Product Service

TEST REPORT

IEC 62852(ed.1)

TÜV SÜD Test report for connectors for photovoltaic systems- Safety requirements and tests

Report reference No. ..... :	70.407.18.302.01-00
Date of issue ..... :	2018.11.29
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Testing laboratory ..... :	Changzhou HuaYang Inspection and Testing Technology Co., Ltd.
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Testing location..... :	as above
Client ..... :	ZHEJIANG TWINSEL ELECTRONIC TECHNOLOGY CO., LTD.
Client number..... :	83073
Address ..... :	Tashan Industry Zone, Meilin Street, Ninghai County 315609 Ningbo, Zhejiang PEOPLE'S REPUBLIC OF CHINA
Standard..... :	This TÜV SÜD test report form is based on the following requirements: IEC 62852(ed.1)
TRF originated by. ..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Copyright blank test report ..... :	This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TÜV SÜD Product Service GmbH. TUV SUD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.
Scheme ..... :	☐ GS, ☐ TÜV Mark, ☐ EU-Directive, ☒ without certification
Non-standard test method..... :	☒ No ☐ Yes, see details under Summary
National deviations ..... :	
Number of pages (Report)..... :	25 pages
Number of pages (Attachments) ..... :	• Photo document 2 pages • Data form for electrical equipment and machinery N/A

Compiled by ..... : Li JinYu
(+ signature)

Approved by.....: Liu XingXing
(+ signature)

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Test sample……..…:	Connector
Type of test object.....:	N/A
Trademark.....:	TWINSEL Electronic Technology
Model and/or type reference .....:	PV-SY02
Rating(s).....:	Rated Voltage: 1500V DC Rated Power: 30A Protection Against Moisture: IP67
Manufacturer.....:	ZHEJIANG TWINSEL ELECTRONIC TECHNOLOGY CO., LTD.
Manufacturer number….....:	83073
Address .....:	Tashan Industry Zone, Meilin Street, Ninghai County 315609 Ningbo, Zhejiang PEOPLE'S REPUBLIC OF CHINA

Order description….....:

☒	Complete test according to TRF
☐	Partial test according to manufacturer's specifications
☐	Preliminary test
☐	Spot check
☐	Transfer the test report of other CB

Date of order…… .....:	2018-09-30
Date of receipt of test item.....:	2018-10-09
Date(s) of performance of test.....:	2018-10-09~2018-11-26

Test item particulars:

Attachments:

General remarks:

"(see remark #)" refers to a remark appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report a comma is used as the decimal separator.
The test results presented in this report relate only to the object tested.
This report shall not be reproduced except in full without the written approval of the testing laboratory.

Summary of testing:

two types of connector，type1：MC4-EVO2 ,Type2：PV-SY02， plug MC4-EVO2 “+” into PV-SY02 “-” （mode1）and plug PV-SY02 “+” into MC4-EVO2 “-” （mode2），according to client’s requirement，test item A5,A10,B1,B2,B3,D1,D2, D3,D4,E1,E2, E3,E4,E5,E6,F1,F2 of IEC 62852(ed.1) had been done with positive result.

Additional information on Non-standard test method(s)

Sub cl..... :

Page..... :

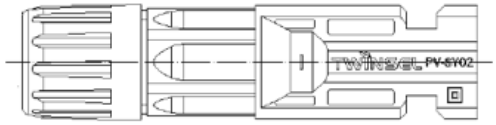
Rational..... :

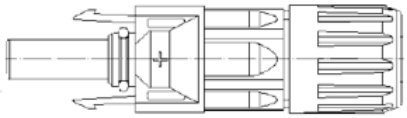
☐ deviation(s) found

☒ no deviations found

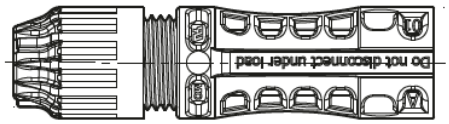
Copy of marking plate:

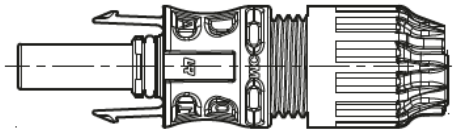
PV-SY02





MC4-EVO2





Picture of the product

MC4-EVO2“+”& PV-SY02“-”（mode1）

PV-SY02“+”& MC4-EVO2“-”（mode2）

Characteristic data
(not shown on the marking plate)

Characteristic data Factory
(only if certification is provided)

Purpose of the product

(Description of intended use)

Possible test case verdicts:

- test case does not apply to the test object..... : N/A / not applicable / not included in the order
- test object does meet the requirement ..... : P / Pass
- test object does not meet the requirement ..... : F / Fail

Possible suffixes to the verdicts:

- suffix for detailed information for the - C / Comment
- suffix for important information for factory - M / Manufacturing

TABLE 0	Characteristic features of the Connector		
	Example .....:	X	Please mark relevant line with "X"
	Kind of equipment	X	Connector
	Existence of an enclosure		Unenclosed connector
		X	Enclosed connector
	Type of the connector		Built-in connector
			Integrated connector
		X	Free connector
	Additional characteristics		Connector with protective earthing contact
		X	Connector without protective earthing contact
		X	Connector with cable clamp
			Connector without cable clamp
			Connectors (without breaking capacity) with protection against electric for hand back safety, when mated
		X	Connectors (without breaking capacity) with protection against electric for finger safety, when mated
			CBC with protection against electric shock for finger safety, both in mated and unmated condition
		X	Degree of protection of a connector
			Connector with interlock
		X	Connector without interlock
		X	Non-rewireable connector
			Rewireable connector
	Pollution degree		1
		X	2
			3
			4
	Over voltage category		I
			II
		X	III
			IV
	Operating cycles		10

			50
		X	100
			500
			1000
			2000
			5000
			According manufacturer's
	Bendings		10
			50
		X	100
			500
			1000
			2000
			5000
			20000
			According manufacturer's
	Upper limiting temperature (ULT)		70°C
			85°C
		X	100°C
			125°C
			90°C
			According manufacturer's
	Lower limiting temperature (LLT)		-10°C
			-25°C
		X	-40°C
			-55°C
			0°C
			According manufacturer's
	Type of conductor		Solid
		X	Flexible
	Termination and connection	X	Crimped connection according to EN 60352-2
			Insulation displacement connection (accessible) according to EN 60352-2

			Insulation displacement connection (non-accessible) according to EN 60352-4	
			Press in connection according to EN 60352-5	
			Insulation piercing connection according to EN 60352-6 or EN 60998-2-3	
			Screwless-type clamping units according to EN 60999-1 or EN 60999-2	
			Screw-type clamping units according to EN 60999-1 or EN 60999-2	
			Flat, quick-connect terminations according to EN 60760 and EN 61210	
			According manufacturer's	
	Values for cable clamp		Cable diameter	
			[≤ 4mm]	
		X	[4–9 mm]	
			[9-12mm]	
			[12-20 mm]	
			[20-32 mm]	
			[33-42 mm]	
			[≥ 42 mm]	
	Application Class	Class A		
	RTI housing material	PV-SY02:115 MC4EVO2:130		
	Flammability class	V-0		
	Rated torque for cable gland	N/A		
	Wire cross section area or cross section range	4mm^2		
	Rated voltage(s)	1500VDC		
	Rated current .....:	30A		
	Rated impulse voltage(s) .....:	16000V		
	Rated insulation voltage(s) .....:	8000V		
	Number of poles .....:	1		
	Protection degree (IP-Code) .....:	PV-SY02:IP67 MC4EVO2:IP68(1m，1h)		
	Mounting .....:	Free connector		

