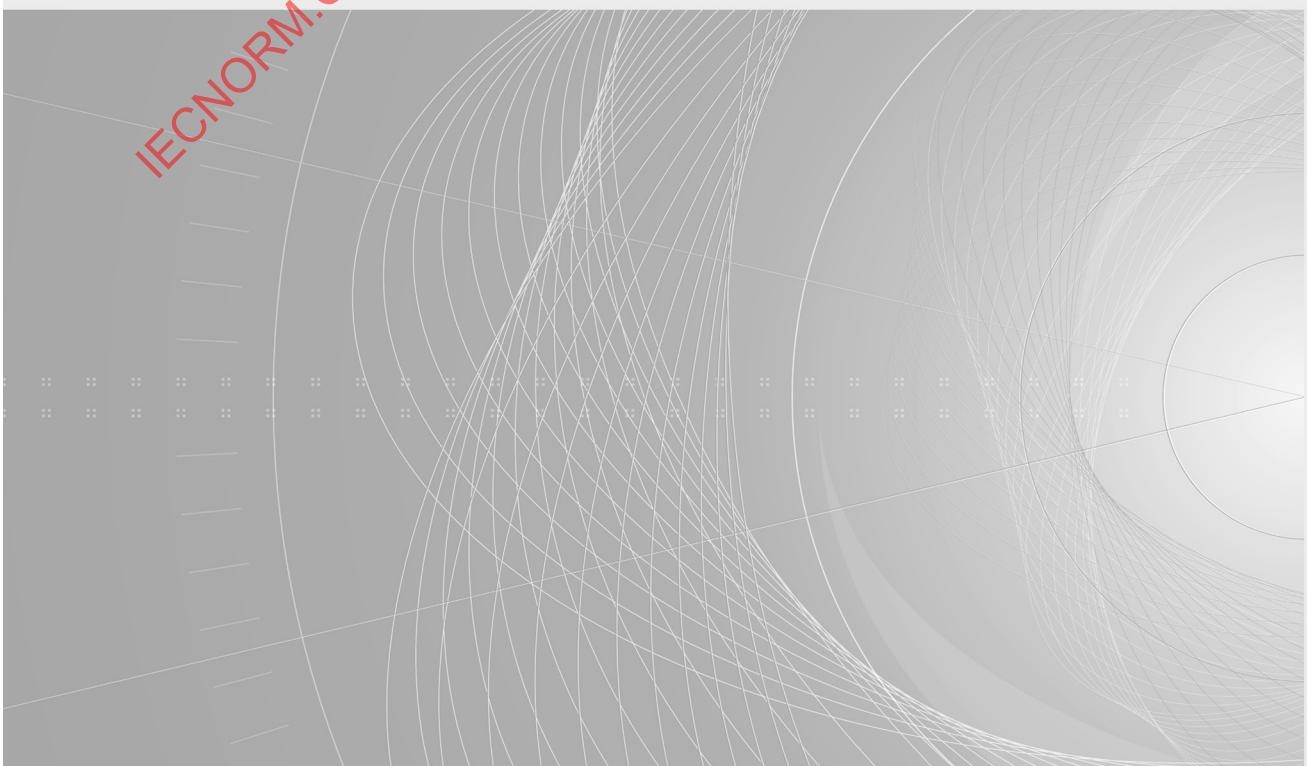
IEC 61076-8-111

Edition 1.0 2025-02

INTERNATIONAL STANDARD

Connectors for electrical and electronic equipment – Product requirements – Part 8-111: Power connectors – Detail specification for 3-pole snap locking rectangular connectors with IP65/IP67 plastic housing for rated current of 20 A



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IEC 61076-8-111 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
48B/3114/FDIS	48B/3132/RVD

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

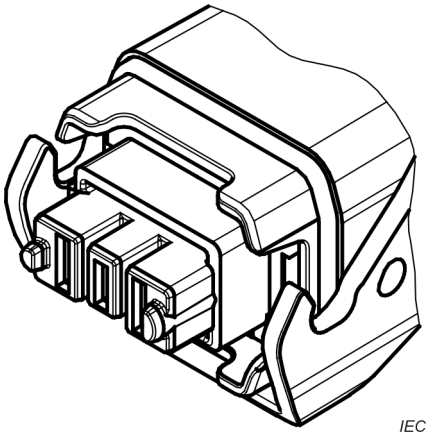
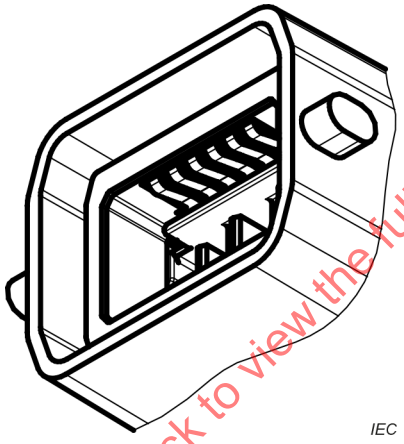
The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61076 series, published under the general title *Connectors for electrical and electronic equipment*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

