IEC 61076-3-122

Edition 1.0 2017-05

INTERNATIONAL STANDARD

colour inside

Connectors for electrical and electronic equipment – Product requirements – Part 3-122: Detail specification for 8-way, shielded, free and fixed connectors for I/O and Gigabit Ethernet applications in harsh environments

IEC 61076-3-122:2017-05(en)

IEC Central Office
3, rue de Varembé
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 It also gives information on projects, replaced and withdrawn publications.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 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 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.

IEC 61076-3-122

Edition 1.0 2017-05

INTERNATIONAL STANDARD

colour inside

Connectors for electrical and electronic equipment – Product requirements – Part 3-122: Detail specification for 8-way, shielded, free and fixed connectors for I/O and Gigabit Ethernet applications in harsh environments

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 31.220.10

ISBN 978-2-8322-4276-6

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 3-122: Detail specification for 8-way, shielded, free and fixed connectors for I/O and Gigabit Ethernet applications in harsh environments

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.

International Standard IEC 61076-3-122 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This first edition cancels and replaces IEC PAS 61076-3-122 published in 2015. This edition constitutes a technical revision.

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

FDIS	Report on voting
48B/2554/FDIS	48B/2563/RVD

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

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

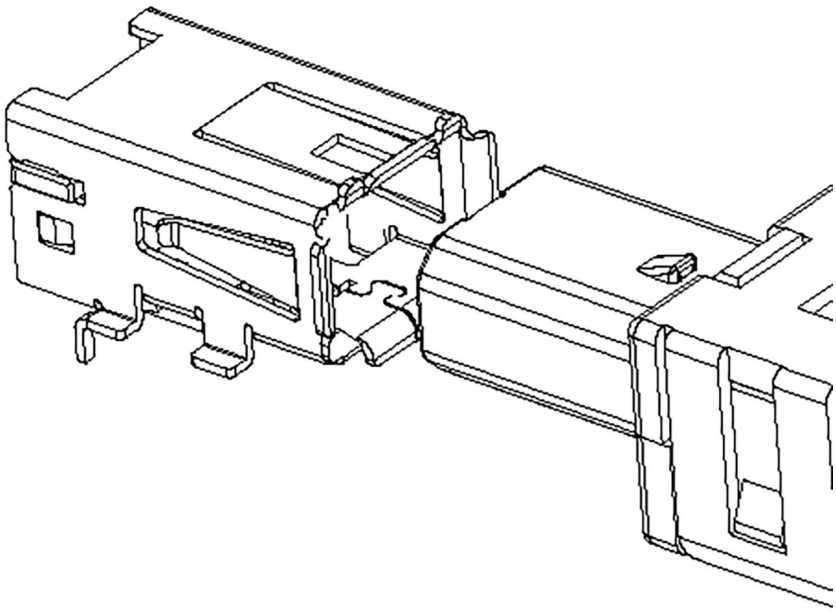
A list of all parts in the IEC 61076 series, published under the general title *Connectors for electronic equipment – Product requirements*, can be found on the IEC website.

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

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

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

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.

	IEC 61076-3-122:2017
Subcommittee 48B: Electrical connectors	
 IEC	Detail specification for 8-way, shielded, free and fixed connectors for I/O and Gigabit Ethernet applications in harsh environments
NOTE The above view shows a Type I connector pair, with coding edges on a short side; for Type II connectors the coding edges are located on a long side.	Fixed connectors are mounted on printed circuit board by means of soldering or press-in, the free connector is attached to wires by means of soldering, crimping, IDC or other termination technology.

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 3-122: Detail specification for 8-way, shielded, free and fixed connectors for I/O and Gigabit Ethernet applications in harsh environments

1 Scope

This part of IEC 61076 covers 8-way, shielded, free and fixed rectangular connectors for I/O and Gigabit Ethernet applications, suitable for use in harsh environments, and is intended to specify the common dimensions, mechanical, electrical and environmental characteristics and tests for this family of connectors.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-581, *International Electrotechnical Vocabulary (IEV) – Chapter 581: Electromechanical components for electronic equipment*

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

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

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

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

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

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

IEC 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: Insulation resistance*

IEC 60512-4-1, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof*

IEC 60512-5-2, *Connectors for electronic equipment – Tests and measurements – Part 5-2: Current-carrying capacity tests – Test 5b: Current-temperature derating*

IEC 60512-6-3, *Connectors for electronic equipment – Tests and measurements – Part 6-3: Dynamic stress tests – Test 6c: Shock*

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

IEC 60512-9-1, *Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance tests – Test 9a: Mechanical operation*

IEC 60512-11-3, *Connectors for electronic equipment – Tests and measurements – Part 11-3: Climatic tests – Test 11c: Damp heat, steady state*

IEC 60512-11-4, *Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic tests – Test 11d: Rapid change of temperature*

IEC 60512-11-7, *Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

IEC 60512-11-9, *Connectors for electronic equipment – Tests and measurements – Part 11-9: Climatic tests – Test 11i: Dry heat*

IEC 60512-11-10, *Connectors for electronic equipment – Tests and measurements – Part 11-10: Climatic tests – Test 11j: Cold*

IEC 60512-13-2, *Connectors for electronic equipment – Tests and measurements – Part 13-2: Mechanical operation tests – Test 13b: Insertion and withdrawal forces*

IEC 60512-15-6, *Connectors for electronic equipment – Tests and measurements – Part 15-6: Connector tests (mechanical) – Test 15f: Effectiveness of connector coupling devices*

IEC 60512-26-100, *Connectors for electronic equipment – Tests and measurements – Part 26-100: Measurement setup, test and reference arrangements and measurements for connectors according to IEC 60603-7 – Tests 26a to 26g*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581, IEC 61076-1, IEC 61076-3 and IEC 60512-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Mating information

4.1 General

Dimensions are given in millimetres. Drawings are shown in third-angle projection. The shape of connectors may deviate from those given in Figures 1 to 6 and Tables 1 to 5 as long as the specified dimensions are not changed.

