

Optimising payments for Electric Vehicle charging

Best practices for an interoperable, secure and seamless Electric Vehicle charging payment experience.



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Visa is one of the leaders in Electric **Vehicle charging payments**

The use of Electric Vehicles is growing rapidly, and as charging infrastructure grows to meet demand, the payment experience has been fragmented for customers. Visa is working to create interoperable, secure and seamless Electric Vehicle payment experiences everywhere for everyone, getting customers where they want to go, faster and easier. Visa is working towards simple payments for Electric Vehicle charging to help further drive the adoption of zero-emission vehicles.



By 2030, 226 million EVs are anticipated on the road globally



12.7 EV charging points anticipated by 2030 globally

3.4m EV charging points anticipated by 2030 in Europe

> installation of public charging points a week in 2023 compared to 1,600 per week in 2021

total US EV stock. In 2021 EV sales increased to 630,000 more than in 2019 and 2020 combined

Sources: Graph: IEA (2023), Global Electric Vehicle Data Explorer, IEA, Paris https:// www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer. The White House, April 2023, FACT SHEET: Biden-Harris Administration Announces New Private and Public Sector Investments for Affordable Electric Vehicles | The White House. Mckinsey (2022), Europe's Electric Vehicle opportunity—and the charging infrastructure needed to meet it, <u>https://</u> www.mckinsey.com/industries/automotive-and-assembly/our-insights/europes-ev-

opportunity-and-the-charging-infrastructure-needed-to-meet-it Data points: Bloomberg NEF; Global Electric Vehicle Outlook 2022 & CNBC.com. 'Auto executives say more than half of U.S. car sales will be Electric Vehicles by 2030, KPMG survey shows." 2021, Nov 30.



Visa's contributions to Electric Vehicle charging and payments



Driving **Ensuring** a Promoting interoperability consumer seamless and security experience choice Visa strives Visa educates Visa was the Paying for EV first financial Charging should to provide consumers on cardholders the importance services and be as simple as paying for fuel. with a of openpayment Visa enables frictionless payment representative Electric payment to join the consumers to Vehicle international pay for charging solutions, charging such as Charging through their Interface preferred and payment contactless Initiative process. or card-notmost (CharIN) that convenient present acceptance. works within payment the e-mobility method. value chain.

Providing thought leadership

Endorsing standardisation

Visa works with regulators and industry forums to promote universal standards for Electric Vehicle charging payments.

The power of choice

In the Electric Vehicle market, there are currently multiple payments services and charging point operators (CPO), which means consumers get an inconsistent experience within a rapidly changing landscape.

By enabling operators to accept multiple payments types, in addition to their proprietary options, Visa removes one of the key barrier consumers face when deciding to switch to an Electric Vehicle.

A complementary solution

Whether it's for slow or fast charging, Electric Vehicle owners will have the choice to use in-car, as well as other payment solutions.





Open-payment solutions provide a frictionless experience

There are two common models for Electric Vehicle charging solutions, open and closed loop. Visa supports both and recommends open-payment, which benefits all players in the Electric Vehicle charging payments landscape by providing consumers with a frictionless experience and charge point operators with cost-efficient interoperability. The open-payment model provides a ubiquitous solution that anyone can use.

Here is a comparison.

Closed-loop models

There are three types of closed-loop models:

- Pay-as-you-go wallet: This is the most common closedloop model. Proprietary cards or mobile apps are tied to stored credentials to initiate charging.
- **Top-up wallet:** Similar to Pay-as-you-go but requires pre-funding by stored credentials.
- Contract based Plug & Charge: Consumers plug in their cars to start a session using linked payment method.

Plug &





In order to ensure a seamless consumer experience, deploying open-payment card-present solutions such as contactless is the best option, offering consumers the option to use their preferred payment methods while also allowing charging point operators to develop their own solutions. Open-payment reduces friction without having to set up an account and then having to log into a mobile app with each purchase. Additionally, these solutions remove complexities for drivers when it comes to interoperability and accessing public charging, cross-border travel and vehicle rentals.

The benefits of open-payment

Visa card-present open-payment may help provide a seamless experience for Electric Vehicle owners, where they can simply use their Visa debit or credit card or digital wallet to pay for EV charging. Moreover, openpayment promotes interoperability, meaning consumers can have their choice of payment method and can use their Visa debit or credit card at Electric Vehicle charging points with the same confidence or convenience as for any other purchase.

Whether its Visa full acceptance (terminal that includes magstripe, chip terminals & contactless) or Visa Contactless-only (terminal has contactless device only*), these models simplify Electric Vehicle charging payments for all parties

*Alternative payment option must be available for cardholders without contactless card (e.g., mobile app).

