



## APsystems DS3-H Microinverters User Manual

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**Installation / User Manual**



**APsystems DS3 series  
(DS3-S, DS3-L, DS3, DS3-H) Microinverters  
(For APAC)**

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## Important Safety Instructions

This manual contains important instructions to follow during the installation and maintenance of the APsystems Photovoltaic Grid-connected Inverter (Microinverter). To reduce the risk of electrical shock and ensure the safe installation and operation of the APsystems Microinverter, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

Specifications are subject to change without notice – please ensure you are using the most recent update found at [www.APsystems.com](http://www.APsystems.com)



### WARNING

This indicates a situation where failure to follow instructions may cause a serious hardware failure or personnel danger if not applied appropriately. Use extreme caution when performing this task.



### NOTICE

This indicates information that is important for optimized microinverter operation. Follow these instructions closely.

### 1.1 Safety Instructions

- Do NOT disconnect the PV module from the APsystems Microinverter without first disconnecting the AC power.
- Only qualified professionals should install and/or replace APsystems Microinverters.
- Perform all electrical installations in accordance with local electrical codes.
- Before installing or using the APsystems Microinverter, please read all instructions and cautionary markings in the technical documents and on the APsystems Microinverter system and the solar array.
- Be aware that the body of the APsystems Microinverter is the heat sink and can reach a temperature of 80°C. To reduce the risk of burns, do not touch the body of the Microinverter.
- Do NOT attempt to repair the APsystems Microinverter. If it fails, contact APsystems Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the APsystems Microinverter will void the warranty.
- Caution!

The external protective earthing conductor is connected to the inverter protective earthing terminal through an AC connector. When connecting, connect the AC connector first to ensure the inverter earthing then do the DC

connections. When disconnecting, disconnect the AC by opening the branch circuit breaker first but maintain the protective earthing conductor in the branch circuit breaker connect to the inverter, then disconnect the DC inputs.

- Please install AC breakers on the AC side of the inverter.

## 1.2 Radio Interference Statement






**CE EMC Compliance** The equipment can comply with CE EMC, which are designed to protect against harmful interference in a residential installation. The equipment could radiate radio frequency energy and this might cause harmful interference to radio communications if not following the instructions when installing and using the equipment. But there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, the following measures might resolve the issues:

A) Relocate the receiving antenna and keep it well away from the equipment.

B) Consult the dealer or an experienced radio / TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

## 1.3 Symbols replace words on the equipment, on a display, or in manuals

	Trademark.
	Caution, risk of electric shock.
	Caution, hot surface.
	The symbol for the marking of electrical and electronic devices according to Directive 2002/96/EC. Indicates that the device, accessories, and packaging must not be disposed of as unsorted municipal waste and must be collected separately at the end of the usage. Please follow Local Ordinances or Regulations for disposal or contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
	Refer to the operating instructions.
Qualified personnel	A person is adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards that electricity can create. For the purpose of the safety information of this manual, a "qualified person" is someone who is familiar with requirements for safety, electrical system, and EMC and is authorized to energize ground, and tag equipment, systems, and circuits in accordance with established safety procedures. The inverter and endues system may only be commissioned and operated by qualified personnel.

## APsystems Microinverter System Introduction

The APsystems Microinverter is used in utility-interactive grid-tied applications, comprised of three key elements:

- APsystems Microinverter
- APsystems Energy Communication Unit (ECU)
- APsystems Energy Monitor and Analysis (EMA) web-based monitoring and analysis system

