DISCLAIMER

This manual describes proper installation procedures and provides necessary standards required for product reliability. Warranty details are available on website. All installers must thoroughly read this manual and have a clear understanding of the installation procedures prior to installation. Failure to follow these guidelines may result in property damage, bodily injury or even death.

IT IS THE INSTALLER’S RESPONSIBILITY TO:

- Ensure safe installation of all electrical aspects of the array. All electrical installation and procedures should be conducted by a licensed and bonded electrician or solar contractor. Routine maintenance of a module or panel shall not involve breaking or disturbing the bonding path of the system. All work must comply with national, state and local installation procedures, product and safety standards.
- Comply with all applicable local or national building and fire codes, including any that may supersede this manual.
- Ensure all products are appropriate for the installation, environment, and array under the site’s loading conditions.
- Use only IronRidge parts or parts recommended by IronRidge; substituting parts may void any applicable warranty.
- Review the Design Assistant and Certification Letters to confirm design specifications.
- Ensure provided information is accurate. Issues resulting from inaccurate information are the installer’s responsibility.
- Validate foundation parameters prior to installation, as a local geotechnical report may be required to assess ground conditions. We recommend consulting with a local engineer familiar with local regulations and build site requirements, including soil conditions, terrain and load criteria. All parameters may impact foundation requirements.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, re-tighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.
- Disconnect AC power before servicing or removing modules, AC modules, microinverters and power optimizers.
- Review module manufacturer’s documentation for compatibility and compliance with warranty terms and conditions.
RATINGS

UL 2703 LISTED

Intertek

- Certified to CSA STD LTR AE-001-2012 Photovoltaic Module Racking Systems.
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 25.6 ft²
- Max Frameless Module Size for Canadian LTR-AE: 21.5 ft²
- CAMO Specific Allowable Design Load Rating: 50 PSF downward, 50 PSF upward, 15 PSF lateral
- LTR AE Canadian Load Rating: 2400 Pa
- System Level Allowable Design Load Rating: meets minimum requirements of the standard (10 PSF downward, 5 PSF upward, 5 PSF lateral). Actual system structural capacity is defined by PE stamped certification letters.

CLASS A SYSTEM FIRE RATING PER UL 2703

- Not Fire Rated

STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7

MARKINGS

Product markings are located on the system’s Rail Connectors.
CHECKLIST

PRE-INSTALLATION

☐ Verify module compatibility. See Page 14 for info.

☐ Purchase 2” or 3” (NPS) ASTM A53 Grade B SCH 40 Pipe, galvanized to a min of ASTM A653 G90 or ASTM A123 G35, or 2.375” or 3.500” (O.D.) Allied Mechanical Tubing with Gatorshield or FlowCoat Zinc Coating (ASTM A1057)

TOOLS REQUIRED

☐ Post Hole Digger or Powered Auger

☐ Socket Drive (7/16”, 9/16”, and 1/2” Sockets)

☐ Torque Wrenches (0-240 in-lbs and 10-40 ft-lbs)

☐ Transit, String Line, or Laser Level

☐ 3/16” Allen Head

TORQUE VALUES

Top Cap Set Screws (3/16” Allen Head)

☐ 2” or 3” NPS Schedule 40 Grade B Pipe: 20 ft-lbs

☐ 2.375” OD Allied Mechanical Tubing: 11 ft-lbs

☐ 3.500” OD Allied Mechanical Tubing: 16 ft-lbs

☐ Foot Ground Screw to Pipe Connection Hardware see page 5.

☐ Top Cap U-Bolt Nuts (9/16” Socket): 15 ft-lbs

☐ Rail Connector Bracket Nuts (9/16” Socket): 21 ft-lbs

☐ Rail Connector U-Bolt Nuts (9/16” Socket): 60 in-lbs

☐ Grounding Lug Nuts (7/16” Socket): 80 in-lbs

☐ Grounding Lug Terminal Screws (7/16 Socket): 20 in-lbs

☐ Universal Fastening Objects (7/16” Socket): 80 in-lbs

☐ Diagonal Brace Set Screws (1/2” Socket): 15 ft-lbs

☐ Diagonal Brace Bolts (1/2” Socket): 40 ft-lbs

☐ Microinverter Kit Nuts (7/16” Socket): 80 in-lbs

☐ Frameless Module Kit Nuts (7/16” Socket): 80 in-lbs

➢ If using previous version of: Integrated Grounding Mid Clamps, Grounding Lug, End Clamps, and Expansion Joints please refer to Alternate Components Addendum (Version 1.60).

➢ If installing on a low slope roof please refer to Ground Mount for Flat Roof Applications Addendum (Version 2.60).
A. MARK LOCATIONS

Establish pier locations. Once grid of pier locations has been set, verify all angles are square.

- Spacing varies with load conditions. Consult engineering specs.

B. POSITION PIERS
CONCRETE FOUNDATIONS

Excavate the foundation holes. Insert vertical piers into foundation holes, and pour in concrete mixture. Ensure vertical piers are plumb, level, square, and placed in parallel rows. Level the tops so they are even.

- Brace piers until concrete foundation has cured.

- In some cases, cross bracing is required to provide extra support for piers. If required, install Diagonal Braces at this time.

