

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Connectors for electronic equipment – Product requirements –
Part 3-001: Rectangular connectors – Blank detail specification**

**Connecteurs pour équipements électroniques – Exigences de produit –
Partie 3-001: Connecteurs rectangulaires – Spécification particulière-cadre**



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Part 3-001: Rectangular connectors – Blank detail specification**

**Connecteurs pour équipements électroniques – Exigences de produit –
Partie 3-001: Connecteurs rectangulaires – Spécification particulière-cadre**

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 General information	9
1.1 Scope.....	9
1.2 Normative references	11
2 Technical information	13
2.1 Terms and definitions	13
2.2 Systems of levels	13
2.2.1 Performance levels	13
2.2.2 Compatibility levels, according to IEC 61076-1:2006	13
2.3 Classification into climatic categories	13
2.4 Clearance and creepage distances	15
2.5 Current-carrying capacity	15
2.6 Marking	15
3 Dimensional information	17
3.1 General	17
3.2 Isometric view and common features	17
3.2.1 Common features	19
3.2.2 Reference system	19
3.3 Engagement (mating) information	21
3.3.1 Engaging (mating) direction	21
3.3.2 Perpendicular to the engaging (mating) direction	21
3.3.3 Inclination	21
3.4 Fixed connectors	21
3.4.1 Dimensions	21
3.4.2 Terminations	21
3.5 Free connectors	23
3.5.1 Dimensions	23
3.5.2 Terminations	23
3.6 Accessories	23
3.7 Mounting information for connectors	23
3.7.1 Mounting on panels	25
3.8 Gauges	25
3.8.1 Sizing gauges and retention force gauges	25
3.8.2 Mechanical function, engaging/separating/insertion/withdrawal force gauges	27
3.8.3 Probes	27
3.8.4 Contact resistance gauge	27
3.8.5 Test panel (for voltage proof test)	27
3.8.6 Test panel (for EMC/crosstalk, etc.)	27
4 Characteristics	29
4.1 General	29
4.2 Pin assignment and other definitions	29
4.3 Classification into climatic categories	29
4.4 Electrical characteristics	29
4.4.1 Creepage and clearance distances	29

4.4.2	Voltage proof.....	31
4.4.3	Current-carrying capacity.....	31
4.4.4	Contact and shield resistance.....	31
4.4.5	Insulation resistance.....	31
4.4.6	Impedance.....	33
4.4.7	Transmission characteristics.....	33
4.5	Mechanical characteristics	37
4.5.1	Mechanical operation	37
4.5.2	Effectiveness of connector coupling devices.....	37
4.5.3	Engaging and separating forces (or insertion and withdrawal forces).....	37
4.5.4	Contact retention in insert.....	37
4.5.5	Polarizing and coding method.....	37
4.6	Other characteristics	39
4.6.1	Shock and vibration (method either random or sine).....	39
4.6.2	Degree of protection provided by enclosures (IP-code).....	39
4.6.3	Screen and shielding properties	39
4.7	Environmental aspects	41
4.7.1	Marking of insulation material (plastics).....	41
4.7.2	Design/use of material.....	41
5	Test schedule.....	43
5.1	General.....	43
5.1.1	Climatic category.....	43
5.1.2	Creepage and clearance distances.....	45
5.1.3	Arrangement for contact resistance measurement	45
5.1.4	Arrangement for dynamic stress tests.....	45
5.1.5	Arrangement for testing static load, axial	45
5.1.6	Wiring of specimens	45
5.2	Test schedules	47
5.2.1	Basic (minimum) test schedule	47
5.2.2	Full test schedule	53
5.3	Test procedures and measuring methods	77
5.4	Pre-conditioning	77
5.5	Wiring and mounting of specimens	77
5.5.1	Wiring.....	77
5.5.2	Mounting	77
Annex A (normative)	New tests and additional test phases	78
Table 1 – Performance levels		13
Table 2 – Isometric view and common features.....		17
Table 3 – Performance levels, example		28
Table 3 – Performance levels		29
Table 4 – Creepage and clearance distances.....		29
Table 5 – Performance levels		43
Table 6 – Creepage and clearance distances.....		45
Table 7 – Tests, example.....		46
Table 8 – Basic tests		47
Table 9 – Number of test specimens and contacts		53

Table 10 – Test group P	53
Table 10 – Test group P (continued)	55
Table 11 – Test group AP	55
Table 11 – Test group AP (continued)	59
Table 12 – Test group BP	61
Table 12 – Test group BP (continued)	63
Table 13 – Test group CP	65
Table 14 – Test group DP	67
Table 15 – Test group EP	69
Table 16 – Test group FP	71
Table 17 – Test group GP	73
Table 18 – Test group HP	75
Table 19 – Test group JP	77
Table 20 – Test group KP	77

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRONIC EQUIPMENT –
PRODUCT REQUIREMENTS –****Part 3-001: Rectangular connectors –
Blank detail specification**

FOREWORD

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International Standard IEC 61076-3-001 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

This second edition cancels and replaces the first edition published in 1999. This edition constitutes a technical revision.

