2400W Li-Ion Diamond™ Series Battery Charger Data Sheet

Description:

Green Watt Power's 2400W (1500W) 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.
- Output power: 2400W @ 230V nominal and
  1500W @ 115V nominal.
- 4 ultra-wide output voltage ranges cover 28V – 156V.
- High efficiency: Up to 92%.
- All-Around Protections: OVP, OCP, SCP, OTP.
- Fan cooled for ambient temperatures up to 50 °C*.
- CAN communication.
- LED Status indicator.
- IP67 waterproof rating.
- Connectors or flying lead versions, with or without a handle.
- Optional 12V/60W AUX output.

Model Selection Table

Input Voltage Range (AC)	Output Power Max. *	Output Voltage Range (DC)	Output Current Range	Efficiency (typ.)	Model Number ** (factory number **)	Mechanical Design **
90 – 264V	2.4kW @ 230Vin	28 – 59V	0 – 40A	92 @ 230Vnom	**EVC-60-2400** (PLD2400-EVCS28-59)	**Connector** version, **Handle** Included
		36 – 74V	0 – 35A		**EVC-74-2400** (PLD2400-EVCS36-74)	
	1.5kW * @ 115Vin	43 – 84V	0 – 30A	90% @ 115Vnom	**EVC-84-2400** (PLD2400-EVCS55-84)	
		71 –156V	0 – 15A		**EVC-156-2400** (PLD2400-EVCS71-156)	

Notes: * See derating curves for details.
**Add following suffix to the part number:
M suffix = Connector Version without Handle
W suffix = Flying lead version, Handle included
MW suffix = Flying lead version, without Handle
-12 suffix = Optional isolated 12V/5A Auxiliary Output.
Example: EVC-84-2400M-12 (PLD2400-EVCS55-84M-12) = Connector Version without Handle and optional 12V Aux Output.

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

Input Specification				
Input Voltage	90 – 264Vac			
Input Frequency	45 – 65Hz			
Input Current Max.	14.5A @115Vac		13.6A @230Vac	
Power Factor (min./typical)	0.97 / 0.98 @115Vac		0.96 / 0.98 @230Vac	
Efficiency at full load (min./typical)	89% / 90% @115Vac		91% / 92% @230Vac	
Output Specification	***EVC-60-2400***	***EVC-74-2400***	***EVC-84-2400***	***EVC-156-2400***
Output Voltage	28 – 59V (±1V)	36 – 74V (±1V)	43 – 84V (±1V)	71 –156V (±1V)
Output Current, see charging curve	0 – 40A (±0.5A)	0 – 35A (±0.5A)	0 – 30A (±0.5A)	0 – 15A (±0.5A)
Voltage Accuracy	±0.5V @Vo max. CC Load 1A			
Output Power	1.5kW @ 115V nom line and 2.4kW @ 230Vnom line input voltage			
Optional Auxiliary Output (-12 suffix)	12V/5A Output (isolated from main power output)			
Current Ripple	±15% Iout max., during constant current mode. Measurement is done by 20MHz bandwidth oscilloscope.			
Communication	CAN			
Turn On Delay	5 sec. max. @ Full Load			
Protection	**OVP, OCP, SCP, OTP**			
Input Under Voltage Protection (UVP)	Shut down at Vin 80VAC (±5V), auto-recovery at Vin >89VAC (±5V).			
Output Over Voltage Protection (OVP)	If output voltage is about 105% Vout max (±2V), charger enters latch mode. Recycle AC input after fault removal to resume operation.			
Battery Under Voltage Protection	Charger will not start with battery voltage is <90-95% Vout min (±2V). Recycle AC input after fault removal to resume 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 at approx. 105% of Io max for >2 seconds. Charger resumes normal operation after removal of fault condition.			
No Load and **Reverse Polarity Protection**	Charger enters self-protection mode with no Load or output in reverse polarity. Charger resumes normal operation after removal of fault condition.			
Timing protection	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**	
	Without Handle	>85°C (±5°C) Tcase	<75°C (±5°C) Tcase	
	With Handle	>75°C (±5°C) Tcase	<70°C (±5°C) Tcase	
Case Temperature Range (see also derating curve for max load)	Without Handle	-40°C to +80°C (Operating)		
	With Handle	-40°C to +60°C (Operating)		
Storage Temp.; Relative Humidity	-40°C to +85°C; 10% RH to 90% RH			
Surge Protection	1kV DM / 2kV CM			
Isolation Test Voltage	Prim. to Sec.: 3000VAC / Prim. to Earth: 1500Vac / Sec. to Earth: 1500VAC Condition: Leakage current 10mA max. duration 60s max.			
Intrusion & Moisture Protection	IP67 (excl. IEC-C20 connector; mating connector must match charger IP rating)			