### PIPE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Approved 2&quot; Pipe</th>
<th>Approved 3&quot; Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALLIED MECH TUBING 12 GA</strong></td>
<td><strong>ALLIED MECH TUBING 8 GA</strong></td>
</tr>
<tr>
<td>• 50 ksi yield strength</td>
<td>• 45 ksi yield strength</td>
</tr>
<tr>
<td>• Galvanized (ALLIED flot-coat, Gatorshield, or Hot Dipped)</td>
<td>• Galvanized (ALLIED flot-coat, Gatorshield, or Hot Dipped)</td>
</tr>
<tr>
<td>TOP CAP SET SCREW INSTALL TORQUE: 11-FTLBS</td>
<td>TOP CAP SET SCREW INSTALL TORQUE: 16-FTLBS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCHEDULE 40 PIPE</th>
<th>SCHEDULE 40 PIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ASTM A53 GR B</td>
<td>• ASTM A53 GR B</td>
</tr>
<tr>
<td>• 35 ksi yield strength</td>
<td>• 35 ksi yield strength</td>
</tr>
<tr>
<td>• Hot Dipped Galvanized</td>
<td>• Hot Dipped Galvanized</td>
</tr>
<tr>
<td>TOP CAP SET SCREW INSTALL TORQUE: 20-FTLBS</td>
<td>TOP CAP SET SCREW INSTALL TORQUE: 20-FTLBS</td>
</tr>
</tbody>
</table>
1. BUILD BASE (CONT.)

GROUND SCREW FOUNDATIONS

Follow respective Ground Screw Manufacturer’s installation methods for driving screws into soil. Insert vertical piers into ground screws, ensuring at least 18” of pier is inserted into ground screw.

Tested and/or Evaluated Ground Screws

<table>
<thead>
<tr>
<th>Manufacture</th>
<th>2&quot; System</th>
<th>3&quot; System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model #</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Ground</td>
<td>N76</td>
<td>N102</td>
</tr>
<tr>
<td>Screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krinner North</td>
<td>G76</td>
<td>G114</td>
</tr>
<tr>
<td>America KSF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friction Bolt</td>
<td>SCHD. 40: 90 ft-lb</td>
<td>SCHD. 40: 120 ft-lb</td>
</tr>
<tr>
<td>Specification</td>
<td>Allied:75 ft-lb</td>
<td>Allied:90 ft-lb</td>
</tr>
</tbody>
</table>

➢ A minimum ground screw length of 1300mm must be used for either ground screw manufacturer. Longer lengths may be required in areas with high wind and snow loads or risk of freeze-thaw heaving. Check with your local jurisdiction for frost line embedment requirements.

➢ Friction Bolt must be IronRidge supplied M16-2.0 x 40mm hot-dip galvanized bolts.

2. CONNECT SUBSTRUCTURE

A. MOUNT TOP CAPS

Mount a Top Cap on each pier. Wait to tighten set screws.

➢ If using Diagonal Braces, install them prior to Top Caps.

B. LAY CROSS PIPE

Set cross pipes or tubing in Top Cap grooves. Attach with 3/8” U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolts to 15 ft-lbs and align assembly.

Torque Top Cap set screws to 20 ft-lbs for Schedule 40 Grade B Pipe, 11 ft-lbs for 2.375” Allied Mechanical Tubing, and 16 ft-lbs for 3.500” Allied Mechanical Tubing.

➢ To join more than one section of cross pipe, see Page 10.
3. PLACE RAILS

A. ATTACH HARDWARE

On the ground, attach Rail Connector brackets to rail by sliding 3/8"-16 bonding bolts into side slot. Space out to match pier spacing. With brackets in place, finger tighten flange nuts onto bolts.

➢ Tape ends of rail, to keep bolts from sliding out while moving.

B. FASTEN CONNECTORS

Center rails on cross pipes, leaving equal distance on ends. Secure with Rail Connector hardware: 3/8"-16 U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolt nuts to 60 in-lbs and bracket to 21 ft-lbs.

➢ Spacing between rails should align with module manufacturer recommended clamping locations.

4. SECURE LUGS

GROUNDING LUGS

Insert T-bolt in top rail slot and torque hex nut to 80 in-lbs. Install a minimum 10 AWG solid copper or stranded grounding wire. Torque terminal screw to 20 in-lbs.

➢ Only one Grounding Lug required per continuous subarray, regardless of subarray size (Unless frameless modules are used, see Page 10).

➢ If using Enphase microinverters or Sunpower AC modules, Grounding Lugs may not be needed. See Page 11 for more info.

➢ Grounding Lugs can be installed anywhere along the rail and in either orientation shown.

➢ Grounding Lugs are intended to for use with one solid or stranded copper wire, conductor size 10-4AWG.
5. SECURE MODULES

A. SECURE FIRST END

Place first module in position on rails, a minimum of 1” from rail ends. Snap Stopper Sleeves onto UFO. Fasten module to rail using the UFO, ensuring that the UFO is hooked over the top of the module. Torque to 80 in-lbs.

➢ Ensure rails are square before placing modules.
➢ Hold Stopper Sleeves on end while torquing to prevent rotation.
➢ If using CAMO instead of UFO + Stopper Sleeve, refer to Page 7 for CAMO installation procedure.

B. SECURE NEXT MODULES

Place UFO into each rail, placing them flush against first module. Slide second module against UFO. Torque to 80 in-lbs. Repeat for each following module.

