BS EN 63002:2017

BSI Standards Publication

Identification and communication interoperability method for external power supplies used with portable computing devices

bsi.

National foreword

This British Standard is the UK implementation of EN 63002:2017. It is identical to IEC 63002:2016.

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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EUROPÄISCHE NORM

EN 63002

March 2017

ICS 31.020; 35.200

English Version

Identification and communication interoperability method for external power supplies used with portable computing devices (IEC 63002:2016)

Méthode d'identification et d'interopérabilité des communications des alimentations externes utilisées avec les dispositifs informatiques portatifs (IEC 63002:2016)

Identifikation und Kommunikation Interoperabilitäts-Verfahren für externe Netzteile in tragbaren Computern (IEC 63002:2016)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

The text of document 100/2595A/CDV, future edition 1 of IEC 63002, prepared by Technical Area 14 "Interfaces and methods of measurement for personal computing equipment", of IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 63002:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-09-03
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-03-03

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 63002:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61000-4-11:2004	NOTE	Harmonized as EN 61000-4-11:2004 (not modified).
IEC 62623	NOTE	Harmonized as EN 62623.
IEC 62680-1-1	NOTE	Harmonized as EN 62680-1-1.
IEC 62680-1-2	NOTE	Harmonized as EN 62680-1-2.
IEC 62680-1-3	NOTE	Harmonized as EN 62680-1-3.
IEC 62680-2-1	NOTE	Harmonized as EN 62680-2-1.
IEC 62680-3-1	NOTE	Harmonized as EN 62680-3-1 [1)].
IEC 62684	NOTE	Harmonized as EN 62684.

1) To be published.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60950-1	-	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	-
IEC 62368-1	-	Audio/video, information and communication technology equipment - Part 1: Safety requirements	EN 62368-1	-
IEC 62680-1-2	-	Universal serial bus interfaces for data and power - Part 1-2: Common components - USB Power Delivery specification	EN 62680-1-2	-
IEC 62680-1-3	-	Universal serial bus interfaces for data and power - Part 1-3: Universal Serial Bus interfaces - Common components - USB Type-C™ cable and connector specification	EN 62680-1-3	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IDENTIFICATION AND COMMUNICATION INTEROPERABILITY METHOD FOR EXTERNAL POWER SUPPLIES USED WITH PORTABLE COMPUTING DEVICES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 63002 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 standard is based on the following documents:

CDV	Report on voting
100/2595A/CDV	100/2700/RVC

Full information on the voting for the approval of this standard 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The objective of this International Standard is to support interoperability of external power supplies used with the increasing variety of portable computing devices that implement the IEC 62680-1-2: USB Power Delivery with the IEC 62680-1-3: USB Type-C™ [1] connector standards. Broad market adoption of this International Standard is expected to make a significant contribution to the global goals of consumer convenience and re-usability of power supplies by building on the global market ecosystem of IEC 62680 compliant devices and facilitating interoperability across different product categories.

IEC 62680-1-2 is expected to enjoy significant adoption in global markets for all kinds of portable computing devices requiring less than 100 watts including notebook computers, tablets, smartphones and other related devices. This International Standard enables the reporting of the identity and power characteristics of external supplies supported by IEC 62680-1-2 (USB Power Delivery) and specifies additional interoperability guidelines for external power. The method for identification of a specific external power supply (EPS) will enable equipment manufacturers to ensure compliant operation of an EPS using IEC 62680-1-2; and promotes data communication that can be used by the portable computing device to predict and mitigate interoperability concerns when an unfamiliar or incompatible external power supply is connected to the device by a user.

This International Standard specifies the minimum technical requirements for interoperability and includes recommendations for EPS functionality and the portable computing device. The approach taken by this International Standard, focusing on common charging interoperability, will allow manufacturers to innovate in aspects such as design, system performance, and energy efficiency.

This International Standard also provides important information regarding consumer safety, system reliability as well as relevant global standards and regulatory compliance.

Other international and regional standards, recommendations and regulatory policies for “universal adapters” or “common product chargers” that reference this International Standard should take into account open technical and regulatory compliance issues that are associated with untested or arbitrary combinations of EPS and devices such as those identified in Annex A. For clarity, this International Standard does not take the approach of specifying “universal” or “common product adapters” because of these open issues and limitations to satisfy market requirements. Instead, it focuses on interoperability specifications in order to support global industry in developing interoperable charging solutions that meet regulatory compliance and market requirements.

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[1] USB Type-C™ and USB-C™ are trademarks of the Universal Serial Bus Implementers Forum (USB-IF).