The International Electrotechnical Commission **IEC SC 48B—Electrical connectors**		**IEC 61076-8-111 Ed. 1**
Detail specification in accordance with IEC 61076-1		
Free connector	 3-pole 20 A free connector	Free rectangular connector; For rated current of 20 A; 3-pole; Female contacts for power; Straight insertion and withdrawal.
Fixed connector	 3-pole 20 A fixed connector	Fixed rectangular connector; For rated current of 20 A; 3-pole; Male contacts for power; Straight insertion and withdrawal.

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 8-111: Power connectors – Detail specification for 3-pole snap locking rectangular connectors with IP65/IP67 plastic housing for rated current of 20 A

1 Scope

This part of the IEC 61076 series describes 3-pole snap locking rectangular power connectors with IP65/IP67 plastic housing, for rated current of 20 A. It includes overall dimensions, interface dimensions, technical characteristics, performance requirements, and test methods.

The products covered by this detail specification are connectors with breaking capacity (CBC) according to IEC 61984 which are mainly used in AC power conduction, in the field of electrical and electronic equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

IEC 60228, *Conductors of insulated cables*

IEC 60352, *Solderless connections (all parts)*

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 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: Insulation resistance*

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

IEC 60512-5-1, *Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-carrying capacity tests – Test 5a: Temperature rise*

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

IEC 60512-6-3, *Connectors for electronic equipment – Tests and measurements – Part 6-3: Dynamic stress tests – Test 6c: Shock*

IEC 60512-6-4, *Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic stress tests – Test 6d: Vibration (sinusoidal)*

IEC 60512-7-2, *Connectors for electronic equipment – Tests and measurements – Part 7-2: Impact tests (free components) – Test 7b: Mechanical strength impact*

IEC 60512-9-1, *Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance tests – Test 9a: Mechanical operation*

IEC 60512-9-2, *Connectors for electronic equipment – Tests and measurements – Part 9-2: Endurance tests – Test 9b: Electrical load and temperature*

IEC 60512-11-3, *Connectors for electronic equipment – Tests and measurements – Part 11-3: Climatic tests – Test 11c: Damp heat, steady state*

IEC 60512-11-4, *Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic tests – Test 11d: Rapid change of temperature*

IEC 60512-11-6, *Connectors for electronic equipment – Tests and measurements – Part 11-6: Climatic tests – Test 11f: Corrosion, salt mist*

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 60512-13-1, *Connectors for electronic equipment – Tests and measurements – Part 13-1: Mechanical operation tests –Test 13a: Engaging and separating forces*

IEC 60512-15-1, *Connectors for electronic equipment – Tests and measurements – Part 15-1: Connector tests (mechanical) – Test 15a: Contact retention in insert*

IEC 60512-15-6, *Connectors for electronic equipment – Tests and measurements – Part 15-6: Connector tests (mechanical) – Test 15f: Effectiveness of connector coupling devices*

IEC 60512-16-5, *Connectors for electronic equipment – Tests and measurements – Part 16-5: Mechanical tests on contacts and terminations – Test 16e: Gauge retention force (resilient contacts)*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

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

IEC 60999-1:1999, *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 61076-1:2006, *Connectors for electronic equipment – Product requirements – Part 1: Generic specification*
IEC 61076-1:2006/AMD1:2019

IEC 61984:2008, *Connectors – Safety requirements and tests*

IEC 62430, *Environmentally conscious design (ECD) – Principles, requirements and guidance*

IEC GUIDE 109:2012, *Environmental aspects – Inclusion in electrotechnical product standards*

ISO 6508-1, *Metallic materials – Rockwell hardness test – Part 1: Test method*

ISO 21920-1, *Geometrical product specifications (GPS) – Surface texture: Profile – Part 1: Indication of surface texture*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

4 Technical information

4.1 Recommended method of termination

4.1.1 General

According to IEC 60999-1 or the IEC 60352 series.

4.1.2 Number of contacts and contact cavities

Number of contacts: 3 poles.

Rated connecting capacity: 4 mm^2.

4.2 Ratings and characteristics

Rated voltage: 250 V AC.

Rated impulse voltage: 4 kV.

Pollution degree: 2.

Rated current: 20 A.

Insulation resistance: 1 000 MΩ min.

4.3 Systems of levels

4.3.1 Performance levels

Performance level for this connector is 1.

4.3.2 Compatibility levels

Products specified by this document are supposed to be intermateable according to 2.2.3.3 of IEC 61076-1:2006.

4.4 Classification into climatic categories

Conditions: according to IEC 60068-1 and Table 1.

