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Universal serial bus interfaces for data and power - Part 1-3: Common components - USB Type-C® Cable and Connector Specification

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35.200	Vmesniška in povezovalna oprema	Interface and interconnection equipment

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IEC TA 18 : MULTIMEDIA HOME SYSTEMS AND APPLICATIONS FOR END-USER NETWORKS

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NOTE FROM TC/SC OFFICERS:

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UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER

Part 1-3: Common components – USB Type-C® Cable and Connector Specification

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https://standards.iteh.ai/catalog/standards/sist/dab1b057-69e1-4191-bdd2-c9c17873106e/sist-en-iec-62680-1-3-2021

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