# UL TEST REPORT AND PROCEDURE

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|---|---|
| **Standard:** | UL 60950-1, 2nd Edition, 2014-10-14 (Information Technology Equipment - Safety - Part 1: General Requirements)<br>CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (Information Technology Equipment - Safety - Part 1: General Requirements) |
| **Certification Type:** | Component Recognition |
| **CCN:** | QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment) |
| **Complementary CCN:** | QQHM2, QQHM8 (Power Supplies, Medical and Dental) |
| **Product:** | Power Supply |
| **Model:** | NV700 or NV-700 Range, RA-PFC-001 (see Model Differences for details of NV700 Range model configurations) |
| **Rating:** | NV700 or NV-700 Range:<br>100-240Vac nominal (90-264V max. tolerance), 47-440Hz, 11A<br>(see Model Differences for details of model ratings)<br><br>RA-PFC-001:<br>input: 100-240Vac nominal (90-264V max. tolerance), 47-63Hz, 11A max.<br>output: 350Vdc, 2.3A max. |
| **Applicant Name and Address:** | TDK-LAMBDA UK LTD<br>KINGSLEY AVE<br>ILFRACOMBE<br>DEVON<br>EX34 8ES UNITED KINGDOM |

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Wojciech Czerniak (Project Handler) Reviewed by: Dennis Butcher (Reviewer)

**Supporting Documentation**

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

A. Authorization - The Authorization page may include additional Factory Identification Code markings.

B. Generic Inspection Instructions -

i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.

ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.

iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

**Product Description**

NV700 or NV-700 series or power supplies for building into end equipment. (see Model Differences for details of model configurations) and RA-PFC-001 (the RA-PFC-001 is comprised of only a filter/boost assembly, chassis, cover, fan assembly, output assembly and output terminal block)

**Model Differences**

RA-PFC-001 consists of the main PFC Converter without any NV700 modules fitted.

NV700 models as described below:

Units may be marked with a Product Code: K7x or NV7x where x may be up to any six letters and/or numbers 0 to 9.

Unit Configuration (Description:) Code may be prefixed by NS # followed by / or - (where # may be any characters indicating non-safety related model differences).

Unit Configuration (Description :) Code:

a) NV-700 or NV7 (these models are identical)

b) followed by: S or C

| | | | |
|---|---|---|---|
| where | S | = | Forward airflow, standard fan |
| | C | = | Customer air, fan not fitted |
| | U | = | Customer air, fan not fitted, cover not fitted |

c) followed by: S or I

| | | | |
|---|---|---|---|
| where | S | = | Screw input terminals |
| | I | = | IEC input |

d) followed by: S, M, L, R, or T

| | | | |
|---|---|---|---|
| where | S | = | Standard Leakage (Class B Filter) |
| | M | = | Medium Leakage |
| | L | = | Low Leakage |
| | R | = | Reduced Leakage |

T = Tiny Leakage

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

e) optionally followed by: EN#V, EN*V, IN#V, IN*V, ES#V, ES*V, IS#V, IS*V.

where
EN#V = AC good, global module good, PSU enable, 5-5.5V, 2A standby output
EN*V = AC good, global module good, PSU enable, 12-13.5V, 1A standby output
IN#V = AC good, global module good, PSU inhibit, 5-5.5V, 2A standby output
IN*V = AC good, global module good, PSU inhibit, 12-13.5V, 1A standby output
ES#V = AC good, PSU enable, 5-5.5V, 2A standby output
ES*V = AC good, PSU enable, 12-13.5V, 1A standby output
IS#V = AC good, PSU inhibit, 5-5.5V, 2A standby output
IS*V = AC good, PSU inhibit, 12-13.5V, 1A standby output

where # represents the standby output voltage and is in the range 5 to 5.5V
where * represents the standby output voltage and is in the range 12-13.5V

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

Modules:

Up to 4 of the following modules types may be fitted:

@B

or @C

or @CM

or @BH

where @ is the output voltage of the module and is within the range given in the single output module table.

or @/#DB or @_#DB

where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DB module tables.

or @/#DA or @_#DA

where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DA module tables. Only 1 DA module may be fitted.

or B/S or B_S

where B/S indicates that a blanking plate is fitted in place of a module.

The following nomenclature may optionally be used for outputs connected in series:
(Note that outputs may be connected in series even when this nomenclature is not used)

@BB or @ BHB or @BBH or @BHBH or @CC or @CCM

where @ is the total voltage of any two B, BH, C or CM modules connected in series.

or @/#BDB or @_#BDB or @BHDB

where @ is the total series voltage of any B or BH module and DB module channel 1. # is the output voltage of the DB module channel 2. Voltages for # are within the range given in the DB module tables.

or @HDB

where @ is the total series voltage of any DB module channel 1 and channel 2.

For all outputs connected in series:
Permissible min. value for @ is given by summing the min. voltage ratings of the outputs connected in series.
Permissible max. value for @ is given by summing the max. voltage ratings of the outputs connected in series.

Custom Models:

Model: NV-700 RSS IN5V 12BH 12BH
Maximum outputs: 12.5V, 20A; 12.5V, 20A (total power 500W max.)
Maximum ambient: 65°C with 2.5%/°C derating of total power and module current above 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.
Comments: PSU has reverse air.

Model: NV-700 CSS ES5V 12C (NV722DCC and NV7Y019T)
Maximum output: 12V, 37.5A (peak power rating as given in electrical and thermal ratings section on following page)
Maximum ambient: 65°C with 2.5%/°C derating of total power and module current above 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Output Interface Assembly:

One of the following output interface assemblies may optionally be fitted:

Wxxx

where xxx is a number between 001 and 999. These assemblies attach to the module output(s) and contain circuitry providing one or more of the following: current sharing, reduced current limit, fusing, sequencing, diode or-ing, module good, filtering, connectors or terminal blocks for outputs or signalling purposes, indicator lamps or LEDs.

Documentation to be made available to the customer detailing ratings of all assembly outputs.

