IEC 60947-7-4

Edition 1.0 2013-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Low-voltage switchgear and controlgear – Part 7-4: Ancillary equipment – PCB terminal blocks for copper conductors

Appareillage à basse tension – Partie 7-4: Matériels accessoires – Blocs de jonction pour cartes de circuits imprimés pour conducteurs en cuivre

IEC 60947-7-4:2013

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CONTENTS

FOREWORD 4
INTRODUCTION 6
1 General 7
1.1 Scope 7
1.2 Normative references 7
2 Terms and definitions 9
3 Classification 10
4 Characteristics 10
4.1 Summary of characteristics 10
4.2 Type of PCB terminal block 10
4.3 Rated and limiting values 10
4.3.1 Rated voltages 10
4.3.2 Rated current 10
4.3.3 Standard cross-sections 10
4.3.4 Maximum cross-section 11
4.3.5 Connecting capacity 11
5 Product information 12
5.1 Marking 12
5.2 Additional information 13
6 Normal service, mounting and transport conditions 13
7 Constructional and performance requirements 13
7.1 Constructional requirements 13
7.1.1 Clamping units 13
7.1.2 Mounting and installation 14
7.1.3 Clearances and creepage distances 14
7.1.4 Terminal identification and marking 14
7.1.5 Resistance to abnormal heat and fire 15
7.1.6 Maximum cross-section and connecting capacity 15
7.2 Performance requirements 15
7.2.1 Temperature rise 15
7.2.2 Dielectric properties 15
7.2.3 Short-time withstand current 15
7.2.4 Contact resistance 16
7.2.5 Ageing test (climatic sequence and corrosion test) 16
7.3 Electromagnetic compatibility (EMC) 16
8 Tests 16
8.1 Kinds of test 16
8.2 General 16
8.3 Verification of mechanical characteristics 17
8.3.1 General 17
8.3.2 Attachment of the PCB terminal block on its support 17
8.3.3 Vacant 17
8.3.4 Verification of the maximum cross-section and connecting capacity 17
8.3.5 Verification of maximum cross-section (special test with gauges) 17
8.4 Verification of electrical characteristics 17
8.4.1 General 17

Withdrawn

AVA Documents
Document Sharing Hub

Full document details: IEC 60947-7-4 2013

8.4.2 Verification of clearances and creepage distances 18
8.4.3 Dielectric tests 18
8.4.4 Verification of contact resistance 19
8.4.5 Temperature rise test 20
8.4.6 Short-time withstand current test 22
8.4.7 Ageing test (climatic sequence and corrosion test) 23
8.5 Verification of thermal characteristics 24
8.6 Verification of EMC characteristics 25
8.6.1 General 25
8.6.2 Immunity 25
8.6.3 Emission 25
Annex A (informative) Structure of a PCB terminal block 26
Annex B (informative) Additional Information to be specified between manufacturer and user 27
Annex C (informative) Examples of PCBs and PCB terminal blocks for high current application 28
Bibliography 30

Figure 1 – Test assembly for the measurement of contact resistance and temperature rise 20
Figure 2 – Example of wiring structure of a multi-tier PCB terminal block 21
Figure 3 – Test assembly for the measurement of short-time withstand current 23
Figure 4 – Test sequence 24
Figure A.1 – Structure of a PCB terminal block 26
Figure C.1 – Structure of a high current PCB 28
Figure C.2 – PCB terminal block with soldered connection to the PCB 28
Figure C.3 – PCB terminal block with screwed connection to the PCB 29

Table 1 – Standard cross-sections of copper conductors 11
Table 2 – Relationship between maximum cross-section and connecting capacity of PCB terminal blocks 12
Table 3 – Standards for clamping units and connecting methods 14
Table 4 – Impulse withstand test voltages 19
Table 5 – Dielectric test voltages corresponding to the rated insulation voltage 19
Table 6 – Length of connectable conductors and conductor loops 21
Table 7 – Examples of cross-sectional distribution of interconnections on printed circuit boards 22

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 7-4: Ancillary equipment – PCB terminal blocks for copper conductors

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

FDIS	Report on voting
17B/1822/FDIS	17B/1827/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.

A list of all parts in the IEC 60947 series, published under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

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INTRODUCTION

This standard IEC 60947-7-4 for PCB terminal blocks covers not only the terminal block requirements according to IEC 60947-7 series but also takes into account the specifications of connectors according to IEC 61984 as the requirements for both components are highly similar due to equivalent applications.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 7-4: Ancillary equipment – PCB terminal blocks for copper conductors

1 General

1.1 Scope

This part of IEC 60947 specifies requirements for PCB terminal blocks primarily intended for industrial or similar use.

