

Constant current independent dimmable driver MUL Series suffix m(Isolation 1-10V/10V PWM/Rx)



Features

- Isolated 1-10V/10V PWM/Rx dimming interface
- 10-level current output can be realized DIP-switch, easier to adjust the luminaire power
- 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 luminaries is the same
- Standby power input<0.5W, meets the ErP requirements of new certification
- High PF, high efficiency, low THD
- Screw-free and pressing type strain relief, easier install
- Independent input and output strain relief, stronger wiring
- Supports 0.75-1.5mm² input wires, stronger wiring
- SELV and Class II design, suitable for use side of the luminaires
- Passed CE, ENEC, UKCA, RCM, EL and other certifications
- IP20 protection grade, indoor use
- 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
- Protective features (short-circuit protection, no-load protection)

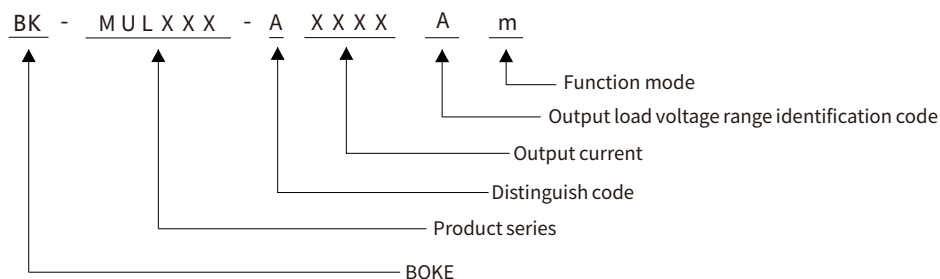
Suitable for lights

- Suitable for luminaries with independent drivers such as downlights, spotlights, panel lights, etc

Typical applications

- LED indoor lighting
- LED office lighting
- LED commercial lighting

Model coding rules of MUL series



Model list

Model	Input voltage	Output power	Output voltage	Output current	Dimension
BK-MUL010-0350Am	200-240VAC/DC	11W MAX.	24-42VDC	0.1-0.35A	L117*W45.5*H24mm
BK-MUL022-0600Am	200-240VAC/DC	23.1W MAX.	24-42VDC	0.225-0.6A	L117*W45.5*H29mm



Technical data

Product model	BK-MUL010-0350Am
Output parameters	
Regulation method	Constant Current
Rated output current range	0.1-0.35A, see the DIP-switch for details
Rated output voltage range	24-42VDC, see the DIP-switch for details
Rated output power	11W Max, see the DIP-switch for details
Output current adjustment	DIP S.W(10 levels)
Output current ripple LF	±2%
Output current accuracy	±5%
Linear regulation	±3%
Load regulation	±3%
No load output voltage	60VDC
Flicker-free(typical)	Flickering percent(IEEE 1789)=0.784%(100Hz), Flicker index(IEEE 1789)=0.001(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	<0.1A (Rated input voltage)
Input frequency	0/50/60Hz
Input PF/Input DF(typical)	PF:0.96, DF:0.97, see the electrical values below for details
Input THD(typical)	7%, see the electrical values below for details
Efficiency(typical)	83%, see the electrical values below for details
In-rush current(typical)	3.8A peak, 162us 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(typical)	Full load(Pin):13.3W, No load(Pno): N/A, On stand-by(Psb): <0.5W, Network stand-by(Pnet): N/A
Safety	
Withstand voltage	I/P-O/P(LED):3750V AC(LED,DIM port must be short-circuited), O/P(LED)-O/P(DIM):1500V AC, I/P-O/P(DIM):1500V AC
Mains surge capability	L-N:2KV(90°/270°, 5 times each with an interval of 60s)(Performance criterion:A)
Leakage current(typical)	0.26mA
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: 0.33mA
Auxiliary power supply	N/A
Dimming range	1%-100%
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=90°C
Operating humidity	5-85% RH, not condensing
Storage temp./humidity	-40-80°C, 5-85% RH, not condensing
IP grade	IP20
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, Full load)
Environmental protection	RoHS
Certifications and standards	
Certification	CE, ENEC, RCM, UKCA, CCC, EL
Safety	GB/T 19510.1, GB/T 19510.213, EN61347-1, EN61347-2-13, EN62384
EMC	GB/T 17743, GB17625.1, 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.
- 2.The driver can not be installed inside the luminaire. when the driver is used with the luminaire, the EMC of the whole luminaire needs to be tested.

