

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**Connectors for electronic equipment – Product requirements –
Part 4-116: Printed board connectors – Detail specification for a high-speed
two-part connector with integrated shielding function**

**Connecteurs pour équipements électroniques – Exigences de produit –
Partie 4-116: Connecteurs pour cartes imprimées – Spécification particulière
pour un connecteur haute vitesse en deux parties avec une fonction de
protection intégrée**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
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.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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

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

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 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.

IEC Customer Service Centre - 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: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) 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 IEC

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

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**Connectors for electronic equipment – Product requirements –
Part 4-116: Printed board connectors – Detail specification for a high-speed
two-part connector with integrated shielding function**

**Connecteurs pour équipements électroniques – Exigences de produit –
Partie 4-116: Connecteurs pour cartes imprimées – Spécification particulière
pour un connecteur haute vitesse en deux parties avec une fonction de
protection intégrée**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.220.10

ISBN 978-2-8322-3047-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

Currently in preview, click buy full version

REDLINE VERSION

VERSION REDLINE



**Connectors for electronic equipment – Product requirements –
Part 4-116: Printed board connectors – Detail specification for a high-speed
two-part connector with integrated shielding function**

**Connecteurs pour équipements électroniques – Exigences de produit –
Partie 4-116: Connecteurs pour cartes imprimées – Spécification particulière
pour un connecteur haute vitesse en deux parties avec une fonction de
protection intégrée**

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	8
1 Scope.....	10
2 Normative references	10
3 Terms and definitions	10
4 General data	11
4.1 Recommended method of mounting.....	11
4.2 Number of contacts and contact cavities	11
4.3 Ratings and characteristics	11
5 Technical data.....	12
5.1 Survey of styles and variants.....	12
5.2 Information on application	12
5.2.1 Complete connectors (pairs).....	12
5.2.2 Fixed board connectors	12
5.2.3 Free board connectors.....	12
5.2.4 Accessories.....	12
5.2.5 Shielding and grounding.....	12
5.2.6 Basic type of termination	12
5.3 Contact arrangement.....	13
6 Dimensional information	13
6.1 General.....	13
6.2 Isometric view and common features.....	14
6.2.1 Fixed board and free board connector	14
6.2.2 Common features	14
6.2.3 Reference system.....	14
6.3 Mating information.....	14
6.3.1 Mating conditions	14
6.3.2 Planarity.....	15
6.4 Fixed board connector.....	16
6.4.1 Dimensions	16
6.4.2 Terminations	17
6.5 Free board connector	18
6.5.1 Dimensions	18
6.5.2 Terminations	20
6.6 Accessories.....	21
6.7 Mounting information for fixed board connectors	21
6.8 Mounting information for connectors.....	22
6.9 Gauges	22
6.9.1 Sizing gauges and retention force gauges	22
6.9.2 Test gauge for first contact point	22
7 Characteristics	22
7.1 Climatical category.....	22
7.2 Electrical characteristics.....	23
7.2.1 Creepage and clearance distances	23
7.2.2 Voltage proof.....	23
7.2.3 Current-carrying capacity.....	23