ELECTRICAL AND THERMAL RATINGS

| | |
|---|---|
| Nominal Input Voltage | 100 - 240 Vac |
| Input Voltage Range | 90 - 264 Vac # |
| Input Frequency Range | 47 - 440 Hz |
| Maximum Input Current | 11 A rms |

# Subject to limitations, see table below.

| Code | Cooling Option | Input Voltage) Range (Vac) | Total output power (W) | Maximum ambient (°C) | Derating |
|---|---|---|---|---|---|
| S | Forward airflow standard fan | 90 - 99.9 | 700W continuous (850W peak if 700W average #) | 65 | 2.5% per °C above 45°C |
| S | Forward airflow standard fan | 100 - 149.9 | 700W continuous (850W peak if 700W average #) | 65 | 2.5% per °C above 50°C |
| S | Forward airflow standard fan | 150 - 264 | 1150W continuous (1450W peak if 1150W average #) | 65 | 2.5% per °C above 45°C |
| C, U | Customer air fan not fitted | Refer to Customer Air Cooling section for details | | | |

Global Option standby outputs (12-13.5V at 1A or 5-5.5V at 2A) should not be included when calculating total PSU output power.
The total output power, module output currents and Global Option output currents are derated by the given value.
# The PSU may output the given peak power for up to 10 seconds providing that the average power from the PSU does not exceed the stated value.

Global Options with output voltages between 5.01 and 5.5V have their max. output current linearly derated from 2A at 50°C ambient to 1.4A at 65°C ambient.

Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Single Output Modules:

| Module | Nominal Voltage (V) | Voltage Range (V) # | Max. Current |
|---|---|---|---|
| B | 3.3 | 3.135 - 3.6 | 40A |
| | 5 | 4.75 - 5.5 | 4.75 - 5.0V: 40A<br>5.0 - 5.5V: Linearly derate from 40 to 36A |
| | 8 | 7 - 9 | 7 - 8V: 22.5A<br>8 - 9V: Linearly derate from 22.5 to 20A |
| | 12 | 12 - 15.5 | 12 - 12.5V: 19.5A<br>12.5 - 15.5V: Linearly derate from 19.5 to 15A |
| | 24 | 24 - 28 | 24V: 10A<br>24 - 28V: Linearly derate from 10 to 8A |
| BH | 12 | 12 - 15.5 | 12 - 12.5V: 20A<br>12.5 - 15.5V: Linearly derate from 20 to 15.5A |
| | 24 | 24 - 28 | 24V: 10A |

| | | | |
|---|---|---|---|
| | | | 24 - 28V: Linearly derate from 10 to 8.5A |
| C & CM | 12 | 12 - 13.2 | 12V: 37.5A. Derated to 450W above 12V |
| | 16 | 15 - 17.6 | 15 - 16V: 28.12A. Derated to 450W above 16V |
| | 24 | 24 - 26.4 | 24V: 18.75A. Derated to 450W above 24V |
| | 30 | 27 - 32 | 27V: 16.67A. Derated to 450W above 27V |

C & CM modules may output up to 600W for up to 10 seconds providing that the average power from the module does not exceed 450W.

Dual Output Modules:

Dual Output Modules, Output 1

| Module | Nominal Voltage (V) | Voltage Range (V) # | Max. Current |
|---|---|---|---|
| DA | 12 | 12.25 | 3A |
| DB | 3.3 | 3.135 - 3.6 | 25A |
| | 5 | 4.75 - 5.5 | 25A |
| | 6 | 5.5 - 6.5 | 25A |
| | 12 | 12 - 15.5 | 12 - 12.5V: 13A<br>12.5 - 15.5V: Linearly derate from 13 to 10A |
| | 24 | 24 - 28 | 24 - 25V: 7A<br>25 - 28V: Linearly derate from 7 to 6A |

Dual Output Modules, Output 2

| Module | Nominal Voltage (V) | Voltage Range (V) # | Max. Current(A) | Max. Power(W) |
|---|---|---|---|---|
| DA | 12 | (-)11.6 - (-)11.9 | 1 | 11.9 |
| DB | 5 | 3.3 - 6 | 10 | 60 |
| | 12 | 7 - 15.5 | 5 | 60 |
| | 24 | 24 - 32 | 2 | 50 |

# Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.
DB modules with 6V nominal channel 1 derated as follows:
Ch.1 : 5.5 - 6V Ch.1 + Ch.2 : 195W total.
Ch.1 : 6.01 - 6.5V Ch.1 + Ch.2 : 170W total.

The DB module may be used with output 1 up to 24V at 8.3A and output 2 up to 16V at 3.13A provided the ambient temperature does not exceed 42°C.

SELV and Outputs Connected In Series:

All individual outputs are SELV. Outputs connected in series are non-SELV if the total output voltage + 30% of the highest of those outputs exceeds 60Vdc (the 30% addition allows for a single fault in any one individual channel).
If the total voltage of outputs connected in series exceeds the 60Vdc SELV limit then all outputs must be considered non-SELV.
The total voltage of outputs connected in series must not exceed 160V.
Non-SELV outputs are hazardous and must be guarded or a deflector fitted during installation to avoid a service engineer making inadvertent contact with the output terminals, or dropping a tool onto them.

All outputs have operational spacings to earth, and due consideration must be given to this in the end product design.

**Technical Considerations**

- Equipment mobility : for building-in
- Connection to the mains : Connection to mains via host equipment, or via appliance inlet
- Operating condition : continuous
- Access location : for building-in
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : Yes (Norway only)
- IT testing, phase-phase voltage (V) : 230V
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 20A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 5000m
- Altitude of test laboratory (m) : 64m
- Mass of equipment (kg) : 0.89 kg for basic unit without additional modules, (max 1.1kg fitted with additional modules and sub-assemblies)
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 50°C at full load to 65°C maximum (see model configuration and output details for models and conditions to which the extended ambient applies. Model RA-PFC-001 was tested with 50°C max. ambient temperature.
- The product is intended for use on the following power systems: TN
- The equipment disconnect device is considered to be: Appliance inlet (if fitted), or provided by the end equipment.
- The product was investigated to the following additional standards: CSA C22.2 No. 60950-1-07 + A1:2011, UL 60950-1 2nd Ed. Revised 2011-12-19, EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013, (which includes all European national differences, including those specified in this test report).
- The following were investigated as part of the protective earthing/bonding: Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- All models are suitable for use at an altitude of 5000 metres.
- Multilayer PWB's accepted under CBTR Ref. No. E349607-A23 dated 2014-07-31 and letter report, see enclosure 8-08 of this report.

