BS EN 62637-1:2011

BSI Standards Publication

Battery charging interface for small handheld multimedia devices

Part 1: 2 mm barrel interface

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National foreword

This British Standard is the UK implementation of EN 62637-1:2011. It is identical to IEC 62637-1:2011.

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.

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EUROPEAN STANDARD

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EN 62637-1

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English version

Battery charging interface for small handheld multimedia devices - Part 1: 2 mm barrel interface
(IEC 62637-1:2011)

Interface de charge de batterie pour petits appareils multimédia portables – Partie 1: Spécification de l'interface cylindrique 2 mm
(CEI 62637-1:2011)

Batterie-Ladeschnittstelle für kleine tragbare Multimedia-Geräte - Teil 1: 2-mm-Zylinder-Schnittstellen-Spezifikation
(IEC 62637-1:2011)

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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 100/1673/CDV, future edition 1 of IEC 62637-1, 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 62637-1 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– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-05-04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 62637-1:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61076-2-102:2002	NOTE Harmonized as EN 61076-2-102:2002 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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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 62637-2	-	Battery charging interface for small handheld multimedia deviced - Part 2: 2mm barrel type interface conformance testing	EN 62637-2	-

CONTENTS

BATTERY CHARGING INTERFACE FOR SMALL HANDHELD MULTIMEDIA DEVICES –

Part 1: 2 mm barrel interface

1 Scope

This part of IEC 62637 defines a charging interface between small handheld multimedia devices and power-supply accessories, specifically chargers. Devices, which could be based on this standard may vary over time, but have to comply with the limited power available[1].

The interface is a 2 mm barrel type charging interface. This standard does not include the whole charger nor does it include the internal functions of the device. Chargers and devices shall follow the applicable EMC and safety standards. The scope of this part of IEC 62637 is illustrated in Figure 1.

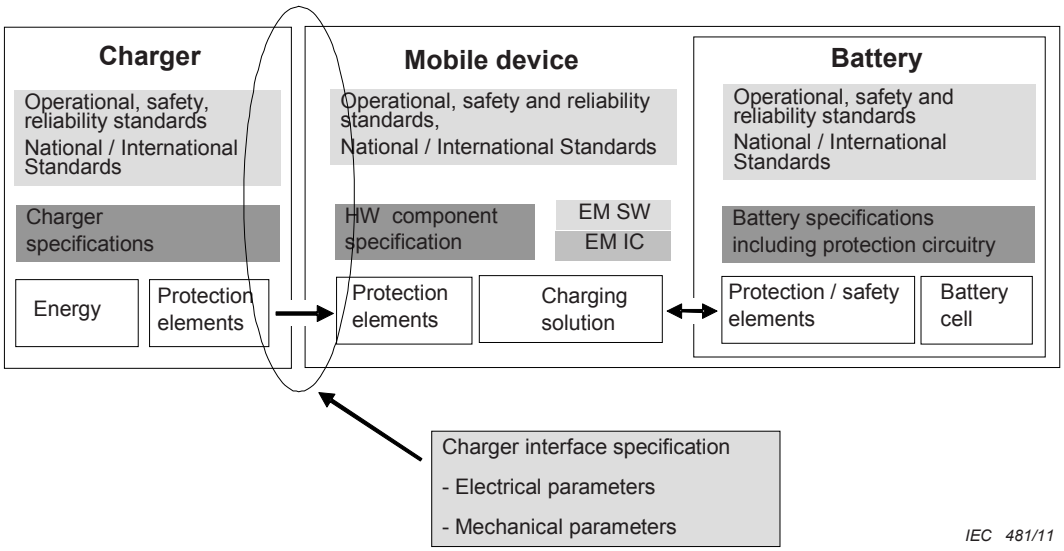

Figure 1 – Scope of the charging interface standard

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 62637-2, *Battery charging interface for small handheld multimedia devices – Part 2: 2 mm barrel type interface conformance testing*

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[1] Devices like mobile phones, MP-3 players, portable radio receivers, small handheld TV receivers, GPS-navigators, gaming devices, digital cameras may use this interface if the delivered power is adequate.

3 Abbreviations and symbols

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

AC	Alternating Current
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
EM	Energy Management
EMC	Electromagnetic Compatibility
ESR	Effective Series Resistance Ω
f	Frequency in Hz
$f_{I\text{char}}$	Charging current change frequency Hz
GND	Ground
HW	HardWare
I	Current A
I_{char}	Charging current A
I_{max}	Maximum current A
I_{peak}	Peak current A
IC	Integrated Circuit
L	Inductance H
R	Resistance Ω
RMS	Root mean square
SW	SoftWare
V	Voltage V
V_{char}	Charging voltage
$V_{\text{max-out}}$	Maximum output voltage
V_{out}	Output voltage
V_{ripple}	Ripple voltage

4 Specifications for 2 mm barrel interface

4.1 General

Clauses 4 to 8 specify the 2 mm barrel type electrical and mechanical charging interface between devices and power-supply accessories, specifically chargers. Clause 7 defines the charger-identification process of these devices.

