



**INSTALLATION MANUAL**

**ACRak<sup>®</sup> 300**

## TABLE OF CONTENTS

<b>IMPORTANT SAFETY INSTRUCTIONS</b> .....	<b>3</b>
Safety Instructions.....	3
Lightning Surge Suppression.....	4
FCC Compliance.....	4
<b>PRE-INSTALLATION</b> .....	<b>5</b>
What's in the Box.....	5
Additional Tools/Equipment Required for Installation.....	5
PV System Layout.....	6
Before Installing the ACRak 300.....	6
<b>INSTALLING THE ACRAK 300</b> .....	<b>7</b>
<b>POST-INSTALLATION</b> .....	<b>9</b>
Commissioning and Operating.....	9
GFDI Fault.....	9
Disconnecting a Micro Inverter.....	9
<b>TECHNICAL SPECIFICATIONS</b> .....	<b>12</b>
ACRak 300, Darfon Inverter-Racking Solution.....	12
MIG300, Darfon Micro Inverter.....	12
XR100, IronRidge XR Rails.....	12
Compatibility and Capacity.....	13
Torque Values.....	13
<b>INSTALLATION MAP TEMPLATE</b> .....	<b>14</b>
<b>NOTES</b> .....	<b>15</b>

## IMPORTANT SAFETY INSTRUCTIONS

### PLEASE READ THESE INSTRUCTIONS BEFORE INSTALLING ANY DARFON PRODUCTS OR DEVICES & KEEP FOR FUTURE REFERENCE.

This manual contains important instructions for the installation and maintenance of Darfon ACRak 300. Before installing, please read these safety instructions carefully. Take special care to follow the warnings indicated on the unit itself as well as the safety instructions listed below.

#### Safety Symbols

To reduce the risk of injury and to ensure the continued safe operation of this product, the following safety instructions and warnings are marked in this manual.



#### WARNING

This indicates the risk of electric shock. The presence of high voltage levels may constitute a risk of injury or death to users and/or installers.



#### CAUTION

This indicates important information where failure to comply may result in safety hazards or cause damage to this product.

#### Safety Instructions

- Read all instructions and cautionary marks in the manual carefully before starting the installation.
- Do not attempt to repair this product; it does not contain user-serviceable parts. Repairs and internal servicing should only be performed by Darfon authorized service personnel.
- Do not tamper with or open this product. Opening this product may result in electric shock.
- Perform all electrical installations in accordance with all applicable local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.
- Only qualified electrical personnel should perform the electrical installation and wiring of this product.
- Be aware that even without an external voltage source connected, the MIG300 micro inverter may contain high voltages and there is a risk of electrical shock.
- Connect the Darfon ACRak 300 to the utility grid only after receiving prior approval from the electrical utility company.
- The temperature of the heat sinks outside of the device can reach over 85°C in normal operation. To reduce risk of burns, use caution when working with micro inverters.
- Do not disconnect the DC power source from the Darfon micro inverter without first disconnecting the AC power source. Both AC and DC power sources must be disconnected before servicing. Be aware that DC power/voltage is generated when the photovoltaic array is exposed to light.
- Switch off the circuit breakers before installation and wiring.
- For the safety of installation, remove all conductive jewelry or equipment during the installation or service of the device parts, connector and/or wiring.
- Do not stand on a wet location while doing installation and wirings. Enclose the outer covering well before switch on the circuit breakers.
- ACRak 300 should be installed as instructed in this manual. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the device. The manufacturer assumes no liability for the customer's failure to comply with these requirements.
- When a GFDI fault (Ground fault) occurs, the LED will flash alternating between orange and red. Please refer to page 11 for more introductions.