IDENTIFICATION AND COMMUNICATION INTEROPERABILITY METHOD FOR EXTERNAL POWER SUPPLIES USED WITH PORTABLE COMPUTING DEVICES

1 Scope

This International Standard defines interoperability guidelines for external power supplies used with portable computing devices that implement the IEC 62680-1-2: Universal Serial Bus Power Delivery Specification with the IEC 62680-1-3: Universal Serial Bus Interfaces for data and power-Common Components- Type-C™ Type-C Cable and Connector Specification.

This International Standard defines normative requirements for an EPS to ensure interoperability, in particular it specifies the data communicated from an EPS to a portable computing device (Figure 1). The scope does not apply to all aspects of an EPS. This International Standard does not specify normative requirements for the portable computing device but provides recommendations for the behaviour of a portable computing device when used with an EPS compliant with this International Standard.

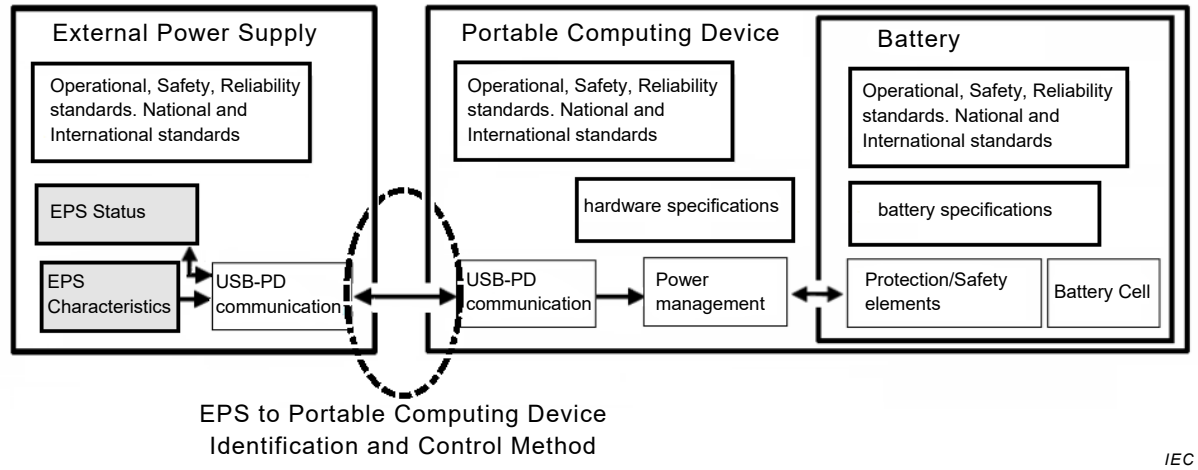

Figure 1 – Scope of the identification and communication method

This International Standard specifies the data objects used by a portable computing system using IEC 62680-1-2 to understand the identity, design and performance characteristics, and operating status of an external power supply. This International Standard is applicable to external power supplies under 100 watts for portable computing devices, with a focus on power delivery application for notebook computers, tablets, smartphones and other related multimedia devices.

This International Standard relies on established mechanical and electrical specifications, and communication protocols established by IEC 62680-1-2 and IEC 62680-1-3. This International Standard proposes methods supported by IEC 62680-1-2 to mitigate problems caused by the connection of untested combinations of EPS and portable computing devices with the aim of improving consumer satisfaction.

In addition, as given in Annex C, this International Standard provides interoperability guidelines for an EPS supporting charging using USB Type-C current when IEC 62680-1-2 functionality is not enabled. Considerations for captive and removable cable are presented in Annex B.

An EPS is expected to follow the applicable global standards and regulatory compliance requirements. Examples of those standards are given in Annex F.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 62680-1-2, *Universal Serial Bus interfaces for data and power – Part 1-2: Common components – USB Power Delivery Specification*

IEC 62680-1-3, *Universal Serial Bus interfaces for data and power –Part 1-3: Common components –USB Type-C™ Cable and Connector Specification*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
vendor identification
VID
unique 16-bit unsigned value assigned by the USB-IF to a given vendor

3.1.2
portable computing device
computing device that is easily moved and can operate on battery power

3.1.3
power source
device designed to comply with a IEC 62680-1-2 device that supplies power over V_{BUS}

3.1.4
power sink
device designed to comply with IEC 62680-1-2 that receives and consumes power

EXAMPLE Portable computing device.

3.1.5
external power supply
EPS
equipment contained in a separate physical enclosure external to the computer casing and designed to convert mains power supply to lower DC voltage(s) for the purpose of powering the computer

Note 1 to entry: An external power supply is not built into the device in a way that the power consuming device inherently knows the identity of the power supply.

