



BSI Standards Publication

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

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Full document details: BS EN 60603-7-5:2009

National foreword

This British Standard is the UK implementation of EN 60603-7-5:2009. It is identical to IEC 60603-7-5:2007.

The UK participation in its preparation was entrusted to Technical Committee EPL/48, Electromechanical components and mechanical structures for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 53505 5

ICS 31.220.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2010

Amendments issued since publication

Amd. No.	Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60603-7-5

November 2009

ICS 31.220.10

English version

**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 60603-7-5:2007)**

Connecteurs pour équipements
électroniques -
Partie 7-5: Spécification particulière
pour les fiches et les embases
blindées à 8 voies
pour la transmission de données
à des fréquences jusqu'à 250 MHz
(CEI 60603-7-5:2007)

Steckverbinder für elektronische
Einrichtungen -
Teil 7-5: Bauartspezifikation
für geschirmte freie und feste
Steckverbinder, 8polig,
für Datenübertragungen bis 250 MHz
(IEC 60603-7-5:2007)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

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Ref. No. EN 60603-7-5:2009 E

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Foreword

The text of document 48B/1741/FDIS, future edition 1 of IEC 60603-7-5, prepared by SC 48B, Connectors, of IEC TC 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60603-7-5 on 2009-09-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60603-7-5:2007 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
-	-	Communication cables - Specifications for test methods - Part 1-14: Electrical test methods - Coupling attenuation or screening attenuation of connecting hardware	EN 50289-1-14	- ¹⁾
IEC 60050-581	- ¹⁾	International Electrotechnical Vocabulary (IEV) - Part 581: Electromechanical components for electronic equipment	-	-
IEC 60068-1	- ¹⁾	Environmental testing - Part 1: General and guidance	EN 60068-1	1994 ²⁾
IEC 60068-2-38	- ¹⁾	Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test	EN 60068-2-38	2009 ²⁾
IEC 60169-16	- ¹⁾	Radio-frequency connectors - Part 16: R.F. coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling - Characteristic impedance 50 ohms (75 ohms) (type N)	-	-
IEC 60352	Series	Solderless connections	EN 60352	Series
IEC 60512	Series	Connectors for electronic equipment - Tests and measurements	EN 60512	Series
IEC 60512-1-100	- ¹⁾	Connectors for electronic equipment - Tests and measurements - Part 1-100: General - Applicable publications	EN 60512-1-100	2006 ²⁾
IEC 60603-1	- ¹⁾	Connectors for frequencies below 3 MHz for use with printed boards - Part 1: Generic specification - General requirements and guide for the preparation of detail specifications, with assessed quality	EN 60603-1	1998 ²⁾
IEC 60603-7	Series	Connectors for electronic equipment - Part 7: Detail specifications for 8-way free and fixed connectors	EN 60603-7	Series
IEC 60664-1	- ¹⁾	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61076-1	- ¹⁾	Connectors for electronic equipment - Product requirements - Part 1: Generic specification	EN 61076-1	2006 ²⁾
IEC 61156	Series	Multicore and symmetrical pair/quad cables for digital communications	-	-
IEC 61196-1	Series	Coaxial communication cables	-	-
ISO/IEC 11801	2002	Information technology - Generic cabling for customer premises	-	-
ISO 1302	- ¹⁾	Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation	EN ISO 1302	2002 ²⁾
ITU-T Recommendation K.20	- ¹⁾	Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents	-	-
ITU-T Recommendation K.44	- ¹⁾	Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation	-	-
ITU-T Recommendation G.117	- ¹⁾	Transmission aspects of unbalance about earth	-	-
ITU-T Recommendation O.9	- ¹⁾	Measuring arrangements to assess the degree of unbalance about earth	-	-

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INTRODUCTION

Applications have emerged which require the use of the interface described in IEC 60603-7:1996 with certain performance specifications at higher frequencies. The parameters for this performance include insertion loss, near end crosstalk (NEXT), far end crosstalk (FEXT), and return loss. Based on application requirements, the specifications for these parameters always apply to a mated connection of a free (plug) and fixed (outlet) connector. Details for testing of connectors and test plugs are given in Annex C.

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

1 General

1.1 Scope

This part of IEC 60603-7 covers IEC 60603-7-5 connectors, and specifies mechanical and environmental requirements, and electrical transmission requirements for frequencies up to 250 MHz. These connectors are typically used as category 6 connectors in class E cabling systems specified in ISO/IEC 11801:2002.

These connectors are intermateable, interoperable, and backward compatible with other IEC 60603-7 series connectors. While the definition of interoperable is being discussed within IEC, “interoperable” in this standard means the following: The fixed and the free connector are capable of interconnecting with any IEC 60603-7 series connector, and that when it is interconnected, it fully meets all requirements of the lower frequency IEC 60603-7 series standard.

NOTE Transmission performance categories: in this part of IEC 60603-7, the term “category”, when used in reference to transmission performance, refers to those categories defined by ISO/IEC 11801:2002.

1.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

IEC 60169-16, *Radio frequency connectors – Part 16: R. F. coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (Type N)*

IEC 60352 (all parts), *Solderless connections*

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

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

IEC 60603-1, *Connectors for frequencies below 3 MHz for use with printed boards – Part 1: Generic specification – General requirements and guide for the preparation of detail specifications, with assessed quality*

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

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

IEC 61196-1 (all parts), *Coaxial communication cables*

ISO/IEC 11801:2002, *Information technology – Generic cabling for customer premises*