**Engineering Conditions of Acceptability**

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The following Production-Line tests are conducted for this product: Electric Strength, Earthing Continuity

- The end-product Electric Strength Test is to be based upon a maximum working voltage of: NV700 Range Primary-SELV: 363 Vrms, 650 Vpk. Primary-Earthed Dead Metal: 343 Vrms, 622 Vpk. RA-PFC-001: Primary-Earthed Dead Metal: 240 Vrms, 430 Vpk. Primary-SELV: 240V rms, 502 Vpk,
- The following secondary output circuits are SELV: - all
- The following secondary output circuits are at hazardous energy levels: 12BH, 24BH, 12C, 16C, 24C, 30C, 12CM, 16CM, 24CM and 30CM modules and primary output of model RA-PFC-001.
- The following output terminals were referenced to earth during performance testing: : All secondary outputs and their return lines individually referenced to obtain maximum working voltage.
- The power supply terminals and/or connectors are: Suitable for factory wiring only with the exception of models fitted with option 1, IEC60320 inlet (end face with fan) which are allowed to be accessible.
- The maximum investigated branch circuit rating is: 20 A
- The investigated Pollution Degree is: 2
- Proper bonding to the end-product main protective earthing termination is: Required
- An investigation of the protective bonding terminals has: Been conducted
- The following end-product enclosures are required: Mechanical, Fire, Electrical
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: Converter: L1 (130°C), L2 (155°C), L3 (155°C), T1 (130°C), C1 (100°C), C3 (100°C), C4 (100°C), RL1 (100°C); Modules: TX1 (130°C), TX2 (130°C), XL1 (125°C), B, BH & DB module L1 (130°C), C & CM Module L1 (140), Global Option T2 (130°C), All electrolytic capacitors (105°C)
- The RA-PFC-001 output has a hazardous Voltage.
- The following magnetic devices (e.g. transformers or inductors) are provided with OBJY3 insulation system with the indicated rating greater than Class A (105°C): T1, T2, TX1 & TX2 (all class F). See table 1.5.1 for details of insulation systems used.

**Additional Information**

Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when C or U options (Customer Air) are fitted, i.e. fan not fitted to PSU. The minimum permitted airflow for customer air cooling is 0.5m/s.

For PSUs and assemblies cooled by customer supplied airflow the components listed in the following table must not exceed the temperatures given. Additionally ratings specified for units with an internal fan shall still be complied with, e.g. mains input voltage range, maximum output power, module voltage / current ratings and maximum ambient temperature. To determine the component temperatures the heating tests shall be conducted in accordance with the requirements of IEC60950-1. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU/assembly to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU/assembly. To determine the most adverse conditions consideration shall be given to the end use equipment maximum operating ambient, the PSU/assembly loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures shall be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive, or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment shall be run until all temperatures have stabilised.

| Circuit Ref. | Description | Max Temperature (°C) |
|---|---|---|

| | | |
|---|---|---|
| L2, L3 | Filter/PFC assy: Choke winding | 155 |
| C1, C3, C4 | Filter/PFC assy: X capacitors | 100 |
| L1 | Filter/PFC assy: Boost choke winding | 130 |
| C12, C13 | Filter/PFC assy: Electrolytic capacitor | 105 |
| T1 | Filter/PFC assy: Flyback transformer winding | 130 |
| RL1 | Filter/PFC assy: Relay | 100 |
| TX1, TX2 | Modules: Power transformer windings | 130 |
| L1, XL1 | B, BH & DB module chokes | 125 |
| L1 | C & CM module chokes | 140 |
| T2 | Global Options: Transformer winding | 130 |
| Various | All other choke & transformer windings | 110 |
| Various | All <=10mm diameter electrolytic capacitors | 105 |
| Various | All 12.5mm diameter electrolytic capacitors | 105 |

This report to include IEC60950-1 + A1 + A2, is a reissue of CBTR Ref. No. E135494-A53-CB-2 dated 2013-03-19 including amendments and corrections with CB Test Certificate Ref. No. DK-27353-A1-UL dated 2013-03-19. Based on previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.
Only the tests below were deemed necessary.
The original report was modified on 2014-10-08 to include the following changes/additions:-
1. Addition/deletion of multilayer PWBs to critical component list
2. Alternative input connector (J1) same ratings, no testing considered.
3. Critical component certificate updates
4. Correction/addition to critical component list
5. Product assessed to 5000m
6. Enclosures updated to include revised handbook, drawings and marking plate
7. Alternative fuse (F2 (Daito)) tested
8. Alternative fan (YS Tech) tested
9. Assessed to IEC60950-1 amendment 2:2013
10. Cemented joint test updated

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Project 4787707401 information:
This is Amendment 1 to the CB Test Report E135494-A53-CB-3 dated 2014-12-05 with CB Test Certificate DK-42330-UL and with Correction 1 dated 2014-12-09. This Amendment is published due to changes provided in Report Summary.
No additional testing has been done.
This amendment shall be read in conjunction with Original Test Report and Test Certificate and with previous Correction 1.

**Additional Standards**

The product fulfills the requirements of: CSA C22.2 No. 60950-1-07 + A2:2014, UL 60950-1 2nd Ed. Revised 2014-10-14, EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

**Markings and instructions**

| Clause Title | Marking or Instruction Details |
|---|---|
| 1.7.1 Power rating - Ratings | Ratings (voltage, frequency/dc, current) |
| 1.7.1 Power | Listee's or Recognized company's name, Trade Name, Trademark or File |

| | |
|---|---|
| rating - Company identification | Number |
| 1.7.1 Power rating - Model | Model Number |
| 1.7.6 Fuses - Non-operator access/soldered-in fuses | Unambiguous reference to service documentation for instructions for replacement of fuses replaceable only by service personnel |

**Special Instructions to UL Representative**

Both full assemblies and sub-assemblies of the NV-700 range as described below, are made at TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe, Devon, EX34 8ES.

Sub-assemblies built at TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe, Devon, EX34 8ES, are to be constructed in accordance with this Follow-Up Service Procedure. Sub-assemblies sent to final assembly locations given below shall be marked with a yellow dot. This identification code is to indicate to the field representative at the final assembly locations that the sub-assemblies were inspected in TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe, Devon, EX34 8ES. If variations are found, the code shall be removed by the manufacturer.

Sub-assemblies built at other locations must have a UL Recognition mark for CCN ZPVI2.

The final NV-700 PSUs built at TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe, Devon, EX34 8ES; Lambda GMBH, Karl-Bold-Str 40, Achern 77855 Germany; Arrow Electronics Inc,1955 E Sky Harbor Cir N, Phoenix Arizona 85034, USA and Avnet Inc, 60 South McKemy Avenue, Chandler, Arizona 85226, USA will consist of assembling all components listed as 'sub-assemblies' into a complete unit.

