INTERNATIONAL STANDARD

IEC 61076-4-114

First edition
2003-02

Connectors for electronic equipment –

Part 4-114:
Printed board connectors –
Detail specification for two-part connector with integrated shielding function having a grid of 1 mm × 1,5 mm

Reference number
IEC 61076-4-114:2003(E)

Publication numbering

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE X

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONNECTORS FOR ELECTRONIC EQUIPMENT –

Part 4-114: Printed board connectors – Detail specification for two-part connector with integrated shielding function having a grid of 1 mm × 1,5 mm

FOREWORD

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International Standard IEC 61076-4-114 has been prepared by subcommittee 48B: Connectors, of IEC Technical Committee 48: Electromechanical components and mechanical structures for electronic equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
48B/1287/FDIS	48B/1307/RVD

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

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

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated when new editions will be published.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

CONNECTORS FOR ELECTRONIC EQUIPMENT –

Part 4-114: Printed board connectors – Detail specification for two-part connector with integrated shielding function having a grid of 1 mm × 1,5 mm

<table>
<tr><td>IEC SC 48B: LF Connectors

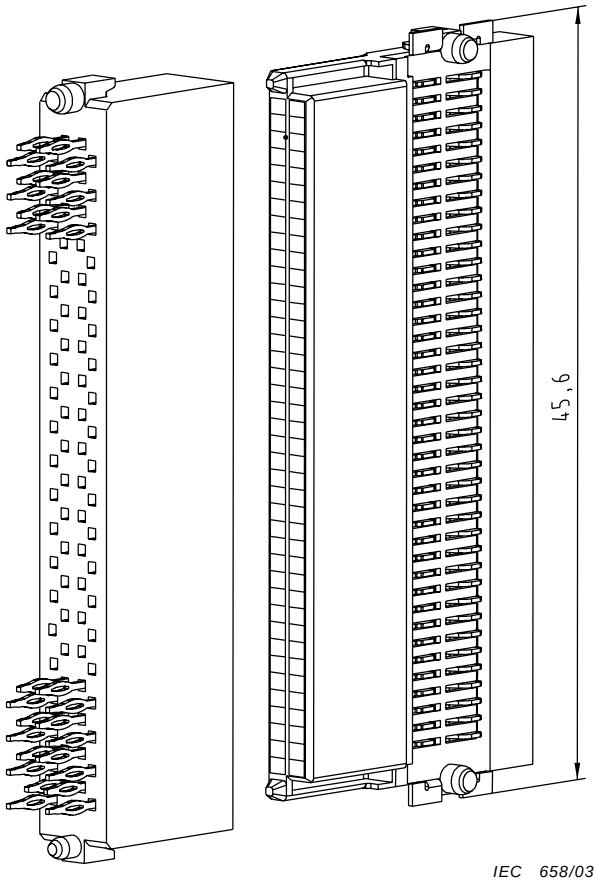
Specification available from:

IEC Central Office or from the addresses shown on the inside cover.

ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH:

- GENERIC SPECIFICATION IEC 61076-1:1995</td><td>Draft IEC 61076-4-114

Blank detail specification number 61076-4-001</td></tr>
<tr><td>See Clause 3 for dimensions

IEC 658/03</td><td>Two-part connector for printed boards and backplanes, grid of 1 mm × 1,5 mm in accordance with IEC 60917-1.

.</td></tr>
<tr><td colspan="2">Information on the availability of components qualified to this detail specification is given in the qualified product list.</td></tr>
</table>

1 General data

This detailed specification contains modular two-part connectors with integrated shielded function having a grid of 1 mm × 1,5 mm in accordance with IEC 60917-1.

1.1 Recommended method of mounting

The free board connectors are provided with contacts for surface mounting technique. Guiding pivots support positioning of the free board connector. The terminations of the free board connectors shall fit on solder pads on printed boards having a grid of 1 mm × 4 mm.

The fixed board connectors are provided with contacts, either with press-in or surface mount terminations.

The connector is fixed by the press-in terminations or by surface mounted terminations. Provided holes in the printed board (diameter 1,4 mm and 1,8 mm) are used for correct positioning and polarisation and are not necessary for secure connector mounting.

1.2 Ratings and characteristics

Rated voltage: Contact/contact for fully loaded connector

Table 1 – Rated voltage

Material group	Pollution degree	Rated voltage V
I, II, IIIa/b	1	200
II, IIIa/b	2	20
NOTE Reference is made to Table 15: Minimum creepage and clearance distances, of this specification, and Table 4 of IEC 60664-1 listing the relation between creepage distances, pollution degree and material groups versus voltages r.m.s.		

Current rating: 1 A at 50 °C for fully loaded connector

Insulation resistance: 10^4 MΩ min.

Climatic category: PL1: 55/125/56
PL2: 55/125/21

Printed board thickness: see Table 10

Contact spacing: 1 mm × 1,5 mm

1.3 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 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 60352-5:2001, *Solderless connections – Part 5: Solderless press-in connections – General requirements, test methods and practical guidance*

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

IEC 60512-1-100:2001, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

IEC 60664-1:2002, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60917 (all parts), *Modular order for the development of mechanical structures for electronic equipment practices*

IEC 60917-1:1998, *Modular order for the development of mechanical structures for electronic equipment practices – Part 1: Generic standard*

IEC 60917-2-2:1994, *Modular order for the development of mechanical structures for electronic equipment practices – Part 2: Sectional specification – Interface co-ordination dimensions for the 25 mm equipment practice – Section 2: Detail specification – Dimensions for subracks, chassis, backplanes, front panels and plug-in units*

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 61076-4:1995, *Connectors with assessed quality, for use in d.c., low-frequency analogue and in digital high-speed data applications – Part 4: Sectional specification – Printed board connectors*

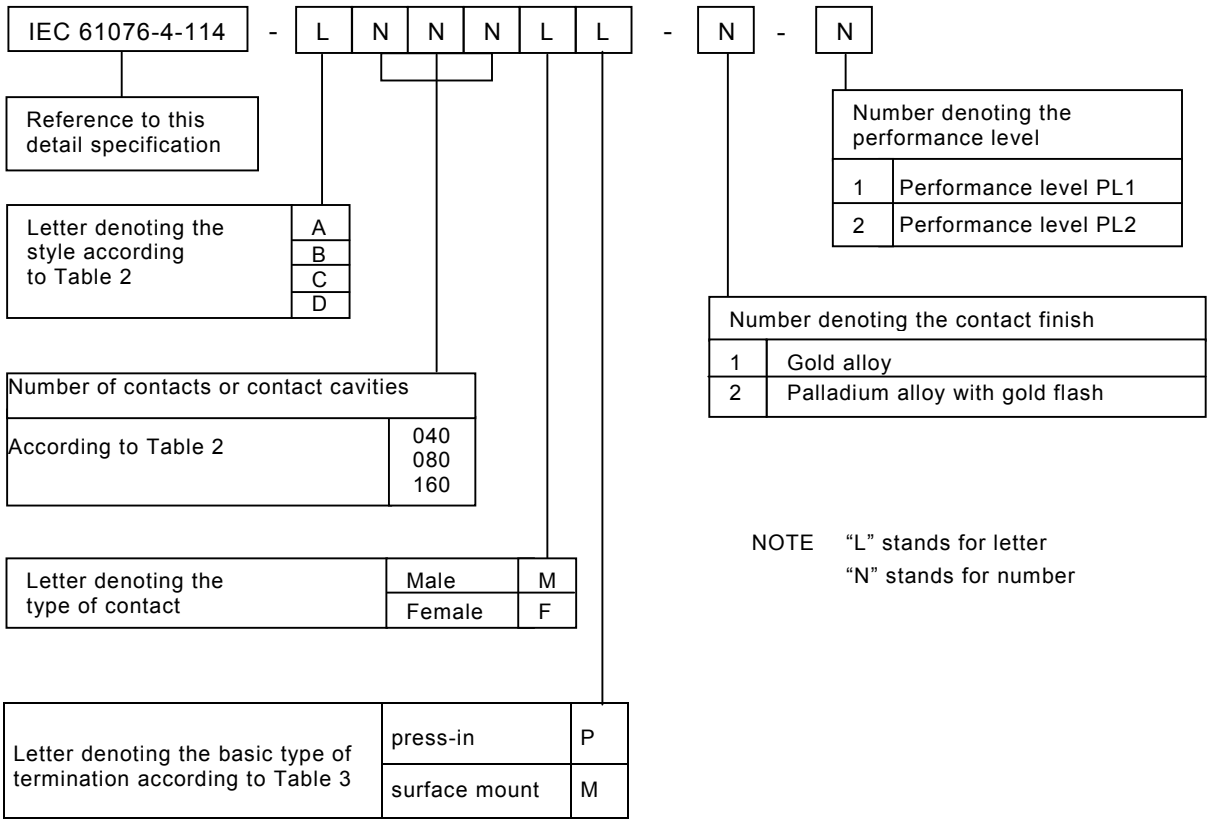
ISO 1302:2002, *Geometrical product specifications (GPS) – Indication of surface texture in technical product documentation*

1.4 Marking

Marking of the connector and the package shall be in accordance with 2.6 of IEC 61076-4.

1.5 IEC Type designation

Connectors, connector bodies and contacts according to this standard shall be designated by the following system:



EXAMPLE Connector style B, having 80 male contacts with press-in terminations, with gold alloy contact finish and with performance level 2:

IEC 61076 – 4 – 114 – B 080 MP – 1 – 2

1.6 Ordering information

For ordering connectors according to this detail specification the type designation described in 1.5 shall be used.

2 Technical information

2.1 Abbreviations

SMT: Surface Mount Technology

FMLB contact: First Make Last Break contact

2.2 Survey of styles and variants

Fully loaded 2-row connectors and 4-row connectors are each available in two length (from 40 to 160 mated lines), for details see Table 2.

Table 2 – Contact arrangement and number of contacts

Style	A	B	C	D
Height of styles mm	27	47	27	47
Number of row	2	2	4	4
Number of contacts	40	80	80	160