3.2 Abbreviated terms

AC	alternating current
DC	direct current
V	voltage, V
A	current, A
W	watt
Hz	hertz
IoC	contracted operating current in IEC 62680-1-2
LPS	limited power source
VAC	volts alternating current
EPS	external power supply
USB	universal serial bus
USB PD	universal serial bus power delivery
USB-IF	Universal Serial Bus Implementers Forum
PDO	power data object
VID	vendor identification
PID	product identification

4 Important characteristics of an external power supply

4.1 General

Untested combinations of an EPS and a portable computing device will benefit from some reporting of the EPS identity, characteristics and status to the portable computing device. The portable computing device is recommended to use such information to confirm operation of the EPS, modify its operation with the EPS, or to reject usage of the EPS. Examples of common usage cases expected for EPS are given in Annex E, and examples of the application of the EPS identity and characteristics in Annex D.

4.2 Positive identification of a unique EPS model

The specific model number of the EPS might be recognized by the portable computing device to allow optimized and compliant operation. The portable computing device can benefit by the ability to distinguish whether the power supply is generic or known.

The hardware version might affect the quality and performance of the EPS. Some provision reporting the date of manufacture or a hardware version allows the portable computing device to identify an EPS whose performance characteristics might vary.

The EPS shall use the USB-IF VID to identify its specific vendor. The EPS should also report a PID unique to the model of the EPS. Lastly, the OEM may report information that helps identify hardware version of the model of the EPS or serial number. The contents of the OEM-

specific identifier and hardware version are not standardized by this International Standard, but might be read by any portable computing device.

4.3 Static characteristics of the external power supply performance and design

4.3.1 General

IEC 62680-1-2 enables identification of the voltage and power capabilities of the power source and also some key electrical parameters for voltage tolerance. This International Standard extends the range of the EPS capabilities that are communicated to the portable computer.

4.3.2 Load current step performance of the EPS

The power consumption of a portable computing device can change dynamically. The ability of the EPS to regulate its voltage output might be important if the portable computing device is sensitive to fluctuations in voltage. Transient changes in the system load with a fixed-voltage EPS will result in changes to the load current from the EPS. The ability of the EPS to respond to transient changes in power sink load is known as “load current step” and capabilities are expressed as the magnitude of current change and also the rate of current change (“slew rate”).

The EPS should announce its guaranteed load current step performance.

a) The default load current step magnitude in IEC 62680-1-2 is established at 25 % of contracted current. The EPS may report a capability of up to 90 % of the full load output, including from both no load and 10 % initial load. An EPS reporting capability greater than the default shall support changes in both positive and negative load current steps from 1 Hz to 5 000 Hz.

b) The default load current step slew rate capability for an IEC 62680-1-2 EPS is established at 150 mA per microsecond. The EPS may report higher capabilities, specifically guaranteeing 500 mA/microsecond, 1 A/microsecond, or 2 A/microsecond slew rates.

4.3.3 Holdup time

The acceptable holdup time capability of the EPS (the condition of voltage regulation being disturbed by a distortion of the AC input on the primary) might depend on whether the portable computing device has its own battery or capacitive backup.

The EPS may report its guaranteed holdup time, from 3 ms to 16 ms. The holdup time, T_{holdup}, is measured at 115 VAC r.m.s. and 60 Hz (or 230 VAC r.m.s. and 50 Hz for an EPS that does not support 115 VAC mains) with the load at rated maximum. The reported time describes the maximum length of time from the last completed cycle until when the output voltage, V_{out}, decays below the guaranteed voltage regulation (Figure 2).

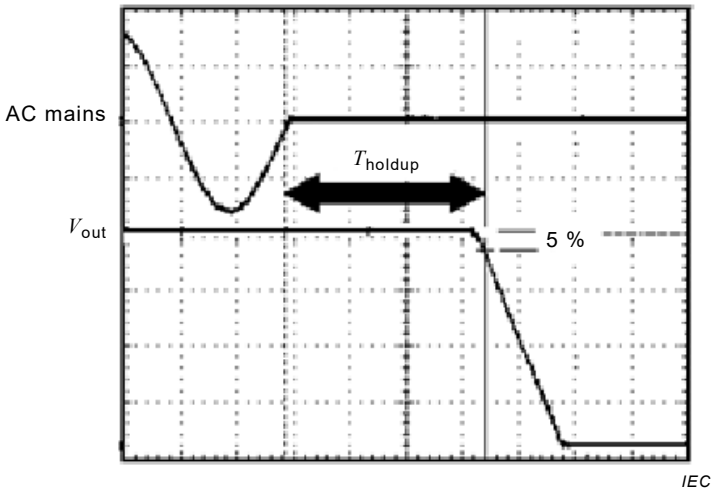

Figure 2 – Measurement of holdup time

4.3.4 Limited power source (LPS) compliance

According to the requirements of IEC 60950-1, a portable computing device that was tested and certified with an LPS EPS is prohibited to use a non-LPS EPS. An alternative, IEC 62368-1, classifies power sources according to their maximum, constrained power output (PS1 or PS2).

