IEC 62680-4

Edition 1.0 2013-06

INTERNATIONAL STANDARD

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colour inside

Universal serial bus interfaces for data and power –
Part 4: Universal Serial Bus Cables and Connectors Class Document, Revision 2.0

Interfaces de bus universel en série pour les données et l'alimentation électrique –
Partie 4: Document des classes des câbles et des connecteurs de bus universel en série, Révision 2.0

IEC 62680-4:2013-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.120; 35.200

ISBN 978-2-83220-843-4

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER –

Part 4: Universal Serial Bus Cables and Connectors Class Document, Revision 2.0

FOREWORD

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The text of this standard is based on documents prepared by the USB Implementers Forum (USB-IF). The structure and editorial rules used in this publication reflect the practice of the organization which submitted it.

The text of this standard is based on the following documents:

CDV	Report on voting
100/1984/CDV	100/2065/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.

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- withdrawn,
- replaced by a revised edition, or
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IMPORTAN

INTRODUCTION

The IEC 62680 series is based on a series of specifications that were originally developed by the USB Implementers Forum (USB-IF). These specifications were submitted to the IEC under the auspices of a special agreement between the IEC and the USB IF.

The USB Implementers Forum, Inc.(USB-IF) is a non-profit corporation founded by the group of companies that developed the Universal Serial Bus specification. The USB-IF was formed to provide a support organization and forum for the advancement and adoption of Universal Serial Bus technology. The Forum facilitates the development of high-quality compatible USB peripherals (devices), and promotes the benefits of USB and the quality of products that have passed compliance testing.

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

IEC 62680-2, *Universal Serial Bus interfaces for data and power – Part 2: USB Micro-USB Cables and Connectors Specification, Revision 1.01*

IEC 62680-3, *Universal Serial Bus interfaces for data and power – Part 3: USB Battery Charging Specification, Revision 1.2*

IEC 62680-4, *Universal Serial Bus interfaces for data and power – Part 4: Universal Serial Bus Cables and Connectors Class Document Revision. 2.0*

This part of the IEC 62680 series consists of several distinct parts:

- the main body of the text, which consists of the original specification developed by the USB-IF.

CONTENTS

Universal Serial Bus
Cables and Connectors
Specification

Revision 2.0
August, 2007

Revision History

Revision	Date	Filename	Comment
2.0 RC6	August 10, 2007	CabConnRC6_Aug10.doc	Added Go/No-go & latch measurement for Micro series Added Drain wire inspection process Added pin contact visual inspection Added clarifying text to 4-axis test description
2.0 RC5	June 5, 2007	CabConn20RC5_June5	Removed Shielding Effectiveness Replace Rotational Continuity with 4-Axis continuity Other miscellaneous minor changes
2.0 RC4	May, 2007	CabConn20RC4_May07	Cable Construction inspection added
2.0	April 4, 2007	CabConn20	Removed Shielding Effectiveness, Added power line resistance test Added cable rotation test
2.0	February 14, 2007	CabConn Rev 2.0	Edits from Tsuyoshi YAMANE of Matsushita
2.0	February 13, 2007	CabConn Rev 2.0	Edited by Jim Koser new chart from Hirose
2.0	February 7, 2007	CabConn Rev 2.0	Edited draft
2.02RC2	February 6, 2007	CabConnRC2_02-06-07	Work group editorials
2.01RC2	December 6, 2006	CabConnRC2_12-06-06	Work group editorials
2.0RC2	July 11, 2006	CabConnRC2_7-11-06	Added durability requirements for Ruggedized Standard “A” receptacle and durability requirements for Micro series
2.0RC2	June 7, 2006	CabConnRC2_6-7-06	Added new critical dimensions drawings for standard “A” and “B” plugs and receptacles and changed the criteria for “mini” products to the use of go – no go gages in Appendix B
2.0RC2	March 24, 2006	CabConnRC2_3-23-06.doc	Added new IP agreement
2.0RC2	December 03, 2003	CabConnRC2.doc	Final edit during USB DWG meeting in Austin prior to posting the document to Web site
2.0RC1	October 29, 2002	CabConnRC1.doc	Adjust formatting in technical edit pass
2.0RC	August 13, 2002		Rewrite of test program to reflect current practice and general updates to reflect changes in the USB Specification.
1.1	September 1, 1999		Editorial Update for improved use. Add Appendices ‘A’ and ‘B.’
1.0	May 22, 1999		Accepted unanimosly by USB-IF DWG after 30-day posting without negative comment.
1.0RC	March 27, 1999		Release for industry comment

Revision	Date	Filename	Comment
0.9a	January 19, 1999		Moved to Revision 0.9 by consensus of the Cable & Connector Work Group. Pending final editorial cleanup RRs to be voted on at a special Cable & Connector Work Group meeting February 21, 1999.
0.9RC	December 18, 1998		Moves Document to 0.9RC by consensus of the Cable & Connector Group to Version 0.9 without Appendices Drawings and Lab Listings. Special dispensation by the DWG to move to Revision 1.0 for use at the January 1999 Plug Fest.
0.8	October 20, 1998		Release for industry comment

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USB Cables and Connectors Class Document

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1 Introduction

1.1 Purpose

This document describes the mechanical, electrical, environmental, design and performance criteria and voluntary supplier compliance requirements for USB connectors, cable and fabricated cable assemblies. In addition, this document provides detailed requirements for the design, approval and implementation of application specific USB connectors and fabricated cable assemblies.

1.2 Scope

The information provided in this document serves as a guideline for design, development and voluntary compliance testing of USB connectors and fabricated cables assemblies, as well as defining mechanical, electrical, environmental and performance characteristics. As such, it defines how USB connectors, cable and fabricated cables assemblies are to be implemented and how manufacturers and/or fabricators will interact with the voluntary compliance requirements.

1.3 Related Documents

American Society for Testing and Materials

ASTM-D-4565 — *Standard Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable*. This specification is available through the World Wide Web site http://www.astm.org/

ASTM-D-4566 — *Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable*. This specification is available through the World Wide Web site http://www.astm.org/

ANSI/EIA 364-C — *Electrical Connector/Socket Test Procedures Including Environmental Classifications*, approved 1994. Available in hard copy – reference search site http://www.nssn.org/information.html

Underwriters Laboratories

UL STD-94 — *Test procedures used to classify polymeric materials 94HB, 94V-1, 94V-2, 94-5VA, 94-5VB, 94VTM-0, 94VTM-1, 94VTM-2, 94HBF, 94HF-1, and 94HF-2*. This specification is available through the World Wide Web site http://www.comm-2000.com/

UL Subject-444 — *Type CMP (plenum cable), Type CMR (riser cable), Type CM (commercial cable), and Type CMX (cable for restricted use*. This specification is available through the World Wide Web site **h**ttp://www.comm-2000.com/

[USB2.0] — *Universal Serial Bus Specification*, revision 2.0 (also referred to as the *USB Specification*). This specification is available on the World Wide Web site http://www.usb.org**.**

USB On-The-Go — *On-The-Go Supplement to the USB 2.0 Specification* (also referred to as the *USB On-The-Go Specification*). This specification is available on the World Wide Web site http://www.usb.org.

1.4 Terms and Abbreviations

Term	Description
A2LA	The American Association for Laboratory Accreditation (A2LA) is a non-profit, professional membership society. A2LA coordinates and manages a broad-spectrum, nationwide laboratory accreditation system and offers training and continuing education in laboratory practices and management. A2LA offers accreditation to private, independent (for hirer), in-house and government testing laboratories in the following fields: acoustics and vibration; biological; chemical; construction materials; electrical; environmental; geotechnical; mechanical; calibration; and, nondestructive and thermal.
ANSI	American National Standards Institute
Approved Integrators List (AIL)	A listing available to USB-IF member companies at http://www.usb.org listing cable and connector products that have successfully completed a Voluntary Compliance Testing program conducted in accordance with the most current version of the USB Specification's Electrical, Mechanical and Environmental Performance Standards as shown in Chapter 6, Chapter 7 and this document.
ASTM	American Society for Testing and Materials.
ASUPS	The acronym for Application Specific USB Product Specification. An ASUPS describes the unique characteristics of a special purpose nonstandard USB connector or cable assembly specification.
C of C	Certificate of Compliance.
Characteristic	A physical, chemical, visual or any other measurable property of a product or material.
Contact Point	One electrical contact of a multi-contact connector.
CTR	Conformance Test Report
Defect	Any nonconformance of the unit of product with specified requirements.
Defective Unit	A unit of product that contains one or more defects.
DWG	USB-IF Device Working Group
EIA	Electronic Industries Association.
EMI/RFI	Electro-magnetic Interference/Radio Frequency Interference.
Full-speed	The USB 'Full-speed' data signaling rate is 12Mb/s.
High-speed	The USB 'High-speed' data signaling rate is 480Mb/s.
Low-speed	The USB 'Low-speed' data signaling rate is 1.5Mb/s.
NIST	National Institute of Standards and Technology.
Power Pair	The non-twisted pair of electrical conductors in a USB cable used to carry power from the 'host controller' and/or a 'selfpowered hub' to the device. Where the 'Red' conductor is Vbus and the 'Black' conductor is Ground.
Signal Pair	The twisted pair of electrical conductors in a USB cable used to carry data from the 'host controller' and/or a 'self-powered hub' to the device. Where the 'Green' conductor is Dplus (D+) and the 'White' conductor is Dminus (D-).
TID	Test Identification Number
Universal Serial Bus	Universal Serial Bus is a serial interconnect bus that supports transfer rates up to 480M/bs for a maximum of 127 USB devices. (Please see USB 2.0)
USB Devices	USB devices can be: 'Hubs' that provide attachment points for USB; or, 'Functions' that provide capabilities to the system, such as an ISDN connection, a digital joystick, a printer, speakers, et cetera.
CNLA	Chinese National Laboratory Accreditation

Term	Description
USB Host	The USB interface to the host computer system is referred to as the Host Controller. The Host Controller may be implemented in a combination of hardware, firmware or software. A 'root hub' is integrated within the host system to provide one or more attachment points. Additional information concerning the 'USB host' may be found in Section 4.9 and Chapter 10 of the USB Specification USB 2.0.
USB Topology	The USB connects USB devices with the USB host. The USB physical interconnection is a tiered star topology. A 'hub' is at the center of each star. Each wire segment is a point-to-point connection between the 'host' and a 'hub' or 'function,' or a 'hub' connected to another 'hub' or 'function.'
USB	The acronym for Universal Serial Bus. (Please see Universal Serial Bus.)
USB-IF	USB Implementers Forum is a nonprofit industry organization made up of original equipment manufacturers (**OEMs**), component manufacturers and firmware/software developers who are actively involved in the advancement of USB technology. (Please see http://www.usb.org)

2 Management Overview

This section is an overview of the contents of this document and provides a brief summary of each of the subsequent sections. It does not establish any requirements or guidelines.

Section 3 describes USB Electrical, Mechanical and Environmental Compliance Standards.

Section 4 describes the acceptance testing criteria and test procedures for USB connectors and fabricated cable assemblies.

Section 5 Certification, Acceptance and Submission

Appendices:

3 USB Electrical, Mechanical and Environmental Compliance Standards

USB cable, connectors and fabricated cable assemblies must meet or exceed the requirements specified by the most current version of Chapter 6 of the USB Specification and applicable Supplements (please see Table 3-1, USB Electrical, Mechanical and Environmental Compliance Standards).

Table 3-1 USB Electrical, Mechanical and Environmental Compliance Standards

Test Description	Test Procedure	Performance Requirement
Durability	EIA 364-09 The object of this test procedure is to detail a uniform test method for determining the effects caused by subjecting a USB connector to the conditioning action of insertion and extraction, simulating the expected life of the connectors. Durability cycling with a gauge is intended only to produce mechanical stress. Durability performed with mating components is intended to produce both mechanical and wear stress.	1500 cycles 5000 cycles for Mini "B" 10,000 cycles for Micro series 10,000 cycles for ruggedized Standard "A" Cycle rate of 500 cycles per hour if done automatically and 200 if manual cycle
Mating Force	EIA 364-13 The object of this test is to detail a standard method for determining the mechanical forces that are required for inserting a USB connector.	35 Newtons maximum at a maximum rate of 12.5 mm (0.492") per minute.

Test Description	Test Procedure	Performance Requirement
Un-mating Force	EIA 364-13 The object of this test is to detail a standard method for determining the mechanical forces that are required for extracting a USB connector	10 Newtons minimum at a maximum rate of 12.5 mm (0.492”) per minute. Standard A & B series 3 Newtons minimum Mini Series. 8 N minimum at a maximum rate of 12.5 mm (0.492”) per minute for MicroUSB
Temperature Life	EIA 364-17 Test Condition 4 - Method A. The object of this test procedure is to detail a standard method to assess the ability of a USB connector to withstand +85º C± 2 temperatures without applied voltage for 500 hours	Must meet the minimum requirements specified by the most current version of Chapter 6 of the USB Specification and must be free of cosmetic and/or mechanical imperfections that will prevent normal use.
Visual & Dimensional Inspection	EIA 364-18 Visual, dimensional and functional inspection in accordance with the USB quality inspection plans	Must meet the minimum requirements specified by the most current version of Chapter 6 of the USB Specification. Plating thickness of contacts
Dielectric Withstanding Voltage	EIA 364-20 The object of this test procedure is to detail a test method to prove that a USB connector can operate safely at its rated voltage and withstand momentary over potentials due to switching, surges and/or other similar phenomena.	The dielectric must withstand 500 VAC for one minute at sea level. 100 V AC for Mini/Micro Series.
Insulation Resistance	EIA 364-21 The object of this test procedure is to detail a standard method to assess the insulation resistance of USB connectors. This test procedure is used to determine the resistance offered by the insulation materials and the various seals of a connector to a DC potential tending to produce a leakage of current through or on the surface of these members.	Pre test Standard — 1,000 MΩ minimum. MIcroUSB – 1,000 MΩ minimum Mini Series — 100 MΩ minimum. Post test 100 MΩ minimum final.
Low Level Contact Resistance	EIA 364-23 The object of this test is to detail a standard method to measure the electrical resistance across a pair of mated contacts such that the insulating films, if present, will not be broken or asperity melting will not occur. Measurement to use Kelvin 4-wire method. Measurements shall be taken form receptacle terminal to plug terminal.	30 mΩ maximum for Standard & MicroUSB (50 mΩ maximum for Mini Series) when measured at 20 mV maximum open circuit at 100 mA. Mated test contacts must be in a connector housing. Measurements to include Power, Ground, D+ and D- contacts of connector. 10 mΩ maximum change for post test LLCR
Mechanical Shock	EIA 364-27 Test Condition H The object of this test procedure is to detail a standard method to assess the ability of a USB connector to withstand specified severity of mechanical shock	No discontinuities of 1 µS or longer duration when mated USB connectors are subjected to 11 ms duration 30 Gs halfsine shock pulses. Three shocks in each direction applied along three mutually perpendicular planes for 18 shocks.