

INTERNATIONAL STANDARD



**Connectors for electronic equipment –
Part 7: Detail specification for 8-way, unshielded, free and fixed connectors**



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67 000 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.



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INTERNATIONAL STANDARD



**Connectors for electronic equipment –
Part 7: Detail specification for 8-way, unshielded, free and fixed connectors**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONNECTORS FOR ELECTRONIC EQUIPMENT –**Part 7: Detail specification for 8-way, unshielded,
free and fixed connectors**

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60603-7 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This fourth edition cancels and replaces the third edition, published in 2008, its Amendment 1:2011 and its Amendment 2:2019. It constitutes a technical revision.

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

- Revised the definitions for intermateability and interoperability; added new definitions.
- Corrected dimension line for dimension AZ2 in Figure 5.
- Corrected dimension line for dimension F1 in Figure A.1.
- Revised the reference to ISO/IEC 11801 to ISO/IEC 11801-1.
- Added lower limiting temperature and upper limiting temperature definitions.
- Revised Table 1 to Table 8 so the column order is Minimum-Nominal-Maximum dimensions (ascending order).
- Corrected Table 7: Climatic category and Upper temperature values to 90 °C (to be consistent with the graph in Figure 10 and Note 1 in Figure 10).
- Revised the wording in 8.2, contact resistance, for clarification.
- Revised Figure 11 and Figure 12 and the wording in the Key below for clarification.
- Removed the sentences under the figure in the Introduction.
- Added Annex E.

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

FDIS	Report on voting
48B/2832/FDIS	8B/2843/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 of IEC 60603-7 series, under the general title *Connectors for electronic equipment*, 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

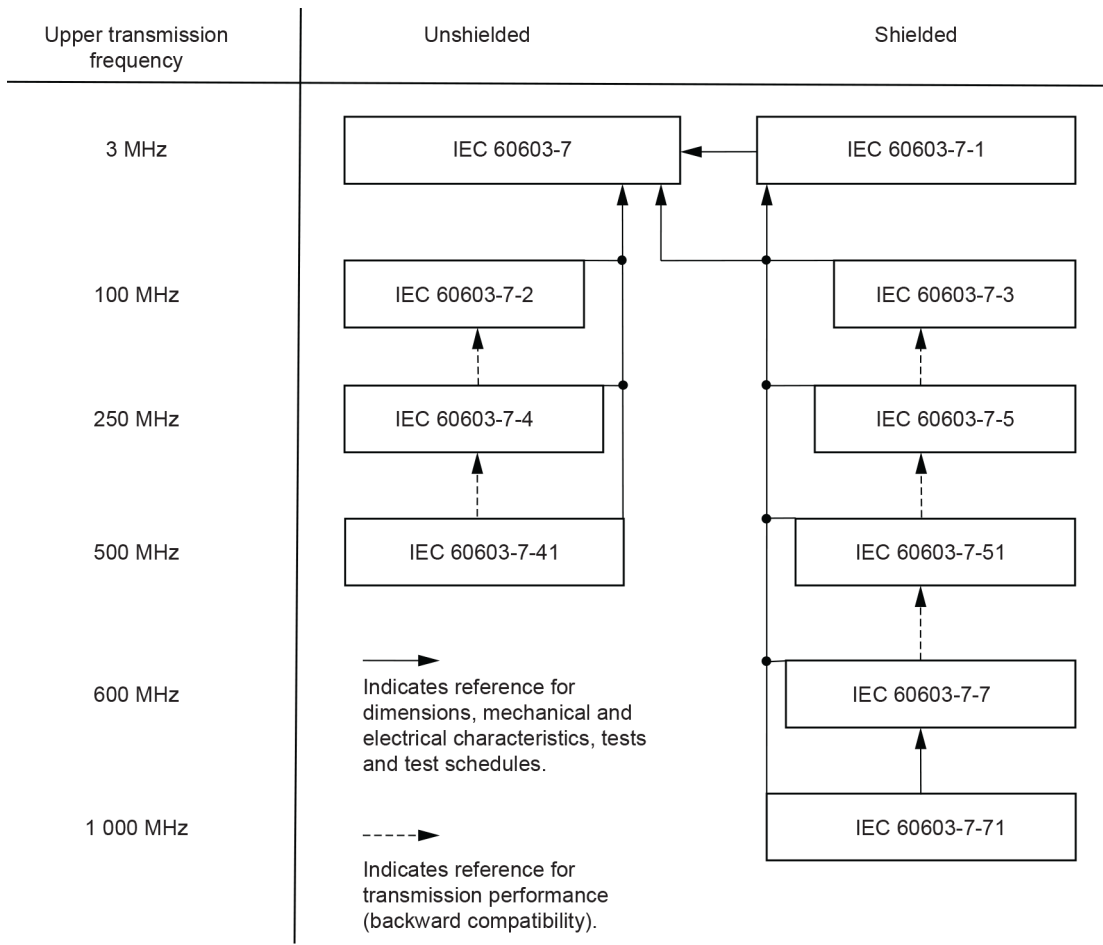
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- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

IEC 60603-7 is the base specification of the whole series. Subsequent specifications do not duplicate information given in the base document, but list only additional requirements. For complete specifications regarding a component of a higher numbered document, all lower numbered documents must be considered as well. Figure 1 shows the interrelation of the documents.

~~It should be noted that during the preparation of the third edition of IEC 60603-7, the subcommittee 48B Cat 6&7 project team members determined the current de-rating curve in the standard was not correct. Several experts researched the current rating temperature rise measurements for 60603-7 style connectors and verified that the de-rating curve in the published standard has been incorrect for many years. A corrected figure (Figure 10) has been prepared and inserted in this edition.~~



IEC

Figure 1 – IEC 60603-7 family document diagram

CONNECTORS FOR ELECTRONIC EQUIPMENT –

Part 7: Detail specification for 8-way, unshielded, free and fixed connectors

~~1~~ General

1 Scope

This part of IEC 60603-7 covers 8-way, unshielded, free and fixed connectors and is intended to specify the common dimensions (interface dimensions), mechanical, electrical and environmental characteristics and tests for the family of IEC 60603-7-x connectors.

These connectors are intermateable (according to IEC 61076-1 level 2) and interoperable with other IEC 60603-7 series 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 60050-581:2008, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment*

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

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

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

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

IEC 60352-3, *Solderless connections – Part 3: Solderless Accessible insulation displacement (ID) connections – General requirements, test methods and practical guidance*

IEC 60352-4, *Solderless connections – Part 4: Solderless Non-accessible insulation displacement (ID) connections – General requirements, test methods and practical guidance*

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

IEC 60352-6, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance*

IEC 60352-7, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance*

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

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

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 dimensions and mass*

IEC 60512-1-100, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

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 60512-2-5, *Connectors for electronic equipment – Tests and measurements – Part 2-5: Electrical continuity and contact resistance tests – Test 2e: Contact disturbance*

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 60512-6-4, *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 60512-9-2, *Connectors for electronic equipment – Tests and measurements – Part 9-2: Endurance tests – Test 9b: Electrical load and temperature*

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 60512-13-2, *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 60603-7 (all parts), *Connectors for electronic equipment*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

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*

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

~~IEC 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*~~

IEC 61156-2, *Multicore and symmetrical pair/quad cables for digital communications – Part 2: Symmetrical pair/quad cables with transmission characteristics up to 100 MHz – Horizontal floor wiring – Sectional specification*

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

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

IEC 61156-5, *Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to ~~600~~ 1 000 MHz – Horizontal floor wiring – Sectional specification*

IEC 61156-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Sectional specification*

IEC 61156-7, *Multicore and symmetrical pair/quad cables for digital communications – Part 7: Symmetrical pair cables with transmission characteristics up to 1 200 MHz – Sectional specification for digital and analog communication cables*

IEC 61760-3, *Surface mounting technology – Part 3: Standard method for the specification of components for through hole reflow (THR) soldering*

IEC TR 63040, *Guidance on clearances and creepage distances in particular for distances equal to or less than 2 mm – Test results of research on influencing parameters*

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

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

ITU-T Recommendation K.20:2000¹, *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

ITU-T Recommendation K.44:2000², *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*

¹ This document has been replaced by a new edition (2003), but for the purposes of this document, the 2000 edition is cited.

² This document has been replaced by a new edition (2003), but for the purposes of this document, the 2000 edition is cited.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581, IEC 61076-1, IEC 60512-1, and the following 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>

3.1

intermateability

intermateability (level 2 of IEC 61076-1:~~2006 (Ed 2.0)~~) is ensured by application of the "Go" and "No-Go" gauge requirements in the standards that may be referenced, and by adherence to the dimensional requirements ~~within~~ therein

SEE: Clause E.3.

3.2

interoperability

interoperability of different IEC 60603-7 connectors and of IEC 60603-7 connectors with connectors of other families (e.g. IEC 61076-3 series) is ensured by compliance with the specified interface dimensions, when they have the same number of contacts, the same electrical wiring-related dimensions and when the lowest electrical, mechanical and climatic performance (performance level) among the two connectors is suitable for the intended application

SEE: Clause E.5.

3.3

category

relevant level of transmission performance as given in ISO/IEC 11801-1

3.4

Keystone connector

is defined by its mounting features

Note 1 to entry: The dimensional requirements for the connector and its corresponding mounting panel are defined in Annex D.

3.5

number of contacts

number of contacts (or ways) that a connector owns, including the protective and/or functional earth contact(s), if any

Note 1 to entry: A connector for removable contacts is characterized by its number of contact positions (seats): its number of contacts (ways) may be lower than the number of contact positions (seats).

Note 2 to entry: The same number of contacts does not grant the same electrical interface: the geometry of said contacts may be different while their number is the same.

3.6

overall dimensions

dimensions providing the overall space occupied by a connector

Note 1 to entry: Two connectors of the same gender may have the same overall dimensions but different mounting dimensions and/or different interface dimensions.

3.7

interface dimensions

set of dimensions required to fully describe the connector's mating interface, belonging to both the connector insert and to the relevant electric contacts

Note 1 to entry: Interface dimensions enable the proper functioning of a mated set of connectors according to the relevant detail product specification or manufacturer's detail specification.

Note 2 to entry: Two connectors with same interface dimensions have the same number of contact seats (or positions), whereas they may not show the same number of contacts (ways).

3.8

mounting dimensions

dimensions enabling the mounting of a connector

Note 1 to entry: Examples of mounting dimensions are panel cutout size, size and interaxes of fixing holes or threads.

Note 2 to entry: The geometry of the mounting interface of Printed Circuit Board connectors to the PCB belongs to the mounting dimensions: two Printed Circuit Board connectors of the same gender with the same mounting dimensions share the same pattern and pitch of their contacts.

Note 3 to entry: Two connectors not of the Printed Circuit Board type of the same gender with the same mounting dimensions may have different interface dimensions.

Note 4 to entry: Two connectors of the same gender with the same mounting dimensions may have different overall dimensions.

3.9

electrical wiring-related dimensions

dimensions related to the wiring of the connector, i.e. to its number and type of contacts (ways)

Note 1 to entry: Two connectors of the same gender with the same electrical wiring-related dimensions have the same number of contacts (ways) or contact positions (seats), the same dimensions of these contacts or contact positions, the same overall dimensions, the same interface dimensions, and if they are Printed Circuit Board connectors, the same mounting dimensions.

3.10

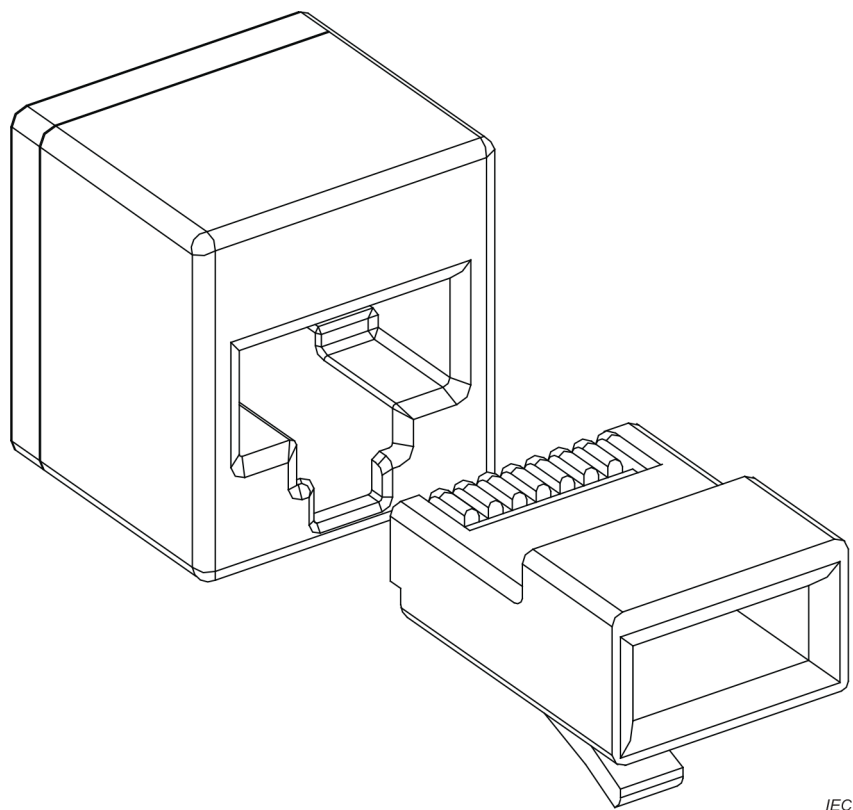
electrical, mechanical and climatic performances

levels of electrical, mechanical and climatic performance assigned to a connector in the relevant detail product specification or manufacturer's detail specification, therein verified through dedicated groups of tests

Note 1 to entry: The electrical performance includes signal integrity.

