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SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

# Test suites for assessment of the external universal power adapter solutions for stationary information and communication technology devices

Recommendation ITU-T L.1006

ITU-T L-SERIES RECOMMENDATIONS

**ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT**

| | |
|---|---|
| OPTICAL FIBRE CABLES | |
| Cable structure and characteristics | L.100–L.124 |
| Cable evaluation | L.125–L.149 |
| Guidance and installation technique | L.150–L.199 |
| OPTICAL INFRASTRUCTURES | |
| Infrastructure including node element (except cables) | L.200–L.249 |
| General aspects and network design | L.250–L.299 |
| MAINTENANCE AND OPERATION | |
| Optical fibre cable maintenance | L.300–L.329 |
| Infrastructure maintenance | L.330–L.349 |
| Operation support and infrastructure management | L.350–L.379 |
| Disaster management | L.380–L.399 |
| PASSIVE OPTICAL DEVICES | L.400–L.429 |
| MARINIZED TERRESTRIAL CABLES | L.430–L.449 |

*For further details, please refer to the list of ITU-T Recommendations.*

# Recommendation ITU-T L.1006

## Test suites for assessment of the external universal power adapter solutions for stationary information and communication technology devices


### Summary

Recommendation ITU-T L.1006 describes the general test suites applicable to the universal power adapter solution (UPA) designed for ICT devices for stationary (non-portable) use defined in Recommendation ITU-T L.1001. It considers the creation of specific test suites to assess certain functional aspects of the energy efficiency, interworking, safety and electromagnetic compatibility (EMC) of universal power adapter solution (UPA) designed for ICT devices for stationary (non-portable) use. Such testing is required to guarantee a minimum quality level of the universal charging solution (UCS) in conformance with the target basic configuration of UPA described in Recommendation ITU-T L.1001. With regard to electromagnetic compatibility (EMC) and safety aspects, additional requirements to those listed in Recommendation ITU-T L.1001 are necessary for a product to be available for use by the general public.



### History

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### Keywords

Conformance, electromagnetic compatibility (EMC), safety, universal power adapter (UPA).


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## Table of Contents

# Recommendation ITU-T L.1006

## Test suites for assessment of the external universal power adapter solutions for stationary information and communication technology devices

### 1 Scope

This Recommendation describes the general test suites applicable to the universal power adapter solution (UPA) designed for ICT devices for stationary (non-portable) use defined in [ITU-T L.1001].

It establishes a test list necessary to assess the universal power adapter solution (UPA) designed for ICT devices for stationary (non-portable) use in [ITU-T L.1001].

With regard to electromagnetic compatibility (EMC) and safety aspects, additional requirements to those listed in [ITU-T L.1001] are necessary for a product to be available for use by the general public.

### 2 Reference

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 standalone document, the status of a Recommendation.

[ITU-T K.21] Recommendation ITU-T K.21 (2016), *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 L.1001] Recommendation ITU-T L.1001 (2012), *External universal power adapter solutions for stationary information and communication technology devices*.

[ITU-T L.1005] Recommendation ITU-T L.1005 (2014), *Test suites for assessment of the universal charger solution.*

[IEC CISPR 22] Recommendation IEC CISPR 22 (2008), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*.

[IEC 60331-23] Recommendation IEC 60331-23 (1999), *Tests for electric cables under fire conditions – Circuit integrity – Part 23: Procedures and requirements – Electric data cables.*

[IEC 60332-1-1] Recommendation IEC 60332-1-1 (2004), *Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus.*

[IEC 60754-1] Recommendation IEC 60754-1 (2011), *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content.*

[IEC 60754-2] Recommendation IEC 60754-2 (2011), *Test on gases evolved during combustion of materials from cables – Part 2: Determination of acidity (by pH measurement) and conductivity.*

[IEC 60950-1] Recommendation IEC 60950-1 (2005), *Information technology equipment – Safety – Part 1: General requirements*.

