

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

**Connectors for electronic equipment – Product requirements –
Part 2-109: Circular connectors – Detail specification for connectors M 12 × 1
with screw-locking, for data transmissions with frequencies up to 500 MHz**

IECNORM.COM: Click to view the full text of IEC PAS 61076-2-109:2010



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

**Connectors for electronic equipment – Product requirements –
Part 2-109: Circular connectors – Detail specification for connectors M 12 × 1
with screw-locking, for data transmissions with frequencies up to 500 MHz**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

T

ICS 13.220.10

ISBN 978-2-88910-792-6

CONTENTS

FOREWORD.....	4
1 General information.....	7
1.1 Scope.....	7
1.2 Recommended method of termination	7
1.2.1 Number of contacts or contact cavities	7
1.3 Ratings and characteristics	7
1.4 Normative references	8
1.5 Marking	8
1.6 Safety aspects.....	8
2 Technical information	8
2.1 Definitions	8
2.2 Survey of styles and variants.....	9
3 Dimensions	9
3.1 General.....	9
3.2 Interface dimensions for connectors with female contacts	9
3.3 Interface dimensions for connectors with male contacts	10
3.3.1 Pin front view of connectors and contact position	11
3.4 Gauges	11
3.4.1 Sizing gauges and retention force gauges	11
4 Characteristics	12
4.1 Climatic category.....	12
4.2 Electrical	12
4.2.1 Rated voltage – Rated impulse voltage – Pollution degree.....	12
4.2.2 Voltage proof.....	12
4.2.3 Current-carrying capacity.....	13
4.2.4 Contact resistance.....	13
4.2.5 Insulation resistance.....	13
4.3 Mechanical	13
4.3.1 IP degree of protection	13
4.3.2 Mechanical operation	13
4.3.3 Insertion and withdrawal forces	13
4.3.4 Contact retention in insert.....	14
4.3.5 Polarizing method.....	14
4.3.6 Vibration (sinusoidal).....	14
4.3.7 Shock	14
5 Test schedule.....	14
5.1 General.....	14
5.1.1 Arrangement for contact resistance measurements.....	15
5.1.2 Arrangement for dynamic stress tests (vibration)	16
5.2 Test schedule.....	17
5.2.1 Test group P-Preliminary	17
5.2.2 Test group AP – Dynamic/ Climatic.....	18
5.2.3 Test group BP – Mechanical endurance.....	20
5.2.4 Test group CP – Electrical load	21
5.2.5 Test group DP – Chemical resistivity	21

5.2.6 Test group EP – Connection method tests	22
5.2.7 Test group FP – Electrical transmission requirements	22
Figure 1 – Interface dimensions for connectors with female contacts	9
Figure 2 – Interface dimensions for connectors with male contacts	10
Figure 3 – Gauge dimensions	11
Figure 4 – Contact resistance arrangement.....	15
Figure 5 – Dynamic stress test arrangement.....	16
Table 1 – Contact termination	7
Table 2 – Interface dimensions fixed connector	10
Table 3 – Interface dimensions free connector.....	11
Table 4 – Gauges	12
Table 5 – Climatic category	12
Table 6 – Rated voltage – Impulse voltage – Pollution degree	12
Table 7 – Voltage proof connectors.....	13
Table 8 – Number of mechanical operations	13
Table 9 – Insertion and withdrawal forces	14
Table 10 – Number of test specimens	15
Table 11 – Test group P	17
Table 12 – Test group AP	18
Table 13 – Test group BP	20
Table 14 – Test group CP	21
Table 15 – Test group DP	21
Table 16 – Test group EP	22
Table 17 – Contact and pair designation for symmetrical cabling	22
Table 18 – Test Group FP	23

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRONIC EQUIPMENT –
PRODUCT REQUIREMENTS –****Part 2-109: Circular connectors –
Detail specification for connectors M 12 × 1 with screw-locking,
for data transmissions with frequencies up to 500 MHz**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC/PAS 61076-2-109 has been prepared 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