Table 1 – Climatic category

Climatic category	Lower temperature °C	Upper temperature °C	Damp heat, steady state d
40/110/10	-40	+110	10

4.5 Clearance and creepage distance

Clearance and creepage distances shall be dimensioned in accordance with the assigned ratings following the rules provided by IEC 60664-1, with the following additional requirements.

For these connectors clearance and creepage distances shall be measured only in unmated condition, being connectors with breaking capacity (CBC) as defined in IEC 61984.

Contacts: clearance 3 mm min., creepage distance 6,3 mm min.

NOTE For robust design of its CBC feature, creepage distance is over-specified compared to the requirement of IEC 60664-1 based on the assigned 250 V rated voltage and pollution degree 2.

4.6 Current-carrying capacity

The current-carrying capacity shall be measured according to IEC 60512-5-2, test 5b and stated by the manufacturer.

The current-temperature derating diagram shall be equal to or better than that described by Formula (1) (test on power contacts only, conductors' cross-sectional area per 4.1.2):

$$I(t) = 35{,}45 \times \left(1 - \frac{t}{110}\right)^{0{,}5} \quad (1)$$

NOTE Formula (1) provides a current-temperature derating diagram compatible with the electrical load and temperature test of 6.2.6 and with the 20 A rated current.

4.7 Marking

The marking of the connector and the package shall be in accordance with 2.7 of IEC 61076-1:2006.

4.8 Safety aspects

For safety aspects IEC 61984 shall be considered.

5 Dimensional information

5.1 General

Dimensions are given in millimetres. Drawings are shown in the third 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.

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

5.2 Isometric view and common features

5.2.1 Isometric view of free connector (Figure 1)

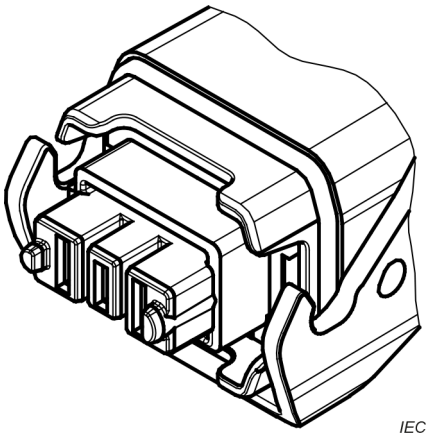
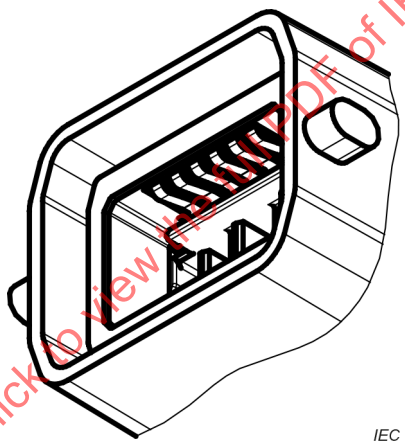


Figure 1 – Free female connector

5.2.2 Isometric view of fixed connector (Figure 2)



NOTE The finger contacts depicted in the figure are neither specified by this document, nor required for compliance to this document.

Figure 2 – Fixed male connector

5.3 Engagement (mating) information

Not applicable.