**Lightning Surge Suppression**

Lightning does not actually need to strike the equipment or building where the PV system is installed to cause damage. Often, a strike nearby will induce voltage spikes in the electrical grid that can damage equipment. Darfon's micro inverters have integral surge protection; however, if the surge has sufficient energy, the built-in protection in the device would be exceeded and the device could potentially be damaged. It is recommended to install surge protection as part of any solar installation. We recommend the following protection devices, which have been tested to ensure that they do not interfere with power line communications.

Residential: Vendor: Citel, Part Number DS72RS-120 or DS73RS-120  
Application: DS72RS-120 is applied when N-G is bound together, or DS73RS-120 were N-G is unbound.

See the vendor datasheet for DS70R Series at  
[http://www.citel.us/data\\_sheets/ac/CITEL\\_DS70R\\_DataSheet.pdf](http://www.citel.us/data_sheets/ac/CITEL_DS70R_DataSheet.pdf)

**FCC Compliance**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 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.

**Other Information**

Product information is subject to change without notice. All trademarks are recognized as the property of their respective owners.

## PRE-INSTALLATION

Thank you for choosing Darfon's ACRak 300 as a key component to your solar power system. Review and follow the instructions in this section before installing the Darfon ACRak 300.

### What's in the Box

	1P Package	4P Package	24P Package
<b>Power Rail</b>			
- 1P: Sub-assembly consists of 1 IronRidge XR100 Rail (42.5"), 1 MIG300 Micro Inverter with Integrated Trunk Cable, Wire Management Hardware, Attachment Hardware, 1 Ground Lug	1	2	12
- 4P/24P: Sub-assembly consists of 1 IronRidge XR100 Rail (85"), 2 MIG300 Micro Inverters, 1 Trunk Cable, Wire Management Hardware, Attachment Hardware, 1 Ground Lug			
<b>Dead Rail</b>			
- 1P: Sub-assembly consists of 1 IronRidge XR100 Rail (42.5"), Attachment Hardware	1	2	12
- 4P/24P: Sub-assembly consists of 1 IronRidge XR100 Rail (85"), Attachment Hardware			
<b>Splice Kits</b>	0	4	12
<b>Grounding Straps</b>	0	2	12
<b>BMC Waterproof Caps</b>	1M, 1F	2M, 2F	4M, 4F
<b>IronRidge XR100 End Cap</b>	2L, 2R	4L, 4R	12L, 12R
<b>BMC Disconnect Tool</b>	1	1	1

### Additional Tools/Equipment Required for Installation

The ACRak 300 is a pre-assembled solution of micro inverters and racking. Additional components will need to be purchased to complete the installation of the PV system.

- PV Module
- IronRidge End Clamps and Mid Clamps
- L-Feet
- Roof Specific Mounts (L-Foot Compatible)
- IronRidge Expansion Joints (If Needed)
- Extension Cables (As Needed)
- Ground Wiring
- Outdoor-Rated AC Junction Box(es)
- Gland/Strain Relief Fittings
- Monitoring System Equipment
- Torque Wrench & Sockets for Mounting Hardware

#### Darfon Part List

Darfon Part No.	Description
5K.WKP00.301	Extension Cable - Female to Male, 1 Meter
5K.WKP00.302	Extension Cable - Female to Female, 1 Meter
5K.WKP00.303	Extension Cable - Male to Male, 1 Meter
5K.WKP00.306	Extension Cable - Female to Male, 2 Meters
5K.WKP00.307	Extension Cable - Female to Female, 2 Meters
5K.WKP00.308	Extension Cable - Male to Male, 2 Meters
5K.WKP00.311	Extension Cable - Female to Male, 15 Meters
JY.M3101.110	Monitoring System - PLC Box
JY.MIUL0.210	Monitoring System - Data Logger

### PV System Layout

The optimal PV array layout will need to be planned before installation. The layout will need to account for the constraints of the cable distance between the micro inverters and PLC box (monitoring equipment). The distance that you need to be aware of is from the PLC to the PCC and the length of the longest segment in the circuit. It is ideal to tap power from the center of the circuit. This maximizes the communication signal strength for monitoring. For example, two (2) segments of eight (8) modules for each circuit will have better communication than one (1) segment of sixteen (16) modules.