The 2 mm barrel interface may have a wide output current range and the current may change with other parameters, but shall stay within the charging current/voltage window specified in 5.6. The recommended minimum current is specified in 5.6.

4.2 Temperature

All specifications apply at normal room temperature 18 °C to 25 °C, unless some other temperature is specified.

4.3 Voltage

All specifications are valid under nominal operating voltage as defined by the manufacturer.

5 Electrical specification for 2 mm barrel type chargers

5.1 Charger output capacitance

The capacitance at the charger output causes charging current spikes when the charger's load is changing. Low-capacitance values are recommended if possible. The maximum charger output filter capacitor size shall be 1 000 µF with + 20 % tolerance if the charger $V_{\text{max-out}}$ is less than 7 V. For output voltages of 7,0 V to 9,3 V, the maximum capacitance value decreases linearly so that for a 9,3 V charger, the maximum output capacitance shall be 700 µF with + 20 % tolerance. The maximum capacitance value is illustrated in Figure 2.

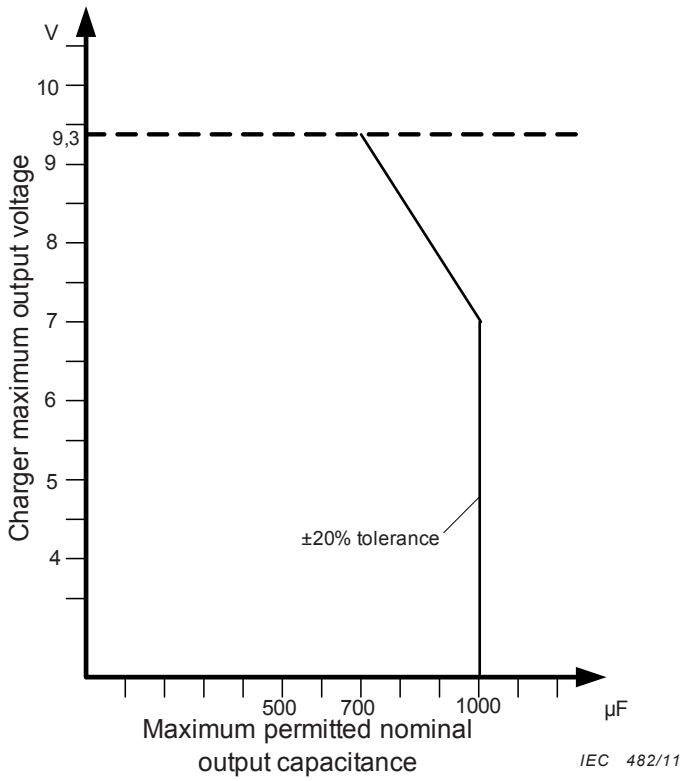

Figure 2 – Maximum permitted charger output capacitance

5.2 Maximum transient voltage and current values

Table 1 gives the maximum limits for voltage values and settling times. These limits apply to all conditions.

Table 1 – Limits for maximum voltage and settling time

Parameter	Limit
Maximum charger output overshoot	16 V
Maximum reverse voltage at charger output	1 V
Maximum time for charger to achieve steady state value (V and I) ± 10 % after load change	10 ms
Maximum duration of charging current overshoot peak value greater than 1,1 A	5 ms
Maximum output voltage undershoot for load currents up to 100 mA	4,1 V

Limits are also valid for a damaged (single fault) charger and these voltage and current limits shall be doubly ensured, meaning that if the general charging voltage control system fails, there shall be a backup limiter inside the charger. The maximum charging current overshoot and maximum voltage undershoot are shown in Figure 3.