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

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

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

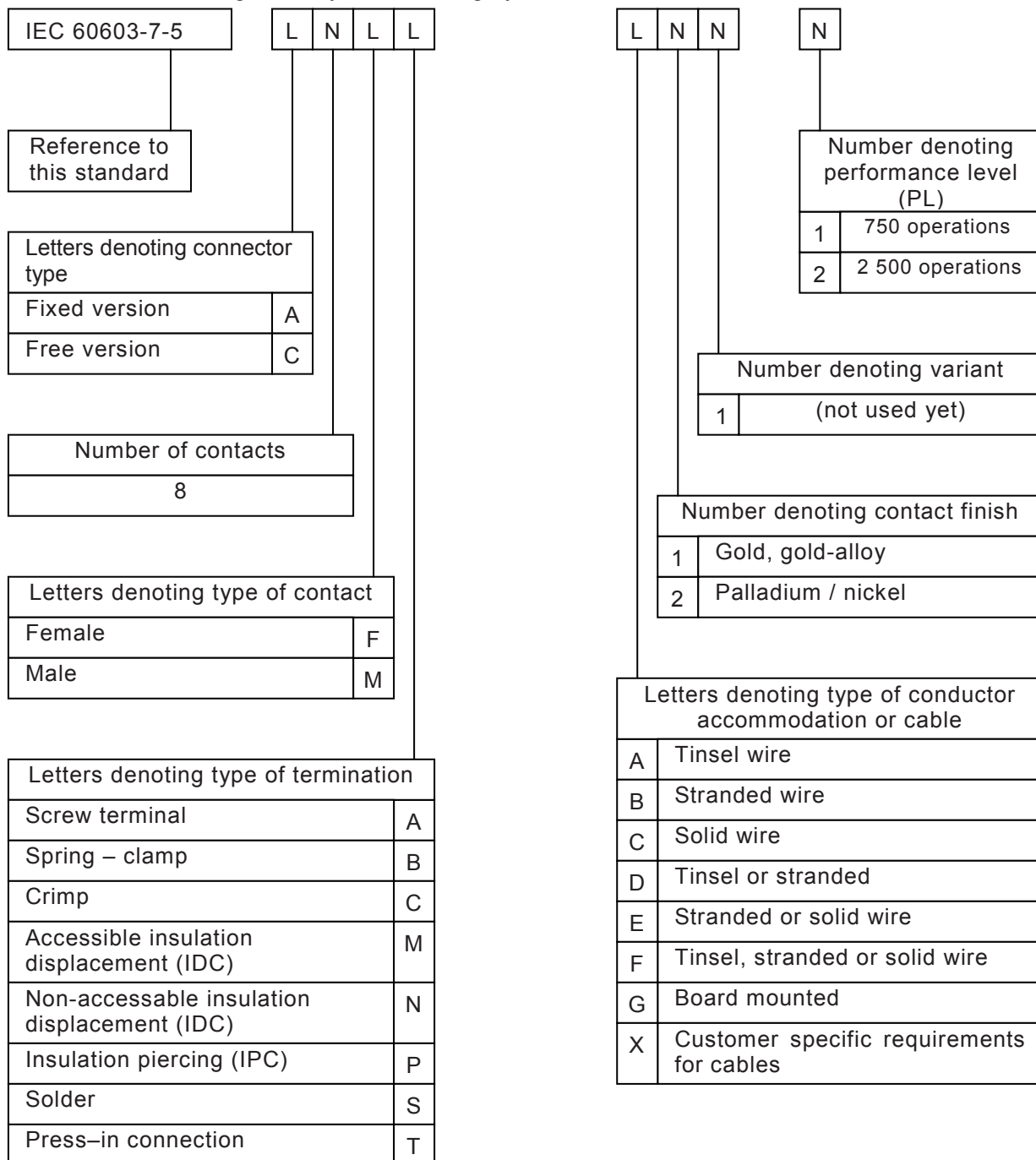
ITU-T G.117, *Transmission aspects of unbalance about earth*

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

EN 50289-1-14, *Communication cables – Specification for test methods – Part 1-14: Electrical test methods – Coupling attenuation or screening attenuation of connecting hardware*

2 IEC type designation

Connectors, connector bodies and connectors with pre-inserted contacts according to this standard shall be designated by the following system:



“L” stands for letter

“N” stands for number

EXAMPLE IEC 60603-7-5 A8FD-E11-1: Fixed connector having 8 female contacts with IDC termination for stranded and solid wire, gold plated, meeting performance level 1.

2.1 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050(581), IEC 61076-1, IEC 60512-1, as well as the following, apply.

2.1.1

transmission performance categories

in this part of IEC 60603-7 the term “Category”, when used in reference to transmission performance, refers to those categories defined in ISO/IEC 11801:2002

2.1.2

interchangeability levels

the connectors described in this part of IEC 60603-7 are intermateable, interoperable and backward compatible with all IEC 60603-7 series connectors

2.1.3

intermateability

intermateability is ensured by applying the “GO” and “NO-GO” gauge requirements herein and adherence to dimensional requirements within

2.1.4

backward compatibility

the backward compatibility requirement ensures that a plug or jack which is in compliance with this part of IEC 60603-7, mated with a jack or plug in compliance with any lower frequency IEC 60603-7 series connector, shall fully comply with the requirements of the lower frequency IEC 60603-7 series connector

2.1.5

interoperability

interoperability of different IEC 60603-7-5 connectors is assured by compliance with all transmission requirements when the fixed connector is mated with a full range of “test” free connectors, or “test plugs”, as described herein

