

# FLEX 12V Power Supply Specification

**Mode:HK600-91PP**

**File No.: EQS-731-7430**

**Prepared by: WeiWei**

**Checked by: Cui Jing**

**Approved by:Cui Jing**

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ECN List

Item	Spec. REV	Revise date	Revise description	Reason
1	V01			
2	V02	2025.6.30	更新线材图纸，增加一个 6+2 端子	客户反馈需要两个 6+2
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## 1.0 Input Characteristics(输入特性)

### 1.1 Input Voltage Range ( 输入电压范围 )

90Vac to 264Vac, single phase.

交流输入电压范围为 90-264 伏，单相。

**Table1. Input Voltage Range**

**表格 1.输入电压范围**

RANGE	MINIMUM	NORMAL	MAXIMUM	UNITS
High Range	90	100-240	264	Vrms

### 1.2 Input Frequency Range (输入频率范围)

Frequency Range: 50-60Hz

频率范围：50-60 赫兹

### 1.3 Input current (输入电流)

Maximum steady state input current shall be less than 10A RMS at 115VAC with maximum load at 25°C.

25 摄氏度下，115 伏交流最大稳态输入电流应小于 10A。

### 1.4 Inrush current (浪涌电流)

Power supply inrush current shall be less than the ratings of its critical components (including bulk rectifiers, fuses, and surge limiting device) under all conditions of line voltage of Section 1.1.

在 1.1 的输入电压条件下，电源的浪涌电流必须低于关键器件的额定值（包括整流桥、保险丝和浪涌限制设备）。

### 1.5 Power Efficiency (能效)

(1)

Min 87% efficiency under 20% full load condition, input Voltage: 115Vac/60Hz

在交流输入 115 伏/频率 60 赫兹、20%满载条件下：效率最低为 87%。

Min 90% efficiency under 50% full load condition, input Voltage: 115Vac/60Hz

在交流输入 115 伏/频率 60 赫兹、50%满载条件下：效率最低为 90%。

Min 87% efficiency under 100%full load condition, input Voltage: 115Vac/60Hz

在交流输入 115 伏/频率 60 赫兹、100%满载条件下：效率最低为 87%

注：线上测试效率考虑到不热机以及线损，效率标准参考生产注意事项要求

(2) PF is not less than 0.9 under 100% load with input voltage 100Vac-240Vac , 50Hz/60Hz.

在交流输入 100 伏至 240 伏、频率 50 赫兹/60 赫兹、100%负载下功率因数应不低于 0.9。

Efficiency test loading

效率测试负载

LOAD	+12V	+5V	+3.3V	-12V	+5VSB
100%	32.52A	11.3A	11.3A	0.3A	2.47A
50%	16.26A	5.65A	5.65A	0.15A	1.23A
20%	6.5A	2.26A	2.26A	0.06A	0.49A

**1.6 Power factor (功率因数)**

The power supply must use a PFC, PF≥0.90 @100% load at 230Vac/50Hz.

电源必须使用功率因数校正, 在 230 伏/50 赫兹、100%负载下, 功率因数大于 0.9。

**1.7 Standby Consumption (待机损耗)**

AC input power should not exceed 1W under +5VSB /0.05A, at 230Vac/50Hz.

在 230 伏交流/50 赫兹、仅+5 伏辅助输出带负载 0.05 安培下, 交流输入电源功率不超过 1 瓦特。

**2.0 Output Characteristics (输出特性)**

**2.1 Static output characteristics (静态输出特性)**

Table2. Static output characteristics

表格 2.静态输出特性

Output Voltage	Load			Regulation	Ripple & Noise
	Min	Max	Surge		Max mV P-P
+5V	0.1A	18A	25A	+/- 5%	50mV
+12V	0.1A	41.6A		+/- 5%	120mV
+5VSB	0.1A	2.5A		+/- 5%	50mV
+3.3V	0.1A	18A	25A	+/- 5%	50mV
-12V	0A	0.3A		+/- 10%	120mV

At 35°C, 90Vac

在 35 摄氏度, 工作电压 90V 下

(1) The continuous output power shall not exceed 500W.

