

Constant current waterproof dimmable driver

MML Series suffix MP(1-10V/10V PWM/Rx+1-10V Programmable)



Features

- Support isolate interface dimming 1-10V/10V PWM/Rx dimming
- The output current of the driver can be programming through the 1-10V(DIM) interface
- High PF, high efficiency, low THD
- Soft dimming and flicker-free at any brightness, meets the new requirements of ErP certification
- Using HPC patented technology, at any dimming level, the brightness of the lights is the same
- Suitable for working at -20-60°C
- Aluminum metal housing design
- Power input on stand-by < 0.5 W, compatible with ErP.
- IP65 design for indoor installation.
- Passed CE, ENEC, UKCA, RCM, EL certifications.
- Nominal life-time up to 100,000 h
- 5.5-year guarantee

Interfaces

- 1-10V 3in1 isolated(1-10V/10V PWM/Rx)

Functions

- Support central emergency application (dimming normal in DC input)
- Support self-contained emergency application
- Programming via 1-10V (EasySet)
- Protective features (short-circuit, overload, no-load, hot plug-in protection)

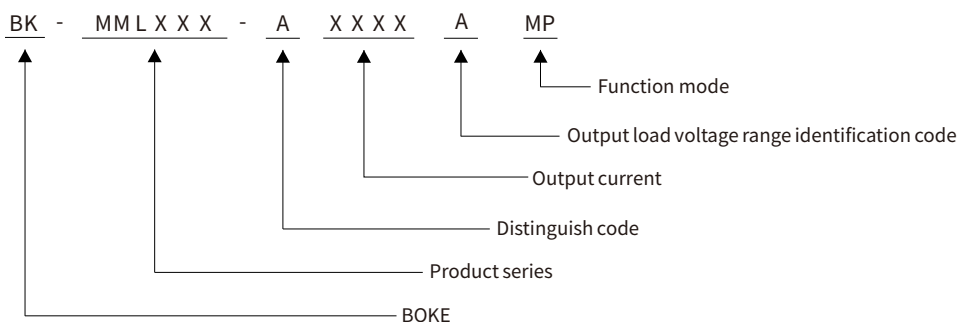
Suitable for lights

- Suitable for lights with indoor or humid environment, such as projection lamps, industrial and mining lamps, floodlights, courtyard lamps, etc
- Suitable for rail transit line lights and other lighting fixtures

Typical applications

- LED Industrial lighting
- LED rail-transit lighting
- LED Subway station lighting

Model coding rules of MML series



Function list

Model	Suffix	Wired dimming	Advanced functions	Device Configuration
		1-10V	AOC	1-10V interfaces
BK-MML022-A BK-MML040-A	MP	√	√	√

Model list

Model	Input voltage	Output power	Output voltage	Output current	Dimension
BK-MML022-A0600AMP	200-240VAC/DC	23.1W MAX.	24-42VDC	0.15-0.6A	L137*W43.5*H34mm
BK-MML040-A1100AMP	200-240VAC/DC	42W MAX.	24-42VDC	0.5-1.1A	L143*W56*H34mm

Technical data

Product model	BK-MML022-A0600AMP
Output parameters	
Regulation method	Constant Current
Rated output current range	0.15-0.6A, see the operating window for details
Rated output voltage range	24-42VDC, see the operating window for details
Rated output power	23.1W Max, see the operating window for details
Output current adjustment	EasySet Programming
Output current ripple(typ.)	±5%(100Hz)
Output current accuracy	±1%
Linear regulation	±1%
Load regulation	±1%
No load output voltage	60VDC
Flicker-free(typ.)	Flickering percent(IEEE 1789)=0.638%(100Hz), Flicker index(IEEE 1789)=0.000(100Hz), Pst LM = 0.013, SVM = 0.004, (The above parameters are obtained from testing the panel lights)
Input parameters	
Rated input voltage range	200-240VAC 200-240VDC
Input voltage range	180-264VAC 180-264VDC
Input voltage shock	<380 V AC
Input current	<0.14A (Rated input voltage)
Input frequency	0/50/60Hz
Input PF/Input DF(typ.)	PF:0.97, DF: 0.97, see the electrical values below for details
Input THD(typ.)	7.5%, see the electrical values below for details
Efficiency(typ.)	86%, see the electrical values below for details
In-rush current(typ.)	7.175A peak, 138us duration(50 % Ipeak), see the description below for details
Start/Switchover/Turn off	<0.5s(AC start), <0.5s(DC start), <0.3s(AC/DC switchover), <0.5s(Turn off)
Switching cycles	> 100,000 switching cycles
Power consumption(typ.)	Full load(Pin):27.2W, No load(Pno): N/A, On stand-by(Psb): <0.5W, Network stand-by(Pnet): N/A
Safety	
Withstand voltage	I/P-O/P:3750VAC(LED, DIM port must be short-circuited), I/P-FG:1750VAC, O/P-FG:500VAC, I/P-DIM:1500V AC, O/P-DIM: 1500V AC.
Mains surge capability	L-N:2KV, L-FG/N-FG:4KV(90°/270°, 5 times each with an interval of 60s)(Performance criterion:B)
Leakage current(typ.)	0.38mA
Isolation resistance	I/P-O/P:100MΩ/500Vdc/25°C/70% RH
Control interface	
DALI dimming port	N/A
pushDIM dimming port	N/A
1-10V 3in1 dimming port	Voltage range:0-10V, interface current consumption: <1mA
Auxiliary power supply	N/A
Dimming range	(1-4)%-100%(The minimum current within the rated output current range is 6mA)
Dimming drive mode	AM(amplitude modulation)
Emergency support	
Central emergency system	Supported
Self-contained emergency	Supported
Environment & Life time	
Operating temperature	Ta=-20-60°C
Case temperature	Tc=80°C
Operating humidity	5-85% RH, not condensed
Storage temp./humidity	-40-80°C, 5-85% RH, not condensed
IP grade	IP65
MTBF	500,000H, MIL-HDBK-217F(25°C)
Life-time	Nominal life-time up to 100,000 h, see the description below for details
Vibration resistant	10~500Hz, 5G 12min./1cycle, period for 72min. each along X,Y,Z axes
Acoustic Noise	<25dB(30cm, Normal operation)
Environmental protection	RoHS
Certifications and standards	
Certification	CE, ENEC, UKCA, RCM, EL
Safety	EN61347-1, EN61347-2-13, EN62384
EMC	EN55015, EN61000-3-2, EN61000-3-3, EN61000-4-2, 3, 4, 5, 6, 8, 11, EN61547
DALI-2	N/A
EL	Compatible IEC 61347-2-13 Annex J, compatible with EN 60598-2-22 and EN 50172
RF	N/A