4 Common features and typical connector pair

4.1 View showing typical fixed and free connectors (see Figure 2)



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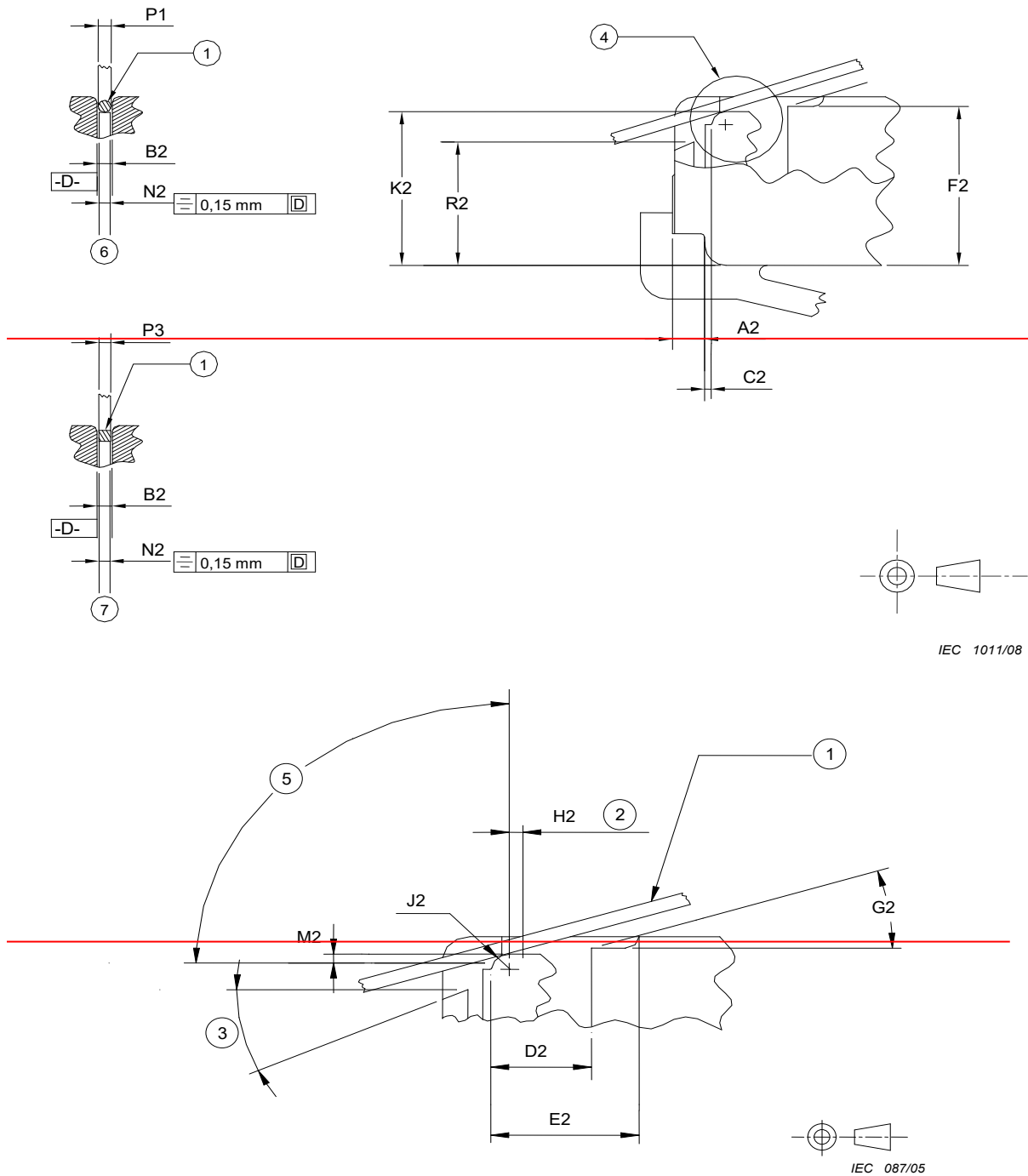
Figure 2 – View showing typical fixed and free connectors

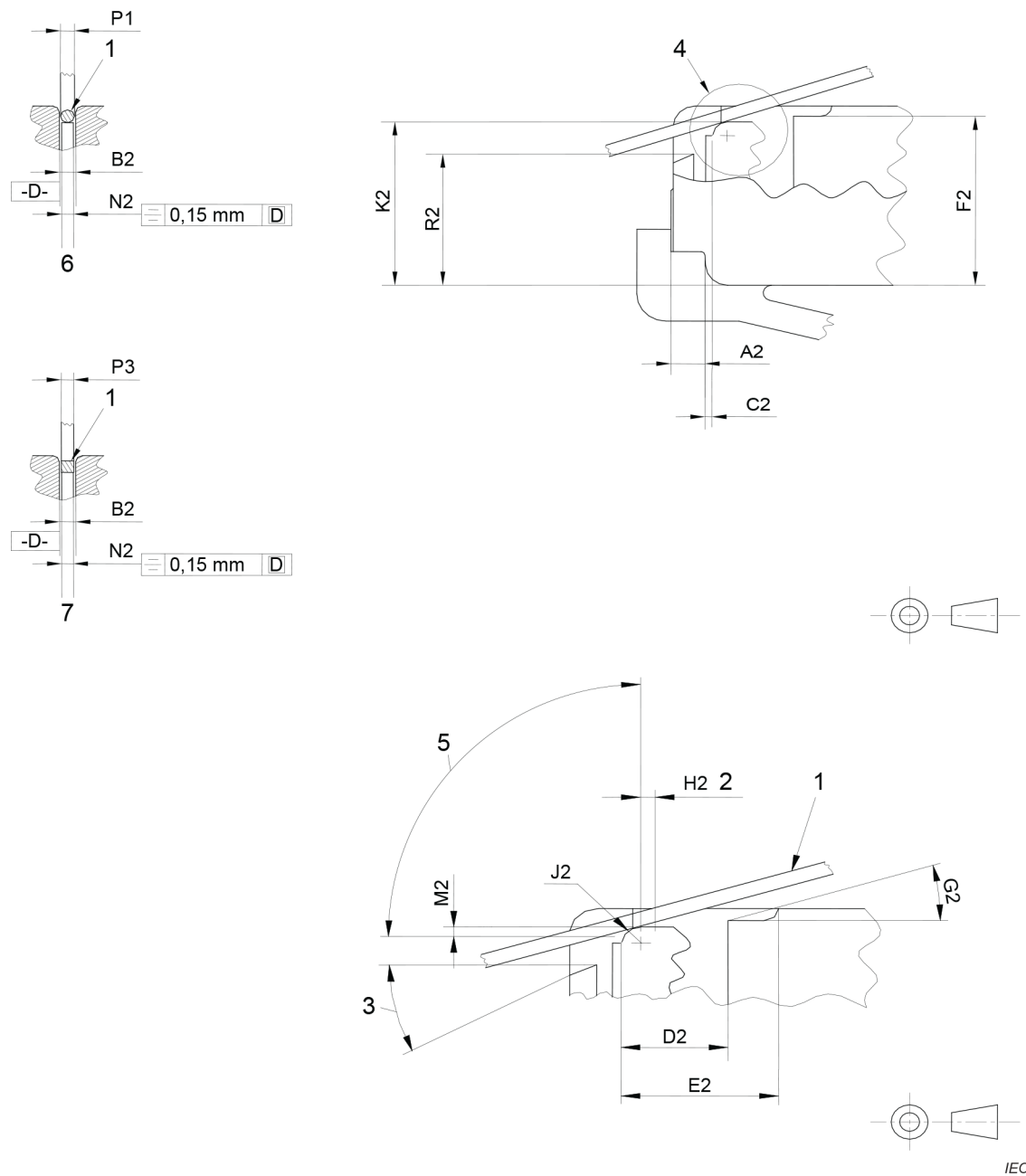
4.2 Mating information

4.2.1 General

Dimensions are given in millimetres. Drawings are shown in third-angle projection. The shape of connectors may deviate from those given in Figure 2 to Figure 5 as long as the dimensions specified are not changed. Table 1 through Table 3 list the dimensions for the connectors in Figure 2 through Figure 5.

4.2.2 Contacts – mating conditions





Key

- 1 Female contact of fixed connector. The mating information shown can only be achieved with a free connector with a cable attached.
- 2 Burrs shall not project above the top of the contact in this area, since it may be a contact area.
- 3 Optional angle.
- 4 Preferred contact interface detail.
- 5 Minimum preferred contact configuration.
- 6 Configuration with round contact profile.
- 7 Configuration with rectangular contact profile.

Figure 3 – Contact interface dimensions with terminated free connector

Table 1 – Dimensions for Figure 3

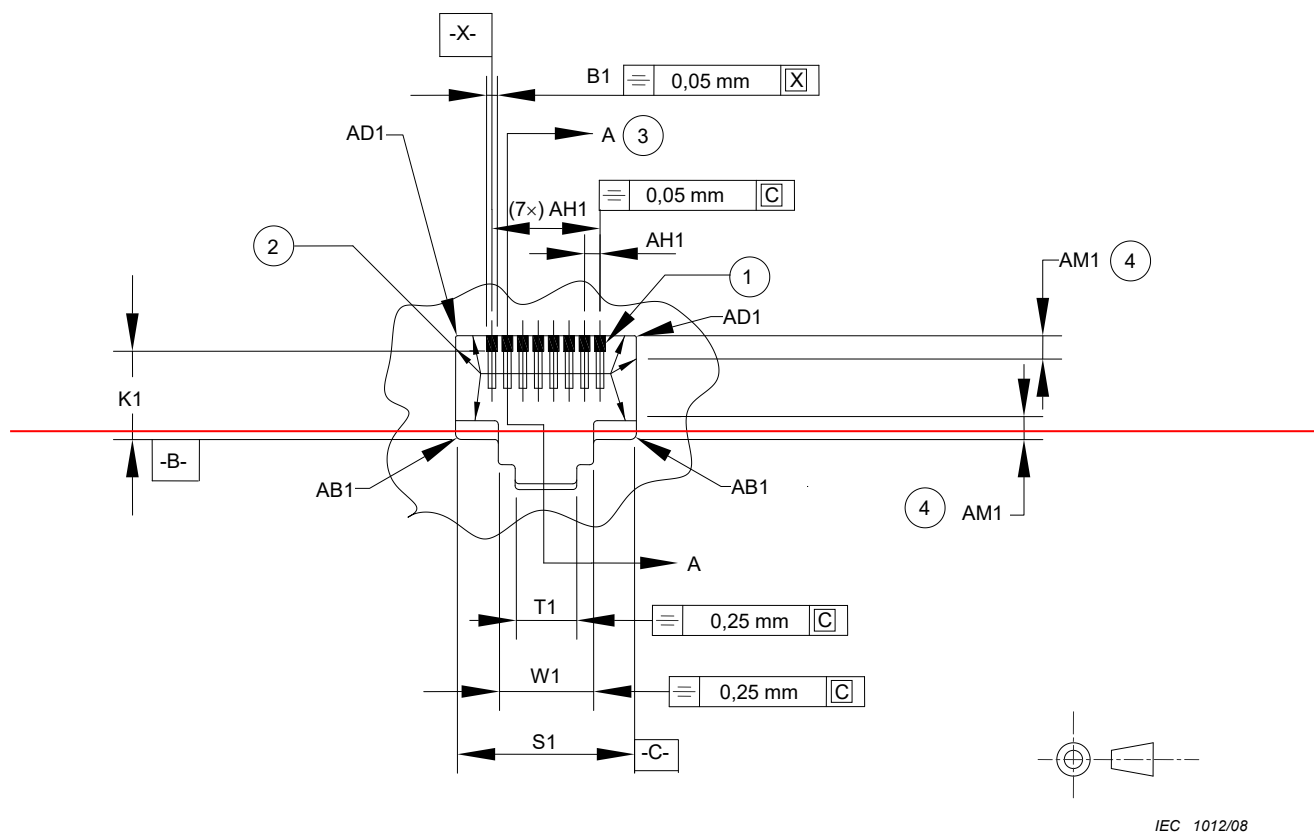
Letter	Maximum mm	Minimum mm
A2	1,45	0,89
B2	0,61	0,51
C2	0,46	0,03
D2		2,79
E2		4,11
F2	6,22	
H2		0,38
J2	0,64	0,38
K2	6,15	5,89
M2		0,30
N2		0,28
P1	0,50	0,45
P3	0,50	0,36
R2	4,83	

Letter	Maximum
G2	10°
Care shall be taken that the fixed connector contacts avoid interference with the plastic of the free connector.	

