

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**

The European Standard EN 60603-7-4:2005 has the status of a
British Standard

ICS 31.220.10

National foreword

This British Standard is the official English language version of EN 60603-7-4:2005. It is identical with IEC 60603-7-4:2005.

The UK participation in its preparation was entrusted to Technical Committee EPL/48/2, Connectors for electronic equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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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 60603-7-4:2005)

Connecteurs pour équipements
électroniques
Partie 7-4: Spécification particulière
pour les fiches et les embases non
blindées à 8 voies pour la transmission
de données à des fréquences
jusqu'à 250 MHz
(CEI 60603-7-4:2005)

Steckverbinder für elektronische
Einrichtungen
Teil 7-4: Bauartspezifikation für
ungeschirmte freie und feste
Steckverbinder, 8polig, für
Datenübertragungen bis 250 MHz
(IEC 60603-7-4:2005)

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 48B/1504/FDIS, future edition 1 of IEC 60603-7-4, 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 60603-7-4 on 2005-03-01.

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) | 2005-12-01 |
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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60603-7-4:2005 was approved by CENELEC as a European Standard without any modification.

CONTENTS

INTRODUCTION.....	8
1 General	9
1.1 Scope.....	9
1.2 Normative references	9
2 IEC type designation	12
2.1 Terms and definitions	13
3 Common features and isometric view	14
3.1 Isometric view	14
3.2 Mating information.....	14
4 Cable terminations and internal connections – Fixed and free connectors	22
4.1 General	22
4.2 Termination types.....	22
5 Gauges	23
5.1 Fixed connectors	23
5.2 Free connectors	26
6 Characteristics	28
6.1 General	28
6.2 Pin and pair grouping assignment	28
6.3 Classification into climatic category	28
6.4 Electrical characteristics.....	29
6.5 Transmission characteristics	31
6.6 Mechanical	33
7 Tests and test schedule.....	33
7.1 General	33
7.2 Arrangement for contact resistance test	34
7.3 Arrangement for vibration test (test phase CP1)	35
7.4 Test procedures and measuring methods	35
7.5 Preconditioning	35
7.6 Wiring and mounting of specimens	36
7.7 Test schedules	36
Annex A (normative) Gauging continuity procedure.....	45
A.1 Object	45
A.2 Preparation of the specimens	45
A.3 Test method	45
A.4 Final measurements	45
A.5 Description of the continuity gauge.....	45
Annex B (normative) Locking-device mechanical operation	49
B.1 Object	49
B.2 Preparation of the specimens	49

B.3	Test method	49
B.4	Final measurements	49
Annex C (normative) Test-plug requirements		50
C.1	General	50
C.2	De-embedding reference NEXT plug construction.....	50
C.3	Set-up and calibration	51
C.4	De-embedding reference plug NEXT measurement	53
C.5	De-embedding reference NEXT jack construction	53
C.6	De-embedding reference jack NEXT measurement.....	54
C.7	Test plug construction	54
C.8	Test plug NEXT measurement	55
C.9	Test plug NEXT requirements.....	56
C.10	Connector NEXT testing	57
C.11	Test plug FEXT loss test procedure – de-embedding method	58
C.12	Test plug FEXT loss test procedure – Coaxial termination method.....	63
C.13	Test plug FEXT requirements	69
C.14	Connector FEXT testing	70
C.15	Test-plug balance.....	70
C.16	Return loss reference plug.....	72
C.17	Connector return loss measurement requirements.....	72
Annex D (normative) General requirements for the measurement set-up.....		73
D.1	Test instrumentation	73
D.2	Coaxial cables and test leads for network analysers	73
D.3	Measurement precautions	73
D.4	Balun requirements	74
D.5	Reference components for calibration.....	75
D.6	Termination loads for termination of conductor pairs.....	75
D.7	Termination of screens	76
D.8	Test specimen and reference planes	77
Annex E (normative) Insertion loss		78
E.1	Object	78
E.2	Test method	78
E.3	Test set-up	78
E.4	Procedure	78
E.5	Test report.....	79
E.6	Accuracy	79

Annex F (normative) Return loss.....	80
F.1 Object	80
F.2 Test method	80
F.3 Test set-up	80
F.4 Procedure	80
F.5 Test report.....	80
F.6 Accuracy	80
Annex G (normative) Near-end crosstalk.....	82
G.1 Object	82
G.2 Test method	82
G.3 Test set-up	82
G.4 Procedure	83
G.5 Test report.....	84
G.6 Accuracy	84
Annex H (normative) Far-end crosstalk	85
H.1 Object	85
H.2 Test method	85
H.3 Test set-up	85
H.4 Procedure	86
H.5 Test report.....	86
H.6 Accuracy	86
Annex I (normative) Transverse Conversion Loss (TCL) and Transverse Conversion Transfer Loss (TCTL).....	87
I.1 Object	87
I.2 Test method	87
I.3 Test set-up	87
I.4 Procedure	89
I.5 Test report.....	90
I.6 Accuracy	90
Annex J (normative) Termination of balun	91
J.1 Termination of balun with low return loss for common mode	91
Annex K (normative) Gauge requirements.....	92
K.1 Fixed connectors	92
K.2 Free connectors	92