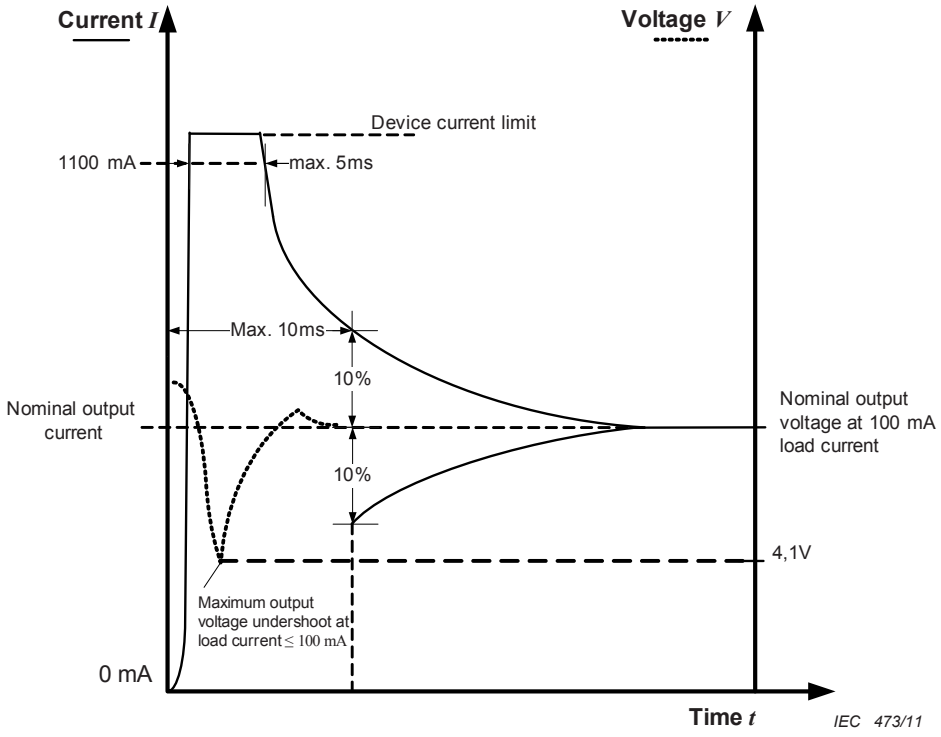

Figure 3 – Maximum duration of charging current overshoot and maximum voltage undershoot

5.3 Maximum output ripple voltage

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

The maximum acceptable output peak-to-peak ripple voltage is separated to four frequency ranges. A sum of ripple voltages over the full frequency range 0 MHz to 1 MHz is 800 mV_{p-p}. Ripple voltage shall be measured using 0 kΩ to 6 kΩ resistive load. During the test all the measured V and I values shall be within the voltage / current window of the charger interface.

Note that charging voltage, including ripple, shall not have peak values outside the V/I window (see 5.6) for charger output.

Maximum ripple voltages V_{ripple} for different frequency ranges are given in Table 2. Maximum peak-to-peak ripple voltage is shown in Figure 4.

Table 2 – 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

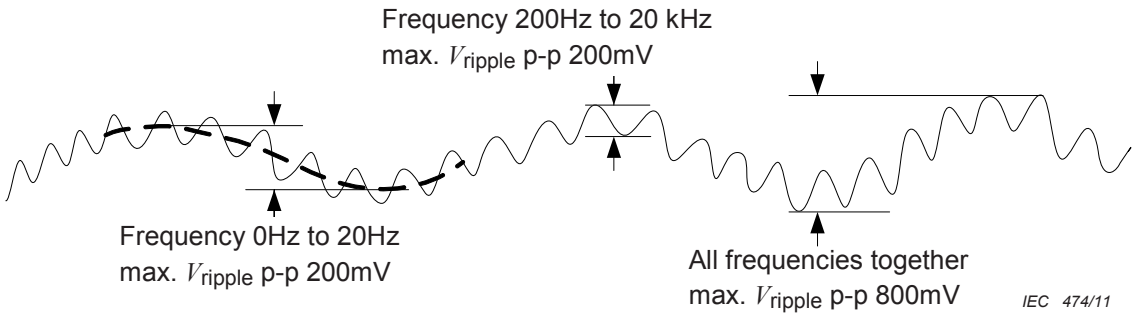

Figure 4 – Maximum peak-to-peak ripple voltage

5.4 High-frequency voltage components at the charger output

The purpose of this part of the specification is concerned with intra-system EMC, to guarantee that the charger connected to the device via the interface does not cause interference with the possible radio receiver reception in the device.

The charger shall not cause more high-frequency voltage components at the charger output than specified in Table 3 and Figure 5 when connected to the artificial load specified in Annex A and measured with the coupling-decoupling network specified in Annex B.

Table 3 – Maximum conducted interference

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

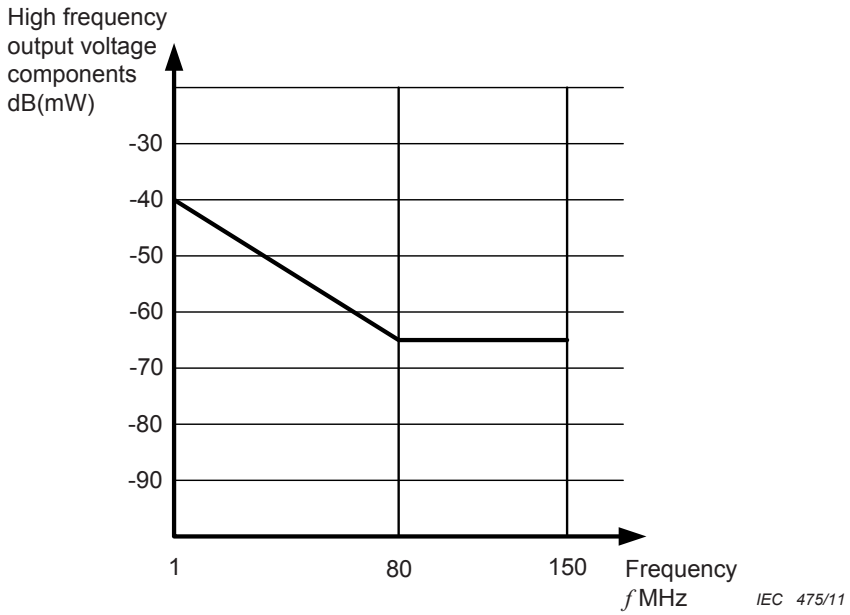

Figure 5 – Maximum high-frequency output voltage components

5.5 Feel current of AC chargers

The purpose of the feel current specification is not electrical safety but to guarantee a minimum physical sensation felt by the user when connecting the devices to chargers using the 2 mm barrel charger interface.

