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www.inventronics-co.com

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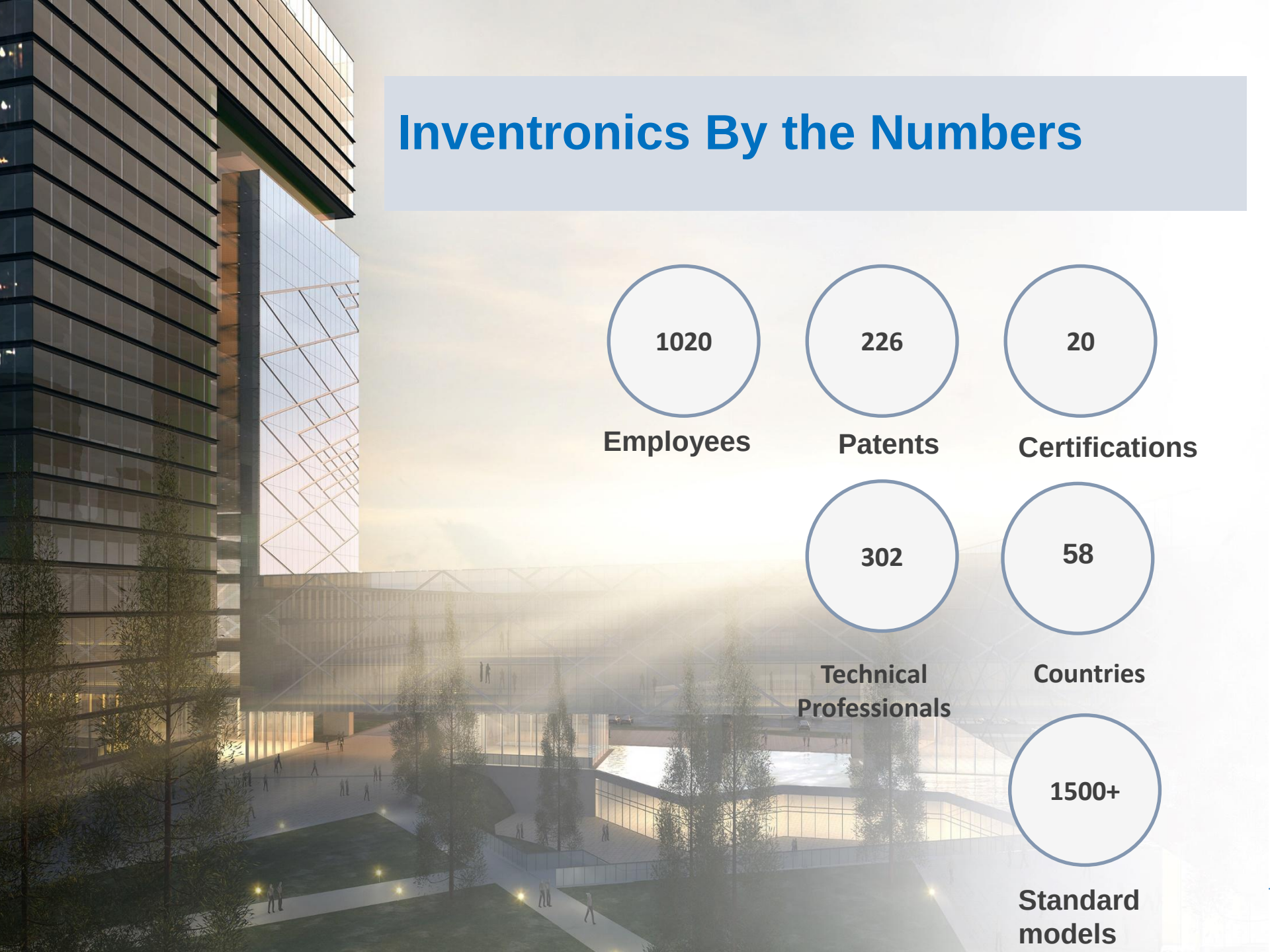
Inventronics (Hangzhou), Inc.

