 3) Subclause 6.4.2 has been modified to clarify that platings other than tin or tin/lead may be used.

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

FDIS	Report on voting
48B/1805A/FDIS	48B/1830/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.

A list of all parts of the IEC 60352 series, under the general title *Solderless connections*, can be found on the IEC website.

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 maintenance result 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.

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

IEC 60352-5:2008

<https://standards.iteh.ai/c/iec/standards/iec/64c54dde-1374-49d5-a9ce-d7c9fe03f156/iec-60352-5-2008>

WITHDRAWN

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 part of IEC 60352.

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

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 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

[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.

4.2.1 Tools evaluation

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 5.2.1.4.

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 4.4.4.2.

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 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

4.4.1 General

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

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 printed boards

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

4.4.4 Plated-through hole

4.4.4.1 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.

4.4.4.2 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	Recommended diameter of the hole prior to plating ^{a b}
0,50	0,50 ± 0,05	0,60 ± 0,01
0,55	0,55 ± 0,05	0,64 ± 0,01
0,60	0,60 ± 0,05	0,70 ± 0,02
0,65	0,65 ^{+0,07} _{-0,04}	0,80 ⁺⁰ _{-0,03}
0,70	0,70 ^{+0,07} _{-0,05}	0,80 ^{+0,03} _{-0,02}
0,75	0,75 ^{+0,05} _{-0,07}	0,85 ^{+0,01} _{-0,04}
0,80	0,80 ^{+0,09} _{-0,03}	0,90 ± 0,025
0,85	0,85 ^{+0,10} _{-0,05}	1,00 ^{+0,01} _{-0,04}
0,90	0,90 ± 0,07	1,00 ± 0,025
1	1,00 ^{+0,09} _{-0,06}	1,15 ± 0,025
1,45	1,45 ^{+0,09} _{-0,06}	1,60 ± 0,025
1,60	1,60 ^{+0,09} _{-0,06}	1,75 ± 0,025
^a These are typical values for the as-drilled pc board hole diameters for FR4 materials and do not necessarily apply to other pc board materials. ^b These values do not apply to moulded interconnection devices.		

<https://standards.iteh.ai/catalog/standards/iec/60352-5-2008>

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.
- There shall be no delamination, blistering or cracking of layers.
- After the press-in operation, no detrimental plating particle chips shall be visible.
- 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 material;
 - finished plated through holes dimension (Table 1);
 - hole dimension prior to plating.
 - b) Press-in zone information
 - material of the press-in termination;
 - plating;
 - dimensions, including tolerances.
 - 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) Instruction and tools for the press-in operation
 - tools to be used;
 - numbers of repairs with or without a new press-in termination.
 - e) Press-in characteristics
 - maximum press-in force per termination;
 - minimum push-out force per termination.
 - f) Any other significant information
- If this information cannot be disclosed, the qualification of the press-in connection will not take place.

5 Tests

5.1 General remarks

5.1.1 General

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 5.3.3.

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 specification of the component in such a way that the duplication of tests may be avoided.