Features

- Panel mount connectors facilitates installation
- Brackets accommodates variety of hanging applications
- Ultra High Efficiency (Up to 96.0%)
- Full Power at Wide Output Current Range (Constant Power)
- Adjustable Output Current (AOC) with Programmability
- Isolated 0-10V/PWM/3-Timer-Modes Dimmable
- INV Digital Dimming, UART Based Communication Protocol
- Dim-to-Off with Low Standby Power
- Minimum Dimming Level with 5% or 10% Selectable
- Maximum Dimming Level with 9V or 10V Selectable
- Fade Time Adjustable
- Always-on Auxiliary Power: 12Vdc, 250mA
- Low inrush current
- Output Lumen Compensation
- End-of-Life Indicator
- Input Surge Protection: DM 6kV, CM 10kV
- All-Around Protection: IUVP, IOVP, OVP, SCP, OTP
- IP66 / IP67 and UL Dry / Damp / Wet Location
- TYPE HL, for use in a Class I, Division 2 hazardous (Classified) location
- 5 Years Warranty

Description

The *ESM-1K2SxxxMGS* series is a 1200W, constant-current, programmable and IP66/IP67 rated LED driver that operates from 249-528Vac input with excellent power factor. Created for many lighting applications including high mast, sports, UV-LED, aquaculture and horticulture etc. It provides an auxiliary voltage and dim-to-off functionality for powering low voltage, wireless controls. The dimming control supports 0-10V dimming as well as two-way communication via Digital Dimming, a UART based communication protocol. The high efficiency of these drivers and compact metal case enables them to run cooler, significantly improving reliability and extending product life. To ensure trouble-free operation, protection is provided against input surge, input under voltage, input over voltage, output over voltage, short circuit, and over temperature.

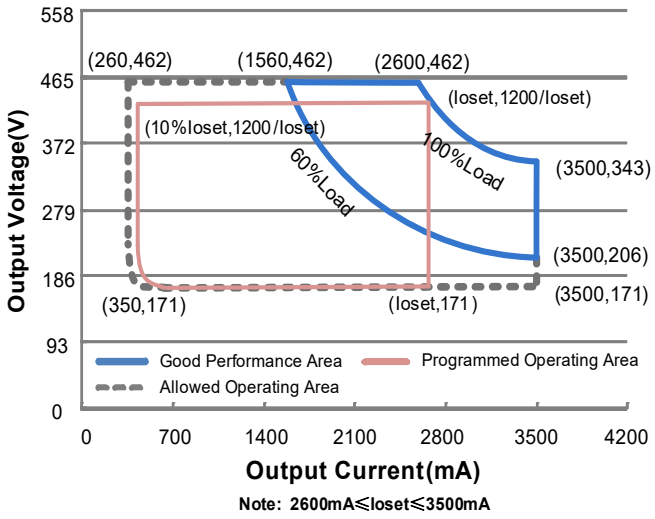
Models

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)	Typical Power Factor		Model Number
							277Vac	480Vac	
0.26-3.5A	2.6-3.5A	3.5 A	249~528Vac 352~500Vdc	171 ~ 462Vdc	1200 W	96.5%	0.99	0.96	ESM-1K2S350MGS
0.395-5.25A	3.95-5.25A	5.25 A	249~528Vac 352~500Vdc	114 ~ 304Vdc	1200 W	96.0%	0.99	0.96	ESM-1K2S525MGS
0.555-7.4A	5.55-7.4A	7.4 A	249~528Vac 352~500Vdc	81 ~ 217Vdc	1200 W	96.5%	0.99	0.96	ESM-1K2S740MGS

Notes: (1) Output current range with constant power at 1200W.
(2) Certified voltage range: 277-480Vac
(3) Measured at 100% load and 480Vac input (see below "General Specifications" for details).

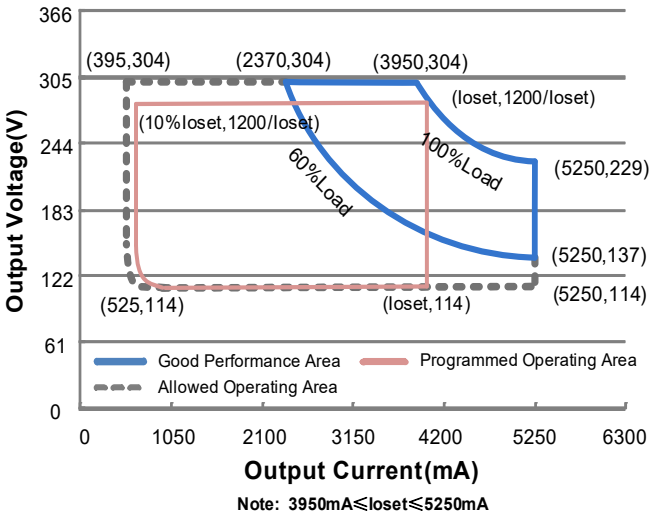
I-V Operating Area

ESM-1K2S350MGS



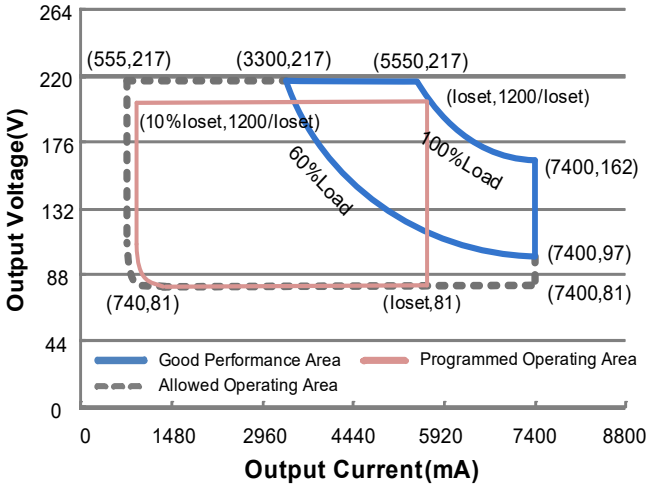
Note: 2600mA≤Ioset≤3500mA

ESM-1K2S525MGS



Note: 3950mA≤Ioset≤5250mA

ESM-1K2S740MGS



Note: 5550mA≤Ioset≤7400mA

Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input AC Voltage	249 Vac	-	528 Vac	
Input DC Voltage	352 Vdc	-	500 Vdc	
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.75 MIU	UL8750; 480Vac/ 60Hz
	-	-	0.70 mA	IEC60598-1; 480Vac/ 60Hz