电源的持续输出功率不应超过 500 瓦特

(2) The total combined 3.3V&5V power shall not exceed 120W.

3.3 伏和 5 伏联合输出总功率不超过 120 瓦特

At 45°C, 100V~264Vac

在 45 摄氏度, 工作电压 100V~264V 下

(3) The continuous output power shall not exceed 500W.

电源的持续输出功率不应超过 500 瓦特

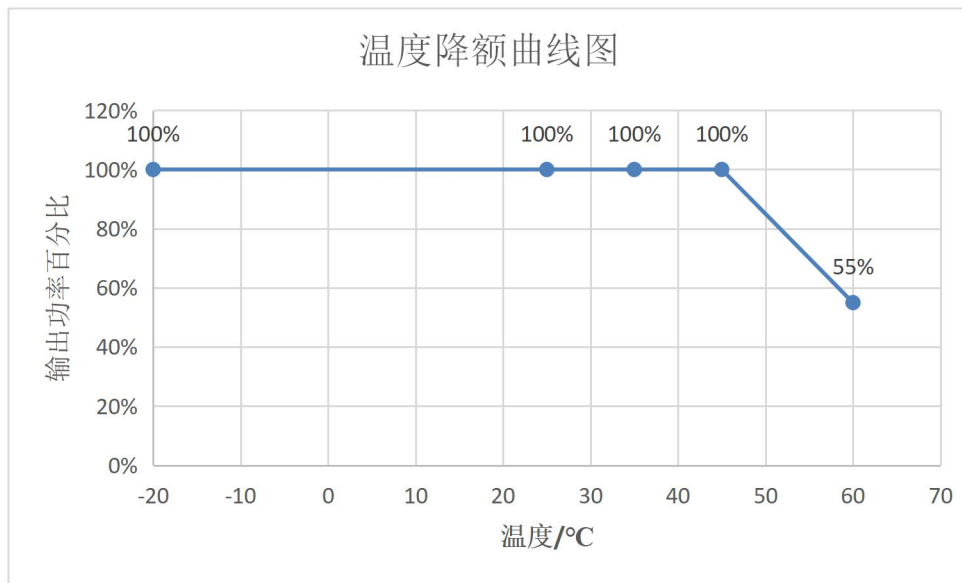
- (4) The total combined 3.3V&5V power shall not exceed 120W.  
3.3 伏和 5 伏联合输出总功率不超过 120 瓦特

At 60°C, 90V~264Vac

在 60 摄氏度, 工作电压 90V~264V 下

- (5) The continuous output power shall not exceed 275W.  
电源的持续输出功率不应超过 275 瓦特

- (6) The total combined 3.3V&5V power shall not exceed 66W.  
3.3 伏和 5 伏联合输出总功率不超过 66 瓦特



## 2.2 Cross-load regulation (交叉负载调整率)

Table 3. Cross Regulation (UNIT: A)

表格 3. 交叉负载

Range	+5V	+3.3V	+12V	-12V	+5VSB
1	0.1	0.1	0.1	0	0.1
2	2.4	2.4	11.4	0.06	0.5
3	6	6	22	0.15	1.25
4	16	10	25	0.3	2.5
5	10	16	25	0.3	2.5
6	10	10	24	0.24	2
7	1	1	40	0.06	1
8(full load)	13	13	31.3	0.3	2.5

Notes: A 0.1uF ceramic disk capacitor and 10uF tantalum capacitors should be put across output terminals during ripple & noise test. The oscilloscope bandwidth is set at 20 MHz and co-axial probe will

be used to measure it.

注意：在纹波噪声试验时，输出端应并联 0.1 微法拉陶瓷电容和 10 微法拉铝电容。示波器带宽设置为 20 兆赫，并使用同轴探头进行测量。

### 2.3 Dynamic Load (动态负载)

The following transient loads are to be applied to the output. The waveform shall be a square wave with the slope of the rise and fall at 0.5A/μs. The square wave shall have a frequency 50Hz to 10KHz with a duty cycle of 10 to 90%.

