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Report Reference # E182560-V4-S14

UL TEST REPORT AND PROCEDURE

Standard:	ANSI/AAMI ES60601-1 (2005/(R) 2012 +A1:2012, C1: 2009/(R) 2012 + A2:2010/(R) 2012) Amendment 1 – Revision Date 2012/08/21.CAN/CSA – C22.2 No. 60601-1:14 – Edition 3 – Revision Date 2014/03.
Certification Type:	Component Recognition
CCN:	QQHM2, QQHM8 (Power Supplies, Medical and Dental)
Product:	Switching Power Supply
Model:	LPS363-M-XXX, LPS364-M-XXX, LPS365-M-XXX, LPS368-M-XXX, LPS366-M-XXX (where -XXX can be any alphanumeric character, symbol or blank that represents customer identity that do not affect safety)
Rating:	Input: 100-240Vac, 5.5A, 50/60Hz 120V(min) - 300V(max)dc, 5.5A DC Output (Model LPS363-M-XXX): +12V, 30A max +12V fan, 1A max +5Vsb, 2A max DC Output (Model LPS364-M-XXX): +15V, 24A max +12V fan, 1A max +5Vsb, 2A max DC Output (Model LPS365-M-XXX): +24V, 15A max +12V fan, 1A max +5Vsb, 2A max DC Output (Model LPS368-M-XXX): +48V, 7.5A max +12V fan, 1A max +5Vsb, 2A max DC Output (Model LPS366-M-XXX): +30.6 - 36V, 11.25A max +12V fan, 1A max +5Vsb, 2A max Maximum Output Power (All Models): 200W Convection Cooling 360W Forced Air Cooling
Applicant Name and Address:	ASTECH INTERNATIONAL LTD - PHILIPPINE BRANCH 16TH FL LU PLAZA 2 WING YIP ST KWUN TONG KOWLOON HONG KONG

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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: Ricky Wang / Clare He

Reviewed by: Sammi Liang

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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

The equipment is an AC/DC switching power supply designed to deliver 200W rated output power during natural convection cooling and 360W rated output power during forced air cooling.

This equipment is intended for use in Class I or Class II application.

Two MOPP insulation is provided between primary circuit to secondary circuit and one MOPP insulation is provided on primary circuit to Earth and secondary circuit to earth. When this equipment is used as Class II equipment earth traces is considered dead metal.

This product had been additionally assessed on the following condition:

Forced Air Cooling (derate each output at 2.5% per degree C from 50 to 70 degrees C)

360W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 50 deg C ambient
270W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 60 deg C ambient
180W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 70 deg C ambient

Forced Air Ventilation Set-up and Power Supply Orientation

Position 1: Fan blowing to Output

Position 2: Fan blowing to component L3

Position 3: Fan blowing to T4 (Power TRF)

Convection Cooling (derate each output at 2.5% per degree C from 50 to 70 degrees C)

200W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 50 deg C ambient
150W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 60 deg C ambient
100W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 70 deg C ambient

Additional Convection Cooling Test Evaluation (derate each output at 2.5% per degree C from 50 to 70 degrees C)

220W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 50 deg C ambient
165W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 60 deg C ambient
110W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 70 deg C ambient

240W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 50 deg C ambient

180W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 60 deg C ambient

120W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 70 deg C ambient

Model Differences

The models differ in DC output ratings except for the +5Vsb output which is the same across all models. The models also differ in the power transformer (T4) and TIW to accommodate the various output ratings. All other construction and components are identical across all models.

Technical Considerations

- Classification of installation and use : Component - to be evaluated in end product
- Device type (component/sub-assembly/ equipment/ system) : Component
- Intended use (Including type of patient, application location) : Recognized power supply for medical equipment usage
- Mode of operation : Continuous
- Supply Connection : Input Connector

- Accessories and detachable parts included : None
- Other options include : None
- The product was investigated to the following additional standards: AAMI ES60601-1 AMD 1 MEDICAL ELECTRICAL EQUIPMENT – PART 1: GENERAL REQUIREMENTS FOR BASIC SAFETY AND ESSENTIAL PERFORMANCE, AMENDMENTS - Edition 1 - Issue Date 2012/08/20.CSA C22.2 NO. 60601-1:14 MEDICAL ELECTRICAL EQUIPMENTS. PT. 1, GENERAL REQUIREMENTS FOR BASIC SAFETY AND ESSENTIAL PERFORMANCE - Edition 3 - Issue Date 2014/01/01.
- The product was not investigated to the following standards or clauses: Biocompatibility (ISO 10993-1), Clause 14, Programmable Electronic Systems, Electromagnetic Compatibility (IEC 60601-1-2)
- The degree of protection against harmful ingress of water is:: Ordinary
- The mode of operation is: Continuous
- The product is suitable for use in the presence of a flammable anesthetics mixture with air or oxygen or with nitrous oxide:: No
- The product is recognized only to the following hazards: Casualty, Fire, Shock.

