# SPECIFICATION

## Model: RA2-G1K0VP

## KT Part Number: AA1RA21K0000

Redundant Power Supply

Active PFC

1000W + 1000W

80+ Gold Efficiency

| Approve | Check | Prepare |
|---|---|---|
| Brian | Vincent | Velarie |

# Release History

| Rev. | Issue description | Issue date | Prepare |
|---|---|---|---|
| X01 | Initial draft release | 2017/01/23 | Vincent |
| A | The final version | 2018/06/15 | Velarie |
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## Contents

# 1. General

This is the specification of Model RA2-G1K0VP; it is intended to describe the functions and performance of the redundant power supply. The RA2-G1K0VP 1000 watts redundant power supply is featured with Active PFC (Power Factor Correction) capability and gold efficiency for 80+ and PMBus function meets IEC61000-3-2 and equips full range Input features.

Base on the KINTRON Product coding rule, you could quickly figure out the description by following:

| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|
| **R** | **A** | **2 -** | **G** | **1K0** | **V** | **P** |

**1**. Power type: M: mini redundant, R: redundant, S: single, U: unit/module.

**2**. Size type: From A to Z and each one has its own dimension.

**3**. Height/PS2: for redundant power mean the height of the set
1: 1U, 2: 2U, 3: 3U, 4: 4U, P: PS2.

**4**. Efficiency: Base on 80+ definition,
B: Bronze, S: Silver, G: Gold, P: Platinum, T: Titanium.

**5**. DC output watt: The total power for power supply and use three digit as naming,
550: 550W, 600: 600W, 1K0:1000W, 1K1:1100W... etc.

**6**. Application dimension: H: Horizontal, V: Vertical.

**7**. PMBus: P: with PMBus, N: without PMBus.

# 2. AC input specifications

2.1 AC input voltage, frequency and current
(Rating: 100V-240 VAC, 47-63Hz, 13-6A)
The power supply must operate within all specified limits over the input voltage range in Table 1.Harmonics distortion of up to 10% THD must not cause the power supply to go out of specified limits.
Base on the minimum voltage and power transfer, the max current calculation as below:

**Max Current ≧ (Watt / Efficiency) / Minimum Voltage**

| Parameter | Minimum | Normal | Maximum | Max. Current |
|---|---|---|---|---|
| Voltage (115V) | 90 VAC | 100-120 VAC | 132 VAC | 13A |
| Voltage (230V) | 180 VAC | 200-240 VAC | 264 VAC | 6A |
| Frequency | 47 Hz | 50 / 60 Hz | 63 Hz | N/A |

Table 1 – AC Input Voltage and Frequency

2.2 AC inrush current

The power supply must meets inrush requirements of any rated AC voltage, during turn on at any phase of voltage, during a single cycle AC dropout condition, during repetitive On/Off cycling of AC, and over the specified temperature range. The peak inrush current shall be 30/60A @ 115/230 VAC (25℃) per module when cold start and less than the rating of its critical components (including input fuse, bulk rectifiers, and surge limiting device).

2.3 Input power factor correction (Active PFC)

The power factor at 50% load shall be ≧ 0.9 at 230V input voltage.

2.4 Input current harmonics

When the power supply is operated in 90-264Vac of Sec. 2.1, the input harmonic current drawn on the power line shall not exceed the limits set by EN61000-3-2 class “D” and GB9254-2008 standards. The power supply shall incorporate universal power input with active power factor correction.

2.5 Dropout

An AC line dropout is defined to be when the AC input drops to 0 VAC at any phase of the AC line for any length of time. During an AC dropout of 18mS or less the power supply must meet dynamic voltage regulation requirements up to 80% of the rated output load. An AC line dropout of one cycle or less shall not cause any tripping of control signals or protection circuits. If the AC dropout lasts longer than 18mS or the load is greater than 80%, the power supply should recover and meet all turn on requirements. The power supply must meet the AC dropout requirement over rated AC voltages, frequencies, and output loading conditions. Any dropout of the AC line shall not cause damage to the power supply. In the case of redundant AC inputs, the AC line dropout may occur on either or both AC inlet.

## 3. DC output specification

3.1 Output current / loading

The following table defines power and current rating. The power supply shall meet both static and dynamic voltage regulation requirements for minimum load condition.

| Output Voltage | +5V | +3.3V | +12V | -12V | +5VSB |
|---|---|---|---|---|---|
| Max. Load | 25A | 25A | 83A | 0.8A | 3.5A |
| Min. Load | 1A | 1A | 1A | 0A | 0.1A |
| Max. Combined | 170W | | | 9.6W | 17.5W |
| Total Output | 1000W | | | | |

Table 2 – Output Loads Range 1

Note 1: Maximum continuous total DC output power should not exceed 1000W.