以下动态负载电流上升速率为 0.5 安培每微秒，电流方波频率从 50 赫兹到 10K 赫兹，占空比从 10%到 90%。The output voltages shall not exceed regulation limits as defined in Table 2 under the following condition:TRANSIENT VOLTAGE TOLERANCE

按照表格 4 的负载，输出电压不应超过表格 2 的规格限制。

Table4. Dynamic Load Step Sizes

表格 4.动态负载

OUTPUT	STEP LOAD	+12V	+5V	+3.3V	-12V	+5VSB	TRANSIENT TOLERANCE(%)
+12V	3~20A	N/A	5	5	0	0.1	+/-5
	22~38A	N/A	5	5	0.1	2.5	
+5V	2~6A	5	N/A	2	0	0.1	+/- 5
	12~16A	10	N/A	2	0.15	2.5	
+3.3V	2~6A	5	2	N/A	0	0.1	+/- 5
	12~16A	10	2	N/A	0.15	2.5	

(Adding external capacitor: 5V/10000uF, 12V/10000uF, 3.3V/10000uF, -12V/350uF, 5Vaux/350uF)  
 (额外增加电容: 5 伏/10000 微法拉, 12 伏/10000 微法拉, 3.3 伏/10000 微法拉, -12 伏/350 微法拉, 5 伏辅助输出/350 微法拉)

### 2.4 Capacitive Load (容性负载)

The power supply should be able to power up and operate with the regulation limits defined in Table 2, with the following capacitances simultaneously present on the DC outputs.

电源应能在表2中规定的调节能限值下通电和运行，直流输出端同时具有以下电容。

Table5. Output Capacitive Loads

表格5.输出容性负载

Output	Capacitive Load
+12V	10000μF

+5V	10000μF
+3.3V	10000μF
-12V	350μF
+5VSB	350μF

The power supply shall have the output connector and wire harness configurations.

电源应具有输出连接器和束线配置

### 3.0 Protection (保护)

#### 3.1 Over Voltage Protection (过压保护)

+5V:7V max, +12V: 16V max, +3.3V: 5V max.

5 伏输出过压点最大 7 伏, 12 伏输出过压点最大 16 伏, 3.3 伏输出过压点最大 5 伏。

#### 3.2 Short Circuit Protection (短路保护)

The main output shall shut down and latch off for shorting +5V, +12V or +3.3V rails to DC-return and shorting.

5 伏输出、12 伏输出、3.3 伏输出短路保护且锁死, 需 PS\_ON 复位或市电重启才能开机。

#### 3.3 Over Power Protection (过功率保护)

Any output shall not exceed requirement of the table. Otherwise, the unit would shut down.

输出不应超过下表的要求。另外, 电源应关闭。

**Table6. Over Power Protection**

**表格6.过功率保护**

Input Voltage	230VAC/50Hz
OPP Range(Output Power)	600W~1000W

#### 3.4 Over Temperature Protection(过温保护)

The power supply shall automatically shut down and latched in the event of any other abnormal condition that result in excessive temperatures within the power supply.

当出现异常情况导致电源内部温度过高时, 电源应自动关闭并锁闭。

#### 3.5 Over Current Protection(过流保护)

The overload currents should be ramped at a minimum rate of 2A/100ms starting from max load. Any output shall not exceed requirement of the table. Otherwise, the power would shut down.

