IEC 60603-7

Edition 4.0 2020-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

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

IEC 60603-7:2020-10 RLV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONNECTORS FOR ELECTRONIC EQUIPMENT –

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

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.
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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

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- withdrawn,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

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.

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.~~

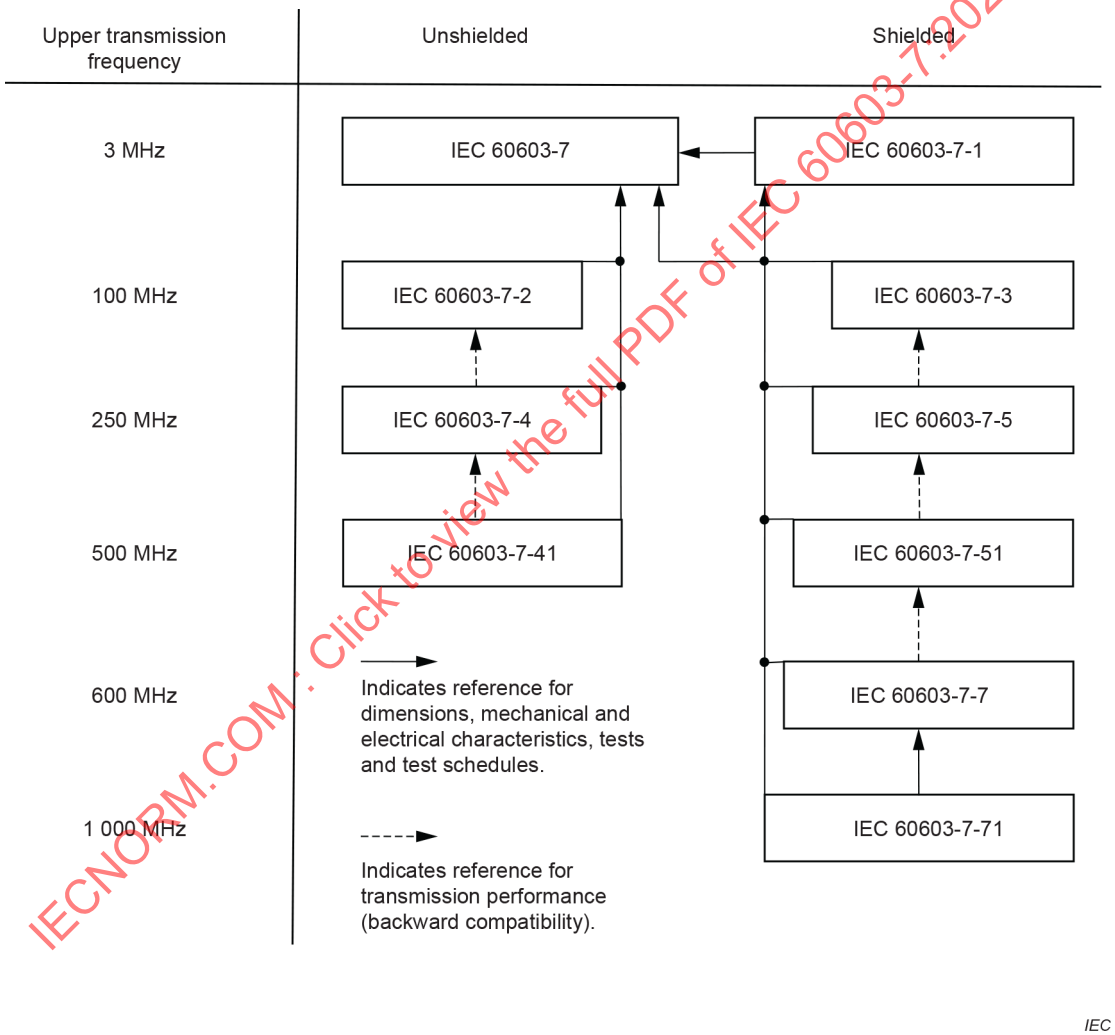

Figure 1 – IEC 60603-7 family document diagram

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.20:2000[1], *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

ITU-T Recommendation K.44:2000[2], *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*

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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)

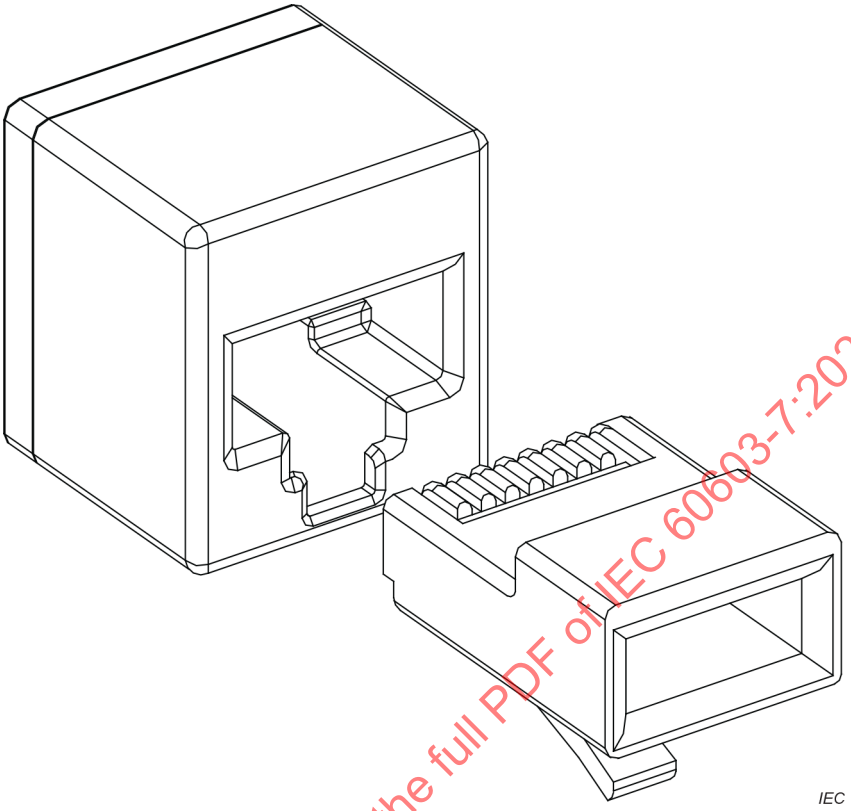


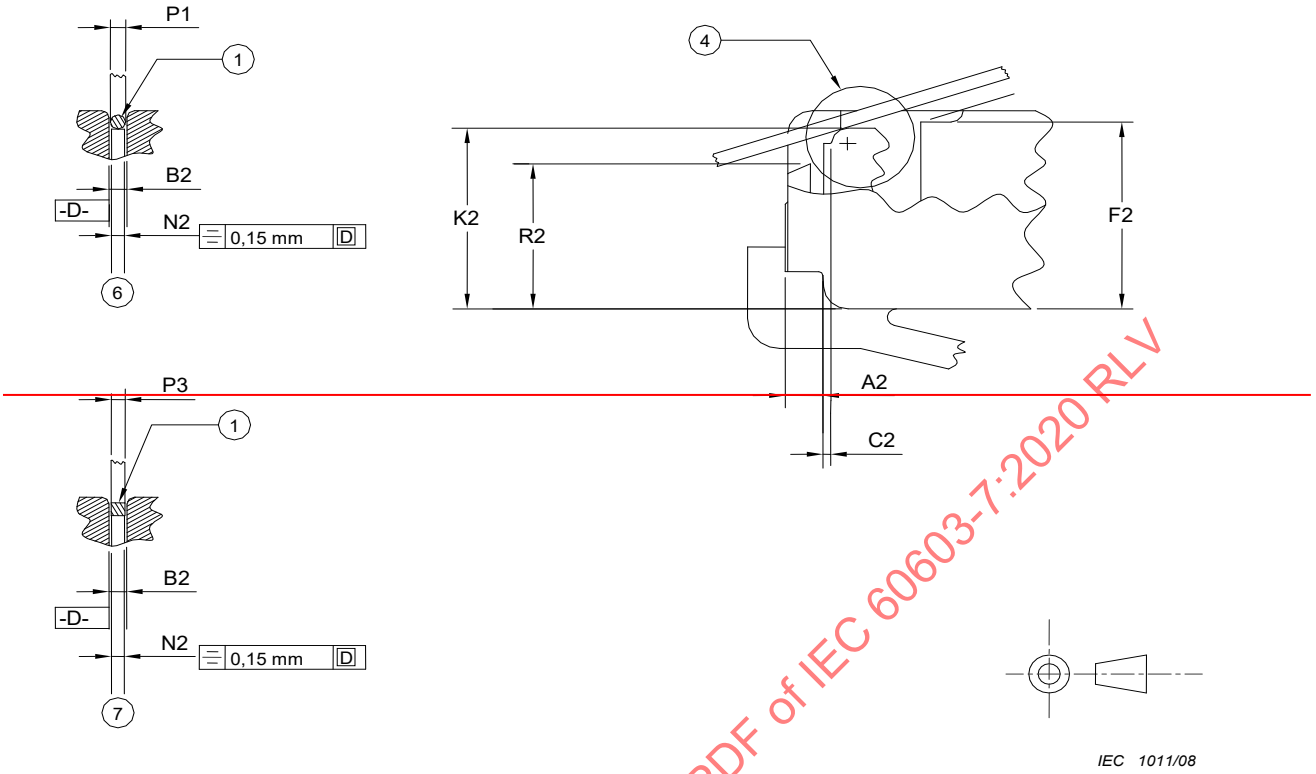
Figure 2 – View showing typical fixed and free connectors

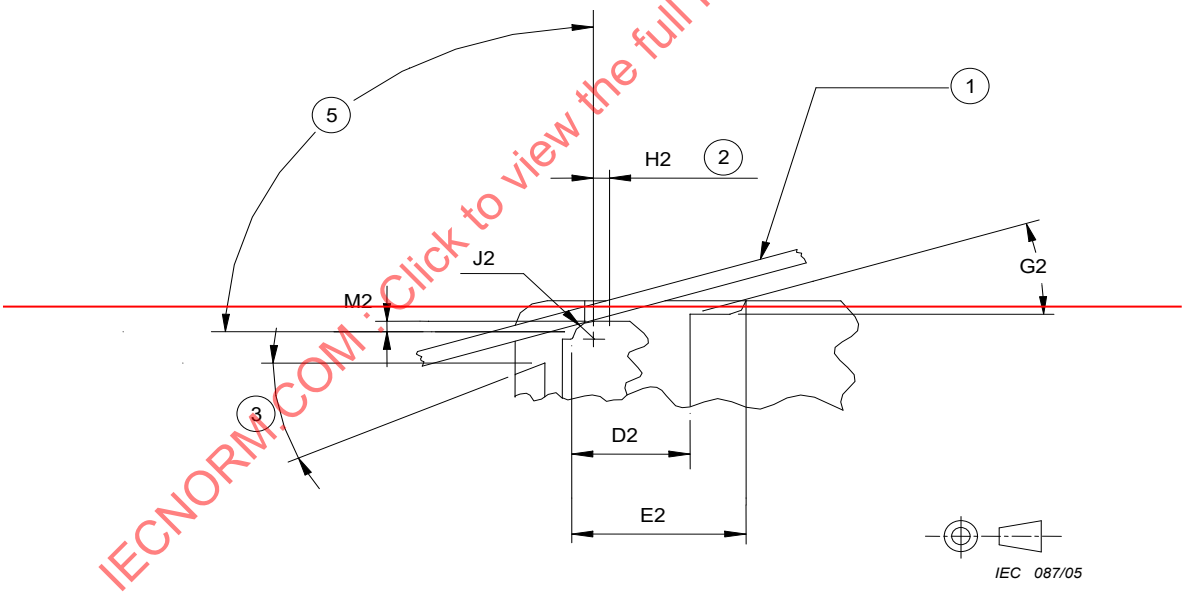
4.2 Mating information

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.~~

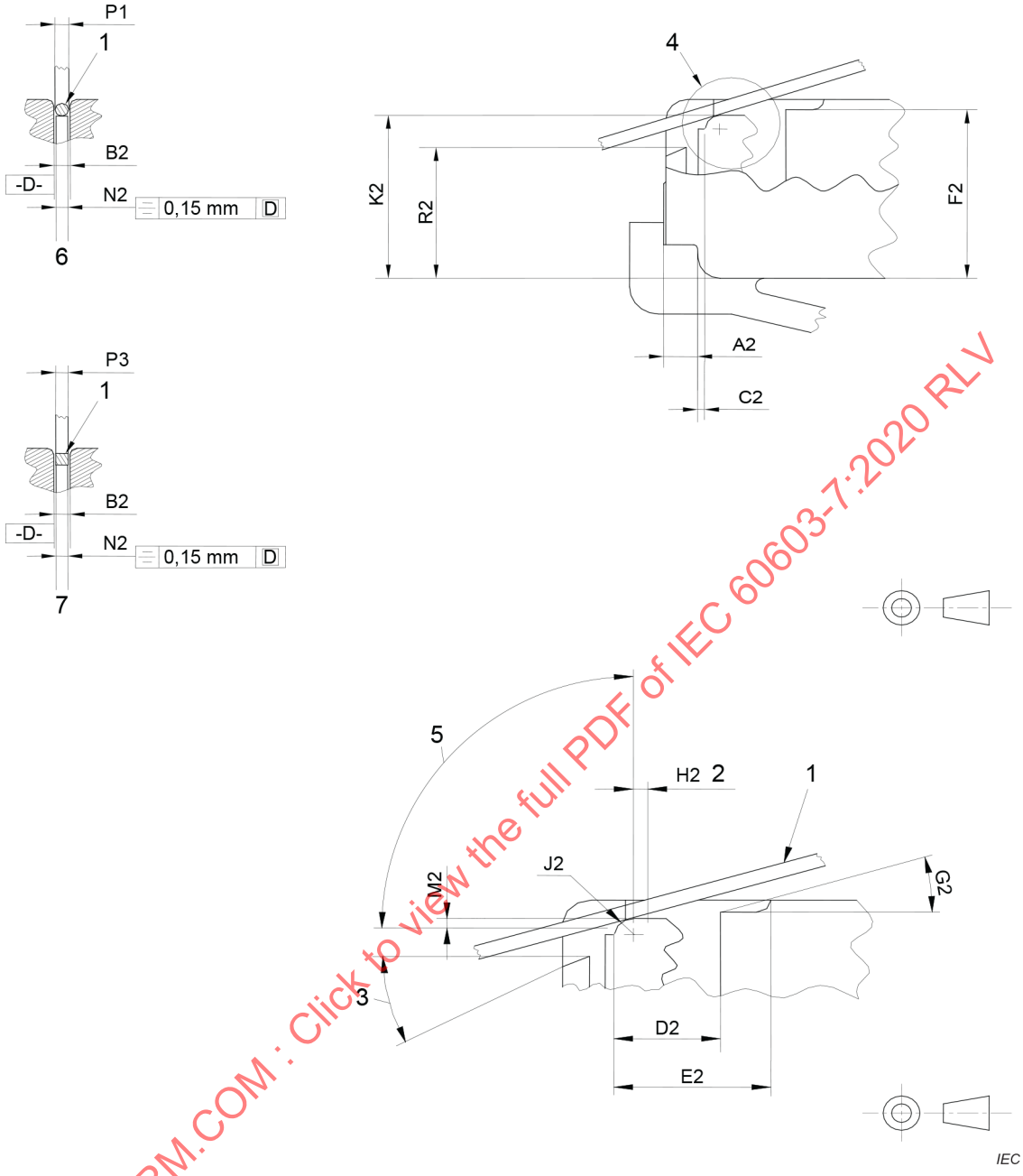
~~3 Optional angle.~~

~~4 Preferred contact interface detail.~~

~~5 Minimum preferred contact configuration.~~

~~6 Configuration with round contact profile.~~

~~7 Configuration with rectangular contact profile.~~



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

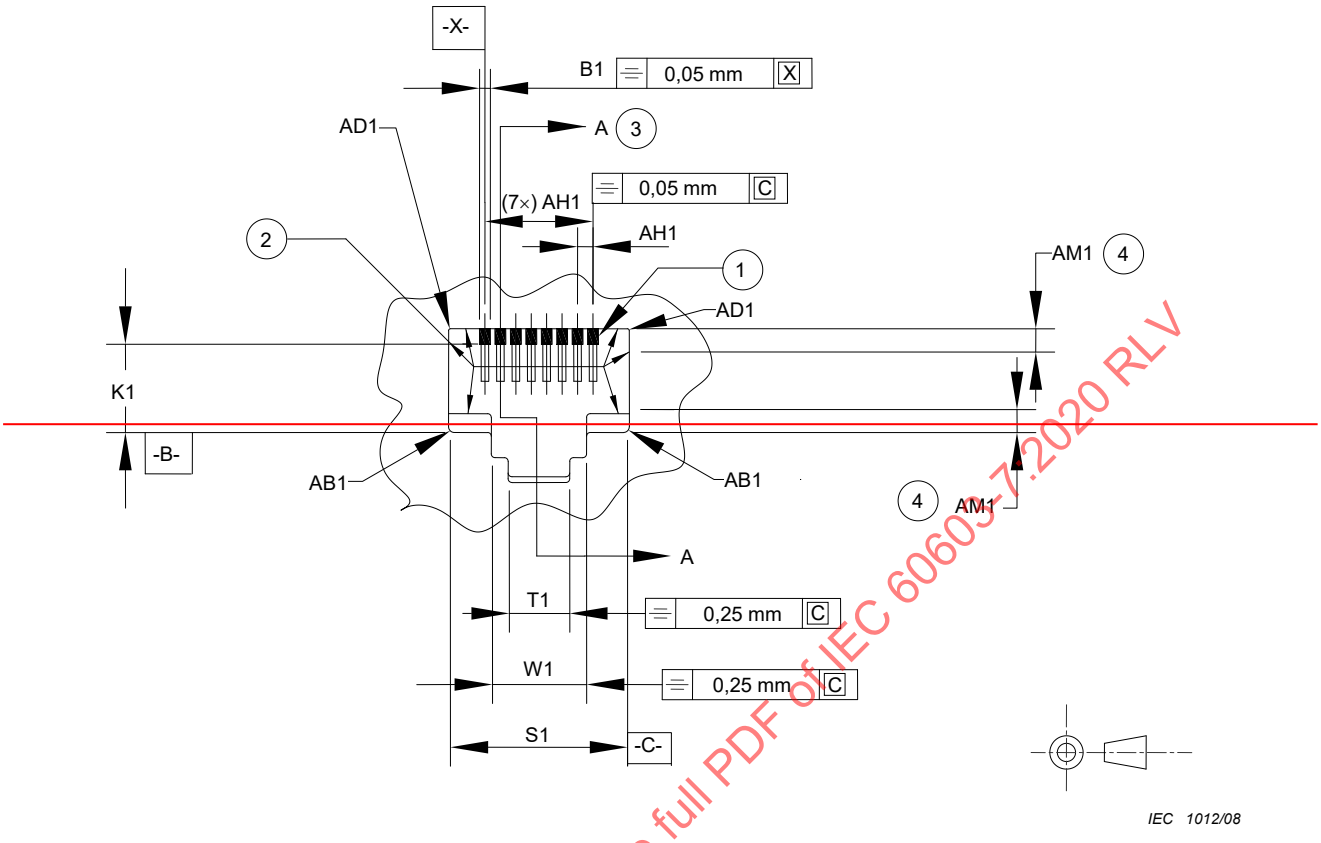
~~Letter~~	~~Maximum~~ ~~mm~~	~~Minimum~~ ~~mm~~
~~A2~~	~~1,45~~	~~0,89~~
~~B2~~	~~0,61~~	~~0,51~~
~~C2~~	~~0,46~~	~~0,03~~
~~D2~~		~~2,79~~
~~E2~~		~~4,11~~
~~F2~~	~~6,22~~	
~~H2~~		~~0,38~~
~~J2~~	~~0,64~~	~~0,38~~
~~K2~~	~~6,15~~	~~5,89~~
~~M2~~		~~0,30~~
~~N2~~		~~0,28~~
~~P1~~	~~0,50~~	~~0,45~~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



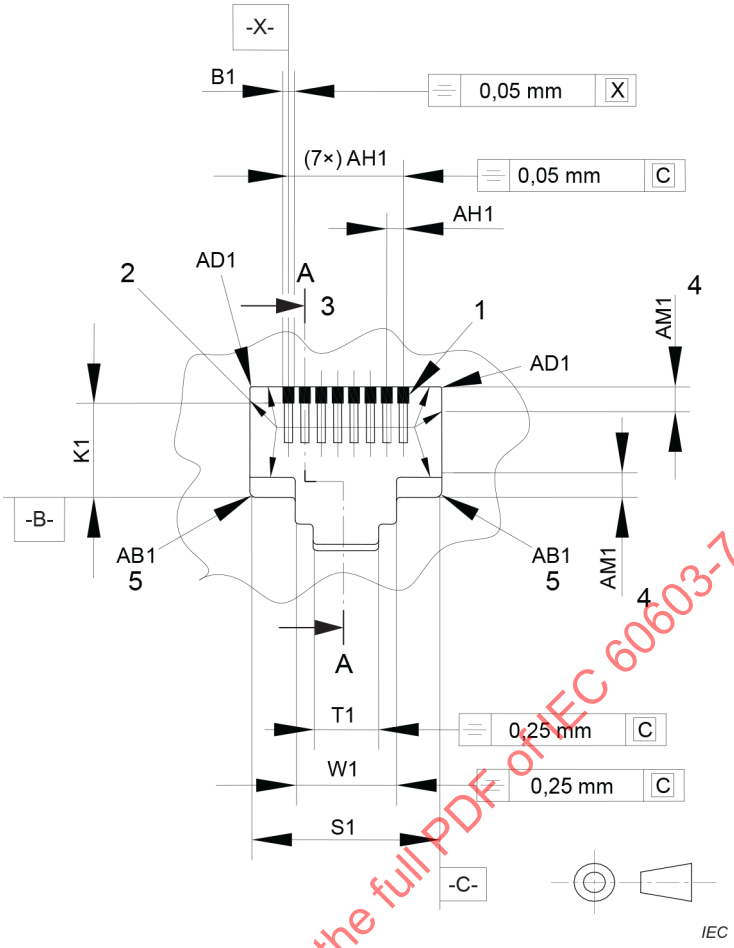
Key

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.

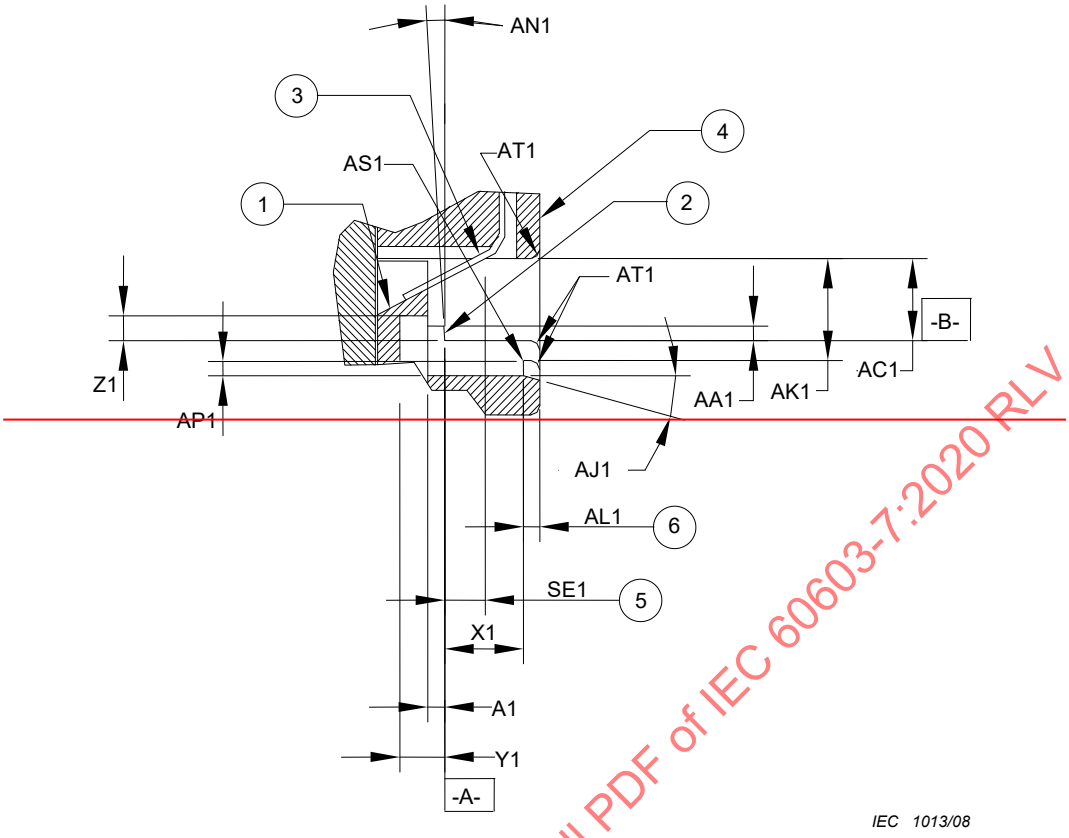
2 0°15' maximum taper.

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



~~View of contact zone section A-A~~

~~Key~~

~~1~~ ~~Optional contact rest.~~

~~2~~ ~~Preferred free connector stop.~~

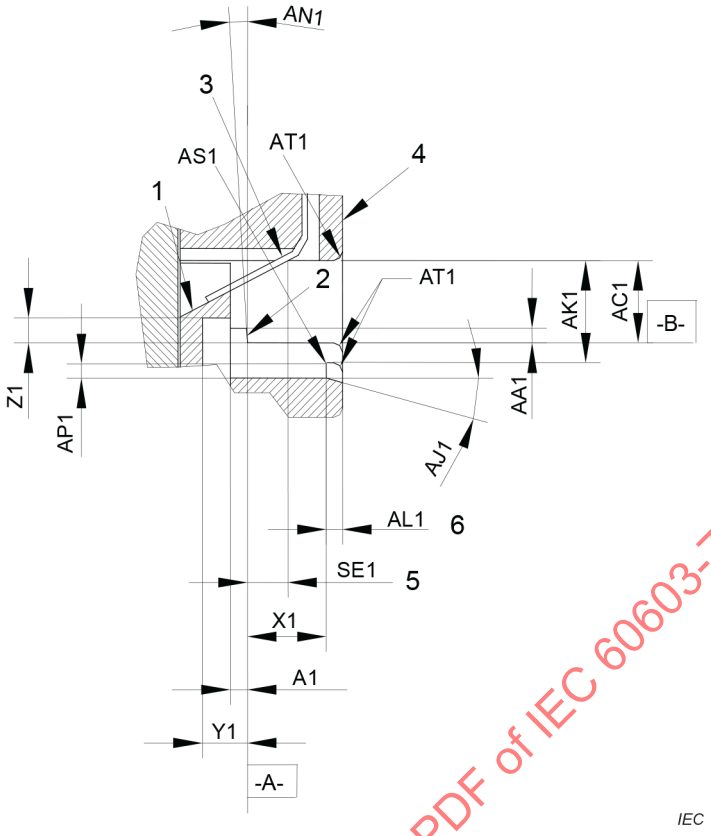
~~3~~ ~~Contacts shown at rest. Contacts shall always be contained inside guide slots. Contacts shall move freely within their guide slots.~~

~~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.~~



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.