3 Common features and isometric view

3.1 Isometric view

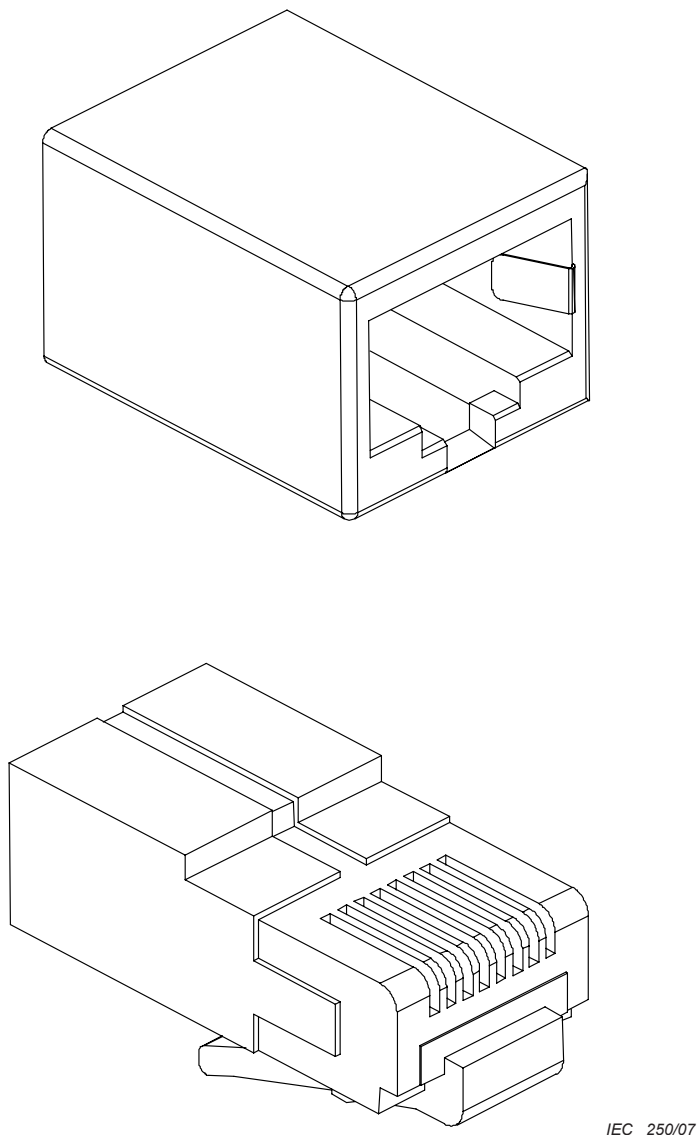


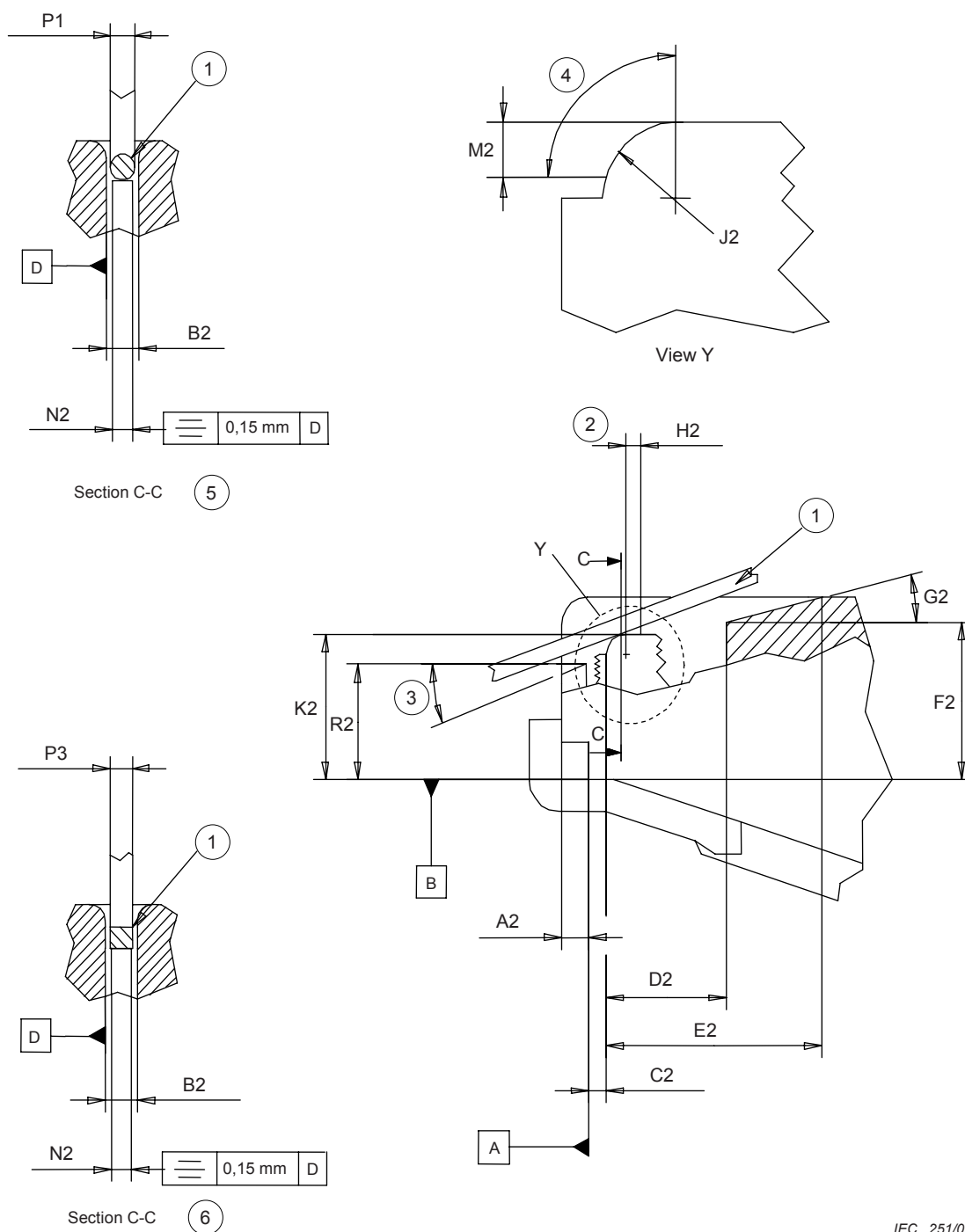
Figure 1 – Isometric view

3.2 Mating information

3.2.1 General

Dimensions are given in millimetres. Drawings are shown in third angle projection. The shape of connectors may deviate from those shapes given in the following figures as long as the specified dimensions are not influenced.

3.2.2 Contacts – mating conditions



IEC 251/07

Key

- 1 Female contact of fixed connector.
- 2 Burrs shall not project above top of the male contact in this area, since it may be a contact area.
- 3 Optional angle.
- 4 Minimum preferred contact configuration.
- 5 Preferred contact configuration.
- 6 Optional contact configuration.