3.2 DC voltage regulation, ripple and noise

The power supply output voltages must stay within the following voltage limits when operating at steady state and dynamic loading conditions. All outputs are measured with reference to the return remote sense (Returns) signal. The +5V, +3.3V, +12V, -12V and +5VSB outputs are measure at the power supply connectors references to Returns. The +5V and +3.3V is measured at its remote sense signal (+5VS, +3.3VS) located at the signal connector.

| Output Voltage | +5V | +3.3V | +12V | -12V | +5VSB |
|---|---|---|---|---|---|
| Load Reg. | ±5% | ±5% | ±5% | ±5% | ±5% |
| Cross Reg. | ±5% | ±5% | ±5% | ±5% | ±5% |
| Line Reg. | ±1% | ±1% | ±1% | ±1% | ±1% |
| Ripple & Noise | 50mV | 50mV | 120mV | 120mV | 50mV |

Table 3 – Regulation, ripple and noise

Ripple and Noise shall be measured using the following methods:

a) Measurements made differentially to eliminate common-mode noise.
b) Ground lead length of oscilloscope probe shall be 0.25 inch.
c) Measurements made where the cable connectors attach to the load.
d) Outputs bypassed at the point of measurement with a parallel combination of 10uF tantalum capacitor in parallel with 0.1uF ceramic capacitors.
e) Oscilloscope bandwidth of 0 Hz to 20MHz.
f) Measurements measured at locations where remote sense wires are connected.
g) Regulation tolerance shall include temperature change, warm up drift and dynamic load.

3.3 Timing requirements

These are the timing requirements for the power assembly operation. The output voltages must rise from 10% to within regulation limits (Tvout_rise) within 5 to 70mS. The +5V, +3.3V and +12V output voltages should start to rise at about the same time. All outputs must rise monotonically. The +5V output must occur first than the +3.3V output during any point of the voltage rise. The +5V output must never be greater than the +3.3V output by more than 2.25V. Each output voltage shall reach regulation within 50 ms (Tvout_on) of each other during turn on of the power supply. Each output voltage shall fall out of regulation within 400 mS (Tvout_off) of each other during turn off. Figure 1 and figure 2 shows the turn on and turn off timing requirement. In Figure 2, the timing is shown with both AC and PSON# controlling the on/off of the power supply.

| Item | Description | MIN | MAX | Units |
|---|---|---|---|---|
| Tvout_rise | Output voltage rise time from each main output.(+5VSB < 70mS) | 5 | 70 | mS |
| Tvout_on | All main output must be within regulation of each other within this time. | N/A | 50 | mS |
| Tvout_off | All main output must leave regulation within this time | N/A | 400 | mS |

