LED switching mains

Operating Instructions

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Thank you for purchasing "Jinxing" LED special mains

Please carefully read the instructions before use

I. Working principle

The switching mains adopt the most advanced technology of switching mains in the world - PWM (pulse width modulation) control mode. It is composed of the following five parts: (1) electromagnetic interference inhibition network (2) input rectification filtering (3)PWM regulation voltage (or current) control (4) switching energy transition (5) output rectification filtering. The working principle of PWM switching stabilization is when input voltage and external loads vary, control circuit conducts the closed-loop feedback of D-value between control signal and benchmark signal to adjust the pulse width of conduction of switching components of main cir cuit, thus stabilizing the output voltage or current of switching mains (i.e.corresponding Constant Voltage Mains or Constant Current Mains).

II. Features

1. **Rated Input Voltage-**VA series is 170-250V、VB series is100-130 V、VD series is 90-264V.

2. **High efficiency**-With perfect protection circuit, the mains is of high reliability. The switching mains adopting PWM control mode is one of the best LED mains.

3. **The product consists of indoor type and outdoor type** - The outdoor type is sealed for waterproof and moisture-proof, and is applicable to various circumstances. It is easy to install. It can be hung or placed horizontally on a supporting object. The indoor type has no waterproof function, and can only be installed indoors.

4. **Convenient wiring** - The product is equipped with input and output connecting wires or terminals. The terminal marked "Input" is the input terminal of the mains and should be connected with corresponding mains supply. The terminal marked "Output" is output terminal and should be connected with corresponding LED lamps. Output "+" is connected with the positive terminal of LED and "-" with negative terminal.

5. **Abnormality protection function** - The mains has built-in overcurrent and short-circuits protection. In case of short-circuits or overload, the product will conduct automatic protection.

6. Various types for your choice - There are two series of products available for your choice: Constant Voltage Mains and Constant Current Mains.

7. Quality assurance - All products are strictly inspected before delivery to guaranty maximum user

III. Load characteristics

The load characteristics of the product are divided into the following two types as per constant modes.

1. Load characteristics of Constant Voltage Mains

(1) Constant Voltage Mains means that the output voltage is constant, when load power is no more than the rated output power of the mains and input voltage varies within the range marked on the mains. (Fluctuation should be within given deviation.)

For example:

Label: Maximal input power 70W Rated output power 60W
Working voltage range 170～250V Output voltage 12V

Meaning that the output voltage of the mains will be constant at 12V, when the power of the load connected at output terminal is no more than 60W and input voltage varies within the range of 170V～250V.

(2) Cautions for connecting loads

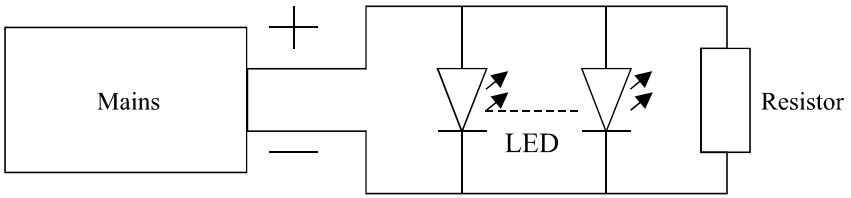
A. In case load power exceeds the maximal output power of the mains (normally 5%～15%), the mains will activate protection and enter the abnormal state of intermittent connection. If the mains works in such situation for a long period, its life span will be shortened.

B. Load power should match the mains power as much as possible. When the load power is too small, the output signal of the mains will become too small, and thus affecting the working of detection circuit. When it is necessary to work under such situation, it is suggested to parallel a resistor with small power at the output terminal of the load. Especially in grading and scanning occasions, ultra-light load will appear for a very short period of time. In this case, the mains and lighting system will work normally if a 0.5 W load is paralleled in the circuit. For example, When mains output is 12V, the resistor paralleled to the ultra-light load is calculated as follows:

$\because P_{rated}=U^2/R \quad \therefore R=U^2/P_{rated}=12^2/0.5=288\Omega$ Rounded off: 300Ω

In practice, $P=1.5\times P_{rated}=1.5\times 0.5=0.75W$, rounded off: 1W

So, a 300Ω/1W resistor should be paralleled.