7.2.4	Contact resistance.....	23
7.2.5	Insulation resistance.....	24
7.2.6	Impedance.....	24
7.2.7	Transmission characteristics.....	24
7.3	Mechanical characteristics	26
7.3.1	Mechanical operation	26
7.3.2	Engaging and withdrawal forces	26
7.3.3	Contact retention in insert.....	27
7.3.4	Static load, transverse.....	27
7.3.5	Gauge retention force.....	27
7.3.6	Vibration (sinusoidal).....	27
7.3.7	Shock.....	27
7.3.8	Polarizing method.....	27
7.3.9	Robustness and effectiveness of coding devices	27
8	Test schedule.....	27
8.1	General.....	27
8.2	Arrangement for contact resistance measurement	28
8.3	Arrangement for contact disturbance measurement (shock and vibration test).....	28
8.4	Arrangement for current carrying measurement.....	29
8.5	Arrangement for dynamic stress tests.....	29
8.6	Arrangement for testing static load; transverse.....	30
8.7	Arrangement for voltage proof and polarization voltage	30
8.8	Arrangement for flammability tests	31
8.9	Test boards for impedance and transmission characteristics	31
8.10	Pre-conditioning	32
8.11	Wiring and mounting of specimens	32
8.11.1	Wiring.....	32
8.11.2	Mounting	32
8.12	Test procedures and measuring methods	33
8.13	Test schedule tables	33
8.13.1	Test group P – Preliminary	33
8.13.2	Test group A – Dynamic/climatic.....	34
8.13.3	Test group B – Mechanical endurance	36
8.13.4	Test group C – Moisture	38
8.13.5	Test group D – Electrical load.....	39
8.13.6	Test group E – Mechanical resistivity.....	40
8.13.7	Test group F – Chemical resistivity	40
8.13.8	Test group G – Connections	41
8.13.9	Test group H – Signal integrity tests	41
Annex A (informative)	Vibration and shock testing of connectors mounted to a mechanical structure for electronic equipment according to IEC 60917 and IEC 60297 – Test setup of assemblies with mass loading of printed boards	43
	Bibliography.....	50
	Figure 1 – Typical arrangement with a two-part connector	8
	Figure 2 – Typical arrangement with a direct edge connector, not covered in this Standard.....	9
	Figure 3 – Fixed board and free board connector	14
	Figure 4 – Mating conditions: lateral offset.....	14

Figure 5 – Mating conditions: misalignment, angular offset	15
Figure 6 – Mating conditions: end stop	15
Figure 7 – Fixed board connector	16
Figure 8 – Free board connector, part 1	18
Figure 9 – Free board connector, part 2	19
Figure 10 – Dimensions of hole pattern in backplane	21
Figure 11 – Reference points	25
Figure 12 – Crosstalk combinations	26
Figure 13 – Arrangement for resistance measurement	28
Figure 14 – Arrangement for measurement of contact disturbance	29
Figure 15 – Wiring arrangement for current-carrying measurement	29
Figure 16 – Test setup for shock and vibration test	30
Figure 17 – Application of static load	30
Figure 18 – Measurement arrangement for voltage proof	31
Figure 19 – Measurement arrangement for flammability tests	31
Figure 20 – Break out area of the connector footprint	31
Figure 21 – Example of a test fixture for fixed board connectors	32
Figure 22 – Example of a test fixture for free board connectors	32
Table 1 – Contact arrangement	13
Table 2 – Dimensions of fixed board connector	17
Table 3 – Dimensions of the free board connector	20
Table 4 – Dimensions of hole pattern in backplane	22
Table 5 – Climatic category	22
Table 6 – Rated insulation voltages	23
Table 7 – Current rating per pin at ambient of 70°C	23
Table 8 – Maximal permissible contact resistance change	24
Table 9 – Minimal insulation resistance	24
Table 10 – Number of specimens for test sequence	28
Table 11 – Test group H	33
Table 12 – Test group A	34
Table 13 – Test group B	36
Table 14 – Test group C	38
Table 15 – Test group D	39
Table 16 – Test group E	40
Table 17 – Test group F	40
Table 18 – Test group G	41
Table 19 – Test group H	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRONIC EQUIPMENT –
PRODUCT REQUIREMENTS –**

**Part 4-116: Printed board connectors –
Detail specification for a high-speed two-part connector
with integrated shielding function**

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, access to 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.