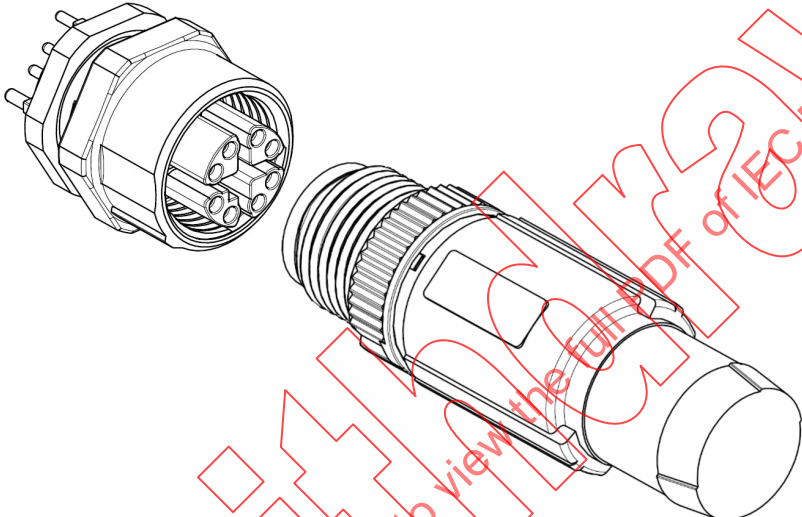
Draft PAS	Report on voting
48B/2077/PAS	48B/2091/RVD

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

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

IECNORM.COM: Click to view the full PDF of IEC PAS 61076-2-109:2010

Withdrawn

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC SC 48B – Connectors	IEC 61076-2-109
ELECTRONIC COMPONENTS in accordance with IEC 61076-1	
	Circular connectors M12 × 1 mm 2 to 8 ways, for data transmissions with frequencies up to 500 MHz Connectors with round contact Rewireable
	Free cable connectors Straight and right angle connectors Fixed connectors Flange mounting Rear mounting

CONNECTORS FOR ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 2-109: Circular connectors – Detail specification for connectors M 12 × 1 with screw-locking, for data transmissions with frequencies up to 500 MHz

1 General information

Throughout this detail specification dimensions are in mm.

1.1 Scope

This Publicly Available Specification (PAS) describes circular connectors with IP 65 and IP 67 protection degree and specified up to 500 MHz, typically used for data transmissions. These connectors consist of fixed and free connectors, either rewirable or non-rewirable, with M12 × 1 screw-locking.

Male connectors have round contacts $\varnothing 0,6$ mm.

1.2 Recommended method of termination

The contact terminations shall be of the following types: screw, crimp, insulation piercing, insulation displacement, press-in or solder.

1.2.1 Number of contacts or contact cavities

2 to 8 contacts and 8 cavities.

Table 1 – Contact termination

Number of contacts	Typical. termination
2 to 8	0,14 mm ² to 0,25 mm ² 1)
NOTE 1 Equals to AWG 26 to 24	

1.3 Ratings and characteristics

Rated voltage: 48 V, see 4.2.1, Table 6

Current rating: 0,5 A, see 4.2.3

Insulation resistance: 10⁸ Ω, see 4.2.5

Climatic category: –25 °C / +85 °C / 21 days, see 4.1, Table 5

Contact spacing: see Clause 3

1.4 Normative references

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

IEC 60050-581, *International Electrotechnical Vocabulary – Part 581: Electromechanical components for electronic equipment*

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

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

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

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

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 61076-2:1998, *Connectors for use in d.c., low-frequency analogue and digital high speed data applications – Part 2: Circular connectors with assessed quality – Sectional specification*

IEC 61076-2-101:2008, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61984, *Connectors – Safety requirements and tests*

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

1.5 Marking

The marking of the connector and the package shall be in accordance with 2.6 of IEC 61076-2.

1.6 Safety aspects

For safety aspects IEC 61984 shall be considered unless otherwise specified.

2 Technical information

2.1 Definitions

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

2.2 Survey of styles and variants

Subclause 2.2 of IEC 61076-2-101:2008 applies.

3 Dimensions

3.1 General

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

For connector dimensions, see 3.2 and 3.3.

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

The missing interface dimensions of the female styles shall be chosen according to the common characteristics of the male styles.