4.2 Contacts – mating conditions

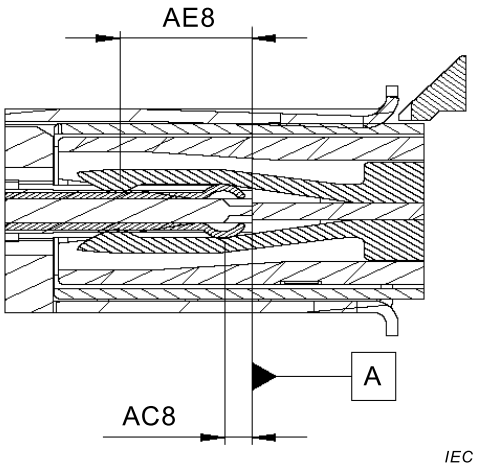


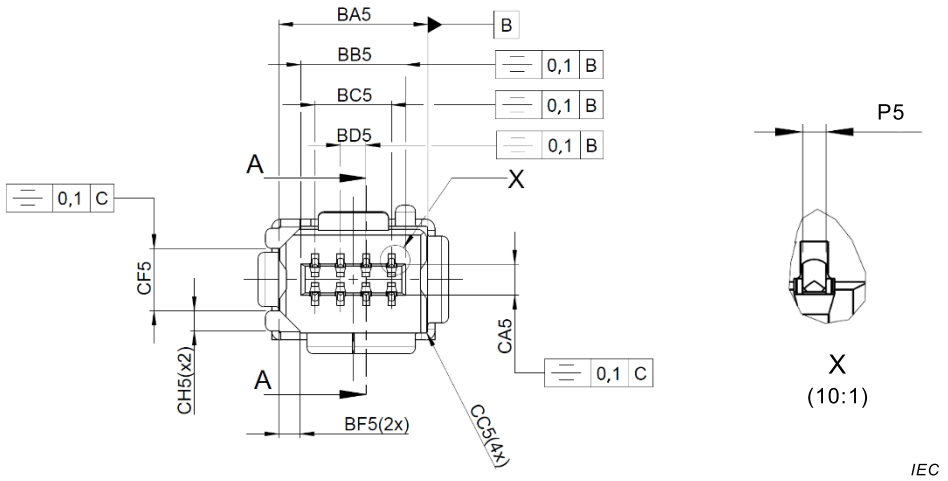
Figure 1 – Contact interface dimensions with a free (male) connector (right side) mated with a fixed (female) connector (left side)

Table 1 – Dimensions for Figure 1

Dimension designation	Minimum	Nominal	Maximum
AC8	0,7	0,8	0,9
AE8	3,7	3,8	3,9

4.3 Fixed connector Type I

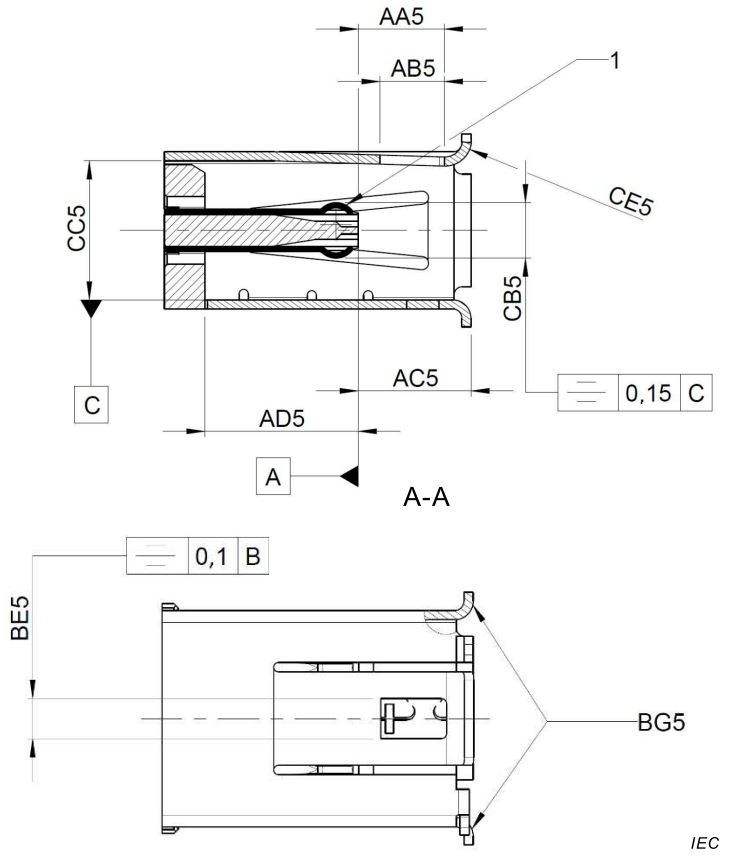
(Dimensions in millimetres)



Detail A: contacts shall be located within their individual contact zone in the indicated area P5.

Section A-A: see Figure 3.

Figure 2a – Fixed female connector Type I – mating side view



NOTE Preferred free connector stop surface.

Figure 2b – Fixed (female) connector – section A-A with top view

Figure 2 – Fixed female connector Type I

Table 2 – Dimensions for Figure 2

(Dimensions in millimetres)

Dimension designation	Minimum	Nominal	Maximum
AA5	3,1	3,2	3,3
AB5	2,3	2,4	2,5
AC5	4,2	4,3	4,4
AD5	5,7	5,8	5,9
BA5	7,35	7,4	7,5
BB5	5,1	5,2	5,3
BC5	3,88	3,9	3,95
BD5	1,15	1,2	1,3
BE5	1,4	1,5	1,6
BF5	0,95	1,05	1,1
BG5	R 0,65	R 0,7	R 0,75
CA5	1,45	1,5	1,55
CB5	2	2,1	2,2
CC5	5,25	5,3	5,35
CE5	R 0,9	R 1,0	R 1,05
CD5	1,05	1,1	1,15
CF5	3	3,1	3,2
P5	0,25	0,3	0,35