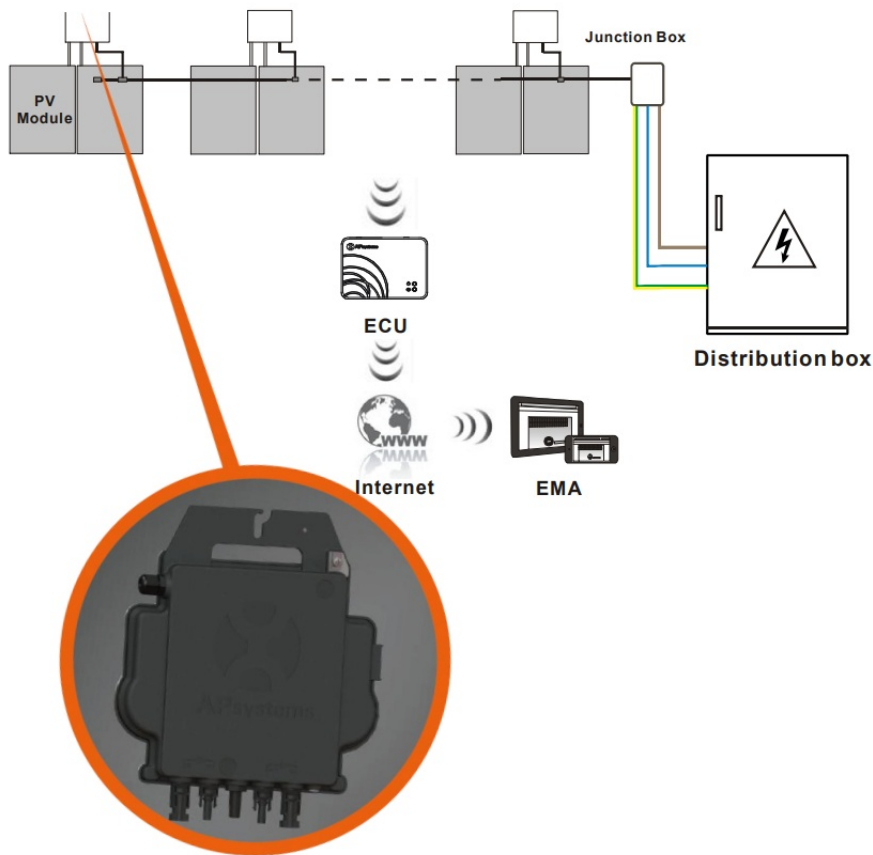


Figure 1

This integrated system improves safety; maximizes solar energy harvest; increases system reliability, and simplifies solar system design, installation, maintenance, and management.

### **APsystems Microinverters maximize PV energy production**

Each PV module has individual Maximum Peak Power Tracking (MPPT) controls, which ensure that the maximum power is produced to the utility grid regardless of the performance of the other PV modules in the array. When PV modules in the array are affected by shade, dust, orientation, or any situation in which one module underperforms compared with the other units, the APsystems Microinverter ensures top performance from the array by maximizing the performance of each module within the array.

### **More reliable than centralized or string inverters**

The distributed APsystems Microinverter system ensures that no single point of system failure exists across the PV system. APsystems Microinverters are designed to operate at full power at ambient outdoor temperatures of up to 149°F (65°C). The inverter case is designed for outdoor installation and complies with the IP67 environmental enclosure rating.

### **Simple to install**

You can install individual PV modules in any combination of Module quantity, orientation, different types, and power rate (check our online module compatibility checker called Edecider or contact APsystems).

### **Smart system performance monitoring and analysis**

The APsystems Energy Communication Unit (ECU) is installed by simply plugging it into any wall outlet and providing an Ethernet or Wi-Fi connection to an broadband router or modem. After installing and setting the ECU (see ECU manual), the full network of APsystems Microinverters automatically reports to the APsystems Energy Monitor and Analysis (EMA) web server. The EMA software displays performance trends and informs you of abnormal events. (This mode can be enabled via the configuration App. Please refer to the “APsystems ECU-R Install & User Manual” or “APsystems ECU-C Install Manual & User Manual”, and “EMA User Guide (for system owner)” on our website at <https://aunz.apsystems.com/resources/library/>, or contact Technical Support for more information.)



#### NOTICE

The RJ45 Signal is designed for DRM0, DRM5, DRM6, DRM7, and DRM8, it should be connected by an RJ45 connector in the package otherwise the inverter will not work.(see ECU manual)



#### NOTICE

Grid Profile: From the workspace, select “Grid profile”; First select country, and then the city. (see ECU manual)

### APsystems Microinverter DS3 series

The APsystems DS3 series Microinverters connect with the single-phase grid, and can also use multiple APsystems Microinverters in the form of a single-phase grid to achieve a three-phase grid, and operates with most 60 and 72-cell PV modules. Contact APsystems Customer Support for checking compatibility. For more information, please see the Technical Data page (p.18) of this manual, or sign in APsystems website to obtain a solar panel list that can match with APsystems Microinverters: [www.APsystems.com](http://www.APsystems.com)

Model Number	AC grid	PV Module	Module Connector
DS3 series	50Hz/230V/240V	60,72 Cell	MC-4 Type

### APsystems Microinverter System Installation

A PV system using APsystems Microinverters is simple to install. Each Microinverter easily mounts on the PV racking, directly beneath the PV module(s). Low voltage DC wires connect from the PV module directly to the Microinverter, eliminating the risk of high DC voltage. Installation MUST comply with local regulations and technical rules.