Immunity and EMI (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 A.

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: Comply with EN55032 (system level test)

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. See specific documents for communication protocol.

LED Status Indicator:

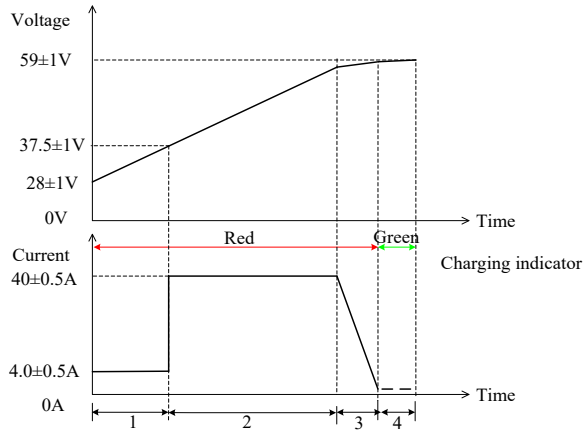
The LED indicator shows the charging status by color:

Battery Status	**LED Indicator**
Battery disconnected	Flashing GREEN
Battery fully charged (charging current <600mA ±200mA)	GREEN
Battery charging (charging current >600mA ±200mA)	RED
Fault Condition (OVP, UVP, Short Circuit, OTP, OCP, RPP）	Flashing RED

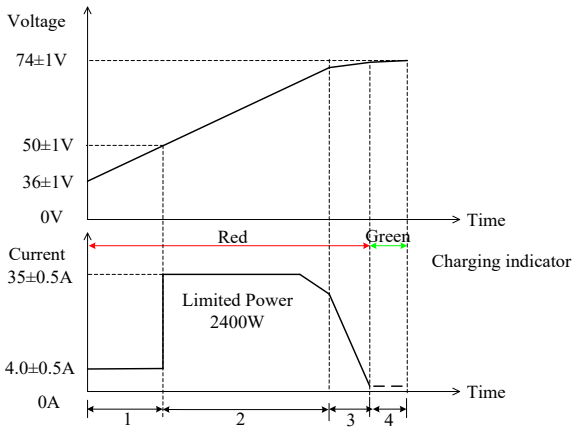
Note: During short-circuit protection, it is normal for the LED to blink from green to off and then to red again for a short time, which does not affect the protection function. It's normal for the LED to change to red when the output current is 600mA to 1000mA, because it is within the range of its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

Typical Charge Curves

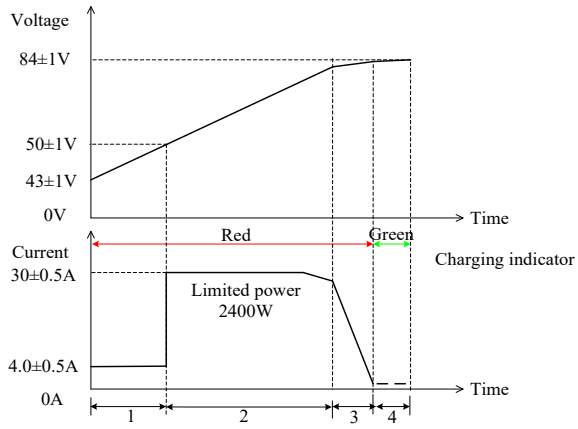
EVC-60-2400 (PLD2400-EVCS28-59)



