**INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)**
*COMMISSION ELECTROTECHNIQUE INTERNATIONALE (CEI)*

**Ref. Certif. No.**
**US 1043 EN**

**IEC SYSTEM FOR CONFORMITY TESTING AND CERTIFICATION OF ELECTRICAL EQUIPMENT (IECEE)**
**CB SCHEME**

*SYSTÈME CEI D'ESSAIS DE CONFORMITÉ ET DE CERTIFICATION DES EQUIPEMENTS ELECTRIQUES (IECEE)*
*METHODE OC*

# CB TEST CERTIFICATE
## *CERTIFICAT D'ESSAI OC*

Product
*Produit*

Computer

Name and address of the applicant
*Nom et adresse du demandeur*

Advantech Co., Ltd.
F1. 4, No. 108-3, Ming-Chuan Road., Shing-Tien City, Taipei, Taiwan, ROC

Name and address of the manufacturer
*Nom et adresse du fabricant*

See Page 2

Name and address of factory
*Nom et adresse de l'usine*

Rating and principal charactistics
*Valeurs nominales et caractéristiques principales*

115/230V ac, 7.5/4 amp, 50/60 Hz,

Trade Mark (if any)
*Marque de fabrique (si elle existe)*

Model/type Ref.
*Ref. de type*

IPC-610

Additional information (if necessary)
*Information complémentaire (si nécessaire)*

**IEC PUBLICATION 60950 EDITION 2:1991**
**Including A1, A2, A3 and A4**

A sample of the product was tested and found to be in conformity with
*Un échantillon de ce produit a été essayé et a été considéré condorme à la*

as shown in the Test Report Ref. No
which form part of this certificate
*comme indiqué dans la Rapport d'essais numéro de référence qui constitue una partie de ce certificat*

9912063386

This CB Test Certificate is issued by the National Certification Body
*Ce Certidicat d' essai OC est établi par l'Organisme National de Certification*

**Entela, Inc.**
**3033 Madison Avenue SE**
**Grand Rapids, MI 49548**
**USA**

Date December 8, 1999

Signature Timothy C. Hubbard
General Manager

Entela, Inc.
Engineering and Testing Laboratories
1-800-888-3787
www.entela.com



**Name and Address of the Manufacturer/Factory**

1. Great Elite Electronic Metal & Plastic Manufacturing Co., Ltd.
   Block A, West Yinhe Industrial Zone, Qingxi, Dongguang, Guangdung, China

2. Advantech Co., Ltd.
   F1.7, No. 1, Lane 169, Kang-Ning Street, Xi-Zhi Town, Taipei Hsien, Taiwan ROC

Entela, Inc

Report.No. 9912063386



COVER PAGE FOR TEST REPORT
IEC 60950: 1991 Second Edition,
SAFETY OF INFORMATION TECHNOLOGY EQUIPMENT,
Amendment No. 1 (1992), Amendment No. 2 (1993), Amendment No. 3 (1995), Amendment No. 4 (1996)

| | |
|---|---|
| Product | PC Chassis Computer |
| Model/Type | IPC-610 |
| Rated values from the marking plate | I/P: 115/230Vac, 7.5/4.0A, 50/60Hz |
| Applicant | Advantech Co., Ltd.<br>F1. 4, No. 108-3, Ming-Chuan Road.l Shing-Tien City, Taipei, Taiwan, ROC |

Standard test methods: IEC 60950: 1991 + A1, A2 , A3, A4
Deviation from standard methods: None or as stated in this report.
Test procedure and any deviations, additions to, or exclusion from the procedure: as stated in this report.
Non-standard test methods: None.
Test procedure : CB Scheme
All applicable tests according to the above specified standard(s) have been carried out.

Test results are valid only for the tested equipment.

These tests fulfill the requirements of standard IEC60950

This test report may be copied only in whole. Permission from Entela Inc. is required if the test report is copied in part. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

This test report includes the following documents:

1. Test report - (31pages)

2. Other enclosures - ( Attachments A1 – External Labels; National Deviations B1 to B40; Drawings, Instructions and schematic C1 to C3 ; D1 to D44 – Power supply CB Certificates and Licenses)

3. Photos - ( 2 pages)

Date of Issue : 08 December 1999

Entela, Inc

Report.No. 9912063386

2 of (32)

TEST REPORT

IEC 60950: 1991

Amendments No. 1, 2, 3 , 4

| | | |
|---|---|---|
| Product: | PC Chassis Computer | |
| Model/Type: | IPC-610 | |
| Serial No. | -- | |
| Name and address of applicant: | Advantech Co., Ltd.<br>F1. 4, No. 108-3, Ming-Chuan Road., Shing-Tien City, Taipei, Taiwan, ROC | |
| Name and address of manufacturer: | Advantech Co., Ltd.<br>F1. 7, No. 1, Lane 169, Kang-Ning Street, Xi-Zhi Town, Taipei Hsien, Taiwan, ROC | |
| | COMMENTS | VERDICT |
| The equipment complies with the publication | IEC60950 + A1, A2, A3, A4 | P |
| National Deviations: | BE,CH, CZ,<br>DE,DK,FI,FR,GB,GR,HU,IE,IT,NL,NO,SE,<br>SI and group difference | P |
| Other requirements: | CSA 950-95, UL 1950 | P |
| List of test equipment available upon request or is included in the project file | | |
| Testing Laboratory:<br>Entela Inc. – 3033 Madision Ave. S.E., Grand Rapids, Michigan U.S.A | | |

| | | |
|---|---|---|
| Prepared by: | Tom Mah | Date: 08 Devember 1999 |
| Signature | | |
| Title | Program Manager | |
| Reviewed by: | Ned Devine | Date: 08 December 1999 |
| Signature | | |
| Title | Program Manager | |

General: The subject product is a PC chassis computer system housed in a metal enclosure. It is for use with Information Technology Equipment and is provided with an Approved detachable power supply cord set. The computer is provided with rack mounted panel and the combination of the product are to be evaluated in the end product.

