



YOTTA
ENERGY

SL-1000

Installation / User Manual



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1. Manual Introduction

This manual contains information and precautions to be used during the handling and installation of Yotta Energy's SolarLEAF (SL-1000) along with technical instructions to be followed during installation, wiring, and maintenance. Not following the contents of this manual will render the warranty and any guarantees there under null and void.



Warning! Outdoor commercial use ONLY.

This energy storage equipment was tested to UL 9540A documented a UL project 4790256937 - YOTTA - UNIT LEVEL REPORT - 2022-09-09. No additional fire protection required.



Please ensure that installation and operation of your SL-1000 is only carried out by qualified personnel, and is carried out in accordance with all safety precautions in this manual and all applicable local codes.



This manual and the instructions set forth herein are part of the product and should therefore be kept for the entire useful life of the installation.



NO user-serviceable parts inside.



Read **ALL** instructions first.

1.1 Disclaimer of Liability


- These instructions are only valid for Yotta Energy's SolarLeaf (SL-1000).
- The information in this manual is based on Yotta Energy's knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, expressed or implied. Yotta Energy reserves the right to change the manual, the specifications or product information sheets without prior notice.
- Because of the use of this manual and the conditions or methods of installation, operation, use and maintenance of the system's products are beyond Yotta Energy's control, Yotta Energy assumes no liability for damage, loss, or expense arising out of or in any way connected with such installation, operation, use or maintenance. Yotta Energy assumes no responsibility extending beyond the functional capability and safety of the system. This manual is only for reference.
- If your questions are not adequately addressed in this manual, please first contact your system supplier. You can find more information on our website www.yottaenergy.com

1. Manual Introduction


1.2 Product Identification

Each SL-1000 has three (4) labels that provide the following information:

- **Nameplate (2 Fixed)** - Describes the product's electrical and mechanical specifications, and certifications. This label includes serial number and MAC address printed inside the white rectangular box in the bottom left corner.
- **Peel off labels (2)** - These labels include serial number and MAC address ONLY. Remove these prior installing the SL-1000 and place them where suggested. One should be placed somewhere visible on the PV module frame sitting on top of the SL-1000 and the other one should be placed in the system map diagram provided in the appendix of this document (Appendix A).
- **NOTICE** - Having this information well kept and accesible will facilitate troubleshooting and prevent retrieving this information on fixed or hard to access applications. Keeping track of this will be required by Yotta Energy in case of service or replacement of a unit.




Removing the Nameplate (Fixed) label will void the Yotta Energy warranty.




Yotta Energy Inc.
Model: SL-1000

This UL9540 Listed ESS consists of:
SolarLEAF (SL-1000) and
Yotta Energy DPI-208 or DPI-480
3-Phase Microinverters.
Please scan the QR codes for details.
www.yottaenergy.com/installation/sl1000csm/manual

ESS Output (AC ~)
480VAC 3 phase/208VAC 3 Phase;
0.81A/1.9A @60Hz w/ DPI-480/DPI-208
Maximum Output Power: 675W/SL-1000









Yotta Energy Inc.
Model: SL-1000

Input (DC ⇔)
Input Voltage Range: 0V - 59.9V
MPPT Operating Voltage: 20V - 50V
Maximum Input Current: 15A
Maximum Input Power: 750W

Output (DC ⇔)
Output Voltage Range: 22V - 45V [40V]
Maximum Output Current: 15A
Maximum Output Power: 675W

Designed in Austin, Texas



No serviceable parts inside

CAUTION! Risk of Electric Shock
Do NOT Remove Cover. Refer Servicing
To Qualified Service Personnel.

Ambient Temperature Range: -20° to 43°C
Weight: ≈25.7kg [56.7lb]

Agency Compliance
UL1973, UN38.3
Contains FCC ID: 2AC7Z-ESPWROOM32UE

Battery UL1973
Nominal Voltage: 38.4Vdc
Capacity: 1kWh
Chemistry: LiFePO₄
Maximum Short Circuit Current: 375A
for 7 ms
Outdoor Only: IP67

2101 E. Sarrill Elmo Road, Suite 150 Austin, TX 78744 +1 (512) 856 7788

2 Nameplate (Fixed) Labels



Peel off Label 1 (Remove and place)



Peel off Label 2 (Remove and place)

*Follow the steps according to this manual to properly attach the peel off labels.

*Size of labels not in 1:1 ratio. For reference only.

2. Safety Guidelines


2.1 IMPORTANT SAFETY INSTRUCTIONS. SAVE THIS DOCUMENTATION.



Caution! Risk of electric shock.



All installations must be in compliance with all applicable regional and local codes, and other national or international electrical standards (as applicable).

- ONLY qualified professionals can install and/or replace the SolarLEAF (SL-1000).
- Do NOT attempt to repair the SL-1000. If it fails, contact Yotta Energy Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the unit will void the warranty.
- Do NOT attempt to disassemble the SolarLEAF (SL-1000).
- Do NOT cut or modify the cable assemblies.
- Do NOT insert items into the connectors.
- Keep children and unauthorized persons away from the SolarLEAF (SL-1000).
- A solar module generates currents and voltages even in low light intensities i.e moonlight or city background light. Therefore, contact with the solar panels or attached system with live modules should be avoided and isolation of live circuits should be taken before any connection or disconnection operation.
- Physically disconnecting connectors or contacts in a live electrical circuit can cause arcing, resulting in injury.
- Never disconnect solar panels when under load. Be aware that even without the presence of daylight, residual voltage may still be present.
- In case of fire, do NOT use water to extinguish it.
- In case of rain, wet, or windy weather, do not install or troubleshoot any component.
- In order to ensure safe mounting, familiarize yourself with all applicable regulations for work site safety and accident prevention.
- Any power connector mated with a socket or connector attached to this product must be from same manufacturer, the same series and have a matching part number.
- All fastenings marked with the ground bonding symbol must be secured before connecting wires to the unit. Ground bonding symbol reference. 

2. Safety Guidelines

2.2 Product Precautions



The SolarLEAF (SL-1000) needs the chassis to be grounded. Ensure the chassis is grounded per code. This can be done via the metal ground foot or a ground lug.

- Do NOT disconnect the power from the output port (DC out) to the DPI Microinverter without disabling power production first. This is not to protect the SolarLEAF (SL-1000), but is required by the DPI microinverter.
- Before installing or using the SL-1000, DPI microinverter, or solar panels, read all instructions and warning notices in the technical documents.
- Be aware that the entire chassis of the SolarLEAF (SL-1000) can reach a temperature of 65°C. To reduce risk of burns, do NOT touch the chassis without protection.
- Do NOT drill into the SolarLEAF (SL-1000).
- Do NOT add any weight or stack once they are outside the box.

2.3 Transport and Storage Safety Guidelines



Inappropriate transportation and/or installation may damage the SolarLEAF (SL-1000) unit. Damaging the unit will void its warranty.