Input Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Input AC Current	-	-	5.0 A	Measured at 100% load and 277 Vac input.
	-	-	2.95 A	Measured at 100% load and 480 Vac input.
Inrush Current(I^2t)	-	-	4.20 A^2s	At 480Vac input, 25 ℃ cold start, duration=12.7 ms, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details.
PF	0.90	-	-	At 277-480Vac,50-60Hz,60%-100% Load (720 - 1200W)
THD	-	-	20%	

Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%Ioset	-	5%Ioset	100% load
Output Current Setting(Ioset) Range ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	 260 mA 395 mA 555 mA	 - - -	 3500 mA 5250 mA 7400 mA	
Output Current Setting Range with Constant Power ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	 2600 mA 3950 mA 5550 mA	 - - -	 3500 mA 5250 mA 7400 mA	
Total Output Current Ripple (pk-pk)	-	5%Iomax	10%Iomax	100% load, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	-	2%Iomax	100% load
Startup Overshoot Current	-	-	10%Iomax	100% load
No Load Output Voltage ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	 - - -	 - - -	 500 V 340 V 240 V	
Line Regulation	-	-	±0.5%	100% load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	-	0.5 s	Measured at 277-480Vac input, 60%-100% Load
Temperature Coefficient of Ioset	-	0.03%/°C	-	Case temperature = 0°C ~Tc max
12V Auxiliary Output Voltage	10.8 V	12 V	13.2 V	
12V Auxiliary Output Source Current	0 mA	-	250 mA	Return terminal is “Dim−“
12V Auxiliary Output Transient Peak Current@6W	-	-	500 mA	500mA peak for a maximum duration of 2.2 ms in a 6.0ms period during which time the average should not exceed 250mA.
12V Auxiliary Output Transient Peak Current@10W	-	-	850 mA	850mA peak for a maximum duration of 1.3 ms in a 5.2ms period during which time the average should not exceed 250mA.

General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 277 Vac input:				
ESM-1K2S350MGS				
Io= 2600 mA	93.0%	95.0%	-	
Io= 3500 mA	93.0%	95.0%	-	Measured at 100% load and steady-state temperature in 25°C ambient;
ESM-1K2S525MGS				
Io= 3950 mA	93.0%	95.0%	-	(Efficiency will be about 2.0% lower if
Io= 5250 mA	92.5%	94.5%	-	measured immediately after startup.)
ESM-1K2S740MGS				
Io= 5550 mA	93.5%	95.5%	-	
Io= 7400 mA	93.0%	95.0%	-	
Efficiency at 400 Vac input:				
ESM-1K2S350MGS				
Io= 2600 mA	94.0%	96.0%	-	
Io= 3500 mA	94.0%	96.0%	-	Measured at 100% load and steady-state temperature in 25°C ambient;
ESM-1K2S525MGS				
Io= 3950 mA	94.0%	96.0%	-	(Efficiency will be about 2.0% lower if
Io= 5250 mA	93.5%	95.5%	-	measured immediately after startup.)
ESM-1K2S740MGS				
Io= 5550 mA	94.0%	96.0%	-	
Io= 7400 mA	94.0%	96.0%	-	
Efficiency at 480 Vac input:				
ESM-1K2S350MGS				
Io= 2600 mA	94.5%	96.5%	-	
Io= 3500 mA	94.0%	96.0%	-	Measured at 100% load and steady-state temperature in 25°C ambient;
ESM-1K2S525MGS				
Io= 3950 mA	94.0%	96.0%	-	(Efficiency will be about 2.0% lower if
Io= 5250 mA	94.0%	96.0%	-	measured immediately after startup.)
ESM-1K2S740MGS				
Io= 5550 mA	94.5%	96.5%	-	
Io= 7400 mA	94.0%	96.0%	-	
Standby Power	-	1.5 W	-	Measured at 480Vac/50Hz; Dimming off
MTBF	-	207,000 Hours	-	Measured at 480Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	101,000 Hours	-	Measured at 480Vac input, 80%Load and 70°C case temperature; See lifetime vs. Tc curve for the details
	-	54,000 Hours	-	Measured at 277Vac input, 100%Load and 40°C ambient temperature
Operating Case Temperature for Safety Tc_s	-40°C	-	+90°C	
Operating Case Temperature for Warranty Tc_w	-40°C	-	+80°C	Case temperature for 5 years warranty Humidity: 10% RH to 95% RH
Storage Temperature	-40°C	-	+85°C	Humidity: 5%RH to 95%RH
Dimensions				With mounting ear
Inches (L × W × H)	12.01 × 6.56 × 1.95			12.99 × 6.56 × 1.95
Millimeters (L × W × H)	305 × 166.5 × 49.5			330 × 166.5 × 49.5
Net Weight	-	4350 g	-	