	Wire cross section area or cross section range .....:	4mm^2
	Cable applied	4~6mm

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Clause	Requirement – Test	Measuring result – Remark	Verdict
A	**MECANICAL TEST GROUP A (TABLE 6)**		—
A1	VISUAL EXAMINATION: EN 60512 / Test [1a]		—
5.2	Marking and identification		—
5.2.1	Identification		P
	a) Manufacturer's name, trademark or mark of origin……..:	TWINSEL Electronic Technology MC	P
	b) Type reference……..:	PV-SY02,MC4EVO2	P
	c) Rated current (A) ..... :	PV-SY02:30A MC4EVO2:45A	P
	d) Rated voltage (V)..... :	15000VDC	P
	e) Rated impulse voltage (kV) ..... :	16000V	P
	f) Pollution degree ..... :	2	P
	g) Protection degree (IPXX)..... :	PV-SY02:IP67 MC4EVO2:IP68(1m，1h)	P
	h) Range of temperature (ULT and LLT, maximum ambient temperature in °C)..... :	ULT:-40°C LLT:+85°C Maximum ambient temperature:100	P
	i) Type of terminals ..... :	Crimped connection	P
	j) Connectable conductors ..... :	Flexible	P
	k) Reference to this standard	IEC 62852(ed.1) EN 62852:2015	P
	l) Symbol "do not connect or disconnect under load" (Alternatively this warning notice can also be in national language)	The symbol is moulded on the product.	P
	m) Polarity of connectors	"+", "-"	P
5.2.2	Marking indelible and easily legible:		P
	- The minimum marking on the connector shall be a) ; l) ; m)	a), b), l) and m) are moulded on the surface of final product, the others are in technical document.	P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	- Marking a) trademark and b) type identification shall be found on the smallest unit of packaging	Complied	P
	Symbol or warning notice listed in I) of 5.2.1 must be imprinted or labelled close to connector.	Complied	P
	Markings a) and b) of 5.2.1 shall be applied on the smallest package unit.	Complied	P
	All other markings of 5.2.1 shall be given in the technical documentation or catalogue of the manufacturer.		P
5.7	General design		----
5.7.1	Fixing means shall not be used to fix live parts		P
5.7.2	Connectors shall be so designed that connection of conductors of the type and cross- sectional areas as specified by the manufacturer shall be possible.	H1Z2Z2-K ,1*4mm^2, -40℃~+90℃ manufactured by ZHEJIANG TWINSEL ELECTRONIC TECHNOLOGY CO., LTD.	P
	No damage of the insulation is possible, e.g. by avoiding of sharp edges.	No sharp edges	P
5.7.3	Non-rewirable connectors shall be so designed that:		P
	-the flexible cable can not be separated from the connector without marking it permanently useless	Complied	P
	-the connector cannot be opened by hand or by using a general purpose tool, for example a screwdriver, as intended	Complied	P
	- means are provided to prevent live parts, e.g. free strands of a conductor, from reducing the minimum insulation distance between such live parts and all accessible external surface of the connector, with the exception of the engagement face of the male connector.	Complied	P
	-the conductor be verified with rated values of the connectors and for the use in photovoltaic systems	Complied	P
	If this cannot be granted by the design or manufacturing process itself, the in-process test schedule according to 6.4 or another test of the same safety level shall be carried out.		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	Cables connected to the connector shall be suitable for use in photovoltaic systems. The values of the rated current and the rated voltage shall have at least the rated values of the connector. Cables shall be flexible and the conductor shall be at least class 5 according to IEC 60228.		P
5.8	Design of a free connector		
	In a free connector the wires shall be protected against shear and tensile stress at the termination and be secured to prevent twisting		P
	This requirement does not apply to:		
	a) Free connectors for termination to cables in fixed mountings		N/A
	b) Free connectors in which the termination is protected against pull and twisting mounting provisions in the end-use product.		N/A
	DIMENSIONAL EXAMINATION: EN 60512		
5.18	Clearances and creepage distances according to EN 60664-1	See Table 5.18	N/A
	Connector dimensions shall comply with the DS or manufacturer`s specification		N/A
A2	DURABILITY OF MARKING		
6.3.2	The test liquid shall be water Test piston size 1; force or 5N; 10 cycles. After the test, the marking shall be still readable.		N/A
	This test shall be also carried out on an additional label with specified warning indication listed under l) from 5.2.1		N/A
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	Visible with the naked eye		N/A
A3	POLARISATION: EN 60512 / Test [13e]		
	Test force: 20N or 1,5 times the insertion force, whichever is higher		N/A
5.3	Multipole connectors shall be so polarised that improper connection of mating parts is prevented:		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	No damage likely to impair function:		N/A
A4	TERMINATIONS		
5.5	Terminations and connection methods		
	Connection method		
	a) Crimped connections according to EN 60352-2:		
	- visual tests on the crimp barrel as specified in EN 60352-2		N/A
	- tensile strength test of the crimp connection as specified in EN 60352-2.		N/A
	- If deviations to EN 60352-2 exist, the tensile strength according to EN 60352-2		N/A
	- and the dimensions according to the manu-factures specification are tested to fulfil EN 61984.		N/A