An EPS shall report its level of compliance to LPS, PS1 or PS2 to the portable computing device. Since the EPS could have several potential output voltage and current settings, all of the available voltage sources shall be compliant to LPS, PS1 or PS2 requirements in order for the EPS to announce corresponding compliance.

4.3.5 Touch current

Touch current relates to both ergonomic and functional aspects of the portable computing device. Touch current results from leakage that is below safety limits but might still be perceived by the user, usually when touching the metallic chassis on the portable computing device, and worsened by high (250 VAC r.m.s.) AC mains. Touch current also affects the performance of capacitive touch input devices such as touchscreens, touchpads, and capacitive buttons.

The EPS may identify itself as a low touch current EPS. Low touch current is leakage less than 65 µA r.m.s when the EPS's maximum nominal power capability is less than or equal to 30 W, or less than 100 µA r.m.s. when its power capability is between 30 W and 100 W. The total combined leakage current is measured in accordance with IEC 60950-1 when tested at 250 VAC r.m.s and 50 Hz.

The EPS shall report whether a ground pin exists, and shall report whether the ground pin is intended for functionality only or is relied upon as a protective earth for safety.

4.3.6 Minimum capabilities for peak current and overcurrent protection

Portable computing devices are highly power managed and their power consumption is dynamic. Each EPS will have its own capabilities for supplying current at or in excess of the label rating, and power draw beyond those capabilities might result in overcurrent protection and surprise shutdown of the EPS. A surprise shutdown of the EPS might result in system slowdown if the portable computing device has a battery backup, or lost work or data if the portable computing device does not have battery backup. IEC 62680-1-2 allows optional reporting of peak current delivery in excess of the contracted amount reported in the source

PDO. Each source PDO may report a peak current field that describes overcurrent capability for up to 10 ms. Two bits of information are used to communicate these power source capabilities. The duration of peak current shall be compensated by an immediate consumption below the operating current (IoC) in order to maintain a 20 ms average power delivery below the IoC current.

The EPS may report its capability of peak current. The amount of peak current shall be reported as a percentage of the maximum nominal operating current offered by the EPS. For example, an EPS with a nominal 1,0 A IoC but with peak current capability of 1,3 A r.m.s shall report “130 %”.

The duration for the overcurrent (the blanking period) shall be a minimum uninterrupted trigger duration of 15 ms. Any decrease in power consumption below the reported peak current capability shall reset the trigger duration timer.

It is recommended that the EPS auto-restart after an overcurrent protection. An EPS that does not auto-restart after an overcurrent protection event (an EPS that requires manual intervention to restart after an overcurrent protection event) shall not report any greater capability of overcurrent tolerance (i.e. only report 100 % for this threshold).

4.3.7 Surface temperature of the enclosure of the EPS

Safety limits for EPS touch temperature are set in applicable product safety standards (e.g. IEC 60950-1 or IEC 62368-1). The EPS may report when its touch temperature performance conforms to the TS1 or TS2 limits described in IEC 62368-1.

4.3.8 Overvoltage protection in the EPS

Overvoltage of the EPS output might lead to damage of the portable computing device. The wide operating range allowed by IEC 62680-1-2 might be excessive for some portable computing devices. IEC 62680-1-2 includes protocol and detection methods to prevent the deliberate output voltage of the EPS from exceeding the explicit requirements of the portable computing device. However, component failures in an EPS might randomly occur and cause a voltage output that exceeds the voltage tolerance of the portable computing device.

The EPS should support and report the capability of overvoltage protection, whereby a detected voltage threshold of no more than 130 % of contracted V_{BUS} leads to an overvoltage protection event, whereby a voltage above the threshold value shall interrupt output current within 250 milliseconds.

It is recommended that the portable computing device consider its design capacity for overvoltage and include its own protective devices. The portable computing device should not consider overvoltage protection in the EPS as principal or redundant protection.