A single SolarLEAF (SL-1000) unit weights 56.7 lbs (25.7 kg) and should be lifted by two (2) people by grasping the flange on the perimeter of the top of the unit.

- Transport the SolarLEAF (SL-1000) in their original packaging until installation.
- Store the SolarLEAF (SL-1000) securely in cool and dry location. The packaging is not weather-resistant.
- Protect the SolarLEAF (SL-1000) against scratches.
- Do NOT subject the SolarLEAF (SL-1000) to mechanical stress.
- Do NOT stand on the SolarLEAF (SL-1000).

2. Safety Guidelines

2.3 Transport and Storage Safety Guidelines

The SolarLEAF (SL-1000) will be shipped via ground freight at a SOC (State of Charge) level of 30% to ensure transportation and storage safety. The units will be in a state of “deep-sleep” to minimize power consumption of the batteries.

- Battery & cells are monitored by the BMS in a “sleep mode”
- Internally, the battery port is disconnected from the rest of the power electronics.
- All (wireless and wired) communication are turned off within the SolarLEAF (SL-1000).

The SolarLEAF (SL-1000) comes from the factory with all connectors protected. Do NOT remove these protected covers until installation.

- Protect from moisture at all times. While not required if stored in a sheltered location, all connectors, DC-In, DC-Out, and M12 connectors, must be protected if the SolarLEAF (SL-1000) is stored outside where moisture could be introduced into the connectors. If the M12 port has also been used, remember to install and tighten the M12 cap.



MC4 Sealing Caps



M12 Cap

- The SolarLEAF (SL-1000) will have a shipped date indicating when the SolarLEAF has left Yotta Energy’s warehouse.
- The SolarLEAF (SL-1000) can be stored on a warehouse or jobsite for up to **TBD** months in a temperature range of **TBD** without any maintenance.
- If this time has exceeded, the dongle can be used to check the SolarLEAF (SL-1000) SOC (State of Charge). By plugging in the dongle, its LCD will show the SOC. If it’s below 25% then the SolarLEAF (SL-1000) will need a topping charge if it will be stored. Call Yotta Energy for assistance.

3. Product Information

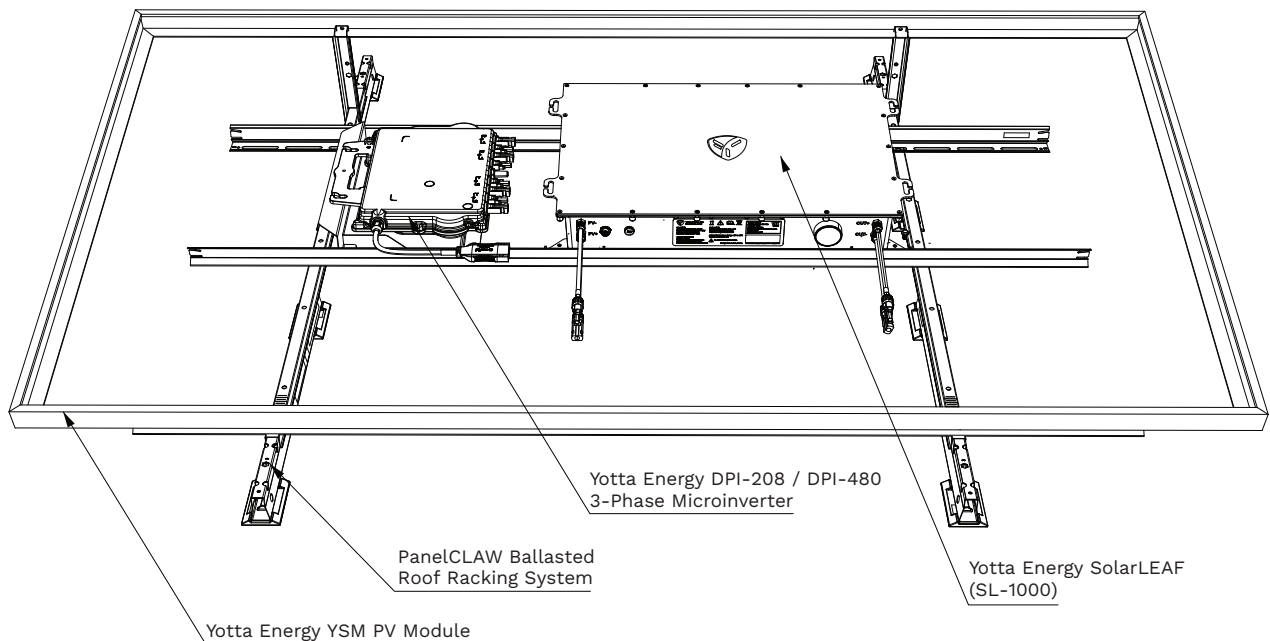
3.1 Introduction

The SolarLEAF (SL-1000) is a PV-coupled, panel-level micro energy storage unit with built-in thermal regulation technology to minimize balance of system costs and the added complexity of installing storage alongside solar projects. Each SolarLEAF (SL-1000) has two pairs of DC ports (IN and OUT). The unit receives energy from one or more solar PV modules on the input port and connects to Yotta Energy's DPI Microinverter on the output port to deliver power to the load. The SolarLEAF (SL-1000) is not intended to be used as a backup storage system.

3.2 SolarLEAF (SL-1000) System

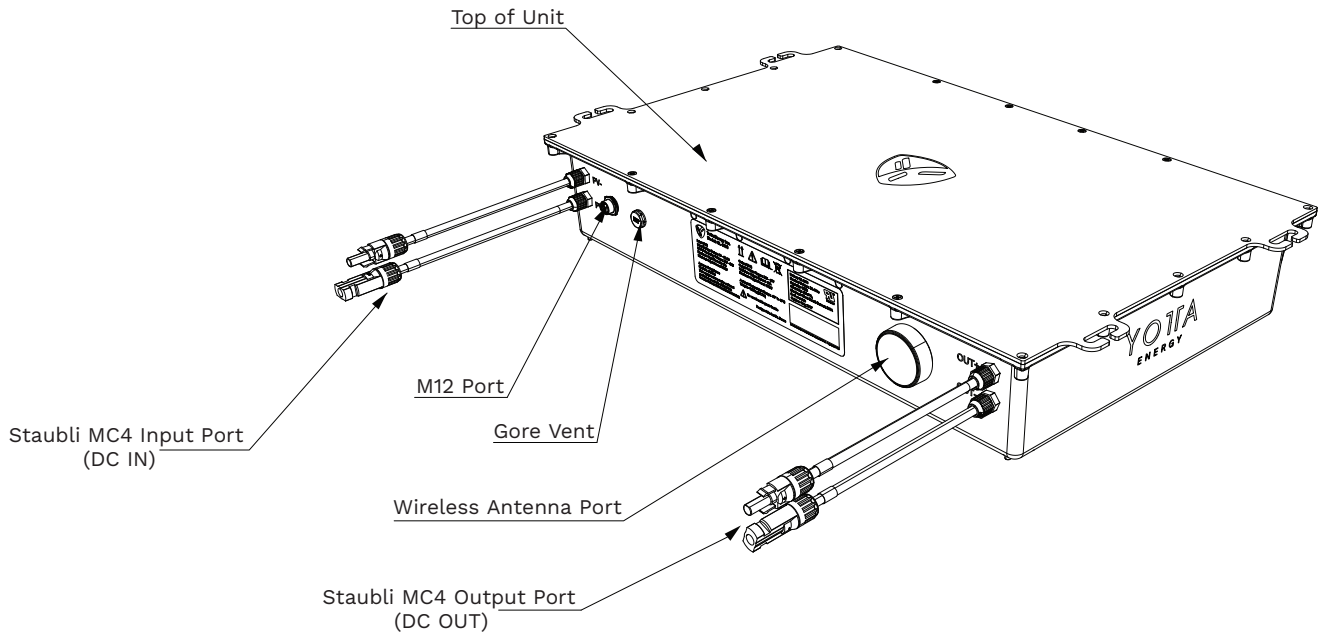
The SolarLEAF (SL-1000) is designed to operate as part of the Yotta ecosystem and is engineered around the following system components:

