



UL Class P

Understanding the Program and Benefits

INVENTRONICS

UL Class P:

The Class P program was introduced in January 2016 with the purpose of better supporting luminaire manufacturers by providing freedom of substitution for LED drivers. In this white paper, we will further explain what UL Class P offers and its benefits.

Why Create a Class P Program:

In the past, UL held general coverage categories when fluorescent lighting was primarily used and had a Class P program that allowed traditional ballasts to easily be interchanged. This worked well for fluorescent lighting; however, LED luminaires require additional considerations depending on the application and the characteristics of the LEDs. Some of these considerations include rated input voltages, output currents, forward voltages of the LEDs, dimming types, thermal performance, physical mounting location, and so on. This causes LED driver interchangeability to be more complex.

With this complexity, every LED driver was required to be evaluated with every luminaire, even if the LED drivers seem to be equivalent products. The lighting industry demanded a similar program allowing freedom of substitution and UL responded with creating a new Class P program for LED drivers.

Added LED Driver Requirements:

The Class P program follows UL 8750 and adds additional requirements to better ensure suitability for substitution. These added requirements are categorized as construction requirements and performance requirements.

The construction requirements include limitations on the type of casing materials

used, limitations to wiring temperature ratings and limitations to the connection methods (i.e.: flying leads cannot be interchanged for a driver with push pin connectors.) It also limits any type of relied upon external protection including surge or temperature protection to meet luminaire requirements.

The performance requirements include added temperature testing, a leakage current test, abnormal failure component tests and an abnormal temperature test performed in a thermal chamber. The abnormal temperature test increases the ambient temperature to 80°C. Under this condition, the driver's case temperature is not allowed to exceed 110°C except per the time/temperature table. This provides UL more confidence that all Class P drivers can maintain safe thermal performance in a system that has already passed evaluation.

Different UL Mark:

UL Recognized is given to components that meet UL safety standards without any foreseeable safety risks; however, the component must still be evaluated within the final product. Drivers that did not apply for the Class P program are classified this way with the UL Recognized Mark (see Figure 1).



Figure 1: UL Recognized Mark

UL Listed is most commonly a certification given to products that meet UL safety standards without any foreseeable safety risks. This is typically given to a finalized product. Drivers that apply for and meet the

Class P requirements are classified in this way with the UL Listed Mark (see Figure 2).



Figure 2: UL Listed Mark

Added Luminaire Requirements:

For lighting OEMs to participate in the Class P program, they must utilize a Class P driver during the luminaire evaluation. This driver is then the “base Class P model” and will be referenced for all future substitutions.

During this evaluation, additional conductor requirements will also be reviewed. This includes temperature ratings for the wiring, relative to the physical distance between the wires and the LED driver. Once a base Class P model is evaluated within the design, other Class P drivers may be interchanged, but this is still dependent on meeting all required substitution equivalency criteria. See Table 1 for the Class P added requirements for the LED Driver and Table 2 for the added requirements for Luminaire design.

Construction:	Performance:
Full Enclosure (Metal or 5VA flammability polymeric)	Normal Temperature Test (case shall not exceed 90°C)
Field wiring leads, terminal block, push-in terminals, etc	Leakage Current Test
No external protection (i.e. external fused, thermal protectors, etc).	Abnormal Tests (case shall not exceed 110°C, excepts per time/temperature table)
	Increased Ambient Test

Table 1: Class P Additional Requirement Summary

Position of Conductors to Class P drivers:	Temperature °C:
Permanently spaced a minimum of 76mm from any Class P driver	60
Less than 76mm from, but prevented from contacting any Class P driver	80
In contact with any Class P driver or spaced less than 76mm and provided with an outer braid	75
In contact with any Class P driver or spaced less than 76mm	90

Table 2: Class P Added Requirements for Luminaire Design

In addition to the temperature requirements above, UL 8750 also suggests that the case temperature (Tc) of the LED driver shouldn't exceed 90°C, when ambient temperature (Ta) is 25°C for independent installation or 40°C for built-in installation.

Substitution Criteria:

After the driver and luminaire have successfully gained certification, interchangeability requirements are set to define which drivers are eligible for use with that luminaire. These requirements follow the substitution criteria which includes 10 points of consideration. This includes comparing input conditions, output conditions, rated output power, connection methods, type of driver and more.

The goal is that the substitute driver will either meet or exceed the specifications of the base model that was originally evaluated within the luminaire.