**Production-Line Testing Requirements**

**Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.**

| Model | Component | Removable Parts | Test probe location | V rms | V dc | Test Time, s |
|---|---|---|---|---|---|---|
| N/A | - | - | - | - | - | - |

**Earthing Continuity Test Exemptions - This test is not required for the following models:**

**Electric Strength Test Exemptions - This test is not required for the following models:**

**Electric Strength Test Component Exemptions - The following solid-state components may be disconnected from the remainder of the circuitry during the performance of this test:**

**Sample and Test Specifics for Follow-Up Tests at UL**

| Model | Component | Material | Test | Sample(s) | Test Specifics |
|---|---|---|---|---|---|
| N/A | | | | | |

| 1.5.1 | **TABLE: list of critical components** | | | | | Pass |
|---|---|---|---|---|---|---|
| Object/part or Description | Manufacturer/ trademark | type/model | technical data | Product Category CCN(s) | Required Marks of Conformity | Supplement ID |
| Single and Double sided PWB's, | Interchangeable | Interchangeable | 94V-1 (Minimum) 130°C | ZPMV2 | UL | |
| IMS PWB's | Interchangeable | Interchangeable | 94V-1 (Minimum) 120°C | ZPMV2 | UL | |
| Multilayer PWB's | As below | B, DB and C module base PWB's<br>Primary control PWB's<br>Primary winding PWB's,<br>DC-DC PWB's | - | - | - | |
| PWB's (multi-layer alternate) | Eurotech | 2 | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.60mm) | ZPMV2 | UL (E76441) | |
| PWB's (multi-layer alternate) | Tak Shing Technology (Hong Kong) Ltd. | TS-M | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.58mm) | ZPMV2 | UL (E305886) | |
| PWB's (multi-layer alternate) | Oki Printed Circuits Co.Ltd. | OM-11 | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.403mm) | ZPMV2 | UL (E48977) | |
| PWB's (multi-layer alternate) | MFS Technology (PCB) Co., Ltd | MDL10 | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.36mm) | ZPMV2 | UL (E94919) | |
| PWB's (multi-layer alternate) | Yan Tat Technology Ltd | Y-16 | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.57mm) | ZPMV2 | UL (E152990) | |
| PWB's (multi-layer alternate) | Garner Osborne Circuits | 3 | 94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced:0.60mm) | ZPMV2 | UL (E176375) | |
| FILTER / PFC ASSEMBLY | - | - | - | - | - | |
| J1 Mains terminal block | Molex Inc. (Beau) | 38700 Series (previously 70 | UL: 300V, 20A, 130°C | XCFR2 | UL, (E48521) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | series) | | | | |
| J1 Mains terminal block (alternate) | Tyco (Buchanan) | 4DB series | UL: 300V, 20A, 105°C | XCFR2 | UL, (E54800) | |
| J1 Mains terminal block (alternate) | Tianli Electrical Machinery (Ningbo) Co. Ltd | B825 Series | UL: 300V, 20A, 105°C | XCFR2 | UL, (E206029) | |
| XR1, XR2, XR3, XR4 Discharge resistors | Interchangeable | Interchangeable | 180K ohm max, 1W min | - | - | |
| F1 fuse | Schurter SAS | 7023.0320PT (A12-BK series) | F16AH, 250V, 6.3x32mm | JDYX2 | UL, (E42088) | |
| F1 fuse (alternate) | Bussmann | GBH-V-016A6F | F16AH, 500V, 6.3x32mm | JDYX2 | UL, (E19180) | |
| F1 fuse (alternate) | Conquer | ABP016 | F16AH, 250V, 6.3x32mm | JDYX2 | UL, (E82636) | |
| C1, C3 X capacitors (optional) | Kemet Electronics OY | PHE840M series | 1uF max, 275Vac, X2, 105°C | FOWX2, | UL, (E73869) | |
| C1, C3 X capacitors (optional) (alternate) | Vishay Capacitors Belgium N V | MKP338-2 series | 1uF max, 250Vac, X2, 105°C | FOWX2, | UL, (E354331) | |
| C1, C3 X capacitors (optional) (alternate) | Carli Electronics Co. Ltd. | MPX series | 1uF max, 275Vac, X2, 100°C | FOWX2, | UL, (E120045) | |
| C1, C3 X capacitors (optional) (alternate) | Xiamen Faratronic Co. Ltd. | MKP62 series | 1uF max, 275Vac, X2, 110°C | FOWX2, | UL, (E186600) | |
| C1, C3 X capacitors (optional) (alternate) | Kemet Electronics Italia SRL (Arcotronics) | R.46 series | 1uF max, 275Vac, X2, 110°C | FOWX2, | UL, (E97797) | |
| C4 X capacitor (optional) | Kemet Electronics OY | PHE840M series | 0.68uF max, 275Vac, X2, 105°C | FOWX2, | UL, (E73869) | |
| C4 X capacitor (optional) (alternate) | Vishay Capacitors Belgium N V | MKP338-2 series | 0.68uF max., 275V, X2, 105°C | FOWX2, | UL, (E354331) | |
| C4 X capacitor (optional) (alternate) | Carli Electronics Co. Ltd. | MPX series | 0.68uF max, 275Vac, X2, 100°C | FOWX2, | UL, (E120045) | |
| C4 X capacitor (optional) (alternate) | Xiamen Faratronic Co. Ltd. | MKP62 series | 0.68uF max, 275Vac, X2, 110°C | FOWX2, | UL, (E186600) | |
| C4 X capacitor (optional) (alternate) | Kemet Electronics Italia SRL (Arcotronics) | R.46 Series | 0.68uF max, 275Vac, X2, 110°C | FOWX2, | UL, (E97797) | |
| C5, C6, C7 Y capacitors (optional) | Kemet Electronics OY | PME271Y series | 1.5nF max, 250Vac, Y2, 100°C | FOWX2, | UL, (E73869) | |
| C5, C6, C7 Y capacitors | Kemet Electronics | PHE850 series | 1.5nF max., 300Vac (UL | FOWX2, | UL, (E73869) | |