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

- 1) This International Standard no longer includes the quality assessment procedures. As described in IEC 61076-1 and IEC 62197-1, a new document structure has been established. IEC 61076-3-001 has been revised to match with this updated structure.
- 2) Subclause 2.2 *Systems of levels* has been introduced.

- 3) Subclause 2.5 *IEC type designation* has been removed following the decision according to 14.2 of the Berlin SC 48B Plenary meeting minutes (48B/1732/RM).
- 4) Clauses 3 *Dimensional Information* and 4 *Characteristics* have been added.
- 5) Old Subclauses 4.2 to 4.4 have been moved to new Subclauses 5.3 to 5.5.
- 6) Table 2 – *Number of test specimens and contacts* has been inserted.
- 7) Test groups have been rearranged. Test group HP has been added.

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

FDIS	Report on voting
48B/1880/FDIS	48B/1913/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.

INTRODUCTION

This blank detail product specification is a supplementary document to the sectional product specification IEC 61076-3 and contains requirements for style, layout and content of detail product specifications for rectangular connectors. It is to be used in conjunction with the following publications: IEC 61076-1 and IEC 61076-3 for product requirements as well as IEC 62197-1 for quality requirements.

The main content of this blank detail product specification is divided into two parts: on one page, the example for a blank detail product specification, on the other page, the guidance notes referring to the example. The guidance notes have the same numbering as the relevant paragraphs of the example pages.

The sample pages can be used like a template when preparing a detail product specification within the scope of this document. This document is not intended to replace the templates and guidance notes of IEC, but to assist in their application. All users are reminded to adhere to relevant directives and guidelines of the IEC when preparing a standard.

NOTE 1 A detail quality specification IEC 62197-3-1xx should be prepared, based on the blank detail quality specification for rectangular connectors future IEC 62197-3-001 and its references and should be used in conjunction with the detail product specification IEC 61076-3-1xx.

NOTE 2 The quality assessment requirements for connectors according to the IEC 61076 series are detailed in IEC 62197-1.

Guidance notes

The following pages give a recommended layout of a detail product specification. The contents of this page give guidance on the information which should, wherever possible, be given on the front page of a detail product specification (see IEC Guide 102).

For the scope and definition of a detail product specification, see 1.2.3 of IEC 61076-1:2006.

The numbers between brackets on the front page of the detail product specification correspond to the following information.

Identification of the detail product specification

- [1] The International Electrotechnical Commission or the national standards organization under whose authority the detail product specification is drafted. It shall also be stated where the detail product specification may be obtained.
- [2] The IECQ/IEC number of the detail product specification and date of issue.
- [3] The IECQ/IEC number and issue number of the generic and the sectional specifications.
- [4] The national number of the detail product specification, if it differs from the IECQ/IEC number.

Identification of the connector

- [5] A short description of the type of connector.
- [6] Information on the typical construction of the connector, for example, it should be stated whether the connector is suitable for mounting on printed boards.
- [7] Outline drawing, preferably of isometric or similar projection, from which the connector may be clearly identified.
- [8] Information on performance level(s) and assessment level(s) specified in the document, if applicable.
- [9] Reference data on the most important properties, to allow comparison between the various connector types.

NOTE It may be convenient to give some of this information in tabular form.

[1]	IEC Detail product specification number [2]
Generic specification number Electronic components of assessed quality in accordance with: [3]	National number of detail product specification (it is not necessary to use this if the IEC number is identical) [4]
Outline drawing [7]	Product description [5]
	[6]
	[8] Performance level(s): Assessment level(s): Combination of performance levels and assessment levels:
	Reference data [9]

1 General information

1.1 Scope

Guidance notes

1.2 Normative references

It may be necessary to refer to other documents in addition to those stated, in which case the list of related documents shall be extended beyond those referenced.

If standards are referenced which are already listed in IEC 61076-1 and IEC 61076-3, their reference shall not be repeated in 1.2 of the detail product specification.