[IEC 61000-3-2] Recommendation IEC 61000-3-2 (2014), *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current up to and including 16 A per phase).*

[IEC 61000-3-3] Recommendation IEC 61000-3-3 (2013), *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current up to and including 16 A per phase and not subject to conditional connection.*

[IEC 61000-4-2] Recommendation IEC 61000-4-2 (2008), *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.*

[IEC 61000-4-3] Recommendation IEC 61000-4-3 (2010), *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*.

[IEC 61000-4-4] Recommendation IEC 61000-4-4 (2012), *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.*

[IEC 61000-4-5] Recommendation IEC 61000-4-5 (2014), *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*.

[IEC 61000-4-6] Recommendation IEC 61000-4-6 (2013), *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*.

[IEC 61000-4-11] Recommendation 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 62684] Recommendation IEC 62684 (2011), *Interoperability specifications of common external power supply (EPS) for use with data-enabled mobile telephones.*

## 3 Definition

### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1 test suite** [ITU-T L.1005]: A list of tests necessary to validate a universal charger solution.

**3.1.2 power adapter** [ITU-T L.1000]: A device that converts mains AC power voltage at the input to low DC power voltage at the output or which converts DC power source, e.g., from Photo Voltaic source to another low voltage DC power output.

**3.1.3 power adapter block** [ITU-T L.1000]: A block which includes a power adapter.

**3.1.4 universal power adapter solution** [ITU-T L.1000]: Family of universal power adapters (UPAs) that defines the power supply solution for different ICT devices.

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC Alternating Current

DC Direct Current

EMC Electromagnetic Compatibility

ESD Electrostatic Discharge

RF Radio Frequency

UCS Universal Charging Solution

UPA Universal Power adapter

## 5 ITU-T L.1001 conformance testing

This part of the Recommendation defines the test to determine whether a UPA meets the conformance requirements described in [ITU-T L.1001].

The need to establish a common test suite for the UPA is derived from the necessity to establish a common modality to assess product quality and to provide a regulatory guide on which product testing could be based for market surveillance purposes.

- Table 5-1 provides a list of tests on energy efficiency that are necessary to check conformance of the UPA with requirements described in [ITU-T L.1001].
- Table 5-2 provides a list of DC tests that are necessary to check conformance of the UPA with requirements described in [ITU-T L.1001].

**Table 5-1 - Test suites for energy efficiency assessment**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 1. | **Energy efficiency requirement** | | | |
| 1.1. | No load | No load power consumption test | See [ITU-T L.1001] Table 3 | |
| 1.2. | Energy Efficiency | Energy efficiency conversion | See [ITU-T L.1001] Table 3 | |

**Table 5-2 - Test suites for DC output characteristic evaluation**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 2. | **DC output** | | | |
| 2.1. | Voltage | DC output voltage | See [ITU-T L.1001] Table 1 | |
| 2.2. | Current | DC output current | See [ITU-T L.1001] Table 3 | |
| 2.3. | Output connector | Output DC plug and connectors | See [ITU-T L.1001] clause 7.1.2 | |
| 2.4. | Common mode noise | Limitation of common mode noise on DC port | See [IEC 62684] clause 5.4 | [ITU-T L.1001] |
| 2.5. | Ripple | Limitation of ripple DC port | 2% of rated voltage (i.e., 100 mVp-p at 5 V and 240 mVp-p at 12 V). | [ITU-T L.1001] |

## 6 Conformance testing for safety

This part of the Recommendation defines the test to determine whether a UPA is in conformance with safety requirements.

Table 6-1 does not provide an exhaustive list of applicable tests.

The UPA shall be designed in line with [IEC 60950-1].