	b) Insulation displacement connections according to EN 60352-3 (accessible IDC):		
	- Visual examination is carried out on new parts for insulation displacement terminals according to EN 60352-3 clause 12.1		N/A
	- and for solderless non-accessible displace-ment terminals according to EN 60352-4, clause 12.2.4		N/A
	- Electrical tests are carried out according to EN 61984.		N/A
	- Thermal tests are carried out according to EN 61984.		N/A
	c) Insulation displacement connections according to EN 60352-4 (non-accessible IDC) :		
	- Visual examination is carried out on new parts for insulation displacement terminals according to EN 60352-3 clause 12.1		N/A
	- and for solderless non-accessible displace-ment terminals according to EN 60352-4, clause 12.2.4		N/A
	- Electrical tests are carried out according to EN 61984.		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	- Thermal tests are carried out according to EN 61984.		N/A
	d) Press-in connections according to EN 60352-5:		
	- visual test as specified in EN 60352-5		N/A
	- dimensional tests on the press-in post as specified in EN 60352-5		N/A
	- test of the push-out force as specified in EN 60352-5		N/A
	e) Insulation piercing connections according to EN 60352-6 or EN 60998-2-3:		
	- Tests according to EN 60352-6 or EN 60998-2-3		N/A
	f) Screwless-type clamping units according to EN 60999-1 or EN 60999-2 or EN 60352-7		
	- mechanical tests on the conductor connection as specified in EN 60999-1 or EN 60999-2 or EN 60352-7.		N/A
	g) Screw-type clamping units according to EN 60999-1 or EN 60999-2:		
	- mechanical tests on the conductor connection as specified in EN 60999-1 or EN 60999-2.		N/A
	NOTE: For prepared conductors the manufacturers instructions for the preparation applies.		N/A
	h) Flat, quick-connect terminations according to EN 60760 and EN 61210		
	- Dimensional tests and safety tests as specified in EN 61210 as far as applicable.		N/A
	- The dimensional test is carried out according to EN 61210.		N/A
	- The compliance check of dimensions is the verification of the safety of the connection according to EN 61984.		N/A
	- The dimensions comply with the specification .		N/A
	- Flat, quick-connect terminations, which are definitely not designed according to EN 61210 can be used if the test program according to EN 61984 is met.		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	Electrical and thermal tests on terminations shall be carried out in conjunction with the test on the connector.		N/A
	Other terminations and connection method has to be tested in accordance with the relevant standards.		N/A
	Electrical connections shall be so designed that the contact pressure is not transmitted through insulating material other than ceramic, pure mica or other material with characteristics not less suitable.		N/A
	Unless there is sufficient resiliency in the metallic parts to compensate for any shrinkage or yielding of the insulating material (see 25.3 of EN 60309-1 or clause 7 of EN 60999-1 or EN 60999- 2).		N/A
	Range of connectable conductor(s) ..... :		N/A
A5	CONTACT RETENTION IN INSERT: EN 60512 / Test [15a]		
	Test load shall be three times the specified insertion force (mating) of one contact or the specified insertion force of one contact plus 50N, whichever is less.	Mode1 ： 87N Mode2 ： 87N	
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
5.15.2	Contacts safety retained		P
	No axial displacement likely to impair normal operation:		P
A 6.1	CABLE CLAMP (PULL): EN 60512 / Test [17c]		
5.14	The cord anchorage shall be suitable for the cable to be connected. The range of acceptable cable diameters shall be specified in the manufacturer's specification.	H1Z2Z2-K, 1*4mm^2	N/A
	Loose parts inserted to obtain clamping of the cable are permissible if they are fixed in the connector in the assembled state.		N/A
	The cord anchorage can be made of insulating material or metal. If it consists of metal, it shall meet one of the following requirements:		
	a) be provided with a covering of insulating material to prevent any accessible metal part becoming live in case of a fault		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	b) no contact shall be possible with the test finger according to EN 60529		N/A
	Compliance is checked by the execution of the test phase A6.1 of Table 6 with the values of Table 1		N/A
	VISUAL EXAMINATION: EN 60512/ Test [1a]		
	Covers mounted / contacts not connected		N/A
A6.2	CABLE CLAMP (TORSION): EN 60512 / Test [17d]		
5.14	Compliance is checked by the execution of the test phase A6.2 of Table 6 with the values of Table 1		N/A
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	Cover mounted		N/A
A7	MECANICAL STRENGTH IMPACT: EN 60512 / Test [7b] (ONLY FREE CONNECTORS)		
	Mass of specimen (g) ……:	<250g	
	Dropping height (mm) ..... :	750mm	
	Dropping cycles……:	8	
	positions in 45° steps, one cycle per position		
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	No damage likely to impair safety		N/A
	Internal insulations not damaged		N/A
	Parts against electric shock not damaged		N/A
	Clearances and creepage distances not Reduced		N/A
A8	Mechanical strength at low temperature		
6.3.10	Mated specimen		
	Stored at a temperature (ºC) ..... :	-40°C	
	Storing duration (h) ..... :	5h	
	Impact energy (J) ..... :	1J	
	Number of impacted positions ..... :	4	