Dimming Specifications

Parameter		Min.	Typ.	Max.	Notes
Absolute Maximum Voltage on the Vdim (+) Pin		-20 V	-	20 V	
Source Current on Vdim (+)Pin		200 uA	300 uA	450 uA	Vdim(+) = 0 V
Dimming Output Range with 10%-100% (Default)	ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	10%Ioset	-	Ioset	2600 mA ⩽ Ioset ⩽ 3500 mA 3950 mA ⩽ Ioset ⩽ 5250 mA 5550 mA ⩽ Ioset ⩽ 7400 mA
	ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	260 mA 395 mA 555 mA	-	Ioset	260 mA ⩽ Ioset < 2600 mA 395 mA ⩽ Ioset < 3950 mA 555 mA ⩽ Ioset < 5550 mA
Dimming Output Range with 5%-100% (Settable)	ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	10%Ioset	-	Ioset	2600 mA ⩽ Ioset ⩽ 3500 mA 3950 mA ⩽ Ioset ⩽ 5250 mA 5550 mA ⩽ Ioset ⩽ 7400 mA
	ESM-1K2S350MGS ESM-1K2S525MGS ESM-1K2S740MGS	130 mA 198 mA 278 mA	-	Ioset	260 mA ⩽ Ioset < 2600 mA 395 mA ⩽ Ioset < 3950 mA 555 mA ⩽ Ioset < 5550 mA
Recommended Dimming Input Range		0 V	-	10 V	Default 0-10V dimming mode.
Dim off Voltage		0.35 V	0.5 V	0.65 V	
Dim on Voltage		0.55 V	0.7 V	0.85 V	
Hysteresis		-	0.2 V	-	
PWM_in High Level		3 V	-	10 V	Dimming mode set to PWM in PC interface.
PWM_in Low Level		-0.3 V	-	0.6 V	
PWM_in Frequency Range		200 Hz	-	3 KHz	
PWM_in Duty Cycle		1%	-	99%	
PWM Dimming off (Positive Logic)		3%	5%	8%	
PWM Dimming on (Positive Logic)		5%	7%	10%	
PWM Dimming off (Negative Logic)		92%	95%	97%	
PWM Dimming on (Negative Logic)		90%	93%	95%	
Hysteresis		-	2%	-	

Safety &EMC Compliance

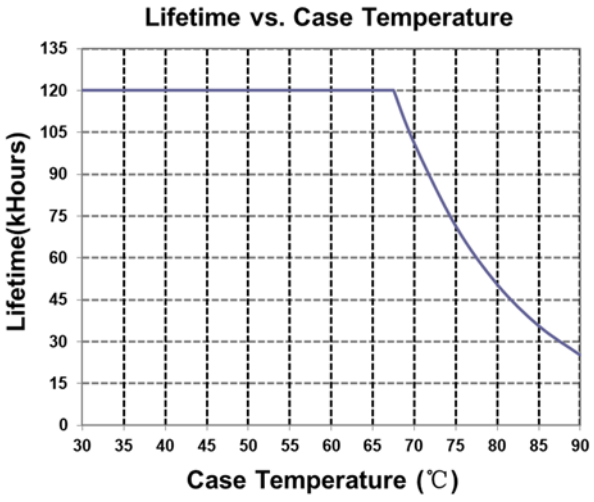
Safety Category	Standard
UL/CUL	UL8750,CAN/CSA-C22.2 No. 250.13
ENEC & CE	EN 61347-1, EN 61347-2-13
UKCA	BS EN 61347-1, BS EN 61347-2-13
CB	IEC 61347-1, IEC 61347-2-13
EAC	ГОСТ Р МЭК 61347-1, ГОСТ IEC 61347-2-13

Safety &EMC Compliance (Continued)

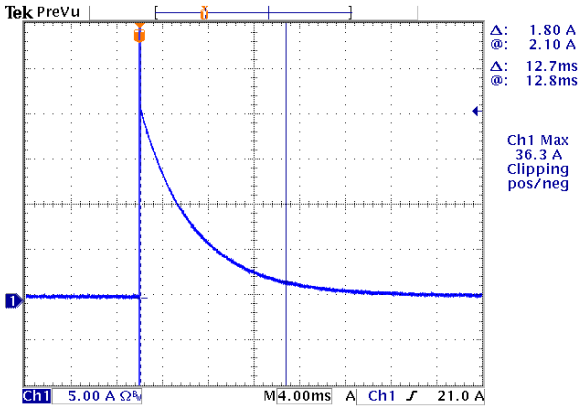
EMI Standards	Notes
BS EN/EN 55015(1)	Conducted emission Test &Radiated emission Test
BS EN/EN 61000-3-2	Harmonic current emissions
BS EN/EN 61000-3-3	Voltage fluctuations & flicker
FCC Part 15(1)	ANSI C63.4 Class B
	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and [2] this device must accept any interference received, including interference that may cause undesired operation.
EMS Standards	**Notes**
BS EN/EN 61000-4-2	Electrostatic Discharge (ESD): 8 kV air discharge, 4 kV contact discharge
BS EN/EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test-RS
BS EN/EN 61000-4-4	Electrical Fast Transient / Burst-EFT
BS EN/EN 61000-4-5	Surge Immunity Test: AC Power Line: Differential Mode 6 kV, Common Mode 10 kV
BS EN/EN 61000-4-6	Conducted Radio Frequency Disturbances Test-CS
BS EN/EN 61000-4-8	Power Frequency Magnetic Field Test
BS EN/EN 61000-4-11	Voltage Dips
BS EN/EN 61547	Electromagnetic Immunity Requirements Applies To Lighting Equipment