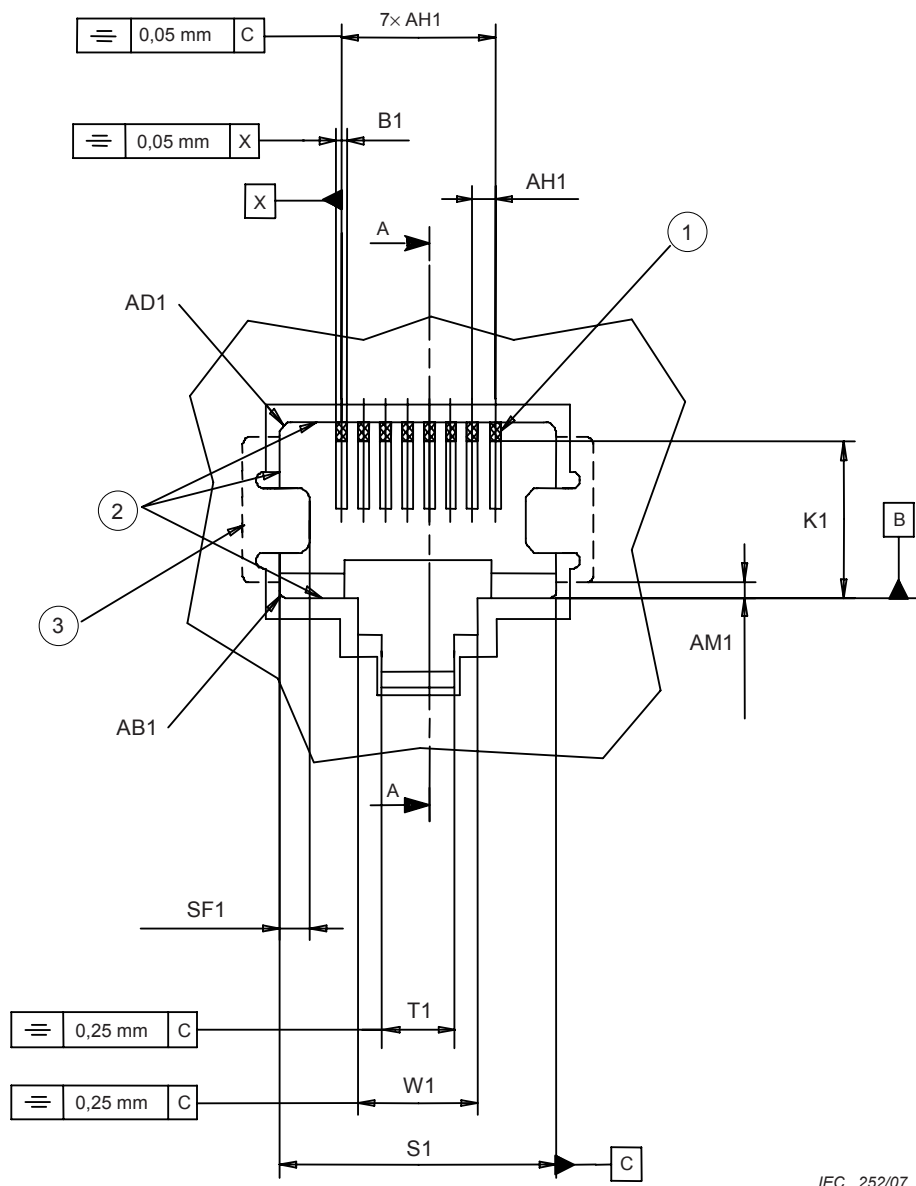
Figure 2 – Contact interface dimensions with terminated free connector

Table 1 – Dimensions for Figure 2

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 contacts of the fixed connector avoid interference with the plastic of the free connector.	

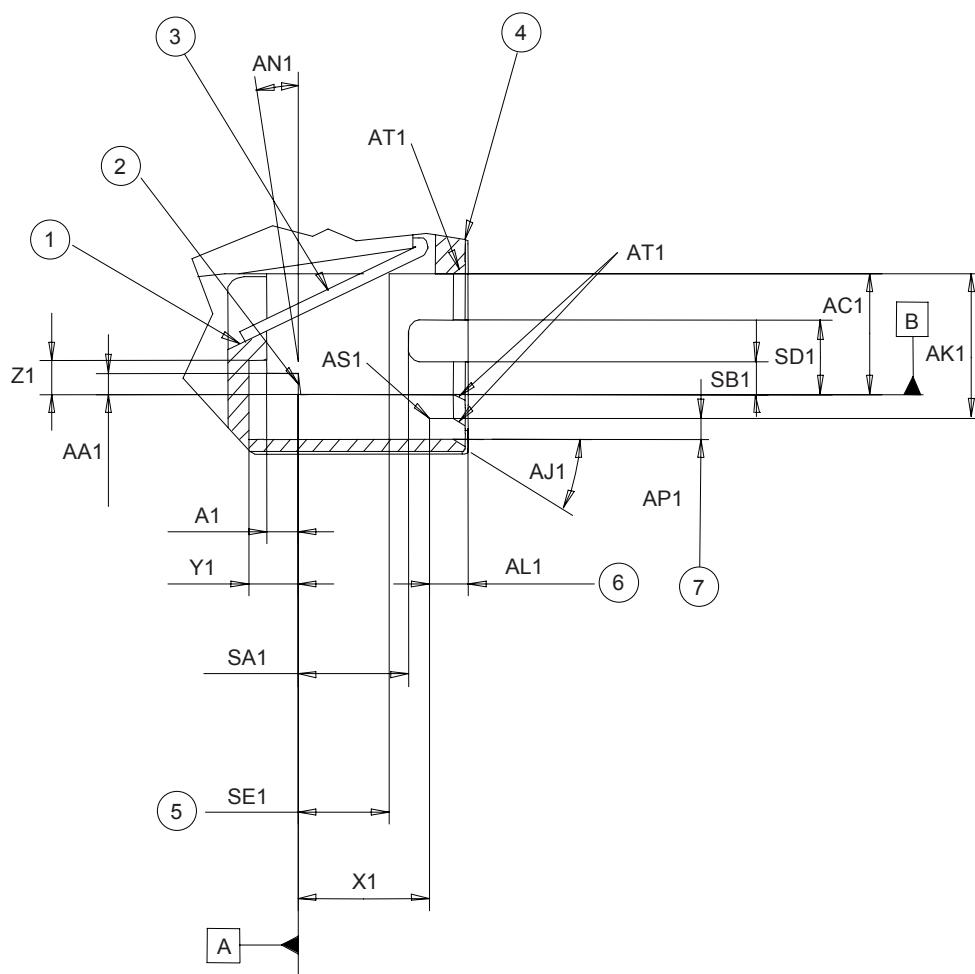
3.2.3 Fixed connector



Key

- 1 Contact zone: female contacts shall be completely within their individual contact zone in the area indicated.
- 2 0,15 mm maximum taper on both sides.
- 3 Relief outside the area defined by AM1 permitted on all four corners.
- 4 Section A – A: see Figure 3b.

Figure 3a – View of contact zone



IEC 253/07

Key

- 1 Optional contact rest.
- 2 Preferred free connector stop.
- 3 Contacts shown at rest.
Contacts shall always be contained inside guide slots and shall move freely within their individual slots.
- 4 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 free connector locking device.
- 7 Flat surface.

NOTE All internal corners in the connector cavity shall be 0,38 mm radius maximum unless otherwise specified.

