BS EN 62637-2:2011

BSI Standards Publication

Battery charging interface for small handheld multimedia devices

Part 2: 2 mm barrel type interface conformance testing

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National foreword

This British Standard is the UK implementation of EN 62637-2:2011. It is identical to IEC 62637-2:2011.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 75274 2

ICS 33.160.99; 97.180

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2011.

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62637-2

May 2011

ICS 33.160.99; 97.180

English version

Battery charging interface for small handheld multimedia devices - Part 2: 2 mm barrel type interface conformance testing
(IEC 62637-2:2011)

Interface de charge de batterie pour petits appareils multimédia portables – Partie 2: Essai de conformité de l'interface de type cylindrique 2 mm
(CEI 62637-2:2011)

Batterie-Ladeschnittstelle für kleine tragbare Multimedia-Geräte - Teil 2: Konformitätsprüfung von Schnittstellen mit 2-mm-Zylinder
(IEC 62637-2:2011)

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Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 62637-2:2011 E

Foreword

The text of document 100/1674/CDV, future edition 1 of IEC 62637-2, prepared by technical area 1, Terminals for audio, video and data services and contents, of IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62637-2 on 2011-05-04.

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The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-02-04
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-05-04

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62637-2:2011 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 62637-1	2011	Battery harging interface for small hand held multimedia devices - Part 1: 2mm barrel interface specification	EN 62637-1	2011

CONTENTS

BATTERY CHARGING INTERFACE FOR SMALL HANDHELD MULTIMEDIA DEVICES –

Part 2: 2 mm barrel type interface conformance testing

1 Scope

This part of the IEC 62637 provides the conformance testing rules and guidelines for equipment built to meet the 2 mm barrel type charging interface specified in the 62637-1.

2 Normative references

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

IEC 62637-1:2011, *Battery charging interface for small handheld multimedia devices – Part 1: 2 mm barrel interface*

3 Abbreviations and symbols

For the purposes of this document, the following abbreviations apply.

AC	Alternating Current
ATT	ATTenuator
C	Capacitance F
CDN	Coupling/Decoupling Network
Crest factor	Current peak value/current RMS value
dB	Decibel
dB(mW)	Power in dB referring to 1 mW
DC	Direct Current
DUT	Device Under Test
EMC	Electromagnetic Compatibility
ESD	ElectroStatic Discharge
ESR	Effective Series Resistance Ω
f	Frequency in Hz
f_{Ichar}	Charging current change frequency Hz
GND	GrouND
I	Current A
I_{char}	Charging current A
I_{max}	Maximum current A
I_{peak}	Peak current A
L	Inductance H

N	Newton
R	Resistance Ω
RBW	Resolution BandWidth
RMS	Root mean square
V	Voltage V
V_{char}	Charging voltage
$V_{max\text{-}out}$	Maximum output voltage
V_{out}	Output voltage
V_{ripple}	Ripple voltage
VBW	Video BandWidth
SWP	SWeeP time

4 Test conditions for the 2 mm barrel charging interface

4.1 General test conditions

The general test conditions are set out below. Manufacturers should note that the actual conditions of use could be more stringent.

Tests conducted using this conformance document do not replace EMC, ESD, safety, type approval, or any tests set by legislation in the chargers or devices using the charging interface specified in IEC 62637-1. The purpose of the conformance testing is to achieve good interoperability between different chargers and devices.

4.2 Temperature

All measurements shall be made at normal room temperature 18 °C to 25 °C, unless some other temperature is specified.

4.3 Voltage

All tests are performed under nominal operating voltage as defined by the manufacturer.

5 Electrical testing of 2 mm barrel type chargers

5.1 Maximum transient voltage and current values

5.1.1 Test purpose

The purpose of this test is to verify that the charger complies with the requirements of settling time, minimum voltage and maximum voltage limits specified in IEC 62637-1, 5.2.

5.1.2 Requirements

The following requirements apply.

