

INTERNATIONAL STANDARD

IEC 60603-7-7

First edition
2002-04

Connectors for electronic equipment –

Part 7-7:

Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 600 MHz (category 7, shielded)

© IEC 2002 — 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 Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XC

For price, see current catalogue

CONTENTS

| | |
|--|----|
| FOREWORD..... | 7 |
| 1 General | 9 |
| 1.1 Scope..... | 9 |
| 1.2 Normative references | 9 |
| 2 IEC type designation | 11 |
| 2.1 Terminology..... | 12 |
| 2.2 Marking | 12 |
| 2.3 Main functions | 12 |
| 2.4 Interchangeability | 12 |
| 3 Common features and isometric view | 14 |
| 3.1 Isometric view | 14 |
| 3.2 Mating information | 15 |
| 4 Dimensions..... | 22 |
| 4.1 General | 22 |
| 4.2 Type C free connectors – switch actuator dimensions | 22 |
| 4.3 Terminations – fixed and free connectors | 23 |
| 5 Gauges..... | 23 |
| 5.1 Fixed connectors | 23 |
| 5.2 Free connectors | 27 |
| 5.3 Switch actuator gauges..... | 29 |
| 6 Characteristics..... | 29 |
| 6.1 General | 29 |
| 6.2 Classification into climatic categories | 29 |
| 6.3 Creepage and clearance distance | 30 |
| 6.4 Electrical characteristics | 30 |
| 6.5 Transmission characteristics, category 7..... | 32 |
| 6.6 Mechanical characteristics | 33 |
| 7 Tests and test schedule | 34 |
| 7.1 General | 34 |
| 7.2 Test procedures and measuring methods..... | 34 |
| 7.3 Preconditioning..... | 34 |
| 7.4 Wiring and mounting of specimens | 34 |
| 7.5 Test schedules | 36 |
| Annex A (normative) Gauging requirements..... | 43 |
| A.1 Fixed connectors..... | 43 |
| A.2 Free connectors | 43 |
| Annex B (normative) Locking device mechanical operation – Test procedure and requirements..... | 44 |
| B.1 Object..... | 44 |
| B.2 Preparation of the specimens | 44 |
| B.3 Test method..... | 44 |
| B.4 Final measurements..... | 44 |

| | |
|---|----|
| Annex C (normative) High frequency (category 7) transmission interoperability testing | 45 |
| C.1 Object..... | 45 |
| C.2 Test equipment..... | 45 |
| C.3 Free connector precision test fixture construction..... | 45 |
| C.4 Fixed connector precision test fixture construction..... | 46 |
| C.5 Alternate fixed or free connector test fixture..... | 46 |
| C.6 Test fixture requirements..... | 46 |
| C.7 Test procedure..... | 46 |
| | |
| Annex D (normative) General requirements for the measurement set-up..... | 47 |
| D.1 Test instrumentation..... | 47 |
| D.2 Coaxial cables and test leads for network analysers..... | 47 |
| D.3 Measurement precautions..... | 47 |
| D.4 Balun requirements..... | 48 |
| D.5 Reference components for calibration..... | 49 |
| D.6 Termination loads for termination of conductor pairs..... | 49 |
| D.7 Termination of screens..... | 50 |
| D.8 Test specimen and reference planes..... | 50 |
| | |
| Annex E (normative) Insertion loss..... | 52 |
| E.1 Object..... | 52 |
| E.2 Test method..... | 52 |
| E.3 Test set up..... | 52 |
| E.4 Procedure..... | 52 |
| E.5 Test report..... | 53 |
| E.6 Accuracy..... | 53 |
| | |
| Annex F (normative) Return loss..... | 54 |
| F.1 Object..... | 54 |
| F.2 Test method..... | 54 |
| F.3 Test set-up..... | 54 |
| F.4 Procedure..... | 54 |
| F.5 Test report..... | 54 |
| F.6 Accuracy..... | 54 |
| | |
| Annex G (normative) Near end cross talk..... | 56 |
| G.1 Object..... | 56 |
| G.2 Test method..... | 56 |
| G.3 Test set-up..... | 56 |
| G.4 Procedure..... | 57 |
| G.5 Test report..... | 58 |
| G.6 Accuracy..... | 58 |
| | |
| Annex H (normative) Far end cross talk..... | 59 |
| H.1 Object..... | 59 |
| H.2 Test method..... | 59 |