Considerations for LED Control Gear in Horticulture

Dec 1st, 2016 by Dimitri De Rop



Inventronics By the Numbers

1020
Employees

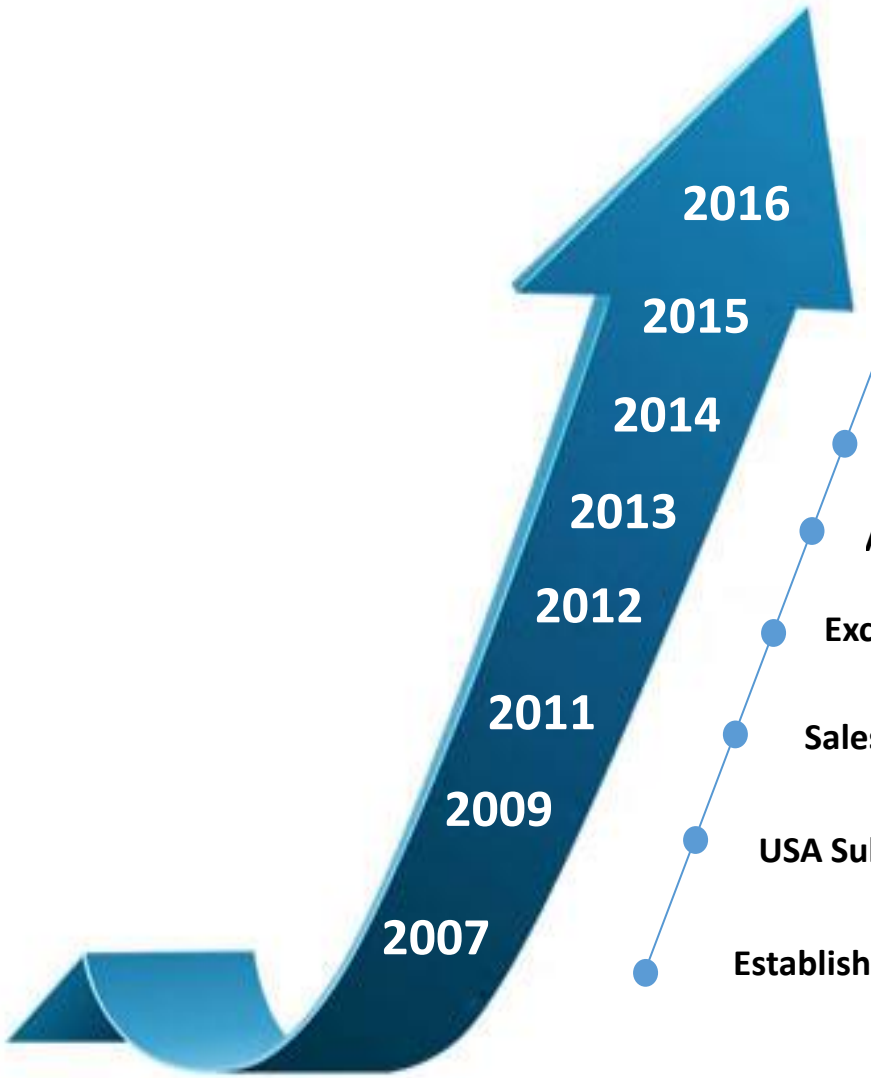
226
Patents

20
Certifications

302
Technical Professionals

58
Countries

1500+
Standard models



2016 Inventronics Science and Technology Park completed
Europe Subsidiary founded

2015 Sold in more than 58 countries and regions
India & SE Asia office founded

2014 Japan Office founded

2013 A Key High-tech Enterprise of the National Torch Plan

2012 Exceeded 200 million watts

2011 Sales revenue reached RMB 100 million

2009 USA Subsidiary founded

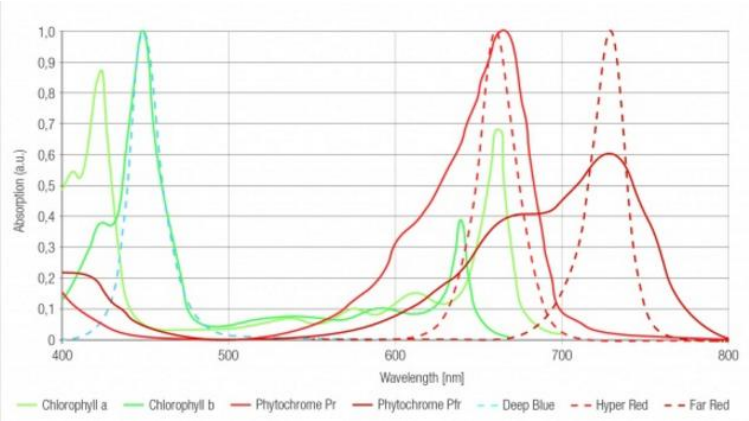
2007 Established

Introduce me

- European Technical Support Manager of Inventronics Europe.
- I worked at several luminaire manufacturers (Massive, Philips and Delta Light) for almost 14 years with a heavy focus on quality & safety.
- Role At Inventronics: technical support to our authorized distributors and our key customers and partners.

Greenhouse with Artificial Light

- Why LED drivers?
- LEDs are well suited to a defined color spectrum (emitting an electromagnetic spectrum appropriate for photosynthesis), long life time, flexible control …



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Topics

- High output power levels
- Traditional gas discharge lamps not dimmable
- 400 Vac
- Programmable
- Surge / environmental issues
- Wireless Solution

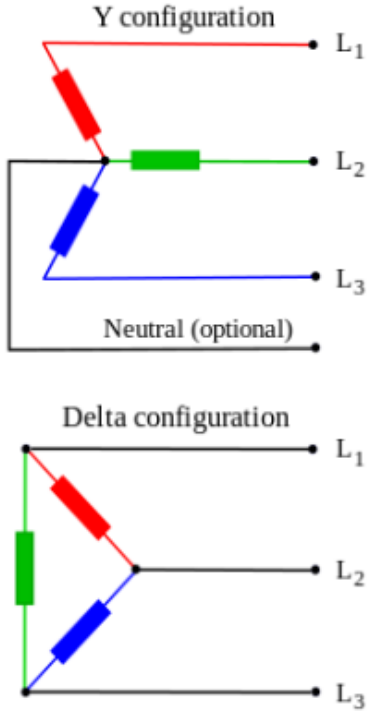
Limitation of Traditional Lamps

- High Cost per Watt
- Limited ability to specify light spectrum