Figure 3b – Section A – A, view of contact zone

Figure 3 – Fixed connector details

Table 2 – Dimensions for Figure 3

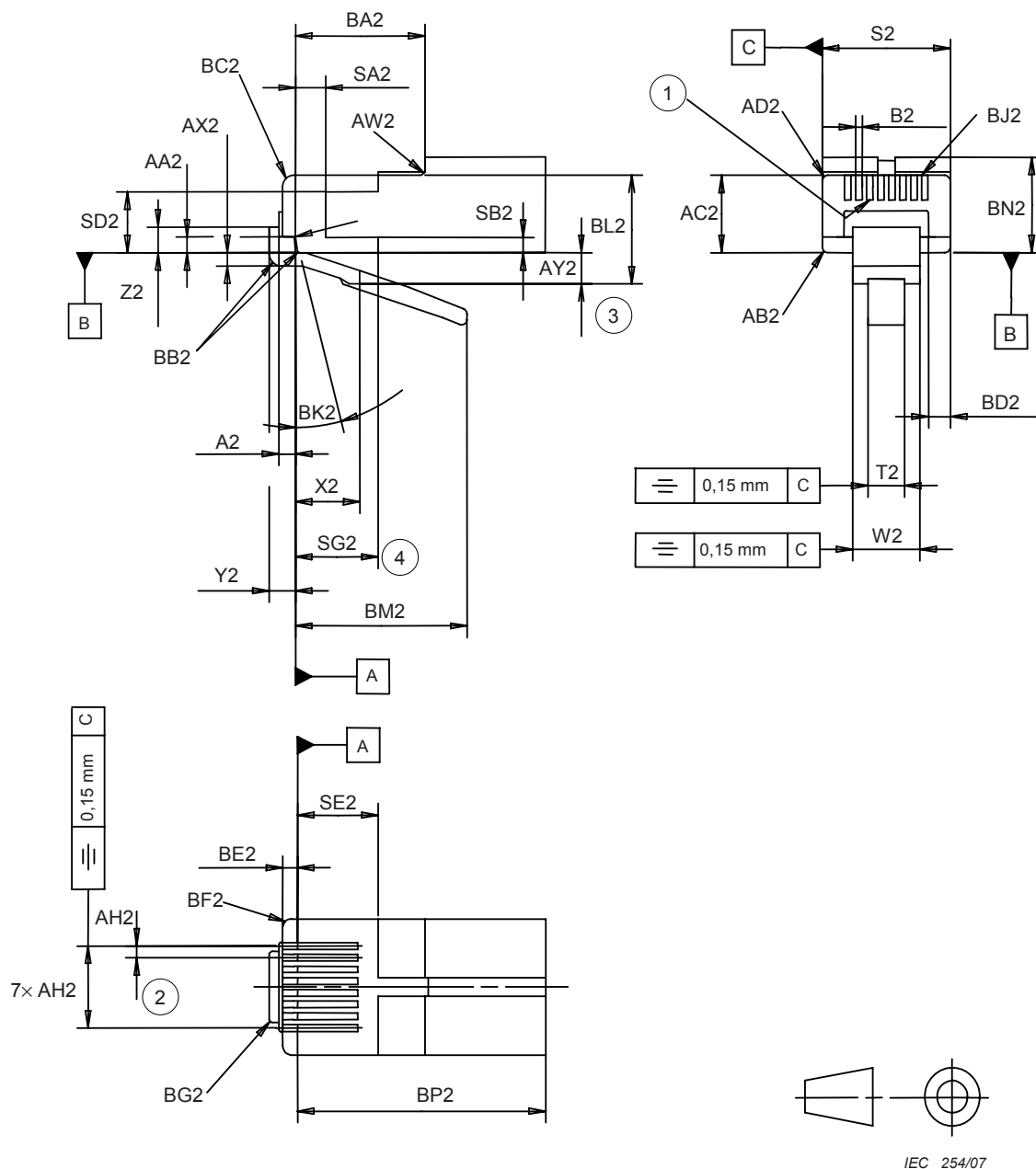
Letter	Maximum mm	Minimum mm	Nominal (ref) mm
A1		1,47	
B1	0,71		
K1	5,84		
S1	12,04	11,84	11,94
T1	4,19	3,94	
W1	6,38	6,22	
X1	6,86	6,68	
Y1		2,40	
Z1		2,08	
AA1	1,24		
AB1	0,38		
AC1	6,96	6,76	6,86
AD1	0,13		
AH1			1,02 TP ¹⁾
AK1	8,66	8,38	
AL1		1,40	
AM1		1,52	
AP1		1,27	
AS1	0,08		
AT1			0,76
SA1		5,31	
SB1		2,16	
SD1	4,90		
SE1	5,80		
SF1		²⁾	

¹⁾ TP indicates true position.

²⁾ Care shall be taken that all screen contacts of the fixed connector always make contact with the screen contacts of the free connector in worst case condition to ensure reliable performance.

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

3.2.4 Free connector (contacts not shown)



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.
- 4 SG2 refers to foremost extension of the screen at the bottom of the plug.

Figure 4 – Free connector view

Table 3 – Dimensions for Figure 4

Letter	Maximum mm	Minimum mm	Nominal (ref) mm
A2 ^{a)}	(See Table 1)	(See Table 1)	1,17
B2 ^{a)}	(See Table 1)	(See Table 1)	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	
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	9,24		
SA2	4,22		
SB2	1,66		
SD2		4,95	
SE2		6,85 ^{b)}	
SG2		6,85 ^{b)}	

a) See Table 1.

b) When this dimension is less than 6,85 mm (ffs), and the free connector is mated with a IEC 60603-7-7 fixed connector, utilising switch option 1, there is a possibility that signal conductors 3,4,5,6 of the fixed connector may make contact with the screen of this free connector.

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

4 Cable terminations and internal connections – fixed and free connectors

4.1 General

A connector may include multiple terminations between the cable termination and the separable contact interface. These may include press in connections of jack springs into PCBs, for example. All terminations shall meet the relevant termination requirements given in 4.2.

If a type of solderless termination is used which is not covered by any IEC specification, the supplier shall assure its reliability by performing similar tests, and demonstrating similar level of performance, to those in the IEC 60352 series.

Free connectors are intended to be terminated to cable to provide connector and cable assemblies. The connector type designation provides basic terminations concerning the type of conductor (tinsel, stranded, solid) to which the conductor 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 jacket, etc., are not intended to be part of this specification. Minor variations in a free connector's interior details to accommodate differing wire gauge sizes, outer jackets, etc., do not require the generation of new free connector specifications.

If the connector is able to be used with multiple cable types, the manufacturer shall assure that all terminations comply with the relevant IEC standards with each of the cable types.

