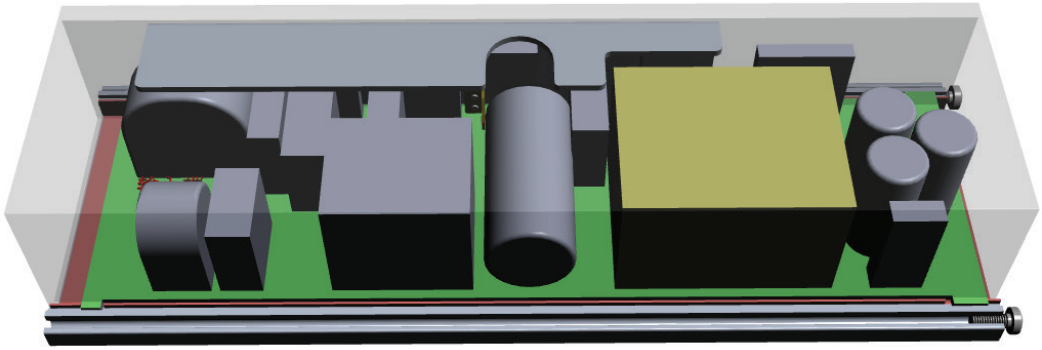
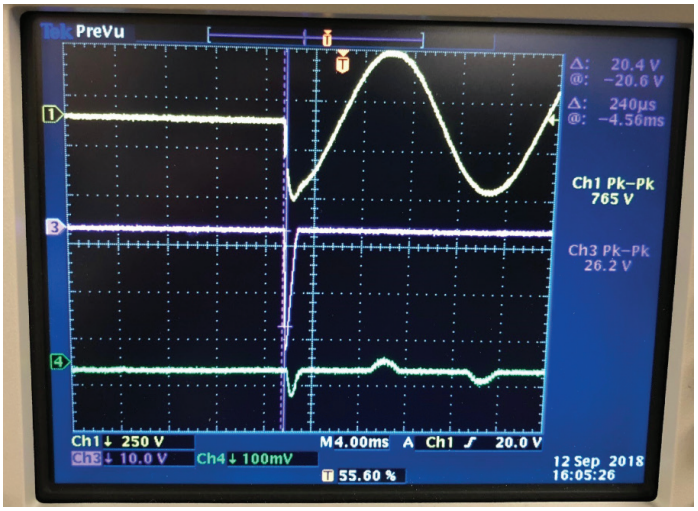
Understanding Inrush Current

Inrush Current is a common phenomenon in all LED lighting applications. It occurs inside the LED driver, at the initial energization of an LED luminaire. LED chips themselves, are inherently low-voltage. The drivers, therefore, take line voltage and convert the input to low voltage to power an LED array. Multiple electrical components are required to convert the voltage and keep it at a steady state to effectively ignite the LED array. The component which affects inrush current is the bulk capacitor.

Bulk capacitors require a charge when a luminaire is first switched on. This charge can product around 40 to 70 Amp and only takes 1 to 2 milliseconds, but does cause an increased peak to the input current long enough to cause a short in the related circuit breaker. The higher the wattage power of an LED driver, the higher the inrush current peak can be. Additional LED drivers in a luminaire, or on a circuit, will increase the max peak inrush current, as well. It is not an exact mathematical calculation, however, due to variance on the impedance of each driver and line impedance. This makes total inrush current calculations for a project a difficult problem to work out on paper. In addition, inrush relies on what phase the input is at when the switch is activated. If it switches on at a voltage peak (positive or negative) then there will be a large positive or negative inrush spike. Finally, transformer type and size, cable size, length of run, distance from the circuit breaker, and other devices on the circuit path can also lead to higher impedance and effects on inrush current. Actual lab test results, or field test results, are the most reliable source of information from which to specify breaker size and the number of luminaires per circuit.





Voltage and Inrush Current

The higher the voltage input supply, the higher the peak inrush current. If at 120 Vac the inrush is 50 Amp, raising the voltage to 240 Vac will increase the peak inrush to 100 Amp.

We have conducted inrush current testing on our main driver offerings (50W, 100W, and 150W). In the following charts, we provide suggestions on the number of drivers, and subsequently the number of luminaires, that could be wired to various breaker types without the risk of tripping. Facility electricians can use these suggestions as a starting point when performing their own calculations.

Number of Drivers Suggested per Breaker Type:

Breaker Type	50W Drivers	100W Drivers	150W Drivers
20 Amp C	30	16	12
20 Amp B	22	12	9
16 Amp C	26	14	10
16 Amp B	15	8	6
10 Amp C	15	8	6
10 Amp B	10	5	4

**Testing conducted at 240 Vac, in controlled lab setting. Actual field applications may vary.*

Number of Luminaires Suggested per Breaker Type:

Series	Lumen Output	Driver(s)	Curve					
			20 Amp C	20 Amp B	16 Amp C	16 Amp B	10 Amp C	10 Amp B
Areamaster™ Generation 3 LED — Circuit Break Type with Max. # of Luminaires								
AMLGL6 AMLZL6	9,000 Lumen	100W	16	12	14	8	8	5
AMLGL7 AMLZL7	14,000 Lumen	150W	12	9	10	6	6	4
AMLGL8 AMLZL8	18,500 Lumen							
AMLHL1 AMHZL1	23,000 Lumen	(2) 100W	8	6	7	4	4	2
AMLHL2 AMHZL2	28,500 Lumen	(2) 150W	6	4	5	3	3	2
AMLHL3 AMHZL3	36,000 Lumen							
Baymaster™ LED — Circuit Break Type with Max. # of Luminaires								
BLLL6 BLZL6	9,000 Lumen	100W	16	12	14	8	8	5
BLLL7 BLZL7	14,000 Lumen	150W	12	9	10	6	6	4
BLLL8 BLZL8	18,500 Lumen							
BHLL1 BHZL1	23,000 Lumen	(2) 100W	8	6	7	4	4	2
BHLL2 BHZL2	28,500 Lumen	(2) 150W	6	4	5	3	3	2
BHLL3 BHZL3	36,000 Lumen							

Number of Luminaires Suggested per Breaker Type:

Series	Lumen Output	Driver(s)	Curve					
			20 Amp C	20 Amp B	16 Amp C	16 Amp B	10 Amp C	10 Amp B
ATX™ FELED Generation 3 LED — Circuit Break Type with Max. # of Luminaires								
FELED3	3,000 Lumen	50W	30	22	26	15	15	10
FELED4	4,000 Lumen							
FELED5	5,000 Lumen							
FELED7	7,000 Lumen	(2) 50W	15	11	13	7	7	5
Mercmaster™ Generation 3 LED — Circuit Break Type with Max. # of Luminaires								
MLGL3 MGZL3	3,000 Lumen	50W	30	22	26	15	15	10
MLGL5 MGZL5	5,000 Lumen							
MLGL7 MGZL7	7,000 Lumen	100W	16	12	14	8	8	5
MLGH9 MGZH9	9,000 Lumen							
MLGH1 MGZH1	11,000 Lumen							
MLGH3 MGZH3	13,000 Lumen	150W	12	9	10	6	6	4
MLGH6 MGZH6	16,000 Lumen							
Mercmaster™ Low-Profile LED — Circuit Break Type with Max. # of Luminaires								
MLLED2	3,300 Lumen	MLLED2	3,300 Lumen	22	26	15	15	10
MLLED3	4,400 Lumen	MLLED3	4,400 Lumen					
MLLED4	5,500 Lumen	MLLED4	5,500 Lumen					

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