➢ When reinstalling UFO, move modules a minimum of 1/16” so UFOs are in contact with a new section of module frame.
➢ When UFOs are loosened and re-tightened, ensure UFO T-bolt bottoms out in rail channel before re-torquing UFO to achieve full engagement between T-bolt and rail.
➢ If using Wire Clips, refer to Page 9.

C. SECURE LAST END

Place last module in position on rails, a minimum of 1” from rail ends. Snap Stopper Sleeves onto UFO. Secure UFO Clamps on rails, ensuring they are hooked over top of module. Torque to 80 in-lbs.

➢ Hold Stopper Sleeves on end while torquing to prevent rotation.
➢ If using CAMO instead of UFO + Stopper Sleeve, refer to Page 7 for CAMO installation procedure.

D. REPEAT STEPS

Secure remaining module rows, leaving a minimum 3/8” gap between rows.

➢ If using End Caps, refer to Page 9.
A. SLIDE INTO RAIL

Slide CAMO into rail channel far enough to clear the module frame. CAMO requires 6” of clearance from end of rail.

B. PLACE MODULE

Place module on rails (module cells not shown for clarity). When installing CAMO the module can overhang the rail no more than 1/4”.

C. PULL TOWARDS END

Pull CAMO towards rail ends, at 45 degree angle, so the bonding bolt contacts the module flange edge.

D. SECURE TO FRAME

Rotate handle with an upwards motion until CAMO snaps into rail channel. Ensure CAMO bonding pins are fully seated on top of module frame.

FRAME COMPATIBILITY

CAMO has been tested or evaluated with all modules listed in the Module Compatibility section having frames within the referenced dimensions. Be sure the specific module being used meets the dimension requirements.

➢ For installations with Hanwha Q CELLS modules with 32 mm frame heights, the maximum ground snow is 45 PSF (33 PSF module pressure).

➢ CAMO is not compatible with Canadian Solar modules.
**Section View**

- **UFO or CAMO**
- **Grounding Lug**
- **Fault Current Ground Path**
- **Min 10 AWG Copper Wire**

---

- **Bonding Points**
- **Fault Current Ground Path**
- **Section View**

*Grounding Lugs and wire are not required in systems using certain Enphase microinverters or certain Sunpower modules. Equipment grounding is achieved with the Engage cable for Enphase or the AC module cable system for Sunpower via their integrated EGC.*

---

*Only one Grounding Lug required per continuous subarray.*
DIAGONAL BRACES (OPTIONAL)

Slide sleeve on north pier 2-3” above the ground (6” max). Attach Diagonal Brace to sleeve with 1/2” hardware.

Slide second sleeve up on south pier 2-3” below top cap (6” max). Raise Diagonal Brace to align holes in sleeve and brace. Attach hardware and raise sleeve to full extent.

Torque Diagonal Brace bolts to 40 ft-lbs. Torque set screws to 15 ft-lbs.

END CAPS

End Caps add a completed look and keep debris and pests from collecting inside rail.

Firmly press End Cap onto rail end.

➢ End Caps come in sets of left and right. Check that the proper amount of each has been provided.
➢ For open-structure installations, you can use adhesive to secure the End Caps.

WIRE CLIPS

Wire Clips offer a simple wire management solution.

The following instructions should be followed, when required, to join more than one section of cross pipe together to ensure bonding is maintained throughout the system.

A. ALLIED MECHANICAL TUBING SPLICES

Mechanical tube splices shown in the table below shall be of equivalent Allied Flowcoat or Gatorshield zinc coating.

<table>
<thead>
<tr>
<th>Mechanical Tube Size of the Structure</th>
<th>Splice Tube Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.375&quot; OD, 12 Gauge</td>
<td>2.000&quot; OD, 9 Gauge, Minimum 12&quot; Long</td>
</tr>
<tr>
<td>3.500&quot; OD, 8 Gauge</td>
<td>3.000&quot; OD, 12 Gauge, Minimum 12&quot; Long</td>
</tr>
</tbody>
</table>

Insert splice tube 6" into first section of cross pipe and secure with 2 self-drilling screws (1/4"-14 x 3/4"), spacing them approximately 1.25" from end of pipe and approximately 3.50" apart, tightening screws to 9 ft-lbs.

Slide second section of cross pipe over splice tube and secure with two more self-drilling screws. Tighten screws to 9 ft-lbs.

➢ Pre-drill 5/32" pilot holes through cross pipe and splice tube for easier installation of self-drilling screws.

B. SCHEDULE 40 GRADE B PIPE SPLICES

Use galvanized threaded pipe couplings that match the pipe size used for the structure. Threaded Schedule 40 Grade B Pipe must be used when splicing cross pipe together.

Fully thread coupling onto both sections of pipe being spliced together.

➢ To ensure structural integrity of cross pipes, mechanical tube or coupling splices are not permitted in end spans or in middle 1/3 of interior cross pipe spans.

C. CROSS PIPES CAN BE JOINED OVER AN INTERIOR TOP CAP WITH A MAXIMUM GAP OF 1/2"

➢ To avoid potential problems from the effects of thermal expansion, a maximum total continuous cross pipe length of 100 ft is recommended.
**MICROINVERTER KITS**

Use IronRidge’s Microinverter Kit to bond compatible microinverters and power optimizers to the racking system.

Insert Microinverter Kit T-bolt into top rail slot. Place compatible microinverter or power optimizer into position and tighten hex nut to **80 in-lbs**.