过载电流应在最大负载开始下以最小 2A/100ms 的步进进行。任何输出不应超过下表要求。并且, 电源

应关闭。

Over Current Protection

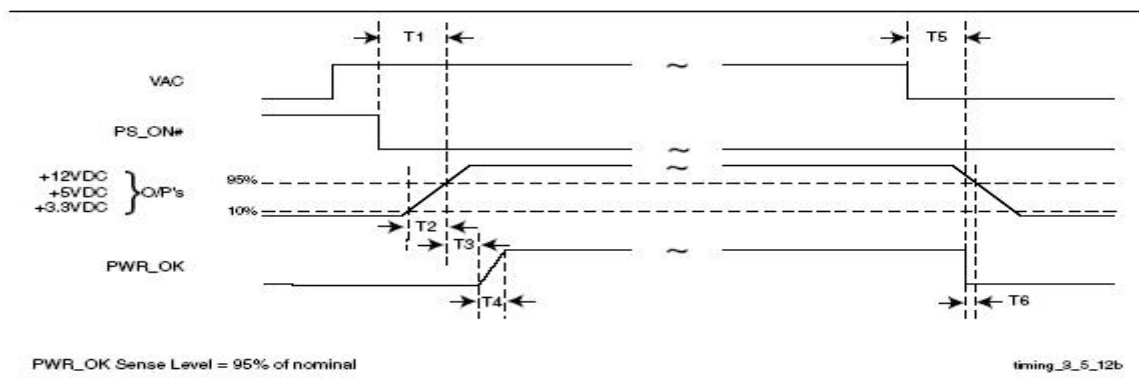
Output	+5V	+3.3V	+12V
Over Current Limit	20~40A	20~40A	44~70A

### 3.6 Reset after shutdown (关机后复位)

When the power supply latches into shutdown condition due to a fault on an output (over current, over voltage or short circuit), the protection latch shall reset within 30S after the fault has been removed and the ON/Off signal has switched state. Also, the latch shall reset within 30S when AC power has been removed.

当电源因输出故障（过电流、过电压或短路）而锁定到关机状态时，保护锁应在故障消除和开/关信号切换状态后 30 秒内复位。此外，当交流电源被切断后，锁死状态应在 30 秒内复位。

### 4.0 Time Sequence (时序)



Power Supply Timing

#### 4.1 Power-on time T1 (开机时间 T1)

The power-on time is defined as the time from when PS\_ON# is pulled low to when the +12 VDC, +5 VDC, and +3.3 VDC outputs are within the regulation ranges specified in Section 2.1. The power-on time shall be less than 500 ms.

开机时间定义为从PS\_ON置低电平到输出电压达到正常电压范围内，且时间小于500ms。

#### 4.2 Rise time T2 (上升时间 T2)

The output voltages shall rise from  $\leq 10\%$  of nominal to within the regulation ranges specified in Section 2.1 within 0.1 ms to 20 ms.

输出电压需在 20 毫秒时间内从 10%上升至正常电压范围内，且上升时间不能小于 0.1ms。

**4.3 PWR\_OK delay T3 (PG 延迟时间)**

The Power Good signal shall have a turn-on delay of at least 100mS but not greater than 500 mS from the time the 3.3V and +5V output has reached their minimum regulation level.

从 3.3V 和+5V 输出电压达到正常范围起，电源需在 100 毫秒到 500ms 之间输出 PWR\_OK 信号。

**4.4 PWR\_OK rise time T4 (PG 上升时间 T4)**

The Power Good signal shall have a rise time (measured from the 10% point to the 90% point) of less than 10 ms.

PWR\_OK 信号上升时间 (从电压 10%到 90%测量) 应小于 10 毫秒。

**4.5 AC loss to PWR\_OK hold-up time T5**

The DC output level for 5V;3.3V and 12V shall remain an up level at least 12msec after AC power is removed and the test condition: 115V/60Hz or 230V/60HZ, 80% full load..

在市电断开后，PWR\_OK应保持至少12毫秒不掉电，并应在3.3伏或+5伏掉出其电压范围之前。此测试在

交流115伏/60赫兹或230V/60赫兹，80%的满载条件下进行。

**4.6. Power Fail Delay Time T6**

The Power \_Down warning signal at least 1msec shall have a power Good Signal change Low Voltage to the 3.3V or +5V falls below their regulation limit.Test condition:115V/60Hz or 230/50Hz, 80% full load.

在市电关机后，PWR\_OK信号需在5V或3.3V电压掉出电压范围前掉电，且间隔时间不少于1毫秒。测试条

件：115伏/60赫兹或230伏/50赫兹，80%满载。

**4.7 Power OK (POK)**

The power supply shall provide a “Power Good” signal to reset system logic, indicate proper operation of the power supply, and give advance warning of impending loss of regulation at turn off.