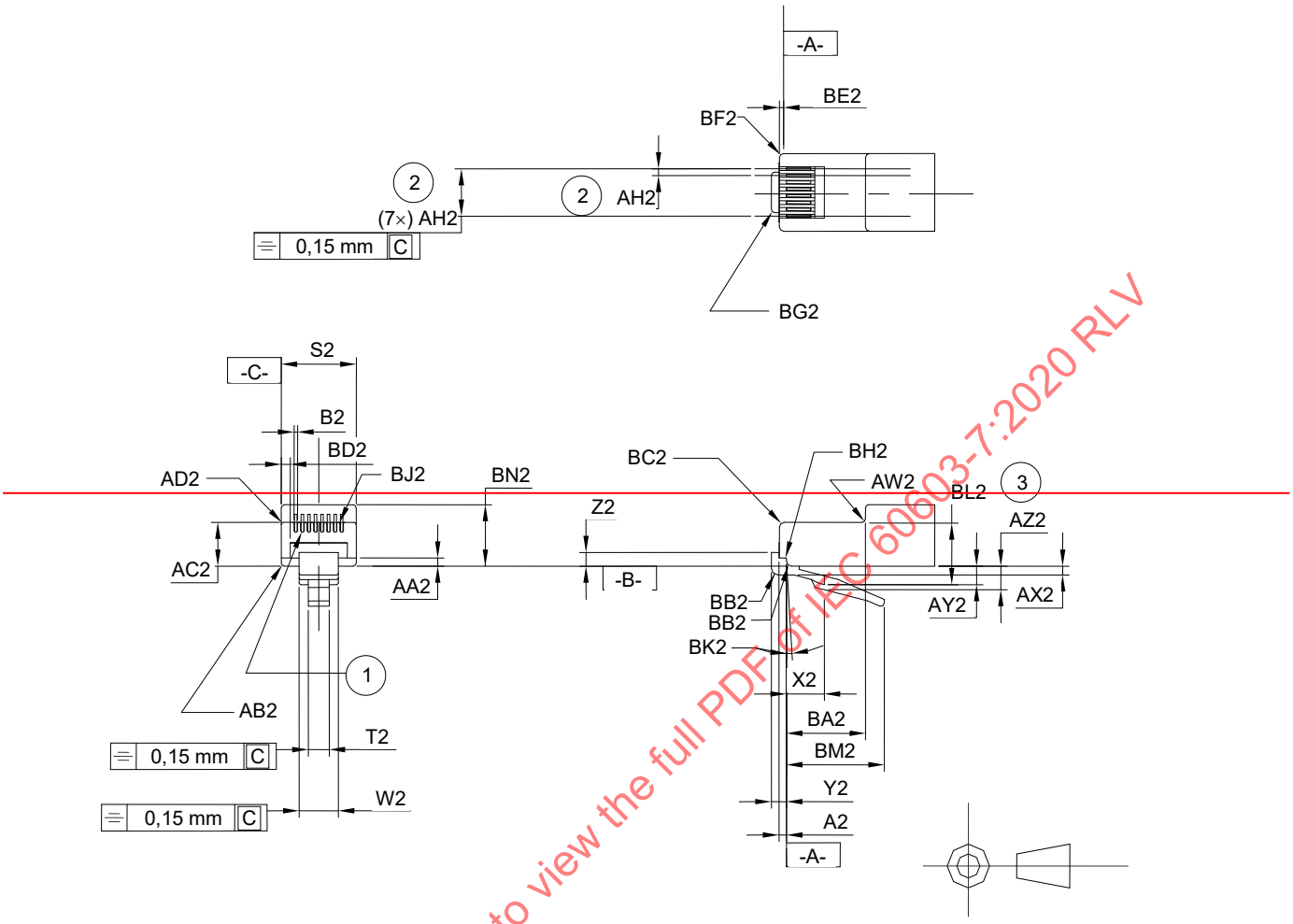
Letter	Maximum	Suggested minimum
AJ1		15°
AN1	3°30'	

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

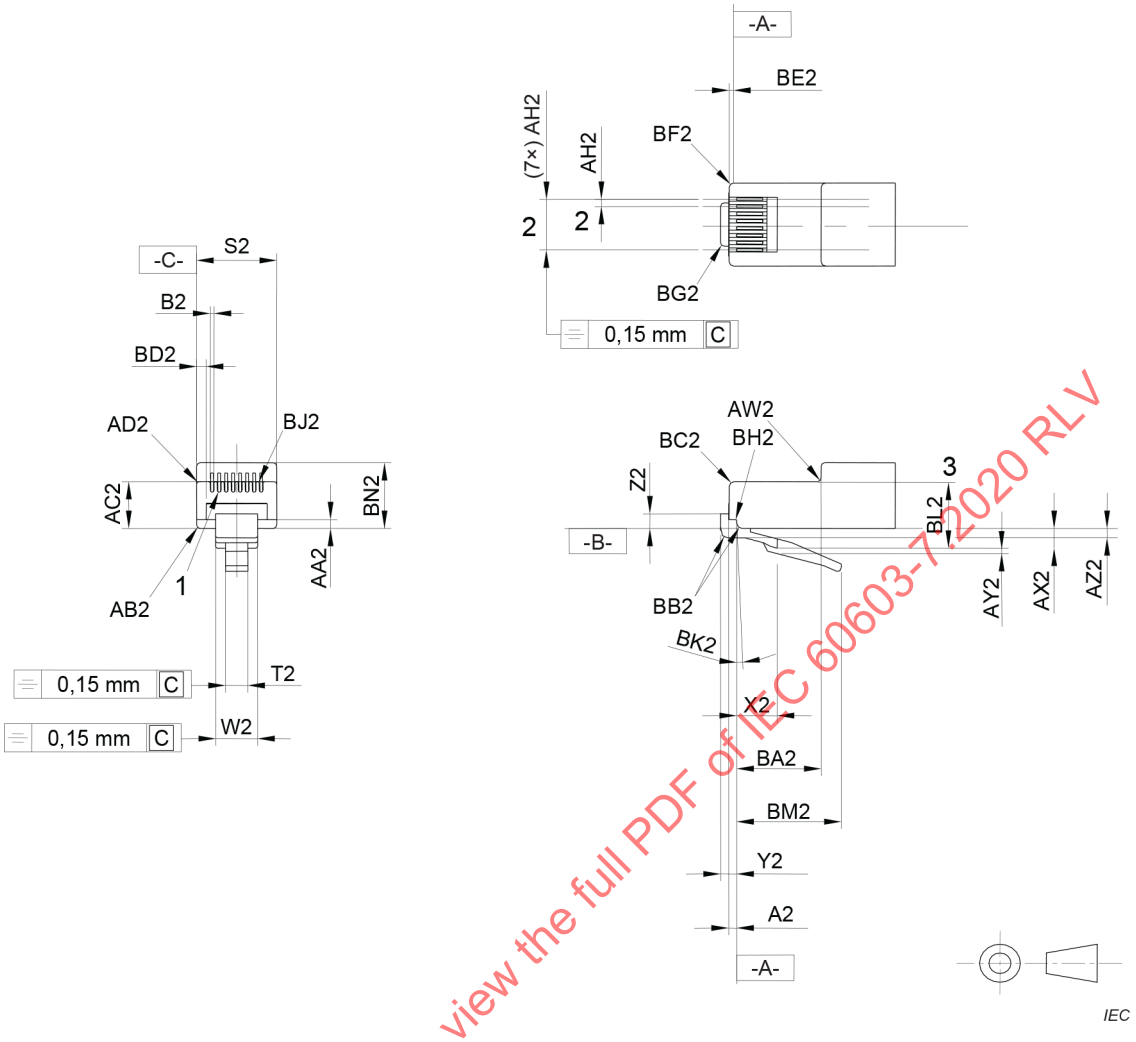


~~**Key**~~

~~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:

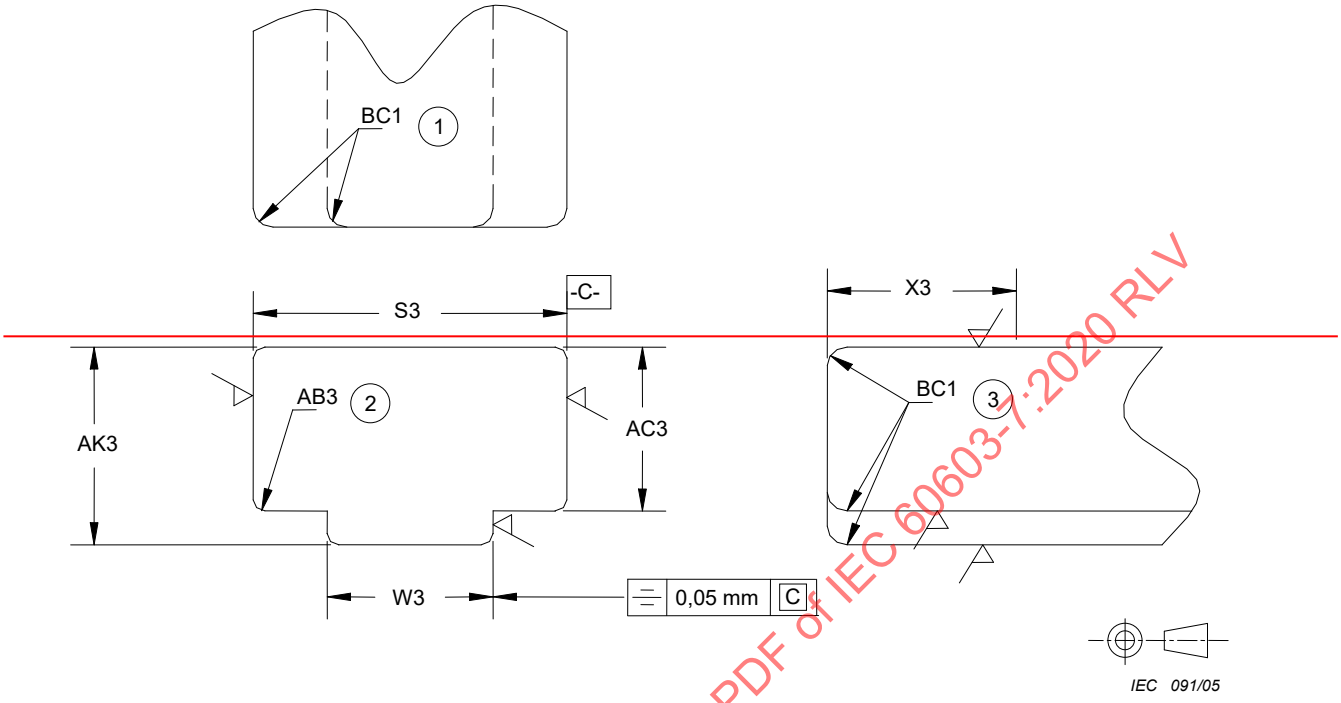
Material: hardened and tempered steel, all sharp edges removed, hardness 650 HV 20 minimum.

$\sqrt{\nabla}$ = 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.~~



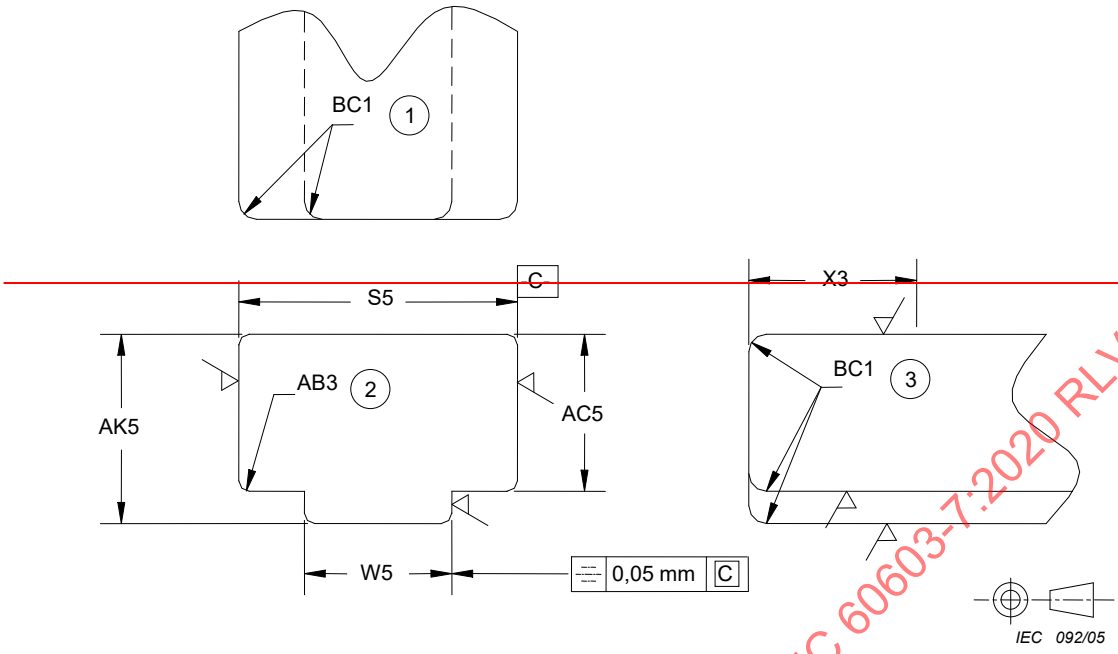
~~Key~~

~~1 Four places.~~

~~2 Six places.~~

~~3 All around.~~

~~Figure 5 – "Go" gauge~~



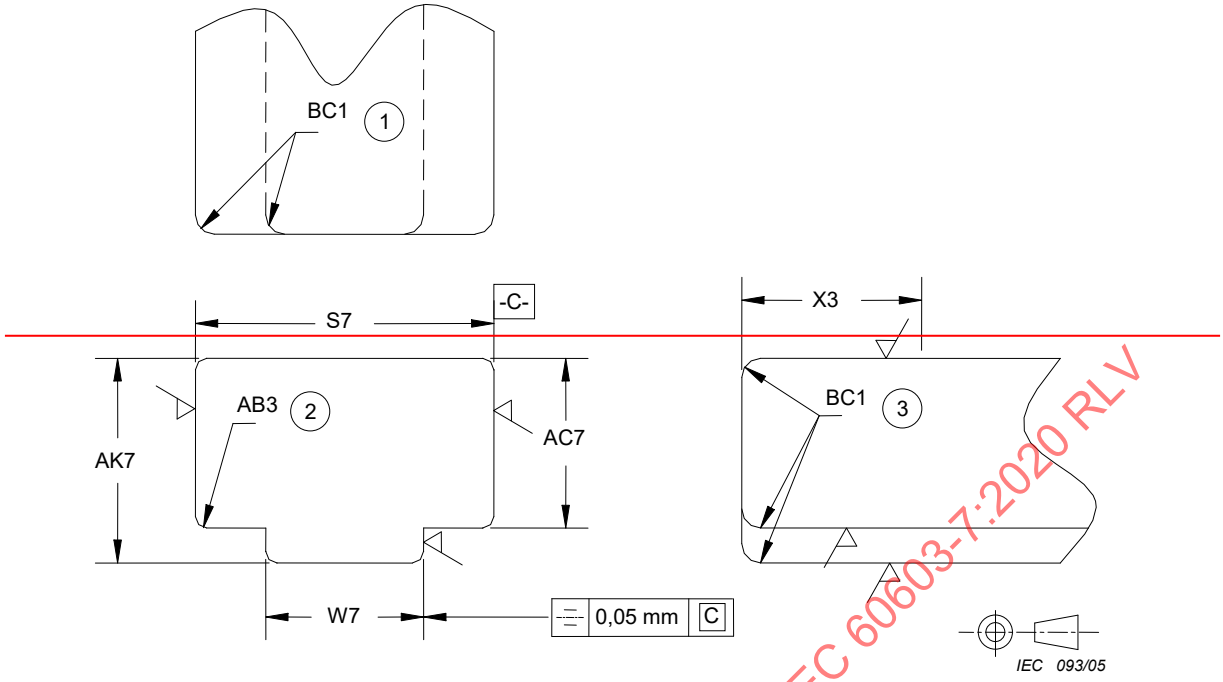
~~Key~~

~~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.~~

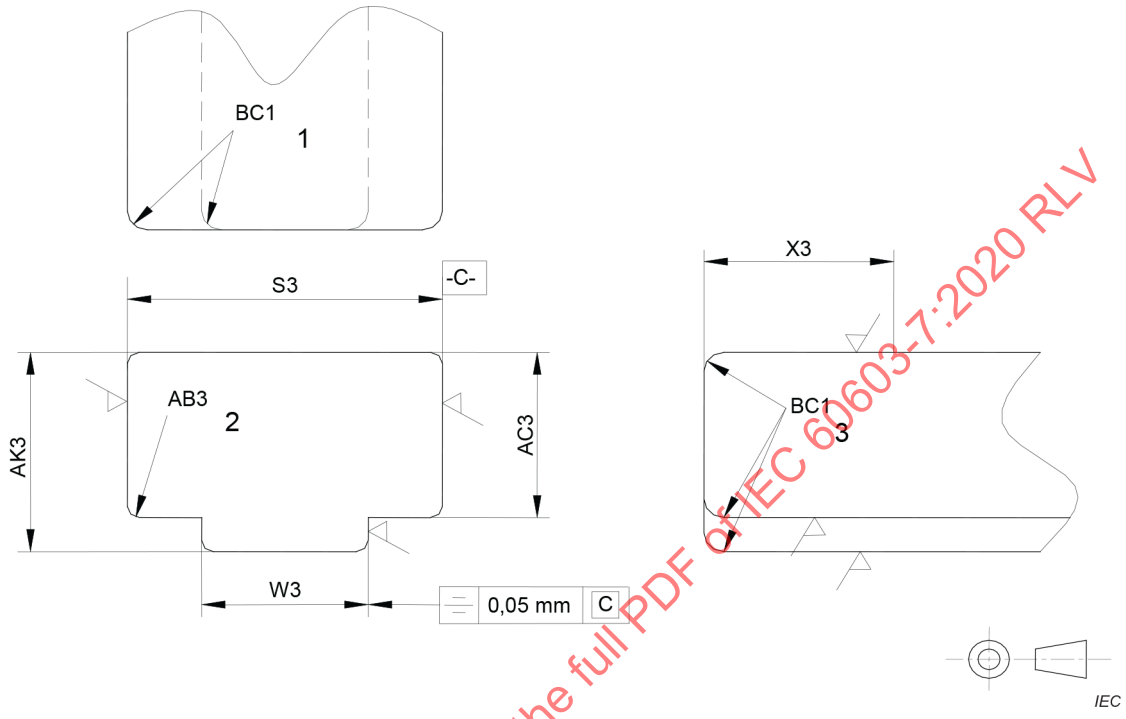
~~Figure 6b) – "No-go" gauge height~~

~~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).



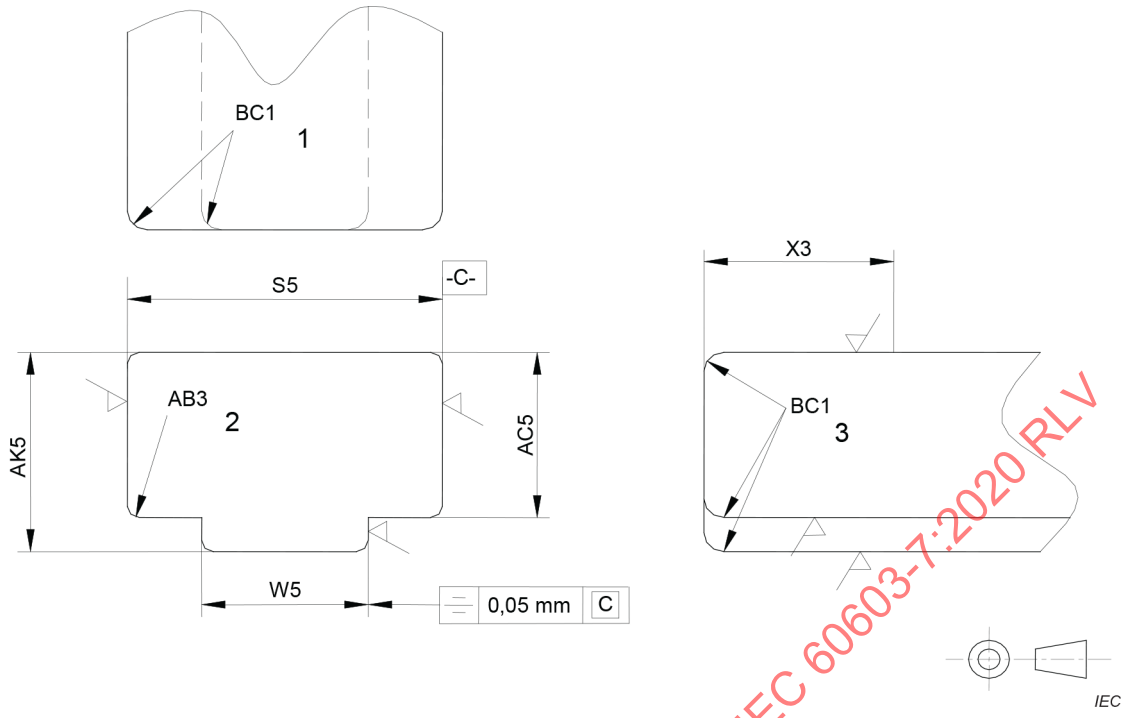
Key

1 Four places.

2 Six places.

3 All around.

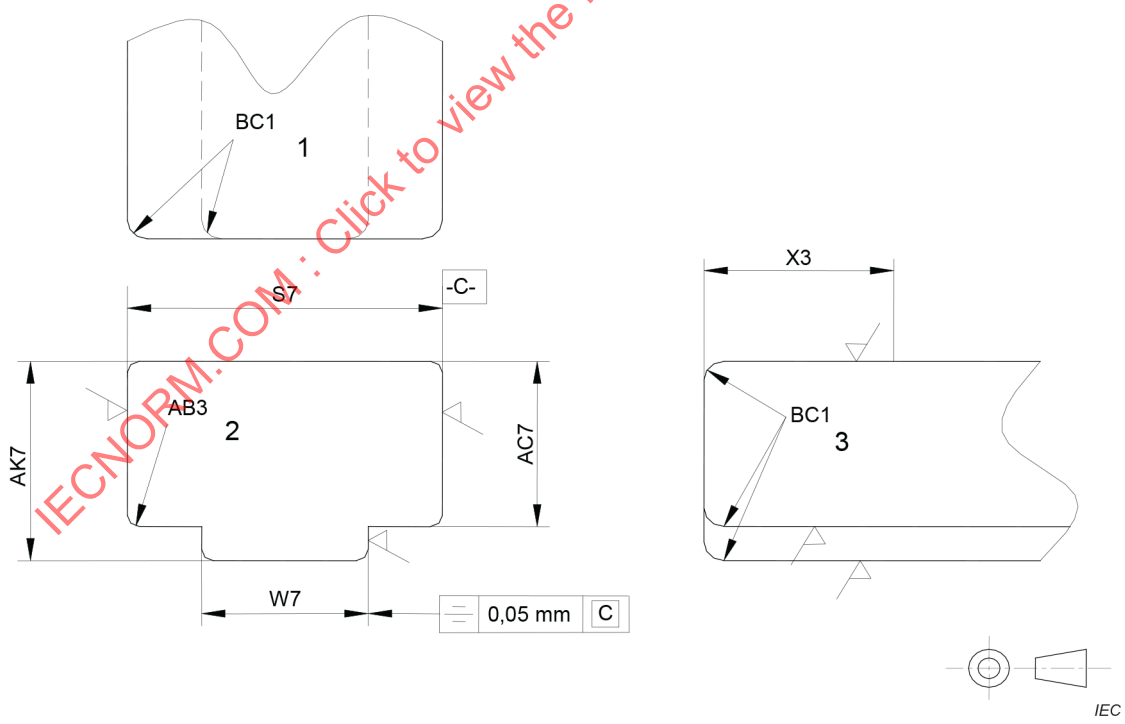
Figure 6 – Fixed connector "Go" gauge



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

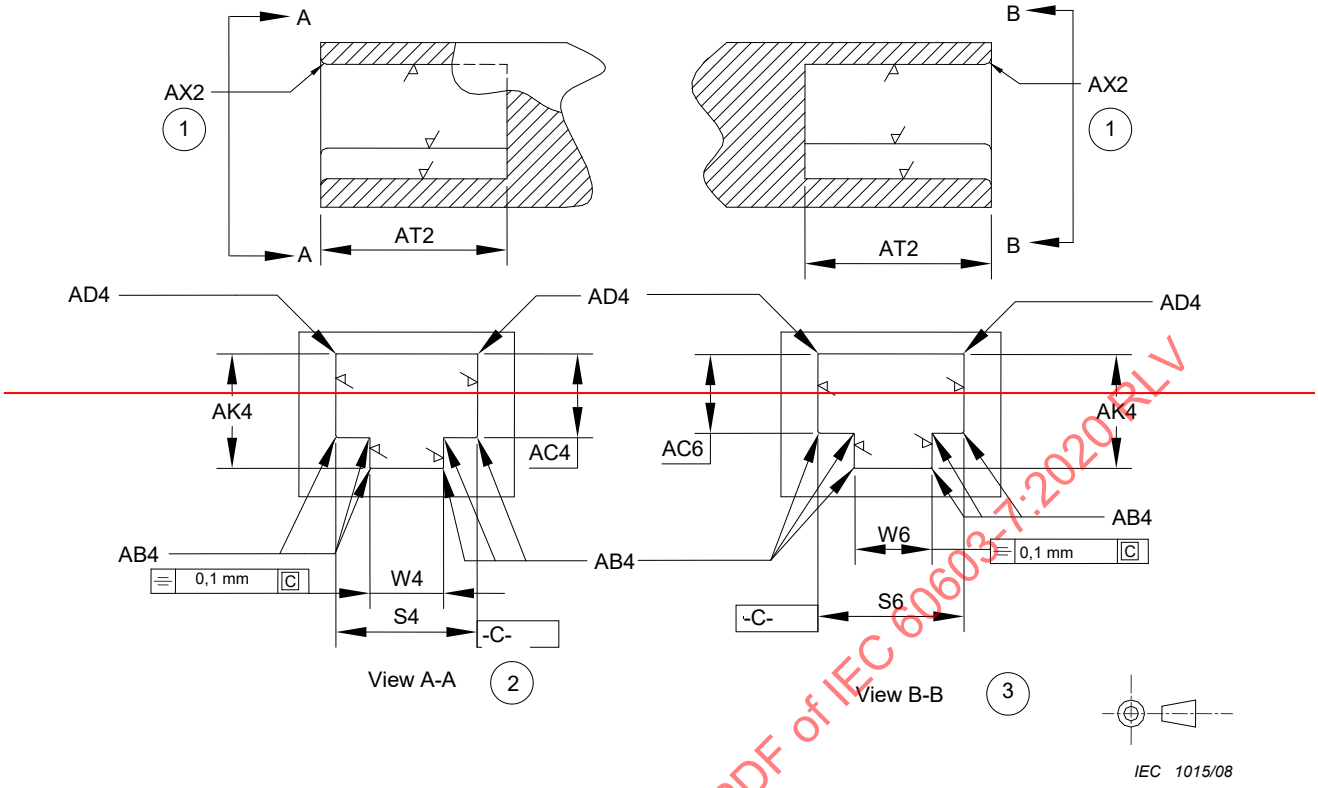
6.2 Free connectors

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

$\sqrt{}$ = Surface roughness, according to ISO 1302.

