**GENERAL APPROVAL** - New - *Micro-inverter*, Models S230 and S280 - Manufactured by Enphase Energy, Inc. - For commercial or residential installations, installed as a part of a Photovoltaic (PV) system.

**CONDITIONS OF APPROVAL**
The installation of the PV Micro-inverters are approved when the following conditions are met:

1. Only the following model designations are approved under this research report:

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Power</th>
<th>Input (DC)</th>
<th>Output (AC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Max Input DC Voltage</td>
<td>MPPT Range</td>
</tr>
<tr>
<td>S230 *</td>
<td>220 VA</td>
<td>48 V</td>
<td>27 - 37 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S280 *</td>
<td>270 VA</td>
<td>48 V</td>
<td>27 - 37 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Followed by -60-LL-x-US, where x is 2 or 5

2. The Micro-inverters shall be plainly and permanently marked on a contrasting color background where readily visible with the following:
   a. Manufacturer’s Name,
   b. Model designation,
   c. Serial Number,
   d. Complete input and output direct current (DC) and alternating current (AC) electrical ratings in Volts, Amperes/Watts,
   e. “Maximum branch circuit protection: 20A”,
   f. Operating ambient temperatures “-40 °C to 65 °C”,
   g. Current CSA listing required markings or labels.
3. Upon installation, the following durable marking on a contrasting color background shall be placed on a tag at the load center or at the end of each PV circuit run(s):

“The installation of this PV Micro-inverter shall comply with City of Los Angeles Research Report (RR) number 930536. Not valid if the RR is expired. For a copy of RR visit www.LADBS.org or call 323-224-2168.”

4. If the listing of this PV Micro-inverter, under CSA Certificate number 70027328 is no longer current, the approval of this Research Report may be suspended or cancelled subject to Test Lab’s evaluation.

5. Micro-inverters shall be supplied from a dedicated 20 Ampere AC branch circuit without GFCI or AFCI protection.

6. The Micro-inverter shall be installed and maintained by “Qualified Person” as defined in the Los Angeles Electrical Code and in strict compliance with manufacturer’s instructions.

7. The maximum number of Micro-inverters in a 20 Amp circuits shall not exceed the following:

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Inverter Power Rating</th>
<th>Inverter Output Voltage Rating</th>
<th>Max Number of Micro-inverters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single Phase Circuit</td>
</tr>
<tr>
<td>S230*</td>
<td>220 VA</td>
<td>208 VAC</td>
<td>Not allowed**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>240 VAC</td>
<td></td>
</tr>
<tr>
<td>S280*</td>
<td>270 VA</td>
<td>208 VAC</td>
<td>Not allowed**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>240 VAC</td>
<td></td>
</tr>
</tbody>
</table>

Followed by -60-LL-x-US, where x is 2 or 5
** Refer to manufacturer’s installation instructions

8. The available symmetrical line to ground fault current at the Micro-inverter shall not exceed 5000 amperes.

9. For installations in a single family dwelling in the City of Los Angeles, The minimum distance between the service equipment to the first micro inverter in a circuit shall comply to the following:

<table>
<thead>
<tr>
<th>Single Family Dwelling, Size of Service</th>
<th>Available Fault Current At the Service</th>
<th>Size of Circuit Between Service &amp; Micro-inverter</th>
<th>Minimum Distance From Service to Closest Micro-inverter</th>
</tr>
</thead>
<tbody>
<tr>
<td>100A to 225A</td>
<td>10,000 Amp</td>
<td>#12 AWG</td>
<td>10 Feet</td>
</tr>
<tr>
<td>100A to 225A</td>
<td>10,000 Amp</td>
<td>#10 AWG</td>
<td>15 Feet</td>
</tr>
<tr>
<td>226A to 400A</td>
<td>22,000 Amp</td>
<td>#12 AWG</td>
<td>15 Feet</td>
</tr>
<tr>
<td>226A to 400A</td>
<td>22,000 Amp</td>
<td>#10 AWG</td>
<td>20 Feet</td>
</tr>
</tbody>
</table>
10. The power source to the engage cable shall be de-energized prior to servicing.