- Energy wasted on light not used by Plants
- Not dimmable

Why 400 Vac?

- 3-phase 230 Y /400 (Δ) Vac circuits: when only L1 and L2 of is available, no neutral

- Changing to 230 Vac would incur significant re-wiring costs



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Why 400 Vac?

- Products designed for American three-phase markets can be used in European Green Houses.

	Y	Δ
Typical North American 3-phase circuits	120 Vac	208 Vac
	277 Vac	480 Vac
	347 Vac	600 Vac
Typical European 3-phase circuits	230 Vac	400 Vac
	400 Vac	690 Vac

Power Levels

- A 360 W LED system can replace a 600 W traditional discharge

- The current largest commercially available LED drivers are approximately 600 W

275 x 144 x 48.5 mm

- Higher power LED drivers are currently under consideration.

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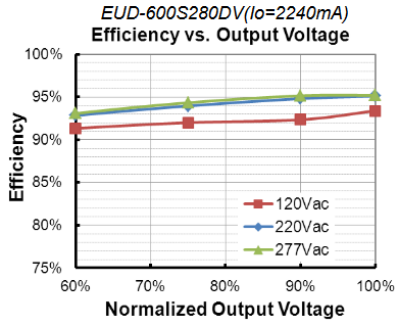
Topologies: Constant Current

Advantages:

- Highest efficiency

Adjustable Output Current Range	Full-Power Current Range(1)	Default Output Current	Input Voltage Range(2)	Output Voltage Range	Max. Output Power	Typical Efficiency (3)	Power Factor		Model Number
							120Vac	220Vac	
0.224-2.80A	2.24–2.80A	2.8 A	90~305Vac/ 127~250Vdc	108 ~ 268Vdc	600 W	95.0%	0.99	0.96	EUD-600S280DV

- Highest Reliability



Implications:

Adjustable Output Current Range	Full-Power Current Range(1)	Default Output Current	Input Voltage Range(2)	Output Voltage Range	Max. Output Power	Typical Efficiency (3)	Power Factor		Model Number
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Inventronics Options:

CC: 320 W, 420 W and 600 W

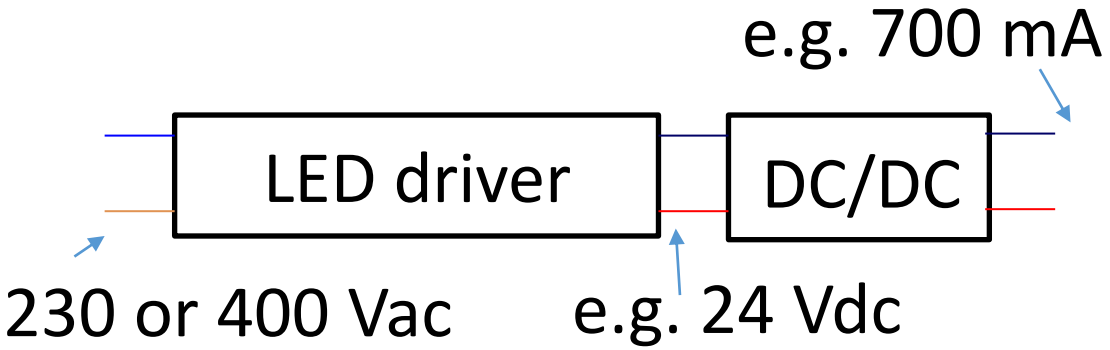
Topologies: Constant Voltage

Advantages:

- Easy Scalability
- Safe output voltages

Disadvantages:

- Low efficiency
- Lower Reliability



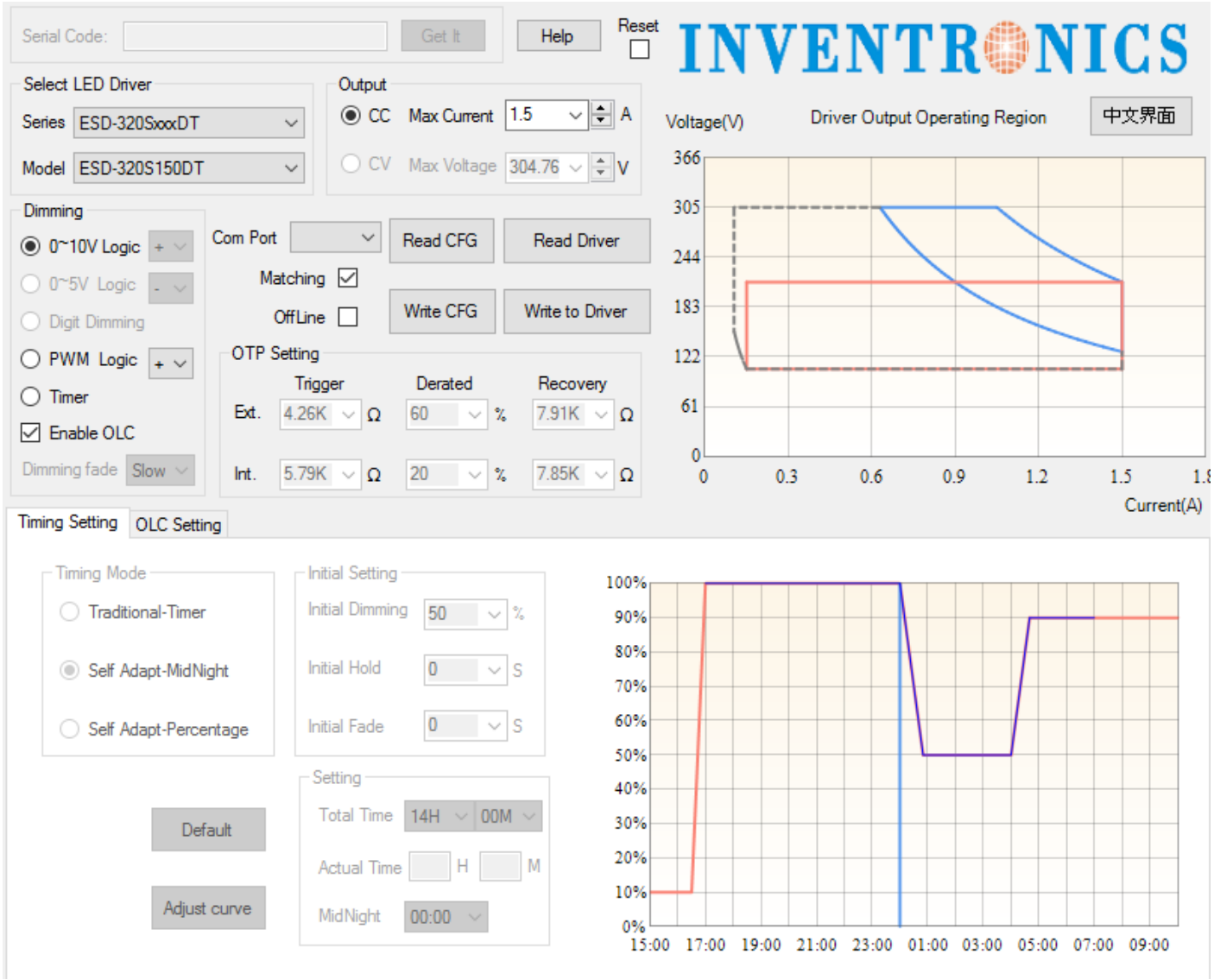
Inventronics Options:

CC: 300W and 500W

Flexible Design

- Programmable drivers allow you reduce number of Stock Keeping Units and to optimize / customize features
  - One driver across multiple luminaires
  - The option to change LED vendor with different current/voltage requirements without changing drivers.
  - The option to tweak output currents for different environment/customer requirements

Flexible Design – Programmable



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Flexible Design – Advanced Features

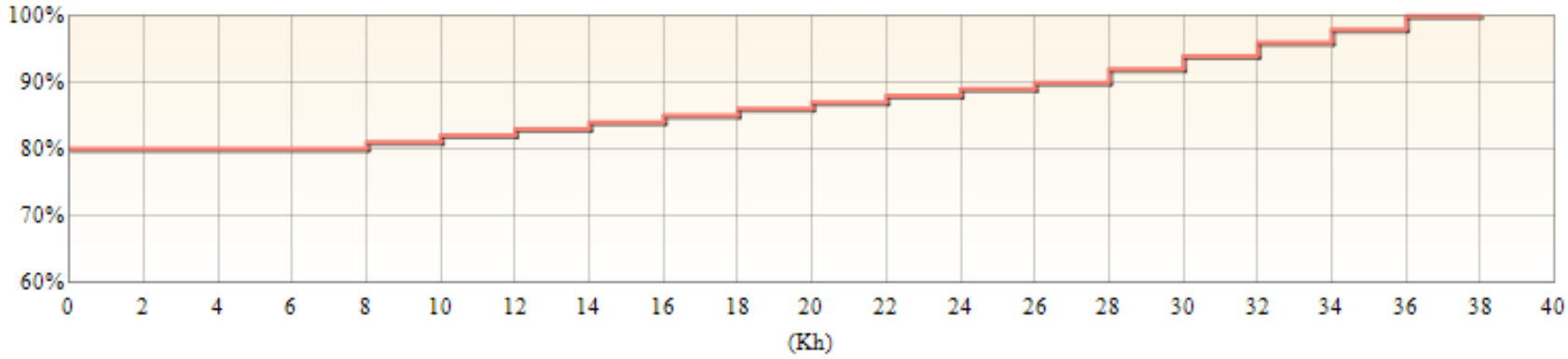
- Output Lumen Compensation (OLC)
  - The ability for the driver to modify its output current over time to compensate for phosphor degradation and ensure constant light output over the lifetime of the luminaire.

- Timer
  - The driver can automatically dim according to a pre-programmed schedule

Programmable - OLC

OLC Running Time 0 H 00 M Reset Times Reset is only valid for 10mins after power on,reboot the device after configurations.

