



UL Solutions Evaluation Report

UL ER346702-06

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UL Category Code: ULFD – Roof and Wall Specialties and Accessories

CSI MasterFormat®

DIVISION: 07 00 00 - Thermal and Moisture Protection
Sub-level: 07 72 00 - Roof Accessories

DIVISION: 26 00 00 - Electrical
Sub-level 26 31 00 - Photovoltaic Collectors

Company:

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1. Subject

Tesla Panel Mount - COMP RAFTER
Tesla Panel Mount - TILE RAFTER
Tesla Panel Mount - FLAT



2. Scope of evaluation

- 2024, 2021, and 2018 *International Building Code*® (IBC)
- 2024, 2021, and 2018 *International Residential Code*® (IRC)
- 2024, 2021 and 2018 *International Fire Code*® (IFC)
- 2023, 2020, and 2017 *NFPA 70 National Electrical Code*® (NEC)
- 2023 and 2020 Florida Building Code (FBC)
- 2025, 2022 and 2019 California Building Code (CBC)

The products were evaluated for the following properties:

- Electrical grounding and bonding to UL 2703
- Fire classification to UL 2703 (Class A with PV modules rated fire Type 1 and 2 only)
- Mechanical loading to UL 2703
- Wind driven rain resistance to TAS No. 100

3. Reference documents

- ANSI/UL 1703, Standard for Flat-Plate Photovoltaic Modules and Panels
- ANSI/UL 2703, Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground lugs for Use with Flat-Plate Photovoltaic Modules and Panel
- ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures
- IEC 61730-1 Photovoltaic (PV) Module safety qualification – Part 1: Requirements for construction
- IEC 61730-2 Photovoltaic (PV) Module safety qualification – Part 2: Requirements for testing
- National Design Specification for Wood Construction (NDS)
- TAS No. 100: Test Procedure for Wind and Wind Driven Rain Resistance – modified (110 mph @ 8.8 in/h water spray)

4. Uses

The **Comp Rafter** mounting system is designed specifically for mounting photovoltaic modules on wood framed roof assemblies that have composition shingle roofing material.

The **Tile Rafter** mounting system is designed specifically for mounting photovoltaic modules on wood framed roof assemblies that have flat and round tile roofing material.

The **Flat** mounting system is designed specifically for mounting photovoltaic modules on flat wood framed roof assemblies that have mod bit/rolled roofing and foam roofing material.

The mounting systems employ aluminum framed photovoltaic modules with the Tesla Groove system, specifically compatible modules are listed in Table 1. The mounting systems may be utilized in high wind areas such as Florida, including High Velocity Hurricane Zones (HVHZ), see Section 6 of this report for structural design requirements.

5. Product Description

Comp Rafter system is comprised of following components - Comp Rafter Base Assembly (P/N 2023000-XX-X), Leveling Foot Assembly (P/N 2032169-XX-X), and Interlock (P/N 1576999-00-X). See Figure 1: Comp Rafter Mounting Base Assembly.