- **Yotta Energy SolarLEAF SL-1000** panel-level storage energy storage system (this manual).
- **Yotta Energy DPI-208 or DPI-480 3-Phase Microinverter** - The DPI-208 and DPI-480 are the devices that convert the DC power from the DC Out port into AC power which is used on site or sent out to the utility grid. The DPI Microinverters also provide rapid shutdown functions as described in the DPI user manual. Contact Yotta Energy for more information.
- **Racking system** - The SolarLEAF (SL-1000) can be installed into many racking systems, including ground-mount racking solutions - as long as a valid ground bonding path is provided. UL2703 Listed racking systems may provide a ground bonding path to building ground. If the racking is not UL2703 Listed a separate ground wire must be attached to each DPI inverter and SolarLEAF element in the system.
- **PV modules** - The SolarLEAF (SL-1000) can be used with 60-cell or 72-cell solar panels.



3. Product Information

3.3 SolarLEAF (SL-1000) Components



3.4 SolarLEAF (SL-1000) Controllers

- The SolarLEAF (SL-1000) system has a MPPT solar charger that provides power to a common DC bus (VCOM). The power can be stored in the SolarLEAF's battery and/or sent to the DPI Microinverter via another DC-DC converter.

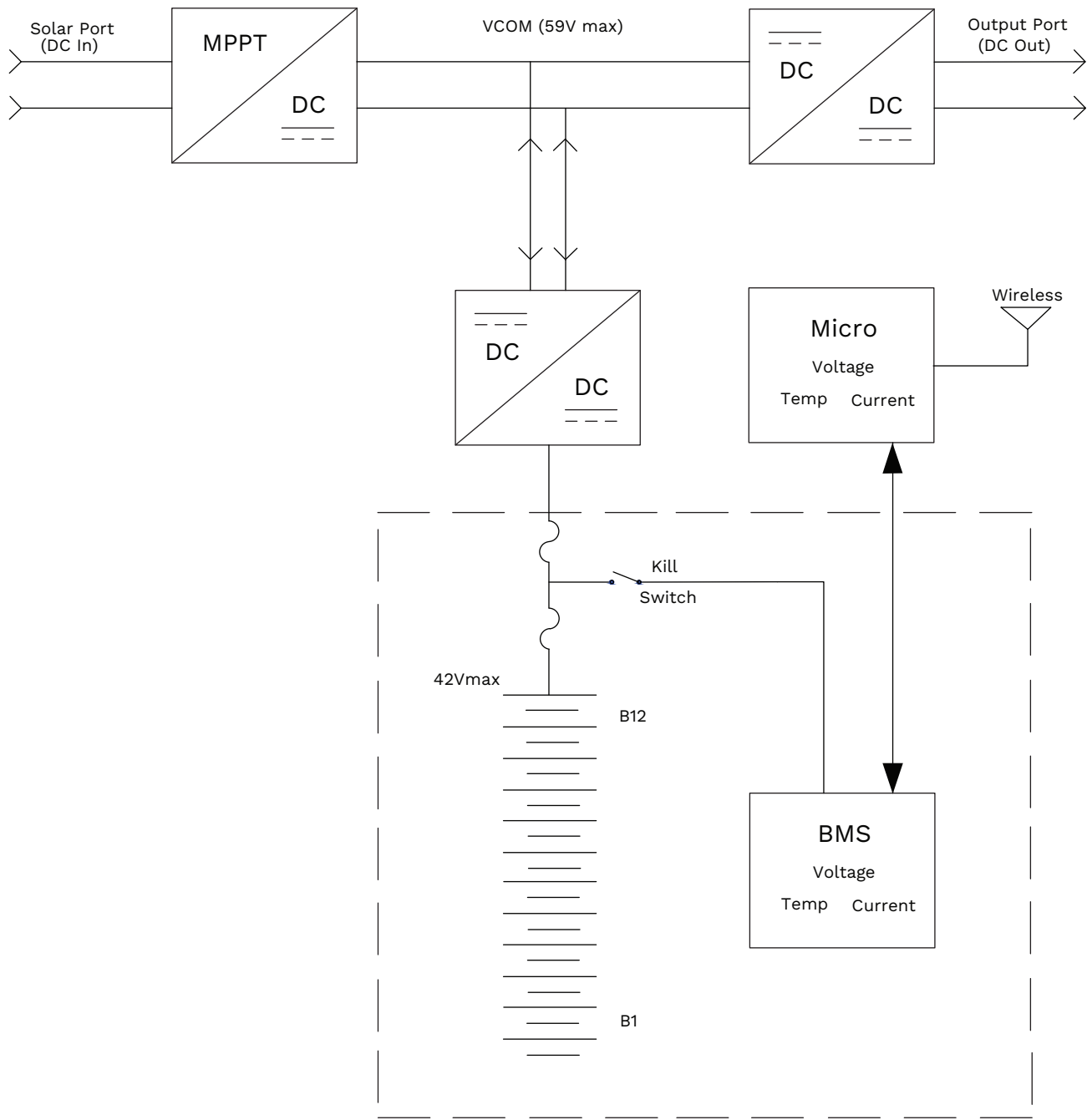
3.5 Radio Interference Statement



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

3. Product Information

3.6 SolarLEAF (SL-1000) Functional Block Diagram



4. Service and Maintenance

4.1 Removal from Service or Replacement

- If the SolarLEAF (SL-1000) is being removed for replacement or from service please contact Yotta Energy.

4.2 Returning a SL-1000 unit to Yotta Energy

If the SolarLEAF (SL-1000) requires replacement, Yotta Energy will ship a replacement unit in reusable shipping materials that will be used to protect the unit when shipped back to Yotta Energy. Be sure to follow the supplied directions and use the prepaid return shipping label.