- Maximum charger output overshoot shall be less than or equal to 16 V.
- Maximum reverse voltage at charger output shall be less than or equal to 1 V.
- Maximum time to achieve steady state value for voltage and current (± 10 % tolerance) after load change (”no load”/”normal load”) shall be less than or equal to 10 ms.
- Maximum duration of charging current overshoot peak value greater than 1,1 A shall be less than or equal to 5 ms.

- Maximum output voltage undershoot with a load current less or equal than 100 mA shall be 4,1 V.

Maximum duration of charging current overshoot is shown in Figure 1.

5.1.3 Test equipment

The following equipment is required to perform the test:

- oscilloscope;
- 6 kΩ load as “no load”;
- a suitable resistor to draw a 100 mA load current at the nominal output voltage;
- 3,0 V current sink type of load with 1,1 A current limit as “normal load”;
- AC power source (if charger is AC powered);
- DC power source (if charger is made for car environment).

5.1.4 Test method

Proceed as follows.

a) Set the oscilloscope to measure voltage and current from the charger output.

b) Set the output of AC or DC power source to nominal value.

c) Measure the voltage and current values when the 6 kΩ load and 3,0 V load (a load, which results 3,0 V charging voltage) are interchanged with a fast electronic switch (switching time less than 100 μs) at the charger output.

d) Measure the voltage undershoot when in 100 mA resistive load (a load, which draws 100 mA at nominal output voltage).

Repeat the test using minimum and maximum supply voltages specified to the charger (recommendation for AC powered chargers is nominal voltage ± 20 %).

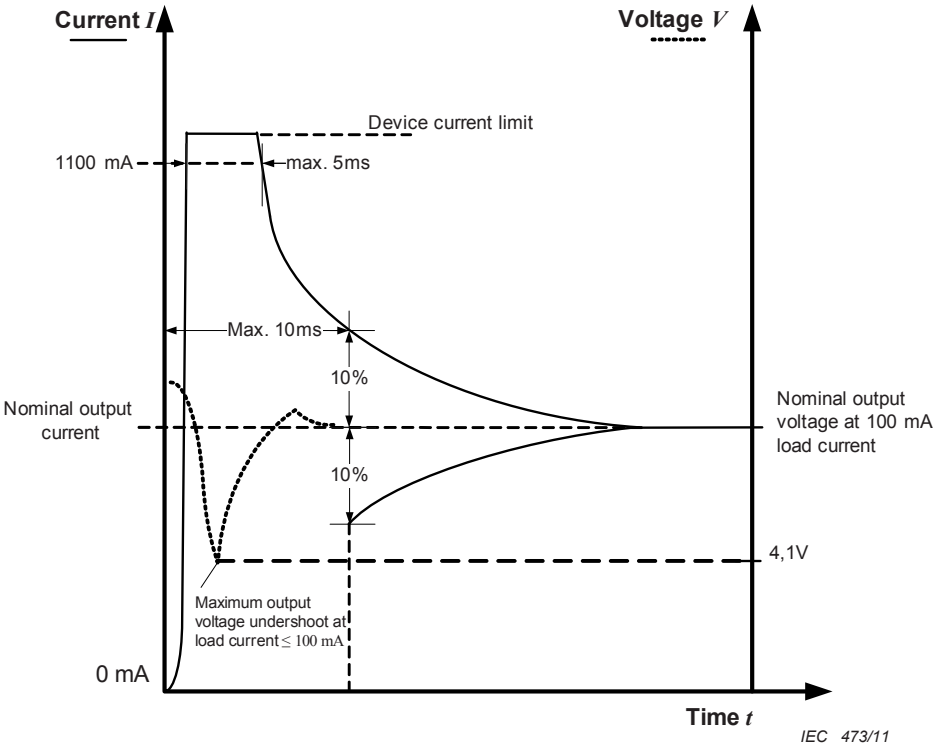

Figure 1 – Maximum duration of charging current overshoot and output voltage undershoot

5.2 Maximum output ripple voltage

5.2.1 Test purpose

The purpose of this test is to verify that the charger complies with the requirements of the ripple voltage specified in 5.3 of IEC 62637-1.

5.2.2 Requirements

Maximum ripple voltages for different frequency ranges are given in Table 1.