Conditions of Acceptability:

1. The mains supply cord set provided with the equipment must be an approved type acceptable to the authorities in the country where the equipment is sold.

Required Modifications:

1. User manual in the language of marketing countries.
2. Lithium Battery - replacement and disposal caution label appeared adjacent to battery holder and in the user manual. User manual provides instruction on correct installation, removal and replacement.
3. Model designation, trade mark and complete electrical ratings appeared on the acceptable type label.
4. "WARNING: SHOCK HAZARD - DO NOT OPEN, together with the two graphical symbols - a lightning flash with arrow-point within an equilateral triangle, and an exclamation point within an equilateral triangle, appears on the removable cover to gain access.

EXPLANATIONS FOR ABBREVIATIONS IN THE "VERDICT" COLUMN:
**P** = PASS **F** = FAIL **N**= NOT APPLICABLE

**1.0 GENERAL**

| Clause Requirement + Test | Results + Remark | VERDICT |
|---|---|---|
| **1.2.2 Operating condition**<br>Continuous, short-time, or intermittent | Continuous operation | P |
| **1.2.3 Equipment mobility**<br>Movable, hand-held, stationary, fixed, for building-in or direct plug-in equipment | Movable equipment | P |
| **1.2.4 Class of equipment**<br>Class I, Class II (by definition or type) or Class III | Class I equipment | P |
| **1.2.5 Connection to supply**<br>Pluggable Type A, Pluggable Type B, Permanently connected | Pluggable A Equipment. | P |
| Detachable or non-detachable power cord | Detachable supply cord | P |

| | | |
|---|---|---|
| **1.2.7 Accessibility** | | P |
| **1.2.12 Tested for IT power system** | | N |
| Weight of equipment | 18 Kg | P |
| Protection against ingress of water: | IPX0 | P |

**SUMMARY OF TESTING**

| CLAUSE | Information/Remarks | RESULTS - COMMENTS |
|---|---|---|
| 1.6 | Power Interface | Satisfactory |
| 1.7 | Marking and Instruction | Satisfactory |
| 2.1 | Protection against electric shock and energy hazards (5V o/p>240VA) | N/A, Investigated as part of Power Supply |
| 2.2 | Insulation | N/A, Investigated as part of Power Supply |
| 2.3 | SELV Circuits | N/A, Investigated as part of Power Supply |
| 2.4 | Limited Current Circuits | N/A, Not used or required |
| 2.5 | Provision for Protective Earthing | Satisfactory |
| 2.9 | Creepage Distances, Clearances and Distance through Insulation | Satisfactory |
| 3.2 | Connected to Primary Power | Satisfactory |
| 3.3 | Wiring Terminal for External Supply Conductors | N/A, Detachable Power Cord |
| 4.1 | Stability and Mechanical Hazards | Satisfactory |
| 4.2 | Mechanical Strength and Stress Relief | Satisfactory |
| 4.3 | Construction Details | Satisfactory |
| 4.4 | Resistance to Fire | N/A, Investigated as part of Power Supply |
| 5.1 | Heating | Satisfactory |
| 5.2 | Earth Leakage Current | Satisfactory |
| 5.3 | Electrical Strength | Satisfactory |
| 5.4 | Abnormal Operating and Fault Conditions | N/A, Investigated as part of Power Supply |
| C1 | Transformer (Output) Overload | N/A, Investigated as part of Power Supply |
| Attachment B | Checklist of National Deviations | Satisfactory |

**LIST OF CRITICAL COMPONENTS**

| object/part No. | manufac-turer/trademark | Type/model | technical data | Standard | mark(s) of conformity |
|---|---|---|---|---|---|
| Chassis | -- | -- | Min. 2 mm thick | -- | -- |
| PCB's | -- | -- | 94V-1 or better, Min. 105 °C | UL94 | UL |
| Power Switch | -- | -- | 250 V, 10 A | IEC 61058-1 | VDE |
| Floppy Disk Drive (Optional) | TEAC | FD-235xx | 5 Vdc, 0.8 A | EN60950 | TUV |
| CD-ROM (Optional) | TEAC | CD-5xx | 5 Vdc, 1.5 A<br>12 Vdc, 1.5 A | EN60950 | TUV |
| Hard Disk Drive (Optional) | Seagate | ST5xxxxy, or ST3xxxxy | 5 Vdc, 0.3 A<br>12 Vdc, 1.5 A | EN60950 | TUV |
| RTC Battery | Rayovac | BR2335 | 3 V, 300 mAh | -- | UL |
| RTC Battery protection resistor (R222) | -- | -- | 1000 ohms | -- | -- |
| RTC Battery protection diode (D6) | -- | -- | -- | -- | -- |
| DC Fan | Adda | AD1212HB-A70GL | 12 Vdc, 0.37 A, 88 CFM | EN60950 | UL, VDE |
| Power Supply | Bestec | BPS-2504-4TU | Input: 115/230 Vac, 50/60 Hz, 7.5/4 A. Output: +5 Vdc @ 24 A, +12 Vdc @ 10 A, +5 Vdc @ 0.5 A, +12 Vdc @ 0.5 A, total 250 W Max | EN60950 | TUV,Nemko CB certificate |
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| object/part No. | manufac-turer/trademark | Type/model | technical data | Standard | mark(s) of conformity |
|---|---|---|---|---|---|
| | | | | | |