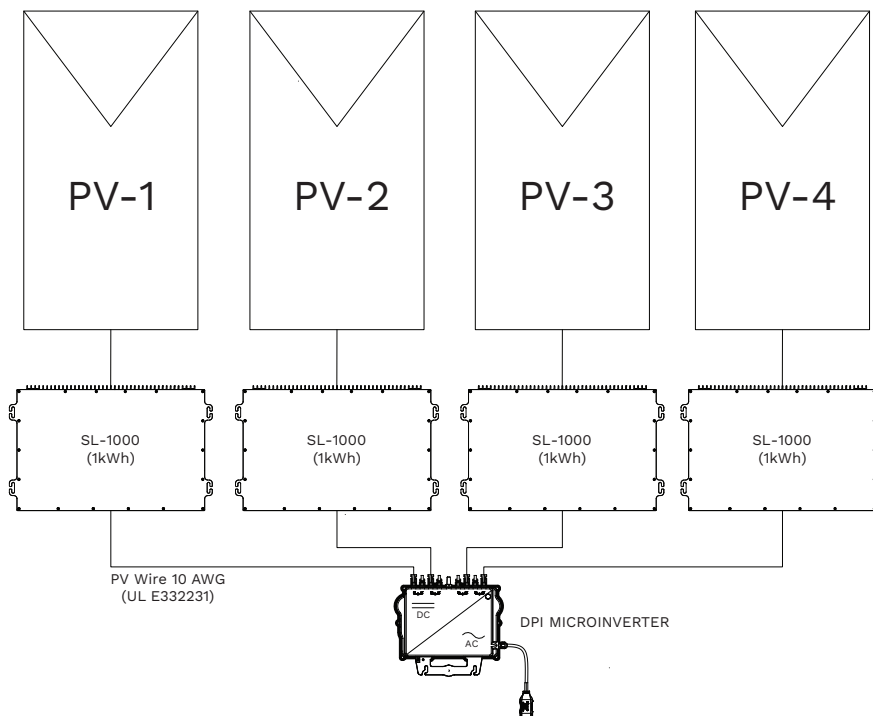
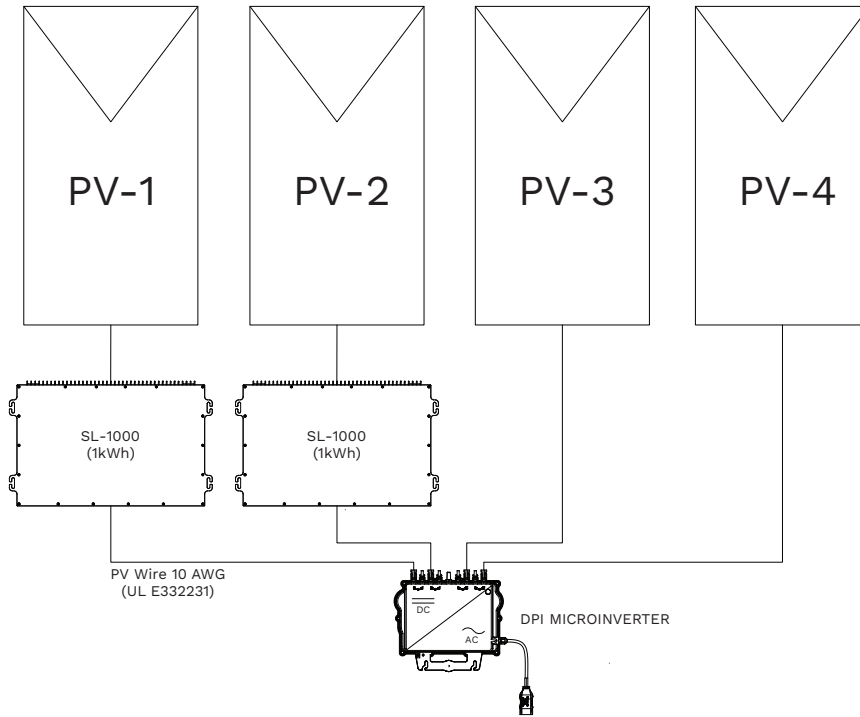


Warning! The SolarLEAF must be shipped in the protective packaging provided by Yotta Energy. Affix all supplied labels and follow the instructions provided.

5. SolarLEAF (SL-1000) Architecture

5.1 Deployment

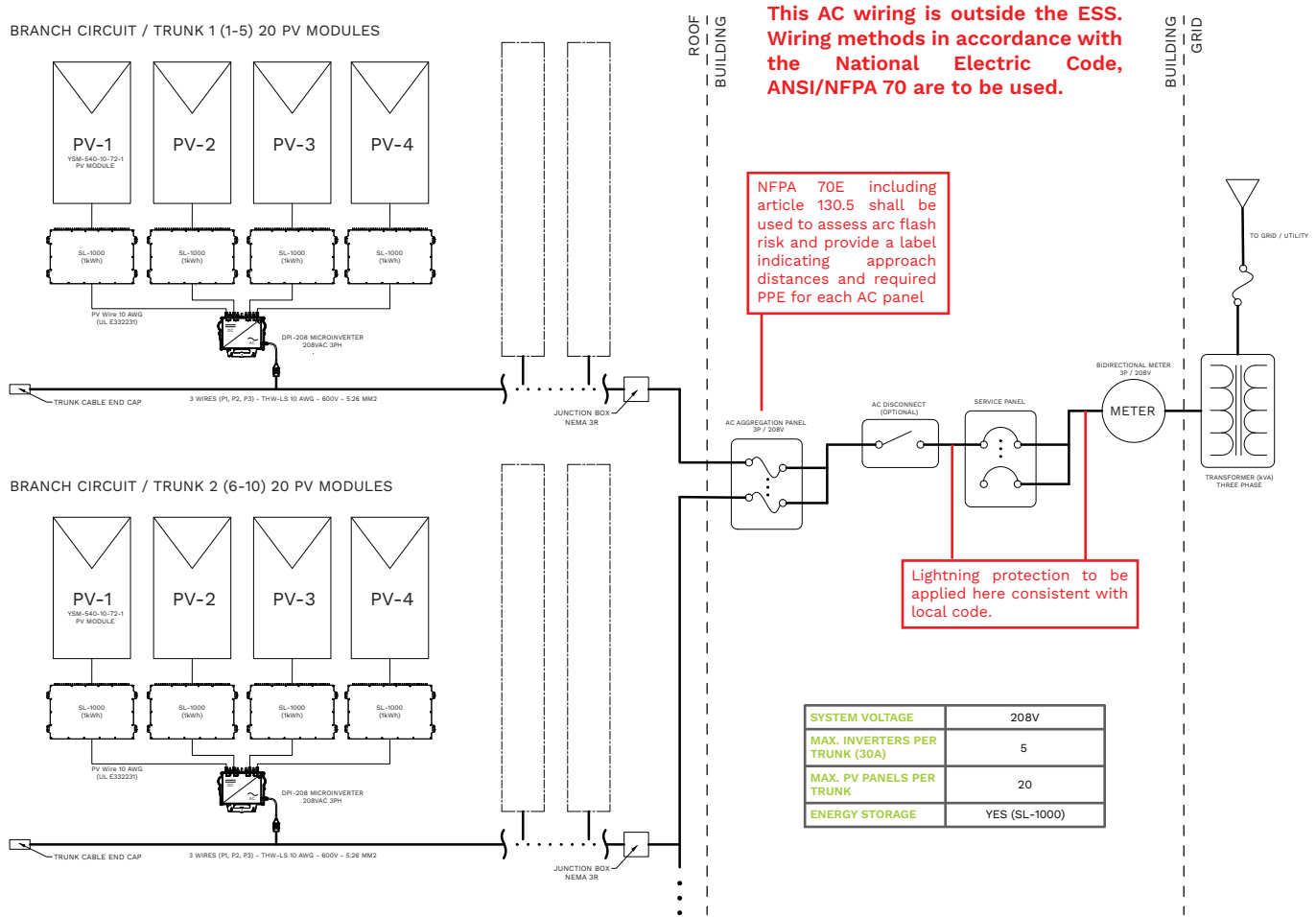
- The SolarLEAF (SL-1000) can be deployed individually or in pairs. Economically, it is preferred to deploy SolarLEAFS in pairs. That means either two (2) or four (4) SolarLEAF (SL-1000) units per one DPI-208 or DPI-480 Microinverter ratio.



