THE DATASHEET OF

933020004

SOLARSPEC PV SOLAR DC PANEL MOUNT PLUGS AND RECEPTACLES

1.0 SCOPE

THIS PRODUCT SPECIFICATION COVERS THE MOLEX SOLARSPEC PV SOLAR DC PANEL MOUNT CONNECTOR SERIES.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBER(S)

A.	PLUG AND RECEPTACLE ASSEMBLY	93301
B.	STAMPED AND FORMED PIN TERMINALS	93302
C.	STAMPED AND FORMED SOCKET TERMINALS	93303
D.	UNLOCK TOOL	130203

2.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKINGS

A. SEE APPLICABLE SALES DRAWINGS FOR DIMENSIONAL DETAIL.
B. HOUSINGS: UNFILLED PC-BLACK
C. PIN AND SOCKET TERMINALS: HIGH COPPER ALLOY
   I. FINISH: SELECTIVE SILVER OVER NICKEL
D. SEALS: SILICONE RUBBER
E. UNLOCK TOOL: GLASS-FILLED POLYAMIDE (PA66)-BLACK

2.3 SAFETY AGENCY APPROVALS

A. UL
B. TUV
C. CSA
D. ALL PARTS ARE ROHS AND REACH SVHC COMPLIANT
E. ALL MOLDED COMPONENTS ARE FLAMMABILITY RATED 94V-0

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

A. **SD-93301-001: SOLARSPEC DC PANEL MOUNT.**
B. **SD-130203-001: UNLOCK TOOL**

4.0 RATINGS

4.1 VOLTAGE

1,000 VOLTS (UL)
1,000 VOLTS (TUV)

4.2 CURRENT AND APPLICABLE WIRES

AWG	Metric	Amps
14	2.5 mm^2	15
12	4.0 mm^2	20
10	6.0 mm^2	35

4.3 WIRE DIAMETER RANGE: 5.8mm – 7.8mm

4.4 TEMPERATURE

Operating: - 40°C to + 85°C
Non-operating: - 40°C to + 105°C

4.5 IP67 (MATED) / IP2X (UNMATED)

4.6 MEETS NEC REQUIREMENTS FOR TOOL TO RELEASE. WILL NOT UNMATE WITHOUT A TOOL

5.0 PERFORMANCE

5.1 Visual Inspection

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	Visual Inspection (EN 60512, 1a)	Parts checked for: Identification, Workmanship Finish, Markings, Cosmetic issues, Tool marks.	No Defects

5.2 Electrical Performance

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
2	Contact Resistance (EN 50521:2008 section B1)	Mate connectors: Test current @1A, (see appendix 2).	Reference Value for subsequent measurements.
3	Dielectric Withstanding Voltage (UL) (UL 1703,section 26)	Unmate connectors: apply a voltage of 2200 VDC for 1 minute between terminals to ground.	No breakdown or flashover, 50 µA MAXIMUM
4	Dielectric Withstanding Voltage (TUV, Voltage Proof) (EN-60512-4-1, test 4a)	Unmate connectors: apply a voltage of 6000 VAC r.m.s. for 1 minute between terminals to ground.	No breakdown or flashover
5	Leakage Current Test (UL 1703, section 21)	Conducted at rated maximum system voltage: All accessible parts and surfaces are to be tested	1 milliamp MAXIMUM
6	Wet Insulation Resistance (UL 1703, section 27)	Submerge in non corrosive liquid: Temp 22°±3°C: duration:2 mins, Measure while still in solution at 500Vdc. Uninsulated terminations are not to be wetted.	No Dielectric breakdown or surface tracking as a result of the applied dc voltage.
7	Temperature Rise (EN 50521, section 6.3.4)	Mate connectors and apply current per 4.2: Measure the temperature rise at the rated current after temperature has stabilized. (ambient temperature 85°C)	Temperature rise: +30°C MAXIMUM