5.4 Fixed connectors

5.4.1 Dimensions (Figure 3 and Table 2)

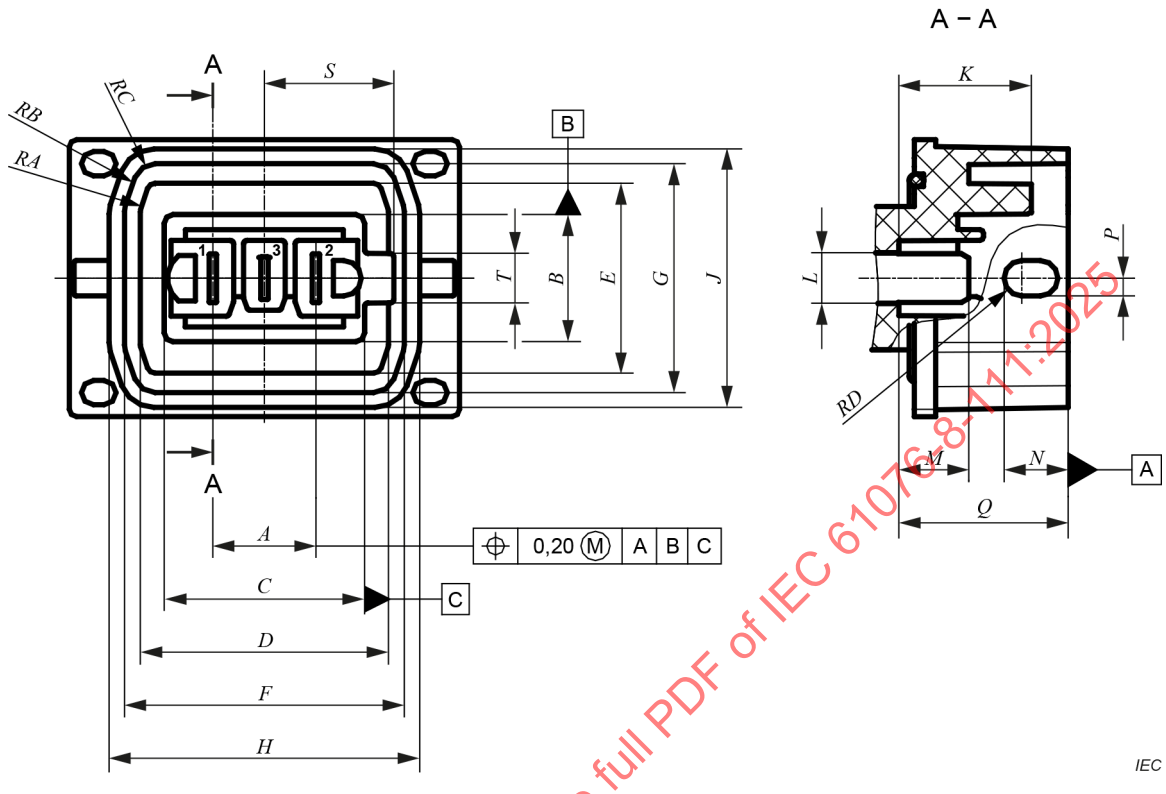


Figure 3 – Fixed male connector

Table 2 – Fixed connector dimensions

Dimensions in mm

Letter	Min.	Nominal	Max.
A	13,90	14,00	14,10
B	17,10	17,20	17,30
C	27,00	27,20	27,40
D	33,25	33,50	33,75
E	25,25	25,50	25,75
F	37,75	38,00	38,25
G	30,75	31,00	31,25
H	42,10	42,50	42,90
J	35,00	35,50	36,00
K	17,50	18,00	18,50
L	6,10	6,30	6,50
M	7,50	7,75	8,00
N	8,40	8,50	8,60
P	2,30	2,40	2,50
Q	23,00	23,25	23,50
S	17,50	18,00	18,50
T	6,00	6,75	7,50
RA	R34,00	R34,50	R35,00
RB	R35,00	R35,50	R36,00
RC	R2,50	R3,00	R3,50
RD	R2,50	R2,75	R3,00

5.4.2 Terminations

Terminations shall comply with IEC 60999-1 (screw-type or screwless type) or the IEC 60352 series (solderless).