Mounting and fixing on the printed circuit board is made by soldering, press-in or equivalent methods to provide electrical and mechanical connection between copper conductors and the printed circuit board.

This standard applies to PCB terminal blocks intended to connect copper conductors, with or without special preparation, having a cross-section between 0,05 mm^2 and 300 mm^2 (AWG 30/600 kcmil), intended to be used in circuits of a rated voltage not exceeding 1 000 V a.c. up to 1 000 Hz or 1 500 V d.c.

NOTE 1 Large cross section terminal blocks are dedicated to specific design of high current PCBs. The range up to 300 mm² is kept to cover any possible application. Examples of high current PCBs and PCB terminal blocks are shown in Annex C.

NOTE 2 AWG is the abbreviation of "American Wire Gage" (Gage (US) = Gauge (UK));

kcmil = 1 000 cmil;

1 cmil = 1 circular mil = surface of a circle having a diameter of 1 mil;

1 mil = 1/1 000 inch.

This standard may be used as a guide for special types of PCB terminal blocks with components, such as disconnect units, integrated cartridge fuse-links and the like.

If applicable, in this standard the term "clamping unit" is used instead of "terminal". This is taken into account in case of references to IEC 60947-1.

1.2 Normative references

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

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60352-1, *Solderless connections – Part 1: Wrapped connections – General requirements, test methods and practical guidance*

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

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

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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 60512-2-1, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-4-1, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof*

IEC 60512-5-2, *Connectors for electronic equipment – Tests and measurements – Part 5-2: Current-carrying capacity tests – Test 5b: Current-temperature derating*

IEC 60512-11-7, *Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

IEC 60512-11-9, *Connectors for electronic equipment – Tests and measurements – Part 11-9: Climatic tests – Test 11i: Dry heat*

IEC 60512-11-10, *Connectors for electronic equipment – Tests and measurements – Part 11-10: Climatic tests – Test 11j: Cold*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60695-2-12, *Fire hazard testing - Part 2-12: Glowing/hot-wire based test methods - Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-13, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*
Amendment 1: 2010

IEC 60998-2-3, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included)*

IEC 60999-2, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm^2 up to 300 mm^2 (included)*

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IEC 61210, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

ISO 6988, *Metallic and other non-organic coatings – Sulfur dioxide test with general condensation of moisture*

2 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60947-1, as well as the following, apply.

2.1
printed circuit board
PCB
piece of insulating material with fixed metal traces to connect electronic components

Note 1 to entry: Printed circuit boards are typically subdivided according to:

– their structure (e.g. single- and double-sided, multilayers);

– the nature of the base material (e.g. rigid, flexible).

2.2
PCB terminal block
part intended to be mounted on a printed circuit board and carrying one or more mutually insulated contact units and which provides an electrical and mechanical connection between copper conductor and printed circuit board

2.3
rated current
current value assigned by the manufacturer which the PCB terminal block can carry continuously (without interruption) and simultaneously through all its poles connected with the maximum cross-section, preferably at an ambient temperature of 40 °C, without the upper limiting temperature being exceeded

2.4
contact unit
conductive part establishing the connection between printed circuit board and connectable conductor(s)

Note 1 to entry: See Annex A.

2.5
upper limiting temperature
ULT
maximum temperature in the PCB terminal block as outcome (sum) of the ambient temperature and the temperature rise due to current flow, at which the PCB terminal block is intended to be still operable

Note 1 to entry: At ambient temperature = ULT the available temperature rise due to current flow is zero, thus the current carrying capacity of the PCB terminal block is zero.

2.6
lower limiting temperature
LLT
minimum temperature of a PCB terminal block assigned by the manufacturer, at which a PCB terminal block is intended to operate

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3 Classification

A distinction is made between various types of PCB terminal blocks, if applicable, as follows:

a) type of clamping unit (see 7.1.1);
b) ability to accept prepared conductors (see 2.3.28 of IEC 60947-1:2007, Amendment 1 (2010));
c) type of electrical contact to the printed circuit board;
d) type of mechanical fastening to the printed circuit board;
e) number of poles;
f) pitch (center to center pin spacing);
g) contact unit with identical or dissimilar clamping units;
h) number of clamping units on each contact unit;
i) service conditions.