Ra = 0,25 μm maximum.

A 0,01 mm wear tolerance shall be applied.



Key

1 All around.

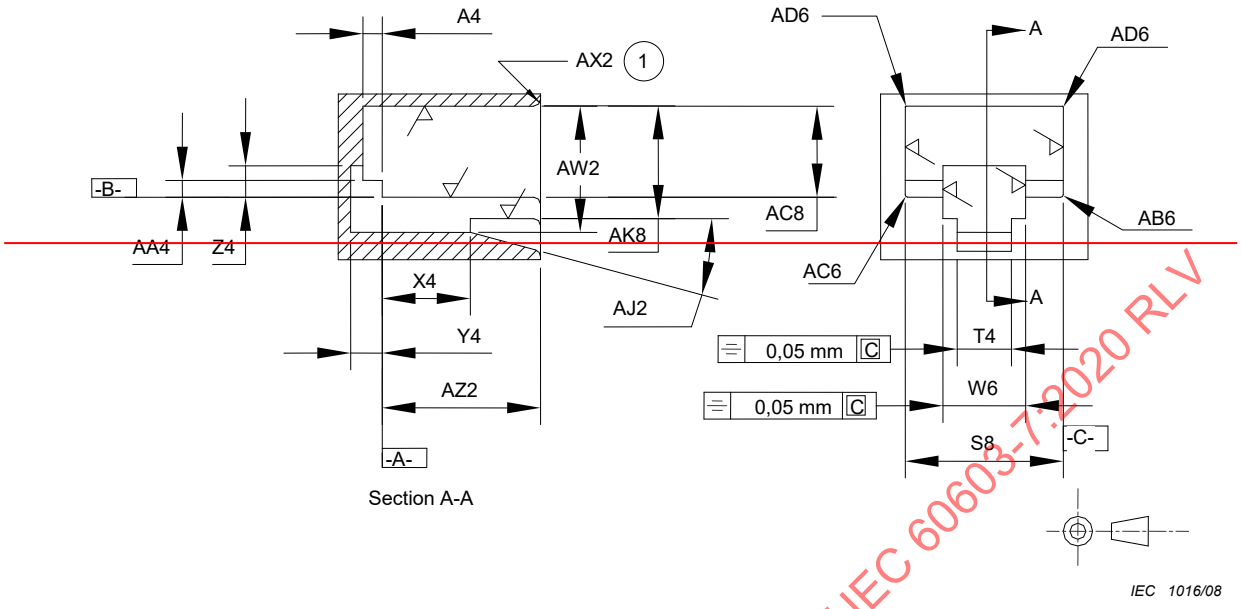
2 Width gauge.

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.

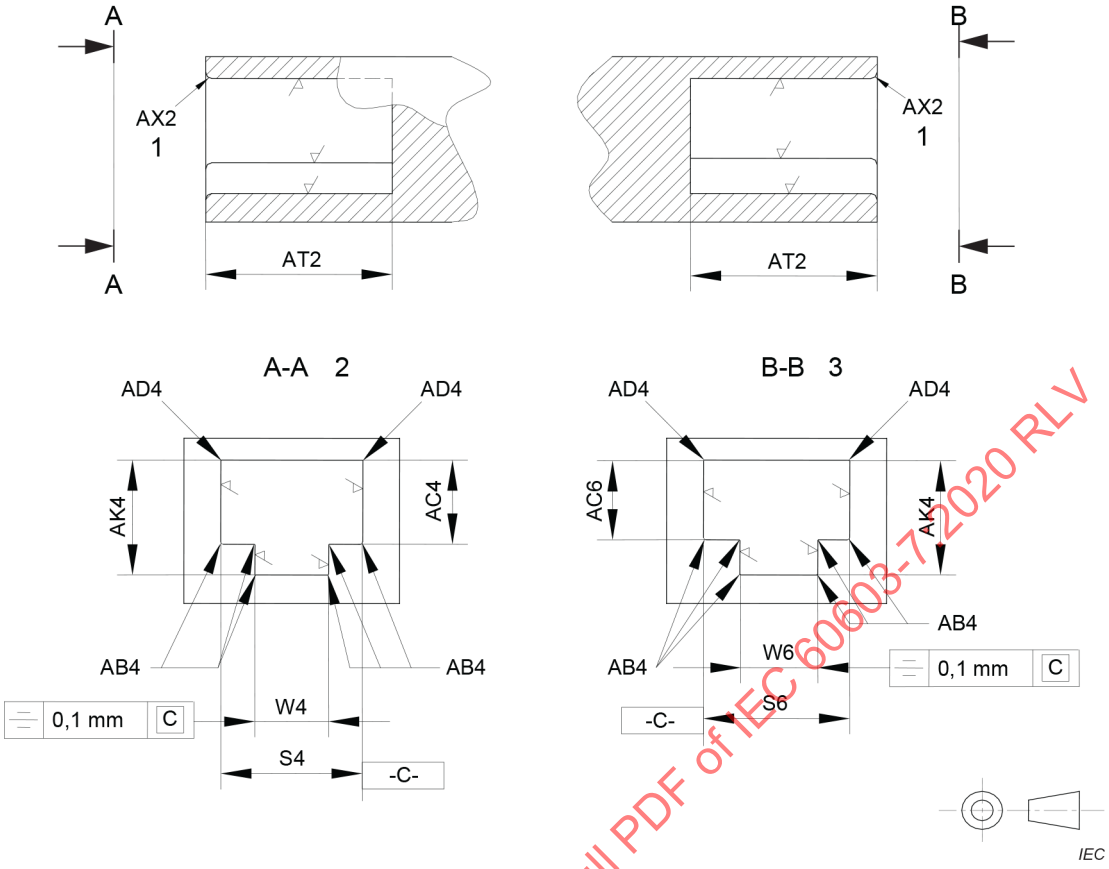
Figure 8 – "Go" gauge

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.

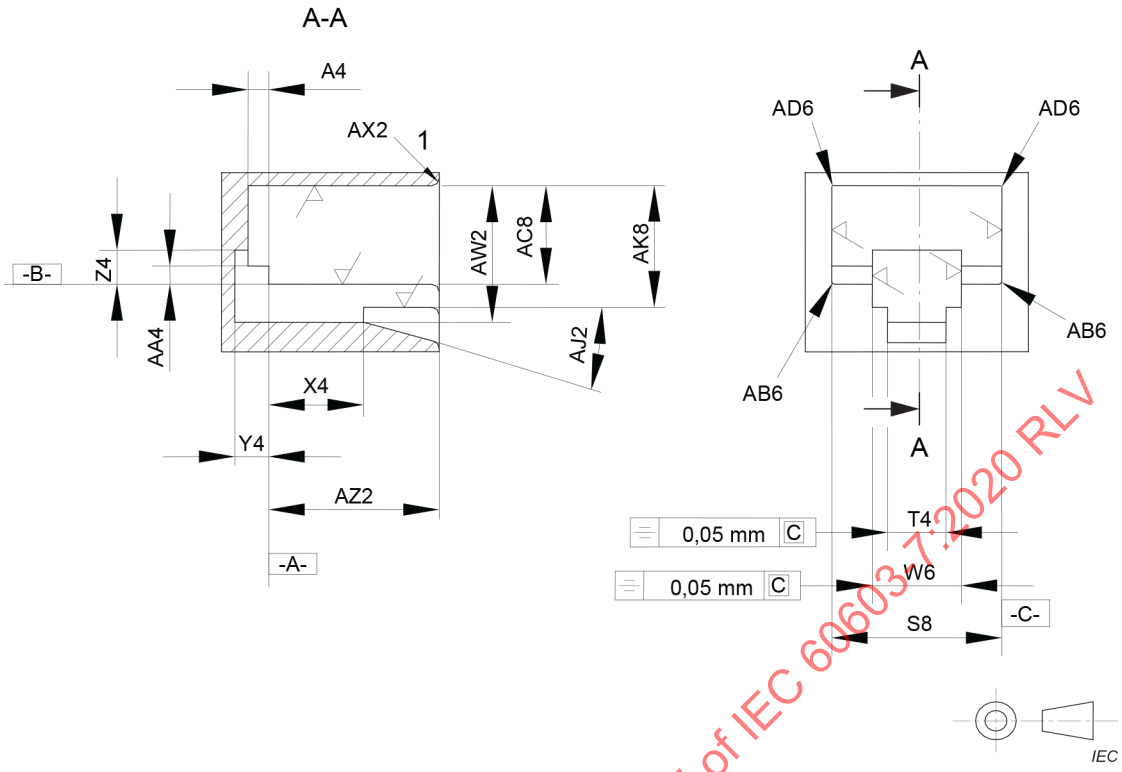
3 Height gauge.

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.

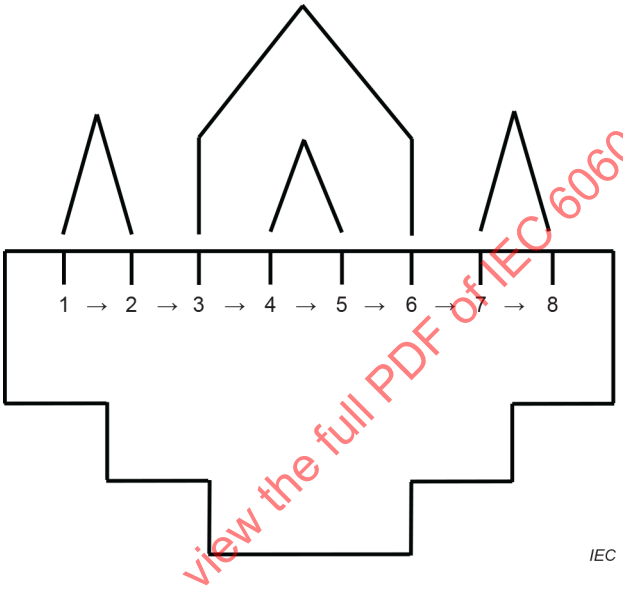


Figure 10 – Fixed connector pin and pair grouping assignment (front view of connector)

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/~~070~~090/21	−40	~~70~~ 90	21

NOTE 1 The 90 ºC UCT shall be verified by testing at 70 ºC 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.

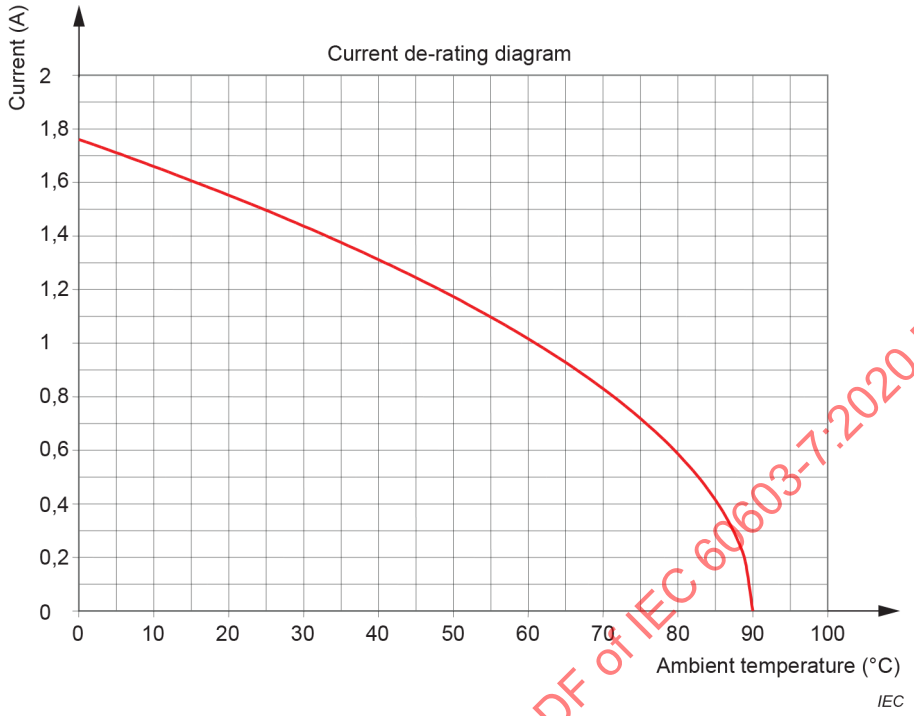
1 500 V DC or AC peak; all contacts connected together to shield, (housing/mounting plate) if present.

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.

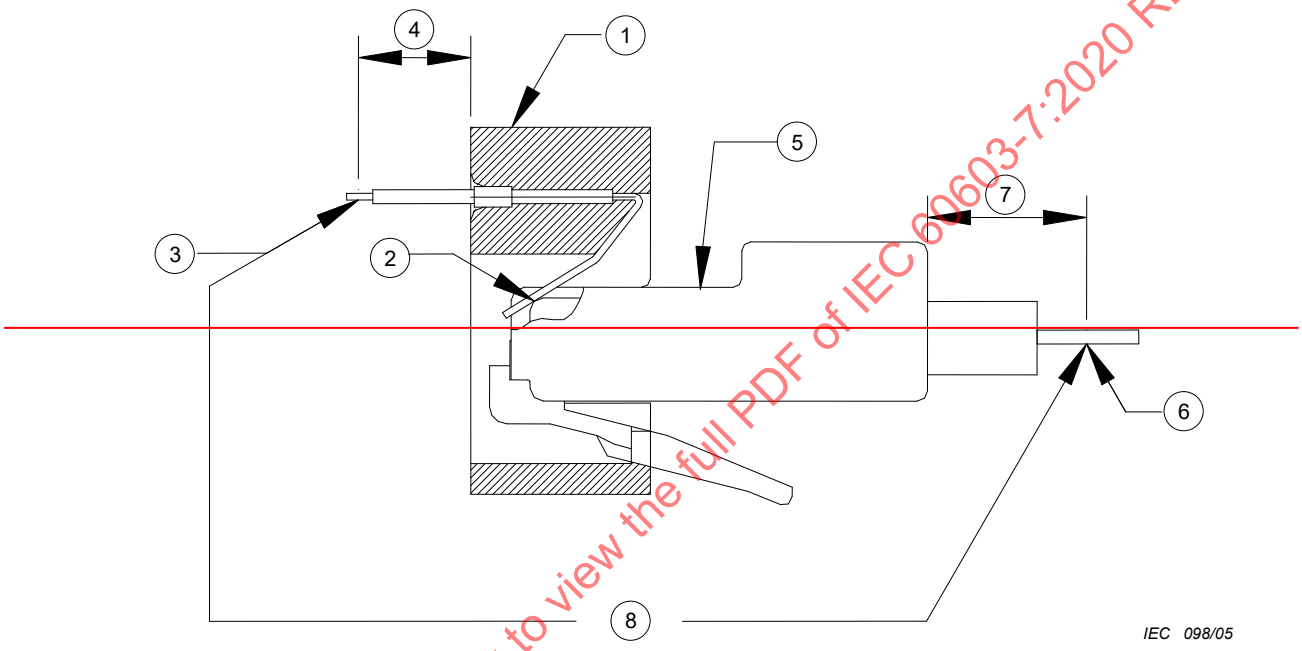
It is permissible to limit the number of variants tested to a selection representative of the whole range for which approval is required (which may be less than the range covered by the

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



~~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}.~~

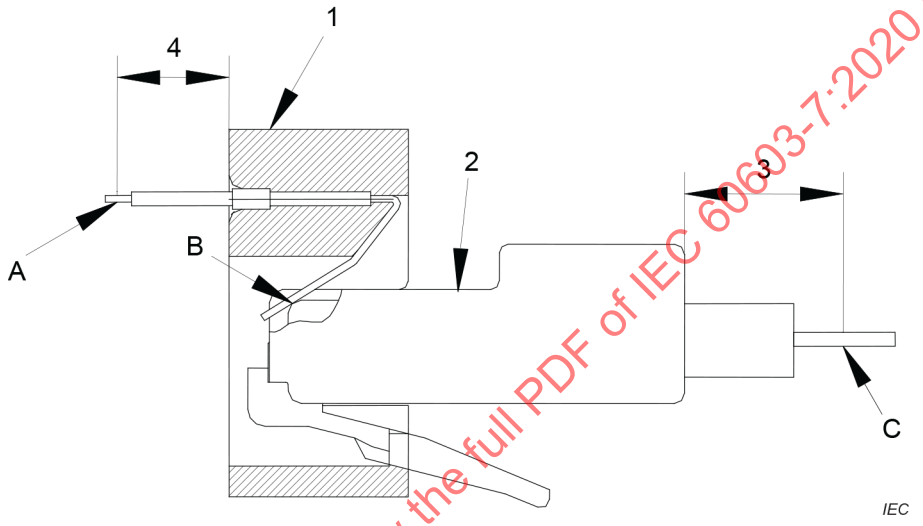
~~c) Measure the total mated connector resistance between points A and C, following the requirements and procedures of IEC 60512, Test 2a. This resistance is noted and recorded as R_{AC}.~~

~~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.~~

~~$$\text{Contact resistance} = R_{AC} - (R_{ABI} + R_{BCI})$$~~

~~where, I, 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: B_1: on the contact of fixed connector, B_2: 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 B_1 of Figure 11 by measurement of the unmated fixed connector. This resistance is noted and recorded as R_{AB_1}.

Determine the bulk resistance of the free connector between points B_2 and C of Figure 11 by measurement of the unmated free connector. This resistance is noted and recorded as R_{B_2C}.

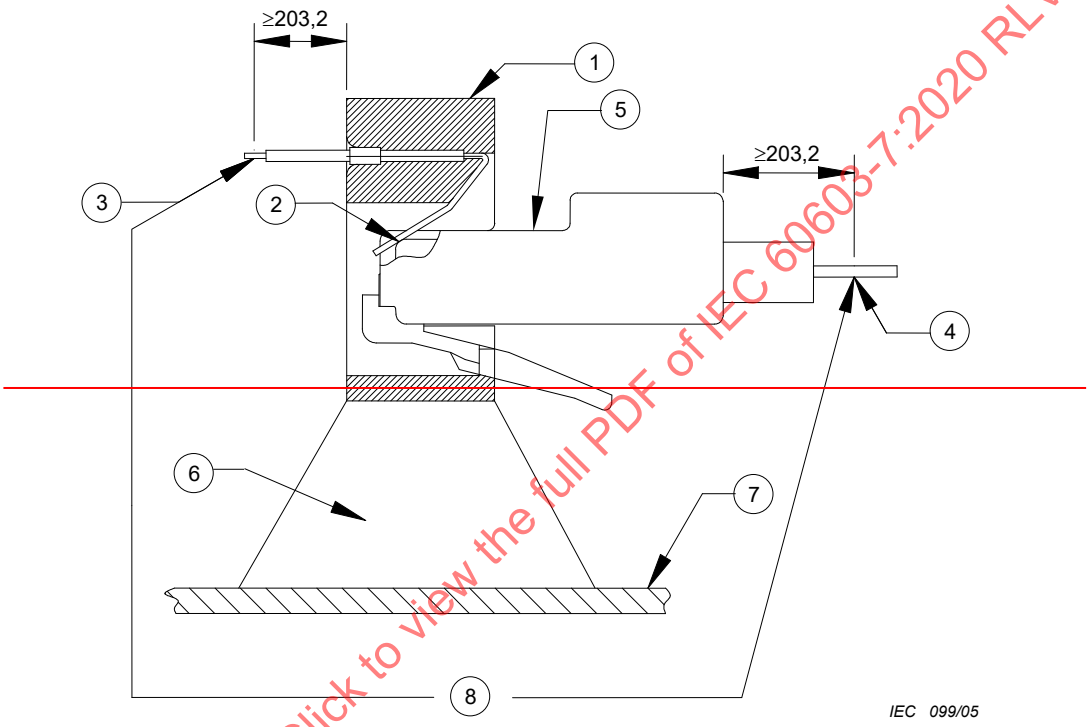
Calculate the contact resistance by subtracting the sum of the bulk resistance of the fixed and free connectors from the total mated connector resistance.

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

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.



~~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.~~

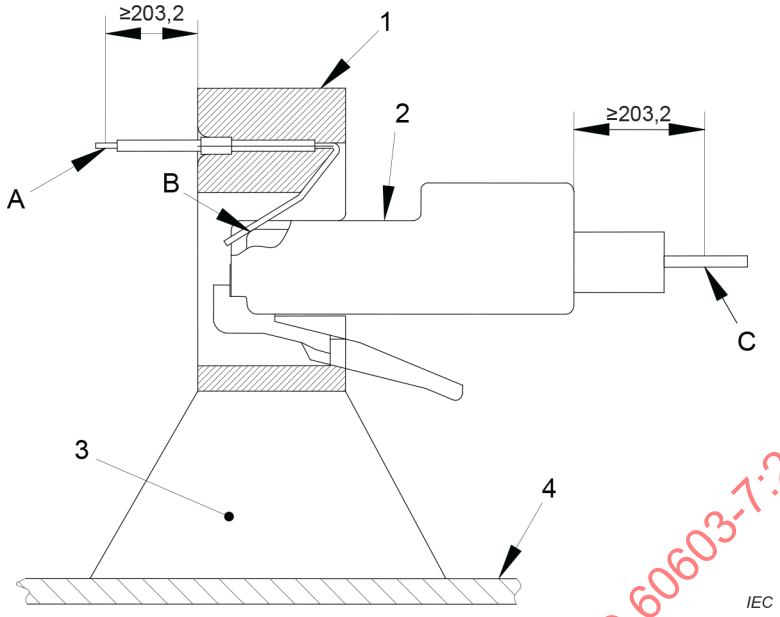
~~5 Free connector.~~

~~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 t = 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~~

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
AP5			Measurement points as in Figure 11 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial
AP6			Contact/contact: Method A Mated connectors	Voltage proof	4a	1 000 V d.c. or a.c. peak
			All contacts to test panel: Method A Mated connectors			1 500 V d.c. or a.c. peak
AP7			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
AP8	Cyclic damp heat	See IEC 60068-2-38	21 cycles: low temperature 25 °C; high temperature 65 °C; cold subcycle –10 °C; humidity 93 % Half of the samples in mated state Half of the samples in unmated state			
AP9			Measurement points as in Figure 11 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial
AP10	Insertion and withdrawal forces	13b	Connector locking device depressed			Insertion force 20 N maximum Withdrawal force 20 N maximum
AP11	Effectiveness of connector coupling device	15f	Rate of load application 44,5 N/s maximum			50 N for 60 s ± 5 s
AP12			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
AP13	Solderability		As applicable			
AP14	Resistance to soldering heat		As applicable			
AP15 [a]			See [a] Contact/contact: Method A Mated connectors	Voltage proof	4a	1 000 V d.c. or a.c. peak
			All contacts to test panel: Method A Mated connectors			1 500 V d.c. or a.c. peak

[a] Test phase AP15 shall only be carried out if test phases AP13 and AP14 are performed.

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	50 N for 60 s ± 5 s Rate of load application 44,5 N/s maximum			
AP3	Rapid change of temperature	11d	−40 °C to 70 °C Mated connectors 25 cycles ι = 30 min Recovery time 2 h			
AP4			Test voltage 100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
AP5			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
AP6			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
AP7			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
AP8	Cyclic damp heat	See IEC 60068-2-38	21 cycles: low temperature 25 °C; high temperature 65 °C; cold subcycle −10 °C; humidity 93 % Half of the samples in mated state Half of the samples in unmated state			
AP9			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
AP10	Insertion and withdrawal forces	13b	Connector locking device depressed			Insertion force 20 N maximum Withdrawal force 20 N maximum
AP11	Effectiveness of connector coupling device	15f	50 N for 60 s ± 5 s Rate of load application 44,5 N/s maximum			
AP12			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
AP13	Solderability		As applicable			
AP14	Resistance to soldering heat		As applicable			
AP15 [a]			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
[a] Test phase AP15 shall only be carried out if test phases AP13 and AP14 are performed.						

