

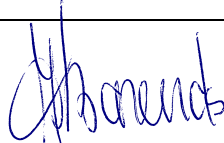




Test Report issued under the responsibility of:



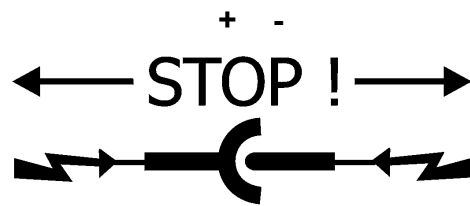
TEST REPORT IEC 62852 Connector for DC – application in photovoltaic systems – Safety requirements and tests	
Report Number	: 2257781.50
Date of issue	: 2021-08-06
Total number of pages	: 15
Name of Testing Laboratory preparing the Report	: DEKRA Certification B.V.
Applicant's name	: Duramotion B.V.
Address	: De Koumen 35 6433 KG Hoensbroek, The Netherlands.
Test specification:	
Standard	: IEC 62852:2014
Test procedure	: CB Scheme
Non-standard test method	: N/A
Test Report Form No.	: IEC 62852A
Test Report Form(s) Originator	: DEKRA Certification B.V.
Master TRF	: Dated 2020-03-13
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Test item description :	Photovoltaic system connectors	
Trade Mark(s) :		
Manufacturer :	SOLING; Amphenol; STAUBLE; Weidmüller	
Model/Type reference :	46010CM&46010CF; HELIOS H4; MC4; PV-STICK	
Ratings :	1000 V, IP68(1 h / 1 m), ULT 105°C	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	DEKRA Certification B.V.
Testing location/ address:	Meander 1051, 6825 MJ Arnhem The Netherlands	
Tested by (name, function, signature):	T. Cai	
Approved by (name, function, signature) ...:	H.R.M. Barends	
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address:		
Tested by (name, function, signature):		
Approved by (name, function, signature) ...:		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address:		
Tested by (name + signature)		
Witnessed by (name, function, signature) ...:		
Approved by (name, function, signature) ...:		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address:		
Tested by (name, function, signature):		
Witnessed by (name, function, signature) ...:		
Approved by (name, function, signature) ...:		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):	
Summary of testing:	
Tests performed (name of test and test clause): Mechanical test group A: A5, A10 Service life test group B: B1, B2, B3 Thermal test group D: D1, D2, D3, D4 Degree of protection test group F: F1, F2, F3	Testing location: DEKRA Certifications B.V. Meander 1051, 6825 MJ Arnhem, The Netherlands
Summary of compliance with National Differences (List of countries addressed):	
<input type="checkbox"/> The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)	
Statement concerning the uncertainty of the measurement systems used for the tests (may be required by the product standard or client)	
<input type="checkbox"/> Internal procedure used for type testing through which traceability of the measuring uncertainty has been established: Procedure number, issue date and title: Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.	
<input type="checkbox"/> Statement not required by the standard used for type testing (Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Do not disconnect under load

Test item particulars: Photovoltaic system connectors									
Classification of installation and use: Free connector									
Supply Connection: Non-rewirable connector									
Possible test case verdicts: - test case does not apply to the test object..... : N/A - test object does meet the requirement..... : P (Pass) - test object does not meet the requirement..... : F (Fail)									
Testing :									
Date of receipt of test item : 2021-06-11									
Date (s) of performance of tests : 2021-06-15 to 2021-08-06									
General remarks:									
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.									
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60335-1:									
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable								
When differences exist; they shall be identified in the General product information section.									
Name and address of factory (ies) : N/A									
General product information and other remarks:									
Maximum current between different combinations:									
<table border="1"> <thead> <tr> <th>Combination between manufacture</th> <th>Max. Current (A)</th> </tr> </thead> <tbody> <tr> <td>SOLINQ + Amphenol</td> <td>32</td> </tr> <tr> <td>SOLINQ + STAUBLE</td> <td>33</td> </tr> <tr> <td>SOLINQ + Weidmüller</td> <td>30</td> </tr> </tbody> </table>		Combination between manufacture	Max. Current (A)	SOLINQ + Amphenol	32	SOLINQ + STAUBLE	33	SOLINQ + Weidmüller	30
Combination between manufacture	Max. Current (A)								
SOLINQ + Amphenol	32								
SOLINQ + STAUBLE	33								
SOLINQ + Weidmüller	30								

