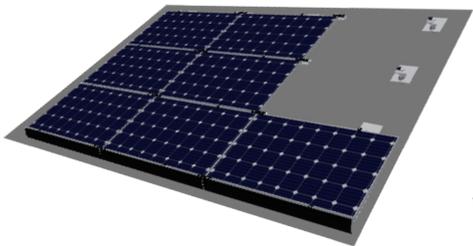




**mounting
systems**

General Installation Manual



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1. Introduction

This manual is intended to provide information regarding usage, handling, construction, safety, maintenance, and other information common to all Mounting Systems, Inc. products. This manual is to be used in conjunction with the product-specific manual relevant to the project. Both this general manual and the product-specific manual are integral parts of the product and should be read and adhered to for every installation.

Please read both manuals carefully prior to any installation, maintenance, or disassembly work. The manuals provide information for the safe performance of these tasks. Should you have any questions after having read these manuals, please contact Mounting Systems at info-us@mounting-systems.com or at our toll-free number 1-855-731-9996. Please refer to our website for further information and details at www.mounting-systems.com.

2. Codes and Standards

When installing any PV system, it is important to be fully cognizant of and to comply with all relevant regulations, codes, and local requirements for the installation. All Mounting Systems products are designed in accordance with and comply with the following codes and practices as they pertain to the particular product:

- International Building Code (IBC) 2012 (or IBC 2009 as determined by the relevant AHJ)
- Ontario Building Code 2012
- ASCE 7-05 Provides requirements for general structural design and includes means for determining dead, live, soil, flood, wind, snow, rain, atmospheric ice, and earthquake loads, and their combinations that are suitable for inclusion in building codes and other documents.
- ASCE 7-10 New release of ASCE 7-05. Provides requirements for general structural design and includes means for determining dead, live, soil, flood, wind, snow, rain, atmospheric ice, and earthquake loads, and their combinations that are suitable for inclusion in building codes and other documents. (New release of ASCE 7-05.)
- ANSI/AISC 360-10 Specifications for Structural Steel Provides design criteria for steel-framed buildings and other structures.
- AISC Steel Construction Manual, 14th Edition Combines all steel specifications for the US including AISC 360-10.
- ACI 318-11 Provides design requirements for structural concrete.
- AF&PA NDS 2012 Provides design requirements for wood construction.
- Aluminum Design Manual 2010 Provides design requirements for aluminum.
- UL *Subject* 2703, Edition 2 Proposed standard for mounting systems, mounting devices, clamping/retention devices, and ground lugs for use with flat-plate photovoltaic modules and panels.
- UL 1703, (Revised Fire Rating) Revised standard to establish fire safety ratings for the combination of PV modules and mounting systems.
- UL 467 Standard for safety grounding and bonding equipment.

3. Installation Personnel

Mounting Systems products are intended to be installed by qualified personnel. Qualified personnel are those who, on the basis of their professional training, are capable of reading, understanding, and complying with installation instructions or, who have received specific instruction on the assembly and installation of the particular Mounting Systems product from qualified personnel.

In order to be qualified, installation personnel must have basic mechanical skills as well as be familiar with and skilled in the use of standard hand tools and power tools as listed in the Required Tools section of the particular Mounting System product installation manual.

Installation personnel must also be capable of assessing the assigned work to identify and mitigate possible dangers.

4. Safety Warnings and Instructions

The following warnings are used in the product-specific installation manuals. Failure to observe and adhere to the safety warning can have the results described below.



DANGER

Indicates the possibility of serious or fatal personal injury and/or major property damage if the specific warning is ignored.



WARNING

Indicates the possibility of severe personal injury and/or substantial property damage if the specific warning is not observed.



CAUTION

Indicates the possibility of relatively less serious personal injury and/or property damage.



ATTENTION

Indicates the possibility of property damage.

5. Safety Instructions

5.1. Intended use

Unless explicitly stated otherwise, Mounting Systems' products are designed exclusively for the installation of PV modules.

The specific mounting systems shall be used only within their defined operating conditions. The concept of intended use also includes compliance with the specifications both within this manual and the respective product-specific installation manual. Mounting Systems shall not be liable for damages caused by the failure to observe the warnings and comply with the instructions in the installation manuals. Mounting Systems shall not be liable for injuries or damage due to incorrect installation, improper use of its products, or use of its products in any way other than as intended.