4.4 Free connector Type I

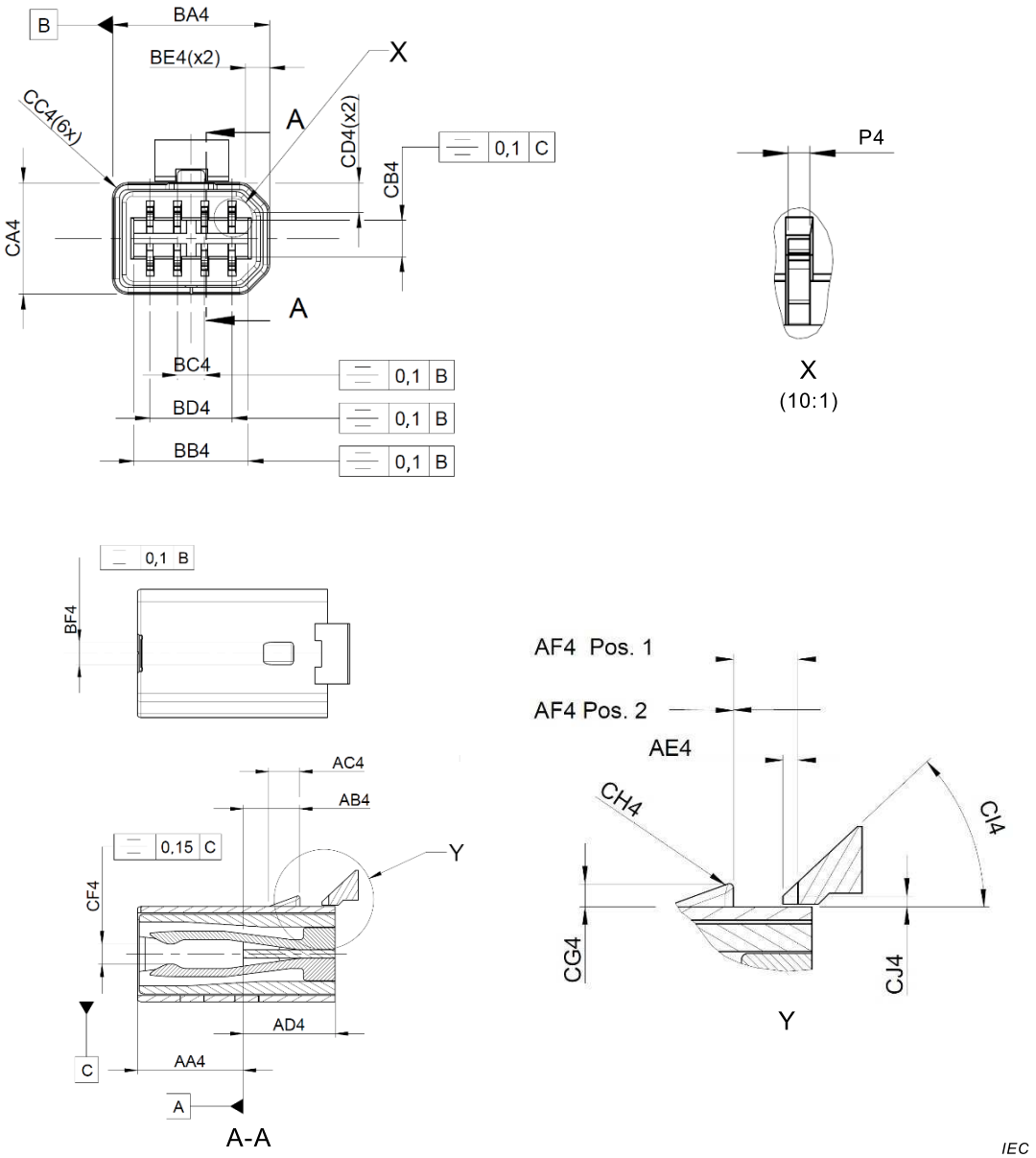


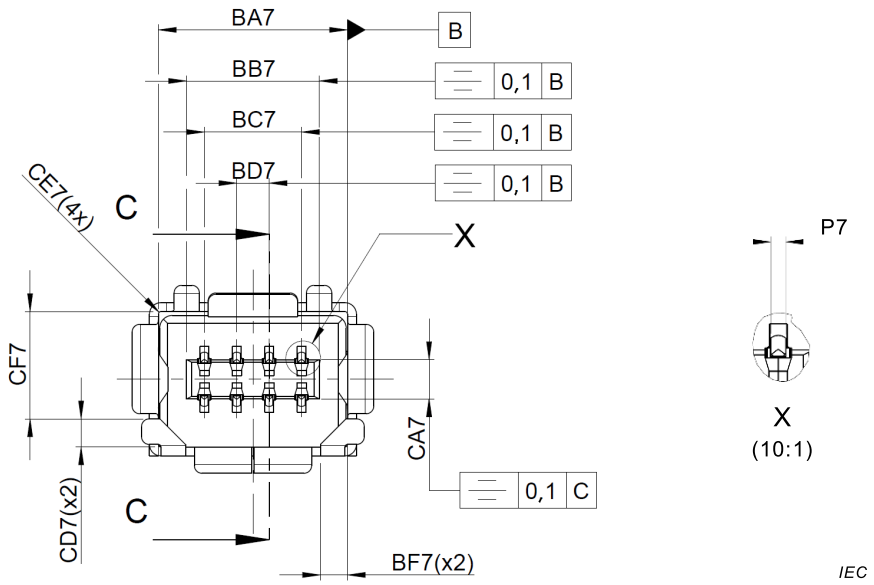
Figure 3 – Free male connector Type I

Table 3 – Dimensions for Figure 3

(Dimensions in millimetres)

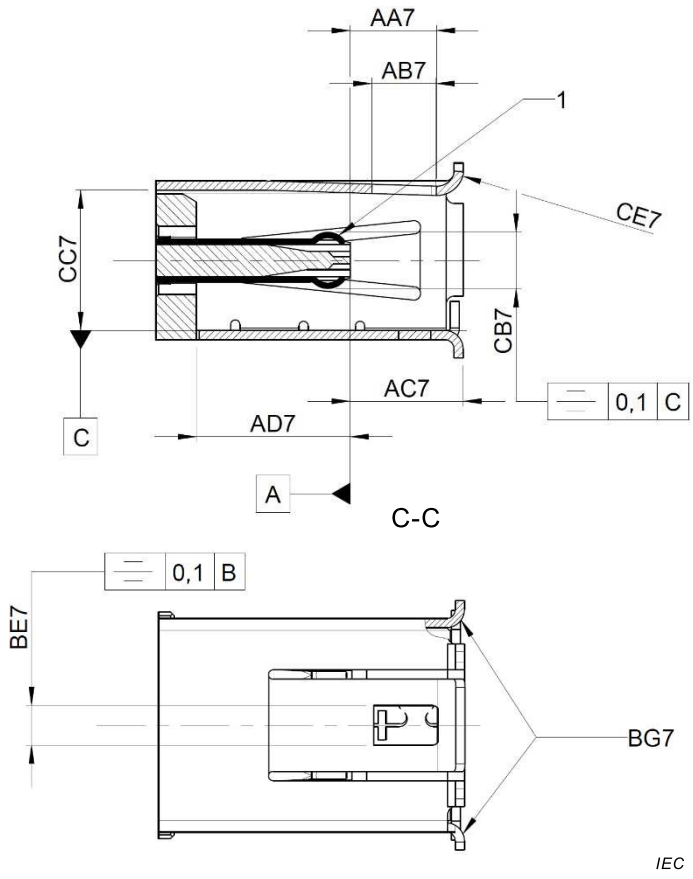
Dimension designation	Minimum	Nominal	Maximum
AA4	5,7	5,8	5,9
AB4	2,9	3	3,1
AC4	1,6	1,7	1,8
AD4	4,9	5	5,1
AE4	0,25	0,35	0,35
AF4 pos. 1	1,6	1,65	1,7
AF4 pos. 2	0	0,05	0,1
CA4	5,15	5,1	5,23
CB4	1,65	1,7	1,7
CC4	R 0,65	R 0,7	R 0,7
CD4	1,25	1,3	1,4
CF4	1	1	1,1
CG4	0,45	0,5	0,55
CH4	R 0,05	R 0,1	R 0,15
CI4	41°	43°	45°
CJ4	0,17	0,2	0,25
BA4	7,24	7,3	7,34
BB4	5,27	5,3	5,33
BC4	1,22	1,27	1,3
BD4	3,7	3,8	3,9
BE4	1,07	1,1	1,13
BF4	1,2	1,3	1,4
P4	0,25	0,3	0,35