4.2 Termination types

4.2.1 Solder terminations

Solder terminations are not covered by the IEC 60352 series and are allowed.

4.2.2 Insulation displacement terminations

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

4.2.3 Crimp terminations

Crimp terminations shall conform to IEC 60352-2.

4.2.4 Insulation piercing terminations

Insulation piercing terminations shall conform to IEC 60352-6.

4.2.5 Press in connections (Compliant Pin (under consideration))

Press in connections shall conform to IEC 60352-5.

4.2.6 Spring clamp terminations

Spring Clamp terminations shall conform to IEC 60352-7.

4.2.7 Other types

In the case where a type of solderless termination is used which is not covered by any IEC specification and the supplier cannot demonstrate similar level of performance or there is no applicable IEC 60352 standard to be used as reference, the supplier shall show conformance with the full test schedule in 7.7 for all possible variations of terminations, for example each cable construction type (screen construction types, wire construction (solid, flexible)) the connector is intended to be used for.

5 Gauges

5.1 Fixed connectors

Gauges shall be made according to the following requirements:

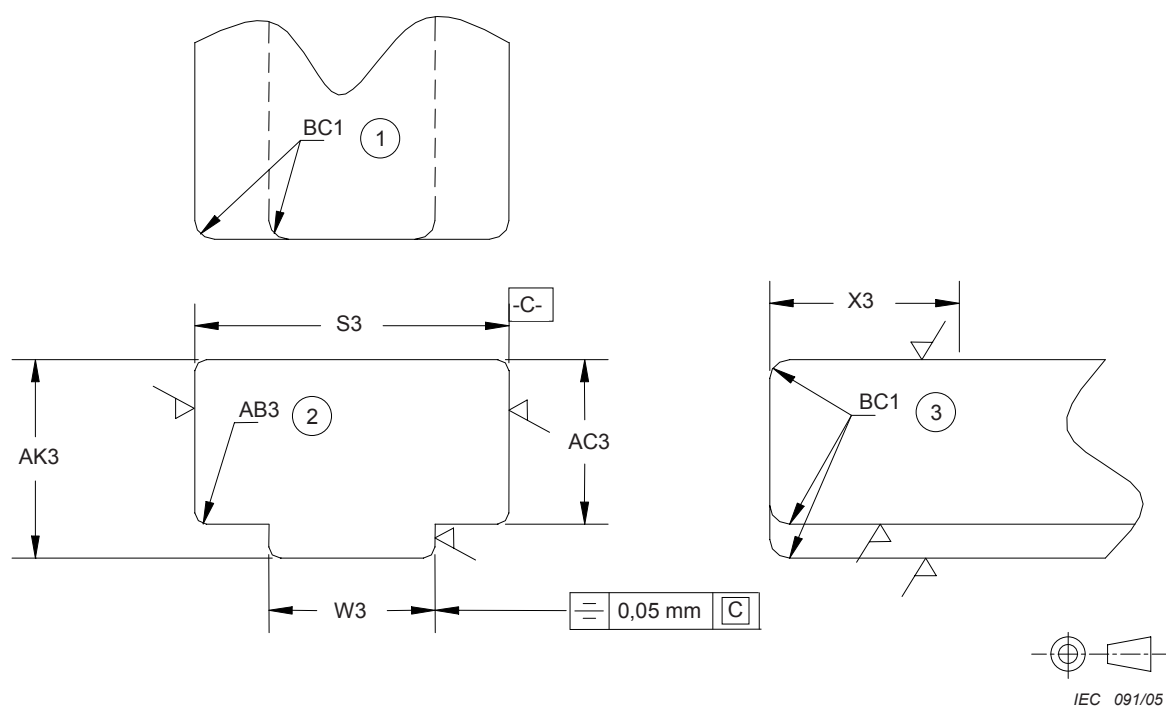
Material: tool steel, hardened.

✓ = Surface roughness, according to ISO 1302.

Ra = 0,25 µm maximum.

A 0,01 mm wear tolerance shall be applied.

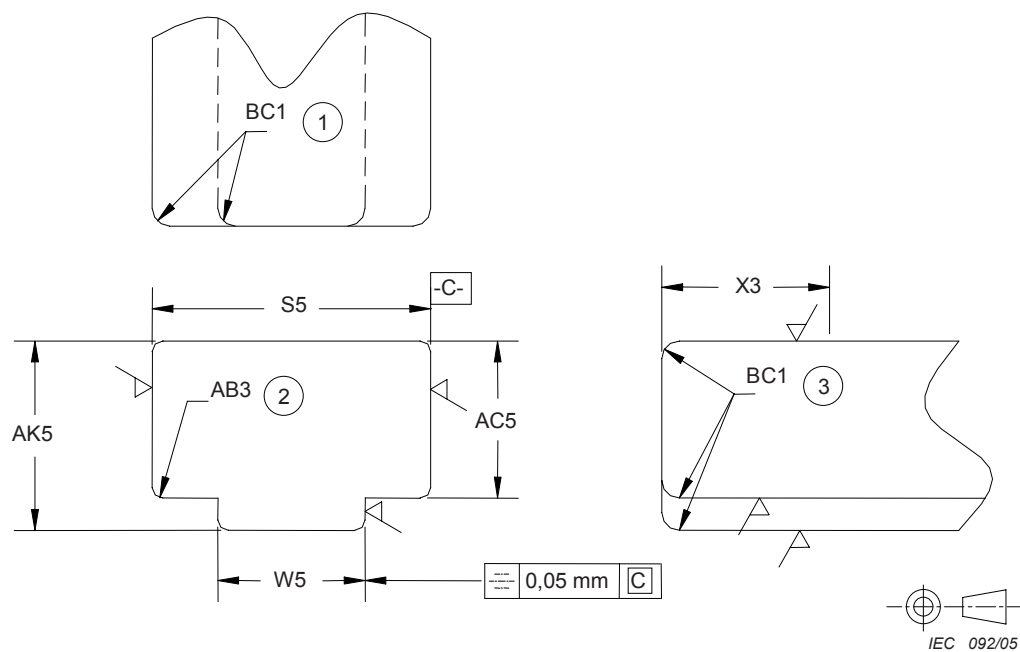
Clearance shall be provided for signal contacts and screen contacts (not shown on drawings).