Note: (1) This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

Lifetime vs. Case Temperature

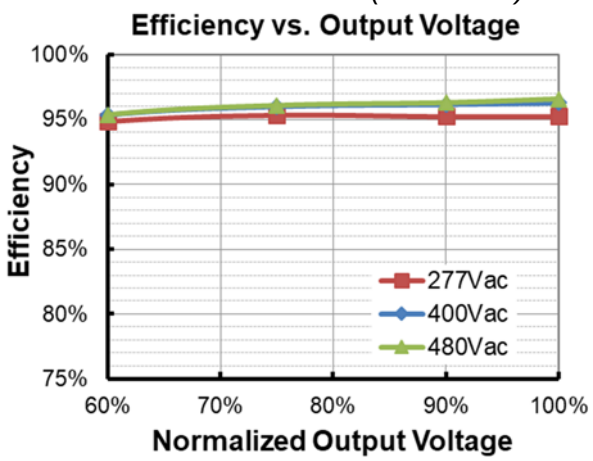


Inrush Current Waveform

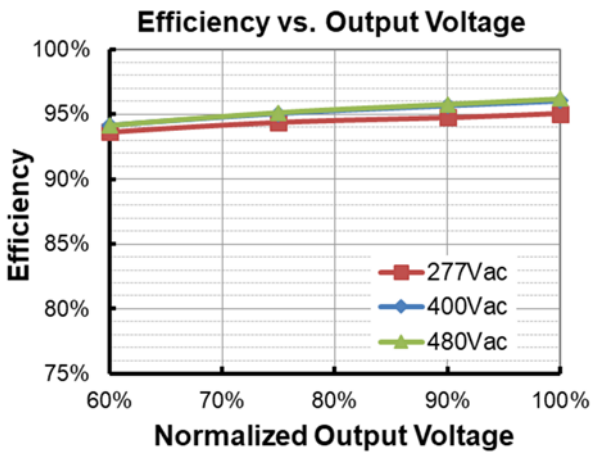


Efficiency vs. Load

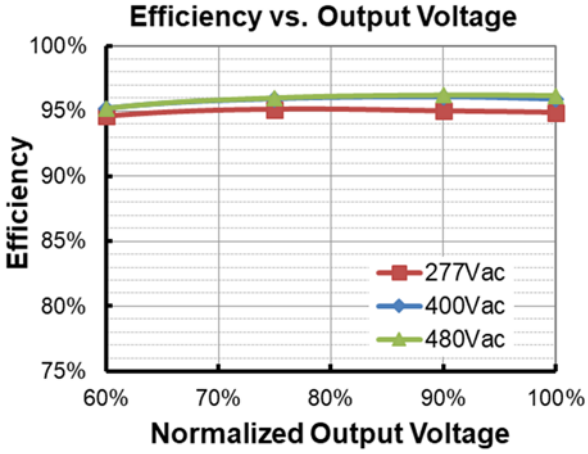
ESM-1K2S350MGS(Io=2600mA)



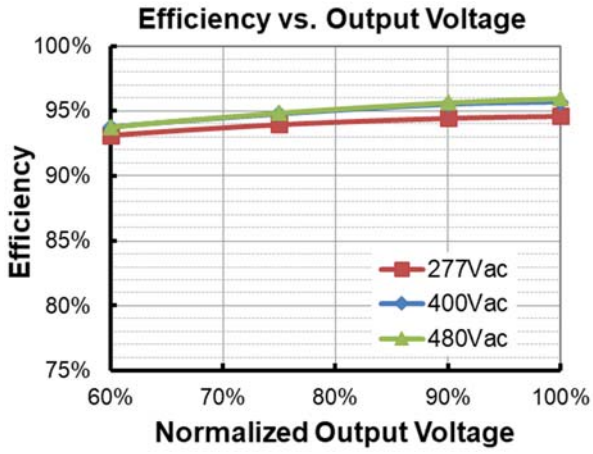
ESM-1K2S350MGS(Io=3500mA)



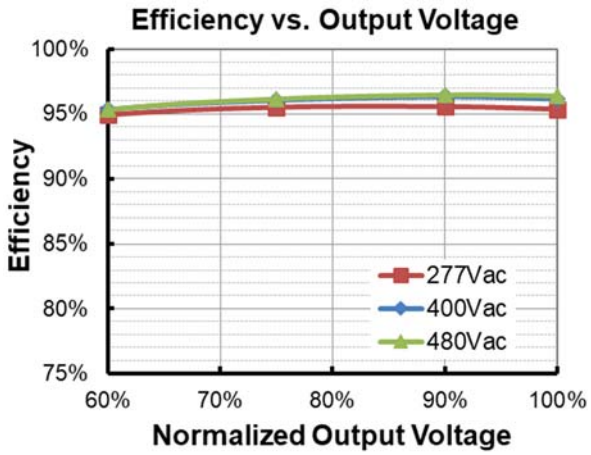
ESM-1K2S525MGS(Io=3950mA)



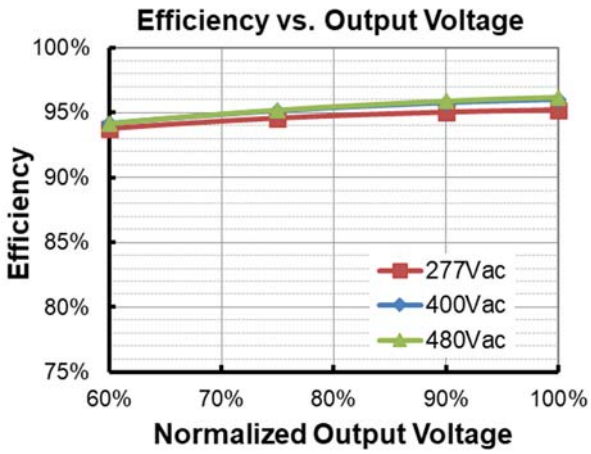
ESM-1K2S525MGS(Io=5250mA)



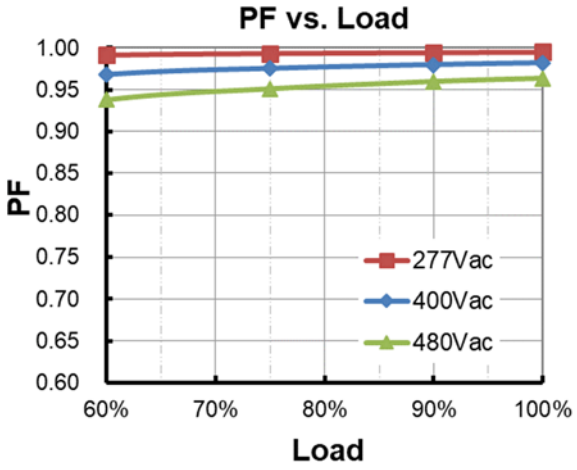
ESM-1K2S740MGS(Io=5550mA)



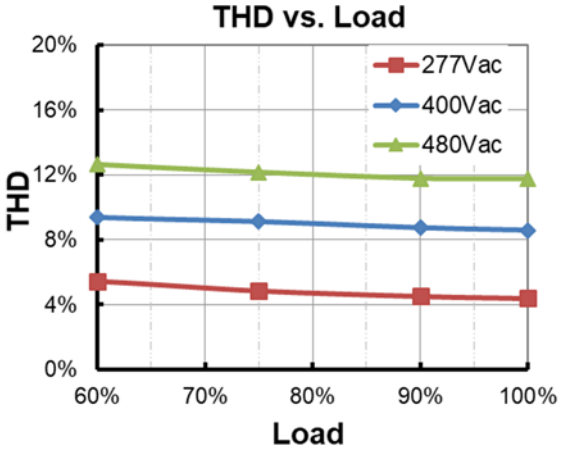
ESM-1K2S740MGS(Io=7400mA)