## 1.5 COMPONENTS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 1.5.1 | Comply with IEC 950 or relevant IEC component standard | Critical components are CSA, UL and IEC approved. See previous page for details | P |
| 1.5.2 | Correct application | Product evaluated according to CSA 950-95, UL 1950 and IEC 950 + A1/A2/A3/A4 | P |
| 1.5.3 | Transformers - suitability and Annex C | All primary circuit and isolation components are housed inside the approved power supply | P |
| 1.5.4 | Flammability class of high-voltage components (>4kV) | No high voltage components | N |
| 1.5.5 | Interconnecting cables | | P |
| 1.5.6 | X capacitors - IEC384-14, or SEV approved | Mains power supply is certified by TUV/VDE/UL/CSA according to relevant standards | P |
| | | | |

## 1.6 POWER INTERFACE

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 1.6.1 | Input current - steady state - <10% rated<br><br>Details in Table 1 of this report | See input measurement data | P |
| 1.6.2 | Rated voltage of hand-held equipment | Not a hand held equipment | N |
| 1.6.3 | Neutral conductor insulated from earth | Neutral insulated from earth | P |
| 1.6.4 | Components connected between phase and earth in equipment intended for IT power system | Not applicable | N |
| 1.6.5 | Rated supply tolerance | + 10 & -10 % | P |
| | | | |

**TABLE 1 - POWER INTERFACE (in normal conditions)**

| Vin (AC) | Input Power (W) | Input Current (A) | Input Freq. (Hz) | Rated Input (A) | Conditions/status |
|---|---|---|---|---|---|
| 103 | 348 | 5.31 | 50 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 115 | 340 | 5.01 | 50 | 7.5 | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 122 | 338 | 4.76 | 50 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 207 | 330 | 3.16 | 50 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 230 | 329 | 2.90 | 50 | 4.0 | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 254 | 330 | 2.66 | 50 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 103 | 347 | 5.10 | 60 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 115 | 339 | 4.87 | 60 | 7.5 | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 122 | 338 | 4.63 | 60 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 207 | 329 | 3.07 | 60 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 230 | 329 | 2.82 | 60 | 4.0 | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |
| 254 | 329 | 2.60 | 60 | | Output Rating: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A |

Comment: The product was tested with following configuration:
Model: IPC-610 (BPS-2504-4TU)
Output Rating: +5V/24A, =12V/10A, -5V/0.5A, -12V/0.5A
Output Test Load: (80% of rated -load was considered maximum normal load)
+5V/19.2A, +12V/8A, -5V/0.4A, -12V/0.4A

## 1.7 MARKING AND INSTRUCTIONS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 1.7.1 | Power rating | 115/230 V~ , 7.5/4.0 A, 50/60 Hz. | P |
| 1.7.2 | Operating, Safety, Installation and Special instructions | Manual provided with necessary information | P |
| 1.7.3 | Short-time/intermittent operation markings | Continuous operation | N |
| 1.7.4 | Marking for multiple voltage/frequency connection | Marked voltage/frequency range : 115/230 V~, 7.5/4.0 A, 50/60 Hz. | P |
| 1.7.5 | Marking at auxiliary power outlets | No auxiliary outlets | N |
| 1.7.6 | Marking at accessible fuseholder or cross-reference in instructions for non-accessible Holders | Fuse is not accessible by end user | N |
| 1.7.7.1 | Protective earthing terminal symbol | Class I equipment powered by approved power supply, grounding symbol is part of the approved power supply. | P |
| 1.7.7.2 | Terminals for external primary conductors | No external primary conductor | N |
| 1.7.8 | Controls and Indicators – Identification, color, symbols (per IEC), figures - Location | Power switch marked with IEC 417 symbol 5009, integral part of the approved power supply, located in rear. | P |
| 1.7.9 | Marking when more than one power source | Only one mains power source | N |
| 1.7.10 | Instructions for installation to IT power system | Not specified for IT power system | N |

**1.7 MARKING AND INSTRUCTIONS (continued)**

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 1.7.11 | Instructions when protection relies on building installation protective devices | Pluggable type A | N |
| 1.7.12 | Marking when leakage current is more than 3.5 mA | Leakage measured max. 1 .03 mA. | N |
| 1.7.13 | Marking at thermostats/regulating devices | No thermostat or regulating device equipped | N |
| 1.7.14 | Language of safety markings/instructions | In English and IEC 417 symbols | P |
| 1.7.15 | Durability and legibility of markings | Durable against cleaning and rubbing test | P |
| 1.7.16 | Required markings not on removable parts | Not on removable parts | P |
| 1.7.17 | Caution marking for replaceable lithium batteries or text in user's manual | Instructions in the manual. | P |
| 1.7.18 | Operator access area with a tool - Marking or tool | Operator access only with the use of a tool | P |
| 1.7.19 | Installation in restricted access location - instructions | Not specified | N |
| | | | |

AFFIX BELOW SAMPLE OF RATINGS LABEL AND OTHER SAFETY MARKINGS (OR ATTACH DRAWINGS)

## 2.1 PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.1.2 | Protection from electric shock and energy hazards in operator access areas | Certified Power Supply, Outputs are SELV | P |
| 2.1.3 | Access to internal wiring in ELV circuits and in hazardous voltage circuits | Certified Power Supply, Outputs are SELV | P |
| 2.1.4 | Protection in Service and Restricted Access Location areas | Parts at hazardous voltage are contained in approved power supply. | P |
| 2.1.5 | Energy hazard - operator access areas | No energy hazard exposed to operator access area | P |
| 2.1.6 | Clearances behind conductive enclosures | Metal enclosure is grounded | P |
| 2.1.7 | Shafts of manual controls | No shafts of knobs etc. at ELV or Hazardous Voltage | P |
| 2.1.8 | Isolation of manual controls, handles, knobs... | No manual controls or shafts | P |
| 2.1.9 | Connection of conductive casing of capacitors | No such component in circuit | N |
| 2.1.10 | Risk of electric shock at external point of disconnection of the mains supply | No residual voltage was observed 1 sec. after supply disconnection | P |
| | Voltage decay: 37% of original value, or by time constant calculation | Measured 0 mV~ 1 Sec. after disconnection from power source | P |
| | | | |

