NEMA EV 40013-2024
(Previously EVSE 1-2018)
EV Charging Network Interoperability Standard

A Contactless RFID Credential for Authentication
(U_R Interface)

Published by

National Electrical Manufacturers Association
Rosslyn, Virginia 22209
www.nema.org

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Foreword

This standard was a product of the NEMA EVSE Network Interoperability Working Group, which was formed to address the topic of service interoperability and roaming among different electric vehicle (EV) charging networks. The primary goal of this standard is to give EV drivers the ability to receive services on EV charging infrastructure different than their chosen affiliation, and among those networks that have agreed to interwork their networks and services. This standard is a result of input from various stakeholders, including EV driver communities, governmental/regulatory bodies, standards development organizations, EV charging network service providers, and EV charging station (EVCS) manufacturers.

Open and standardized access to EV charging services is seen as a high-priority initiative for the EV industry. Through the adoption of standardized directories, credentials, and charging session data exchange, and the ability to establish charging sessions across different EV charging networks, EV drivers will be able to find and receive charging services on any EV charging network that participates in service roaming with the EV charging provider to which the EV drivers are affiliated. With standards in place, EV charging services spanning different operators and geographical areas can be interconnected into an integrated service fabric for EV drivers. An integrated service fabric has the benefits of providing broader and more available service coverage, improving the utilization of EV charging infrastructure, and reducing the potential for stranded electric vehicles and underutilized EVCS assets. All of these access and interconnection initiatives are seen as important factors in promoting EV adoption.

The approach taken in this standard is to develop a protocol enabling interconnection between EV charging networks, together with a set of standards at the service interface between the EV driver, the EV, and the serving EVCS device. No attempt is made in this work to specify the protocols to be used within EV charging networks. Each constituent network remains free to adopt protocols and technology best suited to its own service goals, internal architecture, and business requirements. This approach respects the system, administrative, and organizational boundaries inherent in any diverse collection of independently operated networks, while allowing each network to innovate and provide consumer value. By addressing interconnection at the network level rather than the device level, system scaling is greatly improved, and interoperation is simplified by having a smaller number of hierarchically organized interconnection points.

This standard was originally developed by the NEMA TN-EV Group and published under the NEMA EVSE 1.2-2015 designation. In 2019, it was published under the EVSE 1 designation. In its current form, it was approved by the NEMA TN-EV product section. NEMA changed its designation policy in 2021 and subsequently changed the designation to EV 40013 upon its revision.

> Note: The user's attention is called to the possibility that compliance with this standard could require use of an invention covered by patent rights.

By publication of this standard, no position is taken with respect to the validity of any such claim(s) or of any patent rights in connection therewith. If a patent holder has filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, then details may be obtained from NEMA.

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Section 1
General

1.1 Scope

This standard describes a protocol for authenticating EV charging service requests using ISO/IEC 14443 contactless proximity radio frequency identification (RFID)–type credentials. Authentication provides assurance to the electric vehicle (EV) charging network that the EV driver is the correct authorized party incurring a financial or other obligation for the services to be rendered. Similarly, the EV driver can have confidence that transactions have not been authenticated using forged or fraudulent credentials. Authentication is also an important prerequisite in making access control decisions when other policy considerations need to be applied. The protocol specified in this standard enables secure and reliable EV charging service transactions to take place for both the service provider and the service consumer.

The method of EV driver authentication involves the use of an ISO/IEC 7816-4/5/8–based challenge-response application layer protocol and ISO/IEC 14443 contactless communication. EV drivers (also referred to as users) can hold the contactless *authentication credentials* in proximity to EV charging stations to authenticate, authorize, and receive EV charging services. The authentication credentials can be implemented in wallet-sized cards, mobile phones, key-fob tokens, or other physical form factors. Contactless *authentication devices* compliant with this standard on EV charging stations interact with authentication credentials to obtain unique and verifiable challenge-response data ascribing to the authenticity of the credentials. The challenge-response data are then sent to and validated by the *credential authenticators* in an online manner to confirm that the authentication credentials have not been impersonated (or otherwise compromised) and that the authentication credentials are in good standing (i.e., not declared lost or the associated account overdrawn).

The authentication credential and protocol defined by this standard applies to intra-network operation, as well as operation across inter-networked, multi-operator EV charging networks—with the principal difference in the latter case that authentication takes place at the foreign EV charging network responsible for issuing the credential, rather than at the local network. It is expected that participating networks will issue credentials compliant with this standard to enable their users to receive on-network and off-network EV charging services. By defining an industry standard authentication credential, service interoperability and roaming is made possible, enabling EV drivers to receive charging and other services among compatible equipment and participating networks.

This standard does not describe the data objects and messages exchanged between the authentication credential, the authentication device, and the credential authenticator, or the syntax and semantics of the data objects, along with the sequence of command and response message exchanges.

1.2 Background

EV charging networks have evolved independently using different and incompatible authentication credentials. These incompatibilities have caused significant inconvenience to EV drivers and have required them to hold multiple authentication credentials—typically, one for each EV charging network. This has also forced EV drivers to hold multiple service relationships with different access, registration, account balance, and payment methods. To address these issues, and to support open access, the EV charging industry and stakeholders are developing a common authentication credential and protocol for EV driver authentication. Together with the other affiliated standards in this series, roaming EV charging services and EV charging network interoperability will be possible. This standard is a result of this work among EV charging industry participants, end users, government bodies, and other stakeholders.

The authentication credential and protocol specified here does not dictate specific user service and payment models, and the issuer of the credential is free to implement models that it believes are in the best interest of the EV driver through market choice. Prepaid, post-paid, aggregated-usage, contract-