

## 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 extraordinary performance of low power dissipation directly results in higher reliability and longer lifetime of the charger. This series of chargers offer solid and safe power conversions for use in e-vehicles, e-motorcycles, e-boats, e-machines, and similar applications.

### Features:

- Universal AC Input: 90 – 264V.
- 1000W Output power over 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 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	<b>EVC-60-1000M</b> (PLD1000-EVCS01-58M)	Connector version,	<b>No</b> Handle
				<b>EVC-60-1000MW</b> (PLD1000- EVCS01-58MW)	Flying lead version	
			92% @ 230Vnom	<b>EVC-60-1000</b> (PLD1000-EVCS01-58)	Connector version	<b>Includes</b> Handle
				<b>EVC-60-1000W</b> (PLD1000-EVCS01-58W)	Flying lead version	
		43 – 86V	90% @ 120Vnom	<b>EVC-84-1000M</b> (PLD1000-EVCS55-84M)	Connector version	<b>No</b> Handle
				<b>EVC-84-1000MW</b> (PLD1000- EVCS55-84MW)	Flying lead version	
			92% @ 230Vnom	<b>EVC-84-1000</b> (PLD1000-EVCS55-84)	Connector version	<b>Includes</b> Handle
				<b>EVC-84-1000W</b> (PLD1000-EVCS55-84W)	Flying lead version	

**Note:** \*Add a -12 Suffix to 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 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)	The charger enters latch mode when the output voltage is above 61V max. After the fault condition is removed, recycle the AC input to return to normal operation.	
Battery Under Voltage Protection	When the battery voltage is lower than 25V (±2V), the charger will not work. After the fault condition is removed, recycle the AC input to return to normal operation.	
Short Current Protection (SCP)	With the output in short-circuit mode, the power supply will not be damaged. After removal of the fault condition, the charger will resume normal operation.	
Output Overcurrent Protection	When output current exceeds 19A for >2 seconds, output overcurrent protection is triggered. After fault condition is removed, charger resumes normal operation.	
Reverse Polarity Protection	If the charger is connected in reverse polarity, it goes into self-protection mode and resumes normal operation once the fault condition is removed.	
Timing protection (settable through CAN)	When the power output is 12±1H and the product enters the timing protection, Reinsert the AC input plug to return to normal	
Over Temperature Protection	<b>Without Handle:</b> Unit enters thermal protection when Tcase reaches 85°C ±5°C; auto-recovery with Tcase at or below 75°C ±5°C. <b>Including Handle:</b> Unit enters thermal protection when Tcase reaches 75°C ±5°C; auto-recovery with Tcase at or below 70°C ±5°C	
Max. Case Temperature Range *	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 (as of Nov.2023. Earlier Fan Version was IP54, Flying Lead version was IP65). IEC-C20 connector excluded; mating connector must match charger IP rating.	

\* See also derating curve for max load.

## 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)	The charger enters latch mode when the output voltage is above 88V max. After the fault condition is removed, recycle the AC input to return to normal operation.	
Battery Under Voltage Protection	When the battery voltage is lower than 41V (±2V), the charger will not work. After the fault condition is removed, recycle the AC input to return to normal operation.	
Short Current Protection (SCP)	With the output in short-circuit mode, the power supply will not be damaged. After removal of the fault condition, the charger will resume normal operation.	
Output Overcurrent Protection	When output current exceeds 13A for >2 seconds, output overcurrent protection is triggered. After fault condition is removed, charger resumes normal operation.	
Reverse Polarity Protection	If the charger is connected in reverse polarity, it goes into self-protection mode and resumes normal operation once the fault condition is removed.	
Timing protection (settable through CAN)	When the power output is 12±1H and the product enters the timing protection, Reinsert the AC input plug to return to normal	
Over Temperature Protection	<b>Without Handle:</b> Unit enters thermal protection when Tcase reaches 85°C ±5°C; auto-recovery with Tcase at or below 75°C ±5°C. <b>Including Handle:</b> Unit enters thermal protection when Tcase reaches 75°C ±5°C; auto-recovery with Tcase at or below 70°C ±5°C	
Max. Case Temperature Range *	<b>Without Handle:</b> -40°C to +80°C	<b>Including Handle:</b> -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 (as of Nov.2023. Earlier Fan Version was IP54, Flying Lead version was IP65). IEC-C20 connector excluded; mating connector must match charger IP rating.	

\* See also derating curve for max load.