The maximum feel current from AC mains to the mobile device through the charger shall be 5 μA when measured as specified in IEC 62637-2.

5.6 Charging voltage/current window

The minimum charging current is 300 mA when the voltage is between 2,0 V and 4,65 V. During charging, the current and voltage values at the interface shall not exceed the charging window shown in Figure 6. This means that the charger shall operate inside the window and the devices shall accept all chargers which operate inside the window. The maximum voltage is 9,30 V and maximum current 950 mA. Below 1 V it is allowed that the current may raise to 1,2 A as shown in Figure 6. Below 2 V the minimum current is 100 mA, reducing to 0 mA when the voltage drops to 0 V.

The only case when the charging voltage is allowed to exceed the charging current/voltage window is in a load change situation (see 5.2).

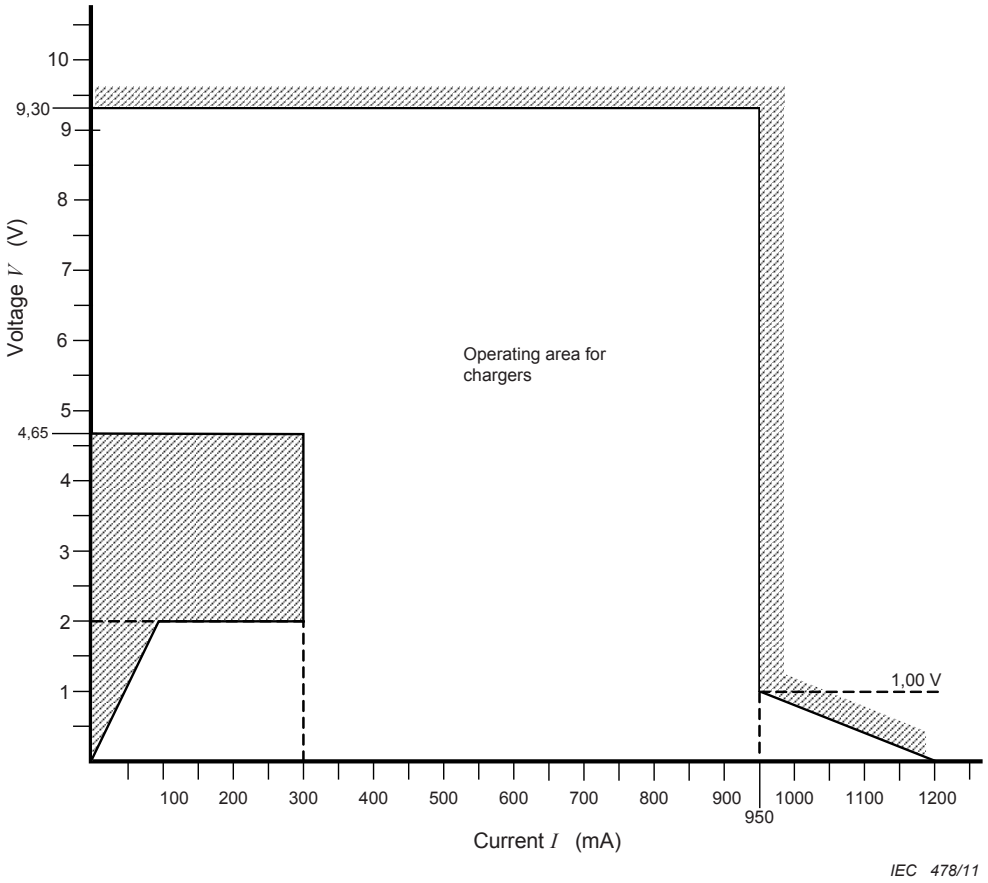

Figure 6 – Charging current/voltage window for 2 mm barrel type chargers

5.7 Current linearity for chargers

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. The maximum current fluctuation shall be 30 % of the current at 3,5 V 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. An example of the current linearity specification is shown in Figure 7.

