

1.0 Reference and Address			
Report Number	102393982LAX-002	Original 11-Apr-2016	Revised: 24-Jul-2018
Standard(s)	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703: 2015 Ed.1]		
Applicant	Unirac, Inc	Manufacturer 1	
Address	1411 Broadway Blvd NE Albuquerque, NM 87102	Address	
Country	USA	Country	
Contact	Klaus Nicolaedis Tom Young	Contact	
Phone	505-462-2190 505-843-1407	Phone	
FAX	NA	FAX	
Email	<a href="mailto:klaus.nicolaedis@unirac.com">klaus.nicolaedis@unirac.com</a> <a href="mailto:jasonm@unirac.com">jasonm@unirac.com</a>	Email	
Manufacturer 2			
Address			
Country			
Contact			
Phone			
FAX			
Email			

<b>2.0 Product Description</b>	
Product	Photovoltaic Mounting System, Sun Frame Microrail - Installed Using Unirac Installation Guide, Rev PUB05JUL18 with Annex North Row Extension Installation Guide Rev PUB19JUL18
Brand name	Unirac
Description	<p>The product covered by this report is the Sun Frame Micro Rail roof mounted Photovoltaic Rack Mounting System. This system is designed to provide bonding and grounding to photovoltaic modules. The mounting system employs anodized or mill finish aluminum brackets that are roof mounted using the slider, outlined in section 4 of this report. There are no rails within this product, whereas the 3" Micro Rail, Floating Splice, and 9" Attached Splice electrically bond the modules together forming the path to ground.</p> <p>The Micro Rails are installed onto the module frame by using a stainless steel bolt anodized with black oxide with a stainless type 300 bonding pin, torqued to 20 ft-lbs, retaining the modules to the bracket. The bonding pin of the Micro Rail when bolted and torqued, penetrate the anodized coating of the photovoltaic module frame to contact the metal, creating a bonded connection from module to module.</p> <p>The grounding of the entire system is intended to be in accordance with the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems. Any local electrical codes must be adhered in addition to the national electrical codes. The Grounding Lug is secured to the photovoltaic module, torqued in accordance with the installation manual provided in this document.</p> <p>Other optional grounding includes the use of the Enphase UL2703 certified grounding system, which requires a minimum of 2 micro-inverters mounted to the same rail, and using the same engage cable.</p>
Models	Unirac SFM

2.0 Product Description	
Model Similarity	NA
Ratings	<p><b>Fuse Rating:</b> 30A</p> <p><b>Module Orientation:</b> Portrait or Landscape  <b>Maximum Module Size:</b> 17.98 ft<sup>2</sup>  <b>UL2703 Design Load Rating:</b> 33 PSF Downward, 33 PSF Upward, 10 PSF Down-Slope            Tested Loads - 50 psf/2400Pa Downward, 50psf/2400Pa Uplift, 15psf/720Pa Down Slope            Trina TSM-255PD05.08 and Sunpower SPR-E20-327 used for Mechanical Loading</p> <p>Increased size ML test:  <b>Maximum Module Size:</b> 22.3 ft<sup>2</sup>  <b>UL2703 Design Load Rating:</b> 113 PSF Downward, 50 PSF Upward, 30 PSF Down-Slope            LG355S2W-A5 used for Mechanical Loading test.  <b>Mounting configuration:</b> Four mountings on each long side of panel with the longest span of 24"  <b>UL2703 Design Load Rating:</b> 40 PSF Downward, 40 PSF Upward, 10 PSF Down-Slope            LG360S2W-A5 and LG355S2W-A5 used for used for Mechanical Loading test.  <b>Mounting configuration:</b> Six mountings for two modules used with the maximum span of 74.5"</p> <p>Fire Class Resistance Rating:            - Class A for Steep Slope Applications when using Type 1 Modules. Can be installed at any interstitial gap. Installations must include Trim Rail.            - Class A for Steep Slope Applications when using Type 2 Modules. Can be installed at any interstitial gap. Installations must include Trim Rail.            - Class A Fire Rated for Low Slope applications with Type 1 or 2 listed photovoltaic modules. This system was evaluated with a 5" gap between the bottom of the module and the roof's surface</p> <p><i>See section 7.0 illustration # 1 and 1a for a complete list of PV modules evaluated with these racking systems</i></p>
Other Ratings	NA