Dimensions in millimetres

Letter	Minimum	Maximum
A2	0,89	1,45
B2	0,51	0,61
C2	0,03	0,46
D2	2,79	
E2	4,11	
F2		6,22
G2		10°
H2	0,38	
J2	0,38	0,64
K2	5,89	6,15
M2	0,30	
N2	0,28	
P1	0,45	0,50
P3	0,36	0,50
R2		4,83
Care shall be taken that the fixed connector contacts avoid interference with the plastic of the free connector.		

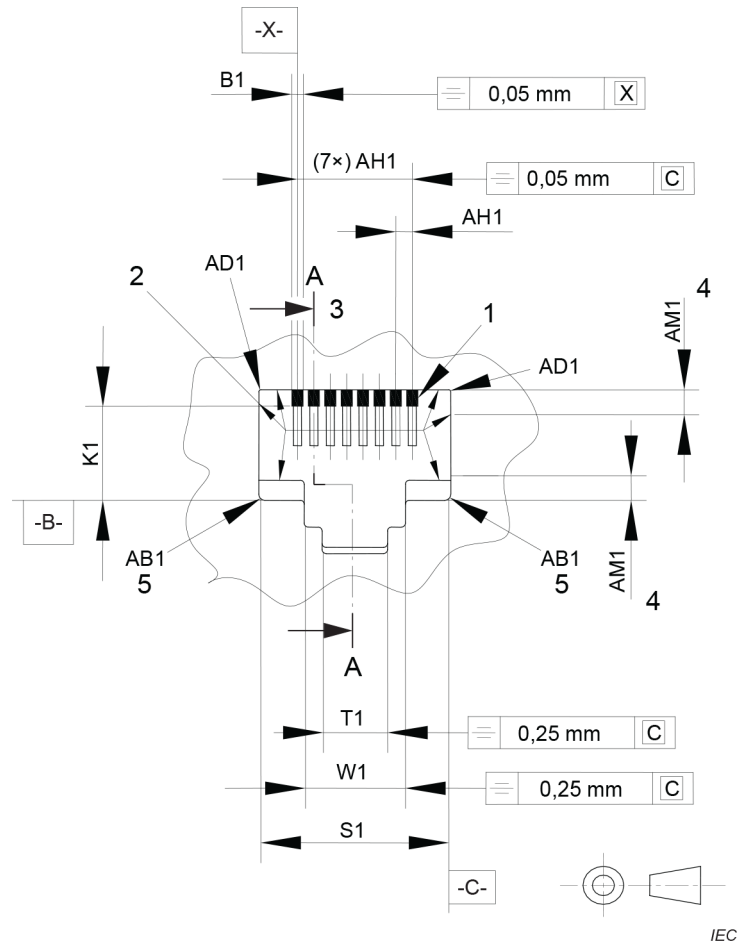
4.2.3 Fixed connector



IEC 1012/08

Key

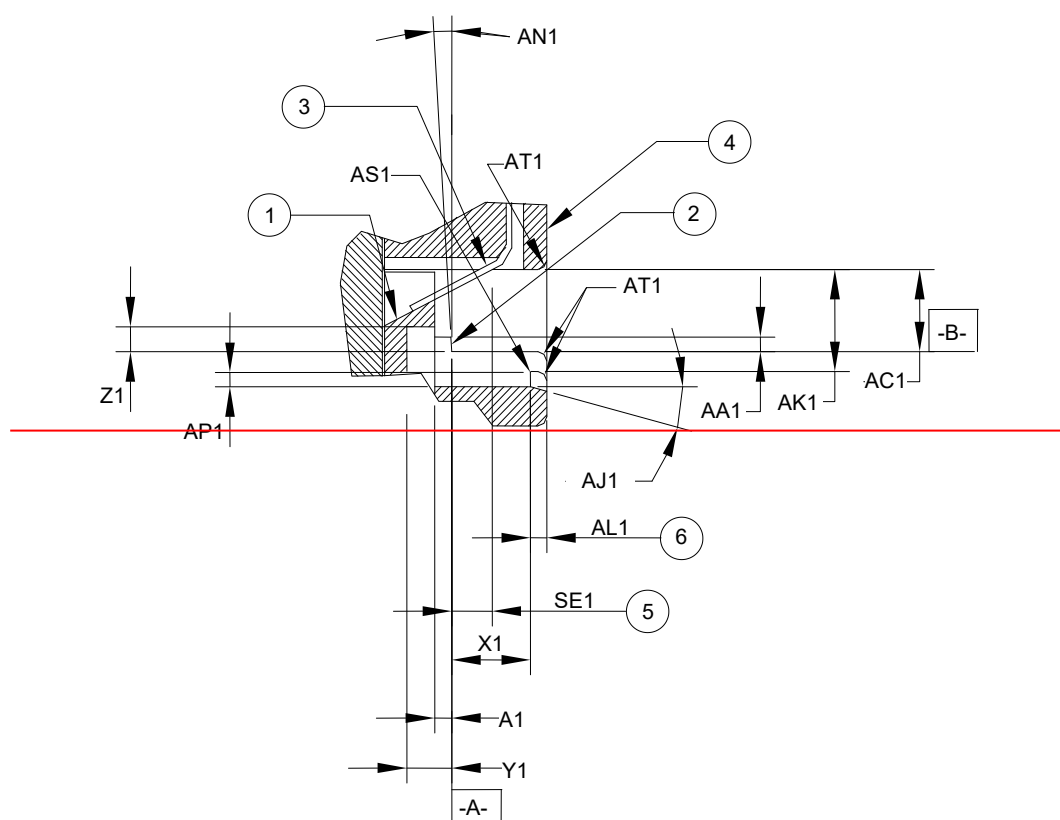
- 1 ~~Contact zone. Contacts shall be completely within their individual contact zone in the area indicated.~~
- 2 ~~0°15' maximum taper.~~
- 3 ~~Section A-A: see Figure 3b).~~
- 4 ~~Relief outside of the area defined by dimension AM1 on both sides of the spring contacts in the fixed connector is permitted.~~



Key

- 1 Contact zone. Contacts shall be completely within their individual contact zone in the area indicated.
- 2 0°15' maximum taper.
- 3 Section A-A: see Figure 4b).
- 4 Relief outside of the area defined by dimension AM1 on both sides of the spring contacts in the fixed connector is permitted.
- 5 All internal corners in the connector cavity shall be 0,38 mm radius maximum unless otherwise specified.

Figure 4a) – View of contact zone

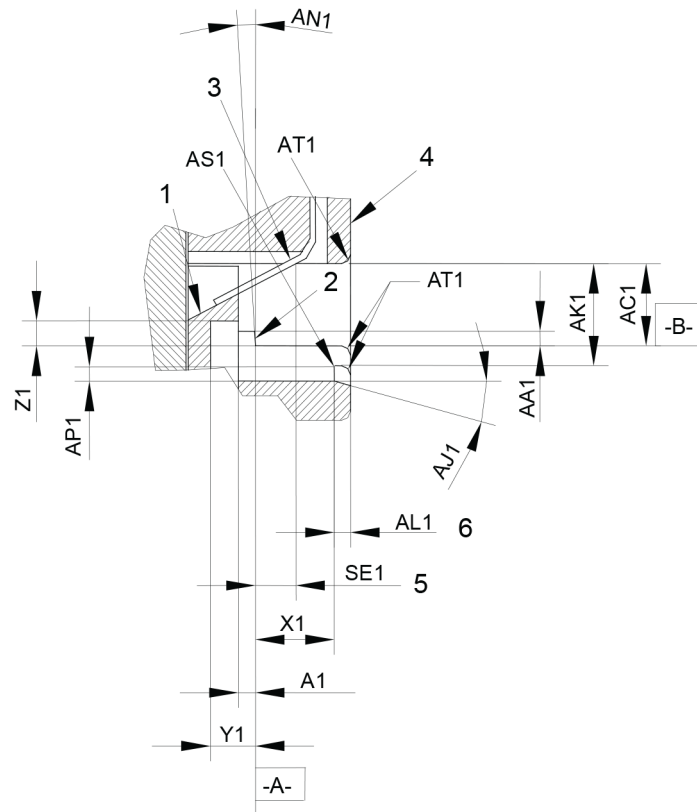


IEC 1013/08

View of contact zone section A-A

Key

- 1 Optional contact rest.
- 2 Preferred free connector stop.
- 3 Contacts shown at rest. Contacts shall always be contained inside guide slots. Contacts shall move freely within their guide slots.
- 4 This surface need not be planar or coincident with the surface below the locking device as long as insertion, latching and unlatching of free connectors is not inhibited.
- 5 Maximum forward extension of contacts below surface AC1 to avoid contact with shields of free connectors. Applies in the mated state.
- 6 Projections beyond AL1 dimension shall not prevent finger access to the free connector locking device.
- 7 All internal corners in the connector cavity shall be 0,38 mm radius maximum unless otherwise specified.



IEC

Key

- 1 Optional contact rest.
- 2 Preferred free connector stop.
- 3 Contacts shown at rest. Contacts shall always be contained inside guide slots. Contacts shall move freely within their guide slots.
- 4 This surface need not be planar or coincident with the surface below the locking device as long as insertion, latching and unlatching of free connectors is not inhibited.
- 5 Maximum forward extension of contacts below surface AC1 to avoid contact with shields of free connectors. Applies in the mated state.
- 6 Projections beyond AL1 dimension shall not prevent finger access to the free connector locking device.

Figure 4b) – Section A-A

Figure 4 – Fixed connector details

Table 2 – Dimensions for Figure 4

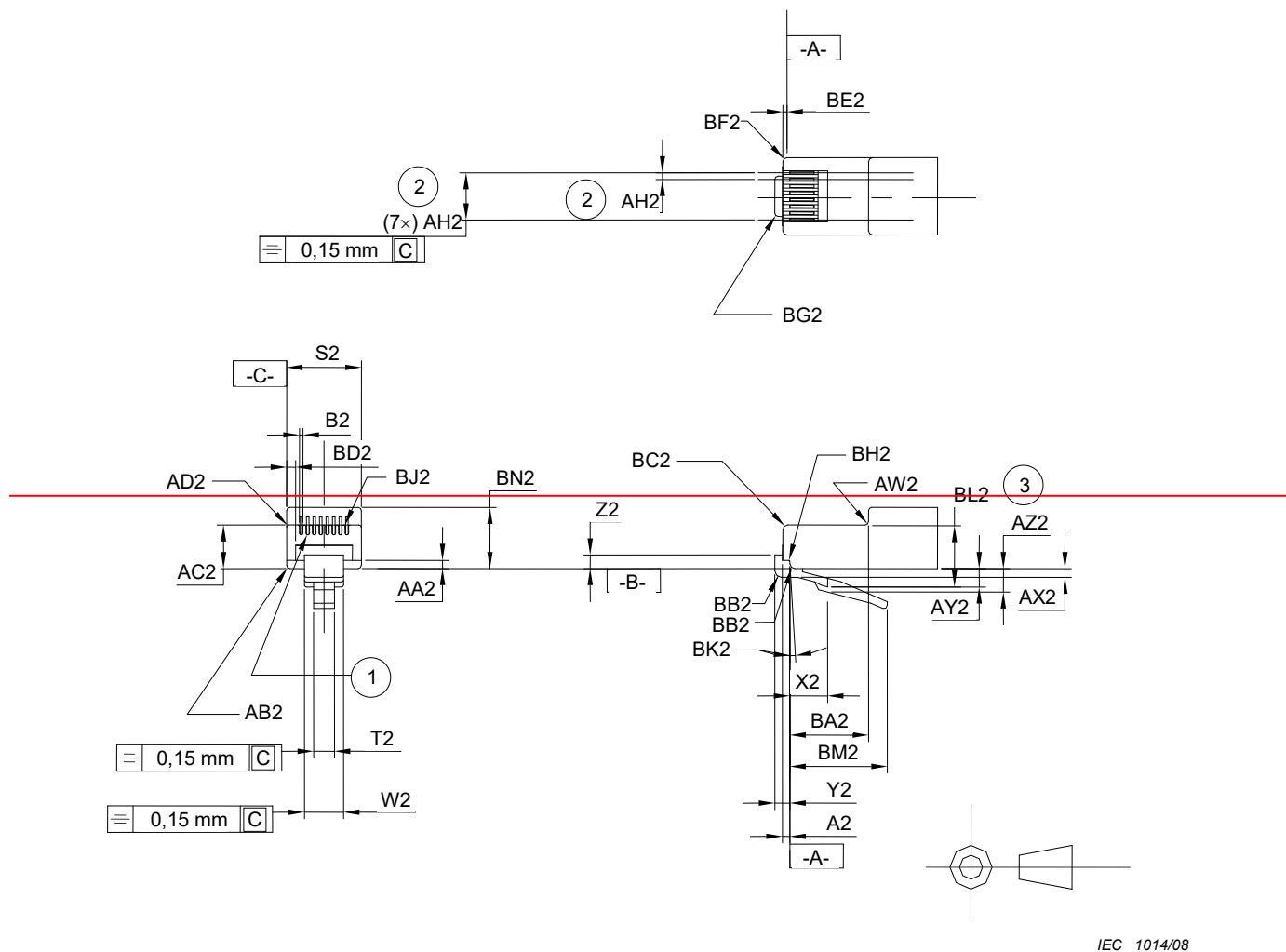
Letter	Maximum mm	Minimum mm	Nominal (ref.) mm
A1		1,47	
B1	0,71		
K1	5,84		
S1	12,04	11,84	11,94
T1	4,19	3,94	
W1	6,38	6,22	
X1	6,86	6,68	
Y1		2,40	
Z1		2,08	
AA1	1,24		
AB1	0,38		
AC1	6,96	6,76	6,86
AD1	0,13		
AH1			1,02 TP ^a
AK1	8,66	8,38	
AL1		1,40	
AM1		1,52	
AP1		1,27	
AS1	0,08		
AT1			0,76
SE1	5,80		
^a TP indicates true position.			