DISCLAIMER

**This Consolidated version is not an official IEC Standard and has been prepared for
convenience. Only the current versions of the standard and its amendment(s)
are to be considered the official documents.**

This Consolidated version of IEC 61076-4-116 bears the edition number 1.1. It consists of the first edition (2012-04) [documents 48B/2280/FDIS and 48B/2289/RVD] and its amendment 1 (2015-11) [documents 48B/2452/FDIS and 48B/2465/RVD]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61076-4-116 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

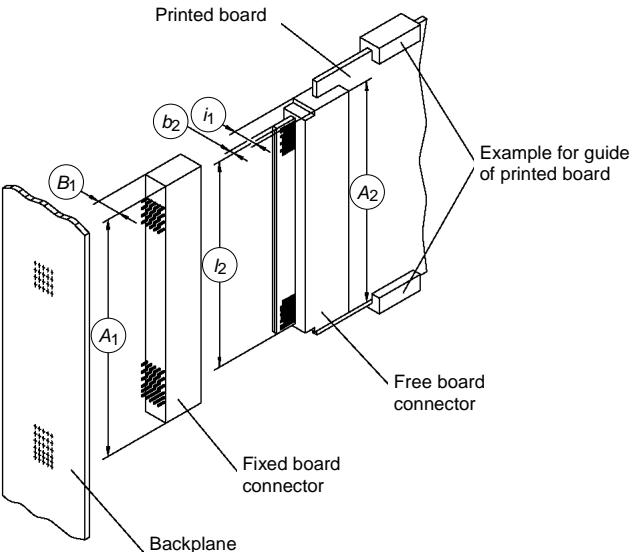
This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61076, under the general title *Connectors for electronic equipment – Product requirements*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

<p>IEC SC 48B – Connectors Specification available from: IEC General secretariat or from the addresses shown on the inside cover.</p>	<p>Draft IEC 61076-4-116 Ed. 1.0</p>
<p>ELECTRONIC COMPONENTS DETAIL SPECIFICATION in accordance with IEC 61076-1 and IEC 61076-4</p>	<p>Page 6 of 42</p>
<p style="text-align: center;">Outline drawing</p>  <p style="text-align: right;"><i>IEC 422/12</i></p>	<p>Two-part connector for printed boards and backplanes</p>
	<p>Fixed and free connectors, for industrial environments</p> <p>Performance level: 1</p>

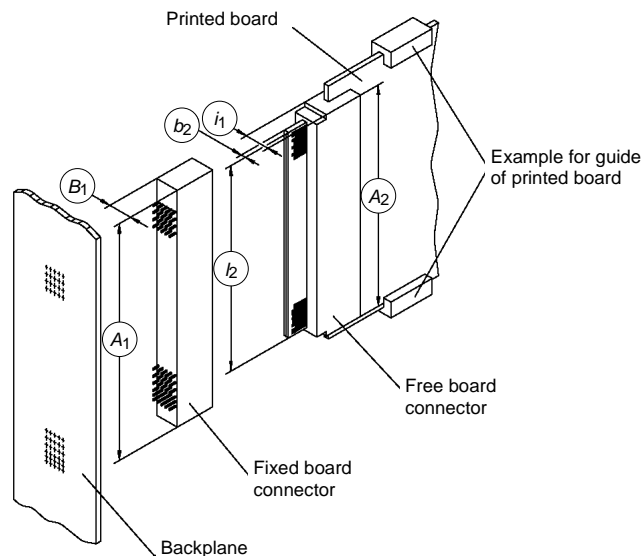
INTRODUCTION

International Standard IEC 61076-4-116 establishes specifications and test requirements for a high-speed two-part connector with integrated shielding function for use as a printed board connector in industrial environments. The connectors have a primary purpose of serving as a platform for telecommunications and enterprise computer network equipment. It is expected that these connectors are going to find applications outside the Telecommunication market, e.g. in the industrial market, as factory automation, process control, industrial communication, medical and others.

The connector type was originally developed in the consortium PCI Industrial Computer Manufacturers Group (whereas PCI is a peripheral component interconnect, which can be used to connect peripheral components to processors via using a bus structure or serially connected fabric based transports). This consortium, referred to in short as PICMG has defined several system specifications describing a backplane connector (fixed connector) in combination with an edge board connector (free connector) as a functional component of a specified Plug-in Unit. These specifications are the AdvancedMC.0 and the MicroTCA.0. The system-description in MicroTCA.0 contains also a test program for the connector. Further information of PICMG and its specifications can be obtained on the following website: www.picmg.org.