电源会提供一个表示电源正常的信号，即PWR\_OK，来控制系统逻辑，在输出电压掉出范围会提前告警系

统。

The electrical characteristics for the Power OK output driver are shown below:

PWR\_OK 信号的电气特性如下所示:

**Table7. Power OK Signal Characteristics**

**表格7.PG信号特性**

Power OK Signal Characteristics	
Signal Type	+5V TTL Compatible
Logic Level Low	<0.4V while sinking 4mA
Logic Level High	Between 2.4V and 5V output while sourcing 200µA
High-State Output Impedance	1kΩ from output to common

## 4.8 PS\_ON

PS\_ON is an active low, +5V tolerant TTL signal that allow the motherboard to remotely control the power supply. An internal pull-up resistor inside the power supply shall provide a TTL high output logic level, once an AC input voltage has been applied to the power supply. The electrical characteristics for the PS\_ON signal are shown below:

PS\_ON是一个低电压有效的+5V耐受TTL信号，允许主板远程控制电源。一旦向电源施加交流输入电压，电源内的上拉电阻器应提供TTL高输出逻辑电平。PS\_ON信号的电气特性如下所示：

**Table8. PS-ON Signal Characteristics**

**表格8.PS-ON信号特性**

PS-ON Signal Characteristics		
Signal Description	Min	Max
Input Low Voltage	0.0V	0.8V
Input Low Current (Vin=0.4V)	-	-1.6mA
Input High Voltage (Iin=-200μA)	2.0V	
VIH open circuit	-	5.25V

## 5.0 Auxiliary 5V Output (5.1V 辅助输出)

The 5.1V auxiliary output will be active and in regulation whenever an AC input within the specified operating range is applied to the power supply input. The PS\_ON pin of P1 will not affect the 5.1V auxiliary output.

当电源输入额定工作范围内的电压时，PS\_ON 信号不能影响到+5V 辅助电源输出。

## 6.0 Environment (环境)

### 6.1 Operating ambient (工作环境)

Air Temperature	-20 to 60 degrees centigrade
Relative Humidity	5 to 85 percent, non-condensing

### 6.2 Shipping and Storage (储存和运输)

Air Temperature	-40 to 70 degrees centigrade
Relative Humidity	5 to 95 percent, including condensation

### 6.3 Altitude (海拔)

Operating to 5000 meters(16,404 ft)

工作在海拔 5000m (16404 英尺) 以下

### 6.4 Cooling (散热)

The power supply shall provide forced air cooling for the host system.

电源散热方式为强制风冷。

### 6.5 Fan speed control (风扇转速控制)

The power supply shall contain thermal sensing circuitry capable of varying fan speed.

电源可以根据温度来调节风扇转数。

## 7.0 Safety and EMC (安全和电磁兼容)

## 7.1 SAFETY REQUIREMENTS AND Certify (安全要求和认证)

The power supply has been certified by CCC ,CE,CB,ULcomply with GB4943-2022 (IEC62368-1). The CCC,CE,CB Safety mark shall appear on the product .

电源已通过GB4943-2022(IEC62368-1)的CCC,CE,CB,UL认证, 产品上应有CCC,CE,CB,UL安全标志。

## 7.2 Conducted and radiated Emissions (传导和辐射)

Conducted and radiated emissions of the power supply shall comply with the requirements of GB/T 9254 (EN55032) Class B.

电源的传导和辐射发射干扰应符合GB/T 9254 (EN55032) B级的要求。

## 7.3 ESD (静电)

ESD of the power supply shall comply with the requirements of GB17626.2 (IEC61000-4-2) Level 4 (Contact Discharge  $\pm 8KV$ /Air Discharge  $\pm 15KV$ ) .

电源的静电测试应符合IEC61000-4-2 4级(接触 $\pm 8KV$ /空气 $\pm 15KV$ )的要求。

## 7.4 EFT (电快速瞬变脉冲群)

EFT of the power supply shall comply with the requirements of GB17626.4 (IEC61000-4-4) Level 3.