8.7.3.4 Test group BP

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~~	~~Locking device mechanical operations~~		~~2 *N* operations (see mechanical operations)~~			~~See Annex B~~
~~BP2~~	~~Mechanical operations~~	~~9a~~	~~*N*/2 operations (see 6.6.1). Speed 10 mm/s. Rest 1 s (when mated and unmated). Locking device inoperative~~			~~N (PL 1) = 750~~ ~~N (PL 2) = 2 500~~
~~BP3~~	~~Flowing mixed gas corrosion~~	~~11g~~	~~4 days~~ ~~Half of the samples in mated state~~ ~~Half of the samples in unmated state~~		~~11g~~	
~~BP4~~			~~Measurement points as in Figure 11~~ ~~All contacts/specimens~~	~~Contact resistance~~	~~2a~~	~~20 mΩ maximum change from initial~~
~~BP5~~	~~Mechanical operations~~	~~9a~~	~~*N*/2 operations (see 6.6.1)~~ ~~Speed 10 mm/s. Rest 5 s (when unmated). Locking device inoperative~~			
~~BP6~~			~~Measurement points as in Figure 11~~ ~~All contacts/specimen~~	~~Contact resistance~~	~~2a~~	~~20 mΩ maximum change from initial~~
~~BP7~~			~~100 V ± 15 V d.c. Method A Mated connectors~~	~~Insulation resistance~~	~~3a~~	~~500 MΩ minimum~~

~~BP8~~			~~Contact/contact:~~ ~~Method A~~ ~~Mated connectors~~	~~Voltage proof~~	~~4a~~	~~1 000 V d.c. or a.c. peak~~
			~~All contacts to test panel:~~ ~~Method A~~ ~~Mated connectors~~			~~1 500 V d.c. or a.c. peak~~
~~BP9~~				~~Visual examination~~	~~1a~~	~~There shall be no defects that would impair normal operation~~

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
BP1	Locking-device mechanical operations		2 N operations (see mechanical operations)			See Annex B
BP2	Mechanical operations	9a	N/2 operations (see 7.6.1). Speed 10 mm/s. Rest 1 s (when mated and unmated). Locking device inoperative			
BP3	Flowing mixed gas corrosion	11g	Method 1 4 days Half of the samples in mated state Half of the samples in unmated state			
BP4			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
BP5	Mechanical operations	9a	N/2 operations (see 7.6.1) Speed 10 mm/s. Rest 5 s (when unmated). Locking device inoperative			
BP6			Measurement points as in Figure 12 All contacts/specimen	Contact resistance	2a	20 mΩ maximum change from initial
BP7			100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
BP8			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
BP9				Visual examination	1a	There shall be no defects that would impair normal operation

8.7.3.5 Test group CP

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~~	~~Vibration~~	~~11c~~	~~f = 10 Hz to 500 Hz,~~ ~~Amplitude = 0,35 mm~~ ~~Acceleration = 50 m/s^2~~ ~~10 sweeps/axis~~ ~~Measurement points as in Figure 12~~	~~Contact disturbance~~	~~2e~~	~~10 µs maximum~~
~~CP2~~			~~Measurement points as in Figure 11~~ ~~All contacts/specimens~~	~~Contact resistance~~	~~2a~~	~~No disturbance of free and fixed connector between vibration test and measurement~~ ~~20 mΩ maximum change from initial~~
~~CP3~~			~~Test voltage 100 V d.c. Method A Mated connectors~~	~~Insulation resistance~~	~~3a~~	~~500 MΩ minimum~~
~~CP4~~			~~Unmated connectors~~	~~Visual examination~~	~~1a~~	~~There shall be no defects that would impair normal operation~~

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
CP1	Vibration	6d	f = 10 Hz to 500 Hz, Amplitude = 0,35 mm Acceleration = 50 m/s^2 10 sweeps/axis Measurement points as in Figure 12	Contact disturbance	2e	10 µs maximum
CP2			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement No disturbance of the free connector to fixed connector electrical connections, between vibration test and contact resistance measurement.
CP3			Test voltage 100 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
CP4			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation

8.7.3.6 Test group DP

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	Electrical load and temperature	9b	5 connectors 500 h 70 °C Recovery period 2 h			0,8 A 5 connectors No current 5 connectors
DP2			Test voltage 100 V d.c. Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
DP3			Contact/contact: Method A Mated connectors	Voltage proof	4a	1 000 V d.c. or a.c. peak
			All contacts to test panel: Method A Mated connectors			1 500 V d.c. or a.c. peak
DP4			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
DP5			Measurement points as in Figure 11 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial
DP6	Gauging	Annex C				All samples tested shall pass all gauges and forces
DP7	Gauging continuity	Annex A	All contacts/specimen	Contact disturbance	2e	10 µs maximum

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
DP1	Electrical load and temperature	9b	5 connectors 500 h 70 °C Recovery period 2 h 0,8 A 5 connectors 0 A 5 connectors			
DP2			Test voltage 100 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
DP3			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
DP4			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
DP5			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
DP6	Gauging	Annex C				All samples tested shall pass all gauges and forces
DP7	Gauging continuity	Annex A	All contacts/specimen	Contact disturbance	2e	10 μs maximum

8.7.3.7 Test group EP

~~For test group EP, see the relevant IEC 60603-7-x specification~~

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	Not applicable					
EP2	Not applicable					
EP3	Not applicable					
EP4	Not applicable					
EP5	Not applicable					
EP6	Not applicable					
EP7	Input to output resistance		Measuring points as defined in Figure 12 All signal contacts	Millivolt level method	2a	Per 7.4.57.4.5.
EP8	Input-to-output DC resistance unbalance		Measuring points as defined in Figure 12 All signal contacts	Millivolt level method	2a	Per 7.4.6.
All measurements to be performed on mated connectors.						

8.7.3.8 Test Group FP

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~~	~~Surge test~~	~~ITU-T K.20:2000~~	~~Mated connectors~~ ~~Table 2a/2b, basic test level~~ ~~Tests 2.1.1a, 2.1.1b, 2.1.3, 2.2.1a, and 2.3.1a~~			~~Test 2.1 and 2.2:~~ ~~Acceptance criterion A per ITU-T K.44, Clause 9~~ ~~Test 2.3:~~ ~~Acceptance criterion B per ITU-T K.44, Clause 9~~
~~FP2~~			~~100 V ± 15 V d.c. Method A Mated connectors~~	~~Insulation resistance~~	~~3a~~	~~500 MΩ minimum~~
~~FP3~~			~~Unmated connectors~~	~~Visual examination~~	~~1a~~	~~There shall be no defects that would impair normal operation~~

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
FP1	Surge test	ITU-T K.20:2000	Mated connectors Table 2a/2b, basic test level Tests 2.1.1a, 2.1.1b, 2.1.3, 2.2.1a, and 2.3.1a (For test 2.3.1a, the load (resistor) value shall be ≥ 40 Ω; line a and line b shall be directly interconnected behind the connector, and a-terminal and b-terminal, respectively, directly connected to ground.).			Test 2.1 and 2.2: Acceptance criterion A per ITU-T K.44:2000, Clause 9 Test 2.3: Acceptance criterion B per ITU-T K.44, Clause 9
FP2			100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
FP3			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation

Annex A
(normative)

Gauging continuity procedure

A.1 Object

The object of this test is to check whether, in worst-case conditions of the free connector, the electrical continuity is guaranteed.

A.2 Preparation of the specimens

This test is carried out using a gauge according to Figure A.1 (see also Table A.1).

A.3 Test method

The test specimen, suitably mounted with the gauge inserted to its fullest extent, is tested according to IEC 60512-2-5, Test 2e. The test shall be repeated for each individual contact of the fixed connector.

For the test of the signal contacts, the gauge shall be fully inserted and then be moved upwards until it stops against the plastic wall of the fixed connector (see Figure A.2).

For the test of the screen contact, the gauge shall be fully inserted and then be moved to both sides of the connector until it stops against the plastic wall of the fixed connectors. This movement shall be repeated 3 times.

During the movements, a forward force of 20 N minimum shall be applied as indicated by the arrow in Figure A.2.

A.4 Final measurements

The test requirements shall be satisfied if no discontinuity ≥ 10 μs is measured for each individual contact.

A.5 Description of the continuity gauge

The gauge shall be made according to the following specification:

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. The surface should be compatible with the contact finish of the connector under test.

A 0,01 mm wear tolerance shall be applied.

Table A.1 – Dimensions for Figure A.1

~~Letter~~	~~Maximum~~ ~~mm~~	~~Minimum~~ ~~mm~~
~~A1~~	~~11,59~~	~~11,57~~
~~B1~~	~~4,90~~	
~~C1~~	~~0,8~~	~~0,6~~
~~D1~~	~~4,12~~	~~4,10~~
~~E1~~		~~15,0~~
~~F1~~	~~0,89~~	~~0,79~~
~~H1~~	~~0,47~~	~~0,45~~
~~J1~~	~~0,69~~	~~0,59~~
~~L1~~	~~6,72~~	~~6,70~~
~~N1~~	~~5,90~~	~~5,88~~
~~P1~~	~~4,7~~	~~4,3~~
~~R1~~	~~1,6~~	~~1,4~~
~~S1~~	~~1,46~~	~~1,44~~
~~T1~~	~~0,1~~	
~~X1~~	~~0,6~~	~~0,4~~
~~Y1~~		~~5,0~~

~~Letter~~	~~Maximum~~	~~Minimum~~
~~K1~~	~~30°~~	~~24°~~

Dimensions in millimetres

Letter	Minimum	Maximum
A1	11,57	11,59
B1		4,90
C1	0,6	0,8
D1	4,10	4,12
E1	15,0	
F1	0,79	0,89
H1	0,45	0,47
J1	0,59	0,69
K1	24°	30°
L1	6,70	6,72
N1	5,88	5,90
P1	4,3	4,7
R1	1,4	1,6
S1	1,44	1,46
T1		0,1
X1	0,4	0,6
Y1	5,0	

Gauging continuity process:

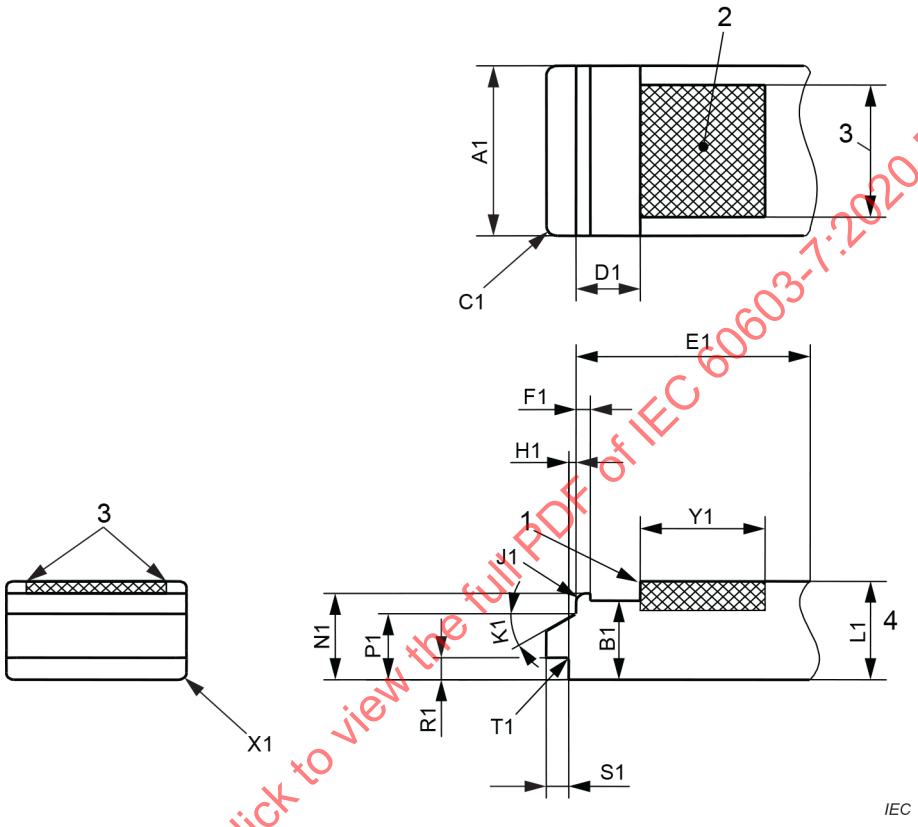
Gauge shall be made as follows (see Figure A.1):

Material: tool steel, hardened with suitable plating finish

Surface roughness, according to ISO 1302

Ra: 0,25 μm maximum

A 0,01 mm wear tolerance shall be applied.



Key

1 Sharp edge.

2 Insulation part.

3 Edge of insulation part may not extend beyond radius of steel part.

4 Dimension to edge of insulation part.

Figure A.1 – Continuity gauge

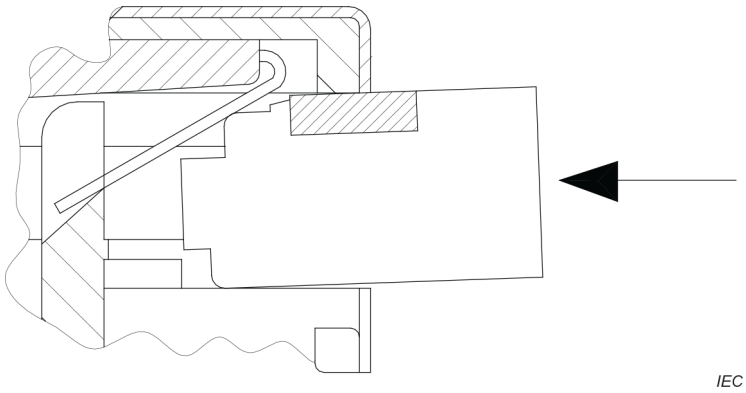


Figure A.2 – Continuity gauge insertion

Annex B
(normative)

Locking device mechanical operation

B.1 Object

The object of this mechanical endurance test is to assess the operational limits of the locking device on the free connectors.

B.2 Preparation of the specimens

The specimen shall be prepared and mounted so that the locking device is readily accessible for application of the test. No other movement of the free connector shall be allowed.

B.3 Test method

The specimen shall be subjected to mechanical operational endurance tests of the number of cycles, as specified in Table 11, group BP, test BP1.

The speed of the operation of the applied force to the locking device shall not exceed 20 cycles per minute.

The specimen shall be operated in the normal manner, and the locking device shall be depressed until it contacts the body of the free connector.

Mechanical aids which simulate normal operations may be used, provided that they do not introduce abnormal stresses.

B.4 Final measurements

After the specified number of operations, the specimens shall be examined per IEC 60512-1-1, Test 1a and show no visual indication of fatigue or stress cracking of the locking device.

Annex C
(normative)

Gauge requirements

C.1 Fixed connectors

The "Go" gauge specified in 6.1 shall be capable of being inserted and removed with a force of 8,9 N maximum.

The "No-go" gauges specified in 6.1 shall not be capable of entering the fixed connector more than 1,78 mm with an 8,9 N insertion force.

C.2 Free connectors

The connector shall be capable of insertion and latching into the "Go" gauge specified in 6.2 with a 20 N or less insertion force with the latch bar depressed.

After insertion and latching, the connector shall be capable of removal, with the latch depressed, with a removal force of 20 N or less applied at an advantageous angle.

The free connectors shall not be capable of entering the "No-go" gauges specified in 6.2 more than 1,78 mm with an 8,9 N insertion force.

Annex D
(normative)

Keystone connector information

D.1 Fixed connector, female contacts Keystone type – Type A, variant 03 in the previous edition of this standard

This annex contains the dimensions that define the panel mounting features on the connector and panel that were referenced in IEC 60603-7:2008 as the Type A, variant 03 connector. Only the dimensions pertaining to the mounting features for what has come to be called a "Keystone connector" have been retained.

The connector dimensions are shown in Figure D.1 and the panel dimensions are given in Figure D.2 (see also Table D.1 and Table D.2).

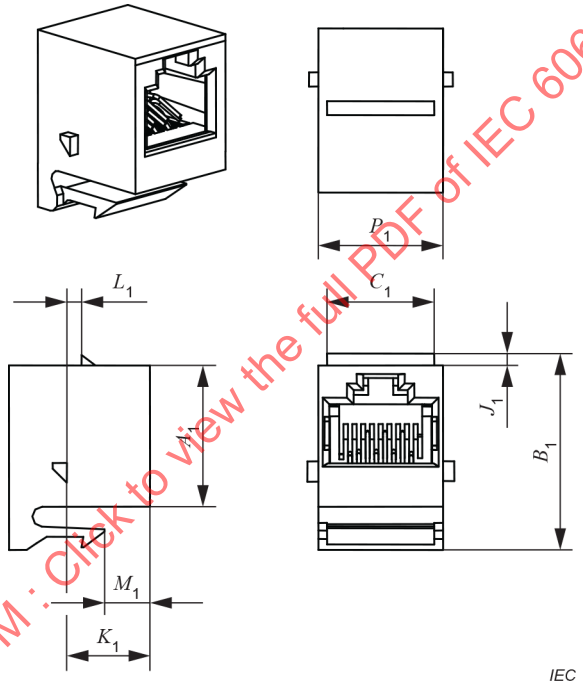


Figure D.1 – Keystone connector

Table D.1 – Dimensions for Figure D.1

~~Letter~~	~~Maximum mm~~	~~Minimum mm~~
~~A_1~~	~~16,51~~	~~16,00~~
~~B_1~~	~~22,43~~	~~22,07~~
~~C_1~~	~~12,65~~	~~12,34~~
~~J_1~~	~~1,65~~	~~1,17~~
~~K_1~~	~~9,78~~	~~9,53~~
~~L_1~~	~~1,75~~	~~1,55~~
~~M_1~~	~~5,46~~	~~5,16~~
~~P_1~~	~~14,61~~	~~14,35~~

Dimensions in millimetres

Letter	Minimum	Maximum
A_1	16,00	16,51
B_1	22,07	22,43
C_1	12,34	12,65
J_1	1,17	1,65
K_1	9,53	9,78
L_1	1,55	1,75
M_1	5,16	5,46
P_1	14,35	14,61

D.2 Mounting dimensions for type A, Keystone type variant 03

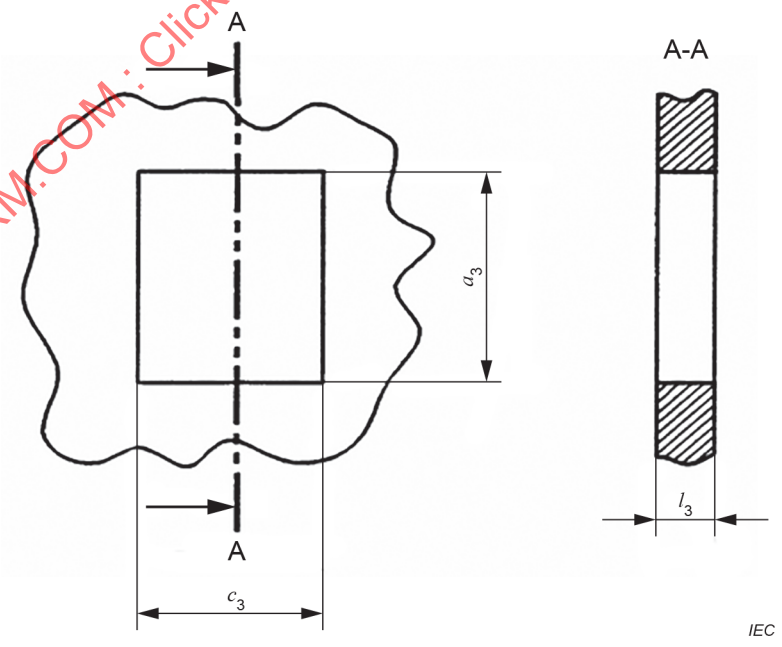


Figure D.2 – Panel drawing

Table D.2 – Dimensions for Figure D.2

~~Letter~~	~~Maximum~~ ~~mm~~	~~Minimum~~ ~~mm~~
~~a_3~~	~~19,61~~	~~19,30~~
~~c_3~~	~~15,04~~	~~14,78~~
~~l_3~~	~~1,54~~	~~1,22~~

Dimensions in millimetres

Letter	Minimum	Maximum
a_3	19,30	19,61
c_3	14,78	15,04
l_3	1,22	1,54

Annex E
(normative)

Levels of compatibility

E.1 General

In applications where connectors according to IEC 60603-7 are used, a mixture of connectors from different sources may be available. In cases where these products were given a different rating by the manufacturer, and also when dimensional details are deviating, it is important to know and consider the right level of compatibility.

The levels of compatibility are intended to compare connectors of the same gender on their capability to be mated with a complementary connector of the different gender. The levels indicate the functional differences (if any) between connector products of the same gender but from different sources.

A detail product specification under this document may declare a certain level of compatibility – e.g. in terms of backward compatibility or of interoperability – with other detail product specification(s) within the same family of standards (e.g. this IEC 60603-7 family or IEC 61076-3 family) or with a cross-reference to a connector covered by a detail product specification belonging to a different IEC family.

In fact, for historical reasons some recent additions have been assigned to this IEC 60603-7 family of standards, while other new connectors have been assigned to the IEC 61076-3 family of rectangular connectors. For this reason a similar Annex has been included in the generic specification IEC 61076-1 in order to align the terminology used in both families in regard to levels of compatibility.

The levels of compatibility between connectors from different sources are characterized – as a function of the standardization degree – by 4 levels. These levels are already defined in 2.2.3.2 to 2.2.3.5 of IEC 61076-1:2006 and shall, when appropriate, be indicated in the relevant detail product specification of connectors.

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In Table E.1, for each level of compatibility the required parameters are indicated in a graphical way.

Table E.1 – Levels of compatibility [b) c)] and required parameters [b)]

	Level of compatibility of IEC 61076-1	Number of contacts	Overall dimensions	Interface dimensions	Mounting dimensions	Electrical wiring-related dimensions	Electrical, mechanical and climatic performance
Intermountable [a)]	Level 1		x		x		
Intermateable [a)]	Level 2			x		x	
Intermountable [a)] **and intermateable** [a)]	Level 3		x	x	x	x	
Interoperable [a)]		x		x		x	x [d)]
Interchangeable [a)]	Level 4	x	x	x	x	x	x
Backward compatible [e)]		x		x		x	x [e)]

[a)] The prefix "inter" in the terms "intermountable", "intermateable", "interoperable", and "interchangeable" has the meaning of "interchangeably" (adv), i.e. intermountable = interchangeably mountable, and so on. Thus the prefix "inter" has not the meaning "among them", i.e. intermountable does not mean "mountable among them", intermateable does not mean "mateable among them". In other words, two intermateable connectors are not a male and a female connector mateable among them.

[b)] Levels of compatibility and relevant required parameters include also the influence of features for latching, locking and keying.

[c)] Special attention is required for safety: all levels of compatibility may pose a certain risk for safety, especially when voltages higher than SELV levels (50 V AC / 120 V DC) and/or high currents are applied.

[d)] Two interoperable connectors shall grant electrical, mechanical and climatic performance suitable for the application. In other words their performance level is not necessarily the same, but none of them owns a performance level unsuitable for the application.

[e)] IEC 60050-581:2008, 581-24-08: "feature of connectors which ensures at least the lower requirements in case of mating connectors with higher and lower requirements". The backward compatibility requirement ensures that a free or fixed connector in compliance with this document, when mated with a fixed or free connector in compliance with any lower frequency IEC 60603-7 series connector standard, fully complies with the requirements of the lower frequency IEC 60603-7 series connector standard.

E.2 Intermountability

The term intermountable (adj) and consequently intermountability (noun) is defined in IEC 60050-581:2008, 581-24-04: "pertaining to each of two connectors when their overall dimensions, dimensions on printed board or panel cut-out, and cable termination are identical".

This level of compatibility is defined as level 1 – Intermountable in 2.2.3.2. of IEC 61076-1:2006. This level standardizes only overall dimensions and mounting dimensions on printed board or panel cut-out and cable termination assembly; mating face dimensions are not relevant to standardize intermountability.

This means that each of two intermountable connectors will fit in a given location (e.g. a position/footprint on a PCB, and/or in a panel cut-out, and/or at the end of a cable). The electrical (e.g. different current and/or voltage rating) or mechanical performance (one connector may be a free or fixed connector with male contacts, the other one with female contacts) may be different. This IEC 60050-581 description even allows two connectors with two completely different types of interface.

Intermountability – once declared for a connector by its manufacturer with respect to certain dimensions common to other products or product families – shall be declared by referencing an unambiguous set of dimensions. This may also be achieved by reference to a set of dimensions as given by a published standard.

E.3 Intermateability

The term intermateable (adj) and consequently intermateability (noun) is defined in IEC 60050-581:2008, 581-24-07: "pertaining to each of two connectors when they feature identical dimensions for electrical and mechanical interfaces".

This level of compatibility is defined as level 2 – Intermateable in 2.2.3.3 of IEC 61076-1:2006. This level standardizes only the dimensions of the mating contact interfaces. The electrical and mechanical and environmental performances and the functionality of connectors from different sources, when mated, are not fully guaranteed.

In other words: here, each of two connectors will fit in one counterpart connector, but the electrical, mechanical and environmental performances and the functionality may be different. For instance: the two connectors from different sources may contain a different number of contacts, different conductive materials, differently rated insulating materials – if the relevant product detail specification allows such choice, different – although compatible – contact plating, different sizing of wire terminations or conductive paths, thus differently sized allowed wiring).

Intermateability shall be proven by testing the mechanical performance and verification of the electrical conductivity of the mated electrical contacts according the relevant requirements of the Product Detail Specification.

NOTE 1 Intermateable connectors can have different number of contacts (ways), i.e. a different electrical interface, within the same mechanical interface. It is allowed that the missing contacts of one of them do not mate with the contacts of the corresponding mating connector, as well as the opposite, i.e. the contacts in excess of one of them do not find correspondence in the corresponding mating connector.

A connector can have less female contacts but due to the lack of holes to accept the male contacts may not be intermateable with a connector having a full set of male contacts.

As the mechanical interface does not include overall dimensions and mounting dimensions covered by intermountability (Clause E.2), two connectors may be intermateable but not intermountable.

NOTE 2 In general, detail product specifications for connectors include dimensions to provide that two connectors in compliance with that detail specification are both intermountable and intermateable, see Clause E.4.

E.4 Intermountability and intermateability

The terms intermountable (adj.) and intermateable (adj.) and consequently the relevant nouns "intermountability" and "intermateability" are already defined in IEC 60050-581 as described in Clause E.2 and Clause E.3.

There is a further level of compatibility defined as level 3 – Intermountable and intermateable in 2.2.3.4 of IEC 61076-1:2006. This level standardizes mounting dimensions, electrical and mechanical interface and overall dimensions.

This means that each of two intermountable and intermateable connectors will fit in a given location (e.g. a position/footprint on a PCB, and/or in a panel cut-out, and/or at the end of a cable) and each of two connectors will fit in one counterpart connector, but the electrical, mechanical and environmental performances and the functionality may be different. For instance: the two connectors from different sources may contain a different number of contacts within a compatible mating face geometry, different conductive materials, differently rated insulating materials (if the relevant product detail specification allows such choice), different – although compatible – contact plating, different sizing of wire terminations or conductive paths, thus differently sized allowed wiring.

Intermateability shall be demonstrated as described in Clause E.3, intermountability as described in Clause E.2.

NOTE Intermateable connectors may have different number of contacts (ways), i.e. a different electrical interface, within the same mechanical interface. It is allowed that the missing contacts of one of them do not mate with the contacts of the corresponding mating connector, as well as the opposite, i.e. the contacts in excess of one of them do not find correspondence in the corresponding mating connector.