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:

- This power supply has been judged on the basis of the required creepage and clearances in the First Edition of the Standard for Medical Electrical Equipment, ANSI/AAMI ES 60601-1, Sub clause 8.9.
- This power supply has not been evaluated for patient connected applications.
- This power supply is type of built-in device as parts of medical equipment. The date of manufacture need to be evaluated in the end-product.
- Consideration should be given to measuring the temperatures on power electronic components and transformer windings when the power supply is installed in the end-use equipment. The transformers (T1 and T4) incorporate a Class 155 (F) insulation system.
- The power supply was evaluated as 2 MOPP Insulation between Primary and Secondary, and as 1 MOPP Insulation between Primary and Earth. See insulation diagram for details
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: LPS363-M-XXX: T1 Primary to Secondary: 425.2 Vrms, 592 Vp; T4 Primary to Secondary: 289.3 Vrms, 460 Vp; LPS364-M-XXX: T1 Primary to Secondary: 417.3 Vrms, 636 Vp; T4 Primary to Secondary: 287.2 Vrms, 460 Vp; LPS365-M-XXX: T1 Primary to Secondary: 416.8 Vrms, 628 Vp; T4 Primary to Secondary: 293.4 Vrms, 468 Vp; LPS368-M-XXX: T1 Primary to Secondary: 416.8 Vrms, 619 Vp; T4 Primary to Secondary: 284.9 Vrms, 451 Vp; LPS366-M-XXX: T1 Primary to Secondary: 418.1 Vrms, 610 Vp; T4 Primary to Secondary: 280.3 Vrms, 451 Vp
- Leakage current test, Temperature test, marking test, and earth impedance test need to be repeated / considered in end-product investigation.
- Earthing terminal at input connector is not considered protective earthing terminal, but is considered bonding terminal. Power supply chassis is to be reliably bonded earthing in end use equipment before energized.
- Instructions and equipment marking shall be provided in a language, which is acceptable in the country in which the equipment is to be installed.
- This power supply was tested on a 30 A branch circuit. If used on a branch circuit greater than this, additional testing may be necessary. The fuse employed didn't fractured and remained intact during the single fault condition testing and short circuit testing performed in client's facility.

- Input terminal/connector shall be connected to the supply neutral in the end use for simultaneous disconnection of all supply poles.
- The insulation between accessible parts and live part must be re-evaluated in end product.
- Maximum Operating Temperature Tmax (°C) is 50 deg. C for full load and 70 deg. C for half of the full load.
- End product Risk Management Process to include consideration of requirements specific to the Power Supply.
- End product Risk Management Process to consider the need for different orientations of installation during testing.
- End product to determine the acceptability of risk in conjunction to the movement of components as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the routing of wires away from moving parts and sharp edges as part of the power supply.
- Temperature Test was conducted without Test Corner. End product to determine the acceptability of risk in conjunction to temperature testing without test corner as part of the power supply.
- End product Risk Management Process to consider the need for simultaneous fault condition testing.
- End product to determine the acceptability of risk in conjunction to the selection of components as it pertains to the intended use, essential performance, transport, storage conditions as part of the power supply.
- A suitable Electrical, Mechanical and Fire Enclosure shall be provided by end use equipment.
- This unit is not intended to be used for permanent connection.
- The output connectors are not acceptable for field connection and are only intended for connections to mating connectors of internal wiring inside the end use product. The acceptability of these and the mating connectors relative to secureness, insulating materials, and temperatures shall be considered in the end-use product.
- Depending on the end product application, additional markings and documentation may be required. This is to be evaluated in the end product.
- The clearance and creepage distance have additionally been assessed for suitability up to 3000m elevation.
- This power supply shall be installed in compliance with the enclosure, mounting, spacing, casualty, markings and segregation requirements of the end-use application.
- Suitability for the PE tab to be used with quick-connect connector needs to be evaluated in end-product.
- Suitability for the PE tab to be used with quick-connect connector needs to be evaluated in end-product.
- This power supply is component level power supply intended for use in Class I or Class II application.
- The suitable fuses shall be considered in end product investigation.
- LPS363-M-XXX: Additional evaluation has been considered on the +12V (-0% / +15%) output voltage adjustability limited to the following combined conditions: maximum 30A load current and 360W output power. , LPS364-M-XXX: Additional evaluation has been considered on the +15V (-5% / +10%) output voltage adjustability limited to the following combined conditions: maximum 24A load current and 360W output power. , LPS365-M-XXX: Additional evaluation has been considered on the +24V (-0% / +15%) output voltage adjustability limited to the following combined conditions: maximum 15A load current and 360W output power. , LPS368-M-XXX: Additional evaluation has

been considered on the +48V (-5% / +10%) output voltage adjustability limited to the following combined conditions: maximum 7.5A load current and 360W output power.

- Overcurrent releases of adequate breaking capacity must be employed in the end product.
- For LPS363-M-XXX: Additional leakage current test was conducted using the following Y-capacitor values as per customer requirement: C1 and C2:470pF, C76 and C77:220pF, C48:1nF.