**Table 6-1 - Test suites for assessment of safety conformance**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 3. | **Safety** | | | |
| 3.1. | General | General – Safety requirement | The power adapter must be a limited power source in accordance with clause 2.5 of [IEC 60950-1] | [IEC 60950-1] |
| 3.2. | Fire resistance | Risk – Ignition reduction and fire propagation of UPA | The power adapter construction and functionality shall be in accordance with clause 4.7 of [IEC 60950-1] | [IEC 60950-1] |
| 3.3. | Fire resistance | Fire propagation of detachable cable | Plastic material V1<br>No fire propagation in accordance with [IEC 60332-1-1]<br>Fire resistance: see [IEC 60331-23] | [IEC 60332-1] |
| 3.4. | Fire resistance | Fumes – Emanation | [IEC 60754-1 (amount of halogen acid gas) and [IEC 60754-2] (acidity of gases evolved during combustion) | [IEC 60754-1]<br>[IEC 60754-2] |

## 7 Conformance testing for EMC

This part of the Recommendation defines the test for a UPA to be in conformance with EMC requirements.

Table 7-1 reports the DC test list necessary to check UPA conformance with EMC requirements.

**Table 7-1 – EMC test suites**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 4. | **Electromagnetic compatibility (EMC)** | | | |
| 4.1. | Radiated emission | Radiated emission from UPA enclosure | [IEC CISPR 22] class B | [IEC CISPR 22] |
| 4.2. | DC conducted emission | Conducted emission on UPA DC line | [IEC CISPR 22] class B | [IEC CISPR 22] |
| 4.3. | AC conducted emission | Conducted emission on UPA AC line | [IEC CISPR 22] class B | [IEC CISPR 22] |
| 4.4. | Harmonic | Limitation of harmonics current | The requirements contained in [IEC 61000-3-2/A1] relevant to harmonic current emission apply for equipment. | [IEC 61000-3-2]/A1 |
| 4.5. | Voltage fluctuations and flicker | Voltage fluctuations and flicker | The requirements contained in [IEC 61000-3-3] relevant to voltage fluctuations and flicker apply. | [IEC 61000-3-3] |
| 4.6. | Radiated immunity | RF electromagnetic field<br>(80 MHz to 1,000 MHz and 1,400 MHz to 2,700 MHz) | 3 V/m<br>For some specific frequency the test level is 10 V/m see [EN 301 489-34] | [IEC 61000-4-3] |
| 4.7. | ESD | Electrostatic discharge enclosure and DC power output port | 4 kV contact discharge<br>8 kV air discharge. | [IEC 61000-4-2] |
| 4.8. | Fast transients | Fast transients common mode DC and AC power ports applicable | DC port 0.5 kV open circuit voltage<br>AC port 1 kV open circuit voltage | [IEC 61000-4-4] |
| 4.9. | Radio frequency (RF) common mode | RF common mode 0.15 MHz to 80 MHz DC and AC power port | Level 2 3 Vrms | [IEC 61000-4-6] |

**Table 7-1 – EMC test suites**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 4.10. | Voltage dips and interruptions | Voltage dips and interruptions<br>AC mains power input | voltage dip: 0% residual voltage for 0.5 cycle;<br>voltage dip: 0% residual voltage for 1 cycle;<br>voltage dip: 70% residual voltage for 25 cycles (at 50 Hz);<br>voltage interruption: 0% residual voltage for 250 cycles (at 50 Hz). | [IEC 61000-4-11] |
| 4.11. | Surges | Surges, line-to-line and line-to-ground<br>AC mains power input | 2 kV line to ground, and 1 kV line to line | [IEC 61000-4-5] |

## 8 Conformance testing for resistibility

This part of the Recommendation defines the test for a UPA to be in conformance with resistibility requirements.

Table 8-1 reports the resistibility test list necessary to check UPA conformance.

**Table 8-1 - Resistibility test suites**

| Test # | Test type | Description | Requirement | Test reference |
|---|---|---|---|---|
| 5. | **Electromagnetic compatibility** | | | |
| 5.1. | Lightning | Inherent, transverse and port-to-earth | [ITU-T K.21] Table 5 basic test level<br>Uc (max) = 2.5 kV R = 0 Ω | [ITU-T K.44] |
| NOTE – Where the basic resistibility requirements are not sufficient due to environmental conditions, national regulations, economic and technical considerations, installation standards or grade of service requirements, network operators may request the enhanced or special resistibility requirements. Guidance on the applicability of enhanced test levels and special levels is given in [ITU-T K.85] | | | | |

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