3.2 Interface dimensions for connectors with female contacts

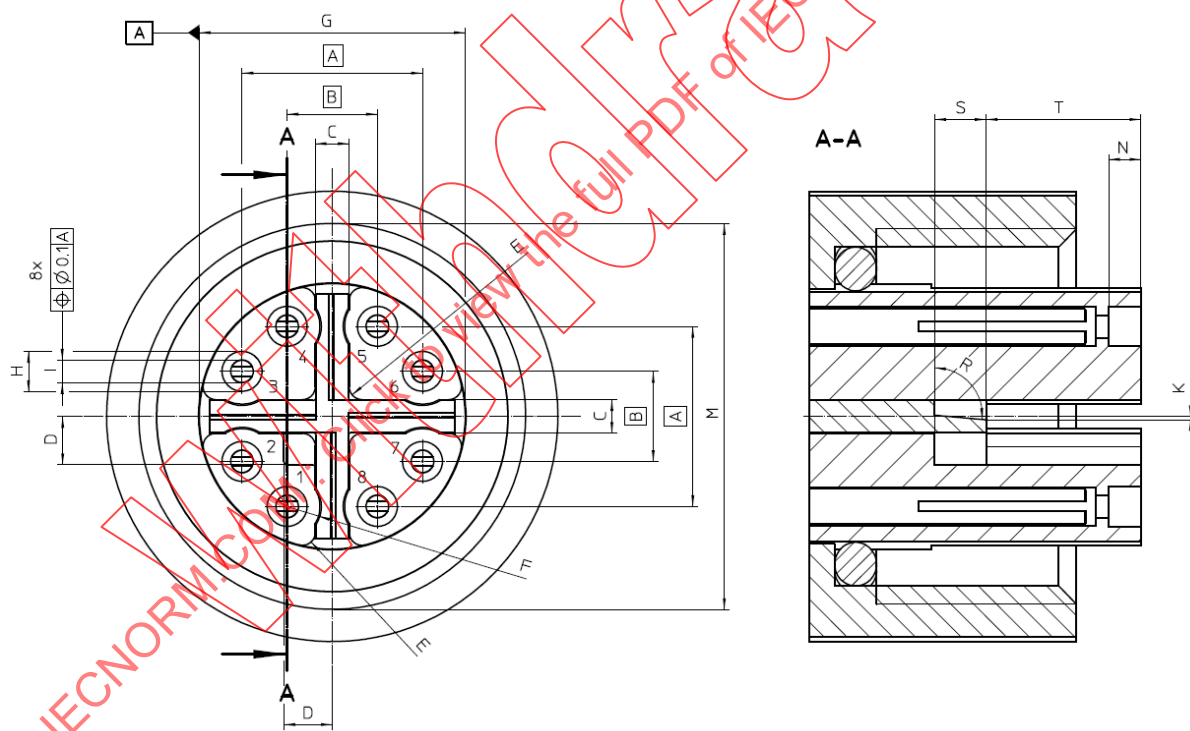


Figure 1 – Interface dimensions for connectors with female contacts

Table 2 – Interface dimensions fixed connector

Reference	Minimum [mm]	Nominal [mm]	Maximum [mm]
A	5,6	5,6	5,6
B	2,8		2,8
C	1,05	1,05	1,1
D	1,5	1,5	1,6
E	0,4	0,4	0,5
F	0,96	1,02	1,02
G	8,15	8,25	8,25
H	1,24	1,24	1,34
I	0,7	0,7	0,75
K	0,1	0,1	0,15
M	M12x1		
N	1	1	1,1
R	94,5°	95°	95°
S	1,6	1,6	1,7
T	4,7	4,8	4,9

NOTE All radii without dimensions are 0,1.

