

Micro Junction Box System

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality standards for the SOLARLOK* Micro-Junction box which allows electrical connection between thin film Photovoltaic (PV) panels and allows connection of the foils exiting the solar panel. This connection is made by soldering the foil to the rail whose interface surface is in a horizontal position and then potting.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 TE Document

- TE Drawing 2270282

2.2. Commercial Standard

- IEC62790:2014: Junction boxes for photovoltaic modules – Safety requirements and tests
- UL 3730: Standard for Photovoltaic Junction Boxes, First Edition dated November 11, 2014

2.3. Reference Documents

- 114-13304: Application Specification (SOLARLOK* Micro Junction Box Assemblies)
 - 404-74000-1: Model Code for SOLARLOK* System
 - 408-10437 Instruction Sheet (SOLARLOK* Micro Junction Box Assemblies)
 - 108-137077 PV4-S Product Specification
 - 114-137077 PV4-S Application Specification
 - IEC-61646: Thin-film Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval
 - UL 746: UL Standard for Safety Polymeric Materials
 - EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
 - IEC 60068-2-2: Environmental Testing - Part 2-2 - Test B, Dry Heat
 - IEC-60512: Electronic Equipment - Tests and Measurements
 - IEC 60529: Degrees of Protection Provided by Enclosures (IP Code)
 - IEC-60695: Fire Hazard Testing
 - IEC 61215: Crystalline Silicon Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval
 - IEC-61701: Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
 - UL 1703: UL Standard for Safety Flat-Plate Photovoltaic Modules and Panels
-

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable production drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Rated voltage, box: TUV 1000 V / UL 600 V up to 1000 volts
- Rated impulse voltage, box: TUV 12 kV
- Rated Module working voltage: TUV < 90 V
- Pollution degree: 3 (2 inside of enclosure)
- TUV Rated reverse current: 30 A
- TUV Rated bypass current (I_{sc}): see TUV Rheinland certification
- Operating temperature: -40 to 115°C *)
- Storage temperature: -40 to 85°C
- Maximum ambient temperature per UL: 75°C at full load
- Degree of protection: IP65/IP67 for box
- Wire size: 4 mm² stranded wire

*) ambient temperature (per IEC 85°C) and heating by current

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

Figure 1

Test Description	Requirement	Procedure
GENERAL		
Visual and dimensional examination.	Meets requirements of product drawing	IEC 60512-2, Tests 1a and 1b
ELECTRICAL		
Voltage proof.	Six kV DC, 60 s duration.	IEC 60512-2, Test 4a
Insulation resistance.	3000 V DC. R > 400 MΩ at 1000 V DC	IEC 61215 10.3



Figure 1 (continued)

Wet leakage current	Water/wetting agent shall have a resistivity of 3500 Ω/cm or less at a temperature of 22 ± 3°C. R > 400 MΩ at 1000 V DC	IEC 61215 10.15.
Bypass diode thermal test	T _{amb} = 75°C I ₂ = 1.25*I ₁ T _{Diode} < T _{junc}	IEC 61215 10.18
Overall resistance (DC)	Resistance for each contact point: < 5 mΩ (1 mΩ typical)	IEC 60512-2, Test 2b

MECHANICAL

Enclosure protection degree	IP 67	IEC 60529
Impact (UL)	No accessible live parts.	UL 1703, Section 30.
Tension and torque	Tensile force 50 x 30 N Displacement < = 2 mm Torque 0.10 Nm Rotation < = 45°	IEC62790:2014, 5.3.21
Strain relief	89 N, 1 min. duration	UL 1703, Section 22.
Random vibration	See Note	EIA-364-28, Condition VII, Level E. .05 G2/Hz (4.9 g)

ENVIRONMENTAL

Thermal cycling	See Note	IEC 61215 10.11 T _a = -40°C ; T _b = + 85 °C Number of cycles: 200
Humidity/freeze.	Maximum over all resistance shall not be exceeded. No discontinuities. See Note	IEC 61215 0.12. Upper temperature: 85°C Lower temperature: -40°C RH: 85% Number of cycles: 10
Damp heat.	See Note	IEC 61215 0.13. Temperature: 85°C RH: 85% Duration: 1000 hours
Salt mist corrosion.	See Note	IEC 61701

Type Approval Tests(UL&TUV)

Junction boxes for photovoltaic modules – Safety requirements and tests		IEC62790:2014 Done at TÜV Rheinland Test Lab
UL Standard for Safety for Photovoltaic Junction Boxes		UL 3730, First Edition, Dated November 11, 2014 Done at UL Test Lab

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Figure 2.

Test or Examination	Test Group (a)								
	A	B	C	D	E	F	G	H	I
	Test Sequence (b)								
Visual and dimensional examination	1,6	1,3,11	1,8	1,7	1,3	1,4	1,4	1,6	1,3
Voltage proof		6,10	6						
Insulation resistance		2,9	2,5	3,6					
Wet leakage current	5	8	3,7	2,5		3	3		
Bypass diode thermal test	3								2
Overall resistance (DC)	2,4							2,5	
Enclosure protection degree		5							
Impact (UL)					2				
Tension and torque						2			
Strain relief							2		
Random vibration								3	
Heat secureness of isolation parts (dry heat)		4							
Thermal cycling		7							
Humidity/freeze				4					
Damp heat			4						
Salt mist corrosion								4	

NOTE

- (a) See paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) The Qualification and Requalification Tests listed in 3.5 and 3.6 will be verified by TE. Except the type approval tests at UL and TUV

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 3 specimens.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.



-
- 4.3. Acceptance
Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.
- 4.4. Quality Conformance Inspection
The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

5. CERTIFICATION

TÜV Rheinland certification: see certification number R 60128247.

UL certification: see UL file number E226440.

List of product variations in TUV Rheinland certification:

- MICRO2GAN1MA
- MICRO2GAN1PA
- MICRO2GBN1MA
- MICRO2GBN1PA
- MICRO2GAR1MA
- MICRO2GAR1PA
- MICRO2GBR1MA
- MICRO2GBR1PA

6. Appendix-components approved in TÜV Rheinland

TUV certificate	Components	Manufacturer	Type/model	Technical data	Approvals	Mark(s) of conformity
R60128247	Cable TE part number: 2270215- x x: length on reel	TE Connectivity (Co-licensed from Changshu JHOSIN Communication Technology Co., Ltd. Type: DPN4012A09_R EV.A/6)	SLKC1A4	Conductor cross section: 4 mm ² CTI > 600 1500 V dc	IEC 62930 EN 50618 UL4703	TÜV number: R 50504538 R 50504540 UL file: E337795
	Cable TE part number: 2270259 - x x: length on reel This is the same cable as 2270215 -1 however with marking for 1000 V for taxation reasons of Taiwan. This cable has the same TÜV Rheinland certificates as 2270215 -1.	TE Connectivity (Co-licensed from Changshu JHOSIN Communication Technology Co., Ltd. Type: DPN4012A09_R EV.A/6)	SLKC0A4	Conductor cross section: 4 mm ² CTI > 600 1000 V dc	IEC 62930 EN 50618 UL4703, UL44	TÜV number: R 50504538 R 50504540 UL file: E337795
	Cable TE part number: 2270245- x x: length on reel	TE Connectivity (Co-licensed from Kunshan Byson Electronics Type: 6352D)	SLKC1B4	Conductor cross section: 4 mm ² CTI > 600 1500 V dc	IEC 62930 EN 50618 UL4703, UL 44, UL 854, UL 1581, UL 2556	TÜV number: R 50504531 R 50504536 UL file: E337795-B
	Cable TE part number: 2270260- x x: length on reel This is the same cable as 2270245-1 however with marking for 1000 V for taxation reasons of Taiwan. This cable has the same TÜV Rheinland certificates as 2270245-1.	TE Connectivity (Co-licensed from Kunshan Byson Electronics Type: 6352D)	SLKC0B4	Conductor cross section: 4 mm ² CTI > 600 1000 V dc	IEC 62930 EN 50618 UL4703, UL 44, UL 854, UL 1581, UL 2556	TÜV number: R 50504531 R 50504536 UL file: E337795-B



Product Specification

108-2469
27SEP2018 Rev. C

		TE Connectivity	PV4-S0b40 b = M(ale) or F(emale)	1000V	IEC 62852:2014 EN 62852:2015	R60148776
		TE Connectivity	PV4-S1b40 b = M(ale) or F(emale)	1500V	IEC 62852:2014 EN 62852:2015	R60148776
		Stäubli Electrical Connectors AG	PV-KBT4/xy PV-KST4/xy		IEC 62852:2014	R 60127190
	Backsheets:					
	Glass					
	Backsheet(PET type)	DUNMORE	DUNSOLAR DS 450	Thicknes s 0,175 mm; max system voltage 1000 V		
			DUNSOLAR DS 375	Thicknes s 0,375 mm; max system voltage 1500 V		
			DUNSOLAR DS 475	Thicknes s 0,325 mm; max system voltage 1500 V		



Annex A

Documentation Change Record

Revision	Clause	Page	Change Description
B	5	6	Update the certification information R 60128247 per IEC62790
C	0	1	Removed Design Objective
C1	6	6 & 7	Added TÜV approved components