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	VISUAL EXAMINATION [1a]: EN 60512		
5.15	MECANICAL STRENGTH		N/A
5.15.1	No visual damage, no cracks on insulations parts likely to impair safety		N/A
5.15.2	Contacts safety retained		N/A
5.15.3	Internal insulation shall not show damage likely to impair safety		N/A
	No damage shall occur which could impair normal use		N/A
A9	WITHSTAND A WITHDRAWAL FORCE: EN 60512 [13 b]		
5.16	Connectors without locking device or without snap-in device shall withstand a withdrawal force of at least 50 N. Compliance shall be tested according to clause 6.3.13		N/A
A10	CONNECTOR WITH LOCKING DEVICE: EN 60512 [15f]		
5.17	Connectors with locking device or with snap-in device shall withstand a load of at least 80N. Compliance shall be tested according to clause 6.3.14		
	VISUAL EXAMINATION EN 60512/ Test [1a]		
	No damage shall occur which could impair normal use		P
B	**SERVICE LIFE TEST GROUP B (TABLE 7)**		
B1	INITIAL MEASUREMENTS (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Reference value for subsequent measurement Contact resistance R_1 (mΩ)……..:	Mode1： 0.545/0.548/0.541mΩ Mode2： 0.550/0.553/0.549mΩ	
	Test current	1A	
B2	MECANICAL OPERATIONS: EN 60512 / Test [9a]		
6.3.5	Operating cycles ..... :	50	

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	Insertion speed ..... :	0,01m/s	
	Rest ..... :	30s	
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
5.11	No damage shall occur which could impair normal use		P
B3	FINAL MEASUREMENTS (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Contact resistance R_2 (mΩ) ..... :	Mode1 ： 0.578/0.580/0.581mΩ Mode2 ： 0.579/0.575/0.576mΩ	P
	Test current ..... :	1A	P
	$R_2 \leq 1{,}5\ R_1$ or $R_2 \leq 5\ m\Omega + R_1$		P
6.3.8b	DIELECTRIC STRENGTH: EN 60512 / Test [4a]		
	Mated specimen..... :		
	r.m.s. withstand voltage ..... :	8000V	
5.10	No breakdown or flashover between ..... :	Live parts and accessible part	P
C1	BENDING TEST: EN 60309-1, 24.4 modified		
6.3.6	Only non-rewireable connectors		
	Rated current ..... :		
	Rated voltage ..... :		
	Wire cross section ..... :		
	Mass (N)……..……..:		
	Numbers of Bendings ..... :		
	DURING THE TEST		—
	No interruption of the test current		N/A
	AFTER THE TEST		
	The cable support sleeve shall not be loosened from the body		N/A
	The insulation shall show no signs of abrasion or of wear and tear		N/A
	Broken strands shall not pierce the insulation		N/A