**Special Statement!** An AC GFCI device should not be used to protect the dedicated circuit to the APsystems microinverter even though it is an outside circuit. None of the small GFCI devices (5mA-30 mA) are designed for back feeding and will be damaged if back feed. In a similar manner, AC AFCIs have not been evaluated for back feeding and may be damaged if back feed with the output of a PV inverter.



#### WARNING

1. Perform all electrical installations in accordance with local electrical codes.
2. Be aware that only qualified professionals should install and/or replace APsystems Microinverters.
3. Before installing or using an APsystems Microinverter, please read all instructions and warnings in the technical documents and on the APsystems Microinverter the system itself as well as on the PV array.
4. Be aware that installation of this equipment includes the risk of electric shock.
5. Do not touch any live parts in the system, including the PV array, when the system has been connected to the electrical grid.



#### NOTICE

Strongly recommend installing Surge Protection Devices in the dedicated meter box.

#### 4.1 Additional Installation components from APsystems

- Bus Cable End Cap (sold separately)
- Bus Cable Y-CONN Cap (sold separately)

- Bus Cable Unlock Tool (sold separately)

## 4.2 Required Parts and Tools from you

In addition to your PV array and its associated hardware, you will need the following items:

- An AC connection junction box
- Mounting hardware suitable for module racking
- Sockets and wrenches for mounting hardware

## 4.3 Installation Procedures

### 4.3.1 Step 1 – Verify the grid voltage to match with a microinverter rating

### 4.3.2 Step 2 – The AC bus distribution

- The AC bus is arranged at the proper position of the inverter.
- One end of the AC bus access junction box into the power grid.
- Wire the conductors of the AC bus: L1 – BROWN; L2 – BLUE PE – YELLOW GREEN.

#### **WARNING**

The wiring color code can be different according to local regulations, check all the wires of the installation before connecting to the AC bus to be sure they match. Wrong cabling can damage irreparably the microinverters, such an issue is not covered by the warranty.

#### **WARNING**

Forbidden to hand carry the inverter through AC cable.



### 4.3.3 Step 3 – Attach the APsystems Microinverters to the Racking

- Mark the location of the microinverter on the rack, with respect to the PV module junction box or any other obstructions.
- Mount one microinverter at each of these locations using hardware recommended by your module racking vendor. When installing a microinverter, the grounding washer must be facing the racking.

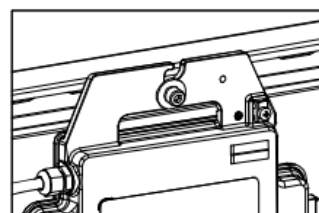
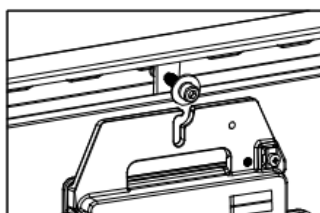
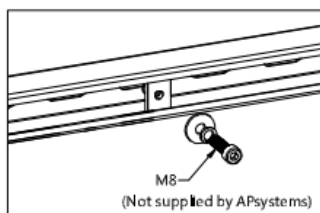


Figure 2

#### **WARNING**

Prior to installing any of the microinverters, verify that the utility voltage at the point of the common connection matches the voltage rating on the microinverter label.

**⚠ WARNING**

Do not place the inverters (including DC and AC connectors) Where exposed to the sun, rain, or snow, or even gap between modules. Allow a minimum of 3/4”(1.5cm.) between the roof and the bottom of the microinverter to allow proper air flow. The racking of the installed microinverter must be reliably grounding.

**4.3.4 Step 4 – Ground the systems**

- There is already has earth wire inside the AC cable, thus the grounding work could be done directly by it.
- For those areas that have special requirements, the external grounding work could be done by grounding brackets.