To ensure that the product remains within the parameters of its intended use, please observe and adhere to the following:

- The mounting system must be installed in accordance with the instructions in this and the product-specific installation manual.
- The mounting system must be installed by qualified personnel as defined herein.
- The mounting system must be, as applicable, transported, stored, installed, assembled, tested, repaired, and operated in accordance with these installation manuals and accepted engineering, mechanical, and other PV installation practices.
- The mounting system is constructed, installed, and operated in accordance with any project-specific technical specifications, drawings, bills of material, and other pertinent documentation provided by Mounting Systems.
- Product modifications and/or deviations from Mounting Systems-supplied documentation may be made only with the explicit consent of Mounting Systems.

- Only genuine, Mounting Systems-supplied or approved products, components, or accessories may be used for installation, operation, or repair purposes.
- The mounting system is inspected and maintained by qualified personnel on an annual basis.
- The design operating conditions and limits of the mounting system must not be exceeded. Mounting Systems shall not be liable for injuries or damage due to these conditions or limits being exceeded.
- The mounting system must not be exposed to environmental conditions which exceed the specified limits of the mounting system, including but not limited to flood, wind (tornadic and otherwise), lightning, and other extreme environmental or meteorological events.
- The mounting system must not be installed in highly corrosive environments or conditions (atmospheric or terrestrial), including the use of components which are galvanically reactive with Mounting Systems' components.



Note:

Any use of a Mounting Systems product which is other than intended will result in forfeiture of any warranty claims.

5.2. Responsibilities of the Installation Supervisor or Contractor

The installation supervisor and/or supervising contractor of the PV system is responsible for ensuring that:

- The installation of the particular PV systems is performed by trained and qualified personnel.
- The installation personnel are familiar with the system components and material.
- Both this manual and the product-specific installation manual are available during the installation.
- The installation manuals, especially the safety instructions, are read and understood by the installation personnel prior to beginning the installation.
- Mounting system connections are installed correctly and tightened per the instructions in the product-specific installation manual.

5.3. Responsibilities of the System Owner or Principal

The owner of the PV system is responsible for:

- Ensuring that the maintenance procedures recommended in the product-specific Installation Manual are performed at the intervals recommended.
- Ensuring that only genuine Mounting Systems parts and assembly material are used for repairs, replacement, or maintenance.

Otherwise, any warranty claims may be denied.

5.4. General Safety Instructions

The following general safety instructions are an important part of this document and are of fundamental importance to the construction and installation of Mounting Systems PV mounting systems.

- Prior to assembly or installation, ensure that the product complies with the relevant soil, environmental, and structural requirements of the site.
- For on-roof systems, ensure that the building can withstand the increased loads caused by the PV installation prior to assembly or installation.
- Prior to accessing the roof, check and ensure the load bearing capacity of all areas subject to load.
- Observe all safety-related codes and regulations.
- Do not transport material via ladders, but by using suitable lifting equipment.
- Take all necessary precautions to ensure that objects do not fall from the roof.
- Wear hard hat, protective gloves, and safety shoes. Where appropriate, use approved safety restraints and harnesses anchored to secure building structural points.
- For the entire duration of the installation, the presence of a second person is essential to provide any necessary assistance and to provide first aid in the event of an emergency.
- Copies of both this manual and the respective product-specific installation instructions must be kept on site.

5.5. Safety Warnings and Cautions



Note:

In addition to the warnings and cautions listed below, please observe the specific safety instructions contained in the pertinent product-specific installation manual.



DANGER

Danger to life from overloading!

Overloading the roof can lead to severe damage to or even collapse of the roof resulting in severe injury or loss of life!

- Prior to any installation work, make sure that the building can withstand the increased loads caused by both the installation work and the PV system itself.
- Do not store the PV system material, especially ballast material centrally, at one position on the roof prior to or during installation.
- Distribute material according to the permissible additional weight on the roof.
- Take adequate measures to prevent damage to the roof surface (e.g. use building protection mats on flat roofs).



DANGER

Danger to life from falling objects!