Technical data

Product model	BK-MUL022-0600Am
Output parameters	
Regulation method	Constant Current
Rated output current range	0.225-0.6A, see the DIP-switch for details
Rated output voltage range	24-42VDC, see the DIP-switch for details
Rated output power	23.1W Max, see the DIP-switch for details
Output current adjustment	DIP S.W(10 levels)
Output current ripple LF	±2%
Output current accuracy	±5%
Linear regulation	±3%
Load regulation	±3%
No load output voltage	60VDC
Flicker-free(typical)	Flickering percent(IEEE 1789)=0.579%(100Hz), Flicker index(IEEE 1789)=0.001(100Hz), Pst LM = 0.014, SVM = 0.007, (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	<0.18A (Rated input voltage)
Input frequency	0/50/60Hz
Input PF/Input DF(typical)	PF:0.97, DF:0.98, see the electrical values below for details
Input THD(typical)	8%, see the electrical values below for details
Efficiency(typical)	85.5%, see the electrical values below for details
In-rush current(typical)	6.68A peak, 202us 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(typical)	Full load(Pin):27W, No load(Pno): N/A, On stand-by(Psb): <0.5W, Network stand-by(Pnet): N/A
Safety	
Withstand voltage	I/P-O/P(LED):3750V AC(LED,DIM port must be short-circuited), O/P(LED)-O/P(DIM):1500V AC, I/P-O/P(DIM):1500V AC
Mains surge capability	L-N:2KV(90°/270°, 5 times each with an interval of 60s)(Performance criterion:B)
Leakage current(typical)	0.31mA
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: 0.33mA
Auxiliary power supply	N/A
Dimming range	1%-100%
Dimming drive mode	AM(amplitude modulation)
Emergency support	
Central emergency system	Supported
Self-contained emergency	Supported
Environment & Life time	
Operating temperature	Ta=-20-45°C
Case temperature	Tc=90°C
Operating humidity	5-85% RH, not condensing
Storage temp./humidity	-40-80°C, 5-85% RH, not condensing
IP grade	IP20
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, Full load)
Environmental protection	RoHS
Certifications and standards	
Certification	CE, ENEC, RCM, UKCA, CCC, EL
Safety	GB/T 19510.1, GB/T 19510.213, EN61347-1, EN61347-2-13, EN62384
EMC	GB/T 17743, GB17625.1, 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

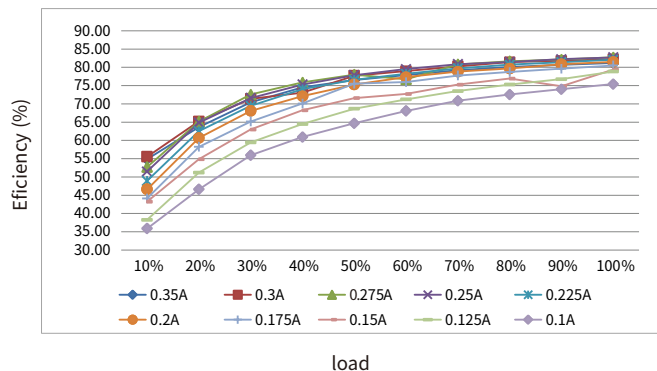
Remarks

- 1.By default, all parameter are measured at 230VAC input, 50Hz, full load and 25°C of ambient temperature.
- 2.The driver can not be installed inside the luminaire. when the driver is used with the luminaire, the EMC of the whole luminaire needs to be tested.

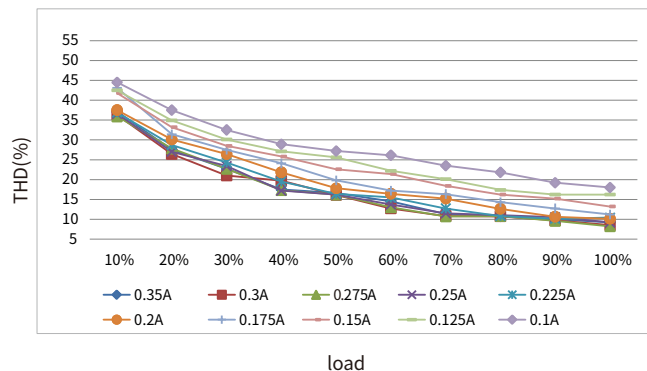
Electrical values

BK-MUL010-0350Am

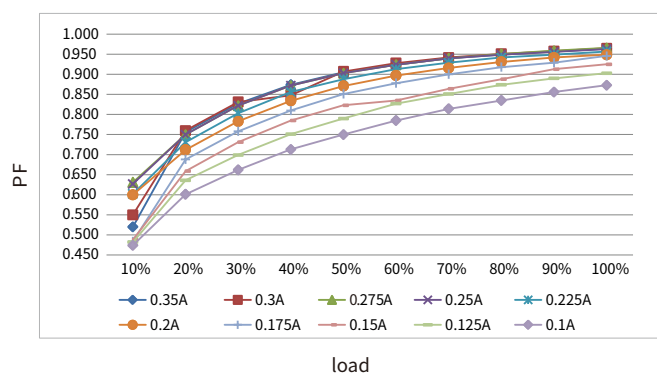
Efficiency vs load



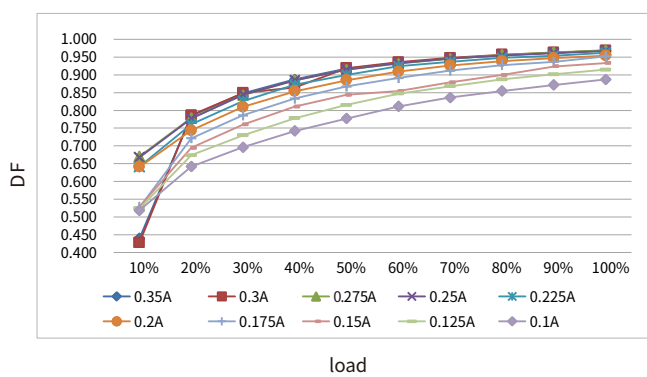
THD vs. load



Power factor vs. Voltage



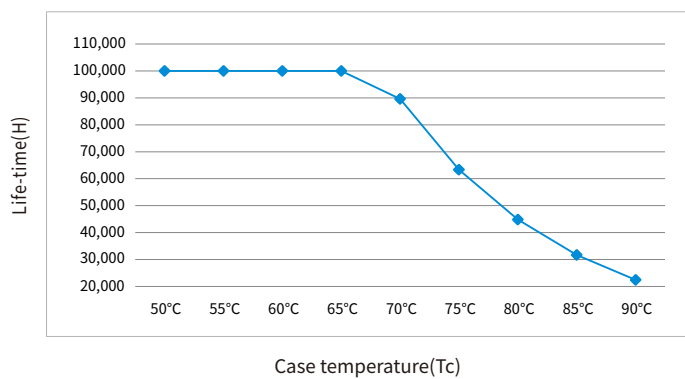
Displacement factor vs. Voltage



Expected life-time

BK-MUL010-0350Am

Life-time vs. case temperature

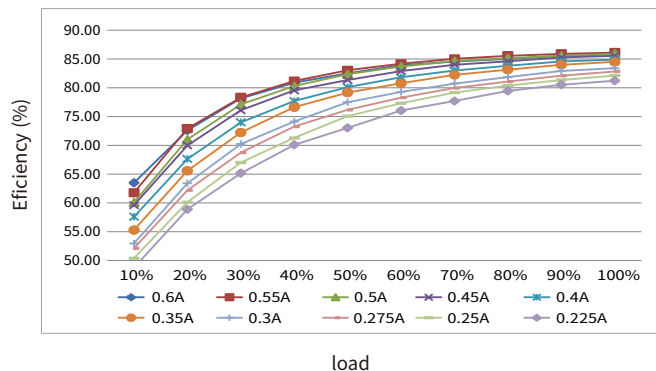


- The life-time of the LED driver is shown in the figure above (calculated based on the 90% survival rate).
- The relation of t_c to t_a temperature depends also on the luminaire design.

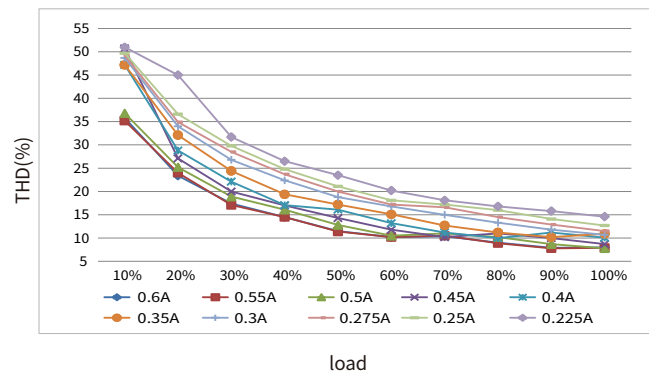
Electrical values

BK-MUL022-0600Am

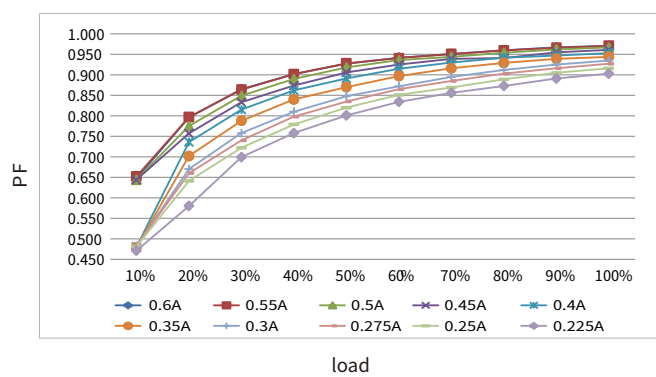
Efficiency vs load



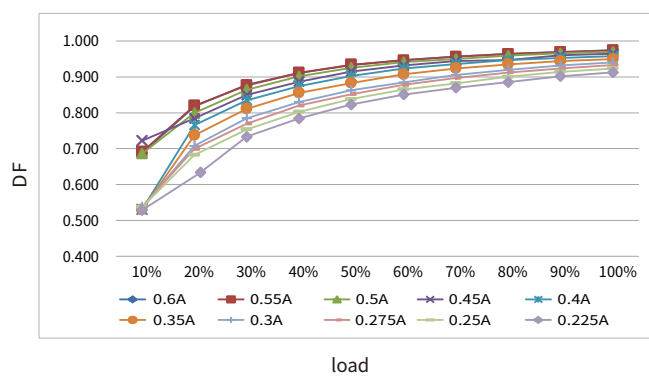
THD vs. load



Power factor vs. Voltage

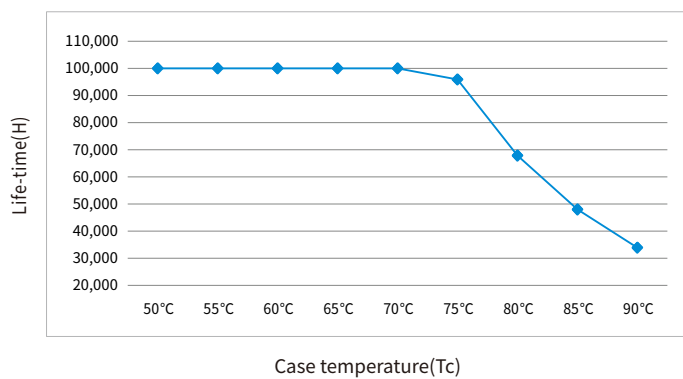


Displacement factor vs. Voltage



Expected life-time

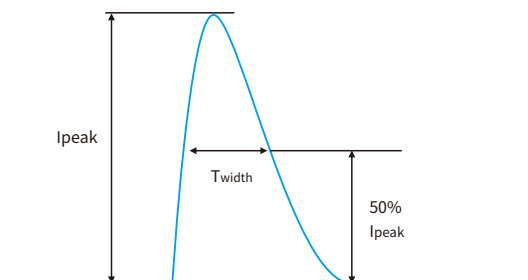
Life-time vs. case temperature



- 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.

Surge

Model	Ipeak	Twidth	Condition	Relative number of MCB															
				B10	B13	B16	B20	B25	C10	C13	C16	C20	C25	D10	D13	D16	D20	D25	
BK-MUL010-0350Am	3.8A	162us	AC 230V,Full load, Cold start,Ta≤30°C, MCB is not installed side by side	102	133	164	204	256	122	159	195	244	305	122	159	195	244	305	
BK-MUL022-0600Am	6.68A	202us		56	59	73	91	114	58	76	93	117	146	58	76	93	117	146	



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.

Insulation between circuits

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

DIP-switch & output current

BK-MUL010-0350Am

Pin(W) typ.	Output						
	Prated(w)	Irated(mA)	Voltage(Vdc)	1	2	3	4
5.57	4.20	100	24-42	--	ON	ON	ON
6.66	5.25	125	24-42	ON	--	ON	ON
7.94	6.30	150	24-42	--	--	ON	ON
9.13	7.35	175	24-42	--	ON	--	ON
10.3	8.40	200	24-42	--	--	--	ON
11.5	9.45	225	24-42	ON	ON	ON	--
12.6	10.5	250	24-42	--	--	ON	--
13.2	11.0	275	24-40	--	ON	--	--
13.1	10.8	300	24-36	ON	--	--	--
12.9	10.5	350 ★	24-30	--	--	--	--

BK-MUL022-0600Am

Pin(W) typ.	Output						
	Prated(w)	Irated(mA)	Voltage(Vdc)	1	2	3	4
11.6	9.45	225	24-42	--	ON	ON	ON
12.7	10.50	250	24-42	ON	--	ON	ON
13.9	11.55	275	24-42	--	--	ON	ON
15.1	12.60	300	24-42	--	ON	--	ON
17.4	14.70	350	24-42	--	--	--	ON
19.7	16.80	400	24-42	ON	ON	ON	--
22.0	18.90	450	24-42	--	--	ON	--
24.4	21.00	500	24-42	--	ON	--	--
26.8	23.10	550	24-42	ON	--	--	--
26.5	22.80	600 ★	24-38	--	--	--	--

Remarks:

- ★ It means that this item is the factory default current.
- It means that this channel is OFF.

Label

BOKE Dimmable Constant Current LED Driver
MODEL: BK-MUL010-0350Am
 INPUT: 200-240V $\approx$ 0/50/60Hz 0.1A Max. λ : 0.82C-0.96
 OUTPUT: 24-30V $\approx$ 350mA 10.5W 60VDC Max.
 Other ratings see selection sheet
 For LED Modules use only
 www.bokedriver.com
 MADE IN CHINA

■ ACL/DC+
 ■ ACN/DC-
 wire prep. 0.75-1.5mm²

Preparation for input and output
 8-9mm

15mm
 26mm Bottom

tc:90°C
 ta:60°C

25 10V

CE UKCA

0/1...10VDC
 PWM signal
 RO...100K Ω

DIM- ■
 DIM+ ■
 LED- ■
 LED+ ■

wire prep. 0.5-1.0mm²

Switching selection sheet

Pin(W) typ.	Output			Switch			
	Prated(w)	Irated(mA)	Voltage(Vdc)	1	2	3	4
5.57	4.20	100	24-42	--	ON	ON	ON
6.66	5.25	125	24-42	ON	--	ON	ON
7.94	6.30	150	24-42	--	--	ON	ON
9.13	7.35	175	24-42	--	ON	--	ON
10.3	8.40	200	24-42	--	--	--	ON
11.5	9.45	225	24-42	ON	ON	ON	--
12.6	10.5	250	24-42	--	--	ON	--
13.2	11.0	275	24-40	--	ON	--	--
13.1	10.8	300	24-36	ON	--	--	--
12.9	10.5	350	24-30	--	--	--	--

For Australia and New Zealand, "the marking label with"

FREE SELV

RGHS

Before use, always check dipswitch settings!

BOKE Dimmable Constant Current LED Driver
MODEL: BK-MUL022-0600Am
 INPUT: 200-240V $\approx$ 0/50/60Hz 0.18A Max. λ : 0.86C-0.96
 OUTPUT: 24-38V $\approx$ 600mA 22.8W 60VDC Max.
 Other ratings see selection sheet
 For LED Modules use only
 www.bokedriver.com
 MADE IN CHINA

■ ACL/DC+
 ■ ACN/DC-
 wire prep. 0.75-1.5mm²

Preparation for input and output
 8-9mm

15mm
 26mm Bottom

tc:90°C
 ta:45°C

25 10V

CE UKCA

0/1...10VDC
 PWM signal
 RO...100K Ω

DIM- ■
 DIM+ ■
 LED- ■
 LED+ ■

wire prep. 0.5-1.0mm²

Switching selection sheet

Pin(W) typ.	Output			Switch			
	Prated(w)	Irated(mA)	Voltage(Vdc)	1	2	3	4
11.6	9.45	225	24-42	--	ON	ON	ON
12.7	10.50	250	24-42	ON	--	ON	ON
13.9	11.55	275	24-42	--	--	ON	ON
15.1	12.60	300	24-42	--	ON	--	ON
17.4	14.70	350	24-42	--	--	--	ON
19.7	16.80	400	24-42	ON	ON	ON	--
22.0	18.90	450	24-42	--	--	ON	--
24.4	21.00	500	24-42	--	ON	--	--
26.8	23.10	550	24-42	ON	--	--	--
26.5	22.80	600	24-38	--	--	--	--

For Australia and New Zealand, "the marking label with"

