

# INTERNATIONAL STANDARD

**IEC**  
**61076-3-104**

Second edition  
2006-07

---

---

## Connectors for electronic equipment – Product requirements –

### Part 3-104:

**Detail specification for 8-way, shielded free  
and fixed connectors for data transmissions  
with frequencies up to 1000 MHz**

© IEC 2006 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE **XC**

*For price, see current catalogue*

## CONTENTS

FOREWORD.....	5
1 General.....	7
1.1 Scope.....	7
1.2 Normative references .....	7
2 Technical information .....	8
2.1 Terminology .....	8
2.2 Groups of related connectors .....	9
2.3 Interchangeability level.....	9
2.4 IEC type designation .....	9
3 Isometric views and common features .....	10
3.1 General.....	10
3.2 Isometric views .....	11
4 Terminations .....	26
4.1 General.....	26
4.2 Referenced termination types.....	26
4.3 Accessories.....	27
4.4 Mounting information for fixed connectors .....	27
4.5 Mounting information for free connectors.....	27
5 Gauges .....	27
5.1 General.....	27
5.2 Fixed connector (outlet) gauges .....	28
5.3 Free connector (plug) gauges.....	31
5.4 Test panels .....	35
6 Characteristics .....	35
6.1 General.....	35
6.2 Pin and pair grouping assignment .....	35
6.3 Classification into climatic categories .....	36
6.4 Electrical characteristics.....	37
6.5 Transmission characteristics .....	39
6.6 Mechanical .....	41
7 Qualification approval test schedule .....	42
7.1 General.....	42
7.2 Test procedures and measuring methods .....	42
7.3 Preconditioning .....	42
7.4 Wiring and Mounting of Specimens.....	43
7.5 Contact resistance measurement arrangement procedure .....	43
7.6 Arrangement for dynamic stress tests (test phase CP1).....	44
7.7 Test schedules .....	44
8 Quality assessment procedures.....	51
Annex A (normative) Gauging requirements .....	52
Annex B (normative) Locking device mechanical operation.....	53
Annex C (normative) Plug and outlet interoperability qualification .....	54
Annex D (normative) General requirements for the measurement set-up .....	56

Annex E (normative) Insertion loss .....	61
Annex F (normative) Return loss .....	63
Annex G (normative) Near end cross talk (NEXT) .....	65
Annex H (normative) Far end cross talk (FEXT) .....	68
Annex I (normative) Transfer impedance .....	71
Annex J (normative) Transverse Conversion Loss (TCL) and Transverse Conversion Transfer Loss (TCTL) .....	78
Annex K (normative) Termination of balun .....	81
Figure 1 – Isometric view of cable and PCB fixed connectors .....	11
Figure 2 – Isometric view of 4, 2 and 1 pair free connectors .....	11
Figure 3 – Variant 01 drawing 1 .....	12
Figure 4 – Variant 01 drawing 2 .....	14
Figure 5 – Variant 02 drawing .....	15
Figure 6 – Variant 03 drawing 1 .....	16
Figure 7 – Variant 03 drawing 2 .....	18
Figure 8 – Variant 03 drawing 3 .....	19
Figure 9 – Variant 04 drawing 1 .....	20
Figure 10 – Variant 04 drawing 2 .....	21
Figure 11 – Variant 05 drawing 1 .....	22
Figure 12 – Variant 05 drawing 2 .....	24
Figure 13 – Variant 05 drawing 3 .....	25
Figure 14 – Fixed connector location "Go" gauge .....	28
Figure 15 – Fixed connector location "No-Go" gauge .....	28
Figure 16 – Fixed connector size "Go" gauge .....	29
Figure 17 – Fixed connector size "No-Go" gauge .....	30
Figure 18 – Free connector location "Go" gauge .....	31
Figure 19 – Free connector location "No-Go" gauge .....	31
Figure 20 – Free connector size "Go" gauge .....	32
Figure 21 – Free connector size "No-Go" gauge .....	33
Figure 22 – Fixed connector panel .....	35
Figure 23 – Isometric views fixed connector .....	36
Figure 24 – Isometric views free connector 4 pair .....	36
Figure 25 – Connector de-rating curve .....	38
Figure 26 – Arrangement for contact resistance test .....	43
Figure 27 – Arrangement for dynamic stress .....	44
Figure C.1 – Precision test fixtures (covers) .....	54
Figure D.1 – 180° hybrid used as a balun .....	57
Figure D.2 – Calibration of reference loads .....	58
Figure D.3 – Resistor load .....	59
Figure D.4 – Definition of reference planes .....	60
Figure E.1 – Calibration .....	61
Figure E.2 – Measuring set-up .....	62