11. The hardware used to mount the Micro-inverter to the racking system shall be of a corrosion resistant type.

12. The PV racking system shall be provided with grounding means (ie. ground lug) for termination of the equipment grounding conductor that is independent from the Micro-inverter. The WEEB connector shall not be relied upon as an approved equipment bonding jumper or equipment grounding conductor.

13. The inverter’s mounting screws shall not be used as a bonding jumper or as a part of the equipment grounding path between the Micro-inverter and the PV racking system.

14. Only a UL or CSA Listed, Micro-inverter Engage cable shall be used for the AC output circuit with the following minimum ratings:
   
a. *Type TC-ER*,
   
b. *THHN or THWN*,
   
c. *4C or 5C*,
   
d. *12AWG*,
   
e. *90°C Dry, 75°C Wet*,
   
f. *300V*,
   
g. *Sun Res.*

15. The installation of the Micro-inverters shall comply with applicable provisions of the Los Angeles City Codes (Building, Electrical, and Fire Codes).

16. The manufacturer shall supply either hard copies of, or downloadable web links for Installation Instructions, Operation Manual, Quick Install Guide, and a copy of this approval letter to the installer.

17. The Micro-inverter shall be installed according to the provisions of this approval and the manufacture installation instructions. When the manufacturer installation instructions conflict with this approval letter, the conditions specified in this approval letter shall prevail.

18. The installation of this Micro-inverter is not approved for Hazardous (Classified) locations as defined in 2014 Los Angeles Electrical Code.

19. Except as permitted under this research report, the installed Micro-inverters and the Engage cables, when replaced, shall be of the identical original manufacturer’s part that was approved by the Los Angeles City Electrical Testing Laboratory.
20. If a Micro-inverter is no longer in service, it shall be disconnected and removed in accordance with the manufacturer’s installation instructions.

21. An electrical permit shall be obtained prior to installation or relocation of a photovoltaic system in the City of Los Angeles.

DISCUSSION:

The product covered under this Research Report is an AC grounded single phase, 208 or 240 volts, utility-interactive, Enphase Micro-inverter models S230 and S280 for use with Photovoltaic (PV) modules not exceeding 48 VDC output.

The Positive and Negative input DC conductors of the inverter are not grounded, and they are electrically isolated from AC output conductors. The inverters operate as an ungrounded DC power source. The Micro-inverter’s enclosure is bonded to the equipment grounding conductor of the engage cable. The inverter’s output AC neutral conductor is not bonded to its metal enclosure.

This Micro-inverter is intended to connect to a single PV module using individual single pin connectors. It can be installed in a single phase or three phase configuration when the appropriate cable harness is used.

The inverter metal enclosure is connected to the AC ground through the approved cable connector and the equipment grounding conductor within the AC cable.

These Micro-inverters consist of an aluminum metal enclosure, built-in ground fault protection in accordance with 2014 Los Angeles Electrical Code (Sec 690.35), positive and negative DC cables and connectors, an AC cable and connector.

The Engage cable consists of four (or five) #12AWG conductors that are 2 (or 3) line conductors, a neutral conductor, an equipment ground conductor, and a male connector. The cable connectors are polarized nonstandard configuration, locking type with a grounding member, where all live parts are guarded against inadvertent contact by a person. The connectors are rated for interrupting full load current without hazard to the operator and are listed or identified for its use. The grounding member of the connector contact is designed to be the first to make and the last to break contact with the mating connector. The wire harness or exposed cable output circuit rated 240V, 30A, or less, are not required to be provided with AFCI protection.

The PV modules, racking system, and associated hardware are not part of this approval. The efficiency and operation of the Micro-inverter were evaluated by CSA under Certificate number 70027328.

When this system is installed in accordance with the provisions of this General Approval, it should meet the minimum safety standards of the Los Angeles City Electrical Code.
For this General Approval to be valid on any installation in the City of Los Angeles, an engineer or inspector of the Department of Building and Safety must make a determination that all conditions of the General Approval required to provide equivalency have been met.

This General Approval is in accordance with Section 93.0303 of the Electrical Code pertaining to "New Materials and Methods of Construction" and does not waive the requirements of the City of Los Angeles Building Code.

This General Approval is neither a product endorsement nor a certification of accuracy or function of the approved item.

PICTURES:

APPROVED BY:

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