

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:	73-936-0048, 73-936-0125, 73-936-0080, 73-936-0024, 73-936-0250, 73-936-0200, 73-936-0012, 73-936-0032
Rating:	DC Input: DC 395 ±5V, 8.5A DC output: For Model 73-936-0125: 125Vdc, 24A For Model 73-936-0048: 48Vdc, 62.5A For Model 73-936-0080: 80Vdc, 37.5A For Model 73-936-0250: 250Vdc, 12A For Model 73-936-0200: 200Vdc, 15A Maximum output power: 3000W For Model 73-936-0024: 24Vdc, 120A Maximum output power: 2880W For Model 73-936-0012: 12V, 200A Maximum output power: 2400W For Model 73-936-0032: 32V, 90A; Maximum output power: 2880W 36V, 83.33A; Maximum output power: 3000W *
Applicant Name and Address:	ASTECH INTERNATIONAL LTD - PHILIPPINE BRANCH 16TH FL LU PLAZA 2 WING YIP ST KWUN TONG KOWLOON HONG KONG

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.

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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 a DC/DC switching power supply designed to deliver 3000W, 2880W and 2400W rated output power.

2MOPP is provided between primary and secondary circuits and 1MOPP is provided between primary circuits and Earth as well as secondary circuit and earth.

Risk management is not addressed in this report.

Model Differences

1. Model 73-936-0125 is exactly the same as model 73-936-0048 except for output ratings, Power transformer (TX100, TX200, TX300), optocoupler, Mini-Aux transformer (L851 for model 73-936-0125, TX851 for model 73-936-0048), secondary PWB and molded plastic insulator in control board.
2. Model 73-936-0080 is exactly the same as model 73-936-0125 except for output ratings and Power transformers (TX100, TX200, TX300).
3. Model 73-936-0024 is exactly the same as model 73-936-0048 except for output ratings and Power transformers of primary (TX100, TX200, TX300).
4. Model 73-936-0250 is exactly the same as models 73-936-0080 and 73-936-0125 except for output ratings and Power transformers of primary (TX100, TX200, TX300).
5. Model 73-936-0200 is exactly the same as model 73-936-0250 except for output ratings and Power transformers of primary (TX100, TX200, TX300).
6. Model 73-936-0012 is exactly the same as model 73-936-0024 except for output ratings and Power transformers of primary (TX100, TX200, TX300).
- 7. Model 73-936-0032 is exactly the same as model 73-936-0024 except for output ratings and Power transformers of primary (TX100, TX200, TX300).**

Technical Considerations

- Classification of installation and use: Component to be installed in end product
- Device type (component/sub-assembly/ equipment/ system): Built-in 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: 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 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

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 standard ANSI/AAMI ES60601-1 (2005/(R)2012 + C1:2009/(R)2012 + A2:2010/(R)2012), Sub clause 8.9.
- This power supply has not been evaluated for patient connected applications.
- 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 (TX100, TX200, TX300, TX800, TX801, TX802) incorporate a Class 155 (F) insulation system.
- The power supply was evaluated as 2 MOPP between Primary to Secondary and 1 MOPP from Primary to Earth, see insulation diagram for details, protective earth reliability is to be evaluated in end product 1 MOPP insulation (BF requirement for Hipot and creepage/clearance only) was also considered between Secondary and PE as part of marketing requirement. Additional spacing construction requirement from marketing and product design were considered on these power supplies. Refer to attached Spacing Construction Requirement document.
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Refer to enclosure Electric Strength Test Requirement document.
- When these power supplies installed in Class I application: Earthing connection and continuity test, leakage current test, 200A fault current test on earth trace shall be checked in end product.
- 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 20 A branch circuit. If used on a branch circuit greater than this, additional testing may be necessary. The fuse employed didn't fracture and remained intact during the single fault condition testing and short circuit testing performed in client's facility.
- The insulation between accessible parts and live part must be re-evaluated in end product.
- Maximum Operating Temperature T_{max} (°C) is 50 deg. C for full load Output power decreases at 2.5% per °C from 50°C to 70°C ambient temperature.
- 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 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.
- 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.
- *Built-in switching power supply. **The following test shall be considered/re-evaluated** in End Product: 8.4.2 - **Limitation of Voltage, Current or Power, legibility and durability of marking, leakage current test, dielectric voltage withstand and temperature test.**
- This power supply is component level power supply intended for use to be defined in end product.
- The suitable fuses **with adequate breaking capacity** shall be considered in end product investigation.
- Additional evaluation has been considered on output ratings for model 73-936-0125: 150V, 20A; for model 73-936-0048: 57.6V, 52.09A; for model 73-936-0080: 96V, 31.25A; for model 73-936-0024: 28.8V, 100A; for model 73-936-0250: 300V, 10A; for model 73-936-0200: 240V, 12.5A; for model 73-936-0012: 14.4V, 166.67A; **for model 73-936-0032: 38.4V, 78.13A.**
- Overcurrent releases of adequate breaking capacity must be employed in the end product.
- *The maximum continuous power supply output (Watts) relied on forced air cooling from: 3000W (all other models) **including 73-936-0032**, 2880W (73-936-0024 **and 73-936-0032**) and 2400W (73-936-0012), external fan at 22.8cfm airflow blowing towards the power supply.
- All 73-936-0XXX model series shall solely be used for iHP Rack power supply model 73-959-0001 **or 73-958-0001** (end system rack).
- These products have been investigated only as a component part for use in equipment where the suitability of the combination is subject to end product investigation.
- The maximum working voltage measured between primary and secondary, for 73-936-0048 is TX100 : 256.8Vrms, 540Vp; for model 73-936-0125 is TX100: 271.1Vrms, 654Vp, for model 73-936-0080 is 258.3Vrms, 568Vp. for model 73-936-0250 is 369.7Vrms, 739Vp; for model 73-936-0024 is 252.6Vrms, 492Vp; for model 73-936-0200 is 325.3Vrms, 590Vp; for model 73-936-0012 is 252.5Vrms, 508Vp; **for model 73-936-0032 is 246.5Vrms, 493Vp.**
- Fan lock test should be considered in the end-product.