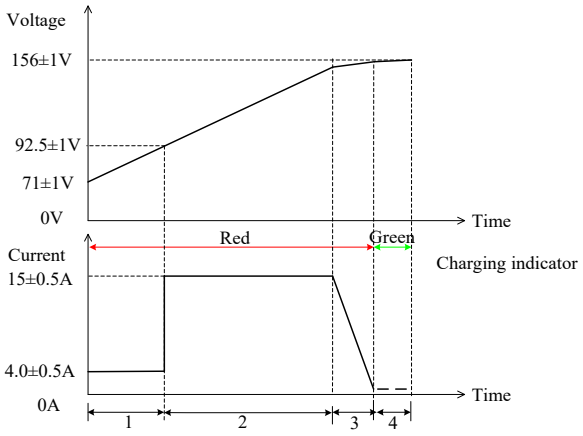
EVC-74-2400 (PLD2400-EVCS36-74)



EVC-84-2400 (PLD2400-EVCS55-84)



EVC-156-2400 (PLD2400-EVCS71-156)

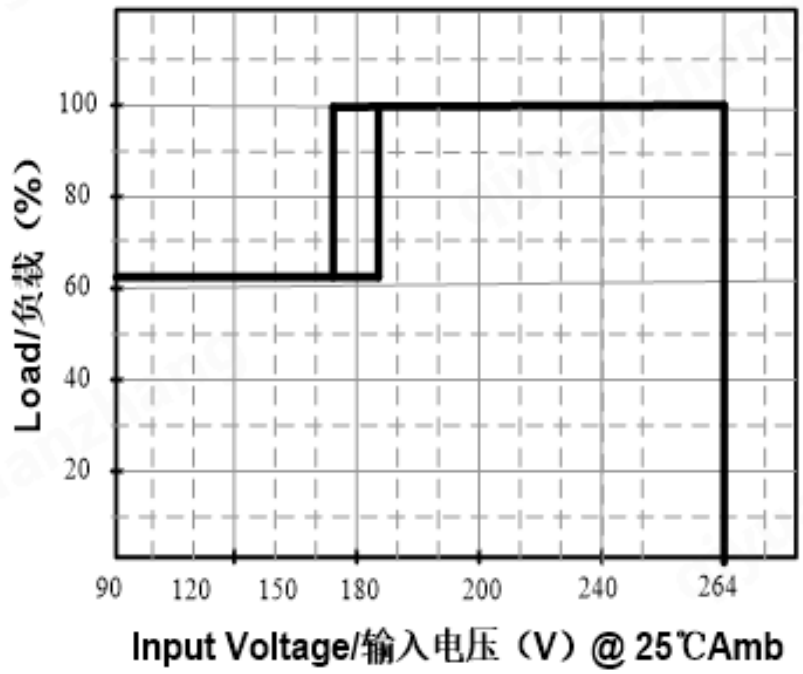


Notes:

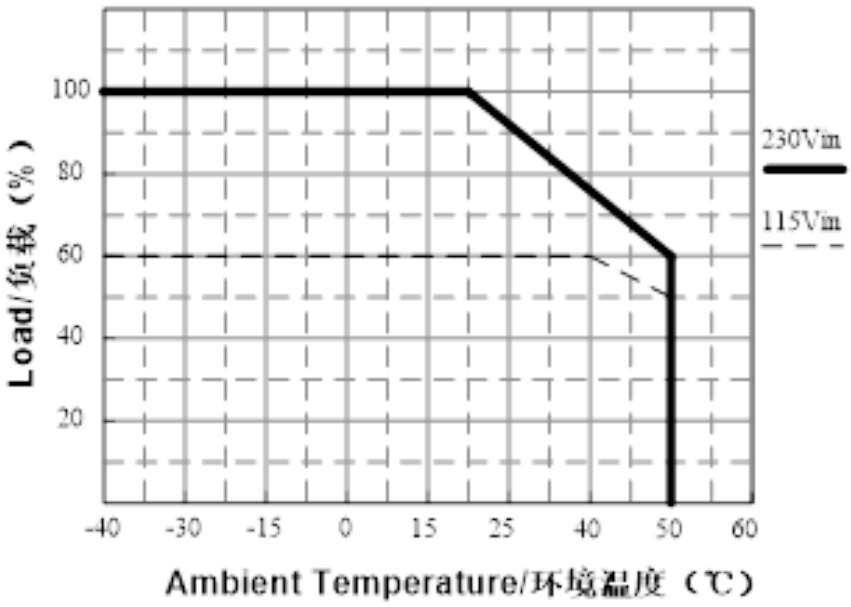
1. The charging curve is based on the charging request, output current and voltage, sent by the BMS. When the requested current and voltage received are higher than the maximum output capacity of the charger, the charger outputs the current and voltage based on its own maximum output capacity.
2. When 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 59/74/84/156V (±1V) respectively, the charger enters constant voltage mode. When the battery voltage is between 37.5-58/50-73/50-83/92.5-155V (±1V), the charger operates in constant current mode.
4. When the battery voltage is higher than 28/36/43/71V (±1V) and less than 37.5/50/50/92.5V (±1V), the charger enters a pre-charge stage and the output current is 4A (±0.5A).
5. Derating is allowed during charging, refer to the derating curve for the actual output current.

Derating Curves

Input Voltage vs. Load



Temp vs. Load



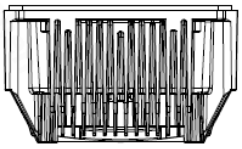
The output current will start derating automatically when case temperature exceeds +65°C (±5°C).

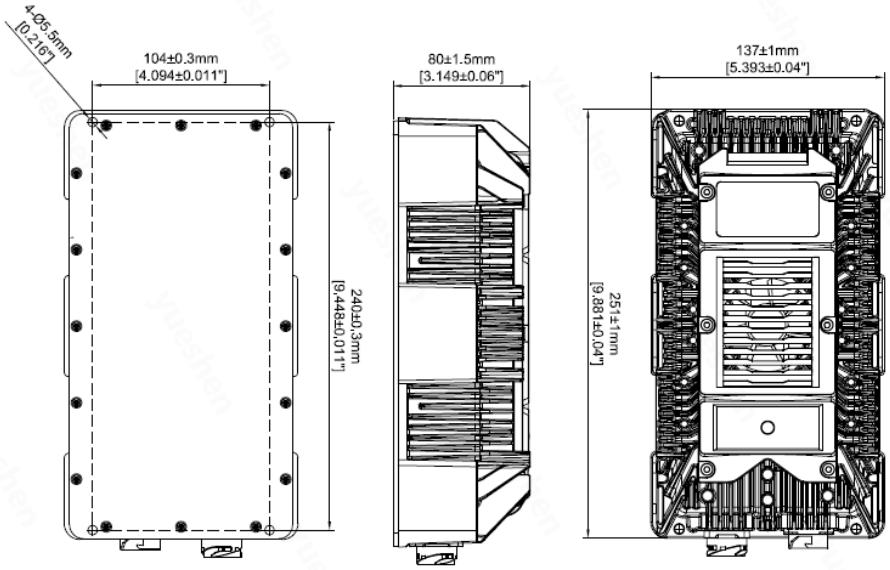
Charger start-up at -40°C is with reduced power and it operates with full load from -30°C (±5°C) up.