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

IEC 61076-3:2008, *Connectors for electronic equipment – Product requirements – Part 3: Sectional specification for rectangular connectors*

IEC 62197-1:2006, *Connectors for electronic equipment – Quality assessment requirements – Part 1: Generic specification*

IEC GUIDE 109, *Environmental aspects – Inclusion in electrotechnical product standards*

IEC GUIDE 114, *Environmentally conscious design – Integrating environmental aspects into design and development of electrotechnical products*

Guidance notes

2 Technical information

The detail product specification shall contain information which contributes to a proper application of the connectors. It will also provide specificities for a better understanding of the detail product specification.

2.1 Terms and definitions

Terminology used in and applicable to this specification is stated in 2.1 of IEC 61076-1:2006. IEC 60512-1 also contains applicable terms. Any term used in the detail product specification which is currently not defined in the above cited terminology shall be defined in the detail product specification under this subclause.

2.2 Systems of levels

If appropriate, the detail product specification shall contain information about the different performance levels and/or the compatibility levels. These levels, if they are appropriate, shall be indicated in the detail product specification according to the definitions of IEC 61076-1:2006.

The information may be provided in a table. Table 1 may serve as an example.

2.3 Classification into climatic categories

This classification requires the assignment of the following parameters to the connector:

- lower limiting temperature,
- upper limiting temperature,
- duration (days) of the relevant damp heat, steady state test of IEC 60512.

See also 4.3 in this blank detail product specification.

2 Technical information

2.1 Terms and definitions

2.2 Systems of levels

2.2.1 Performance levels

Table 1 – Performance levels

Connector style	Performance level				

2.2.2 Compatibility levels, according to IEC 61076-1:2006

2.3 Classification into climatic categories

Guidance notes

2.4 Clearance and creepage distances

See 5.1.2 in this blank detail product specification.

2.5 Current-carrying capacity

See 4.4.3 in this blank detail product specification.

2.6 Marking

The marking of the connector and the package shall be in accordance with 2.7 of IEC 61076-1:2006.

2.4 Clearance and creepage distances

2.5 Current-carrying capacity

2.6 Marking

Guidance notes

3 Dimensional information

In order to facilitate comparison of various specifications, a uniform presentation of drawing information is recommended, in accordance with 3.1 to 3.5 of IEC 61076-1:2006.

Drawings and dimensions shall cover

- a) isometric view showing the basic design including common characteristics of related connectors;
- b) fixed connectors;
- c) free connectors and/or board-edge of printed boards;
- d) mating information;
- e) accessories;
- f) mounting information for fixed connectors;
- g) mounting information for free connectors, if applicable;
- h) mounting information for connectors with accessories;
- i) testing gauges, probes and test panels.

3.1 General

It shall be stated in the detail product specification if original dimensions are millimetres or inches.

It shall be stated in the detail product specification if drawings are shown in first-angle or in third-angle projection.

The system of lettering shall be as described by 3.2 of IEC 61076-1:2006.

The following statement shall be included in the detail product specification:

The shape of the connectors may deviate from those given in the following drawings as long as the specified dimensions are not influenced.

Wherever practical, the same dimension letters shall be used for corresponding dimensions of fixed and free connectors.

3.2 Isometric view and common features

An isometric view shall be included and shall show the main characteristics of the design including common features, if applicable.

It is convenient to show the dimension reference, the dimension and the feature description in the form of a table (see Table 2).

3 Dimensional information

3.1 General

The shape of the connectors may deviate from those given in the following drawings as long as the specified dimensions are not influenced.

3.2 Isometric view and common features

Table 2 – Isometric view and common features

Reference	Dimension	Feature description

Guidance notes

3.2.1 Common features

A description of all the common features relating to the style of connectors covered by the detail product specification shall be included.

Data which could be specified includes

- a) datum point or datum line with reference to the datum;
- b) position of the mounting hole(s) of the fixed connector;
- c) position of the terminations of the fixed connector;
- d) position of the free or edge-socket connector;
- e) position of the mounting holes of the free connector or the terminations of an edge-socket connector;
- f) position of the printed board;
- g) position of the grid of the printed board.

3.2.2 Reference system

The detail product specification shall state the coordination dimensions to allow for (modular) arrangement of the connector parts. When such a reference system is based on guidelines for mechanical structures, it is recommended to refer to such information.

3.2.1 Common features

3.2.2 Reference system

Coordination dimensions are dimensions without tolerances which indicate the boundary or centre-line references in order to allow for (modular) arrangement.

Guidance notes

3.3 Engagement (mating) information

Details of the limiting factors, within which correct engagement (mating) is ensured relates to dimensional data on the following:

3.3.1 Engaging (mating) direction

The range over which the specified contact resistance is ensured in the plug-in direction.