Electric Vehicle open-payment model benefits everyone

Consumers

Frictionless experience

Consumers can simply continue to use what they already have in their wallets and use for any other day-to-day purchases.



Simplify and enhance the charging experience

Eliminate uncertainty about the accessibility of Electric Vehicle charging stations

Work towards a consistent experience across all networks

Remove the complexity of having multiple payments methods

Make long distance and international travel with Electric Vehicles seamless with international interoperability

Charge point operators

Cost-efficient interoperability

CPOs can easily install secure and innovative payments infrastructure, allowing for fast rollout and quick cost recovery.

Reduce the complexity of Electric Vehicle charging

Accelerate infrastructure deployment





Increase usage through simplification and customer preferred payment options







Reduce risk of fraud and increase security around payments and customer data





Use the correct Merchant Category Code (MCC) to classify transactions

In 2019, MCC 5552 for Electric Vehicle Charging was created to enable Electric Vehicle charging transactions to be tracked separately from other similar transactions, such as petrol fuel, parking or utilities. There are three different codes that apply to Electric Vehicle charging. Visa recommends proper classification to avoid issues stemming from misclassified transactions, including transaction declines, disruption of Electric Vehicle charging rewards benefits that lead to customer complaints and the inability to track industry growth.

Electric Vehicle charging MCC use cases



What are the key advantages for the industry to use the correct MCC 5552?



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Important: A Public Charging Station should never use MCC 4900 (Utilities).

Why should the Electric Vehicle MCC be used?

Some Issuers of MCC-restricted cards have reported seeing high numbers of declines as a result of misclassified transactions. This can also cause high levels of complaints for merchants, and potentially decreased customer loyalty. Using the correct MCC also allows the ecosystem to track transactions and growth. For example, all VisaNet reporting on Electric Vehicle charging transactions relies on data in the Electric Vehicle charging MCC; if merchants are not using this correct MCC, their PV will not be visible in VisaNet data.

What MCC should be used for public Electric Vehicle charging that also has a parking fee but predominately gets revenue from parking?

In this situation, use MCC 7523. When in doubt, however, it is best to use code 5552 for Electric Vehicle charging transactions to avoid issues stemming from misclassified transactions.

For Electric Vehicle charging points that are located in a parking or retailers, what is the right MCC to use?

For public Electric Vehicle charging that is located in retailers, using MCC 5552 for the Electric Vehicle chargers, may allow correct tracking and may drive new loyalty programs between both services. The same rationale applies to hospitality, as it is also an environment where loyalty and rewards are key strategies and splitting both MCC will ultimately benefit this end.

What happens when the wrong MCC is used?



Issuers have authorisation rules based on specific transaction types. Misclassifying transactions can result in transaction declines.

charging rewards programs that can lead to more public Electric Vehicle charging transactions. Misclassifying transactions results in customer complaints, meaning they are less likely to continue the programs.

Key point: Whenever in doubt, use MCC 5552 for Electric Vehicle charging transactions!



Causes complaints

Issuers are creating Electric Vehicle

Inability to track

The ecosystem loses its ability to track the growth, affects transaction integrity and reduces Visa's ability to effectively respond to concerns and issues.



Visa helps to provide flexible authorisation models to meet processing needs

Currently, three primary payment models existing in Electric Vehicle Charging - Pre-Pay, Post-Pay and Flexible Authorisation Model. Visa recommends using the flexible authorisation model when deploying EV solutions, as it may provide a **seamless customer experience** for vehicle owners.

In this model, when the consumer taps their card or app to start the Electric Vehicle charging session an initial authorisation is performed, and estimated amount is ring-fenced on the cardholder account. After the charge session is stopped, a "true-up" is performed (either an additional authorisation or a partial reversal) to reflect the actual cost of the charging session.

This model is the most flexible solution for merchants and provides better risk management; issuers receive all necessary information to efficiently manage consumers' open-to-buy balance; and consumers get a quick, convenient payment method.

What are the benefits?

funds to pay.



Provides a foundation for creating frictionless consumer experiences. satisfying cardholder needs for speed and ease of consumption. do not have the



Reduces a merchant's Increases exposure to bad debt opportunities for from cardholders who incremental sales consume goods or by making upsell services but ultimately purchases seamless and easy for the appropriate level of cardholder.



Use cases

- Initial amount is submitted based off average transaction
- Follow-up authorisations are done to increment the auth, amount up or partial reverse down

Merchant impact

• Most flexible solution with better risk management option

Consumer

 Issuers receive all necessary information to efficiently manage consumer open to buy balance









Provides a costeffective solution by avoiding the need to revisit purchase decisions with cardholders via multiple transactions during consumption.