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| (optional) (alternate) | OY | | 250Vac), Y2, 100°C | | | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Wima Spezialvertrieb Elektronishcher Bauelemente GMBH & Co. KG | MP 3-Y2 series | 1.5nF max., 250Vac, Y2, 110°C | FOWX2, | UL, (E100438) | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Xiamen Faratronic Co.Ltd. | MKP-63 series | 1.5nF max, 250Vac, Y2, 105°C | FOWX2, | UL, (E186600) | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Vishay Capacitors Belgium N V | MKP338-6 series | 1.5nF max, 300Vac, Y2, 105°C | FOWX2, | UL, (E354331) | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Kemet Electronics Corp | ERP 610 Series | 1.5nF maximum, 250V, Y1, 125°C | FOWX2 | UL (E356389) | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Murata mfg Co. Ltd. | KX series | 1.5nF max, 250Vac, Y1, 125°C | FOWX2 | UL (E37921) | |
| C5, C6, C7 Y capacitors (optional) (alternate) | Vishay | VY1 series | 1.5nF max, 500Vac, Y1, 125°C | FOWX2 | UL (E183844) | |
| L2, L3 Common mode choke | Interchangeable | Interchangeable | Core: OD 22mm ID 13mm, depth 13mm. Wire: Class H 0.95mm min. ECW Base:- Manufactured by EI Dupont Rynite FR530 or FR530L, 0.8mm thick min rated 94V-0, RTI 155°C. | QMFZ2 | UL, (E41938) | |
| L2, L3 cradle | Interchangeable | Interchangeable | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 0.9mm thick | QMFZ2 | UL, (E41938) | |
| RL1 Relay | Tyco (OEG) | PCD-112D1M | 240V, 10A, coil 12V | NRNT2 | UL, (E82292) | |
| RL1 Relay (alternate) | Tyco (OEG) | PCD-112D2M | 240V, 10A, coil 12V | NRNT2 | UL, (E82292) | |
| RL1 Relay (alternate) | Omron | G5CA-1A-E-12VDC | 250V,10A, coil 12V | NRNT2, | UL, (E41515) | |
| XTH101 Thermistor | Murata | PRF18BB471+++++ where + may be any number or letter | 115°C Required for safety (eng. Note – cURus component with IEC/EN60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| L1 Boost choke | Interchangeable | Interchangeable | Cores: 35 by 26 by 21mm overall. Wire: Class B min 0.14mm min. ECW Base:- | QMFZ2 | UL, (E41938) | |

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| | | | Manufactured by EI Dupont Rynite FR530 or FR530L, 0.9mm thick min rated 94V-0, RTI 155°C | | | |
| L1 bobbin | Interchangeable | Interchangeable | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 0.9mm thick | QMFZ2 | UL, (E41938) | |
| C12, C13 Reservoir capacitor (optional) | Interchangeable | Interchangeable | 220uF max, 400V min., 105°C | FOWX2 | - | |
| F2 Fuse | Bussmann | PC-Tron PCB1-R | F1AL, 450Vdc | JDYX2 | UL (E19180) | |
| F2 Fuse (alternate) | Daito | DCP 10 | F1AL, 450Vdc | JDYX2 | UL (E59783) | |
| F2 Fuse (alternate) | Daito | DCP 20 | F2AL, 450Vdc | JDYX2 | UL (E59783) | |
| T1 flyback transformer | TDK-Lambda UK Ltd or Trio Engineering Co Ltd | TDKL Part No: 33037. May be followed by T. | Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1 | OBJY3 or OBJY2 | UL, (E148927 or E182446) | |
| T1 flyback transformer core | Interchangeable | Interchangeable | 2 E-cores total 16mm x 8mm x5mm | - | - | |
| T1 flyback transformer bobbin | Interchangeable | Interchangeable | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 1.0mm thick | QMFZ2 | UL, (E41938) | |
| T1 flyback transformer triple insulated wire | Totoku | 3S-ETFE or TIW-E | Triple insulated wire. 26 AWG (0.4mm dia.) min. Provides reinforced insulation Class F | OBJT2, | UL (E166483) | |
| T1 flyback transformer triple insulated wire (alternate) | New England Wire Technologies Corp. | WxxT1.5EyyyTC1A (xx may be 26 or 24 and y may be any number between 0-9) | Triple insulated wire 26AWG (0.4mm diameter) min. Provides reinforced insulation. Class F | OBJT2, | UL (E205791) | |
| XU4 Opto coupler | Vishay | SFH6156 series | 4420Vac (UL). Provides Reinforced insulation. | FPQU2, | UL, (E52744) | |
| XU4 Opto coupler (alternate) | Renesas Electronics Corporation | PS2581L2 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| XU4 Opto coupler | Renesas Electronics | PS2561L2-1 | 5000Vac May be marked NEC | FPQU2, | UL, (E72422) | |

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| (alternate) | Corporation | | and/or Renesas Provides Reinforced insulation | | | |
| XU4 Opto coupler (alternate) | Renesas Electronics Corporation | PS2561DL2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| J20 to J24 and J26 to J27 Connector | Molex | 38-00-1335 (4455 series) | 250V, 2.5A, UL94V-0 | ECBT2 | UL, (E29179) | |
| END CAP ASSY | - | - | - | - | - | |
| Fan (S cooling option only) | Sunonwealth | PMD1204PKB3 | 12V, 13.3cfm | GPWV2 | UL, (E77551) | |
| Fan (S cooling option only) | YS Tech | FD124020UB-H-NAH | 12V, 14.4cfm | GPWV2 | UL, approvals pending (E187205) | |
| IEC 60320 Inlet (Input option I only) (optional) | Schurter AG | 6100-41xx, where xx is a number (panel thickness) | 250V, 10A (250V, 15A UL) , UL94V-0 | AXUT2, | UL, (E96454) | |
| Wiring from IEC 60320 inlet to terminal block Live and Neutral (Input option I only) (optional) | Interchangeable | Interchangeable | 20AWG min, 300V min 80°C min UL Style 1015 or 1050 | AVLV2 | UL | |
| Wiring from IEC 60320 inlet to terminal block Earth (Input option I only) (optional) | Interchangeable | Interchangeable | 18AWG min, 300V min 80°C min UL Style 1015 or 1050 | AVLV2 | UL | |
| CHASSIS & COVER INSULATORS: | - | - | - | - | - | |
| Insulation on chassis | Interchangeable | Interchangeable | Polyester or polyimide tape with cut-outs. Single layer provides Basic insulation, 2 layers provide reinforced insulation. | OANZ2 | UL | |
| Insulator on chassis below module heatsinks | Interchangeable | Interchangeable | Polyester or polyimide tape. Provides Basic insulation (Hazardous secondary to earth) | OANZ2 | UL | |
| Insulation on cover | Interchangeable | Interchangeable | Polyester or polyimide tape. Provides Basic and Reinforced insulation | OANZ2 | UL | |