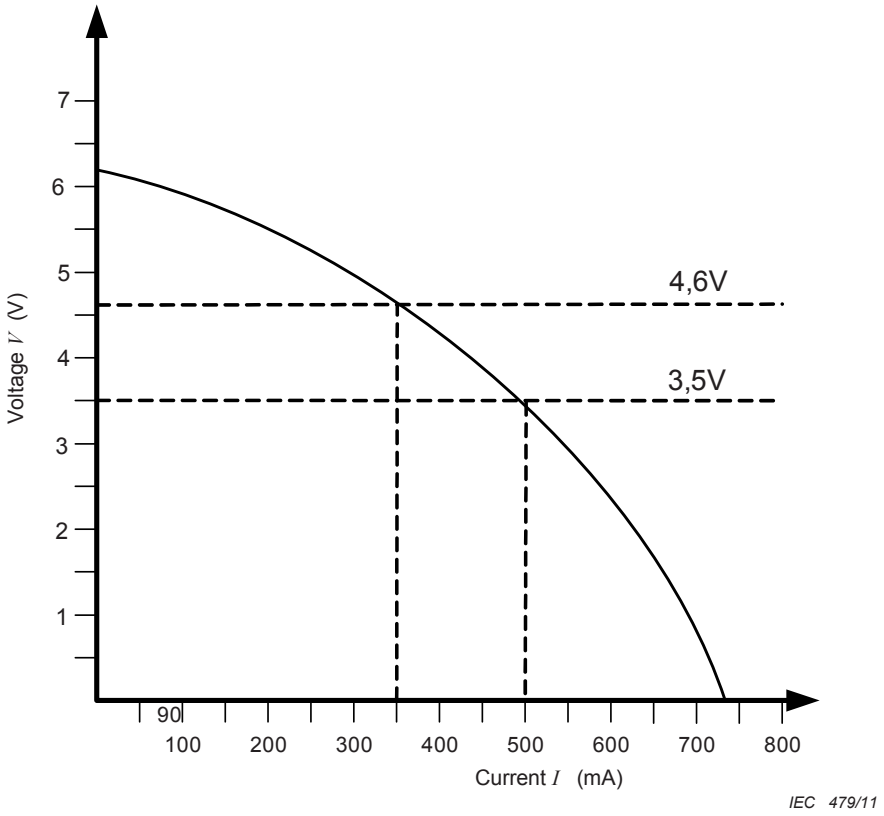

Figure 7 – Current linearity specification example

6 Accessories connected between the 2 mm barrel charger and the mobile device

6.1 Accessory interfaces

An accessory (for example a desk stand) connected between the charger and the device shares energy with that device while taking energy for its own needs. The sharing policy varies based on the type of accessory and the operating conditions. The accessory shall provide an interface to the device that meets this 2 mm barrel interface specification, but a current allowance of 100 mA is given for the accessory, lowering the recommended minimum current to the device from 300 mA to 200 mA. The interface is indicated with dashed lines in Figure 8.

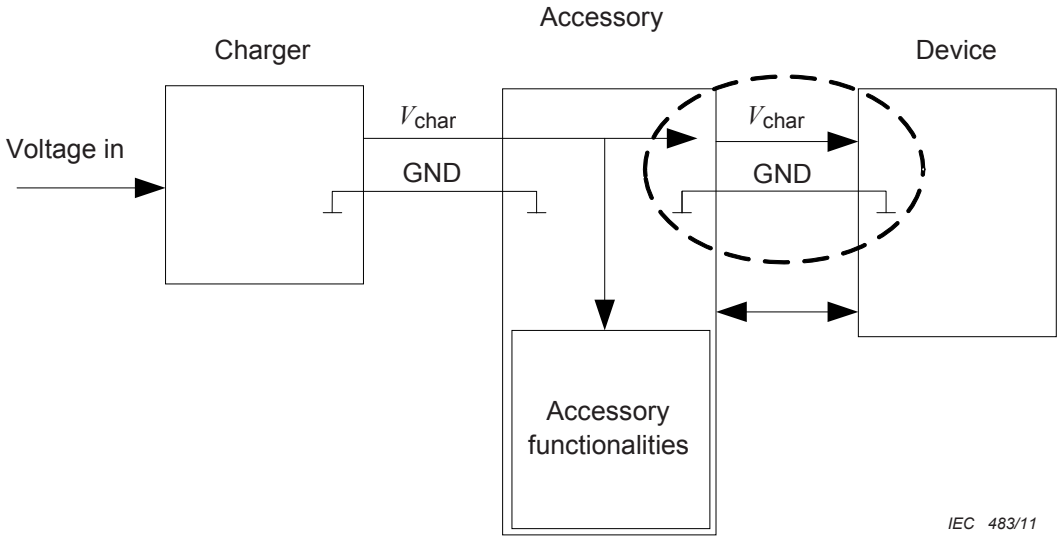

Figure 8 – Accessory/device interface

6.2 Electrical specifications for accessories

Accessories connected between the charger and the mobile device and having direct contact with charging lines (for example a desk stand), shall not disturb the charging or charger identification. Minimum, maximum and typical values for accessory contacts are given in Table 4.