Objects falling from the roof could lead to severe or fatal injuries.

- Do not perform any work under extremely windy conditions.
- Prior to any installation work, make sure that the material stored or partially installed on the roof is secured against the effects of wind and cannot be displaced or blown off the roof.
- Safeguard the danger area on the ground prior to installation to avoid personal injuries caused by falling objects.
- Do not linger in the danger area on the ground!
- Make sure all parts on the roof are prevented from falling!
- Always wear protective clothing!
- After the installation work, check and ensure attachment of all mounting system components and the PV modules are secured.



DANGER

Danger to life caused by falls!

Falling from the roof could lead to severe or fatal injuries.

- Always use protective equipment including safety and restraint harnesses when working on the roof.



WARNING

Risk of injuries and material damage due to improper inspection, maintenance, or repair!

Improper inspection, maintenance, or repair may impair the operational safety of the photovoltaic system.

- Perform recommended maintenance at the stipulated intervals.
- Ensure that inspection, maintenance and repair work is only implemented by a qualified skilled personnel.



WARNING

Risk of burns.

The module surfaces and metal parts exposed to the sun will be hot.

- Wear gloves and other necessary protective equipment.



CAUTION

Risk of personal injury and material damage due to improper material handling.

Mounting Systems' parts can be heavy, bulky, and sharp-edged. Proper material handling safety precautions should be observed.

- Use suitable precautions to guard against loose clothing or extremities being cut or crushed during material handling and movement.
- Wear protective equipment, including quality work gloves and safety shoes.
- Store material and components in such a way that prevents toppling.
- Do not climb or scale the mounting system.

**CAUTION****Water damage to the building.**

Improperly performed work on the roof can lead to leakage and water damage to the building.

- Observe the respective product-specific installation manual when installing the roof connections.
- Observe all appropriate codes and regulations for roofing and working on roofs.
- Prior to any installation work, assess whether the designated material is suitable for the specific conditions on-site and whether it can be installed properly in compliance with the pertinent rules and regulations. When in doubt, contact a qualified roofer.

**ATTENTION****Damages caused by shipment and transportation.**

Although Mounting Systems takes all reasonable precautions to prevent damage in transit, damage due to mishandling by the carrier may occur. Damages may also be incurred by improper transportation. Damages may impair functionality of the mounting system.

- Upon receipt of the shipment, immediately check for visible damage; if damage is visible, the shipment should be refused and a claim filed with the carrier. Contact the supplier to request replacement parts.
- Large, long, and bulky parts are easily damaged in transit to and at the job site. Exercise care during all receipt, storage, and transshipment operations. If a claim is not filed with the carrier at the time of delivery, neither the supplier nor Mounting Systems (as applicable) will be liable for subsequent damage claims.



ATTENTION

Material damage caused by faulty installation.

Incorrect installation of bolts, Clickstones, T-head bolts, washers, nuts, and other connection parts can cause weakness or instability in the mounting system and lead to damage to or failure of the system.

- Use only the materials supplied by Mounting Systems or materials of equivalent specifications and quality.
- Ensure clamps and other connections are installed in accordance with the instructions in the respective product-specific installation manual.
- If so instructed, tighten the connection to the torque specified in the product-specific installation manual. Under-torqued connections can loosen and lead to product failure.
- Do not over-torque connections. Over-tightening can cause connections to distort or break.
- Check and set power driver torque settings to the specified torque or use a good torque wrench when tightening bolted connections.



ATTENTION

Module damage due to thermal expansion/ contraction

PV Modules can be severely damaged if installed over thermal expansion breaks.

- Do not install PV modules over thermal expansion gaps in the rail.



ATTENTION

Damages to the modules and/or mounting system due to improper disassembly.

Improper disassembly may result in damage to the mounting system and the modules.

- If disassembly is required, contact Mounting Systems for disassembly instructions.
- Disassembly should be undertaken only by skilled, qualified personnel.

6. Delivery

After delivery of the order, unpack it carefully and check that it contains all the parts and materials called out on the bill of materials or delivery documentation. Notify the supplier or Mounting Systems (as appropriate) in the event of discrepancies.