3.3.1.1 Contact levels and sequencing

Dimensional parameters of the different contact levels and their sequence, if applicable.

3.3.2 Perpendicular to the engaging (mating) direction

The maximum allowable displacement in the perpendicular direction which can be accommodated.

3.3.3 Inclination

The maximum allowable inclination in the longitudinal and transverse axes in the form of appropriate drawings and tables.

NOTE The specification may be given with the aid of drawings if this ensures clarity.

3.4 Fixed connectors

3.4.1 Dimensions

The detail product specification shall include (an) outline drawing(s) of the fixed connector(s) showing the prime dimensions and associated geometrical tolerances.

For clarity the value of the dimensions may be included as tables which may be separated for those dimensions which are common to all styles/variants and those dimensions which are particular to styles/variants.

Details of marking of contact positions; within a row by numbers and marking of contact rows by letters shall be included in the drawing(s).

3.4.2 Terminations

When different types of terminations are possible, information on use shall be presented in the detail product specification in tabular form.

The detail product specification shall include termination length, width, thickness, and diagonal dimensions, as appropriate.

3.3 Engagement (mating) information

3.3.1 Engaging (mating) direction

3.3.1.1 Contact levels and sequencing

3.3.2 Perpendicular to the engaging (mating) direction

3.3.3 Inclination

3.4 Fixed connectors

3.4.1 Dimensions

3.4.2 Terminations

Guidance notes

3.5 Free connectors

3.5.1 Dimensions

(An) outline drawing(s) with prime dimensional and geometrical tolerances shall be included in the detail product specification.

3.5.2 Terminations

The detail product specification shall include termination length, width, thickness, and diagonal dimensions, as appropriate.

3.6 Accessories

When accessories provide an essential support to the application of the connectors, the features and use shall be outlined in the detail product specification, where applicable.

In cases where accessories may be used with the connectors, outline drawings with prime dimensions shall be included in the detail product specification.

Accessories may take the form of optional mounting hardware, coding devices, shielded contacts, high current contacts, etc., which are not normally provided fitted to the connector.

Information on accessories may be presented as outline drawings with associated tabular data similar to that used for the connector dimensional details.

When coding or mounting devices, which are not an integral part of the connector, are used, separate information shall be given in the detail product specification. The same is valid also for shielding and/or grounding features, which do not form an integral part of the connector or its accessories.

3.7 Mounting information for connectors

3.5 Free connectors

3.5.1 Dimensions

3.5.2 Terminations

3.6 Accessories

3.7 Mounting information for connectors

Guidance notes

3.7.1 Mounting on panels

The detail product specification shall show a plan view drawing of the required panel aperture and the position(s) and size of mounting hole(s).

The minimum sizes of the dimensions of the panel aperture shall be stated together with the relative position of the aperture to the mounting holes.

Where appropriate, dimensional references shall be the same as those used in 3.4.1.

3.8 Gauges

3.8.1 Sizing gauges and retention force gauges

Drawings of the gauges required to size and measure the retention force of resilient contacts shall be included in the detail product specification.

The drawings of the gauges shall specify the material to be used for the gauges, the minimum hardness value of the gauges, the surface according to ISO 1302, and the surface finish to be applied, if any.

The dimensions and tolerances stated shall include wear allowance.

Sizing gauges shall simulate the maximum conditions, retention force gauges shall simulate the minimum conditions.

The mass of the retention gauges shall be stated.

3.7.1 Mounting on panels

3.8 Gauges

3.8.1 Sizing gauges and retention force gauges

Guidance notes

3.8.2 Mechanical function, engaging/separating/insertion/withdrawal force gauges

Where appropriate, drawings of the gauges required to conduct endurance testing and for measurement of engaging/separating forces or insertion/withdrawal forces shall be included in the detail product specification. The drawings of the gauges shall specify the material to be used for the gauges, the surface according to ISO 1302, and the surface finish to be applied.

The gauges shall simulate nominal conditions.

3.8.3 Probes

Probe damage testing is intended to apply only to female contacts.

The test probe shall be specified in the detail product specification in accordance with the requirements of test 16a of IEC 60512.

3.8.4 Contact resistance gauge

For edge-socket and other types of one-part connectors, the contact resistance measurement shall be made using a gauge made of copper alloy (or other appropriate material) of minimum thickness or a suitable printed board as defined in the detail product specification.

A surface condition according to ISO 1302, and a suitable surface finish compatible with that of the contacts of the connector to be tested shall be specified.