Power Factor



Total Harmonic Distortion



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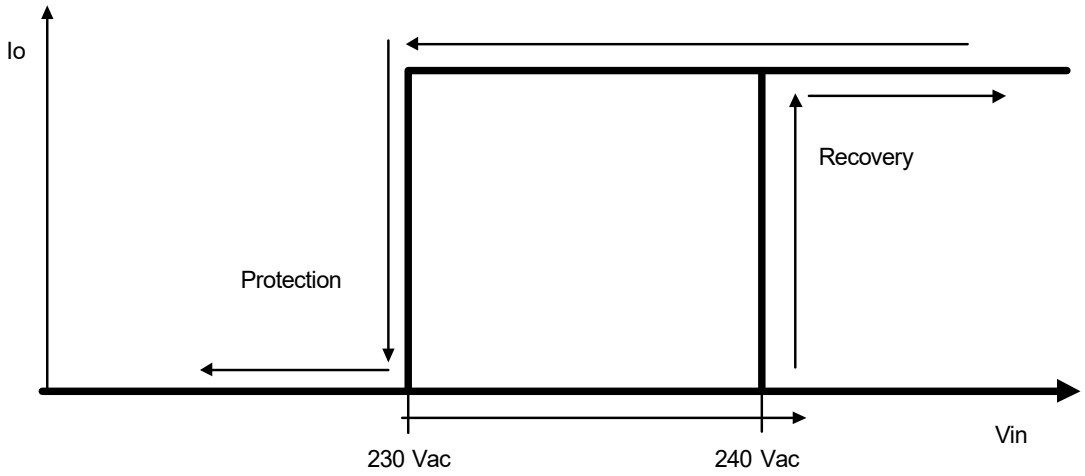
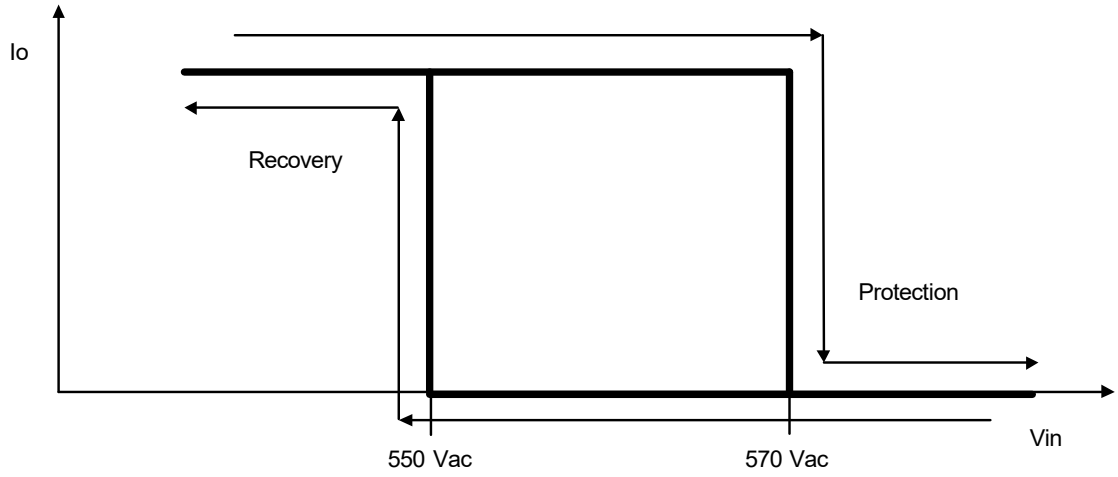
Protection Functions

Parameter		Min.	Typ.	Max.	Notes
Over Temperature Protection		Decreases output current, returning to normal after over temperature is removed.			
Short Circuit Protection		Auto Recovery. No damage will occur when any output is short circuited. The output shall return to normal when the fault condition is removed.			
Over Voltage Protection		Limits output voltage at no load and in case the normal voltage limit fails.			
Input Under Voltage Protection (IUVP)	Input Protection Voltage	220 Vac	230 Vac	240 Vac	Turn off the output when the input voltage falls below protection voltage.
	Input Recovery Voltage	230 Vac	240 Vac	250 Vac	Auto Recovery. The driver will restart when the input voltage exceeds recovery voltage.
Input Over Voltage Protection (IOVP)	Input Over Voltage Protection	550 Vac	570 Vac	590 Vac	Turn off the output when the input voltage exceeds protection voltage.
	Input Over Voltage Recovery	530 Vac	550 Vac	570 Vac	Auto Recovery. The driver will restart when the input voltage falls below recovery voltage.
	Max. of Input Over Voltage			590 Vac	The driver can survive for 8 hours with a stable input voltage stress of 590Vac.