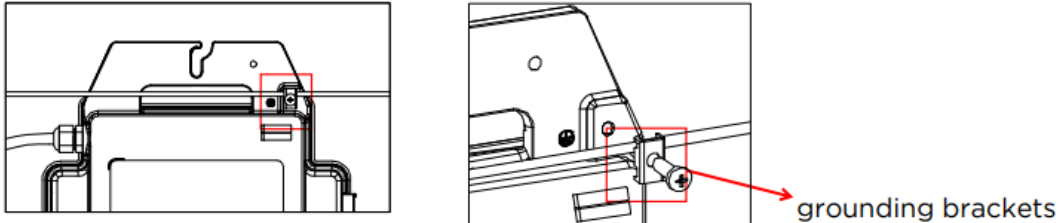


Figure 3

**4.3.5 Step 5 – Connect the APsystems microinverter to AC bus cable**

Push the microinverter AC connector to the trunk cable connector. Listen for the “Click”.

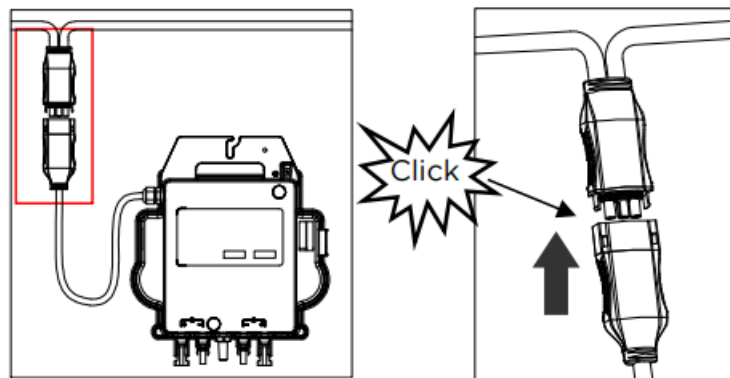


Figure 4

Best Practice: Use the Bus Cable Unlock Tool of AC Bus to split the connectors.

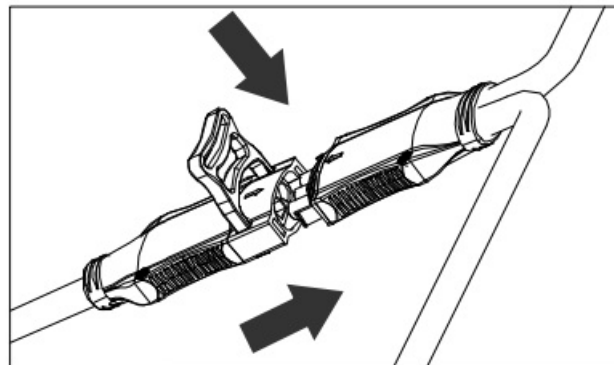


Figure 5

- Check the microinverter technical data page(p.20) for the maximum allowable number of microinverters on each AC branch circuit.
- Plug the AC connector of the microinverter into the AC bus

AC connector interface as follows.

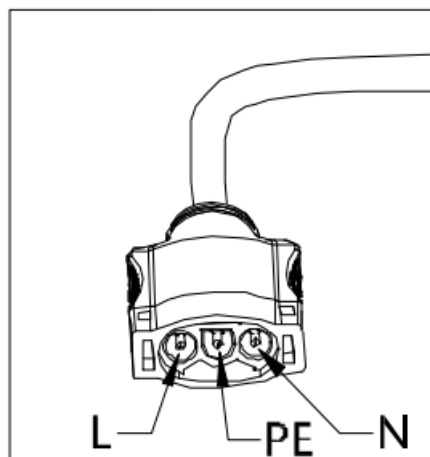


Figure 6

Cover any unused connectors with Bus Cable Y-CONN to protect the connectors.

