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TECHNICAL SPECIFICATION

colour inside

DC power supply for notebook computers

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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DC POWER SUPPLY FOR NOTEBOOK COMPUTERS

FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC/TS 62700, which is a technical specification, has been prepared by technical area 14: Interfaces and methods of measurement for personal computing equipment of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
100/2170/DTS	100/2231/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International Standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

In consideration of global discussion on reducing e-waste and improving re-usability of power supplies, this Technical Specification addresses the common electro-mechanical characteristics for AC adapters used with a specified array of notebook computers.

In the current market, hundreds of millions of notebook computers are shipped every year with AC adapters which can typically be shared between generations of OEM notebook computers. A wide range of notebook computers are designed to meet unique market requirements and specific purposes. Each AC adapter is tuned and designed to optimally satisfy the requirements and specifications of the target notebook computers.

Specific combinations of OEM supplied AC adapters and notebook computers are tested and certified as a system in compliance with existing regulations and standards. Failing combinations are not shipped by the OEM to the consumer. This approach promotes consumer satisfaction, safety, and product reliability, while reducing the encroachment of poorly designed or manufactured aftermarket substitutes which may affect the operation of the notebook computer in compliance with regulatory requirements. Additionally, arbitrary combinations of AC adapters and notebook computers have been known to present functional and regulatory safety and EMC compliance issues for the notebook computer. These risks should be considered in any development or adoption of specifications for common AC adapters.

The objective of a common DC power supply is to support global interoperability of adapters for a specific range of notebook computers. This Technical Specification describes design considerations for the common adapters and identifies technical areas that require further development for interoperability with existing notebook computer technologies. The open technical and regulatory compliance issues identified within this Technical Specification which affect both AC adapters and the host notebook computers should be resolved before this specification can be considered as a normative within other standards or regulatory policies and before IEC standardization of the subject matter can be completed.

This Technical Specification also identifies important considerations required to maintain the high standard of safety, compliance and performance expected by users of notebook computers and global regulatory agencies.

The development of this Technical Specification is described in Annex A. Annexes C, D and E describe additional important areas which are required to be resolved in further standardization work.

The objective for future IEC standardization work will be to complete the development of the technical specifications which incorporates considerations for consumer safety, product reliability, system performance, regulatory compliance and technical innovations.

DC POWER SUPPLY FOR NOTEBOOK COMPUTERS

1 Scope

This Technical Specification states the minimum requirements for DC power supply for notebook computers. Specifically, it gives

– an electrical specification (performance characteristics),

– an ID pin method,

– a connector for DC power output.

The no-load power and power efficiency are outside the scope of this Technical Specification.

Note that safety requirements are covered by IEC 60950-1 and EMC requirements are covered by CISPR 22 and CISPR 24. CISPR 32 may be used in place of CISPR 22 for this purpose. These requirements are neither re-stated nor challenged by this Technical Specification but the designer should give due consideration to the performance of the power supply when used with a compatible notebook computer.

NOTE Applications for use in aerospace, military, medical, or smart grid are not addressed in this Technical Specification.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*
Amendment 1:2009
Amendment 2:2013

IEC 61076-2-102, *Connectors for electronic equipment – Part 2-102: Circular connectors with assessed quality – Detail specification for plugs and jacks for external low voltage power supply*

IEC 61204:1993, *Low-voltage power supply devices, d.c. output – Performance characteristics*

Amendment 1:2001

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

CISPR 24, *Information technology equipment – Immunity characteristics – Limits and methods of measurement*

CISPR 32, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60950-1 as well as the following apply.

3.1.1
notebook computer
lightweight compactly designed computer with a screen and attached keyboard that is capable of running on battery power for extended periods of time and is relatively easy to transport from one location to another by a single individual

3.1.2
DC power supply
adapter
AC adapter
external power supply which provides DC to the notebook computer

3.1.3
DC output connector
connecting body to connect and disconnect the electrical interface between DC power supply and the notebook computer

3.1.4
DC output plug
male connector of DC output connectors for connecting the DC power supply

3.1.5
identification signal
ID signal
signal which enables communication between a DC power supply to a notebook computer

3.1.6
identification signal connector pin
ID pin
electrical connector pin to transport ID signal

