

UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12 (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)
Product:	Switching Power Supply for building-in
Model:	73-690-0001 and MP1-abc-abc-abc-abc-abc-abc-xx; MP1-3E-2D-1L-1L-00-669
Rating:	<p>Note: For use in Information Technology Equipment where "abc" is any alphanumeric character or blank for specific model designation. Please XX refer in ID.6-01 for Instruction Manual</p> <p>Input rating: (for model 73-690-0001 and MP1-abc-abc-abc-abc-abc-abc-xx): AC 100-240 V, 15A, 50/60/400Hz</p> <p>(for model MP1-3E-2D-1L-1L-00-669) AC 74-240V, 15A, 50/60/400Hz DC 93.5Vmin - 300Vmax, 15A</p> <p>Output rating: (For 73-690-0001): DC output: +380V, 1500W max +380V, 1200W max (for 400Hz input only)</p> <p>(for MP1-abc-abc-abc-abc-abc-abc-xx) Refer details in report</p> <p>(for MP1-3E-2D-1L-1L-00-669) DC output: +5V, 72Amax +3.3V, 36Amax +12V, 10.2Amax +12V, 10.2Amax (total 600W max)</p>
Applicant Name and Address:	ASTEC INTERNATIONAL LTD 16TH FL LU PLAZA 2 WING YIP ST KWUN TONG KOWLOON HONG KONG

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Report Reference #

E186249-A161-UL

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.

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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.

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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

Component - switching power supply, Model 73-690-0001 for use in Information technology equipment.

This unit is rated 15A and is equipped with a fuse rated 20A. This has to be considered when the power supply is installed in the end system (permanent connection or plug type B has to be used).

Normal load as described in Annex L or as close as possible to the most severe normal use:

Loaded to the rated output: (for Model 73-690-0001)

+380V (using PAPST 612N/2GN)

- 1250W, 50°C ambient with forced air cooling
- 625W, 70°C ambient with forced air cooling
- 1250W, 40°C ambient with suction air cooling
- Fans (2pcs.) with at least 24.1 CFM each can be separately provided by the end system

+380V (using other fan sources):

- 1500W, 50°C ambient with forced air cooling
- 750W, 70°C ambient with forced air cooling
- 1250W, 40°C ambient with suction air cooling
- 1500W, 40°C ambient with suction air cooling at 134-240V 50/60/400Hz
- 1200W, 50°C ambient with suction air cooling at 100-240V 400Hz
- 600W, 70°C ambient with forced air cooling at 100-240V 400Hz
- Fans (2pcs.) with at least 24.4 CFM each can be separately provided by the end system

Component - Switching Power Supply, Model MP1-abc-abc-abc-abc-abc-abc-abc-xx (MP1 series) for use in Information Technology Equipment where "abc" is any alphanumeric character or blank for specific model designation. See report for details.

MP1 configured model series consists of the front-end case model 73-690-0001 and any combination of separately approved DC-DC module series as output. Each MP1 series model has 7 slots for the DC-DC converter modules. There are single, dual and triple output converter modules, some of which occupy more than 1 slot.

The MP1 series can be configured with various combination of the following DC-DC converter modules:

- 73-553-xxxx series: 600W, Single output (width=3 slots)
- 73-552-xxxx series: 360W, Single output (width=2 slots)
- 73-551-xxxx series: 210W, Single output (width=1 slots)
- 73-554-xxxx series: 144W, Dual output (width=1 slots)
- 73-554-xxxxi series: 144W, Dual output (width=1 slots)
- 73-550-xxxx series: 36W, Triple output (width=1 slots)

Component - Switching Power Supply, Model MP1-3E-2D-1L-1L-00-669 for use in Information Technology Equipment. The unit is rated AC74-240V, 15A, 50/60/400Hz.

Model MP1-3E-2D-1L-1L-00-669 consists of the front-end case model 73-690-0001 with the built-in fan removed and the following DC-DC modules:

- 73-553-0005: +5V output (1 pc)
- 73-552-0005: +3.3V output (1pc)
- 73-551-0012: +12V output (2 pcs)

Model MP1-3E-2D-1L-1L-00-669 uses external fan cooling with 30CFM.

Model Differences

Model 73-690-0001 is a subassembly of Model MP1 series.

Model MP1-3E-2D-1L-1L-00-669 is covered by MP1 series except for AC and DC input voltage and additional external fan setup.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : To be determined in the end system
- Operating condition : continuous
- Access location : operator accessible
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : -
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 15A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 3048
- Altitude of test laboratory (m) : <2000
- Mass of equipment (kg) : <5 kg
- The product was investigated to the following additional standards: EN 60950-1:2006 + A11:2009 + A1:2010 (which includes all European national differences, including those specified in this test report),.
- LEDs provided in the product are considered low power devices: Yes
- Maximum continuous output power rating for Model MP1 series when the 73-690-0001 case uses Minebea, Type 2410ML-04W-B60; Nidec, Type TA225DC; or Protechnic Electric Co Ltd, Type MGA6012ZB-025: 1. 1200W at 50°C ambient temperature with normal forced air cooling. 2. 1000W at 40°C ambient temperature with reversed airflow (rear exhaust) cooling. 3. 600W at 70°C ambient temperature with normal forced air cooling. 4. 1200W at 40°C ambient temperature with reversed airflow (rear exhaust) cooling for the voltage range 134-240 Vac, 50/60/400Hz. 5. 1200W at 50°C ambient temperature with normal forced air cooling for the voltage range 100-240Vac 400Hz. 6. 300W at 70°C ambient temperature with normal forced air cooling for the voltage range 100-240Vac 400Hz The two fans provided on the 73-690-0001 case can be separately provided in the end system, each with at least 24.4 CFM airflow.
- Maximum continuous output power rating for Model MP1 series when the 73-690-0001 case uses PAPST Type 612N/2GN fans: a. 1000W at 50°C ambient temperature with normal forced air cooling. b. 1000W at 40°C ambient temperature with reversed airflow (rear-exhaust) cooling. c. 500W at 70°C ambient temperature with normal forced air cooling. The two fans on 73-690-0001 case can be separately provided in the end system, each with at least 24.1 CFM airflow.
- Output power of Model 73-690-0001 and MP1 series decreases or derates at 2.5% per °C from 50°C to 70°C ambient temperature.
- Model MP1 series has up to 7 output module slots, maximum three outputs for each module. Output voltage is set at factory and marked on the model label of configured model.
- Total loading of dual output modules are not to exceed 144W and total loading of triple output modules not to exceed 36W.

- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: 50°C (up to 70°C at derated power). See details in report.
- The means of connection to the mains supply is: To be considered in the end system application. Equipment is provided with an AC input terminal block.
- The product is intended for use on the following power systems: TN
- The equipment disconnect device is considered to be: Equipment is provided with an AC input terminal block. Must be considered in end system.
- The class of laser product is: Class 1 (I). LED for indication purpose only.
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- The following were investigated as part of the protective earthing/bonding: Input terminal block PE to chassis.
- Model 73-690-0001 is a subassembly of Model MP1-abc-abc-abc-abc-abc-abc-abc-xx.
- Maximum continuous output power rating for Model MP1-3E2D-1L-1L-00-669 is 600W at 60°C ambient temperature with external forced air cooling using 30CFM.

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 component has been judge din the basis of the required creepages and clearances in the Second Edition of the Standard for Safety of Information Technology Equipment, Sub-clause 2.10, and which covers the end-use product for which the component was designed. The functional insulations among the primary circuits and among secondary circuits have been evaluated by short-circuiting the insulation per Sub-clause 5.3.4 (c) of UL60950-1, Second Edition and CSA C22.2 No.60950-1-07.
- This power supply has been evaluated for use in Class I equipment as defined in UL 60950-1, Second Edition and CAN/CSA C22.2 No. 60950-1-07, and shall be properly earthed in the end use. An additional evaluation shall be made if the power supply is intended for use in other than Class I equipment.
- Fan airflow direction may be normal (fans blow air towards the components) or reversed (fans blow air away from components).
- This power supply is Classified Level 5 as defined by UL 60950-1, Second Edition and CAN/CSA No. 60950-1-07.
- A suitable power supply disconnection means is to be provided by end use equipment.
- This equipment was not evaluated for end system mounting. When installed in the end system, proper evaluation should be considered.
- Clearances have additionally been assessed for suitability up to 3048m elevation.
- The earthing terminal at the input terminal block is not considered protective earthing terminal but is considered bonding terminal. Power supply chassis is to be reliably bonded to protective earthing in the end-use equipment before energized. See also illustration for details.
- The secondary outputs of the DC-DC modules are considered SELV except for the secondary output +48V DC-DC modules which exceeds 60Vdc and is not suitable for SELV. There is a hazardous energy level that exceeds 240VA at the DC-DC module outputs of the equipment.
- The equipment have been evaluated for use in 25°C up to 50°C ambient at 100% rated load and up to 70°C ambient with derating of 2.5% of rated output power from 50°C to 70°C. Fan is reversible up to 40°C ambient at 100% rated load. Two pieces of 30CFM fans were utilized during the testing of

MP1 configured model and 73-690-0001 case.

- EMC / EMI compliance has not been investigated and is not part of this report. Must be considered in the end system.
- Warning: High touch current at 400Hz, earthing connection essential before connecting supply.
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 388 Vrms, 560 Vpk Primary-Earthed Dead Metal: 250 Vrms, 354 Vpk
- The following secondary output circuits are SELV: all outputs of DC-DC modules except for 73-551-0048, 73-552-0048 and 73-553-0048. Said outputs are considered non-SELV and must be considered in the end system.
- The following secondary output circuits are at hazardous energy levels: All outputs of DC-DC modules except outputs of 73-550-xxxx and 73-554-xxxx modules.
- The following secondary output circuits are at non-hazardous energy levels: outputs of DC-DC modules 73-554-xxxx and 73-550-xxxx.
- The power supply terminals and/or connectors are: Not investigated for field wiring
- 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 magnetic devices (e.g. transformers or inductor) are provided with an OBJ2 insulation system with the indicated rating greater than Class A (105°C): T5 Auxiliary transformer (Class F) designated 155-10A, 155-10B or 155-10C.
- The following end-product enclosures are required: Fire, Mechanical, Electrical
- The maximum continuous power supply output (Watts) relied on forced air cooling from: two fans provided blowing air towards the components. See critical components list. Each fan with minimum 24.1CFM at 1000W rating and minimum 24.4CF at 1200W rating. Fan airflow is reversible at up to 40°C ambient for AC134-240Vac input voltage.
- The equipment is suitable for direct connection to: To be considered in end system
- The following Production-Line tests are conducted for this product: Electric Strength, Earthing Continuity
- Tests for Model MP1-3E-2D-1L-1L-00-669 are covered by MP1 series. Additional testing was considered for AC66V (-10% of lower rated voltage of AC74) and DC input.
- Additional evaluation using an external forced air-cooling from fan side to input/output terminals with air flow 30 CFM was conducted (Built-in fan of 73-690-0001 removed). Evaluation was done using 66Vac and DC input at 60°C ambient with 600W output power. This should be considered when installing into the end system.