Estimates and increments allow merchants to secure additional funds, as needed, from a cardholder without the cardholder having to be present.

Incremental authorisation requests must include the following indicators:

Processing Requirements

For estimated/incremental authorisation and reversals

Field Name	Field number	Description	Estimated auth	Incremental auth	Reversal	Clearing
Addtional Authorisation Indicator	60.10	This field indicates an estimated authorisation and must carry either a value of "2" (estimated amount) or a "3" (estimated amount and terminal accepts partial authorisation responses).	Yes			
Message Reason Code	63.3	This field contains the reason for authorisation and must carry the value of "3900" for incremental authorisations. Merchants (primarily in U.S.) may also use the Authorisation Characteristics Indicator – Field 62.1 to also identify an incremental authorisation and must carry the value of "I" (incremental).		Yes		Yes
Transation Identifier (TID)	62.2	This field must match the Transaction Identifier (TID) generated by Visa and returned as part of the response message to the original estimated authorisation request. The TID from the estimated authorisation must be sent in incremental authorisation requests and reversals, as well as the clearing. It is a key element that links original estimated authorisation requests to subsequent messages.	Yes	Yes	Yes	Yes
RetriElectric Vehicleal Reference Number (RRN)	37	This field must contain the value from the original authorisation request message. RRN is used with other key data elements to identify and track all messages related to a given cardholder transaction.	Yes	Yes	Yes	
System Trace Audit Number (STAN)	11	This is a number assigned by the merchant that uniquely identifies a cardholder transaction and all the message types that it comprises. The same trace number is used in an estimated authorisation request and response, incremental authorisation request and response, and in a subsequent reversal request and response.	Yes	Yes	Yes	Yes
Transaction Amount	4	For incremental authorisation, this field should contain the additional authorisation amount being requested. Authorisation reversals (full or partial) should always contain the orginal transaction amount in this field. In the case of authorisations that have been incremented, this field should contain the total amount authorised (sum of all original and incremental authorisations).	Yes	Yes	Yes	Yes
Replacement Amount	54	Contains the corrected amount of an authorisation transaction.			Yes	

How to use estimated authorisation

Visa provides merchants the flexibility to adjust the authorised amount at any time following an estimated authorisation request

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Merchants must inform cardholders:

- That the authorisation is an estimate and not final and provide the authorisation amount.
- That subsequent authorisations may occur.

Authorisation reversals

Authorisation Reversals notify the issuer that all, or part, of a transaction has been cancelled, and that the authorisation hold should be removed and opento-buy amounts should be adjusted. To help ensure that cardholders have access to all their available funds, merchants should process authorisation reversals in a timely manner.

Transaction not completed

Entire authorised amount must be reversed within 24 hours of the merchant becoming aware that the transaction cannot be completed or the end of the authorisation validity period, which ever comes first.





How it works:

- The cardholder spends more than expected, the merchant may obtain an additional authorisation using an incremental authorisation reauest.
- If the estimated authorisation exceeds the final amount the merchant must reduce the authorised amount, using a partial authorisation.

Incremental authorisation request

An incremental authorisation is used to increase the total authorised amount. The amount in the request is the additional amount by which the merchant wishes to increase the total authorised amount. A merchant may request an incremental authorisation anytime the total authorised amount appears to be insufficient.

Completed transaction

Where the sum of an estimated authorisation and any incremental authorisation(s) exceeds the final amount: The difference between the authorised amount (or amounts) and the transaction amount must be reversed within 24 hours of when the transaction is completed.

Pre-pay model Known amount pre-selected by cardholder



Post-pay model Known amount paid after charging completes



Issuer receives information after charging session stops and customer is charged with final transaction amount





Visa Acceptance Solutions

Visa Acceptance Solutions provides an open infrastructure that connects sellers, buyers and financial institutions with innovative solutions as an enabler of digital commerce.

> **Visa Platform Connect** supports multiple payment channels and forms of payments. This creates a strong foundation for a diverse range of multichannel future-proof solutions, including support for in-app solutions. A global payment gateway that creates a secure, reliable and scalable foundation for flexible payment solutions. Offering solutions that are payment-scheme and payment-type agnostic, provides organizations with maximum flexibility and

choice.



Card Present Connect enables our technology partners and acquirers to connect to the Visa Acceptance Platform and process card-present transactions. Plug into the Visa Acceptance Platform for cardpresent processing connectivity and access other services on our powerful payments management platform.