4 Characteristics

4.1 Summary of characteristics

The characteristics of a PCB terminal block are as follows:

– type of PCB terminal block (see 4.2);
– rated and limiting values (see 4.3).

4.2 Type of PCB terminal block

The following shall be stated:

– type of clamping units (see 7.1.1);
– type of contacting on the printed circuit board;
– number of clamping units.

4.3 Rated and limiting values

4.3.1 Rated voltages

Subclauses 4.3.1.2 and 4.3.1.3 of IEC 60947-1:2007 apply.

4.3.2 Rated current

Verification of the rated current specified by the manufacturer is made according to 8.4.5.

If an ambient temperature other than 40 °C is used for the definition of the rated current, the manufacturer should state, in the technical documentation, the ambient temperature on which the rating is based, with reference, if appropriate, to the derating curve defined in IEC 60512-5-2, Test 5b.

The derating curve is obtained by applying a reduction factor of 0,8 according to IEC 60512-5-2, Test 5b. If another reduction factor is used, this shall be stated in the technical documentation.

4.3.3 Standard cross-sections

The standard values for cross-sections of copper conductors to be used are given in Table 1.

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Table 1 – Standard cross-sections of copper conductors

Metric size ISO	Comparison between AWG/kcmil and metric sizes	
	Size	Equivalent metric area
mm^2	AWG/kcmil	mm^2
0,05	30	0,05
0,08	28	0,08
0,14	26	0,13
0,2	24	0,205
0,34	22	0,324
0,5	20	0,519
0,75	18	0,82
1	–	–
1,5	16	1,3
2,5	14	2,1
4	12	3,3
6	10	5,3
10	8	8,4
16	6	13,3
25	4	21,2
35	2	33,6
50	0	53,5
70	00	67,4
95	000	85
–	0000	107,2
120	250 (kcmil)	127
150	300 (kcmil)	152
185	350 (kcmil)	177
240	500 (kcmil)	253
300	600 (kcmil)	304

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4.3.4 Maximum cross-section

The maximum cross-section shall be selected from the standard cross-sections given in Table 1.

4.3.5 Connecting capacity

For PCB terminal blocks with a maximum cross-section between 0,05 mm^2 and 35 mm^2 inclusive, the minimum range contained in Table 2 applies. The conductors may be rigid (solid or stranded) or flexible. The manufacturer shall state the types and the maximum and minimum cross-sections of conductors that can be connected and, if applicable, the number of conductors simultaneously connectable to each clamping unit. The manufacturer shall also state any necessary preparation of the end of the conductor.

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Table 2 – Relationship between maximum cross-section and connecting capacity of PCB terminal blocks

Maximum cross-section		Connecting capacity	
mm^2	AWG/kcmil	mm^2	AWG
0,05	30	0,05	30
0,08	28	0,05 – 0,08	30 – 28
0,14	26	0,05 – 0,08 – 0,14	30 – 28 – 26
0,2	24	0,08 – 0,14 – 0,2	28 – 26 – 24
0,34	22	0,14 – 0,2 – 0,34	26 – 24 – 22
0,5	20	0,2 – 0,34 – 0,5	24 – 22 – 20
0,75	18	0,34 – 0,5 – 0,75	22 – 20 – 18
1	–	0,5 – 0,75 – 1	–
1,5	16	0,75 – 1 – 1,5	20 – 18 – 16
2,5	14	1 – 1,5 – 2,5	18 – 16 – 14
4	12	1,5 – 2,5 – 4	16 – 14 – 12
6	10	2,5 – 4 – 6	14 – 12 – 10
10	8	4 – 6 – 10	12 – 10 – 8
16	6	6 – 10 – 16	10 – 8 – 6
25	4	10 – 16 – 25	8 – 6 – 4
35	2	16 – 25 – 35	6 – 4 – 2
50	0	25 – 35 – 50	4 – 2 – 0
70	00	35 – 50 – 70	2 – 0 – 00
95	000	50 – 70 – 95	0 – 00 – 000
–	0000	–	00 – 000 – 0000
120	250	70 – 95 – 120	000 – 0000 – 250
150	300	95 – 120 – 150	0000 – 250 – 300
185	350	120 – 150 – 185	250 – 300 – 350
–	400	–	300 – 350 – 400
240	500	150 – 185 – 240	350 – 400 – 500
300	600	185 – 240 – 300	400 – 500 – 600

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5 Product information

5.1 Marking

A PCB terminal block shall be marked in a durable and legible manner with the following:

a) the name of the manufacturer or a trade mark by which the manufacturer can be readily identified;

b) a type reference permitting its identification in order to obtain relevant information from the manufacturer or his catalogue.