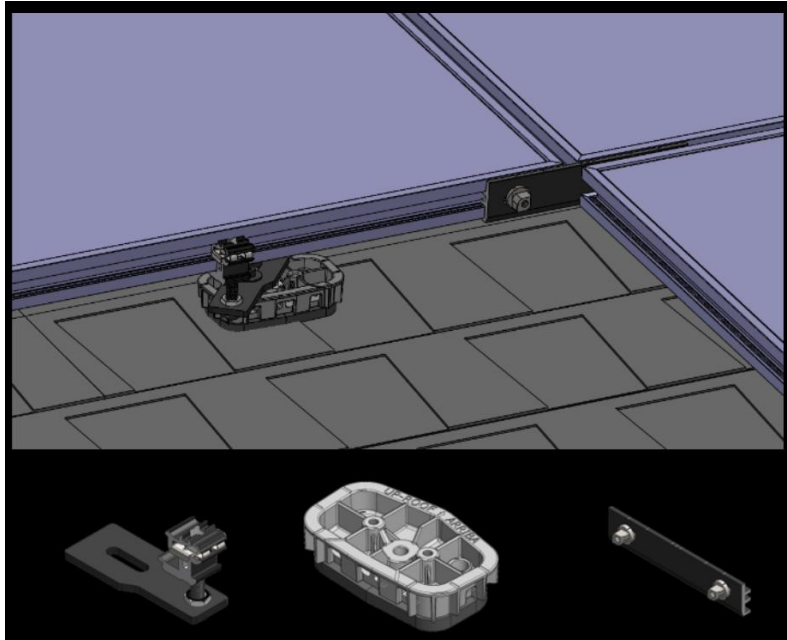


Figure 1: Comp Rafter Base Mounting Assembly

Tile Rafter system is comprised of following components – Tile hook (P/N 2125722-00-X or 2262305-00-X), Spanner Bar (P/N 2129978-01-X, 2129978-02-X, 2129978-03-X), Spanner Splice (P/N 2129977-00-X), Interlock (P/N 1576999-00-X), Hybrid Interlock (P/N 1578969-00-X), Flat tile Leveling Foot Assembly (P/N 2177129-00-X), and Round tile Leveling Foot Assembly (P/N 2133094-00-X). See Figure 2: Tile Rafter Mounting Hook Assembly.

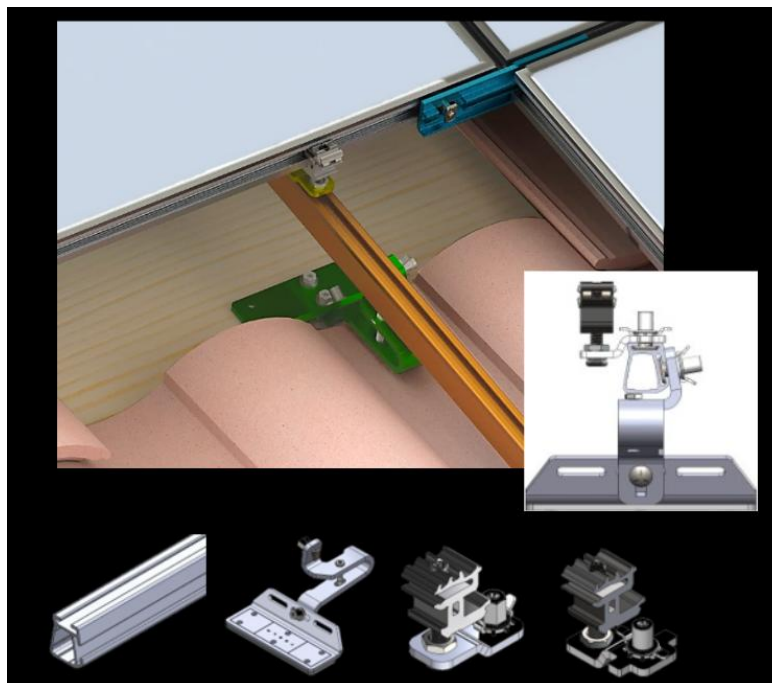


Figure 2: Tile Rafter Base Mounting Hook Assembly (for flat and round tile)

Flat system is comprised of following components – Lag screw (P/N 2291585-00-X or 2291586-00-X), Base Foot (P/N 1577562-00-X), Mechanical Tubing (P/N 1577385-00-X), Cross Brace Assembly (P/N 1576606-00-X), Post mount assembly (P/N 2233066-00-X), Spanner Bar (P/N 2129978-0-X, 2129978-02-X or 2129978-03-X), Spanner Splice (P/N 2129977-01-X), and Leveling Foot Assembly (P/N 2133094-00-X). See Figure 3: TPM-Flat Assembly.

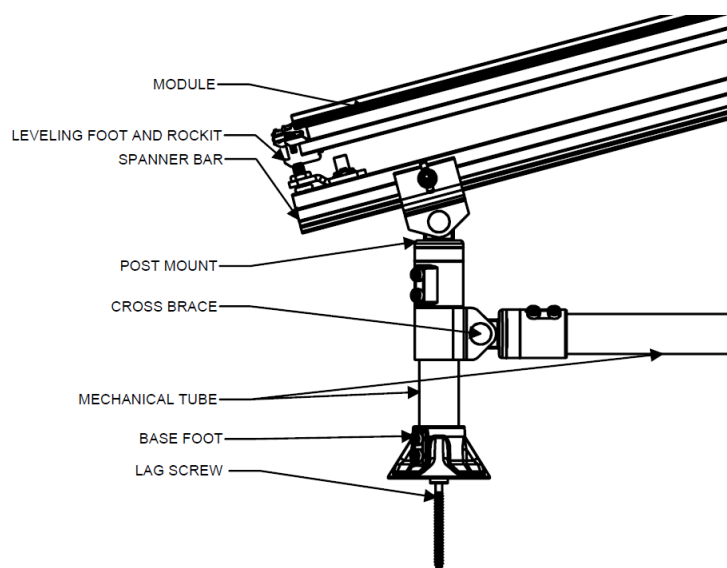


Figure 3: TPM-flat assembly (Post mount, Cross Brace)