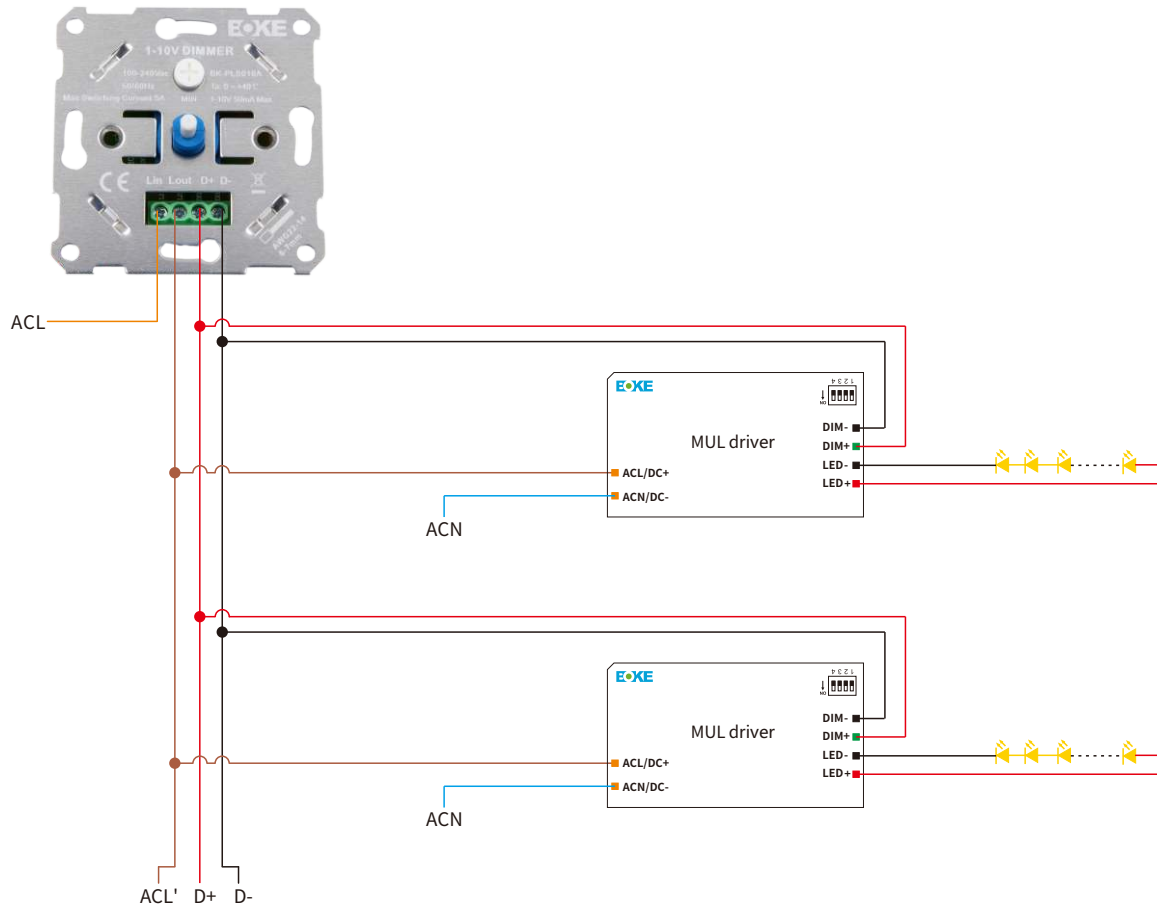
FREE SELV

RGHS

Before use, always check dipswitch settings!

1-10V/10V PWM dimming application

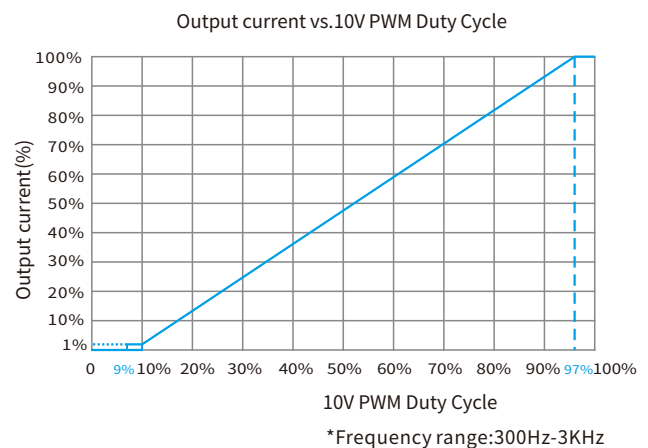
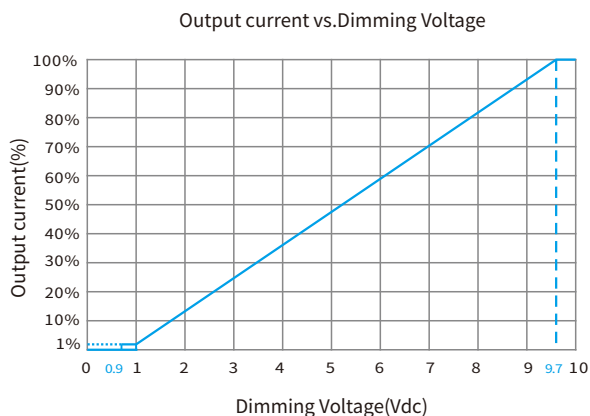
Wiring diagram



Remarks

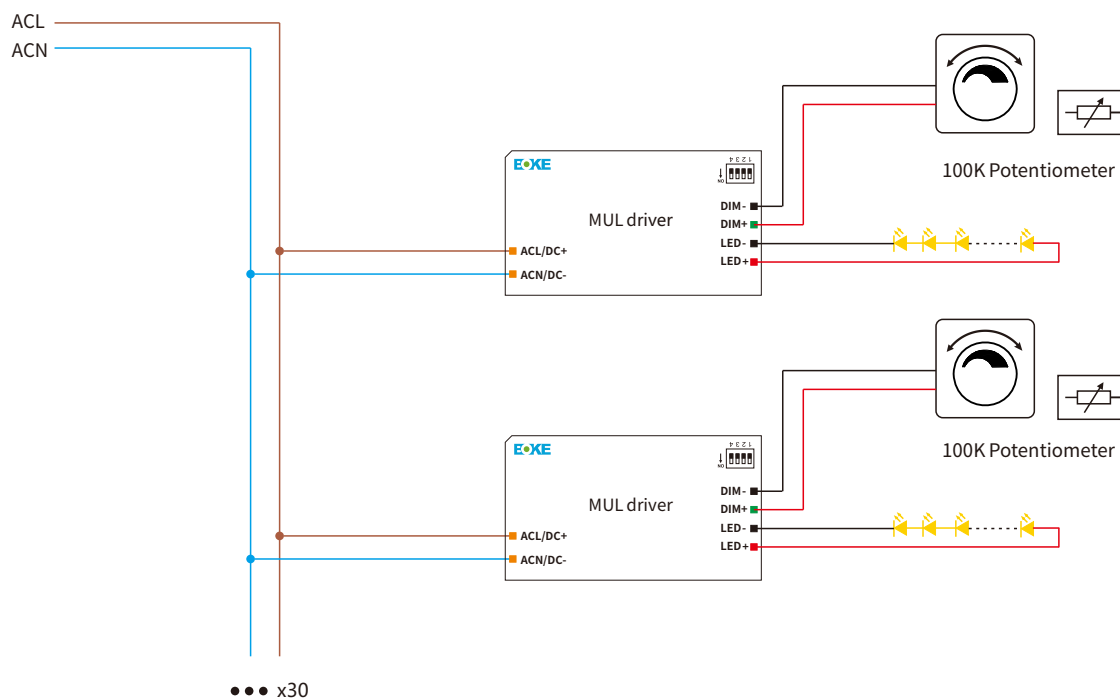
- Dimming interface characteristics: 0.9V and below are closed, 1V is the darkest, 10V is the brightest, 1-10V is the dimming range.
- The dimming interface distinguishes between positive and negative, DIM+ is positive, DIM- is negative, please do not reverse.
- Dimming interface does not support voltage 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



100K potentiometer dimming application

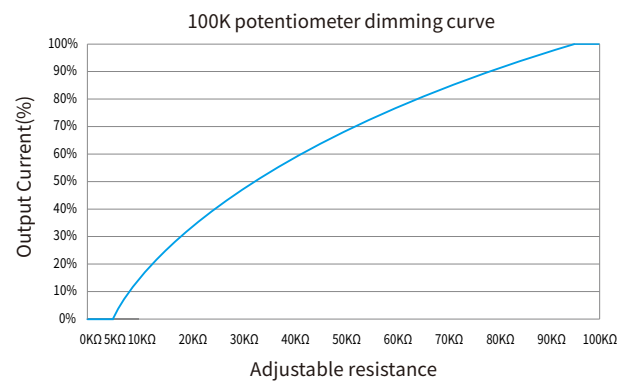
Wiring diagram



Remarks

- In the 100K potentiometer dimming mode, the potentiometer can only be connected to one driver.

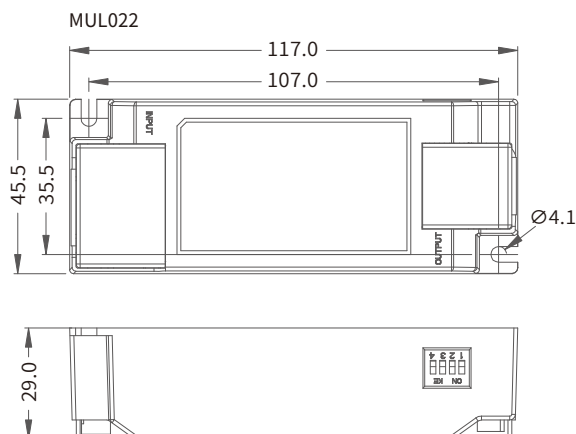
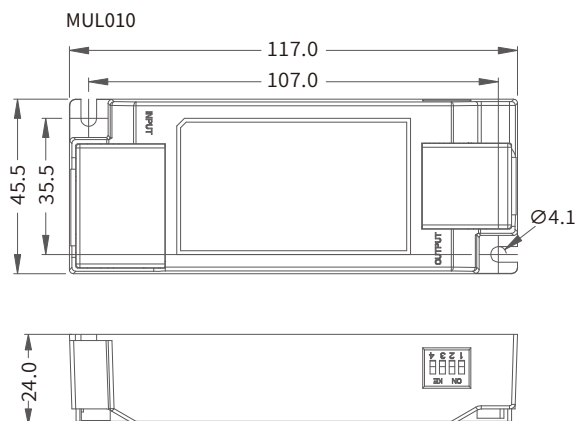
Dimming curve



Installation

Mechanical dimensions

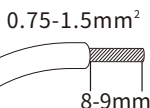
Unit:mm



INPUT

Numbering	function	colour
1	ACL/DC+	orange
2	ACN/DC-	orange

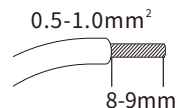
Input wire



OUTPUT

Numbering	function	colour
1	DIM-	black
2	DIM+	green
3	LED+	red
4	LED-	black

Output wire



Installation note

Hot plug-in

- Hot plug-in is not supported due to residual output voltage of > 0 V.

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.

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 luminaire radiator).
- If the driver is used externally (it needs to be used with the accessories), the installation of the driver should also meet the following conditions:
 - 1.The driver should be a certain distance between the drivers, as shown in Figure 1.
 - 2.The driver keeps a certain distance from surrounding objects, as shown in Figure 2.

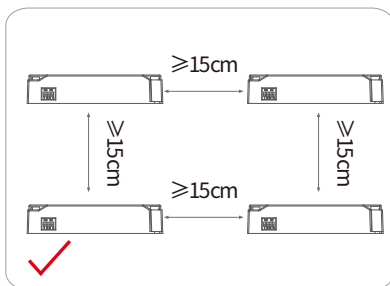
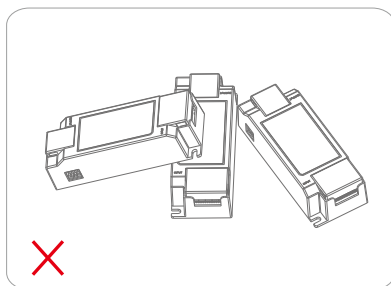


Figure 1

Replace LED module

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

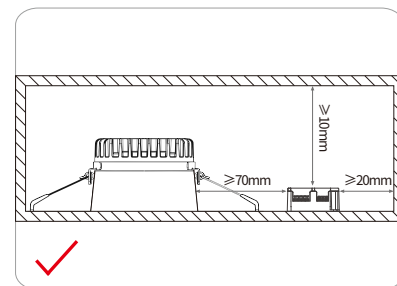
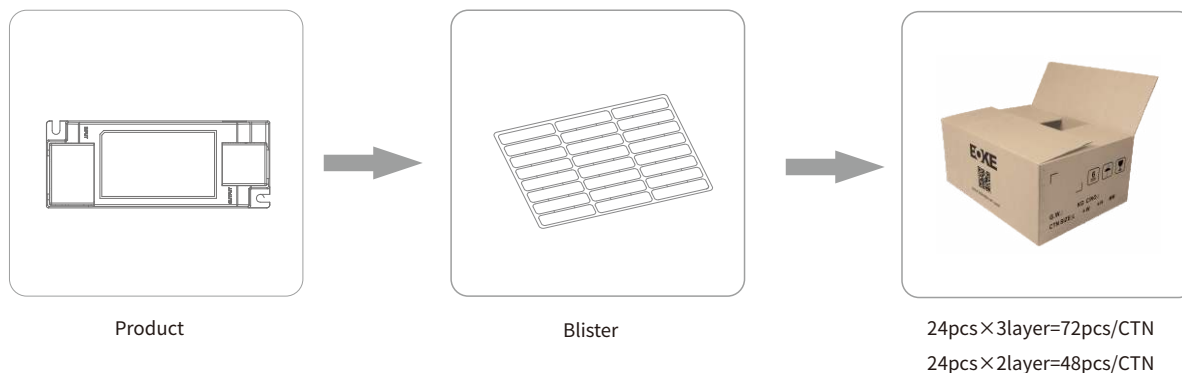


Figure 2

Packaging

Optional 1: factory default



Model	Product size	Weight	Blister size	Carton size	Qty/carton	N.W	G.W
MUL010	L117*W45.5*H24mm	85g	L430*W340*H47mm	L450*W350*H180mm	72pcs	6.12kg	7.70kg
MUL022	L117*W45.5*H29mm	102g	L430*W340*H47mm	L450*W350*H180mm	72pcs	7.34kg	8.51kg

Optional 2:



Model	Product size	Weight	Packaging size	Carton size	Qty/carton	N.W	G.W
MUL010	L117*W45.5*H24mm	85g	L140*W35*H50mm	L330*W300*H170mm	54pcs	4.60kg	6.50kg
MUL022	L117*W45.5*H29mm	102g	L140*W35*H50mm	L330*W300*H170mm	54pcs	5.50kg	7.50kg

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.