4.5 Fixed connector Type II



Contact zone: Contacts shall be completely within their individual contact zone in the indicated area P7.

Figure 4a – Fixed (female) connector Type II – mating side view



NOTE Preferred free connector stop surface.

Figure 4b – Fixed (female) connector Type II – Section C-C with top view

Figure 4 – Fixed (female) connector Type II

Table 4 – Dimensions for Figure 4

(Dimensions in millimetres)

Dimension designation	Minimum	Nominal	Maximum
AA7	3,1	3,2	3,3
AB7	2,3	2,4	2,5
AC7	4,2	4,3	4,4
AD7	5,7	5,8	5,9
BA7	7,35	7,4	7,5
BB7	5,1	5,2	5,3
BC7	3,88	3,9	3,95
BD7	1,15	1,2	1,3
BE7	1,4	1,5	1,6
BF7	0,95	1,1	1,05
BG7	R 0,65	R 0,7	R 0,75
CA7	1,45	1,5	1,55
CB7	2	2,1	2,2
CC7	5,25	5,3	5,35
CE7	R 0,9	R 1,0	R 1,05
CD7	1,05	1,1	1,15
CF7	4,1	4,2	4,3
P7	0,25	0,3	0,35

4.6 Free connector Type II

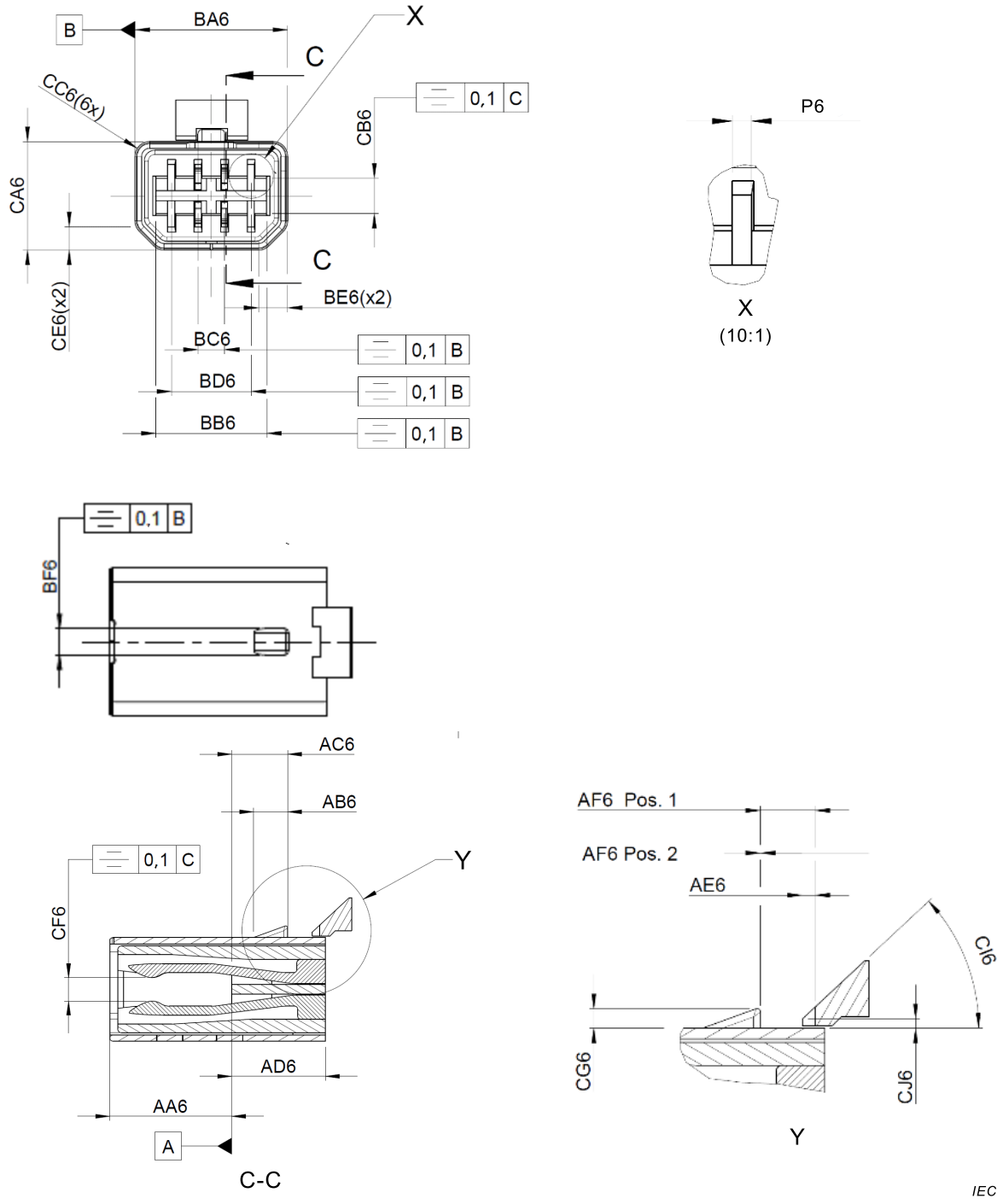


Figure 5 – Free (male) connector Type II

Table 5 – Dimensions for Figure 5

(Dimensions in millimetres)