5.5 Free connectors

5.5.1 Dimensions (Figure 4 and Table 3)

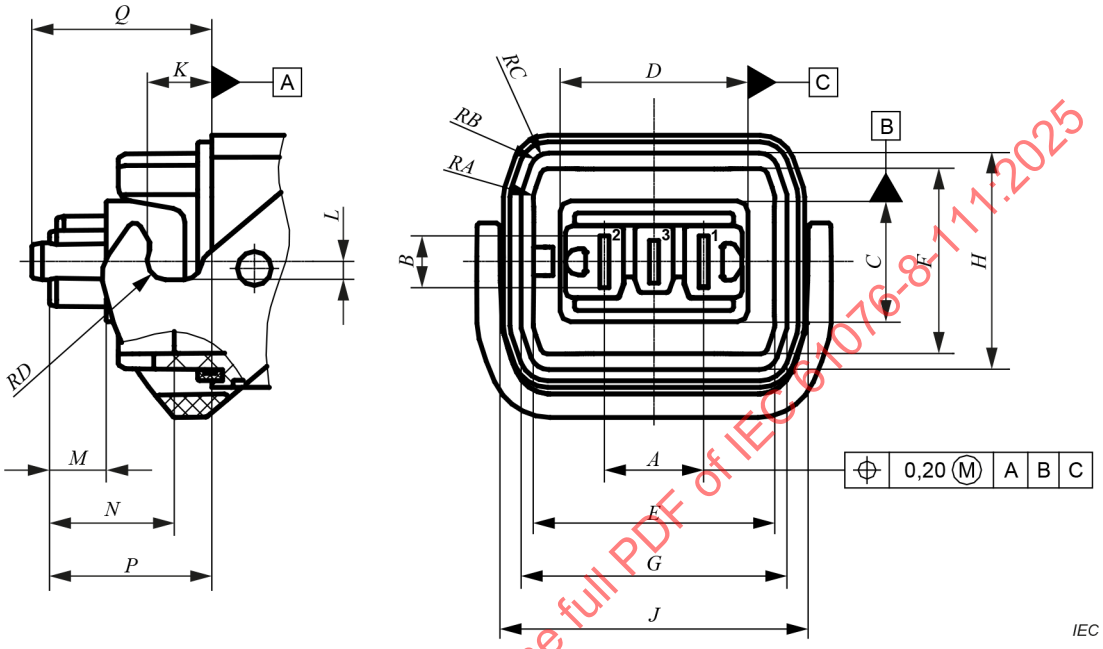


Figure 4 – Free female connector

Table 3 – Free connector dimensions

Dimensions in mm

Letter	Minimum	Nominal	Maximum
A	13,90	14,00	14,10
B	7,10	7,30	7,50
C	16,90	17,00	17,10
D	26,30	26,50	26,70
E	33,80	34,00	34,20
F	25,80	26,00	26,20
G	37,20	37,40	37,60
H	30,30	30,50	30,70
J	43,20	43,50	43,80
K	8,90	9,10	9,30
L	2,60	2,80	3,00
M	8,00	8,25	8,50
N	17,35	17,50	17,65
P	22,30	22,55	22,80
Q	24,40	25,00	25,60
RA	R33,00	R33,50	R34,00
RB	R36,00	R36,50	R37,00
RC	R2,00	R2,50	R3,00
RD	R2,00	R2,25	R2,50

5.5.2 Terminations

Terminations shall comply with IEC 60999-1 (screw-type or screwless-type) or the IEC 60352 series (solderless).

5.6 Accessories

Not applicable.

5.7 Mounting information

Mounting information could be specified upon agreement between manufacturer and customer.

5.8 Gauges

5.8.1 Sizing gauges and retention force gauges (Figure 5 and Table 4)

Material: tool steel, with hardness of HRC: 60 to 64 according to ISO 6508-1 and surface roughness of 0,8 µm according to ISO 21920-1.

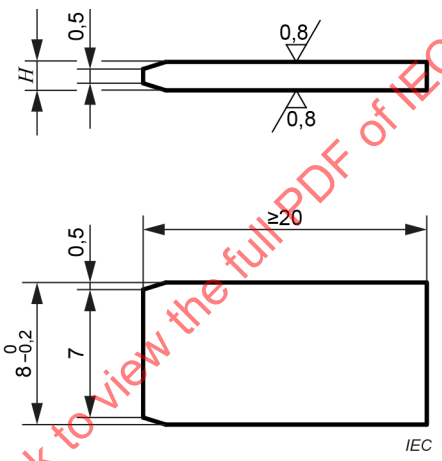


Figure 5 – Gauge for contacts

Table 4 – Gauge dimensions

Gauge	Mass G	Application	*H* mm
P1	-	Sizing	$1{,}05_{0}^{+0{,}005}$
P2	153	Retention force	$0{,}95_{-0{,}005}^{0}$

6 Technical characteristics

6.1 Classification into climatic categories

See 4.4

6.2 Electrical characteristics

6.2.1 Clearance and creepage distance

See 4.5.

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

6.2.2 Voltage proof

Conditions: IEC 60512-4-1, method A.

Standard atmospheric conditions, the connectors are mated. Test voltage shall be 2 210 V AC.

Requirements: There shall be no breakdown or flashover.

6.2.3 Contact resistance

6.2.3.1 Initial contact resistance

Conditions: IEC 60512-2-1.

Standard atmospheric conditions.

Requirements: 0,5 mΩ max.

6.2.3.2 Contact resistance after test

Conditions: IEC 60512-2-1.

Standard atmospheric conditions.

Requirements: 0,8 mΩ max.

6.2.4 Insulation resistance

6.2.4.1 Initial insulation resistance

Conditions: IEC 60512-3-1, method A.

Standard atmospheric conditions, the connectors are mated.

Test voltage: 500 V DC ± 50 V DC.

Requirements: Adjacent contacts: 1 000 MΩ min.

6.2.4.2 Insulation resistance after test

Conditions: IEC 60512-3-1, method A.

Standard atmospheric conditions, the connectors are mated.

Test voltage: 500 V DC ± 50 V DC.

Requirements: Adjacent contacts: 100 MΩ min.

6.2.5 Temperature rise

Conditions: IEC 60512-5-1.

Standard atmospheric conditions, mated connectors, contacts are connected with IEC 60228 class 5 stranded copper wires, conductor cross-sectional area in accordance with 4.1.2.

Test current: 20 A.

Requirements: value of temperature rise: 30 K max., appearance of the connectors shall meet the requirements of test phase P1.

6.2.6 Electrical load and temperature

Conditions: IEC 60512-9-2.

Standard atmospheric conditions, mated connectors, contacts are connected with IEC 60228 class 5 stranded copper wires, conductor cross-sectional area in accordance with 4.1.2

Test current: 20 A, temperature: 75 °C ± 5 °C, duration: 500 h.