Designed for ease of integration, growth and built to support Electric Vehicle Charging standards, **Visa Acceptance Solutions focus on key success**

factors including time-to-market, scalability and futureproofing. Ideally positioned and ready to partner with sellers and technology partners to drive the continued evolution in Electric Vehicle Charging.



Visa Acceptance Platform

provides access to acquirers, technology, and platform providers globally. One connection into the Visa Acceptance Platform provides reach and scalability enabling technology providers to open up new market opportunities with reduced integration challenges.

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Token Management Service

is a new way to harness the power of payment tokenization to keep your customer data secure and give you valuable insights into customer behavior. Our Token Management Service simplifies payments by linking tokens from different networks, issuers and channels, bringing together payments, customer data and network tokens into a unified, proprietary network token. Richer insights can be gained from customers' buying behaviors across different channels and card types so you can build deeper relationships and experiences.



FAQs

Best practice for payment solution in Electric Vehicle Charging

Which payment solution does Visa recommend?

Visa recommends the Open-Payment Card Acceptance model, which may provide a seamless experience for EV owners. Closed loop payment solutions present complexities for drivers around interoperability, accessing public charging, cross border travel and vehicle rentals. Closed loop models also don't provide merchants and cardholders with a high level of protection and often require



additional steps to ensure security. Visa's position is underpinned by our commitment to enable safe and secure payment methods. We believe that open payment solutions demonstrate tested and secure protocols and already provide compliance with industry security and data privacy standards.

Regulations in payments

What does the Alternative Fuels Infrastructure Regulation (AFIR) mandate for EV public charging in Europe?

On 27 March 2023, the European institutions agreed on the final text of the review of the Alternative Fuels Infrastructure Regulation setting hard targets and requirements for a pan European infrastructure for alternative fuels to be made publicly available and accessible for light and heavy duty vehicles. The Regulation mandates access to payment terminals with card payment readers or with NFC contactless readers for all new public fast EV charging stations (DC chargers with power output equal and above to 50Kw) across the EU, from March 2024 onwards and retrofitting all existing infrastructure by 2027.

Relevant article 5 (infrastructure requirements) include:

- Mandatory access to card payment readers with contactless functionalities at all new public EV charging infrastructure equal and above 50Kw (DC fast chargers) from March 2024 onwards
- Mandatory retrofitting for core and IEU Member States are required to comprehensive TEN T network from 2027
- present their national strategies for the rollout of the EV infrastructure and implementation of AFIR by January 2026 in order to unlock access

What does the UK mandate for EV public charging?

In July 2023, the UK government laid regulations before parliament which require:

All new public charge points of 8kW and above, and all existing rapid public charge points of 50kW and above, must offer contactless payment within one year of the regulations coming into force. Proprietary charge point networks which open for public use after the regulations come into force must offer contactless payment within one year of becoming public charge points. A charge point operator must also, within two years of the regulations come into force, ensure that a person using any of its charge points is able to pay using a payment service provided by a third party roaming provider.

The regulations now need to be approved by parliament before they can be brought into force as law. Expectation is that this will be completed by the end of the year.

Source: EU Regulation on the Deployment of Alternative Fuels Infrastructure

What does the Office for Zero Emission Vehicles (OZEV) mandate for EV public charging in the UK?

In 2022 the Office for Zero Emission Vehicles confirmed that it would mandate that contactless payment is available at all new charge points above 8kW and existing rapid CPs (50kW and above). OZEV is looking to lay regulations in UK Parliament that will implement this policy (and other policies relating to the consumer experience at charge points) at the earliest opportunity, as soon as parliamentary time allows.

The payment method requirements, for the most part, will apply 12 months after the legislation comes into effect.

What does the National Electric Vehicle Infrastructure (NEVI) requires for public charging in the US?

On 15 February 2023, NEVI published a rule building on the Biden Administration's goal of equitable infrastructure to ensure fair distribution of EV charging deployment in an effort for engagement with rural, underserved and disadvantaged communities.

The regulation provisions include:

- Chargers must confirm to ISO 15118 3 and must have hardware capable of implementing both ISO 15118 2 and ISO 15118 20. By F15 February 2024, charger software must conform to ISO 15118 2 and be capable of Plug and Charge. Conformance testing for charger software and hardware should follow ISO 15118 4 and ISO 15118 5, respectively.
- Charging stations must provide a contactless payment method at minimum that accepts major credit/ debit cards and accept payment through either an automated toll free phone number or SMS.

Note: These restrictions are mandated at a federal level. If states want to apply for NEVI funding/grants, they are required to follow these guidelines. Individual states may have additional payment and/or charger regulations implemented on their own, but federal mandates are required to receive funding.