Letter	Maximum	Suggested minimum
AJ1		15°
AN1	3°30'	

Dimensions in millimetres

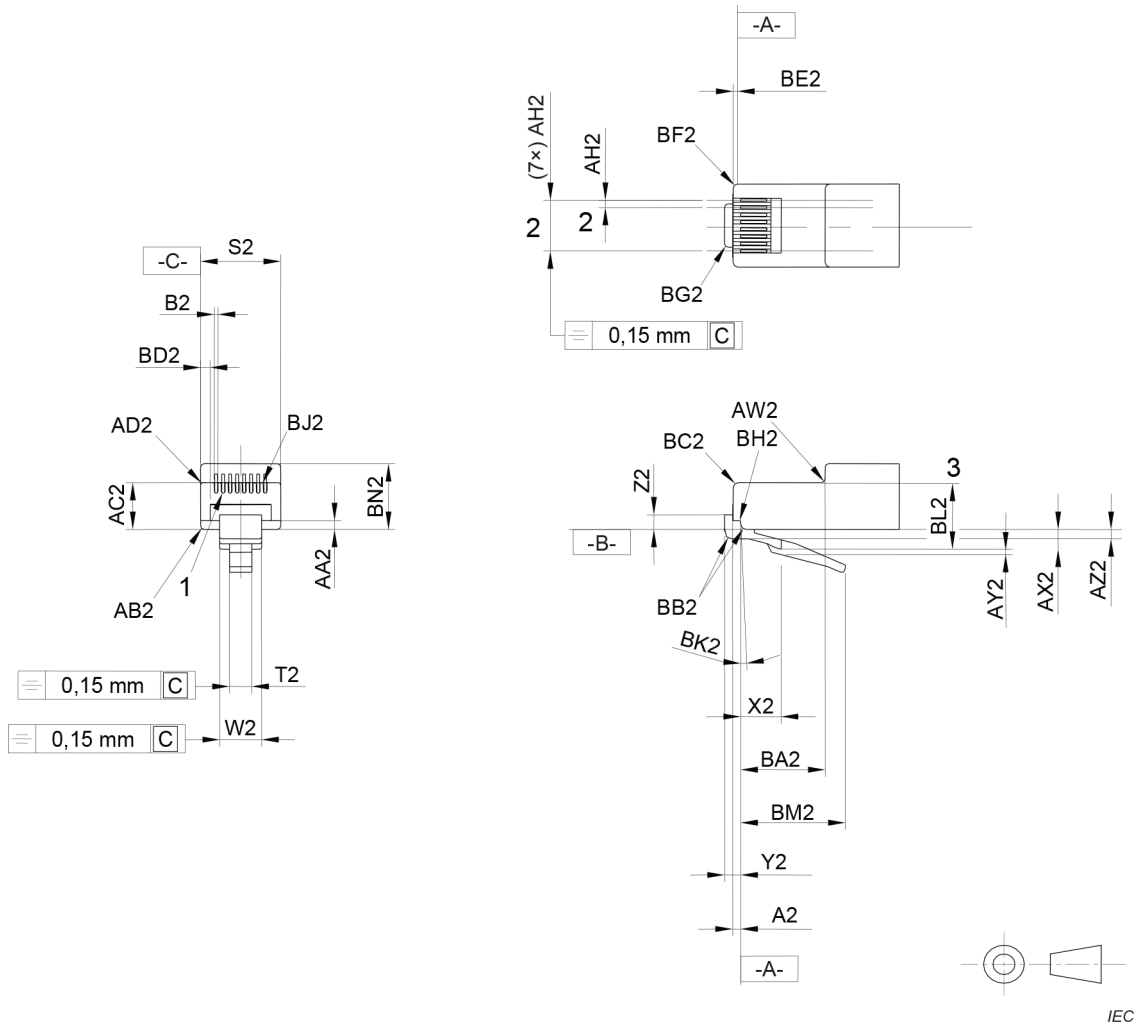
Letter	Minimum	Nominal (ref.)	Maximum
A1	1,47		
B1			0,71
K1			5,84
S1	11,84	11,94	12,04
T1	3,94		4,19
W1	6,22		6,38
X1	6,68		6,86
Y1	2,40		
Z1	2,08		
AA1			1,24
AB1			0,38
AC1	6,76	6,86	6,96
AD1			0,13
AH1		1,02 TP ^a	
AJ1	15°		
AK1	8,38		8,66
AL1	1,40		
AM1	1,52		
AN1			3°30'
AP1	1,27		
AS1			0,08
AT1		0,76	
SE1			5,80
^a TP indicates true position.			

4.2.4 Free connector



Key

- 1 Full radius permitted on all slots.
- 2 These dimensions apply to the locations of the contact slots.
- 3 Applies with locking device depressed.



Key

- 1 Full radius permitted on all slots.
- 2 These dimensions apply to the locations of the contact slots.
- 3 Applies with locking device depressed.

Figure 5 – Free connector view

Table 3 – Dimensions for Figure 5

Letter	Maximum mm	Minimum mm	Nominal (ref.) mm
A2 ^a	a	a	1,17
B2 ^a	a	a	0,56
S2	11,79	11,58	11,68
T2	3,38	3,12	
W2	6,17	6,02	
X2	6,02	5,77	
Y2	2,34		
Z2	2,06		
AA2		1,24	
AB2	0,64	0,38	
AC2	6,71	6,50	6,60
AD2	0,64	0,13	
AH2			1,02
AW2	0,51		
AX2	1,32		
AY2	2,87	2,67	
AZ2	0,64		
BA2		12,32	
BB2	1,14	0,38	
BC2	1,02	0,51	
BD2		0,51	
BE2	1,09		
BF2	0,64		
BG2	0,64	0,38	
BH2			0,13
BL2	8,36		
BM2	15,88	14,61	
BN2	8,00		
^a -See Table 1.			

Letter	Maximum	Nominal (ref.)
BJ2		Full-radius
BK2	3°30'	

Dimensions in millimetres

Letter	Minimum	Nominal (ref.)	Maximum
A2 ^a	a	1,17	a
B2 ^a	a	0,56	a
S2	11,58	11,68	11,79
T2	3,12		3,38
W2	6,02		6,17
X2	5,77		6,02
Y2			2,34
Z2			2,06
AA2	1,24		
AB2	0,38		0,64
AC2	6,50	6,60	6,71
AD2	0,13		0,64
AH2		1,02	
AW2			0,51
AX2			1,32
AY2	2,67		2,87
AZ2			0,64
BA2	12,32		
BB2	0,38		1,14
BC2	0,51		1,02
BD2	0,51		
BE2			1,09
BF2			0,64
BG2	0,38		0,64
BH2		0,13	
BJ2		Full radius	
BK2			3°30'
BL2			8,36
BM2	14,61		15,88
BN2			8,00
^a See Table 1.			

5 Cable terminations and internal connections – Fixed and free connectors

5.1 General

A connector may include multiple terminations between the cable termination and the separable contact interface. These may include press-in connections of fixed connector contacts into PCBs for example. All terminations shall meet the relevant termination requirements.

Free connectors are intended to be terminated to cable to provide connector and cable assemblies. The connector manufacturer shall provide basic information concerning the type of conductor (stranded, solid) to which the connector may be applied, and the type of connection used (solder, insulation displacement, etc.). Specific details concerning wire gauge size, type and thickness of conductor insulation, size and shape of cordage or cable sheath, etc., are not intended to be part of this detail specification. Minor variations in a free connector's interior details to accommodate differing wire gauge sizes, outer sheaths, etc., do not require the generation of new free-connector specifications.

5.2 Termination types

5.2.1 Solder terminations (~~under consideration~~)

Soldered terminations shall conform to IEC 61760-3.

5.2.2 Solderless terminations

5.2.2.1 Insulation displacement terminations

Insulation displacement terminations shall conform to IEC 60352-3 or IEC 60352-4.

5.2.2.2 Crimp terminations

Crimp terminations shall conform to IEC 60352-2.

5.2.2.3 Insulation piercing terminations

Insulation piercing terminations shall conform to IEC 60352-6.

5.2.2.4 Press-in terminations

The compliant pin shall conform to IEC 60352-5.

5.2.2.5 Spring clamp terminations

Spring clamp terminations shall conform to IEC 60352-7.

5.2.2.6 Other types

In the case where a type of solderless termination is used which is not covered by any IEC standard and the supplier cannot demonstrate a similar level of performance or there is no applicable IEC 60352 standard to be used as a reference, the supplier shall show conformance with the full test schedule in 8.7.3 for all possible variations of termination, for example each cable construction type (screen construction types, wire construction (solid, flexible)) the connector is intended to be used for.

6 Gauges

6.1 Fixed connectors

Gauges shall be made according to the following requirements:

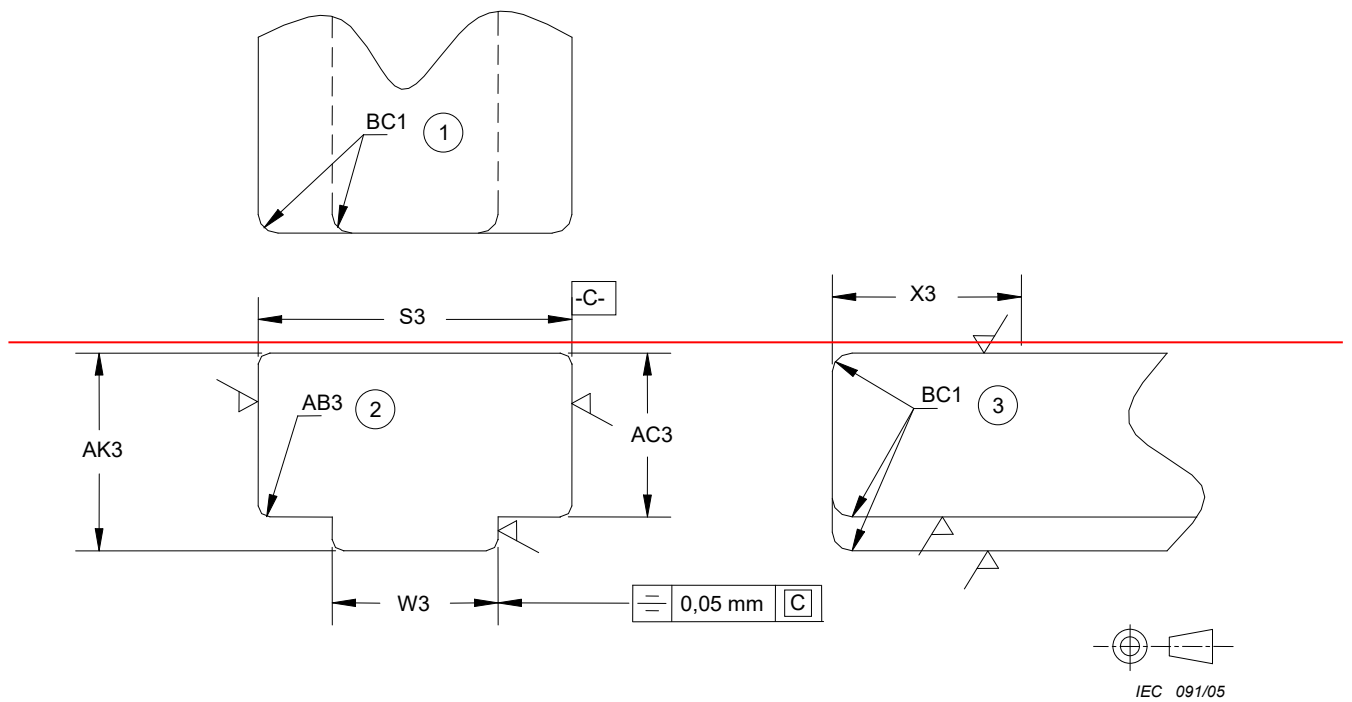
Material: hardened and tempered steel, all sharp edges removed, hardness 650 HV 20 minimum.

✓ = Surface roughness, according to ISO 1302.

Ra = 0,25 µm maximum.

A 0,01 mm wear tolerance shall be applied.