E.5 Interoperability

A connector is interoperable with another connector of the same gender but from different source or product family if the two connectors are intermateable and if both connectors offer the same contact functions. In the case of interoperability, the level of performance of this interoperability is always that of the less performing connector, and the performance level shall be suitable for the application. One of the two interoperable connectors of the same gender may be provided with a level of performance in excess of the requirements for the application, none can be provided with performance level unfit for the application

In other words: here, each of two connectors will fit and contact in one counterpart connector. The electrical, mechanical and climatic performances may be different but the functionality is similar. The two connectors from different manufacturers will contain the same number of contacts, but may be produced of different conductive materials, differently rated insulating materials – if the relevant product detail specification allows such choice. Also, different – although compatible – contact plating, different wire termination sizes or conductive paths, may occur.

NOTE Connector specifications according to IEC 61984 cannot be met with interoperable connectors from different sources.

E.6 Interchangeability

The term interchangeable (adj.) and consequently interchangeability (noun) is defined in IEC 60050-581:2008, 581-24-03: "pertaining to a connector when all elements guaranteeing compliance of electrical, mechanical and climatic performance of mated connectors when individual connector halves are from different sources".

This level of compatibility is defined as level 4 – Interchangeable in 2.2.3.5 in IEC 61076-1:2006. This level standardizes all the elements guaranteeing compliance of the electrical, mechanical and environmental performances of mated connector pairs when individual connectors are from different sources.

To be interchangeable, the form, fit, function and performance of connectors from different sources are identical, so that a connector from one source can be replaced by a similar connector from another source without loss of functionality or performance of the connector pair.

NOTE The term "identical" when addressing dimensions and ratings is used herein with the meaning "within the tolerances provided either by a published detail product specification (standard sheet) or as a result of a comparison of the different manufacturer detail product specifications and/or drawings".

Interchangeability shall be proven by comparison of the drawings and completion of the full test schedule of the Detail Product Specification on all possible combinations of the interchangeable connectors.

E.7 Backward compatibility

Backward compatibility is defined in IEC 60050-581:2008, 581-24-08: "feature of connectors which ensures at least the lower requirements in case of mating connectors with higher and lower requirements".

Backward compatibility is a subset of intermateability. Backward compatibility between two connectors from different sources or different type or product family is only possible when these are intermateable as per Clause E.3. In cases where connectors are intermateable they may have different levels of performance. For backward compatible connectors, as a minimum the lower of these two levels is guaranteed.

For instance: the backward compatibility requirement ensures that a free or fixed connector which is in compliance with this standard, which is mated with a fixed or free connector in compliance with any lower frequency IEC 60603-7 series connector, fully complies with the requirements of the lower frequency IEC 60603-7 series connector.

Backward compatibility shall be proven by testing all possible combinations of the backward compatible connectors against the full test schedule of the Detail Product Specification with the lower requirement.

Bibliography

IEC 60068-2-61:1991, *Environmental testing – Part 2-61: Test methods – Test Z/ABDM:Climatic sequence*

IEC 60603-7-1, *Connectors for electronic equipment – Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors*

IEC 60603-7-2, *Connectors for electronic equipment – Part 7-2: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-3, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-4, *Connectors for electronic equipment – Part 7-4: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*

IEC 60603-7-5, *Connectors for electronic equipment – Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*

IEC 60603-7-7, *Connectors for electronic equipment – Part 7-7: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 600 MHz*

IEC 60603-7-41, *Connectors for electronic equipment – Part 7-41: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz* [3]

IEC 60603-7-51, *Connectors for electronic equipment – Part 7-51: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz* [4]

IEC 60603-7-71, *Connectors for electronic equipment – Part 7-71: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 1 000 MHz* [5]

IEC 61169-16, *Radio-frequency connectors – Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (Type N)*

IEC 61984, *Connectors – Safety requirements and tests*

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

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[3] To be published.

[4] To be published.

[5] To be published.

IEC 60603-7

Edition 4.0 2020-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Connecteurs pour équipements électroniques – Partie 7: Spécification particulière pour les fiches et les embases non écrantées à 8 voies

IEC 60603-7:2020-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

CONNECTORS FOR ELECTRONIC EQUIPMENT –

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

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.
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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

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

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.

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.

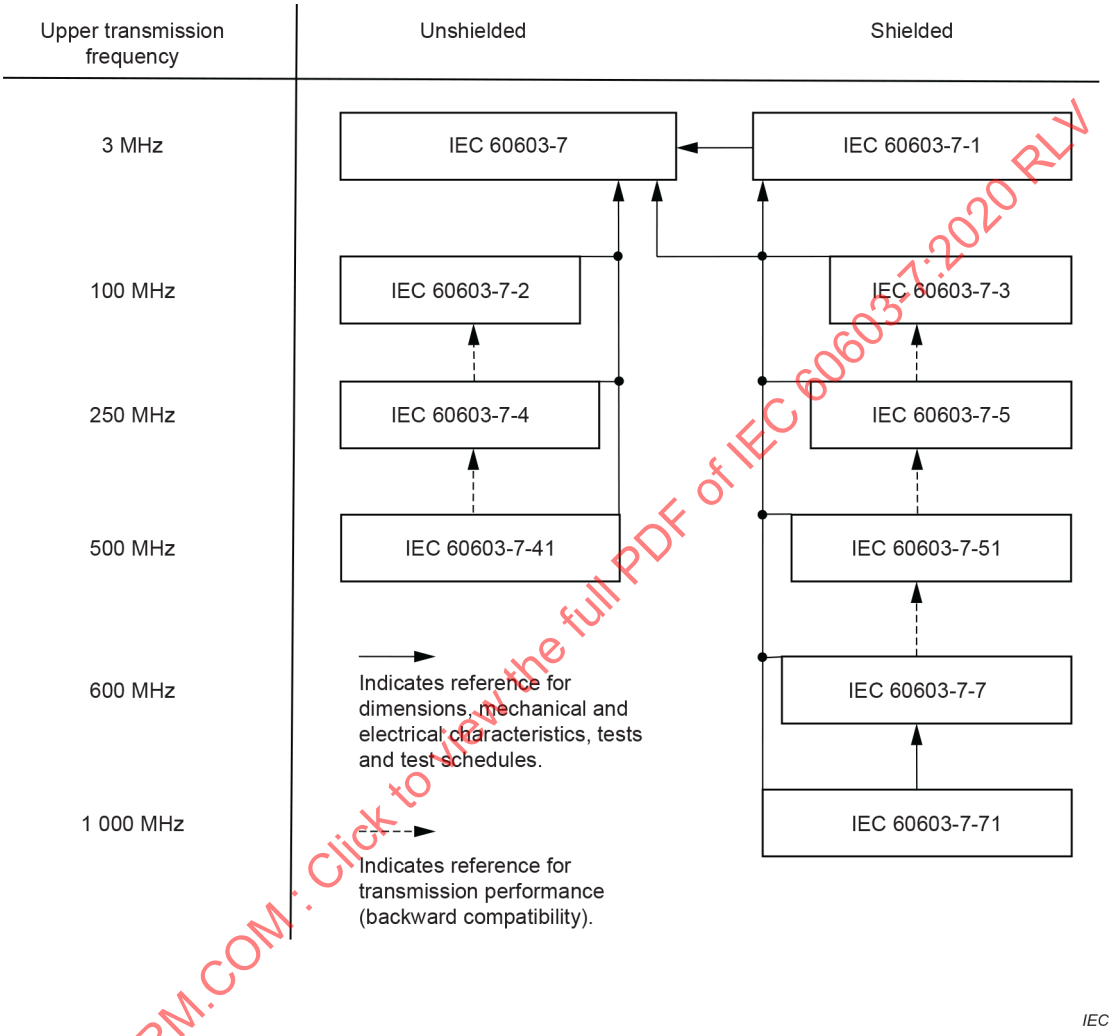


Figure 1 – IEC 60603-7 family document diagram

CONNECTORS FOR ELECTRONIC EQUIPMENT –

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

1 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 60068-2-38: *Environmental testing – 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: Accessible insulation displacement (ID) connections – General requirements, test methods and practical guidance*

IEC 60352-4, *Solderless connections – Part 4: 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 60512-1, *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 61156-2, *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 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 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.20:2000[1], *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

ITU-T Recommendation K.44:2000[2], *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*

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

[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.

3.1
intermateability
intermateability (level 2 of IEC 61076-1) 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 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)

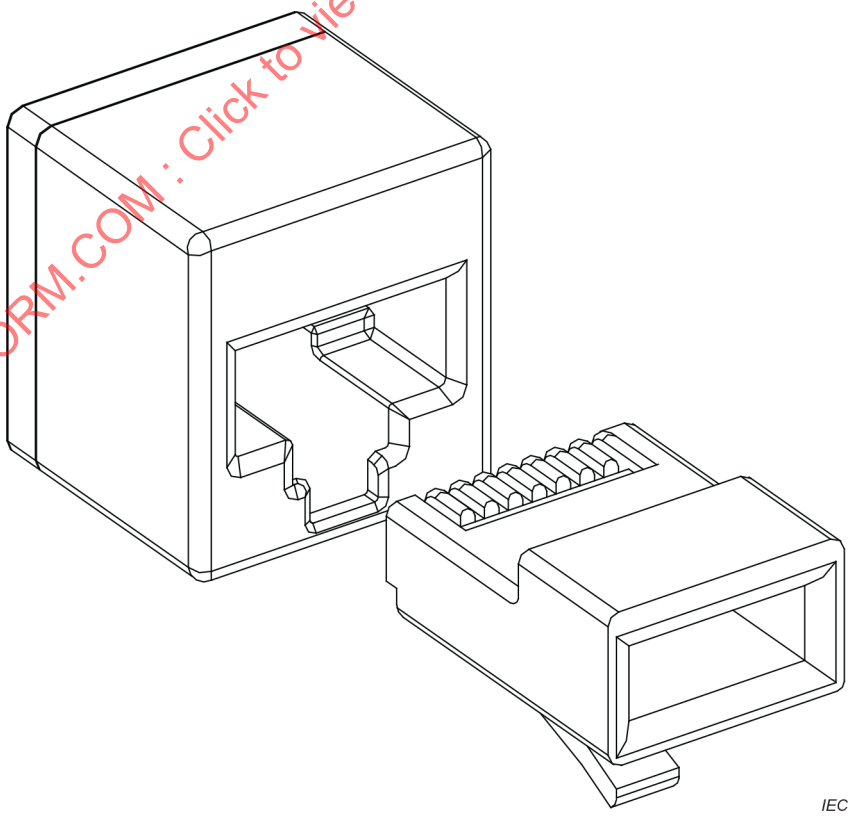


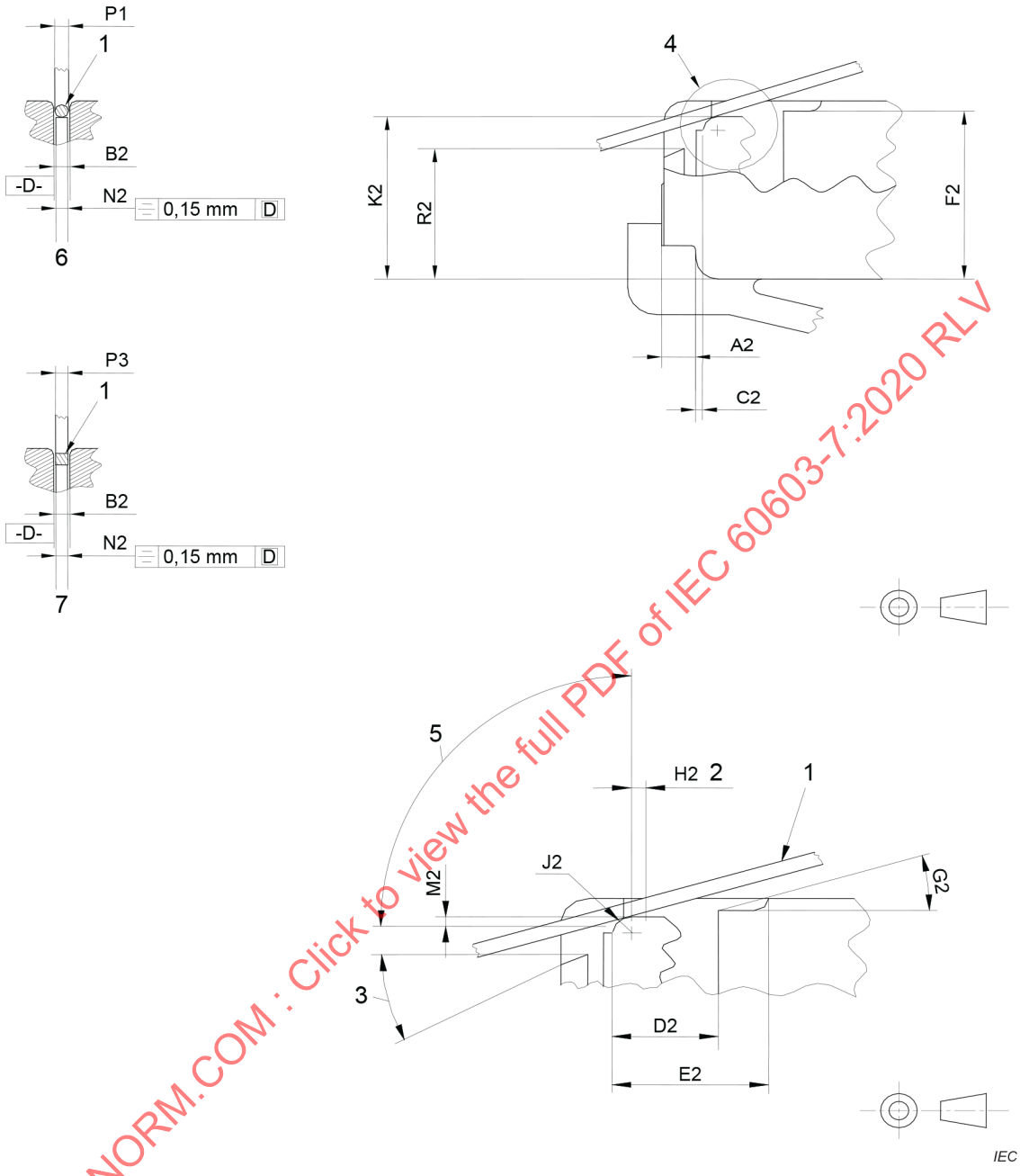
Figure 2 – View showing typical fixed and free connectors

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.

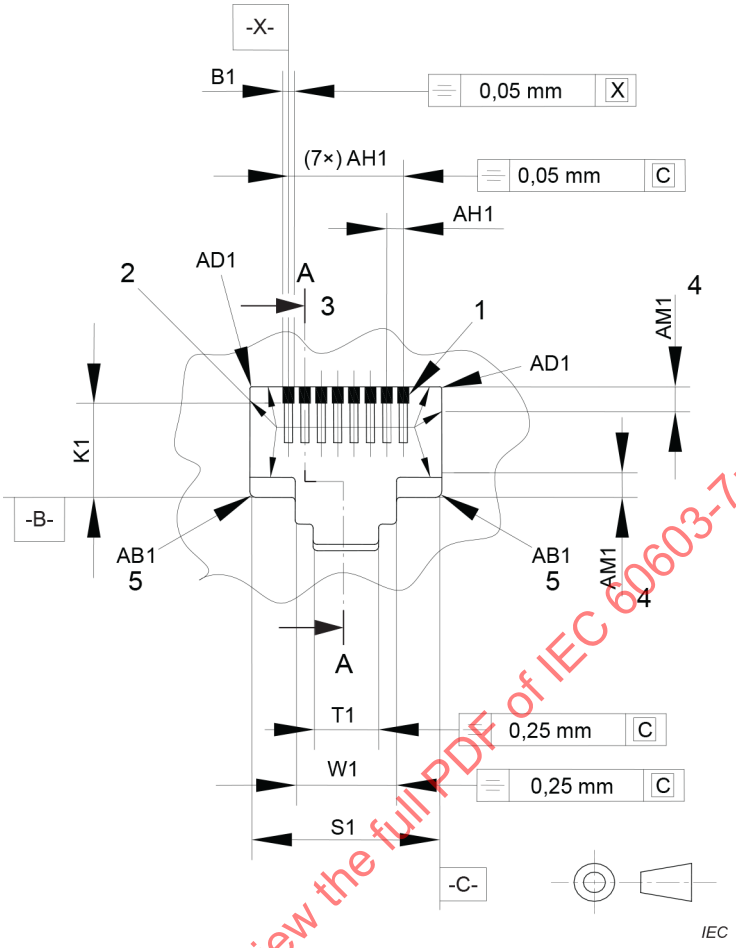
Figure 3 – Contact interface dimensions with terminated free connector

Table 1 – Dimensions for Figure 3

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



Key

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

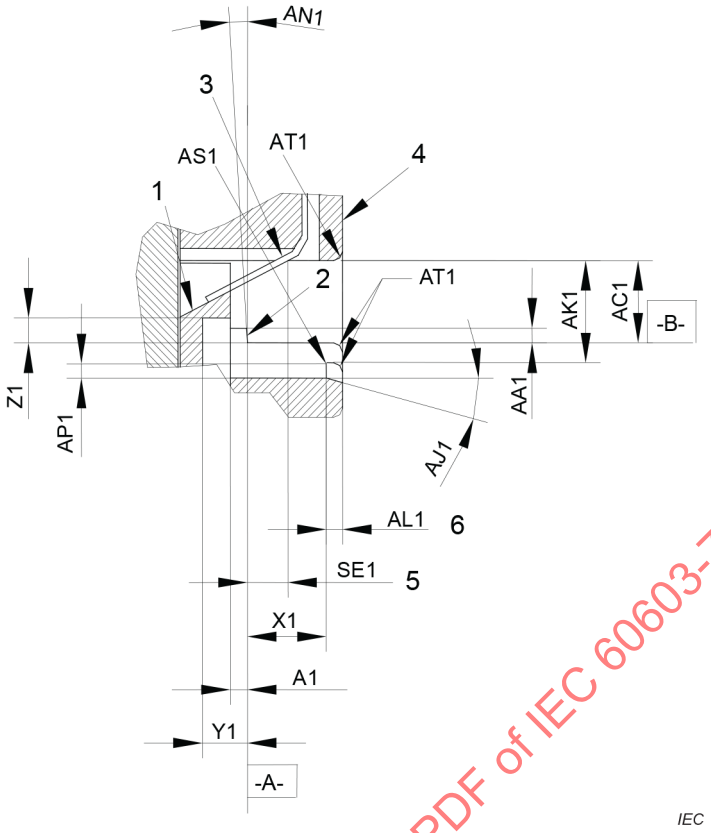
2 0°15' maximum taper.

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



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

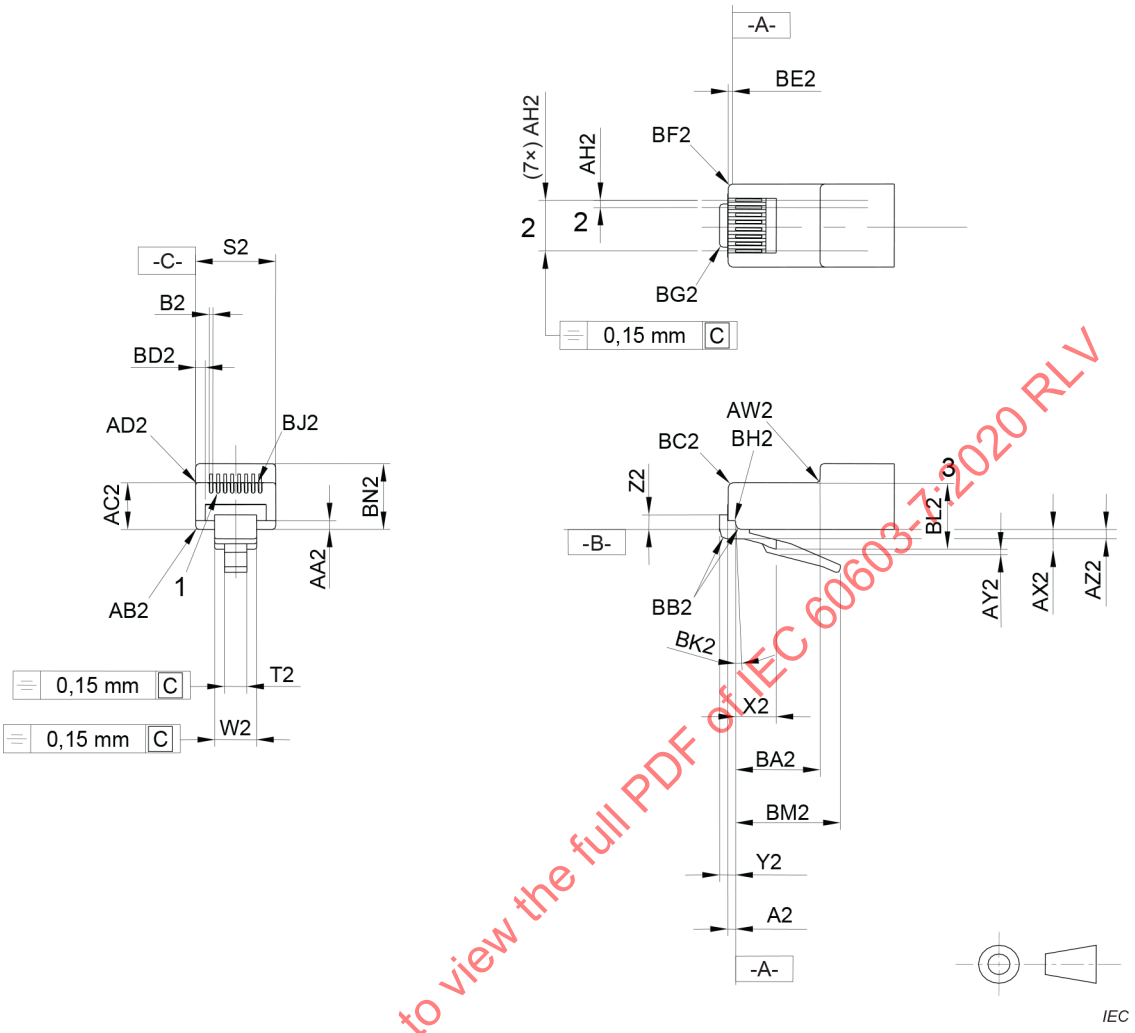
Table 2 – Dimensions for Figure 4

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.

Figure 5 – Free connector view

Table 3 – Dimensions for Figure 5

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

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:

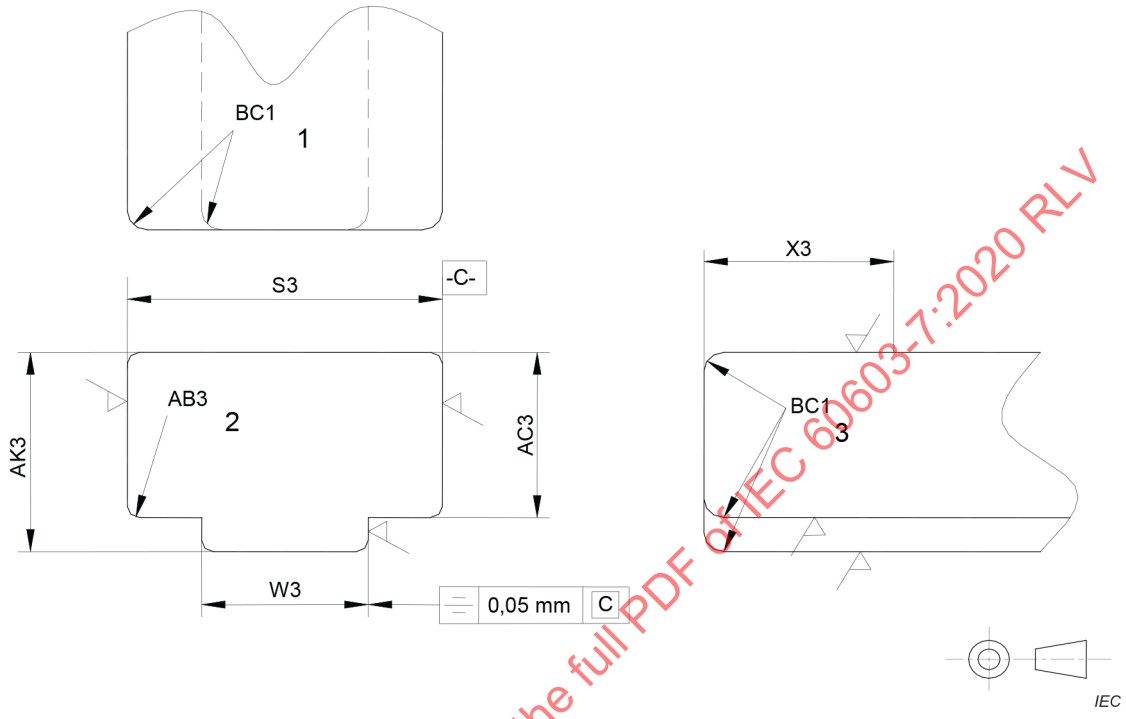
Material: hardened and tempered steel, all sharp edges removed, hardness 650 HV 20 minimum.

$\sqrt{}$ = Surface roughness, according to ISO 1302.

Ra = 0,25 μm maximum.

A 0,01 mm wear tolerance shall be applied.

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).