Key

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

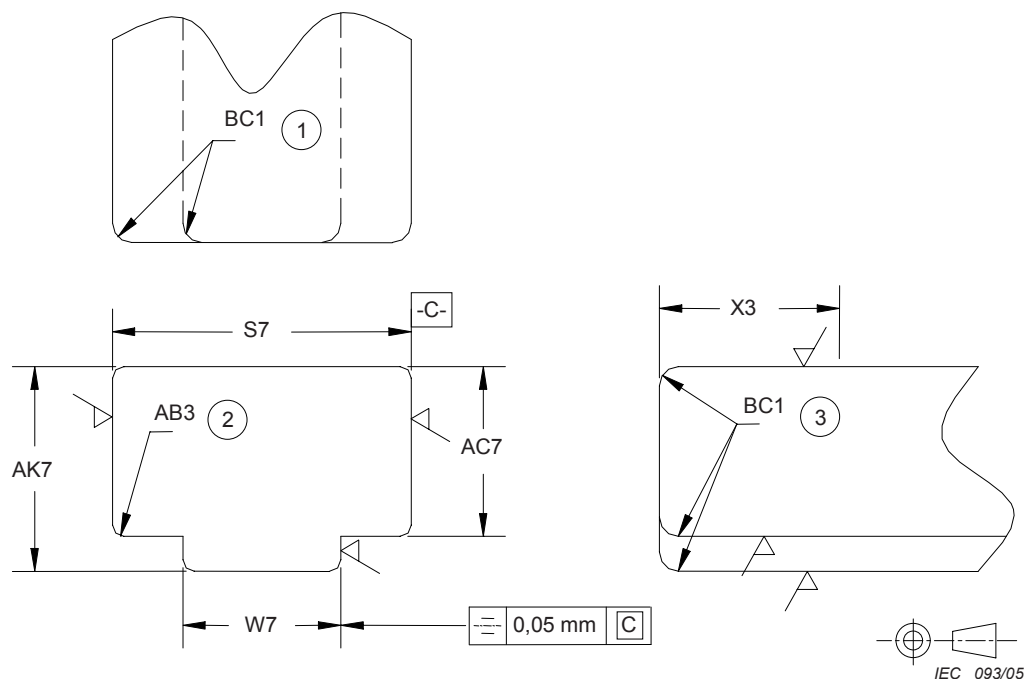
Figure 5 – “Go” gauge



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	

5.2 Free connectors

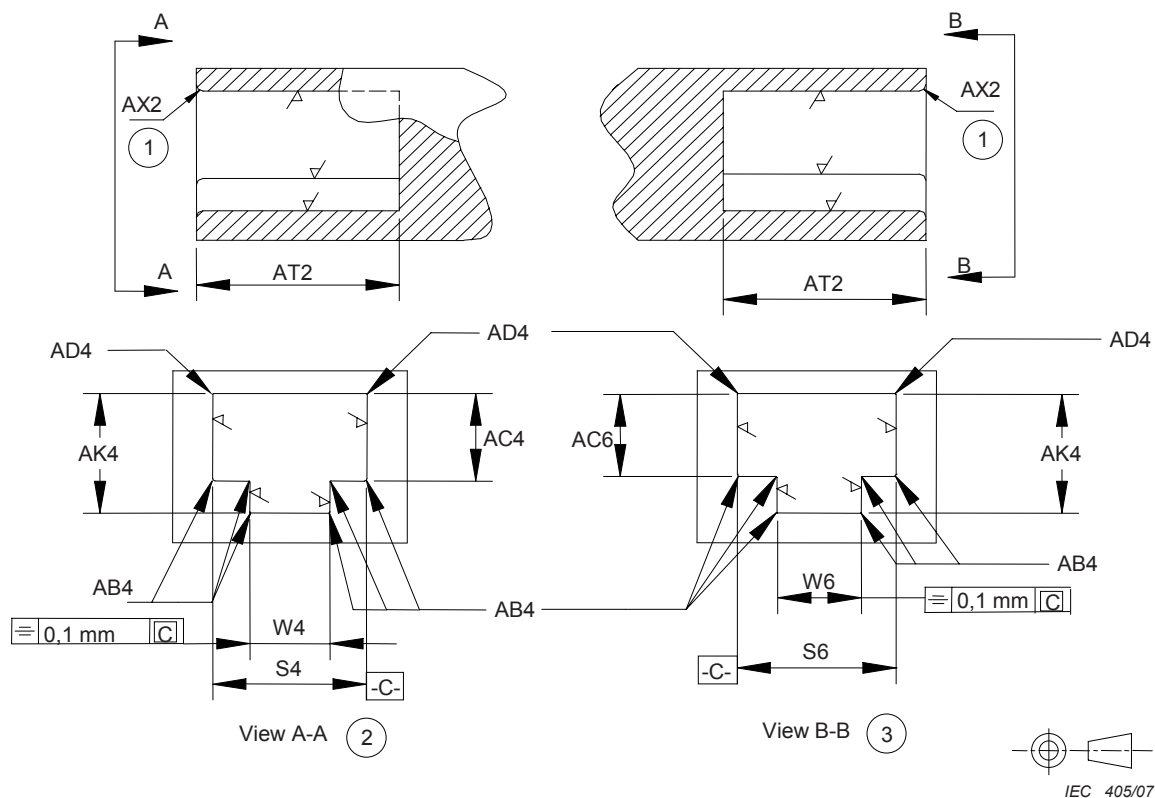
Gauges shall be made according to the following requirements:

Material: tool steel, hardened.

✓ = Surface roughness, according to ISO 1302.

Ra = 0,25 µm maximum.

A 0,01 mm wear tolerance shall be applied.