Current(%)	80	81	82	83	84	85	86	87	88	89	90	92	94	96	98	100
Time(Kh)	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38



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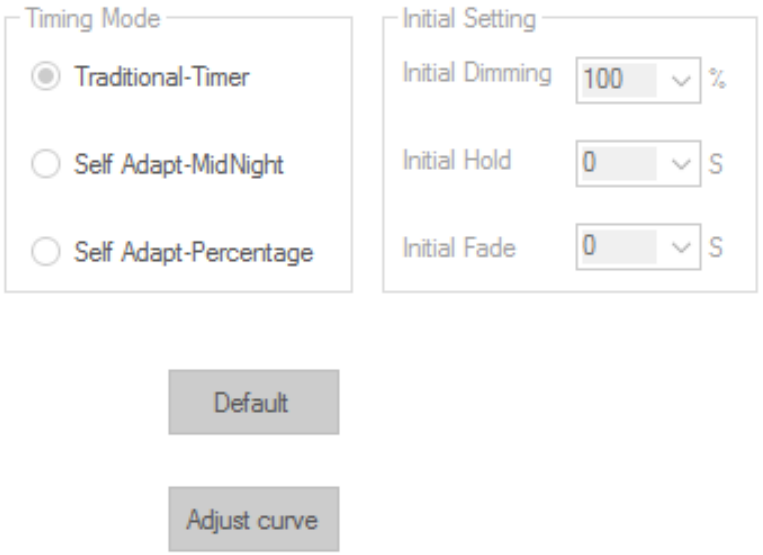
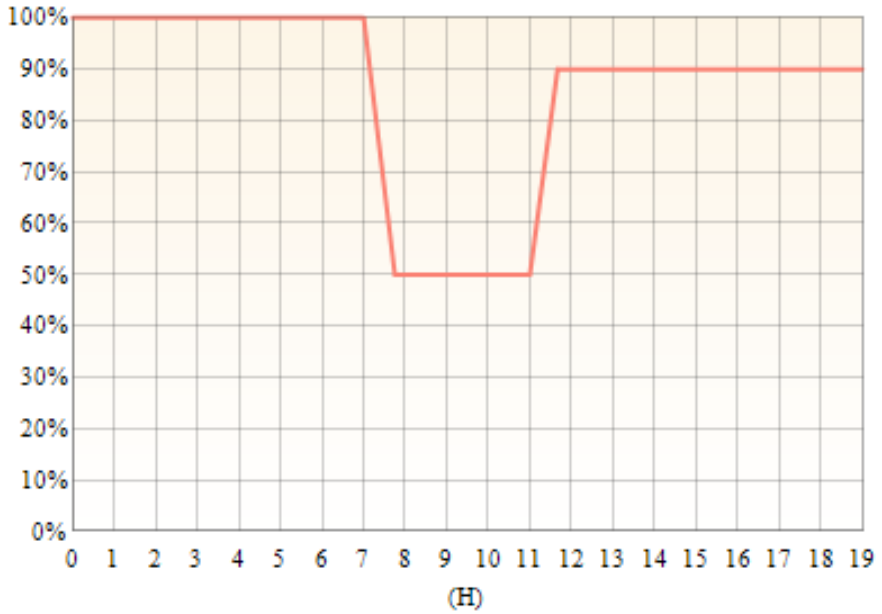
Programmable - Timer





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Harsh environment

- Green houses are likely to be hot & humid.
- They may also be dirty, and regularly subject to spraying with fertilizers & insecticides.
- The AC environment could suffer from long wiring runs, poorly maintained.
- Generators may generate extra surges on the AC line.

Solutions to Harsh Environment

- Hot Humid & Dirty Environment.
  - An IP67 driver preferably fully potted with good temperature performance.
  - Aluminium Case.
- Poor AC Environment
  - High Surge Immunity

Quality of Light

- Output current will be dimmed by using **Constant Current Reduction (CCR)** instead of using Pulse Width Modulation (PWM), so no stroboscopic effects
- Output current with very **low ripple**

Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%Ioset	-	5%Ioset	At full load condition
Output Current Setting(Ioset) Range	7%Iomax	-	100%Iomax	
Output Current Setting Range with Constant Power	70%Iomax	-	100%Iomax	
Total Output Current Ripple (pk-pk)	-	5%Iomax	10%Iomax	At full load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	2%Iomax	-	At full load condition. Only this component of ripple is associated with visible flicker.
Startup Overshoot Current	-	-	10%Iomax	At full load condition

Wired Dimming

- Wired dimming options
  - 0-10V
    - Advantages/Disadvantages
  - DALI
    - Advantages/Disadvantages
  - DMX
    - Advantages/Disadvantages

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