Table 3 – Styles of termination

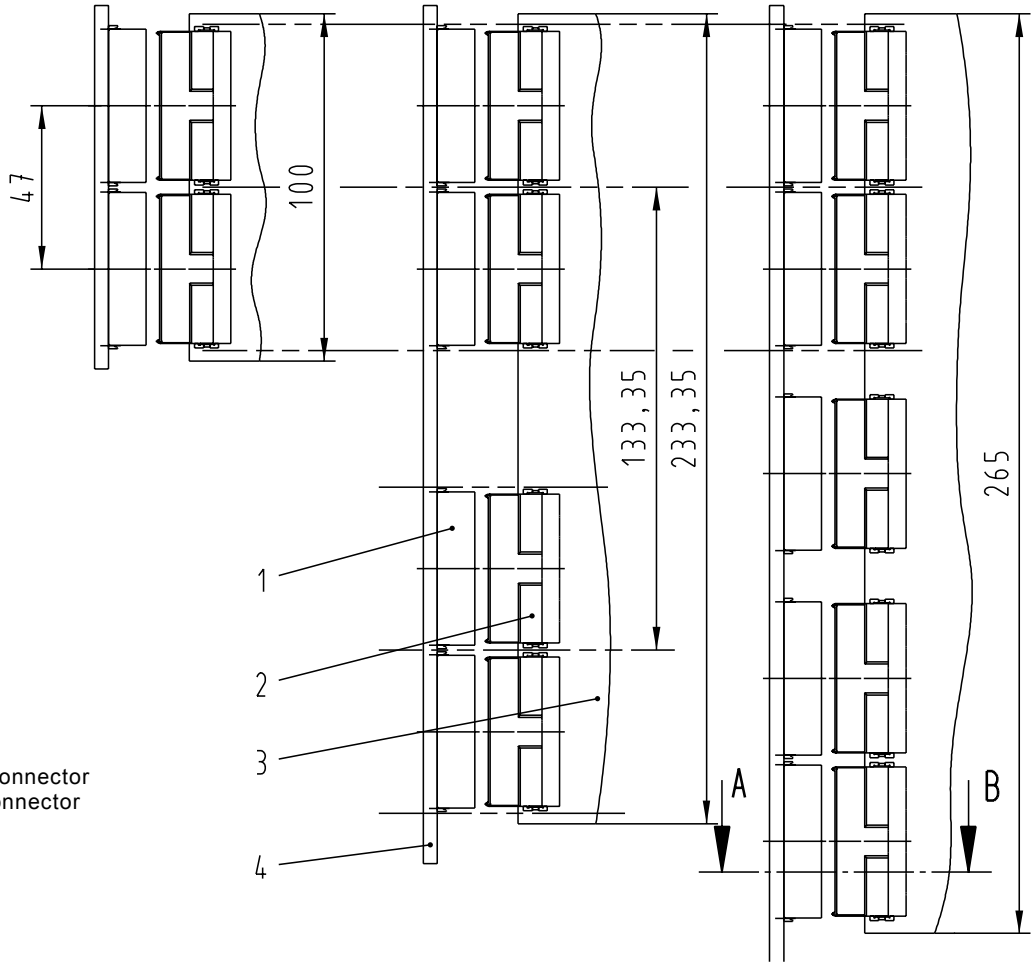
Identification letter for style of termination	Connector style	Free board connector	Fixed board connector
M	A, B	Termination for surface mounting to a printed and solder pads, according to 3.8	Termination for surface mounting on a fixed and solder pads, according to 3.7
M	C, D	Termination for surface mounting to a printed board with a thickness of 1,6 mm to 2,4 mm and solder pads, according to 3.8	
P	all styles		Termination for press-in with solid pin on fixed board connector to a printed board with a thickness of 1,6 mm min. and plated through holes diameter. 0,6 mm according to IEC 60352-5

2.3 Information on application

2.3.1 Complete connectors (pairs)

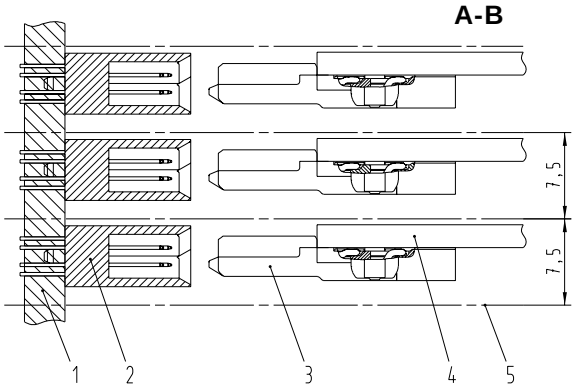
The arrangement of the free board connectors are normally the same as the arrangements of the fixed board connectors, other arrangements are possible.

Examples for arrangements of fixed and free board connectors.



Key

1 Fixed board connector
2 Free board connector
3 Printed board
4 Backplane



Key

1 Backplane
2 Fixed board connector
3 Free board connector
4 Surface mounted contacts
5 Datum plane

IEC 659/03

Figure 1 – Free and fixed board connectors for modular arrangement

Table 4 – Complete connectors

Card-height	100 mm	233,35 mm	265 mm
Number of connectors	2	4	5
Number of contacts	320	640	800

2.3.2 Fixed board connectors

To ensure contact safety the planarity of the connector before press-in or solder operation to backplane shall meet the requirements according to 3.4.1. After press-in or solder to backplane the connector shell meet the requirements according to 5.1.6.

2.3.3 Free board connectors

To ensure contact safety the planarity of the connector before solder operation to printed board shall meet the requirements according to 3.5.1. After solder to printed board the connector shell meet the requirements according to 5.1.6.

2.3.3.1 Accessories

Not applicable

2.3.4 Shielding/grounding

Under preparation

2.3.5 Basic type of termination

The fixed and free board connectors are provided with guiding pivots. This pivots are not used for connector fixing but they are necessary for guiding and alignment purposes under repair conditions.

Furthermore they have a polarisation function.

2.4 Contact arrangements

Fixed and free board connectors are always fully loaded – contact arrangement 1.

2.4.1 Fixed board connectors

2-row fixed board connector

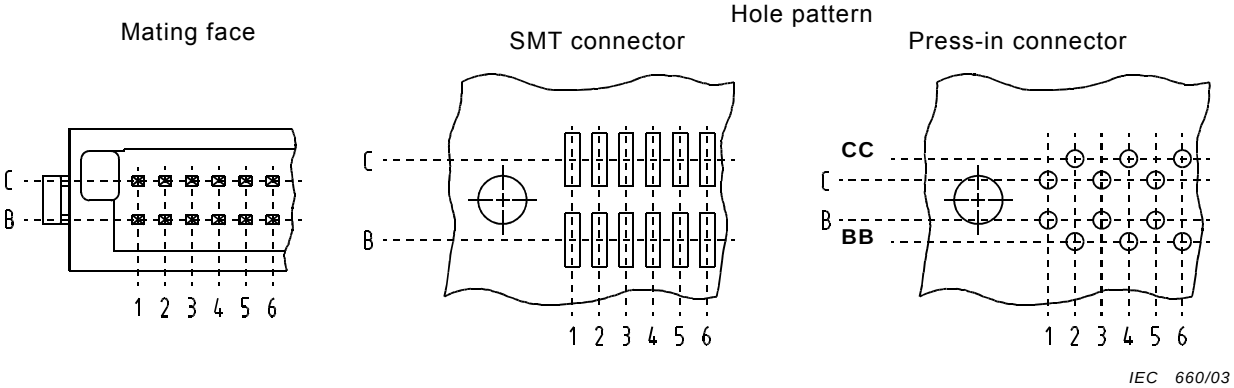


Figure 2 – Contact arrangements

NOTE For mounting information see 3.7.1 (hole pattern)

4-row fixed board connector under preparation

2.4.2 Free board connectors

2-row free-board connector

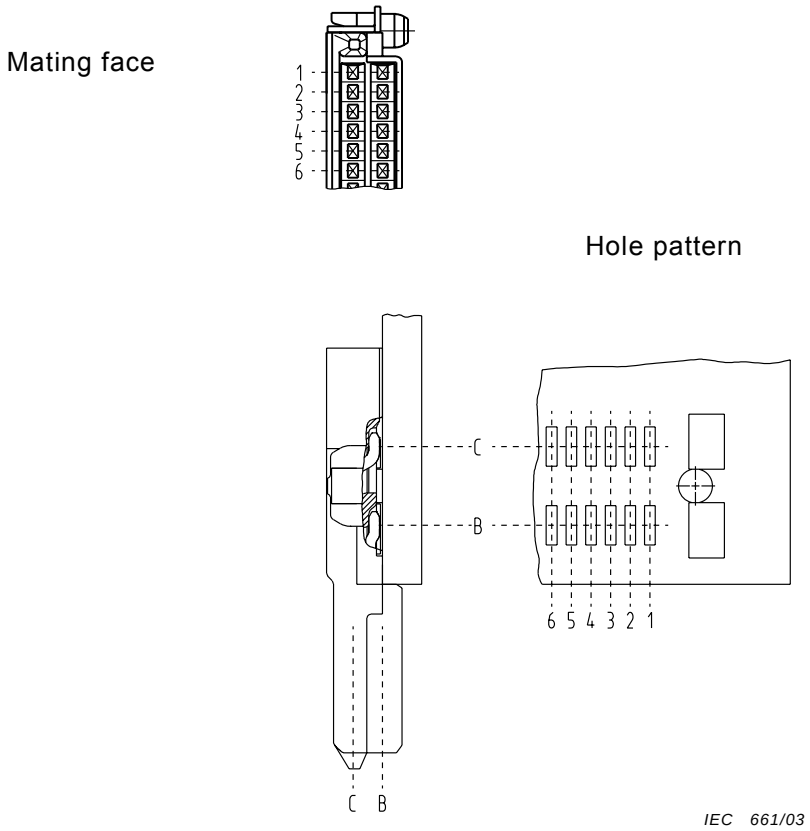


Figure 3 – Contact arrangements

NOTE For mounting information see 3.8.1 (hole pattern)

4-row free-board connector under preparation

3 Dimensional information

3.1 General

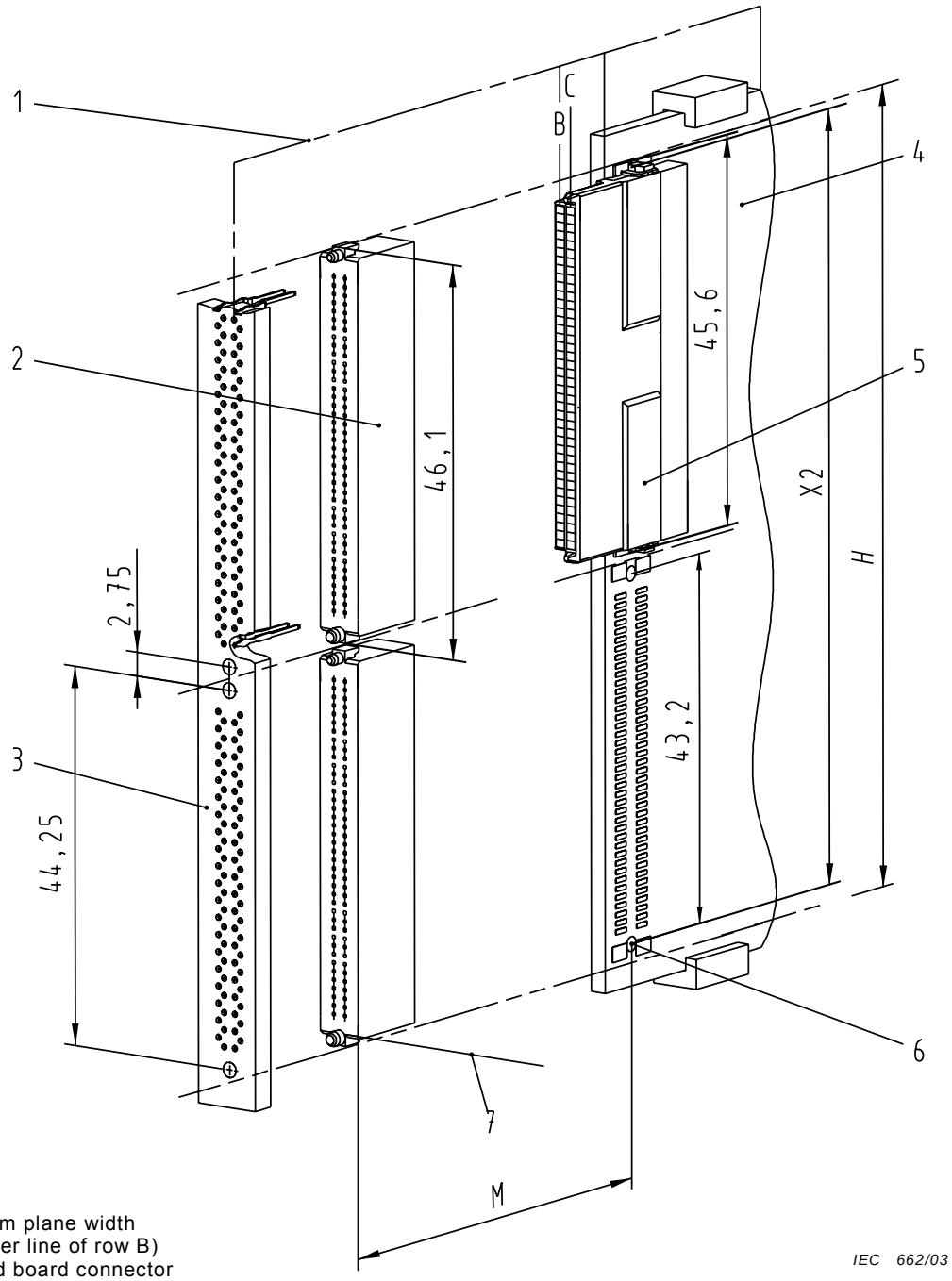
All dimensions in millimetres.