Very small PCB terminal blocks with a surface which cannot be marked shall be marked only according to a). In those cases all specified information shall be marked on the smallest packing unit.

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5.2 Additional information

The following information shall be stated by the manufacturer, if applicable, e.g. in the manufacturer's data sheet or his catalogue or on the packing unit:

a) IEC 60947-7-4, if the manufacturer claims compliance with this standard;

b) the maximum cross-section;

c) the connecting capacity, if different from Table 2, including the number of conductors simultaneously connectable;

d) the rated current and the reduction factor to determine the derating curve if different from 0,8;

NOTE Unless otherwise specified, the rated current is preferably determined on four-pole contact units.

e) the rated insulation voltage (U_i);

f) the rated impulse withstand voltage (U_{imp}), when determined;

g) service conditions, if different from those in Clause 6;

h) special preparation of the end of the conductor.

6 Normal service, mounting and transport conditions

Clause 6 of IEC 60947-1:2007 applies.

7 Constructional and performance requirements

7.1 Constructional requirements

7.1.1 Clamping units

The clamping units shall allow the conductors to be connected by means ensuring that a reliable mechanical linkage and electrical contact is properly maintained.

No contact pressure shall be transmitted through insulating materials other than ceramic, or other material with characteristics not less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage of the insulating material.

The corresponding test is under consideration.

Clamping units and connecting methods listed in Table 3 fulfil the requirements of this standard.

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Table 3 – Standards for clamping units and connecting methods

Ref.	Clamping units and connecting methods	Reference standards
a)	Screw-type clamping unit	IEC 60999-1 or IEC 60999-2
b)	Screwless-type clamping unit	IEC 60999-1 or IEC 60999-2 or IEC 60352-7
c)	Wrapped connection	IEC 60352-1
d)	Crimped connection	IEC 60352-2
e)	Insulation displacement connection (accessible)	IEC 60352-3 or IEC 60998-2-3
f)	Insulation displacement connection (non accessible)	IEC 60352-4 or IEC 60998-2-3
g)	Press-in connection	IEC 60352-5
h)	Insulation piercing connection	IEC 60352-6 or IEC 60998-2-3
i)	Flat quick-connect termination	IEC 61210
j)	Soldered connection	IEC 60068-2-20 [a]
[a] The test method selected shall be stated in the test report.		
NOTE The relevant standard applies for the preconditioning of prepared conductors.		

7.1.2 Mounting and installation

PCB terminal blocks shall be so designed that safe mounting on a printed circuit board is possible by means of soldering, pressing-in, screwing, etc. The connection to the printed circuit board shall not be damaged by connecting the conductors.

Tests shall be made in accordance with 8.3.2.

7.1.3 Clearances and creepage distances

For PCB terminal blocks for which the manufacturer has stated values of rated impulse withstand voltage (U_{imp}) and rated insulation voltage (U_i), minimum values of clearances and creepage distances are given in Tables 13 and 15 of IEC 60947-1:2007, Amendment 1 (2010).

For PCB terminal blocks for which the manufacturer has not declared a value of rated impulse withstand voltage (U_{imp}), guidance for minimum values is given in Annex H of IEC 60947-1:2007.

Electrical requirements are given in 7.2.2.

7.1.4 Terminal identification and marking

Subclause 7.1.8.4 of IEC 60947-1:2007 applies with the following addition.

A PCB terminal block shall have provision, or at least space, for identification marks or numbers for each clamping unit or contact unit related to the circuit of which it forms a part except when such marking is not physically possible.

If such marking is not possible the information shall be stated by the manufacturer, e.g. in the manufacturer's data sheet or his catalogue or on the packing unit.

Such provision may consist of separate marking items, such as marking tags, identification labels, etc.

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Full document details: IEC 60947-7-4 2013

7.1.5 Resistance to abnormal heat and fire

The insulation materials of PCB terminal blocks shall not be adversely affected by abnormal heat and fire.

Compliance is checked by:

a) the glow-wire test on the complete product according to 8.5 or

b) verification of the insulating material in accordance with

   1) IEC 60695-2-12, method GWFI at a temperature of 850 °C or

   2) IEC 60695-2-13, method GWIT at a temperature of 775 °C.

This verification is not necessary for small parts (see IEC 60695-2-11).

NOTE 1 The relevant test method is specified by the manufacturer.

NOTE 2 For some applications it may be mandatory to check compliance by the glow-wire test on the complete product according to 8.5 only. The need is either defined in the end-product standard or by agreement between manufacturer and users. See B.1.

7.1.6 Maximum cross-section and connecting capacity

PCB terminal blocks shall be so designed that conductors of the maximum cross-section and the connecting capacity, if applicable, can be accepted.

Compliance is checked by the test described in 8.3.4.

The verification of the maximum cross-section may be performed by the special test according to 8.3.5.

7.2 Performance requirements

7.2.1 Temperature rise

PCB terminal blocks shall be tested in accordance with 8.4.5. The sum of ambient temperature and temperature rise of the PCB terminal block shall not exceed the upper limiting temperature (ULT).

7.2.2 Dielectric properties

If the manufacturer has declared a value of the rated impulse withstand voltage (U_{imp}) (see 4.3.1.3 of IEC 60947-1:2007), the requirements of 7.2.3 and 7.2.3.1 of IEC 60947-1:2007, Amendment 1 (2010) apply. If applicable, the impulse withstand voltage test shall be carried out in accordance with 8.4.3 a).

For the verification of solid insulation the power-frequency withstand voltage test shall be carried out in accordance with 8.4.3 b).

The verification of sufficient clearances and creepage distances shall be made in accordance with 8.4.2. For PCB terminal blocks for which the manufacturer has not declared a value of rated impulse withstand voltage (U_{imp}), guidance for minimum values is given in Annex H of IEC 60947-1:2007.

7.2.3 Short-time withstand current

A PCB terminal block shall be capable of withstanding the short-time withstand current which corresponds to 120 A/mm² for 1 s, in accordance with 8.4.6.

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Full document details: IEC 60947-7-4 2013

The test shall be performed using the smallest cross-section in the current path of the contact unit as declared by the manufacturer.

7.2.4 Contact resistance

When measured according to 8.4.4, the change in contact resistance of a PCB terminal block caused by the conductor connection and the mounting on the printed circuit board shall not exceed the permissible deviations.

7.2.5 Ageing test (climatic sequence and corrosion test)

For the verification of the resistance of connections against the influence of temperatures and corrosive atmospheres the climatic sequence test shall be carried out.

Compliance is checked by the test described in 8.4.7.

7.3 Electromagnetic compatibility (EMC)

Subclause 7.3 of IEC 60947-1:2007, Amendment 1 (2010) applies.

8 Tests

8.1 Kinds of test

Subclause 8.1.1 of IEC 60947-1:2007 applies with the following addition.

No routine tests are specified. The verification of the maximum cross-section according to 8.3.5 is a special test. All other tests are type tests.

8.2 General

Unless otherwise specified, PCB terminal blocks are tested in new and in clean condition, and installed as for normal use (see 6.3 of IEC 60947-1:2007) at an ambient temperature of (25 ± 10) °C.

The tests are carried out in the order described in the subclauses.

Each test is carried out on new individual specimens with at least four contact units (one set) where each multipole PCB terminal block may contain the required number of contact units.

For a PCB terminal block family with the same design and comparable form, tests need only be performed on specimens representing the most unfavourable case.

The surface of the conductors shall be free of contamination and corrosion which degrades performance.

Care shall be taken when stripping conductors to avoid cutting, nicking, scraping or otherwise damaging the conductors.

In cases where the manufacturer has stated that special preparation of the end of the conductor is necessary, the test report shall indicate the method of preparation used.

The tests are carried out with the type of conductors (rigid or flexible) as stated by the manufacturer.

If one of the PCB terminal blocks does not withstand one of the tests, this test shall be repeated on a second set of PCB terminal blocks, all of which shall then comply with the

Withdrawn

AVA Documents Document Sharing Hub

Full document details: IEC 60947-7-4 2013

repeated test. If this test is part of a test sequence, the complete test sequence shall be repeated.

8.3 Verification of mechanical characteristics

8.3.1 General

The verification of mechanical characteristics includes the following test:

– attachment of the PCB terminal block on its support (see 8.3.2);
– verification of the maximum cross-section and connecting capacity (see 8.3.4);
– verification of maximum cross-section (special test with gauges) (see 8.3.5).

8.3.2 Attachment of the PCB terminal block on its support

The tests shall be carried out on the smallest number of poles, preferably two poles, of a PCB terminal block, which is mounted on an appropriate support (printed circuit board) as in normal use according to the manufacturer's instructions. For PCB terminal blocks to be soldered on printed circuit boards, this test shall be carried out on printed circuit boards with plated-through holes.

The wiring of the PCB terminal blocks for this test shall be carried out as shown in Figure 1 with the maximum cross-section as specified by the manufacturer.

After the verification of the contact resistance according to 8.4.4 this conductor shall be connected and disconnected five times according to the manufacturer's instructions. For each connection a new end of the conductor shall be used.

The tightening torque for PCB terminal blocks with screw-type clamping units shall be in accordance with Table 4 of IEC 60947-1:2007 or alternatively with a higher value as specified by the manufacturer.

At the end of the test the PCB terminal blocks shall comply with the contact resistance test according to 8.4.4. After the test the terminal assembly shall be free from damage which may impair further use.

8.3.3 Vacant

8.3.4 Verification of the maximum cross-section and connecting capacity

The verification of the maximum cross-section and connecting capacity shall be carried out according to the standard for clamping units to be used (see 7.1.1).

NOTE The mechanical properties of clamping units are tested according to the applicable connecting methods listed in Table 3.

8.3.5 Verification of maximum cross-section (special test with gauges)

Subclause 8.2.4.5 of IEC 60947-1:2007, Amendment 1 (2010) applies with the following addition.

The test shall be carried out on each clamping unit of one PCB terminal block.

8.4 Verification of electrical characteristics

8.4.1 General

The verification of electrical characteristics includes the following:

– verification of clearances and creepage distances (see 8.4.2);

Withdrawn

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Full document details: IEC 60947-7-4 2013

– dielectric tests (see 8.4.3);
– verification of the contact resistance (see 8.4.4);
– temperature rise test (see 8.4.5);
– short-time withstand current test (see 8.4.6);
– ageing test (see 8.4.7).

8.4.2 Verification of clearances and creepage distances

8.4.2.1 General

The verification is made between two adjacent PCB terminal blocks or mutually insulated contact units of a multipole PCB terminal block and all live parts and accessible metal parts of a PCB terminal block.

The measurement of clearances and creepage distances shall be made under the following conditions:

a) the PCB terminal blocks shall be connected with the most unfavourable conductor type(s) and conductor cross-section(s) among those declared by the manufacturer or without a conductor, if this turns out to be the most unfavourable case;
b) the conductor ends shall be stripped, if required, to a length specified by the manufacturer.

The method of measuring clearances and creepage distances is described in annex G of IEC 60947-1:2007.

8.4.2.2 Clearances

The measured values of clearances shall be higher than the values given in Table 13 of IEC 60947-1:2007 for case B – homogeneous field (see 7.2.3.3 of IEC 60947-1:2007) based on the value of the rated impulse withstand voltage (U_{imp}) and the pollution degree stated by the manufacturer.

The impulse withstand voltage test shall be carried out in accordance with 8.4.3 a) unless the measured clearances are equal to or larger than the values given in Table 13 of IEC 60947-1:2007 for case A – inhomogeneous field (see 8.3.3.4.1, item 2), of IEC 60947-1:2007, Amendment 1 (2010)).

8.4.2.3 Creepage distances

The measured creepage distances shall be not less than the values given in Table 15 of IEC 60947-1:2007, Amendment 1 (2010) in connection with 7.2.3.4 a) and b) of IEC 60947-1:2007 based on the rated insulation voltage (U_i), the material group and the pollution degree as specified by the manufacturer.

8.4.3 Dielectric tests

a) If the manufacturer has declared a value for the rated impulse withstand voltage (U_{imp}), the impulse withstand voltage test shall be carried out in accordance with Table 4.
b) The power-frequency withstand verification of solid insulation according to IEC 60512-4-1 shall be made in accordance with the test voltages given in Table 5. For this test, the PCB terminal blocks are connected with the most unfavourable conductor (without a printed circuit board). The duration of the test is 1 min. The test voltage shall be applied between each of the poles which can assume different potentials in the application.

NOTE The relationship between nominal voltages and of the rated impulse withstand voltage (U_{imp}) are given in Annex H of IEC 60947-1:2007 (see also 7.1.3).

A voltage dip of the test voltage or a disruptive discharge or flashover is not allowed.

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Full document details: IEC 60947-7-4 2013