Table 4 – Output Voltage Timing

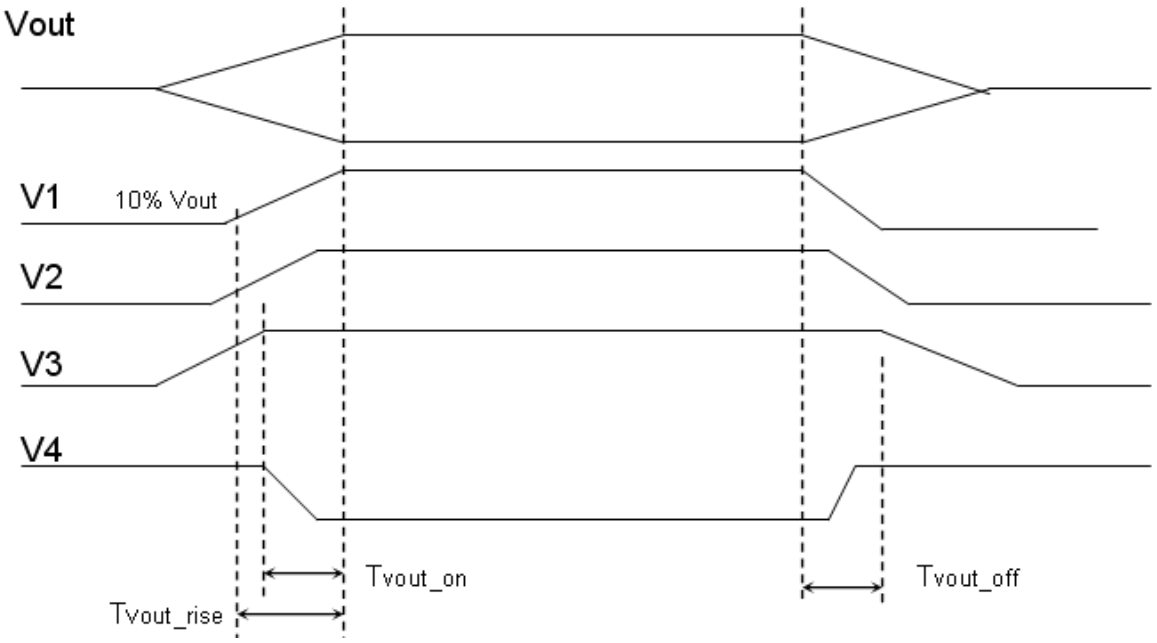



Figure 1 – Voltage Output Timing

| Item | Description | MIN | MAX | Units |
|---|---|---|---|---|
| Tsb_on-delay | Delay from AC being applied to +5VSB is being within regulation. | N/A | 1500 | mS |
| Tac_on-delay | Delay from AC being applied to all output voltages being Within regulation. | N/A | 2500 | mS |
| Tvout_holdup | Main output voltage stay within regulation after loss of AC tested at 80% of maximum load. | 18 | N/A | mS |
| Tpwok_holdup | Delay from loss of AC deassertion of PWOK. | 17 | N/A | mS |
| Tpson_on_delay | Delay from PSON# active to output voltage within regulation limits. | 5 | 400 | mS |
| Tpson_pwok | Delay from PSON# deactive to PWOK being deasserted. | N/A | 50 | mS |
| Tpwok_on | Delay from output voltage within regulation limits to PWOK asserted at turn on. | 100 | 500 | mS |
| Tpwok_off | Delay from PWOK deasserted to output voltages (+5V, +3.3V, +12V) dropping out of regulation limits. | 1 | N/A | mS |
| Tpwok_low | Duration of PWOK being in the deasserted state during an off/on cycle using AC or the PSON# signal. . | 100 | N/A | mS |
| Tsb_vout | Delay from +5VSB being in regulation to O/Ps being in regulation at AC turn on. | 50 | 1000 | mS |

Table 5 – Turn On/Off Timing

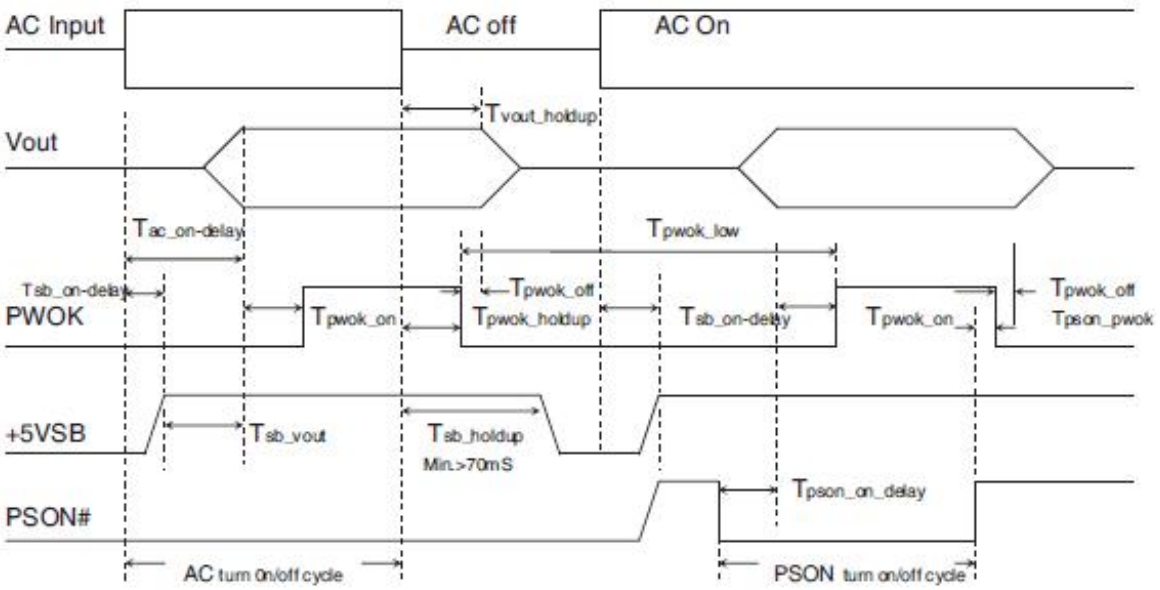



Figure 2 – Turn On/Off Timing

3.4 Remote On/Off Control: PSON#

The PS_ON signal is required to remotely turn on/off the main output of the power supply. PS_ON is and active low signal that turns on the main output power rail. When this signal is not pulled low by the system or left open, the outputs (except the +5VSB) turn off. PS_ON is pulled to a standby voltage by a pull-up resistor internal to the power supply.

| | |
|---|---|
| Signal Type | Accepts an open collector/drain input from the system. Pull-up to VSB located in power supply. |
| PSON# = Low | Power ON |
| PSON# = High | Power OFF |

Table 6 – PWOK Signal Characteristic

3.5 Efficiency (80+ Gold)

The efficiency should be measured power module at 230 VAC and with external fan power source at specified loading.

| Input Voltage | 20% Load | 50% Load | 100% Load |
|---|---|---|---|
| 230 VAC | 88% | 92% | 88% |

Reference www.80plus.org all test conditions.