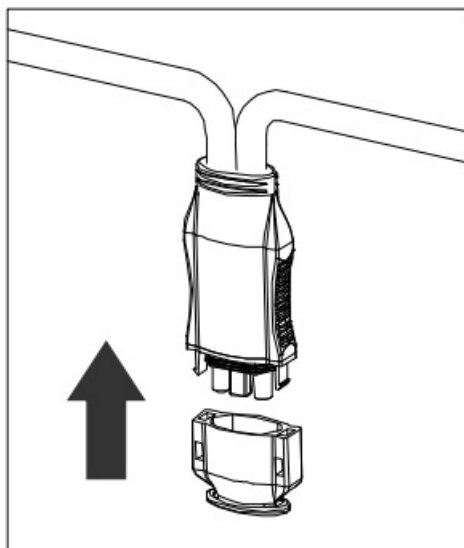
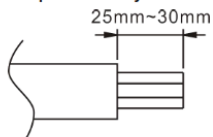


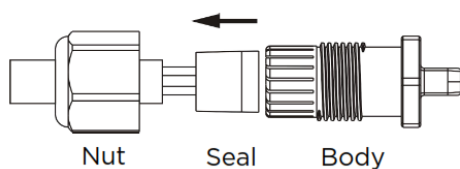
Figure 7

#### 4.3.6 Step 6 – Install a Bus Cable End Cap at the end of AC bus cable

- a. Strip cable jacket.



- b. Insert the cable end into the seal.



- c. Insert the wires into the cable clamps.



- d. Rotate the nut with 3.3N·m until the latching mechanism meets the base.

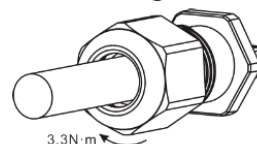
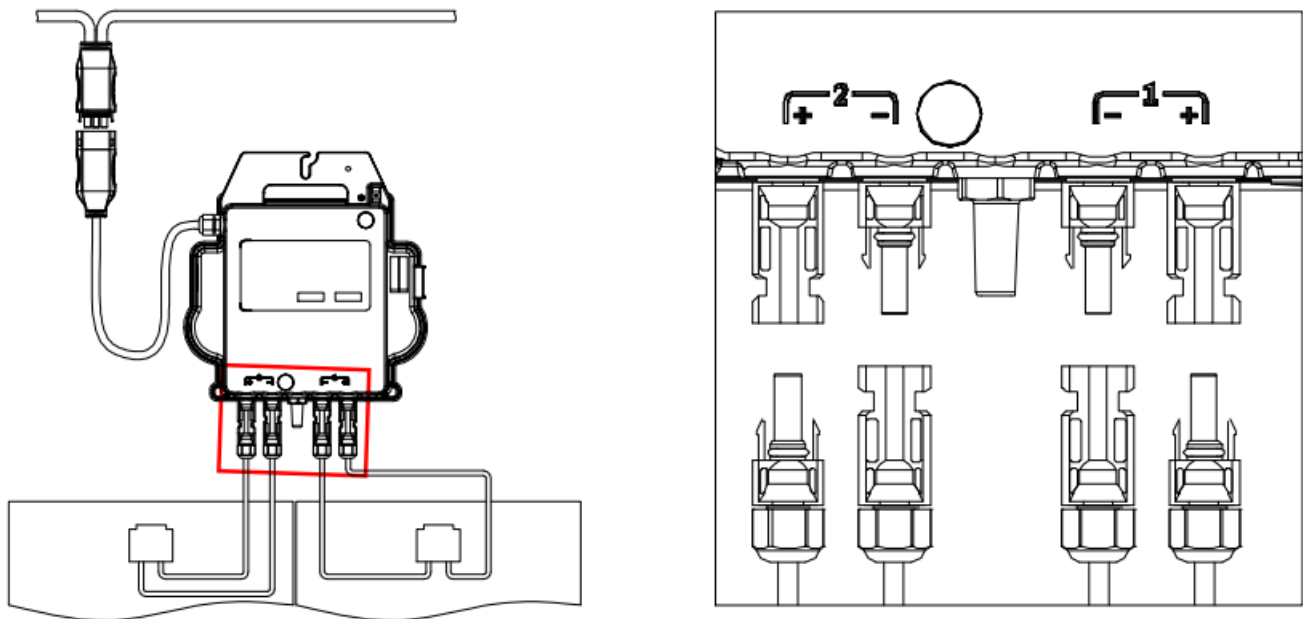


Figure 8



#### 4.3.7 Step 7 – Connect APsystems Microinverters to the PV Modules



#### NOTICE

When plugging in the DC cables, the microinverter should immediately blink green three times. This will happen as soon as the cables are plugged in and will show that the microinverter is functioning correctly. This entire check function will start and end within 5 seconds of plugging in the unit, so pay careful attention to these lights when connecting the DC cables.