- **Input Under Voltage Protection Diagram**



- **Input Over Voltage Protection Diagram**



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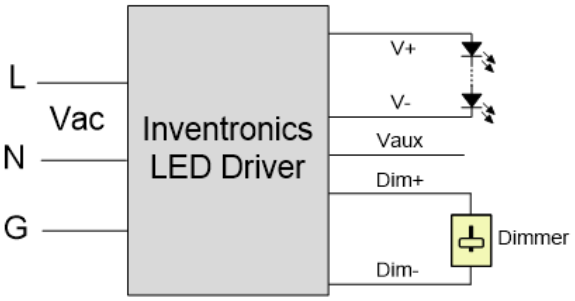
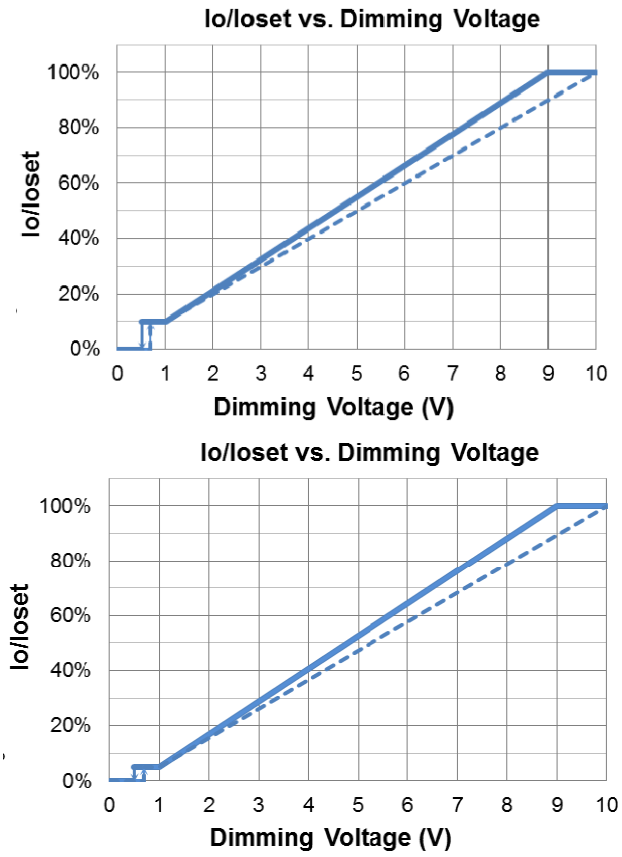
Dimming

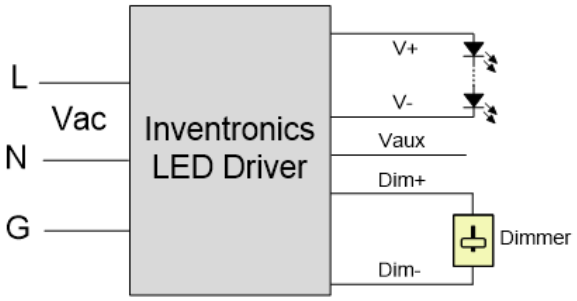
● 0-10V Dimming

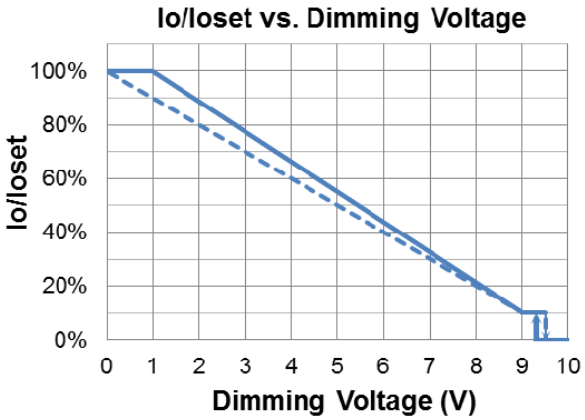
The recommended implementation of the dimming control is provided below.

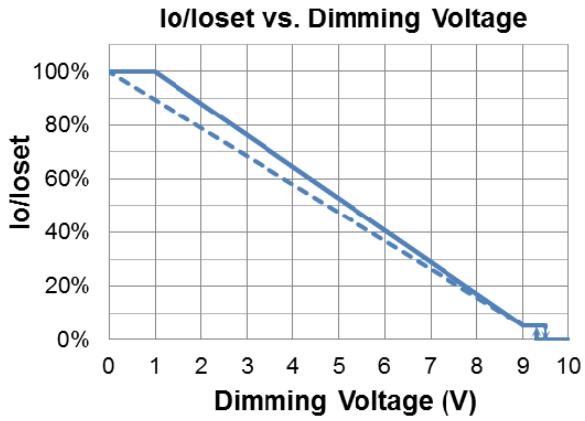




Implementation 1: Positive logic







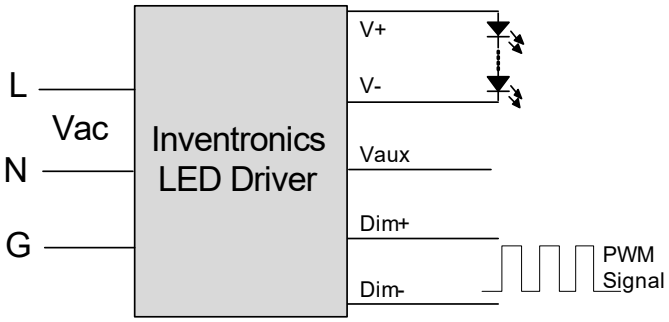
Implementation 2: Negative logic

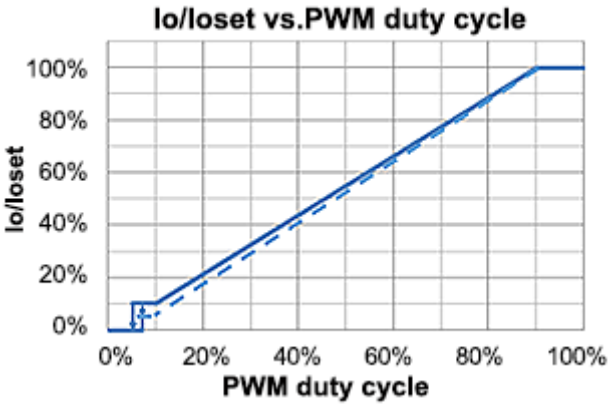
Notes:

1. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like zener.
3. When 0-10V negative logic dimming mode and Dim+ is open, the driver will dim to off and be standby.

● PWM Dimming

The recommended implementation of the dimming control is provided below.





Implementation 3: Positive logic

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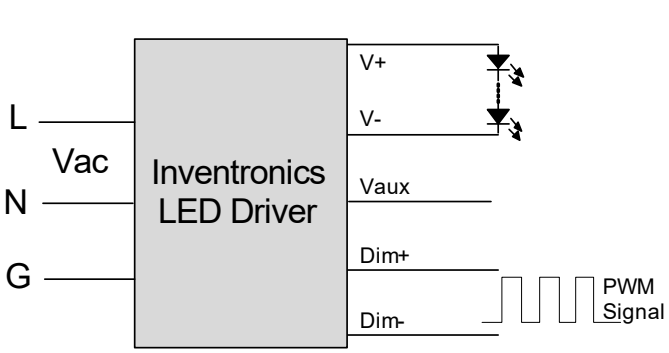
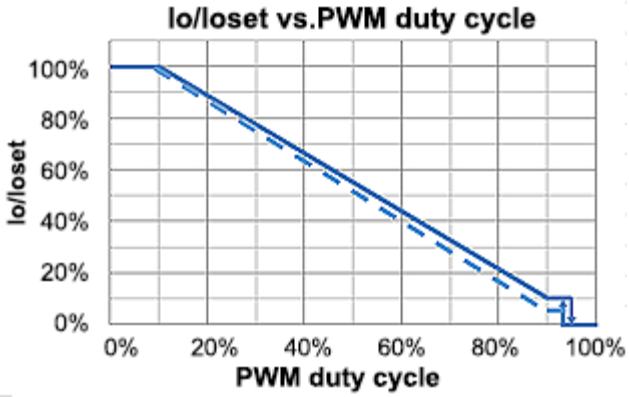




Implementation 4: Negative logic

Notes:

1. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
2. When PWM negative logic dimming mode and Dim+ is open, the driver will dim to off and be standby.

- **Time Dimming**

  Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting Percentage and Traditional Timer.
  - **Self Adapting-Midnight**: Automatically adjusts the dimming curve based on the on-time of past two days (if difference <15 minutes), assuming that the center point of the dimming curve is midnight local time.
  - **Self Adapting-Percentage**: Automatically adjusts the on-time of each step by a constant percentage = (actual on-time for the past 2 days if difference <15 min) / (programmed on-time from the dimming curve).
  - **Traditional Timer**: Follows the programmed timing curve after power on with no changes.

- **Output Lumen Compensation**

  Output Lumen Compensation (OLC) may be used to maintain constant light output over the life of the LEDs by driving them at a reduced current when new, then gradually increasing the drive current over time to counteract LED lumen degradation.

- **Minimum Dimming Level with 5% or 10% Selectable**

  The minimum dimming level can be set as 5% or 10% by Inventronics Multi Programmer,10% is default.

- **Maximum Dimming Level with 9V or 10V Selectable**

  The maximum dimming level can be set as corresponding dimming voltage is 9V or 10V by Inventronics Multi Programmer,9V is default.

- **Fade Time Adjustable**

  Soft-start time and dimming slope can be adjusted by Inventronics Multi Programmer to get customized fade time experience, disable mode is default.

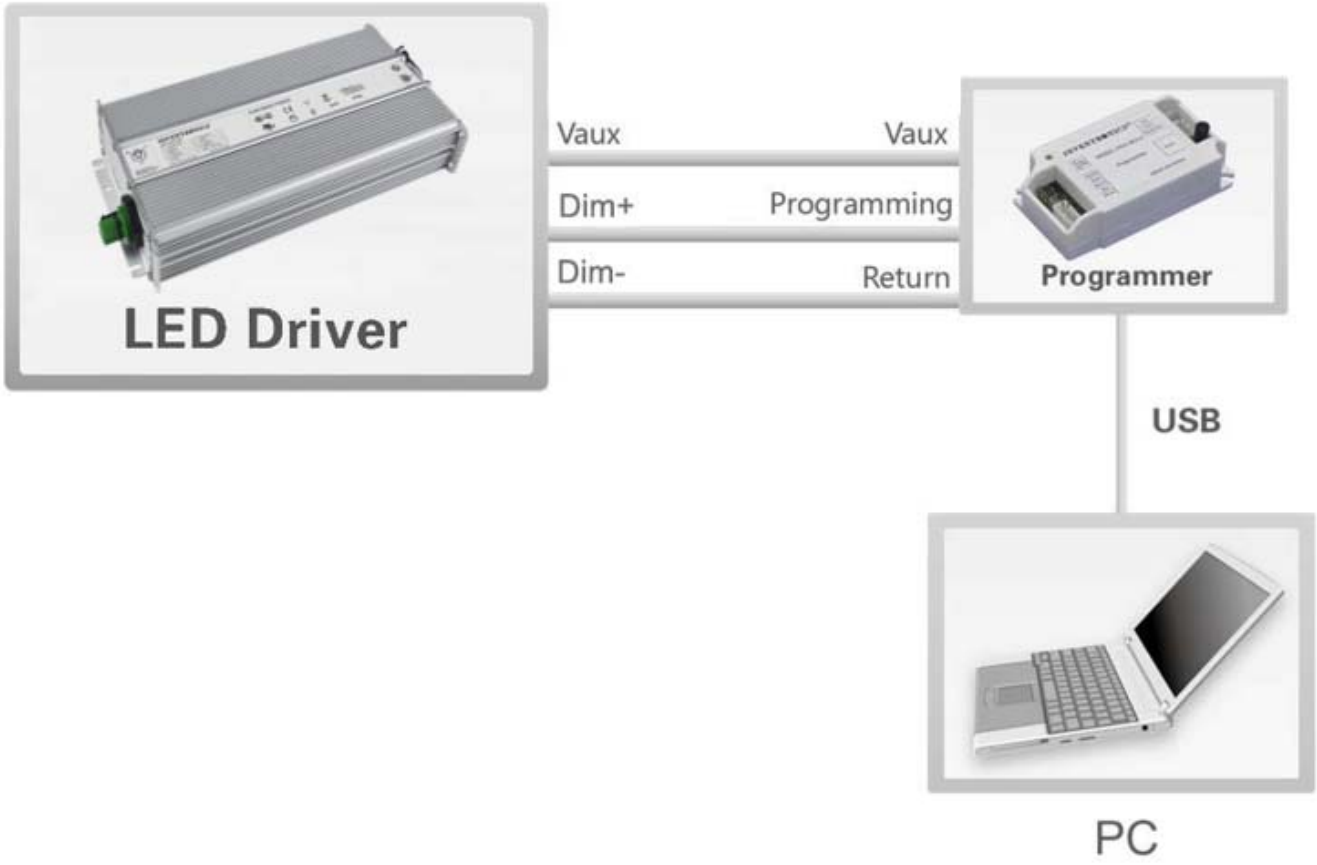
- **End Of Life**

  End-of-Life (EOL) is providing a visual notification to a user that the LED module has reached the end of manufacturer-specified life and that the replacement is recommended. Once active, an indication is given at each power-up of the driver, which the driver indicates this through a lower light output during the first 1 minute before normal operation is continued.