Annex A
(informative)

Open issues related to arbitrary combinations of EPS and portable computing device

A.1 EMC, safety and performance

Untested or arbitrary combinations of EPS and portable computing device cannot guarantee the same level of assurance for EMC and safety as that of the specific combinations that were tested by certification bodies.

EPSs supplied with portable computing devices are typically designed for use and tested together. System performance and reliability might be guaranteed only for those tested combinations.

A.2 Authentication, attestation, and data integrity protection

This International Standard relies on a foundation of trust between the EPS and the portable computing device. Functionality, EMC compliance and safety (and the mitigation methods suggested in this International Standard) assume that the information provided by the EPS is genuine. Counterfeit EPSs might masquerade and report the identity or characteristics of a trusted EPS, but not follow the quality of design or manufacturing that ensured the original's operation.

IEC 62680-1-2 has the communications capability believed to be appropriate for the portable computing device to authenticate the identity of the EPS. Establishing an industry standard authentication method, a method of surveillance that can help recognize clones, and identifying a supported set of policies for warning the user or revocation is beyond the scope of this International Standard. Future versions of this International Standard may recognize standardized authentication methods that are developed to support IEC 62680-1-2.

A.3 Conducted noise from the EPS

Common mode output noise might affect the operation of devices in the portable computing device, particularly capacitive sensors (touchscreen or touchpad) that rely on sensing a capacitive path to earth ground. Common mode noise is typically a product of the switching frequency of the conversion topology of the EPS. The EPS might have multiple stages of power conversion and each switching frequency might change dynamically, for example as a function of the output voltage, mains voltage, or activation of PFC. Reporting narrowband noise characteristics of the EPS could conceivably allow the portable computing device to "frequency hop" to avoid functional problems due to this interference. However, further work is needed in this area.

Annex B
(informative)

Considerations regarding EPS cable

USB Type-C devices may terminate in either a plug or receptacle. The USB Type-C specification provides detailed requirements over cables with USB Type-C connectors in order to minimize interoperability issues. For example, all cables that support SuperSpeed USB signalling or support currents above 3 A are required to contain an electronic marker. Without detection of an appropriate electronic marker, all charging is limited to 3 A regardless of the capabilities of the EPS and the portable computing device.

Power is commonly provided to small devices such as cell phones and tablets from power sources other than charging blocks, such as portable computing devices and charging outlets. Connection to portable computing devices often carries data as well as power. If the EPS has a detachable cable, then the user can use just one cable for all his/her charging and data communication needs.

An EPS terminating in a USB Type-C receptacle has several benefits.

– It can support interchangeability with products that do not use a USB Type-C receptacle.
– It can support re-use of the EPS upon independent failure of the secondary cable.
– It can be easier to store and carry.

An EPS with captive cable allows the EPS supplier to control the quality of the cable, or to match the characteristics of the EPS to the cable. Conductor resistance or EMI characteristics of the cable are inherently part of the EPS with a captive cable.

Annex C
(informative)

Recommended capabilities for EPS and legacy support

IEC 62680-1-3 describes USB Type-C cabling connections and specifies standardized methods of power negotiation using analogue or digital communication methods. IEC 62680-1-3 requires all USB Type-C sources to implement the USB Type-C current announcement and requires implementation of USB PD digital communication for sources and sinks that support a maximum voltage above 5V and/or the maximum current above 3A.

IEC 63002 requires EPS support of IEC 62680-1-2 (USB PD) with IEC 62680-1-3 (USB Type-C). Support of USB PD digital communication is fundamental to reporting of the EPS characteristics described in this document as well as other beneficial capabilities such as fast charging and authentication. Therefore, it is recommended that all EPS terminating in USB Type-C connectors and USB Type-C compliant sinks implement support for USB PD.

IEC 62680-1-3 also permits an EPS to support legacy (IEC 62680-1-1: USB BC 1.2) current announcements and/or USB default current announcements (as specified in IEC 62680-2-1: USB 2.0 and IEC 62680-3-1: USB 3.1). EPSs normally do not support USB default current announcements in order to avoid the complexity of having to implement a USB Host Controller. When an EPS supports multiple methods for announcing power capability, IEC 62680-1-3 specifies the priority of power announcements. It is recommended that USB Type-C compliant sinks rely on USB Type-C current methods instead of using USB BC 1.2 methods. Consequently, EPSs that are compliant to IEC 63002 are not required to support USB BC 1.2 current announcements or USB default power announcements.

Annex D
(informative)

Example usage scenarios of enhanced reporting from the EPS

D.1 General

This International Standard recognizes that quality of operation for a computing device ultimately relies on testing and mitigation of potential interoperability issues. This International Standard cannot address quality of an EPS, and does not require any operation of the portable computing device.