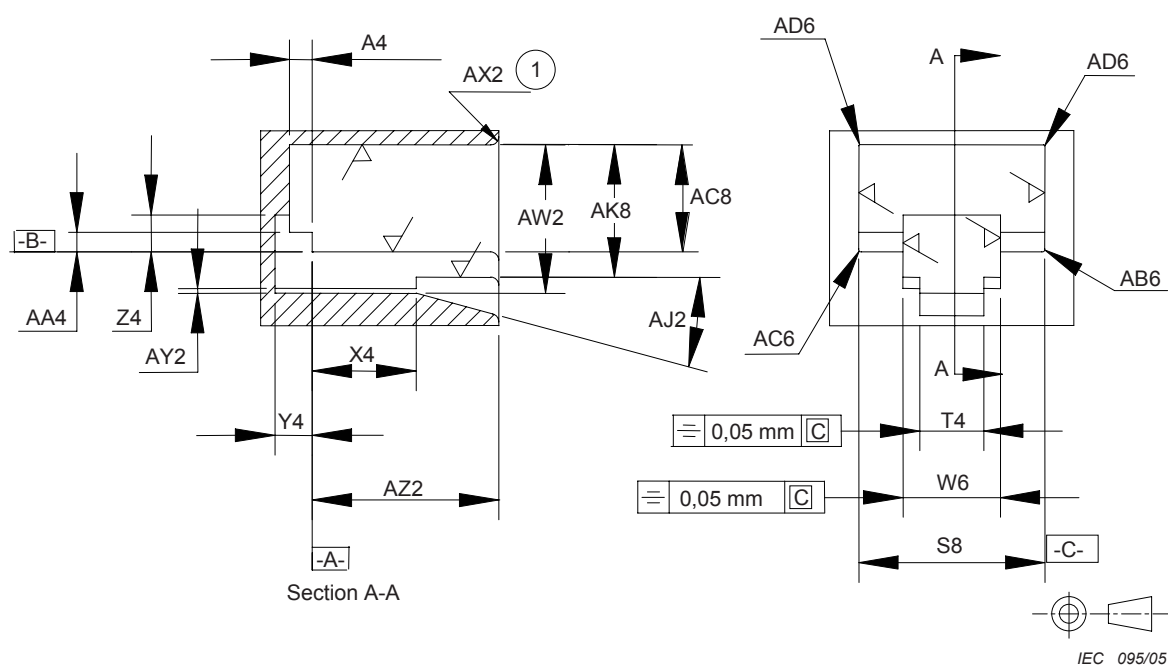
Key

- 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	0,3



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	9,42	9,32
AX2	0,64	0,38
AY2	0,305	0,295
AZ2	11,91	11,81

Letter	Maximum	Minimum
AJ2	16°	14°

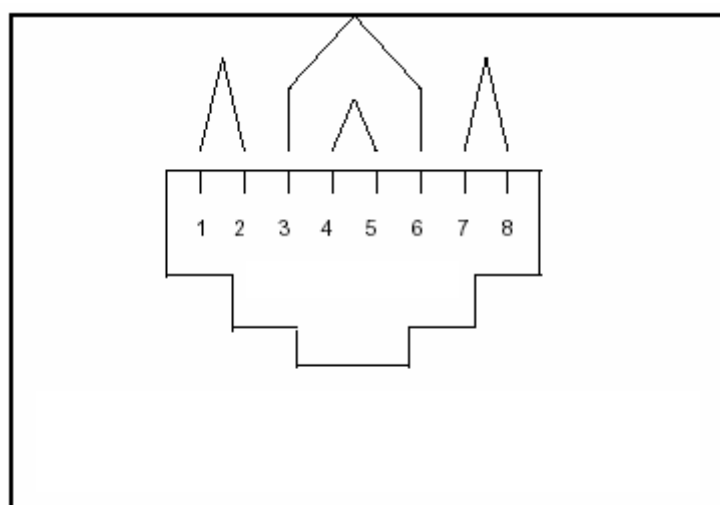
6 Characteristics

6.1 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.

6.2 Pin and pair grouping assignment.

For those specifications for which pin and pair groupings are relevant, unless otherwise specified, the pin and pair grouping assignments shall be as shown in Figure 9.



IEC 096/05

**Figure 9 – Fixed connector pin and pair grouping assignment
(front view of connector)**

6.3 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. The connectors are classified into climatic categories in accordance with the general rules given in IEC 60068-1. The preferred temperature range and severity of the damp heat steady state test given in Table 7 has been selected to comply with the IEC 61156 series.

Table 7 – Climatic categories – selected values

Climatic category	Lower temperature °C	Upper temperature °C	Damp heat steady state Days
40/070/21	–40	70	21

6.4 Electrical characteristics

6.4.1 Creepage and clearance distances

The permissible operating voltages depend on the application and on the applicable or specified safety requirements.

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

Therefore, the creepage and clearance distances are given as operating characteristics of mated connectors.

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

Table 8 – Creepage and clearance distances

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

6.4.2 Voltage proof

Conditions:

IEC 60512, Test 4a, Method A

Standard atmospheric conditions

Mated connectors

All variants: 1 000 V d.c. or a.c. peak, contact-to-contact

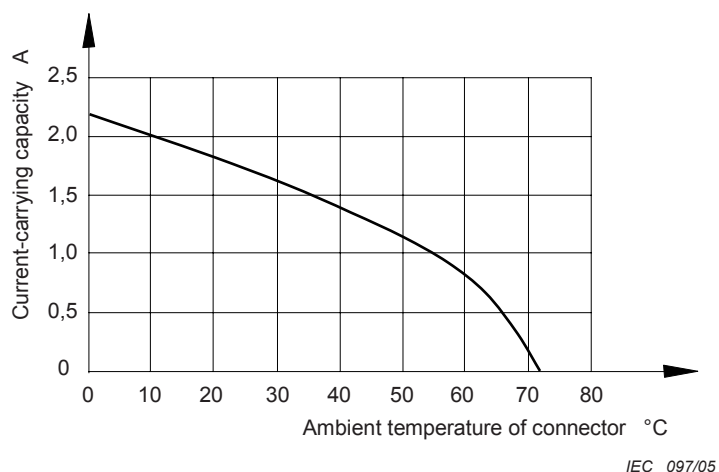
1 500 V d.c. or a.c. peak, contact to screen and test panel

6.4.3 Current-carrying capacity

Conditions: IEC 60512, Test 5b

All contacts, connected in series

The permanent current carrying capacity of each signal contact when connected in series in accordance with the requirements of 2.5 of IEC 61076-1 shall comply with the de-rating curve given in Figure 10.



The maximum temperature rise is when 30° C applying 0,75 A at ambient 60° C.

Figure 10 – Connector de-rating curve

6.4.4 Initial contact resistance between separable fixed and free connectors

Conditions:

IEC 60512, Test 2a

Arrange according to 7.2

Mated connectors

Measurement points: as specified in Figure 11

Signal contacts: 20 mΩ maximum

Screen contact: 20 mΩ maximum

6.4.5 Input to output d.c. resistance

Conditions :

IEC 60512, Test 2a

Mated connectors

Connection points: cable termination to cable termination

Signal contacts: 200 mΩ maximum

Screen: 100 mΩ maximum

6.4.6 Input to output d.c. resistance unbalance

Conditions:

IEC 60512, Test 2a

Mated connectors

Connection points: cable termination to cable termination

Among all signal conductors, maximum difference between maximum and minimum

50 mΩ maximum