IEC 62852			
Clause	Requirement + Test	Result - Remark	Verdict
5	CONSTRUCTIONAL REQUIREMENTS AND PERFORMANCE		
5.15.2	Contact retention in insert (test phase A5)		
	Test load is three times the specified insertion force (mating) of one contact or the specified insertion force of one contact plus 50N, whichever is less		P
	Contacts safety retained		P
	No axial displacement likely to impair normal operation		P
5.17	Connector with locking device (test phase A10)		
	Connectors with locking device or with snap-in device withstand a load of at least 80N with a rate of 10N/sec withdrawal force		P
	No disengagement of the connectors is possible.		P
5.17	No damage occurred which could impair normal use		P
6	TESTS		
Table 9 B1	Initial measurement (Contact resistance measurement) (test phase B1)		
	Test current: 1 A		
	Reference value for subsequent measurement:	See table B1	P
6.3.5	Mechanical operations (test phase B2)		
	Operating cycles	50	P
	Insertion speed: 0,01 m/s		P
	Rest: 30 s		P
5.11.1	No damage occurred which could impair normal use		P
Table 9 B3	Final measurement (Contact resistance measurement) (test phase B3)		
	Test current: 1 A		
	$R_2 \leq 1,5 R_1$ or $R_2 \leq 5 \text{ mohm} + R_1$	See table B3	P
6.3.8.b	Dielectric strength: IEC 60512 / Test 4a		
	Test voltage:	6 000 V	P
5.10	No breakdown or flashover of the test voltage		P
Table 9 D1	Initial measurement (Contact resistance measurement) (test phase D1)		
	Test current: 1 A		
	Reference value for subsequent measurement:	See table D1	P

IEC 62852			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.4	Temperature rise test: IEC 60512 - test 5a (test phase D2)		
	Test conductor length:	550 mm	P
	Test conductor:	4 mm ² as delivered	P
	Test current:	See table D2	P
	Ambient temperature – components:	85 °C	P
	Upper limit temperature – components:	105 °C	P
5.13	The upper limiting temperature specified for the specimen is not exceeded	See table D2	P
Table 9 D3	Dry heat: IEC 60512 - test 11i (test phase D3)		
	Test duration:	1000 h	P
	Upper temperature limit:	105 °C	P
Table 9 D4	Final measurement (Contact resistance measurement) (test phase D4)		
	No visual damage, no cracks on insulations parts likely to impair safety		P
	Internal insulation doesn't show any damages likely to impair safety		P
	Final measurement: IEC 60512 - test 2b		
	Test current: 1 A		
	$R2 \leq 1,5 R1$ or $R2 \leq 5 \text{ mohm} + R1$	See table D4	P
6.3.3.1	Protection against electric shock (test phase F1)		
	Connectors are tested by the test probe 11 according to IEC 61032 with a test force of 10N. All lids and cover which are remove without a tool are disconnected		P
5.4.1	Connectors are so designed, that after mounting, its live parts are not accessible by the IEC test finger in accordance with IEC 60529. No live parts accessible		P
5.4.2	Protection against electric shock have been ensured also during insertion and withdrawal. This is proved by the IEC test probe 11 in accordance with IEC 61032 with a test force of 10N at disengaged connectors. No live parts accessible		P
6.3.3.2	Degree of protection IP code: IEC 60529 (test phase F2)		
	IP-Degree of protection	IP68 (1 h / 1 m)	P
5.9	Maximum and minimum cross- section connected...:	4 mm ²	P
	No ingress of dust		P
	No ingress of water		P

IEC 62852			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.8 b)	Dielectric strength: IEC 60512 - Test 4a (test phase F3)		
	Dielectric strength: IEC 60512 / Test 4a		
	Test voltage.....:	6 000 V	P
5.10	No breakdown or flashover of the test voltage		P

IEC 62852					
Clause	Requirement + Test			Result - Remark	Verdict
	TABLE B1: Initial measurements (Contact resistance)				P
Test current	1 A				—
Combination		Test sample			
46010CM + HELIOS H4 female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,14	0,16	0,16	P
	R1 [m Ω]	0,14	0,16	0,16	
46010CF + HELIOS H4 male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,13	0,14	0,15	P
	R1 [m Ω]	0,13	0,14	0,15	
46010CM + MC4 female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,16	0,14	0,13	P
	R1 [m Ω]	0,16	0,14	0,13	
46010CF + MC4 male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,14	0,13	0,12	P
	R1 [m Ω]	0,14	0,13	0,12	
46010CM + PV-STICK female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,22	0,22	0,28	P
	R1 [m Ω]	0,22	0,22	0,28	
46010CF + PV-STICK male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,25	0,23	0,25	P
	R1 [m Ω]	0,25	0,23	0,25	
supplementary information:					