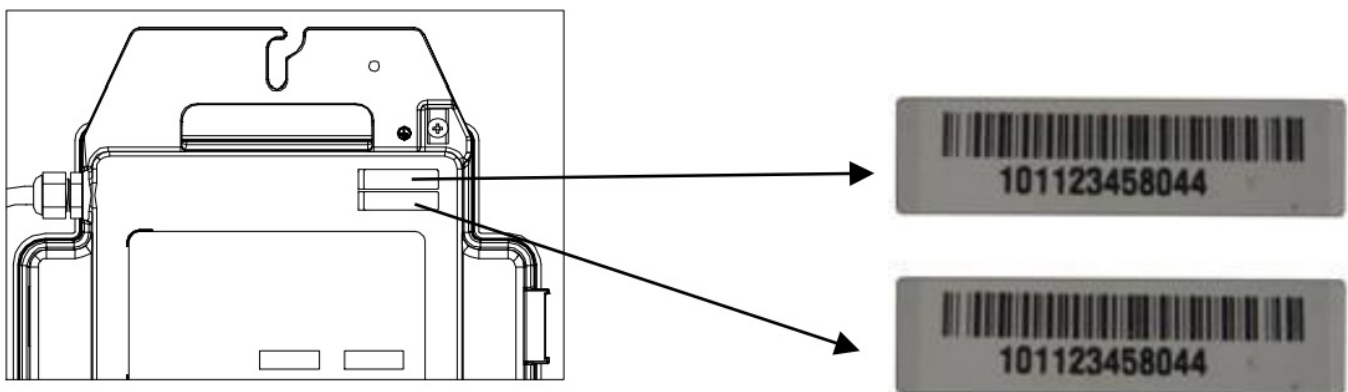
#### WARNING

Double-check to make sure all of the AC and DC wirings have been correctly installed. Ensure that none of the AC and/or DC wires are pinched or damaged. Make sure that all of the junction boxes are properly closed.

#### 4.3.8 Step 8 – Complete the APsystems installation map

Fill in the APsystems Registration Cards, which provide system information and the installation map. Feel free to provide your own layout if a larger or more intricate installation map is required. The layout map provided is designed to accommodate labels in a vertical or horizontal orientation to meet all the field PV connections.

- Each APsystems Microinverter has removable serial number labels.
- Peel labels off, affix one to the respective location on the APsystems installation map, and fill in 1,2 in the label below, according to the layout on the roof.
- The other serial number label, posted on the solar module frame is easy to view the position.



#### Power Quality Response Modes

AS 4777.2:2015 Clause 6.3 specifies requirements relating to an inverter's capability to contribute to maintaining the power quality at the point of connection or to provide support to a grid. The intent of voltage response modes is to

- **Power derating for voltage variation (Volt-Watt mode)** The inverter power output will vary in response to the AC grid voltage. This is switched on by default.

- Reactive power regulation for voltage variation (Volt-VAr mode)  
The power output or input will vary in response to the AC grid voltage. This function is switched off by default.

## APsystems Microinverter&Energy Communication Unit Warranty Card

## Installation Map Template

[illegible]

## NOTICE

1. The layout of the inverters' serial numbers on the warranty card is only suitable for general arrangement.
2. The warranty card is located in the Appendix on the last page of this manual.
3. You can use Scanning Gun or a mobile phone to scan the serial numbers on the map when set ECU (see ECU manual).

## APsystems microinverter system operating instructions

### To operate the APsystems microinverter PV system:

1. Turn ON the AC circuit breaker on each microinverter AC branch circuit.
2. Turn ON the main utility-grid AC circuit breaker. Your system will start producing power after a two-minute waiting time.
3. The units should start blinking green every 2 seconds five minutes after turning on the AC circuit breaker. This means they are producing power normally, but have not yet connected to the ECU. After the ECU has been plugged in, the setup acknowledges the Microinverters, they will start to blink green every 10 seconds.
4. Plug in the ECU and follow the instructions according to the manual for the ECU.
5. The APsystems Microinverters will start to send performance data to the ECU. The time required for all the Microinverters in the system to report to the ECU will vary with the number of Microinverters in the system. You can verify the proper operation of the APsystems Microinverters via the ECU. See the ECU Installation and Operation Manual for more information.