5. SolarLEAF (SL-1000) Architecture

5.2 National Electric Code and Local Requirements for 208V Systems

- The SolarLEAF (SL-1000) is designed to work hand in hand with the Authorities Having Jurisdiction in locations where the system is deployed. This figure shows where the Energy Storage System (ESS) ends and where National and Local Standards for AC and grid connected wiring begin.

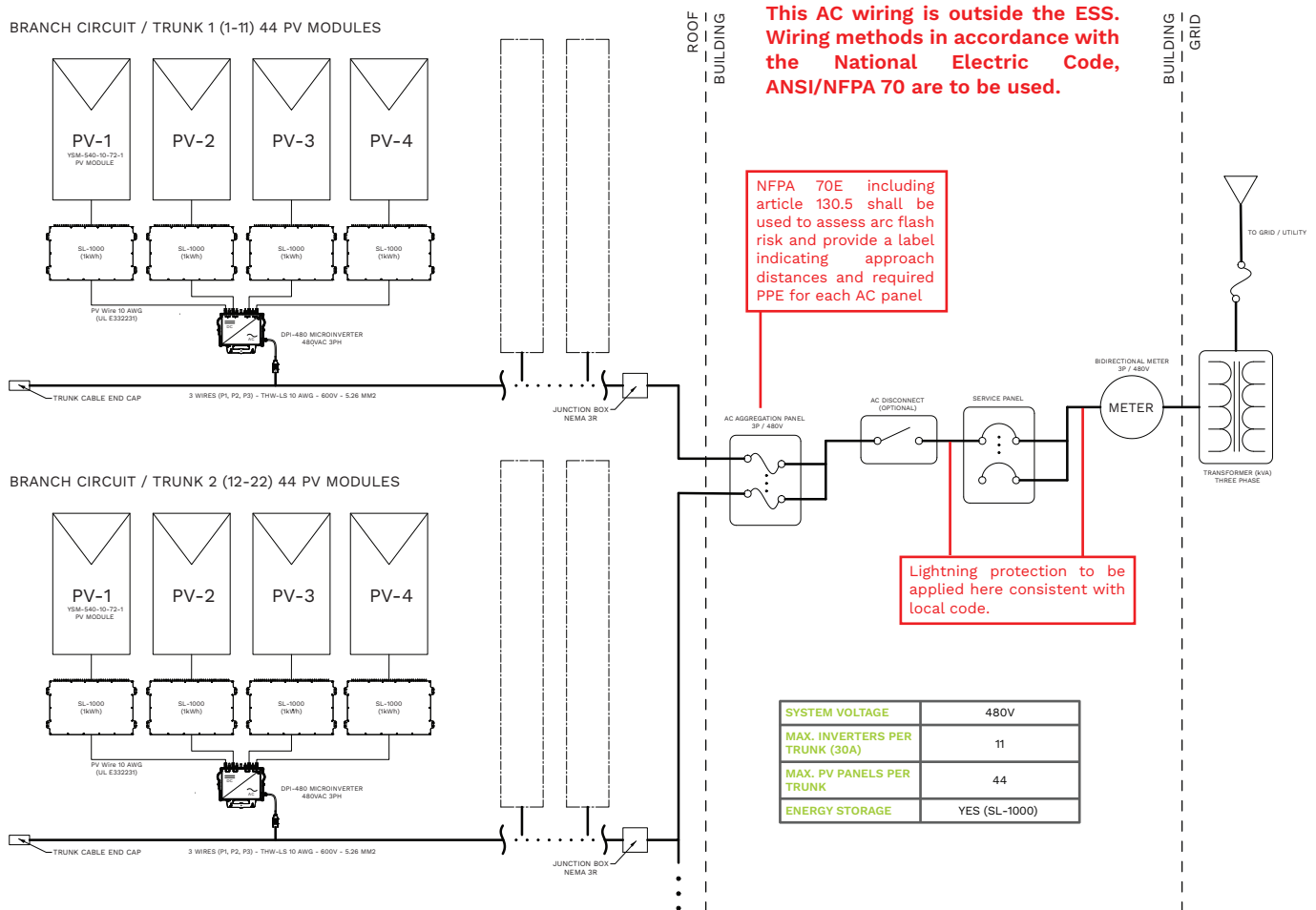


- Lightning Protection: Add a Type 1 (on the line side of the main panel) or Type 2 (on the load side of the main panel) surge protection device to provide a Category 3 surge environment for the inverters, depending on local code.
- AC Aggregation Panel Arc Flash Calculations: Each 208V DPI inverter sources a maximum fault current of **85.4A** peak with a duration of 13.6 milliseconds. All recommended configurations result in the aggregation panel containing less than fifty (50) 30A breakers. This should put the arc flash characteristics in row 1 of NFPA 70E Table 130.7(C)(15)(a): Less than 250V and less than 25kA fault current. The corresponding approach boundary is 485mm (19 inches) with Class 1 PPE required.

5. SolarLEAF (SL-1000) Architecture

5.2 National Electric Code and Local Requirements for 480V Systems

- The SolarLEAF (SL-1000) is designed to work hand in hand with the Authorities Having Jurisdiction in locations where the system is deployed. This figure shows where the Energy Storage System (ESS) ends and where National and Local Standards for AC and grid connected wiring begin.



