



Automated Charging Device (ACD) Standardisation, Advantages, and Implementations

Roger Bedell, B.S.E.E.

Product Director Opbrid Charging Systems, Furrer+Frey AG

chargingsystems@furrerfrey.ch

+41 31 357 6111

Thunstrasse 35

3005 Bern, CH

What is an ACD?

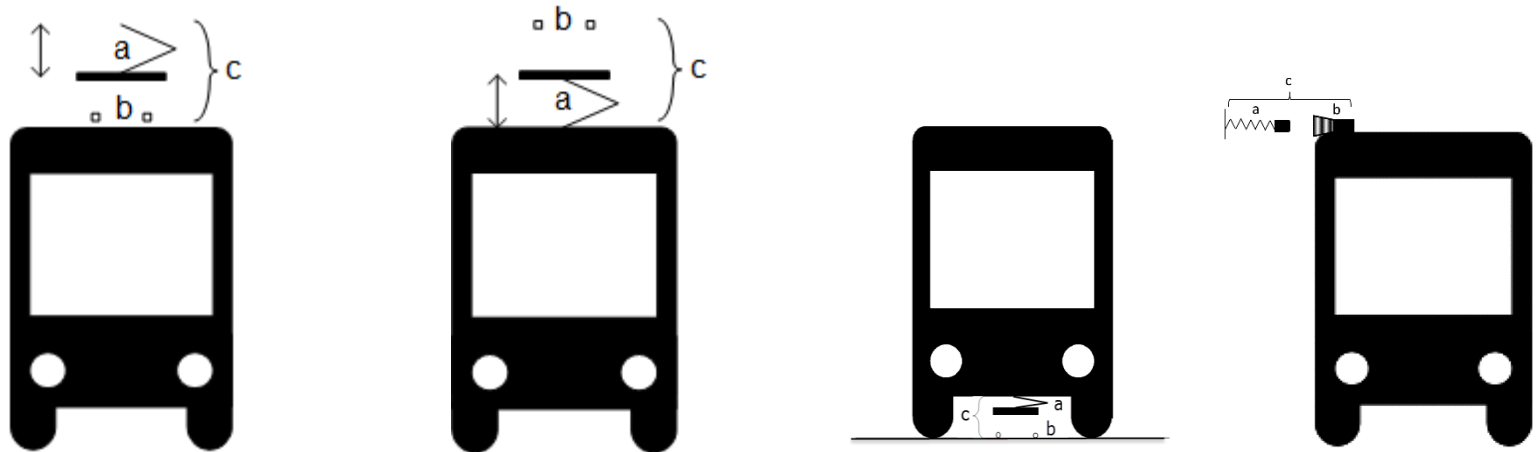
Automated Charging Device

“Opportunity Charging” Interface

Fast connection/disconnection

Safe for very high power

Automatic



Why Standards?

Goal: Any Bus can Charge at Any Charger

Operators can purchase buses from any vendor with confidence

Municipalities can install charging stations from any vendor with confidence

Tenders can be written by references to standards

Multiple suppliers for competitive products

Caveat 1: There are still multiple standards to choose from, and these standards are not interoperable – e.g. rooftop vs under vehicle can never be interoperable.

Caveat 2: Some standards are essentially sole source

The ACD Standards

IEC 61851-23-1 Electrical and Safety of ACD

ISO 15118-2 Ed 2 Communication between bus and charger

ISO 15118-8 Wireless communication between bus and charger

EN 50696 Mechanical Connection of ACD

The Current State of the Standards

The EU has mandated that the ACD standards should be released before the end of 2019

IEC 61851-23-1 Electrical and Safety of ACD – In good shape, but depends upon the release of the underlying IEC 61851-23 Ed. 2

ISO 15118-2 Ed 2 Communication between bus and charger – Also in good shape with a Draft International Standard being circulated, but quite complex.

ISO 15118-8 Wireless communication between bus and charger - Released

EN 50696 Mechanical Connection of ACD – Actively being worked on. Now adding annexes for the differing systems.

How to Tender a Particular System

Example: For an Interoperable Inverted Rooftop Pantograph System:

IEC61851-23-1 Annex CC, Case D

EN 50696 Annex A

Example: For an Interoperable Vehicle Rooftop Pantograph System:

IEC61851-23-1 Annex CC, Case E

EN 50696 Annex B

These standards in turn refer to the other standards, e.g. 15118 etc.

ACD Cases

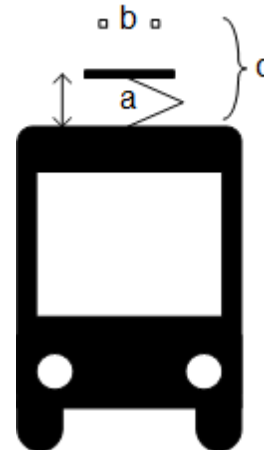
Depends on where the moving part is.

Case D: Moving part on the infrastructure

Case E: Moving part on the vehicle



Case D



Case E

Other Considerations

Even with all these standards met, there may still be some non standardized components that need to be specified separately.

- 1) Power transfer capability: EN 50696 may only guarantee a minimum power transfer capability for a particular annex, for example 600A.
- 2) Electronic docking assistance: Some parking situations may require additional parking assistance for safety, for example, in a free floor depot. While the communication messages have been set, a particular hardware standard has not. This may be moot if, for example, a bus knows precisely where it is.

Case D (Infrastructure ACD) Case Study

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IEC61851-23-1 Annex CC, Case D

EN 50696 Annex A

Enhancements:

- A defined contact order is enforced (Earth connects first, disconnects last)
- High current capability
- Equal contact force at all parking positions
- White sheet designed as critical infrastructure

Furrer+Frey AG EN 50696 Annex A Inverted Pantograph



Furrer+Fre^y

Opbrid charging systems

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