5.3 Mechanical Performance

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
8	Terminal Insertion and Withdrawal Forces (EN 60512, test 13b)	Insert and withdraw terminal (male to female) at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	30 N (6.7 lbf) MAXIMUM insertion force & 5 N (1.1 lbf) MINIMUM withdrawal force
9	Connector Mate and Un-mate Forces	Mate and unmate connector (male to female) at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. When unmating, the latches are to be fully compressed.	50 N (11.2 lbf) MAXIMUM insertion force & 5 N (1.1 lbf) MINIMUM withdrawal force
10	Polarization (EN 60512, test 13e)	While trying to mate connectors in an unintended manner, apply either 20N (4.5 lb) or 1.5X mating force.	No damage
11	Crimp Terminations (EN 50521:2008, section A4)	-Visual and tensile strength test minimum -1 contact at each end of the connector	Minimum Pull Force: 6.0mm² 356.0 N 4.0mm² 312.0 N 2.5mm² 223.0 N
12	Terminal Insertion Force (into Housing)	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch).	7 N (1.6 lbf) MAXIMUM insertion force
13	Terminal Retention Force (in Housing)	Axial pullout force on the terminal in the housing (opposite to the direction of insertion at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	50 N (11 lbf) MINIMUM retention force.
14	Durability (EIA-364-09)	Mate connectors manually for 50 cycles at a maximum rate of 10 cycles per minute.	50% change from initial or 5 milliohms MAXIMUM
15	Effectiveness of connector coupling device (EN 60512, test 15f)	Apply an axial pull on the connectors at a rate of 10 N/s (2.2 lbf/s).	80 N (18.0 lbf) MINIMUM retention force

5.4 Environmental Performance

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
16	Dry Heat (EN 50521:2008, section C3)	Mate connectors; expose to: 1000 hours at 110 ± 3°C	50% change from initial or 5 milliohms MAXIMUM & Visual: No Damage
17	Thermal Cycling (Thermal shock) (TUV) (EN-60068-2-14,test Nb)	Mate connectors: expose for 200 cycles between temperatures -40 ± 2°C and 85 ± 2°C; dwell 0.5 hours at each temperature. Transfer time 3 minutes maximum. {Note: Remove surface moisture and air dry for 1 hour prior to measurements}	50% change from initial or 5 milliohms MAXIMUM (change from initial) & Must pass dielectric voltage test
18	Temperature Cycling Test. (UL) (UL 1703, 35)	Mate connectors: expose for 200 cycles: 25 ± 2°C to -40 ± 2°C; dwell 0.5 hours -40 ± 2°C to 90 ± 2°C; dwell 0.5 hours 90 ± 2°C to 25 ± 2°C - 6 hours maximum per cycle. {Note: Remove surface moisture and air dry for 1 hour prior to measurements}	Must still function & Must pass dielectric voltage test
19	Damp Heat (EN 60068-2-78)	Mate connectors: expose to a temperature of 85 ± 2°C with a relative humidity of 85%±5% for 1000 hours. {Note: Remove surface moisture and air dry for 1 hour prior to measurements.}	50% change from initial or 5 milliohms MAXIMUM (change from initial) & Must pass dielectric voltage test
20	Humidity Cycling Test (UL 1703, section 36)	Humidity test @ 85% Rel Humidity – 10 cycles of - Transition from 25°C to 85°C - 85°C for 20 Hrs min - Transition from 85°C to -40°C - -40°C for 30 minutes - Transition from -40°C to 25°C - 4 hours max per cycle.	Must still function No Corrosion

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
21	Mold Stress-Relief Distortion Test (UL 746C, section 29)	Sample is to be placed in the oven at a temperature of not less that 10°C higher than max operating temperature for 7 hours.	No softening, shrinkage, warpage, or distortion that results in: Accessibility of live parts or reduction in creepage distance and air gap
22	Flowing Mixed Gas Corrosion Test (EN 50521:2008, section D4 Test 1)	4 days Half of the samples in mated state Half of the samples in unmated state	50% change from initial or 5 milliohms MAXIMUM (change from initial) & Visual: No Damage
23	Ingress Protection (IEC 60529)	IP67	No Water or Dust Ingress

5.4 TEST SEQUENCE

		Sequence						
Description	**Item**	A	B	C	D	E	F	G
Visual Inspection	1	1	1	1, 5	1	1	1	1
Contact Resistance	2		2, 4	2, 6	2, 7			
Dielectric Withstand Voltage (UL)	3					2, 6	2, 6	
Dielectric Withstand Voltage (TUV, Voltage proof)	4		5		5			
Leakage Current Test	5					3, 7	3, 7	
Wet Insulation Resistance	6					4, 8	4, 8	
Temperature Rise	7			3				
Terminal Insertion & Withdrawal Forces	8	2						
Connector Mate & Un-mate Forces	9	2						
Polarization	10	2						
Crimp Terminations	11	2						
Terminal Insertion Force (into housing)	12	2						
Terminal Retention Force (in housing)	13	2						
Durability	14		3					
Effectiveness of connector coupling device	15	2						
Dry Heat	16			4				
Thermal Cycling (TUV)	17				3			
Temperature Cycling (UL)	18					5		
Damp Heat	19				4			
Humidity Cycling	20						5	
Mold Stress-Relief Distortion	21							2
Flowing Mixed Gas	22				6			
Ingress Protection	23	2						