3.6 +5VSB (Standby power)

The +5VSB output always provides output when AC power is applied and the power switch is turned on. +5VSB line can provide up to 3.5A of current for PC board circuit operation.

# 4. Protection

Protection circuits inside the power supply shall cause only the power supply's main outputs to shutdown. If the power supply latches off due to a protection circuit tripping, either an AC cycle OFF for 15 sec or PSON #cycle HIGH for 1 sec must be able to restart the power supply.

## 4.1 Over power protection

The OPP function shall work at 110%~150% of rating of output power, then all outputs shut down in a latch off mode. The latch shall be cleared by toggling the PSON# signal or by cycling the AC power. The power supply shall not be damaged from repeated power cycling in this condition. If only one module works inside the power supply, the OPP is at 110%~160% of rating of power supply.

## 4.2 Over voltage protection

Each hot swap module has respective OVP circuit. Once any power supply module shut down in a latch off mode while the output voltage exceeds the over voltage limit shown in Table 7, the other modules should deliver the sufficient power to the device continually.

| Voltage | Minimum | Maximum | Shutdown Mode |
|---|---|---|---|
| +5V | +5.7V | +6.5V | Latch Off |
| +3.3V | +3.9V | +4.5V | Latch Off |
| +12V | +13.3V | +14.5V | Latch Off |
| +5VSB | +5.7V | +6.5V | Auto recovery |

Table 7 –Over Voltage protection

## 4.3 Over current protection

The power supply should contain the OCP function on each hot swap module. The power supply should be shut down in a latch off mode while the respective output current exceeds the limit as shown in Table 8. When the latch has been cleared by toggling the PSON# single or cycling the AC input power. The power supply module should not be damaged in this condition.

| Voltage | Minimum | Maximum | Shutdown Mode |
|---|---|---|---|
| +5V | 110% | 150% | Latch Off |
| +3.3V | 110% | 150% | Latch Off |
| +12V | 110% | 150% | Latch Off |
| +5VSB | 110% | 150% | Auto recovery |

Table 8 –Over Current protection

4.4 Short circuit protection

The power supply shall shut down in a latch off mode when the output voltage is short circuit.

## 5. Environmental requirements

5.1 Temperature

| | |
|---|---|
| Operating Temperature Range: | 0°C ~ 45°C (32°F~ 113°F) |
| Non-Operating Temperature Range: | -20°C ~ 70°C (-4°F~ 158°F) |

5.2 Humidity

| | |
|---|---|
| Operating Humidity Range: | 20% ~ 90%RH non-condensing |
| Non-Operating Humidity Range: | 5% ~ 95%RH non-condensing |

## 6. Agency requirements

6.1 Safety

| | |
|---|---|
| Safety Approvals | UL/cUL, TUV, CB, CE, CCC, FCC, KCC |
| Emissions | EN55032, class A Conducted<br>EN55032, class A Radiated |
| Harmonic Currents | EN61000-3-2 |
| Voltage Flicker | EN61000-3-3 |
| ESD | EN61000-4-2 |
| RS | EN61000-4-3 |
| Surge | EN61000-4-4 |
| EFT | EN61000-4-5 |
| Conducted Immunity | EN61000-4-6 |
| PFMF | EN61000-4-8 |
| Voltage Dips | EN61000-4-11 |

6.2 AC Input leakage current

Input leakage current from line to ground will be less than 3.5mA rms. Measurement will be made at 240 VAC and 60Hz.

# 7. Redundant power supply function

7.1 Redundancy

The redundant power supply is N+1=N (1000W+1000W=1000W) function power supply, each one module is redundancy when any one module was failed. To be redundant each item must be in the hot swap power supply module.

7.2 Hot swap requirements

Hot Swapping a power supply is the process of inserting and extracting a power supply from an operating power system. During this process the output voltage shall remain within the limits specified in Table 7. The hot swap test must be conducted when the system is operating under static, dynamic and zero loading conditions. The power supply can be hot swapped by the following method:

Extraction:

The power supply may be removed from the system while operating with PSON asserted, while in standby mode with PSON de-asserted or with no AC applied. No connector damage should occur during un-mating of the power supply.

Insertion:

The power supply may be inserted into the system with PSON asserted, with PSON de-asserted or with no AC power present for that supply. No connector damage should occur due to the mating of the output and input connector.

In general a failed (of by internal latch or external control) supply may be removed, then replaced with a good power supply, however, hot swap needs to work with operational as well as failed power supplies. The newly inserted power supply will get turned on into standby or Power On mode once inserted.