- **Digital Dimming**

  Inventronics Digital Dimming is a UART (Universal Asynchronous Receive Transmitter) based communication protocol. Please refer to Inventronics Digital Dimming file for details.

Programming Connection Diagram



Note: The driver does not need to be powered on during the programming process.

- **Please refer to PRG-MUL2 (Programmer) datasheet for details.**

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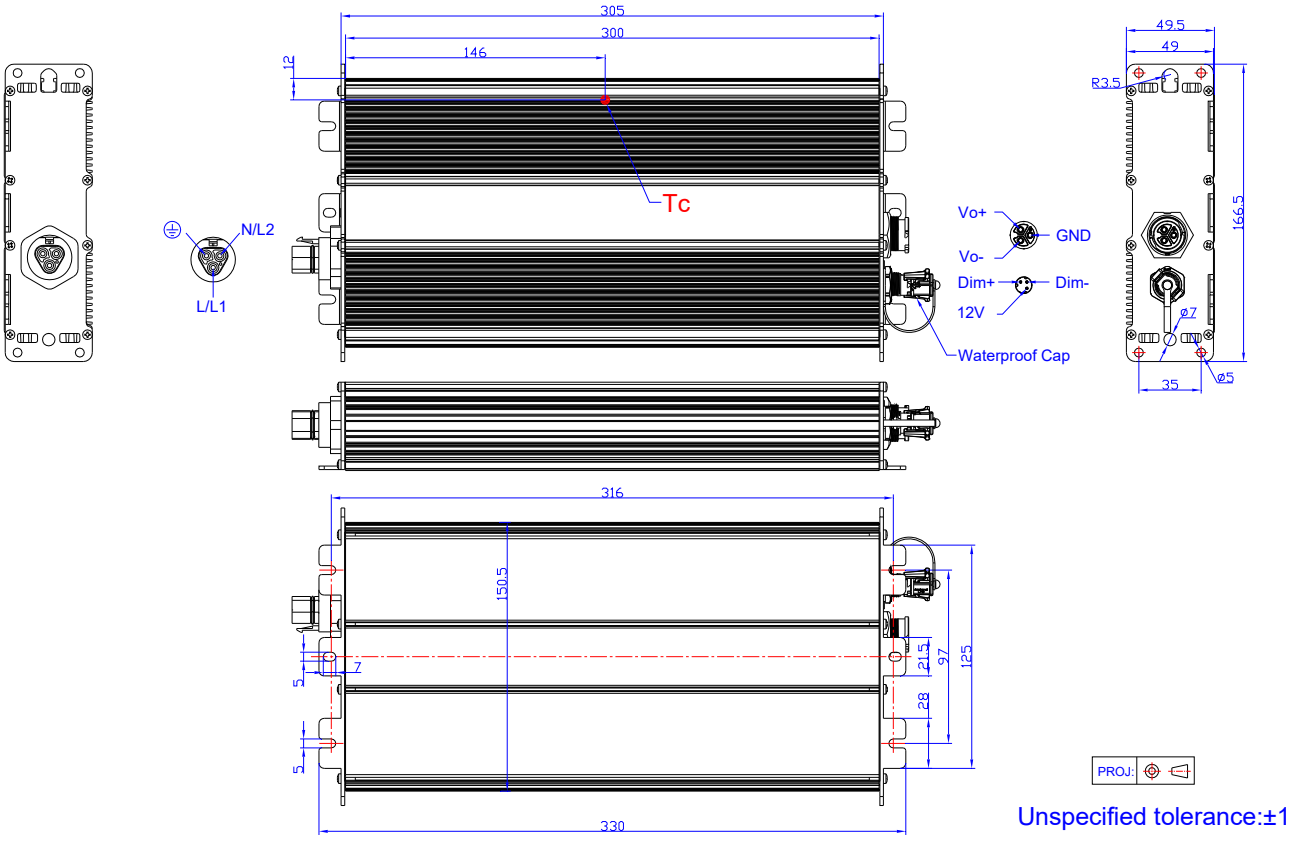
Mechanical Outline



Unspecified tolerance:±1

Note: This driver features UL Wet Location, IP67 panel mount connectors to streamline wiring in the field while still supporting stringent environmental conditions. The mating push-lock are not supplied by Inventronics. Please contact Wieland and Amphenol LTW or one of their suppliers for assistance sourcing the mating push-lock

Location	Series	Rating voltage/current	PN of connector on driver	PN of mating push-lock
Vin	Wieland RST20i3	600V/5A	96.032.1055.7	96.031.0055.7 (Spring) or 96.031.4055.7 (Screw)
		600V/10A	96.032.5055.7	
Vo	ALTW X-Lok,C-Size	600V/10A	ABAB-CAQ03000091	CC-03BFMB-QL8APA
		300V/20A	ABAB-CAQ03000100	CC-03BFMB-QL8APP
Dim	ALTW X-Lok,A-Size	300V/5A	ABAB-AMQ03000091	AD-03BFFB-QL8AP0
Dim	ALTW X-Lok,A-Size Waterproof Cap	/	CAP-WAAMQPC1	/

RoHS Compliance

Our products comply with reference to RoHS Directive (EU) 2015/863 amending 2011/65/EU, calling for the elimination of lead and other hazardous substances from electronic products.

Revision History

Change Date	Rev.	Description of Change		
		Item	From	To
2021-11-23	A	Datasheet Release	/	/
2022-01-26	B	Product Photograph	/	Updated
		EAC logo	/	Added
		Models	I-V Operating Area	Updated
		Safety &EMC Compliance	/	Updated