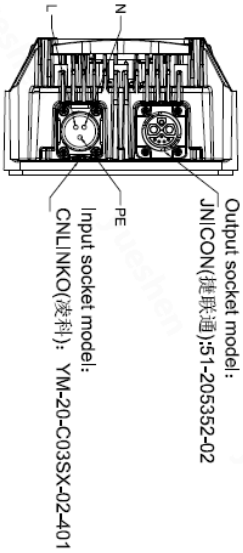
MECHANICAL DATA

Connector Version, without Handle (M suffix):

(See also description of connectors)





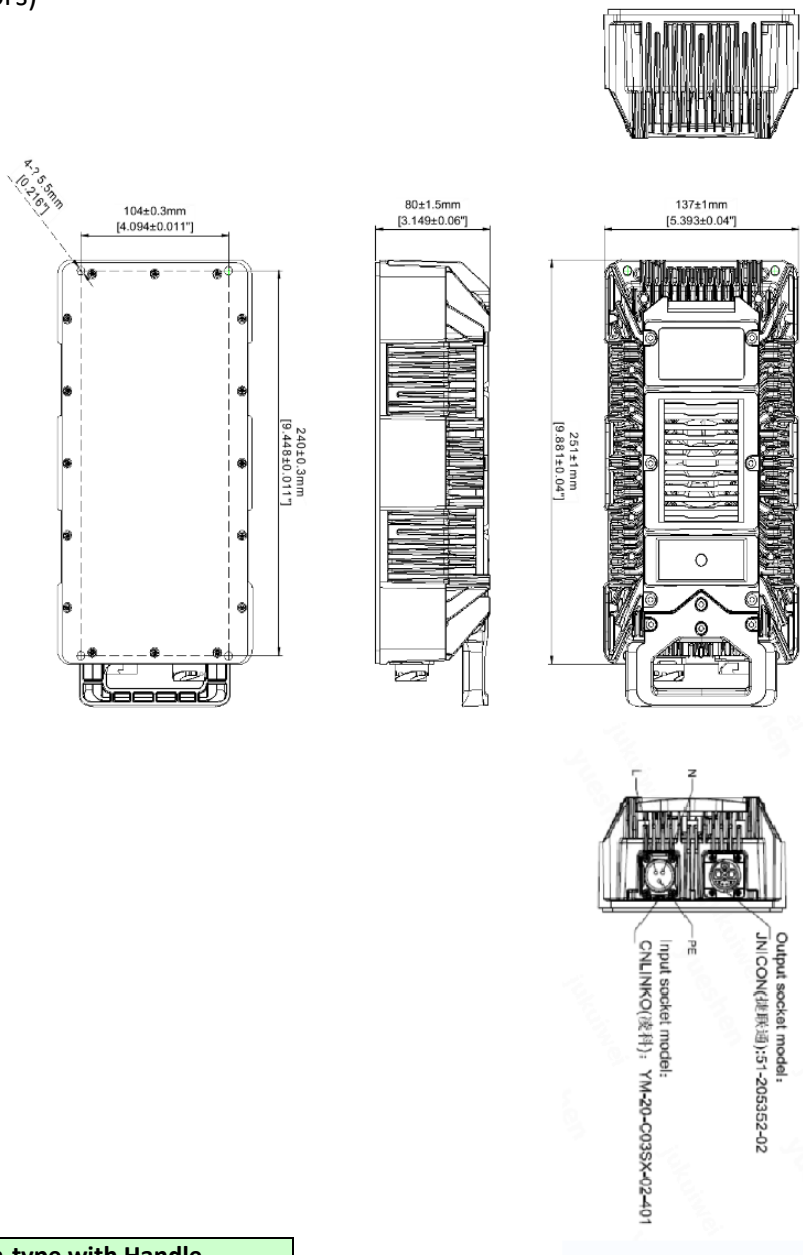


Mechanical	Fan-type No Handle
Dimensions (L x W x H)	251 x 137 x 80 mm 9.88 x 5.39 x 3.15 in
Weight	3.8kg / 8.38 lbs.

MECHANICAL DATA

Connector Version with Handle (no suffix):

(See also description of connectors)

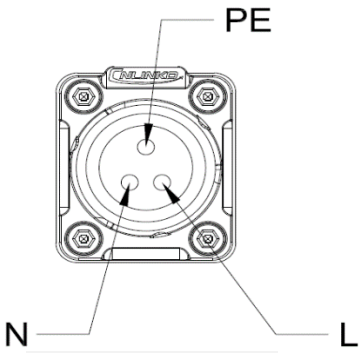


Mechanical	Fan-type with Handle
Dimensions (L x W x H)	277 x 137 x 80 mm 10.91 x 5.39 x 3.15 in
Weight	4.0kg / 8.82 lbs.