Figure 1 – Isometric view	14
Figure 2 – Contact interface dimensions with terminated free connector	15
Figure 3 – Fixed connector details	18
Figure 4 – Free connector view	20
Figure 5 – Go gauge	23
Figure 6 – No-go gauges	25
Figure 7 – No-go gauges	26
Figure 8 – Go gauge	27
Figure 9 – Fixed connector pin and pair grouping assignment (front view of connector)	28
Figure 10 – Connector de-rating curve	30
Figure 11 – Arrangement for contact resistance test	34
Figure 12 – Arrangement for vibration test	35
Figure A.1 – Gauge	47
Figure A.2 – Gauge insertion	48
Figure C.1 – De-embedding reference plug	51
Figure C.2 – De-embedding reference jack	53
Figure C.3 – De-embedding reference FEXT plug without sockets	58
Figure C.4 – De-embedding reference FEXT plug with sockets	59
Figure C.5 – Reference FEXT plug mated to PWB	59
Figure C.6 – Reference FEXT plug-test lead position	60
Figure C.7 – Reference FEXT plug assembly	60
Figure C.8 – Test leads connected to de-embedded reference jack/PWB assembly	62
Figure C.9 – Reference FEXT plug mated to reference jack/PWB assembly	62
Figure C.10 – Exploded assembly of the coaxial termination reference test head	64
Figure C.11 – Detailed view of the coaxial termination reference test-head interface	64
Figure C.12 – THI3KIT test head interface with baluns attached	65
Figure C.13 – Alternative to item 3.1 in Table C.6	67
Figure C.14 – Back-to-back through calibration	67
Figure C.15 – Mated test plug/coaxial termination reference test-head test configuration	69
Figure D.1 – 180° hybrid used as a balun	74
Figure D.2 – Calibration of reference loads	75
Figure D.3 – Resistor load	76
Figure D.4 – Definition of reference planes	77
Figure E.1 – Calibration	78
Figure E.2 – Measuring set-up	79
Figure G.1 – NEXT measurement for differential and common mode terminations	83
Figure H.1 – FEXT measurement for differential and common mode terminations	85
Figure I.1 – TCL and TCTL measurements	88
Figure J.1 – Balanced attenuator for balun centre tap grounded	91
Figure J.2 – Balanced attenuator for balun centre tap open	91

Table 1 – Dimensions for Figure 2	16
Table 2 – Dimensions for Figure 3	19
Table 3 – Dimensions for Figure 4	21
Table 4 – Dimensions for Figures 5 and 6	25
Table 5 – Dimensions for Figure 7	26
Table 6 – Dimensions for Figure 8	27
Table 7 – Climatic categories – Selected values	28
Table 8 – Creepage and clearance distances	29
Table 9 – Test group P	37
Table 10 – Test group AP	38
Table 11 – Test group BP	40
Table 12 – Test group CP	41
Table 13 – Test group DP	42
Table 14 – Test group EP	43
Table 15 – Test group FP	44
Table A.1 – Dimensions for Figure A.1	46
Table C.1 – Category 6 de-embedded real and imaginary reference jack vectors	55
Table C.2 – Test plug NEXT loss limits	56
Table C.3 – Test plug NEXT loss ranges	57
Table C.4 – Coaxial termination reference head component list	63
Table C.5 – Coaxial termination reference head component list	65
Table C.6 – Coaxial termination reference head, additional parts	66
Table C.7 – Test plug FEXT requirements – De-embedding method	69
Table C.8 – Category 6 differential mode reference jack vectors	70
Table C.9 – Test-plug differential and differential with common-mode consistency	71
Table C.10 – Return loss requirements for return loss reference plug	72
Table D.1 – Test balun performance characteristics	74
Table F.1 – Uncertainty band of return loss measurement at frequencies below 100 MHz	81
Table F.2 – Uncertainty band of return loss measurement at frequencies above 100 MHz	81

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 7-4: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz

1 General

1.1 Scope

This part of IEC 60603 covers 8-way unshielded free and fixed 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 it means the following: the fixed and the free connector are capable of interconnecting with any IEC 60603-7 series connector, and when it is interconnected, it fully meets all requirements of the lower frequency IEC 60603-7 series standard.

NOTE Transmission performance categories: in this IEC standard, 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: Electro-mechanical components for electronic equipment*

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

IEC 60068-2-14, *Environmental testing – Part 2: Tests – Test N: Change of temperature*

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: 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 60352 (all parts), *Solderless connections*

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

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

IEC 60352-4, *Solderless connections – Part 4: Solderless non-accessible insulation displacement 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 60512-1-100, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

IEC 60603-7 (all parts), *Connectors for electronic equipment*

IEC 60603-7-2:—, *Connectors for electronic equipment – Part 7-2: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*¹

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

IEC 61076-1:1995, *Connectors with assessed quality, for use in d.c., low-frequency analogue and in digital high speed data applications – Part 1: Generic 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: Horizontal floor wiring – Sectional specification*

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

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

¹ To be published.

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

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 Recommendation G.117, *Transmission aspects of unbalance about earth*

