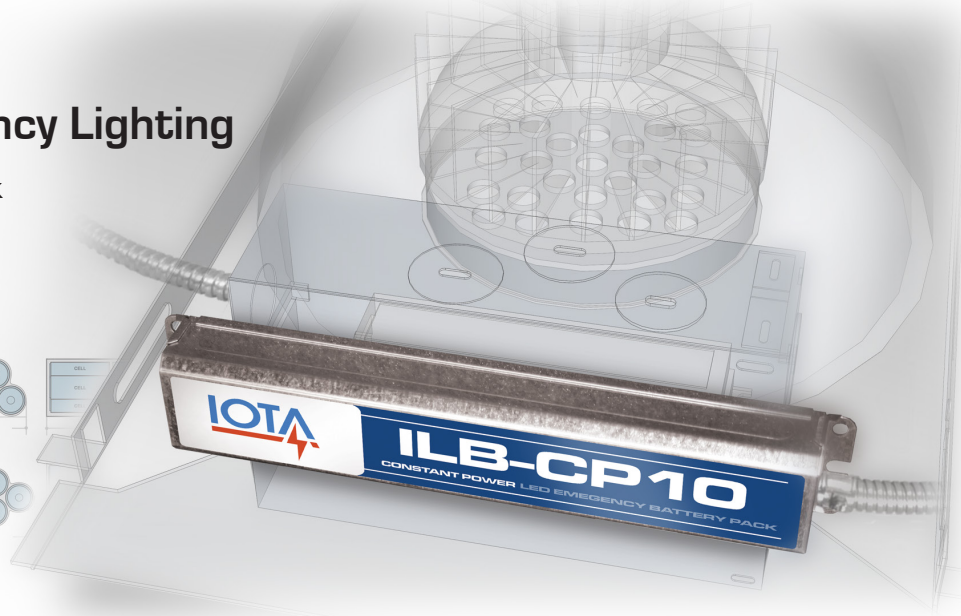
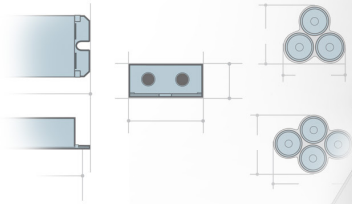


LEDs and Emergency Lighting

Part 2: Integral Battery Pack Designs and Performance



Content Highlights

- Wattage and lumen output are directly related
- LED battery packs are available with constant current and constant voltage designs
- Constant current battery packs available for outdoor egress
- Constant power designs provide consistent illumination for the emergency duration
- Mounting configuration options provide solutions for different fixture types.

Primarily, integral emergency battery packs for LEDs are UL Component Recognized in the United States and Canada, which means that these products can be used as a component within a product that complies with UL requirements (see Part 1 of this article “New Solutions for New Technologies” for additional information). When applying the UL Recognized mark to products, UL takes into account “the performance and constructional characteristics of the final end product insofar as this can be determined and the areas that require additional consideration for application of the component to the product.”¹ After the manufacturer installs a UL Recognized battery pack in the lighting fixture, they perform a series of tests to ensure the fixture meets certain performance benchmarks for egress lighting and compliance with UL 924 requirements.

Measuring Lumens by Watt

Lumens are the units of “visible” light emitted by a source, such as an LED. Lumens describe the total amount of visible light that humans can see, and one lumen is equivalent to the light output of one candle. The lumen level produced by a fixture is directly related to the wattage of the lamp, but will vary depending on the lamp technology, reflector design, and lens transmissivity. LEDs use less watts to produce the same lumen output of traditional incandescent or fluorescent lamps, making LEDs more appealing for efficiency considerations. With regards to emergency lighting, a battery pack which produces a constant output of watts (even when battery voltage diminishes) is important because of its relationship to lumen output. If the number of watts produced by the battery decreases, so does the lumen output. While the Life Safety Code specifies the acceptable depreciation of illumination over the 90-minute duration, choosing an emergency battery pack which produces a constant number of watts, thus preserving the required illumination can be beneficial to end-users.

¹UL. **Marks for North America.** <http://www.ul.com/global/eng/pages/corporate/aboutul/ulmarks/mark/marks-for-north-america/>

Ohm's Law in Relation to Lumen Output

Since lumen output is a direct result of the LED wattage, a simple means of demonstrating the nature of emergency lumens can be found in Ohm's Law:

$$P = E \times I$$

(where P = watts, E = volts, and I = amps.)