- If installing in areas with ground snow loads greater than 40 psf, install MLPe devices directly next to module frame edge

**COMPATIBLE PRODUCTS**

**Enphase**
M250-72, 250-60, M215-60, C250-72, S230, S280, IQ 6, IQ 6+, IQ IQ7, IQ 7A, IQ 7+, IQ 7X, Q Aggregator

**Darfon**
MIG240, MIG300, G320, G640

**SolarEdge**
M1600, P300, P320, P340, P370, P400, P401, P405, P485, P505, P600, P700, P730, P800p, P800s, P801, P850, P860, P950, P960

**SMA**
RoofCommKit-P2-US, TS4-R Module Retrofit Kits (TS4-R-S, TS4-R-O, TS4-R-F)

**Tigo**
Tigo Access Point (TAP)
TS4-R-X (where X can be F, M, O, or S)
TS4-R-X-DUO (where X can be M, O, or S)
TS4-A-X (where X can be F, 2F, O, O-DUO, or S)

**AP Systems**
QS1, YC600

➢ Remove Grounding Washer on AP Systems QS1 and YC600 inverters before installing to XR rails.

➢ Remove the Stainless Steel Clip on Tigo-“A” MLPe Devices before attaching to XR rails.

➢ Use the number of IronRidge Microinverter kits allowed by the MLPE mounting flange. Some will require 1 kit and others 2 kits.

**SYSTEMS USING ENPHASE MICROINVERTERS OR SUNPOWER AC MOD-**

IronRidge systems using approved Enphase products or SunPower modules eliminate the need for lay-in lugs and field installed equipment grounding conductors (EGC). This solution meets the requirements of UL 2703 for bonding and grounding and is included in this listing.

**COMPATIBLE PRODUCTS**

**Sunpower**
Modules with model identifier Ab-xxx-YY and InvisiMount (G5) 46mm frame; where “A” is either E, or X; “b” can be 17, 18, 19, 20, 21, or 22; and “YY” can be C-AC, D-AC, BLK-C-AC, or BLK-D-AC.

**Enphase**

➢ A minimum of two inverters mounted to the same rail and connected to the same Engage cable are required.

➢ The microinverters or Sunpower AC modules must be used with a maximum 20 A branch rated overcurrent protection device (OCPD).

➢ If an AC module is removed from a circuit for maintenance, you must first disconnect AC power and then install a temporary EGC to bridge the gap by inserting an AC extension cable (or via other NEC-compliant means), in order to maintain effective ground continuity to subsequent modules.
Use IronRidge's Microinverter Kit to bond compatible microstorage devices to the racking system. Insert Microinverter Kit T-bolt into top rail slot. Place compatible microstorage into position and tighten hex nut to 80 in-lbs.

**COMPATIBLE PRODUCTS**

**PHAZR**
PHAZR Devices PHAZR-X, where X is 6-12.

- Running a separate equipment grounding conductor to the PHAZRs is not required.
- If installing in areas with ground snow loads greater than 40 psf and underneath a module, install PHAZR devices as close as possible to module frame edge.
- Use the number of IronRidge Microinverter kits allowed by the microstorage mounting flange. Some will require 1 kit and others 2 kits.

**FRAMELESS MODULE KITS**

Insert Frameless Kit T-bolt in top rail slot. Place star washer over T-bolt, allowing it to rest on top of rail. Secure module clamps with a hex nut and torque to 80 in-lbs.

**COMPATIBLE PRODUCTS**

**Sunforson**
Sunforson silver or black SFS-UTMC-200(B) mid and SFS-UTEC-200(B) end clamps.

**Sunpreme**
Sunpreme silver or black mid and end clamps with part numbers 7500105X where “X” is 1, 5, 6 or 7.

**Ironridge**
IronRidge silver or black mid and end clamps with part numbers FMLS-XC-001-Y where “X” is E or M and “Y” is B or blank.

- Follow module manufacturer’s installation instructions to install the module clamps.
- Frameless modules require using a Grounding Lug on every rail.
- For Sunpreme Modules Only: If required to use slide prevention hardware, see Module Slide Prevention Addendum (Version 1.10).
The Ground Mount System may be used to ground and/or mount a PV module complying with UL 2703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, “xxx” refers to the module power rating and both black and silver frames are included in the certification.