## 2.2 INSULATION

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.2.2 | Insulating materials - Properties | Approved power supply | P |
| 2.2.3 | Humidity treatment - 48 hrs. | No hygroscopic material used. Use certified power supply and component, no other insulation materials used to insulate hazardous live parts | N |
| 2.2.4 | Requirements for insulation: heating, dielectric strength and Cr. and Cl. distances | Test with satisfactory results. See test data. | P |
| 2.2.8 | Doubled or reinforced insulation bridged by components (resistors or capacitors), accessibility. | No resistors or capacitors bridging the double insulation outside of power supply | N |

## 2.3 SELV CIRCUITS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.3.1 | SELV circuit safe to touch under normal and single fault condition | Certified SELV power supplies<br>Primary and secondary are double insulated | P |
| 2.3.2 | Voltage under normal conditions - Single/interconnected SELV circuit(s), and for Class I equipment, between SELV and protective earthing terminal | | N |
| 2.3.3 | Voltage under fault conditions in SELV circuits shall not exceed 42.4Vpk or 60 Vdc (>0.2secs) with a limit of 71Vpk or 120Vdc | All components isolating SELV circuit from primary circuit are housed inside the approved power supply. | P |
| | Method used for separation? | Method 1 | P |
| 2.3.8 | Additional constructional requirements for SELV circuits | Hazardous voltages were effectively separate from SELV circuit. | P |
| 2.3.9 | SELV circuits connected to other circuits | SELV not connected with other circuit | N |

## 2.4 LIMITED CURRENT CIRCUITS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.4.1 | Design of limited current circuits | Limited Current not used or required | N |
| 2.4.2 | Measured current | Limited Current not used or required | N |
| 2.4.3 | Measured capacitance | Limited Current not used or required | N |
| 2.4.4 | Measured charge | Limited Current not used or required | N |
| 2.4.5 | Measured energy | Limited Current not used or required | N |
| 2.4.6 | Connection to other circuits | Limited Current not used or required | N |

## 2.5 PROVISIONS FOR PROTECTIVE EARTHING

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.5.1 | Class I equipment - Reliable connection | Grounding to the mains is done inside the approved power supply unit. | P |
| 2.5.2 | Earthing in Class II equipment | Class I equipment | N |
| 2.5.3 | Switches/fuses in earthing conductors | No switch or fuse in earthing circuit | N |
| 2.5.4 | Assured earth connection in systems made up of Class I and II | See 2.5.1 | N |
| 2.5.5 | Green/yellow insulation | All insulated protective earth conductors are green/yellow. | P |
| 2.5.6 | Continuity of earth connections | It is not possible to disconnect protective earth without disconnecting mains, an appliance coupler is used as disconnect device. | P |
| 2.5.7 | Protective earth connection (make first/break last) for plug on power cord, an appliance coupler or connector | With certified coupler as the mains connection, the earth connection is make first and break last | P |
| 2.5.8 | Protective earth connection - Servicing | Class I equipment – No user servicing needed | P |
| 2.5.9 | P.E. terminals for fixed supply conductors or non-detachable cords - clamping means | Detachable power supply cord | N |
| 2.5.10 | Corrosion resistance | Grounding made by copper connector to the metal chassis, no risk corrosion is expected during normal operation | P |
| 2.5.11 | Resistance of p.e. conductors: $\leq 0.1\ \Omega$ | 0.27 mΩ | P |
| | Test current | 30 A at low voltage | P |
| | | | |

## 2.6 DISCONNECTION FROM PRIMARY POWER

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.6.2 | Disconnect device - Type | Detachable power cord and appliance coupler | P |
| 2.6.3 | Permanently connected equipment | Class I equipment, not permanently connected | N |
| 2.6.4 | Parts on supply side of disconnect device which remain energized | No parts remains energized after disconnection | P |
| 2.6.5 | (Isolating) Switches in flexible cords | No switch attached on power cord | N |
| 2.6.6 | Disconnection of both poles simultaneously | Certified detachable power cord disconnected both pole simultaneously | P |
| 2.6.7 | Disconnection of all phases | Single phase equipment | N |
| 2.6.8 | Marking for switch (disconnect device) | Panel switch marked with 417 IEC 5009 symbol | P |
| 2.6.9 | Plug as the disconnect device - installation inst. | IEC type appliance coupler | N |
| 2.6.11 | Interconnected units - disconnect, warning | No interconnecting units | N |
| 2.6.12 | Multiple power sources, marking | Single power source | N |

## 2.7 OVERCURRENT AND EARTH FAULT PROTECTION IN PRIMARY CIRCUITS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.7.1 | Type of protective device | Approved power supply. Over-current protected by fast acting fuse | P |
| | a) Integral part of equipment | Fast acting fuse on PCB (Power Supply) | P |
| | b) At building installation | Not rely on building installation | N |
| | c) Rated current > 16A, pluggable type B or permanently connected - Building installation | | N |
| 2.7.2 | Faults not covered in 5.4 | Considered | P |
| 2.7.3 | Adequate breaking capacity or short circuit back-up at building installation | Adequate protective device. | P |
| 2.7.4 | Number and location of protective devices | One fuse connected in series to hot side inside the approved power supply | P |
| 2.7.5 | Protection by several devices | Fuse only | N |
| 2.7.6 | Warning to service personnel on possible hazards | Warning is not required for SELV circuit | N |

## 2.8 SAFETY INTERLOCKS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.8.3 | Protection against inadvertent reactivation | No interlocks | N |
| 2.8.4 | Reliability | No interlocks | N |
| 2.8.5 | Overriding an interlock | No interlocks | N |
| 2.8.6 | Mechanically operated | No interlocks | N |
| 2.8.6.1 | Contact gap | No interlocks | N |
| 2.8.6.2 | Endurance - 50 cycles | No interlocks | N |
| 2.8.6.3 | Electric strength test | No interlocks | N |
| 2.8.7 | Mechanical actuators - protection against overstress | No interlocks | N |