| | | |
|--|---|----|
| H.3 | Test set-up | 59 |
| H.4 | Procedure | 60 |
| H.5 | Test report | 61 |
| H.6 | Accuracy | 61 |
| Annex I (normative) Longitudinal conversion loss | | 62 |
| I.1 | Object | 62 |
| I.2 | Test method | 62 |
| I.3 | Test set-up | 62 |
| I.4 | Procedure | 63 |
| I.5 | Test report | 63 |
| I.6 | Accuracy | 63 |
| Annex J (normative) Transfer impedance | | 64 |
| J.1 | Object | 64 |
| J.2 | Test method | 64 |
| J.3 | Definitions | 64 |
| J.4 | Test set-up | 65 |
| J.5 | Procedure | 68 |
| J.6 | Test report | 69 |
| J.7 | Accuracy | 69 |
| Annex K (normative) Coupling attenuation | | 70 |
| K.1 | Object | 70 |
| K.2 | Test method | 70 |
| K.3 | Test equipment and set-up | 70 |
| K.4 | Procedure | 71 |
| K.5 | Test report | 71 |
| Annex L (normative) Termination of balun | | 73 |
| L.1 | Termination of balun with low return loss for common mode | 73 |
| Annex M (normative) Gauge dimensions supplement for switch actuator for use with standard IEC 60603-7 series connectors | | 74 |
| M.1 | Fixed connectors | 74 |
| M.2 | Free connectors | 77 |
| Annex N (normative) Switch function | | 79 |
| N.1 | Basic switch function | 79 |
| N.2 | Alternate switch function | 80 |
| Figure 1 – Examples fixed and free connectors, free connector shown with both switch positions | | 14 |
| Figure 2 – Physical interface, contacts interface, see table 1 | | 15 |
| Figure 3 – Physical interface, switch actuator, see table 1 | | 16 |
| Figure 4 – Physical interface, fixed connector contacts, front view, see table 2 | | 18 |

| | |
|---|----|
| Figure 5 – Physical interface, fixed connector contacts, side view, see table 2 | 18 |
| Figure 6 – Physical interface, free connector contacts, see table 3..... | 20 |
| Figure 7 – Free connector, switch actuator dimensions, see table 4 | 22 |
| Figure 8 – Fixed connector GO gauge, see table 5 | 24 |
| Figure 9 – Fixed connector NO-GO gauges, see table 5 | 25 |
| Figure 10 – Free connector NO-GO gauges, see table 6..... | 27 |
| Figure 11 – Free connector GO gauges, see table 7 | 28 |
| Figure 12 – Connector derating curve..... | 31 |
| Figure 13 – Arrangement for contact resistance measurement..... | 35 |
| Figure 14 – Arrangement for dynamic stress tests | 36 |
| Figure C.1 – Free connector precision test fixture | 45 |
| Figure C.2 – Fixed connector precision test fixture | 46 |
| Figure D.1 – 180° hybrid used as a balun | 48 |
| Figure D.2 – Calibration of reference loads..... | 49 |
| Figure D.3 – Resistor load..... | 50 |
| Figure D.4 – Definition of reference planes..... | 51 |
| Figure E.1 – Calibration..... | 52 |
| Figure E.2 – Measuring set-up..... | 53 |
| Figure G.1 – NEXT measurement for differential mode only terminations | 56 |
| Figure G.2 – NEXT measurement differential and common mode terminations..... | 57 |
| Figure H.1 – FEXT measurement for differential mode only terminations..... | 59 |
| Figure H.2 – FEXT measurement for differential and common mode terminations | 60 |
| Figure I.1 – LCL measurement | 62 |
| Figure J.1 – Preparation of test specimen..... | 65 |
| Figure J.2 – Triaxial test set-up | 66 |
| Figure J.3 – Impedance matching for $R_1 < 50 \Omega$ | 67 |
| Figure J.4 – Impedance matching for $R_1 > 50 \Omega$ | 68 |
| Figure L.1 – Balanced attenuator for balun centre tap grounded..... | 73 |
| Figure L.2 – Balanced attenuator for balun centre tap open | 73 |
| Figure M.1 – Fixed connector switch GO gauge, see table M.1 | 74 |
| Figure M.2 – Fixed connector switch NO-GO gauges, see table M.1 | 75 |
| Figure M.3 – Free connector switch NO-GO gauges, see table M.2..... | 77 |
| Figure M.4 – Free connector switch GO gauges, see table M.2..... | 78 |
| Figure N.1 – Basic switch function | 79 |
| Figure N.2 – Alternate switch function | 80 |
| Table 1 – Physical interface contacts interface and switch actuator dimensions | 17 |
| Table 2 – Physical interface, fixed connector contacts dimensions..... | 19 |
| Table 3 – Physical interface, free connector contact dimensions | 21 |
| Table 4 – Free connector, switch actuator dimensions | 22 |
| Table 5 – Fixed connector gauge dimensions | 26 |
| Table 6 – Free connector NO-GO gauges dimensions | 28 |
| Table 7 – Free connector GO gauges dimensions..... | 29 |
| Table 8 – Climatic categories – selected values..... | 30 |
| Table 9 – Minimum distances | 30 |
| Table 10 – Test group P..... | 37 |