CONNECTOR DETAILS: Connector Version with or without Handle

Charger Side Connector Details

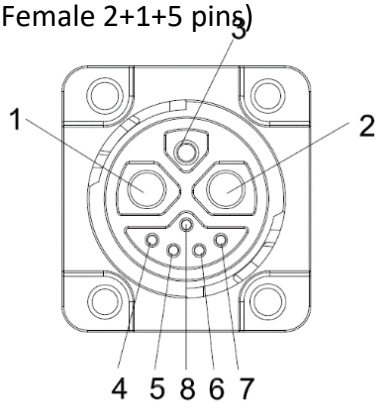
AC connector on Charger:
CNLINKO, YM-20-C03SX-02-401 (3-pin male)



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

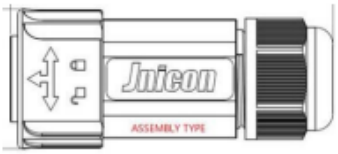


Customer Side Mating Connector Info:

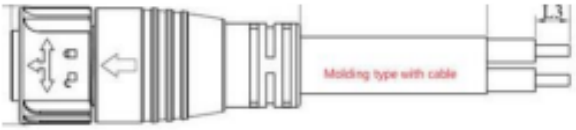
(will be provided with samples; for volume orders, customer must source separately).

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)