6. Design

A structural designer or other qualified person acceptable to the Authority Having Jurisdiction must calculate the applicable design forces and relevant load combinations for the system from the applicable code and compare against the load ratings for the attachment as listed in this report. The designer must analyze the wood framing members for the applicable design forces and load combinations from the applicable code and then compare connection capacity in accordance with the National Design Specification for Wood Construction (NDS).

Maximum design uplift, downforce, and lateral (down slope)load values for the system were determined from test data and calculated values from test data, see Table 2, Table 3 and Table 4 Design Load Rating. Attachment patterns or spacings for the mounting system shall be determined based on site-specific parameters and solar module and PV array geometry, building and roof geometry and siting, and any applicable design loads (e.g., dead, wind, and snow loading).

For HVHZ regions, the following is prescribed by the FBC.

- Wind loads calculated per ASCE 7 Chapter 29
- Minimum Exposure Category C; Exposure Category D (as applicable)
- Miami-Dade County Wind Speeds Broward County Wind Speeds

Risk Category 1 = 165 mph	Risk Category 1 = 156 mph
Risk Category 2 = 175 mph	Risk Category 2 = 170 mph
Risk Category 3 = 186 mph	Risk Category 3 = 180 mph
Risk Category 4 = 195 mph	Risk Category 4 = 185 mph

7. Installation

Installation of mounting systems as described in this report shall comply with this report and the manufacturer's published installation instructions. The installation instructions are to be available at the job site during installation.

Installation of mounting systems as described in this report except Flat mounting system is limited to roofs having a minimum slope of 2:12 to a maximum slope of 12:12.

Installation of Flat mounting system is limited to roofs having a minimum slope of 0:12 to a maximum slope of 2:12. Refer to installation instructions specific to identified roof type to ensure correct installation to the roof rafters. The Flat mounting system installation requires that the base of the post must be bearing on the roof sheathing, requiring any insulation to be cored out of roof assemblies, see installation manual for more information.

8. Condition of use

The mounting systems described in this report comply with those codes listed in Section 2 of this report, subject to the following conditions:

- 8.1** Materials and methods of installation shall comply with this report and the manufacturer's published installation instructions. In the event of a conflict between the installation instructions and this report, this report governs.
- 8.2** A registered design professional's report demonstrating compliance with the applicable code, as referenced in Section 6, shall be provided where required by the authority having jurisdiction.
- 8.3** Manufacturer's installation instructions shall be provided to the code official upon request for inspection purposes.
- 8.4** The Mounting Systems in this report shall be installed only by professional personnel trained and approved by the manufacturer.
- 8.5** Photovoltaic modules supported by the modular mounting system shall be listed and labeled in accordance with UL 1703 or both UL 61730-1 and UL 61730-2. Rooftop mounted photovoltaic panel systems must comply with the following Code editions as applicable.

Code Version	Code Section
IBC – 2018, 2021, and 2024	1505.9, 3111.3
IRC - 2018, 2021, and 2024	R329.3, R902.4
FBC – 2020 and 2023	1505.9, 1620, 3111.3
CBC- 2019, 2022 and 2025	1505.9, 3111.3

- 8.6** Installation of photovoltaic modules must comply with following Code editions as applicable.

Code Version	Code Section
IFC - 2018	1204
IFC – 2021 and 2024	1205
NEC – 2017, 2020 and 2023	690

- 8.7** See UL Online Certification Directory for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels ([QIMS](#)) for certification of mounting systems in this report.

- 8.8** Wood framing members shall be predrilled for installation of lag screws in conformance with the applicable sections of the National Design Specification for Wood Construction (NDS) and the manufacturer's installation instructions (7/32 inch pilot hole). Edge and end distances of the lag screw in the wood framing member shall be sufficient to prevent unusual splitting and not less than the requirements of the applicable Tables of the National Design Specification for Wood Construction (NDS).
- 8.9** The Tesla Inc. Comp, and Tile Rafter, and TPM Flat mounts are manufactured under the UL Solutions Certification and Follow-Up Service Program, which includes audits in accordance with the quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC10.