Requirements: The appearance, contact resistance (6.2.3.2), insulation resistance (6.2.4.2), voltage proof (6.2.2), Engaging and separating force (6.3.5) shall meet the requirements of this specification after test.

6.3 Mechanical characteristics

6.3.1 Mechanical strength impact

Conditions: IEC 60512-7-2.

Standard atmospheric conditions, connector is fixed with test fixture, height: 100 0 mm ± 10 mm. Operating cycles: 3 times of the mating connector in each direction, 12 times.

Requirements: There is no damage to the connector that affects product functionality after test.

6.3.2 Mechanical operation

Conditions: IEC 60512-9-1.

Standard atmospheric conditions, mated connectors.

Rate of insertion and withdrawal: 10 mm/s max.

Operating cycles: 500 cycles.

Requirements: The appearance, contact resistance (6.2.3.2), insulation resistance (6.2.4.2) and voltage proof (6.2.2) shall meet the requirements of this specification after test.

6.3.3 Breaking capacity (engaging and separating with electrical load)

Conditions: IEC 61984:2008, 7.3.5.

Standard atmospheric conditions, mated connectors, contacts are connected with IEC 60228 class 5 stranded copper wires, wire cross-sectional area in accordance with 4.1.

Test current: 20 A, Test voltage: 250 V AC.

Speed of insertion and withdrawal: (0,8 ± 0,1) m/s.

Operating cycles: 200 cycles, inductive load with cos φ = (0,9 ± 0,05).

The specimen is inserted into and withdrawn from its counterpart at a rate of 3 to 4 cycles/min. Electrical contact shall be maintained for no more than 4 s and no less than 2 s.

Requirements: During the test, no sustained arcing shall occur. After the test, the appearance, contact resistance (6.2.3.2), insulation resistance (6.2.4.2), voltage proof (6.2.2), engaging and separating force (6.3.5) shall meet the requirements of this specification.

6.3.4 Effectiveness of connector coupling devices

Conditions: IEC 60512-15-6.

Standard atmospheric conditions, mated connectors, contacts are connected with IEC 60228 class 5 stranded copper wires, wire cross-sectional area in accordance with 4.1.

The force applied through the main body of the connector housing. Axial force: 150 N, rate of application: 25 mm/min max.

Requirements: 1 µs max. of duration of disturbance during the test. The connectors shall remain fully engaged; after test, the appearance shall meet the requirements of test phase P1, the locking mechanism of the connector shall not be unlocked or broken.

6.3.5 Engaging and separating force

Condition: IEC 60512-13-1.

Standard atmospheric conditions.

Rate of engagement and separation: 50 mm/min max.

Requirements: engaging force: 85 N max., separating force: 5 N min.

6.3.6 Contact retention in insert

Conditions: IEC 60512-15-1.

Standard atmospheric conditions, unmated connectors.

Axial force: 100 N.

Requirements: contact displacement shall be less than 0,5 mm when applying axial forces and be less than 0,3 mm after forces are removed. Contacts and insulation housings should not have any mechanical damage.

6.3.7 Gauge retention force (resilient contact)

Condition: IEC 60512-16-5, method A.

Standard atmospheric conditions.

Requirements: The gauges in accordance with 5.8.1 shall be retained.

6.3.8 Conductor secureness

Conditions: IEC 60999-1, test 9.4 and test 9.5.

Standard atmospheric conditions, class 5 stranded copper wires per IEC 60228.

See Table 5 for the section area, mass, pulling force and height (H).

Table 5 – Conductor secureness test

Conductor cross-sectional area mm^2	Pulling force N	Height (H ± 15 mm) mm	Mass kg
4	60	280	0,9

After test, apply the pulling force in Table 5 to the wire for 1 min without sudden application. The wire should be neither pulled out of terminals nor broken near the clamping area after test.

6.4 Dynamic stress test

6.4.1 Vibration (sine)

Conditions: IEC 60512-6-4.

Standard atmospheric conditions, mated connectors, according to Table 6.

Table 6 – Vibration

NO.	Frequency range Hz	Amplitude mm	Acceleration m/s^2	Sweep rate oct/min	Duration h
1	10 to 55	1,5	—	1	8 × 3 axes = 24
2	55 to 500	—	147		

Requirements: 1 µs max. of duration of disturbance during the test. The appearance, contact resistance (6.2.3.2), and shall meet the requirements of this specification after test.

6.4.2 Shock

Conditions: IEC 60512-6-3.

Standard atmospheric conditions.

Acceleration: 490 m/s^2, duration: 11 ms, half-sine wave, 3 shocks in each direction of 3 mutually perpendicular axes, total 18 shocks.

Requirements: 1 µs max. of duration of disturbance during the test. Appearance, contact resistance (6.2.3.2) shall meet the requirements of this specification after test.

6.4.3 IP degree of protection

Conditions: according to IEC 60529, mated connectors: IP65/IP67.