When ordering additional components to complete the ACRak installation, the array design needs to be taken into account.

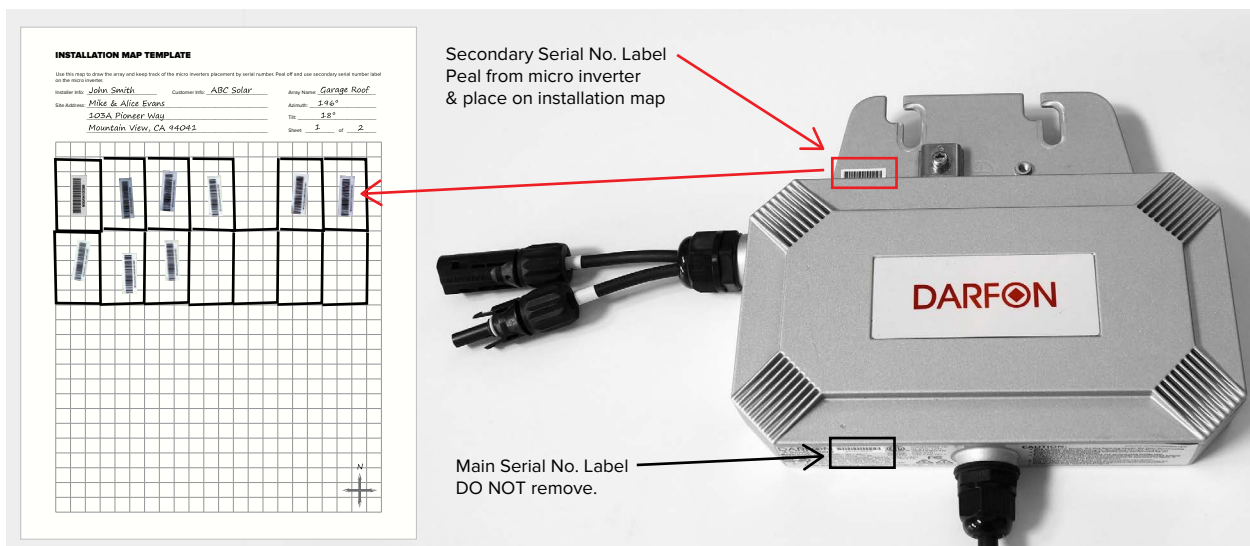
- The ACRak comes in 1P, 4P and 24P packages. 1P will need to be order for any rows with an odd number panels. 1P, 4P and 24P are pre-assembled packages for 1, 4 and 24 panels, respectively. 4P and 24P are pre-cut into 2-panel sections.
- Extension cables are needed to connect rows, arrays and the grid. To accommodate various designs, extension cables come in three connector options: male-to-male, female-to-male and female-to-female. In each section, the female connector is on the right and male is on the left. Make sure your extension cables have the correct connectors for the installation.

### Before Installing the ACRak 300

The following needs to be completed prior to the installation of the ACRak 300.

- Measure the service entrance conductors at the site to confirm AC service. Verify the AC voltages at the electrical utility connection and at the junction box for each AC branch circuit are within the ranges.
- Install the roof attachments and L-feet. Refer to the roof attachment’s installation manual. Note: Make sure you have the appropriate roof attachments for your roof type.
- Using the installation map template in this manual, draw out the layout of the array and have it readily available during the installation of the ACRak 300 to record micro inverter location. Note: Tracking micro inverter location by serial number is key for data monitoring and warranty servicing.