IEC 62852					
Clause	Requirement + Test			Result - Remark	Verdict
TABLE B3: Final measurements (Contact resistance)					P
Test current				1 A	—
Number of cycles of B2				50	—
Condition				R2max ≤ 1,5R1 or R2max ≤ 5 mΩ + R1	—
		Test sample			
46010CM + HELIOS H4 female	Contact	1	2	3	—
	R2max [mΩ]	5,14	5,16	5,16	P
	ΔU2 [mV]	0,19	0,20	0,19	
	R2 [mΩ]	0,19	0,20	0,19	
46010CF + HELIOS H4 male	Contact	1	2	3	—
	R2max [mΩ]	5,13	5,14	5,15	P
	ΔU2 [mV]	0,18	0,19	0,21	
	R2 [mΩ]	0,18	0,19	0,21	
46010CM + MC4 female	Contact	1	2	3	—
	R2max [mΩ]	5,13	5,14	5,15	P
	ΔU2 [mV]	0,19	0,18	0,16	
	R2 [mΩ]	0,19	0,18	0,16	
46010CF + MC4 male	Contact	1	2	3	—
	R2max [mΩ]	5,14	5,13	5,12	P
	ΔU2 [mV]	0,15	0,16	0,15	
	R2 [mΩ]	0,15	0,16	0,15	
46010CM + PV-STICK female	Contact	1	2	3	—
	R2max [mΩ]	5,22	5,22	5,28	P
	ΔU2 [mV]	0,29	0,27	0,32	
	R2 [mΩ]	0,29	0,27	0,32	
46010CF + PV-STICK male	Contact	1	2	3	—
	R2max [mΩ]	5,25	5,23	5,25	P
	ΔU2 [mV]	0,29	0,28	0,28	
	R2 [mΩ]	0,29	0,28	0,28	
supplementary information:					

IEC 62852					
Clause	Requirement + Test	Result - Remark			Verdict
	TABLE D1: Initial measurements (Contact resistance)				P
Test current	1 A			—	
Combination		Test sample			
46010CM + HELIOS H4 female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,13	0,13	0,15	P
	R1 [m Ω]	0,13	0,13	0,15	
46010CF + HELIOS H4 male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,12	0,12	0,13	P
	R1 [m Ω]	0,12	0,12	0,13	
46010CM + MC4 female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,13	0,16	0,14	P
	R1 [m Ω]	0,13	0,16	0,14	
46010CF + MC4 male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,13	0,13	0,11	P
	R1 [m Ω]	0,13	0,13	0,11	
46010CM + PV-STICK female	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,24	0,27	0,25	P
	R1 [m Ω]	0,24	0,27	0,25	
46010CF + PV-STICK male	Contact	1	2	3	—
	$\Delta U1$ [mV]	0,24	0,25	0,22	P
	R1 [m Ω]	0,24	0,25	0,22	
supplementary information:					

IEC 62852			
Clause	Requirement + Test	Result - Remark	Verdict
	TABLE D2: Temperature Rise test		P
	Test Current (A)..... :	See below	—
	Test Conductor Length(mm)..... :	550	
	Test Conductor Section(mm ²)..... :	4	
	Ambient (°C)..... :	85	—
Thermocouple Locations / Combination	Test current (A)	Max. temperature measured, (°C)	Max. temperature limit, (°C)
46010CM + HELIOS H4 female	32	104,5	105
46010CF + HELIOS H4 male	32	104,8	105
46010CM + MC4 female	33	104,3	105
46010CF + MC4 male	33	102,6	105
46010CM + PV-STICK female	30	104,6	105
46010CF + PV-STICK male	30	101,7	105
Supplementary information:			

IEC 62852					
Clause	Requirement + Test			Result - Remark	Verdict
TABLE D4: Final measurements (Contact resistance)					P
Test current				1 A	—
Condition				R2max ≤ 1,5R1 or R2max ≤ 5 mΩ + R1	—
		Test sample			
46010CM + HELIOS H4 female	Contact	1	2	3	—
	R2max [mΩ]	5,13	5,13	5,15	P
	ΔU2 [mV]	0,17	0,15	0,20	
	R2 [mΩ]	0,17	0,15	0,20	
46010CF + HELIOS H4 male	Contact	1	2	3	—
	R2max [mΩ]	5,12	5,12	5,13	P
	ΔU2 [mV]	0,19	0,15	0,15	
	R2 [mΩ]	0,19	0,15	0,15	
46010CM + MC4 female	Contact	1	2	3	—
	R2max [mΩ]	5,13	5,16	5,14	P
	ΔU2 [mV]	0,16	0,16	0,18	
	R2 [mΩ]	0,16	0,16	0,18	
46010CF + MC4 male	Contact	1	2	3	—
	R2max [mΩ]	5,13	5,13	5,11	P
	ΔU2 [mV]	0,14	0,14	0,13	
	R2 [mΩ]	0,14	0,14	0,13	
46010CM + PV-STICK female	Contact	1	2	3	—
	R2max [mΩ]	5,24	5,27	5,25	P
	ΔU2 [mV]	0,31	0,29	0,26	
	R2 [mΩ]	0,31	0,29	0,26	
46010CF + PV-STICK male	Contact	1	2	3	—
	R2max [mΩ]	5,24	5,25	5,22	P
	ΔU2 [mV]	0,30	0,24	0,26	
	R2 [mΩ]	0,30	0,24	0,26	
supplementary information:					

Pictures of test samples