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| Insulator on cover above module power trx. clips | Interchangeable | Interchangeable | 2 pieces laid on top of each other polyester or polyimide tape. Provides Reinforced insulation (Hazardous secondary to earth) | OANZ2 | UL | |
| Insulator for module heatsinks | Bergquist Co. | GPVOUS-0.040 Gap Pad V0 Ultra Soft | Provides Supplementary insulation | QMFZ2 | UL, (E59150) | |
| Insulator for module heatsinks (alternate) | Shiu Li Technology Co Ltd | L37-3 or H48-2 | Provides Supplementary insulation | QMFZ2 or OCDT2 | UL, (E317540) or (E256821) | |
| Gap filling insulator on cover above IMS | Bergquist Co. | GPVOUS-0.040 Gap Pad V0 Ultra Soft | Provides Basic insulation | QMFZ2 | UL (E59150) | |
| Gap filling insulator on cover above IMS (alternate) | Shiu Li Technology Co Ltd | L37-3 or H48-2 series | Provides Basic insulation | QMFZ2 or OCDT2 | UL (E317540) or (E256821) | |
| B, BH and DB MODULES: | - | - | - | - | - | |
| Module cradle | Interchangeable | Interchangeable | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 0.9mm thick min | QMFZ2 | UL, (E41938) | |
| L1 choke (optional) | Interchangeable | Interchangeable | Core: OD 8mm ID 4mm, depth 3mm. Wire: Class H 0.3mm min. ECW. Base:- Manufactured by EI Dupont Rynite FR530 or FR530L, 0.8mm thick rated 94V-0, RTI 155°C. Or interchangeable manufacturers, Nema FR4, 1.6mm 94V-0, RTI 140°C | QMFZ2 or ZPMV2 | UL, (E41938) | |
| XL1 choke (3.3V & 5V Ch. 1, base board) | Interchangeable | Interchangeable | Cores: 12 by 12 by 9mm max. overall. Rated 40.5A min. | - | - | |
| XL1 choke, (12V Ch. 1, base board) | Interchangeable | Interchangeable | Cores: 12 by 12 by 9mm max. overall. Rated 22.2A min. | - | - | |
| XL1 choke, (24V Ch. 1, | Interchangeable | Interchangeable | Cores: 12 by 12 by 9mm max. | - | - | |

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| base board) | | | overall. Rated 11.2A min. | | | |
| XR23 Thermistor (fitted to module base PWB. Protects single modules and channel 1 on twin output modules). | Murata | PRF18AR471+++ ++ where + may be any number or letter | 135°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XR23 Thermistor (fitted to module base PWB. Protects 12B, 12BH, DB24/5, 12, 24 modules) | Murata | PRF18BB471+++ ++ where + may be any number or letter | 115°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XR23 Thermistor (fitted to module base PWB. Protects 24B & 24BH modules) | Murata | PRF18BC471+++ ++ where + may be any number or letter | 105°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XR9 (18 & 24V O/Ps) Thermistor for channel 2 on twin output modules). | Murata | PRF18BB471+++ ++ where + may be any number or letter | 115°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XR16 (5 & 12V O/Ps) (Thermistor for channel 2 on twin output modules). | Murata | PRF18BA471+++ ++ where + may be any number or letter | 125°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XU1, XU3 & XU4 Opto coupler | Vishay | SFH6156 series | 4420Vac (UL). Provides Reinforced insulation. | FPQU2, | UL, (E52744) | |
| XU1, XU3 & XU4 Opto coupler | Renesas Electronics Corporation | PS2581L2 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| XU1, XU3 & XU4 Opto coupler | Renesas Electronics Corporation | PS2561L2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| XU1, XU3 & XU4 Opto coupler | Renesas Electronics Corporation | PS2561DL2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| Twin output modules: 12V Ch. 2: XL1 choke | Interchangeable | Interchangeable | Cores: 12 by 12 by 5mm overall. | - | - | |
| B, BH & DB Module Power Transformers: | - | - | - | - | - | |

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| TX1 Power trx. bobbin | Interchangeable | TDKL Part No: 66757 | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 1mm thick | QMFZ2 | UL, (E41938) | |
| TX1 Power trx. clip | Interchangeable | TDKL Part No: 66765 | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI) or Sumitomo Bakelite E4008 (130°C - RTI), 1mm thick | QMFZ2 | UL, (E41938) or (E54705) | |
| TX1 Power trx. cores | Interchangeable | Interchangeable | Cores: 27 by 19 by 18mm overall | - | - | |
| TX1 Power trx. PWB 11 turn, type A | Interchangeable | TDKL Part No: 12634 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 11 turn, type B | Interchangeable | TDKL Part No: 12635 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 12 turn, type A | Interchangeable | TDKL Part No: 12636 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 12 turn, type B | Interchangeable | TDKL Part No: 12637 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 14 turn, type A | Interchangeable | TDKL Part No: 13922 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 14 turn, type B | Interchangeable | TDKL Part No: 13923 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 16 turn, type A | Interchangeable | TDKL Part No: 12638 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| TX1 Power trx. PWB 16 turn, type B | Interchangeable | TDKL Part No: 12639 | UL94V-1 min, 130°C. | ZPMV2 | UL | |
| Note: The TX1 Power Trx. PWBs listed above provide Reinforced insulation. | - | - | - | - | - | |
| Secondary winding, 1 turn | Interchangeable | TDKL Part No: 52121, 52321, 52331 | Secondary winding, 1 turn | - | - | |
| Secondary winding, 2 turn | Interchangeable | TDKL Part No: 52122, 52322, 52332 | Secondary winding, 2 turn | - | - | |

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| Secondary winding, 3 turn | Interchangeable | TDKL Part No: 52123, 52323, 52333 | Secondary winding, 3 turn | - | - | |
| Secondary winding, 4 turn | Interchangeable | TDKL Part No: 52124, 52324, 52334 | Secondary winding, 4 turn | - | - | |
| Secondary winding, 5 turn | Interchangeable | TDKL Part No: 52125, 52325, 52335 | Secondary winding, 5 turn) | - | - | |
| Secondary winding, 6 turn | Interchangeable | TDKL Part No: 52126, 52326, 52336 | Secondary winding, 6 turn | - | - | |
| C and CM Modules | - | - | - | - | - | |
| Module cradle | Interchangeable | Interchangeable | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 0.9mm thick | QMFZ2 | UL, (E41938) | |
| L1 choke (optional) | Interchangeable | Interchangeable | Core outer dimension: 9mm; inner dimension: 4mm; 4mm depth Class F 0.22mm min. ECW. Base:- Manufactured by EI Dupont Rynite FR530 or FR530L, 0.8mm thick rated 94V-0, RTI 155°C. Or interchangeable manufacturers, Nema FR4, 1.6mm 94V-0, RTI 140°C | QMFZ2 or ZPMV2 | UL, (E41938) | |
| TX2 transformer | TDK-Lambda UK Ltd or Trio Engineering Co Ltd | TDKL Part No: 33600, 33601, 33602, 33603. May be followed by T. | Class F Reinforced insulation, system CEL-CF4 or TEC-CF4 | OBJY3 | UL, (E148927) | |
| TX2 cradle | Interchangeable | TDKL Part No: 60828 | Material manufactured by EI Dupont Rynite FR530 or FR530L, 1mm thick rated 94V-0, RTI 155°C | QMFZ2 | UL, (E41938) | |
| TX2 bobbin | Interchangeable | Interchangeable | Material manufactured by EI | QMFZ2 | UL, (E41938) | |