7.3 Current Sharing

As this power supply has redundant function, the output current sharing should within ±5% when half and full load. The supplies must be able to load share in parallel and operate in a hot-swap/redundant configuration.

7.3 LED Indicators

| **Status** | **LED Colors** |
|---|---|
| Power OK, all the power outputs are available. | Green |
| Power Fail, protection or FAN failed. | Red |
| Standby mode, only +5VSB output. | Orange (Green + Red) |

# 8. Reliability

8.1 Mean time between failures (MTBF)

The MTBF of the power supply shall be calculated utilizing the Part-Stress Analysis method of MIL-217F or Bell core RPP. The calculated MTBF of the power supply shall be greater than 200,000 hours under the following conditions:

Full rated load

90V AC input

Ground Benign

25°C

8.2 Warranty

Three (3) years manufacture's warranty.

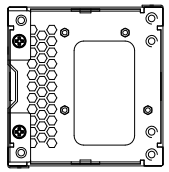
Technical information in this specification is subject to change without notice.

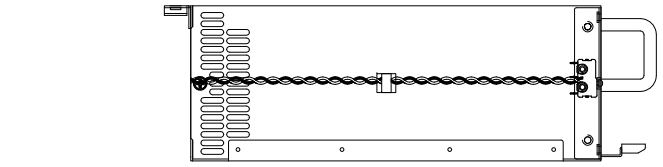
The revision of specification will be marked on the cover.

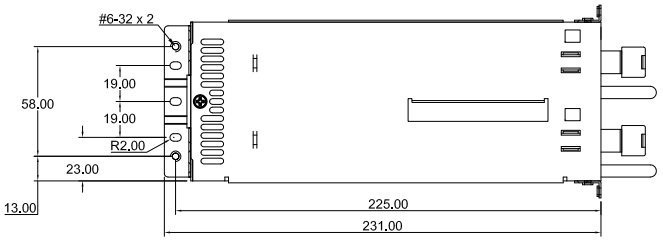
## 9. Physical characteristics size

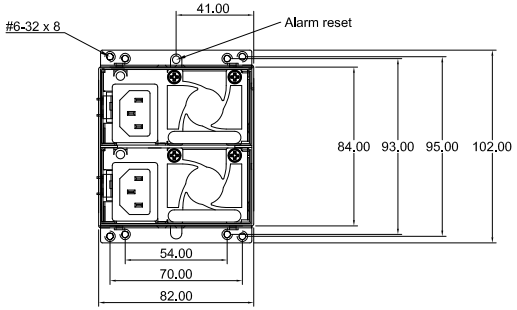
9.1 Dimension: 82(W) x 84m (H) x 217(D)  (Next page)

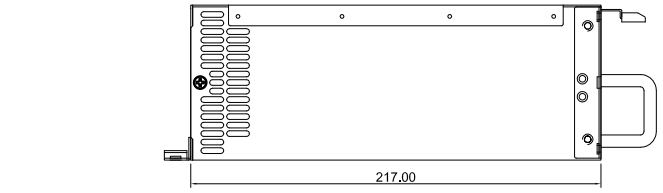
| Mark | Rev. | Description | Date | Draw by | Approve by |
|---|---|---|---|---|---|
| - | A | Initial drawing. | 2017-6-15 | Brian Hsueh | Vincent Wang |








Locked Bracket:
BLK-R2-RB2(NO.2) x2 PCS
BLK-R3-RB2(NO.3) x1 PCS

TOLERANCES:±0.5mm

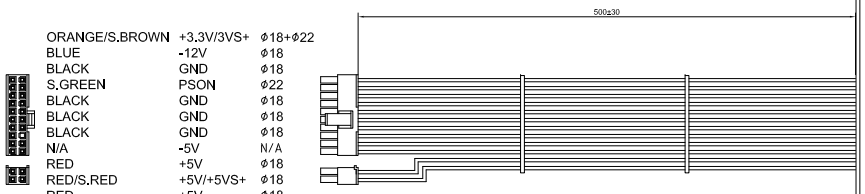
| NOTES: Tolerance as follows unless otherwise specified tolerances. | | MODEL NO: RA2-G1K0VP | 勤創電子 KINTRON ELECTRONICS | | | |
|---|---|---|---|---|---|---|
| LENGTH (mm) | TOLERANCES (mm) | MATERIAL: - | PROJECTION | | | |
| 0~30 | 0.084 | | | | | |
| 31~50 | 0.100 | PART NO: - | UNITS | mm | SCALE | 1 : 4 |
| 51~120 | 0.140 | | | | | |
| OVER 120 | 0.185 | DRAW NO: | SHEET | 1 OF 1 | | |