2. Load characteristics of Constant Current Mains

(1) Constant Current Mains means that the output current is constant, when output voltage is within stipulated range and input voltage varies within stipulated range.

For example:

Label: Maximal output power 30W Input voltage range 170~250V
Output current 900mA Output voltage range 15~36V

Meaning that the output current will be constant at 900mA, when input voltage varies within the range of 170~250V under the condition that the maximal power of the load connected at output terminal is no more than 30W and voltage at both ends of the load is within the range of 15V to 30V.

(2) Cautions for connecting loads

A. Select matching mains output current as per required for the current of the load.

B. Output voltage range:

With fixed output voltage ranges, all constant current mains should work within their respective nominal voltage range. If exceeding the nominal range, the mains will not work properly and the life span will be shortened.

For example:

Label: Constant current mains at 2.5V-12V output voltage and 350mA constant output current, its maximal and minimal output power are as follows:

$P_{max}=0.35A\times 12V=4.2W$

$P_{min}=0.35A\times 2.5V=0.88W$

Minimal voltages at both ends of the load are 2.5V and maximal

voltage of the load is 12 V.

C. Working in extreme situations:

For example, it is required to connect one 2V/350mA lamp to the above mains in scanning occasion. How to do? It is suggested to connect a resistor in series in the circuit. The system can work properly only when equivalent load voltage is >2.5V. The method of calculating the resistance:

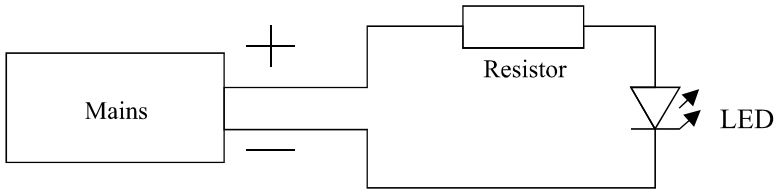
R=(Umains-Ulamp)/I=(2.5-2)/0.35≈1.4Ω Rounded off 1.5Ω

Prated=I^2×R=0.35^2×1.5=0.18W

In practice: P=1.5×Prated=1.5×0.18=0.27W Usually assumed: 0.5W or 1W,

Therefore, a 1.5Ω/0.5W or 1.5Ω/1W resistor should be connected in series.

As shown in the figure:



IV. Simple calculation methods for selecting mains

1. The method of selecting Constant Voltage Mains (It is suggested that load power to be 80% of mains output power.)

P load≤P mains

U load=U mains

2. The method of selecting Constant Current Mains (It is suggested that load power to be 80% of mains output power.)

P load P mains I mains = I load

U mains min U load U mains max

3. Simple calculation methods for selecting the quantity and power of LED and mains power:

(1) When mains power and LED power are known, calculate the quantity of LED that can be driven.

* LED quantity = Mains power/power of a single LED (The quantity is a rounded-off integral.)

For example, if the rated power of the mains is 10W, how many LEDs with the dissipation power of 50mW and the rated

current of 20mA can be equipped?

It is calculated in the following way:

LED quantity=10W/0.05W=200pcs

(2) Calculation of Constant Voltage Mains:

For example, for a mains with 20W rated power, 5V voltage and 4A current. How many LEDs with 70mW dissipation power, 20mA rated current and 2.5V rated voltage can be equipped? How many branches are paralleled and how many LEDs are connected in series in each branch?

① Calculate the maximal quantity of LEDs that can be driven:
$n1=P_{mains}/P_{LED}=20/0.07=285.7\approx285$ (the minimal integral)

② Calculate the quantity of LEDs that can be connected in series in each branch (n_2):
$n2=U_{mains\ voltage}/U_{LED\ voltage}=5V/2.5V=2$ pcs (the minimal integral)

③ Calculate the quantity of paralleled branches n3:
n3=n1/n2=285/2=142

Therefore, when output current is 4A, a maximum of 142 lines can be connected. In each line, 2 LEDs connected in series comprise a LED group. Therefore, a total of 284 LEDs can be connected.

(3) Calculation of Constant Current Mains:

For example, for a mains with 10W rated power, 0.35mA current and 12-20V voltage range. How many LEDs with 1W dissipation power, 350mA rated current and 2.5V rated voltage can be driven at most? How many at least?

① Calculate the maximal quantity of LEDs that can be driven:
$n1=P_{mains}/P_{LED}=10/1=10pcs$ $n2=U_{the\ maximal\ value\ of\ mains}/U_{LED}=20/2.5=8pcs$
$n=\{n1,n2\}_{the\ minimal\ value}=8$ pcs

② Calculate the minimal quantity of LEDs that can be driven:
$n=U_{the\ maximal\ value\ of\ mains}/U_{LED}=12/2.5\approx5$ pcs

(4) Calculate and select mains on the basis of the dissipation power, current value, voltage values of both ends, quantity and using method of LEDs:

① Calculation method of Constant Voltage Mains:

For example, the dissipation power and voltage of a LED are 70mV and 2.5V respectively. Seven LEDs are connected in series in each branch and 56 LEDs are used. What are the specifications of the mains?

A. Calculate the total power of LED

$P_{load}=P_{LED}\times n=0.070\times 56=3.92W\approx 4W$

$\therefore P_{mains}\geq P_{load}=4W$

i.e.: Mains output power＞4W, it is suggested to use a mains with 5W output power.

B. Calculate the series voltage value of LED

$U=U_{LED}\times n=2.5\times 7=17.5V$

It is suggested to use Constant Voltage Mains with 18V output voltage and 5W output power and connect a small resistor in series on each branch to balance voltage.

② Calculation method of Constant Current Mains:

For example, the dissipation power, current and voltage of a LED are 1W, 350mA and 3V respectively. Seven LEDs are connected in series in each branch. What are the specifications of the mains?

A. Calculate the total power of LED

$P_{load}=P_{LED}\times n=1\times 7=7W$

$\because P_{mains}\geq P_{load}=7W$

B. Calculate the series voltage value of LED

$U=U_{LED}\times n=3\times 7=21V$ $\therefore U_{mains\ min}\leq U_{load}\leq U_{mains\ max}$

It is suggested to use Constant Current Mains with 10W output power, 350mA output current and 12～25V output voltage.

V. Thermal performance of the mains

1. Relations between the temperature and life span of the mains

Switching mains is an electronic product. The life span of electronic products depends on their maximal working temperature to a large extent. The higher the temperature is, the shorter the life span becomes. In addition, the mains itself also consumes energy and thus generating heat. Therefore, installing the mains in high temperature environment should be avoided. In addition, different heat emission methods should be adopted as much as possible to reduce the temperature of the mains. In this way, the lifespan of the mains can be extended.

2. Mechanics of thermal transmission (radiation)

The heat of the mains is transmitted from the inside to the surface and emitted to surrounding media in such three modes as exchange, convection and radiation. The faster the heat emits, the lower the temperature of the mains becomes; and vice versa.

Below are the three heat emission mechanics and special attentions on heat emission during installation.

(1) Radiation: On one hand, heat emission depends on the surface features of heating unit (the mains). Objects with tarnish surfaces have strong radiation capability (good radiation effect) and objects with lustrous surfaces have poor radiation capability. On the other hand, heat emission depends on the temperature of media surrounding the thermal unit, i.e. the dimensions, shape and structure of lamps. Consequently, the mains should be installed in a place where the temperature of surrounding media is much lower to enable heat radiation.

(2) Convection: When temperature difference exists between solid and fluid surface (such as air), heat exchange between tow media will appear. Heat will be conducted from a high-temperature object (the mains) to a low-temperature object (the air) and emitted into the air. As a result, ventilation and large airflow space will facilitate heat emission. The mains should be installed in an open space and exposed to the air to enable air to flow through. If it is required to install the mains in a box, the box should be as large as possible. In addition, large symmetrical holes should be opened at the top and bottom, in front and at back, on the right and left of the box to facilitate airflow to improve convection efficiency. In this way, the purpose of heat emission can be reached.

(3) Heat exchange: It is a course of transmitting heat energy from the part of higher temperature to the part of lower temperature through mutual collision among molecules, atoms or electrons of objects. Metal is a good conductor, while on the contrary, asbestos, sponge and wood are poor conductors. The mains should be installed on a sheet metal with largest possible surface area to enable heat exchange. Then, heat will be emitted via the sheet metal. In this way, the temperature of the mains can be reduced. Installing the mains directly onto poor heat-conductors such as asbestos or wood should be avoided.

In summary, in order to extend the life span of the mains, the working temperature must be reduced. If it is not possible to install the mains in an ideal situation due to the limitation of environment conditions, the above three modes of thermal transmission should be used as much as possible for heat emission to ensure normal working temperature of the mains, otherwise its

life span will be shortened and the mains will be damaged.

VI. Cautions and cases of installation and operation of the product

1. Three principles for installation and operation

The installation and operation of the product must follow the three principles:

(1) The voltage of power supply must fall into the working voltage range of the mains. For example, the mains with 170～250V input voltage cannot be connected to 280V power supply network.

(2) Never use it with abnormal loads - Never overload, or connect it with ultra-light loads. The mains should match loads reasonably.

A. Constant Voltage Mains (For details, please refer to product load characteristic 1.)

B. Constant Current Mains (For details, please refer to product load characteristic 2.)

(3) Create an installation mode and environment that facilitate efficient heat emission:

A. It is prohibited to install the mains in an environment with high temperature.

B. Three modes of heat transfer should be adopted as much as possible for heat emission.

① Exposed to flowing air.

②The radiation space is as far as possible big.

③ Install the mains on a sheet metal with a largest possible surface area. To let the mains contact directly with the sheet metal to allow heat transmission.

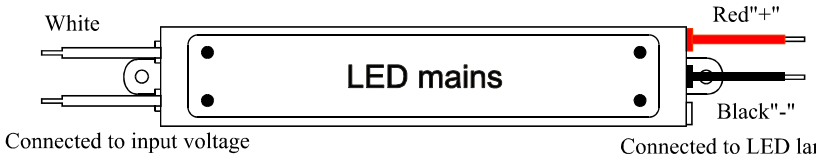
2. Installation methods and steps

(1) In order to facilitate heat emission, fix the mains directly on a large metal sheet.

(2) Wires must be connected securely. Reversed connection of input and output wires is forbidden. The "+" of output should be connected with the "positive" of LED and "-" with the "negative" of LED.

(3) Check the multi-meter to make sure the power supply of the line corresponds with the working voltage of the mains. Switch on only after it was confirmed.

3. Wiring diagram

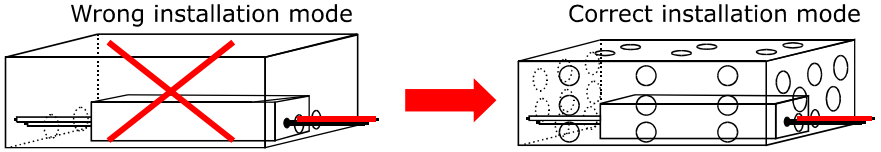


Note: There are three output wires in the LED switching mains, including brown-blue, red-black, and white-black. Brown, red and White are the positive output of the mains, and blue, black are negative output. Input line is white. Black waterproof line with sleeve is input line and white line with sleeve is output line. White output core wire is positive and black one is negative.

4. Installation cases:

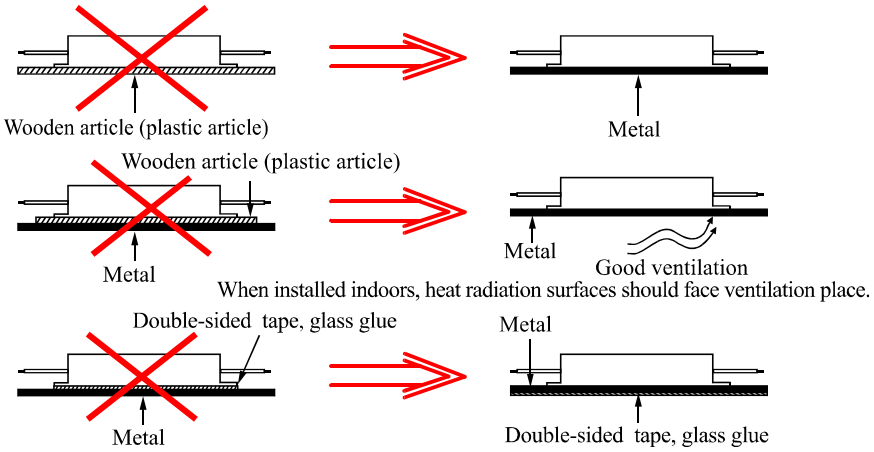
(In the following figures, unreasonable installation modes are marked with"×".)

(1) Wrong installation modes with poor heat emission and correct installation modes



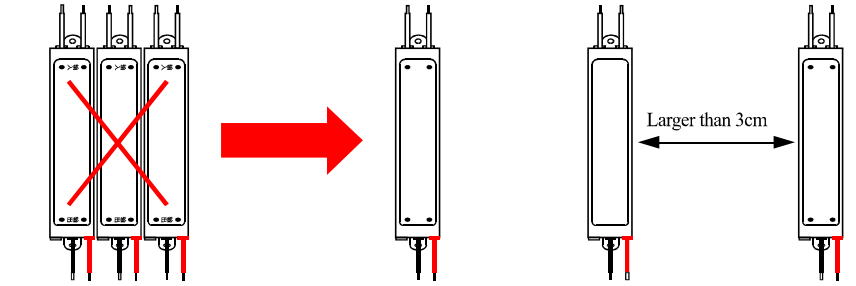
The mains should not be installed in a closed and wind-tight box.

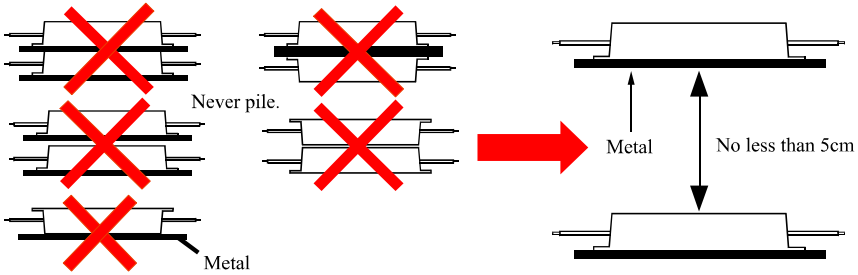
When the mains is installed in a box, more holes should be opened on sides of the box for convection.



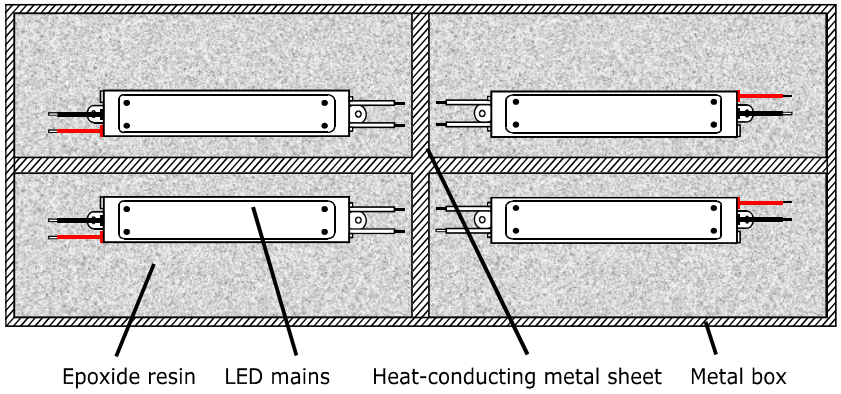
Double-sided tape and silicone glue (glass glue) are poor heat conductors, so heat-conducting metal sheet should be installed before the mains is attached on other objects.

(2) Installation clearance of LED switching mains



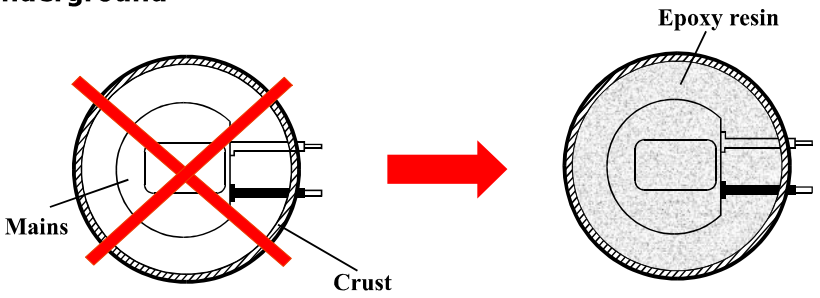


(3) The installation mode for several LED switching mains in a metal box



When several mains are installed in a sealed box, heat-conducting metal sheets should be added in the middle and the box should be filled with epoxide resin, thus facilitating heat conduction and emission.

(4) Installation mode for LED switching mains buried underground



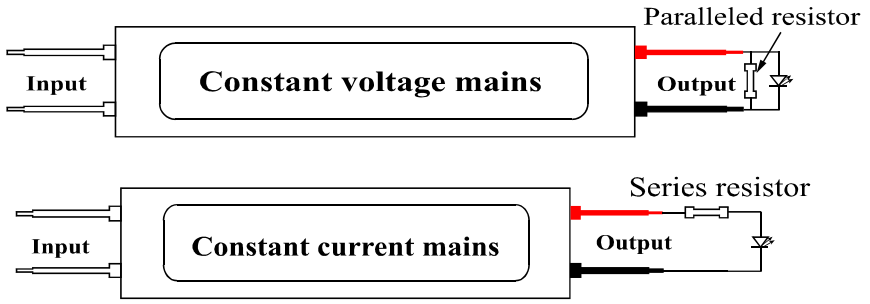
When the mains are buried underground, heat cannot be emitted through the air. So it is necessary to conduct heat emission via heat-conducting objects, e.g. epoxide resin.

(5) Application characteristics of abnormal ultra-light load

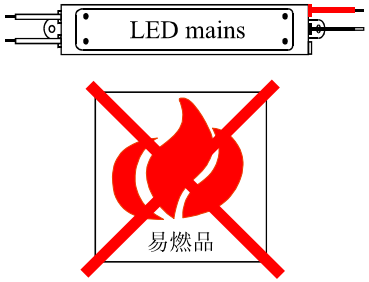
In case of ultra-light loads of the mains, extra loads should be added to match the working of LED mains:

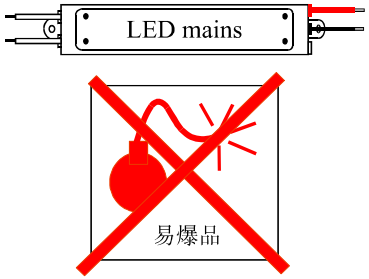
For Constant Voltage Mains, a resistor should be connected in parallel at output terminal.

For Constant Current Mains, a resistor should be connected in series at output terminal to increase loads of the mains. (For details, please refer to product load characteristic.)



(6) Never install LED-switching mains near inflammable and explosive articles.





VII. Operating and storage conditions of the product

1. Outdoor type: Temperature: -25℃～+40℃; maximum relative humidity: ≤100%
2. Indoor type: Temperature: -10℃～+40℃; maximum relative humidity: ≤90%
3. Storage conditions: Temperature: -10℃～+60℃; maximum relative humidity: ≤85%

VIII. Warranty

1. Under normal and reasonable operating conditions, the warranty period of the product is one year starting from its delivery date. In case of any fault of the product found during warranty period, we will replace the faulty unit with a product of the same type free of charge, provided that the faulty unit was inspected by us and confirmed that the fault is caused due to poor quality.

2. In one of the following situations, the user will not enjoy warranty:

(1) The product is damaged due to the user fails to operate it as per the instructions.

(2) The product is damaged due to the user disassembles any parts without permission.

(3) The housing of the product was seriously damaged or deformed.

(4) The factory delivery date or machine No. on the product was scraped or altered.

3. The company bears no responsibility for any third party's liability caused by wrong or improper installation, wrong or improper use, or the installation or use beyond warranty period. The user or the person in charge of project shall purchase third party's liability insurance for customer's own protection.