During the 90-minute required run-time of an emergency battery pack, the battery voltage (E) decreases during discharge, naturally resulting in a decrease of watts (P) and lower lumen value. The Constant Power design of the ILB-CP Series holds both voltage and current stable over the 90-minute runtime to maintain consistent wattage to the LED array.

Constant Current, Constant Voltage and Constant Power Options

LED drivers provide constant current or constant voltage to LED arrays and similarly, emergency battery packs can provide constant voltage or constant current. Constant power is the next generation technology that offers manufacturers more design flexibility and better preserves illumination to meet the Life Safety Code regulations than constant voltage and constant current emergency battery packs.

Constant Voltage

Constant voltage emergency battery packs provide LED arrays with a constant output of voltage even when the current depreciates. As the LED array draws power from the battery pack some degradation of illumination will occur over the 90-minute duration. When manufacturers design the LED fixture they must account for this degradation and ensure illumination does not fall below the specified levels required by the Life Safety Code.

Constant voltage emergency battery packs can be used with constant current LED drivers, as long as the voltage of the LED array is within the parameters of the emergency battery pack. Refer to **Table A** for further model specifications.

Constant Current

Constant current LED emergency battery packs provide constant output of current to the LED array even when battery voltage depreciates. The actual forward volts (V_f) requirement of the LED array will determine the performance of the constant current emergency battery pack. As with constant voltage emergency battery packs, some degradation of illumination will occur over the 90-minute duration. It's important that designers and manufacturers account for this light output degradation when creating the lighting design to meet the Life Safety Code illumination requirements. To minimize compatibility issues with LED drivers, manufacturers should use a constant current battery pack with a constant current LED driver.

IOTA's ILB constant current emergency battery pack models will operate 12V, 24V and 30V LED arrays. In addition, the ILB-3020-CW and ILB-1826-CW are specially adapted for cold weather applications with a temperature rating of -20° to 50° C. Refer to **Table A** for further model specifications.

Constant Power

The ILB-CP constant power battery packs offer advantages over constant current or constant voltage battery packs for designers and manufacturers. The

 **Table A: IOTA Constant Current model specifications**

Table A: IOTA Constant Current Battery Packs

	ILB-1207	ILB-1212	ILB-2407	ILB-2412	ILB-1826	ILB-3020
Input Voltage	120/277VAC	120/277VAC	120/277VAC	120/277VAC	120/277VAC	120/277VAC
Output Voltage	10-12VDC	10-12VDC	24-27VDC	24-27VDC	18-26VDC	27-30VDC
Output Current	600mA (constant)	1000mA (constant)	300mA (constant)	500mA (constant)	750mA (constant)	750mA (constant)
Output Power	7W (max)	12W (max)	7W (max)	12W (max)	Up to 20W (max)	Up to 24W (max)
Temp. Rating	0° to 50° C	0° to 50° C	0° to 50° C	0° to 50° C	0° to 50° C*	0° to 50° C*

*Models are also available for outdoor egress applications from -20° to 50° C

Table B: IOTA Constant Power Battery Packs

	ILB-CP05	ILB-CP07	ILB-CP10	ILB-CP12
Input Voltage	90-300VAC	90-300VAC	90-300VAC	90-300VAC
Output Voltage	10-60VDC	10-60VDC	10-60VDC	10-60VDC
Output Current	0.5A(@10VDC)-0.08A(@60VDC)	0.7A(@10VDC)-0.12A(@60VDC)	1.0A(@10VDC)-0.17A(@60VDC)	1.2A(@10VDC)-0.2A(@60VDC)
Output Power	5W (constant)	7W (constant)	10W (constant)	12W (constant)
Temp. Rating	0° to 50° C	0° to 50° C	0° to 50° C	0° to 50° C

greatest advantage is the assurance that the original design which specified the appropriate foot-candle requirements will be maintained throughout the 90-minute required duration. The innovative design of the ILB-CP battery pack automatically produces a consistent voltage and inversely proportional current to provide constant power to the LED array during the entire emergency run time (see **Figure 1: Current vs. Time Discharge** graph).

For manufacturers, the ILB-CP provides design flexibility with 5-watt, 7-watt, 10-watt, or 12-watt units for 10 to 60V LED arrays. With the ILB-CP, compatibility issues between constant current and constant voltage LED drivers are reduced, which makes assembly and final UL testing by the manufacturer an easier and simpler process. Additionally, IOTA's ILB-CP constant power LED battery packs can be used with constant current or constant voltage LED drivers and are Class 2 Compliant UL Component Recognized.