6.5 Climatic test

6.5.1 Damp heat, steady state

Conditions: IEC 60512-11-3.

Duration: 10 days, mated connectors.

Requirements: insulation resistance (6.2.4.2), voltage proof (6.2.2), contact resistance (6.2.3.2), engaging and separating force (6.3.5), appearance of the connectors shall meet the requirements of this specification after test.

6.5.2 Rapid change of temperature

Conditions: IEC 60512-11-4.

Conditions: temperature: −40 °C to 110 °C, mated connectors.

Requirements: the insulation resistance (6.2.4.2), contact resistance (6.2.3.2), voltage proof (6.2.2) and appearance of the connectors shall meet the requirements of this specification after test.

6.5.3 Corrosion, salt mist

Conditions: IEC 60512-11-6.

Duration: 48 h, mated connectors.

Requirements: the contact resistance (6.2.3.2) and appearance of the connectors shall meet the requirements of this specification after test.

6.5.4 Dry heat

Conditions: IEC 60512-11-9.

Temperature: 110 °C ± 2 °C, duration: 96 h, mated connectors.

Requirements: the appearance, contact resistance (6.2.3.2), Engaging and separating force (6.3.5), voltage proof (6.2.2) shall meet the requirements of this specification after test.

6.5.5 Cold

Conditions: IEC 60512-11-10.

Temperature: −40 °C ± 2 °C, duration: 96 h, mated connectors.

Requirements: the appearance, contact resistance (6.2.3.2), Engaging and separating force (6.3.5), voltage proof (6.2.2) shall meet the requirements of this specification after test.

6.6 Environmental aspects

6.6.1 Marking of insulation material (plastic)

If applicable and possible, all plastic material should be marked according to ISO 11469 for recycling.

6.6.2 Design/use of material

Concerning use of materials with regard to the environment, the design shall take into account the relevant IEC guides for designing products, such as IEC 62430 and IEC Guide 109.

7 Tests and test schedules

7.1 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, mated sets of connectors shall be tested. Ensure a particular combination of connectors is kept together during the complete test sequence; when unmating is, for example, necessary for a certain test, the same connectors shall be mated for the subsequent tests.

The necessary specimens are stated in Table 7.

Table 7 – Number of test specimens

Test group	AP	BP	CP	DP	EP	FP	GP	HP	JP	KP
Test specimens	3	3	3	3	3	Not applicable	3	Not applicable	See relevant test specification	3

7.2 Test schedules

7.2.1 Basic (minimum) test schedule

Not applicable.

7.2.2 Full test schedule

7.2.2.1 Test group P – Preliminary

All specimens shall be subject to the tests in Table 8.

Table 8 – Test group P

Test phase	Test			Measurement to be performed		Requirements
	Title	**IEC 60512** Part No. (Test No.)	**Severity or condition of test**	**Title**	**IEC 60512** Part No. (Test No.)	
P1	General examination		Unmated connectors	Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation
				Dimensions of dimensions and mass	1-2 (1b)	The dimensions shall comply with 5.4 and 5.5
P2				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.1 0,5 mΩ max.
P3			Method A. Test voltage: 500 V DC ± 50 V DC. Adjacent contacts	Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.1 1 000 MΩ min.
P4			Method A. connectors are mated, 2 210 V AC	Voltage proof	4-1 (4a)	Shall be as per 6.2.2 No breakdown or flashover

7.2.2.2 Test group AP – Dynamic climate

All specimens shall be subject to the tests in Table 9.

Table 9 – Test group AP

Test phase	Test			Measurement to be performed		Requirements
	Title	**IEC 60512** Part No. (Test No.)	**Severity or condition of test**	**Title**	**IEC 60512** Part No. (Test No.)	
AP1			Rate of engagement and separation: 50 mm/min max.	Engaging and separating force	13-1 (13a)	Shall be as per 6.3.5 Engaging force: 85 N max., separating force: 5 N min.
AP2	Rapid change of temperature	11-4 (11d)	-40 °C to 110 °C cycles: 5 Duration of exposure t_1: 10 min			
AP3				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.2 0,8 mΩ max.
AP4				Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.2 100 MΩ min.