Dimension designation	Minimum	Nominal	Maximum
AA6	5,7	5,8	5,9
AB6	2,9	3	3,1
AC6	1,6	1,7	1,8
AD6	4,9	5	5,1
AE6	0,25	0,3	0,35
AF6 pos. 1 (unmated)	1,6	1,65	1,7
AF6 pos. 2 (mated)	0	0,05	0,1
CA6	5,15	5,2	5,23
CB6	1,65	1,7	1,7
CC6	R 0,65	R 0,7	R 0,7
CD6	1,25	1,3	1,4
CE6	1	1,1	1,2
CF6	1	1	1,1
CG6	0,45	0,5	0,55
CH6	R 0,05	R 0,1	R 0,15
CI6	41°	43°	45°
CJ6	0,17	0,2	0,25
BA6	7,24	7,3	7,34
BB6	5,27	5,3	5,33
BC6	1,22	1,27	1,3
BD6	3,7	3,8	3,9
BE6	1,07	1,1	1,13
BF6	1,2	1,3	1,4
P6	0,25	0,3	0,35

5 Characteristics

5.1 General

Compliance to the test schedules is intended to ensure the reliability of all performance parameters, over the range of operating climatic conditions. Stable and compliant contact resistance is a good indication of the stability of transmission performance.

5.2 Pin and pair grouping assignment

For those specifications where pin and pair groupings are relevant, the pin and pair grouping assignments shall be as shown in Figure 7, unless otherwise specified.

Board connector pin location, see Figure 6.

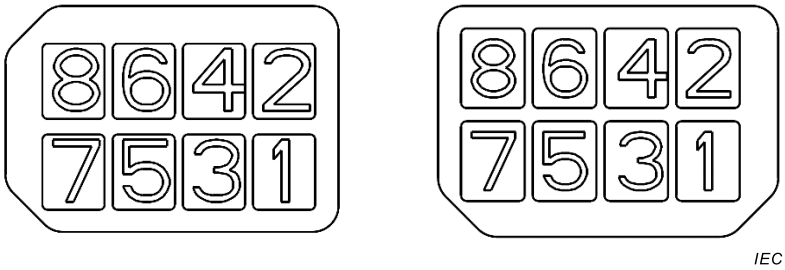


Figure 6 – Fixed connector pin and pair grouping assignment for Type I (left, with coding edges on one short side) and Type II (right, with coding edges on one long side), front view of connector

For the board connector pin assignment for 10/100 Mb Ethernet applications, see Table 6. For the board connector pin assignment for 1 Gb Ethernet applications, see Table 7.

Table 6 – Pin assignment for 10/100 Mb Ethernet

Pin No.	Signal	Function
1	TXD_P	Transmit Data +
2	TXD_N	Transmit Data –
3	RXD_P	Receive Data +
4	N.C.	Not connected
5	N.C.	Not connected
6	RXD_N	Receive Data –
7	N.C.	Not connected
8	N.C.	Not connected

Table 7 – Pin assignment for 1 Gb Ethernet

Pin No.	Signal	Function
1	BI_DA_P	1000Base-T signal, Bi-directional pair A +
2	BI_DA_N	1000Base-T signal, Bi-directional pair A –
3	BI_DB_P	1000Base-T signal, Bi-directional pair B +
4	BI_DC_P	1000Base-T signal, Bi-directional pair C +
5	BI_DC_N	1000Base-T signal, Bi-directional pair A –
6	BI_DB_N	1000Base-T signal, Bi-directional pair B –
7	BI_DD_P	1000Base-T signal, Bi-directional pair D +
8	BI_DD_N	1000Base-T signal, Bi-directional pair D –

5.3 Classification into climatic category

The lowest and highest temperatures and the duration of the damp-heat steady-state test shall be selected from the preferred values stated in 2.3 of IEC 61076-1:2006. The connectors are classified into climatic categories in accordance with the general rules given in IEC 60068-1. The temperature range and severity of the damp heat, steady state test are given in Table 8.

Table 8 – Climatic category

Climatic category	Lower temperature °C	Upper temperature °C	Damp heat, steady state days
-55/85/21	-55	85	21

5.4 Electrical characteristics

5.4.1 Voltage proof

Conditions: IEC 60512-4-1, Test 4a, Standard atmospheric conditions

Mated connectors

All variants: 500 V d.c.; one contact to all other contacts connected together.

2 250 V d.c.; between bridged signal contacts on plug and board side and earth shield.

5.4.2 Voltage rating

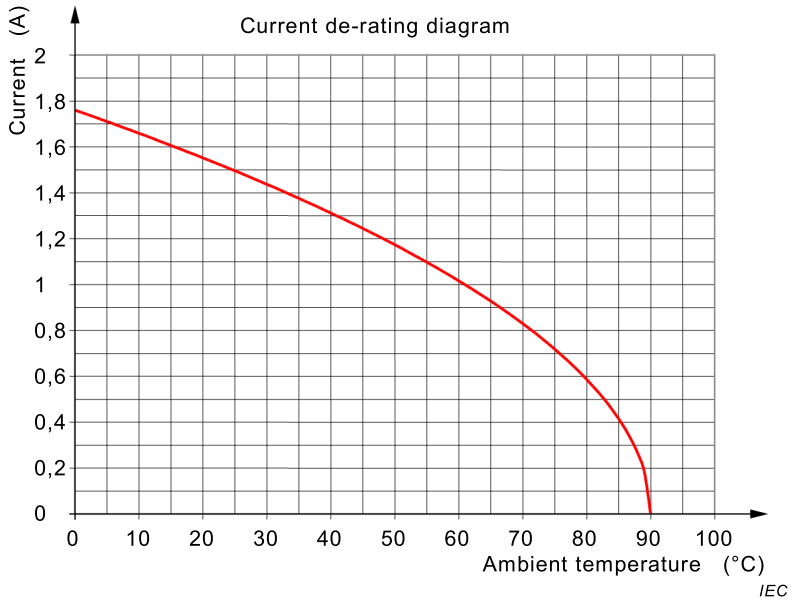
Signal connectors, intended for a voltage up to and including 50 V a.c./ 120 V d.c.

5.4.3 Current-temperature derating

Conditions: IEC 60512-5-2, Test 5b

All contacts, connected in series with the relevant contacts of the fixed connector are connected with each other on the PCB, and where the free connector is terminated on wires with the highest possible cross-section.

The current-carrying capacity of connectors in accordance with the requirements of 2.5 of IEC 61076-1:2006 shall comply with the de-rating curve given in Figure 7.