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

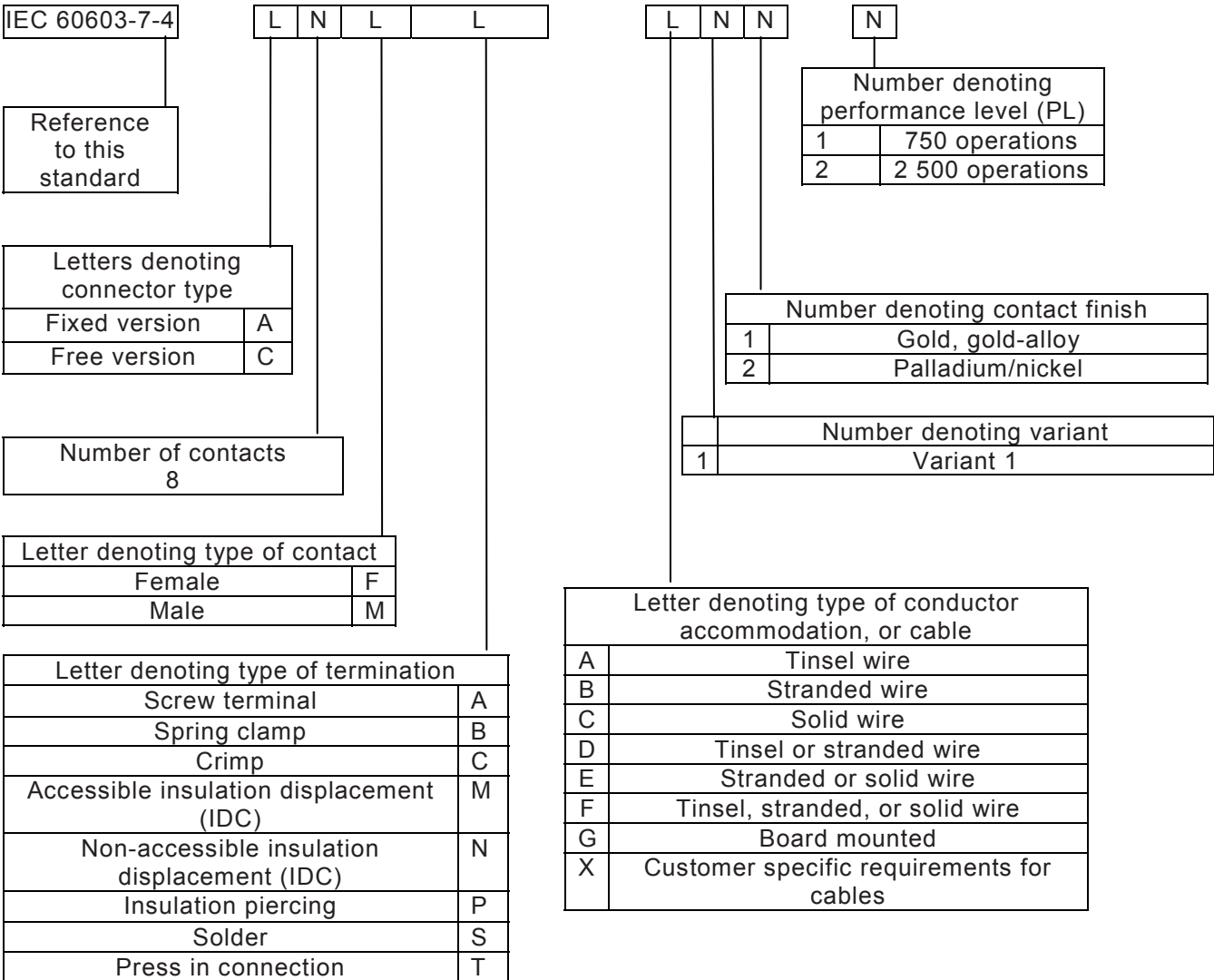
ITU-T Recommendation K.44:2000, *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*

ITU-T Recommendation 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 60603-7-4 A8FP-E11-1: Fixed connector, panel mounted, having 8 female contacts in standard contact positions, 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

interchangeability level

level at which these connectors are intermateable, interoperable and backward compatible with IEC 60603-7 series connectors

2.1.2

intermateability

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

2.1.3

backward compatibility

plug or jack which is in compliance with this detail specification, mated with a jack or plug in compliance with any lower frequency IEC 60603-7 series connector, fully complying with the requirements of the lower frequency IEC 60603-7 series connector

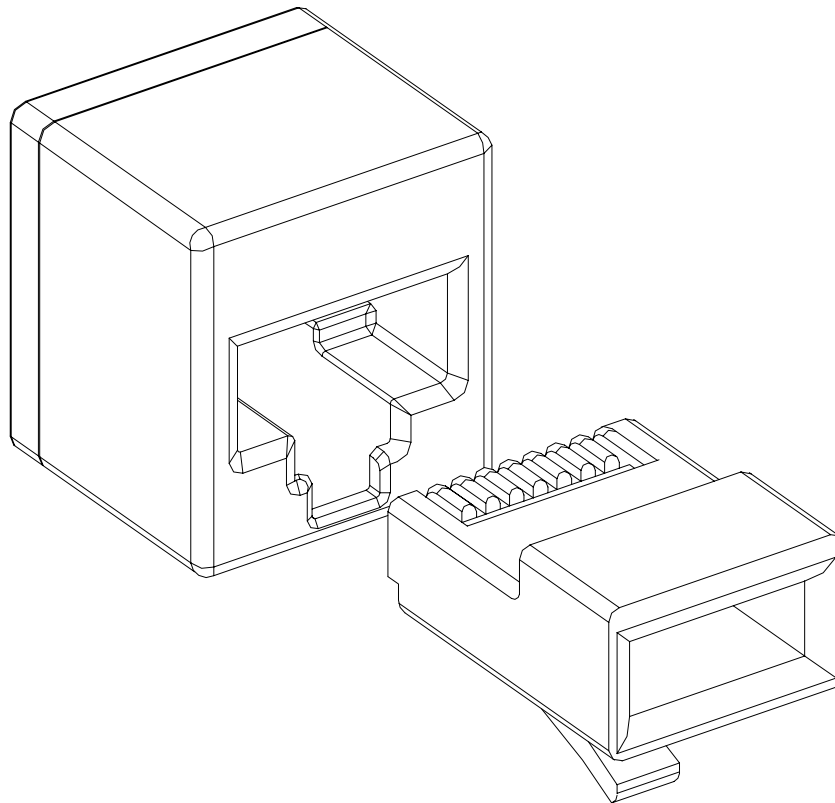
2.1.4

interoperability

interoperability of different IEC 60603-7-4 connectors is assured by compliance with all transmission requirements for the different IEC 60603-7-4 connectors 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