## 2.9 CLEARANCES, CREEPAGE DISTANCES AND DISTANCES THROUGH INSULATION

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.9.2.1 | Clearances in primary circuits | Approved power supply | P |
| 2.9.2.2 | Clearances in secondary circuits | Approved power supply | P |
| 2.9.3 | Creepage distances | Approved power supply | P |
| | Material Group: I, II, IIIa, IIIb<br>CTI (default to 100 as minimum) | Group I | P |
| **2.9.4**<br>2.9.4.1 | **Solid insulation**<br>Minimum distances thru insulation | Approved component power supply | P |
| 2.9.4.2 | Thin sheet material | No thin sheet material used as an insulating material | N |
| 2.9.4.3 | Printed boards - Per Table 6A in standard | Approved component power supply | N |
| 2.9.4.4 | Wound components without interleaved insulation | | N |
| 2.9.5 | Separation distances on coated printed boards | Approved component power supply | P |
| 2.9.6 | Enclosed and sealed parts - Pollution Deg.1 | | N |
| 2.9.7 | Spacing filled by insulating compound | | N |
| 2.9.8 | Component external terminations, if per 2.9.7 | See 2.9.7 | N |
| 2.9.9 | Insulation with varying dimensions - transformers with various working voltages | Not applicable | N |

**TABLE 2 CLEARANCES, CREEPAGE DISTANCES AND DISTANCES THROUGH INSULATION**

| 2.9.2, 2.9.3 Location / | Vp or dc | V rms | Creepage distances | | Clearance | |
|---|---|---|---|---|---|---|
| Insulation type | | | Req/mm | Meas/mm | Req/mm | Meas/mm |
| | | | | | | |
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| 2.9.4 Solid Insulation | Working Voltage | Electric Strength (Vac) | Req/mm | Meas/mm |
|---|---|---|---|---|
| Distance through insulation | | | | |
| Thin sheet material | | | | |
| Printed boards | | | | |

Req = Requirement, Meas = Measured

Comments:

Approved Power Supply by Nemko and UL according EN 60950:1992+A1+A2+A3+A4 / UL-1950/CSA-950-95

**2.10 INTERCONNECTION OF EQUIPMENT and**
**2.11 LIMITED POWER SOURCES**

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 2.10.1 | Connection of SELV and TNV circuits | | N |
| 2.10.2 | Types of interconnection circuits - No ELV | | P |
| 2.10.3 | ELV circuits as interconnection circuits | | N |
| 2.11 | Mains operated limited power source or battery- operated limited power source | | N |

**3.1 WIRING, CONNECTIONS AND SUPPLY**

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 3.1.1 | Cross-sectional area and protection | Adequate cross sectional area on internal wiring. | P |
| 3.1.2 | Wireways | Printed wiring | P |
| 3.1.3 | Fixing of internal wiring | Printed wiring | P |
| 3.1.4 | Fixing of uninsulated conductors | | N |
| 3.1.5 | Insulation of internal wiring conductors | All wires are suitable for the voltage, current and temperature. | P |
| 3.1.6 | Green/yellow color combination only for P.E. | | P |
| 3.1.7 | Fixing of beads and similar insulators | No beads | N |
| 3.1.8 | Required electrical contact pressure | No electrical contact made through screw pressure | N |
| 3.1.9 | Reliable electrical connections | No contact pressure against plastics | N |
| 3.1.10 | Stranded conductors soldering vs. contact pressure | No stranded conductors used | N |
| 3.1.11 | Thread-cutting screws (sheet metal or self-tapping) | No thread-cutting screws used | N |

### 3.2 CONNECTION TO PRIMARY POWER

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 3.2.1 | Means of connection | An appliance inlet for connection of a detachable power cord set | P |
| 3.2.2 | Provision for permanent connection | Not for permanent connection | N |
| 3.2.3 | Appliance inlet | | P |
| 3.2.4 | Type and cross-sectional area of power supply cord | IEC 227 type power cord used. Min H03VV-F 3 x 0.75 sqmm | P |
| 3.2.5 | Cord anchorage and strain relief | | N |
| 3.2.6 | Protection of power supply cord | | N |
| 3.2.7 | Cord guard - Non detachable power cord or hand held | | N |
| | Mass (M), Diameter of cord (D), Radius of curvature of cord after test (R) | M=<br>D= (See 3.2.4)<br>R= | N |
| 3.2.8 | Supply wiring space | Not applicable | N |
| | | | |

### 3.3 WIRING TERMINALS FOR EXTERNAL POWER SUPPLY CONDUCTORS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 3.3.1 | Terminals | | N |
| 3.3.2 | Special non-detachable cord<br>Type of connection: Pull test at 5 N | Class I equipment Equipped with IEC type appliance coupler with detachable cord set | N |
| 3.3.3 | Screws and nuts | | N |
| 3.3.4 | Fixing of conductors | | N |
| 3.3.5 | Connection of conductors with nominal cross section area | | N |
| 3.3.6 | Size of terminals | | N |
| 3.3.7 | Protection against damage of conductors | | N |
| 3.3.8 | Terminal location | | N |
| 3.3.9 | Test with 8 mm stranded wire | | N |
| | | | |

## 4.1 STABILITY AND MECHANICAL HAZARDS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 4.1.1 | Stability tests | | P |
| | Angle of 10° | | P |
| | Floor standing unit (>25 kg) | | N |
| | Floor standing unit - overbalance | | N |
| 4.1.2 | Protection against personal injury from moving parts | No moving parts, except for the fan. Fans are located at the back of the unit and the approved power supply, a suitable finger guard has been provided | P |
| 4.1.3 | Warning and means provided for stopping hazardous moving parts | See 4.1.2 | P |
| 4.1.4 | Edges and corners | Edges and corners are rounded | P |
| 4.1.5 | Enclosure of a high pressure lamp | No high pressure lamp used | N |
| | | | |