3.8.5 Test panel (for voltage proof test)

The drawing of the test panel shall show the minimum allowable aperture, the mounting hole position(s) and size, and the panel thickness.

The panel shall be manufactured from an electrically conductive material which may have a suitable surface finish.

3.8.6 Test panel (for EMC/crosstalk, etc.)

3.8.2 Mechanical function, engaging/separating/insertion/withdrawal force gauges

3.8.3 Probes

3.8.4 Contact resistance gauge

3.8.5 Test panel (for voltage proof test)

3.8.6 Test panel (for EMC/crosstalk, etc.)

Guidance notes

4 Characteristics

4.1 General

To provide information on specified essential electrical and mechanical characteristics, preferred methods of tests and measurements are listed, additional characteristics may be added to the detail product specification, when appropriate, for example in test group KP.

4.2 Pin assignment and other definitions

To provide information about the pin assignment.

NOTE Other information like the marking of first make last break contacts or different contact materials can be given here as well.

4.3 Classification into climatic categories

The climatic category of the connector shall be stated in the detail product specification, in accordance with 2.3 of IEC 61076-3:2008.

The detail product specification may contain more than one performance level, to which the climatic category is linked. The relationship may be clarified by showing the details in a table, for example:

Table 3 – Performance levels, example

Performance level	Climatic category	Temperature		Damp heat, steady state: number of days
		Lower °C	Upper °C	
1	55/125/56	–55	125	56
2	25/085/10	–25	85	10

4.4 Electrical characteristics

4.4.1 Creepage and clearance distances

These parameters are given in Table 4 as an example. If these dimensions differ per connector style, a reference to such a style shall be given. If it could occur in the application of the connectors that there is the possibility of a reduction of the creepage or clearance distances, then the following note shall be included in the detail product specification:

Application information – The permissible rated voltage depends on the application or specified safety requirements. Reductions in creepage or clearance distances may occur due to the printed board or wiring used, and shall duly be taken into account.

A rated voltage is the value of the voltage, assigned to a connector by the manufacturer, to which operation and performance characteristics are referred. This value may be added to the table.

4 Characteristics

4.1 General

The reference to the corresponding detail quality specification IEC 62197-3-1XX should be given, if appropriate.

4.2 Pin assignment and other definitions

4.3 Classification into climatic categories

Table 3 – Performance levels

Performance level	Climatic category	Temperature		Damp heat, steady state: number of days
		Lower °C	Upper °C	

4.4 Electrical characteristics

4.4.1 Creepage and clearance distances

Table 4 – Creepage and clearance distances

Connector style and number of contacts	Style reference letter(s)				
Minimum creepage and clearance distance					

Application information – The permissible rated voltage depends on the application or specified safety requirements. Reductions in creepage or clearance distances may occur due to the printed board or wiring used, and shall duly be taken into account.

Guidance notes

4.4.2 Voltage proof

The detail product specification shall state:

- a) that the connector shall be mounted to the test panel specified in 3.8.5;
- b) whether test method A, B or C is applicable;
- c) the d.c. or a.c. r.m.s. voltage that shall be applied, contact to contact, and contact to test panel.

The information may be presented in the form of a table.

4.4.3 Current-carrying capacity

The detail product specification shall show a current-carrying capacity curve for the connector determined in accordance with the test procedure of Test 5b of IEC 60512. The preparation of specimen, type and size of cable/wire bundle shall be as specified in 5.1.6.

As an alternative, one value of current at a stated temperature on the current-carrying capacity curve, together with the maximum operating temperature, may be stated in the detail product specification. Derating values in tabular form are also permitted, provided that a minimum of two points, including the ambient and the maximum temperatures, are given.

Important values, for example the current at 70 °C, shall be shown in a derating graph¹.

4.4.4 Contact and shield resistance

The detail product specification shall state if the measurement is to be taken with mated connectors or with a contact resistance gauge as specified in 3.8.4.

The detail product specification shall state the maximum allowable value of the contact resistance in milliohm (mΩ). Initial resistance, resistance after testing and resistance including terminations (if applicable) shall be given. The connecting points shall be as specified in 5.1.3. It is recommended that a figure showing the test arrangement be included. If a shield exists, the shield resistance shall also be taken into account (optional).

4.4.5 Insulation resistance

The detail product specification shall state:

- a) that the connector shall be mounted to the test panel specified in 3.8.5;
- b) whether test method A, B or C is applicable;
- c) the d.c. voltage that shall be applied, contact to contact, and contact to test panel;
- d) the minimum allowable value of insulation resistance, in megaohm (MΩ), initially and after testing.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence.

