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CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

External universal power adapter solutions for portable information and communication technology devices

Recommendation ITU-T L.1002



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Recommendation ITU-T L.1002

External universal power adapter solutions for portable information and communication technology devices

Summary

Recommendation ITU-T L.1002 defines the requirements, and provides guidelines on the environmental aspects, of universal power adapter solutions (UPA) designed for use with portable information and communication technology (ICT) devices. It is complementary to Recommendations ITU-T L.1000 and ITU-T L.1001 and aims to cover the widest possible range of ICT devices for portable use within identified voltage and power ranges. It firstly describes basic configurations of UPAs, consisting of a power adapter block with a detachable input cable and a detachable output cable to the ICT device. Then, it defines different general recommendations for UPAs and their interfaces, including cables, connectors, voltage, current, ripple noise, energy efficiency, no-load power, safety, electromagnetic compatibility, resistibility and eco-environmental specifications. All the recommendations have been set with the aim to reduce e-waste and increase usability.

History

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

This Recommendation¹ defines the requirements, and provides guidelines on the environmental aspects, of universal power adapter solutions (UPA) designed for use with portable information and communication technology (ICT) devices. It also takes into consideration energy efficiency, emissions reduction and the use of scarce and raw materials.

Power supplies are a contributory factor to the increasing electricity consumption of households in Europe [b-CLASP]. The impact assessment for the ecodesign regulation on external power supplies calculated an increase in energy consumption from about 7.3 TWh in 2010 to about 7.5 TWh in 2020 (business as usual scenario). According to [b-EPS CoC] savings are expected to be 1.04 TWh in 2020. Only a part of these external power supplies (EPSs) would be UPAs used with portable ICT devices.

Considering [b-IEA] on standby mode consumption, given the average of 0.3 W to 0.5 W in no-load consumption of EPS, with a new value of 0.1 W savings would be in the order of some TWh/year/billion for portable UPAs following the requirement of this Recommendation.

The best approach for UPAs is to achieve several objectives: convenience for consumers to power their portable ICT devices from any available UPA or from other common interfaces through a detachable cable; while ensuring consumer safety, device protection and system reliability.

The direct current (DC) detachable cable has the same replacement possibility as for the alternating current (AC) detachable cable reducing a lot of e-waste as the common failure mode is the same, and the rupture of the wire at the output of the adapter case, due to frequent cable rolling. Detachable cable solutions can enable the sharing of power adapters among the existing and future ICT portable devices where such a solution is adopted. This will enable a market opportunity to reduce the number of duplicate portable power adapters.

It is noted that the environmental impact of any universal power adapter solution should be considered over its entire life cycle and that the transition towards universal power adapter solutions does not aim to replace the existing adapters immediately, as billions of them are currently in use and billions of external power adapters are being introduced for new devices or to replace old ones. Any universal power adapter solution is expected to be time limited as continual development provides a more efficient solution to meet the requirements for future innovative products. Solutions focused on common charging interoperability can avoid longevity limitations associated with universal power adapter solutions. (see the section on [IEC 63002] in Appendix I). This Recommendation focuses on universal power adapter solutions that operate within identified current and voltage ranges of common mobile product categories in market.

It should be noted that lifetime, safety, electromagnetic compatibility (EMC) and environmental issues have been considered in the drafting of this Recommendation.

Appendix IV identifies future work that is needed to address arbitrary combinations.

¹ The United States of America requested that the following be appended to this Recommendation:

NOTE 1 – This Recommendation is intended to not conflict with or supersede existing regulatory requirements and international/regional/national standards.

NOTE 2 – Hold-up time is not a requirement needed for UPAs for mobile devices which have internal battery systems. [CISPR 22 Class B] compliance is inherently met when a battery is installed.

NOTE 3 – For lifetime requirements, further studies on the test conditions and test methods are required to analyse the effects of various parameters (e.g., temperature, use).

NOTE 4 – [b-IEC TS 62700] recognizes that UPA-side barrel connectors are not internationally standardized and current and future market trends for detachable/captive cables need further consideration.

It is important to propose a low voltage DC interface to directly power ICT devices, especially for emerging countries that show fast mobile and Internet development despite the absence of a reliable AC grid. Considering the rapid increase of the cost of fossil fuel used in engine generators and the reduction of the cost of renewable energy sources, this kind of energy solution is developing fast and is among the main enablers of ICT deployment in such regions. The use of DC is much more efficient and increases the overall reliability as it allows removing the DC/AC inverters and insulated AC/DC adapters. A simple (and low cost) detachable cable could then be sufficient to power ICT devices. In some cases, only a DC/DC converter with very high efficiency would be used to adapt voltage, e.g., 12 V or 24 V to 5 V. This solution is also considered in developed countries for home DC networks (see appendices I and V of [ITU-T L.1001]).

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Recommendation ITU-T L.1002

External universal power adapter solutions for portable information and communication technology devices

1 Scope

This Recommendation defines the requirements, and provides guidelines on the environmental aspects, of universal power adapter solutions (UPA) designed for use with portable information and communication technology ICT (ICT) devices.

UPAs covered by this Recommendation are those that are used with the devices with voltage and power levels identified in clause 7.1.1.

This Recommendation does not cover UPAs defined in [ITU-T L.1000] and [ITU-T L.1001].

This Recommendation provides requirements and guidelines for energy efficiency and no load power. It aims to reduce greenhouse gas (GHG) emissions to optimize the use of scarce and raw materials and to enable a long product lifetime to reduce e-waste generation.

The considered UPA does not provide any charge control for rechargeable batteries.

The load full charging function in the portable device, if present, is not within the scope of this Recommendation.

This Recommendation describes basic configurations and general requirements for UPAs and their interfaces, including cables, connectors, voltage, current, ripple, noise, energy efficiency, safety, electromagnetic compatibility, resistibility and eco-environmental specifications.