## 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.

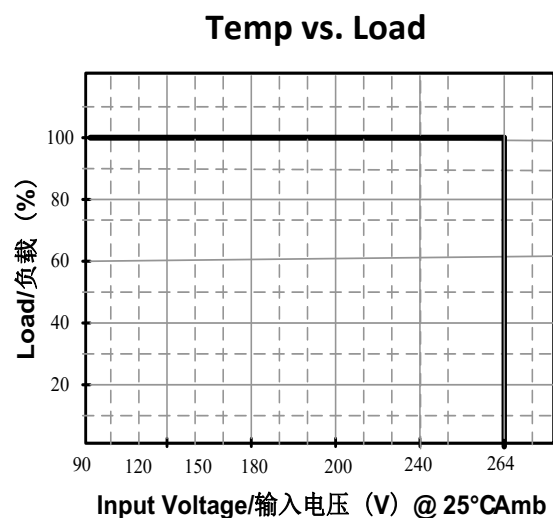
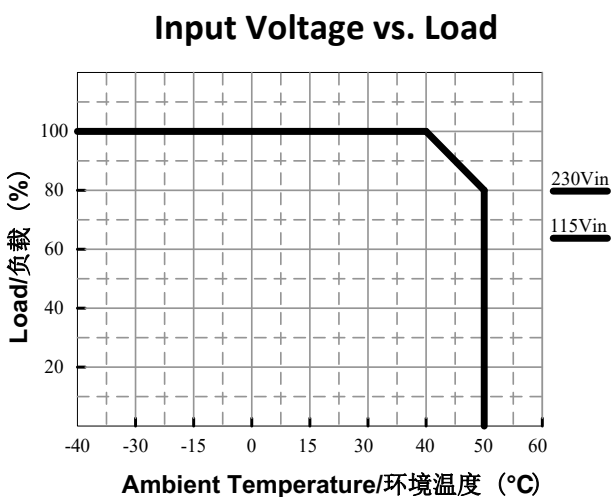
## Safety (Designed to meet):

EN60335 & UL62368

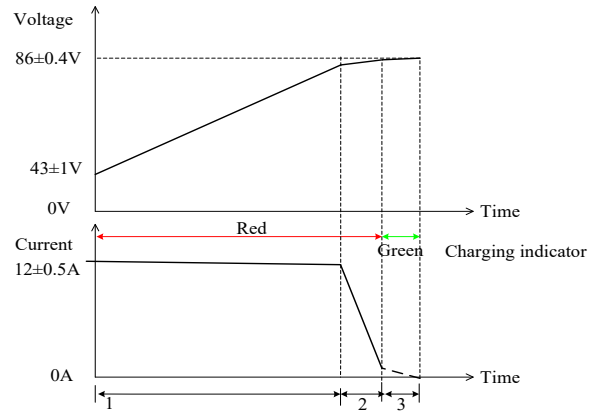
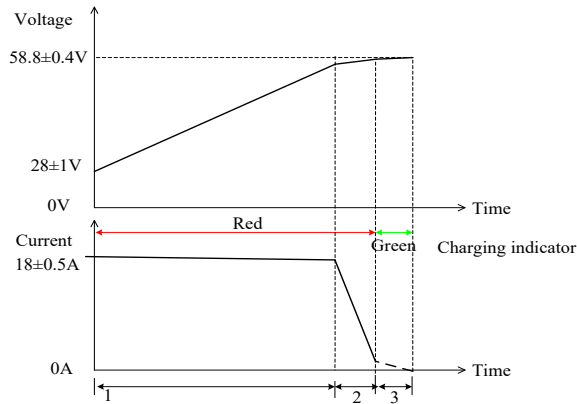
## Communication Protocol:

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 factory for specific documents and communication protocol.

## 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 (±1V) respectively, the charger enters constant voltage mode. When the battery voltage is between 28V – 57.5V / 43V – 84.5V (±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:

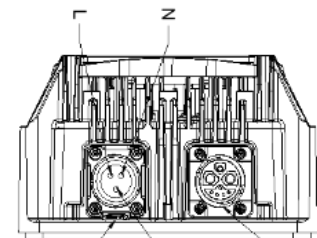
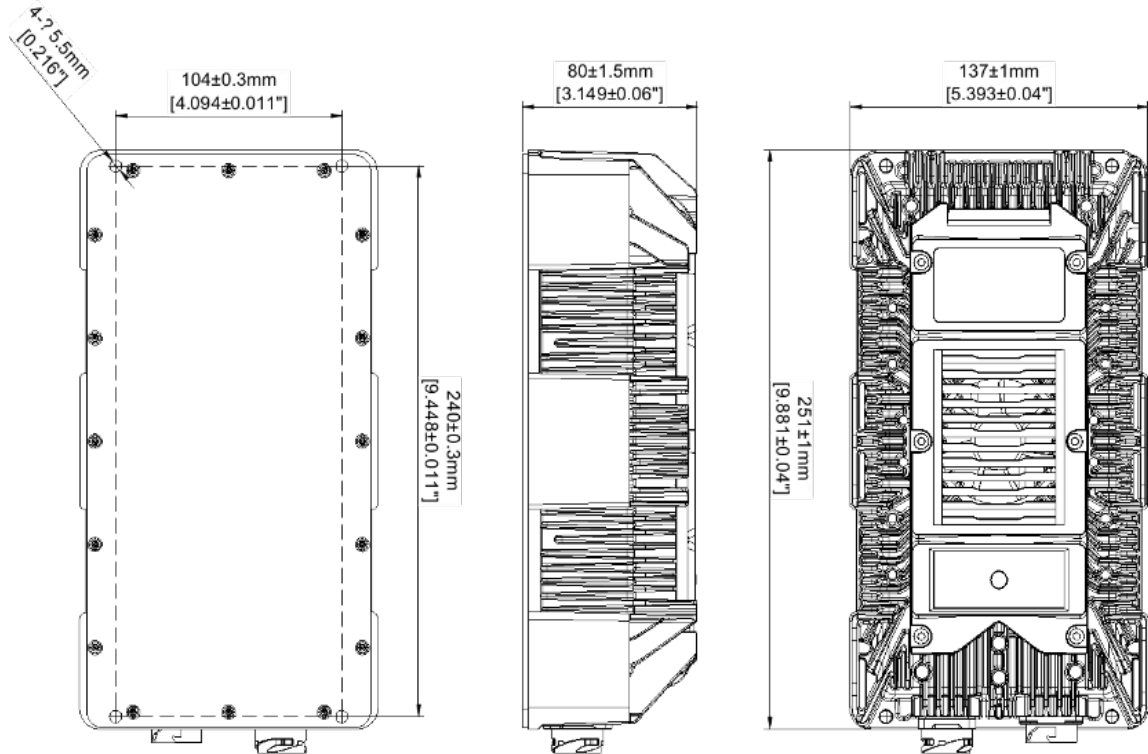
Battery Status	LED Indicator
Battery disconnected	Flashing GREEN
Battery fully charged (charging current <400mA ±200mA)	GREEN
Battery charging (charging current >800mA ±200mA)	RED
Fault Condition (OVP, UVP, Short Circuit, OTP, OCP, RPP)	Flashing RED

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)



Input socket model:  
CNLINKO (凌科): YM-20-C03SX-02-401

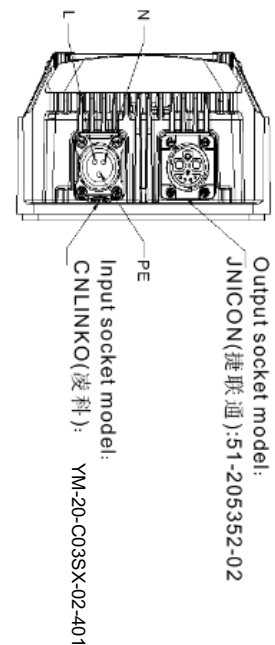
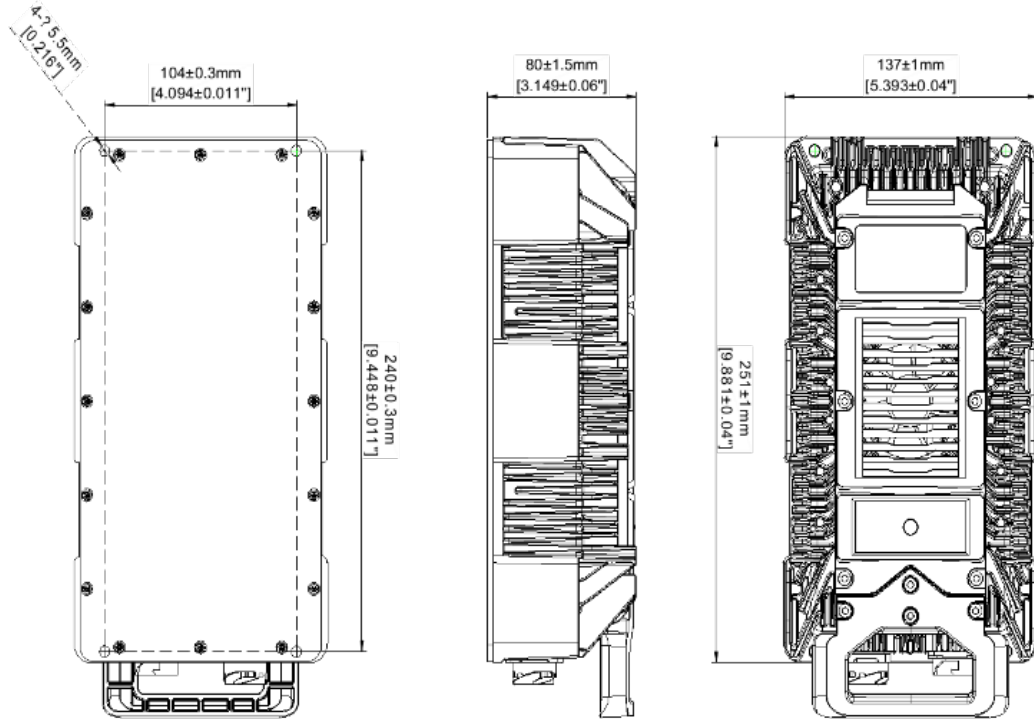
Output socket model:  
JNICON (捷联通): 51-205352-02