9.2 DC Output Wire (Next page)

| Mark | Rev. | Description | Date | Draw by | Approve by |
|---|---|---|---|---|---|
| - | A | Update standard drawing. | 2018-05-17 | Velarie Chou | Vincent Wang |

H6657R1-20-02A
Material: Nylon UL 94V-0 or UL 94V-2
Color: Natural
Electrical rating: 250V 5A, AC/DC

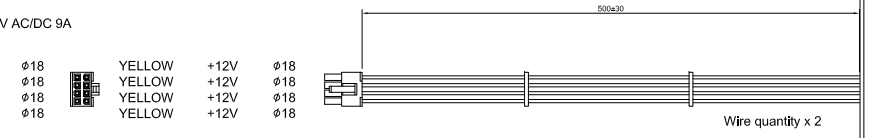
| | | | | | |
|---|---|---|---|---|---|
| ORANGE | +3.3V | Φ18 | ORANGE/S.BROWN | +3.3V/3VS+ | Φ18+Φ22 |
| ORANGE | +3.3V | Φ18 | BLUE | -12V | Φ18 |
| BLACK | GND | Φ18 | BLACK | GND | Φ18 |
| RED | +5V | Φ18+Φ22 | S.GREEN | PSON | Φ22 |
| BLACK | GND | Φ18 | BLACK | GND | Φ18 |
| RED | +5V | Φ18 | BLACK | GND | Φ18 |
| BLACK | GND | Φ18 | BLACK | GND | Φ18 |
| S.GRAY | PG | Φ22 | N/A | -5V | N/A |
| PURPLE | +5VSB | Φ18 | RED | +5V | Φ18 |
| YELLOW | +12V | Φ18+Φ22 | RED/S.RED | +5V/+5VS+ | Φ18 |
| YELLOW | +12V | Φ18 | RED | +5V | Φ18 |
| ORANGE | +3.3V | Φ18 | BLACK | GND | Φ18 |




H6657R1-04-02B
Material: Nylon UL 94V-0 or UL 94V-2
Color: Natural
Electrical rating: 250V 5A, AC/DC

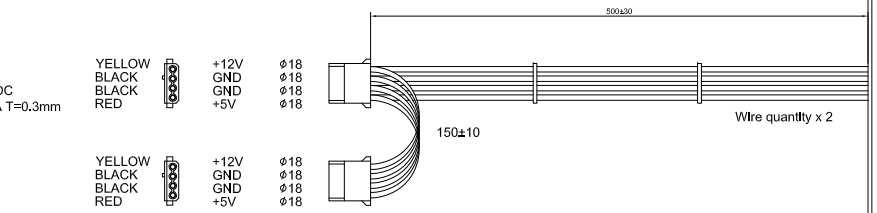
WST-P08-I42002
Material: Nylon 66 UL E149293 94V2
Color: Natural
Terminal: WST I42002PS-2A 250V AC/DC 9A

| | | | | | |
|---|---|---|---|---|---|
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |



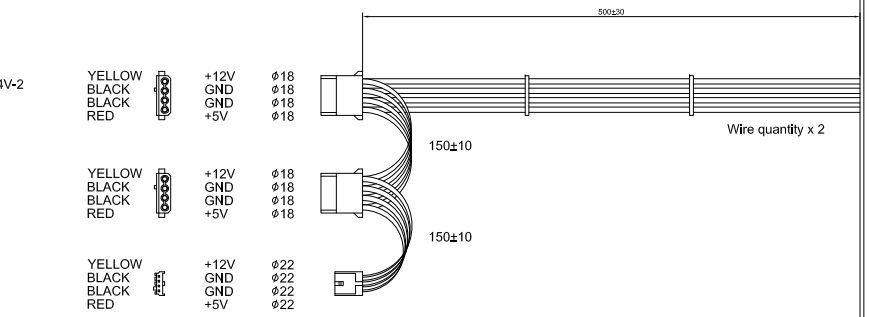

JMT JP1120-4
Material: Nylon PA66 UL 94-V2
Color: Natural
Electrical rating: 250V 10A, AC/DC
Terminal thickness: J1120BS-2A T=0.3mm

| | | | |
|---|---|---|---|
| YELLOW | +12V | Φ18 | |
| BLACK | GND | Φ18 | |
| BLACK | GND | Φ18 | |
| RED | +5V | Φ18 | |
| YELLOW | +12V | Φ18 | |
| BLACK | GND | Φ18 | |
| BLACK | GND | Φ18 | |
| RED | +5V | Φ18 | |