电源的电快速瞬变脉冲群测试应符合GB17626.4 (IEC61000-4-4) 3级的要求。

## 7.5 Voltage fluctuations and flicker(电压波动和闪烁)

Voltage fluctuations and flicker of the power supply shall comply with the requirements of GB17625.2(IEC61000-3-3).

电源的电压波动和闪烁测试应符合GB17625.2(IEC61000-3-3)的要求。

## 7.6 Voltage dips, short interruptions and voltage variation Immunity (电压暂降、短时中断和电压变化的抗扰度)

Voltage dips, short interruptions and voltage variation Immunity of the power supply shall comply with the requirements of GB17626.11(IEC61000-4-11).

电源的电压暂降、短时中断和电压变化的抗扰度测试应符合GB17626.11(IEC61000-4-11)的要求。

## 7.7 Surge Susceptibility (抗浪涌干扰)

Surge Susceptibility of the power supply shall comply with the requirements of GB17626.5 (IEC61000-4-5) Level 3(Differential mode  $\pm 1KV$ /Common mode  $\pm 2KV$ ).

电源的抗浪涌干扰测试应符合GB17626.5 (IEC61000-4-5) 3级(差模 $\pm 1KV$ /共模 $\pm 2KV$ )的要求。

## 7.8 Harmonic Current (谐波电流)

(1) The harmonic of the power line and neutral current shall comply the standard GB17625.1-2022 (IEC61000-3-2) for class D equipment.

谐波电流应符合GB17625.1-2022 (IEC61000-3-2) D标准要求。

(2) Measurement shall be performed at 75W input power and full output load, Input voltage shall be 230Vac/50Hz, Don't test in process under low range.

测量应在75瓦输入功率和全输出负载下进行, 输入电压应为230V/50Hz。

## 7.9 Hi-Pot (高压)

Input to GND: Voltage 2500VDC Time 3.0S, Cut off current 100uA MAX

输入对地之间施加 2500VDC电压持续3.0s, 截止电流应最大100uA 。

## 7.10 Grounding Continuity Test (接地连续测试)

100m $\Omega$  MAX at 25.0A .

25A下100m $\Omega$ 最大。

### 7.11 Ground Leakage Current (漏电流测试)

3.5mA MAX. at 264V/50Hz.

264V/50Hz 下 3.5mA 最大。

**NOTE:** To better simulate the using environment, the applicant required that EMI and EMS tests shall performed on EUT with a metal box (Length 65cm, Width 43cm, Height 18cm).

注意: 为更好模拟使用环境, 受试设备在测试 EMI 和 EMS 时, 必须放置在金属盒子 (长 65CM, 宽 43CM, 高 18CM) 内。

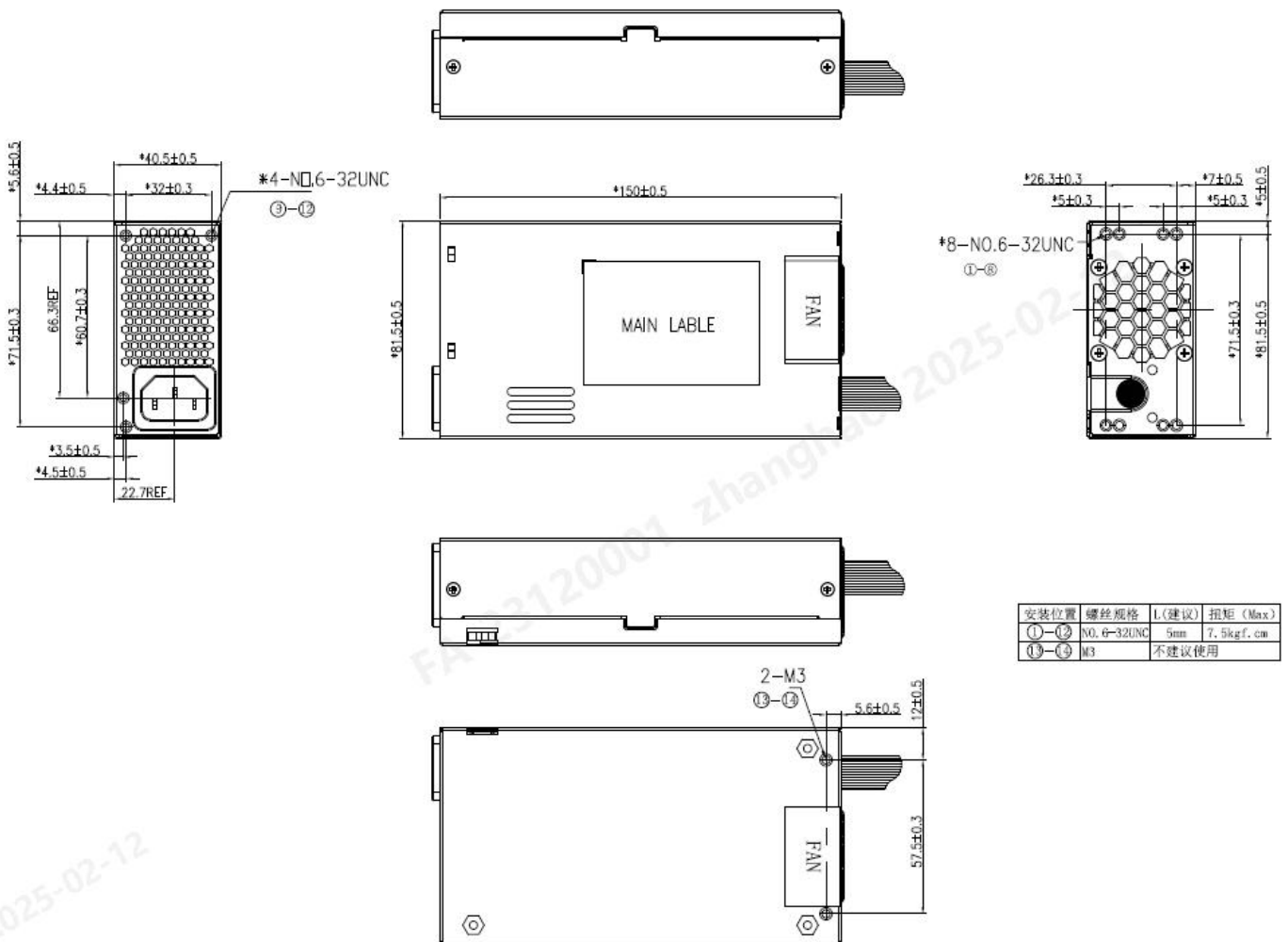
### 8.0 Requirement of environment protection (环保要求)

The power supply shall meet the RoHS requirement.