### Framed Module List

<table>
<thead>
<tr>
<th>Make</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adani</td>
<td>Adani modules with 35 and 40mm frames</td>
</tr>
<tr>
<td></td>
<td>ASX-Y-ZZ-xxx</td>
</tr>
<tr>
<td></td>
<td>Where &quot;X&quot; can be B, M or P, &quot;Y&quot; can be 6 or 7, and &quot;ZZ&quot; can be blank, PERC, B-PERC, or AB-PERC</td>
</tr>
<tr>
<td>Amerisol</td>
<td>Amerisolar modules with 35, 40 and 50 mm frames</td>
</tr>
<tr>
<td></td>
<td>AS-bYxxxxZ</td>
</tr>
<tr>
<td></td>
<td>Where &quot;b&quot; can be 5 or 6; &quot;Y&quot; can be M, P, M27, P27, M30, or P30; and &quot;Z&quot; can be blank, W or WB</td>
</tr>
<tr>
<td>Aptos</td>
<td>Aptos modules with 35 and 40 mm frames</td>
</tr>
<tr>
<td></td>
<td>DNA-yy-zz23-xxx</td>
</tr>
<tr>
<td></td>
<td>Where &quot;yy&quot; can be 120 or 144; and &quot;zz&quot; can be MF or BF</td>
</tr>
<tr>
<td>Astronergy</td>
<td>Astronergy modules with 30, 35, 40, and 45 mm frames</td>
</tr>
<tr>
<td></td>
<td>aaSMbbyyC/zz-xxx</td>
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<tr>
<td></td>
<td>Where &quot;aa&quot; can be CH or A; &quot;bb&quot; can be 60, 66, or 72; &quot;yy&quot; can be blank, 10 or 12; &quot;C&quot; can M, P, M(BL), M-HC, M(HL)-HC, P-HC, P(DG), or P(DGT); and &quot;zz&quot; can be blank, HV, F-B, or F-BH</td>
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<tr>
<td>ASUN</td>
<td>ASUN modules with 35 and 40 mm frames</td>
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<td></td>
<td>ASUN-yyyy-YYYYZ-aa</td>
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<tr>
<td></td>
<td>Where &quot;YY&quot; can be 60 or 72; &quot;ZZ&quot; can be M, or MH5; and &quot;aa&quot; can be blank or BB</td>
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<tr>
<td>Auxin</td>
<td>Auxin modules with 40 mm frames</td>
</tr>
<tr>
<td></td>
<td>AXN6y6zAxxxx</td>
</tr>
<tr>
<td></td>
<td>Where &quot;y&quot; can be M or P; &quot;z&quot; can be 08, 09, 10, 11, or 12; and &quot;A&quot; can be F or T</td>
</tr>
<tr>
<td>Axitec</td>
<td>Axitec Modules with 35 and 40 mm frames</td>
</tr>
<tr>
<td></td>
<td>AC-xxxY/aaZZb</td>
</tr>
<tr>
<td></td>
<td>Where &quot;Y&quot; can be M, P or MH; &quot;aa&quot; can be blank, 125- or 156-; &quot;ZZ&quot; can be 54, 60, 72, 120, or 144; &quot;b&quot; can be S</td>
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<tr>
<td>Boviet</td>
<td>Boviet modules with 35 and 40mm frames</td>
</tr>
<tr>
<td></td>
<td>BVM66aaYY-xxxxBcc</td>
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<tr>
<td></td>
<td>Where &quot;aa&quot; can be 9, 10 or 12; &quot;YY&quot; is M or P; and &quot;B&quot; can be blank, L or S; and &quot;cc&quot; can be blank, H, H-BF, H-BF-DG, H-HC, H-HC-BF, H-HC-BF-DG, HC-BF or HC-BF-DG</td>
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<td>BYD</td>
<td>BYD modules with 35 mm frames</td>
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<td></td>
<td>BYDxxxAY-ZZ</td>
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<tr>
<td></td>
<td>Where &quot;A&quot; can be M6, P6, MH or PH; &quot;Y&quot; can be C or K; and &quot;ZZ&quot; can be 30 or 36</td>
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<tr>
<td>Canadian Solar</td>
<td>Canadian Solar modules with 30, 35 and 40 mm frames</td>
</tr>
<tr>
<td></td>
<td>CSbY-xxxZ</td>
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<tr>
<td></td>
<td>Where &quot;b&quot; can be 1, 3 or 6; &quot;Y&quot; can be H, K, L, P, U, V, W, or X; and &quot;Z&quot; can be M, P, MS, PX , M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, or MS-SD</td>
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<tr>
<td>CertainTeed</td>
<td>CertainTeed modules with 35 and 40 frames</td>
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<td>CTxxYYZZ-AA</td>
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<tr>
<td></td>
<td>Where &quot;Y&quot; can be M, P, or HC; &quot;ZZ&quot; can be 00,01, 10, or 11; and &quot;AA&quot; can be 01, 02, 03, or 04</td>
</tr>
<tr>
<td>CSUN</td>
<td>Csun modules with 35 and 40 mm frames</td>
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<tr>
<td></td>
<td>YYxxx-zzAbb</td>
</tr>
<tr>
<td></td>
<td>Where &quot;YY&quot; is CSUN or SST; &quot;zz&quot; is blank, 60, or 72; and &quot;A&quot; is blank, P or M; &quot;bb&quot; is blank, BB, BW, or ROOF</td>
</tr>
<tr>
<td>Module</td>
<td>Compatibility</td>
</tr>
<tr>
<td>--------</td>
<td>---------------</td>
</tr>
</tbody>
</table>
| Dehui | Dehui modules with 30, 35 and 40mm frames  
DH-MYYYZ-xxx  
Where “YYY” can be 760, 772, 860, 872; and “Z” can be B, F or W |
| Ecosolary | Ecosolary modules with 35, 40, and 50 mm frames  
ECOxxxYzzA-bbD  
Where “Y” can be A, H, S, or T; “zz” can be 125 or 156; “A” can be M or P; “bb” can be 60 or 72; and “D” can be blank or B |
| ET Solar | ET Solar modules with 30, 35, 40, and 50 mm frames  
ET-Y6ZZxxxxAA  
Where “Y” can be P, L, or M; “ZZ” can be 60, 72 or 72BH; and “AA” can be GL, WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC |
| Flex | Flex modules with 35, 40, and 50 mm frames  
FXS-xxxYY-ZZ  
Where “YY” can be BB or BC; and “ZZ” can be MAA1B, MAA1W, MAB1W, SAA1B, SAA1W, SAC1B, SAC1W, SAD1W, SBA1B, SBA1W, SBC1B, or SBC1W |
| GCL | GCL modules with 35 mm and 40 mm frames  
GCL-ab/YY xxx  
Where “a” can be M or P; “b” can be 3 or 6; and “YY” can be 60, 72, 72H, or 72DH |
| GigaWatt Solar | GigaWatt modules with 40 mm frames  
GWxxxYY  
Where “YY” can be either PB or MB |
| Hansol | Hansol modules with 35 and 40 frames  
HSxxxYY-zz  
Where “YY” can be PB, PD, PE, TB, TD, UB, UD, or UE; and “zz” can be AH2, AN1, AN3, AN4, HH2, HV1, or JH2 |
| Hanwa Solar | Hanwha Solar modules with 40, 45, and 50 mm frames  
HSLaap6-YY-1-xxxZ  
Where “aa” can be either 60 or 72; “YY” can be PA or PB; and “Z” can be blank or B |
| Hanwha Q CELL | Hanwha Q CELLS Modules with 32, 35, 40, and 42mm frames  
aaYY-ZZ-xxx  
| Helivene | Helivene modules with 40 mm frames  
YZZZxxxxA  
Where “YY” can be 36, 60, 72, or 96; “ZZ” can be M, P, or MBLK; and “A” can be blank, HomePV, or Bifacial |
| HT-SAAE | HT-SAAE modules with 35 and 40 mm frames  
HTy1-156Z-xxx  
Where “yy” can be 60 or 72, “Z” can be M, P, M-C, P-C, M(S), M(VS), M(V), P(V), M(V)-C, P(V)-C |
| Hyundai | Hyundai modules with 33, 35, 40 and 50 mm frames  
HIy-SxxxxZZ  
Where “Y” can be A, D, M or S; and “ZZ” can be GI, HG, HI, I1, MI, MF, MG, PI, RI, RG, RG(BF), RG(BK), SG, TI, or TG |
## Module Compatibility

