

1000W Li-Ion Diamond™ Series Battery Charger Data Sheet

Green Watt Power's 1000W Diamond™ Series universal Li-ion battery on-board and off-board chargers are designed with ultra-high efficiency. The low power dissipation and extraordinary performance directly result in higher reliability and a longer charger lifetime. This Diamond series of chargers offers solid and safe power conversion to charge Li-Ion batteries in e-motorcycles, e-boats, e-vehicles, e-machines, and similar applications.

Features:

- Universal AC Input: 90 – 264V.
- 1000W Output power over the entire Vin range
- Two ultra-wide output voltage ranges: 28V – 58.8V and 43 – 86V
- High efficiency: Up to 92%.
- All-Around Protections: OVP, OCP, SCP, OTP.
- Fan cooled for wide ambient temperature operation.
- CAN communication.
- LED Status indicator.
- IP67 waterproof rating.
- Available in two mechanical versions: Fixed On-Board and portable Off-Board version with a handle.
- Optional 12V/60W AUX output.



Model Selection Table (On-Board Versions)

Input Voltage	Output		Efficiency (typ.)	Model Number * (factory number *)	Mechanical Design	
	Power	Voltage				
90 – 264VAC	1000W	28 – 58.8VDC	90% @ 120Vnom	EVC-60-1000M (PLD1000-EVCS01-58M)	Connector version,	No Handle
				EVC-60-1000MW (PLD1000- EVCS01-58MW)	Flying lead version	
			92% @ 230Vnom	EVC-60-1000 (PLD1000-EVCS01-58)	Connector version	Includes Handle
				EVC-60-1000W (PLD1000-EVCS01-58W)	Flying lead version	
		43 – 86V	90% @ 120Vnom	EVC-84-1000M (PLD1000-EVCS55-84M)	Connector version	No Handle
				EVC-84-1000MW (PLD1000- EVCS55-84MW)	Flying lead version	
			92% @ 230Vnom	EVC-84-1000 (PLD1000-EVCS55-84)	Connector version	Includes Handle
				EVC-84-1000W (PLD1000-EVCS55-84W)	Flying lead version	

Note: *Add a -12 Suffix to the Model number for optional isolated 12V/5A Auxiliary Output.
For example: EVC-60-1000M-12 (PLD1000-EVCS01-58M-12)

58.8V Models Electrical Specifications

General Condition: 25°C ambient, input 230VAC @ full load unless noted.

Input Specification			
Input Voltage	90 – 264VAC		
Input Frequency	47 – 63Hz		
Input Current Max.	9.5A @120VAC		4.9A @230VAC
Power Factor (min./typical)	0.97 / 0.98 @120VAC		0.96 / 0.98 @230VAC
Efficiency at full load (min./typical)	89% / 90% @120VAC		91% / 92% @230VAC
Output Specification			
Output Voltage	28 – 58.8V (±1V)		
Output Current	0 – 18A (±0.5A)		
Voltage Accuracy	±0.4V		
Output Power	1kW @ 120/230Vnom line input voltage		
Optional Auxiliary Output (-12 suffix)	12V/5A Output (isolated from main power output)		
Current Ripple	±15% Iout max. (constant current mode). 20MHz BW, rated input and rated output.		
Communication	CAN		
Turn On Delay	5.0s max. @ Full Load		
Protection	OVP, OCP, SCP, OTP		
Input Under Voltage Protection (UVP)	Charger shut down at Vin <80VAC (±5V) and auto-recovers at Vin >90VAC (±5V)		
Output Over Voltage Protection (OVP)	With Vout >61V, the charger enters latch mode. Recycle AC input after fault removal to return to normal operation.		
Battery Under Voltage Protection	A battery voltage <25V triggers charger latch mode. Recycle AC input after fault removal to return to normal operation.		
Short Current Protection (SCP)	Charger self-protects when output is in short-circuit. Charger resumes normal operation after removal of fault condition.		
Output Overcurrent Protection	Output overcurrent protection triggers >19A for >2 seconds. Charger resumes normal operation after removal of fault condition.		
Reverse Polarity Protection	Charger enters self-protection mode with output in reverse polarity. Charger resumes normal operation after removal of fault condition.		
Timing protection (settable through CAN)	Timing protection activates after 12 hours (±1h) of charging. Recycle AC input to return to normal operation.		
Over Temperature Protection	Thermal protection ON		Thermal protection OFF
	No Handle	>85°C (±5°C) Tcase	<75°C (±5°C) Tcase
	Incl. Handle	>75°C (±5°C) Tcase	<70°C (±5°C) Tcase
Max. Case Temperature Range (see also derating curve for max load)	Without Handle: -40°C to +80°C		Including Handle: -40°C to +60°C
Storage Temperature Range	-40°C to +85°C		
Surge Protection	1kV DM / 2kV CM		
Isolation Test Voltage	Prim. to Sec.: 3000VAC / Prim. to Earth: 1500Vac / Sec. to Earth: 500VAC Condition: Leakage current 10mA max. duration 60s max.		
Intrusion & Moisture Protection	IP67 (IEC-C20 connector excluded; mating connector must match charger IP rating)		