3.3 Interface dimensions for connectors with male contacts

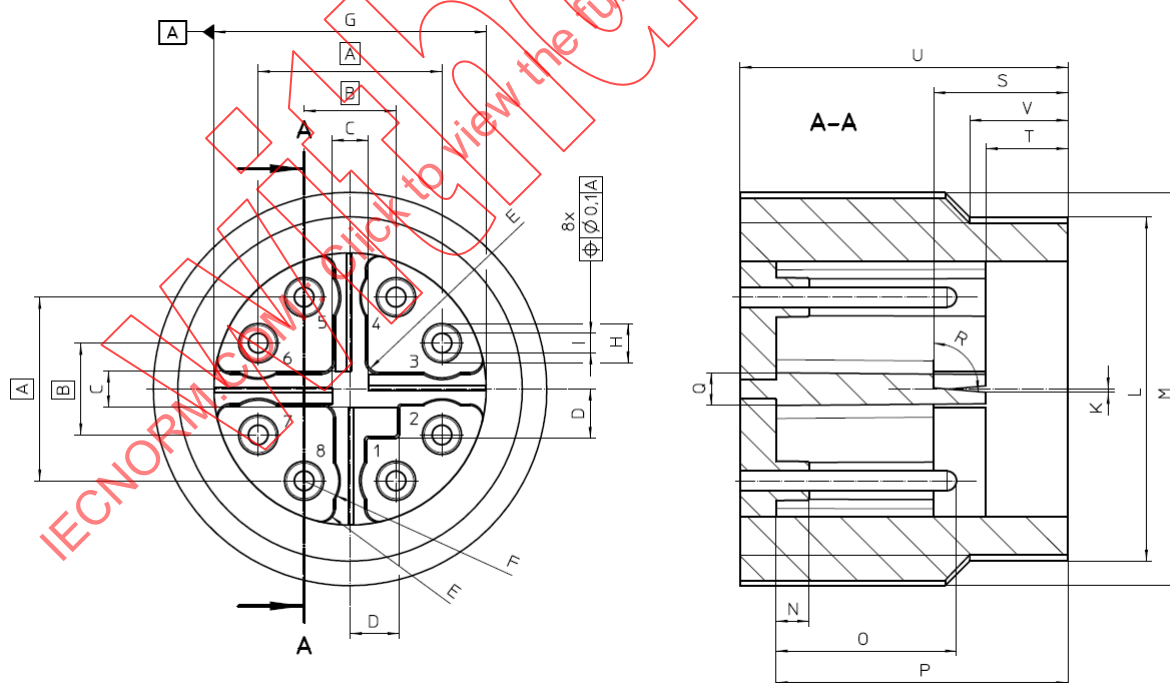


Figure 2 – Interface dimensions for connectors with male contacts

Table 3 – Interface dimensions free connector

Reference	Minimum [mm]	Nominal [mm]	Maximum [mm]
A	5,6	5,6	5,6
B	2,8	2,8	2,8
C	1,1	1,1	1,2
D	1,4	1,5	1,5
E	0,3	0,4	0,4
F	1,06	1,06	1,11
G	8,3	8,3	8,45
H	1,1	1,2	1,2
I	0,57	0,6	0,63
K	0,07	0,1	0,13
L	10,2	10,5	10,5
M	M12×1		
N	0,9	1	1
O	5,5	5,5	5,7
P	8,7	8,9	8,9
Q	0,9	1	1
R	94,5°	95°	95°
S	4,1	4,1	4,2
T	2,5	2,5	2,6
U	10		
V			3
NOTE All radii without dimensions are 0,1.			

3.3.1 Pin front view of connectors and contact position

As described in 3.2.

The contact or cavity marking shall be on the termination side of the connector insert as long as the size of the components allows the placement there.

3.4 Gauges

3.4.1 Sizing gauges and retention force gauges

Material: tool steel, hardened

▽ = Surface roughness according to ISO 1302: Ra = 0,25 µm max.
0,15 µm min.

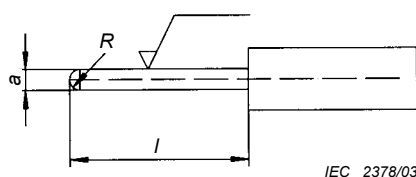


Figure 3 – Gauge dimensions

Table 4 – Gauges

Gauge	Mass g	Application	Ø a mm	l min. mm
P31	–	Sizing	0,63	10
P32	30	Retention force	0,57	10

4 Characteristics

4.1 Climatic category

Conditions: IEC 60068-1

Table 5 – Climatic category

Climatic category	Category of temperature		Damp heat steady-state		Days
	Lower °C	Upper °C	Temperature °C	Relative humidity %	
25/85/21	–25	+85	40	93	21

4.2 Electrical

4.2.1 Rated voltage – Rated impulse voltage – Pollution degree

Conditions: IEC 60664-1

The permissible rated voltage depends on the application or specified safety requirement. Reductions in creepage or clearance distances may occur due to the printed board or wiring used and shall be duly taken into account.

