

# INTERNATIONAL STANDARD

---

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



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2020 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.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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 corrigendum or an amendment might have been published.

**IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

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 It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

**Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

# INTERNATIONAL STANDARD

---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 31.220.10

ISBN 978-2-8322-8476-6

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Requirements .....	10
4.1 General.....	10
4.2 Tools .....	10
4.2.1 General .....	10
4.2.2 Tools evaluation .....	10
4.3 Press-in terminations .....	10
4.3.1 Materials .....	10
4.3.2 Dimensions of the press-in zone.....	10
4.3.3 Surface finishes.....	10
4.4 Test boards.....	11
4.4.1 General .....	11
4.4.2 Materials .....	11
4.4.3 Thickness of test boards.....	11
4.4.4 Hole.....	11
4.4.5 Plated-through hole .....	12
4.5 Press-in connections.....	13
4.6 Manufacturer’s specification .....	14
5 Tests .....	15
5.1 General remarks .....	15
5.1.1 General .....	15
5.1.2 Standard conditions for testing .....	15
5.1.3 Mounting of specimens .....	15
5.2 Test and measuring methods .....	16
5.2.1 General examination.....	16
5.2.2 Mechanical tests.....	16
5.2.3 Contact resistance measurements .....	19
5.2.4 Climatic tests.....	20
5.3 Test schedules.....	21
5.3.1 General .....	21
5.3.2 Qualification test schedule.....	21
5.3.3 Flow chart.....	23
5.3.4 Application test schedule .....	24
5.4 Test report .....	25
5.4.1 Qualification test report .....	25
5.4.2 Application test report.....	26
Annex A (informative) Practical guidance.....	27
A.1 General.....	27
A.2 Current-carrying capacity .....	27
A.3 Tool information .....	27
A.3.1 Termination insertion tool .....	27
A.3.2 Support block .....	27

A.3.3	Termination removal tool .....	28
A.4	Information to press-in termination and press-in connections .....	28
A.4.1	General .....	28
A.4.2	Design features .....	28
A.4.3	Materials and surface finishes .....	29
A.4.4	Press-in terminations with connector contact elements .....	29
A.5	Printed board information .....	29
A.5.1	General .....	29
A.5.2	Plated-through hole .....	30
A.5.3	Dimensioning of the hole .....	30
A.5.4	Manufacturing of the hole, example with drilling for FR4 .....	31
A.5.5	Manufacturing of the hole with materials other than FR4 .....	31
A.6	Press-in connection information .....	31
A.6.1	General .....	31
A.6.2	Press-in connection .....	31
A.6.3	Repair of press-in connections .....	32
A.6.4	Combination of press-in connections and soldered connections .....	33
A.6.5	Bimetallic electrolytic corrosion effects .....	33
	Bibliography .....	34
	Figure 1 – Guide for hole ranges in a test board .....	12
	Figure 2 – Plated-through hole .....	13
	Figure 3 – Location and example of the transversal micro section for measuring the copper thickness .....	13
	Figure 4 – Test arrangement – push-out force .....	17
	Figure 5 – Transverse section of a press-in connection .....	18
	Figure 6 – Longitudinal section of a press-in connection .....	19
	Figure 7 – Test arrangement for contact resistance .....	20
	Figure 8 – Qualification test schedule .....	24
	Figure A.1 – Conceptual composition of a four-layer printed circuit board .....	30
	Figure A.2 – Example of a termination removal tool .....	33
	Table 1 – Plated-through hole requirements for test printed boards .....	12
	Table 2 – Vibration, preferred test severities .....	18
	Table 3 – Qualification test schedule – Test group AP .....	22
	Table 4 – Qualification test schedule – Test group BP .....	22
	Table 5 – Qualification test schedule – Test group CP .....	23
	Table 6 – Application test schedule – Test group DP .....	25
	Table A.1 – Example for dimensioning the printed circuit board hole .....	31

## 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, accept IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This fifth edition cancels and replaces the fourth edition published in 2012. This edition constitutes a technical revision.

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

- a) revising the scope by removing the wording "... telecommunication equipment and in electronic devices employing similar techniques" and replacing it by "... electrical and electronic equipment and components" in the first paragraph;
- b) adding terms and definitions for 'board', 'hole' and 'metal board' to recognize that press-in terminations are being used in many non-printed board materials;

- c) editorial changes to clarify the difference between the two test schedules for qualification and application;
- d) modification of upper limit of copper thickness of the plated-through-hole to reflect actual market trends and manufacturing practices;
- e) removal of bending test, as this test is very specific for applications of press-in technology no longer common;
- f) adding graphs to document the press-in and push-out force, since this is common testing practice and provides further insight into mechanical performance of the contact zone;
- g) reducing the number of test specimens required, since in previous testing scheme a lot of test samples were discarded;
- h) new wording in 4.5 for cracked and bent terminations;
- i) added Figure 7b to show V and A connection locations when the press-in termination does not protrude through the bottom side of the board.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
48B/2810/FDIS	48B/2822/RVD

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

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

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

The committee has decided that the content of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

## INTRODUCTION

This part of IEC 60352 includes requirements and relevant tests (normative) as well as a practical guidance in Annex A (informative) for press-in connections.

Two test schedules are provided.

- a) The qualification test schedule applies to individual press-in connections to demonstrate the suitability of the press-in zone.

These press-in connections 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.

The requirements and tests apply to all elements involved in the manufacturing of a press-in connection:

- the press-in termination, which may be part of a component (e.g. a multi-pole connector);
- the board, printed board or MID (moulded interconnected device) - (plated-through holes dimensions) for which the termination is suitable;
- the tool(s) required to produce the press-in connection.

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 document for simplicity to indicate the manufacturer of the press-in termination. The manufacturers of the other items playing a role in the qualification of press-in connections are specified, if needed, as the board manufacturer or the tool(s) manufacturer.

The practical guidance in Annex A (informative) serves as a guide for the workmanship required in 4.1. Attention is drawn to the fact that some industries (e.g. automotive, aircraft and aerospace, nuclear, military) may have specific workmanship standards and/or quality requirements, which are outside the scope of this document.

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

## SOLDERLESS CONNECTIONS –

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

#### 1 Scope

This part of IEC 60352 is applicable to solderless press-in connections for use in electrical and electronic equipment and components.

The press-in connection consists of a termination having a suitable press-in zone which is inserted into a hole of a board.

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

The object of this document 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.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60512-1, *Connectors for electrical and electronic equipment – Tests and measurements – Part 1: Generic specifications*

IEC 60512-1-1, *Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination*

IEC 60512-1-2, *Connectors for electronic equipment – Tests and measurements – Part 1-2: General examination – Test 1b: Examination of dimension and mass*

IEC 60512-2-1, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-2-5, *Connectors for electronic equipment – Tests and measurements – Part 2-5: Electrical continuity and contact resistance tests – Test 2e: Contact disturbance*

IEC 60512-6-4, *Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic stress tests – Test 6d: Vibration (sinusoidal)*

IEC 60512-11-1, *Connectors for electrical and electronic equipment – Tests and measurements – Part 11-1: Climatic tests – Test 11a – Climatic sequence*