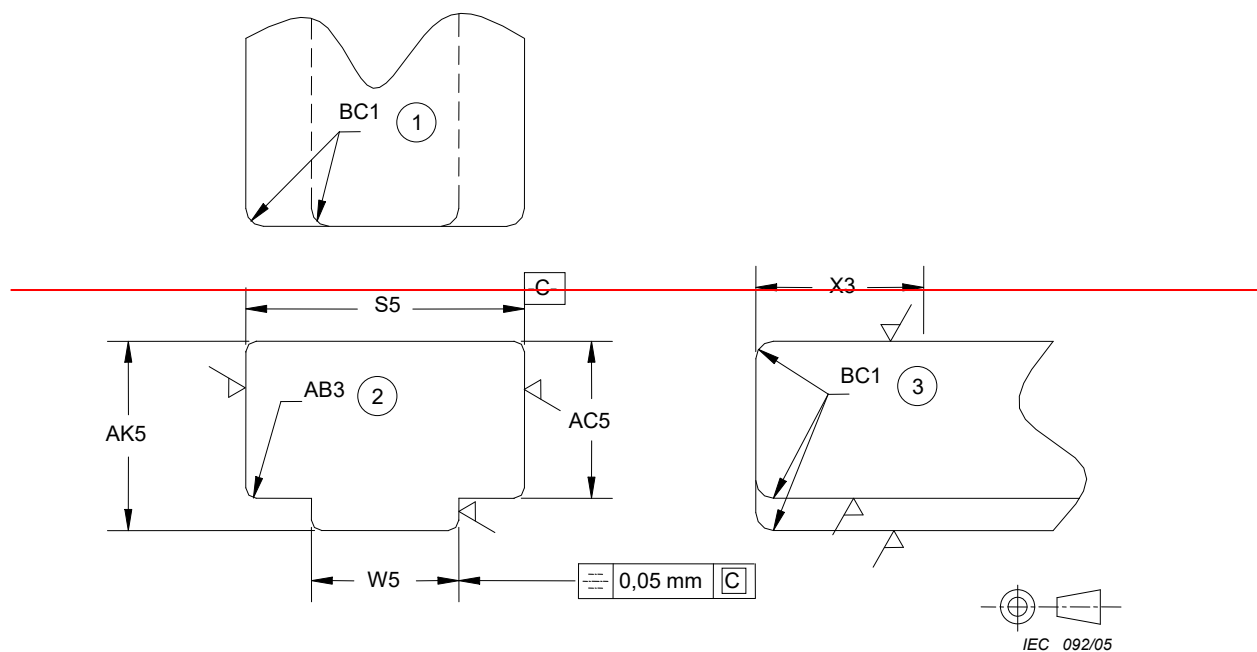
~~Clearance shall be provided for connector contacts.~~



Key

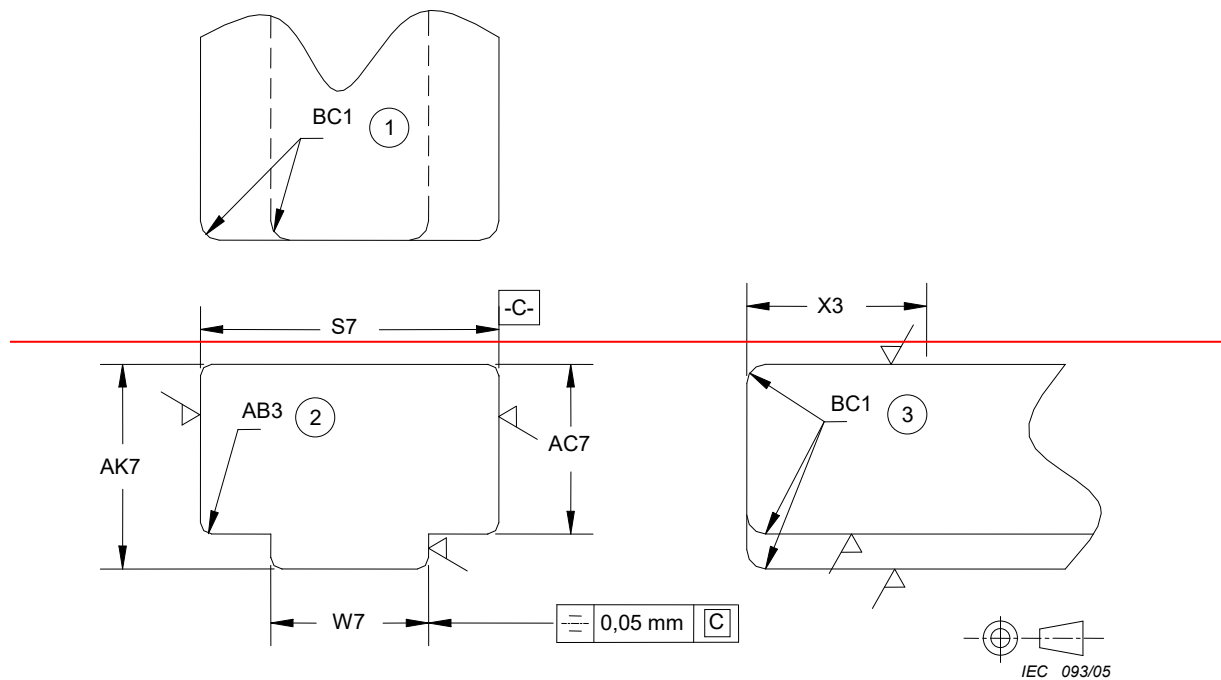
- 1 Four places.
- 2 Six places.
- 3 All around.

Figure 5 — “Go” gauge

**Key**

- 1 Four places.
- 2 Six places.
- 3 All around.

Figure 6a) — “No-go” gauge width



Key

- 1 Four places.
- 2 Six places.
- 3 All around.

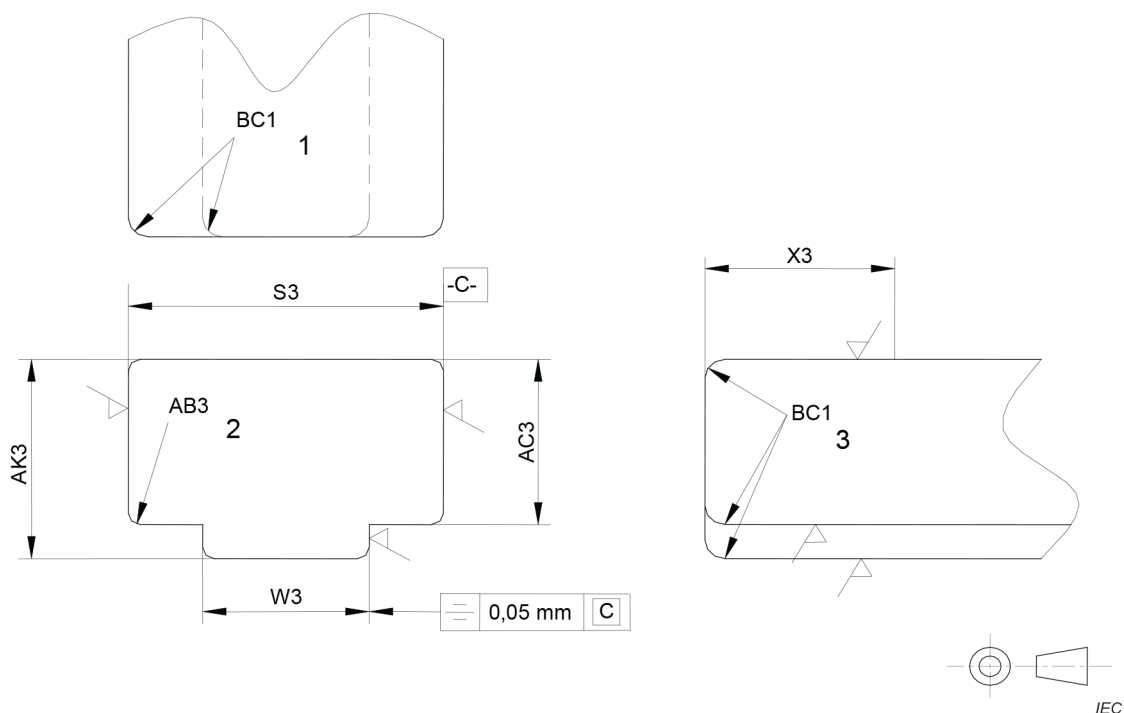
Figure 6b) – “No-go” gauge height

Figure 6 – “No-go” gauges

Table 4 – Dimensions for Figures 5 and 6

Letter	Maximum mm	Minimum mm	Nominal (ref) mm
S3	11,796	11,786	
S5	12,050	12,040	
S7	11,68	11,58	
X3		10,16	
AB3	0,51	0,389	0,450
AC3	6,716	6,706	
AC5	6,45	6,35	
AC7	6,970	6,96	
BC1	0,89	0,64	0,76
W3	6,12	6,109	
W5	6,38	6,365	
W7	5,97	5,89	
AK3	8,357	8,346	
AK5	8,13	8,05	
AK7	8,672	8,66	

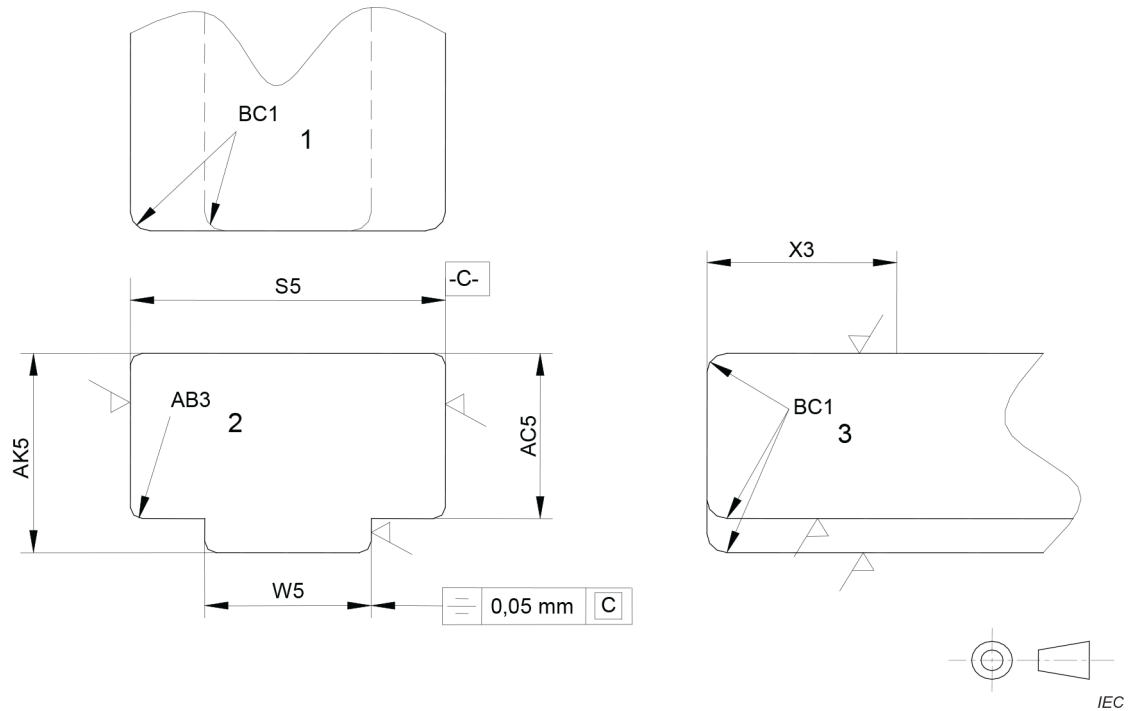
The "Go" gauge in Figure 6 is intended to assess the fixed connector minimum aperture width and height, and shall not be used to assess contact forces. Clearance shall be provided for connector signal contacts. If connector shield contacts are present, either clearance shall be provided for these contacts (as long as the minimum aperture width and height are still assessed) or these contacts, within the connector aperture, shall be removed. The "No-go" gauge is shown in Figure 7 (see also Table 4).



Key

- 1 Four places.
- 2 Six places.
- 3 All around.