<b>7.0 Illustrations</b>	
<b>Illustration 1- Other ratings</b>	
<b>Evaluated Module List</b> xxx = power in Watts	
<b>Manufacturer</b>	<b>Model</b>
Aleo	P18/P19/S18/S19/S59/S79.
Auxin	AXN6M610Txxx, AXN6P610Txxx, AXN6M612Txxx, AXN6P612Txxx.
Axitec	AXIblackpremium 60 (35mm), AXIpower 60 (35mm), AXIpower 72 (40mm), AXIpremium 60 (35mm), AXIpremium 72 (40mm).
Boviet	BVM6610, BVM6612, BNM6612
BYD	P6K Series (35mm)
Canadian Solar	CS6V-xxxM, CS6P-xxxP, CS6K-xxxM, CS5A-xxxM, CS6K-xxxMS CS6U-P, CS6U-M, CS6X-P, CS6K-MS, CS6K-M, CS6K-P, CS6P-P, CS6P-M, CS3U-P, CS3U-MS, CS3K-P, CS3K-MS, CS1K-MS, CS3K, CS3K, CS3U, CS3U-MB-AG, CS3K-MB-AG, CS3K-MB-AG, CS6K, CS6U, CS3L and CS3W
Centrsolar America	C and E series.
Certainteed	CTxxxMxx-01, CTxxxPxx-01, CTxxxMxx-02    Where "xx" denotes frame and backsheet color.
Eco Solargy	ORION 1000 ECOXXH156P-60, APOLLO 1000 ECOXXT156M-60, and APOLLO 1000 ECOXXA156M-60.
GCL	40mm frame: GCL-P6/72 35mm frame: GCL-P6/72, GCL-P6/72H, GCL-M6/72, GCL-M6/72H 35mm frame (Black frame): GCL-P6/60, GCL-M6/60
Hansol	TD-AN3 (40mm), TD-AN4, UB-AN1 (35mm), UD-AN1 (40mm)
Heliene	36M, 60M, 72M, 60P, and 72P.
Hyundai	KG, MG, TG, RI, RG, TI and KI series (35mm and 40mm).
ITEK	iT-xxx, iT-xxx-HE, iT-xxx-SE, iT-xxx-SE-72 (40mm).
JA Solar	JAP6 60-xxx, JAM6-60-xxx/SI, JAM6(K)-60/xxx, JAP6(k)-72-xxx/4BB, JAP72SY-xxx/ZZ, JAP6(k)-60-xxx/4BB, JAP60SY-xxx/ZZ, JAM6(k)-72-xxx/ZZ, JAM72SY-xxx/ZZ, JAM6(k)-60-xxx/ZZ, JAM60SY-xxx/ZZ. i. YY: 01 white backsheet, 02 black backsheet, 03 half-cell and white backsheet ii. ZZ: SC standard cell, PR = perc, BP = bifacial, HiT = HIT, IB = IBC, MW = MWT
Japan Solar	JPS-xxxP-60 (35mm), JPS-xxxM-60 (35mm), JPS-xxx-P-72 (40mm), JPS-xxxM-60-BB (35mm), JPS-xxx-P-72-BB (40mm)
Jinko	JKM xxx P-60, JKM xxx PP-60, JKM xxx M-60, JKM xxx M-60B, JKMS xxx PP-60 JKMS xxx P-60, JKMSxxx-72, JKMxxxP-72, JKMSxxxP-72, JKMxxxM-72, JK07A (JKMSxxxPP-60 & JKMSxxxPP-72), JK07B (JKMSxxxPP-60)
Hanwha Q-Cells	G3, L-G4 and L-G2, Q.PLUS G4 xxx, Q.PLUS BFR G4.1/TAA xxx, Q.PLUS BFR, G4.1/MAX xxx, Q.PLUS BFR G4.1 xxx, Q.PRO-G4 xxx, Q.PRO EC-G4.4 xxx, Q.PRO BFR G4 xxx, Q.PRO BFR G4.1 xxx, Q.PRO BFR G4.3 xxx, Q.PEAK-G4.1 xxx Q.PEAK- G4.1/MAX xxx, Q.PEAK BLK G4.1 xxx, Q.PEAK-G4.1/TAA xxx Q.PEAK BLK G4.1/TAA xxx, B.LINE PRO BFR G4.1 xxx, B.LINE PLUS BFR G4.1 xxx, B.LINE PRO BFR G4.1 xxx, Q.PEAK DUO-G5-xxx, Q.PEAK DUO-G5.X-xxx and Q.PEAK DUO BLK-G5-xxx Q.PEAK L G4.2, Q.PLUS L G4.2, Q.PLUS L G4.1 -35mm, Q.PLUS L G4 - 35mm, Q.PRO L G4 -35mm, Q.PRO L G4.1 - 35mm, Q.PRO L G4.2 - 35mm, B.LINE PLUS L G4.2 - 35mm, B.LINE PRO L G4.1 - 35mm, B.LINE PRO L G4.2 - 35mm, Q.PLUS L-G4.2/TAA -35mm, Q.PEAK DUO L-G5.2
Kyocera	KU26x-6MCA where x is 0 or 5.