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Module Compatibility</th>
</tr>
</thead>
</table>
| Itek         | Modules with 40 and 50 mm frames  
IT-xxx-YY  
Where “YY” can be blank, HE, or SE, or SE72 |
| JA Solar     | Modules with 30, 35, 40 and 45 mm frames  
JAYyzz-bbww-xxx/aa  
Where “yy” can be M, P, M6 or P6; “zz” can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG); “bb” can be 48, 60, or 72; “ww” can be D09, S01, S02, S03, S06, S09, S10, or S12; and “aa” can be BP, MR, SI, SC, PR, 3BB, 4BB, 4BB/RE, 5BB |
| Jinko        | Modules with 35 and 40 mm frames  
JKMYxxxxZZ-aa  
Where “Y” can either be blank or S; “ZZ” can be M, P, or PP; and “aa” can be blank, 60, 60B, 60H, 60L, 60BL, 60HB, 60HBL, 6HBL-EP, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 7RL3-V, 7RL3-TV, 72, 72B, 72-J4, 72B-J4, 72(Plus), 72-V, 72L-V, 72H-LV, 72-MX, 72H-BDVP, 72HL-TV, or 72HL-V-MX3 |
| Kyocera      | Modules with 46mm frames  
KYxxxZZ-XX-XX  
Where “Y” can be D or U; “ZZ” can be blank, GX, or SX; and “XX” can be LPU, LFU, UPU, LPS, LPB, LFB, LFBS, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, 8BC, 6MCA, or 6MPA |
| LG           | Modules with 35, 40, and 46 mm frames  
LGxxxxYaZ-bb  
Where “Y” can be A, E, M, N, Q, S; “a” can be 1 or 2; “Z” can be C, K, T, or W; and “bb” can be A3, A5, B3, G3, G4, J5, K4, L5, N5, or V5 |
| Longi        | Modules with 30, 35, and 40 mm frames  
LRa-YYZZ-XX-XX  
Where “a” can be 4 or 6; “YY” can be blank, 60 or 72; and “ZZ” can be blank, BK, BP, HV, PB, PE, PH, HBD, HPB, or HPH |
| Mission Solar| Modules with 33 and 40 mm frames  
MSEbbxyzzZZ  
Where “bb” can be blank or 60A; “zz” can be blank, MM, SE, SO, SQ, SR, or TS; and “aa” can be blank, 1J, 4J, 4S, 5K, 5T, 60, 6J, 6S, 6W, 8K, 8T, or 9S |
| Mitsubishi   | Modules with 46 mm frames  
PV-MYxxxxZZ  
Where “YY” can be either HD, HD2, or FB |
| Moltech      | IM and XS series modules with 40, 45, and 50 mm frames |
| Neo Solar Power | Solar Power modules with 35 mm frames  
D6YxxxxZZ-aa  
Where “Y” can be M or P; “ZZ” can be B3A, B4A, E3A, E4A, H3A, H4A; and “aa” can be blank, (TF), ME or ME (TF) |
| Panasonic (HIT) | Modules with 35 and 40 mm frames  
VBHNxxxxYyZZ  
Where “YY” can be either KA, RA, SA or ZA; “zz” can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and “A” can be blank, E, G, or N |
| Panasonic (EverVolt) | Modules with 30 mm frames  
EVPVxxxxXX  
Where “AA” can be blank or K |
| Peimar       | Modules with 40 mm frames  
SbxxxxYzz  
Where “b” can be G, M or P; “Y” can be M or P; and “zz” can be blank, (BF) or (FB) |
| Philadelphia Solar | Modules with 35 and 40 mm frames  
PS-YzzXX-XX  
Where “Y” can be M or P; “zz” can be 60 or 72; and “AA” can be blank or (BF) |
<table>
<thead>
<tr>
<th>Module Brand</th>
<th>Modules with Frame Dimensions</th>
<th>Module Code Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phono Solar</td>
<td>35, 40, and 45 mm frames</td>
<td>PSxxxY-ZZ/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “Y” can be M, M1, MH, or M1H or P; “ZZ” can be 20 or 24; and “A” can be F, T, U, or TH</td>
</tr>
<tr>
<td>Recom</td>
<td>35 and 40 mm frames</td>
<td>RCM-xxx-6yy</td>
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<tr>
<td></td>
<td></td>
<td>Where “yy” can be MA or MB</td>
</tr>
<tr>
<td>REC Solar</td>
<td>30, 38 and 45 mm frames</td>
<td>RECxxyYYZZZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “YY” can be AA, M, NP, PE, PE72, TP, TP2, TP2M, TP2SM, or TP2S; and “ZZ” can be blank, Black, BLK, BLK2, SLV, or 72</td>
</tr>
<tr>
<td>Renesola</td>
<td>35, 40 and 50 mm frames</td>
<td>AAxxxY-ZZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “AA” can be SPM(SLP) or JC; “Y” can be blank, F, M or S; and “ZZ” can be blank, Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bh, Bh-b, Bbv, Bbv-b, Db, Db-b, or 24/Bb</td>
</tr>
<tr>
<td>Renogy</td>
<td>40 and 50 mm frames</td>
<td>RNG-xxY</td>
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<tr>
<td></td>
<td></td>
<td>Where “xx” is the module power rating; and “Y” can be D or P</td>
</tr>
<tr>
<td>Risen</td>