## 4.2 MECHANICAL STRENGTH AND STRESS RELIEF

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 4.2.2 | Internal enclosures 30 N ± 3 N/5 s | | N |
| 4.2.3 | External enclosures 250 N ± 10 N/5 s | Metal external enclosure | P |
| 4.2.4 | Steel sphere Test | | P |
| | Vertical Impact | | P |
| | Horizontal Impact | | N |
| 4.2.5 | Drop Test - Direct plug-in or other hand held or desk top <5 kg | Weights more than 5 Kg | N |
| 4.2.6 | Stress relief test (enclosures of molded or formed thermoplastic) | | N |
| 4.2.7 | Compliance criteria | | P |
| 4.2.8 | Mechanical strength of cathode ray tubes | No CRT equipped | N |
| | | | |

## 4.3 CONSTRUCTION DETAILS

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 4.3.1 | Changing of setting for different power supply voltages | No hazard observed during voltage selector was switched, integral part of the approved power supply. | P |
| 4.3.2 | Adjustment of accessible control devices | | N |
| 4.3.4 | Prevention of dangerous concentration of dust, liquid and gas | | N |
| 4.3.5 | Fixing of knobs, grips, handles, levers | No handles, grips, levels or knobs equipped | N |
| 4.3.6 | Driving belts/couplings shall not ensure electrical insulation | No mechanical driving device equipped. | N |
| 4.3.7 | Retaining of sleeves | No sleeving used | N |
| 4.3.9 | Protection of loosening parts | Components are mechanically fixed on PWB. No hazard or loosening was observed during the tests | P |
| 4.3.11 | Insulation resistance to oil, grease and similar | Not intended for use in an environment which is exposed to oil, grease or other similar substances | N |
| 4.3.12 | Protection against harmful concentration of ionizing radiation or UV or laser or flammable liquids/gases and similar | Class I laser is part of the approved CD ROM reader/writer. | P |
| 4.3.13 | Security of screwed connections | No mechanical stress occurring in normal use against screws | P |
| 4.3.15 | Openings on top of fire/electrical enclosures | | N |
| 4.3.16 | Openings on the sides of enclosures | | N |
| 4.3.17 | Mis-mating of plugs, sockets and connectors | | N |
| 4.3.18 | Direct plug-in - strain on socket outlet | Not a plug-in device | N |
| 4.3.19 | Protection against excessive pressure, if contains liquids | | N |
| 4.3.20 | Protection of heating elements in Class I equipment - | Not a heating device | N |
| 4.3.21 | Protection circuit when using lithium or similar cells – charging, installation | Provided with blocking diode and 1000 ohm resistor in series to prevent charging. | P |
| 4.3.22 | Aging of adhesive used on barrier or screen | No barrier or screen used | N |

**4.4 RESISTANCE TO FIRE**

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 4.4.2 | Minimizing the risk of ignition | No excessive temperature was observed | P |
| 4.4.3.2 | Flammability of materials and components | | P |
| 4.4.3.3 | Exemptions | Not applicable, see 4.4.2 | N |
| 4.4.3.4 | Wiring harnesses | All wiries are located in SELV circuit only. | P |
| 4.4.3.5 | Cord anchorage bushings | Equipped with appliance inlet | N |
| 4.4.3.6 | Air filter assemblies | No air filter | N |
| 4.4.4 | Flammability of outer enclosures and decorative parts | Metal enclosure, except the front decorative panel. Plastic materials are flame retardant material, 94HB min. | P |
| 4.4.5 | Conditions for fire enclosure - components | Metal enclosure | P |
| 4.4.6 | Fire enclosure construction | Metal enclosure | P |
| 4.4.7 | Doors and covers | Painted metal covers, secured to the metal frame. | P |
| 4.4.8 | Protection against spreading of flammable liquids | No flammable liquid used | N |
| | | | |

**5.1 HEATING (Continued)**

**THERMAL TEST DATA**

| | | | Results + Remark | | VERDICT |
|---|---|---|---|---|---|
| $t_1$ = 23.1 °C<br>$t_2$ = 23.1 °C | | | | | P |
| Test voltage | | | | | |
| Winding | R1/Ω | R2/Ω | Δt Measured (°K) | Δt Allowed (°K) | Insulation Class |
| | | | | | |
| | | | | | |

| Other measured parts | Δt Measured (°C) | Δt Allowed (°K) |
|---|---|---|
| H.D.D. Body | 10.7 | 60 |
| F.D.D. Body | 7.8 | 60 |
| CD-ROM Body | 8.2 | 60 |
| CPU Body | 7.2 | 60 |
| Battery Bady | 3.9 | 60 |
| U6 Body | 8.7 | 90 |
| U29 Body | 14.6 | 90 |
| PCB under PCI CPU | 9 | 55 |
| U12 Body | 10.1 | 90 |
| U2 Body of VGA | 5.4 | 90 |
| NF Coil | 44.0 | 50 |
| C8 Body | 26.4 | 35 |
| SH1 Body | 22.7 | 60 |
| T1 Coil | 22.6 | 40 |
| T1 Core | 31.3 | 40 |
| T2 Coil | 24.5 | 40 |
| SH2 Body | 46.8 | 60 |
| T3 Coil | 51.8 | 60 |
| Surface of PC | 5 | 20 |
| Ambient Air | 23.1 | -- |

Restricted access location installation:
Comments: Heating test was conducted with 103 V~ 60