9. Supporting Evidence

- 9.1** Manufacturer's descriptive product literature:
- Tesla Panel Mount - Comp Rafter Installation Manual, and Technical Bulletin (DOC-0034764).
 - Tesla Panel Mount - Tile Rafter Installation Manual, and Technical Bulletin (DOC-0037353).
 - Tesla Panel Mount - Flat Installation Manual, and Technical Bulletin (DOC-0039098).
- 9.2** UL test reports and Listing, UL File E346702, in accordance with ANSI/UL 2703 for grounding and bonding, fire performance and mechanical loading. See UL Product Certification Category for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels – UL Product iQ ([QIMS](#)).
- 9.3** Resistance to water infiltration data utilizing TAS No. 100: Test Procedure for Wind and Wind Driven, testing conducted by ISO/IEC 17025 accredited test lab.

10. Identification

The **Tesla Inc.** Comp, Tile and Flat mounting systems described in this evaluation report are identified by markings bearing the report holder's name (Tesla Inc.), the plant identification, if applicable the UL Listing Mark, and the evaluation report number **UL ER346702-06**. The validity of the evaluation report is contingent upon this identification appearing on the product or on the smallest unit container in which the product is packaged.

11. Use of UL Evaluation Report

- 11.1** The approval of building products, materials or systems is under the responsibility of the applicable authorities having jurisdiction.
- 11.2** UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.
- 11.3** The current status of this report, as well as a complete directory of UL Evaluation Reports may be found at [UL.com](#) via our On-Line Certifications Directory.
- 11.4** Comprehensive guidance for design and installation of solar photovoltaic systems and associated equipment is beyond the scope of this document. For support on these topics, refer to a contractor, system designer, building official or registered design professional, as appropriate, or where required by the Authority Having Jurisdiction. Evaluation of existing structures for structural sufficiency and code compliance is beyond the scope of this report. It shall be the responsibility of the installer to investigate and comply with all local building code requirements and criteria as may be applicable to the installation of Comp Rafter to an existing structure.

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Table 1: Compatible Photovoltaic Modules with Tesla Groove used in all mounting systems as described in this report.

Manufacture	Model	R/C QIMS2 Frame Profile
Hanwha Q-Cells	Q.PEAK DUO BLK ML-G10.a+/TS XXX (XXX=395–415)	700-0290
	Q.PEAK DUO BLK ML-G10+/TS XXX (XXX=395–415)	
Tesla Inc.	TSP-4XX (4XX=405-430)	

Table 2 : Design Level (ASD) Load Rating per ANSI/UL 2703 Mechanical Listing for **Comp Rafter** Mounting System

Hanwha Q-Cells: Q.PEAK DUO BLK ML-G10+/TS & Q.PEAK DUO BLK ML-G10.a+/TS Systems					
Panel Securement Configuration	Horizontal Span (in)	Allowable Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	72	24	27.6	30.0	11.8
	64	22	31.1	36.7	13.2
	48	16	41.5	50.0	17.6
	32	10.5	62.2	73.3	26.4
	24	8	82.9	85.0	35.3
	16	6	85.0 ¹	85.0 ¹	37.0 ¹
Portrait ²	64	22	15.0	15.0	7.2
	48	16	20.0 ¹	20.0 ¹	8.0 ¹
	32	11	20.0	20.0	8.0
	24	8	20.0	20.0	8.0
	16	6	20.0	20.0	8.0
Tesla Inc.: TSP-4XX Systems					
Panel Securement Configuration	Horizontal Span (in)	Allowable Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	72	26	25.5	38.4	10.8
	64	24	28.7	43.6	12.2
	48	18	34.8	54.0	16.2
	32	13	51.6	58.0	24.4
	24	14	60.0	60.0	30.0
	24	12	60.0	60.0	32.5
	16	6	60.0 ¹	60.0 ¹	37.0 ¹
Portrait ²	48	16	20.0 ¹	20.0 ¹	8.0 ¹
	32	11	20.0	20.0	8.0
	24	8	20.0	20.0	8.0
	16	6	20.0	20.0	8.0