NOTE 1 The maximum permissible current for a given ambient temperature (t) is: $I_{(t)} = 1{,}76 \cdot \left(1 - \frac{t}{90}\right)^{0,5}$

NOTE 2 For ambient temperatures lower than 0 °C, the maximum permissible current per conductor is 1,76 A.

Figure 7 – Connector de-rating curve

5.4.4 Initial insulation resistance

Conditions: IEC 60512-3-1, Test 3a

Method A

Mated connectors

Test voltage: 500 V d.c.

All types: 500 MΩ minimum

5.5 Mechanical characteristics

5.5.1 Mechanical operation

Conditions: IEC 60512-9-1, Test 9a

Speed: 10 mm/s maximum

Rest: 1 s minimum (mated and unmated)

250 operations

5.5.2 Insertion and withdrawal forces

Conditions: IEC 60512-13-2, Test 13b

Speed: maximum rate of 12,5 mm per minute.

All types, insertion and withdrawal: 20 N maximum

5.6 Transmission performance

5.6.1 General

Compliance to this document, in respect to transmission characteristics, shall be determined according to specific test methods described in test group FP. All transmission performance requirements shall apply between the reference planes specified in IEC 60512-26-100. All

transmission results shall be reported as worst case result for the corresponding pair or pair combination after testing all samples.

NOTE In the following subclauses f is the frequency, expressed in MHz.

5.6.2 Insertion loss

Conditions according to IEC 60512-26-100, test 26a
Mated connectors
All pairs: ≤ $0{,}04x\sqrt{f}$ dB from 1 MHz to 100 MHz.
Whenever the equation results in a value less than 0,1 dB, the requirement shall revert to 0,1 dB.

5.6.3 Return loss

Conditions according to IEC 60512-26-100, test 26b
Mated connectors
All pairs: ≥ 60-20log (f) dB from 1 MHz to 100 MHz.
Whenever the equation results in a value greater than 30 dB, the requirement shall revert to 30 dB.

5.6.4 Near end cross talk

Conditions according to IEC 60512-26-100, test 26c
Mated connectors
All pair combinations: ≥ 83-20log (f) dB from 1 MHz to 100 MHz.
Whenever the equation results in a value greater than 75 dB, the requirement shall revert to 75 dB.

5.6.5 Far end cross talk

Conditions according to IEC 60512-26-100, test 26d
Mated connectors
All pair combinations: ≥ 75,1-20log (f) dB from 1 MHz to 100 MHz.
Whenever the equation results in a value greater than 75 dB, the requirement shall revert to 75 dB.

5.6.6 Transverse conversion loss

Conditions according to IEC 60512-26-100, test 26f
Mated connectors
All pairs: ≥ 66-20log (f) dB from 1 MHz to 100 MHz.
Whenever the equation results in a value greater than 50 dB, the requirement shall revert to 50 dB.

5.6.7 Transfer conversion transfer loss

Conditions according to IEC 60512-26-100, test 26g
Mated connectors
All pairs: ≥ 66-20log (f) dB from 1 MHz to 100 MHz.
TCTL at frequencies that correspond to calculated values of greater than 50 dB shall revert to a minimum requirement of 50 dB.

5.6.8 Transfer impedance

Conditions according to IEC 60512-26-100, test 26e
Mated connectors
All pairs: ≤ 0,1 x $f^{0,3}$ Ω from 1 MHz to 10 MHz and ≤ 0,02 x f Ω from 10 MHz to 80 MHz.

6 Tests and test schedule

6.1 General

This clause states the test sequence (in accordance with this document) and the number of specimens for each test sequence.

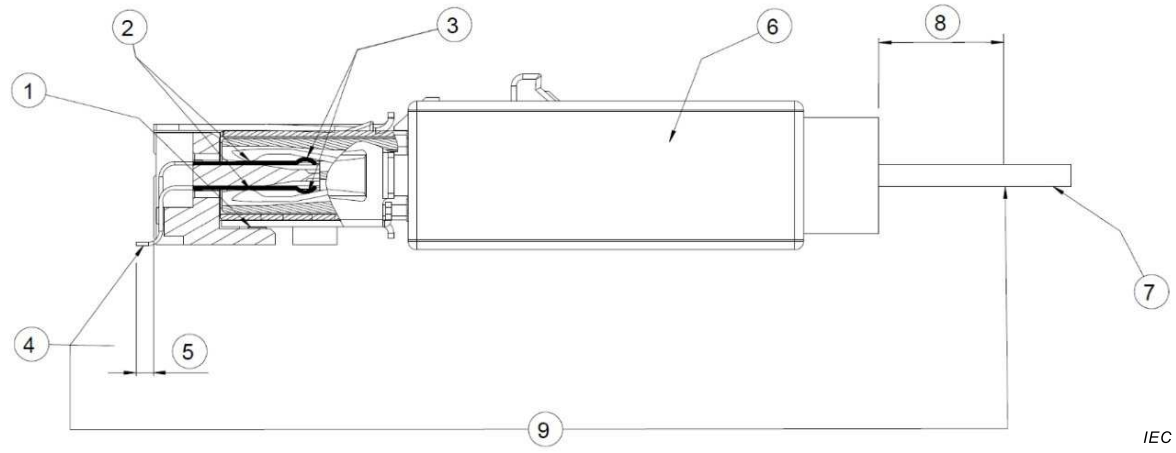
Individual variants may be submitted to type tests for approval of those particular variants.

Testers may 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 specification), but each feature and characteristic shall be validated against the dimensional requirements and test sequences specified in this document.

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

Unless otherwise specified, mated sets of connectors shall be tested. For contact resistance measurements, care shall be taken to keep a particular combination of connectors together during the complete test sequence; that is, when un-mating is necessary for a certain test, the same connectors shall be mated for subsequent tests.

6.2 Arrangement for contact resistance test (Figure 8)



Key

1 Fixed connector

2 Point P1

3 Point P2

4 Point A. Measure the DC resistance across each of the 8 signal pins

5 As short as practical (except for vibration test EP5)

6 Free connector

7 Point C

8 As short as practical (except for vibration test EP5)

9 Contact resistance measurement points

Figure 8 – Arrangement for contact resistance test

The test procedure is as follows:

a) Determine the bulk resistance of the fixed connector between points A and P1 of Figure 9 by calculation or by measurement. This resistance is noted and recorded as R_{AP1}.