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

The information about the bending in 3.3.4 and 5.1.6 is valid for the condition of delivery. The permissible bending of the mounted connector is stated in 5.1.6.

Missing dimensions can be chosen according to the common characteristics and the intended use.

3.2 Isometric view and common features



Key

1 Datum plane width (Center line of row B)
2 Fixed board connector
3 Backplane
4 Free printed board
5 Free board connector
6 Hole for guiding pivot
7 Datum plane depth

Figure 4 – Isometric view

Fixed board connectors are shown as press-in version.

Table 5 – Isometric view and common features

Reference letter	Dimensions mm	Legend
H	n × 47	Maximum height of the fixed board connector with n = 1, 2, 3, 4, 5
M	17,5 – 20	Contact range in plug-in direction (see Figure 8) NOTE For information only see 3.3
X2	H – 3,8	Distance between centre lines of the guiding pivots of free board connector

3.2.1 Common features

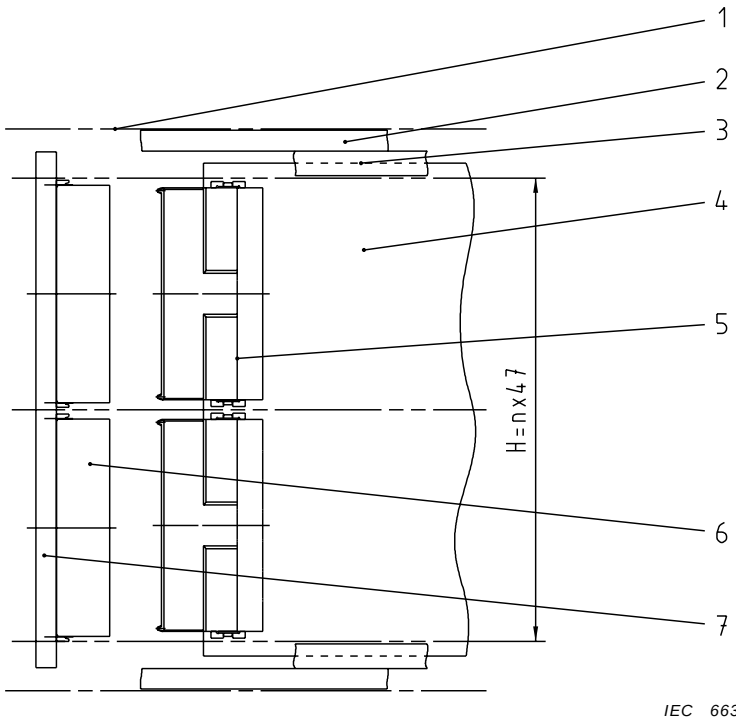
Not applicable

3.2.2 Reference system

Co-ordination dimensions are dimensions without tolerances and indicate the max. dimension.

These co-ordination dimensions are based upon the 0,05 mm module specified in the series IEC 60917. The datum planes are indicated in 3.2.3, 3.2.4 and 3.2.5.

3.2.3 Height dimensions



Key

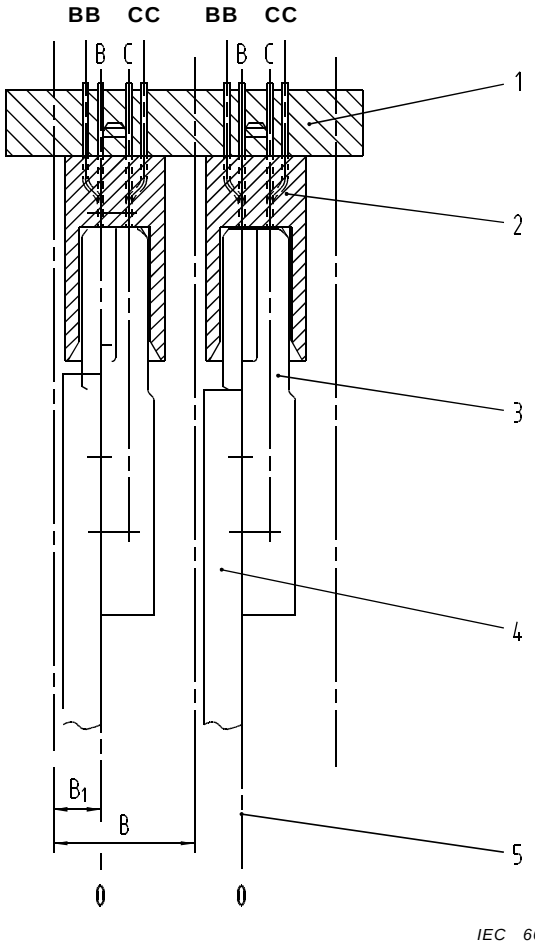
1 Datum plane of subrack
2 Subrack
3 Guide rail
4 Free printed board
5 Free board connector
6 Fixed board connector
7 Backplane

Figure 5 – Height dimensions

Table 6 – Height dimensions

Number of multi modules	1	2	3	4	5
H = connector height in mm	47	94	141	188	235

3.2.4 Width dimensions



Key

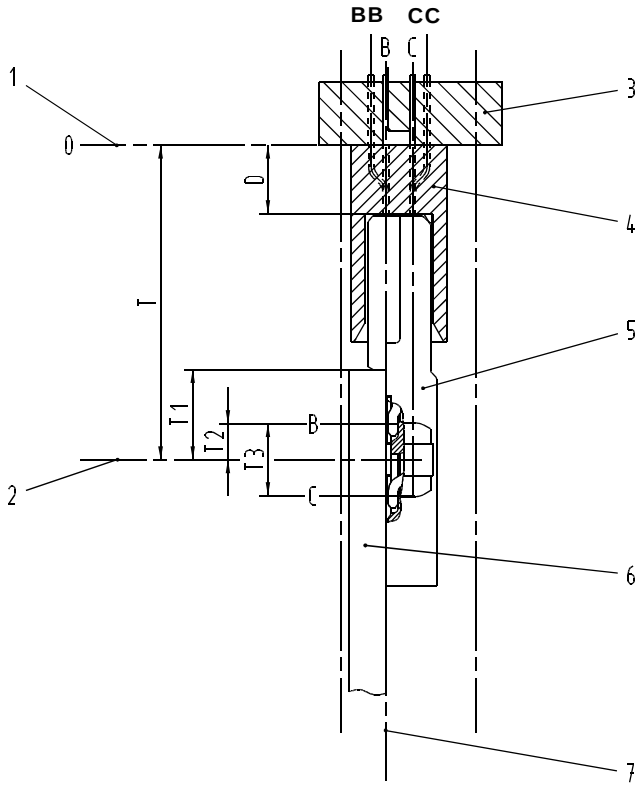
1 Backplane
2 Fixed board connector
3 Free board connector
4 Free printed board
5 Datum plane width (Centre line of row B)

Figure 6 – Width dimensions

Table 7 – Width dimensions

		Without coding
B =	connector width	3 × 2,5 mm = 7,5 mm
B_1 =	width reference to printed board	1 × 2,5 mm = 2,5 mm

3.2.5 Depth dimensions



IEC 665/03

Key

1 Datum plane depth
2 Reference pivot
3 Backplane
4 Fixed board connector
5 Free board connector
6 Free printed board
7 Datum plane

Figure 7 – Depth dimensions

Table 8 – Depth dimensions

T =	Centre line of guiding pivots of free board connector to mounting plane fixed board connector	7 × 2,5 mm = 17,5 mm
D =	Thickness of connector bottom fixed board connector	3,8 mm
T_1 =	Distance between edge of printed board and centre line of guiding pivots for free board connector fixing	5 mm
T_2 =	Distance between centre line of pivot and first row of terminations free board connector	2,0 mm
T_3 =	Spacing of terminations free board connector	4,0 mm

3.3 Engagement (mating) information

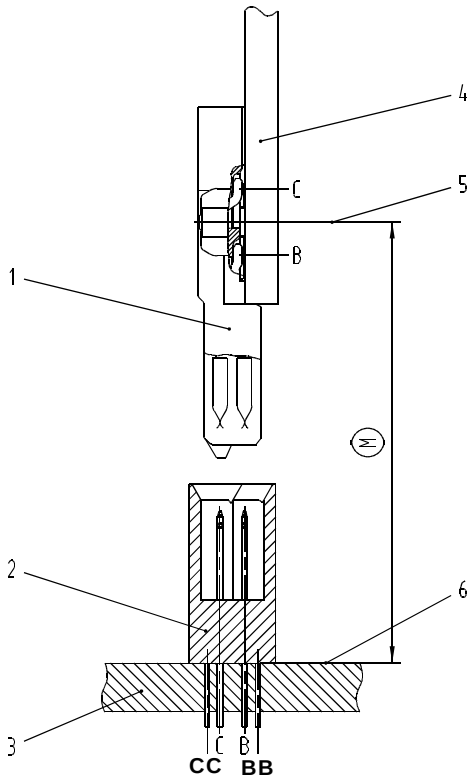
3.3.1 Electrical engagement length

The specified contact resistance must be maintained on a mated pair, within the range of M = 17,5 mm to 20 mm.

If the connector could be engaged below dimension M = 17,5 mm the specified contact resistance must also be met.

The common requirements for FMLB contacts are also included in this specification. At worst case mating conditions and most unfavourable dimensions of mated pair the pre-mating of the FMLB contact is 0,15 mm.

The nominal pre-mating is 0,7 mm. Number and arrangement of the pre-mating contacts are to be agreed separately between user and producer.



Key

1 Free board connector
2 Fixed board connector
3 Backplane
4 Free printed board
5 Centre line of guiding pivots (for reference)
6 Datum plane, depth

Figure 8 – Mating conditions

3.3.1.1 Contact levels and sequencing

Table 9 – Ranges of safe contact performance

Contact level	Standard male contact	FMLB contact
Electrical engagement length range (M)	17,5 mm – 20 mm	17,5 mm – 20,7 mm

3.3.1.2 First contact point

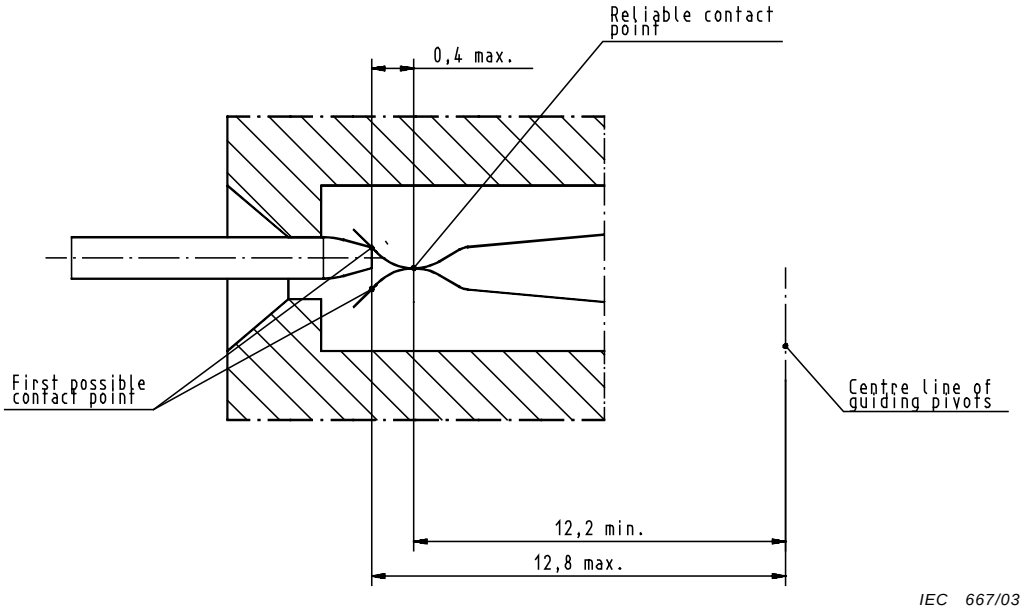


Figure 8a – First contact point

3.3.2 Perpendicular to engagement (mating) direction

The design of the free and fixed board connector must accept a misalignment of at least 1 mm in the longitudinal and transversal direction of the connectors. To achieve necessary alignment of both parts, one part of the connector pair is float mounted.