IEC 086/05

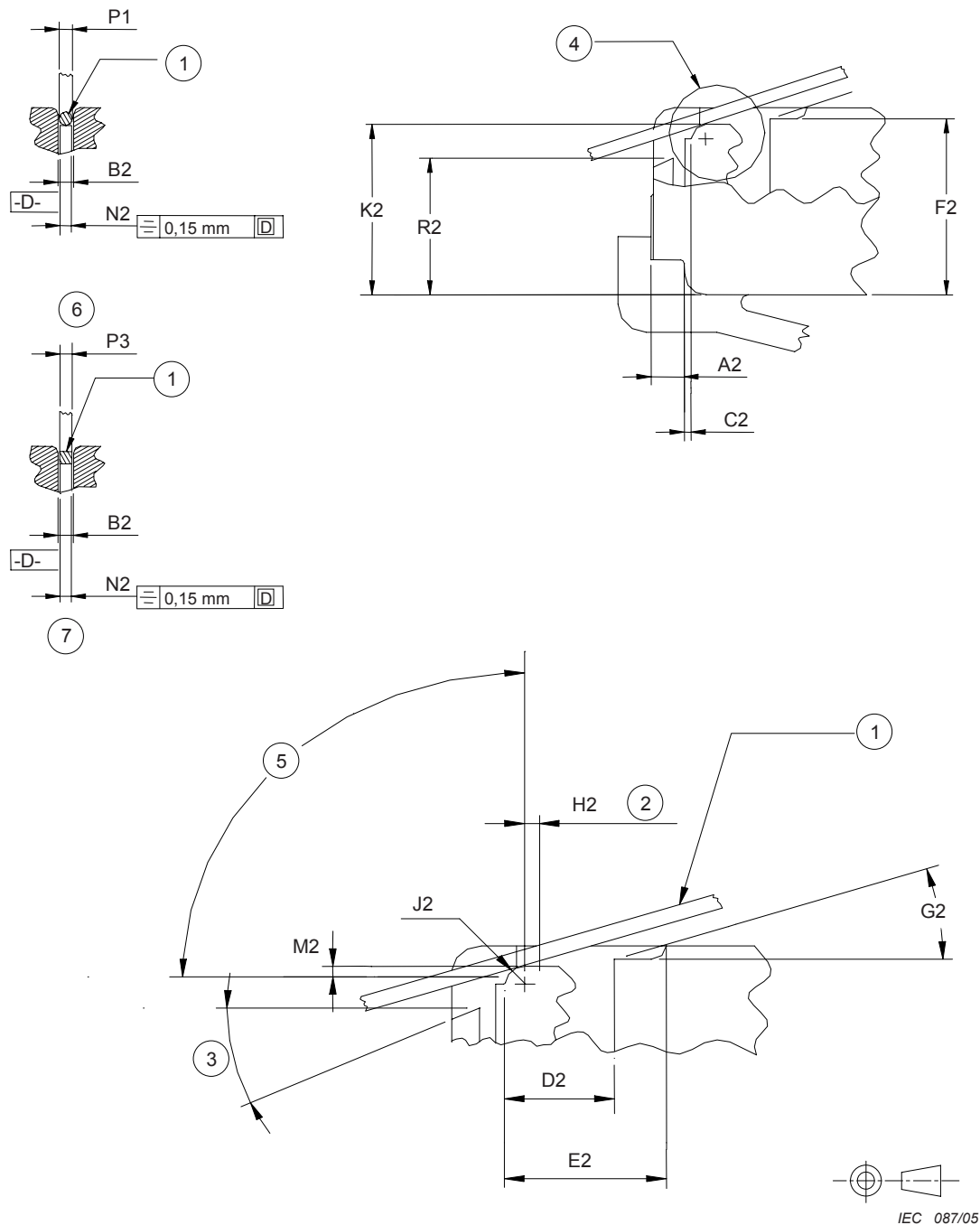
Figure 1 – Isometric view

3.2 Mating information

3.2.1 General

Dimensions are given in millimetres. Drawings are shown in third-angle projections. The shape of connectors may deviate from those shapes given in Figures 1 to 4 as long as the dimensions specified are not influenced.

3.2.2 Contacts – Mating conditions



- 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 Preferred contact configuration.
- 7 Optional contact configuration.

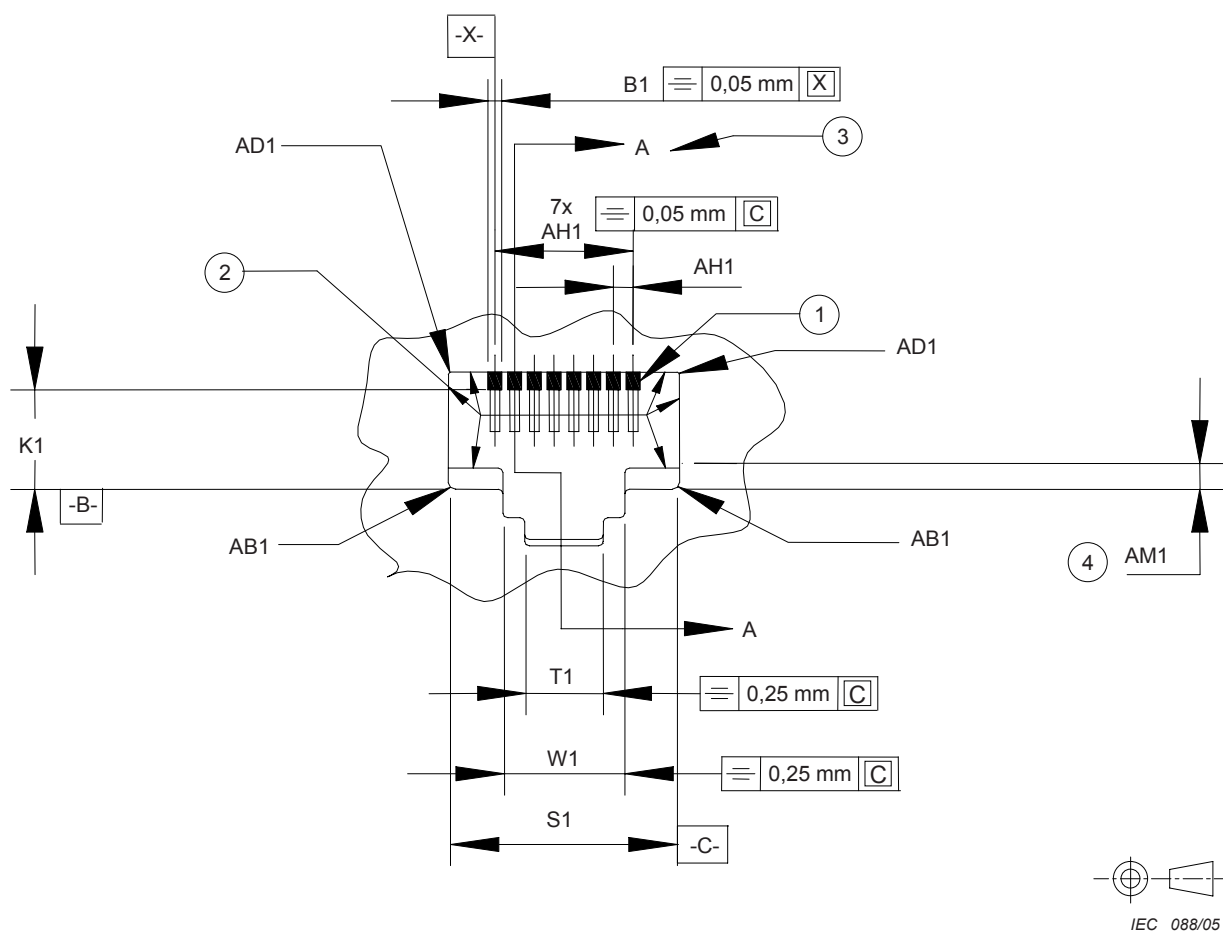
Figure 2 – Contact interface dimensions with terminated free connector