Market issues associated with: counterfeit products or untested combinations of ICT devices and UPAs are not within the scope of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T K.21] Recommendation ITU-T K.21 (2015), *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*.
- [ITU-T K.44] Recommendation ITU-T K.44 (2016), *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*.
- [ITU-T K.74] Recommendation ITU-T K.74 (2015), *EMC, resistibility and safety requirements for home network devices*.
- [ITU-T K.85] Recommendation ITU-T K.85 (2011), *Requirements for the mitigation of lightning effects on home networks installed in customer premises*.
- [ITU-T L.1000] Recommendation ITU-T L.1000 (2011), *Universal power adapter and charger solution for mobile terminals and other handheld ICT devices*.
- [ITU-T L.1001] Recommendation ITU-T L.1001 (2012), *External universal power adapter solutions for stationary information and communication technology devices*.

- [ITU-T L.1200] Recommendation ITU-T L.1200 (2012), *Direct current power feeding interface up to 400 V at the input to telecommunication and ICT equipment.*
- [ITU-T L.1410] Recommendations ITU-T L.1410 (2014), *Methodology for environmental life cycle assessments of information and communication technology goods, networks and services.*
- [EN 50563] CENELEC EN 50563 (2011), *External A.C. – D.C. and A.C. – A.C. power supplies – Determination of no-load power and average efficiency of active modes.*
- [IEC 60038] IEC 60038 (2009), *IEC standard voltages.*
- [IEC 60068-2-38] IEC 60068-2-38 (2009), *Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test.*
- [IEC 60320-1] IEC 60320-1 (2015), *Appliance couplers for household and similar general purposes – Part 1: General requirements.*
- [IEC 60335-1] IEC 60335-1 (2010), *Household and similar electrical appliances – Safety – Part 1: General requirements.*
- [IEC 60950-1] IEC 60950-1 (2005), *Information technology equipment – Safety – Part 1: General requirements.*
- [IEC 61000-3-2] IEC 61000-3-2 (2014), *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).*
- [IEC 61000-4-11] IEC 61000-4-11 (2004), *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests.*
- [IEC 62282-5-1] IEC 62282-5 (2012), *Fuel cell technologies – Part 5-1: Portable fuel cell power systems – Safety.*
- [IEC 62301] IEC 62301 (2011), *Household electrical appliances – Measurement of standby power.*
- [IEC 62368-1] IEC 62368-1 (2014-02), *Audio/video, information and communication technology equipment – Part 1: Safety requirements.*
- [IEC 62680-1-2] IEC 62680-1-2 (2016), *Universal serial bus interfaces for data and power – Part 1-2: Common components – USB Power Delivery specification.*
- [IEC 62680-1-3] IEC 62680-1-3 (2016), *Universal serial bus interfaces for data and power – Part 1-3: Universal Serial Bus interfaces – Common components – USB Type-C™ Cable and Connector Specification.*
- [IEC 62680-2-1] IEC 62680-2-1 (2015), *Universal serial bus interfaces for data and power – Part 2-1: Universal Serial Bus Specification, Revision 2.0.*
- [IEC 62684] IEC 62684 (2011), *Interoperability specifications of common external power supply (EPS) for use with data-enabled mobile telephones.*
- [IEC 63002] IEC 63002 (2016), *Identification and communication interoperability method for external power supplies used with portable computing devices.*
- [IEC-CISPR 22] IEC-CISPR 22 (2008), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.*
- [IEC-CISPR 24] IEC-CISPR 24 (2010), *Information technology equipment – Immunity characteristics – Limits and methods of measurement.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 safety extra-low voltage circuit: Secondary circuit that is so designed and protected that under normal operating conditions and single fault conditions, its voltages do not exceed a safe value. ([IEC 62282-5-1]).

NOTE 1 to entry – For commercial, industrial and telecommunication applications, the SELV voltage limits provided in [IEC 60950-1] are applicable. For household applications, the SELV voltage limits in [IEC 60335-1] (2010) shall be used.

NOTE 2 to entry – The limit values of voltages under normal operating conditions and single fault conditions (see 1.4.14 of [IEC 60950-1]) are specified in 2.2 of [IEC 60950-1]. See Table 1A of [IEC 60950-1].

NOTE 3 to entry – This definition of a SELV circuit differs from the term "SELV system" as used in [IEC 61140].

3.1.2 functional earthing: Earthing of a point in equipment or in a system, which is necessary for a purpose other than Safety ([IEC 60950-1]).

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 captive cable: A cable integral to the universal power adapter (UPA).

3.2.2 detachable alternating current (AC) cable: A detachable cable used to connect the power adapter to the alternating current (AC) mains for powering through two connectors, one on the universal power adapter (UPA) side and the other on the AC mains side.

3.2.3 detachable direct current (DC) cable: A detachable direct current (DC) cable connects the power adapter to the information and communication technology (ICT) device for powering through two connectors, one on the universal power adapter (UPA) side and the other on the ICT device side.

3.2.4 hiccup mode: Hiccup mode is a power supply overcurrent protection mode which stops power output followed by trying to restart the power supply intermittently.

3.2.5 power adapter: A device that converts the mains alternating current (AC) power voltage at the input to the low direct current (DC) power voltage at the output, or one that converts DC power source, e.g., from photo voltaic source to another low voltage DC power output.

3.2.6 power adapter block: A block that includes a power adapter.

3.2.7 universal power adapter solutions: External power adapters that are designed to provide power to different information and communication technology (ICT) devices.

3.2.8 safety extra-low voltage (SELV) DC: A DC voltage in a circuit respecting the condition defined for a safety extra-low voltage circuit.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC Alternating Current

CoC Code of Conduct