For fixed mounted connector pairs, the mounting tolerances must be kept accordingly in a sufficient small range.

3.3.3 Inclination

The design of the free and fixed board connector must accept an initial angular misalignment of ±0,5° in longitudinal and transverse axes.

In the mated position the condition according to 3.3.1 shall be met.

The permissible angular misalignment of ±0,5° is valid for 5 connectors maximum and includes the total deviation from racks to subracks considering the pre-mated contacts.

3.3.4 Planarity

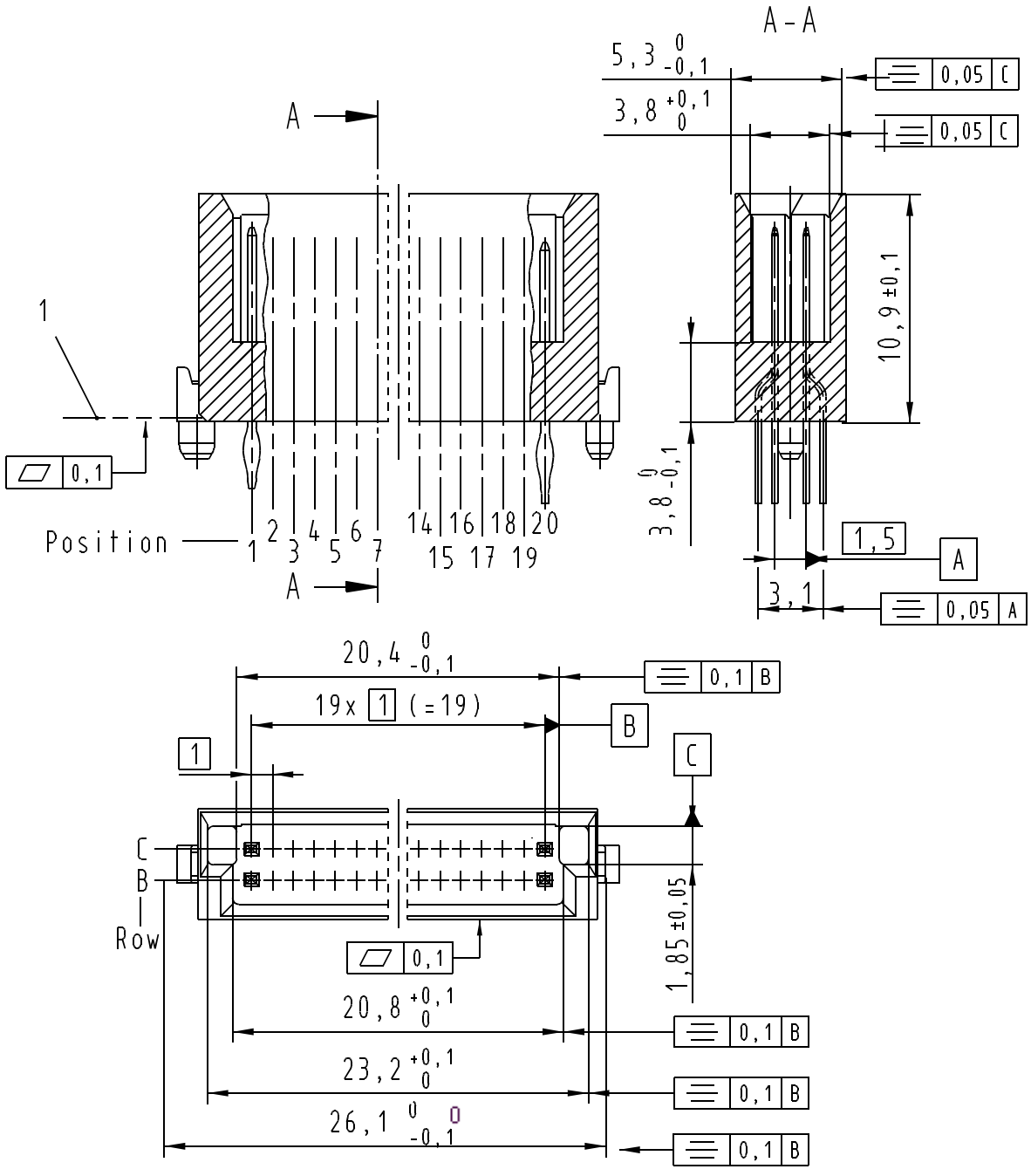
Permissible warpage of mounted connectors is shown in 5.1.6.

In order to guarantee the function of the FMLB contact, the warpage of the mounted connector shall not exceed 0,1 mm.

3.4 Fixed board connectors

3.4.1 Dimensions

3.4.1.1 Style A



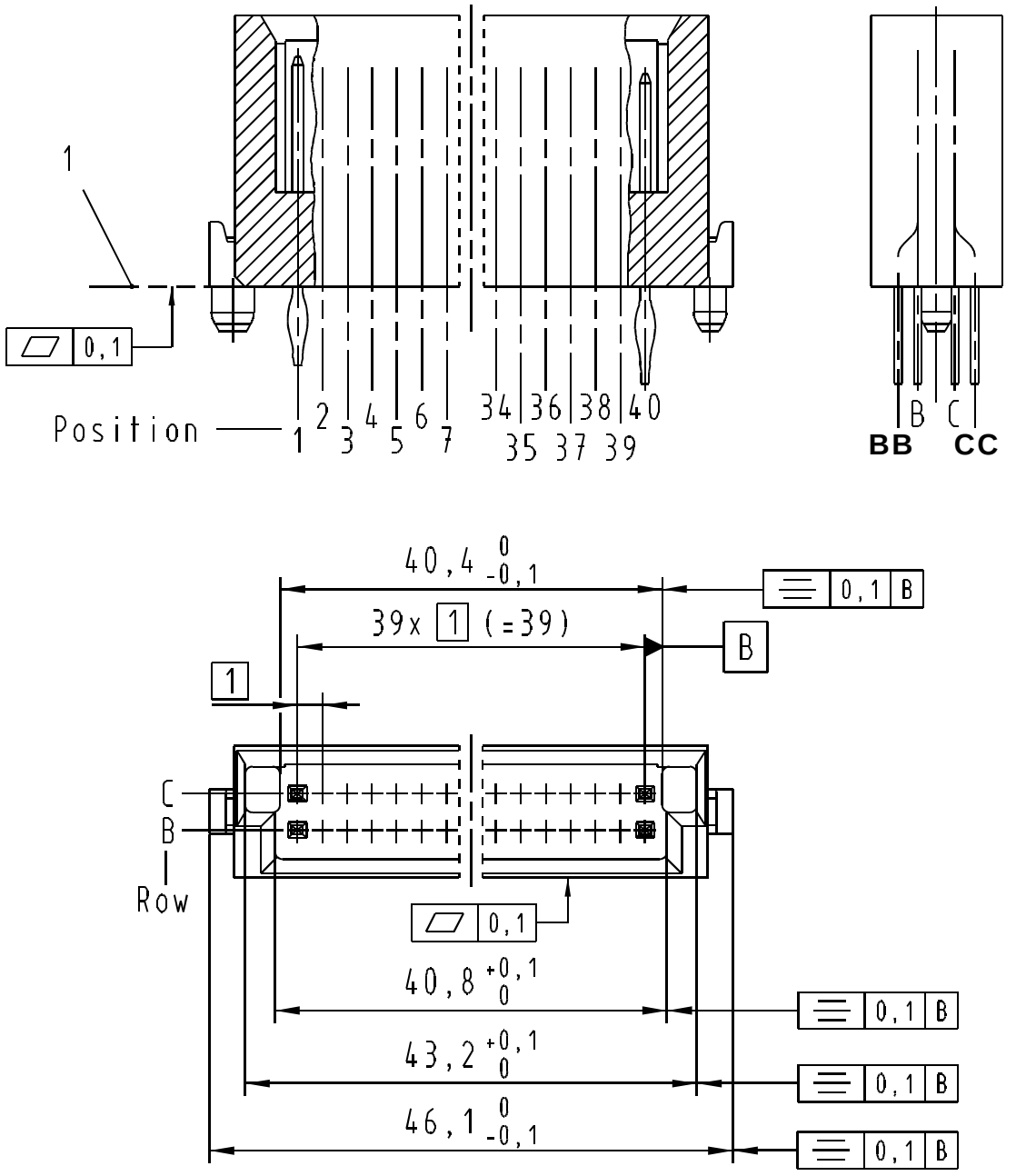
Key

1 Datum plane depth

NOTE All styles – for terminations see 3.4.2.

Figure 9 – Style A

3.4.1.2 Style B



Key

1 Datum plane depth

IEC 669/03

NOTE For missing dimensions see 3.4.1.