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	

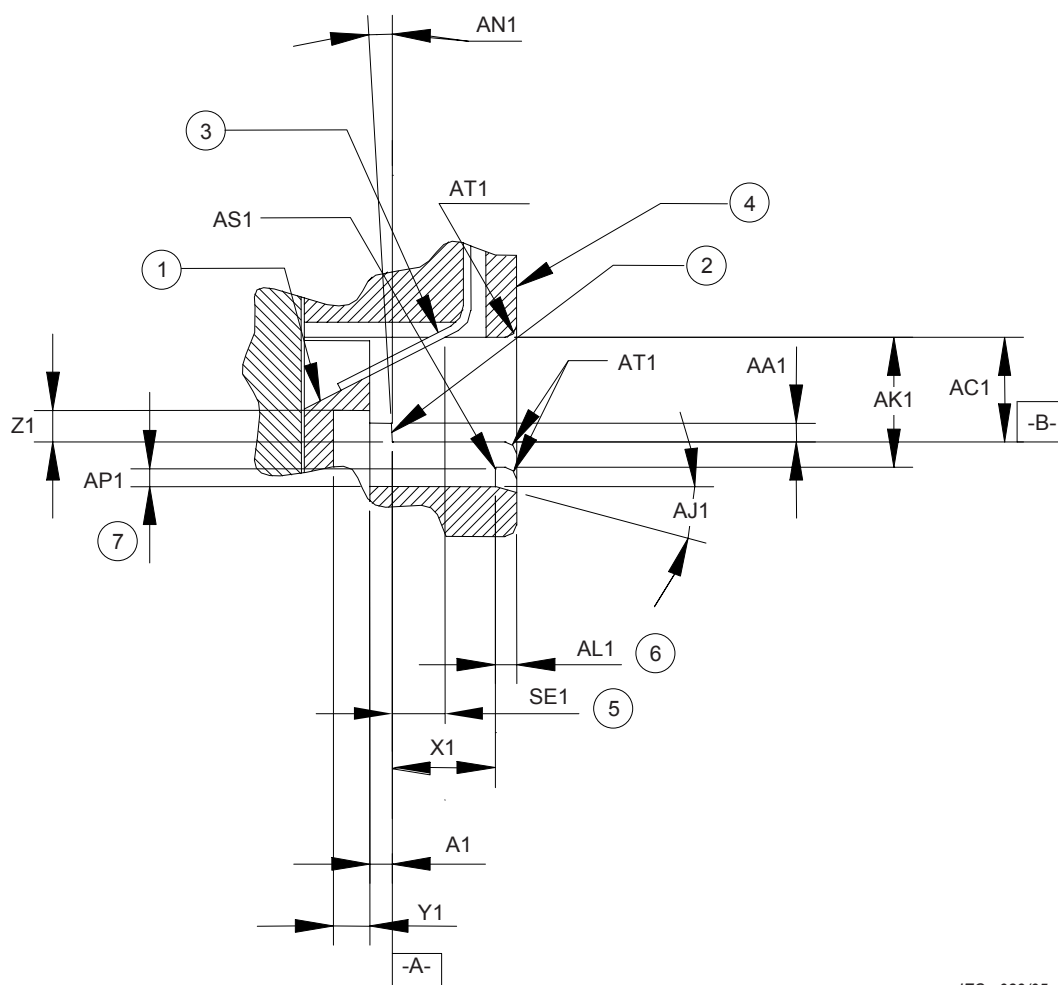
Letter	Maximum
G2	10°
Care shall be taken that the jack contacts avoid interference with the plastic of the free connector.	

3.2.3 Fixed connector



- 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.

Figure 3a) – View of contact zone



IEC 089/05

View of contact zone section A-A

- 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 Flat surface.
- 8 All internal corners in the connector cavity shall be 0,38 mm radius maximum unless otherwise specified.