D.2 Unique identification of the EPS

The VID, PID and hardware version form an identity of the specific manufacturer and model of the EPS. The portable computing device might use the identity to recognise that the EPS has been tested. Or, the portable computing device might understand limitations or known characteristics of the attached EPS and modify its policy. The PID/VID might be interpreted to indicate that the power source is a particular EPS or instead a docking station or monitor.

A portable computing device might use the identity to approve the use of an EPS as a function of operating mode. For example, an untested EPS might be considered to pose less of a user problem if its usage is only to provide battery charge while the system is off, or enable only partial battery charge.

The identity might be used to recognize when a new device is attached or to establish usage models that suggest the portable computing device is used in a particular location. For example, the hardware version might be distinguished as “new” and USB data on the port disabled as a security measure. Or, the identity might distinguish the location (work or home) to employ a particular power consumption policy. The identity might also be used when the device is a dual mode (consumer/provider), for example, to automatically configure a direction of power sharing when both devices are battery powered.

The hardware version field can also be used, for example, to recognize devices that might be prone to failure and alert the user to a maintenance action.

The EPS identity might be used by the portable computing device rejecting any usage.

D.3 Identification of voltage regulation, load current step and slew rate

Battery powered devices generally are tolerant of broad changes in voltage supply. The actual voltage regulation to the portable computing device will depend on both the EPS voltage range and the detachable cable. The portable computing device might consider the potential voltage variance of the EPS and cable, consider its own active power consumption, and, for example, might choose a different voltage if the total voltage tolerance will not guarantee complete operation or battery charge.

D.4 Load current step magnitude and slew rate capability

Load current step magnitude and slew rate of the EPS might be evaluated by the portable computing device and the amount of dynamic power consumption affected. For example, an EPS guaranteed for only 25 % load current step magnitude might be perfectly accepted by a notebook with a small processor and dominant static load (display, battery charge). A desktop computer without significant static load might reject an EPS with less than 90 % magnitude guarantee, or might include sufficient local capacitance so as to accept an EPS with limited

load current step slew rate. Any type of portable computing device might limit performance capabilities, or establish policies that modify their transitions in power consumption so as to operate within the reported capabilities of the EPS.

D.5 Holdup time

Holdup time is only expected to be relevant to a system without battery backup. A computing device might limit its maximum power consumption in order to operate reliably from an EPS without significant local capacitance, or might reject the use of the EPS.

D.6 Low touch current reporting

Certain users might have internal requirements for touch current, or might reject use of an EPS if the touch current is higher. If the portable computing device has a non-conductive chassis, or is rarely in contact with the user, touch current might not be noticed. If the portable computing device chassis is metal, or if there is a suggestion that it is physically being used on a person's lap, or in a location with high voltage AC mains, the portable computing device might reject use of an EPS that has a touch current that is higher than desired.

D.7 Peak current capability

Knowledge of the EPS peak current capability can be used as a performance tool for the portable computing device. In contrast to static loads (such as battery charging), the power management of a portable computing device is highly dynamic. Portable computing devices generally have very limited local energy storage (capacitance) and the variation in load current and power can be significant. Peak current consumptions are generally instantaneous and characterization (not closed loop feedback) is essential to avoid normal power consumption of the portable computing device from being confused as circuit failure or short circuit by the EPS.

D.8 Surface temperature of the EPS

The portable computing device might consider the TS1 or TS2 rating of the EPS, compare to their own power consumption and might decide to limit battery charge rate or otherwise average their own power consumption in order to limit the touch temperature of the EPS.

Annex E
(informative)

Common charging interoperability use cases

E.1 General

It is anticipated that IEC 63002 will support global industry in developing market solutions for improving re-usability of EPS across mainstream portable device categories and facilitate future charging interoperability use cases. The greatly increased potential for re-use of EPS enables significant environmental benefits such as e-waste reduction in addition to increasing user convenience.

E.2 Examples of device use cases

E.2.1 Smartphone

Smartphone charging interoperability has been enabled by global market adoption of USB technologies (IEC 62680-1-1, IEC 62680-2 and IEC 62684). Compliance with IEC 63002 further enhances charging interoperability as follows:

- Standardized methods with IEC 62680-1-2 (USB Power Delivery) and IEC 62680-1-3 (USB Type-C) to support higher voltages/power for faster smartphone charging applications, replacing incompatible proprietary methods.
- Enables use cases of higher power adapters (compliant with IEC 63002) for charging smartphones.
- Enables use cases for smartphone EPS with higher power devices such as tablets and notebook computers (with slower charging time considerations).