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
C2	**Final measurement**		
5.11.2	No damage shall occur which could impair normal use		N/A
	Voltage proof		N/A
	Visual examination		N/A
6.3.8.b	DIELECTRICAL STRENGTH: IEC 60512/ TEST [4a]		
	Testvoltage: …… …….[kV/A.C]		N/A
D	**THERMAL TEST GROUP C (TABLE 8)**		
D1	INITIAL MEASUREMENTS (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Reference value for subsequent measurement Contact resistance R_1 (mΩ)……..:	Mode1： 0.543/0.545/0.542mΩ Mode2： 0.549/0.551/0.550mΩ	
	Test current	1A	
D2	TEMPERATURE RISE TEST: EN 60512 / Test [5a]		
	Test conductor .....:	4mm²	
6.3.4	Mated specimen		
	Test current .....:	30A	
	Ambient temperature – components .....:	+85°C	
	Upper limit temperature(ULT) – components :	+100°C	
5.13	The sum of the ambient temperature and the temperature rise of a connector shall not exceed the upper limiting temperature (ULT).	Mode1： 94.964℃,94.343℃,95.170℃ Mode2：96.403℃,93.511℃, 96.563℃	P
D3	DRY HEAT: EN 60512 / Test [11i]		
	Mated specimen		P
	Test duration .....:	1000h	P
	Upper temperature limit .....:	+100°C	P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
D4	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	Sufficient contact pressure through insulation		P
	No visual damage, no cracks on insulations parts likely to impair safety		P
	Internal insulation shall not show damage likely to impair safety		P
	FINAL MEASUREMENTS (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Contact resistance R_2 (mΩ) .....:	Mode1： 0.608/0.607/0.609mΩ Mode2： 0.611/0.610/0.613mΩ	P
	Test current .....:	1A	P
	$R_2 \leq 1{,}5\ R_1$ or $R_2 \leq 5\ m\Omega + R_1$		P
E	**CLIMATIC TEST GROUP D (TABLE 9)**		
E1	INITIAL MEASUREMENTS (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Reference value for subsequent measurement Contact resistance R_1 (mΩ)……..:	Mode1： 0.545/0.546/0.541mΩ Mode2： 0.550/0.551/0.549mΩ	
	Test current .....:	1A	
E2	THERMAL CYCLE: EN 60068-2-14,Test Nb		
6.3.11	Mated specimen		P
	Test duration .....:	210h	
	Lower temperature limit .....:	-40°C	
	Upper temperature limit .....:	+85°C	
	Number of cycles .....:	200	
	During thermal cycle test the rated current shall be applied such that it is conducted through the current-carrying contacts.		
	No damage shall occur which could impair normal use		P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
E3	DAMP HEAT: EN 61215 / Test 10.13		
6.3.12	Test duration .....:	1000 h	
	Temperature .....:	+85°C	
	Relative humidity.....:	85%RH	
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	No damage shall occur which could impair normal use		P
E4	DIELECTRIC STRENGTH: EN 60512 / Test [4a]		
	Mated specimen.....:		
6.3.8 a)	Impulse withstand voltage .....:	16kV	
6.3.8 b)	r.m.s. withstand voltage .....:	8000V	
5.10	No breakdown or flashover between .....:		P
E5	PROTECTION AGAINST CORROSION: EN 60512 / Test [11g]		
6.3.9 Test 1	Flowing mixed gas corrosion according to EN 60512-11-7, test 11g Method 1 or alternatively Mehod 4 (Table 1 of EN 60512-11-7)). Test duration shall be 4 days.		N/A
5.21.1	Metal parts shall be so designed that corrosion shall not impair safety with regard to electrical and mechanical characteristics.		N/A
	All current carrying parts shall be consisting of metal, so that during the normal function under the occurring conditions a sufficient mechanical strength, electrical conductivity and corrosion resistance is given.		N/A