<b>7.0 Illustrations</b>	
<b>Illustration 1a - Other Ratings Continue</b>	
LG	LG xxx S1C-A5, LG xxx N1C-A5, LGxxxQ1C(Q1K)-A5, LGxxxN1C(N1K)-A5, LGxxxS1C-A5, LGxxxA1C-A5, LGxxxN2T-A4, LGxxxN2T-A5, LGxxxN2W-A5, LGxxxS2W-A5, LGxxxE1C-A5, LGxxxN1C(N1K)-G4, LGxxxN2W-G4, LGxxxS2W-G4, LGxxxS1C-G4, LGxxxE1K-A5
LONGi	LR6-60 (40mm), LR6-72 (40mm), LR6-60 HV (40mm), LR6-72 HV (40mm), LR6-60 PH (40mm), LR6-72 PH (40mm), LR6-60 PE (40mm), LR6-72 PE (45mm), LR6-60 BK (40mm Black frame), LR6-72 BK (40mm Black frame), LR6-60 PB (40mm Black frame), LR6-72 PB (45mm Black frame) Number in paranthesis signifies frame profile height.
Mission Solar	MSE series
Mitsubishi	MJE, MLE
NSP	D6M and D6P
Panasonic	VBHNxxxSA16/VBHNxxxSA16B, VBHNxxxSA15/VBHNxxxSA15B, VBHNxxxKA01, VBHN SA17/18/KA03/04
REC Solar	PEAK Energy Series, PEAK Energy BLK2 Series, PEAK Energy 72 Series TWINPEAK 2 SERIES, TWINPEAK 2 BLK2 SERIES, TWINPEAK SERIES
Renesola	Virtus II with module ratings of 250-260 in increments of 5. 156 series with module ratings of 270-275.
S-Energy	SN3xxM-10/SN3xxP-10 (40mm), SNxxxM-10/SN2xxP-10 (40mm), SNxxxP-15 (40mm)
Seraphim	SEG-6PA-XXXWB (XXX=280 to 335), SEG-6PA-XXXBB (XXX=280 to 335), SEG-6PB-XXXWW (XXX=240 to 275), SEG-6PB-XXXWB (XXX=240 to 275), SEG-6PB-XXXBB (XXX=240 to 275), SEG-6MA-XXXWW (XXX=290 to 370), SEG-6MA-XXXWB (XXX=290 to 370), SEG-6MA-XXXBB (XXX=290 to 370), SEG-6MB-XXXWW (XXX=250 to 305) SEG-6MB-XXXWB (XXX=250 to 305), SEG-6MB-XXXBB (XXX=250 to 305) SEG-E01A-XXX (XXX=325 to 400), SEG-E01B-XXX (XXX=275 to 330) SEG-E11A-XXX (XXX=325 to 385), SEG-E11B-XXX (XXX=275 to 320) SRP-XXX-6QA-WX-XX (XXX=345 to 370) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QA-BX-XX (XXX=345 to 370) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QB-WX-XX (XXX=280 to 300) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QB-BX-XX (XXX=280 to 300) (XX=40 or 50 mm) (X=B or S for Black or Silver frame)
Sharp	60 and 72 NUSA-xxx/NUSC-xxx
Silfab	SLA-M and SLG-M
Solaria	PowerXT-xxxy-zz where xxx is power in watts y is module size (R for residential, C for commercial) zz is other PowerXT-xxxy-zz all share the same rail profiles
SunEdison/ Flextronics	F-Series / FXS, R-Series / FXS
Suniva	MVX xxx-60, OPT xxx-60-4-100
Sunpower	E20-xxx-COM, X21-xxx, X22-360-C-AC. **Evaluated with both the G3 and G5 frame** SPR-P17-xxx-COM (xxx: module power rating)
Suntech	STP 35/40

<b>7.0 Illustrations</b>	
<b>Illustration 1ab - Other Ratings Continue</b>	
Talesun	TP572, TP596, TP654, TP660 (35mm/40mm), TP672, Hipor M350+ (40mm), Talesun Smart (35mm) M = Mono P = Poly B = Black T = Transparent (H) = 1500V without (H) is 1000V
Trina Solar	TSM-xxx PA05.08, TSM-xxx PD05.10, TSM-xxx PD05.08, TSM-xxx DD05.08 TSM-xxx DD05A.05(II), TSM-xxx DD05A.05(II), TSM-DD14/PE14/PD14, TSM- DE14
Upsolar	UP-MxxxP, UP-MxxxP-B, UP-MxxxM, UP-MxxxM-B
Yingli	YL xxx P-29b, YLM 60, YLM 72
Winaico	WST (35mm), WSP (40mm)