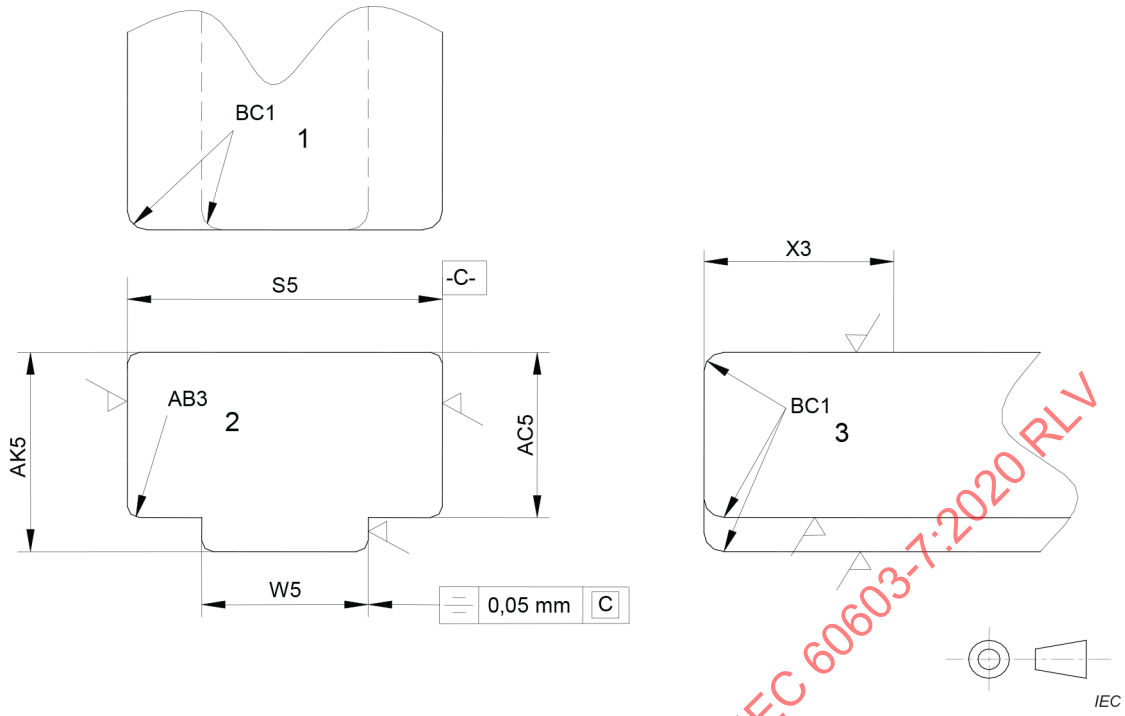
Key

1 Four places.

2 Six places.

3 All around.

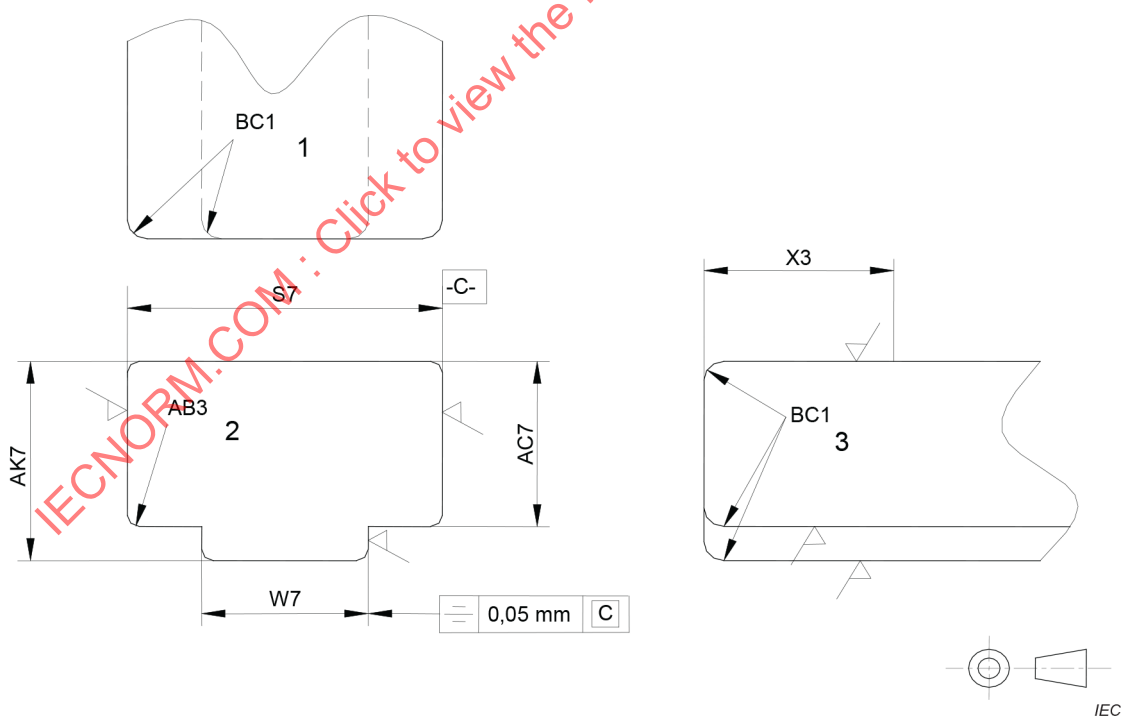
Figure 6 – Fixed connector "Go" gauge



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

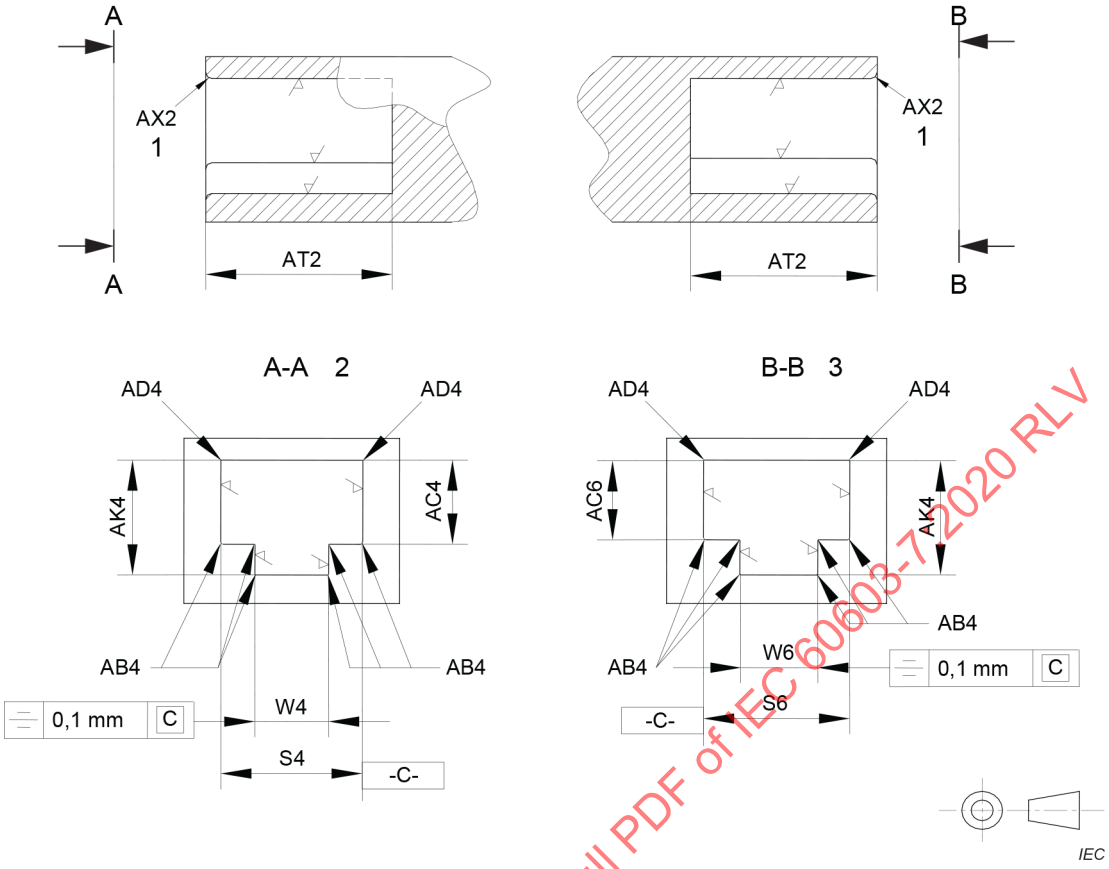
Material: hardened and tempered steel, all sharp edges removed, hardness 650 HV 20 minimum.

$\sqrt{}$ = Surface roughness, according to ISO 1302.

Ra = 0,25 μm maximum.

A 0,01 mm wear tolerance shall be applied.

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.

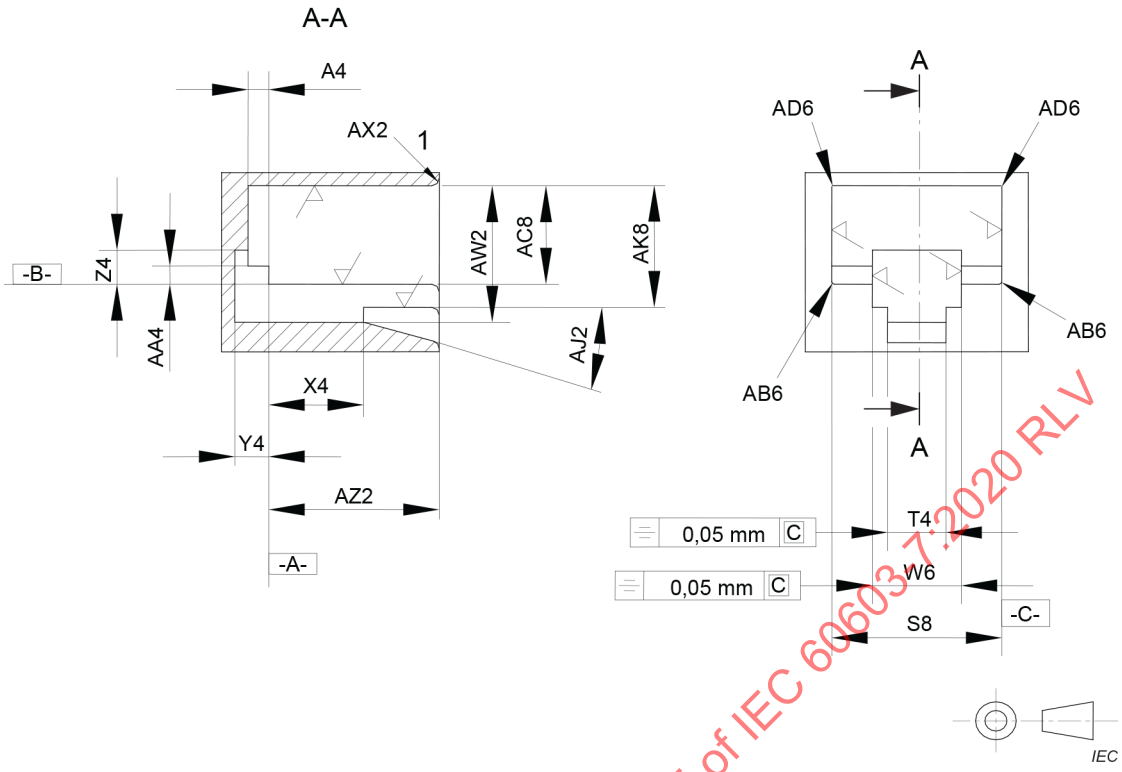
3 Height gauge.

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.

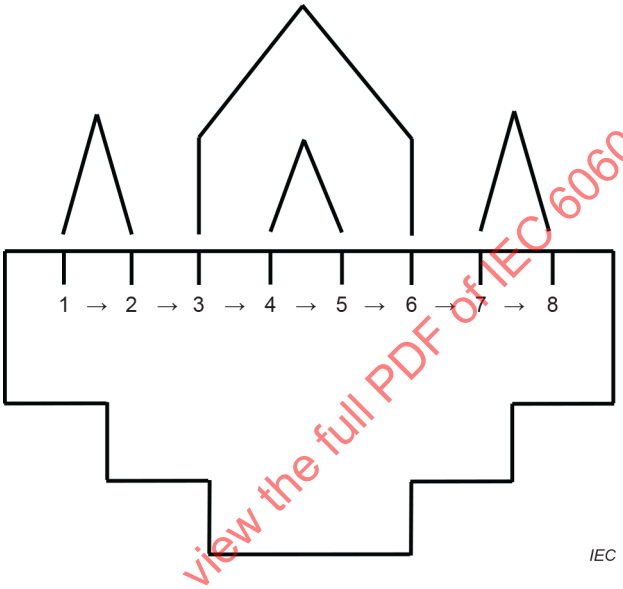


Figure 10 – Fixed connector pin and pair grouping assignment (front view of connector)

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
40/090/21	−40	90	21

NOTE 1 The 90 ºC UCT shall be verified by testing at 70 ºC 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.

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 can occur due to the conductive pattern of the printed board or the wiring used, and 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.

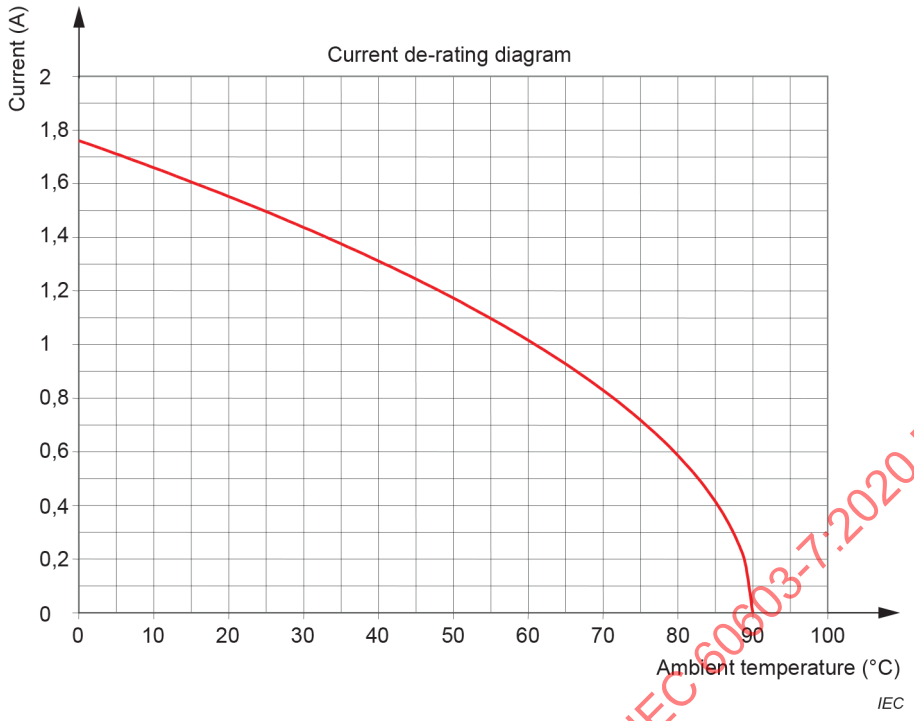
1 500 V DC or AC peak; all contacts connected together to shield, (housing/mounting plate) if present.

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 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.

Figure 11 – Connector de-rating curve

7.4.4 Interface contact resistance – initial only

Conditions: IEC 60512, Test 2a

Arrange according to 8.2

Mated connectors

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

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

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.

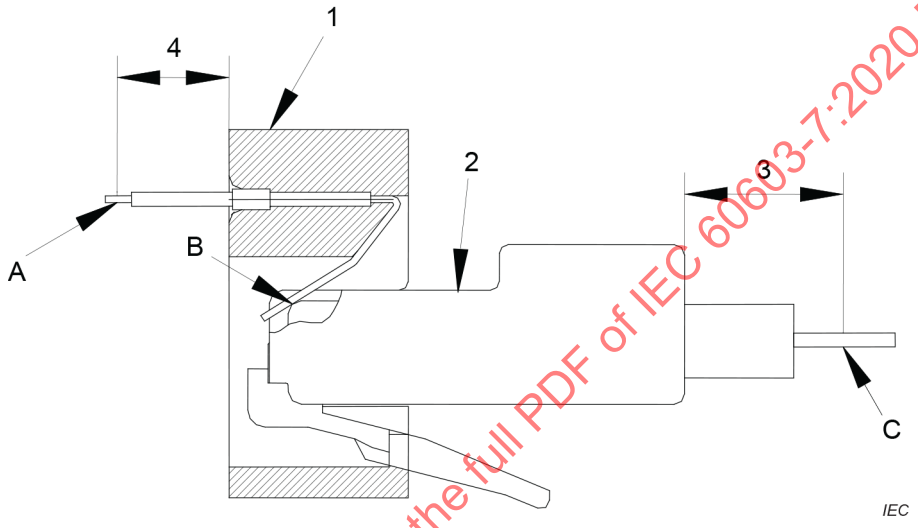
It is permissible to limit the number of variants tested to a selection representative of the whole range for which approval is required (which may be less than the range covered by the detail specification), but each feature and characteristic shall be validated against the dimensional requirements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

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: B_1: on the contact of fixed connector, B_2: 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 B_1 of Figure 11 by measurement of the unmated fixed connector. This resistance is noted and recorded as R_{AB_1}.

Determine the bulk resistance of the free connector between points B_2 and C of Figure 11 by measurement of the unmated free connector. This resistance is noted and recorded as R_{B_2C}.

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

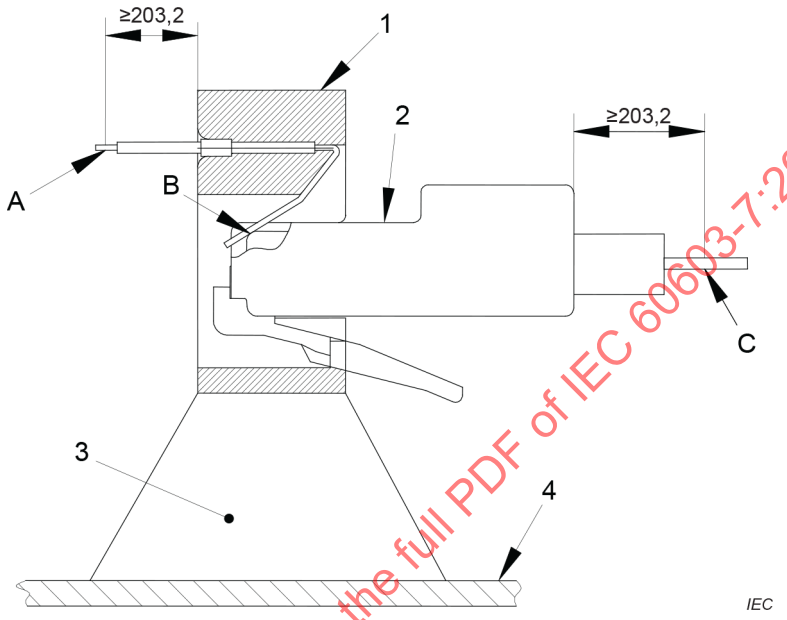
$$\text{Contact resistance} = R_{AC} - (R_{AB_1} + R_{B_2C})$$

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.

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		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	50 N for 60 s ± 5 s Rate of load application 44,5 N/s maximum			
AP3	Rapid change of temperature	11d	−40 °C to 70 °C Mated connectors 25 cycles ι = 30 min Recovery time 2 h			
AP4			Test voltage 100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirements
AP5			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
AP6			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
AP7			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
AP8	Cyclic damp heat	See IEC 60068-2-38	21 cycles: low temperature 25 °C; high temperature 65 °C; cold subcycle −10 °C; humidity 93 % Half of the samples in mated state Half of the samples in unmated state			
AP9			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
AP10	Insertion and withdrawal forces	13b	Connector locking device depressed			Insertion force 20 N maximum Withdrawal force 20 N maximum
AP11	Effectiveness of connector coupling device	15f	50 N for 60 s ± 5 s Rate of load application 44,5 N/s maximum			
AP12			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
AP13	Solderability		As applicable			
AP14	Resistance to soldering heat		As applicable			
AP15 [a]			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

[a] Test phase AP15 shall only be carried out if test phases AP13 and AP14 are performed.

8.7.3.4 Test group BP

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	Locking-device mechanical operations		2 N operations (see mechanical operations)			See Annex B
BP2	Mechanical operations	9a	N/2 operations (see 7.6.1). Speed 10 mm/s. Rest 1 s (when mated and unmated). Locking device inoperative			
BP3	Flowing mixed gas corrosion	11g	Method 1 4 days Half of the samples in mated state Half of the samples in unmated state			
BP4			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
BP5	Mechanical operations	9a	N/2 operations (see 7.6.1) Speed 10 mm/s. Rest 5 s (when unmated). Locking device inoperative			
BP6			Measurement points as in Figure 12 All contacts/specimen	Contact resistance	2a	20 mΩ maximum change from initial
BP7			100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
BP8			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
BP9				Visual examination	1a	There shall be no defects that would impair normal operation

8.7.3.5 Test group CP

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	Vibration	6d	f = 10 Hz to 500 Hz, Amplitude = 0,35 mm Acceleration = 50 m/s^2 10 sweeps/axis Measurement points as in Figure 12	Contact disturbance	2e	10 µs maximum
CP2			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement No disturbance of the free connector to fixed connector electrical connections, between vibration test and contact resistance measurement.
CP3			Test voltage 100 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
CP4			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation

8.7.3.6 Test group DP

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	Electrical load and temperature	9b	5 connectors 500 h 70 °C Recovery period 2 h 0,8 A 5 connectors 0 A 5 connectors			
DP2			Test voltage 100 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
DP3			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
DP4			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation
DP5			Measuring points as in Figure 12 All contacts/specimens	Contact resistance	2a	20 mΩ maximum change from initial measurement
DP6	Gauging	Annex C				All samples tested shall pass all gauges and forces
DP7	Gauging continuity	Annex A	All contacts/specimen	Contact disturbance	2e	10 μs maximum

8.7.3.7 Test group EP

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	Not applicable					
EP2	Not applicable					
EP3	Not applicable					
EP4	Not applicable					
EP5	Not applicable					
EP6	Not applicable					
EP7	Input to output resistance		Measuring points as defined in Figure 12 All signal contacts	Millivolt level method	2a	Per 7.4.57.4.5.
EP8	Input-to-output DC resistance unbalance		Measuring points as defined in Figure 12 All signal contacts	Millivolt level method	2a	Per 7.4.6.
All measurements to be performed on mated connectors.						

8.7.3.8 Test Group FP

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	Surge test	ITU-T K.20:2000	Mated connectors Table 2a/2b, basic test level Tests 2.1.1a, 2.1.1b, 2.1.3, 2.2.1a, and 2.3.1a (For test 2.3.1a, the load (resistor) value shall be ≥ 40 Ω; line a and line b shall be directly interconnected behind the connector, and a-terminal and b-terminal, respectively, directly connected to ground.).			Test 2.1 and 2.2: Acceptance criterion A per ITU-T K.44:2000, Clause 9 Test 2.3: Acceptance criterion B per ITU-T K.44, Clause 9
FP2			100 V DC ± 15 V DC Method A Mated connectors	Insulation resistance	3a	500 MΩ minimum
FP3			Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operation

Annex A
(normative)

Gauging continuity procedure

A.1 Object

The object of this test is to check whether, in worst-case conditions of the free connector, the electrical continuity is guaranteed.

A.2 Preparation of the specimens

This test is carried out using a gauge according to Figure A.1 (see also Table A.1).

A.3 Test method

The test specimen, suitably mounted with the gauge inserted to its fullest extent, is tested according to IEC 60512-2-5, Test 2e. The test shall be repeated for each individual contact of the fixed connector.

For the test of the signal contacts, the gauge shall be fully inserted and then be moved upwards until it stops against the plastic wall of the fixed connector (see Figure A.2).

For the test of the screen contact, the gauge shall be fully inserted and then be moved to both sides of the connector until it stops against the plastic wall of the fixed connectors. This movement shall be repeated 3 times.

During the movements, a forward force of 20 N minimum shall be applied as indicated by the arrow in Figure A.2.

A.4 Final measurements

The test requirements shall be satisfied if no discontinuity ≥ 10 μs is measured for each individual contact.

A.5 Description of the continuity gauge

The gauge shall be made according to the following specification:

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. The surface should be compatible with the contact finish of the connector under test.

A 0,01 mm wear tolerance shall be applied.

Table A.1 – Dimensions for Figure A.1

Dimensions in millimetres

Letter	Minimum	Maximum
A1	11,57	11,59
B1		4,90
C1	0,6	0,8
D1	4,10	4,12
E1	15,0	
F1	0,79	0,89
H1	0,45	0,47
J1	0,59	0,69
K1	24°	30°
L1	6,70	6,72
N1	5,88	5,90
P1	4,3	4,7
R1	1,4	1,6
S1	1,44	1,46
T1		0,1
X1	0,4	0,6
Y1	5,0	

Gauging continuity process:

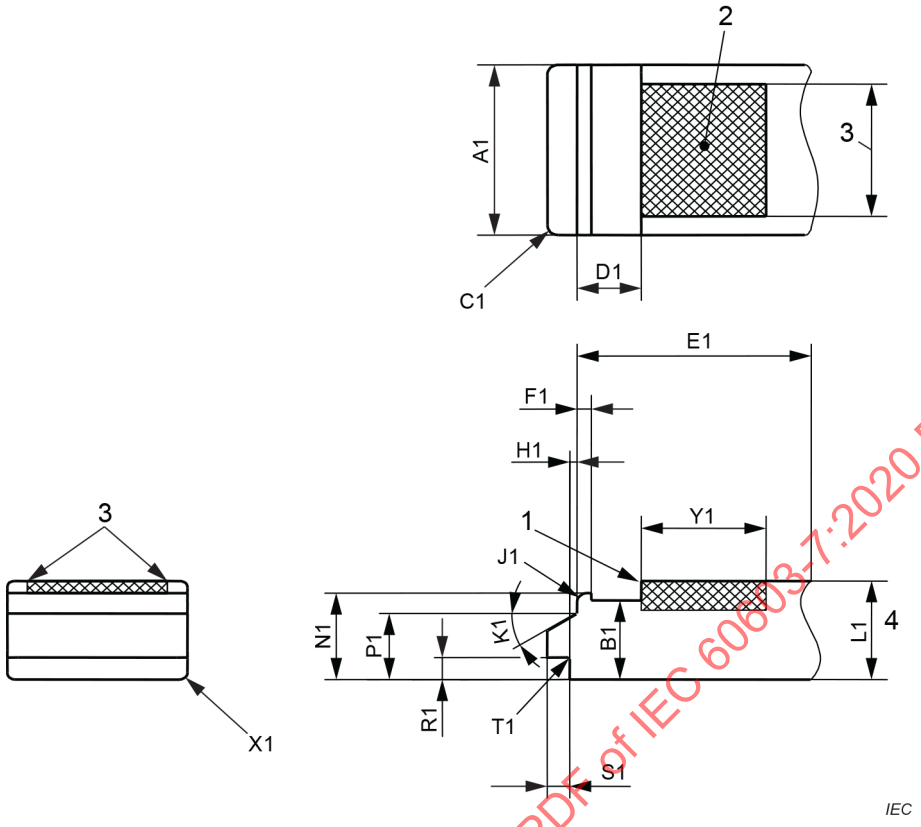
Gauge shall be made as follows (see Figure A.1):

Material: tool steel, hardened with suitable plating finish

Surface roughness, according to ISO 1302

Ra: 0,25 μm maximum

A 0,01 mm wear tolerance shall be applied.