<td>35 and 40 mm frames</td>
<td>RSMyy-6-xxZZZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “yy” can be 60, 72, 120 or 144; and “ZZ” can be M or P</td>
</tr>
<tr>
<td>S-Energy</td>
<td>35 and 40 mm frames</td>
<td>SABB-CCYY-xxxZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “A” can be C, D, L or N; “BB” can be blank, 20, 25, 40 or 45; “CC” can be blank, 60 or 72; “YYY” can be blank, BDE, MAE, MAI, MBE, MBI, MCE or MCI; and “Z” can be V, M-10, P-10 or P-15</td>
</tr>
<tr>
<td>Seraphim</td>
<td>30, 35 and 40 mm frames</td>
<td>SEG-aYY-xxxZZ</td>
</tr>
<tr>
<td>Energy Group</td>
<td></td>
<td>Where “a” can be blank, 6 or B; “YY” can be blank, MA, MB, PA, or PB; and “ZZ” can be blank, BB, BG, BW, HV, WB, WW, BMB, BMB-HV, BMA-HV, BMA-BG</td>
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<tr>
<td>Seraphim USA</td>
<td>35 and 40 mm frames</td>
<td>SEG-aYY-xxxZZ</td>
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<tr>
<td></td>
<td></td>
<td>Where “a” can be blank, 6 or B; “YY” can be blank, MA, MB, PA, or PB; and “ZZ” can be blank, BB, BG, BW, HV, WB, WW, BMB, BMB-HV</td>
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<tr>
<td>Sharp</td>
<td>35 and 40 mm frames</td>
<td>NUYYxxx</td>
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<td></td>
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<td>Where “YY” can be SA or SC</td>
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<tr>
<td>Silfab</td>
<td>38 mm frames</td>
<td>SYY-Z-xxxAb</td>
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<tr>
<td></td>
<td></td>
<td>Where “YY” can be IL, SA, LA, SG or LG; “Z” can be blank, M, P, or X; “A” can be blank, B, H, M, or N; and “b” can be A, L, G, or T</td>
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<tr>
<td>Solaria</td>
<td>40 mm frames</td>
<td>PowerXT xxxY-ZZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where “Y” can be R or C; and “ZZ” can be AC, BD, BX, BY, PD, PM, PM-AC, PX, PZ, WX or WZ</td>
</tr>
<tr>
<td>Solarcity (Tesla)</td>
<td>40 mm frames</td>
<td>SCxxxYY</td>
</tr>
<tr>
<td></td>
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<td>Where “YY” can be blank, B1 or B2</td>
</tr>
<tr>
<td>SolarTech</td>
<td>40 mm frames</td>
<td>SCxxxYY</td>
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<tr>
<td></td>
<td></td>
<td>Where “YY” can be blank, B1 or B2</td>
</tr>
<tr>
<td>SolarWorld AG</td>
<td>Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 31, 33 or 46 mm frames</td>
<td>SW-xxx</td>
</tr>
<tr>
<td>Module Compatibility</td>
<td>Notes</td>
<td></td>
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<tr>
<td>-----------------------</td>
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</tr>
</tbody>
</table>
| SolarWorld Americas   | SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 33 mm frames  
SWA-xxx |
| Stion                 | Stion Thin film modules with 35 mm frames  
STO-xxx or STO-xxxA |
| SunEdison             | SunEdison Modules with 35, 40 & 50 mm frames  
SE-YxxxZABCDE  
Where "Y" can be B, F, H, P, R, or Z; "Z" can be 0 or 4; "A" can be B,C,D,E,H,I,J,K,L,M, or N ; "B" can be B or W;  
"C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2 |
| Suniva                | Suniva modules with 35, 38, 40, 46, and 50 mm frames  
OPTxxx-AA-B-YYY-Z  
MVxxx-AA-B-YYY-Z  
Where "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B |
| Sunpower              | Sunpower standard (G3 or G4) or InvisiMount (G5) 40 and 46 mm frames  
SPR-Zb-xxx-YY  
Where "Z" is either A, E, P or X; "b" can be blank, 17, 18, 19, 20, 21, or 22; and "YY" can be blank, BLK, COM, C-AC, D-AC, E-AC, BLK-E-AC, G-AC, BLK-C-AC, or BLK-D-AC |
| Sunspark              | Sunspark modules with 40 mm frames  
SYY-xxxZ-A  
Where "YY" can be MX or ST; and "Z" can be M, MB, M3, P, or W; and "A" can be 60 or 72 |
| Suntech               | Suntech Modules with 35, 40 and 50mm frames  
STPxxxx-zz/aa  
Where "y" is blank or S; and "zz" can be 20, 24, A60 or A72U; and "aa" can be Vd, Vem, Vfw, Vfh, Wdb, Wde, Wd, or Wfthb |
| Talesun               | Talesun modules with 30, 35 and 40mm frames  