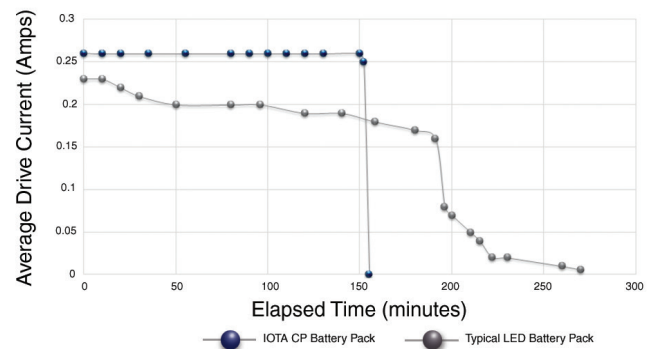
Reliable, Custom Solutions with Flexible Options

LEDs provide more lighting design options than other lamp technologies, and an installed LED emergency battery pack brings added value to these fixture designs. To achieve this added value, IOTA ILB-CP and ILB Series emergency battery packs not only offer models for individual driver and array requirements, but are also available in different mounting configurations for various fixture types (see **Sidebar, Page 4** for details). The ILB-CP and ILB units are suitable for damp locations and meet or exceed all National Electric Code and Life Safety Code Emergency lighting requirements. Additionally, specially-designed cold weather models - the ILB-3020-CW and ILB-1826-CW - give designers the added convenience of extending the emergency lighting system to outside paths of egress or facilities with interior temperatures ranging from -20° to 50° C.

IOTA has a tradition of delivering emergency lighting solutions that allow architects, designers, manufacturers, and facility managers to utilize their existing fixtures for code-required emergency lighting. As LED designs continue to emerge as the lighting technology of choice, IOTA will continue the design and development of compatible and reliable

Table B: IOTA Constant Power model specifications. The ILB-CP battery pack designs maintains consistent wattage even as battery voltage decreases.

Figure 1: Current vs. Time Discharge. This graph demonstrates the constant power from an IOTA ILB-CP07 battery pack applied to a 7000 lumen light engine load. The output power of the IOTA battery pack maintains a consistent lumen level beyond the required 90-minute runtime, whereas a typical LED battery pack suffers a 20% degradation for the same duration.



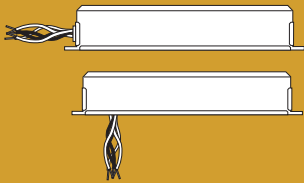
Mounting Configurations

Integral emergency battery packs are designed to accommodate different fixture types:

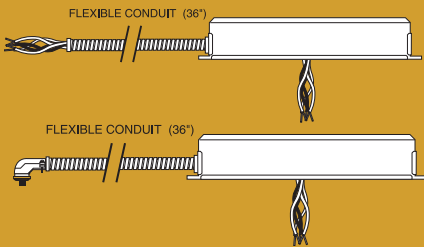
Dual-flex units install atop or adjacent to the fixture and wiring is routed to the junction box and test accessories via flexible conduit.



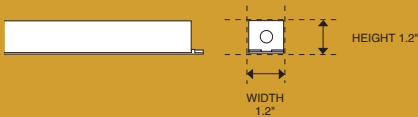
Non-flex units mount within or atop the fixture, and wiring is routed directly within the driver compartment.



Single-flex units mount onto the junction box or driver compartment and wiring runs to the test accessories via flexible conduit.



Slim-line units (available for Constant Power units only) feature a 1.2 inch profile for installation within the narrow and shallow compartments of LED strip fixtures.



emergency solutions for these applications. LED technology presents unique demands to emergency lighting requirements and IOTA is always working closely with manufacturers to achieve successful emergency lighting solutions for their customers. For more information regarding IOTA's emergency lighting products for LED applications, contact us at 1-800-866-4682 or visit us online at www.iotaengineering.com.

About IOTA Engineering

IOTA is a privately held, family-owned company that has worked continuously in the electronic R & D field, designing and manufacturing innovative products for the lighting and electronics industries since 1968. Initially focused on the development of low voltage solid state ballasts, IOTA has expanded to include emergency battery packs for contemporary lighting designs, DC inverter ballasts, and AC/DC power converters and battery chargers. The company is a leader in developing emergency battery pack designs that meet unique customer specifications. IOTA is continually expanding its development of state-of-the-art electronics that keep pace with customer needs and industry demands. From the circuit board design to the completed unit, IOTA designs and develops products that maintain superior performance, and is dedicated to providing the highest levels in customer satisfaction, quality and innovation in the industry.