¹ The value of current carrying capacity at this specific ambient temperature is considered important when linked to a temperature rise of 30 K for the widely used upper limiting temperature of 100 °C for the connector. The temperature rise (K) on the terminations must generally be within the operating limits for the connector described by its upper limiting temperature. Furthermore, severe limitation may be due to safety requirements in the end use application or by other considerations, e.g. the cable sheathing.

4.4.2 Voltage proof

Condition: IEC 60512, Test 4a

Standard atmospheric conditions

4.4.3 Current-carrying capacity

Conditions: IEC 60512, Test 5b

All contacts

Values at 70 °C are shown in a derating graph.

4.4.4 Contact and shield resistance

Conditions: IEC 60512, Test 2a, 2b and 2f

Standard atmospheric conditions

4.4.5 Insulation resistance

Conditions: IEC 60512, Test 3a

Standard atmospheric conditions

Guidance notes

4.4.6 Impedance

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) measurement system rise time;
- c) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- d) fixturing requirements;
- e) location for the measurement points.

4.4.7 Transmission characteristics

Only if applicable.

4.4.7.1 Attenuation/insertion loss

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- c) frequency range for the measurements;
- d) fixturing requirements;
- e) the location for the measurement points.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence. A figure showing the test arrangement is recommended.

4.4.7.2 Return loss

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- c) frequency range for the measurements;
- d) fixturing requirements;
- e) the location for the measurement points.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence. A figure showing the test arrangement is recommended.

4.4.6 Impedance

Conditions: IEC 60512, Test 25g

Standard atmospheric conditions

Frequency range of measurements:

4.4.7 Transmission characteristics

4.4.7.1 Attenuation/Insertion loss

Conditions: IEC 60512, Test 25b

Standard atmospheric conditions

4.4.7.2 Return loss

Conditions: IEC 60512, Test 25e

Standard atmospheric conditions

Frequency range of measurements:

Guidance notes

4.4.7.3 Near-end crosstalk loss (NEXT)

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- c) frequency range for the measurements;
- d) fixturing requirements;
- e) the location for the measurement points.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence. A figure showing the test arrangement is recommended, see also 5.1.4.

4.4.7.4 Far-end crosstalk loss (FEXT)

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- c) frequency range for the measurements;
- d) fixturing requirements;
- e) the location for the measurement points.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence. A figure showing the test arrangement is recommended.

4.4.7.5 Voltage Standing Wave Ratio (VSWR)

The detail product specification shall state:

- a) signal and ground contact assignments;
- b) measurement system rise time;
- c) specimen environment impedance (50 Ω , 75 Ω or other for single-ended and 100 Ω or 150 Ω or other for differential);
- d) fixturing requirements;
- e) the location for the measurement points.

The information may be presented in the form of a table, which shall be numbered in the appropriate sequence.

4.4.7.6 Transfer impedance/shielding effectiveness

The detail product specification shall state:

- a) contact(s) to be energized;
- b) frequency range of test;
- c) special fixturing requirements.

A figure is recommended showing the test arrangement.

4.4.7.3 Near-end crosstalk loss (NEXT)

Conditions: IEC 60512, Test 25a

Standard atmospheric conditions

Frequency range of measurements:

4.4.7.4 Far-end crosstalk loss (FEXT)

Conditions: IEC 60512, Test 25a

Standard atmospheric conditions

Frequency range of measurements:

4.4.7.5 Voltage Standing Wave Ratio (VSWR)

Conditions: IEC 60512, Test 25g

Standard atmospheric conditions

Frequency range of measurements:

4.4.7.6 Transfer impedance/shielding effectiveness

Conditions: IEC 60512, Test 23c

Standard atmospheric conditions

Frequency range of measurements:

Guidance notes

4.5 Mechanical characteristics

4.5.1 Mechanical operation

The detail product specification shall state:

- a) the frequency of the operations;
- b) the speed of the operations;
- c) the number of mechanical operations;
- d) any pause time, mated or unmated (deviation from the standard method).

If the detail product specification contains more than one performance level, to which the number of mechanical operations is linked, the relationship may be clarified by showing the details in a table.

4.5.2 Effectiveness of connector coupling devices

The detail product specification shall state the test to be applied as well as the forces.

4.5.3 Engaging and separating forces (or insertion and withdrawal forces)

The detail product specification shall state:

- a) the maximum allowable value of the engaging (or insertion) force;
- b) the minimum and maximum (if necessary) allowable value of the separating (or withdrawal) force;
- c) the rate of engagement and separation.

Test 13a of IEC 60512, engaging and separating force measurement, is normally used when the connectors have a device that assists the engaging and separating operations.