## Troubleshooting

Qualified personnel can use the following troubleshooting steps if the PV system does not operate correctly:

### 6.1 Status Indications and Error Reporting

#### 6.1.1 Start up LED

One quick red light followed by three short green blinks when DC power is first applied to the Microinverter indicates a successful Microinverter startup.

#### 6.1.2 Operation LED

Flashing Slow Green (10 sec. gap) – Producing power and communicating with ECU

Flashing Fast Green (2 sec. gap) – Producing power and not communicating with ECU over 60mins

**Flashing Red** – Not producing power

**Steady Red** – Electrode assembly ground fault protection

#### 6.1.3 GFDI Error

A solid red LED indicates the Microinverter has detected a Ground Fault Detector Interrupter (GFDI) error in the PV system. Unless the GFDI error has been cleared, the LED will remain red and the ECU will keep reporting the fault.

After the ground fault error is fixed, follow the instructions in the ECU Installation and Operation Manual to clear this GFDI error reporting.

#### 6.1.4 Other Faults

All other faults are reported to the ECU. Refer to the ECU Installation and Operation Manual for a list of additional faults and troubleshooting procedures.



#### **WARNING**

Only qualified personnel should directly handle the APsystems Microinverter.



#### **WARNING**

1. Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting.
2. Always disconnect AC power before disconnecting the PV module wires from the APsystems Microinverter.
3. The APsystems Microinverter is powered by PV module DC power. AFTER disconnecting the DC power, when reconnecting the PV modules to the Microinverter, be sure to watch for the three short LED flashes.

## 6.2 Troubleshooting a non-operating APsystems Microinverter

There are two possible overall areas of trouble:

- A. The Microinverter itself may be having problems.
- B. The Microinverter itself is working fine but it is having trouble communicating with the ECU. The items below refer to Microinverter issues, not communication issues (addressed in the ECU manual).

A quick way to tell whether the issue is the Microinverter or a communication problem with the ECU:

1. Diagnosing from the Microinverter: A red light:
  - a. A blinking red light means a microinverter problem or an AC connection problem.
  - b. A solid red light means ground fault detector interrupter error.
2. Diagnosing from the ECU:
  - a. No-Data-Display: This is probably a communication issue- not a Microinverter problem.
  - b. Problems with erratic display: Data is displayed for some period and then no data is displayed: most likely a communication issue.
  - c. 0 watts, or 2 watts: Possibly a Microinverter problem
  - d. Erratic data display that is not coordinating with data displays from other units: most likely a Microinverter problem.

**To troubleshoot a non-operating APsystems Microinverter, Follow the steps below in order:**

1. Verify the utility voltage and frequency are within the ranges shown in the Technical Data section of this manual.
2. Check the connection to the utility grid. Verify utility power is present at the inverter in question by removing AC, then DC power. Never disconnect the DC wires while the microinverter is producing power. Re-connect the DC module connectors and watch for three short LED flashes.
3. Check the AC branch circuit interconnection between all the microinverters. Verify each inverter is energized by the utility grid as described in the previous step.
4. Make sure that any AC breakers are functioning properly and are closed.
5. Check the DC connections between the microinverter and the PV module.
6. Verify the PV module DC voltage is within the allowable range shown in the Technical Data of this manual.
7. If the problem persists, please call APsystems Customer Support.

### **WARNING**

Do not attempt to repair the APsystems microinverter. If troubleshooting methods fail, please return the microinverter to your distributor for replacement.

## 6.3 Maintenance

No need to Maintenance.

### **Replace a microinverter**

#### **Follow the procedure to replace a failed APsystems Microinverter**

A. Disconnect the APsystems Microinverter from the PV Module, in the order shown below:

1. Disconnect the AC by turning off the branch circuit breaker.

2. Disconnect the inverter AC connector from the AC Bus.
3. Disconnect the PV module DC wire connectors from the microinverter.
4. Remove the Microinverter from the PV array racking.

B. Install a replacement Microinverter to the rack. Remember to observe the flashing LED light as soon as the new Microinverter is plugged into the DC cables.

C. Connect the AC cable of the replacement Microinverter to the AC bus.

D. Close the branch circuit breaker, and verify the operation of the replacement Microinverter.

## Technical Data



### WARNING

1. Be sure to verify the voltage and current specifications of your PV module match those of the Microinverter. Please refer to the datasheet or user manual which can be downloaded from the APsystems website [www.APsystems.com](http://www.APsystems.com).
2. You must match the DC operating voltage range of the PV module with the allowable input voltage range of the APsystems Microinverter.
3. The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APsystems.

### 8.1 DS3 series Microinverter Datasheet

Model Input Data (DC)	DS3-S	DS3-L	DS3	DS3-H
Recommended PV Module Power (STC) Range	255Wp-550Wp +	255Wp-550Wp +	300Wp-620Wp +	330Wp-660 Wp +
Peak Power Tracking Voltage	22V-55V			
Operation Voltage Range	16V-60V			
Maximum Input Voltage	60V			
Maximum Input Current	18A x 2	18A x 2	20A x 2	20A x 2
ISC PV	22.5 x 2	22.5 x 2	25Ax2	25Ax2
Start-Up DC Voltage	22V			
Maximum Inverter Backfeed Current To Array	0A			

### Output Data (AC)

Rated Apparent Power	625VA	750VA	880VA	960VA
Nominal Output Voltage	230V			
Adjustable Output Voltage Range 1	170V-278V			
Rated Current	2.7A	3.3A	3.8A	4.2A
Maximum Units per 20A Branch2	7 units	5 units	5 units	4 units
Nominal Output Frequency/Range1	50Hz/48Hz-51Hz			
Adjustable Output Frequency Range	45.1Hz-54.9Hz			
Power Factor(Default/Adjustable)	0.99/0.8 leading...0.8 lagging			
Total Harmonic Distortion	<3%			
Inrush Current	11.92A			
Maximum Output Fault Current	24A			
Maximum Output Overcurrent Protection	10A			

## Efficiency

Peak Efficiency	97%
Nominal MPPT Efficiency	99.50%
Night Power Consumption	20mW

## Mechanical Data

Operating Ambient Temperature Range	-40°C to +65°C
Storage Temperature Range	-40°C to +85°C
Dimensions (W x H x D)	262mm X 218mm X 41.2mm
Weight	2.6kg
AC Bus Cable	2.5mm <sup>2</sup> /4mm <sup>2</sup> Optional
Connector Type	MC4
Cooling	Natural Convection – No Fans
Enclosure Environmental Rating	IP67
Inverter Topology	Isolated
Active Anti-islanding Method	Frequency shift
Protective Class	I
Over Voltage Category	OVC III[MAINS], OVC II[PV]

## 8.1 DS3 series Microinverter Datasheet

### Features

Communication (Inverter To ECU)	Wireless
Transformer Design	High-Frequency Transformers, Galvanically Isolated
Monitoring	Energy Monitoring & Analysis(EMA) System
Warranty	10 Years Standard; 20 Years Optional
Maximum Altitude	All Data At This Technical Specifications Has Been Tested Under <2000m

### Certificate&Compliance

Compliance	AS/NZS 4777.2; IEC 62109-1, IEC 62109-2; EN 61000-6-3
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1. The nominal voltage/frequency range can be extended beyond nominal if required by the utility.
2. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

Specifications are subject to change without notice – please ensure you are using the most recent update found at [latam.APsystems.com](http://latam.APsystems.com)

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## Wiring Diagram

### 9.1 Sample Wiring Diagram – Single Phase







Please scan the QR code to get the mobile app and more support to help with the installation.  
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## Documents / Resources

	<p><a href="#">APsystems DS3-H Microinverters</a> [pdf] User Manual DS3-S, DS3-L, DS3, DS3-H, Microinverters, DS3-H Microinverters, Inverter</p>
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## References

- [APsystems Global | The global leader in multi-platform MLPE technology](#)
- [APsystems | The global leader in multi-platform MLPE technology](#)
- [Documents Library for Australia & New Zealand – APsystems Australia & New Zealand | The global leader in multi-platform MLPE technology](#)