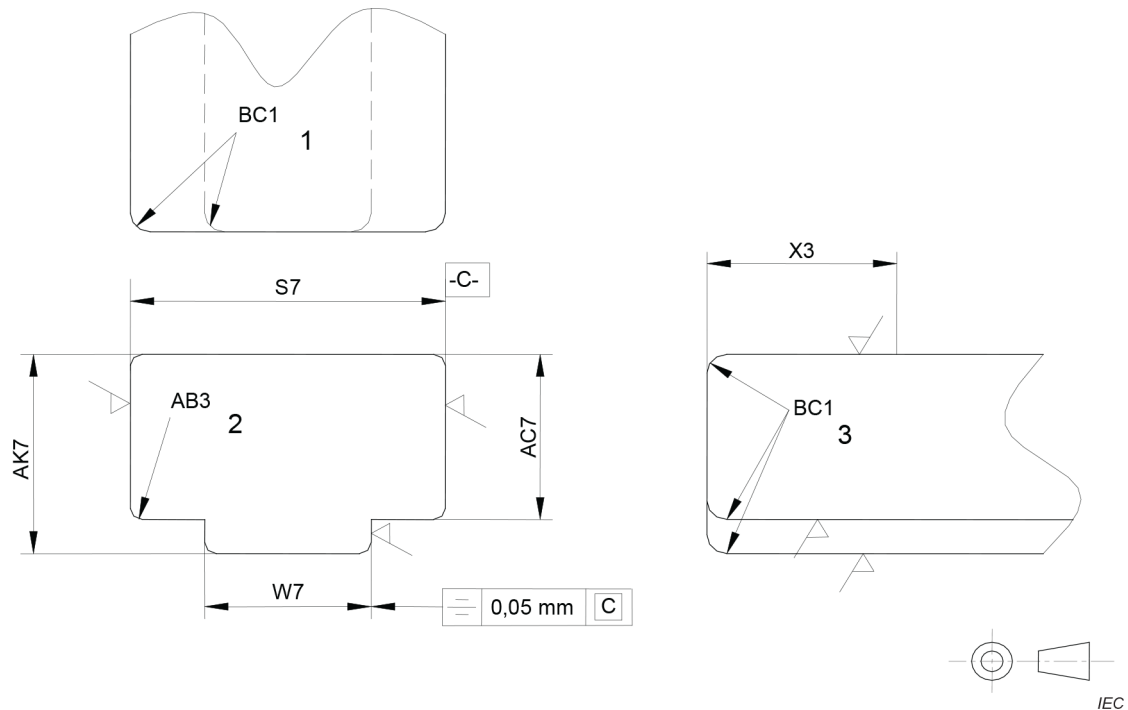
Figure 6 – Fixed connector "Go" gauge



Key

- 1 Four places.
- 2 Six places.
- 3 All around.

Figure 7a) – Fixed connector "No-go" width gauge



Key

- 1 Four places.
- 2 Six places.
- 3 All around.

Figure 7b) – Fixed connector "No-go" height gauge

Figure 7 – Fixed connector "No-go" gauges

Table 4 – Dimensions for Figure 6 and Figure 7*Dimensions in millimetres*

Letter	Minimum	Nominal (ref)	Maximum
S3	11,786		11,796
S5	12,040		12,050
S7	11,58		11,68
X3	10,16		
AB3	0,389	0,450	0,51
AC3	6,706		6,716
AC5	6,35		6,45
AC7	6,96		6,970
BC1	0,64	0,76	0,89
W3	6,109		6,12
W5	6,365		6,38
W7	5,89		5,97
AK3	8,346		8,357
AK5	8,05		8,13
AK7	8,66		8,672

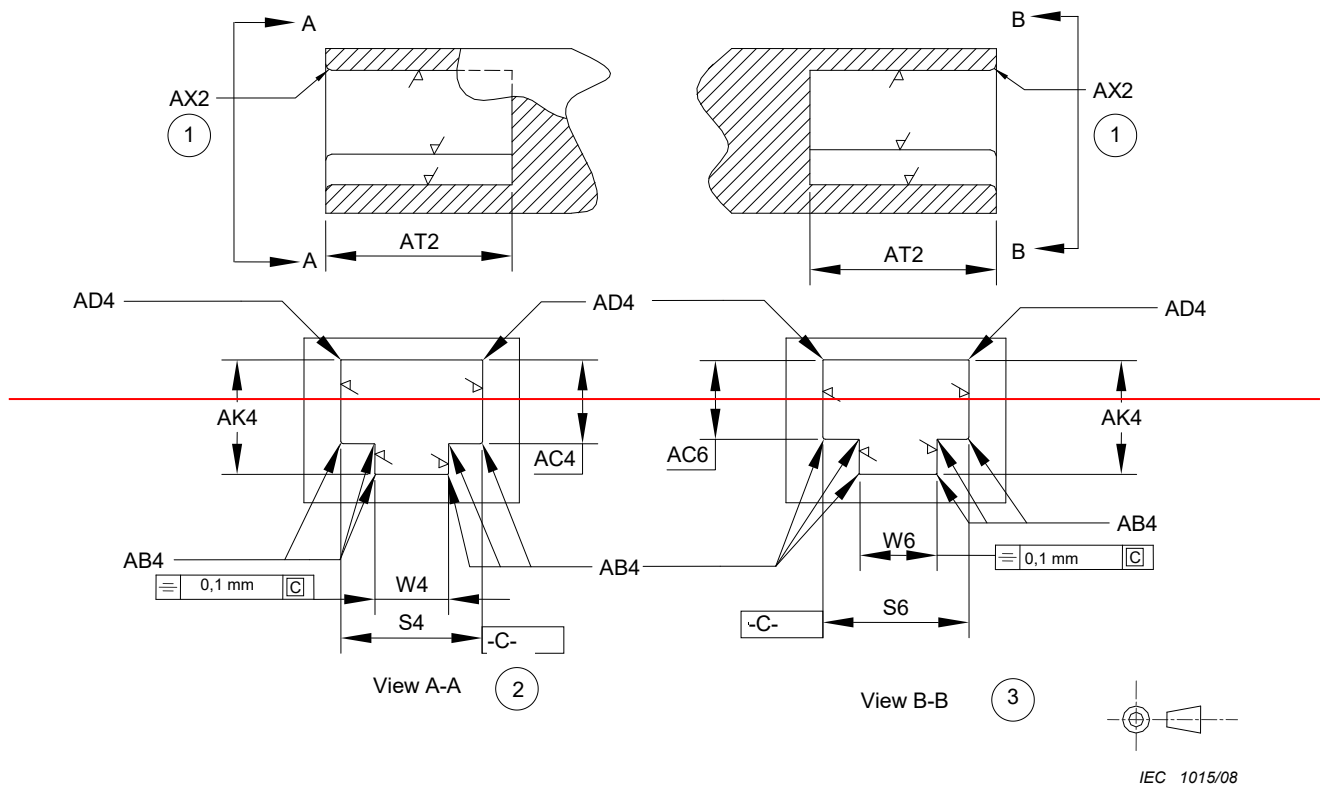
6.2 Free connectors

Material: hardened and tempered steel, all sharp edges removed, hardness 650 HV 20 minimum.

√ = Surface roughness, according to ISO 1302.

Ra = 0,25 µm maximum.

A 0,01 mm wear tolerance shall be applied.



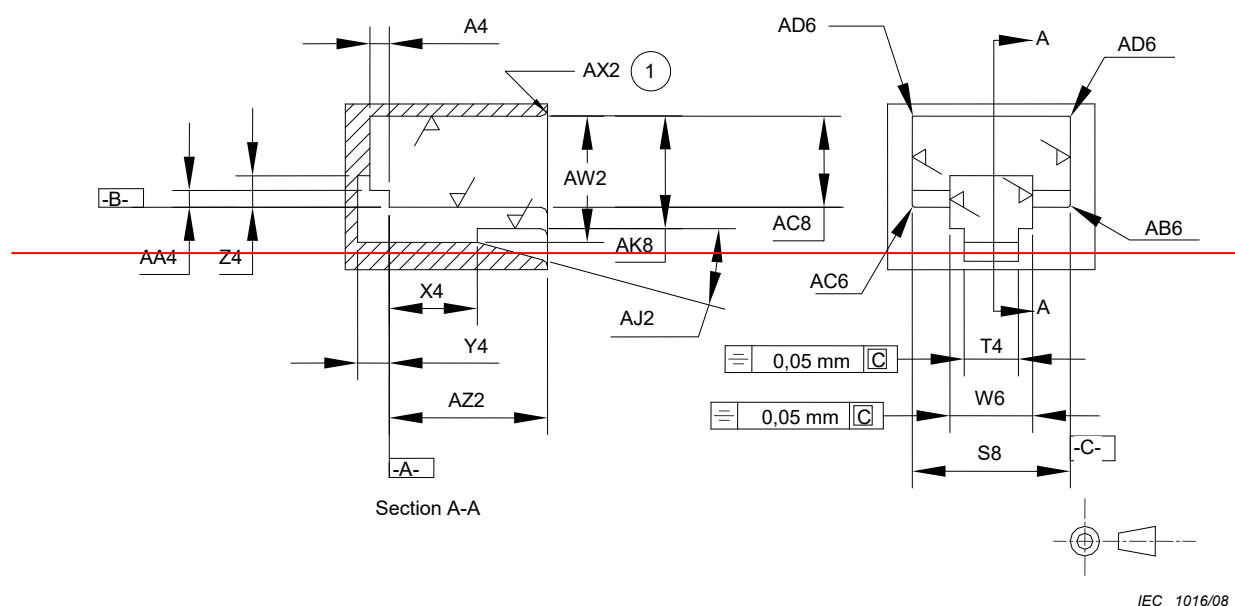
Key

- 1 All-around.
- 2 Width gauge.
- 3 Height gauge.

Figure 7—“No-go” gauges

Table 5—Dimensions for Figure 7

Letter	Maximum mm	Minimum mm
S4	11,593	11,582
S6	11,989	11,887
W4	6,02	6,010
W6	6,40	6,30
AB4	0,38	0,0
AC4	6,91	6,81
AC6	6,512	6,502
AD4	0,127	0,0
AK4	9,42	9,32
AT2	15,29	15,19
AX2	0,635	0,38

**Key**

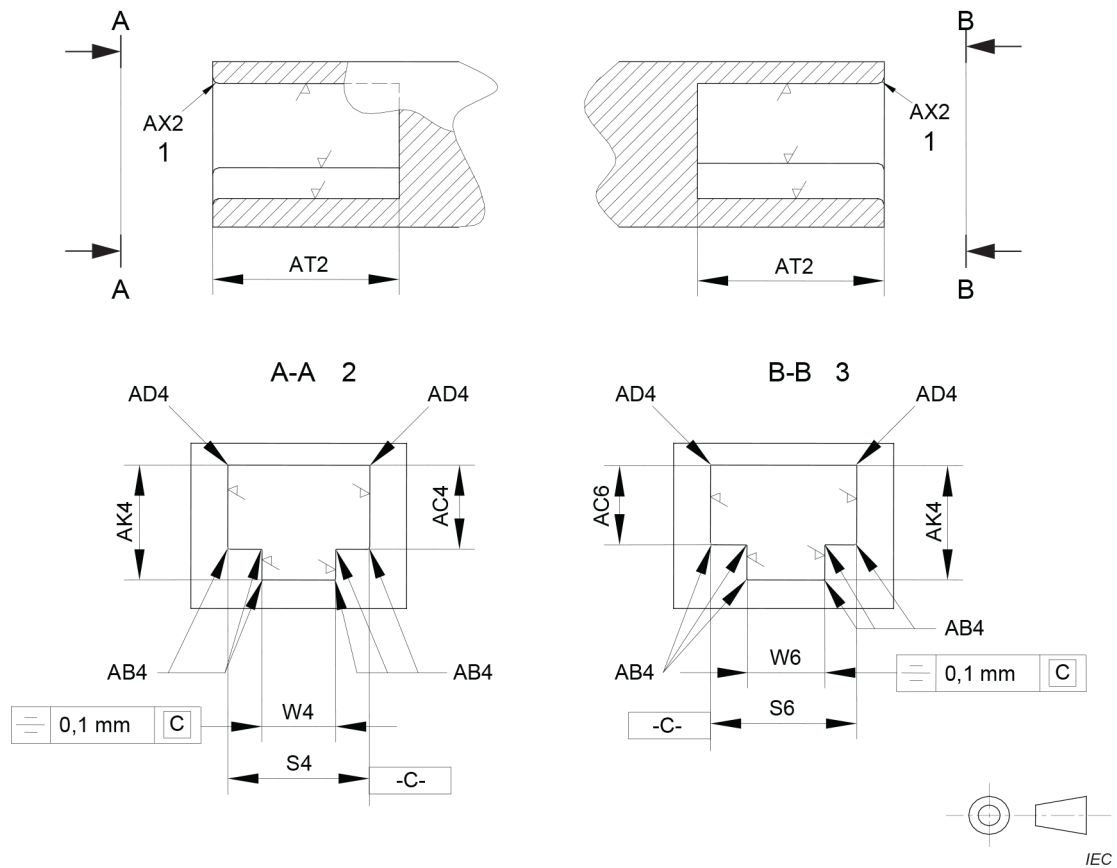
1—All around.

Figure 8 — “Go” gauge**Table 6 — Dimensions for Figure 8**

Letter	Maximum mm	Minimum mm
A4	1,448	1,438
S8	11,847	11,836
T4	4,115	4,013
W6	6,198	6,187
X4	6,604	6,594
Y4	2,39	2,34
Z4	2,39	2,29
AA4	1,255	1,245
AB6	0,38	0,0
AC8	6,767	6,756
AD6	0,13	0,0
AK8	8,357	8,346
AW2	9,725	9,615
AX2	0,64	0,38
AZ2	11,91	11,81

Letter	Maximum	Minimum
AJ2	16°	14°

The “No-go” and “Go” gauges are defined in Figure 8 and Figure 9 respectively (see also Table 5 and Table 6).