Table 6 – Rated voltage – Impulse voltage – Pollution degree

Contact arrangement according to Clause 3	Rated voltage V	Rated impulse voltage kV	IP 65 and IP 67 variants Pollution degree ^{b)}
8 poles	48 ^{b)}	1,5 ^{b)}	3 ^{a)}
a) In mated and locked condition. b) The rated voltage and impulse voltage are based on pollution degree 2. This results from application of the rules from IEC 60664-1.			

4.2.2 Voltage proof

Conditions: IEC 60512-4-1, Test 4a
 Standard atmospheric conditions
 Mated connectors

Table 7 – Voltage proof connectors

Values in kilovolts (kV)

	Impulse withstand voltage Between contacts		Impulse withstand voltage Between contacts and metal housing	
	Fixed connectors	Free connectors	Fixed connectors	Free connectors
Contact arrangement according to Figure 1	0,5	0,5	0,5	0,5

4.2.3 Current-carrying capacity

Conditions: IEC 60512, Test 5a
All contacts
Values at 40 °C ambient temperature

8 pole (0,25mm² wire gauge) = 0,5 A (single contact 1 A)

4.2.4 Contact resistance

Conditions: IEC 60512, Test 2a
Standard atmospheric conditions
Connecting points see 5.1.1

Contact resistance < 5 mΩ

4.2.5 Insulation resistance

Conditions: IEC 60512, Test 3a, Method A
Standard atmospheric conditions
Insulation resistance $\geq 10^8 \Omega$

4.3 Mechanical**4.3.1 IP degree of protection**

IP65 and IP67 according to IEC 60529 connectors in mated and locked position. IP68 as agreed between manufacturer and user.

4.3.2 Mechanical operation

Conditions: IEC 60512, Test 9a
Standard atmospheric conditions
Max. speed of operations = 10 mm/s
Rest: 30 s, unmated

Table 8 – Number of mechanical operations

Contact finish	Mechanical operations
Gold	100
Other types	a)

a) Other mating cycles are permissible when agreed between manufacturer and user.

4.3.3 Insertion and withdrawal forces

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

Table 9 – Insertion and withdrawal forces

Total insertion force N	Total withdrawal force N
30 max	30 max

4.3.4 Contact retention in insert

Not applicable

4.3.5 Polarizing method

Conditions: IEC 60512, Test 13e
Engaging force: $1,5 \times$ total insertion force but 35 N min.

4.3.6 Vibration (sinusoidal)

Conditions: IEC 60512, Test 6d
Standard atmospheric conditions
Connectors in mated and locked position
The fixed and free connector shall be rigidly installed in a suitable fixture as specified in 5.1.2
Vibration Severity: 10 Hz to 500 Hz and 0,35 mm or 5 g

4.3.7 Shock

Conditions: IEC 60512 Test 6c
Connectors in mated and locked position
The fixed and free connector shall be rigidly installed in a suitable fixture as specified in 5.1.2
Half sine shock acceleration 490m/s^2 (50g)
Duration of impact: 11ms

5 Test schedule

5.1 General

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

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1, as directed by the applicable part of IEC 60512.

Unless otherwise specified, mated and locked 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 connector styles as before shall be mated for the subsequent tests.

In the following, a mated and locked sets of connector styles is called a specimen.

When the initial tests have been completed, all the specimens are divided in the 4 test groups AP, BP, CP and DP. In addition 20 single contacts are used for EP and 20 additional specimens for FP.

Before testing commences, the connectors shall be stored for at least 24 h in the non-engaged state under standard atmospheric conditions as per IEC 60068-1.

The necessary specimens are stated in Table 1.

Table 10 – Number of test specimens

	Test group						
	P	AP	BP	CP	DP	EP	FP
Number of specimen	12	3	3	3	3	20 single contacts	2

5.1.1 Arrangement for contact resistance measurements

Conditions: 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.