Table 4 – Electrical specification for accessory contacts

Description	Minimum	Typical	Maximum	Unit
Ground lead resistance with contacts	0		0,05	Ω
Positive lead resistance	0	0,2	0,40	Ω
Capacitance between charging lines	0		4,0	μF

The accessory does not need to fulfill the current linearity specification.

6.3 Booting up the mobile device when connected to an accessory

While the device is booting up, the accessory connected between the charger and the device shall not limit the charging current between the two. Also, it shall be possible to boot up the device when there is an accessory connected between the charger and the device and the battery of the device is fully discharged.

For example an accessory may have current consumption I_{max} = 10 mA as long as the charging voltage V_{char} is below 3,5 V and when the device is booting up.

6.4 Charger identification

An accessory connected between the charger and the device shall not prevent the device from identifying the charger type correctly. For example if the accessory is connected to the charger and the device, which is powered on, is later connected to the accessory, the power consumption of the accessory may result in the wrong charger identification. The accessory shall limit its power consumption (or use some other method) so that there is a minimum 4,65 V charging voltage available in the charging interface for the mobile device during the first 300 ms after the mobile device is connected to the accessory.

7 Charger identification method for the 2 mm barrel interface

When a charger is connected to the device, the device shall start the charger recognition procedure by checking the charger voltage with 1 mA to 5 mA current. Identification is based on measured average voltage and waveform: voltage from 4,65 V to 9,3 V is identified as a 2 mm barrel interface charger. The charger should fulfill the voltage window specified here and shown in Figure 9 for the charger identification process.

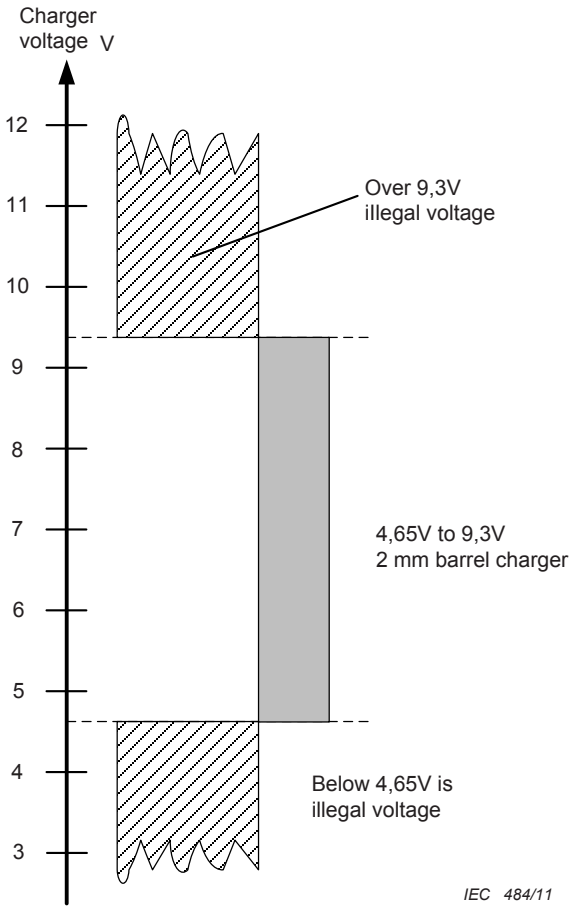

Figure 9 – Charger identification voltages

8 Connectors for the 2 mm barrel interface

8.1 Connectors

Information of the plug and jack used in the 2 mm barrel charging interface is given in Annex C. A general view of the 2 mm barrel charging plug is shown in Figure 10.

NOTE It is recognized that tolerance variations allow the plug connector as described in this standard to be mated to the receptacle described in IEC 61076-2-102[2]. The user is recommended to consider this possibility when designing these connectors into their equipment and provide appropriate electronic protection.

8.2 Charging voltage polarity

The charging voltage positive terminal is connected to the center pin and the ground is connected to the outer surface of the plug.

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2 See Bibliography.