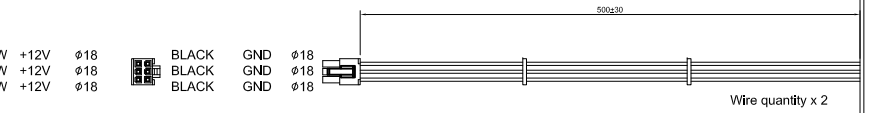

TKP H6657R1-4
Material: Nylon UL 94V-0 or UL 94V-2
Color: Natural
Electrical rating: 250V 5A, AC/DC

| | | | |
|---|---|---|---|
| YELLOW | +12V | Φ18 | |
| BLACK | GND | Φ18 | |
| BLACK | GND | Φ18 | |
| RED | +5V | Φ18 | |
| YELLOW | +12V | Φ18 | |
| BLACK | GND | Φ18 | |
| BLACK | GND | Φ18 | |
| RED | +5V | Φ18 | |
| YELLOW | +12V | Φ22 | |
| BLACK | GND | Φ22 | |
| BLACK | GND | Φ22 | |
| RED | +5V | Φ22 | |



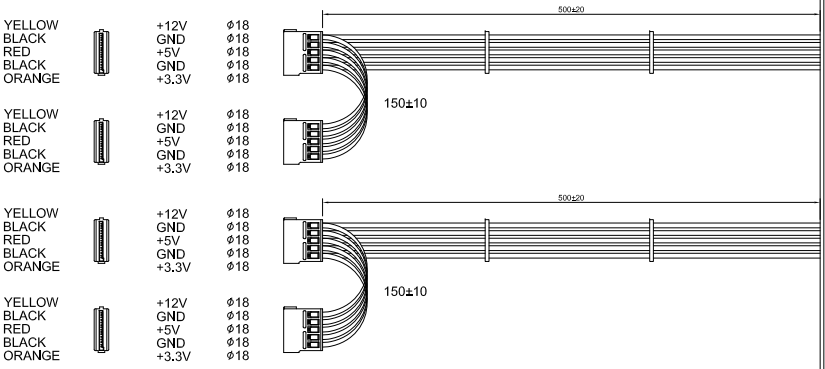

WST P6-I42002K13-B+P2-I42002K13-B
Material: Nylon UL 94V-0 or UL 94V-2
Color: Black
Electrical rating: 250V 5A, AC/DC

| | | | | | |
|---|---|---|---|---|---|
| YELLOW | +12V | Φ18 | BLACK | GND | Φ18 |
| YELLOW | +12V | Φ18 | BLACK | GND | Φ18 |
| YELLOW | +12V | Φ18 | BLACK | GND | Φ18 |



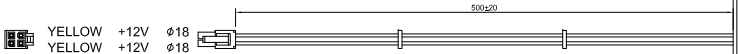

MOLEX 675820000 or equivalent
Material: Nylon UL 94V-0 or UL 94V-2
Color: Black
Electrical rating: 30V 8.3A, AC/DC

| | | | | | |
|---|---|---|---|---|---|
| YELLOW | +12V | Φ18 | YELLOW | +12V | Φ18 |
| BLACK | GND | Φ18 | BLACK | GND | Φ18 |
| RED | +5V | Φ18 | RED | +5V | Φ18 |
| BLACK | GND | Φ18 | BLACK | GND | Φ18 |
| ORANGE | +3.3V | Φ18 | ORANGE | +3.3V | Φ18 |



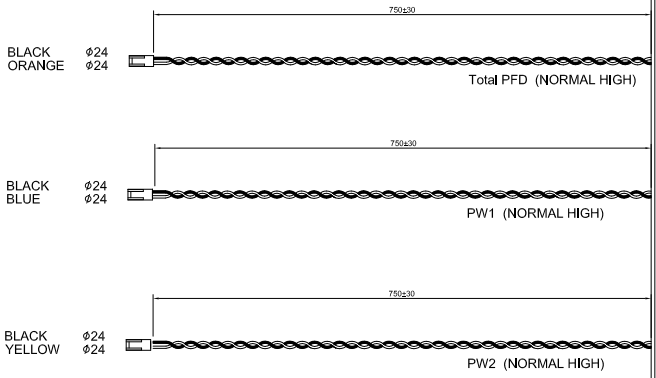

TKP H6657R1-4
Material: Nylon UL 94V-0 or UL 94V-2
Color: Natural
Electrical rating: 250V 5A, AC/DC

| | | | | | |
|---|---|---|---|---|---|
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |
| BLACK | GND | Φ18 | YELLOW | +12V | Φ18 |




TKP 2510: 2 Circuits, 2.54mm
Material: Nylon UL 94V0
Color: White
Electrical rating: 250V 2A, AC/DC