- Lightning Protection: Add a Type 1 (on the line side of the main panel) or Type 2 (on the load side of the main panel) surge protection device to provide a Category 3 surge environment for the inverters, depending on local code.
- AC Aggregation Panel Arc Flash Calculations: Each 208V DPI inverter sources a maximum fault current of **35.1A** peak with a duration of 13.6 milliseconds. All recommended configurations result in the aggregation panel containing less than fifty (50) 30A breakers. This should put the arc flash characteristics in row 2 of NFPA 70E Table 130.7(C)(15)(a): Less than 600V and less than 25kA fault current. The corresponding approach boundary is 900mm (3 feet) with Class 2 PPE required.

6. Mechanical Installation



Notice: To comply with **NFPA 855**, no more than 600 SolarLEAF (SL-1000) battery storage systems can be installed on a single roof. For additional system design guidelines contact Yotta Energy.

6.1 Positioning

The SolarLEAF (SL-1000) is designed to be shaded by the solar panel or its equivalent at all times. The units cannot be left out in the sun awaiting installation or waiting for the PV modules to be installed. During the installation, the units must be shaded from direct sunlight.

The simplest way is to keep the SolarLEAF (SL-1000) protected by its own cardboard box until a solar panel is installed. Do NOT leave the protecting element (cardboard or plastic covering) on top of the units after solar panel is installed. Doing so could produce excessive heat causing a faulty system and a possible fire hazard.

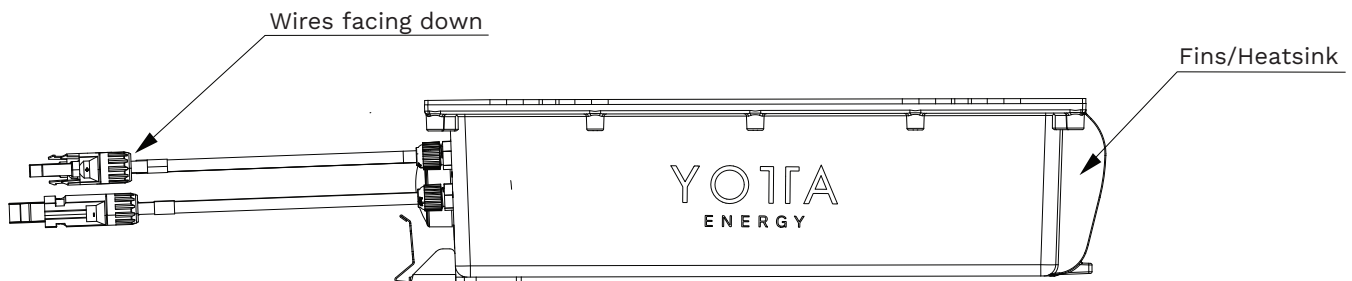
- Avoid mounting the SolarLEAF (SL-1000) units in a location that will interfere with the PV modules. Leave enough clearance/separation:

Minimum of 1" (25mm) from the solar panel.

Minimum of 2.3" (60mm) from the roof.



Warning! The SolarLEAF (SL-1000) needs to be level or fin side high when mounted to the rack. This can be checked by putting a level on top of the SolarLEAF. Fins/heatsinks should be facing up as shown below. Be sure to check every SolarLEAF (SL-1000) unit since the pitch of the roof may require different orientations or even a possible negative slope.



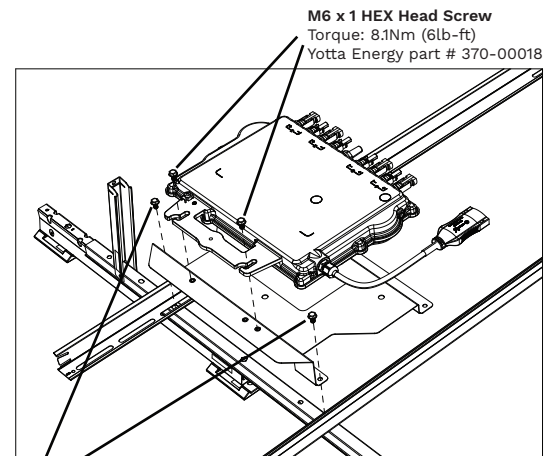
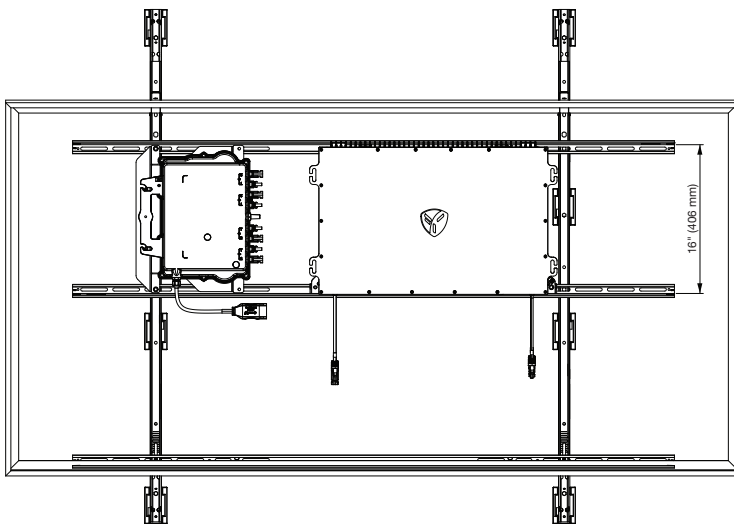
6. Mechanical Installation

6.2 Attaching to Racking System



Warning! Grounding feet should mechanically attach the unit to the grounding system. Please refer to hardware specifications. Use bolts to provide ground bond using existing holes. At least one bolt and nut is required for grounding as allowed by local code.

- Prior to attaching the SolarLEAF (SL-1000) unit to the racking system, the distance between rails should approximately match the size of a standard solar panel ballast block (ASTM C90) of 16" x 4" x 8" (L X W X H) oriented in portrait. Use the existing weldnuts in the main rails to locate the ballast rails about 16 inches apart.
- In case of a PanelClaw rack, reuse two (2) PanelClaw screws to attach the inverter bracket at the cross points. Torque to 8.1 Nm (6 ft-lbs). Only two (2) screws are required. Attach the inverter to the bracket using Yotta hardware.