* IP54 for Fan version with production date codes before Nov. 2023.

86V models Electrical Specifications

General Condition: 25°C ambient, input 230VAC @ full load unless noted.

Input Specification			
Input Voltage	90 – 264VAC		
Input Frequency	47 – 63Hz		
Input Current Max.	9.5A @120VAC		4.9A @230VAC
Power Factor (min./typical)	0.97 / 0.98 @120VAC		0.96 / 0.98 @230VAC
Efficiency at full load (min./typical)	89% / 90% @120VAC		91% / 92% @230VAC
Output Specification			
Output Voltage	43 – 86V (±1V)		
Output Current	0 – 12A (±0.5A)		
Voltage Accuracy	±0.4V		
Output Power	1kW @ 120/230Vnom line input voltage		
Optional 12V Aux. Output (-12 suffix)	Output Current 5A (isolated from main power output)		
Current Ripple	±15% lout max., during constant current mode. Measurement is done by 20MHz bandwidth oscilloscope. (Test under the condition of rated input and rated output).		
Communication	CAN		
Turn On Delay	5.0s max. @ Full Load		
Protection	OVP, OCP, SCP, OTP		
Input Under Voltage Protection (UVP)	The charger shuts down when Vin drops to 80VAC (±5V) and auto-recovers when Vin raises above 90VAC (±5V)		
Output Over Voltage Protection (OVP)	With Vout >88V, the charger enters latch mode. Recycle AC input after fault removal to return to normal operation.		
Battery Under Voltage Protection	A battery voltage <41V triggers charger latch mode. Recycle AC input after fault removal to return to normal operation.		
Short Current Protection (SCP)	Charger self-protects when output is in short-circuit. Charger resumes normal operation after removal of fault condition.		
Output Overcurrent Protection	Output overcurrent protection triggers >13A for >2 seconds. Charger resumes normal operation after removal of fault condition.		
Reverse Polarity Protection	Charger enters self-protection mode with output in reverse polarity. Charger resumes normal operation after removal of fault condition.		
Timing protection (settable through CAN)	Timing protection activates after 12 hours (±1h) of charging. Recycle AC input to return to normal operation.		
Over Temperature Protection	No Handle Incl. Handle	Thermal protection ON >85°C (±5°C) Tcase >75°C (±5°C) Tcase	Thermal protection OFF <75°C (±5°C) Tcase <70°C (±5°C) Tcase
Max. Case Temperature Range (see also derating curve for max load)	Without Handle: -40°C to +80°C Including Handle: -40°C to +60°C		
Storage Temperature Range	-40°C to +85°C		
Surge Protection	1kV DM / 2kV CM		
Isolation Test Voltage	Prim. to Sec.: 3000VAC / Prim. to Earth: 1500Vac / Sec. to Earth: 500VAC Condition: Leakage current 10mA max. duration 60s max.		
Intrusion & Moisture Protection	IP67 (IEC-C20 connector excluded; mating connector must match charger IP rating)		

* IP54 for Fan version with production date codes before Nov. 2023.

Immunity (Designed to meet):

- EN61000-3-2: Harmonic Current Emission.
- EN61000-3-3: Voltage Fluctuations and Flicker.
- EN61000-4-2: ESD 8kV Air Discharge, 4kV Contact Discharge, Criteria B.
- EN61000-4-3: Radio-Frequency Electromagnetic Field Susceptibility Test-Rs Level 3, Criteria A.
- EN61000-4-4: Electrical Fast Transient/Burst-EFT 1kV, Criteria B.
- EN61000-4-5: Surge Immunity Test, AC Power Line: Line to Line 1kV; Line to Earth 2kV Criteria B.
- EN61000-4-6: Conducted Radio Frequency Disturbance Test-CS Level 3, Criteria A.
- EN61000-4-8: Power Frequency Magnetic Field Test 3A/m, Criteria A.
- EN61000-4-11: Voltage Dips, Criteria B.
- EMI: Test with the system.

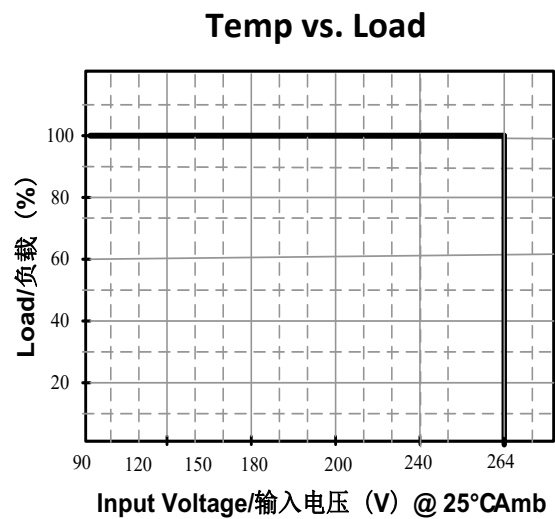
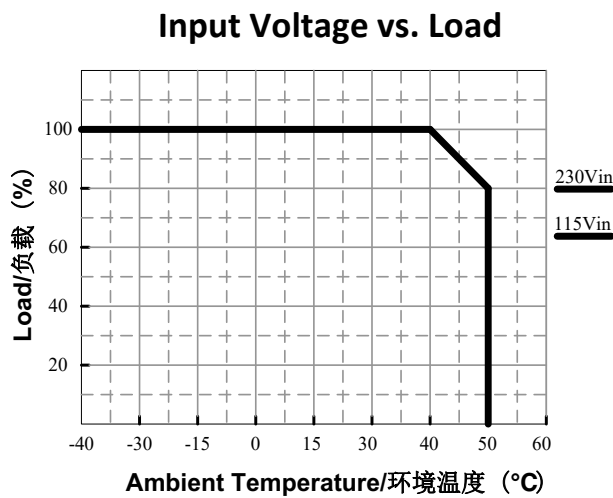
Safety (Designed to meet):

EN60335 & UL62368

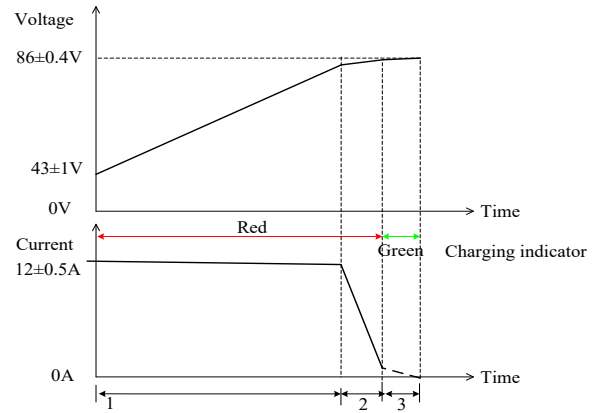
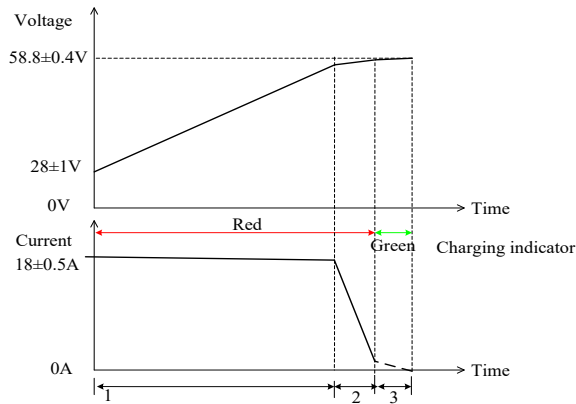
Communication Protocol:

The charger has CAN communication function with a baud rate of 500kbit. The charger does not have a terminal resistor by default, it is optional. Contact the factory for specific documents and communication protocols.

Derating Curves



Typical Charge Curves



Note:

1. The charging curve is based on the charging request, output current, and voltage, sent by the BMS. When the requested current and voltage received are higher than the maximum output capacity of the charger, the charger outputs the current and voltage based on its own maximum output capacity.
2. When the BMS board sends a command to inform the completion of charging, the charger finished charging and the LED color changes to continuous green.
3. When the battery voltage is at $58.8V / 86V (\pm 1V)$ respectively, the charger enters constant voltage mode. When the battery voltage is between $28V - 57.5V / 43V - 84.5V (\pm 1V)$ respectively, the charger operates in constant current mode.
4. Derating conditions should be considered for the actual output current.

LED Status Indicator:

The LED indicator shows the charging status by color:

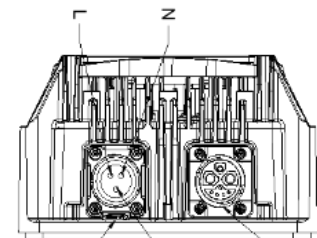
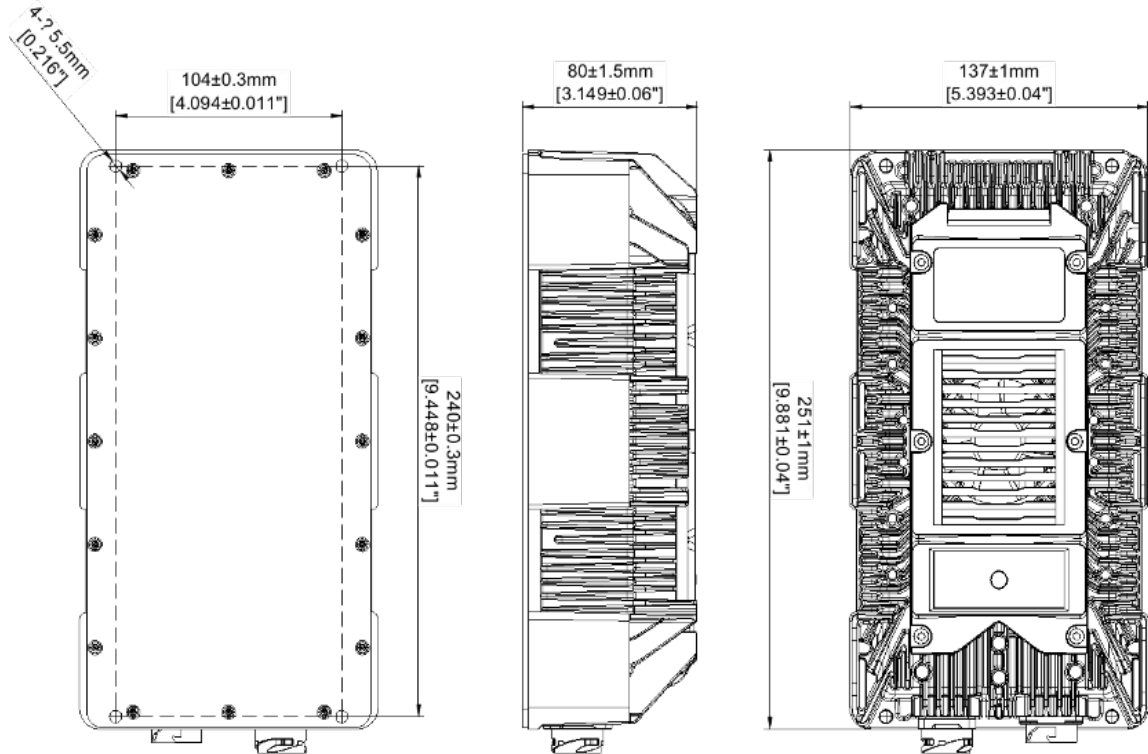
Battery Status	LED Indicator
Battery disconnected	Flashing GREEN
Battery fully charged (charging current $< 400mA \pm 200mA$)	GREEN
Battery charging (charging current $> 800mA \pm 200mA$)	RED
Fault Condition (OVP, UVP, Short Circuit, OTP, OCP, RPP)	Flashing RED

Note: During short-circuit protection, it is normal for the LED to blink from green to off and then to red again for a short time, which does not affect the protection function. It's normal for the LED to change to red when the output current is $600mA$ to $1000mA$, because it is within the range of its hysteresis.

MECHANICAL DATA

On-Board Connector Version:

(See also description of connectors)

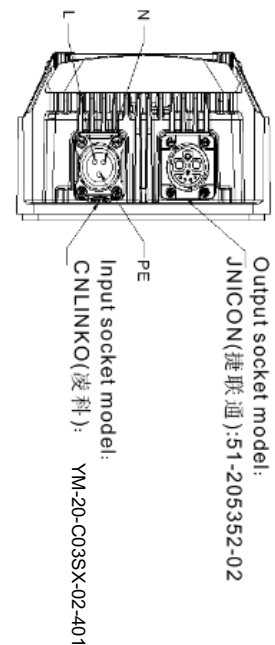
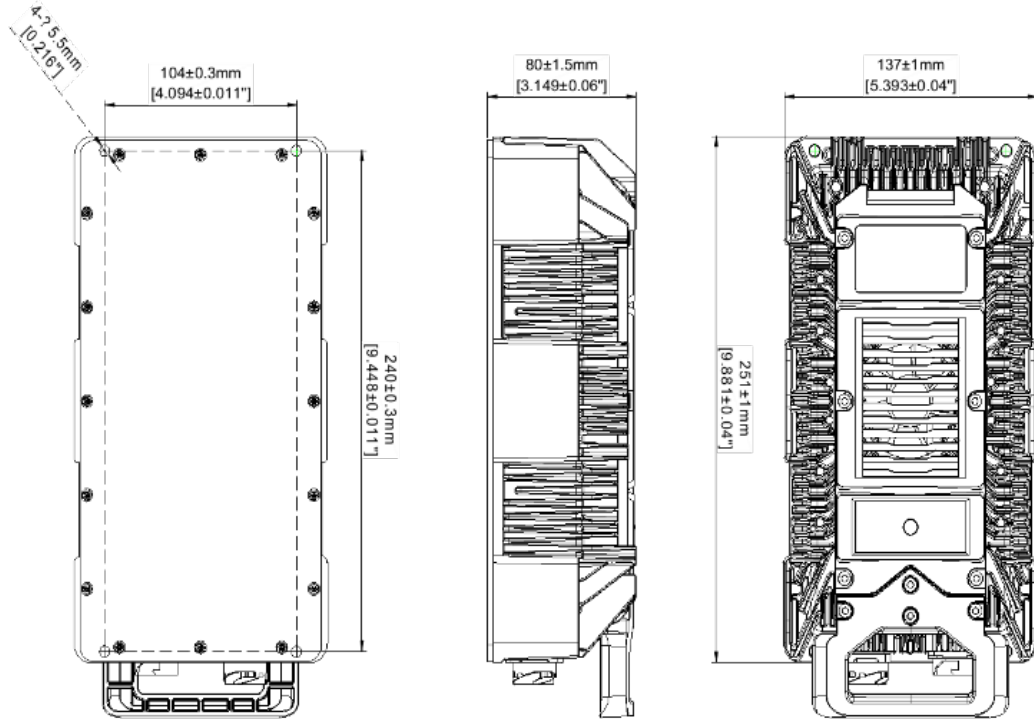


Mechanical	Fan-type No Handle
Dimensions (L x W x H)	251 x 137 x 80 mm 9.88 x 5.39 x 3.15 in
Weight	3.8kg / 8.38 lbs.

MECHANICAL DATA

Off-Board Connector Version:

(See also description of connectors)



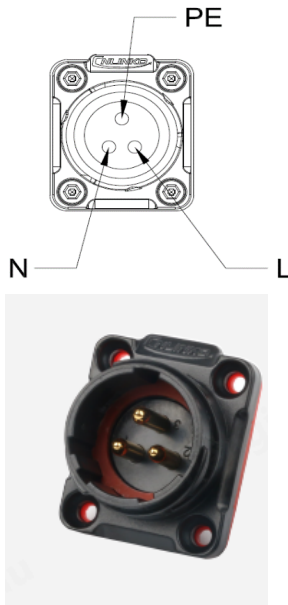
Mechanical	Fan-type with Handle
Dimensions (L x W x H)	277 x 137 x 80 mm 10.91 x 5.39 x 3.15 in
Weight	4.0kg / 8.82 lbs.

CONNECTOR DETAILS: Connector Version:

Charger Side Connector Details

AC connector on Charger:

CNLINKO, YM-20-C03SX-02-401 (3 pin, male)

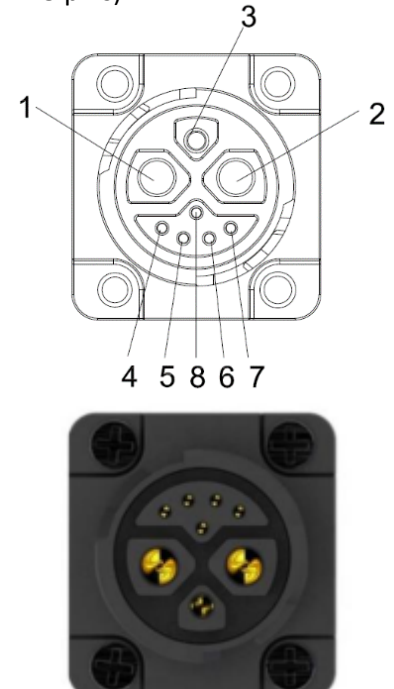


DC/Signal connector on Charger:

Jnicon, 51-205352-02 (Female 2+1+5 pins)

Pin	Function	Wire
1	BAT+	10AWG
2	BAT-	10AWG
3	NC (optional +12V)	20AWG
4	NC (*reserved*)	22AWG
5	NC (*reserved*)	22AWG
6	CAN_H	22AWG
7	CAN_L	22AWG
8	NC (optional -12V)	20AWG

* Consult factory for
Wake-up function



Customer Side Mating Connector Info

(will be provided with samples; for volume orders, customer must source separately).

AC mating connector (not provided):

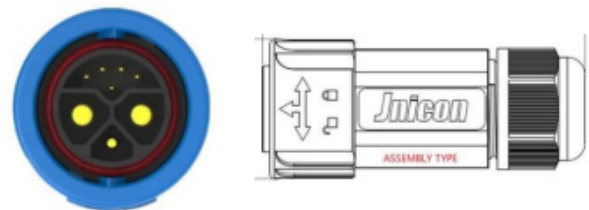
CNLINKO, YM-20-J03PE-02-001 (3 pin, female)

<http://www.cnlinkousa.com/where-to-buy.html>

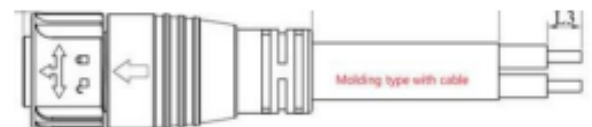


DC/Signal mating connector (not provided):

Jnicon, 51-105311-01 (Assembly, 2+1+5 pins)



Jnicon, 51-105311-01-0001 (Molding option)

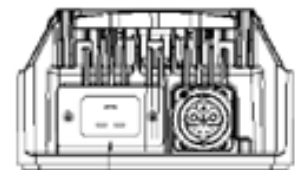
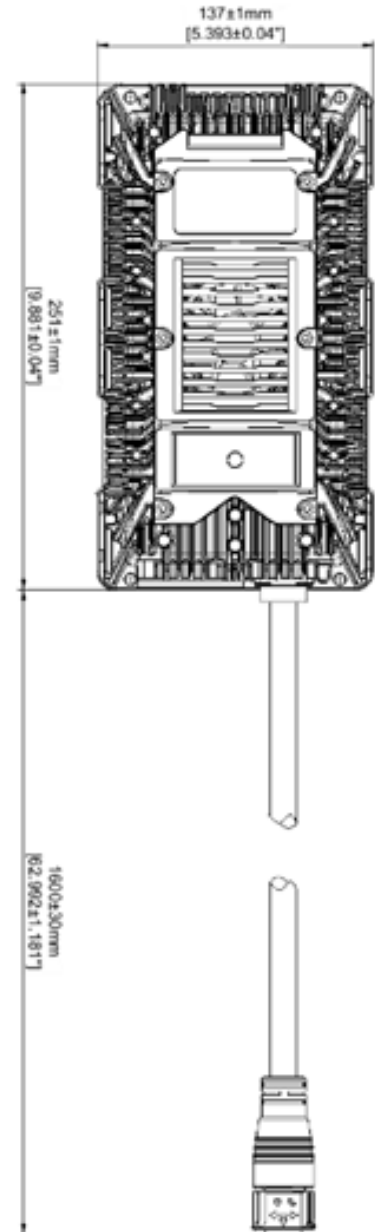
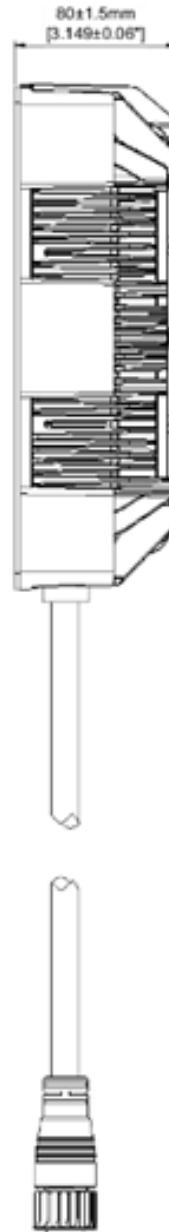
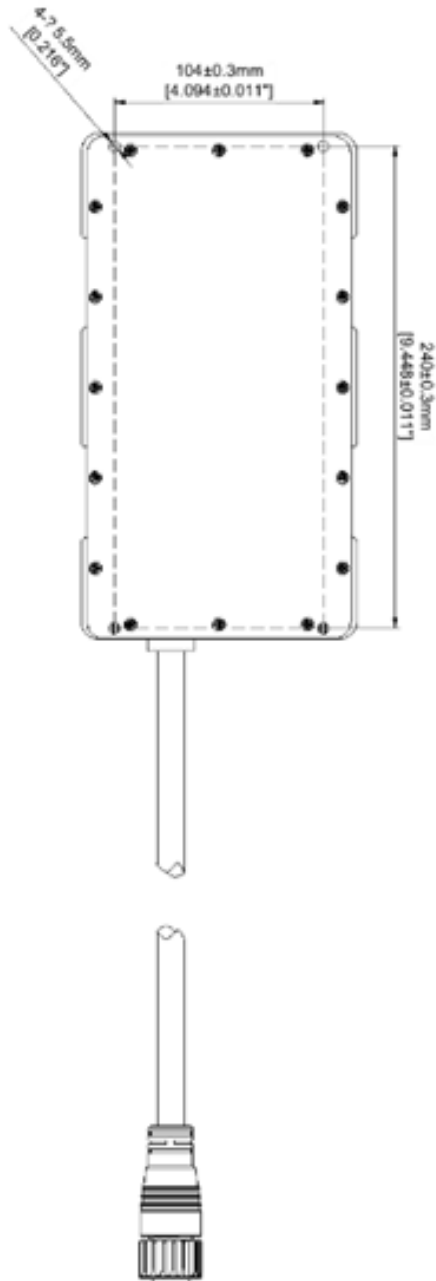


https://www.jniconconnector.com/buy-M23_self_locking_2+1+5.html

MECHANICAL DATA

On-Board Flying Lead Version:

(See also description of connectors)



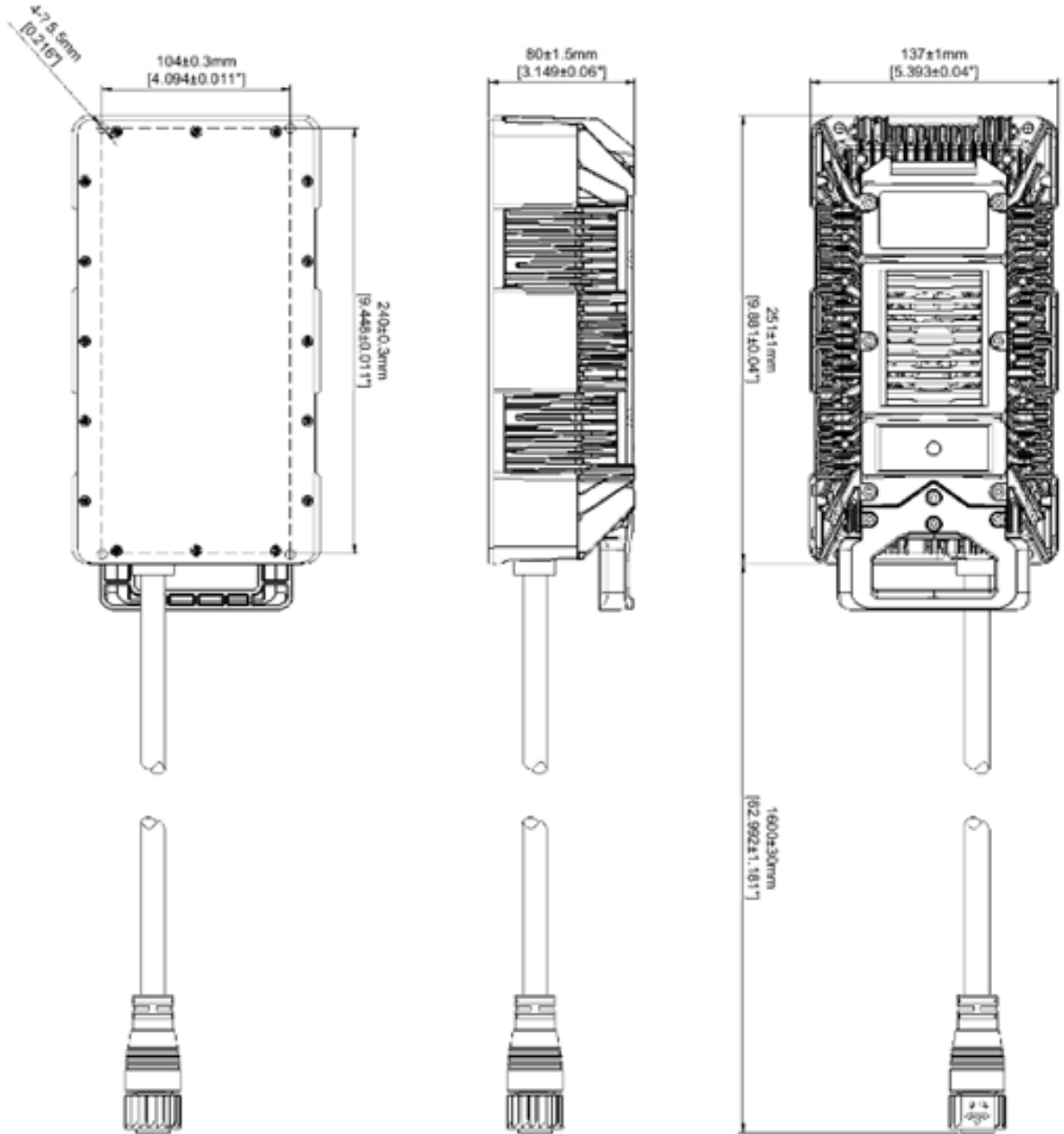
Mechanical	Fan-type No Handle
Dimensions (L x W x H)	251 x 137 x 80 mm 9.88 x 5.39 x 3.15 in
Weight	3.8kg / 8.38 lbs.



MECHANICAL DATA

Off-Board Flying Lead Version:

(See also description of connectors)



Mechanical	Fan-type with Handle
Dimensions	277 x 137 x 80 mm
(L x W x H)	10.91 x 5.39 x 3.15 in
Weight	4.0kg / 8.82 lbs.

CONNECTOR DETAILS: Flying Lead Version

Charger Side Connector Details

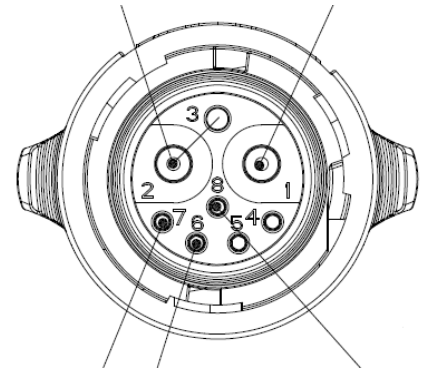
AC Socket on Charger:
Standard IEC-C20 (male)



DC/Signal Male connector on Charger:
Jnicon 51-105311-01-0001 (Molding, 2+1+5)

Pin	Function	Wire
1	BAT+	10AWG
2	BAT-	10AWG
3	NC (optional +12V)	20AWG
4	NC (*reserved*)	22AWG
5	NC (*reserved*)	22AWG
6	CAN_H	22AWG
7	CAN_L	22AWG
8	NC (optional -12V)	20AWG

* Consult factory for
Wake-up function



Mating Connector Info:

(will be provided with samples; for volume orders, customer must source separately).

AC mating connector (not provided):
Standard IEC-C20 (female) with cable.

DC/Signal mating connector (not provided):
Jnicon, 51-205352-02 (Female 2+1+5 pins)



https://www.jniconconnector.com/buy-M23_self_locking_2+1+5.html