Figure G.1 – NEXT measurement differential mode only terminations .....	65
Figure G.2 – NEXT measurement differential and common mode terminations.....	66
Figure H.1 – FEXT measurement differential mode only terminations.....	68
Figure H.2 – FEXT measurement differential and common mode terminations .....	69
Figure I.1 – Preparation of test specimen.....	72
Figure I.2 – Triaxial test set-up .....	73
Figure I.3 – Impedance matching for $R_1 < 50 \Omega$ .....	74
Figure I.4 – Impedance matching for $R_1 > 50 \Omega$ .....	75
Figure J.1 – TCL measurement.....	78
Figure J.2 – TCTL measurement.....	79
Figure K.1 – Balanced attenuator for balun centre tap grounded.....	81
Figure K.2 – Balanced attenuator for balun centre tap open.....	81
Table 1 – Variant 01 drawing 1 dimensions .....	13
Table 2 – Variant 01 drawing 2 dimensions.....	14
Table 3 – Variant 02 drawing dimensions.....	15
Table 4 – Variant 03 drawing 1 dimensions.....	17
Table 5 – Variant 03 drawing 2 dimensions.....	18
Table 6 – Variant 03 drawing 3 dimensions.....	19
Table 7 – Variant 04 drawing 1 dimensions.....	21
Table 8 – Variant 04 drawing 2 dimensions.....	22
Table 9 – Variant 05 drawing 1 dimensions.....	23
Table 10 – Variant 05 drawing 2 dimensions.....	24
Table 11 – Variant 05 drawing 3 dimensions.....	25
Table 12 – Fixed connector (outlet) gauge dimensions.....	30
Table 13 – Free connector (plug) gauge dimensions.....	34
Table 14 – Fixed connector panel dimensions.....	35
Table 15 – Climatic category – selected values.....	37
Table 16 – Creepage and clearance distances.....	37
Table 17 – Test group F.....	45
Table 18 – Test group AP.....	46
Table 19 – Test group BP.....	48
Table 20 – Test group CP.....	49
Table 21 – Test group DP.....	49
Table 22 – Test Group EP.....	50
Table 23 – Test Group FP.....	51
Table D.1 – Test balun performance characteristics.....	57
Table F.1 – Uncertainty band of return loss measurement at frequencies below 100 MHz.....	64

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRONIC EQUIPMENT –  
PRODUCT REQUIREMENTS –****Part 3-104: Detail specification for 8-way, shielded free and fixed  
connectors for data transmissions with frequencies up to 1 000 MHz**

## 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 informative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning connectors given in 3.2.2 and 3.2.4.

The IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he is willing to give free licences with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with the IEC.

Information may be obtained from:

The Edison Company  
Edison Business Park  
76 Westbury Park Road  
Westertown, CT 06795-0400  
USA

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61076-3-104 has been prepared by sub-committee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

This second edition of IEC 61076-3-104 cancels and replaces the first edition, published in 2003, and constitutes a technical revision.

Changes from the first edition of this standard (2003) include editorial changes throughout the standard and:

- 1) an increase of upper frequency from 600 MHz to 1 000 MHz;
- 2) changes to the characteristics clause (Clause 6) and test schedules clause (Clause 7) to align the document with test schedules of IEC 60603-7 series documents.

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

FDIS	Report on voting
48B/1678/FDIS	48B/1702/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.

A list of all parts of the IEC 61076 series, 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 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.

A bilingual version of this publication may be issued at a later date.

## CONNECTORS FOR ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

### Part 3-104: Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 1000 MHz

#### 1 General

##### 1.1 Scope

This part of IEC 61076 establishes uniform specifications, type testing requirements and quality assessment procedures for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 1 000 MHz, and intended to be used within cabling for information and communications technology, home entertainment and multimedia. It contains a choice of all test methods and sequences, severity and preferred values for dimensions and characteristics.

##### 1.2 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, *International Electrotechnical Vocabulary. Electromechanical components for electronic equipment*

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-6, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60169-16, *Radio-frequency connectors. Part 16: R.F. coaxial connectors with inner diameter of outer conductor 7 mm (0.276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (Type N)*

IEC 60352 (all parts), *Solderless connections*

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 60512-7, *Connectors for frequencies below 3 MHz for use with printed boards – Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality*

IEC 61076-1:2006, *Connectors for electronic equipment – Product requirements – Part 1: Generic specifications*

IEC 61156-2, *Multicore and symmetrical pair/quad cables for digital communications – Part 2: Horizontal floor wiring – Sectional specification*

IEC 61156-3, *Multicore and symmetrical pair/quad cables for digital communications – Part 3: Work area wiring – Sectional specification*

IEC 61156-4, *Multicore and symmetrical pair/quad cables for digital communications – Part 4: Riser cables – Sectional specification*

IEC 61156-5, *Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 600 MHz – Horizontal floor wiring – Sectional specification*

IEC 61196, *Coaxial communication cables*

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

EN 50289-1-14, *Communication cables – Specifications for test methods – Part 1-14: Electrical test methods – Coupling attenuation or screening attenuation of connecting hardware*

ISO 1302, *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

ITU-T G.117, *Transmission aspects of unbalance about earth*

ITU-T O.9, *Measuring arrangements to assess the degree of unbalance about earth*