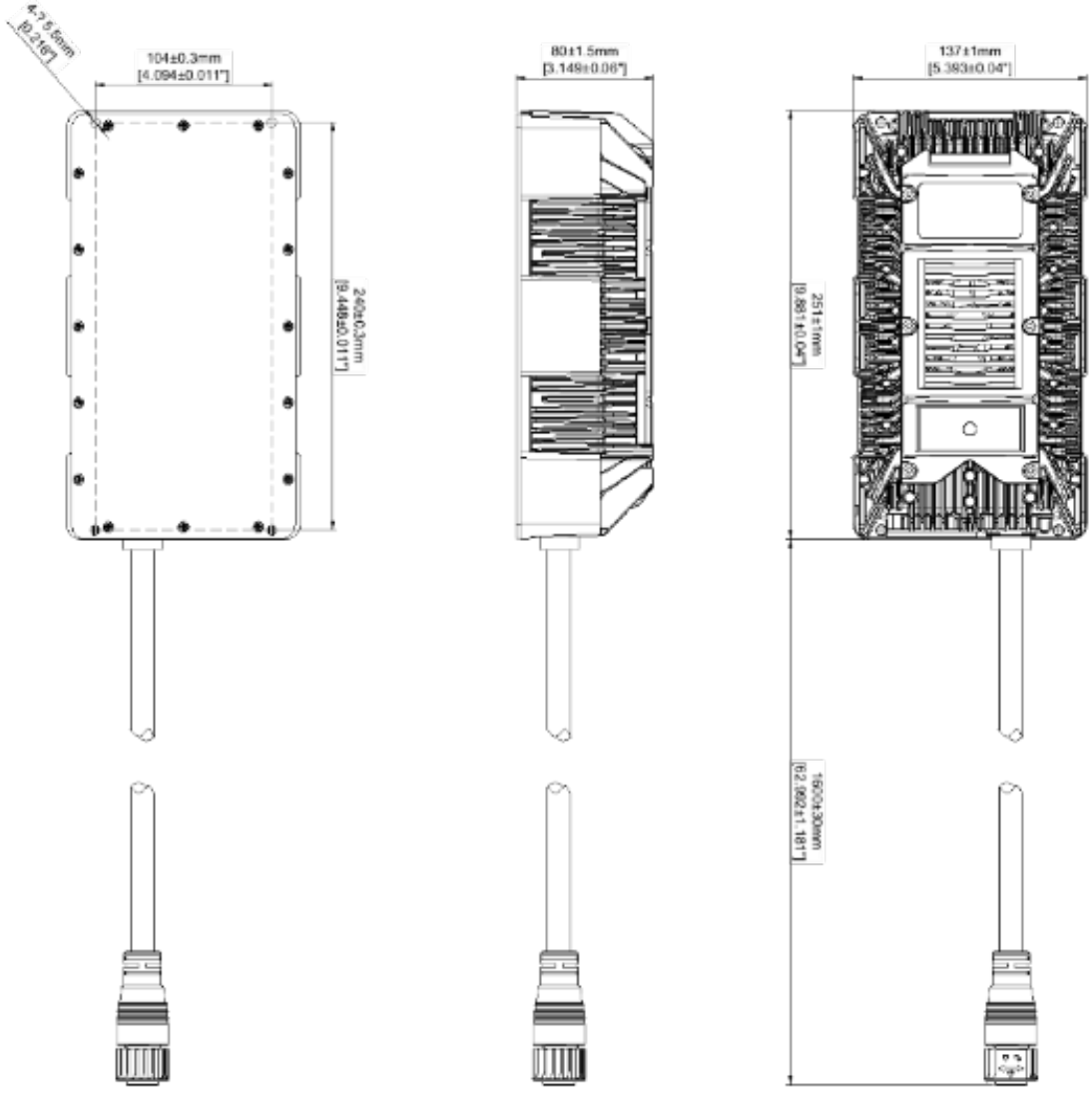


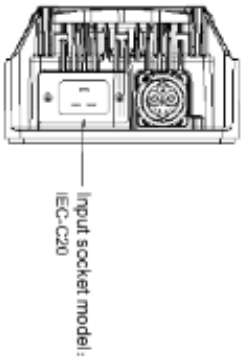
https://www.jniconconnector.com/buy-M23_self_locking_2+1+5.html

MECHANICAL DATA

Flying Lead Version without Handle (MW suffix):

(See also description of connectors)