M6 x 1 HEX Head Screw

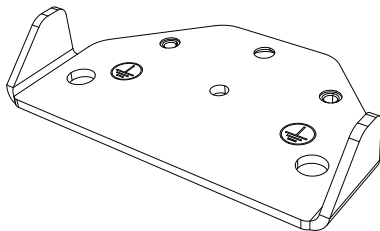
Torque: 8.1Nm (6lb-ft)

Yotta Energy part # 370-00018

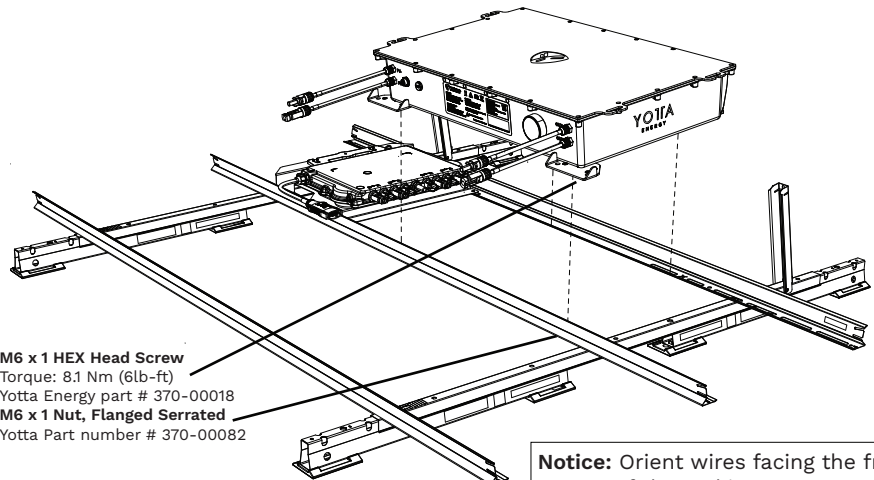
M6 x 16 mm HEX Head Screw (Existing)

Torque: 8.1Nm (6lb-ft)

Panel Claw Part # 2000697



Grounding Feet (2)



M6 x 1 HEX Head Screw

Torque: 8.1 Nm (6lb-ft)

Yotta Energy part # 370-00018

M6 x 1 Nut, Flanged Serrated

Yotta Part number # 370-00082

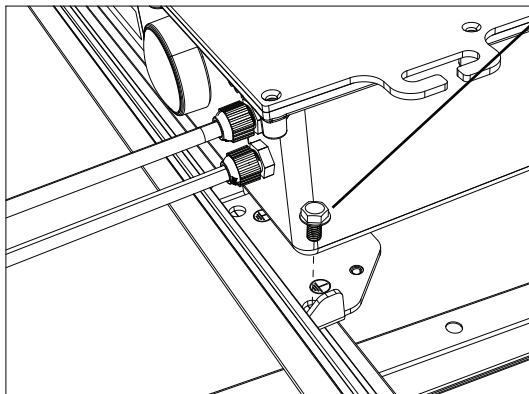
Notice: If SolarLEAF is LEVEL. Top of SolarLEAF should be level. If not level, wiring side should be lower than finned heat sink side.

Notice: Orient wires facing the front of the racking system.

6. Mechanical Installation

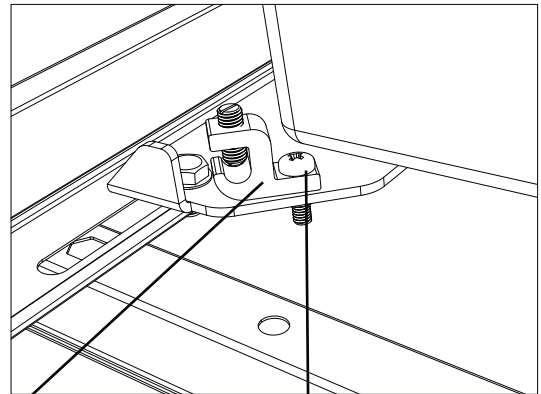
6.2 Attaching to Racking System

- Place the SolarLEAF (SL-1000) into the racking system
- Attach one or two bolts with corresponding nut on opposite side to provide a valid bond ground near the ground bond symbol. If the rack system is not UL2703 Listed, or you are in anyway uncertain about the grounding of the rack , use IlSCO GBL-4SS Ground Lug (UL 467 Listed, UL 2703 Listed, UL File Number E34440, C22.2 No. 65-03, CSA File Number LR-29601) Yotta part number 370-00085, secured by 10-32 Screw, Yotta part number 370-00084, to establish a bonding ground.
- Run a 10 AWG solid ground wire through the IlSCO lug back to the building ground. Use 10 AWG or thicker copper ground wire and torque based on gage and stranding. For 10 AWG solid ground wire lay in the wire and then torque set screw to 2.3 Nm (1.7 lbf-ft, 20 in-lb).



Screw should match the rail's existing adjustable slotted hole. Do **NOT** drill any new holes.

M6 x 1 HEX Head Screw
Torque: 8.1Nm (6lb-ft)
Yotta Energy part # 370-00018
M6 x 1 Nut, Flanged Serrated
Yotta Energy part # 370-00082



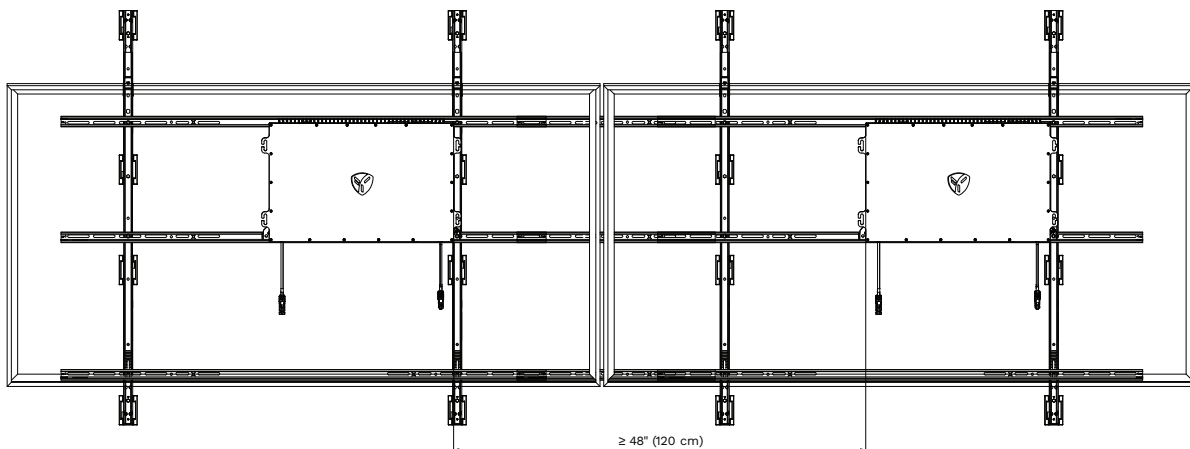
ILSCO GBL-4SS
Torque: 10.9Nm (8lb-ft)
Yotta Energy part # 370-00085
Torque: 2.3Nm (1.7lb-ft)

10-32 Stainless Steel Screw
Torque: 2.7Nm (2lb-ft)
Yotta Energy part # 370-00084



Warning! AC power to the DPI Microinverters should **NOT** be turned **ON** at this point of installation. All microinverters should be mounted and connected to their associated trunk cable (AC connection) prior to mounting the SolarLEAF (SL-1000) units for an easier installation process.