Temperature measured at room temperature of 23.1 °C
~~Air Ambient = 50°C~~

Entela, Inc

Report.No. 9912063386



**5.1 HEATING (Continued)**

**THERMAL TEST DATA**

| | | | Results + Remark | | VERDICT |
|---|---|---|---|---|---|
| $t_1$ = 22.3 °C<br>$t_2$ = 22.3 °C | | | | | P |
| Test voltage | | | | | |
| Winding | R1/Ω | R2/Ω | Δt Measured (°K) | Δt Allowed (°K) | Insulation Class |
| | | | | | |
| | | | | | |

| Other measured parts | t Measured (°C) | Δt Allowed (°K) |
|---|---|---|
| H.D.D. Body | 9.8 | 60 |
| F.D.D. Body | 6.9 | 60 |
| CD-ROM Body | 7.1 | 60 |
| CPU Body | 6.5 | 60 |
| Battery Body | 3.8 | 60 |
| U6 Body | 8.2 | 90 |
| U29 Body | 13.8 | 90 |
| PCB under PCI CPU | 8.8 | 55 |
| U12 Body | 10.1 | 90 |
| U2 Body of VGA | 5.4 | 90 |
| NF Coil | 22.3 | 50 |
| C8 Body | 21.5 | 35 |
| SH1 Body | 22.9 | 60 |
| T1 Coil | 17.7 | 40 |
| T1 Core | 30.3 | 40 |
| T2 Coil | 22.8 | 40 |
| SH2 Body | 46.3 | 60 |
| T3 Coil | 53.8 | 60 |
| Surface of PC | 4.4 | 20 |
| Ambient Air | 22.3 | |

Restricted access location installation:

Comments: Heating test was conducted with 254 V~ 60

Temperature measured at room temperature of 22.3 °C

~~Air Ambient = 50°C~~

Entela, Inc

Report.No. 9912063386



**5.4.1 BLOCK VENT**

**THERMAL TEST DATA**

| | | | | | |
|---|---|---|---|---|---|
| $t_1$ = 22.3 °C<br>$t_2$ = 22.3 °C | | | Results + Remark | | VERDICT<br>P |
| Test voltage | | | | | |
| Winding | R1/Ω | R2/Ω | Δt Measured (°K) | Δt Allowed (°K) | Insulation Class |
| | | | | | |
| | | | | | |

| Other measured parts | t Measured (°C) | Δt Allowed (°K) |
|---|---|---|
| H.D.D. Body | 12.9 | - |
| F.D.D. Body | 10.7 | - |
| CD-ROM Body | 11.3 | - |
| CPU Body | 12.1 | - |
| Battery Body | 9 | - |
| U6 Body | 12.8 | - |
| U29 Body | 19.3 | - |
| PCB under PCI CPU | 15.3 | - |
| U12 Body | 16.3 | - |
| U2 Body of VGA | 11.6 | - |
| NF Coil | 28.8 | - |
| C8 Body | 26.3 | - |
| SH1 Body | 30 | - |
| T1 Coil | 28.8 | 150 |
| T1 Core | 37.3 | 150 |
| T2 Coil | 28.6 | 150 |
| SH2 Body | 55.5 | - |
| T3 Coil | 66.2 | 150 |
| Surface of PC | 6.8 | - |
| Ambient Air | 22.3 | - |

Restricted access location installation:

Comments: Heating test was conducted with vent blocked at 254V~ 60Hz
Unit shutdown at 100 minutes, no hazard
Temperature measured at room temperature of 22.3 °C

Entela, Inc

Report.No. 9912063386



**5.4.1 STALLED FAN**

**THERMAL TEST DATA**

| | | | | | |
|---|---|---|---|---|---|
| $t_1$ = 23 °C<br>$t_2$ = 23 °C | | | Results + Remark | | VERDICT<br>P |
| Test voltage | | | | | |
| Winding | R1/Ω | R2/Ω | Δt Measured (°K) | Δt Allowed (°K) | Insulation Class |
| | | | | | |
| | | | | | |

| Other measured parts | t Measured (°C) 60Hz | Δt Allowed (°K) |
|---|---|---|
| H.D.D. Body | 13 | - |
| F.D.D. Body | 7 | - |
| CD-ROM Body | 10 | - |
| CPU Body | 10 | - |
| Battery Body | 10 | - |
| U6 Body | 10 | - |
| U29 Body | 16 | - |
| PCB under PCI CPU | 10 | - |
| U12 Body | 13 | - |
| U2 Body of VGA | 11 | - |
| NF Coil | 33 | - |
| C8 Body | 34 | - |
| SH1 Body | 60 | - |
| T1 Coil | 52 | 150 |
| T1 Core | 49 | 150 |
| T2 Coil | 34 | 150 |
| SH2 Body | 97 | - |
| T3 Coil | 71 | 150 |
| Surface of PC | 6 | - |
| Ambient Air | 23 | - |

Restricted access location installation:

Comments: Heating test was conducted with fan stalled at 254 V~ 60Hz
Unit shutdown at 36 minutes, no hazard
Temperature measured at room temperature of 23 °C

**5.2 EARTH LEAKAGE CURRENT**

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 5.2.2 | Equipment type | Computer | P |
| 5.2.3 | Single phase equipment | | -- |
| | Test Voltage | 254 V~ | |
| | Measured current<br>Maximum allowed current 3.5ma | Between Line and ground 1.03 mA<br>Between neutral and ground 0.98 mA | P |
| 5.2.4 | Three-phase equipment | Not a three phase equipment | N |
| | Test Voltage | | |
| | Measured leakage per phase | | |
| | Allowable leakage current | | |
| 5.2.5 | Condition for equipment with earth leakage current exceeding 3.5 mA - Class I stationary, permanently connected or pluggable type B | Not over 3.5 mA | N |
| | | | |