Table 1 – Maximum ripple voltage in different frequency ranges

Frequency range	Maximum ripple voltage (peak-to-peak)
f < 20 Hz	200 mV
20 Hz ≤ f < 200 Hz	200 mV
200 Hz ≤ f < 20 kHz	200 mV
20 kHz ≤ f < 1 MHz	400 mV

The maximum allowed output ripple voltage with maximum output current in constant current mode is 300 mV RMS for output voltages V_{out} between 2,5 V and 5,5 V.

A sum of ripple voltages over the full frequency range 0 MHz to 1 MHz is 800 mV (peak-to-peak).

During the test all the measured V and I values shall be within the voltage / current window of the charger interface.

Maximum peak-to-peak ripple voltage is shown in Figure 2.

5.2.3 Test equipment

The following equipment is required to perform the test:

- oscilloscope which offers the possibility of selecting a measured frequency band;
- variable resistive load 0 kΩ to 6 kΩ. Maximum stray capacitance of ripple test load (e.g. on-line testing) is 2 μF;
- AC power source (if charger is AC powered);
- DC power source (if charger is designed for car environment).

5.2.4 Test method

Proceed as follows.

a) Set the output of AC or DC power source to nominal value. Connect charger to power supply and to variable load.

b) Set the oscilloscope to measure voltage from charger's output. Connect charger to variable load and set the load as 6 kΩ.

c) Set the oscilloscope to measure ripple voltage peak-to-peak value from frequency band 0 Hz to 20 Hz. Reduce resistance slowly until the output voltage is 1,5 V. Find the highest peak-to-peak value between maximum voltage and 1,5 V.

d) Set the oscilloscope to measure ripple voltage peak-to-peak value from frequency band 20 Hz to 200 Hz. Reduce resistance slowly until the output voltage is 1,5 V. Find the highest peak-to-peak value between maximum voltage and 1,5 V.

e) Set the oscilloscope to measure ripple voltage peak-to-peak value from frequency band 200 Hz to 20 kHz. Reduce resistance slowly until the output voltage is 1,5 V. Find the highest peak-to-peak value between maximum voltage and 1,5 V.

f) Set the oscilloscope to measure ripple voltage peak-to-peak value from frequency band 20 kHz to 1 MHz. Reduce resistance slowly until the output voltage is 1,5 V. Find the highest peak-to-peak value between maximum voltage and 1,5 V.

g) Set the variable resistance so that the output voltage is 5,5 V. Remove frequency band limitations from the oscilloscope. Set the oscilloscope to measure the root mean square (RMS) value of ripple voltage. Decrease resistance slowly so that the output voltage is 2,5 V. Find the largest RMS value between 5,5 V and 2,5 V.

Repeat tests c) to g) using minimum and maximum supply voltages specified for charger (recommendation for AC-powered chargers is the nominal voltage ± 20 %). Repeat tests in minimum and maximum temperatures specified for charger.

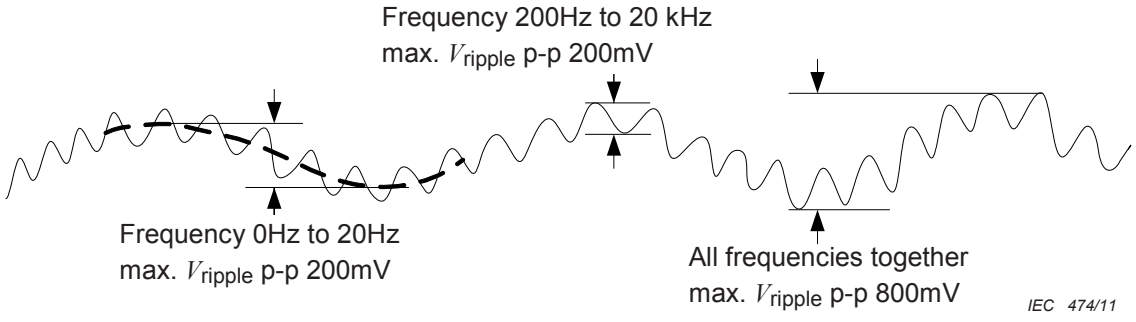

Figure 2 – Maximum peak-to-peak ripple voltage

5.3 High-frequency voltage components at the charger output

5.3.1 Test purpose

The purpose of this test is to verify that the charger complies with the requirements for high-frequency voltage components at the charger output specified in IEC 62637-1, 5.4.