Figure 10 – Style B

3.4.1.3 Style C

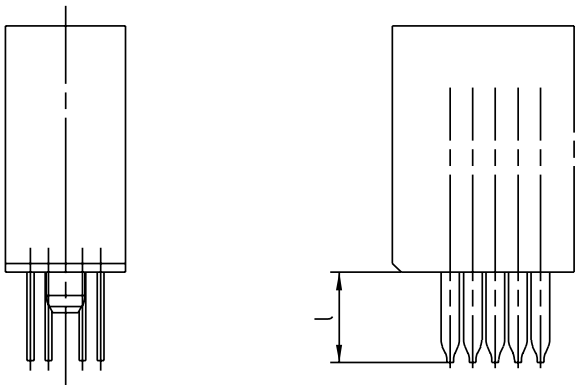
Under preparation

3.4.1.4 Style D

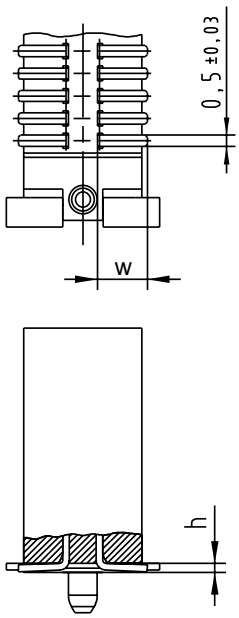
Under preparation

3.4.2 Terminations

Press-in terminations



SMT terminations



IEC 670/03

Figure 11 – Terminations

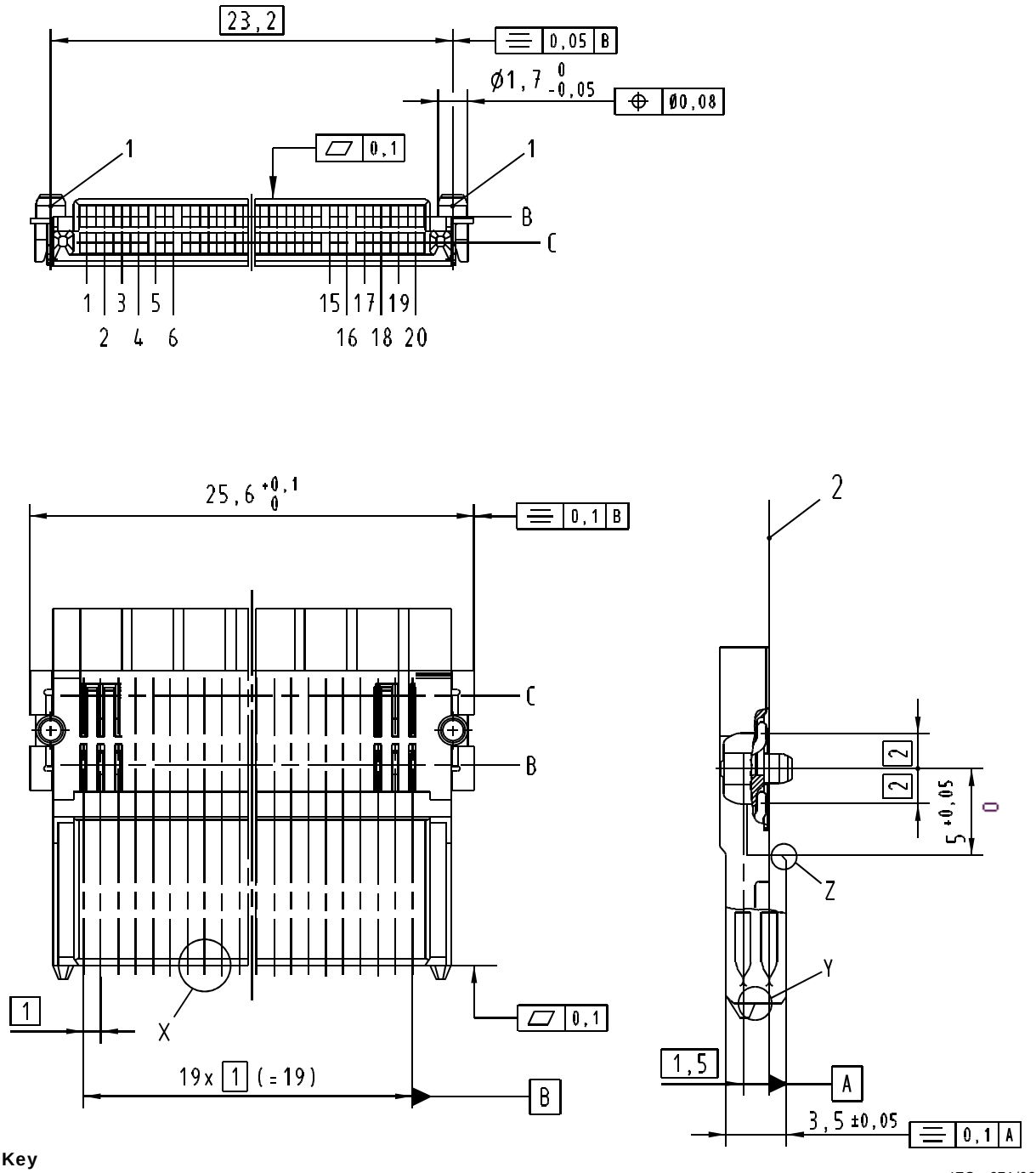
Table 10 – Dimensions of terminations and printed board thickness

Type of termination		M	P
Length	l	–	4,5 max
Width	w	2,2 ± 0,1	–
Height	h	0,45 max	–
Backplane thickness		1,6 min	1,6 – 4,0
Plated through hole in backplane (see 3.8)			Ø 0,6 ± 0,05
Plated land pattern for SMT on backplane (see 3.8)		0,55 ± 0,03 × 2,5 ± 0,05	

3.5 Free board connectors

3.5.1 Dimensions

3.5.1.1 Style A



IEC 671/03

Key

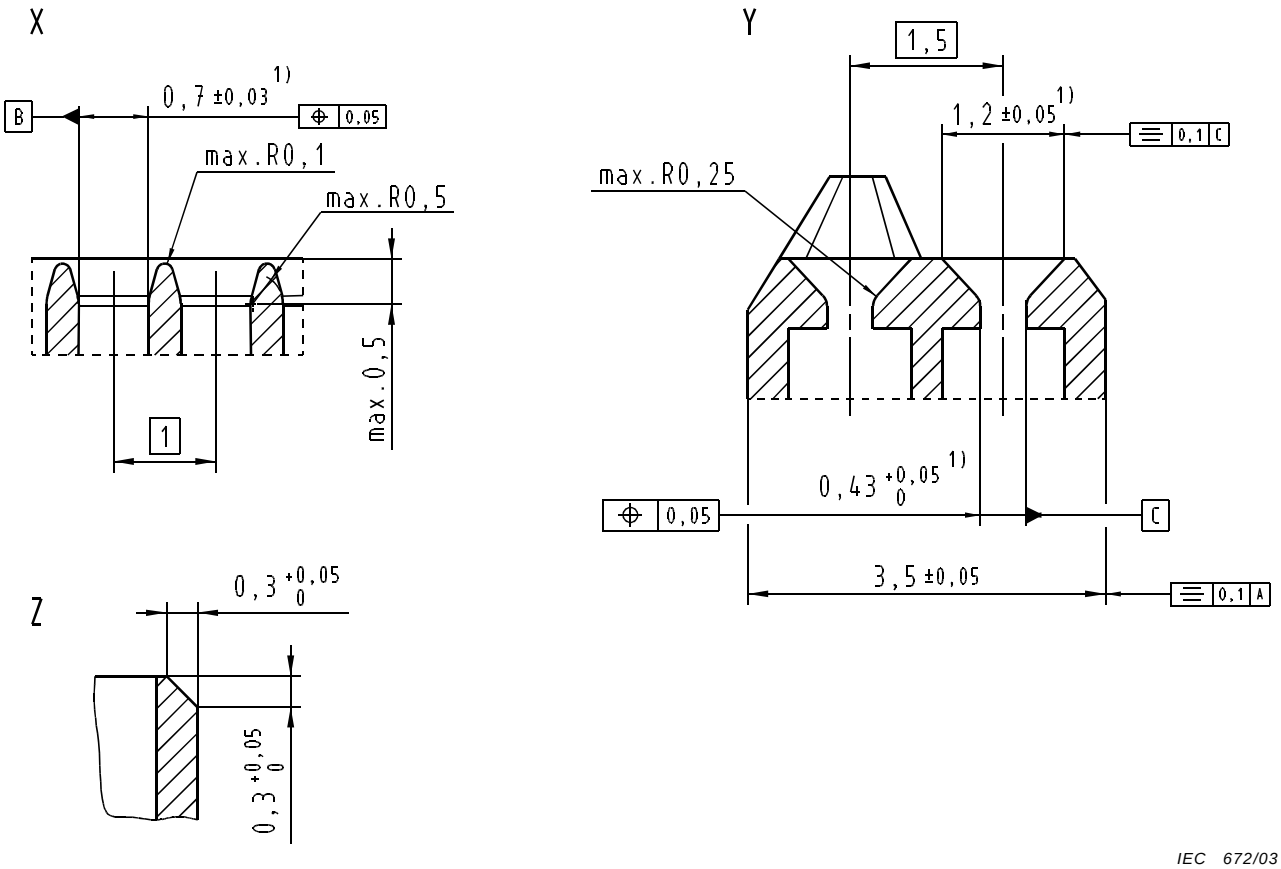
1 Guiding pivots

2 Centre line of row B (Datum plane width)

NOTE All styles – for contact arrangements see 2.4.2 – for terminations see 3.5.2.

Figure 12 – Style A

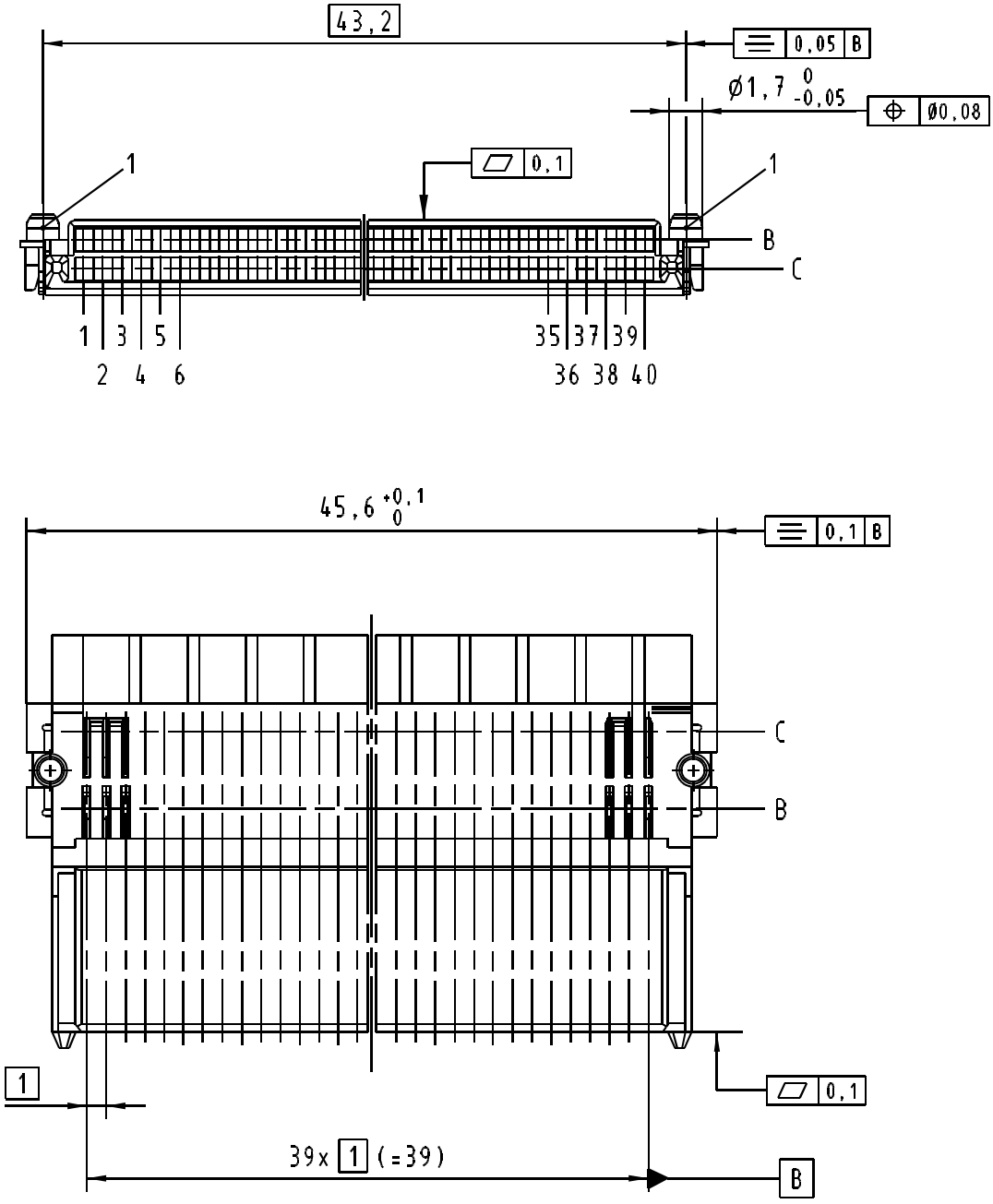
Details X, Y, Z



1) All orifices.