| | |
|---|----|
| Table 11 – Test group AP | 38 |
| Table 12 – Test group BP | 39 |
| Table 13 – Test group CP | 40 |
| Table 14 – Test group DP | 40 |
| Table 15 – Test group EP | 41 |
| Table 16 – Test group FP | 42 |
| Table D.1 – Test balun performance characteristics | 48 |
| Table F.1 – Uncertainty band of return loss measurement at frequencies below 100 MHz..... | 55 |
| Table M.1 – Fixed connector switch gauge dimensions | 76 |
| Table M.2 – Free connector switch gauge dimensions..... | 78 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONNECTORS FOR ELECTRONIC EQUIPMENT –**Part 7-7: Detail specification for 8-way, shielded,
free and fixed connectors, for data transmission with frequencies
up to 600 MHz (category 7, shielded)**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of patent(s).

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 negotiate licences under reasonable and non-discriminatory terms and conditions 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:

Nexans
16, rue de Monceau
75008 Paris
France

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 60603-7-7 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

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

| | |
|----------------------|------------------|
| FDIS | Report on voting |
| 48B/1166, 1166A/FDIS | 48B/1214/RVD |

Full information 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 3.

Annexes A, B, C, D, E, F, G, H, I, J, K, L, M and N form an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2002. At this date, the publication will be

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

CONNECTORS FOR ELECTRONIC EQUIPMENT –

Part 7-7: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 600 MHz (category 7, shielded)

1 General

1.1 Scope

This part of IEC 60603 covers 8 way connectors, up to 4 pairs, to be used up to 600 MHz, when used with an appropriate cable. These cables are specified in the IEC 61156 series and used in cabling systems specified in ISO/IEC 11801¹.

The connectors are backward compatible with the already defined IEC 60603-7-X connectors.²

The connectors are interoperable with the already defined IEC 60603-7-X connectors.³

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

IEC 60068-2-14, *Basic environmental testing procedures – Part 2: Tests – Test N: Change of temperature*

IEC 60068-2-38, *Basic environmental testing procedures – Part 2: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

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 60352-2:1990, *Solderless connections – Part 2: Solderless crimped connections – General requirements, test methods and practical guidance*

IEC 60352-3:1993, *Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-4:1994, *Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-5:2001, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

¹ ISO/IEC 11801 contains various 'category' designations corresponding to various frequency ranges.

² Backward compatibility definition and requirements are given in 2.4.2.

³ Interoperability definition and requirements are given in 2.4.3.

IEC 60352-6:1994, *Solderless connections – Part 6: Insulation piercing 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 60603-7, *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 60603-7-1, *Connectors for electronic equipment – Part 7-1: Detail specification for 8-way, shielded free and fixed connectors with common mating features, with assessed quality*

IEC 60807-1, *Rectangular connectors for frequencies below 3 MHz – Part 1: Generic specification – General requirements and guide for the preparation of detail specifications for connectors with assessed quality*

IEC 61076-1:1995, *Connectors with assessed quality, for use in d.c., low frequency analogue and in digital high speed data applications – Part 1: Generic specification*

IEC/PAS 61076-3-110:2002, *Connectors for electronic equipment – Part 3-110: Detail specification for 8 way connectors for frequencies up to 600 MHz*

IEC 61156 (all parts), *Multicore and symmetrical pair/quad cables for digital communications*

IEC 61196 (all parts), *Radio-frequency cables*

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

ISO 1302, *Technical drawings – Method of indicating surface texture*

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

ITU-T K.20, *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

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

CENELEC PREN 50289-1-6, *Communication Cables – Specifications for Test Methods – Part 1-6: Electrical Test Methods – Electromagnetic Performance*