5.3.2 Requirements

The charger shall not cause more high frequency voltage components at the charger output than specified in Table 2 and Figure 3 when connected to an artificial load specified in Annex A of IEC 62637-1 and measured with a coupling/decoupling network as specified in Annex B of IEC 62637-1.

Table 2 – Maximum high-frequency voltage components at the charger output

Frequency range MHz	**Maximum high frequency voltage components** dB(mW)
1 to 80	−40 to −65 linear slope
80 to 150	−65

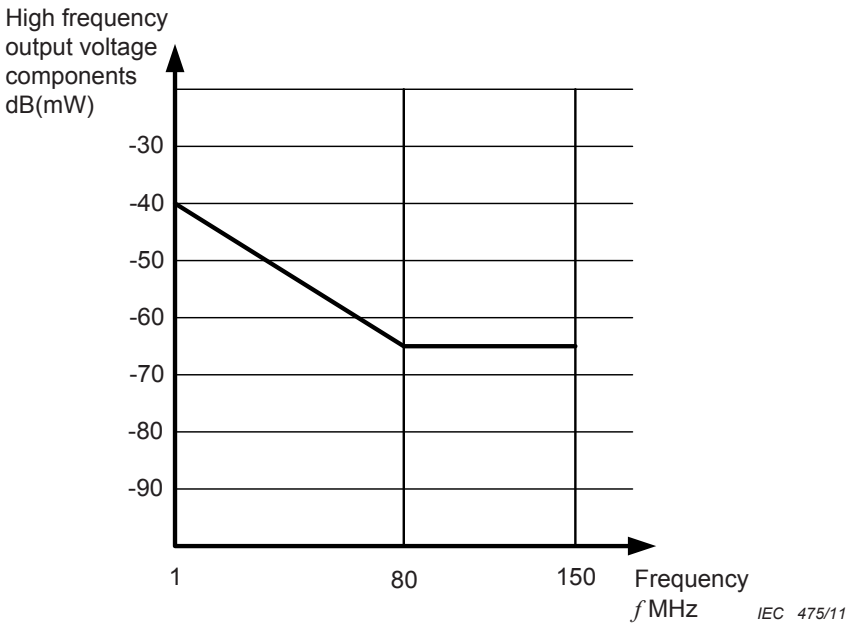

Figure 3 – Maximum high frequency output voltage components

5.3.3 Equipment

The following equipment is required to perform the test:

- shielded room to avoid any external interference;
- spectrum analyzer;
- coupling/decoupling network (CDN) specified in Annex B of IEC 62637-1;
- artificial load working as standard device charging interface. The artificial load is specified in Annex A of IEC 62637-1.

5.3.4 Test method

The test set up is shown in Figure 4.

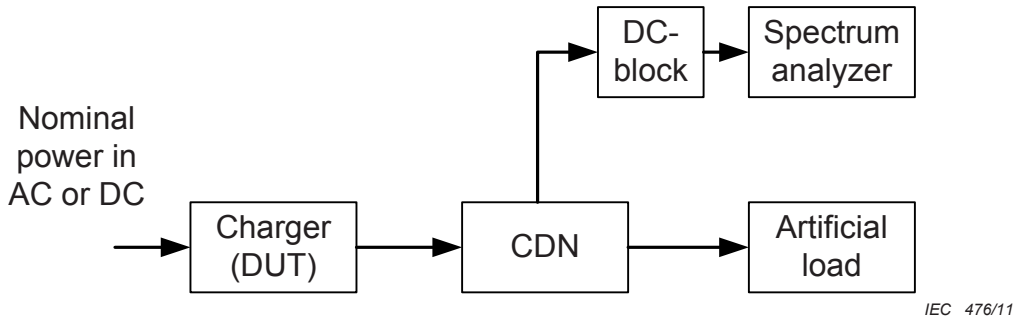

Figure 4 – Test set up for high frequency voltage components

Proceed as follows:

a) connect supply power for charger, power in AC or DC nominal operating voltage as defined by the manufacturer;

b) connect the charger to artificial load via coupling/decoupling network (CDN) and connect spectrum analyzer via DC block to CDN;

c) set output voltage to 5,0 V by artificial load control;

d) Measure high frequency components from 1 MHz to 150 MHz using the following spectrum analyzer settings:

- input attenuator: 0 dB (ATT);
- video resolution band filter: 100 kHz (VBW);
- resolution band filter: 100 kHz (RBW);
- sweep time: 30 ms (SWP);
- detector: maximum peak;
- average measurement.

5.4 Feel current of AC chargers

5.4.1 Test purpose

The purpose of this test is to verify that the charger complies with the requirements of feel current specified in 5.5 of IEC 62637-1.

5.4.2 Requirements

Maximum feel current from AC mains to the mobile device through the charger is 5 μA measured according to the method specified in 5.4.4.

5.4.3 Equipment

The following equipment is required to perform the test:

- test network and mains power supply according Figure 5;
- oscilloscope or voltmeter to measure the voltage V_2 of Figure 5.

5.4.4 Test method

The test set up is shown in Figure 5.

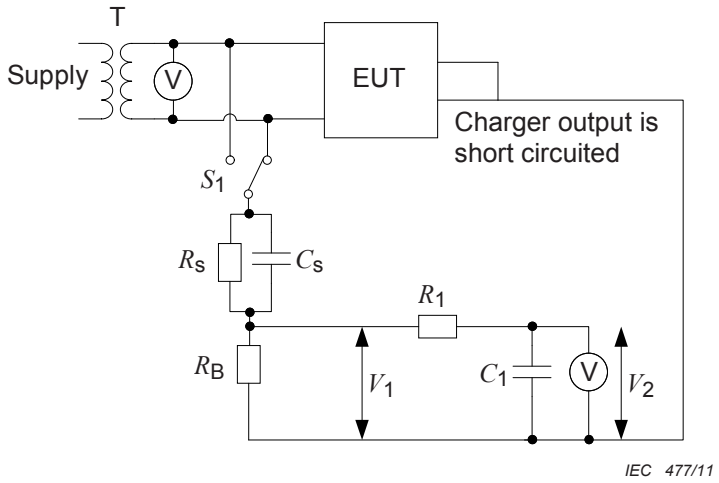

Figure 5 – Test set up

The component values of the test set up of Figure 5 are the following.

R_S = 1 500 Ω

C_S = 0,22 μF

R_B = 500 Ω

R_1 = 10 000 Ω

C_1 = 0,022 μF

Proceed as follows.

a) Connect the charger (EUT) to the test set up shown in the Figure 5.

b) Make sure that the charger output is short circuited.

c) Set the mains supply voltage to a nominal value according the charger specification.

d) Measure the voltage V_2 with both positions of the switch S1.

e) Calculate the feel current by $I_{feel} = V_2/R_B$ by using the higher value of the two measured V_2 voltages.

5.5 Charging voltage / current window

5.5.1 Test purpose

The purpose of this test is to verify that the charger complies with voltage / current window specified in 5.6 of IEC 62637-1.

5.5.2 Requirements

The minimum charging current is 300 mA between 2,0 V and 4,65 V. During charging, the current and voltage values shall not exceed the charging window shown in Figure 6.