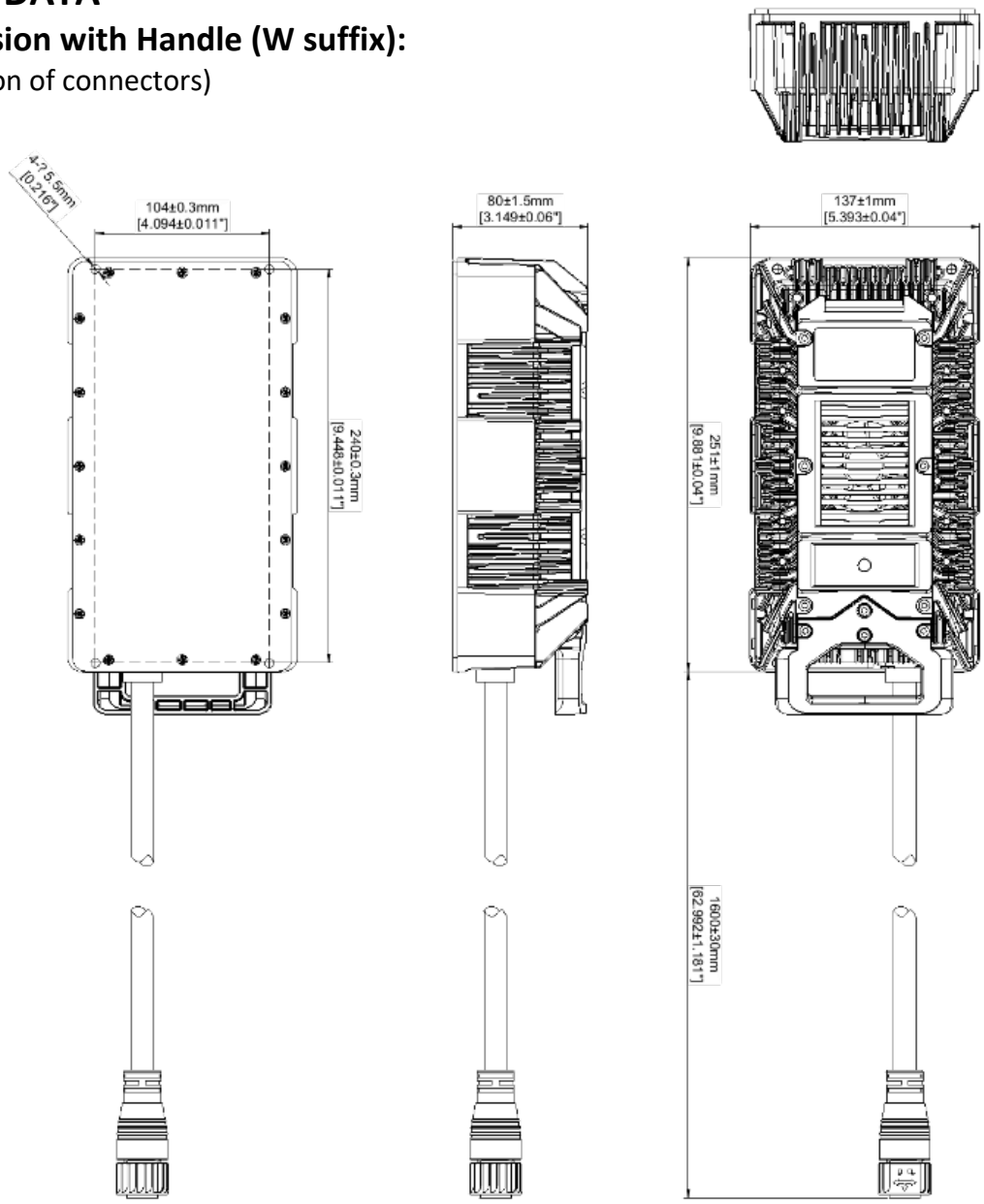


Mechanical	Fan-type No Handle
Dimensions (L x W x H)	251 x 137 x 80 mm 9.88 x 5.39 x 3.15 in
Weight	3.8kg / 8.38 lbs.

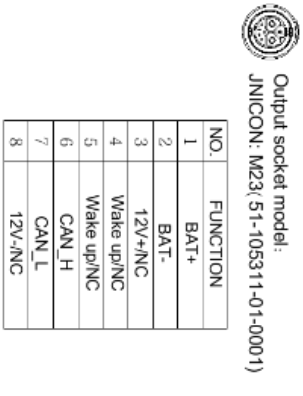
MECHANICAL DATA

Flying Lead Version with Handle (W suffix):

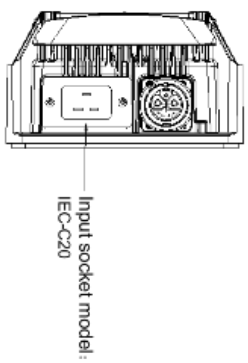
(See also description of connectors)



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.



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



CONNECTOR DETAILS: On & Off Board Flying Lead Version

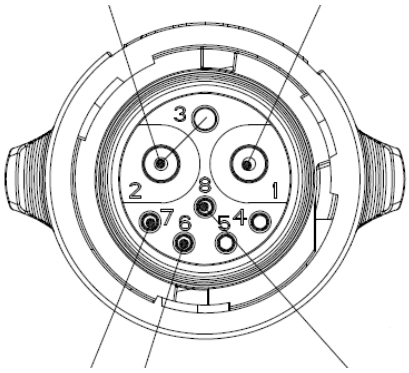
Charger Side Connector Details

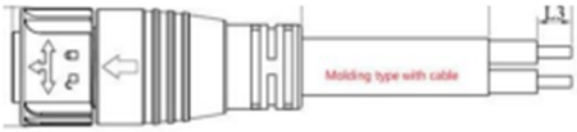
AC Socket on Charger:
Standard IEC-C20 (male)

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: Customer Side

(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