Key

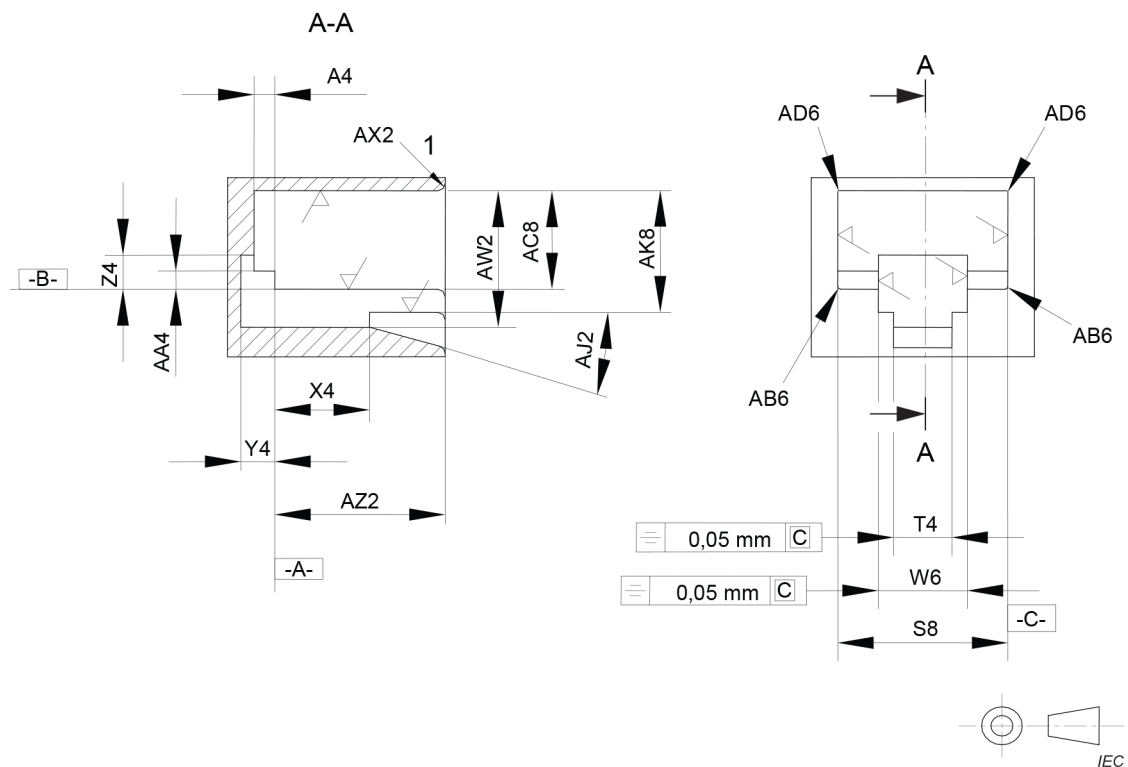
- 1 All around.
- 2 Width gauge.
- 3 Height gauge.

Figure 8 – Free connector "No-go" gauges

Table 5 – Dimensions for Figure 8

Dimensions in millimetres

Letter	Minimum	Maximum
S4	11,582	11,593
S6	11,887	11,989
W4	6,010	6,02
W6	6,30	6,40
AB4	0,0	0,38
AC4	6,81	6,91
AC6	6,502	6,512
AD4	0,0	0,127
AK4	9,32	9,42
AT2	15,19	15,29
AX2	0,38	0,635

**Key**

- 1 All around.

Figure 9 – Free connector "Go" gauge**Table 6 – Dimensions for Figure 9***Dimensions in millimetres*

Letter	Minimum	Maximum
A4	1,438	1,448
S8	11,836	11,847
T4	4,013	4,115
W6	6,187	6,198
X4	6,594	6,604
Y4	2,34	2,39
Z4	2,29	2,39
AA4	1,245	1,255
AB6	0,0	0,38
AC8	6,756	6,767
AD6	0,0	0,13
AJ2	14°	16°
AK8	8,346	8,357
AW2	9,615	9,725
AX2	0,38	0,64
AZ2	11,81	11,91

7 Characteristics

7.1 General

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

7.2 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 10, unless otherwise specified.

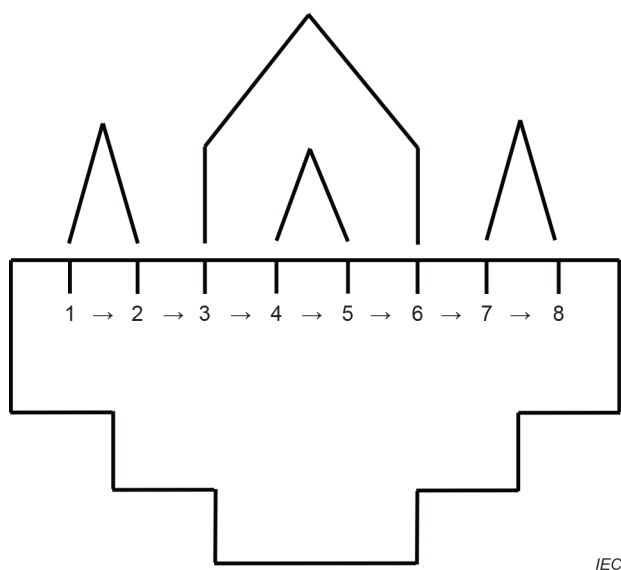


**Figure 10 – Fixed connector pin and pair grouping assignment
(front view of connector)**

7.3 Classification into climatic category

The lowest and highest temperatures and the duration of the damp-heat steady-state test should 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 given in Table 7 are compatible with ISO/IEC 11801-1 classification of an office environment.

Table 7 – Climatic categories – selected values

Climatic category	Lower temperature °C	Upper temperature °C	Damp heat, steady state days
40/070090/21	-40	70 90	21

NOTE 1 The 90 °C UCT shall be verified by testing at 70 °C and 0,8 A current load as specified in Table 13, test DP1.

NOTE 2 Based upon the correlation provided in IEC 60068-2-61:1991,8.2.5, the 21 cycles of damp heat, cyclic test specified as AP8 in Table 10, test group AP, cover by large measure the 21 days of damp heat, steady state test required by the climatic category assigned in Table 7.

7.4 Electrical characteristics

7.4.1 Creepage and clearance distances

The permissible operating voltages depend upon the application and also on the specified safety requirements.

~~Insulation coordination is not required for this connector; therefore, the creepage and clearance distances in IEC 60664-1 are reduced and covered by overall performance requirements.~~

~~The creepage and clearance distances are given as operating characteristics of mated connectors.~~

Although insulation coordination is not required for these connectors for safety aspects, it is required for electrical functional requirements. In general, for minimum values of creepage and clearance distances, IEC 60664-1 shall apply, based upon the assigned voltage rating 50 V AC and 60 V DC.

NOTE As indicated in IEC 60664-1, IEC TR 63040 provides an alternative and more precise dimensioning procedure for clearances equal to or less than 2 mm.

The creepage and clearance distances that cover performance requirements in IEC 60664-1 may be reduced, based on IEC TR 63040.

The creepage and clearance distances given in Table 8 apply as operating characteristics of mated connectors according to this document.

In practice, reductions in creepage or clearance distances ~~may~~ can occur due to the conductive pattern of the printed board or the wiring used, and ~~shall~~ should in such case duly be taken into account.

Table 8 – Creepage and clearance distances

Dimensions in millimetres

Minimum distance between contacts and chassis		Minimum distance between adjacent contacts	
Creepage	Clearance	Creepage	Clearance
1,40	0,51	0,36	0,36

7.4.2 Voltage proof

Conditions: IEC 60512, Test 4a, Method A

Standard atmospheric conditions

Mated connectors

All variants: 1 000 V DC or AC peak; one contact to all other contacts connected together.

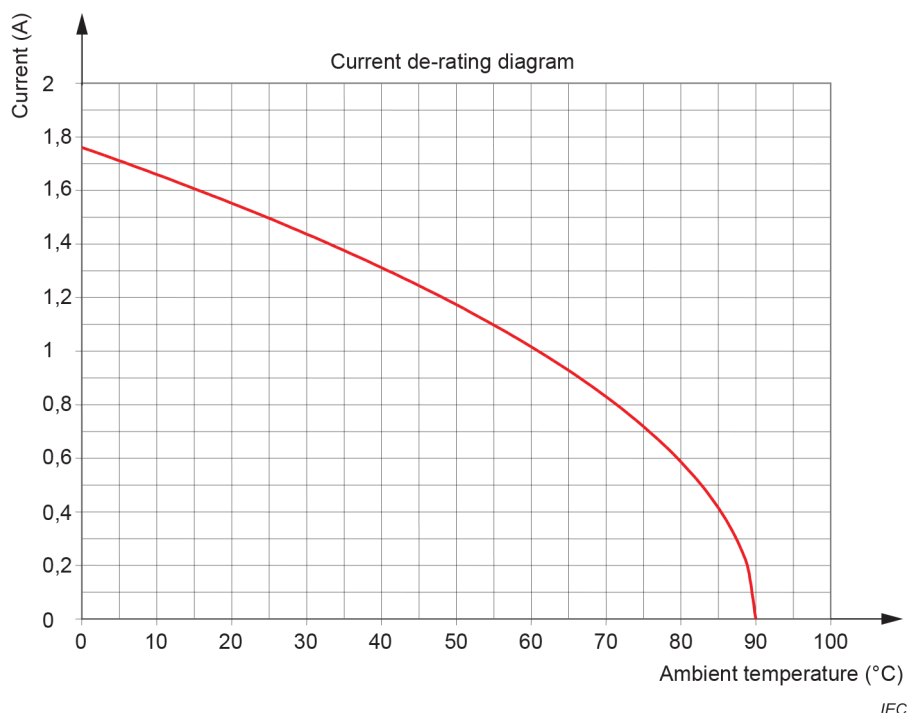
1 500 V DC or AC peak; all contacts connected together to shield, (housing/mounting plate) if present.

7.4.3 Current-temperature derating

Conditions: IEC 60512, Test 5b

All contacts, connected in series

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 11.



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

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

NOTE 3 ~~For further information, see Introduction.~~

Figure 11 – Connector de-rating curve

7.4.4 ~~Initial contact resistance – interface only (separable fixed and free contact)~~ Interface contact resistance – initial only

Conditions: IEC 60512, Test 2a

Arrange according to 8.2

Mated connectors

~~Connection~~ Measuring points: as specified in Figure 12

All types: 20 mΩ maximum

7.4.5 Input to output DC resistance

Conditions: IEC 60512, Test 2a

Mated connectors

~~Connection points: Cable termination to cable termination~~

Measuring points: as specified in Figure 12

All types: 200 mΩ maximum

7.4.6 Input-to-output DC resistance unbalance

Conditions: IEC 60512, Test 2a

Mated connectors

~~Connection~~ Measuring points: Cable termination to cable termination

Among all signal conductors, maximum difference between maximum and minimum

All types: 50 mΩ maximum

7.4.7 Initial insulation resistance

Conditions: IEC 60512, Test 3a

Method A

Mated connectors

Test voltage: 100 V DC

All types: 500 MΩ minimum

7.4.8 Transfer impedance

Not applicable.

7.5 Transmission characteristics

Transmission characteristics are defined in the applicable IEC 60603-7-x specifications for connectors with assigned upper transmission frequencies above 3 MHz. For connectors that operate up to 3 MHz frequency, these characteristics are covered by test group EP.

7.6 Mechanical characteristics

7.6.1 Mechanical operation

Conditions: IEC 60512, Test 9a

Speed: 10 mm/s maximum

Rest: 1 s minimum (mated and unmated)

PL 1: 750 operations

PL 2: 2 500 operations

NOTE PL defines the performance level. This document specifies two of them.

7.6.2 Effectiveness of connector coupling devices

Conditions: IEC 60512, Test 15f

All types: 50 N for 60 s ± 5 s

7.6.3 Insertion and withdrawal forces

Conditions: IEC 60512, Test 13b

Speed: 10 mm/s maximum

All types, insertion and withdrawal: 20 N maximum

8 Tests and test schedule

8.1 General

See Clause 5 of IEC 61076-1:2006.

This document 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.