	<b>240V (Single Phase)</b>
L1 to L2	211 to 264VAC
L1, L2 to neutral	106 to 132VAC

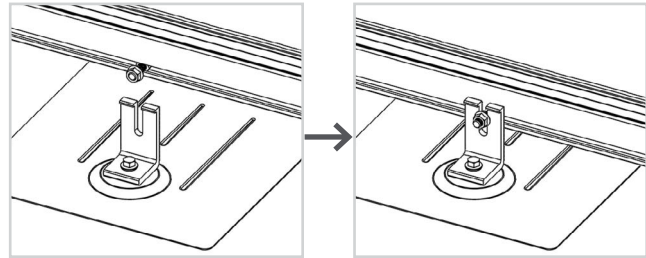


## INSTALLING THE ACRAK 300

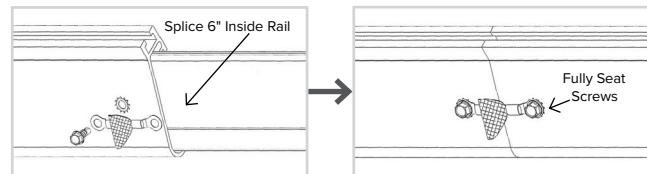
The following section list steps on how to install the ACRak 300. Prior to installing the ACRak 300, please review the Pre-Installation section of the manual to ensure all the proper preparations have been completed.

### Step 1. Attach the Rails to the Roof

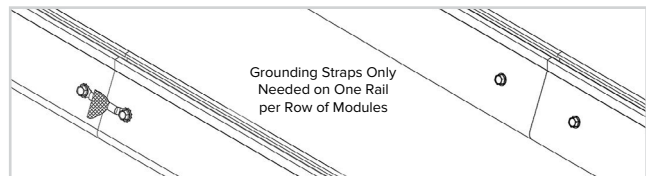
- 1.1 Loosen and space the bolts to match the roof attachment spacing.
- 1.2 Drop the rail with hardware into the slotted L-Feet. Level rail at the desired height, then torque the bolts to 204 in-lbs.



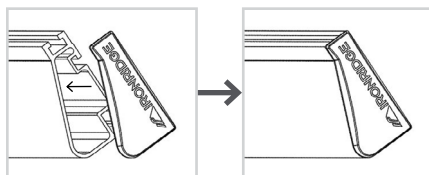
- 1.3 Use splice kits to connect rails together when necessary.



- 1.3.1 Insert internal splice 6" into the first rail and secure with a screw along the depression line on the front or back of the rail.
- 1.3.2 Slide second rail over internal splice and secure.



- 1.4 Use extension cables on non-connecting rails together when necessary. See page 5 for extension cable part numbers.
- 1.5 Install a minimum 10 AWG solid copper grounding wire from the grounding lug to GEC ground. Torque hex nut to 84 in-lbs. Torque set screw to 20 in-lbs.
- 1.6 Firmly press the end caps onto the rail ends.

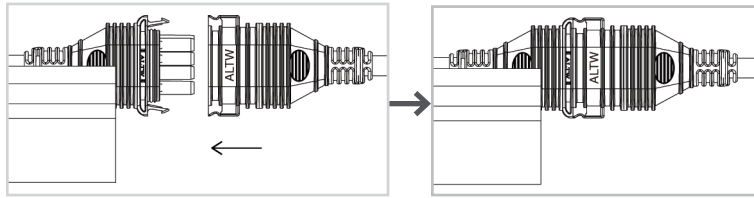


#### Notes:

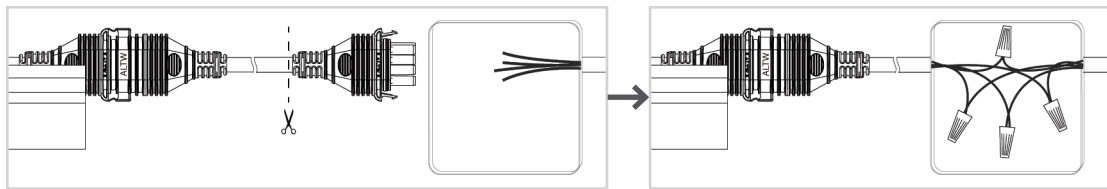
- Grounding straps and star washers need to be installed with the internal splice on the rails with the grounding lugs and micro inverters. Ensure the screws are fully seated.
- Only one grounding lug is needed per row of modules. The grounding lug may be moved along the rail if the site requires a different location than delivered. Rows exceeding 100ft of rail must use expansion joints.
- The micro inverter, MIG300, meets the requirements of NEC 690.35. Because the DC circuit is isolated and insulated from ground, the MIG300 does not require that you install a GEC between micro inverters.

**Step 2. Connect Trunk Cable to Grid**

2.1 Attach the extension cable to the trunk cable on the rail.

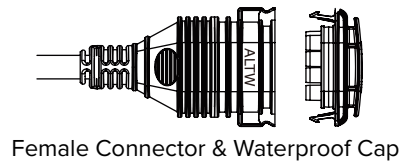
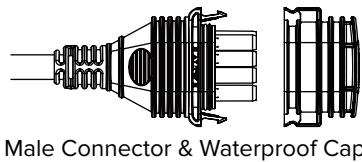


2.2 Cut the unused connector from the extension cable and wire to the grid-tie conductors.



2.3 Attach a Waterproof cap to the unused connector on the truck cable.

Note: Additional waterproof caps may be needed depending on the array design and the number of arrays.



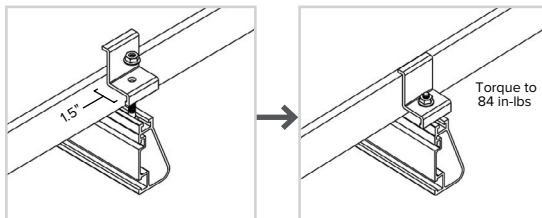
**Step 3. Mount the PV Modules**

Connect the PV modules leads to the micro inverters leads as you are mounting and securing the PV modules onto the rails.

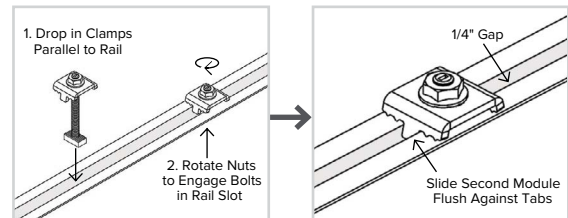
Note:

- The first and last module of each row needs to be mounted at least 1.5” from the rail ends.
- End clamps must be used to secure the first/last PV module of each row needs to the top and bottom rail.
- Mid clamps must be used between each PV module to secure it to the top and bottom rail.
- The micro inverter and PV module’s DC cables have two connectors. Connect the micro inverter positive connector to the PV module negative connector, and vice versa.

**Installing End Clamps**



**Installing Mid Clamps**



**Step 4. [Optional] Install equipment for data monitoring system.**

Refer to the installation manual for Darfon’s cloud-based monitoring system.



## POST-INSTALLATION



### WARNING

- Service/changes to your electrical system should be carried out only by qualified electricians.
- Do not attempt to repair this product; it does not contain user-serviceable parts. Repairs and internal servicing should only be performed by Darfon authorized service personnel.

### Commissioning and Operating

- Step 1. Turn on the AC disconnect or the circuit breaker from each micro inverter AC branch circuit.
- Step 2. Turn on the main utility-grid AC circuit breaker. Your system will start producing power after five minutes and the status LED will turn solid green.
- Step 3. [Optional] Register PV system on Darfon Solar Portal.  
Refer to the installation manual for Darfon's cloud-based monitoring system.

Note: Depending on the strength of the signal, it can take up to 2 hours before the monitoring system detects all the micro inverters in the PV system.

### GFDI Fault

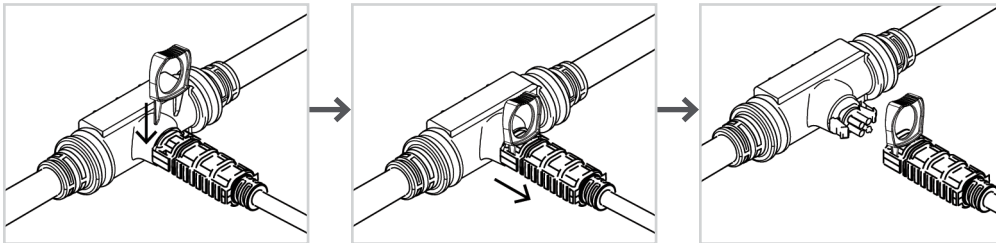
GFDI fault is defined as an unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment or earth. When a Ground fault occurs, the GFDI will trigger the LED light to flash in alternating colors of Orange and Red, and the MIG300 will automatically disconnect the all conductors to prevent as a safety precaution.

If the GFDI has detected a ground fault, please contact with the installer and follow the Operation Manual to clear this condition. Or you can contact with Darfon customer support at [support@darfon.com](mailto:support@darfon.com).

### Disconnecting a Micro Inverter

Never remove a PV module while the inverter is connected to the grid. Always disconnect all circuits to the array before any work is done.

- Step 1. Disconnect the micro inverter from the AC trunk cable.



- Step 2: Completely cover the PV module with an opaque cover.



### WARNING

Be aware that DC power/voltage is generated when the PV module is exposed to light.

Step 3: Using a clamp-on meter, verify that the DC conductors between the PV module and the micro inverter do not have any current.

Step 4: Disconnect the PV module from the micro inverter. To disconnect the micro inverter's positive connector, squeeze the locking mechanism and pull the connectors apart. The micro inverter's negative connector is tool-removable only.



Positive Connector



Negative Connector

Step 5: Remove the micro inverter from the PV racking.



**WARNING**

Do not leave the T-branch connector on the AC trunk cable exposed for an extended period of time. If the removed micro inverter will not be replaced with another micro inverter immediately, connect a sealing cap to the T-branch connector.

## TROUBLESHOOTING

If the PV system is not operating correctly, use the steps in this section to troubleshoot the problem. If the issue cannot be corrected using the steps in this section, please contact a Darfon authorized service representative.

### LED Indicators

Depending on the position/location of the installed micro inverter, the use of hand-held mirrors may be needed. If the micro inverter's LED indicator is not showing a color or is flashing red, follow these steps.

LED Status	Description
● Flashing Orange	Normal Start-up Operation
● Solid Orange	Minimum Start Voltage Met
● Solid Green	Operating - MPPT/Grid Mode On
● Flashing Green	Operating - Over Maximum Wattage
● Solid Red	Not Operating - Low Voltage
● Flashing Red (0.5 Hz)	Restarting - Minimum Voltage Met
● Flashing Red (2 Hz)	Halt Manually/Calibration or Flash Programming

Step 1: Verify that the AC voltage and Frequency are in the appropriate ranges. Ranges are in the Technical Specifications section on page 12.

Step 2: Verify that the AC voltages at the electrical utility connection and at the junction box for each AC branch circuit are within the ranges.

	240V (Single Phase)
L1 to L2	211 to 264VAC
L1, L2 to neutral	106 to 132VAC

Step 3: Verify that any upstream AC disconnects, as well as the dedicated circuit breakers for each AC branch circuit, are functioning properly and are closed.

Step 4: Verify the PV module DC voltage is within the allowable voltage and wattage range shown in the Technical Specifications section on page 12.

Step 5: Verify the DC leads are connected correctly between the micro inverter and the PV module.

Step 6: If the problem persists, contact Darfon Technical Support at [support@darfon.com](mailto:support@darfon.com).

## TECHNICAL SPECIFICATIONS

### ACRak 300, Darfon Inverter-Racking Solution

Compliances	ISO 9001
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### MIG300, Darfon Micro Inverter

Input Data (DC)	
Nominal Input Power	300W
Maximum Input DC Voltage	60V
Maximum Peak Power Tracking Voltage	24 to 40V
Minimum Start Voltage	24V
Maximum DC Short Circuit Current	12A
Maximum Input Current	10A
Output Data (AC)	
Maximum Continuous Output Power	250W
Maximum Peak Output Power	260W
Nominal Output Current	1.04A
Nominal Voltage / Range	240 / 211-264 V
Nominal Frequency / Range	60 / 59.3-60.5 Hz *
Power Factor	>0.95
Maximum Units per Branch Circuit (Single Phase)	20A Branch Circuit: 16 Units
Efficiency	
Peak Inverter Efficiency	95.8%
CEC Weighted Efficiency	95%
Nominal MPP Tracking	99%
Night Time Power Consumption	< 89mW
Mechanical Data	
Ambient Temperature Range	-40°C to 65°C
Operating Temperature Range (Internal)	-40°C to 85°C
Dimensions (WxHxD)	8.7 x 5.1 x 1.5 in (220 x 130 x 37mm)
Weight	5.5 lbs (2.5 kg)
Cooling	Natural Convention - No Fans
Enclosure Environmental Rating	Outdoor - NEMA 6
Features	
Communication	Powerline
Compliance	EN 61000-6-2, EN 61000-6-3, FCC Part15 Class B, UL1741, IEEE 1547

\* Extended frequency range available to serve local markets.

### XR100, IronRidge XR Rails

Compliances	UL2703, UL1703
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### Compatibility and Capacity

The ACRak 300 uses Darfon MIG300 micro inverters which are electrically compatible with PV modules that have a voltage range of 24V to 60V. Please refer to the 'Compatible PV Module Calculator' on Darfon website at [www.darfonsolar.com](http://www.darfonsolar.com) to verify the PV module is electrically compatible.

### Electrical Compatibility

Model	PV MPPT Voltage Range	PV Module Connector Type
MIG300	24V to 40V	MC-4 Locking [Male-Anode (+), Female-Cathode (-)]

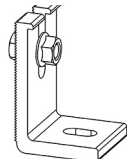

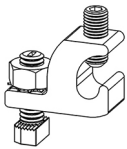
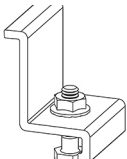

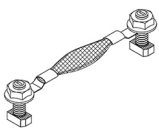


### WARNING

Do not exceed sixteen micro inverters per circuit using a dedicated circuit breaker of 20A or less.

### Torque Values

These are the torque values for the nuts and screws attached to the ACRak. For the torque values for other components being used, please refer to their manufacturer's documentation.

	Part Description	Torque Value
	L-Foot Nuts (3/8"-16)	204 in-lbs
	Internal Splice Screws (1/4"-14)	Fully seat
	Grounding Lug Nuts (1/4"-20)	84 in-lbs
	Grounding Lug Set Screws (1/4"-28)	20 in-lbs
	End Clamp Nuts (1/4"-20)	84 in-lbs
	Mid Clamp Nuts (1/4"-20)	84 in-lbs
	Expansion Joint Nuts (1/4"-20)	84 in-lbs

# INSTALLATION MAP TEMPLATE

Use this map to draw the array and keep track of the micro inverters placement by serial number. Peel off and use secondary serial number label on the micro inverter.