Test 13b of IEC 60512, insertion and withdrawal force measurement, is normally used when the measurement is taken without the effect of any locking or similar devices.

Usually, the design of the connector determines whether test 13a or test 13b shall be specified in the detail product specification.

4.5.4 Contact retention in insert

To assess the ability of the contact retaining system (if any) to withstand mechanical stresses during normal usage, a contact retention test shall be conducted.

The force to be applied and the maximum axial displacement after the force is removed shall be stated in the detail product specification.

4.5.5 Polarizing and coding method

To assess the capability of the polarizing and coding method, if applicable, a test shall be conducted to check whether the polarizing and coding method prevents the mismatching of incorrectly matched connector halves.

4.5 Mechanical characteristics

4.5.1 Mechanical operation

Conditions: IEC 60512, Test 9a

Standard atmospheric conditions

4.5.2 Effectiveness of connector coupling devices

Conditions: IEC 60512, Test 8a or IEC 60512, Test 15f

Standard atmospheric conditions

4.5.3 Engaging and separating forces (or insertion and withdrawal forces)

Conditions: IEC 60512, Test 13a or Test 13b

4.5.4 Contact retention in insert

Conditions: IEC 60512, Test 15a

Standard atmospheric conditions

The measurement of axial displacement while force is applied is not required.

4.5.5 Polarizing and coding method

Conditions: IEC 60512, Test 13e

Standard atmospheric conditions

Guidance notes

4.6. Other characteristics

4.6.1 Shock and vibration (method either random or sine)

Include information as to the fixturing dimensions, placement of the accelerometer, contacts to be measured, and other information to properly perform the test. This would include the type of cable (conductor size, length, screening effectiveness requirements if any, method of mounting – including the unsupported length of cable from the specimen to the clamp).

A figure should be included showing the test arrangement.

4.6.2 Degree of protection provided by enclosures (IP code)

The following information shall be provided:

- a) Test method applied to specimens.
- b) Method of mounting and description of wiring of specimens.

4.6.3 Screen and shielding properties

The following information shall be provided:

- a) Test method applied to specimens.
- b) Method of mounting and description of wiring of specimens.

4.6 Other characteristics

4.6.1 Shock and vibration (method either random or sine)

Conditions: IEC 60512, Test 6c, 6d or 6e

Standard atmospheric conditions

Frequency range

Duration and the number of cycles per axis

Mounting/fixtures information

4.6.2 Degree of protection provided by enclosures (IP code)

Conditions: IEC 60529:1989, Test 14.2.5 and Test 14.2.7 (second numeral) and IEC 60529:1989, Test 6, Table 7 (first numeral)

4.6.3 Screen and shielding properties

Conditions: IEC 60512, Test 23c

Guidance notes

4.7 Environmental aspects

4.7.1 Marking of insulation material (plastics)

If applicable and possible, all plastic material should be marked according to ISO 11469 to ease recycling.

4.7.2 Design/use of material

The design has to take into account the relevant IEC guides for designing products (IEC Guide 114: Environmentally conscious design – Integrating environmental aspects into design and development of electrotechnical products) and the use of material (IEC Guide 109: Environmental aspects – Inclusion in electrotechnical product standards) with regard to the environment.

4.7 Environmental aspects

4.7.1 Marking of insulation material (plastics)

4.7.2 Design/use of material

Guidance notes

5 Test schedule

5.1 General

See Clause 5 of IEC 61076-1:2006.

The detail product specification shall state the test sequence (in accordance with this standard), and the number of specimens (not less than three) and contacts (not less than thirty) for each test sequence.

Individual variants may be submitted to type tests for approval of those particular variants.

It is permissible to limit the number of variants tested to a selection representative of the whole range for which approval is required (which may be less than the range covered by the detail product specification), but each feature and characteristic shall be proved.

The connectors shall have been processed in a careful and workmanlike manner, in accordance with good current practices.

Guidance with regard to the application of a basic (minimum), intermediate or full test schedule, the test phase numbers and the addition of tests, is given in 5.2 of IEC 61076-3:2008.

When the sequence of the test phases in a test group according to 5.2 is not entirely appropriate for a particular type or style, the given sequence may be altered (see 5.2 of IEC 61076-3:2008). This is to be specified in the detail product specification.

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1, and applicable parts of IEC 60512. The detail product specification shall state to which connector styles the test sequence(s) is applicable. Most of the test programme may not be applicable to connectors without shells (housings).

The necessary number of specimens to perform the entire test sequence shall be given in tabular form in 5.2.2.