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| | | | Dupont Rynite FR530 or FR530L (155°C - RTI), 0.9mm thick | | | |
| TX2 cores | Interchangeable | Interchangeable | Core dimension: 27 x 18 x 13mm | QMFZ2 | UL | |
| TX2 triple insulated wire | New England Wire Technologies Corp. | W21T1.5EyyyMW 80S60A (where y may be any number between 0-9) | Triple insulated 21AWG min. winding wire rated (Class F) | OBJT2, | UL (E205791) | |
| XR23 Thermistor | Murata | PRF18BB471+++ ++ where + may be any number or letter | 115°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XR23 Thermistor (alternative) | Murata | PRF18BC471+++ ++ where + may be any number or letter | 105°C Required for safety (eng. Note – cURus component with IEC60738-1 Annex J) | XGPU2 | UL, (E137188) | |
| XU1, XU3, XU4 opto-couplers | Vishay | SFH6156 series | 4420Vac (UL). Provides Reinforced insulation. | FPQU2, | UL, (E52744) | |
| XU1, XU3 & XU4 Opto coupler. (alternate) | Renesas Electronics Corporation | PS2581L2 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| XU1, XU3 & XU4 Opto coupler (alternate) | Renesas Electronics Corporation | PS2561L2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| XU1, XU3 & XU4 Opto coupler (alternate) | Renesas Electronics Corporation | PS2561DL2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| C6 CM module secondary to earth capacitor. | Murata MFG Co. Ltd. | KY series | 10nF maximum, 250V, Y2, 125°C | FOWX2 | UL (E37921) | |
| C6 CM module secondary to earth capacitor (alternative may also use any types from C5, C6 and C7) | Murata MFG Co. Ltd. | KX series | 10nF maximum, 250V, Y1, 125°C | FOWX2 | UL (E37921) | |

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| Insulator on module heatsinks | Bergquist Co | GPVOUS-0.040 Gap pad V0 | 24 by 19mm min., Rated VTM-0 | QMFZ2 | UL, (E59150) | |
| Insulator on module heatsinks (alternate) | Shiu Li Technology Co Ltd | L-37-3 or H48-2 | 24 by 19mm min., Rated VTM-0 | QMFZ2 or OCDT2 | UL (E317540) or (E256821) | |
| DA MODULE: | - | - | - | - | - | |
| XU3 Opto coupler | Vishay | SFH6156 series | 4420Vac (UL). Provides Reinforced insulation. | FPQU2, | UL, (E52744) | |
| XU3 Opto coupler. (alternate) | Renesas Electronics Corporation | PS2581L2 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| XU3 Opto coupler (alternate) | Renesas Electronics Corporation | PS2561L2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| XU3 Opto coupler (alternate) | Renesas Electronics Corporation | PS2561DL2-1 | 5000Vac May be marked NEC and/or Renesas Provides Reinforced insulation | FPQU2, | UL, (E72422) | |
| TX1 transformer assembly | TDK-Lambda UK Ltd or Trio Engineering Co Ltd | TDKL Part No: 33349 May be followed by T. | Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1 | OBJY3 or OBJY2 | UL, (E148927 or E182446) | |
| TX1 transformer bobbin | Interchangeable | TDKL Part No: 20172 | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI) or Sumitomo Bakelite E4008 (130°C - RTI), 0.6mm thick | QMFZ2 | UL, (E41938 or E54705) | |
| TX1 transformer E cores | Interchangeable | Interchangeable | 2 E-cores total 20mm x 20mm x 7mm | - | - | |
| TX1 transformer triple insulated wire | Totoku | 3S-ETFE or TIW-E | Triple insulated wire. 0.4mm dia. minimum. Provides reinforced insulation. (Class F) | OBJT2, | UL (E166483) | |
| TX1 transformer triple insulated wire (alternate) | New England Wire Technologies Corp. | WxxT1.5EyyyTC1A (xx may be 26, 24 or 22 and y may be any number between 0-9) | Triple insulated wire 26AWG (0.4mm diameter) min. Provides reinforced insulation. Class F | OBJT2, | UL (E205791) | |

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| GLOBAL OPTIONS: | - | - | - | - | - | |
| XU3, XU4, XU5, XU6, XU7 Opto couplers (Optional dependent upon global option type) | Vishay | SFH6156 series | 4420Vac (UL). Provides Reinforced insulation. | FPQU2, | UL, (E52744) | |
| XU3, XU4, XU5, XU6, XU7 Opto coupler. (alternate) | Renesas Electronics Corporation | PS2581L2 | 5000Vac May be marked NEC and/or Renesas. Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| XU3, XU4, XU5, XU6, XU7 Opto coupler. (alternate) | Renesas Electronics Corporation | PS2561L2-1 | 5000Vac May be marked NEC and/or Renesas. Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| XU3, XU4, XU5, XU6, XU7 Opto coupler. (alternate) | Renesas Electronics Corporation | PS2561DL2-1 | 5000Vac May be marked NEC and/or Renesas. Provides Reinforced insulation. | FPQU2, | UL, (E72422) | |
| Global option trx. T2 assembly | TDK-Lambda UK Ltd or Trio Engineering Co Ltd | CLL Assy Part No 32456, 32457, 33408, 33407. May be followed by T. | Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1 | OBJY3 or OBJY2 | UL, (E148927 or E182446) | |
| Global option trx. T2 bobbin | Interchangeable | TDKL Part No: 20172 | Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI) or Sumitomo Chemical Co. Ltd., Sumikasuper E4008 (130°C - RTI), 0.6mm thick | QMFZ2 | UL (E41938 or E54705) | |
| Global option trx. T2 E cores | Interchangeable | Interchangeable | 2 E-cores total 20mm x 20mm x 7mm | - | - | |
| Global option trx. T2 wire | Totoku | 3S-ETFE or TIW-E | Triple insulated wire. 24AWG minimum. Provides reinforced insulation | OBJT2, | UL (E166483) | |
| Global option trx. T2 wire (alternate) | New England Wire Technologies Corp. | WxxT1.5EyyyTC1A (where xx can be 24 or 22 and y may be any number between 0-9) | Triple insulated wire. 24 AWG minimum. Provides reinforced insulation. Class F | OBJT2, | UL (E205791) | |
| OUTPUT INTERFACE | - | - | - | - | - | |