Key

1 Sharp edge.

2 Insulation part.

3 Edge of insulation part may not extend beyond radius of steel part.

4 Dimension to edge of insulation part.

Figure A.1 – Continuity gauge

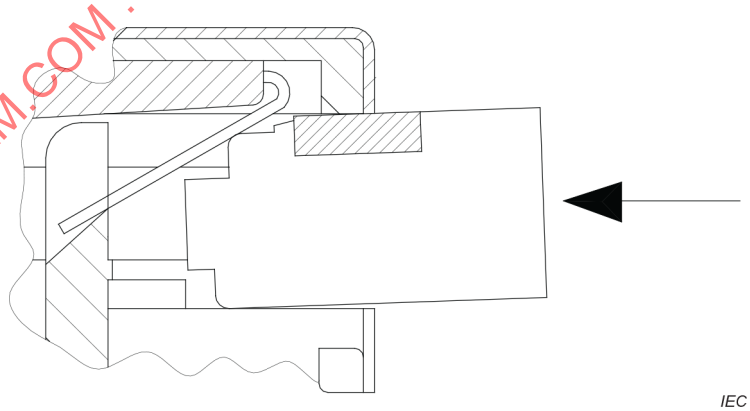


Figure A.2 – Continuity gauge insertion

Annex B
(normative)

Locking device mechanical operation

B.1 Object

The object of this mechanical endurance test is to assess the operational limits of the locking device on the free connectors.

B.2 Preparation of the specimens

The specimen shall be prepared and mounted so that the locking device is readily accessible for application of the test. No other movement of the free connector shall be allowed.

B.3 Test method

The specimen shall be subjected to mechanical operational endurance tests of the number of cycles, as specified in Table 11, group BP, test BP1.

The speed of the operation of the applied force to the locking device shall not exceed 20 cycles per minute.

The specimen shall be operated in the normal manner, and the locking device shall be depressed until it contacts the body of the free connector.

Mechanical aids which simulate normal operations may be used, provided that they do not introduce abnormal stresses.

B.4 Final measurements

After the specified number of operations, the specimens shall be examined per IEC 60512-1-1, Test 1a and show no visual indication of fatigue or stress cracking of the locking device.

Annex C
(normative)

Gauge requirements

C.1 Fixed connectors

The "Go" gauge specified in 6.1 shall be capable of being inserted and removed with a force of 8,9 N maximum.

The "No-go" gauges specified in 6.1 shall not be capable of entering the fixed connector more than 1,78 mm with an 8,9 N insertion force.

C.2 Free connectors

The connector shall be capable of insertion and latching into the "Go" gauge specified in 6.2 with a 20 N or less insertion force with the latch bar depressed.

After insertion and latching, the connector shall be capable of removal, with the latch depressed, with a removal force of 20 N or less applied at an advantageous angle.

The free connectors shall not be capable of entering the "No-go" gauges specified in 6.2 more than 1,78 mm with an 8,9 N insertion force.

Annex D
(normative)

Keystone connector information

D.1 Fixed connector, female contacts Keystone type – Type A, variant 03 in the previous edition of this standard

This annex contains the dimensions that define the panel mounting features on the connector and panel that were referenced in IEC 60603-7:2008 as the Type A, variant 03 connector. Only the dimensions pertaining to the mounting features for what has come to be called a "Keystone connector" have been retained.

The connector dimensions are shown in Figure D.1 and the panel dimensions are given in Figure D.2 (see also Table D.1 and Table D.2).

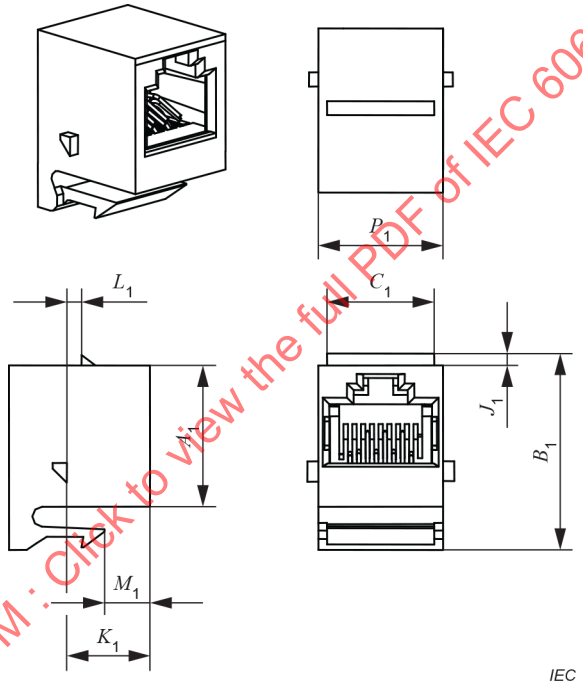


Figure D.1 – Keystone connector

Table D.1 – Dimensions for Figure D.1

Dimensions in millimetres

Letter	Minimum	Maximum
A_1	16,00	16,51
B_1	22,07	22,43
C_1	12,34	12,65
J_1	1,17	1,65
K_1	9,53	9,78
L_1	1,55	1,75
M_1	5,16	5,46
P_1	14,35	14,61

D.2 Mounting dimensions for type A, Keystone type variant 03

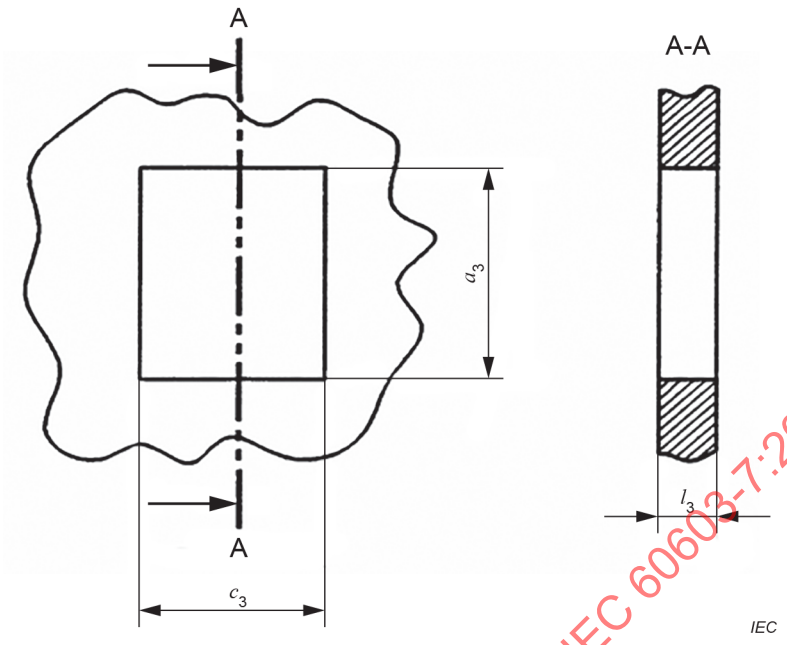


Figure D.2 – Panel drawing

Table D.2 – Dimensions for Figure D.2

Dimensions in millimetres

Letter	Minimum	Maximum
a_3	19,30	19,61
c_3	14,78	15,04
l_3	1,22	1,54

Annex E
(normative)

Levels of compatibility

E.1 General

In applications where connectors according to IEC 60603-7 are used, a mixture of connectors from different sources may be available. In cases where these products were given a different rating by the manufacturer, and also when dimensional details are deviating, it is important to know and consider the right level of compatibility.

The levels of compatibility are intended to compare connectors of the same gender on their capability to be mated with a complementary connector of the different gender. The levels indicate the functional differences (if any) between connector products of the same gender but from different sources.

A detail product specification under this document may declare a certain level of compatibility – e.g. in terms of backward compatibility or of interoperability – with other detail product specification(s) within the same family of standards (e.g. this IEC 60603-7 family or IEC 61076-3 family) or with a cross-reference to a connector covered by a detail product specification belonging to a different IEC family.

In fact, for historical reasons some recent additions have been assigned to this IEC 60603-7 family of standards, while other new connectors have been assigned to the IEC 61076-3 family of rectangular connectors. For this reason a similar Annex has been included in the generic specification IEC 61076-1 in order to align the terminology used in both families in regard to levels of compatibility.

The levels of compatibility between connectors from different sources are characterized – as a function of the standardization degree – by 4 levels. These levels are already defined in 2.2.3.2 to 2.2.3.5 of IEC 61076-1:2006 and shall, when appropriate, be indicated in the relevant detail product specification of connectors.

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In Table E.1, for each level of compatibility the required parameters are indicated in a graphical way.

Table E.1 – Levels of compatibility [b) c)] and required parameters [b)]

	Level of compatibility of IEC 61076-1	Number of contacts	Overall dimensions	Interface dimensions	Mounting dimensions	Electrical wiring-related dimensions	Electrical, mechanical and climatic performance
Intermountable [a)]	Level 1		x		x		
Intermateable [a)]	Level 2			x		x	
Intermountable [a)] **and intermateable** [a)]	Level 3		x	x	x	x	
Interoperable [a)]		x		x		x	x [d)]
Interchangeable [a)]	Level 4	x	x	x	x	x	x
Backward compatible [e)]		x		x		x	x [e)]

[a)] The prefix "inter" in the terms "intermountable", "intermateable", "interoperable", and "interchangeable" has the meaning of "interchangeably" (adv), i.e. intermountable = interchangeably mountable, and so on. Thus the prefix "inter" has not the meaning "among them", i.e. intermountable does not mean "mountable among them", intermateable does not mean "mateable among them". In other words, two intermateable connectors are not a male and a female connector mateable among them.

[b)] Levels of compatibility and relevant required parameters include also the influence of features for latching, locking and keying.

[c)] Special attention is required for safety: all levels of compatibility may pose a certain risk for safety, especially when voltages higher than SELV levels (50 V AC / 120 V DC) and/or high currents are applied.

[d)] Two interoperable connectors shall grant electrical, mechanical and climatic performance suitable for the application. In other words their performance level is not necessarily the same, but none of them owns a performance level unsuitable for the application.

[e)] IEC 60050-581:2008, 581-24-08: "feature of connectors which ensures at least the lower requirements in case of mating connectors with higher and lower requirements". The backward compatibility requirement ensures that a free or fixed connector in compliance with this document, when mated with a fixed or free connector in compliance with any lower frequency IEC 60603-7 series connector standard, fully complies with the requirements of the lower frequency IEC 60603-7 series connector standard.

E.2 Intermountability

The term intermountable (adj) and consequently intermountability (noun) is defined in IEC 60050-581:2008, 581-24-04: "pertaining to each of two connectors when their overall dimensions, dimensions on printed board or panel cut-out, and cable termination are identical".

This level of compatibility is defined as level 1 – Intermountable in 2.2.3.2. of IEC 61076-1:2006. This level standardizes only overall dimensions and mounting dimensions on printed board or panel cut-out and cable termination assembly; mating face dimensions are not relevant to standardize intermountability.

This means that each of two intermountable connectors will fit in a given location (e.g. a position/footprint on a PCB, and/or in a panel cut-out, and/or at the end of a cable). The electrical (e.g. different current and/or voltage rating) or mechanical performance (one connector may be a free or fixed connector with male contacts, the other one with female contacts) may be different. This IEC 60050-581 description even allows two connectors with two completely different types of interface.

Intermountability – once declared for a connector by its manufacturer with respect to certain dimensions common to other products or product families – shall be declared by referencing an unambiguous set of dimensions. This may also be achieved by reference to a set of dimensions as given by a published standard.

E.3 Intermateability

The term intermateable (adj) and consequently intermateability (noun) is defined in IEC 60050-581:2008, 581-24-07: "pertaining to each of two connectors when they feature identical dimensions for electrical and mechanical interfaces".

This level of compatibility is defined as level 2 – Intermateable in 2.2.3.3 of IEC 61076-1:2006. This level standardizes only the dimensions of the mating contact interfaces. The electrical and mechanical and environmental performances and the functionality of connectors from different sources, when mated, are not fully guaranteed.

In other words: here, each of two connectors will fit in one counterpart connector, but the electrical, mechanical and environmental performances and the functionality may be different. For instance: the two connectors from different sources may contain a different number of contacts, different conductive materials, differently rated insulating materials – if the relevant product detail specification allows such choice, different – although compatible – contact plating, different sizing of wire terminations or conductive paths, thus differently sized allowed wiring).

Intermateability shall be proven by testing the mechanical performance and verification of the electrical conductivity of the mated electrical contacts according the relevant requirements of the Product Detail Specification.

NOTE 1 Intermateable connectors can have different number of contacts (ways), i.e. a different electrical interface, within the same mechanical interface. It is allowed that the missing contacts of one of them do not mate with the contacts of the corresponding mating connector, as well as the opposite, i.e. the contacts in excess of one of them do not find correspondence in the corresponding mating connector.

A connector can have less female contacts but due to the lack of holes to accept the male contacts may not be intermateable with a connector having a full set of male contacts.

As the mechanical interface does not include overall dimensions and mounting dimensions covered by intermountability (Clause E.2), two connectors may be intermateable but not intermountable.

NOTE 2 In general, detail product specifications for connectors include dimensions to provide that two connectors in compliance with that detail specification are both intermountable and intermateable, see Clause E.4.

E.4 Intermountability and intermateability

The terms intermountable (adj.) and intermateable (adj.) and consequently the relevant nouns "intermountability" and "intermateability" are already defined in IEC 60050-581 as described in Clause E.2 and Clause E.3.

There is a further level of compatibility defined as level 3 – Intermountable and intermateable in 2.2.3.4 of IEC 61076-1:2006. This level standardizes mounting dimensions, electrical and mechanical interface and overall dimensions.

This means that each of two intermountable and intermateable connectors will fit in a given location (e.g. a position/footprint on a PCB, and/or in a panel cut-out, and/or at the end of a cable) and each of two connectors will fit in one counterpart connector, but the electrical, mechanical and environmental performances and the functionality may be different. For instance: the two connectors from different sources may contain a different number of contacts within a compatible mating face geometry, different conductive materials, differently rated insulating materials (if the relevant product detail specification allows such choice), different – although compatible – contact plating, different sizing of wire terminations or conductive paths, thus differently sized allowed wiring.

Intermateability shall be demonstrated as described in Clause E.3, intermountability as described in Clause E.2.

NOTE Intermateable connectors may have different number of contacts (ways), i.e. a different electrical interface, within the same mechanical interface. It is allowed that the missing contacts of one of them do not mate with the contacts of the corresponding mating connector, as well as the opposite, i.e. the contacts in excess of one of them do not find correspondence in the corresponding mating connector.

E.5 Interoperability

A connector is interoperable with another connector of the same gender but from different source or product family if the two connectors are intermateable and if both connectors offer the same contact functions. In the case of interoperability, the level of performance of this interoperability is always that of the less performing connector, and the performance level shall be suitable for the application. One of the two interoperable connectors of the same gender may be provided with a level of performance in excess of the requirements for the application, none can be provided with performance level unfit for the application

In other words: here, each of two connectors will fit and contact in one counterpart connector. The electrical, mechanical and climatic performances may be different but the functionality is similar. The two connectors from different manufacturers will contain the same number of contacts, but may be produced of different conductive materials, differently rated insulating materials – if the relevant product detail specification allows such choice. Also, different – although compatible – contact plating, different wire termination sizes or conductive paths, may occur.

NOTE Connector specifications according to IEC 61984 cannot be met with interoperable connectors from different sources.

E.6 Interchangeability

The term interchangeable (adj.) and consequently interchangeability (noun) is defined in IEC 60050-581:2008, 581-24-03: "pertaining to a connector when all elements guaranteeing compliance of electrical, mechanical and climatic performance of mated connectors when individual connector halves are from different sources".

This level of compatibility is defined as level 4 – Interchangeable in 2.2.3.5 in IEC 61076-1:2006. This level standardizes all the elements guaranteeing compliance of the electrical, mechanical and environmental performances of mated connector pairs when individual connectors are from different sources.

To be interchangeable, the form, fit, function and performance of connectors from different sources are identical, so that a connector from one source can be replaced by a similar connector from another source without loss of functionality or performance of the connector pair.

NOTE The term "identical" when addressing dimensions and ratings is used herein with the meaning "within the tolerances provided either by a published detail product specification (standard sheet) or as a result of a comparison of the different manufacturer detail product specifications and/or drawings".

Interchangeability shall be proven by comparison of the drawings and completion of the full test schedule of the Detail Product Specification on all possible combinations of the interchangeable connectors.

E.7 Backward compatibility

Backward compatibility is defined in IEC 60050-581:2008, 581-24-08: "feature of connectors which ensures at least the lower requirements in case of mating connectors with higher and lower requirements".

Backward compatibility is a subset of intermateability. Backward compatibility between two connectors from different sources or different type or product family is only possible when these are intermateable as per Clause E.3. In cases where connectors are intermateable they may have different levels of performance. For backward compatible connectors, as a minimum the lower of these two levels is guaranteed.

For instance: the backward compatibility requirement ensures that a free or fixed connector which is in compliance with this standard, which is mated with a fixed or free connector in compliance with any lower frequency IEC 60603-7 series connector, fully complies with the requirements of the lower frequency IEC 60603-7 series connector.

Backward compatibility shall be proven by testing all possible combinations of the backward compatible connectors against the full test schedule of the Detail Product Specification with the lower requirement.

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IEC 60603-7-2, *Connectors for electronic equipment – Part 7-2: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-3, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-4, *Connectors for electronic equipment – Part 7-4: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*

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IEC 60603-7-71, *Connectors for electronic equipment – Part 7-71: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 1 000 MHz*

IEC 61169-16, *Radio-frequency connectors – Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (Type N)*

IEC 61984, *Connectors – Safety requirements and tests*

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

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CONNECTEURS POUR ÉQUIPEMENTS ÉLECTRONIQUES –

Partie 7: Spécification particulière pour les fiches et les embases non écrantées à 8 voies

AVANT PROPOS

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La Norme internationale IEC 60603-7 a été établie par le sous-comité 48B: Connecteurs électriques, du comité d'études 48 de l'IEC: Connecteurs électriques et structures mécaniques pour les équipements électriques et électroniques.

Cette quatrième édition annule et remplace la troisième édition publiée en 2008, l'Amendement 1:2011 et l'Amendement 2:2019. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à la précédente édition:

– Révision des définitions de la compatibilité d'accouplement et de l'interopérabilité; ajout de nouvelles définitions.
– Correction de la ligne de cote AZ2 à la Figure 5.

– Correction de la ligne de cote F1 à la Figure A.1.
– Révision de la référence à l'ISO/IEC 11801, devenant ISO/IEC 11801-1.
– Ajout des définitions de la température limite inférieure et de la température limite supérieure.
– Révision des Tableau 1 à Tableau 8 de sorte que l'ordre des colonnes corresponde à l'ordre croissant des valeurs, soit "Minimales", "Nominales", "Maximales".
– correction du Tableau 7: correction de la colonne "Catégorie climatique" et de la colonne "Température supérieure", qui spécifie désormais une valeur de 90 °C (à des fins de cohérence avec le graphique de la Figure 10 et la Note 1 de la Figure 10).
– Révision, à des fins de clarification, de la formulation en 8.2, Disposition pour l'essai de la résistance de contact.
– Révision de la Figure 11 et de la Figure 12, et de la formulation dans les légendes correspondantes, à des fins de clarification.
– Suppression des phrases présentes sous la figure, dans l'Introduction.
– Ajout de l'Annexe E.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
48B/2832/FDIS	8B/2843/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 60603-7, sous le titre général *Connecteurs pour équipements électroniques*, est disponible sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, le document sera

- reconduit,
- supprimé,
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- amendé.

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INTRODUCTION

L'IEC 60603-7 est la spécification de base pour toute la série. Les spécifications qui en découlent ne redonnent pas les informations fournies dans le document de base mais elles stipulent uniquement les exigences supplémentaires. Pour avoir les spécifications complètes d'un composant donné lorsque le numéro du document est élevé, il faut également prendre en compte tous les documents de numérotation inférieure. La Figure 1 montre l'interrelation des documents.

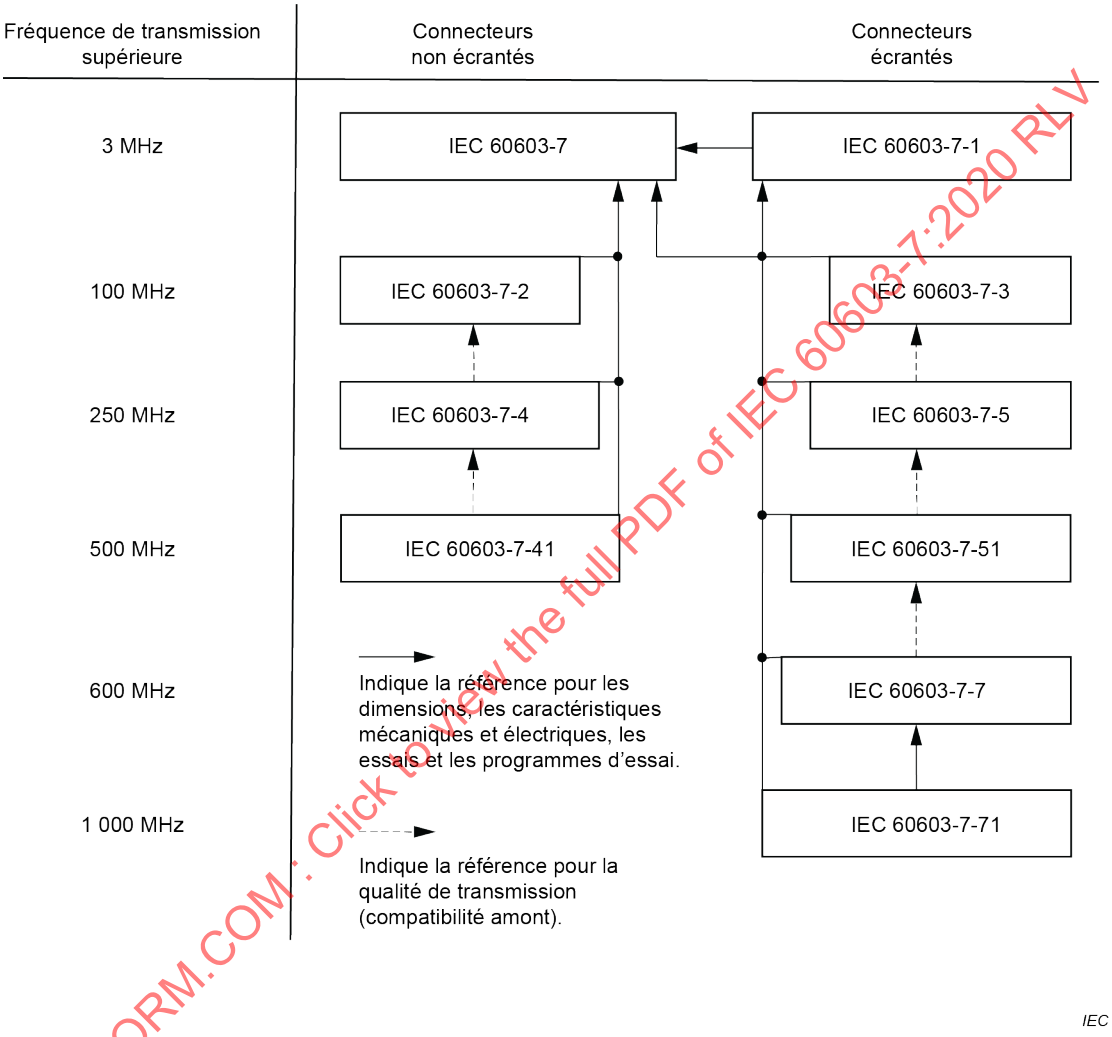

Figure 1 – Schéma présentant les relations entre les documents de la série IEC 60603-7

CONNECTEURS POUR ÉQUIPEMENTS ÉLECTRONIQUES –

Partie 7: Spécification particulière pour les fiches et les embases non écrantées à 8 voies

1 Domaine d'application

La présente partie de l'IEC 60603-7 couvre les fiches et les embases non écrantées à 8 voies; elle est destinée à spécifier les dimensions communes (dimensions de l'interface), les caractéristiques mécaniques, électriques et environnementales ainsi que les essais pour la famille des connecteurs IEC 60603-7-x.

Ces connecteurs sont accouplables (conformes à l'IEC 61076-1 niveau 2) et interopérables avec les autres connecteurs de la série IEC 60603-7.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60050-581:2008, *Vocabulaire Electrotechnique International (IEV) – Partie 581: Composants électromécaniques pour équipements électroniques*

IEC 60068-1, *Essais d'environnement – Partie 1: Généralités et lignes directrices*

IEC 60068-2-38: *Essais d'environnement – Partie 2-38: Essais – Essai Z/AD: Essai cyclique composite de température et d'humidité*

IEC 60352-2, *Connexions sans soudure – Partie 2: Connexions serties – Exigences générales, méthodes d'essai et guide pratique*

IEC 60352-3, *Connexions sans soudure – Partie 3: Connexions autodénudantes accessibles – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-4, *Connexions sans soudure – Partie 4: Connexions autodénudantes (CAD) non accessibles – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-5, *Connexions sans soudure – Partie 5: Connexions insérées à force – Exigences générales, méthodes d'essai et guide pratique*

IEC 60352-6, *Connexions sans soudure – Partie 6: Connexions à percement d'isolant – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-7, *Connexions sans soudure – Partie 7: Connexions à ressort – Règles générales, méthodes d'essai et guide pratique*

IEC 60512-1, *Connecteurs pour équipements électriques et électroniques – Essais et mesures – Partie 1: Spécification générique*

IEC 60512-1-1, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 1-1: Examen général – Essai 1a: Examen visuel*

IEC 60512-1-2, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 1-2: Examen général – Essai 1b: Examen de dimensions et masse*

IEC 60512-1-100, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 1-100: Généralités – Publications applicables*

IEC 60512-2-1, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 2-1: Essais de continuité électrique et de résistance de contact – Essai 2a: Résistance de contact – Méthode du niveau des millivolts*

IEC 60512-2-5, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 2-5: Essais de continuité électrique et de résistance de contact – Essai 2e: Perturbation de contact*

IEC 60512-3-1, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 3-1: Essais d'isolement – Essai 3a: Résistance d'isolement*

IEC 60512-4-1, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 4-1: Essais de contrainte diélectrique – Essai 4a: Tension de tenue*

IEC 60512-5-2, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 5-2: Essais de courant limite – Essai 5b: Taux de réduction de l'intensité en fonction de la température*

IEC 60512-6-4, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 6-4: Essais de contraintes dynamiques – Essai 6d: Vibrations (sinusoïdales)*

IEC 60512-9-1, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 9-1: Essais d'endurance – Essai 9a: Fonctionnement mécanique*

IEC 60512-9-2, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 9-2: Essais d'endurance – Essai 9b: Charge électrique et température*

IEC 60512-11-4, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 11-4: Essais climatiques – Essai 11d: Variations rapides de température*

IEC 60512-11-7, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 11-7: Essais climatiques – Essai 11g: Essai de corrosion dans un flux de mélange de gaz*

IEC 60512-13-2, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 13-2: Essais de fonctionnement mécanique – Essai 13b: Forces d'insertion et d'extraction*

IEC 60512-15-6, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 15-6: Essais (mécaniques) des connecteurs – Essai 15f: Efficacité des dispositifs d'accouplement des connecteurs*

IEC 60603-7 (toutes les parties), *Connecteurs pour équipements électroniques*

IEC 60664-1, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 1: Principes, exigences et essais*

IEC 61076-1:2006, *Connecteurs pour équipements électroniques – Exigences de produit – Partie 1: Spécification générique*

IEC 61076-3, *Connecteurs pour équipements électroniques – Exigences de produit – Partie 3: Connecteurs rectangulaires – Spécification intermédiaire*

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* (disponible en anglais seulement)

IEC 61156-3, *Multicore and symmetrical pair/quad cables for digital communications – Part 3: Work area cable – Sectional specification (disponible en anglais seulement)*

IEC 61156-4, *Multicore and symmetrical pair/quad cables for digital communications – Part 4: Riser cables – Sectional specification* (disponible en anglais seulement)

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

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* (disponible en anglais seulement)

IEC 61156-7, *Câbles multiconducteurs à paires symétriques et quartes pour transmissions numériques – Partie 7: Câbles à paires symétriques avec caractéristiques de transmission jusqu'à 1 200 MHz – Spécification intermédiaire pour câbles de transmissions numériques et analogiques*

IEC 61760-3, *Technique du montage en surface – Partie 3: Méthode normalisée relative à la spécification des composants pour le brasage par refusion à trous traversants (THR, Through Hole Reflow)*

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* (disponible en anglais seulement)

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements* (disponible en anglais seulement)

ISO 1302, *Spécification géométrique des produits (GPS) – Indication des états de surface dans la documentation technique de produits*

Recommandation UIT-T K.20:2000[1], *Immunité des équipements de télécommunication des centres de télécommunication aux surtensions et aux surintensités*

Recommandation UIT-T K.44:2000[2], *Essais d'immunité des équipements de télécommunication exposés aux surtensions et aux surintensités – Recommandation fondamentale*

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1 Ce document a été remplacé par une nouvelle édition (2003), mais pour les besoins du présent document, l'édition de 2000 est citée.