TA6yZZaaxxx-b  
Where "A" can be D or P, "y" can be blank, F, G, H, or L; "ZZ" can be 60 or 72; "aa" can be M, M(H), or P;  
and "b" can be blank, B, T, or (H) |
| Trina                 | Trina Modules with 30, 35, 40 and 46mm frames  
TSM-xxxYYYYZ  
Where "YY" can be DD05, DD06, DD14, DE14, DE15, DEG15, PA05, PC05, PD05, PD06, PA14, PC14,  
PD14, PE14, or PE15 ; and "ZZ" can be blank,.05,.08,.10,.18,.08D,.18D,.82,.002,.00S,.05S,.08S,A,A.05,A.08,A.10,A.18,A(I),A.05(II),A.08(II),A.082(II),A.10(II),A.18(II),H,H(II),H.05(II),H.08(II),HC.20(II),  
HC.20(II), or M |
| URE                   | URE modules with 35 mm frames  
DyZxxxHaa  
Where "y" can be 6 or 7; "Z" can be K or M; and "aa" can be H3A, H4A, or H8A |
| Vikram                | Vikram solar modules with 40 mm frames  
VSSyy.ZZ.AAA.bb  
Where "yy" can be M, P, MBB, MH, MS, MHBB, or PBB; "ZZ" can be 60 or 72; "AAA" is the module power rating; and "bb" can be 03.04 or 05 |
| VSUN                  | VSUN modules with 35 and 40 mm frames  
VSUNxxx-YYYYz-aa  
Where "YY" can be 60, 72, 120, or 144; "z" can be M, P, MH, PH, or BMH; and "aa" can be blank, BB, BW, or DG |
| Winaico               | Winaico modules with 35 and 40 mm frames  
Wsyy-xxxZa  
Where "y" can be either P or T; "Z" can be either M, P, or MX; and "a" can be blank or 6 |
<p>| Yingli                | Panda, YGE, YGE-U, and YLM series modules with 35, 40, and 50 mm frames |</p>
<table>
<thead>
<tr>
<th>MAKE</th>
<th>MODELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronergy Solar</td>
<td>Astronergy frameless modules</td>
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<td>CHSM6610P(DG)-xxx</td>
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<tr>
<td>Canadian Solar</td>
<td>Canadian Solar frameless modules</td>
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<td>CSbY-xxx-Z</td>
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<td>Where “b” can be 3 or 6; “Y” is K, P, U, or X; and “Z” can be M-FG, MS-FG, P-FG, MB-FG, or PB-FG</td>
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<tr>
<td>Heliene</td>
<td>Heliene frameless modules</td>
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<td>YYZZxxxA</td>
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<td>Where “YY” can be 72; “ZZ” can be M; and “A” can be GH</td>
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<td>Jinko</td>
<td>Jinko frameless modules</td>
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<td>JKMxxxPP-DV</td>
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<td>Prism Solar</td>
<td>Prism Solar frameless modules</td>
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<td>BiYY-xxxBSTC</td>
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<td>Where “YY” can be 48, 60, 60S, 72 or 72S</td>
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<td>Risen</td>
<td>Risen frameless modules</td>
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<td>RSMyy-6-xxxZZ</td>
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<td></td>
<td>Where “yy” can be 60, 72, 120 or 144; and “ZZ” can be MDG or PDG</td>
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<td>Stion</td>
<td>Stion frameless modules</td>
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<td>STL-xxx or STL-xxxA</td>
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<td>Sunpreme</td>
<td>Sunpreme frameless modules</td>
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<td>GXB-xxxYY</td>
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<td>Where “YY” can be blank or SL</td>
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<td>Trina</td>
<td>Trina frameless modules</td>
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<td>TSM-xxxYY</td>
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<tr>
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<td>Where “YY” can be either DEG5(II), DEG5.07(II), DEG5.40(II), DEG5.47(II), DEG14(II), DEG14C(II), DEG14C.07(II), DEG14.40(II), PEG5, PEG5.07, PEG5.40, PEG5.47, PEG14, or PEG14.40</td>
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