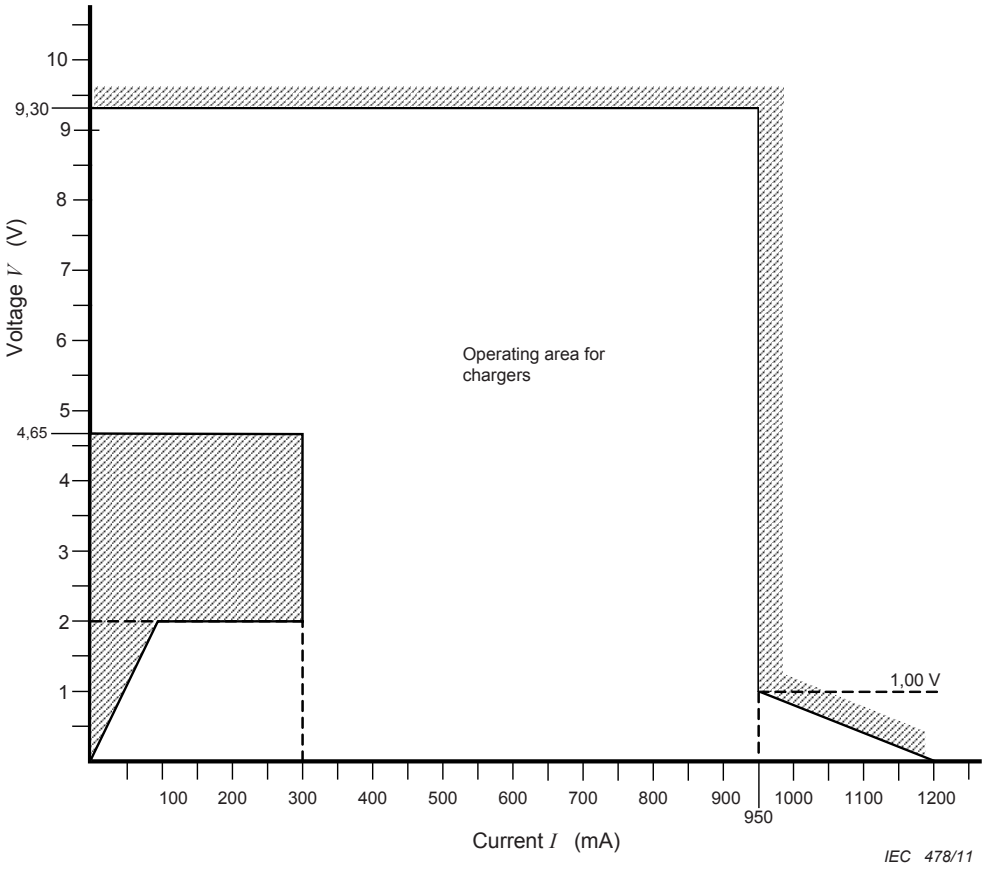

Figure 6 – Charging current/voltage window for 2 mm barrel chargers

5.5.3 Equipment

The following equipment is required to perform the test:

- variable resistive load 0 kΩ to 6 kΩ;
- voltage meter or oscilloscope;
- current meter;
- AC power source (if charger is AC powered);
- DC power source (if charger is designed for car environment).

5.5.4 Test method

Proceed as follows.

a) Connect the charger to variable load and set variable load to maximum resistance (6 kΩ).

b) Set power source output to nominal value and connect charger to power source.

c) Measure output voltage from charging interface.

d) Increase the load step by step to a short circuit. Measure the voltage and the current at each step. Use at least 30 steps covering entire resistance area from 6 kΩ to short circuit.

Repeat the test using minimum and maximum supply voltages specified to the charger (recommendation for AC-powered chargers is nominal voltage ± 20 %). Repeat tests in minimum and maximum temperatures specified to charger.

5.6 Current linearity for chargers

5.6.1 Test purpose

The purpose of this test is to verify that the charger complies with the current linearity requirements of IEC 62637-1 5.7. The current linearity requirement is specified in a way that the allowed current change is given for narrow voltage range from the middle of the total voltage range, but is sufficient to guarantee adequate linearity also for output voltages below or above the specified range.

5.6.2 Requirements

The maximum current fluctuation is 30 % when the charger output voltage varies from 3,5 V to 4,6 V (for example 500 mA – 0,3 × 500 mA = 350 mA) when input voltage and ambient temperature stay constant. The current linearity specification is shown in Figure 7.