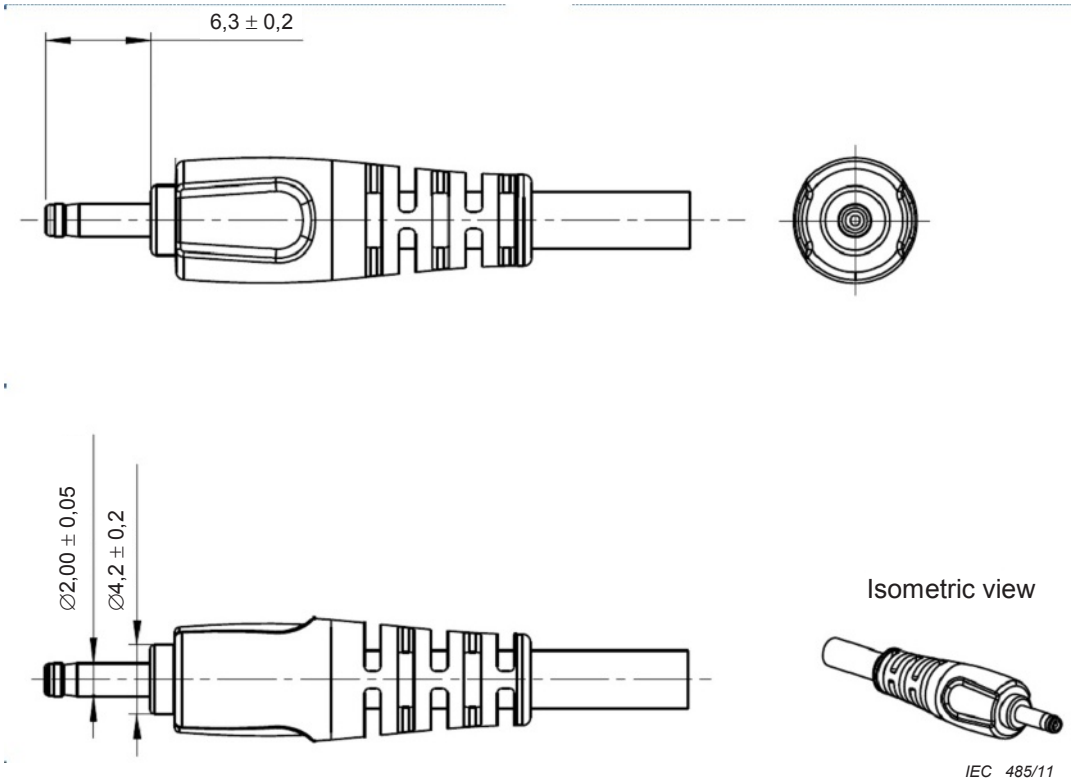

Figure 10 – General view of the 2 mm barrel charging plug

Annex A
(normative)

Artificial load

The artificial load, which is used in measuring the conducted interference, is shown in Figure A.1.

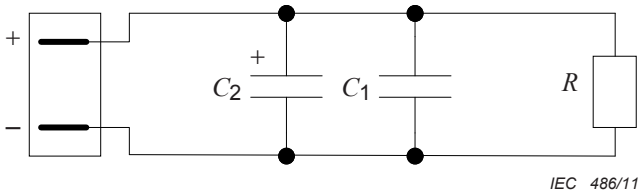

Figure A.1 – Artificial load

The component values in the artificial load circuit are the following:

- R value is selected so that charger output is 4,50 V;
- C_1 = 1 nF, ceramic capacitor;
- C_2 = 4 400 μF to 6 000 μF, low ESR(<0,5 Ω).

Annex B
(normative)

Coupling/decoupling network

Figure B.1 shows a coupling/decoupling network.

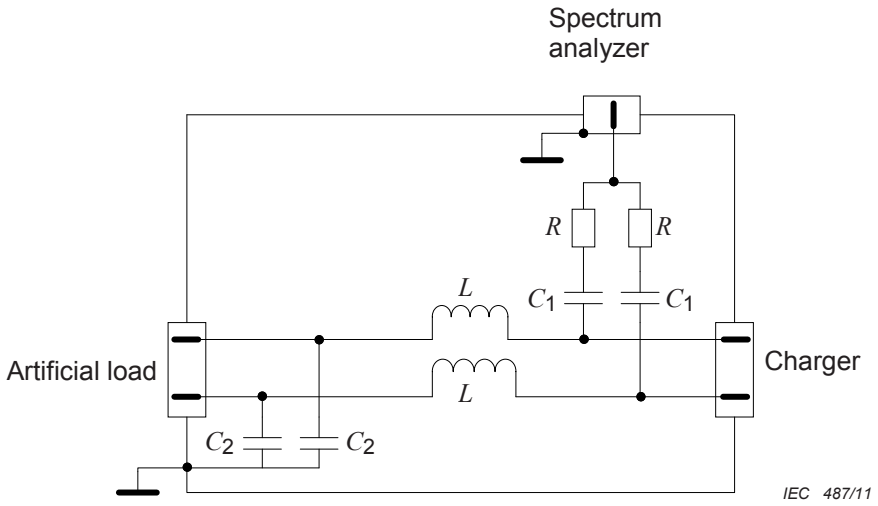

Figure B.1 – Coupling/decoupling network

The component values in the coupling decoupling circuit are the following:

- R = 200 Ω;
- C_1 = 10 nF;
- C_2 = 47 nF;
- $L \geq$ 280 μH at 150 kHz.