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.

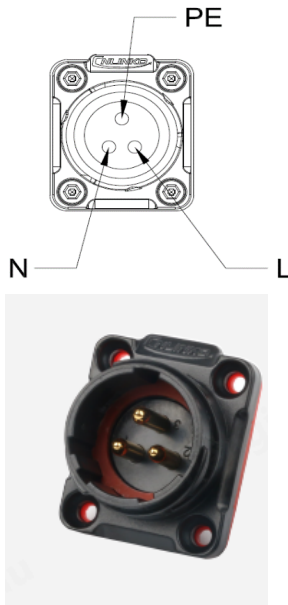


## CONNECTOR DETAILS: Connector Version:

### Charger Side Connector Details

#### AC connector on Charger:

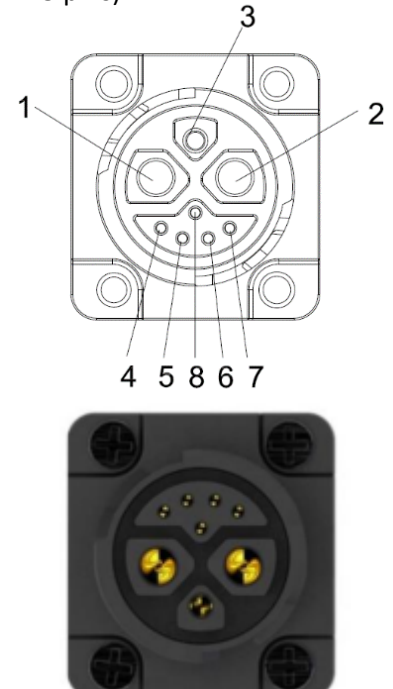
CNLINKO: YM-20-C03SX-02-401 (3 pin, male)



#### DC/Signal connector on Charger:

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

Pin	Function	Wire
1	BAT+	10AWG
2	BAT-	10AWG
3	12V+ / NC	20AWG
4	Wake up / NC	22AWG
5	Wake up / NC	22AWG
6	CAN_H	22AWG
7	CAN_L	22AWG
8	12V- / NC	20AWG



### Customer Side Mating Connector Info

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

#### AC mating connector (not provided):

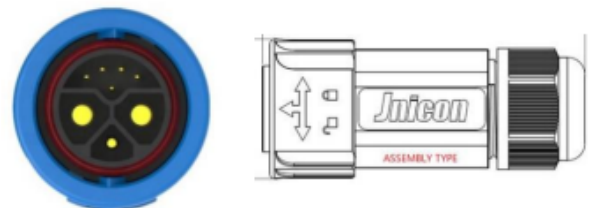
CNLINKO, YM-20-J03PE-02-001 (3 pin, female)