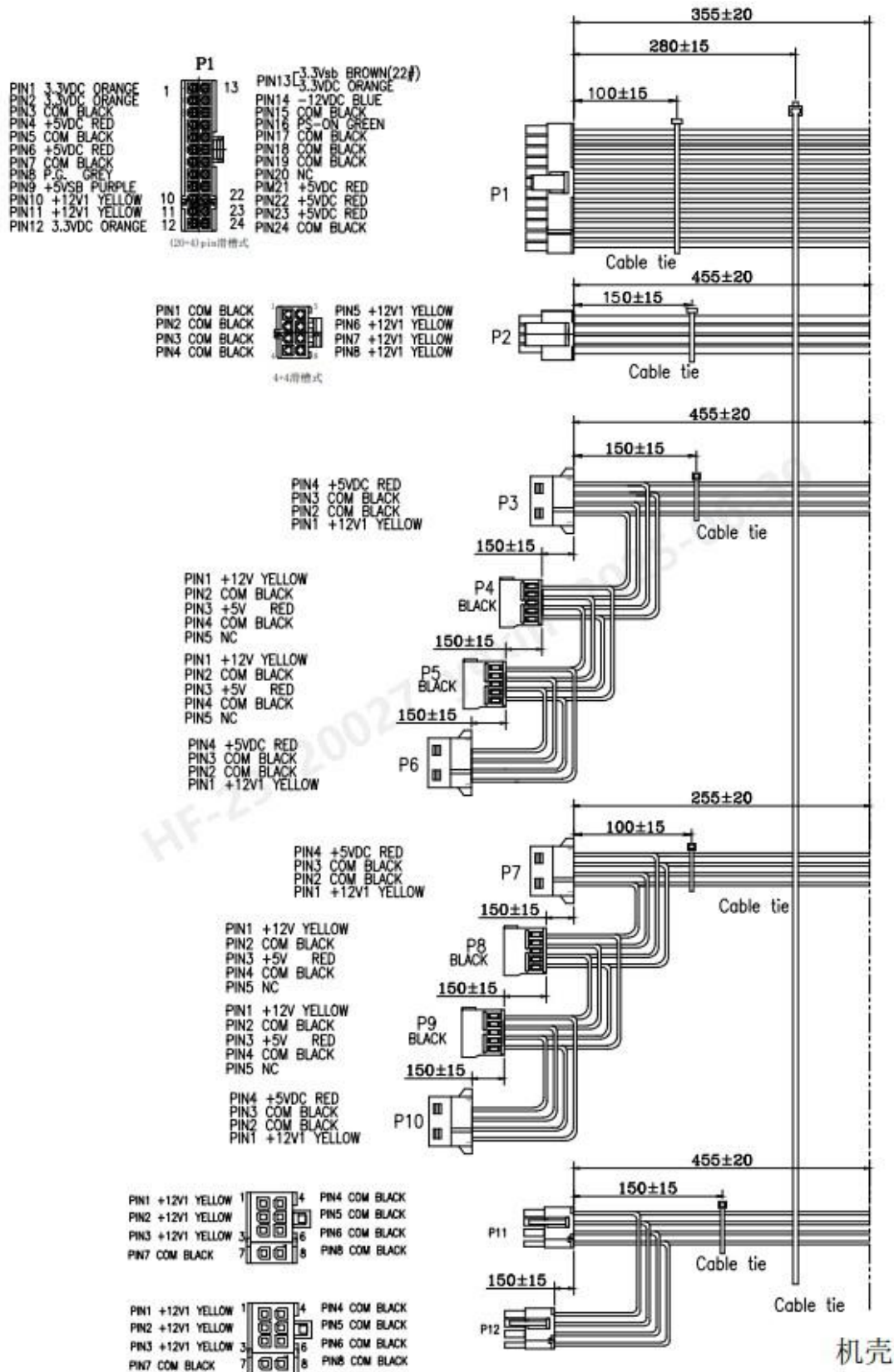
此款电源符合 RoHS 要求

### 9.0 Mechanical (机械结构)

#### 9.1 Mechanical outline (机械外观图)



### 9.2 DC wire drawing (输出线材尺寸图纸)



### 9.3 Label drawing ( 标贴 )

**Huntkey 航嘉**

SWITCHING POWER SUPPLY  
开关电源


型号/MODEL: HK600-91PP

交流输入/AC INPUT: 100-240V~, 50-60Hz, 10A

直流输出/DC OUTPUT:

+5V == 18A, +12V == 41.6A, -12V == 0.3A

+3.3V == 18A, +5VSB == 2.5A




额定输出功率/RATED POWER: 500W

+5V&+3.3V联合输出功率不超过120W  
+5V&+3.3V COMBINED OUTPUT NOT EXCEED 120W

Avertissement: les non-professionnels ne doivent pas ouvrir ce couvercle par eux-mêmes!  
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警告: 非专业人员请勿自行开启此盖!

深圳市航嘉驰源电气股份有限公司  
Shenzhen Huntkey Electric Co., Ltd. 中国制造/MADE IN CHINA  
Huntkey Industrial Park, Xue-xiang Village, Banxue Road Bantian Shenzhen, Guangdong 518129 P.R, China



HK60091PPXXXXXXXXX\*\*\*

REV:A00

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Prepare by	Check by	Approved by
Wei Wei	Cui Jing	Cui Jing
Date:	2025.02.12	