Annex C
(informative)

Additional information on connectors for 2 mm barrel interface

C.1 Mechanical dimensions

Detailed dimensions of the 2 mm barrel charging plug are shown in Figure C.1

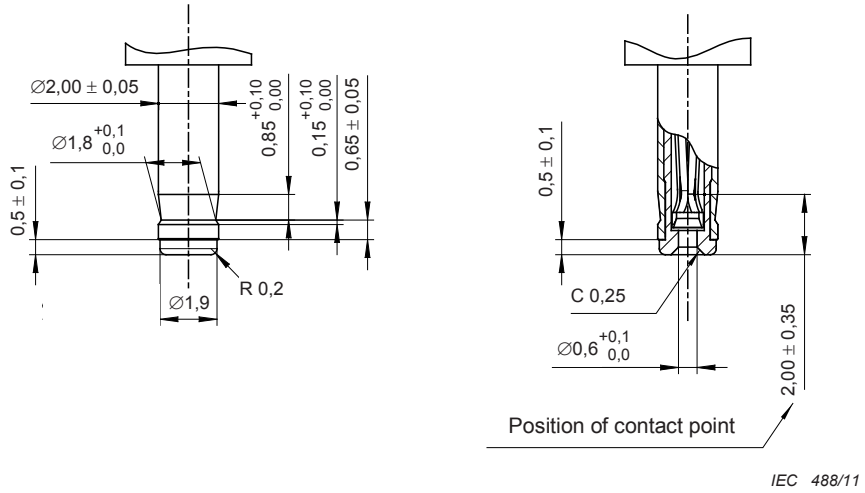

Figure C.1 – 2 mm barrel charging plug – Details

Detailed dimensions of the 2 mm barrel charging receptacle are shown in Figure C.2.

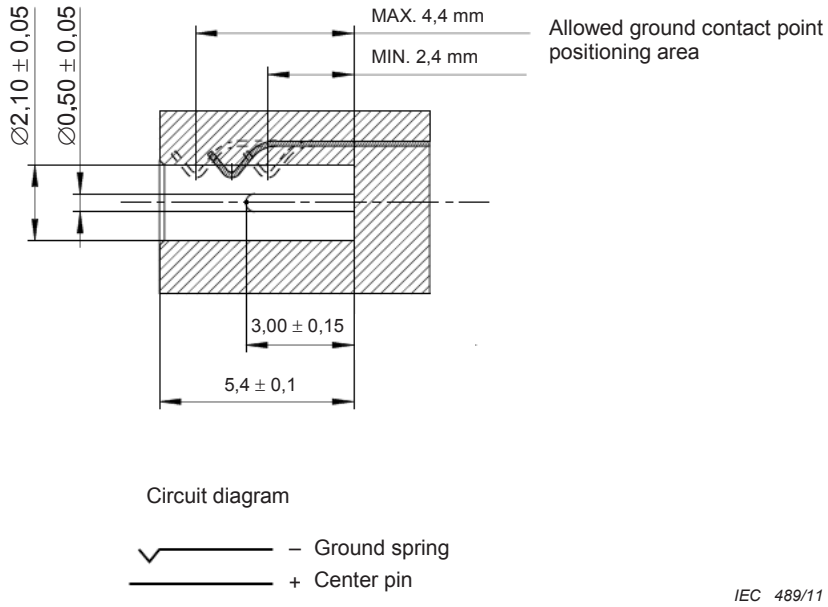

Figure C.2 – 2 mm barrel charging receptacle – Details

C.2 Other mechanical specifications

C.2.1 Durability

Durability should be 6 000 cycles. The 2 mm barrel interface plug and receptacle have to fulfil all the electrical and mechanical specifications after 6 000 insertion/extraction cycles, unless otherwise specified.

C.2.2 Insertion force

Maximum insertion force after 6 000 insertion/extraction cycles is 15 N.

C.2.3 Extraction force

Extraction force should be from 5 N to 15 N between 0 and 3 000 insertion/extraction cycles. Extraction force should be from 3 N to 15 N between 3 000 and 6 000 insertion/extraction cycles.

C.2.4 Insertion/extraction forces with measurement gauge

The purpose of the test gauge measurements is to ensure proper working of the plug's inner terminal. Test gauge diameter shall be 0,5 mm + 0,005/−0,0.

Insertion force: 0 N to 10 N after 2 insertion/extraction cycles.

Extraction force: Over 1,5 N after 2 insertion/extraction cycles.

Over 0,5 N after 6 000 insertion/extraction cycles.

C.2.5 Mechanical strength of the plug

The 2 mm barrel charging plug should break with 30 N to 70 N force when bending is applied, as shown in Figure C.3.

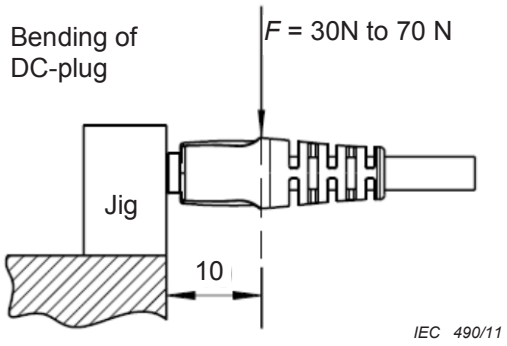

Figure C.3 – Bending durability

Bibliography

IEC 61076-2-102:2002, *Connectors for electronic equipment – Part 2-102: Circular connectors with assessed quality – Detail specification for plugs and jacks for external low voltage power supply*

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