**5.2 ELECTRIC STRENGTH**

| Clause | | Results + Remark | VERDICT |
|---|---|---|---|
| 5.3.2 | System insulation, insulation coatings, transformers with varying insulation along length of winding | The insulation between primary circuit and enclosure and accessible port pins were tested according to Table 18. | P |
| | | | |

| LOCATION | TEST VOLTAGE | RESULTS |
|---|---|---|
| Primary and Secondary | 4242 Vdc / 1 min | P |
| Primary and Ground | 3000 Vdc / 1 min | P |
| | | |
| | | |
| | | |
| | | |

## 5.4 ABNORMAL OPERATING AND FAULT CONDITIONS

| Clause | Requirement + Test | Results + Remark | | | VERDICT |
|---|---|---|---|---|---|
| 5.4.2 | Motors - overload, locked rotor or other | No motor equipped | | | N |
| 5.4.3 | Transformers - Overload protection Annex C.1 | Approved power supply | | | P |
| 5.4.4 | Compliance of operational insulation or insulation between a secondary ckt. and inaccessible conductive earthed. | | | | P |
| 5.4.5 | Electromechanical components in secondary circuits (other than motors) | No electromechanical component used in secondary circuit | | | N |
| 5.4.6 | Components in primary circuits, load impedance on output connectors or other faults | Meet 5.4.4. a) requirement | | | P |
| 5.4.7 | Test in any expected condition and foreseeable misuse | See abnormal test data | | | P |
| 5.4.8 | Unattended use of equipment having thermostats, temperature limiters etc. | No thermostats or temperature limiters | | | N |
| 5.4.9 | Compliance - No fire, no molten metal, enclosure integrity, electric strength | No fire, melt metal or deform of the enclosure after electric strength test | | | P |
| 5.4.10 | Thermoplastics - parts at hazardous voltages | No plastic material used to direct support live parts | | | N |
| | Tested parts | Temp.(°C) | Impression. | Requirement. | Result |
| | | | | | |

### FAULT CONDITION TESTS

Equipment, Assembly or Power Supply Type/Model/ P/N: Computer; IPC-610

Manufacturer: Advantech Co., Ltd.

Equipment Ratings: +5V/24A, +12V/10A, -5V/0.5A, -12V/0.5A
Output Test Load (80% of load): +5V/19.2A, +12V/8A, -5V/0.4A, -12V/0.4A
Stalled fan and blocked vent tests with satisfactory results, see table 5.4.1 for details. Dielectric strength tested after abnormal tests between primary to secondary 4242Vdc and between primary to ground 3000Vdc with satisfactory results.

## 6.2 TNV CIRCUITS AND PROTECTION AGAINST ELECTRIC SHOCK

| Clause | Requirement + Test | Results + Remark | VERDICT |
|---|---|---|---|
| 6.2.1.1 | Limits of TNV circuits<br>a) TNV-1 circuits<br>b) TNV-2 and TNV-3 circuits | | N |
| 6.2.1.2 | Separation from other circuits and from accessible parts: SELV, TNV-1 and accessible conductive parts from TNV-2 and TNV-3 circuits - Compliance with Table 19 or meets other conditions - Allowances | | N |
| 6.2.1.3 | Operating voltages generated externally - as specified by 6.2.1.2 | | N |
| 6.2.1.4 | TNV circuit separated from circuits at hazardous voltages | | N |
| 6.2.1.5 | Connection of TNV to other circuits | | N |
| 6.2.2 | Protection against contact with TNV circuits Accessibility – Battery compartments | | N |
| 6.3.1 | Protection from hazardous voltages - for direct connection to telecom network - Same as SELV or TNV circuit compliance | | N |
| 6.3.2 | Use of protective earthing-Class I equipment shall not rely on telecom network | | N |
| 6.3.3 | Separation of telecom network from earth – Requirements of components, insulation, dielectric strength - Exclusions | | N |
| 6.3.4 | Leakage currents to and from telecommunication network networks – Limitations of the leakage current to a telecommunication network | | N |
| 6.4 | Protection of equipment users from over-voltages on telecommunication networks – Separation requirements - test procedure selection: Impulse test, electric strength test Compliance criteria | | N |
| 6.5 | Protection of the telecommunication wiring system from overheating - Compliance with current limiting | | N |
| | | | |

**ANNEX A**
**TESTS FOR RESISTANCE TO HEAT AND FIRE**

| | | | |
|---|---|---|---|
| | ENTER N IF THIS ANNEX IS NOT USED: | N | |
| | | | |
| | | Results + Remark | VERDICT |
| | Manufacturer | | |
| | Material Description :<br>Connector | | |
| | Additional information, where used, etc. | | |
| | | | |
| | A.1 Flammability test for movable equipment > 18 kg | | |
| | A.2 Flammability test for movable equipment < 18 kg<br>and for materials within enclosure | | |
| | | | |
| | **When this Annex is used include details for:** | | |
| | Preconditioning, mounting of samples, wall thickness, number of samples, burning time and results | | |

**ANNEX B**
**MOTOR TESTS UNDER ABNORMAL CONDITIONS**

| Requirement + Test | Results + Remark | VERDICT |
|---|---|---|
| B.1 General Requirements | | N |
| Manufacturer, Type, Rated Voltage and Current | | N |
| B.2 Test Conditions | | N |
| B.3 Maximum Temperatures | | N |
| B.4 Running overload test | | N |
| B.5 Locked-rotor overload test - Duration, temperature values, and electric strength | | N |
| B.6 Running overload test for DC motor in secondary circuits | | N |
| B.7 Locked-rotor overload test for DC motor in secondary circuits - Per B.7.2 or B.7.3 - Test duration | Impedance protected fan has TUV, UL and CSA approvals | N |
| B.8 Test for motors with capacitors | | N |
| B.9 Test for three-phase motors | | N |
| B.10 Test for series motors | | N |
| | | |