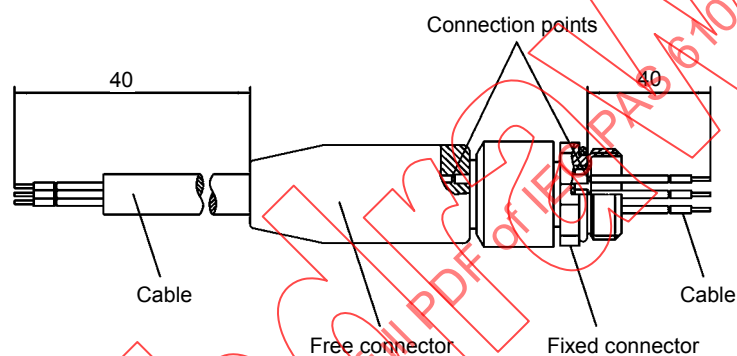


Figure 4 – Contact resistance arrangement

5.1.2 Arrangement for dynamic stress tests (vibration)

Conditions: see 4.3.6

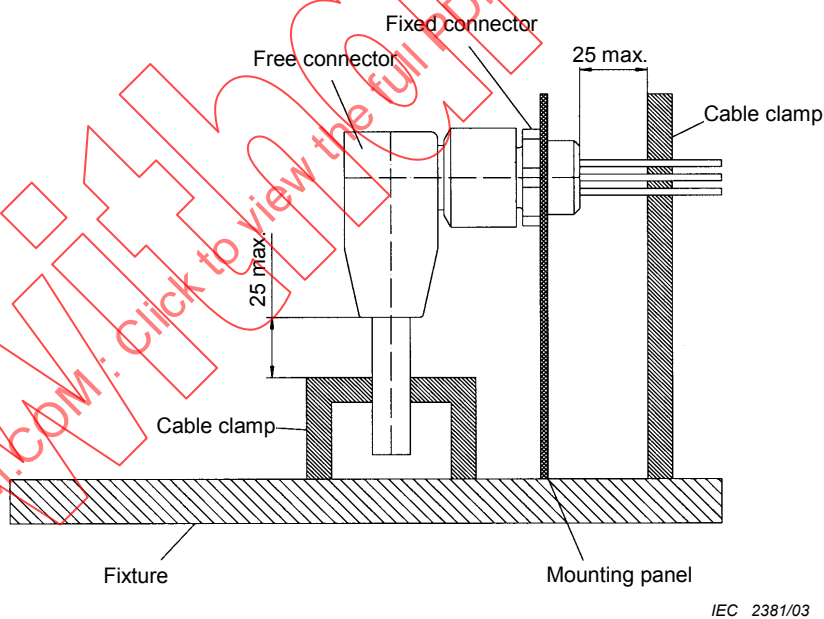
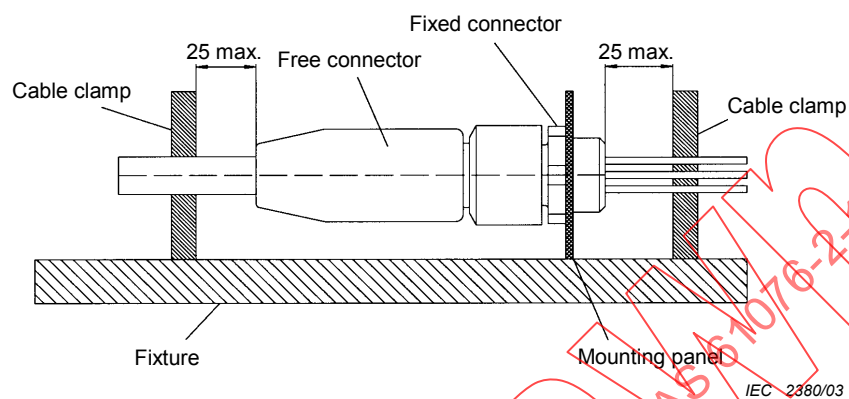


Figure 5 – Dynamic stress test arrangement

5.2 Test schedule

5.2.1 Test group P-Preliminary

All specimens shall be subject to the following tests.

Table 11 – Test group P

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 605 12 Test No.	Severity or condition of test	Title	IEC 605 12 Test No.	All connector styles
P1	General examination	1	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 2.2 and 3
P2			Connection points according to 5.1.1 all contacts per specimens	Contact resistance – Millivolt level method	2a	Initial value according to 4.2.4
P3			Test voltage 500 V $\pm$ 15 V d.c. Method A	Insulation resistance	3a	Initial value according to 4.2.5
P4			Contact/ contact same measuring points as for P3	Voltage proof	4a	According to 4.2.2

The specimen shall be divided into 4 groups. All connectors in each group shall undergo the tests specified for the relevant group.