Installer Info: \_\_\_\_\_ Customer Info: \_\_\_\_\_

Array Name: \_\_\_\_\_

Site Address: \_\_\_\_\_

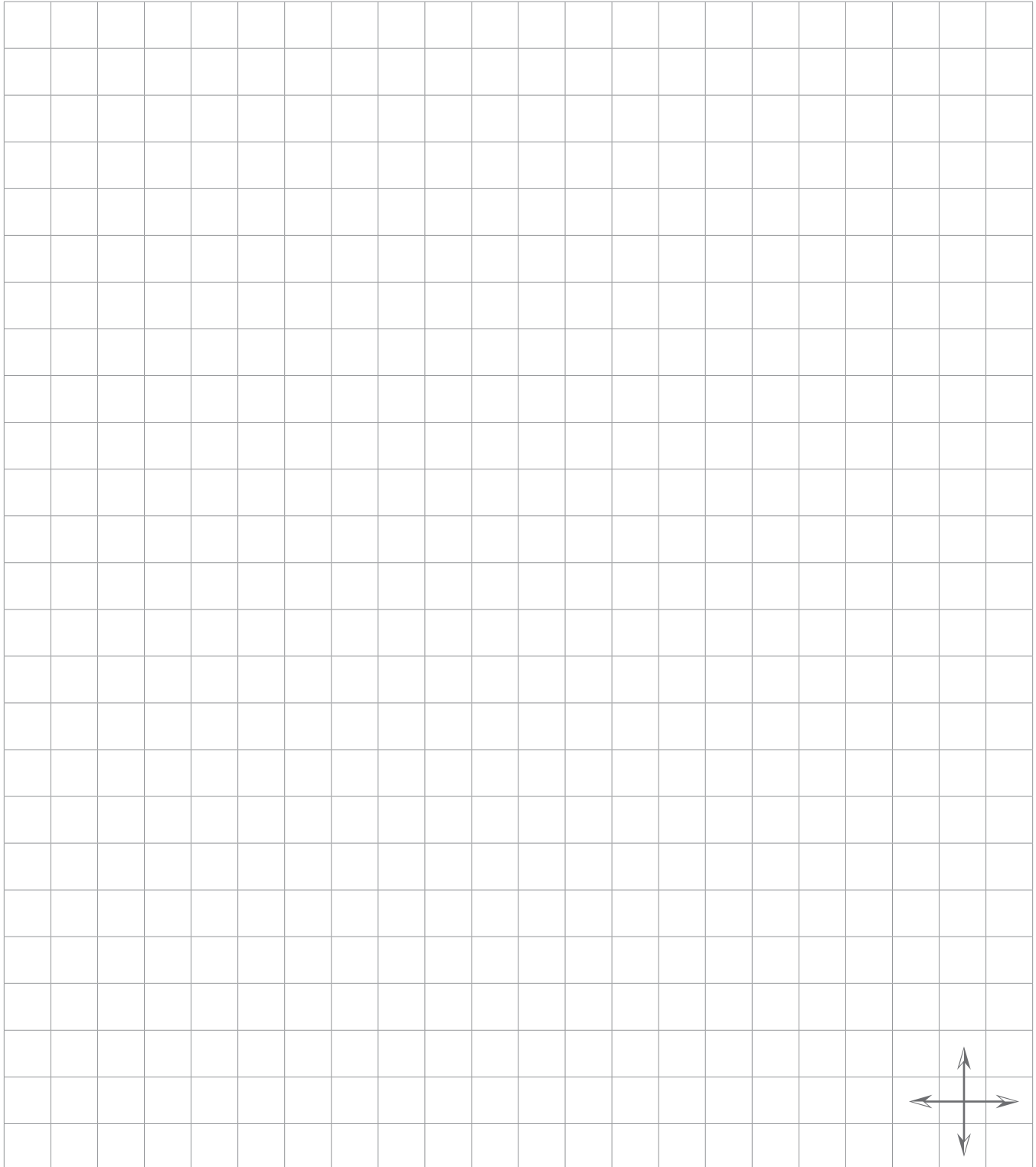
Azimuth: \_\_\_\_\_

\_\_\_\_\_

Tilt: \_\_\_\_\_

\_\_\_\_\_

Sheet \_\_\_\_\_ of \_\_\_\_\_





# DARFON

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