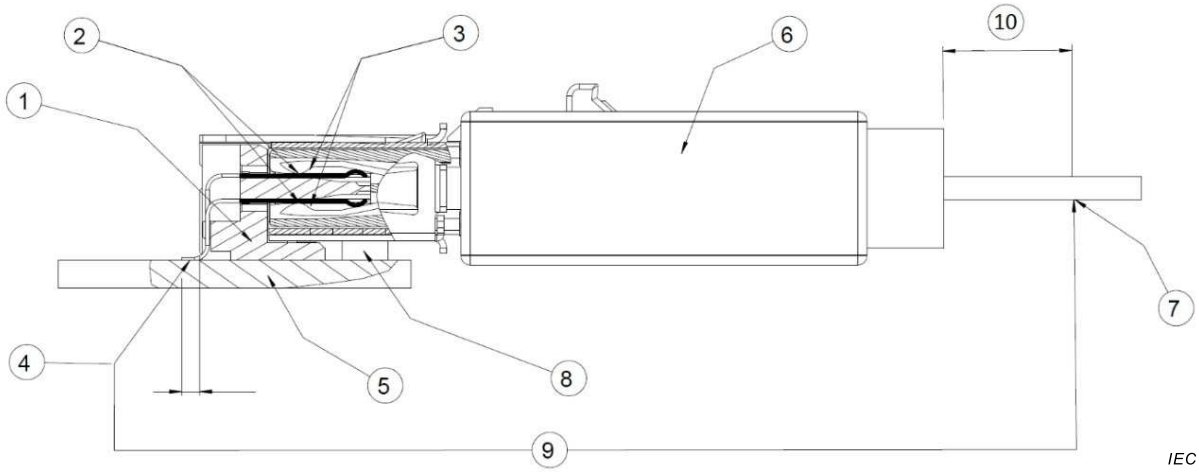
b) Determine the bulk resistance of the free connector between points P2 and C of Figure 9 by calculation or by measurement. This resistance is noted and recorded as R_{CP2}.

c) Measure the total mated connector resistance between points A and C, following the requirements and procedures of IEC 60512, Test 2a. This resistance is noted and recorded as R_{AC}.

d) Calculate the contact resistance by subtracting the sum of the bulk resistance of the fixed and free connectors from the total mated connector resistance.

$$\text{Contact resistance} = R_{AC} - (R_{AP1} + R_{CP2})$$

6.3 Arrangement for vibration test (test phase DP3) (Figure 9)



Key

1 Fixed connector vibration feature

2 Not relevant for vibration testing

3 Not relevant for vibration testing

4 Point A: secure to the vibrating member, measure the DC resistance across each of the 8 signal pins

5 Mounting plate

6 Free connector

7 Point C: secure to the non-vibrating membe.

8 Fixed connector rigidly fixed to the mounting plate

9 Contact resistance measurement point

10 Cable length ≥ 200 mm

Figure 9 – Arrangement for vibration test

6.4 Test procedures and measuring methods

The test methods specified and given in the relevant standards are the preferred methods, but not necessarily the only ones that can be used. In case of dispute, however, the specified method shall be used as the reference method.

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1.

NOTE Where approval procedures are involved and alternative methods are employed, it is the responsibility of the manufacturer to satisfy the authority granting approval that any alternative methods which he may use give results equivalent to those obtained by the methods specified in this document.

6.5 Preconditioning

Before the tests are made, the connectors shall be preconditioned under standard atmospheric conditions for testing as specified in IEC 60068-1 for a period of 24 h, unless otherwise specified by the detail specification.

6.6 Test schedules

6.6.1 General

The test parameters required shall not be less than those listed in Clause 7.

6.6.2 Basic (minimum) test schedule

Not applicable.

6.6.3 Full test schedule

6.6.3.1 General

The following tests specify the characteristics which shall be checked and the requirements which shall be fulfilled.

For a complete test sequence, 21 specimens shall be used (Test groups AP, BP, DP, EP and FP shall each consist of 3 specimens. Test group CP consists of 6 specimens).

Contact resistance tests shall apply only to the interface.

6.6.3.2 Test group P – preliminary

All specimens shall be subjected to the following tests. All the test group specimens shall be subjected to the preliminary group P tests in the following sequence, see Table 9.

The specimens shall then be divided into the appropriate number of groups (Tables 10 to 15). All connectors in each group shall undergo the following tests as described in the sequence given.

Table 9 – Test group P

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
P1	General examination			Visual examination	1a	There shall be no defects that would impair normal operation
				Examination of dimensions and mass	1b	The dimensions shall comply with those specified in the detail specification
P2	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	Max. 80 mΩ initial, 100 mΩ final
P3			500 V d.c. 1 min hold	Insulation resistance	3a	500 MΩ minimum
P4			Subject specimens to 500 V d.c. between adjacent contacts and 2 250 V d.c. between bridged signal contacts and earth shield	Voltage proof	4a	No breakdown or flashover

6.6.3.3 Test group AP – Climatic

Table 10 – Test group AP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
AP1	Insertion and withdrawal force		Measure the force necessary to insert / withdraw the specimens at a max. rate of 12,5 mm per minute (latching mechanism inactivated)		13b	20 N max. for insertion and for withdrawal
AP2	Rapid change of temperature	11d	Subject mated specimens to 10 cycles between -55 °C and 85 °C with 30 min dwell at temp. extremes and 1 min transition between temperatures			Meet visual requirements, show no physical damage.
AP3			Subject specimens to 500 V d.c. between adjacent contacts and 2 250 V d.c. between bridged signal contacts and earth shield	Voltage proof	4a	No breakdown or flashover
AP4			500 V d.c., 1 min hold	Insulation resistance	3a	500 MΩ minimum
AP5			All contacts/ specimens	Contact resistance	2a	80 mΩ max.

