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:	LCM3000X-T (where X can be L,Q,U,W)
Rating:	AC Input: 100-240Vac, 20A MAX, 50/60Hz 200-240Vac, 20A MAX, 50/60Hz DC Output: **For model LCM3000L-T** At Input 100-240Vac +9 - +15Vdc, 125A MAX (1500W MAX) +5Vsb, 2A MAX At Input 200-240Vac +9 - +15Vdc, 250A MAX (3000W MAX) +5Vsb, 2A MAX **For model LCM3000Q-T** At Input 100-240Vac +18 - +30Vdc, 62.5A MAX (1500W MAX) +5Vsb, 2A MAX At Input 200-240Vac +18 - +30Vdc, 125A MAX (3000W MAX) +5Vsb, 2A MAX **For model LCM3000W-T** At Input 100-240Vac +36 - +60Vdc, 31.2A MAX (1500W MAX) +5Vsb, 2A MAX At Input 200-240Vac +36 - +60Vdc, 62.5A MAX (3000W MAX) +5Vsb, 2A MAX **For model LCM3000U-T** At Input 100-240Vac +27 - +45Vdc, 41.7A MAX (1500W MAX) +5Vsb, 2A MAX At Input 200-240Vac +27 - +45Vdc, 83.3A MAX (3000W MAX) +5Vsb, 2A MAX
Applicant Name and Address:	ASTEC INTERNATIONAL LTD 16TH FL

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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: **Skye Mo** Reviewed by: **Sammi Liang**

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 switching power supplies for building-in, intended for use in medical application. The equipment is provided with terminal block as input connector for AC mains supply connection. 2 MOPP is provided between primary and secondary circuits. 1 MOPP is provided between primary circuits and protective earth. Isolation transformers are used and all electronic components are mounted on PWB that rated V-0 and housed in a metal enclosure.

Model Differences

All model variants have the same construction (same PCB, electrical circuit, **Auxiliary transformers, Current transformers, Gate Drive** transformers, enclosures) except for primary configuration boards and output bussbars. The primary configuration boards and output bussbars are used to change the output of the power supply.

Model LCM3000U-T uses different power transformer(801-007556-XXXX) compare to three models LCM3000L-T, LCM3000Q-T and LCM3000W-T(801-007429-XXXX), these two power transformer only differ in secondary winding.

Mains output voltage rating each model.
LCM3000L-T: +9V - +15Vdc
LCM3000Q-T: +18V - +30Vdc
LCM3000W-T: +36V - +60Vdc
LCM3000U-T: +27V - +45Vdc

Technical Considerations

- Classification of installation and use : For building in
- 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 : To be determined in end system
- Accessories and detachable parts included : None
- Other options include : None
- The product was investigated to the following additional standards:: N/A
- 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 following accessories were investigated for use with the product:: None
- The product is suitable for use in the presence of a flammable anesthetics mixture with air or oxygen or with nitrous oxide:: No

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 Edition 3.1 of the Standard for Medical Electrical Equipment, ANSI/AAMI ES 60601-1, Sub Clause 8.9.
- The power supply is a built-in device as part of medical equipment. The date of manufacture needs to be evaluated in the end product

- This power supply has been evaluated as a Class I, continuous operation, ordinary Equipment and has not been evaluated for use in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide. An additional evaluation shall be made if the power supply is intended for use in other than Class I equipment.
- This power supply was tested on a 30A branch circuit. If used on a branch circuit greater than this, additional testing may be necessary.
- The power supply was evaluated as 2 MOPP between Primary to Secondary and 1 MOPP from Primary to Earth. See insulation diagram for details.
- 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 (T701 – 4 provided, T900, T601 and T602) incorporate a Class 155 (F) insulation system.
- The secondary circuit of this power supply has not been evaluated for patient connected applications.
- The maximum ambient temperature 50degC (with output power decreases 2.5% per degree C from 50℃ to 70℃)
- The following tests shall be performed in the end-product evaluation: Legibility Test, Marking Durability Test, Limitation of Voltage, Current or Power, Earthing and Potential Equalization Test, Temperature Test, Dielectric Voltage Withstand Tests and Leakage Current Tests.
- The maximum working voltage is 366.8Vrms, 692Vpk for Primary - Secondary and 365.7Vrms, 676Vpk for Primary - Earth Dead Metal. The electric strength tests in the end-product shall be based on these values or by Client's request whichever is higher.
- This power supply shall be installed in compliance with the enclosure, mounting, spacing, casualty, markings and segregation requirements of the end use application.
- "Voltage or charge limitation" may need to reconsider if additional EMC filter is provided between appliance inlet/power cord to the product.
- A suitable Mechanical, Electrical and Fire enclosure shall be provided in the end-use product.
- This power supply is operated up to 5000m above sea level as declared by manufacturer.
- Separation from secondary to earth need to evaluated in end product.
- End product Risk Management Process to include consideration of requirements specific to the Power Supply.
- The input and output connectors are not suitable for field connection.
- Proper bonding to the end product main protective earthing termination is required.
- End product Risk Management Process to consider the need for simultaneous fault condition testing.
- 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 insulation to resistance to heat, moisture, and dielectric strength.
- End product to determine the acceptability of risk in conjunction to the movement of components and conductors 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 to determine the acceptability of risk in conjunction to the Cleaning and Disinfection Methods as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the Leakage of Liquids as part of the power supply.

- End product to determine the acceptability of risk in conjunction to the Arrangement of Indicators as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the results of Mechanical Testing conducted as part of the power supply.
- 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
- The end-product evaluation shall ensure that the requirements related to Accompanying Documents, Clause 7.9 are met.
- The touch time for external enclosure isn't determined by the client, end product shall consider it according to client's definition.
- The product was also tested at inhibit mode (fan off / stop condition) at 50degC ambient temperature
- Fans: The fans (2 provided) in this sub-assembly are provided with a fan guard to reduce the risk of operator contact with the stator.