E.2.2 Higher power portable computing devices (tablets, notebook computers, etc.)

Adoption of IEC 63002 can support increased interoperability of adapters within a device category and across different device categories. IEC 63002 also enhances the capability of devices to identify capabilities and detect potential technical issues which can reduce functional problems and increase protection of devices and users. These capabilities might assist diagnosis and technical support. Devices will also be enabled to provide enhanced information to users regarding the power adapter used and charging characteristics.

E.3 Examples of consumer use cases

Examples of anticipated consumer use cases enhanced by broad market adoption of IEC 63002, IEC 62680-1-2, and IEC 62680-1-3:

- Users are able to charge their personal computing device (notebook computer, tablet, smartphone and other related devices such as wearables, music/video players, gaming machines, rechargeable toys) with external power adapters from different manufacturers.
- Users are able to charge their personal computing device from an AC powered external display connected by USB Type-C.
- Users are able to charge their personal computing device from a hub or dock which is itself connected to a USB PD EPS, both connections using USB Type-C.
- Users are able to charge their personal computing device with external power adapters that were provided with a different device. Users can efficiently charge their device when using a power adapter for the same product category or higher power product categories. Users can maintain charge or charge their device more slowly when using a power adapter for lower power product categories.

EXAMPLE 1 Users can charge a smartphone with a notebook computer power adapter.

EXAMPLE 2 Users can charge a tablet with a smartphone power adapter.

EXAMPLE 3 Users can travel with just one adapter for charging multiple devices such as a small and light adapter for smartphone and notebook computer (with overnight charging), or a larger adapter for charging multiple higher power devices.

- Users can view enhanced information provided by the device on charging characteristics or any issues with the specific adapter used for charging.
- Users are able to charge their personal computing device, without an external power adapter, from IEC 62680-1-3 compliant sockets in automobiles, planes, furniture, electrical wall plates, etc.

EXAMPLE 4 Users can charge their notebook computer from an in-seat socket in an airport departure lounge while waiting for a flight. This expands the use case beyond smartphones and lower power tablets which has been enabled by IEC 62680-2-3 (USB Type-A) compliant sockets.

Annex F
(informative)

Conformance and market considerations

F.1 General

Annex F describes EPS reported parameters and their test references, and examples of existing regulatory conformance and market compliance programs which are in practice.

This International Standard does not replace or supersede any existing regulatory requirements or compliance programmes for external power supplies or personal computing devices. Additionally, compliance requirements relating to IEC 62680 are covered under the USB-IF Compliance Program.

F.2 Summary of reported items and test references

Table F.1 summarizes the parameters reported by an EPS to a portable computing device.

Table F.1 – Summary of reported parameters from EPS to portable computing device

IEC 63002 sub-clause	Name	Values	Description	IEC63002 Compliance requirement	Test reference
Identification and static reports					
4.2	VID PID hardware version serial number	Hex or ASCII strings	Identification of manufacturer, model number of the EPS, and hardware version VID is assigned by USB-IF PID, hardware version, and serial number are OEM assigned	VID required PID and hardware version number recom-mended	USB-IF Compliance Program www.usb.org/developers/compliance
4.3.2	Load current step magnitude	25 % of IoC (default), or 90 % of IoC	Guaranteed capability of the EPS, magnitude of the load change supported	Recom-mended	4.3.2
	Load current step slew rate	150 mA/µs (default), or 500 mA/µs, or 1 A/µs, or 2 A/µs	Guaranteed capability of the EPS	Recom-mended	
4.3.3	Holdup time	3 ms to16 ms	Duration voltage stays in regulation upon interruption of AC mains	Recom-mended	IEC 61000-4-11:2004 4.3.3
4.3.4	Compliance to LPS/PS1/PS2	Yes or no for each: PS1 compliant PS2 compliant LPS compliant	PS1 and PS2 compliance per IEC 62368-1 LPS compliance per IEC 60950-1	Required	IEC 60950-1 IEC 62368-1

IEC 63002 sub-clause	Name	Values	Description	IEC63002 Compliance requirement	Test reference
4.3.5	Low touch current EPS	Yes or no	Low touch current EPS is less than 100 µA for EPS with 30 W to 100 W power capability, 65 µA or less for EPS lower than 30 W power capability	Recom-mended	IEC 60950-1
	Ground	EPS has a ground pin (yes or no)	Simple reporting of the option for ground on the EPS body	Required	
		Ground pin is intended for functionality only, or Ground is intended as protective earth.	Distinguish purpose for the ground pin as functional or protective.	Required	IEC 60950-1
4.3.6	Peak current	100 % to 200 %	Peak current as a % of highest guaranteed IoC of the EPS that will not trip overcurrent protection if applied continuously for 15 ms	Recom-mended	4.3.6
4.3.7	Touch temperature	60950-1 (default), or 62368-1 TS1, or 62638-1 TS2	Touch temperature compliance	Recom-mended	IEC 60950-1 IEC 62368-1
4.3.8	Overvoltage protection	Yes or No	EPS has secondary overvoltage protection corresponding to contracted source PDO voltage	Recom-mended	4.3.8

F.3 USB-IF Compliance Program

The universal serial bus (USB) specifications define the product design targets at the level of interfaces and mechanisms. To complement the specifications and enable measurement of compliance in real products, the USB-IF has instituted a Compliance Program that provides reasonable measures of acceptability. Products that pass this level of acceptability are added to the Integrators List and have the right to license the appropriate USB-IF logo.

Products certified by the USB-IF and listed on the Integrators List are compliant to the specific specification and have been tested for interoperability.

F.4 General regulatory compliance for EPS

Each EPS is expected to be so designed and manufactured to meet the regulatory requirements for its intended markets.

Examples of current regulations and standards applicable to EPS for the US and EU in the areas of safety, EMC, energy and environmental requirements are given in Table F.2. This table is for illustration only and is not intended to be exhaustive.

Table F.2 – Examples of current regulations and standards in the US and EU applicable to external power supplies used with portable computing devices (non-exhaustive list)

Compliance area	Regulation	Standard(s)	Applicable country/region
Safety	NEC/OSHA/NRTL Listing	UL 60950-1	USA
	Low Voltage Directive	EN 60950-1 or EN 62368-1 (as of 2019)	EU
EMC	FCC	FCC Part 15 Sub B	USA
	EMC Directive	EN 55022 or EN 55032 EN 55024 EN 61000-3-2, EN 61000-3-3, etc.	EU
Energy efficiency	Department of Energy	79 FR 7845	USA
	Regulation (EC) No. 278/2009	EN 50563	EU
Environmental	RoHS Directive	EN 50581	EU
	WEEE Directive	See national provisions	EU

F.5 Other considerations for system testing

Manufacturers should also be aware of other standards related to existing regional market requirements or voluntary programmes for EPS and host devices, for example IEC 62623. IEC 62623 enables the measurement of the power and/or energy consumption in each of the power modes identified in the scope. In addition, it highlights the EPS test method for calculating the energy efficiency of single-voltage external AC-DC and AC-AC power supplies.

{Example referencing: EPRI methods via www.epri.com for External Power Supply Efficiency Test Method.}

F.6 After-market firmware updates to EPS

Before an aftermarket firmware update is distributed, the responsible organization should ensure the EPS has had appropriate testing with the firmware update applied.

Bibliography

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 62623, *Desktop and notebook computers Measurement of energy consumption*

IEC 62680-1-1, *Universal serial bus interfaces for data and power – Part 1-1: Common components – USB Battery Charging Specification, Revision 1.2*

IEC 62680-1-2, *Universal Serial Bus interfaces for data and power – Part 1-2: Common components – USB Power Delivery Specification*

IEC 62680-1-3, *Universal Serial Bus interfaces for data and power – Part 1-3: Common components –USB* Type-C™ Cable and Connector Specification

IEC 62680-2-1, *Universal Serial Bus interfaces for data and power – Part 2-1: Universal Serial Bus Specification, Revision 2.0*

IEC 62680-3-1, *Universal Serial Bus interfaces for data and power – Part 3-1: Universal Serial Bus Specification, Revision 3.1*

IEC 62684, *Interoperability specifications of common external power supply (EPS) for use with data-enabled mobile phones*

FCC, *Part 15 subpart B-Unintentional Radiators, Code of Federal Regulations, Title 47 Part 15 (47 CFR 15)*

EN 55022, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

EN 55024, *Information technology equipment – Immunity characteristics – Limits and methods of measurement*

EN 55032:2015 *Electromagnetic compatibility of multimedia equipment – Emission requirements (CISPR 32: 2012)*

EN 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

EN 61000-3-3, *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 ≤ 16 A per phase and not subject to conditional connection*

EN 50563, *External a.c. – d.c. and a.c. – a.c. power supplies – Determination of no-load power and average efficiency of active modes*

EN 50581, *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

USB-IF Compliance Program, www.usb.org/developers/compliance

79 FR 7845, *Energy Conservation program: Energy conservation standards for external power supplies, Department of energy*

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