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
AP6	Dry heat	11i	Subject mated specimens to a temperature of 85 °C during 21 days			Meet visual requirements, show no physical damage.
AP7	Humidity/temperature cycling		Subject mated specimens to 10 cycles (10 days) between 25 °C and 60 °C at 80 % to 100 % RH		IEC 60068-2-38, test Z/AD	Meet visual requirements, show no physical damage.
AP8	Cold	11j	Subject mated samples to a temperature of -55 °C for 10 days			Meet visual requirements, show no physical damage.
AP9	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
AP10			Subject specimens to 500 V d.c. between adjacent contacts and 2 250 V d.c. between bridged signal contacts and earth shield	Voltage proof	4a	No breakdown or flashover
AP11			500 V d.c., 1 min hold	Insulation resistance	3a	500 MΩ minimum
AP12	Insertion and withdrawal force		Measure the force necessary to insert / withdraw the specimens at a max. rate of 12,5 mm per minute (latching mechanism inactivated)		13b	20 N max. for insertion and for withdrawal
AP13	Effectiveness of connector coupling device	15f	Rate of load application 45 N/s maximum.			50 N for 60 s ± 5 s.
AP14	General examination			Visual examination	1a	There shall be no defects that would impair normal operation

6.6.3.4 Test group BP – Mechanical endurance

Table 11 – Test group BP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
BP1	Insertion and withdrawal force		Measure the force necessary to insert / withdraw the specimens at a max. rate of 12,5 mm per minute (latching mechanism inactivated)		13b	20 N max. for insertion and for withdrawal
BP2	Mechanical operation (half of the specified number of cycles)		Mate and un-mate the specimens for 50 cycles at a max. rate of 200 cycles/hour		9a	Shall meet visual requirements, show no physical damage
BP3	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
BP4	Mixed flowing gas corrosion		Subject mated specimens to environment Method 2 for 14 days (unmated for 7 days, then mated for 7 days)		11g	Shall meet visual requirements, show no physical damage.
BP5	Mechanical operation (remaining number of operations)		Mate and un-mate the specimens for 50 cycles at a max. rate of 200 cycles/hour		9a	Meet visual requirements, show no physical damage
BP6	Humidity/temperature cycling		Subject mated specimens to 10 cycles (10 days) between 25 °C and 60 °C at 80% to 100 % RH		IEC 60068-2-38, test Z/AD	Meet visual requirements, show no physical damage.
BP7	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
BP8	General examination			Visual examination	1a	There shall be no defects that would impair normal operation

6.6.3.5 Test group CP – Moisture

Table 12 – Test group CP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
CP1	Insertion and withdrawal force		Measure the force necessary to insert / withdraw the specimens at a max. rate of 12,5 mm per minute (latching mechanism inactivated)		13b	20 N max. for insertion and for withdrawal
CP2	Damp heat, steady state		Subject mated specimens to a relative humidity of 95 % at a temperature of 40 °C during 21 days		11c	Shall meet visual requirements, show no physical damage.
CP3	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
CP4			500 V d.c., 1 min hold	Insulation resistance	3a	500 MΩ minimum
CP5			Subject specimens to 500 V d.c. between adjacent contacts and 2 250 V d.c. between bridged signal contacts and earth shield	Voltage proof	4a	No breakdown or flashover.
CP6	Insertion and withdrawal force		Measure the force necessary to insert / withdraw the specimens at a max. rate of 12,5 mm per minute (latching mechanism inactivated)		13b	20 N max. for insertion and for withdrawal
CP7	General examination			Visual examination	1a	There shall be no defects that would impair normal operation

6.6.3.6 Test group DP – Heat and electrical load

Table 13 – Test group DP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
DP1	Mechanical operation (remaining number of operations)		Mate and unmate the specimens for 50 cycles at a max. rate of 200 cycles/hour		9a	Shall meet visual requirements, show no physical damage
DP2	Dry heat	11i	Subject mated specimens to a temperature of 85 °C during 21 days			Shall meet visual requirements, show no physical damage.
DP3	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
DP4			500 V d.c., 1 min hold	Insulation resistance	3a	500 MΩ minimum
DP5			Subject specimens to 500 V d.c. between adjacent contacts and 2 250 V d.c. between bridged signal contacts and earth shield	Voltage proof	4a	No breakdown or flashover,
DP6	General examination			Visual examination	1a	There shall be no defects that would impair normal operation

6.6.3.7 Test group EP – Dynamic stress

Table 14 – Test group EP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
EP1	Vibration, sinusoidal		10-55-10 Hz, 1,55 mm displ. 2 h in each of 3 mutually perpendicular axes.		6d	There shall be no discontinuities with duration > 1 μs
EP2	General examination			Visual examination	1a	There shall be no defects that would impair normal operation
EP3	Mechanical shock		Subject mated specimens to 300 m/s^2 half-sine shock pulses of 11 ms duration, 3 shocks in both directions of 3 mutually perpendicular directions (totally 18 shocks)		6c	There shall be no discontinuities with duration > 1 μs
EP4	Contact resistance		All contacts/ specimens	Low level contact resistance	2a	100 mΩ max.
EP5	General examination			Visual examination	1a	There shall be no defects that would impair normal operation

6.6.3.8 Test group FP – Signal integrity

These tests are applicable for signal connectors for symmetrical pair cabling. Measurements shall be performed between pairs which are connected according the pin and pair grouping assignment as indicated in 4.2.

Table 15 – Test group FP

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test no	Severity or condition of test	Title	IEC 60512 Test no	Requirements
FP1	Insertion loss				26a	Test result shall be ≤0,04 $\sqrt{f}$ dB see 5.6.2
FP2	Return loss		All pairs, both directions		26b	≥60 – 20log(f) dB see 5.6.3
FP3	Near end crosstalk		All pairs, both directions (pair to pair)		26c	Test result shall be ≥83 – 20log(f) dB see 5.6.4
FP4	Far end crosstalk		All pairs, both directions (pair to pair)		26d	Test result shall be ≥75,1 – 20log(f) dB see 5.6.5
FP5	Transverse conversion loss		All pairs, both directions		26f	For all pairs, the test result shall be ≥66 – 20log(f) dB see 5.6.6
FP6	Transverse conversion transfer loss		All pairs, both directions		26g	For all pairs, the test result shall be ≥66 – 20log(f) dB see 5.6.7
FP7	Transfer impedance		Measuring points according to 5.2, all signal contacts and screen		26e	Test result shall be ≤0,1 x $f^{0,3}\Omega$ from 1 MHz to 10 MHz ≤0,02 x $f^{0,3}\Omega$ from 10 MHz to 100 MHz see 5.6.8
FP8	Input to output resistance		Measuring points according to 5.2, all signal contacts and screen		2a	Signal contact resistance shall be 200 mΩ max. Screen resistance shall be 100 mΩ max.
FP9	Resistance unbalance		Measuring points according to 5.2, all signal contacts and screen	Low level contact resistance	2a	Unbalance resistance shall be 50 mΩ max.

7 Mounting of specimens

When mounting is required in a test, the connectors shall be rigidly mounted on a metal plate, a printed board or to specified accessories, whichever is applicable, using the normal mounting method, fixing devices and panel cut-out.

_____

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3, rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

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