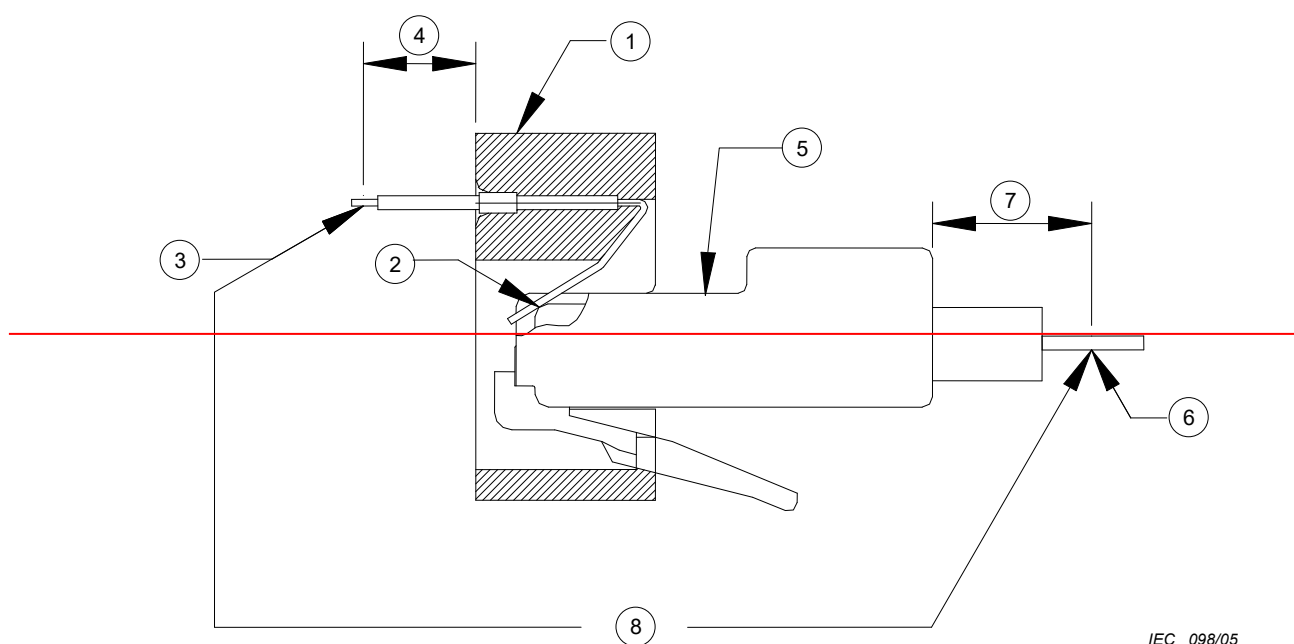
It is permissible to limit the number of variants tested to a selection representative of the whole range for which approval is required (which may be less than the range covered by the

detail 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.

8.2 Arrangement for interface contact resistance test



IEC 098/05

Key

- 1 Fixed connector.
- 2 Point B.
- 3 Point A.
- 4 As short as practical (except for vibration test CP2, see 7.3).
- 5 Free connector.
- 6 Point C.
- 7 As short as practical (except for vibration test CP2, see 7.3).
- 8 Contact resistance measurement points.

Figure 11 — Arrangement for contact resistance test

The test procedure is as follows.

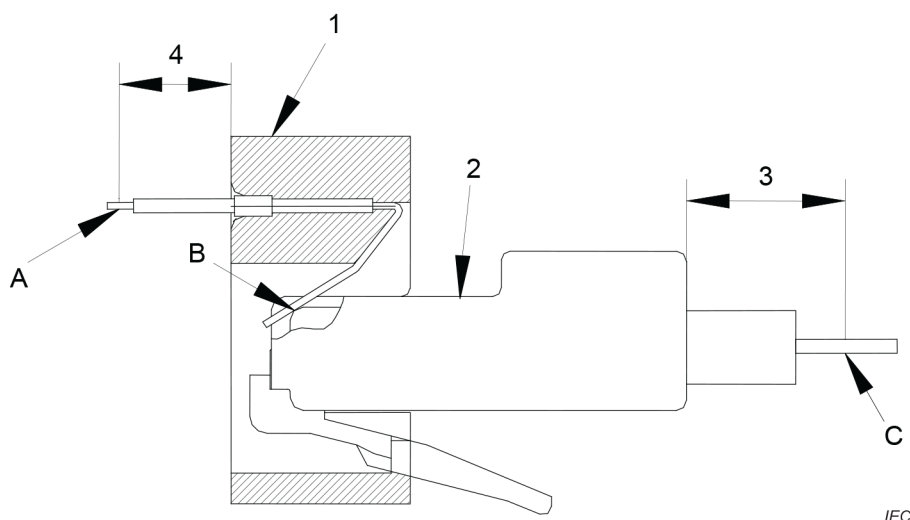
- a) Determine the bulk resistance of the fixed connector between points A and B of Figure 11 by calculation or by measurement. This resistance is noted and recorded as R_{AB} .
- b) Determine the bulk resistance of the free connector between points B and C of Figure 11 by calculation or by measurement. This resistance is noted and recorded as R_{BC} .

- 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.~~

$$\text{Contact resistance} = R_{AC} - (R_{AB1} + R_{BC1})$$

~~where, 1, indicates initial value.~~

Figure 12 illustrates the arrangements for the free and fixed connector interface contact resistance measurements.



Key

- 1 Fixed connector
- 2 Free connector
- 3 As short as practical (except for vibration test CP2, see 7.3)
- 4 As short as practical (except for vibration test CP2, see 7.3)
- A Measuring point A
- B Measuring point B: B₁: on the contact of fixed connector, B₂: on the contact of free connector
- C Measuring point C

Figure 12 – Arrangement for interface contact resistance test

The test procedure, to be performed on all contacts, is as follows.

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} .

Determine the bulk resistance of the fixed connector between points A and B₁ of Figure 11 by measurement of the unmated fixed connector. This resistance is noted and recorded as R_{AB1} .

Determine the bulk resistance of the free connector between points B₂ and C of Figure 11 by measurement of the unmated free connector. This resistance is noted and recorded as R_{B2C} .

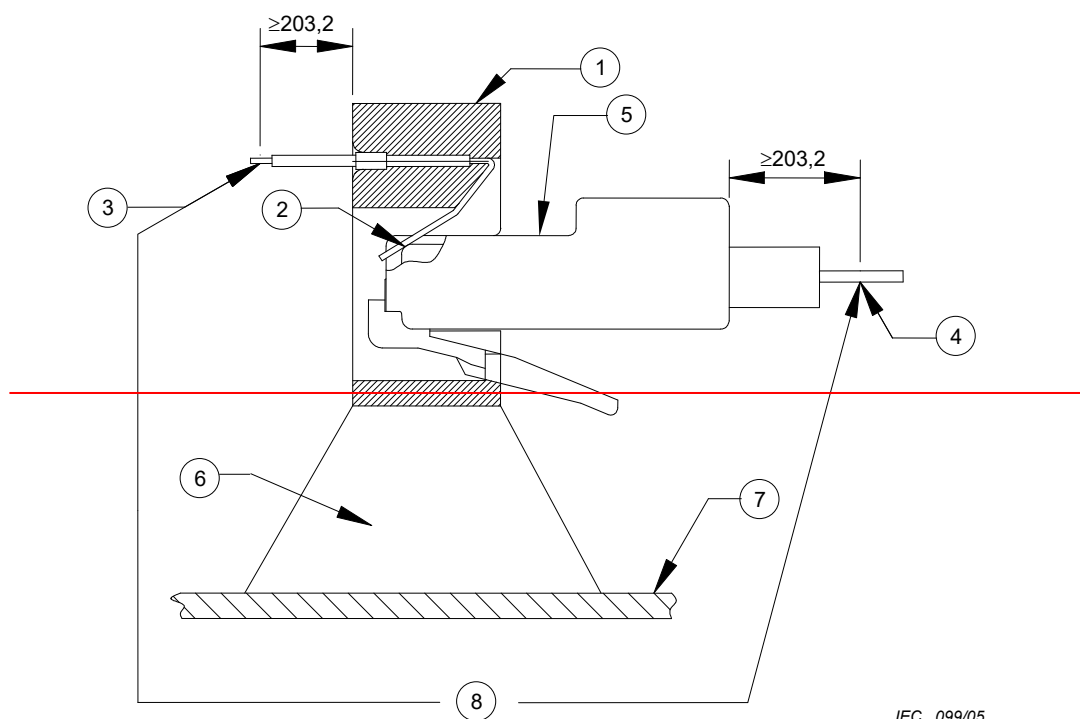
Calculate the contact resistance by subtracting the sum of the bulk resistance of the fixed and free connectors from the total mated connector resistance.

$$\text{Contact resistance} = R_{AC} - (R_{AB_1} + R_{B_2C})$$

Where AB_1 and B_2C indicate bulk values.

8.3 Arrangement for vibration test (test phase CP1)

Figure 13 illustrates the arrangements for the free and fixed connector wiring and mounting for vibration testing.

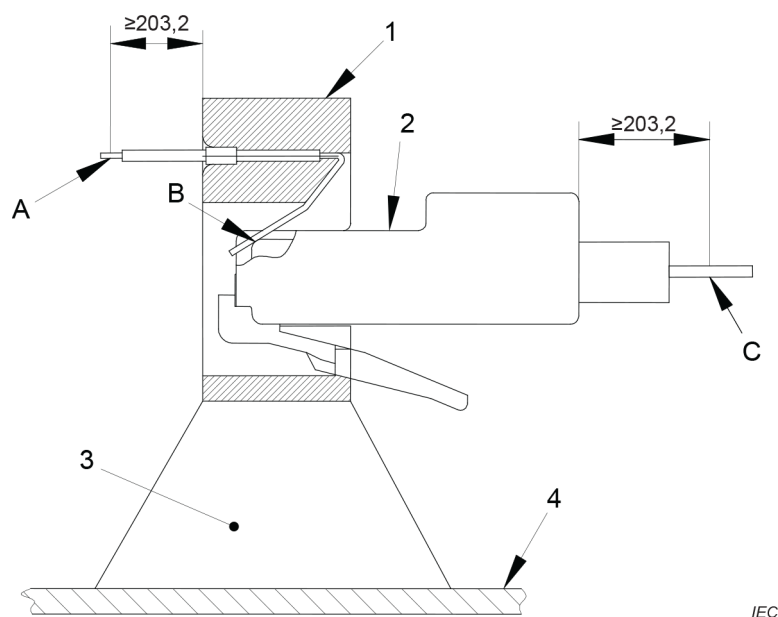


IEC 099/05

Key

- 1 Fixed connector vibration feature.
- 2 Contact point.
- 3 Point A: secure to the non-vibrating member.
- 4 Point C: secure to the non-vibrating member.
- 5 Free connector.
- 6 Fixed connector rigidly fixed to the mounting plate.
- 7 Mounting plate.
- 8 Contact resistance measurement point.

Dimensions in millimetres

**Key**

- 1 Fixed connector
- 2 Free connector
- 3 Mounting fixture for the fixed connector to the mounting plate
- 4 Mounting plate
- A Electrical resistance measuring point A: cabling is secured to the non-vibrating member
- B Contact interface location of mated fixed and free connectors
- C Electrical resistance measuring point C: cabling is secured to the non-vibrating member

Figure 13 – Arrangement for vibration test**8.4 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.

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.

8.5 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.

8.6 Wiring and mounting of specimens

8.6.1 Wiring

The conductor diameter for these connectors shall be specified by the manufacturer, and shall be selected (as a minimum) from the following:

- a) for the fixed connector, the conductor diameter of IEC 61156-2, IEC 61156-4, IEC 61156-5 or IEC 61156-7;

for the free connector, the conductor diameter of IEC 61156-3 or IEC 61156-6.

8.6.2 Mounting

When mounting is required in a test, unless otherwise specified, the connectors shall be rigidly mounted on a metal plate or to specified accessories, whichever is applicable, using the specified connection methods, fixing devices and panel cut-outs as laid down in this specification.

8.7 Test schedules

8.7.1 General

The test parameters required shall not be less than those listed in Clause 6.

8.7.2 Basic (minimum) test schedule

Not applicable.

8.7.3 Full test schedule

8.7.3.1 General

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

For a complete test sequence, 62 specimens are needed (6 groups of 10 and 1 group of 2: the group of 2 shall be for transmission testing, group EP).

Contact resistance tests apply only to the interface (see 8.2).

8.7.3.2 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. All connectors in each group shall undergo the following tests as described in the sequence given (see Table 10 through Table 15).

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	Polarization	Not applicable				
P3	Contact resistance		Measurement points as in Figure 11 All contacts/specimens	Millivolt level method	2a	Contact resistance = 20 mΩ maximum
P4			100 V d.c.	Insulation resistance	3a	500 MΩ minimum
P5			Contact/contact Method A Mated connectors	Voltage proof	4a	1 000 V d.c. or a.c. peak; one contact to all other contacts connected together
			All contacts to test panel Method A Mated connectors			1 500 V d.c. or a.c. peak; all contacts connected together to shield; (housing/mounting plate) if present

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	Polarization	Not applicable				
P3	Contact resistance		Interface resistance (initial); measuring points as in Figure 12. All contacts/specimens	Millivolt level method	2a	20 mΩ maximum
P4			100 V DC	Insulation resistance	3a	500 MΩ minimum
P5			Per 7.4.2 1 000 V DC or AC peak; one contact to all other contacts connected together	Voltage proof	4a	No flashover or breakdown
			Per 7.4.2 1 500 V DC or AC peak; all contacts connected together to shield, (housing/mounting plate) if present			No flashover or breakdown

8.7.3.3 Test group AP

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 forces	13b	Connector locking device depressed			Insertion force 20 N maximum Withdrawal force 20 N maximum
AP2	Effectiveness of connector coupling device	15f	Rate of load application 44,5 N/s maximum			50 N for 60 s ± 5 s
AP3	Rapid change of temperature	See IEC 60068 -2-14	–40 °C to 70 °C Mated connectors 25 cycles ± 30 min Recovery time 2 h			
AP4			Test voltage 100 V ± 15 V d.c. Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum