



PV Edge Solar Junction Box

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality standards for the SOLARLOK* PV Edge Solar Junction Box which allows the electrical connection between Photovoltaic (PV) panels.

License holder: Tyco Electronics Austria GmbH, Schrackstrasse 1, 3830 Waidhofen/Thaya, Austria.

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.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number for this testing is 501-134079.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Documents

- [114-32157](#): Application Specification (SOLARLOK* PV Edge Solar Junction Box Assemblies)
- [404-74000-1](#): Model Code for SOLARLOK* System
- [501-134079](#): Qualification Test Report (SOLARLOK* PV Edge Solar Junction Box)

2.2. Customer drawings

- 2306314 (Flap), 2306315 (No Flap), 2307520 (Large Flap): S-Clip Termination Versions
- 2306316 (Flap), 2306317 (No Flap), 2307521 (Large Flap), Ω-Clip Termination Versions
- 2306318 (Flap), 2306319 (No Flap), 2307522 (Large Flap), Weld Termination Versions

2.3. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC-60512: Electronic Equipment - Tests and Measurements
- IEC 60529: Degrees of Protection Provided by Enclosures (IP Code)
- IEC-60695: Fire Hazard Testing
- IEC 62790: Junction boxes for photovoltaic modules, TÜV Rheinland certificate: RXXXXXX
- IEC 61215: Terrestrial Photovoltaic (PV) Modules
- IEC-60068-2: Electronic Equipment & Product Standards
- UL 1703: UL Standard for Safety Flat-Plate Photovoltaic Modules and Panels
- UL 3730: Safety for Photovoltaic Junction Boxes, UL file: E321923-20170829

2.4. Components tested at TÜV Rheinland in conjunction with the junction box

- Adhesive for JB/ backsheet Dow Corning PV-804 (black or white)
- Bypass Diode TE 2213713-1
- Thermal Interface Material TE 2213728-1
- Back sheet
voltage of 1000 V dc) Krempel AKALIGHT CMF 377 (maximum rated system
- Back sheet Dunmore DS-375
- Back sheet Dunmore DS-475
- Back sheet Dunmore DS-450 (maximum rated system voltage of 1000 V dc)

3. REQUIREMENTS

3.1. Design and Construction

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

3.2. Ratings

- Rated voltage, box: 1500 V dc
- Rated impulse voltage, box: 16 kV
- Rated Module working voltage: < 45 V
- Pollution degree: 3 (2 inside of enclosure)
- Rated reverse current: 30 A
- Rated bypass current (Isc) see TÜV Rheinland certification
 - PVEDGExXxXxTXx (15amps, Without Thermal Interface Material (TIM))
 - PVEDGExXxXxVXx (17amps, With Thermal Interface Material(TIM))
- Operating temperature: -40 to 115 °C **
- Storage temperature: -40 to 85 °C
- Degree of protection: IP65 and IP67
- Wire size 4 mm² (12AWG) stranded wire via TE PV4-S1 Connectors
 ** 85 °C ambient temperature plus heating by current (30 °C Maximum)

3.3. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

Test Description	Requirement	Procedure
Examination of product	Meets requirements of product drawing and Application Specification	IEC 60512-1-1, Test 1a IEC 60512-1-2, Test 1b
ELECTRICAL		
Dielectric Strength	8000 V rms, 1 min. No Breakdown or flashover	IEC 62790 5.3.6(b)
Wet leakage current	Water/wetting agent shall have a resistivity of 3500 Ω/cm or less at a temperature of 22 ± 2 °C. R > 400 MΩ at 1500 volts DC.	IEC 62790 5.3.16
Overall resistance (DC)	Resistance for each contact point: < 5 mΩ	IEC 60512-2-2, Test 2b (1A dc)
Bypass-Diode thermal test per IEC 62790	T _{amb} =75 ± 5 °C I ₁ ; I ₂ =1.25 times I ₁ ; 1 h each; no physical damage	IEC 62790 5.3.18

Test Description	Requirement	Procedure
Bypass-Diode thermal test per IEC 61215	$T_{amb}=75 \pm 5 \text{ }^\circ\text{C}$, 96 hr I1; I2=1.25 times I1, 1 h; no physical damage	IEC 61215 10.18
Current carrying capacity	$I_{max}/Box = 17 \text{ A}$ $\Delta T = 30 \text{ }^\circ\text{C max}$	IEC 60512-5-1, Test 5a (replace diode with 16AWG wire)
MECHANICAL		
Foil retention force for contact rail assembly	Retention force min. 4 N (0.9lbf)	Steel gauge: 5 mm x 0.2 mm Surface roughness: Rz 2.0 μm Test speed 25 mm/min
Protection Degree	IP65 and IP67 then dielectric strength	IEC 60529
Strain relief	89 N (20lbf), straight pull	UL 3730, Section 25 Time of testing: 60 s
Cold Impact (UL)	6.78 J (5ft-lb) / 51 mm (2") steel ball 535 g (1.18 lb) falling 1.295 m (51 ")	UL 3730, Section 28, 0 $^\circ\text{C}$
Tension and torque	Tensile force 30 N (6.7 lbf), Apply force 50 times, Displacement $\leq 2 \text{ mm}$ (0.08 in) Torque 0.15 Nm (21 ozf-in) Rotation $\leq 45 \text{ }^\circ$.	IEC 62790: 5.3.21.1
Vibration (sinusoidal)	No physical damage. No discontinuities greater than $t > 1 \mu\text{s}$ Freq. 10-60 Hz \Rightarrow 0.7 mm (pk/pk) 60-500 Hz/5g 2.5 h per axis 3 axis direction 1 Oct./min	IEC 60512-6-4, test 6d
ENVIRONMENTAL		
Temperature Life	240 Hours @ 85 $^\circ\text{C}$ No physical damage	EIA 364-17, Method A
Thermal Cycle, 50 cycles	$I = 17 \text{ A}$ No physical damage. Maximum over all resistances must not be exceeded.	IEC 62790; 5.3.9 (.3) $T_a = -40 \text{ }^\circ\text{C}$ $T_b = 85 \text{ }^\circ\text{C}$ Number of cycles: 50
Thermal Cycle, 200 cycles	$I = 17 \text{ A}$ No physical damage. Maximum over all resistances must not be exceeded.	IEC 62790; 5.3.9 (.2) $T_a = -40 \text{ }^\circ\text{C}$ $T_b = 85 \text{ }^\circ\text{C}$ Number of cycles: 200
Humidity freeze	No physical damage. Maximum over all resistances must not be exceeded. No discontinuities $> 1 \mu\text{S}$ No physical damage	IEC 62790; 5.3.17 Temperature: 85 $^\circ\text{C}$ Temperature: -40 $^\circ\text{C}$ Rel. humidity: 85 % Number of cycles: 10
Damp heat	No physical damage	IEC 60068-2-78 Temperature 85 $^\circ\text{C}$ Rel. humidity: 85 % Duration: 1000 h
Salt mist	14 Days at position of use No physical damage	IEC 60068-2-11 Ka

Test Description	Requirement	Procedure
Rapid change of temperature	No physical damage	IEC 60512-11-4 test 11d Ta = -40 °C Tb = 85 °C ta = 15 min. tb =15 min. Time of cycles tzyk = 30 minutes Number of cycles: 100

Figure 1



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.

3.4. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)										
	1	2	3	4	5	5a	6 (d)	7 (c,d)	8 (c)	9(d)	10
	Test Sequence (b)										
Examination of product	1, 6	1, 8	1, 10	1, 7	1, 8	1, 7	1, 7	1, 6	1, 4	1, 3	1, 3
Dielectric Strength		3, 6	3, 8	2, 5	2, 6	2, 5					
Wet leakage current	5	7	9	6	7	6	6		3		
Bypass-Diode per IEC 62790 (e)	3										
Bypass Diode per IEC 61215 (e)											2
Overall resistance (DC)	2, 4	2, 5	2, 7				2, 5	2, 5			
Current carrying capacity								3			
Foil retention force for contact rail assembly										2	
Protection Degree (IP6x)						4					
Protection Degree (IPx7)					5						
Protection Degree (IPx5)					4						
Tension and torque							3				
Strain relief			6								
Cold impact (UL)									2		
Vibration (sinusoidal)								4			
Temperature Life					3	3					
Thermal Cycle, 50 cycles			4								
Thermal Cycle, 200 cycles		4									
Humidity Freeze			5								
Damp heat				4							
Salt mist							4				
Rapid change of temperature				3							

Figure 2


NOTE

- (a) The samples shall be prepared in accordance with product drawings. They shall be selected at random from current production. Test Groups 2,3,4,5,5a,6,7,8,9,10 shall consist of:
Three of each 3-2306314-1, 3-2306314-2, 3-2306314-5 (S-Clip, Flap type with TIM tested on Glass-Glass panels, Test Group 9 shall not be mounted on panels)
Three of each 3-2306317-1, 3-2306317-2, 3-2306317-5 (Ω Clip, Non Flap type with TIM tested on Glass-Back sheet panels, Test Group 9 shall not be mounted on panels)
For Test Group One, Three of each 3-2306314-1, 3-2306314-2, 3-2306314-5 (S-Clip, Flap type **with TIM** tested on Glass-Glass panels), rated test current is **17 amps**.
For Test Group One, Three of each 1-2306317-1, 1-2306317-2, 1-2306317-5 (Ω Clip, Non Flap type **without TIM** tested on Glass-Back sheet panels), rated test current is **15 amps**.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Samples can be prepared on Polycarbonate sheets in place of glass-glass or glass-back sheet for safety.
- (d) Testing not performed by TÜV Rheinland as part of approval. Testing performed by TE.
- (e) By-pass diode tests performed with single SL2020A diode.

4. CERTIFICATION

The PV Edge product line has been reviewed for agency evaluation and approval to standards UL3730 and IEC-62790 per the following:

SOLARLOK PV Edge junction boxes are component recognized by Underwriters Laboratory, Inc. in file E321923 Volume 5. Product has been evaluated per the UL3730 standard.

SOLARLOK PV Edge junction boxes have been tested and certified compliant to IEC-62790 by TÜV Rheinland. Product is contained within TÜV Rheinland certification R60120924.

NOTE

This product is intended to be installed at ambient conditions of 0 °C or above per UL3730 section 28.4 and section 41.9. Product use temperature range is specified within applicable agency certificates.