Figure 3b) – Section A-A

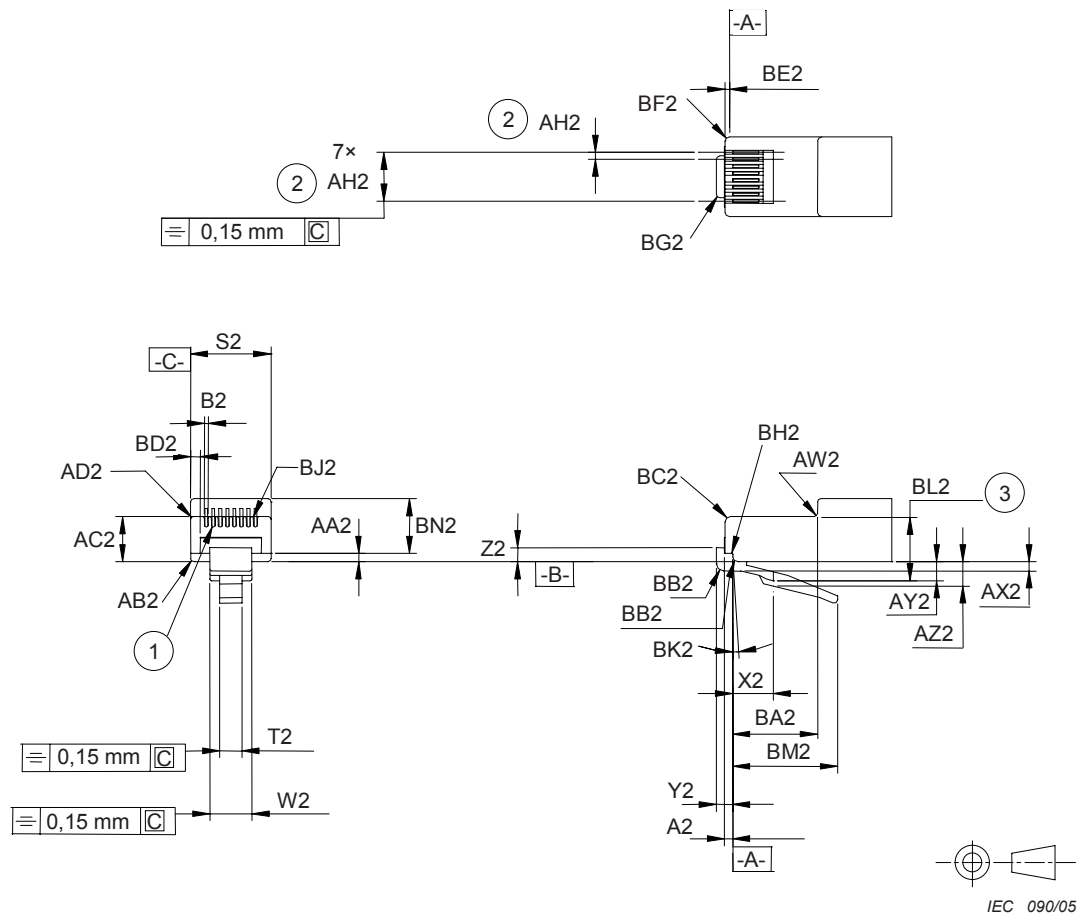
Figure 3 – Fixed connector details

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 ^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'	

3.2.4 Free connector



- 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 4 – Free connector view

Table 3 – Dimensions for Figure 4

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'	

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.

If a type of solderless termination which is not covered by any IEC specification is used, the supplier shall assure its reliability by performing similar tests, and demonstrating a 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 (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 detail 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.

4.2 Termination types

4.2.1 Solder terminations

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 Compliant pin

The compliant pin 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 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 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:

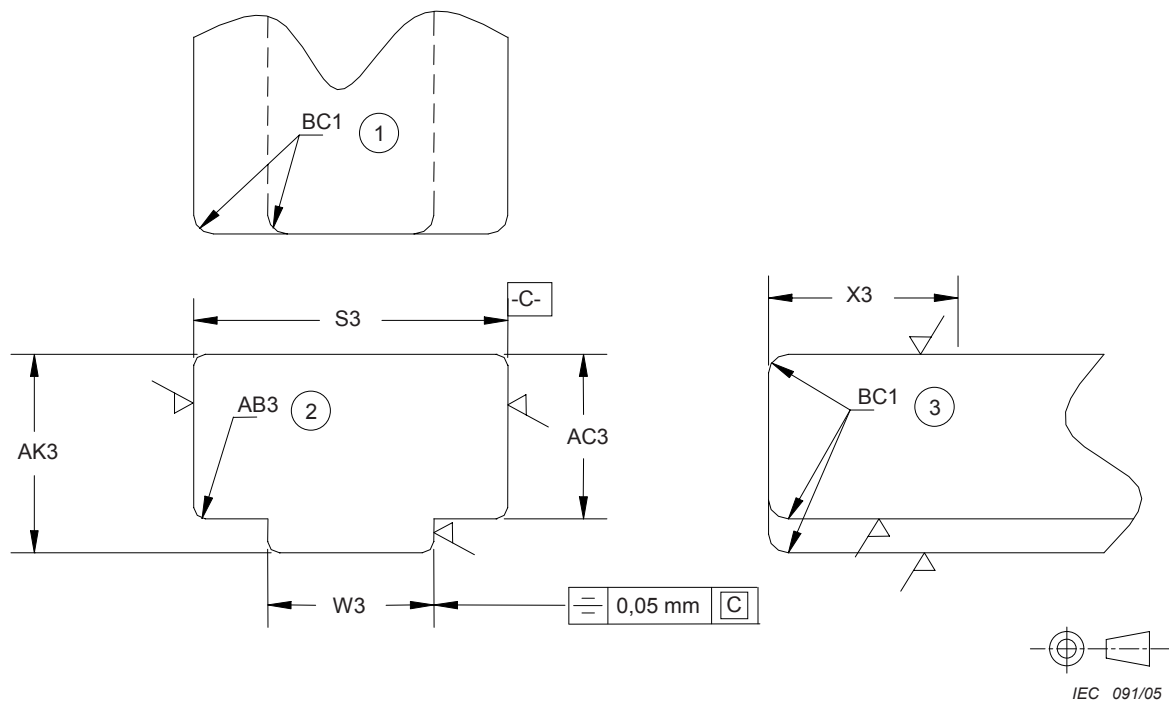
Material: tool steel, hardened.

✓ = Surface roughness, according to ISO 1302.

Ra = 0,25 µm maximum.