Remarks

1. By default, all parameter are measured at 230VAC input, 50Hz, full load and 25°C of ambient temperature.

Technical data

Product model	BK-MML040-A1100AMP
Output parameters	
Regulation method	Constant Current
Rated output current range	0.5-1.1A, see the operating window for details
Rated output voltage range	24-42VDC, see the operating window for details
Rated output power	42W Max, see the operating window for details
Output current adjustment	EasySet Programming
Output current ripple(typ.)	±2%(100Hz)
Output current accuracy	±1%
Linear regulation	±1%
Load regulation	±1%
No load output voltage	60VDC
Flicker-free(typ.)	Flickering percent(IEEE 1789)=0.279%(100Hz), Flicker index(IEEE 1789)=0.000(100Hz), Pst LM = 0.037, SVM = 0.004, (The above parameters are obtained from testing the panel lights)
Input parameters	
Rated input voltage range	200-240VAC 200-240VDC
Input voltage range	180-264VAC 180-264VDC
Input voltage shock	<380 V AC
Input current	<0.24A (Rated input voltage)
Input frequency	0/50/60Hz
Input PF/Input DF(typ.)	PF:0.98, DF: 0.98, see the electrical values below for details
Input THD(typ.)	7% , see the electrical values below for details
Efficiency(typ.)	87% , see the electrical values below for details
In-rush current(typ.)	7.56A peak ,182us duration(50 % Ipeak), see the description below for details
Start/Switchover/Turn off	<0.5s(AC start), <0.5s(DC start), <0.3s(AC/DC switchover), <0.5s(Turn off)
Switching cycles	> 100,000 switching cycles
Power consumption(typ.)	Full load(Pin):48.5W, No load(Pno): N/A, On stand-by(Psb) : <0.5W, Network stand-by(Pnet) : N/A
Safety	
Withstand voltage	I/P-O/P:3750VAC(LED,DIM port must be short-circuited), I/P-FG:1750VAC, O/P-FG:500VAC , I/P-DIM:1500V AC, O/P-DIM: 1500V AC.
Mains surge capability	L-N:2KV, L-FG/N-FG:4KV(90°/270° , 5 times each with an interval of 60s)(Performance criterion:B)
Leakage current(typ.)	0.36mA
Isolation resistance	I/P-O/P:100MΩ/500Vdc/25°C/70% RH
Control interface	
DALI dimming port	N/A
pushDIM dimming port	N/A
1-10V 3in1 dimming port	Voltage range:0-10V, interface current consumption: <1mA
Auxiliary power supply	N/A
Dimming range	(1-2)%-100%(The minimum current within the rated output current range is 10mA)
Dimming drive mode	AM(amplitude modulation)
Emergency support	
Central emergency system	Supported
Self-contained emergency	Supported
Environment & Life time	
Operating temperature	Ta=-20-60°C
Case temperature	Tc=80°C
Operating humidity	5-85% RH, not condensed
Storage temp./humidity	-40-80°C, 5-85% RH, not condensed
IP grade	IP65
MTBF	500,000H, MIL-HDBK-217F(25°C)
Life-time	Nominal life-time up to 100,000 h, see the description below for details
Vibration resistant	10~500Hz, 5G 12min./1cycle, period for 72min. each along X,Y,Z axes
Acoustic Noise	<25dB(30cm, Normal operation)
Environmental protection	RoHS
Certifications and standards	
Certification	CE, ENEC, UKCA, RCM, EL
Safety	EN61347-1, EN61347-2-13, EN62384
EMC	EN55015, EN61000-3-2 , EN61000-3-3, EN61000-4-2,3,4,5,6,8,11, EN61547
DALI-2	N/A
EL	Compatible IEC 61347-2- 13 Annex J , compatible with EN 60598-2-22 and EN 50172
RF	N/A