Figure 13 – Details X, Y, Z

3.5.1.2 Style B



Key

1 Guiding pivots – missing dimensions see 3.5.1.1.

Figure 14 – Style B

3.5.1.3 Style C

Under preparation

3.5.1.4 Style D

Under preparation

3.5.2 Terminations

Under preparation

3.6 Accessories

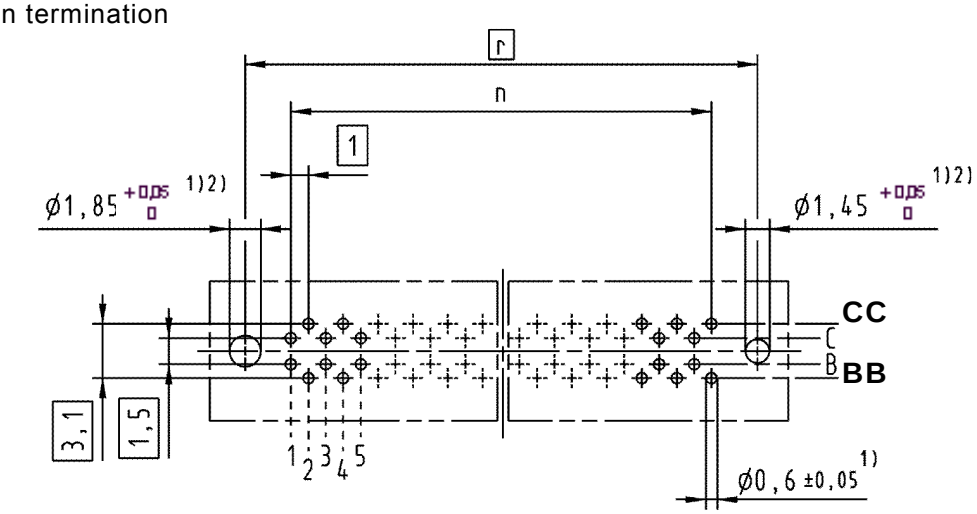
Not applicable

3.7 Mounting information for fixed board connectors

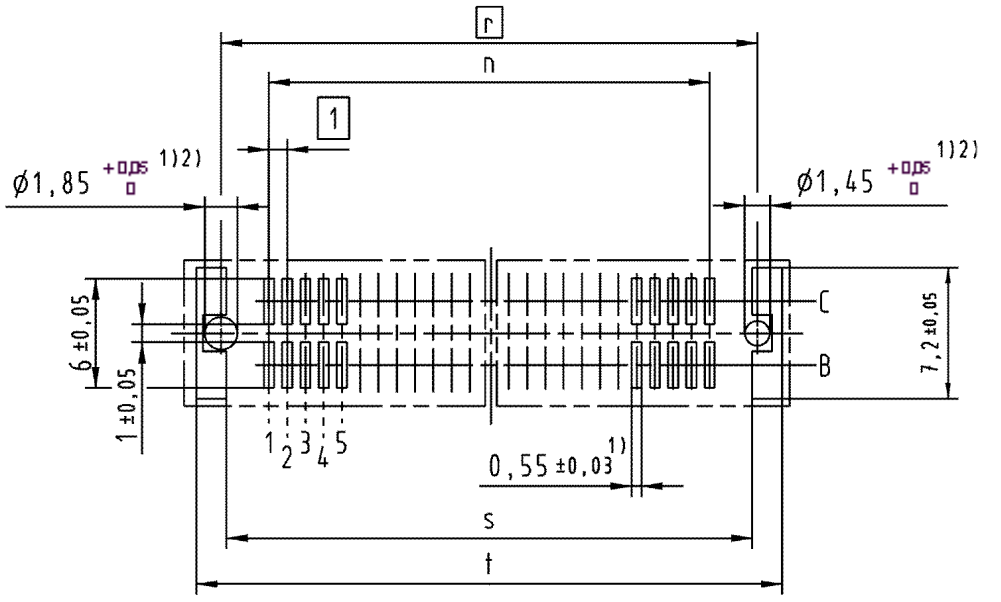
3.7.1 Hole pattern on backplane

Drawings: View on components side of panel.
The letters on the right-hand designate the contact row.
The numbers below designate the position of the contact.
Plated through holes are recommended.

Press-in termination



SMT termination



IEC 674/03

Figure 15 – Hole pattern on backplane

NOTE 1 ⌖ Ø0,05 all holes.

NOTE 2 Holes not through plated.

Table 11 – Hole pattern on backplane

Style	n	r	s	t
A	19	23,25	23,6 ± 0,05	26,95 ± 0,05
B	39	43,25	43,6 ± 0,05	46,95 ± 0,05

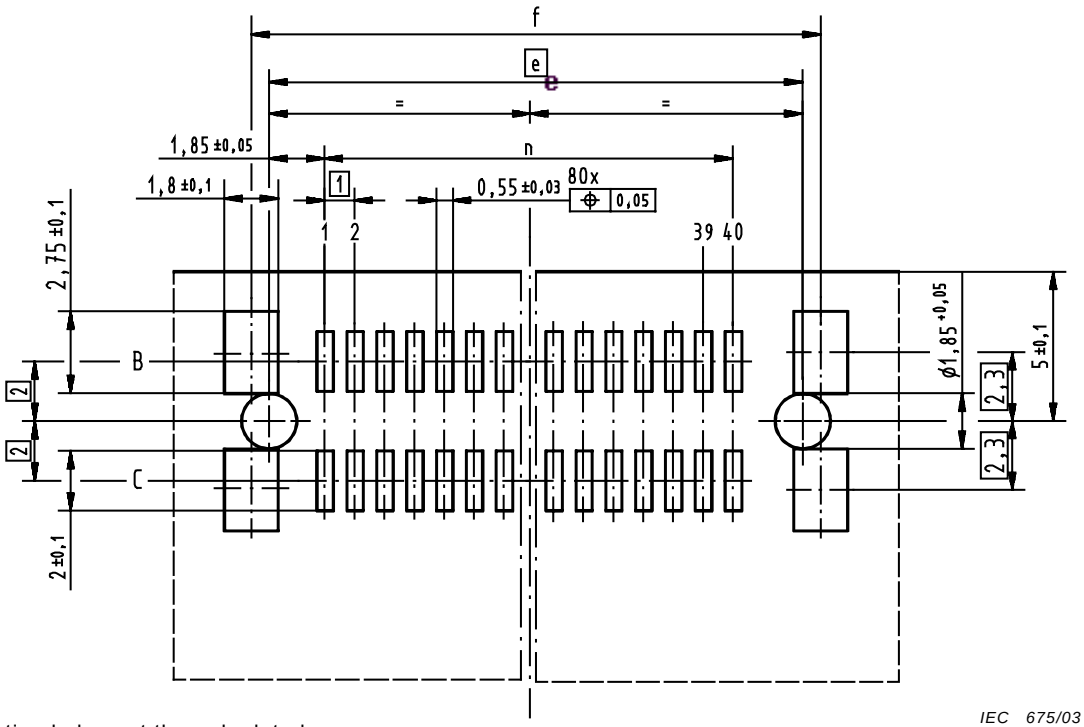
3.8 Mounting information for free board connectors

3.8.1 Hole pattern on printed boards

Drawings: View on components side of printed board.

The letters on the right-hand designate the contact row.
The numbers below designate the position of the contact.
Plated through holes are recommended.

SMT termination



NOTE Mounting holes not through plated.

Figure 16 – Hole pattern on printed boards

Table 12 – Hole pattern on printed boards

Style	n	e	f
A	19	23,2	24,4 ± 0,1
B	39	43,2	44,4 ± 0,1

3.9 Gauges

3.9.1 Sizing gauges and retention force gauges

Material: tool steel, hardened.

$\sqrt{}$ = surface roughness according to
ISO 1302: Ra = 0,25 μm max.
0,15 μm min.

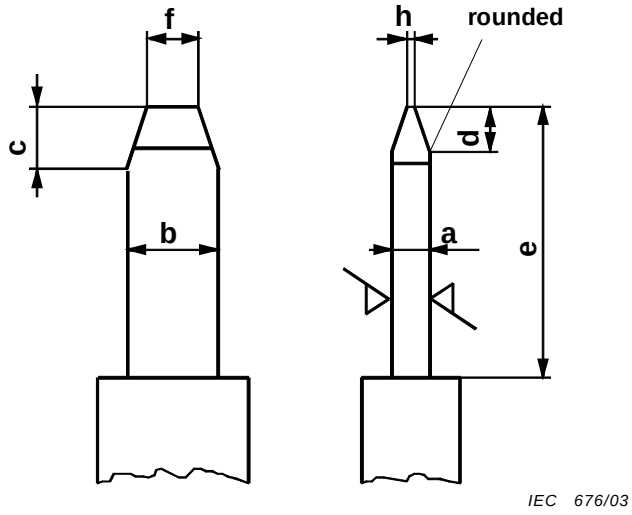


Figure 17 – Gauge dimensions

Table 13 – Gauges

Gauge	Mass g	Application	a mm	b mm	c mm	d mm
PA	–	Sizing	0,33 0,31	0,46	0,38	0,38
PM	12 $^{+1}$	Retention force	0,29 0,28	0,44	0,32	0,32

Gauge	Application	e min. mm	f max. mm	h max. mm
PA	Sizing	6	0,2	0,15
PM	Retention force			

4 Characteristics

4.1 Climatic category

Table 14 – Climatic category

Performance level	Climatic category	Category temperature		Damp heat, steady state		Days
		Lower temperature °C	Upper temperature °C	Temperature °C	Relative humidity %	
1	55/125/56	–55	125	40	93	56
2	55/125/21	–55	125	40	93	21

4.2 Electrical

4.2.1 Creepage and clearance distances

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

Therefore the clearance and creepage distances are given as operating characteristics. 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 15 – Minimum creepage and clearance distances

Contact and termination arrangement	Between contact rows		Between contacts in the same row	
	Fixed board connector	Free board connector	Fixed board connector	Free board connector
1	0,8	0,6	0,48	0,6

4.2.2 Voltage proof

Conditions: IEC 60512, Test 4a
Standard atmospheric conditions
Mated connectors

Table 16 – Voltage proof

Contact arrangement	1
According to 2.4.2	Voltage proof
Contact/contact	500 V r.m.s.
Contact/test panel	Not applicable

4.2.3 Current carrying capacity

Conditions: IEC 60512, Test 5b
Standard atmospheric conditions
All contacts
1 A at 50 °C for all styles

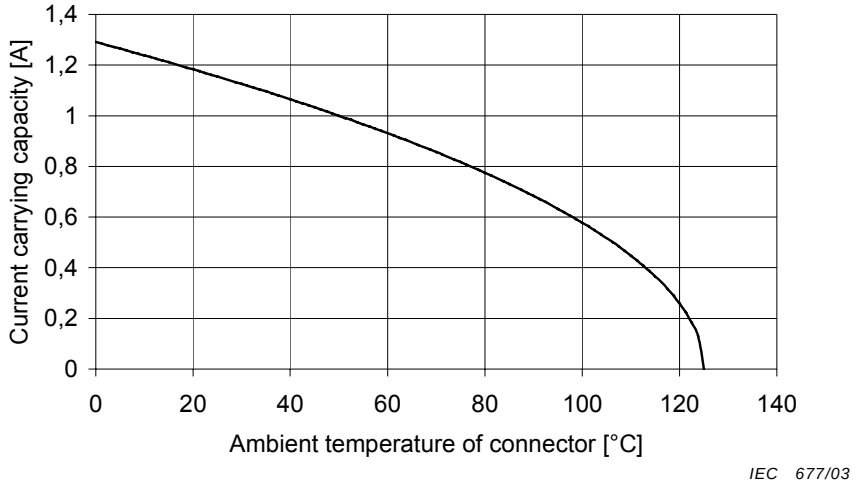
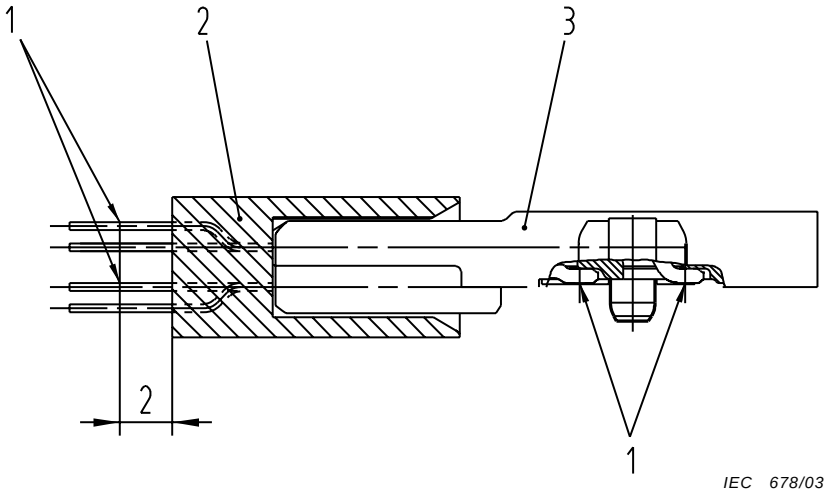


Figure 18 – Current carrying capacity

4.2.4 Contact resistance

Conditions: IEC 60512, Test 2a
Standard atmospheric conditions
Mated connectors
15 mΩ max.