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

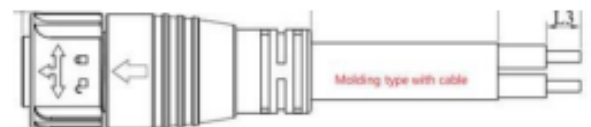


#### DC/Signal mating connector (not provided):

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



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



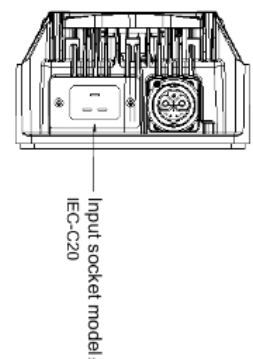
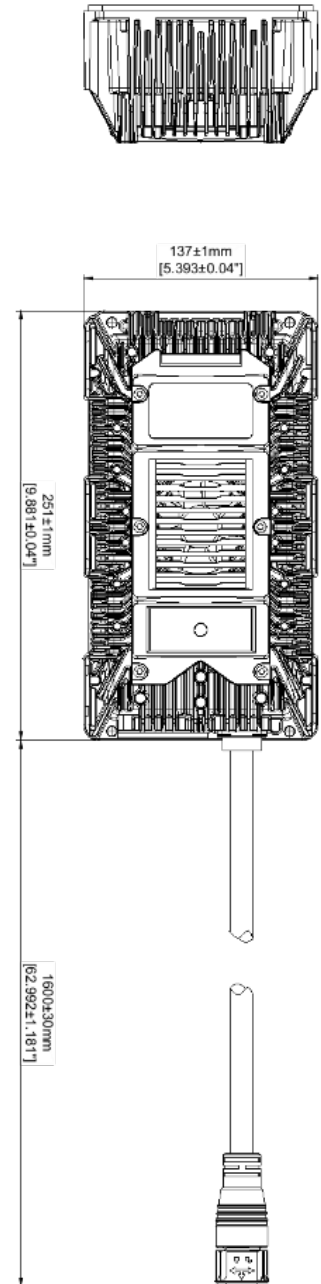
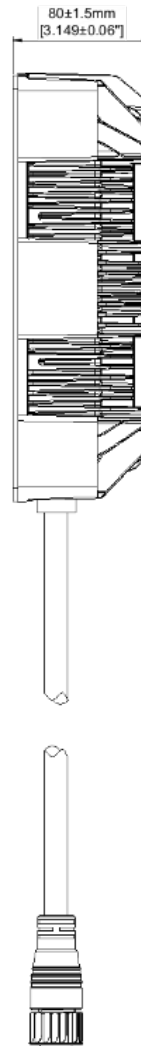
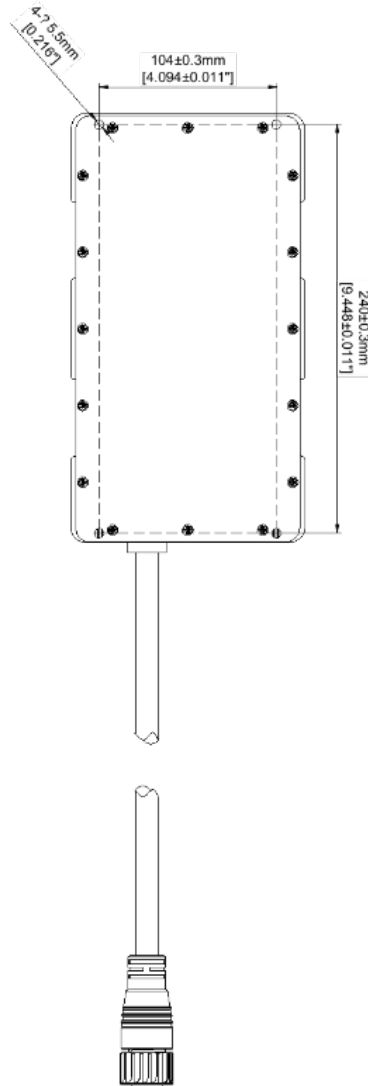
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## MECHANICAL DATA

### On-Board Flying Lead Version:

(See also description of connectors)



Output socket model:  
JNICON: M23( 51-105311-01-0001)