5.1.1 Climatic category

The climatic category of the connector shall be stated in the detail product specification, in accordance with 2.3 of IEC 61076-3:2008.

The detail product specification may contain more than one performance level, to which the climatic category is linked. The relationship may be clarified by showing the details in a table, for example see Table 3.

5 Test schedule

5.1 General

This test schedule shows the tests and the order in which they shall be carried out, as well as the requirements to be met.

Unless otherwise specified, mated sets of connectors shall be tested. Care shall be taken to keep a particular combination of connectors together during the complete test sequence; when unmating is, for example, necessary for a certain test, the same connectors shall be mated for the subsequent tests.

In the following, a mated set of connectors is called a specimen.

5.1.1 Climatic category

Table 5 – Performance levels

Performance level	Climatic category	Temperature		Damp heat, steady state: number of days
		Lower °C	Upper °C	

Guidance notes

5.1.2 Creepage and clearance distances

These parameters are quoted in Table 6 as an example. If these dimensions differ according to connector style, a reference to such style shall be given. If in the application of the connectors, there is the possibility of a reduction of the creepage or clearance distances occurring, then the following note shall be included in the detail product specification:

Application information – The permissible rated voltage depends on the application or specified safety requirements. Reductions in creepage or clearance distances may occur due to the wiring used, and shall duly be taken into account.

A rated voltage is the value of the voltage, assigned to a connector by the manufacturer, to which operation and performance characteristics are referred. This value may be added to the table.

5.1.3 Arrangement for contact resistance measurement

The detail product specification shall contain a pictorial representation of the mated connectors on which the points of connection for the measurement of contact resistance shall be shown.

5.1.4 Arrangement for dynamic stress tests

The detail product specification shall contain a pictorial representation of the method of mounting, dimensions of printed boards, details of the clamping of wires, etc., to the mounting fixture.

5.1.5 Arrangement for testing static load, axial

The detail product specification shall contain details of the method of mounting the fixed connector, the dimensions of the testing tool and the position of the testing tool relative to the connector.

5.1.6 Wiring of specimens

It shall be stated in the detail product specification how the specimens shall be wired so that the selected method of test for insulation resistance, voltage proof and current-carrying capacity can be conducted. The wire size (or rating) and the type of insulation shall be stated.

For wiring of specimens for solderless termination tests, it shall be stated in the detail product specification how the terminations shall be wired, in accordance with the relevant part of IEC 60352. For screw-type or screwless-type connection tests, the relevant requirements of IEC 60999 should also duly be taken into account.

5.1.2 Creepage and clearance distances

Table 6 – Creepage and clearance distances

Connector style and number of contacts	Style reference letter(s)				
Minimum creepage and clearance distance					

Application information – The permissible rated voltage depends on the application or specified safety requirements. Reductions in creepage or clearance distances may occur due to the wiring used, and shall duly be taken into account.

5.1.3 Arrangement for contact resistance measurement

Conditions: IEC 60512, Test 2a

The measurement of contact resistance shall be carried out on the number of contacts specified. Any subsequent measurements of contact resistance shall be made on the same contacts.

5.1.4 Arrangement for dynamic stress tests

Conditions: IEC 60512, Test 6a, 6b, 6c and 6d

5.1.5 Arrangement for testing static load, axial

Conditions: IEC 60512, Test 8b

5.1.6 Wiring of specimens

Guidance notes

5.2 Test schedules

This test schedule shows the tests and the order in which they shall be carried out, as well as the requirements to be met.

Unless otherwise specified, mated sets of connectors shall be tested. Care shall be taken to keep a particular combination of connectors together during the complete test sequence; when unmating is, for example, necessary for a certain test, the same connectors shall be mated for the subsequent tests.

In the following, a mated set of connectors is called a specimen.

When a detail product specification is applicable to connectors having more than one performance level (PL), the differing severity/conditions of test and/or requirements shall be entered in the test schedule tables (see example given in Table 7) under the appropriate test phase.

Table 7 – Tests, example

Test phase	Test			Measurement to be performed		Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL	All connector styles
BP5	Mech-anical operation	9a	Speed: 2 mm/s maximum Rest: 10 s when mated			1	250 operations
						2	125 operations
						3	75 operations
BP6							

5.2.1 Basic (minimum) test schedule

When a basic (minimum) test schedule is applicable, the following tests and severities/conditions, similar to the full test schedule, will apply:

Test phases:

- 1 To apply IEC 60512, Tests 1a and 1b, the detail product specification shall specify:
 - features to be checked,
 - gauging details, if applicable,
 - type and magnification power of measuring equipment,
 - failure criteria.