# SECTION 26 51 13

# Interior Lighting

## LED Dimming Drivers

Specifier: This is intended to be used as a guide specification for dimmable LED drivers. Please visit [www.eldoled.com](http://www.eldoled.com) or contact nasales@eldoled.com for more information.

PARt 1- GENERAL

* 1. SUMMARY
		1. Section Includes:
			1. LED dimming driver.
		2. Related Sections:
			1. Edit the following subparagraphs to coordinate with other sections in the Project Manual.
			2. Section [262726 - Wiring Devices] [\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_\_]
			3. Section [265100 – Interior Lighting] [\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_\_]
			4. Section [260923 – Lighting Control Devices:] [\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_\_:]
	2. REFERENCES
		1. Underwriters Laboratories, Inc. (UL)
			1. 1310 and 8750 – Light Emitting Diode (LED) equipment for use in lighting products.
		2. American National Standards Institute (ANSI)
			1. ANSI C82.11 – Performance requirement for high frequency ballasts
			2. ANSI/IES RP-16-10 – Nomenclature and definitions for illuminating engineering
			3. ANSIE1.20 - Remote Device Management Over DMX512 Networks
			4. ANSI C62.41 – Recommended practice in low power circuits
		3. International Electrotechnical Commission (IEC[www.iec.ch](http://www.iec.ch/)).
			1. IEC 61347-1 – General and safety requirements for lamp control gear
			2. IEC 61347-2-13 – Particular requirements for electronic control gear for LED modules
			3. IEC 62384 b- DC or AC supplied electronic control gear for LED modules – performance requirements
			4. IEC 61000-3-2 - Harmonic current emissions
			5. IEC 61547 - EMC immunity requirements
			6. IEC 62386-101/102/207 – Digital addressable lighting interface (DALI)
		4. European Mark for Electrotechnical products (ENEC)
			1. EN55015 – Radio disturbances <30 Mhz
			2. EN55022– Performance requirement for EMC, Information technology and Telecommunications equip.
			3. EN60929/IEC60929 – Performance requirement for AC supplied electronic equipment
		5. Federal Communications Commission (FCC) rules – Part 15 Class B: Radio Frequency Devices.
			1. Commercial rated
		6. Entertainment Services and Technology Association
			1. ESTA E1.3 - Entertainment Technology - Lighting Control System - 0 to 10V Analog Control Protocol
		7. Institute for Electrical and Electronics Engineers (IEEE)
			1. IEEE PAR1789 - Recommending practices for modulating current in High Brightness LEDs for mitigating health risks to viewers
	3. Submittals
		1. See Section 013000 – Administrative Requirements for submittal procedures
		2. Shop Drawings: Clearly indicate the name of the job, Architect/Engineer and list fixture type (s) for each specific driver. Contractor shall endeavor to submit all drivers as one package along with the luminaire package.
		3. Product Data: Provide dimensions, ratings and specific catalog number and identification of items and accessories and performance data.
		4. Wiring Diagrams – as needed for special operation or interaction with other system(s)
	4. DESCRIPTION
		1. LED dimming driver.
			1. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
			2. Digital (DALI Low Voltage Controlled) Dimming Drivers
			3. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
	5. QUALITY ASSURANCE
		1. Manufacturer: Minimum 3 years experience in manufacture of dimmable electronic lighting drivers.
		2. Recognized by UL for use in the US and Canada. Provide evidence of compliance upon request.
	6. PROJECT CONDITIONS
		1. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
			1. Ambient temperature: -20 degrees to 50 degrees C (-4 degrees to 122 degrees F).
			2. Relative humidity: Maximum 90 percent, non-condensing.
			3. Protected from dust and excess moisture during installation.
	7. WARRANTY
		1. Provide manufacturer’s warranty covering 3 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature, within the driver manufacturer warranty parameters will be responsible for all driver warranty related costs over the warranty period.
1. **- Products**
	1. MANUFACTURERS
		1. Acceptable Manufacturer: eldoLED
		2. [Basis of design product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:]
			1. eldoLED
			2. <insert manufacturer’s name>
	2. GENERAL
		1. LED dimming shall be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
		2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

*Specifier: To reduce false circuit breaker tripping due to turn on inrush, the following statement ensures that electronic dimming driver will meet NEMA inrush recommendations.*

* + 1. Driver must limit inrush current.
			1. Base specification: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps2 – seconds.
			2. Preferred Specification: Meet or exceed 30mA2s at 277VAC for up to 50 watts of load and 75A at 240us at 277VAC for 100 watts of load.
		2. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
		3. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
		4. Total Harmonic Distortion less than 20% percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
		5. Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
			1. Adjustment of forward LED voltage, supporting 3V through 55V.
			2. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA
			3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
		6. Driver must be able to operate for a (+/- 10%) supply voltage of 120V through 277VAC at 60Hz.
		7. Driver should be UL Recognized under the component program and shall be modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
		8. Driver shall include ability to provide no light output when the analog control signal drops below 0.3 V , or the DALI/DMX digital signal calls for light to be extinguished and shall consume 0.5 watts or less in this standby. Control dead band between 0.3V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
	1. Light Quality
		1. Over the entire range of available drive currents, driver shall provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0% relative light output, or 100 – 1% light output and step to 0% where indicated. Driver shall respond similarly when raising from 0% to 100%
			1. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
		2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
		3. Drivers to track evenly across multiple fixtures at all light levels, and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range.

*Specifier: To provide similar visual performance and illumination quality to existing fluorescent dimming solution, system should minimize flicker:*

* + 1. Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-0.1 percent luminaire shall have:
			1. LED dimming driver shall provide continuous step-free, flicker free dimming similar to incandescent source.
			2. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.
			3. Preferred specification: Flicker index shall be equal to incandescent, less than 1% at all frequencies below 1000 Hz

*Specifier: Alternative to above, choose a luminaire that shall have flicker index below 800 Hz of 5 percent or less, which is equivalent to incandescent dimming.*

* 1. Control Input
		1. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
			1. Must meet IEC 60929 Annex E for General White Lighting LED drivers
			2. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V.  Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
			3. Must meet ESTA E1.3 for RGBW LED drivers
		2. Digital (DALI Low Voltage Controlled) Dimming Drivers
			1. Must meet IEC 62386
		3. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
			1. Must meet DMX / RDM: USITT DMX512A and ANSI E1.20 (Explore & Address)
			2. Capable of signal interpolation and smoothing of color and intensity transitions
	2. Installation
		1. To be installed per manufacturers prescribed methods.
		2. Driver may be remote mounted up to 300 ft. (100 m) depending on power level and wire gauge.
		3. 0-10V input shall be protected from line voltage miswire, and shall be immune and output unresponsive to induced AC voltage on the control leads.