2 Ce document a été remplacé par une nouvelle édition (2003), mais pour les besoins du présent document, l'édition de 2000 est citée.

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions donnés dans l'IEC 60050-581, l'IEC 61076-1, l'IEC 60512-1, ainsi que les suivants, s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.1
compatibilité d'accouplement
compatibilité d'accouplement (niveau 2 de l'IEC 61076-1) assurée par l'application des exigences des calibres "Entre" et "N'entre pas" dans les normes qui peuvent être citées en référence et par le respect des exigences dimensionnelles qui y sont données

VOIR: Article E.3.

3.2
interopérabilité
interopérabilité de différents connecteurs de l'IEC 60603-7 entre eux, et de connecteurs de l'IEC 60603-7 avec des connecteurs d'autres familles (par exemple des connecteurs de la série IEC 61076-3) assurée par la conformité aux dimensions d'interface spécifiées, lorsque les connecteurs ont le même nombre de contacts, les mêmes dimensions relatives au câblage électrique et lorsque les plus faibles performances (niveau de performance) électriques, mécaniques et climatiques des deux connecteurs conviennent à l'application prévue

VOIR: Article E.5.

3.3
catégorie
niveau de qualité de transmission concerné, tel qu'il est donné dans l'ISO/IEC 11801-1

3.4
connecteur Keystone
est défini par ses caractéristiques de montage

Note 1 à l'article: Les exigences dimensionnelles pour le connecteur et le panneau de montage correspondant sont définis à l'Annexe D.

3.5
nombre de contacts
nombre de contacts (ou de voies) qu'un connecteur possède, y compris les contacts de la terre de protection et/ou de la terre fonctionnelle, le cas échéant

Note 1 à l'article: Un connecteur pour contacts amovibles est caractérisé par son nombre de positions de contacts (sièges): son nombre de contacts (voies) peut être inférieur au nombre de positions de contacts (sièges).

Note 2 à l'article: Un même nombre de contacts ne donne pas forcément la même interface électrique: différentes géométries peuvent utiliser un même nombre de contacts.

3.6
dimensions hors tout
dimensions de l'ensemble de l'espace occupé par un connecteur

Note 1 à l'article: Deux connecteurs du même genre peuvent avoir les mêmes dimensions hors tout, mais des cotes de montage différentes et/ou des dimensions d'interface différentes.

3.7
dimensions d'interface
ensemble des dimensions exigées pour décrire complètement l'interface d'accouplement d'un connecteur, appartenant à la fois à l'isolant de connecteur et aux contacts électriques utiles

Note 1 à l'article: Les dimensions d'interface permettent le bon fonctionnement d'un ensemble de connecteurs accouplés conformément à la spécification particulière de produit applicable ou à la spécification particulière du fabricant.

Note 2 à l'article: Deux connecteurs avec les mêmes dimensions d'interface ont le même nombre de positions de contacts (sièges), mais ils peuvent ne pas avoir le même nombre de contacts (voies).

3.8
cotes de montage
dimensions permettant le montage d'un connecteur

Note 1 à l'article: Des exemples de cotes de montage sont la taille du perçage du panneau, la taille et les entraxes des trous de fixation ou des filetages.

Note 2 à l'article: La géométrie de l'interface de montage de connecteurs pour carte de circuit imprimé sur la carte de circuit imprimé fait partie des cotes de montage: la configuration et le pas des contacts de deux connecteurs pour carte de circuit imprimé du même genre et avec les mêmes cotes de montage sont les mêmes.

Note 3 à l'article: Deux connecteurs non destinés à des cartes de circuit imprimé du même genre et avec les mêmes cotes de montage peuvent avoir des dimensions d'interface différentes.

Note 4 à l'article: Deux connecteurs du même genre et avec les mêmes cotes de montage peuvent avoir des dimensions hors tout différentes.

3.9
dimensions relatives au câblage électrique
dimensions relatives au câblage du connecteur, c'est-à-dire au nombre et au type de contacts (voies)

Note 1 à l'article: Deux connecteurs du même genre et avec les mêmes dimensions relatives au câblage électrique ont le même nombre de contacts (voies) ou de positions de contact (sièges), les mêmes dimensions de ces contacts ou de ces positions de contacts, les mêmes dimensions hors tout, les mêmes dimensions d'interface et s'il s'agit de connecteurs pour cartes de circuit imprimé, les mêmes cotes de montage.

3.10
performances électriques, mécaniques et climatiques
niveaux de performances électriques, mécaniques et climatiques attribués à un connecteur dans la spécification particulière de produit applicable ou la spécification particulière du fabricant, vérifiés par des groupes d'essais dédiés

Note 1 à l'article: Les performances électriques incluent l'intégrité des signaux.

4 Caractéristiques communes et paire de connecteurs type

4.1 Vue représentant les embases et les fiches types (voir Figure 2)

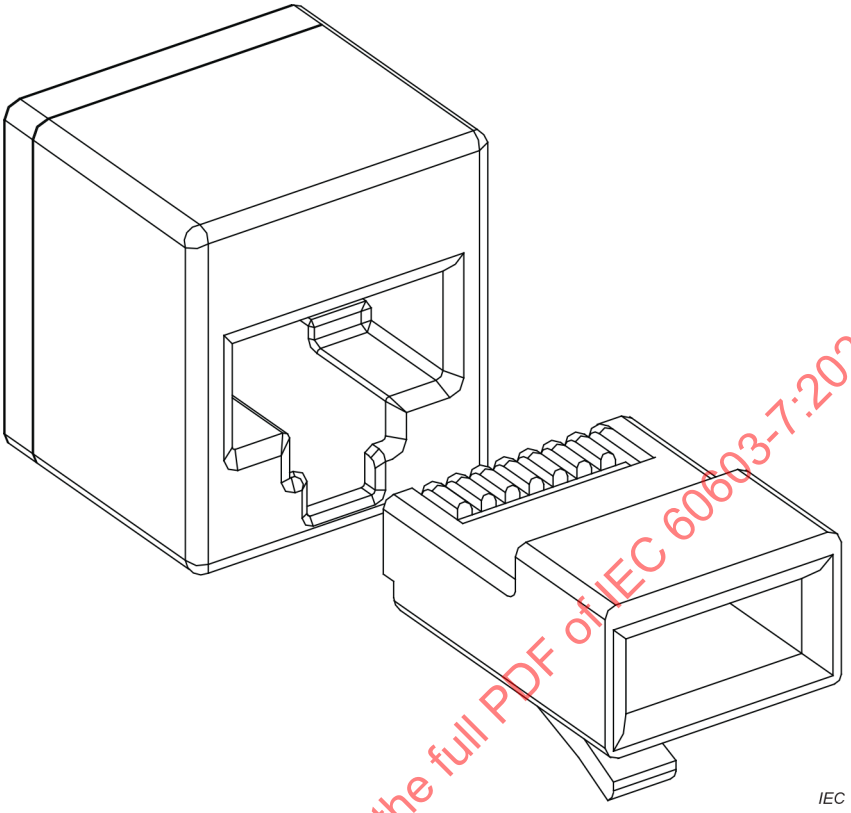


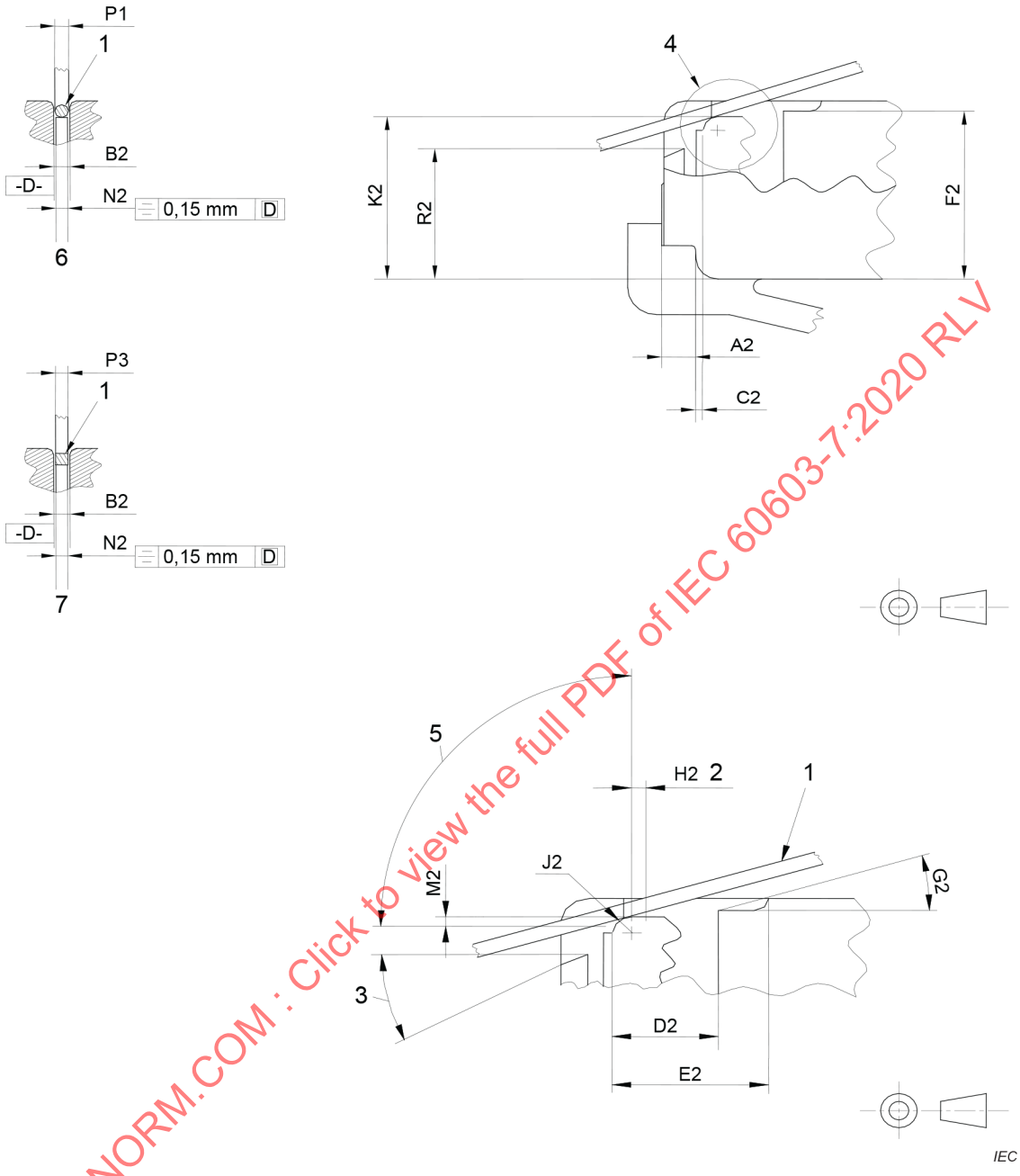
Figure 2 – Vue représentant une embase et une fiche types

4.2 Informations relatives à l'accouplement

4.2.1 Généralités

Les dimensions sont données en millimètres. Les dessins sont représentés en utilisant la projection du troisième dièdre. La forme des connecteurs peut varier par rapport à celles données de la Figure 2 à la Figure 5 à condition que les dimensions spécifiées ne soient pas modifiées. Les dimensions des connecteurs représentées de la Figure 2 à la Figure 5 sont listées du Tableau 1 au Tableau 3.

4.2.2 Contacts – Conditions d'accouplement



Légende

1 Contact femelle de l'embase. Les informations d'accouplement représentées ne peuvent être respectées qu'avec une fiche équipée d'un câble.

2 Aucune bavure ne doit dépasser le sommet du contact dans cette zone, dans la mesure où il peut s'agir d'une zone de contact.

3 Angle facultatif.

4 Détail de l'interface de contact privilégiée.

5 Configuration de contact minimal privilégiée.

6 Configuration avec profil de contact rond.

7 Configuration avec profil de contact rectangulaire.

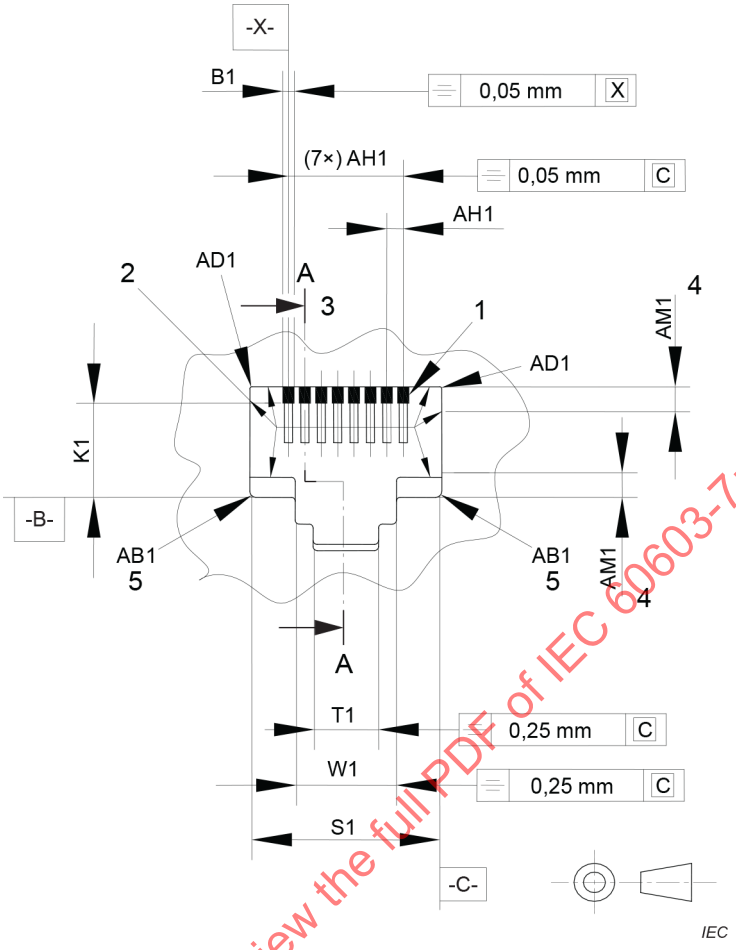
Figure 3 – Dimensions de l'interface de contact avec fiche équipée

Tableau 1 – Dimensions pour Figure 3

Dimensions en millimètres

Cote	Minimales	Maximales
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
Il faut veiller à ce que les contacts de l'embase évitent toute interférence avec le plastique de la fiche.		

4.2.3 Embase



Légende

1 Zone de contact. Les contacts doivent être complètement à l'intérieur de leur zone de contact individuel dans la zone indiquée.

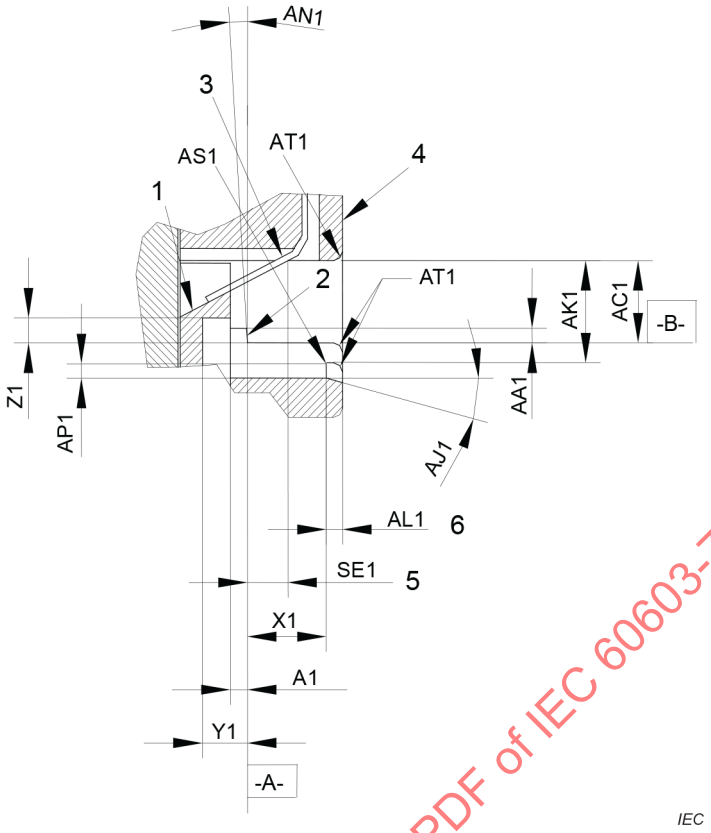
2 Conicité maximale 0°15'.

3 Coupe A-A: voir Figure 4b).

4 La conicité à l'extérieur de la zone définie par la cote AM1 des deux côtés des contacts à ressort de l'embase est admise.

5 Sauf spécification contraire, tous les coins internes dans la cavité du connecteur doivent avoir un rayon maximal de 0,38 mm.

Figure 4a) – Vue de la zone de contact



Légende

1 Repos du contact facultatif.

2 Butée privilégiée de la fiche.

3 Contacts représentés au repos. Les contacts doivent toujours être à l'intérieur des fentes de guidage. Les contacts doivent se déplacer librement dans leurs fentes de guidage.

4 Il n'est pas nécessaire que cette surface soit planaire ou coïncide avec la surface sous le dispositif de verrouillage tant que l'insertion, le verrouillage et le déverrouillage des fiches ne sont pas entravés.

5 Extension maximale vers l'avant des contacts sous la surface AC1, pour éviter tout contact avec les écrans des fiches. S'applique à l'état accouplé.

6 Les projections au-delà de la cote AL1 ne doivent pas empêcher l'accès du doigt au dispositif de verrouillage de la fiche.

Figure 4b) – Coupe A-A

Figure 4 – Détails de l'embase

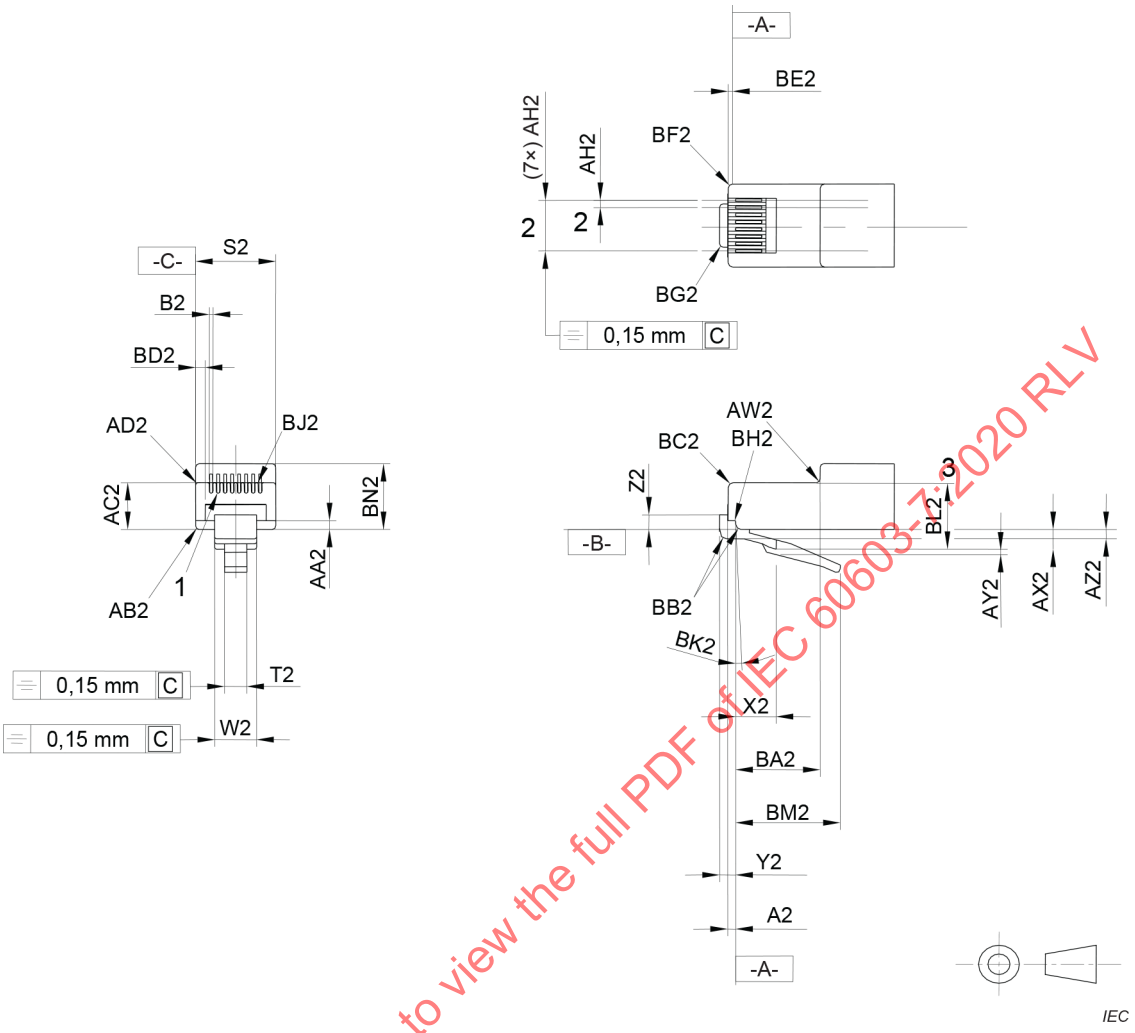
Tableau 2 – Dimensions pour Figure 4

Dimensions en millimètres

Cote	Minimales	Nominales (réf.)	Maximales
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 indique la position vraie.

4.2.4 Fiche



Légende

1 Rayon complet admis sur toutes les fentes.

2 Ces cotes s'appliquent aux emplacements des fentes de contact.

3 S'applique lorsque le dispositif de verrouillage est enfoncé.

Figure 5 – Vue de la fiche

Tableau 3 – Dimensions pour Figure 5

Dimensions en millimètres

Cote	Minimales	Nominales (réf.)	Maximales
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		Rayon complet	
BK2			3°30’
BL2			8,36
BM2	14,61		15,88
BN2			8,00

[a] Voir Tableau 1.

5 Sorties de câbles et connexions internes – Embases et fiches

5.1 Généralités

Un connecteur peut comprendre de multiples sorties entre la sortie de câble et l’interface de contact séparable. Par exemple, celles-ci peuvent comprendre des connexions de contacts d’embase insérées à force dans les cartes de circuit imprimé. Toutes les sorties doivent satisfaire aux exigences appropriées pour les sorties.

Les fiches sont destinées à être dotées de câbles, afin de constituer des assemblages de connecteurs et de câbles. Le fabricant du connecteur doit fournir des informations de base concernant le type de conducteur (multibrin, massif) auquel le connecteur peut être appliqué et le type de connexion utilisé (à souder, autodénudante, etc.). Les détails particuliers concernant la section du fil, le type et l'épaisseur de l'enveloppe isolante, la dimension et la forme du cordon ou de la gaine du câble, etc., ne sont pas destinés à être traités dans la présente spécification particulière. Des changements mineurs concernant des détails à l'intérieur de la fiche pour accepter différentes dimensions de fils, de gaines extérieures, etc., n'exigent pas la définition de nouvelles spécifications de fiches.

5.2 Types de sorties

5.2.1 Sorties à souder

Les sorties pour connexion à souder doivent être conformes à l'IEC 61760-3.

5.2.2 Sorties sans soudure

5.2.2.1 Sorties autodénudantes

Les sorties pour connexion autodénudante doivent être conformes à l'IEC 60352-3 ou à l'IEC 60352-4.

5.2.2.2 Sorties à sertir

Les sorties pour connexion à sertir doivent être conformes à l'IEC 60352-2.

5.2.2.3 Sorties à percement d'isolant

Les sorties pour connexion à percement d'isolant doivent être conformes à l'IEC 60352-6.

5.2.2.4 Sorties pour connexion insérée à force

La broche de contact élastique doit être conforme à l'IEC 60352-5.

5.2.2.5 Sorties s à ressort

Les sorties pour connexions à ressort doivent être conformes à l'IEC 60352-7.

5.2.2.6 Autres types

Dans le cas où un type de sortie sans soudure est utilisé, que celui-ci n'est couvert par aucune spécification IEC et que le fournisseur ne peut pas démontrer un niveau similaire de performance ou qu'il n'existe pas de norme applicable dans la série IEC 60352 qui puisse être utilisée comme référence, le fournisseur doit démontrer la conformité avec le programme d'essais complet donné en 8.7.3, pour toutes les variantes possibles de sorties, par exemple chaque type de construction de câble (type de construction d'écran, construction des fils (massifs, souples)) avec lesquels le connecteur est destiné à être utilisé.