Test Group	A	B	C	D	E	F	G
Sample Size	3	3	6	6	3	3	6
AWG Size	N/A	12, 14	10	10	10, 14	10, 14	10, 14
Cable Length	N/A	100mm	100mm	100mm	100mm	100mm	N/A

6.0 PACKAGING

Parts shall be packaged to protect against damage during handling, transit and storage.

7.0 APPLICATION TOOLING

A. TBD

8.0 OTHER INFORMATION

APPENDIX 1

UL 6703 REQUIRED TESTS:

Test	Reference (Standard, Section)	Sample Requirements
Leakage Current Test – As Received	UL 1703, 21	3 assemblies, mated
Dielectric Voltage Withstand Test – As Received	UL 1703, 26	–
Wet Insulation Resistance Test – As Received	UL 1703, 27	3 assemblies, mated
Water Spray Test	UL 1703, 33	3 assemblies, mated
Dielectric Voltage Withstand Test Following Water Spray Test	UL 1703, 26	–
Leakage Current Test Following Water Spray Test	UL 1703, 21	–
Temperature Cycling Test	UL 1703, 35	3 assemblies, mated
Dielectric Voltage Withstand Test Following Temperature Cycling Test	UL 1703, 26	–
Leakage Current Test Following Temperature Cycling Test	UL 1703, 21	–
Wet Insulation Resistance Test Following Temperature Cycling Test	UL 1703, 27	–
Humidity Cycling Test	UL 1703, 36	3 assemblies, mated
Dielectric Voltage Withstand Test Following Humidity Cycling Test	UL 1703, 26	–
Leakage Current Test Following Humidity Cycling Test	UL 1703, 21	–
Wet Insulation Resistance Test Following Humidity Cycling Test	UL 1703, 27	–
Accelerated Aging of Gaskets Test	UL 1703, 34	Requires material samples
Strain Relief Test	UL 1703, 22	6 assemblies, 3 mated and 3 not mated
Impact Test	UL 1703, 30	3 assemblies, mated
Low Temperature Impact Test	UL 1703, 30	3 assemblies, mated
Crush Resistance Test	UL 746C, 21	3 assemblies, mated
Mold Stress-Relief Distortion Test Followed by Strain Relief	UL 746C, 29	6 assemblies, mated
Static Heating Sequence	UL 486A-486B, 9.3	4 assemblies, max wire size/amp rating, mated
Mechanical Sequence	UL 486A-486B, 9.4	4 assemblies, min wire size, not mated

Test	Reference (Standard, Section)	Sample Requirements
Dielectric Voltage Withstand	UL 486A-486B, 9.5	24 assemblies, max & min - 6 assembled and mated as received - 6 assemblies aged then assembled and mated - 6 assemblies mated, conditioned, then tested - 6 assemblies unmated then mated
Stress Corrosion (Only for Informational Purposes)	UL 486A-486B, 9.12	3 assemblies, max wire size, not mated

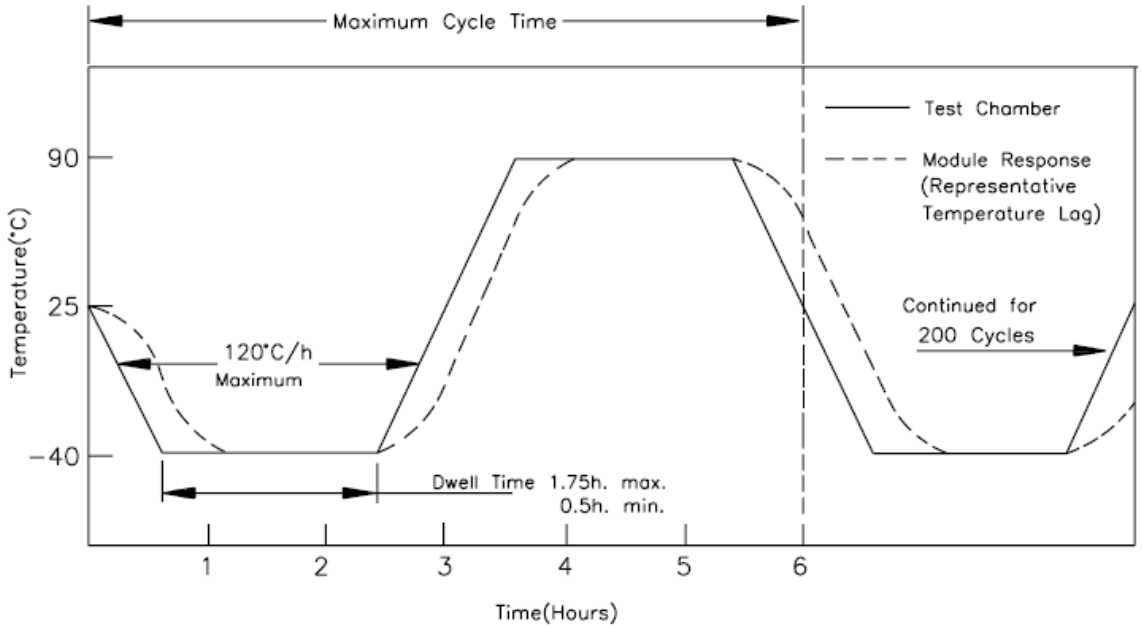
Note 1 - The sample requirements assume only one construction (male and female) and one size and type conductor unless otherwise noted. Additional tests and samples may be required based on construction.

Note 2 - 1 Assembly consists of 1 male and 1 female connector with 0.7 m of intended conductor for each connector.

Note 3 - If connectors may be assembled in the field, unassembled connectors and 2 sets of all necessary tools are required.

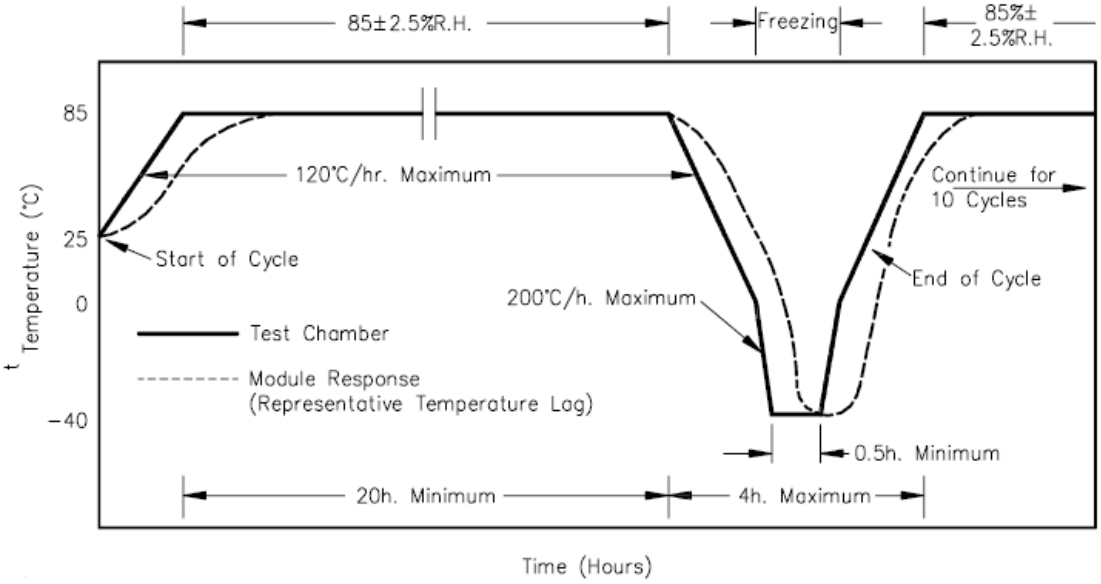
UL 1703 SECTION 35 – THERMAL CYCLE TEST

Figure 35.1
Thermal cycle test



UL 1703 Section 36 – HUMIDITY CYCLE TEST

Figure 36.1
Humidity-freezing cycle test



Appendix 2

Reference value for subsequent measurements.

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