5.2.2 Test group AP – Dynamic/ Climatic

Table 12 – Test group AP

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	All connector styles
AP1			See 4.3.3	Insertion and withdrawal forces	13b	Requirements see 4.3.3
AP2	Gauge retention force		Female contacts only 3 contacts/ specimen sizing and retention force gauge see 3.3.1	Engaging and separating forces	16e	See 3.3.1
AP3	Vibration	6d	Sweep cycles: 10 Full duration: 6 h See 4.3.6	Contact disturbance	2e	Duration of disturbance 1 µs max.
				Contact resistance – Millivolt level method	2a	Rise in relation to initial values ≤10 mΩ
				Visual examination	1a	There shall be no defect that would impair normal operation
AP4	Shock	6c	See 4.3.7	Contact disturbance	2e	Duration of disturbance 1 µs max.
				Contact resistance – Millivolt level method	2a	Rise in relation to initial values ≤10 mΩ
				Visual examination	1a	There shall be no defect that would impair normal operation
AP5	Rapid change of temperature	11d	–25 °C to 85 °C t = 30 min. 5 cycles	Contact resistance – Millivolt level method	2a	Rise in relation to initial values ≤10 mΩ
				Insulation resistance	3a	Initial value according to 4.2.5
				Voltage proof	4a	According to 4.2.2
				Visual examination	1a	There shall be no defect that would impair normal operation

Table 12 (continued)

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	All connector styles
AP6	Climatic sequence	11a				
AP6.1	Dry heat	11i	Temperature: 85 °C Duration: 16 h	Insulation resistance at high temperature	3a	Initial value according to 4.2.5
AP6.2	Damp heat, cyclic, first cycle	11m	Method dB Temperature: 40 °C Recovery time: 2 h	Visual examination	1a	There shall be no defect that would impair normal operation
AP6.3	Cold	11j	Temperature: -25 °C Duration: 2 h Recovery time: 2 h	Visual examination	1a	There shall be no defect that would impair normal operation
AP6.4	Damp heat, cyclic, remaining cycles	11m	Conditions according to AP6.2 5 cycles Recovery time: 2 h	Contact resistance – Millivolt level method	2a	Rise in relation to initial values ≤15 mΩ
				Insulation resistance	3a	Initial value according to 4.2.5
				Voltage proof	4a	According to 4.2.2
				Insertion and withdrawal forces	13b	Requirements see 4.3.3
				Visual examination	1a	There shall be no defect that would impair normal operation
AP7	IP Protection degree	IEC 60529		Table 1 of IEC 60529		According to 4.3.1
AP8				Visual examination	1a	There shall be no defect that would impair normal operation
AP9	Polarizing method	13e	See 4.3.5			It shall be possible to correctly align and mate the appropriate mating connectors. It shall not be possible to mate the connectors in any other than the correct manner. The insertion and withdrawal forces according to AP1

5.2.3 Test group BP – Mechanical endurance

Table 13 – Test group BP

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Test No.	Severity or condition of test	Title	IEC 60512 Test No.	All connector styles
BP1			Female contacts only 3 contacts/specimen sizing and retention force gauge see 3.3.1	Gauge retention force	16e	See 3.3.1
BP2	Mechanical operation (half of the specified number of operations)	9a	Speed 10 mm/s max. Rest 30 s (unmated) Operations see 4.3.2 Speed: 10 mm/s max. Rest time: 30 s (unmated)			
				Contact resistance- Millivolt level method	2a	Rise in relation to initial values $\leq 15 \text{ m}\Omega$
				Visual examination	1a	There shall be no defect that would impair normal operation
BP3	Climatic test					
BP3.1	Corrosion industrial atmosphere	11g	Flowing mixed gas corrosion - 4 days, test method 4 according to IEC 60068-2-60	Contact resistance- Millivolt level method	2a	Rise in relation to initial values $\leq 15 \text{ m}\Omega$
BP4	Mechanical operation (remaining half of specified number of operations)	9a	See BP2	Contact resistance – Millivolt level method	2a	Rise in relation to initial values $\leq 10 \text{ m}\Omega$
				Insulation resistance	3a	Initial value according to 4.2.5
				Voltage proof	4a	According to 4.2.2
				Unmated connectors Visual examination	1a	There shall be no defect that would impair normal operation
BP5				Insertion and withdrawal forces	13b	For requirements, see 4.3.3
BP6			Female contacts only 3 contacts/specimen sizing and retention force gauge, see 3.3.1	Gauge retention force	16e	See 3.3.1