Note ¹: Load rating values determined in accordance with UL 2703 by UL Solutions

Note ²: Landscape configuration – mounting means secured to the modules long-side frame
Portrait configuration – mounting means secured to the module's short-side frame

Table 3: Design Level (ASD) Load Rating per ANSI/UL 2703 Mechanical Listing for **Tile Rafter** Mounting system

Hanwha Q-Cells:							
Q.PEAK DUO BLK ML-G10+/TS & Q.PEAK DUO BLK ML-G10.a+/TS Systems							
Panel Securement Configuration	Vertical Span (in)	Horizontal Span (in)	Allowable Vertical Cantilever (in)	Allowable Horizontal Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	52	72	24	26	20.9	20.9	13.1
	52	64	22	26	23.5	23.5	14.7
	52	48	16	26	31.4	31.4	19.6
	52	32	11	26	47.1	47.1	29.4
	52	24	8	26	62.8	62.8	39.2
	52	16	6	26	85.0 ¹	85.0 ¹	58.8 ¹
Portrait ²	52	48	16	26	17.8	20.0	15.7
	52	32	11	26	26.6	30.0	23.6
	52	24	8	26	35.5 ¹	42.0 ¹	31.4 ¹
Tesla Inc.: TSP-4XX Systems							
Panel Securement Configuration	Vertical Span (in)	Horizontal Span (in)	Allowable Vertical Cantilever (in)	Allowable Horizontal Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	52	72	26	26	19.7	20.9	13.1
	52	64	24	26	22.2	23.5	14.7
	52	48	18	26	29.6	31.4	19.6
	52	32	13	26	44.4	47.1	29.4
	52	24	14	26	54.6	57.9	36.2
	52	24	12	26	59.1	60.0	39.2
	52	16	6	26	60.0 ¹	60.0 ¹	58.8 ¹
Portrait ²	52	48	16	26	18.6	27.2	16.5
	52	32	11	26	27.0	28.8	24.7
	52	24	8	26	27.0	28.8	32.9

Note ¹: Load rating values determined in accordance with UL 2703 by UL Solutions

Note ²: Landscape configuration – mounting means secured to the modules long-side frame
 Portrait configuration – mounting means secured to the module's short-side frame

Table 4: Design Level (ASD) Load Rating per ANSI/UL 2703 Mechanical Listing for **Flat Mounting** system

Hanwha Q-Cells:							
Q.PEAK DUO BLK ML-G10+/TS & Q.PEAK DUO BLK ML-G10.a+/TS Systems							
Panel Securement Configuration	Vertical Span (in)	Horizontal Span (in)	Allowable Vertical Cantilever (in)	Allowable Horizontal Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	72	72	24	26	21.4	22.6	4.6
	72	64	22	26	24.1	25.4	5.1
	72	48	16	26	32.1	33.9	6.8
	72	32	11	26	48.1	50.9	10.3
	72	24	8	26	55.0	67.8	13.7
	72	16	6	26	75.0 ¹	85.0 ¹	20.5 ¹
Portrait ²	72	48	16	26	17.8	18.8	6.8
	72	32	11	26	26.6	28.2	10.3
	72	24	8	26	35.5 ¹	37.5 ¹	13.7 ¹
Tesla Inc.: TSP-4XX Systems							
Panel Securement Configuration	Vertical Span (in)	Horizontal Span (in)	Allowable Vertical Cantilever (in)	Allowable Horizontal Cantilever (in)	Uplift Pressure (PSF)	Downforce Pressure (PSF)	Down Slope Load (psf)
Landscape ²	72	72	26	26	19.7	20.8	4.6
	72	64	24	26	22.2	23.4	5.1
	72	48	18	26	29.6	31.3	6.8
	72	32	13	26	44.4	46.9	10.3
	72	24	14	26	46.8	57.7	12.6
	72	24	12	26	50.7	60.0	13.7
	72	16	6	26	60.0 ¹	60.0 ¹	20.5 ¹
Portrait ²	72	48	16	26	18.6	19.7	6.8
	72	32	11	26	27.0	28.8	10.3
	72	24	8	26	27.0 ¹	28.8 ¹	13.7 ¹

Note ¹: Load rating values determined in accordance with UL 2703 by UL Solutions

Note ²: Landscape configuration – mounting means secured to the modules long-side frame
 Portrait configuration – mounting means secured to the module's short-side frame

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