Test Report for Safety of Product ~Main Power

Product name: LEX9 LED light source
Test equipment serial number: 90019
Subject: Temperature test
Test Date and Place: 2024/04/08 @Kanda-Lab. Brainvision Inc.
Inspector: Michinori Ichikawa

This report concerns the electrical safety testing of our product LEX9.

1. Methods and Measurement Setup

1-1 Methods
To test electrical safety, we conducted electrical insulation tests on high voltage parts, electrical conductivity between each part of the casing and ground, and overcurrent tests to detect internal abnormalities.The test methods for each are as follows.

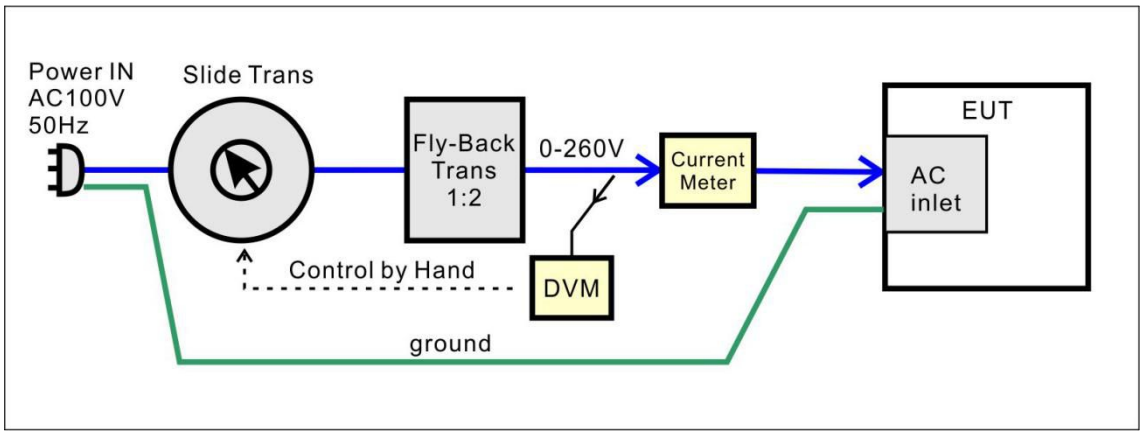
1. In the floating ground test, with the inlet ground open and the device operating on a 230V power supply, the current between the FG and ground was measured with a micro ampere meter. The same test was conducted in two modes: when the main power switch was ON and when it was OFF.
2. In the electrical insulation test, a high voltage of up to 1.5KV was applied between the primary power supply terminal and ground, and the current between them was detected. The same test was conducted in two modes: when the main power switch was ON and when it was OFF.
3. In the grounding conductivity test, a 10A DC current was passed through the grounding terminal and the measurement point, and the voltage was measured. Measurement points were the power inlet terminal, various parts of the frame, screw heads, and the ground terminal of the connector.
4. In the overload test, a simulated overcurrent was applied by connecting a resistor to the secondary output terminal of the main power supply unit. We tried three types of resistance: 0ohm (short), 1ohm (added 5A, total 32A).

The target device was placed on a wooden table, with 0.3m around the device free of obstacles and at least 1.0m free space above.
Measurements are performed from a sufficiently room temperature (24 to 26 degrees Celsius) and natural atmospheric pressure (approximately 1 atm) state.

1-2 Special notes specific to this exam

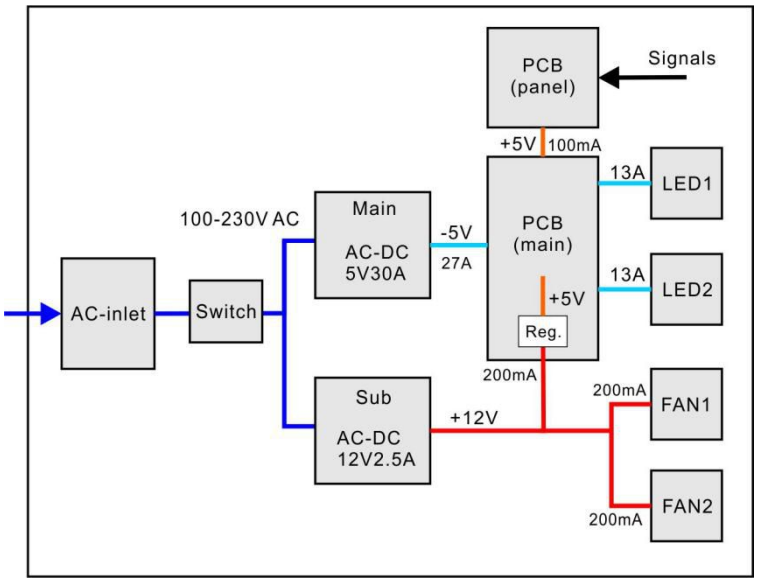
1-2-1 Setup for voltage control of main power supply and primary V-I measurement

Since the power supply in Japan is 100V AC, we obtained 230V using a slide transformer (so-called Slidac) and a fly-back transformer. Since the voltage changes slightly depending on the load, the voltage was measured and adjusted manually according to the test situation.



1-2-2 Inside block diagram for power distribution of LEX9

The diagram below shows the power distribution of the target equipment. The device is equipped with two independent AC-DC units of 5V 30A and 12V 2.5A. The main power supply is 5V, and a large current of up to 27A flows. A 12V sub-power supply powers the control unit and FAN. Even if the large current system supplied by the main power supply goes down, control can continue and the fan will not stop. If the sub power supply goes down, the output transistor cannot turn on, then the LED will automatically turn off.



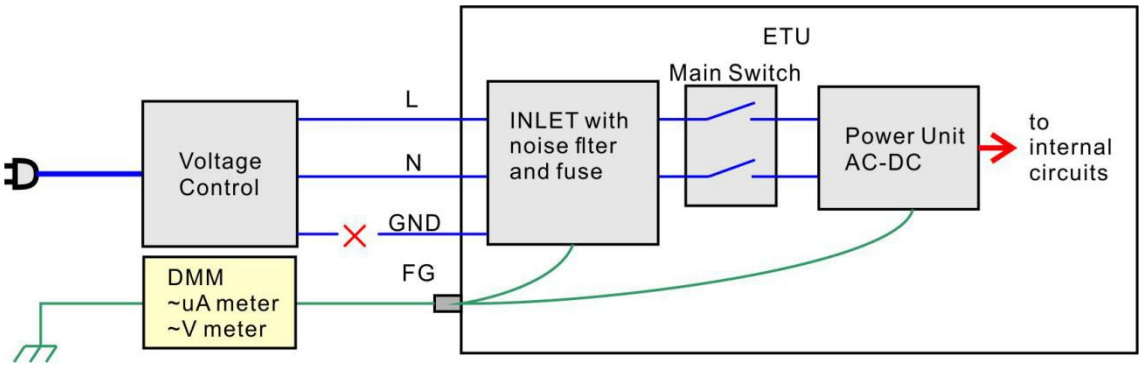
1-3 Devices

DC Power Supply	TEXIO PSW360L30 (0-30V 360W output)
High voltage Tester	TEXIO STW9701 (programmed AC 1500V/10sec typical schedule)
Digital Multimeter	TEKTRONIX DMM916 (true RMS AC-volt function is used)
Slide Trans	RIKO RSA-10 (0V-130V 1KVA)
Fly-back Trans	TOYOZUMI SD21-200A2 (using for over 200V test only)

2. Test

2-1 Floating Ground Test

With the inlet ground open and the device operating on a 230V power supply, the current between the FG and ground was measured with a micro ampere meter. Also, The voltage between the FG and ground was measured. The same test was conducted in two modes: when the main power switch was ON and when it was OFF.

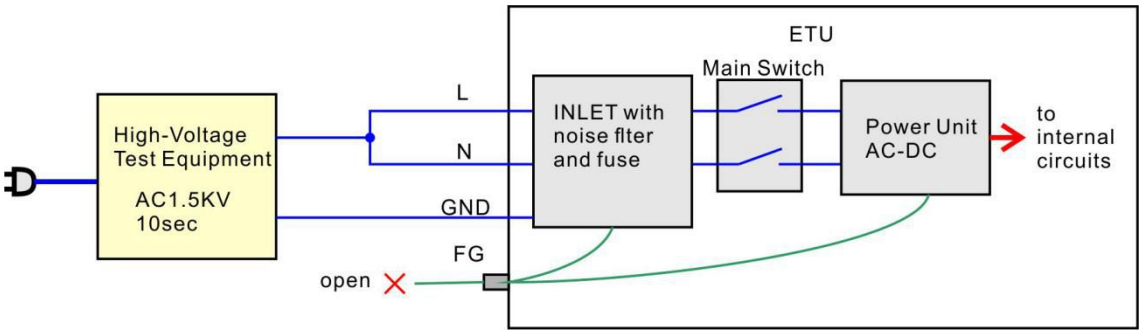


2-1-2 Results

Mode	Voltage	Current	
Main Switch Off	6.0V AC	0.2uA AC	
Main Switch On	7.2V AC	3.3uA AC	

2-2 High Voltage Isolation Test

1.5KV was applied between the primary power supply terminal and ground, and the current between them was detected. The same test was conducted in two modes: when the main power switch was ON and when it was OFF. Tried 10 seconds three times in each mode.

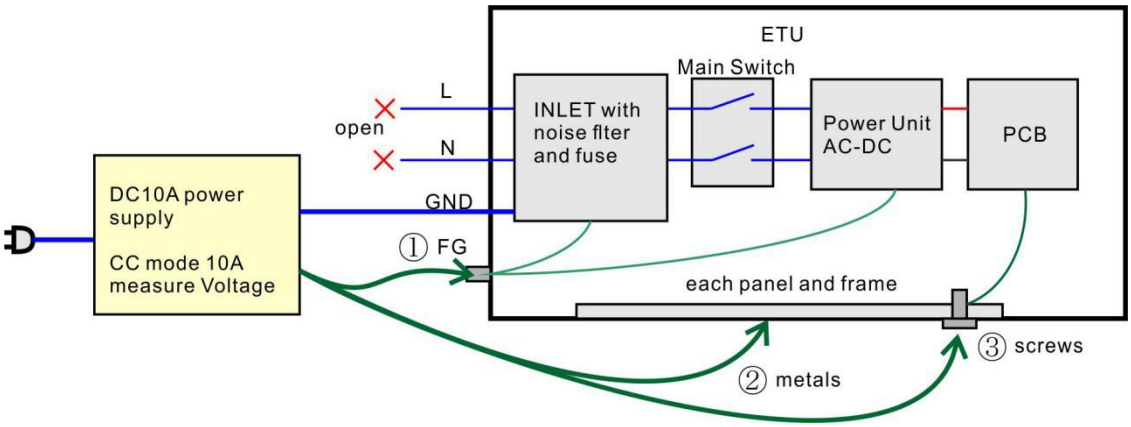


2-2-2 Results

Mode	1.50KV 1st trial	1.50KV 2nd trial	1.50KV 3rd trial
Main Switch Off	0.00mA	0.00mA	0.00mA
Main Switch On	3.43mA	3.43mA	3.43mA

2-3 Protective Test

A 10A DC current was passed through the grounding terminal of an inlet and the measurement point, and the voltage was measured. Measurement points were the power inlet terminal, various parts of the frame, screw heads, and the ground terminal of the connector.



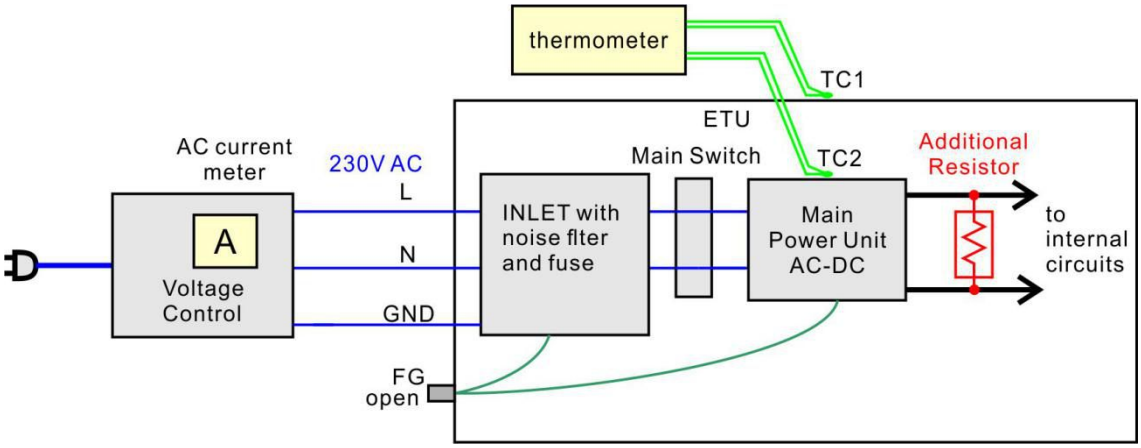
2-3-2 Results

Item	1 FG	2-1 Back	2-2 Front	3-1 Top	3-2 Front	Short
Voltage @10A(DC)	0.27V	0.38V	0.58V	0.45V	0.48V	0.21V
Corrected (-0.21V)	0.06V	0.19V	0.37V	0.24V	0.27V	0
Resistance	6mOhm	19mOhm	37mOhm	24mOhm	27mOhm	0

2-4 Short and Overload Test

A simulated over current was applied by connecting a resistor to the secondary output terminal of the

main power supply unit. We tried three types of resistance: 0ohm (short) and 1ohm (added 5A, total about 32A). The current adjustment for both LEDs was set to 125% (13.5A), and the current with no resistance was confirmed to be 26.7A. Additionally, to confirm safety, we measured the temperature of the upper panel and internal power supply unit using thermocouples.



2-4-2 Results

Additional Resistor	Load Current (5V Output)	Primary Current	Temperature at top panel (TC1)	Temperature at power unit (TC2)
None	26.7A	0.63A	30.9	33.2
1 Ohm	31.7A	0.75A	31.1	36.2
0 Ohm (shut down)	0.06A	0.06/0.12A	25.3	27.1

* Temperature is the result of 30 minutes after power on

3. Summary

Item	Conditions	Worst Value	Results
Floating Ground	230V Input and FG	3.3uA/7.2V	Pass
H-V Isolation	1500V AC Input-FG	3.43mA	Pass
Protective	10A Inlet-Gnd to FG	37mOhm	Pass
Overload	31A for 30A power unit	Temperature +5deg.	Pass
Short	Secondary power short	Shut down	Pass