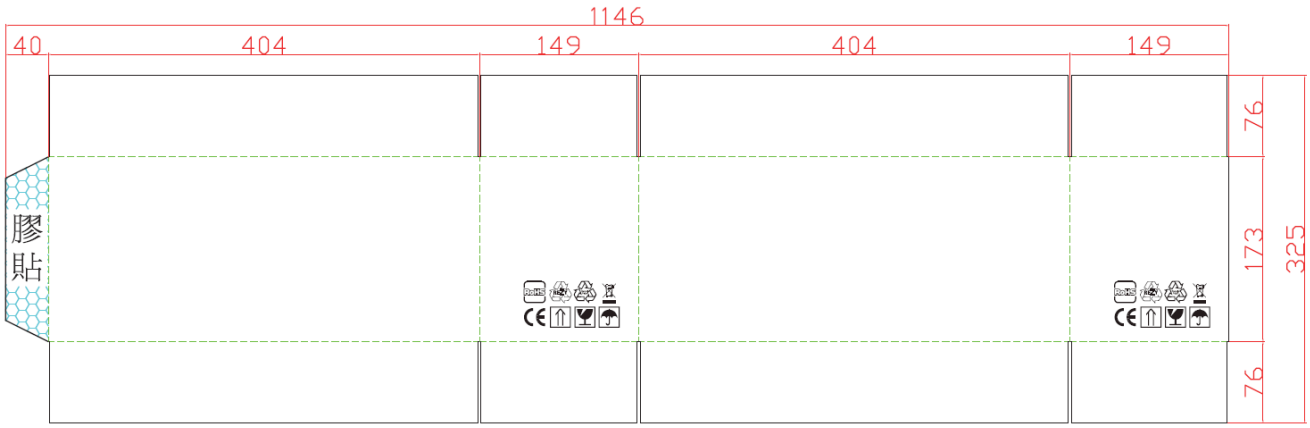
| | | |
|---|---|---|
| BLACK | Φ24 | |
| ORANGE | Φ24 | |
| BLACK | Φ24 | |
| BLUE | Φ24 | |
| BLACK | Φ24 | |
| YELLOW | Φ24 | |



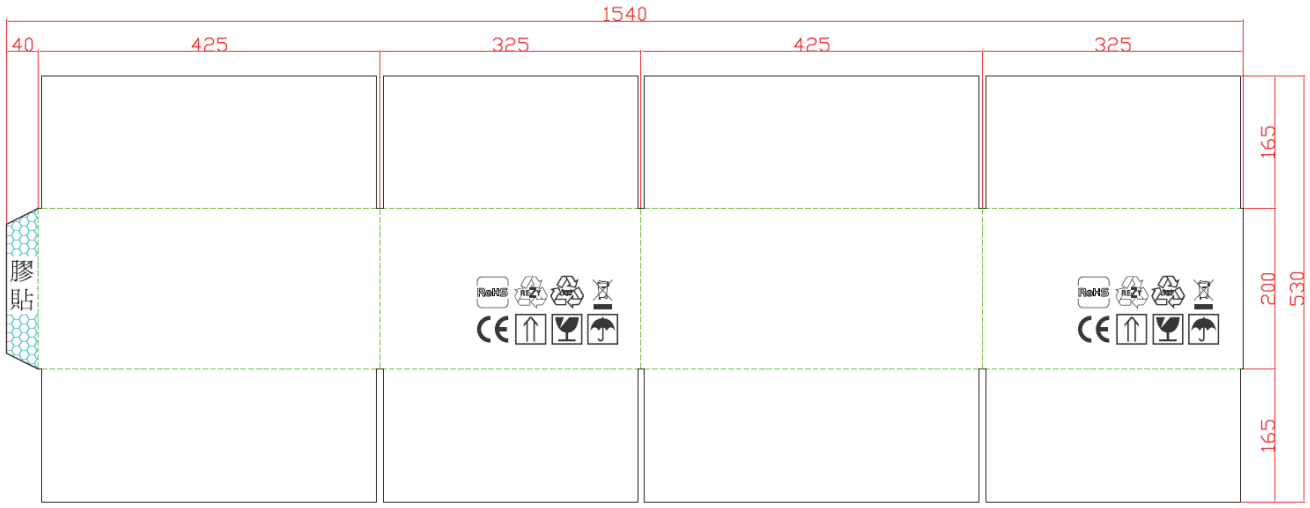

| NOTES: Tolerance as follows unless otherwise specified tolerances. | | MODEL NO: RA2-G1K0VP all wire | 勤創電子 KINTRON ELECTRONICS | |
|---|---|---|---|---|
| LENGTH (mm) | TOLERANCES (mm) | MATERIAL: UL1007 | PROJECTION | |
| 0~30 | 0.084 | | | |
| 31~50 | 0.100 | PART NO: AA1RA21K0000 | UNITS mm | SCALE 1 : 4 |
| 51~120 | 0.140 | | | |
| OVER 120 | 0.185 | DRAW NO: | SHEET 1 OF 1 | |

9.3 Carton Dimension

RA2- G1K0VP carton size




RA2-G1K0VP Outside carton ( 2 in 1 )



9.4 Model label

Module Label


Housing Label