Connection points:



Key

1 Measuring points
2 Fixed board connector
3 Free board connector

Figure 19 – Measuring points

4.2.5 Insulation resistance

Conditions: IEC 60512, Test 3a: Method A
Standard atmospheric conditions
Test voltage 100 V ± 15 V d.c.
Mated connectors
Performance level P1 and P2: 10^6 MΩ min.

4.3 Mechanical

4.3.1 Mechanical operation

Conditions: IEC 60512, Test 9a
Standard atmospheric conditions
Max. speed of operation: 10 mm/s

Table 17 – Number of mechanical operations

Performance level	1	2
Operations	500	250

4.3.2 Insertion and withdrawal forces

Conditions: IEC 60512, Test 13b
Standard atmospheric conditions
Max. speed 10 mm/min.

Table 18 – Insertion and withdrawal forces

Total insertion force	**Total withdrawal force**	
	min.	**max.**
n × 0,7 N max.	n × 0,15 N max.	n × 0,45 N max.
n = Number of contacts		

4.3.3 Contact retention in insert

Not applicable

4.3.4 Static load, axial

Not applicable

4.3.5 Vibration (sinusoidal)

Conditions: IEC 60512, Test 6d
Standard atmospheric conditions
Mated connectors
The fixed and free board connector shall be rigidly installed in a suitable fixture as specified in 5.1.2

Table 19 – Vibration severity

Performance level	**Severity**
1	10 Hz to 2000 Hz and 1,5 mm or 20 *g*
2	10 Hz to 500 Hz and 0,35 mm or 5 *g*

5 Test schedule

5.1 General

This test schedule shows all tests and the order in which they shall be carried out as well as the requirements to be met.

An “X” in the column “Requirements” of the following tables indicates that the test or conditioning shall be applied.

Unless otherwise specified, mated sets of connectors shall be tested. Care shall be taken to keep a particular combination of connectors together during the complete test sequence, i.e. when unmating is necessary for a certain test, the same connectors as before shall be mated for the subsequent tests.

In the following a mated set of connectors is called a “specimen”.

When the initial tests have been completed, all the specimens are divided up according to the test groups. Before testing commences, the connectors must have been stored for at least 24 h in the non-inserted state under normal climatic conditions for testing as per IEC 60068-1.

The following specimens are necessary for the entire inspection and test sequence according to the style and number of poles (styles without special contacts):

Table 20 – Number of specimens

Style	Initial test group		Test groups													
	P		AP		BP		CP		DP		EP		FP		GP	
	Performance levels															
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
A	25	25	4	4	4	4	4	4	4	4	4	4	4	4	4	4
B	25	25	4	4	4	4	4	4	4	4	4	4	4	4	4	4
C	25	25	4	4	4	4	4	4	4	4	4	4	4	4	4	4
D	25	25	4	4	4	4	4	4	4	4	4	4	4	4	4	4

5.1.1 Arrangement for contact resistance measurement

Conditions: IEC 60512, Test 2a

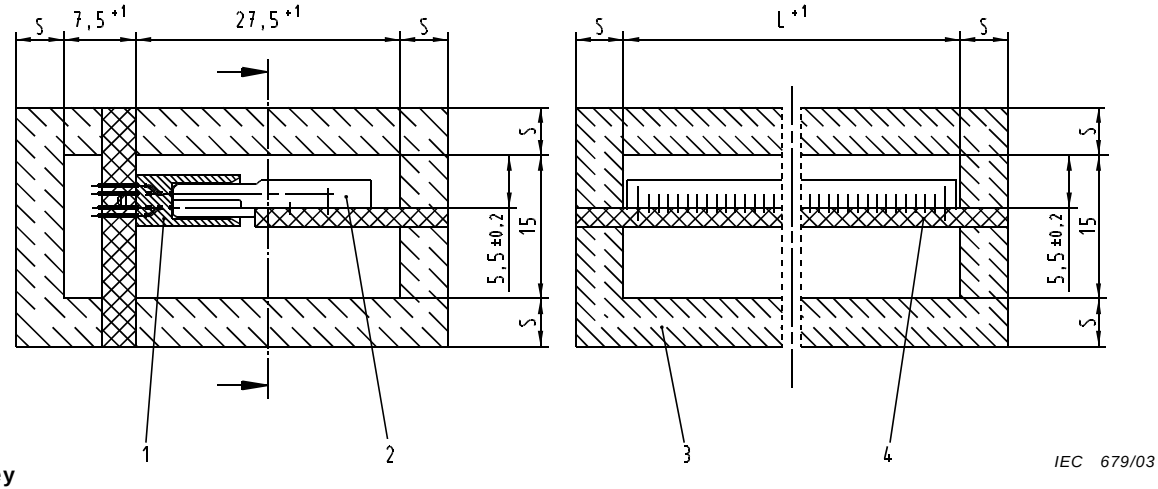
Points of connection: see 4.2.4

The measurement of contact resistance shall be carried out on the number of contacts specified. Any subsequent measurements of contact resistance shall be made on the same contacts.

5.2 Arrangement for dynamic stress tests

Conditions: IEC 60512, Test 6a; Test 6b; Test 6c and Test 6d

Fixed and free board connectors rigidly installed in fixture



Key

1 Fixed board connector
2 Free board connector
3 Fixture for testing
4 Dimensions of this printed boards are different from those specified in 5.1.7

Figure 20 – Arrangement for dynamic stress tests

Table 21 – Dynamic stress tests

	Style			
	A	B	C	D
L mm	29	49	29	49
s mm	≥25			

5.2.1 Arrangement for testing static load, axial

Conditions: IEC 60512, Test 8b
Not applicable

5.2.2 Wiring arrangement for voltage proof and polarization voltage during damp heat test

Conditions: IEC 60512, Test 3a, Test 4a

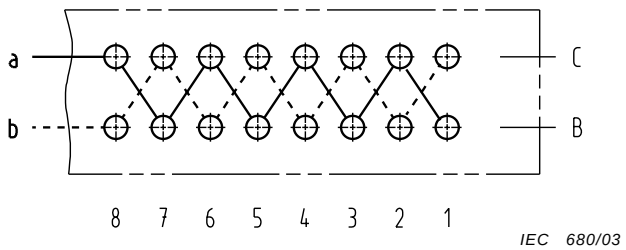
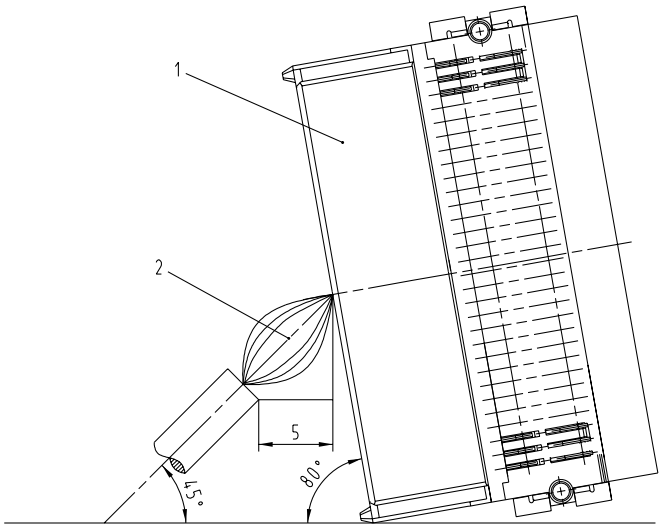


Figure 21 – Wiring of specimen

5.2.3 Arrangement for flammability test

Conditions: IEC 60512, Test 20a



IEC 681/03

Figure 22 – Arrangement for flammability test

5.2.4 Planarity of mounted connectors

Under preparation

5.2.5 Test board for fixed and free board connectors

Hole pattern depends on style, contact- and termination arrangement

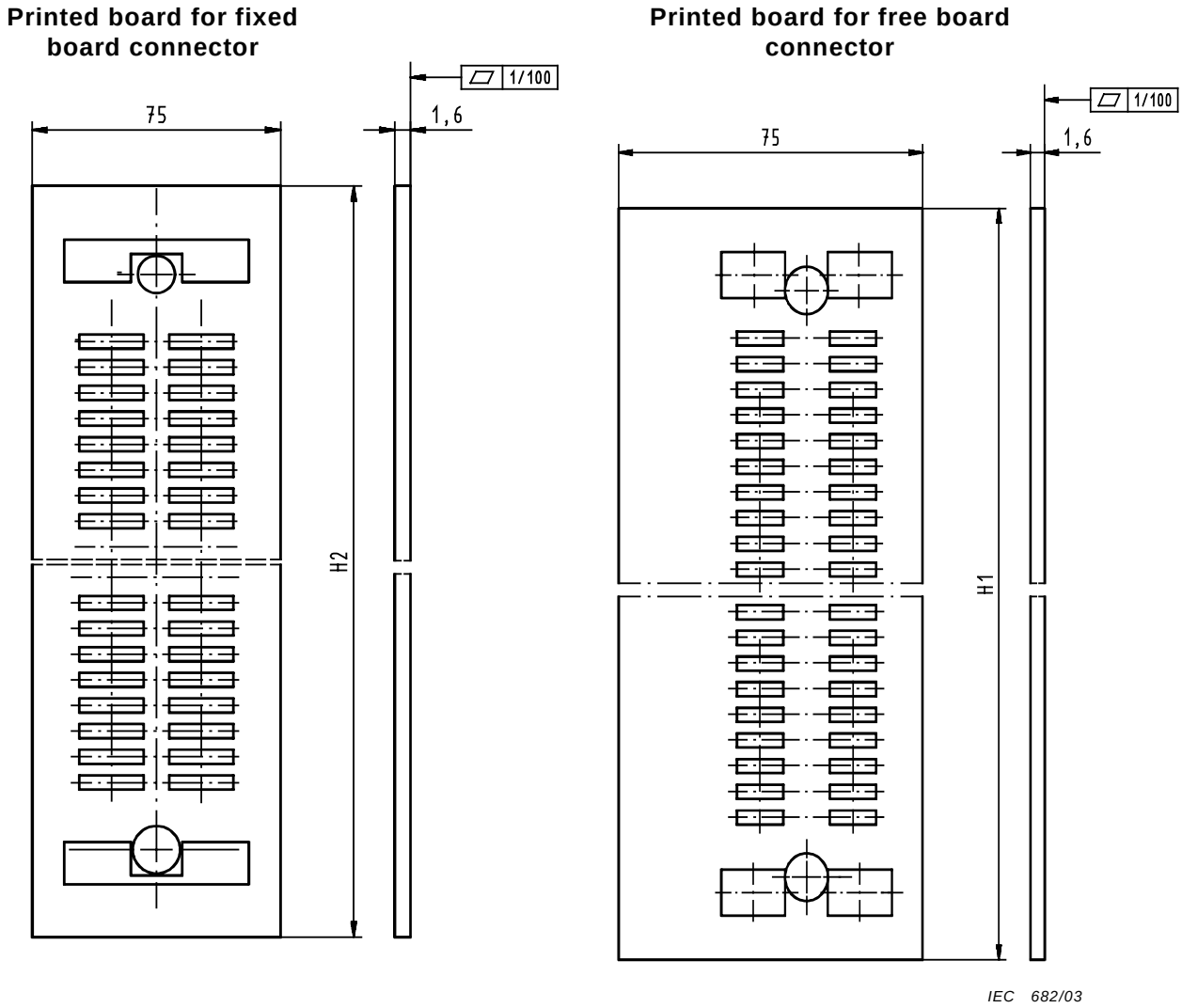


Figure 23 – Test board for fixed and free board connectors

Table 22 – Test board for fixed and free board connectors

			Style			
			A	B	C	D
H1	±2	mm	55	75	55	75
H2	±2	mm	40	60	40	60

5.3 Test schedule tables

5.3.1 Preliminary group P

All specimens shall be subjected to the following tests in sequence:

Test phase	Test			Measurement to be performed		PL	Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.			All connector styles
P1	General examination		Unmated connectors	Visual examination	1a	1 2	X X	There shall be no defect that would impair normal operation
				Dimensional examination	1b	1 2	X X	The dimensions shall comply with those specified in 3, including creepage and clearance distances as specified in 4.2.1
P2	Polarizing method	13e	Not applicable					
P3			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	15 mΩ max.
P4			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^4 MΩ min.
P5			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)

The specimens shall be divided into five groups. All connectors in each group shall undergo the tests specified for the relevant group.