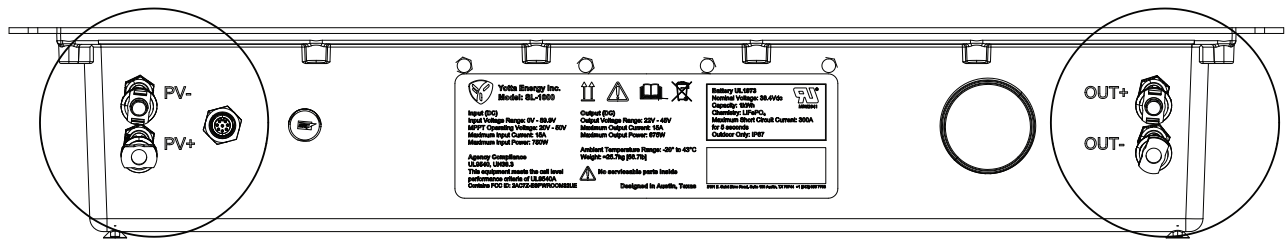
- Separate the SolarLEAF (SL-1000) units by a minimum of 48" (120 cm) which is allowed per UL9540A and NFPA855 (Section 15.13).



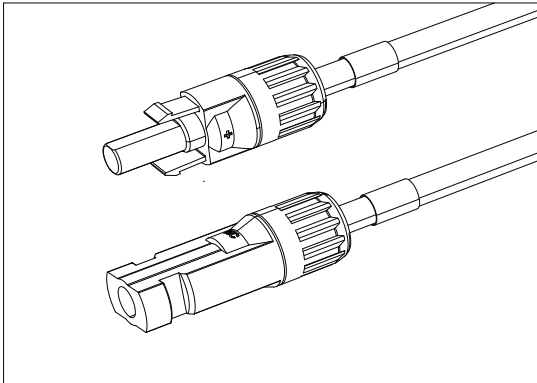
7. Electrical Installation



Warning! Ensure the DC jumper wires from the SolarLEAF (SL-1000) to the PV module and DPI Microinverter are plugged into the correct terminals or damage will occur and void the warranty. Take note of the DC input and DC output (Marked OUT- and OUT+) terminal locations on the SolarLEAF (SL-1000) shown below.



The SolarLEAF (SL-1000) system is an extension of any existing solar install using Yotta Energy's DPI Microinverters. It's a plug-and-play solution for adding energy storage within the safety of a Low Voltage (< 60V) DC Architecture.



Staubli PV-KST4/6X-UR and Staubli PV-KBT4/6X-UR

- **Input** - Connect the (+/-) DC wires from the PV (MC4 compatible) to the input ports (Marked PV- and PV+) of the SolarLEAF (MC4 compatible).
- **Output** - Connect the (+/-) DC wires from the SolarLEAF (Marked OUT- and OUT+) to the positive and negative terminals of the corresponding channel of the DPI Microinverter input port.



Always use matching connectors and a proper disconnection tool to ensure easy connection/disconnection.

7.1 Site Mapping

The SolarLEAF (SL-1000) comes with a MAC identification number which is unique to each unit. The MAC number has a permanent identification number, and two (2) peel-off labels that can be removed and attached to the PV module above the unit and to the site mapping table in Appendix A.

- Place the MAC number for each SolarLEAF (SL-1000) on the DPI channel to identify which PV input channel the SolarLEAF is attached to.

See Appendix A | Installation Map for a reference document.

8. Operation

8.1 Activating the System

Each SolarLEAF (SL-1000) unit comes with plug-and-play ready for time-of-use shifting. No user or installer interaction is required. After connecting the DPI Microinverter to a grid connection, the output of the currently-sleeping SolarLEAF (SL-1000) should be connected to an available pair of ports on the DPI Microinverter. The battery will automatically wake, when it detects a voltage greater than 12V DC on its PV port—so connecting the associated PV module with the SolarLEAF (SL-1000) will turn the unit on.

8.2 Disposal



Contact your local authorities for proper disposal and recycling regulations.

8.3 Troubleshooting

For further assistance contact Yotta Energy.

www.yottaenergy.com

+1 (512) 856-7788

2101 East Saint Elmo Road, Building 1, Suite 150, Austin, TX, 78744

Appendix A | Installation Map

Installer		PV Module			Qty		SolarLEAF Model	SL-1000
Site / Owner		DPI Model			Qty		Qty of SL units	
Row	DPI Information	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	
Row 1	DPI S/N							
	MPPT 1 SL MAC							
	MPPT 2 SL MAC							
	MPPT 3 SL MAC							
Row 2	MPPT 1 SL MAC							
	MPPT 2 SL MAC							
	MPPT 3 SL MAC							
	MPPT 1 SL MAC							
Row 3	DPI S/N							
	MPPT 1 SL MAC							
	MPPT 2 SL MAC							
	MPPT 3 SL MAC							
Row 4	MPPT 1 SL MAC							
	MPPT 2 SL MAC							
	MPPT 3 SL MAC							
	MPPT 1 SL MAC							
Row 5	DPI S/N							
	MPPT 1 SL MAC							
	MPPT 2 SL MAC							
	MPPT 3 SL MAC							
				Sheet			of	

Appendix B | SolarLEAF (SL-1000) Data Sheet

MODEL	SL-1000
ELECTRICAL	
Solar PV Input	Up to 750W
Module Compatibility	Voc(max) 60V - Isc(max) 15A
Inverter Compatibility	Yotta DPI Microinverter
DC Voltage - Nominal	38.4V
Amp Hours	26.4Ah
Rated Capacity	1000Wh @ (100% DoD) 800Wh @ (80% DoD)
Allowable Depth of Discharge (DoD) (1)	Up to 100%
Input Voltage (1)	53V
Output Voltage Range	22-45V
MPPT Operating Range	20-50V
Max Continuous Current (charge & discharge)	15A
Max Power Output (2) (discharge)	Up to 675W
Chemistry	Lithium Iron Phosphate
Cycle Life	6,000+ Cycles (@ 80% DoD)
MECHANICAL	
Weight	56.7 lbs (25.7kg)
Roof Loading	2.7 / 3.0 psf typical
Mounting Options	Attaches to PV or ballast racking
Ambient Op. Temp.	-20° to 43°C max continuous (-4° to 109°F)
Storage Temp.	-20° to 55°C (-4° to 114°F)
Dimensions	15.75 x 26.25 x 4.25 (in)
SAFETY AND WARRANTY	
Warranty	10 Years
Enclosure	NEMA 4X, IP67
Certifications	UL 1973 UL 9540 UN38.3
MONITORING	Yotta Vision
COMPLIANCE	UL 9540, UL 1973
	Meets the performance criteria for UL 9540A

(1) Maximum operating ranges. Refer to warranty for recommended conditions.
 (2) From battery, but further limited by solar inverter.