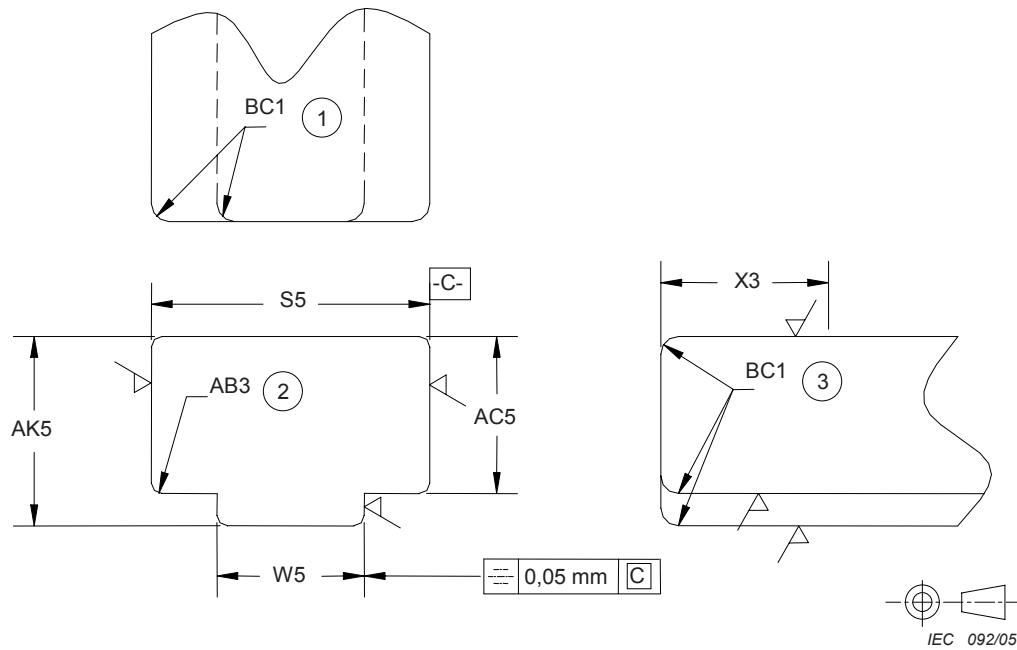
A 0,01 mm wear tolerance shall be applied.

Clearance shall be provided for connector contacts.



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

Figure 5 – Go gauge



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

Figure 6a) – No-go gauge width

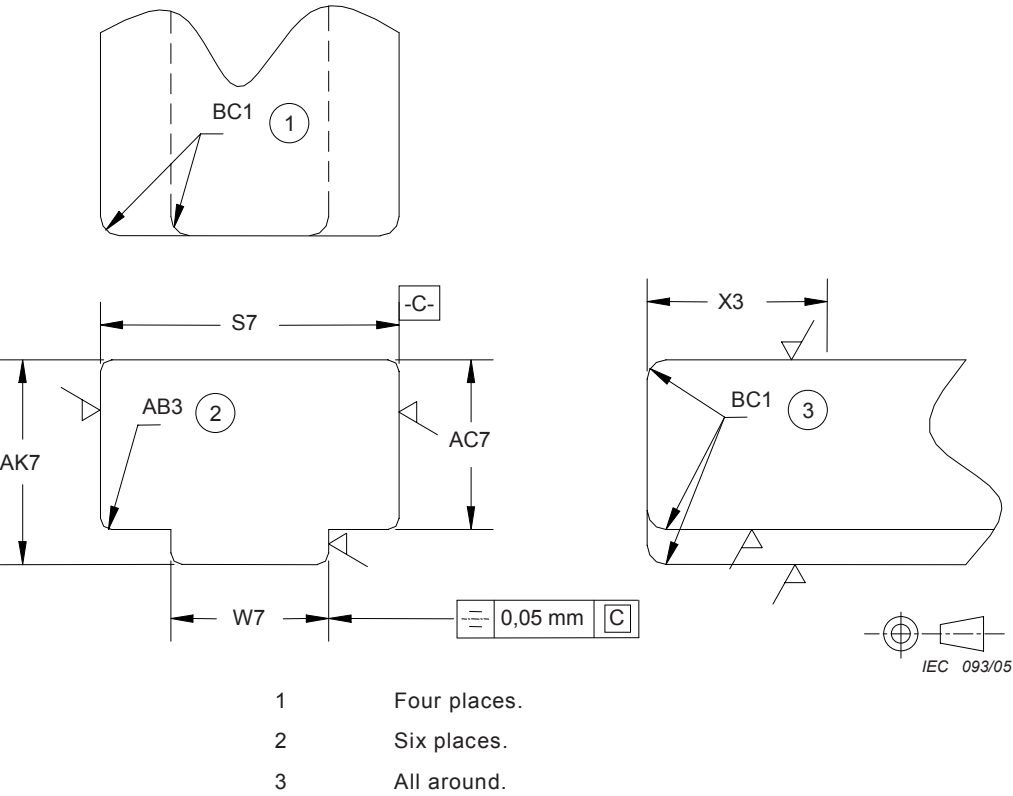


Figure 6b) – No-go gauge height

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

Material: tool steel, hardened.

▽ = Surface roughness, according to ISO 1302

Ra = 0,25 µm maximum.

A 0,01 mm wear tolerance shall be applied.