Based on the connector type and on PICMG-developments, this International Standard was developed by experts of IEC SC 48B, Connectors. In contrast to the PICMG-standard, the connector described here has two connector halves (a fixed and a free connector, as shown in Figure 1). The fixed connector is based on a $1,6 \text{ mm} \pm 10 \%$ plug-in unit printed board thickness similar to PICMG specifications. In addition, the test program of this IEC Standard differs from that defined in PICMG based on previous existing tests defined in IEC for connectors to suit the needs for use in industry. The resulting test schedule differs from the test-procedures as defined within PICMG to some degree not only in test-severity and conditions but also in test sequence. Experts within IEC SC48B work together with experts from PICMG to reach consensus with regard to similarities and differences in the relevant testprogram. The outcome is intended to be published in separate documents.

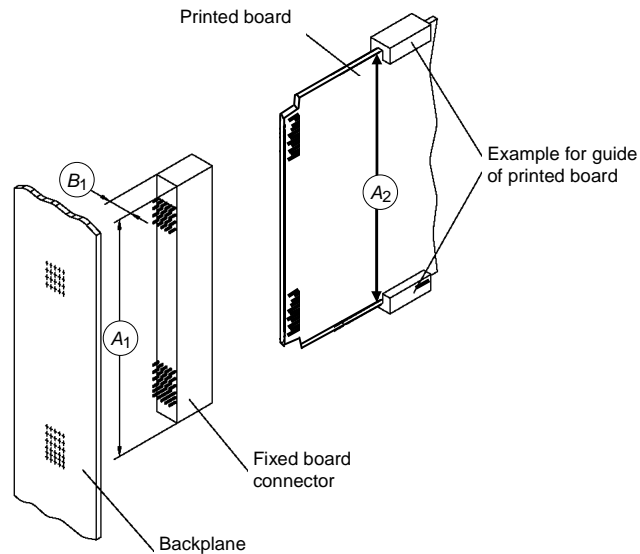
A typical arrangement for such a two-part connector is shown in the following outline sketch (see Figure 1):



IEC 423/12

Figure 1 – Typical arrangement with a two-part connector

Not covered in this International Standard are direct edge connector contacts for printed boards. The reason for this is, that in difference to the PICMG-specification this International Standard is intended to define the connector as a component together with test-procedures only and is not intended to detail functions which are not directly related to the connector system. Examples for such details are the characteristics of the printed circuit board. However, based on the information given in 4.5.1 of this Standard contact positioning and mechanical edge board connector details can be derived. Further information may be obtained in PICMG-specification AdvancedMC.0. Such direct edge connector contacts are applied directly to the printed board edge as part of the printed board circuit (free connector) and form the interface to the backplane (fixed connector), as can be seen in Figure 2.



IEC 424/12

**Figure 2 – Typical arrangement with a direct edge connector,
not covered in this Standard**

The connectors as described in this Standard are referenced in IEC 60297-3-107, which describes dimensions of subracks and plug-in units for their use.

CONNECTORS FOR ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 4-116: Printed board connectors – Detail specification for a high-speed two-part connector with integrated shielding function

1 Scope

This International Standard establishes specifications and test requirements for a high-speed two-part connector with integrated shielding function for use as a printed board connector in industrial environments.

The connectors connect a backplane to printed boards.

2 Normative references

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, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-52: 1996, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60068-2-54: 2006, *Environmental testing – Part 2-54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method*

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

IEC 60352-5, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60352-8, *Solderless connections – Part 8: Compression mount connections – General requirements, test methods and practical guidance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581 apply as well as the following.

3.1

contact for general purpose

electrical contact, which does not have a predefined function (neither for power, ground nor signal). The function can be defined according to the application