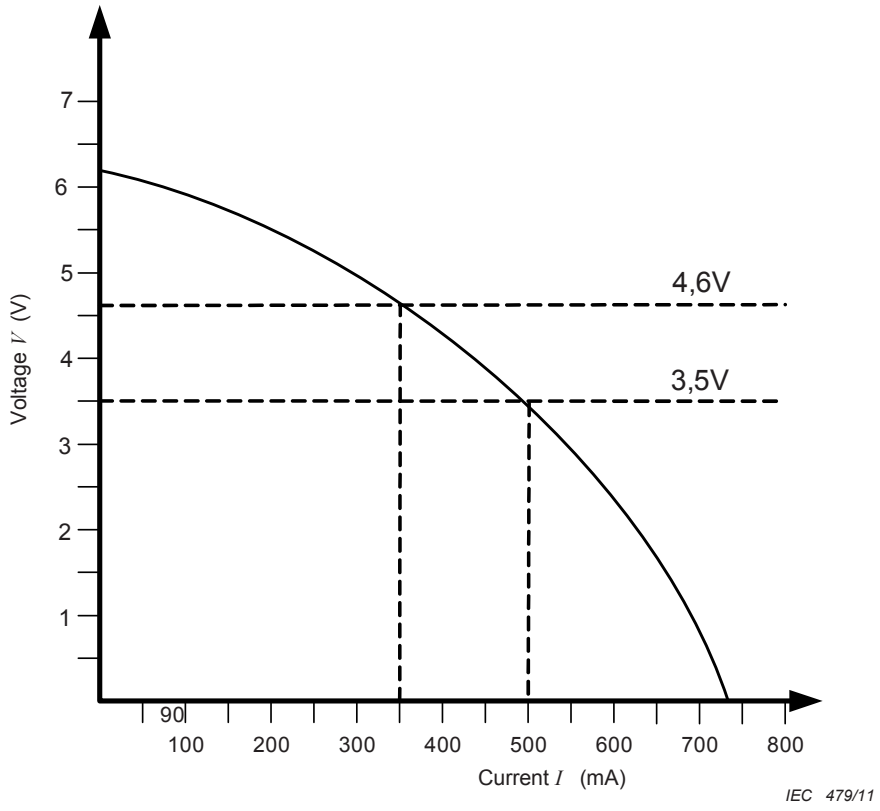

Figure 7 – Current linearity specification

5.6.3 Equipment

The following equipment is required to perform the test:

- variable resistive load 0 Ω to 5 kΩ;
- voltage meter or oscilloscope;
- current meter;
- AC power source (if charger is AC powered);
- DC power source (if charger is designed for car environment).

5.6.4 Test method

Proceed as follows.

a) Connect charger output to variable load via current meter.

b) Set power source output to nominal value and connect charger to power source.

c) Set voltage meter to measure output voltage and adjust the variable load so that the output voltage is 3,5 V. Measure the current.

d) Adjust variable load so that the output voltage is 5,0 V and measure the current again.

6 Electrical testing of 2 mm barrel interface accessories

6.1 General

These tests are designed to be used for accessories that are connected between a charger and a device both using the 2 mm barrel charging interface.

6.2 Charging voltage / current window

6.2.1 Test purpose

The purpose of this test is to verify that the accessory’s charging interface complies with the requirements specified in 6.1 of IEC 62637-1.

6.2.2 Requirements

During charging, the current and voltage values shall not exceed the charging window shown in Figure 6. For operation, it is allowed that the recommended minimum current of 300 mA is reduced to 200 mA.

6.2.3 Equipment

The following equipment is required to perform the test:

- DC power source;
- variable resistive load 0 kΩ to 6 kΩ;
- voltage meter or oscilloscope;
- current meter.

6.2.4 Test method

Proceed as follows.

a) Set the DC power source output to 6,0 V, current limit to 500 mA, and connect it to the accessory's 2 mm barrel charging input connector.

b) Connect the accessory's charging interface (output) to a variable load. Set the variable load to maximum resistance value of 6 kΩ.

c) Measure the output voltage from the accessory's charging interface. Increase the load value step by step to short circuit. Use at least 30 steps covering the entire resistance area from 6 kΩ to short circuit.