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Part No. (Test No.)	Severity or condition of test	Title	IEC 60512 Part No. (Test No.)	
AP5				Voltage proof	4-1 (4a)	2 210 V AC Shall be as per 6.2.2 No breakdown or flashover.
AP6				Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation.
AP7	Climatic sequence	11-1 (11a)	Mated connectors			
AP7.1	Dry heat	11-9 (11i)	Temp.: 110 °C ± 2 °C	Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.2 100 MΩ min.
AP7.2	Damp heat, cyclic, first cycle	11-12 (11m)		Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation.
AP7.3	Cold	11-10 (11j)	Temp.: -40 °C ± 2 °C			
AP7.4	Damp heat, cyclic, remaining cycles	11-12 (11m)	Not applicable			
AP8				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.2 0,8 mΩ max.
AP9				Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.2 100 MΩ min.
AP10				Voltage proof	4-1 (4a)	2 210 V AC Shall be as per 6.2.2 No breakdown or flashover
AP11	IP degree of protection					IP65/IP67
AP11.1	Second characteristic numeral		IPX5	See 14.2.5 of IEC 60529:1989		See 14.3 of IEC 60529:1989
AP11.2	Second characteristic numeral		IPX7	See 14.2.7 of IEC 60529:1989		See 14.3 of IEC 60529:1989
AP11.3[a]	First characteristic numeral		IP6X	See Table 7 of IEC 60529:1989		See 13.6.2 of IEC 60529:1989

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Part No. (Test No.)	Severity or condition of test	Title	IEC 60512 Part No. (Test No.)	
AP12			Rate of engagement and separation: 50 mm/min max.	Engaging and separating force	13-1 (13a)	Shall be as per 6.3.5 Requirements: Engaging force: 85 N max, withdrawal force: 5 N min.
AP13	Effectiveness of connector coupling devices	15-6 (15f)	Speed: 25 mm/min max. force to be applied: 150 N	Contact disturbance	2-5 (2e)	Shall be as per 6.3.4 Duration of disturbance: 1 µs max.
AP14				Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation
[a] It is allowed to perform AP11.3 with an additional specimen, extending the total number of specimens by 1.						

7.2.2.3 Test group BP – Mechanical endurance

All specimens shall be subject to the tests in Table 10.

Table 10 – Test group BP

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Part No. (Test No.)	Severity or condition of test	Title	IEC 60512 Part No. (Test No.)	
BP1				Gauge retention force	16-5 (16e)	Shall be as per 6.3.7
BP2			Rate of engagement and separation: 50 mm/min max.	Engaging and separating force	13-1 (13a)	Shall be as per 6.3.5 Requirements: Engaging force: 85 N max, withdrawal force: 5 N min.
BP3	Mechanical operation	9-1 (9a)	Speed: 10 mm/s max. number of cycles: 250			
BP4	Corrosion, salt mist	11-6 (11f)	Mated connectors, duration: 48 h			
BP5				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.2 0,8 mΩ max.
BP6				Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Part No. (Test No.)	Severity or condition of test	Title	IEC 60512 Part No. (Test No.)	
BP7	Mechanical operation	9-1 (9a)	Speed: 10 mm/s max. number of cycles: 250			Shall be as per 6.3.2
BP8				Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation
BP9				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.2 0,8 mΩ max.
BP10				Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.2 100 MΩ min.
BP11				Voltage proof	4-1 (4a)	2 210 V AC Shall be as per 6.2.2 No breakdown or flashover
BP12	IP degree of protection					IP65/IP67
BP12.1	Second characteristic numeral		IPX5	See 14.2.5 of IEC 60529:1989		See 14.3 of IEC 60529:1989
BP12.2	Second characteristic numeral		IPX7	See 14.2.7 of IEC 60529:1989		See 14.3 of IEC 60529:1989
BP12.3[a]	First characteristic numeral		IP6X	See Table 7 of IEC 60529:1989		See 13.6.2 of IEC 60529:1989

[a] It is allowed to perform BP12.3 with an additional specimen, extending the total number of specimens by 1.

7.2.2.4 Test group CP – Moisture

All specimens shall be subject to the tests in Table 11.

Table 11 – Test group CP

Test phase	Test			Measurement to be performed		Requirements
	Title	IEC 60512 Part No. (Test No.)	Severity or condition of test	Title	IEC 60512 Part No. (Test No.)	
CP1			Rate of engagement and separation: 50 mm/min max.	Engaging and separating force	13-1 (13a)	Shall be as per 6.3.5 Requirements: Engaging force: 85 N max, withdrawal force: 5 N min.
CP2	Damp heat, steady state	11-3 (11c)	Mated connectors Duration: 10 days			
CP3				Contact resistance	2-1 (2a)	Shall be as per 6.2.3.2 0,8 mΩ max.
CP4				Insulation resistance	3-1 (3a)	Shall be as per 6.2.4.2 100 MΩ min.
CP5				Voltage proof	4-1 (4a)	2 210 V AC Shall be as per 6.2.2 No breakdown or flashover.
CP6			Rate of engagement and separation: 50 mm/min max.	Engaging and separating force	13-1 (13a)	Shall be as per 6.3.5 Requirements: Engaging force: 85 N max, withdrawal force: 5 N min.
CP7				Visual examination	1-1 (1a)	There shall be no defect that would impair normal operation

7.2.2.5 Test group DP – Heat and electrical load

All specimens shall be subject to the tests in Table 12.