5.21.2	Under wet ambient conditions all metal parts may not be in contact with each other which have a difference of their electrochemical potentials from > 350mV according to EN 60943		N/A
6.3.9 Test 2 alternative	Sulfur dioxide test with general condensation of moisture according to ISO 6988 . Test duration shall be 24h (1 test cycle)	0,32L/450L; 42°C; 100%;24,2h	P
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	No damage shall occur which could impair normal use		P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
E6	FINAL MEASUREMENT (CONTACT RESISTANCE): EN 60512 / Test [2b]		
	Contact resistance R_2 (mΩ) ..... :	Mode1 ： 0.619/0.617/0.620mΩ Mode2 ： 0.623/0.621/0.619mΩ	P
	Test current ..... :	1A	
	$R_2 \leq 1{,}5\ R_1$ or $R_2 \leq 5\ m\Omega + R_1$		P
F	**DEGREE OF PROTECTION TEST GROUP E (TABLE 10)**		
F1	PROTECTION AGAINST ELECTRIC SHOCK		
6.3.3.1	Connectors shall be tested by the test finger in accordance to EN 60529 using a test force of 10 N. For the test all covers and housing parts shall be removed which are detachable without a tool.		P
5.4.1	A connector shall be so designed that, after mounting, its live parts are not accessible by the test finger in accordance with EN 60529.		P
5.4.2	Protection against electric shock shall be ensured also during insertion and withdrawal. Compliance shall be tested by the test finger in accordance with EN 60529		P
F2	DEGREE OF PROTECTION IP CODE: EN 60529		
6.3.3.2	IP-Degree of protection	IP67	
	Mated samples		
5.9	Maximum and minimum cross- section connected		
	No ingress of dust :	IP6X	P
	No ingress of water :	IPX7	P
F3	DIELECTRIC STRENGTH: EN 60512 / Test [4a]		
Remark	Additional wet leakage current test before F3, IEC61215 / clause 10.15		P
6.3.8b	Mated specimen		
	r.m.s. withstand voltage ..... :	8000V	
5.10	No breakdown or flashover between ..... :	Live parts and accessible parts	P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
G	**INSULATION MATERIAL GROUP F (TABLE 11)**		
G1	WEATHER RESISTANCE: ISO 4892-2 Method A		
	Radiation ..... :	550W/m²	
	Waveband ..... :	290 ~ 800nm	
	Black standard temperature ..... :	+65°C	
	Relative humidity ..... :	65%RH	
	Cycle ..... :	18min spraying 102min drying	
	Test duration ..... :	500h	
	VISUAL EXAMINATION: EN 60512 / Test [1a]		
	No cracks		N/A
5.20.2 b)	Isolating material shall have a CTI-value complying with the rated values of this standard according to EN 60664-1 ..... :	CTI value from UL yellow card for Enclosure(PC/ PC-10FRN-BK(V)(e)(f1)):2 Cable gland PA66-RNG00(r4)(f1):0	N/A
G2	ELECTRICAL STRENGTH: EN 60512 / Test [4a]		
6.3.8b	r.m.s. withstand voltage ..... :	6000V	
5.10	No breakdown or flashover between ..... :	Live parts and accessible parts	N/A
G3	FLAMMABILITY RATING FOR POLYMERIC MATERIALS SERVING AS AN ENCLOSURE FOR LIVE PARTS		
5.20.2a	Insulation materials serving as an enclosure have flammability class HB, V-2, V-1, V-0 acc. to EN 60695-11-10..... :		N/A
5.20.2c	Glow wire temperature during test acc. to EN 60695-2-10..... :	650°C	
	No ignition of the material ..... :	See Table 5.20c	N/A
G4	FLAMMABILITY RATING FOR PLOYMERIC MATERIALS SERVING TO SUPPORT LIVE PARTS		
5.20.3a	Insulation materials serving as an enclosure have flammability class HB, V-2, V-1, V-0 acc. to EN 60695-11-10ef*340.03 177.26 0.72f*57 196.01 56.		