5.3.2 Group AP – Dynamic/Climatic

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
AP 1.2				Insertion and withdrawal forces	13b	1 2	X X	Requirements see 4.3.2
AP4			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
AP5	Contact retention in insert	15a	Not applicable			1 2		
AP6	Bump	6b	Not applicable					
AP7	Vibration	6d	Arrangement according to 5.2 Endurances by sweeping 10 Hz – 2000 Hz 1,5 mm resp. 20 *g* Sweep cycles: 10 Full duration: 7,5 h	Contact disturbance	2e	1	X	10 µs max.
			10 Hz – 500 Hz 0,35 mm resp. 5 *g* Sweep cycles: 10 Full duration: 6 h			2	X	10 µs max.
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a or 2b	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
AP8	Shock	6c	Arrangement according to 5.2 Half sine Shock acceleration: 490 m/s^2 (50 *g*) Duration of impact: 11 ms	Contact disturbance	2e	1 2	X	10 µs max.
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
AP9	Acceleration, steady state	6a	Arrangement according to 5.2 Acceleration: 980 m/s^2 (100 *g*) Duration: 5 min. per axis Axes: Both directions of the three major axes	Visual examination	1a	1 2	X X	No damage likely to impair normal operation
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.

5.3.2 Group AP – Dynamic/Climatic *(continued)*

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
AP10	Rapid change of temperature	11d	–55 °C to 125 °C Mated t_1: 30 min. 5 cycles	Insulation resistance	3a	1 2	X X	10^4 MΩ min.
			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation
AP11	Climatic sequence	11a	Unmated connectors					
AP 11.1	Dry heat	11i	PL1/PL2:125 °C unloaded Duration: 16 h Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance at high temperature	3a	1 2	X X	10^3 MΩ min.
AP 11.2	Damp heat, cyclic, first cycle	11m	Method 1 PL1: 55 °C PL2: 40 °C Recovery time: 2 h	Visual examination	1a	1 2	X X	No damage likely to impair normal operation
AP 11.3	Cold	11j	PL1,2: –55 °C Duration: 2 h	Visual examination	1a	1 2	X X	No damage likely to impair normal operation
AP 11.4	Low air pressure	11k	Not applicable	Voltage proof	4a			
AP 11.5	Damp heat, cyclic, remaining cycles	11m	Conditions according to P5 PL1: 5 cycles PL2: 1 cycle	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
			Conditions according to AP4 PL1: 5 cycles PL2: 1 cycle	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
AP 12.2				Insertion and withdrawal forces	13b	1 2	X X	Requirements see 4.3.2
AP13				Visual examination	1a	1 2	X X	No damage likely to impair normal operation

5.3.3 Group BP – Mechanical endurance

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
BP1			Female contacts only 20 contacts/specimen Sizing and retention force gauge see 3.9.1	Gauge retention force	16e	1 2	X X	The gauge shall be retained
BP2	Mechanical operation (half of the specified number of operations)	9a	Speed 10 mm/s max. Rest 30 s (unmated) 100 cycles/h			1	X	250 operations
						2	X	125 operations
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
BP 3.2	Flowing single gas corrosion test	11p	Half mated/half unmated			1	X	10 days
						2	X	4 days
BP4	Mechanical operation (remaining half of specified number of operations)	9a	Speed 10 mm/s max. Rest 30 s (unmated) 100 cycles/h			1	X	250 operations
						2	X	125 operations
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
BP5	Probe damage	16a	Not applicable					
BP6	Static load, axial	8b	Not applicable					

5.3.4 Group CP – Moisture

Test phase	Test			Measurement to be performed				Requirements
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
CP1	Damp heat, steady state	11c	Unloaded Polarising voltage: 60 V d.c. Recovery time: 2 h			1	X	56 days
						2	X	21 days
			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
				Insertion and withdrawal forces	13b	1 2	X X	Requirements see 4.3.2
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation

5.3.5 Group DP – Electrical load

Test phase	Test			Measurement to be performed				Requirements
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
DP1	Mechanical operation (number of operations as specified for BP2)	9a	Speed 10 mm/s max. Rest 30 s (unmated) 100 cycles/h			1	X	250 operations
						2	X	125 operations
DP2	Electrical load and temperature	9b	Duration: 1 000 h Ambient temperature: 70 °C Current load according to 4.2.3			1 2	X X	Temperature in centre of specimen max. 125 °C
			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1 2	X X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
			Contact/contact same measuring points as for P4	Voltage proof	4a	1 2	X X	According to 4.2.2 (see Table 16)
				Visual examination	1a	1 2	X X	No damage likely to impair normal operation

5.3.6 Group EP – Mechanical resistivity

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
EP1	Robustness of terminations	16f	Not applicable					
EP2	Contact retention in insert	15a	See AP5	Visual examination	1a			
EP3*	Probe damage	16a	Female contacts only 20 contacts/specimen Sizing and retention force gauge see 3.9.1	Gauge retention force	16e	1 2	X X	The gauge shall be retained
EP4			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1 2	X X	10^2 MΩ min.
EP5	Mould growth	11e	**	Visual examination	1a	1 2	X X	These shall be not damage that would impair normal operation
				Insulation resistance	3a	1 2	X X	10^2 MΩ min.
EP6	Flammability needle flame	20a	Test flame No. 1 Arrangement of specimen according to 5.1.5 Exposure time: 10 s			1	X	Burning time 10 s max. after removal of flame
EP7			Unmated connectors	Visual examination	1a	1	X	No damage likely to impair normal operation

* If applicable this test should be performed at the end of this test group sequence.

** When satisfactory evidence that the materials utilised in the construction of the connectors are resistant to mould growth is available, this test phase and also EP6 and EP7 need not to be conducted.

5.3.7 Group FP – Chemical fluids

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
FP1	Resistance to fluids, solvents	(u.c.)				1	X	
FP 2.2				Insertion and withdrawal forces	13b	1	X	Requirements see 4.3.2
FP3			Connection points according to 5.1.1 50 contacts per group	Contact resistance - Millivolt level method	2a	1	X	Limit values according to P3, max. change in relation to initial values 5 mΩ max.
FP4			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	1	X	10^2 MΩ min.
FP5	General examination		See P1	Visual examination	1a	1	X	No damage likely to impair normal operation

5.3.8 Group GP – Connections

Test phase	Test			Measurement to be performed			Requirements	
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	PL		All connector styles
GP1	Press-in connections		Tests according to IEC 60352-5			1 2	X X	
GP2	Surface mount connection		Under preparation				X X	

Annex A
(normative)

Requirements for application to mechanical structures

A.1 Scope

When referring to, or claiming compliance with, standards for any mechanical structures, this annex shall give to the user of connectors basic information on the dimensions necessary to support a proper use of the connector in such mechanical structures.

A.2 Requirements for use of connectors

Unless otherwise specified, it is assumed that the user is applying mechanical structures according to IEC specifications. Missing dimensions of these specifications shall be taken from Table A.1.

Table A.1 – Dimensions required in accordance with IEC 60917-2-2

D_S	175	225	250	300
D_{S1}	175,5	225,5	250,5	300,5
D_{S3}	160	210	235	285
D_{S5}	171,2	221,2	246,2	296,2
D_S= co-ordination dimension for subrack depth D_{S1}= aperture depth of subrack for plug-in units (=DS including tolerances) D_{S3}= depth of printed board D_{S5}= plug-in unit depth, inspection dimension				
NOTE All dimensions in mm.				

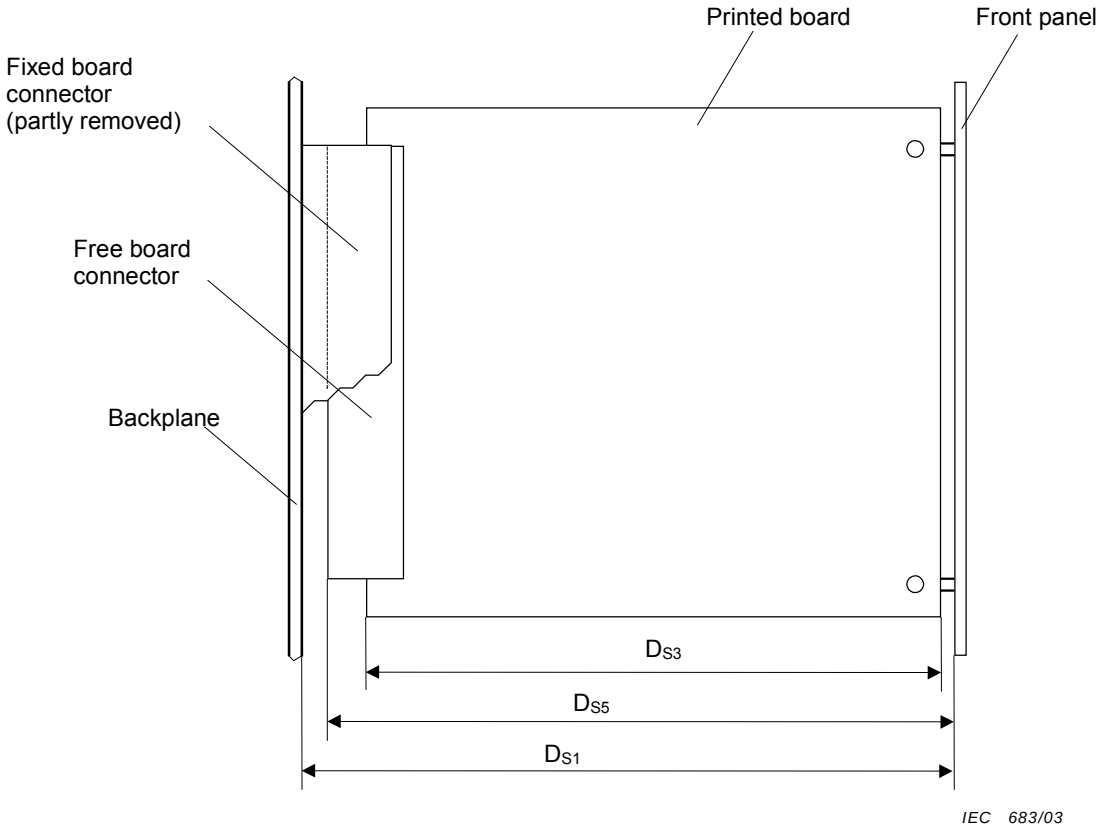


Figure A.1 – Plug-in unit dimension

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testing engineer ❑
marketing specialist ❑
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technical documentation ❑
thesis ❑
manufacturing ❑
other.....

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nearly ❑
fairly well ❑
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standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

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technical contents.....
logic of arrangement of contents .....
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ISBN 2-8318-6891-2

ICS 31.220.10

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND