PUBLICLY
AVAILABLE
SPECIFICATION

IEC PAS 61076-3-117

Pre-Standard

First edition
2006-09

Connectors for electronic equipment – Product requirements –

Part 3-117:
Rectangular connectors – Protective housings for use with 8-way shielded and unshielded connectors for frequencies up to 600 MHz for industrial environments incorporating IEC 60603-7 – Variant 14 related to IEC 61076-3-106 – Push-pull coupling

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
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CONNECTORS FOR ELECTRONIC EQUIPMENT – Product requirements –

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IEC-PAS 61076-3-117 has been processed by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
48B/1655/NP	48B/1697A/RVN

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned will transform it into an International Standard.

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CONNECTORS FOR ELECTRONIC EQUIPMENT – Product requirements –

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1 General data

1.1 Scope

This Publicly Available Specification (PAS) covers protective housings for upgrading existing 8-way shielded and unshielded connectors utilizing the interface described in IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, IEC 60603-7-5, IEC 60603-7-7 to IP65 and IP67 ratings according to IEC 60529, for use in industrial environments.

The housings cover a variety of different locking mechanisms according to this PAS and a variety of different mounting configurations and termination types which are detailed in IEC 60603-7.

Common mating configurations for all variants are defined in IEC 60603-7. The mating dimensions for the housings under Clause 3 allow the mating conditions under IEC 60603-7 to be fulfilled.

The fully assembled variants (connectors) described in this document incorporate fixed and free connectors which are fully compliant which IEC 60603-7.

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 60050-581:1978, *International Electrotechnical Vocabulary – 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 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

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

IEC 60529:1989, *Degree of protection provided by enclosures (IP Code)*

IEC 60603-7: *Connectors for frequencies below 3 MHz for use with printed boards – Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality*

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]

[1] To be published.

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

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

IEC 60603-7-5: *Connectors for electronic equipment – Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*[2]

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

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

IEC 61076-1, *Connectors for electronic equipment – Product requirements – Part 1: Generic specification*

IEC 61156-2: *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*

2 To be published.

1.3 IEC type designation

Protective housings and connectors in protective housings according to this standard shall be designated by the following system.

IEC-61076-3-106	L	N	L	N	–	N

Reference to this standard

Letters denoting the housing type	
Fixed version Panel mounted	A
Free version Cable mounted	B

Number denoting the protective housing variants	
Variant 01	01
Variant 02	02
Variant 12	12
Variant 13	13
Variant 14	14

Letter denoting type of contact	
Female	F
Male	M

Number denoting the performance level of the housing	
1	250 operations
2	750 operations

Number denoting internal interface conformance type	
0	Housing without insert
2	IEC 60603-7-2
3	IEC 60603-7-3
4	IEC 60603-7-4
5	IEC 60603-7-5
6	IEC 60603-7-7

NOTE “L” stands for letter
“N” stands for number

Example:

IEC-PAS 61076-3-106 A14F5 – 2: Fixed protective housing panel mounted, housing variant 14, female version, insert according to IEC 60603-7-5 (250 MHz – shielded), housing for 750 operations.

2 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581 apply.

3 Dimensional information

3.1 Common features

The industrial connectors referenced in this specification are composed of IEC 60603-7 style fixed and free connectors housed in unique, industrial rated interfaces. The mating information and contact requirements of the IEC 60603-7 interface portion of these industrial connectors shall be compliant with the relevant part of IEC 60603-7.

The following requirements apply to the complete connector comprised of both the free and fixed connectors in one of the described variant shells/outer housing.

3.2 General

Dimensions are given in millimeters; drawings are shown in first-angle projection. The shape of connectors may deviate from the shapes given in the following figures as long as the specified dimensions are not influenced.

3.3 Contact arrangement of all connector types

Contact arrangements shall be in accordance with the relevant IEC 60603-7 specifications.

3.4 IP65 and IP67 sealing

Connectors meant to comply with IP ratings according to IEC 60529 require sealing of the components in order to meet the requirements detailed in the test schedules in 6.8.2 through 6.8.7.

3.5 Industrial IEC 60603-7 variant 14 – Rectangular push-pull coupling

3.5.1 Industrial IEC 60603-7 variant 14, fixed connector

First-angle projection

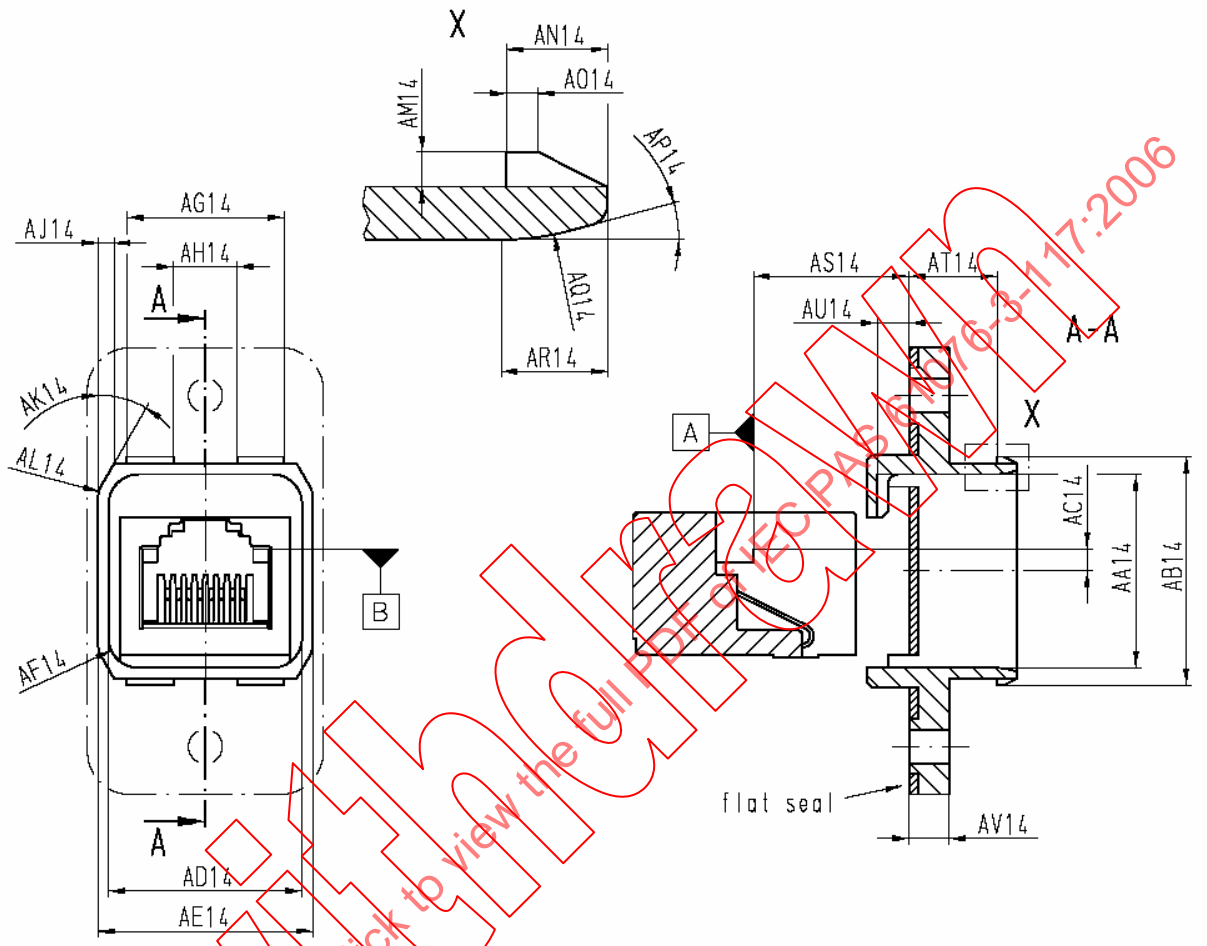

Figure 1 – Variant 14, fixed connector

Table 1 – Dimensions fixed connector variant 14

Letter	Maximum mm	Minimum mm	Nominal mm
AA_{14}	18,23	18,17	18,2
AB_{14}	21,55	21,45	21,5
AC_{14}	2,11	1,99	2,05
AD_{14}	18,23	18,17	18,2
AE_{14}	20,3	20,1	20,2
AF_{14}	2,83	2,77	2,8
AG_{14}	14,85	14,75	14,8
AH_{14}	6,05	5,95	6
AJ_{14}	1,7	1,3	1,5
AK_{14}	31	29	30
AL_{14}	2,1	1,9	2
AM_{14}	0,7	0,6	0,65
AN_{14}	1,95	1,85	1,9
AO_{14}	0,65	0,55	0,6
AP_{14}	16	14	15
AQ_{14}	5,1	4,9	5
AR_{14}	2,1	1,9	2
AS_{14}	14,85	14,45	14,65
AT_{14}	8,35	8,25	8,3
AU_{14}	3,1	2,9	3
AV_{14}	3,9	3,7	3,8

3.5.2 Industrial IEC 60603-7 variant 14, free connector

First-angle projection

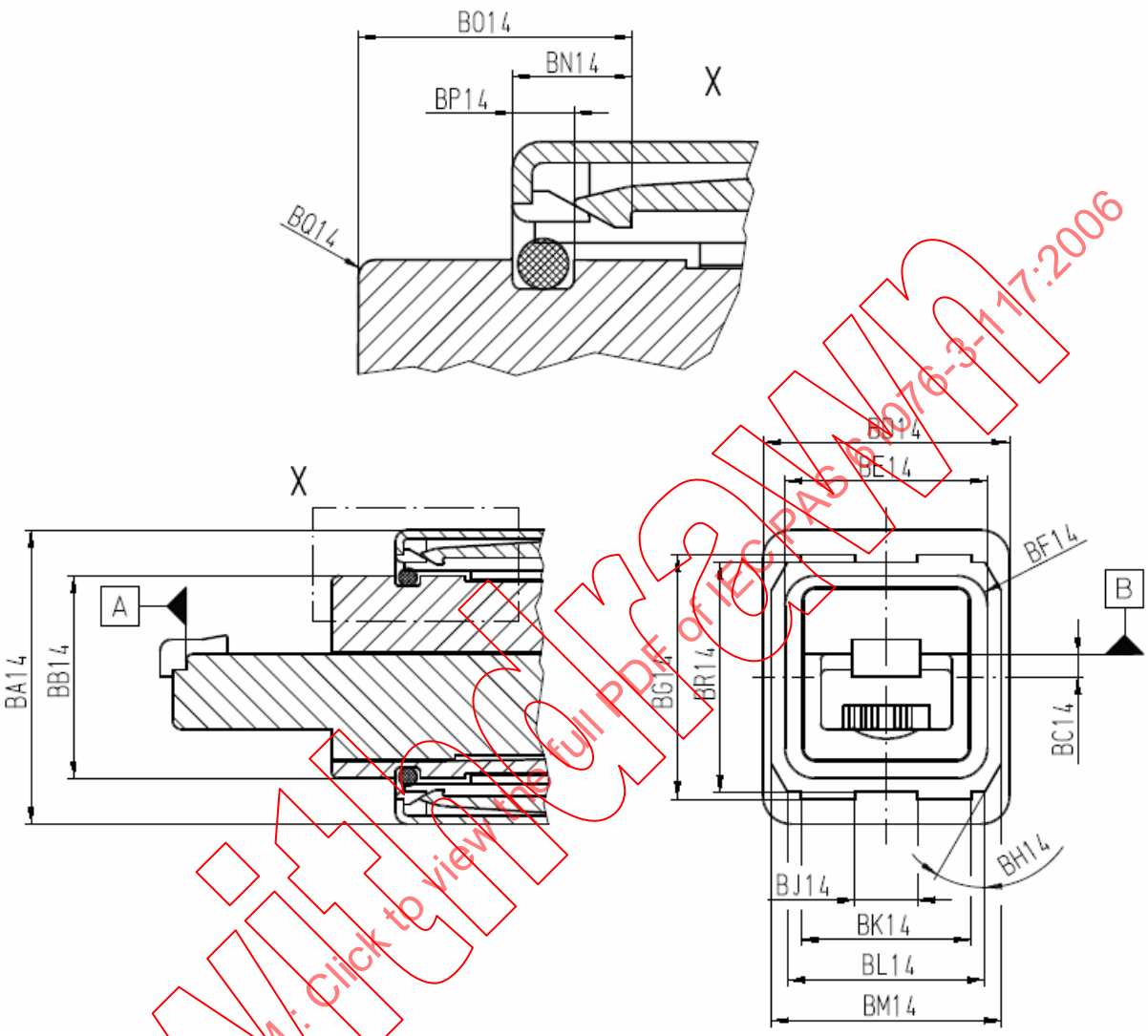

Figure 2 – Variant 14, free connector

Table 2 – Dimensions free connector variant 14

Letter	Maximum mm	Minimum mm	Nominal mm
BA_{14}	29	-	-
BB_{14}	18,09	18,03	18,06
BC_{14}	2,11	1,99	2,05
BD_{14}	22,8	-	-
BE_{14}	18,09	18,03	18,06
BF_{14}	2,73	2,67	2,7
BG_{14}	21,9	21,7	21,8
BH_{14}	31	29	30
BJ_{14}	5,75	5,45	5,6
BK_{14}	15,35	15,05	15,2
BL_{14}	17,8	17,4	17,6
BM_{14}	20,6	20,4	20,5
BN_{14}	4,3	-	-
BO_{14}	11	-	-
BP_{14}	2,25	2,15	2,2
BQ_{14}	0,65	0,55	0,6
BR_{14}	20,55	20,45	20,5

3.6 Termination and mounting information

3.6.1 General

Terminations according to IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, IEC 60603-7-5, IEC 60603-7-7.

3.6.2 Mounting information for variant 14, fixed connector

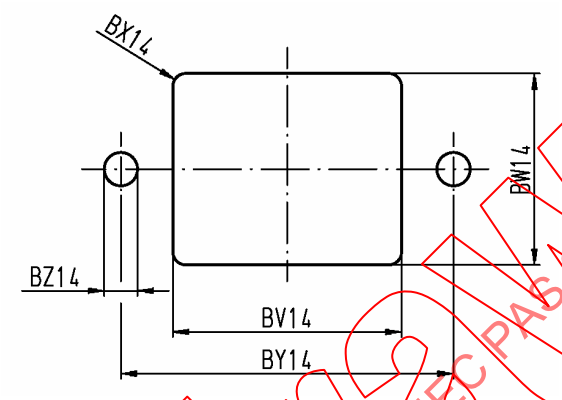

Figure 3 – Variant 14 mounting drawing

Table 3 – Variant 14 mounting information

Letter	Maximum mm	Minimum mm	Nominal mm
BV_{14}	22,05	21,95	22
BW_{14}	18,45	18,35	18,4
BX_{14}	R 1,25	-	-
BY_{14}	33,1	32,9	33
BZ_{14}	-	-	M 3

4 Gauges

4.1 Connectors, IEC 60603-7 interface

Refer to the relevant IEC 60603-7 specifications.

5 Characteristics

5.1 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 and shall not exceed the values defined in the relevant IEC 60603-7 specification.

The following preferred temperature range and severity of the damp-heat steady-state test have been selected to comply with IEC 61156.

Table 4 – Climatic categories – Selected values for environmental performance level A

Climatic category	Lower temperature °C	Upper temperature °C	Damp-heat steady-state (days)
40/70/21	-40	70	21

5.2 Electrical

5.2.1 Clearance and creepage distances

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

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

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

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

Table 5 – Clearance and creepage distances

Type	Distance between contacts and shield		Minimum distance between adjacent contacts	
	Creepage	Clearance	Creepage	Clearance
	mm	mm	mm	mm
A, B	1,40	0,51	0,36	0,36

The electrical characteristics are specified in the relevant part of IEC 60603-7.

5.2.2 Voltage proof

Conditions:

IEC 60512-2, Test 4a, Method A.
Standard atmospheric conditions.
Mated connectors.
All variants: 1 000 V d.c. or a.c. peak, contact-to-contact
1 500 V d.c. or a.c. peak, contact-to-shield

5.2.3 Current-carrying capacity

Conditions: IEC 60512-3, Test 5b.
All contacts, connected in series.

The current-carrying capacity of connectors in accordance with the requirements of 2.4 of IEC 61076-1 shall comply with the derating curve given in Figure 4.

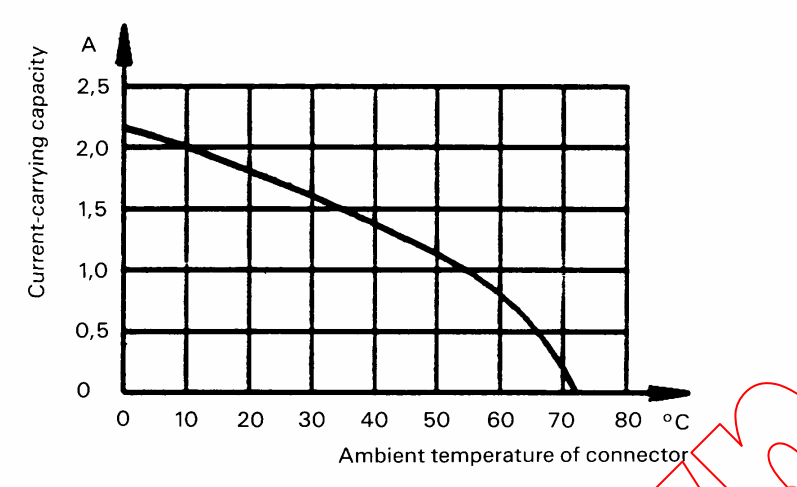

Figure 4 – Connector derating curve

5.2.4 Mating cycles with power applied

On agreement between manufacturer and user.

5.2.5 Initial contact resistance

Conditions: IEC 60512, Test 2a

Mated connectors
Measurement points: as specified in the relevant clause of IEC 60603-7
Signal contacts: 20 mΩ max.
Shield contact: 20 mΩ max.

5.2.6 Input to output resistance

Conditions: IEC 60512, Test 2a

Mated connectors
Signal contacts: 200 mΩ maximum
Shield: 100 mΩ maximum

5.2.7 Resistance unbalance

Conditions: IEC 60512, Test 2a

Mated connectors
Among all conductors, difference between maximum and minimum
100 mΩ max.

5.2.8 Initial insulation resistance

Conditions: IEC 60512, Test 3a

Method A
Mated connectors
Test voltage: 100 V d.c.
Each contact and shield to all others: 500 MΩ min.

5.3 Transmission characteristics

5.3.1 General

Transmission performance is defined by the relevant part of IEC 60603-7.

5.3.2 Mechanical

5.3.3 Mechanical operation

Conditions: IEC 60512, Test 9a

Speed: 10 mm/s max.
Rest: 5 s min. (unmated)
PL1: 750 operations
PL2: 250 operations

5.3.4 Effectiveness of connector coupling devices transversal

Conditions: IEC 60512, Test 8a.

Force 60 N to be applied at the end of the free housing to load the coupling device with the maximum torque

5.3.5 Effectiveness of connector coupling devices

Conditions: IEC 60512, Test 15f

All types: 50 N for 60 s ± 5 s

5.3.6 Separation and engagement forces

Conditions: IEC 60512, Test 13a

Speed: 50 mm/s max.

All types, insertion and withdrawal: 30 N max.

Initial torque test insertion 1,0 Nm max. and withdrawal 0,7 Nm max.
After conditioning torque test insertion 2,0 Nm max. and withdrawal 1,2 Nm max.

6 Test schedule

6.1 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.

Reference is made to the test groups of the relevant part of IEC 60603-7 for electrical and environmental test groups.

Tests according to this PAS shall demonstrate the performance of the protective housings under harsh industrial environment with the relevant IEC 60603-7 connector inserted.

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; that is, when unmating is necessary for a certain test, the same connectors shall be mated for the subsequent tests.

Hereinafter, a mated set of connectors is called a "specimen".

6.2 Test procedures and measuring methods

The test methods specified and given in the relevant standards are the preferred methods but not necessarily the only ones that can be used. In case of dispute, however, the specified method shall be used as the reference method.

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1.

Where approval procedures are involved and alternative methods are employed, it is the responsibility of the manufacturer to satisfy the authority granting approval that any alternative methods which he may use give results equivalent to those obtained by the methods specified.

6.3 Preconditioning

Before the tests are made, the connectors shall be preconditioned under standard atmospheric conditions for testing as specified in IEC 60068-1 for a period of 24 h unless otherwise specified by the manufacturer.

6.4 Wiring and mounting of specimens

6.4.1 Wiring

Wiring of these connectors shall take into account the wire diameter of the cables defined in IEC 61156-2, IEC 61156-3 and IEC 61156-4 as applicable. Where wiring and/or shielding of test specimens is required, the detail specification of the relevant part of IEC 60603-7 shall be reviewed for information suitable to comply with the selected methods of test.

6.4.2 Mounting

When mounting is required in a test, unless otherwise specified, the connectors shall be rigidly mounted on a metal plate or to specified accessories, whichever is applicable, using the specified connection methods, fixing devices and panel cut-outs as laid down in 3.6.

6.5 Arrangement for contact resistance test

As specified in the relevant part of IEC 60603-7.

6.6 Arrangement for dynamic stress tests (test phase AP2)

Contact resistance measurement as specified in the relevant part of IEC 60603-7.

6.7 Basic (minimum) test schedule

Not applicable.

6.8 Full test schedule

The detail specification shall call for the following tests and shall specify the characteristics to be examined and the requirements to be fulfilled.

For a complete test sequence, 18 specimens are needed (3 groups of 6). Within each group, only 2 of the 6 samples shall be subjected to the IPX5 and IPX7 tests. The same samples are used for both tests, spray and immersion. Two additional samples are used for the dust test, IP6X.

6.8.1 Test preliminary group P

The specimens shall be comprised on the variant shell and an IEC 60603-7-X interface. All specimens shall be subjected to the following tests. All the test group specimens shall be subjected to the preliminary group P tests in the following sequence.

The specimens shall then be divided into the appropriate number of groups. All connectors in each group shall undergo the following tests as described in the detail specification and in the sequence given, unless the detail specification of the relevant part of IEC 60603-7 requires alteration of the sequence of tests or adds new tests to verify additional connector characteristics.

The test parameters required shall not be less than those listed. The following tests specify the characteristics to be checked and the requirements to be fulfilled.

6.8.2 Test group P

Table 6 – Test group P

Test phase	Test			Measurement to be performed		
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	Requirement All connector styles
P1	General exam-ination		Unmated connectors	Visual examination	1a	There shall be no defect that would impair normal operation
				Dimensional examination	1b	The dimensions shall comply with those specified in the relevant figure of Clause 3
P2	Polarizing method	13e	Not applicable			
P3			Test voltage 100 V ± 15 V d.c. Method A 8 contacts/specimen	Insulation resistance	3a	500 MΩ min.
P4			Contact/contact: Method A mated connectors	Voltage proof	4a	1 000 V d.c. or a.c. peak
			All contacts to test panel: Method A mated connectors			X 1 500 V d.c. or a.c. peak