3.2 Abbreviations

AC	Alternating Current
CPU	Central Processing Unit
EIAJ	Electronic Industries Association of Japan
EMC	Electromagnetic Compatibility
EMI	Electro Magnetic Interference
EUT	Equipment Under Test
LPS	Limited Power Supply
OEM	Original Equipment Manufacturer
PSE	Product Safety Electrical appliance and material
SPM	Smart Power Management
VCC	Voltage at the Common Collector

4 Electrical specification (performance characteristics)

4.1 AC input rating

The range of AC input rating acceptable by the power supply shall be stated and specified as (100 to 240) Vrms, 50/60 Hz. Operating tolerance shall be (90 to 264) Vrms at 47 Hz to 63 Hz to accommodate specific country/regional requirements. No further tolerances shall be applied.

4.2 Inrush current

The maximum inrush current, from power-on (with power on at any point on the AC sinewave) and including, but not limited to, three line cycles, shall be less than 220 A. The limit shall be met at the maximum input voltage and across both cold start (all components at minimum temperature) and hot start conditions (and after sustained operation at maximum rated power and ambient temperature).

4.3 DC output load condition and voltage regulation

There are still comments and concerns with respect to the DC output load conditions and voltage regulations. Informative text is given in Clause E.1.

4.4 DC output ripple and noise

The ripple and noise performance for DC output shall be stated and specified as maximum 600 mV peak-to-peak for steady state, except when no load is attached.

IEC 61204:1993, and its Amendment 1:2001, 3.10 “Periodic and random deviation” is applicable.

4.5 Output transient response and capacitor load

The transient response at the output terminal and the capacitor load of the power supply shall be stated. The capacitor load shall be specified as 2 200 μF maximum.

IEC 61204:1993, 3.16 “Transient response to load current changes” is applicable.

4.6 Power supply timing

4.6.1 Turn on delay time

The time taken, after switch-on of the source, for the output voltage to enter the specification band, shall be stated and specified as less than 3 s maximum under all load conditions.

4.6.2 Hold-up time

The hold-up time shall be stated as more than 10 ms at 110 Vrms/50 Hz.

Note that a reference load should be considered in future work.

4.6.3 Rise time of output voltage

The rise time of output voltage shall be greater than 2 ms and less than 40 ms.

Note that a reference load should be considered in future work.

4.7 Protection

4.7.1 Over-current protection

There are still comments and concerns with respect to over-current protection. Informative text is given in Clause E.2.

4.7.2 Short-circuit protection

Short-circuit protection shall comply with IEC 60950-1.

4.8 Over shoot

During power on or power off, the output voltage shall not exceed 21 V peak nor be outside the regulation requirements for more than 10 ms.

Note that the maximum value shall be verified after further definition of 4.3.

5 DC power supply identification and communication method for notebook computers

This clause needs further investigation and development and is for information only. The use of the ID pin should be clearly defined (including pin configuration and communication mode). This Technical Specification has not addressed any definite method of communication between the AC adapter and computer, nor has the group yet discussed the scope of the data to be communicated.

Historically, AC adapters have commonly used mechanical interference of the DC connector to prevent incompatible combinations of AC adapters and notebook computers. Non-mechanical electrical methods (digital communication, voltage of the adapter, or analog reference) are in proprietary use today with some OEMs and work by identifying the AC adapter to the notebook computer. In general, the identification method is developed by each individual computer manufacturer and the methods used are different. On the other hand, there are many PCs and power supplies that do not use any identification protocol.

Further investigation is necessary in order to determine an identification method. To agree to a data communication protocol, data content and format is a complex task. Measures of robustness and integrity shall be used to help determine a minimum baseline of communication and allow for future evolution of this Technical Specification. Questions to answer are the following.

– Is an ID pin communication mandatory for functionality?
– When should it be acceptable for a computer to reject certain models of AC adapters?
– Which communications standard shall be used?
– What should the system do in the event of a failure of the communication?
– Can a scalable system of both low cost analog and higher function digital approaches be devised?
– Should the communication be bidirectional, or support networking of multiple devices?
– Which is the minimum information that shall be provided by the AC adapter? Which obligations does the notebook computer have to the AC adapter?
– What mechanism will allow for OEM specific innovation? To gain acceptance, the Technical Specification should not exclude innovative or proprietary solutions from manufacturers.
– What roadmap can be provided for future innovation in the communication method, or what process can be used for standardizing new data?