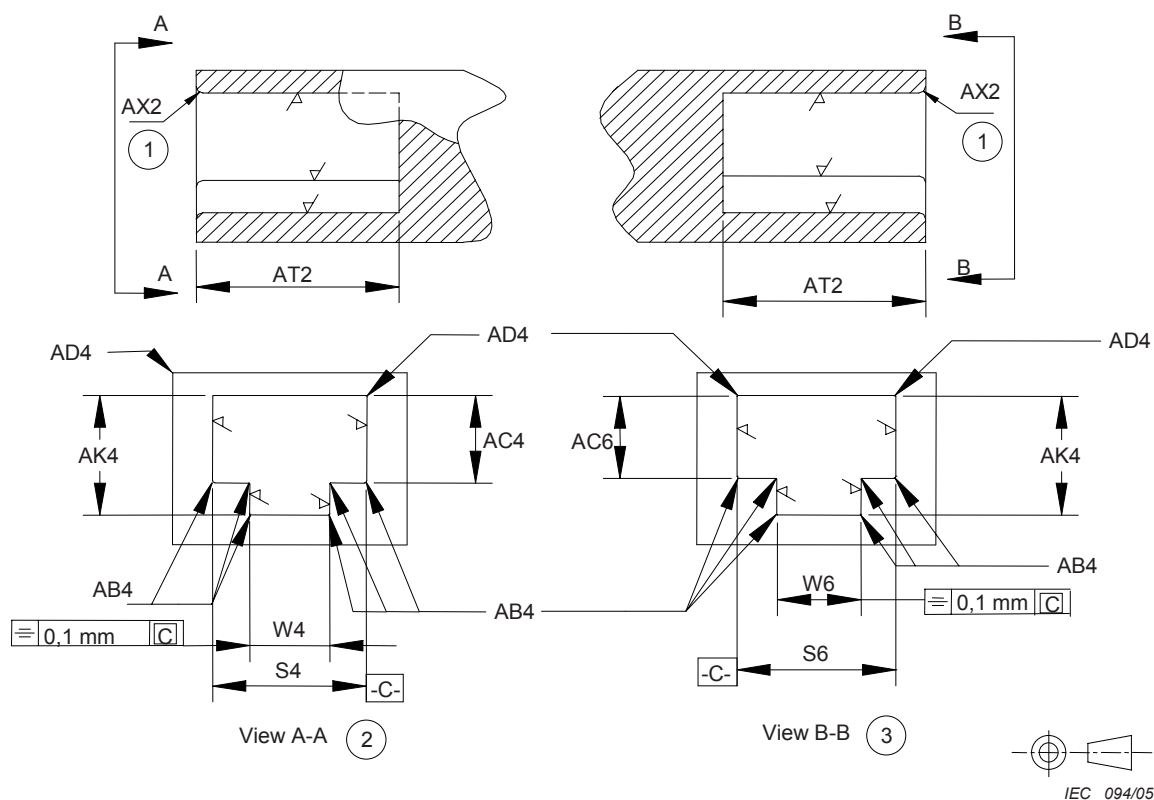
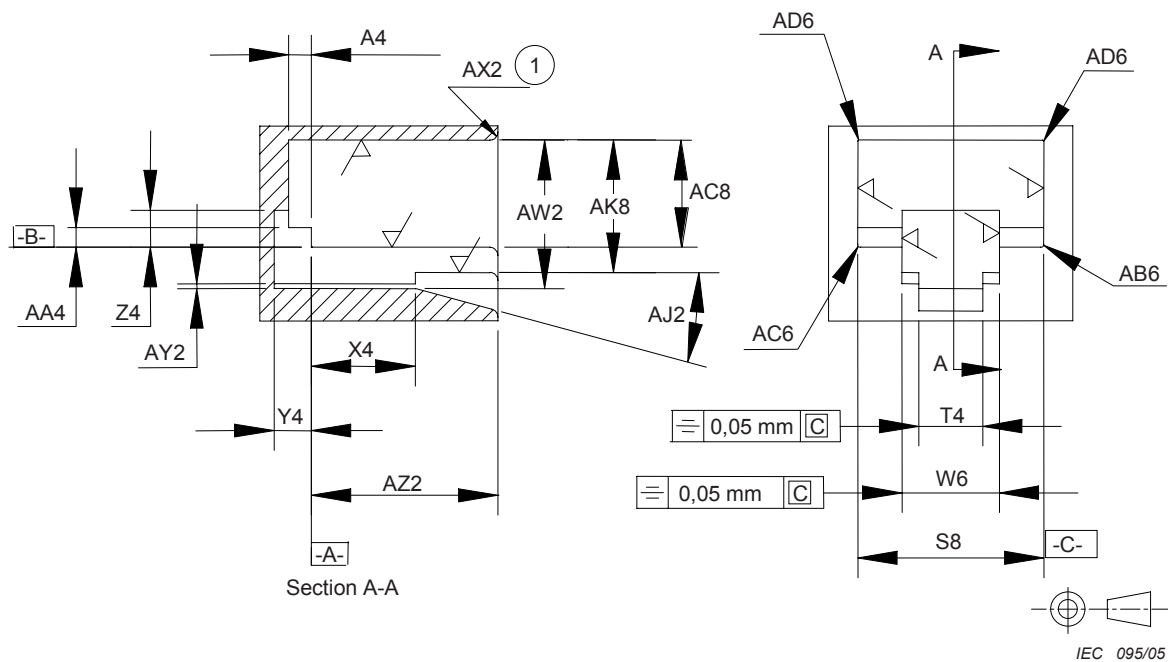


Figure 7 – No-go gauges

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



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.

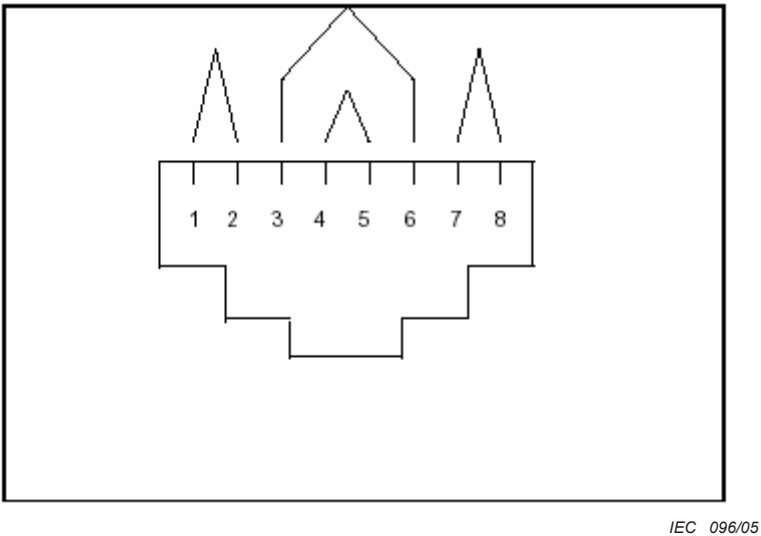


**Figure 9 – Fixed connector pin and pair grouping assignment
(front view of connector)**

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 2.2 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