7. Product-Specific Installation Manual

The planning and configuration of a PV system and selection of a suitable mounting system depend largely on the installation site, the building type, and the owner's specific requirements. Consequently, the installation steps are both project-specific and product-specific and can vary significantly. Mounting Systems offers product-specific installation manuals which contain information on

- The permissible conditions for use
- The specific components
- The preparation of the installation
- The secure and complete mechanical installation of the mounting system and the modules

The product specific installation manuals are valid only in combination with this document. In some cases, additional documents (e.g. overview drawings, project-specific assembly drawings, etc.) are referenced in the product-specific installation manuals and the relevant instructions in those documents must be followed.

8. Maintenance

Mounting Systems stipulates yearly maintenance of its PV mounting systems, both to ensure the longevity of the system and repair potential damage or problems at an early stage, thereby avoiding subsequent damages or failure.

Mounting Systems recommends carrying out maintenance in the spring after any snow has thawed. If a year-to-year increase in the number of discrepancies is detected during the inspection, the maintenance intervals should be shortened accordingly. Additional maintenance work should be scheduled, if necessary, after severe storms, floods, earthquakes, or other natural disasters.

The scope of the maintenance work listed below is limited to mechanical security. Matters of electrical performance are not included. These should be checked and serviced separately, in accordance with the module manufacturer's specifications.

For each maintenance step, be sure to observe all pertinent safety instructions in the product-specific installation manual.

Annual maintenance should, for all mounting systems, include visual inspection of the installation with special attention to:

- Damage to any of the components
- Marked degradation of materials, e.g. corrosion of metallic components. (Slight surface corrosion or tarnishing of the excluded aluminum parts are normal and harmless.)
- Secure hold of all components
- Secure hold of all module attachments, clamps, and bolts
- Soiling of the system

Following the visual inspection, appropriate subsequent measures are to be taken, for example:

- If damage is observed, appropriate repair or replacement work should be performed.
- Displaced modules and loose bolts must be restored to their proper positions and secured per the product-specific instructions.
- Major soiling, e.g. fallen leaves, excessive dirt and debris should be removed.

In addition to the general inspection points, some product specific details must be observed and appropriate actions taken as necessary:

On-roof (Alpha+ & Tau+)

- Condition and fit of the roof attachments, for example the roof hooks, as well as the bordering roofing tiles/ roof covering.

Open terrain (Sigma Systems)

- Marked degradation of materials, for example corrosion of metal parts and Sigma posts on an area of $> 0.15 \text{ in}^2 / 1 \text{ cm}^2$. (Slight surface corrosion or tarnishing of the excluded aluminum parts are normal and harmless.)
- Inspection of the driven piles (or other method of foundation) for soil erosion, above-average sinking/ settling and deflection.
- When determining soil erosion and above-average sinking/settling or deflection of the posts, appropriate countermeasures should be taken after consultation with the relevant geotechnical firm.
- Inspection of the installation (spot tests with a scope of 0.1%): Secure hold of all module attachments and bolts; if discrepancies are discovered during the spot tests, the test batch should be augmented by a factor of 10. If the defect rate for the second test batch amounts to more than 1%, tests on the entire installation should be carried out.

Actual failures of any product not directly resulting from conditions specifically excluded in the Mounting Systems warranty should be brought to the attention of Mounting Systems for resolution.

9. Disassembly



WARNING

Danger of personal injury due to shock or burns from module cables.

PV modules can produce dangerous amounts of electricity any time they are exposed to sunlight.

- Do not allow the exposed ends of disconnected PV module cables to contact any part of the mounting system.
- Do not allow the exposed ends of disconnected PV module cables to contact each other or other exposed module cable ends.
- Properly insulate the ends of disconnected module cables to avoid arcing and potentially dangerous short circuits.

Disassembly should be done in the following sequence:

- Disconnect and insulate PV module cables
- Remove any auxiliary equipment or items that have been attached to the mounting system.
- Remove and store the PV modules.
- Disassemble the mounting system, observing the same safety precautions used during installation and assembly.

10. Disposal

Please dispose of the mounting system responsibly. All aluminum parts may be recycled and, in most cases, steel parts.

Rubber protection mats may be recycled through rubber recyclers.

Please observe all local codes and regulations that govern the recycling of these materials.



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