See Table 3 on the next page for a list of substitution equivalency criteria.

10 Points to Consider:
1. The Luminaire has been previously evaluated with an integral Class P LED driver per the applicable requirements in UL 1598 (base Class P driver)
2. The LED load has not changed in the luminaire from what was originally evaluated.
3. Equivalent LED driver type (Constant Current or Constant Voltage) of base Class P driver
4. Equivalent output type (LVLE, Class 2, Isolated, Non-Isolated) of base Class P driver
5. Input Current and Power Rating (W or VA) is \leq base Class P driver
6. Constant Current drivers must have an Output Current Rating \leq base Class P driver
7. Constant Current drivers must have an Output Voltage Rating range \leq base Class P driver
8. Constant Voltage drivers must have an Output Voltage Rating \leq base Class P driver
9. Equivalent or more severe environmental rating (dry, damp, wet) of base Class P driver
10. Equivalent input type and supply connection method (leads, terminals, etc) of base Class P driver. Assumes 90°C leads if employed.

Table 3: Class P Substitution Equivalency Criteria

Note, that programmable or adjustable drivers with the ability to output more current than the base model **are** acceptable if there is a marking on the driver showing that the actual output current is the same, **or less than**, the originally evaluated output current.

Is Class P Right for You:

Class P was developed to provide manufacturers a more flexible and time-saving option to eliminate recertification or retesting. This provides manufacturers with reduced costs, the ability to improve their speed to market and easily adjust their product lines. This program is ideal for

manufacturers who target a large variety of applications that require many different feature sets, use the same fixture and load design for long periods of time and have a primary market focus in North America.

Inventronics Class P Solutions:

Inventronics offers a wide selection of Class P LED drivers designed to provide manufacturers the flexibility they need in their fixture designs. These drivers provide many benefits and features such as programmability, compact form factors, multiple dimming options, isolated dimming, Controls-Ready, full-power current ranges, long lifetimes and many others.

Inventronics has recently expanded its product offering with their newest EUM and ESM families. Both leverage the new, next generation platform offering an optimized design and more compact housing without sacrificing quality, performance or surge protection. Their programmable interface and constant-power operation allow for in-house customization which achieves optimal results and various current configurations without the need of powering on the driver. They supply improved safety with a wide range of isolated dimming options including 1-5V, 1-10V, 0-10V, PWM and multiple timers. They offer a high level of design flexibility with DALI-2 D4i (EUM-BT), NFC programming (EUM-LT and EUM-BT), Digital Dimming (EUM-LT and ESM-LT) and power monitoring (EUM-LT, ESM-LT and EUM-BT). The EUM-xT provide 90-305Vac and the ESM-xT provide 249-528Vac.

The EUM and ESM families also helped Inventronics introduce product series utilizing a global cable to help reduce inventory skus (xG models). The global cable helps to merge the "UL" and "IEC" worlds together to be used worldwide and provide manufacturers with reduced

carrying costs associated with overstocking products.

While Inventronics does provide a full portfolio suitable for global use, we also value the benefits and solutions the Class P program provides to our partners. Because of this, we have invested in providing a wide range of models with various power levels and features to fit a multitude of applications.

To learn more about Inventronics Class P drivers, visit:

[Next Generation, Class P LED Drivers](#)

Summary:

Class P drivers adhere to all UL Listed requirements in addition to the UL Recognized requirements. The substitution and flexibility allowed in the Class P program can better help manufacturers with sourcing, avoiding delays from long lead times, adjusting existing designs to meet various application specific features and provides a simple way to upgrade your driver without having to pay additional fees for evaluation.

Inventronics goal is to provide full luminaire design freedom with seamless driver integration and seeks to achieve this through supporting the Class P program. By providing an extensive Class P portfolio we hope to help manufacturers reduce costs, accelerate product development and get their products to market faster.

For questions on the UL Class P program or Inventronics UL Class P drivers, contact our [Technical Support team](#), your [local sales representative](#) or [distribution partner](#).



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Bobbie Grider is the marketing communications manager for Inventronics and is responsible for developing the company's marketing, advertising and public relations strategies for their broad portfolio of LED drivers and lighting accessories. Based in Oklahoma City, OK Grider manages the branding and messaging for Inventronics, a leading manufacturer of LED drivers for the solid-state lighting market. She has a bachelor's degree in journalism and business marketing. She has five years' experience in the power and lighting industry.

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