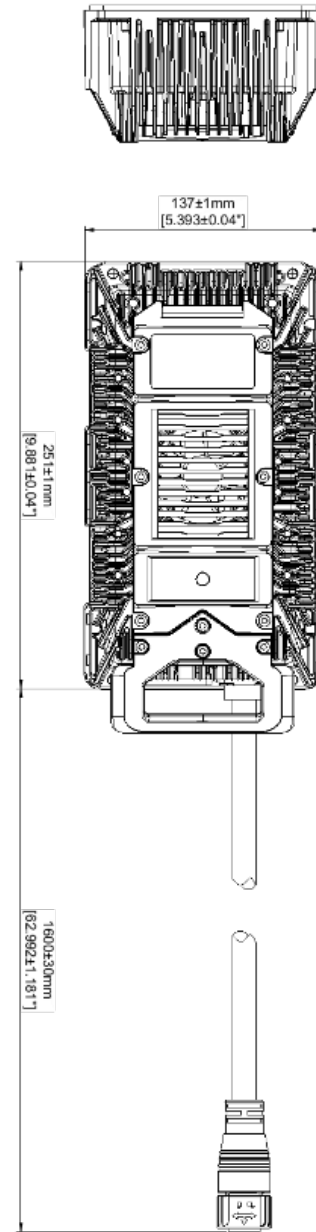
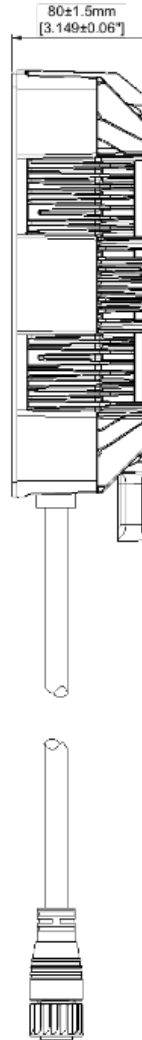
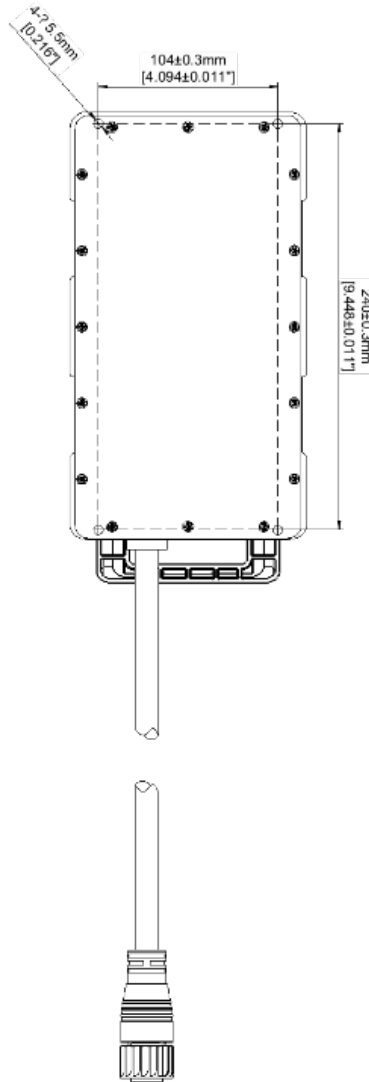
NO.	FUNCTION
1	BAT+
2	BAT-
3	12V+/NC
4	Wake up/NC
5	Wake up/NC
6	CAN_H
7	CAN_L
8	12V-/NC

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:

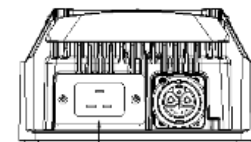
(See also description of connectors)



Output socket model:  
JNICON: M23 (51-105311-01-0001)

NO.	FUNCTION
1	BAT+
2	BAT-
3	12V+VNC
4	Wake up/VNC
5	Wake up/VNC
6	CAN_H
7	CAN_L
8	12V-VNC

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.



Input socket model:  
IEC-C20

## CONNECTOR DETAILS: Flying Lead Version

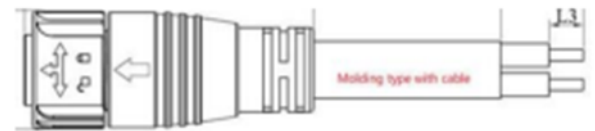
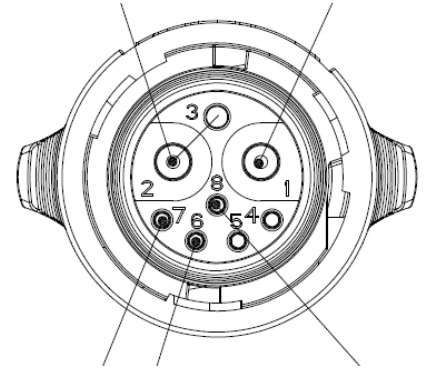
### Charger Side Connector Details

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	12V+ / NC	20AWG
4	Wake up / NC	22AWG
5	Wake up / NC	22AWG
6	CAN_H	22AWG
7	CAN_L	22AWG
8	12V- / NC	20AWG



### 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)



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