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| ASSEMBLIES: | | | | | | |
| Output interface assemblies may contain any of the following critical components. Additional non-critical components (not described) may also be used. Documentation to be made available to the customer detailing ratings of all assembly outputs. | - | - | - | - | - | |
| Fuse | Interchangeable | Interchangeable | Used within the manufacturers voltage and current rating. 40Adc max. Max circuit voltage 160Vdc. Secondary circuit only. Not operator accessible. | JDYX2 | UL | |
| Fuse holder | Interchangeable | Interchangeable | Used within the manufacturers voltage and current rating, UL94V-1 min. 40Adc max. Max circuit voltage 160Vdc. Secondary circuit only. Not operator accessible. | JDYX2 | UL | |
| Connector - Secondary | Interchangeable | Interchangeable | Used within the manufacturers voltage and current rating UL94V-1 min. | ECBT2 | UL | |
| Choke | Interchangeable | Interchangeable | Used within the manufacturers voltage and current rating UL94V-1 min. | - | - | |
| Indicator lamps or LEDs | Interchangeable | Interchangeable | Any colour except red. Class 1-565nm pk wavelength | - | - | |
| Board of RA-PFC-001 | - | - | - | - | - | |
| C1 Y capacitor (optional) s | Kemet Electronics OY | PME271Y series | 1.5nF max, 250Vac, Y2, 100°C | FOWX2, | UL, (E73869) | |
| C1 Y capacitor (optional) s (alternate) | Kemet Electronics OY | PHE850 series | 1.5nF max., 300Vac, (UL 250Vac), Y2, 100°C | FOWX2, | UL, (E73869) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| C1 Y capacitor (optional) s (alternate) | Wilhelm Westermann Spezialvertrieb Elektronischer (WIMA) | MP 3-Y2 series | 1.5nF max., 250Vac, Y2, 110°C | FOWX2, | UL, (E100438) | |
| C1 Y capacitor (optional) s (alternate) | Xiamen Faratronic Co. Ltd. | MKP-63 series | 1.5nF max, 250Vac, Y2, 105°C | FOWX2, | UL, (E186600) | |
| C1 Y capacitor (optional) s (alternate) | Vishay Capacitors Belgium N V | 338-6 series (MKP) | 1.5nF max, 300Vac, Y2, 105°C | FOWX2, | UL, (E354331) | |
| Wiring connecting the Converter Board and output connector | Interchangeable | Interchangeable | 18AWG min, 300V min 80°C min UL Style 1007 | AVLV2 | UL | |
| Sleeving used on the converter wiring | Interchangeable | Interchangeable | Rated 600V minimum 125°C, VW-1 | YDPU2 | UL | |
| Output connector | Molex | 38730 series (73) | Rated 300V minimum 100°C, V-0, | XCFR2 | UL, (E48521) | |
| Plexiglas cover of the output connector | Interchangeable | Interchangeable | Rated minimum HB. | QMFZ2 | UL | |
| MISC. ITEMS: | - | - | - | - | - | |
| Blanking plates (fitted to close unused module slots) | Interchangeable | Interchangeable | Aluminium, having overall dimensions 127 by 37 by 38mm or 127 by 37 by 26mm or 127 by 37 by 22mm or 143 by 37 by 12mm or 82 by 37 by 13 mm | - | - | |
| Sleeving, used on fan leadouts | Interchangeable | Interchangeable | Rated 300V minimum 125°C, VW-1 | UZFT2 | UL | |
| Sleeving, used on fan leadouts (alternate) | Interchangeable | Interchangeable | Rated 300V minimum 125°C, VW-1 | YDPU2 | UL | |
| Optional coating, may be used on all parts of PSU | Dymax Corporation | 984-LVUF | 120°C | QMJU2 | UL (E140512) | |
| Optional coating, may be used on all parts of PSU (alternate) | Dow Corning | 1-2577 or 1-2577 Low VOC | 130°C | QMJU2 | UL (E81611) | |
| Optional coating, may be used on all parts of PSU (alternate) | Lackwerke Peters GmbH & Co KG | DSL 1600E-FLZ | 125°C | QMJU2 | UL, (E80315) | |

# Enclosures

| Type | Supplement Id | Description |
|---|---|---|
| Photographs | 3-01 | NV700 PSU |
| Photographs | 3-02 | NV700 PSU with cover removed |
| Photographs | 3-03 | NV700 underside of cover |
| Photographs | 3-06 | NV700 front-end assembly (input filter and boost) |
| Photographs | 3-07 | NV700 front-end assembly bottom view |
| Photographs | 3-08 | BH module |
| Photographs | 3-09 | C module |
| Photographs | 3-10 | CM module |
| Photographs | 3-11 | RA-PFC-001 |
| Photographs | 3-12 | RA-PFC-001 with cover removed |
| Photographs | 3-13 | RA-PFC-001 Converter PWB top view |
| Photographs | 3-14 | RA-PFC-001 Converter PWB bottom view |
| Photographs | 3-15 | RA-PFC-001 Converter PWB - inside insulation at enclosure (fuse side) |
| Photographs | 3-16 | RA-PFC-001 Converter PWB - inside insulation at enclosure (J2 connector side) |
| Diagrams | 4-01 | Transformer drawings |
| Diagrams | 4-02 | Transformer drawings (updated) |
| Schematics + PWB | 5-01 | PWB Trace Layouts (upper and lower) |
| Schematics + PWB | 5-02 | PWB Trace of RA-PFC-001 Converter PWB top view |
| Schematics + PWB | 5-03 | PWB Trace of RA-PFC-001 Converter PWB bottom view |
| Schematics + PWB | 5-04 | PWB's (updated) |
| Manuals | 6-08 | RA-PFC-001 handbook |
| Manuals | 6-09 | NV700 handbook |