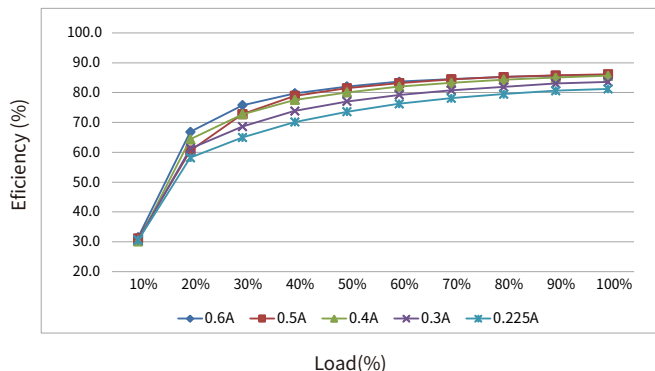
Remarks

1.By default, all parameter are measured at 230VAC input, 50Hz, full load and 25°C of ambient temperature.

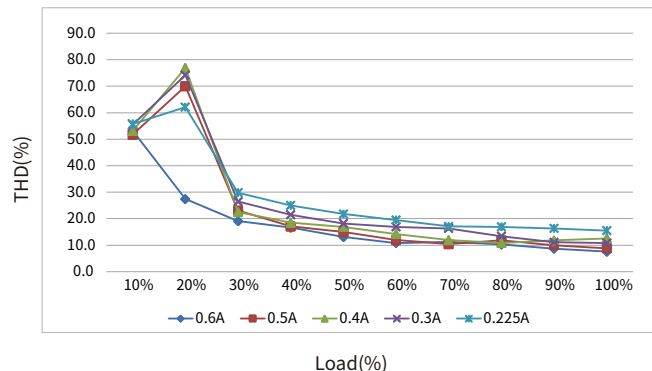
Electrical values

BK-MML022-A0600AMP

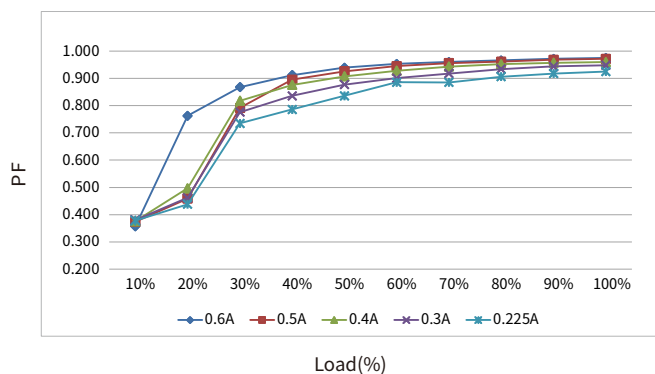
Efficiency vs load



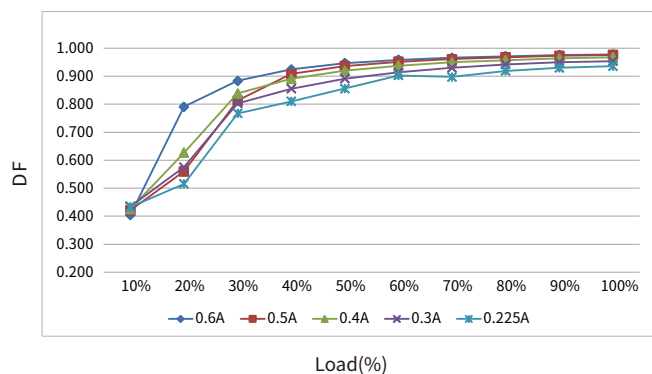
THD vs. Load



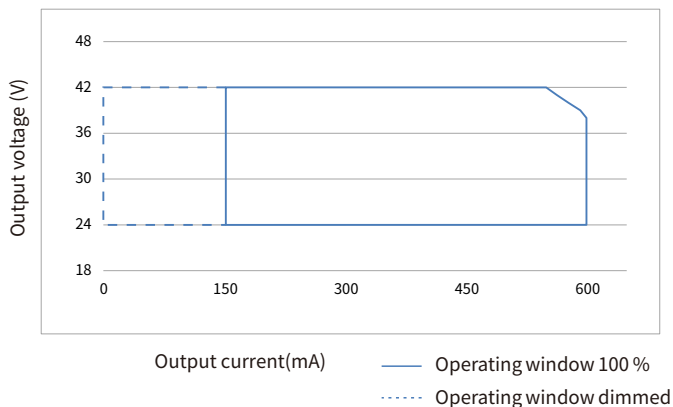
Power factor vs. Load



Displacement factor vs. Load



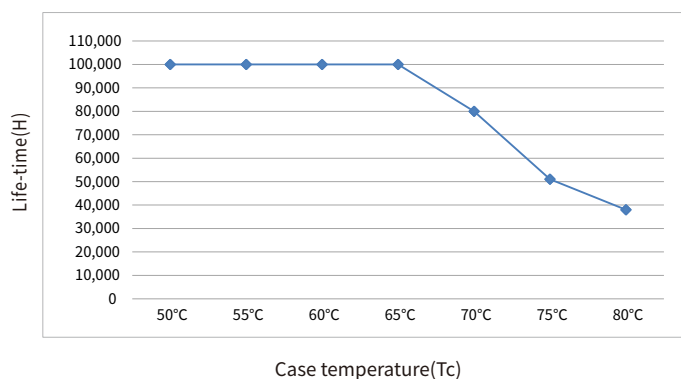
Operating window



- Output voltage x output current = output power
- The minimum current step is 1mA, the minimum voltage step is 1V, the voltage range is 24-42V, the current range is 150-600mA, and the voltage and current can be set arbitrarily under the premise that the output power does not exceed 23.1W.

Expected life-time

Life-time vs. case temperature

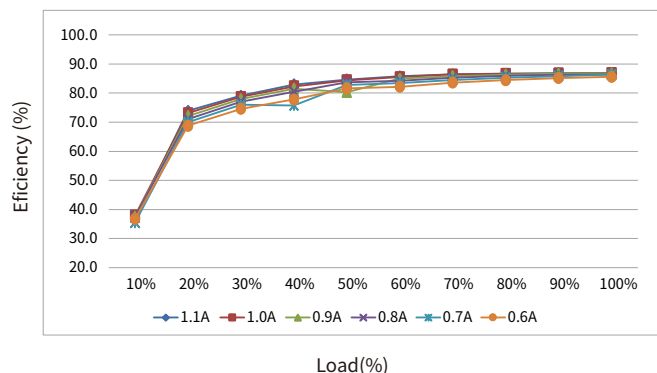


- The life-time of the LED driver is shown in the figure above (calculated based on the 90% survival rate).
- The relation of t_c to t_a temperature depends also on the luminaire design.

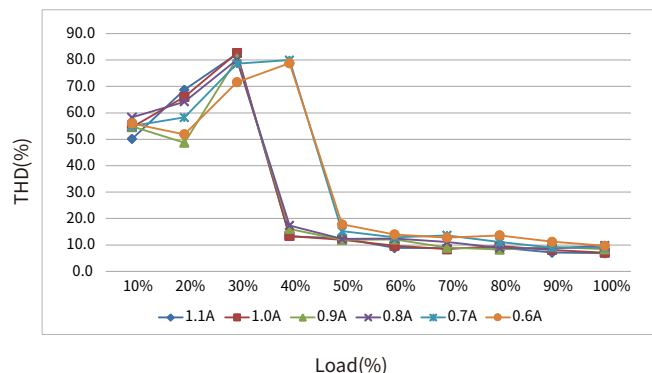
Electrical values

BK-MML040-A1100AMP

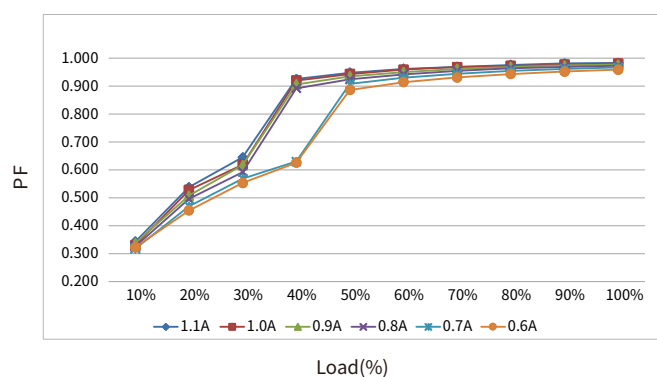
Efficiency vs load



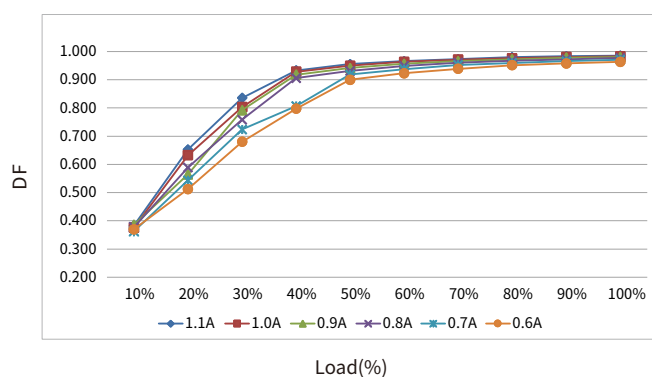
THD vs. Load



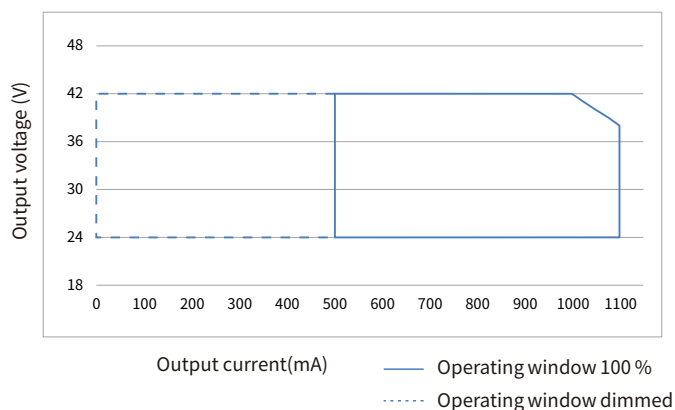
Power factor vs. Load



Displacement factor vs. Load



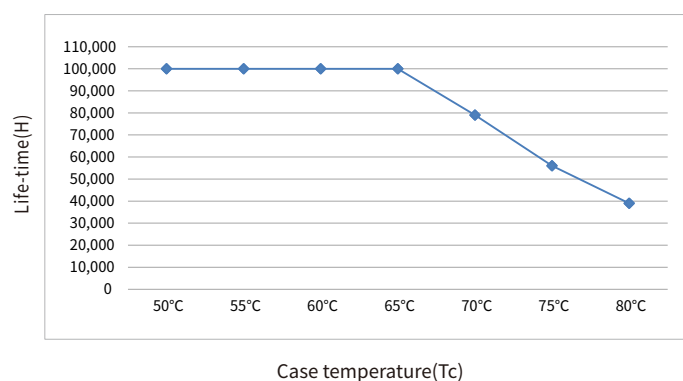
Operating window



- Output voltage x output current = output power
- The minimum current step is 1mA, the minimum voltage step is 1V, the voltage range is 24-42V, the current range is 500-1100mA, and the voltage and current can be set arbitrarily under the premise that the output power does not exceed 42W.

Expected life-time

Life-time vs. case temperature



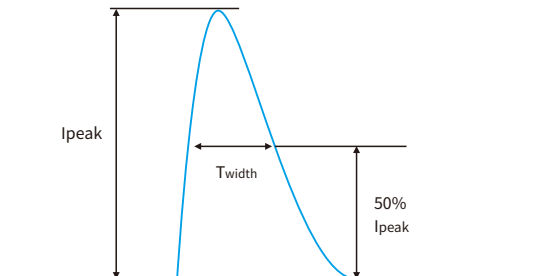
- The life-time of the LED driver is shown in the figure above (calculated based on the 90% survival rate).
- The relation of tc to ta temperature depends also on the luminaire design.

Surge

Model	Ipeak	Twidth	Condition	Relative number of MCB/pcs															
				B10	B13	B16	B20	B25	C10	C13	C16	C20	C25	D10	D13	D16	D20	D25	
BK-MML022-A	7.175A	138us	AC 230V,Full load, Cold start,Ta≤30°C, MCB is not installed side by side	56	73	90	112	141	56	73	90	112	141	56	73	90	112	141	
BK-MML040-A	7.56A	182us		37	48	59	74	92	37	48	58	74	92	37	48	59	74	92	

Remarks

- The number of drives mounted under different MCBs in the table is the maximum value. Please do not exceed this number during installation.
- Calculation uses typical values from ABB series S200 as a reference.
- Different brands and models of miniature circuit breakers, the number of drives mounted will be slightly different.
- If the ambient temperature of the MCB installation exceeds 30°C or multiple MCBs are installed side by side, the number of drives mounted will be reduced and the calculation needs to be recalculated.
- Electrician's usually consider Type B for household lighting and Type C for commercial lighting application.



Functions

Output short-circuit behaviour

- Output short-circuit will not damage the driver.
- After removing the short circuit fault, the driver will automatically resume output.

Output no-load operation

- Output no-load will not damage the driver.
- Please turn off the driver first if you need to connect the LED load.

Output overload protection

- The LED driver turns off the output if the output voltage range is exceeded.
- The output will be activated again after restart the LED driver.

Driver restart method

There are two ways to restart the driver:

- Through the AC input: disconnect the AC of the driver and power it again.
- Through dimming interface.
- 1-10V: first adjust the output voltage of the dimmer to 0.9V or below, then adjust it to 1V or above.

Adjustable output current (AOC)

- The output current of the driver can be adjusted within a certain range, and can be selected through the EasySet configuration software.

Configuration programming(EasySet)

- The programming configuration of the driver is realized using the BOKE EasySet programming suite and through the driver's 1-10V interface.
- Please see the "Device configuration" section.
- More information about the EasySet programming suite can be found at www.bokedriver.com.

Insulation between circuits

Isolation	Input	Output	Case	DIM
Input	-	Double	Basic	Basic
Output	Double	-	Basic	Basic
Case	Basic	Basic	-	Basic

Label

INPUT

- ACL/DC+ (Brown)
- ACN/DC- (Blue)
- (Green/Yellow)

BOKE Dimmable Constant Current LED Driver
MODEL: BK-MML022-A0600AMP
INPUT: 200-240V $\approx$ 0/50/60Hz 0.14A Max.
 λ : 0.65C-0.95
OUTPUT: 24-42V $\approx$ 0.15-0.6A 23.1W 59VDC Max.
For LED Modules use only
MADE IN CHINA
tc: 80°C • tc
ta: 60°C

OUTPUT

- DIM+/PROG (Blue)
- DIM+/PROG (Brown)
- LED+ (Red)
- LED- (Black)

INPUT

- ACL/DC+ (Brown)
- ACN/DC- (Blue)
- (Green/Yellow)