Set DC power source output to 5,7 V and current limit to 300 mA, and repeat the test in minimum and maximum temperatures specified for the accessory.

Set DC power source output to 9,3 V and current limit to 950 mA, and repeat the test in minimum and maximum temperatures specified for the accessory.

6.3 Accessory power consumption during device booting

6.3.1 Test purpose

The purpose of this test is to verify that an enhancement does not disturb the booting up of the device. When a device is booting up with an empty battery, the accessory can only use a very small amount of power. See IEC 62637-1, 6.3.

This test does not apply for accessories designed for the car environment.

6.3.2 Requirements

The recommended maximum current difference (current consumption in accessory) is 10 mA when the voltage in the accessory's charging interface is less than or equal to 3,5 V.

The maximum current consumption in the accessory during boot-up is shown in Figure 8.

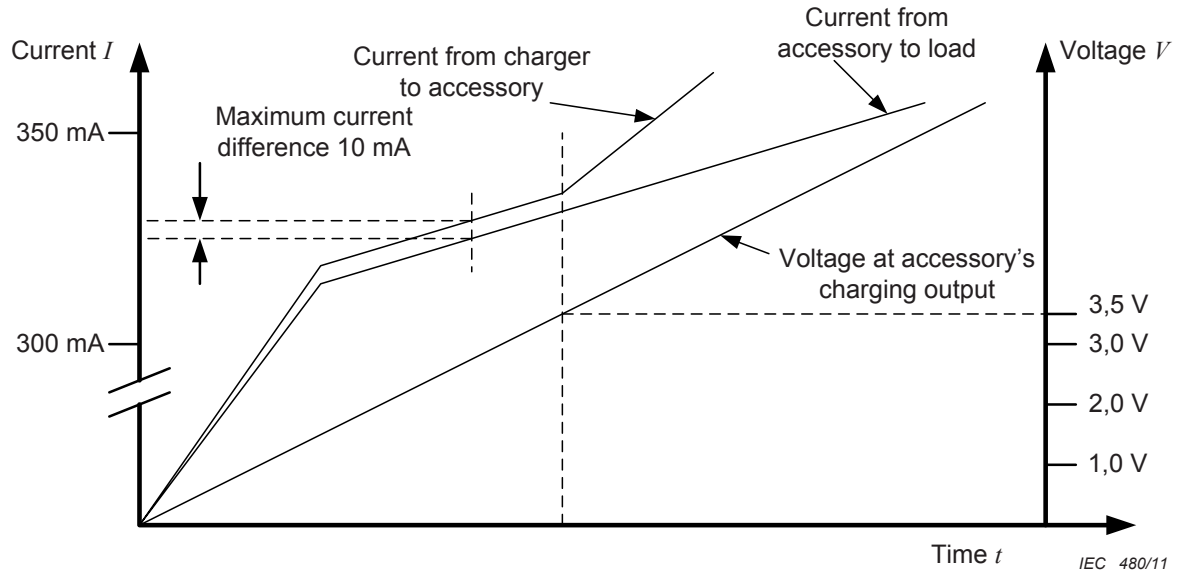

Figure 8 – Maximum current consumption in accessory during boot-up

6.3.3 Equipment

The following equipment is required to perform the test:

- 2 current meters (oscilloscope can be used);
- voltage meter (oscilloscope can be used);
- variable load, maximum load 10 kΩ;
- DC power supply.

6.3.4 Test method

Proceed as follows.

a) Set the output of a DC power supply to 5,7 V and the current limit to 300 mA.

b) Connect the DC power supply to the accessory and the accessory's charging interface (output) to variable load.

c) Set one current meter to measure the current from the DC power supply to the accessory and another current meter to measure the current from the accessory to the load.

d) Set a voltage meter to measure the voltage from the accessory's charging interface (output).

e) Set load so that the voltage is 2,0 V. Decrease the load so that voltage rises, and measure both currents all the time. The test is completed when the voltage has risen to 4,0 V.

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