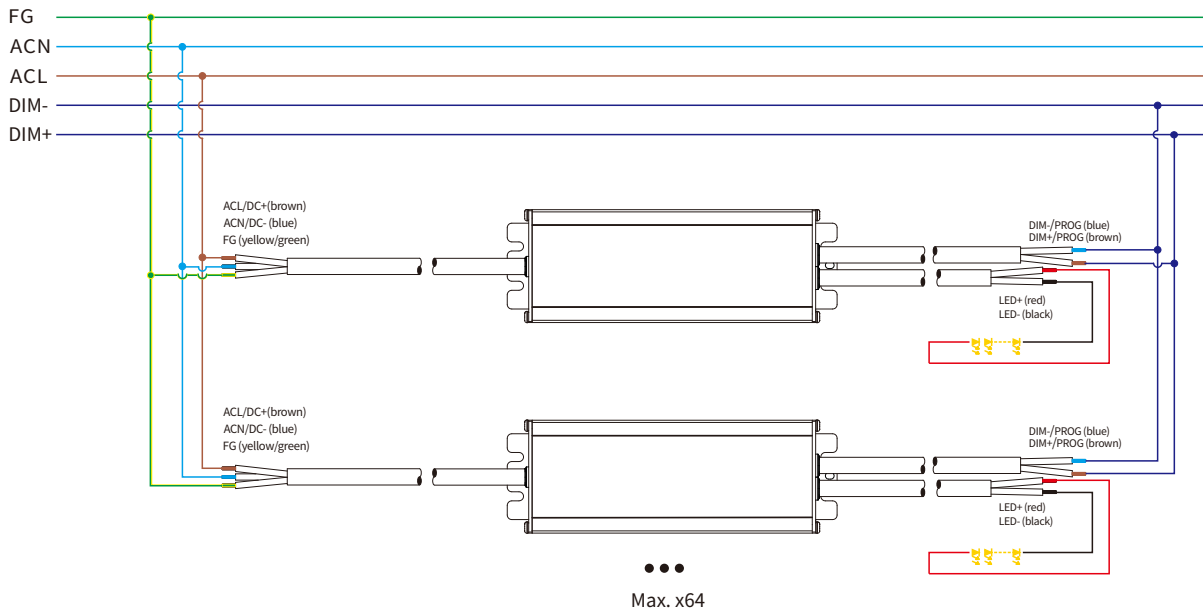
BOKE Dimmable Constant Current LED Driver
MODEL: BK-MML040-A1100AMP
INPUT: 200-240V $\approx$ 0/50/60Hz 0.24A Max.
 λ : 0.8C-0.95
OUTPUT: 24-42V $\approx$ 0.5-1.1A 42W 59VDC Max.
For LED Modules use only
MADE IN CHINA
tc: 80°C • tc
ta: 60°C

OUTPUT

- DIM+/PROG (Blue)
- DIM+/PROG (Brown)
- LED+ (Red)
- LED- (Black)

DALI dimming application

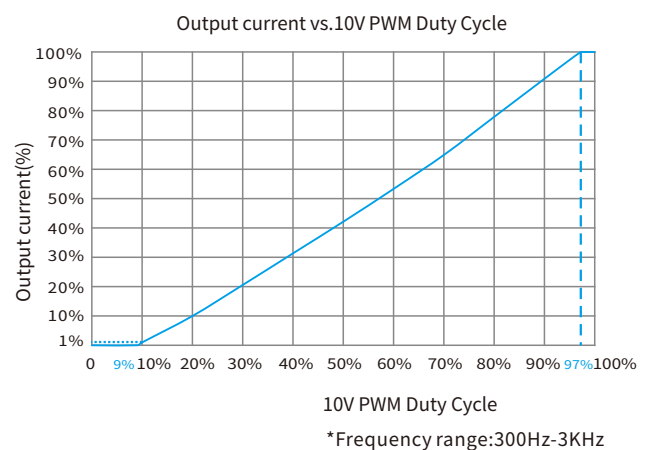
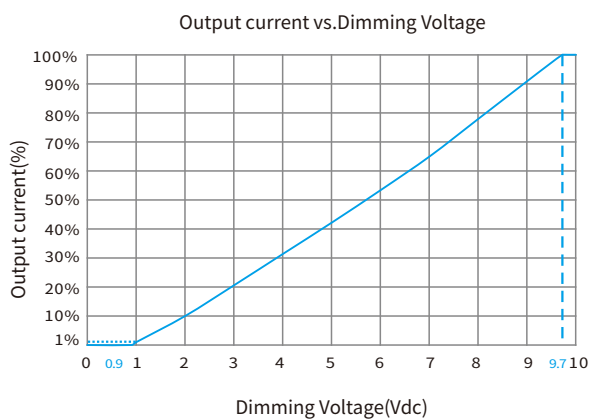
Wiring diagram



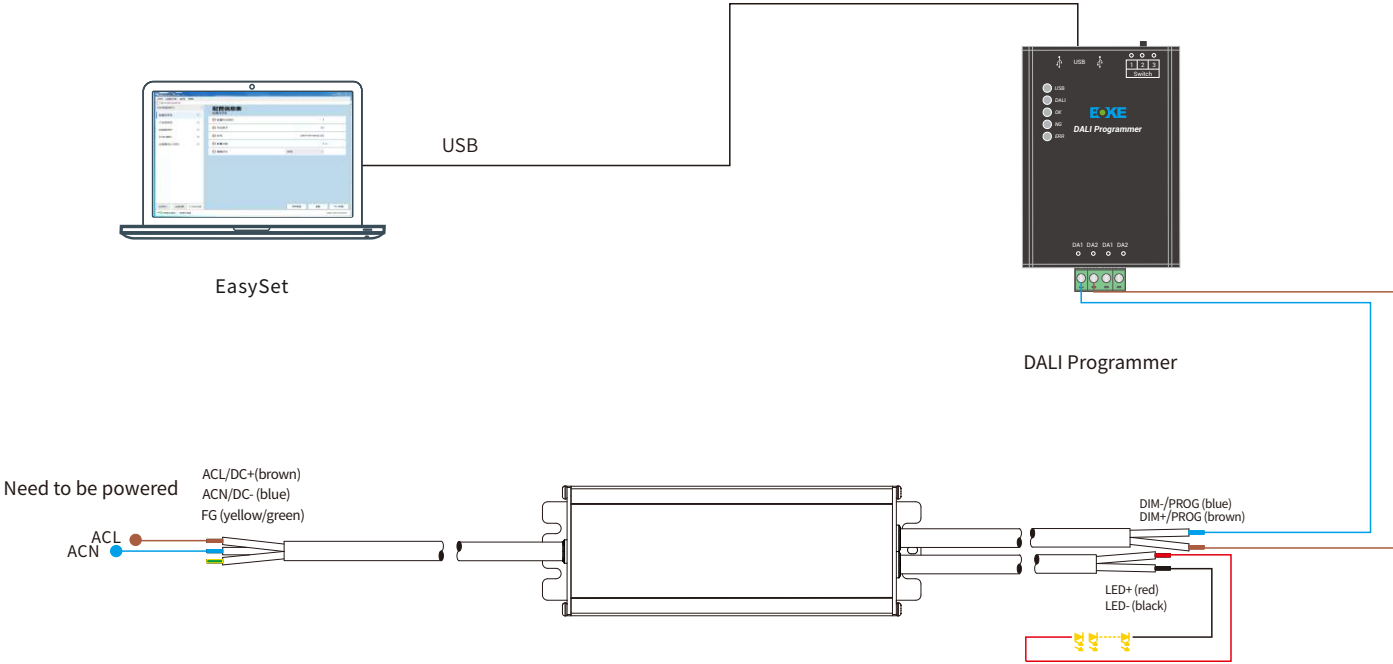
Remarks

- Dimming interface characteristics: 0.9V and below are closed, 1V is the darkest, 10V is the brightest, 1-10V is the dimming range.
- The dimming interface distinguishes between positive and negative, DIM is positive, GND is negative, please do not reverse.
- Dimming interface does not support voltage access higher than 15V, otherwise it will cause damage to the internal components.
- When the dimming interface is open, the driver outputs the maximum current. When the interface is short-circuited, the current output is closed.
- When multiple synchronous dimming is required, the positive poles of the dimming interface of each driver are connected together, and the negative poles are connected together.
- Support passive dimmer or isolated active dimmer dimming, does not support non-isolated active dimmer dimming.
- In general, it is recommended that the number of mounted drives does not exceed 30pcs, and the wiring length does not exceed 100m.
- It is recommended that the dimming wires should not be lower than the 22AWG wire.
- Do not put the dimming wires with high voltage or interference sources. If it is unavoidable, please use the shielded wires.
- If you need a drive with 0-10V dimming characteristics, please contact BOKE.

Dimming curve



Device configuration



Software download(PC)



Note:PC supports Windows 7/Windows 10/Windows 11 32bit/64bit.

Device configuration

Configure tools and software

Type	Name	Brand	Name	Minimum version
Programmer	DALI programmer	BOKE	BK-CS01-SDL	V1.0.0
Software	PC Software	BOKE	BOKE EasySet	V1.0.0

Parameters configure

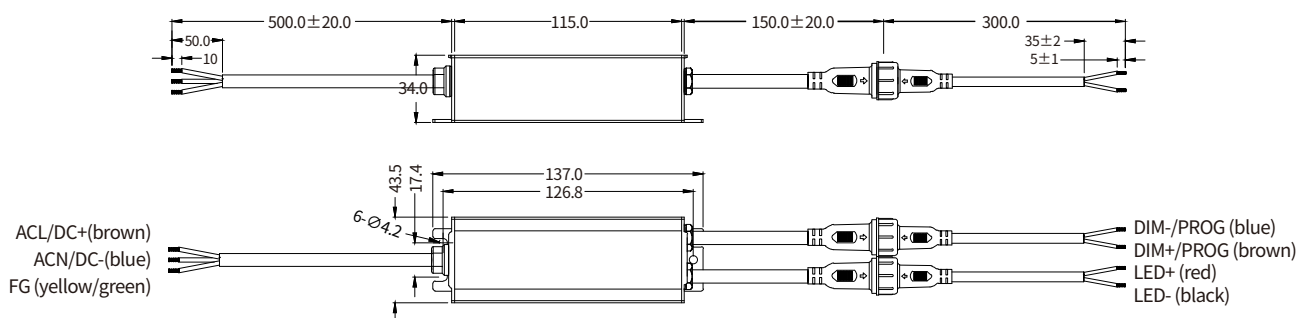
Configuration items	Factory settings	Parameter configuration	Read/Wirte
Product information	-	NO	Read Only
Adjustable output current(AOC)	Activated	YES	Read/Wirte
Hot plug-in protection(HPP)	Activated	YES	Read/Wirte

Installation

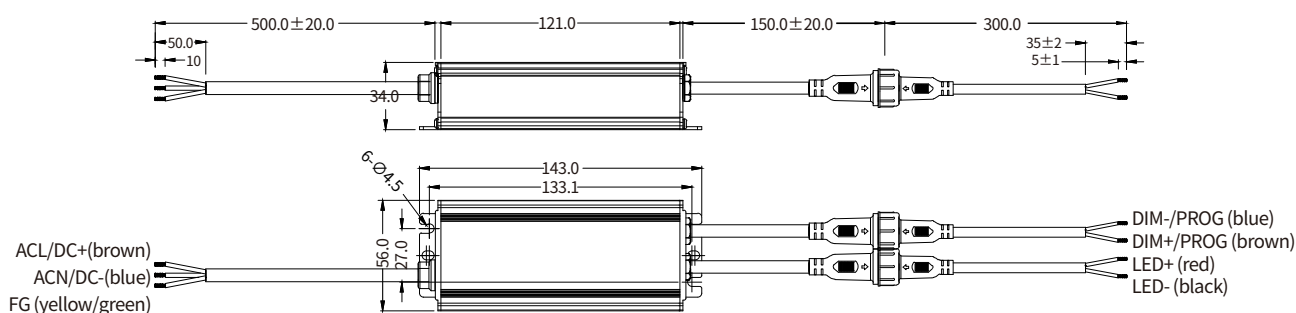
Mechanical dimensions

Unit:mm

MML022-A



MML040-A



INPUT

Function	Colour	Wire specification
ACL/DC+,ACN/DC-,FG	brown,blue,yellow/green	1.0mm ² *3; H05RN-F; Rubber wire,The outer skin is black, and the inner package is brown, blue, yellow / green three core wire.

Dimming interface

Function	Ccolour	Wire specification
DIM-/PROG,DIM+/PROG	brown,blue	0.75mm ² *2; H05RN-F; Rubber wire,The outer skin is black, and the inner package is brown and blue two core wire.

OUTPUT

Function	Colour	Wire specification
LED-,LED+	black,red	0.75mm ² *2; H05RN-F; Rubber wire,The outer skin is black, and the inner package is red and black two core wire.

Installation note

Hot plug-in

- Hot plug-in is not supported due to residual output voltage of > 0 V.
- If a LED load is connected the device has to be restarted.
- Restart can be achieved by re-powering the driver or executing a on/off command (action) through the control interface (DALI).

Wiring guidelines

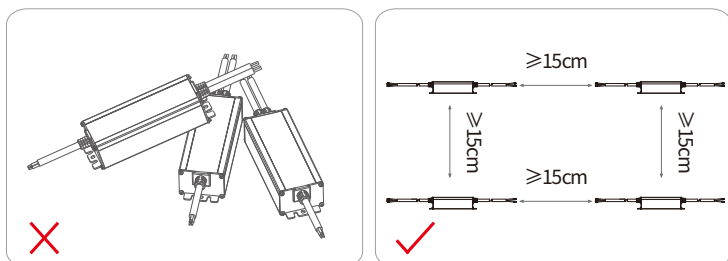
- All connections must be kept as short as possible to ensure good EMI behaviour.
- Mains leads should be kept apart from LED Driver and other leads (ideally 5 – 10 cm distance)
- Max. length of output wires is 2 m.
- Incorrect wiring can damage LED modules.

Replace LED module

1. Mains off
2. Wait more than 5 seconds
3. Remove LED module
4. Connect LED module again

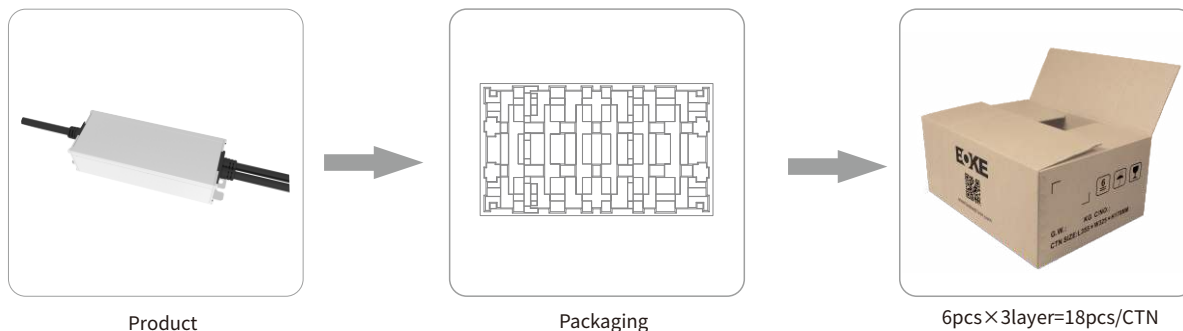
Installation requirements

- The driver should be installed in a dry, acid-free, oil-free, fat-free environment.
- The installation ambient temperature of the driver shall not exceed the value of Ta at any time.
- The temperature of the mounting surface of the driver should be lower than the temperature of Ta.
- The driver should keep a certain distance from the heating stuff (such as the lamp radiator).



Please do not stack the products. The distance between two products should be $\geq 15\text{cm}$ so as not to affect heat dissipation and the lifespan of the products.

Packaging



Model	Product size	Weight	Packaging size	Carton size	Qty/carton	N.W	G.W
MML022-A	L137*W43.5*H34mm	380g	L520*W295*H62mm	L530*W310*H230mm	18pcs	6.84kg	8.81kg
MML040-A	L143*W56*H34mm	495g	L520*W295*H62mm	L530*W310*H230mm	18pcs	8.91kg	10.9kg

Additional information

1. The life and MTBF of the product are for reference only, and do not represent a warranty statement.
2. For more information, please send an email to info@bokedriver.com.