Contactless acceptance solutions for Electric Vehicle chargers

What is the "one to many" terminal deployment model?

There are numerous charging deployments that have one card acceptance device connected to multiple charging units, known as "one to many" or "kiosk model", which reduces the cost of acceptance. These solutions are likely to be particularly popular in parking lots where there is space to experiment with the optimal layout of one terminal to multiple chargers. One to many solutions, therefore, mitigate costs for CPOs, as they will need to deploy a much smaller



• Payment through a mobile application is included in

- this rule through language designating it as "another payment device."
- No membership is required for payment methods.
- Payment systems may support chip as well.
- All publicly available EV chargers must display location, pricing, payment requirements, real time availability and accessibility through mapping and the information must be available free of charge to third party software developers





number of payment terminals while still ensuring compliance with payment industry standards and providing consumers with easy and effective way to pay. One to many solutions have no impact on the transaction processing, as the payment terminal will be able to communicate with each individual charger to authorise payments independently for each driver's charging session.

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Authorisations best practices



How could I solve the majority of pre authorisation issues for the end user and remove the customer experience hassle?

Visa recommends the flexible authorisation model for transaction processing, in which an initial estimated authorisation is performed when the consumer taps their card or use app to start the Electric Vehicle charging session, and an additional (incremental) authorisation or a partial reversal is performed after charging has stopped to reflect the actual cost of the charging session. It provides better risk management for merchants; issuers receive all necessary information to efficiently manage consumers' open to buy balances; and consumers get a quick, convenient payment method.

Electric Vehicle charger set up

Does Visa support RFID and mobile app solutions?

Visa supports multiple methods of payment, including proprietary mobile apps and RFID tags. RFID based identification solutions are offered by the charging operators to identify the customers and link payment credentials to customer account. However, to ensure a seamless consumer experience, especially in light of regulations



requiring contactless payments at public charging stations, Visa recommends also deploying open payment, card present solutions, such as contactless. Open payment payments will enable EV drivers with interoperable and frictionless payment while enabling cross border traveling.

How would contactless only solutions impact SCA/PSD2 requirements?

European clients must consider PSD2 regulation in both card present and card not present scenarios. For card present, contactless terminals are subject to VEPS (Visa Easy Pay Solution) limits on the value of the transaction — generally EUR 20, though it is higher in many markets, and SCA may require customers to enter a PIN number on occasion. For more information, please see the Visa Rules. For CNP, 3 D Secure 2.0 will need to be supported. Visa is currently engaging with both regional and national governments to explore the possibility of an SCA exemption for the Electric Vehicle Charging MCC.

Payment signage: EV drivers should be informed of available payment methods (e.g., tap or insert) with clear and consistent signage.

PSD2/SCA

Requires cardholder authentication for certain transactions based on the amount of spend or number of attempts

Impact

Electric Vehicle Charging transactions are unattended card present or card not present, resulting in:



Card present A PIN pad is necessary to authenticate



Card not present 3 D Secure 2.0 authentication will need to be supported, UNLESS it is a merchant initiated transaction

Fleet enhancement data

How did Visa enhance fleet transaction information?

Commercial vehicles represent the majority share of the Electric Vehicles on the road today, and fleet operators need additional data points to operate their fleets effectively. Visa is enhancing transaction information to support the business needs of hybrid and Electric Vehicle fleets, including adding new units of measure as well as specific new Electric Vehicle fields to authorisation and clearing records to support transactions. Existing fields already in place will support specific items for an Electric Vehicle transaction.

New units of measure

- kWh (kilowatts per hour) and Charging Minutes (CM) as new units of measure
- Kg (Kilogram) can be used for Hydrogen gas as the unit of measure

New Electric Vehicle Charging fields in authorisation and clearing records

- Charging power output capacity Refers to the charging station power output capacity, i.e. 50kW charging station
- Total time plugged in Provides the total time plugged in
- Total charging time Provides the action time taken for the Electric Vehicle Charge
- Start time of charge and finish time of charge (with time zone)
- Charging reason code Provides a reason code for any situation or issues with the charging session
- Additional charging fees Depends upon the charging station and the time taken to charge
- Fee type and Fee charged Two sets of this pair will be provided
- Estimated km/miles added Provides an estimate of the total distance added (based on the kWh added and the type of vehicle engine charged)
- Estimated vehicle km/miles available After charge completion, provides the estimated range the car will have once it leaves the Electric Vehicle charging station





New Electric Vehicle Charging fields in authorisation and clearing records

Merchant detail fields (Electric Vehicle Charging station name, address, city, state), Expanded Fuel Type (FB or FC for Electric Vehicle 2 / Electric Vehicle 3 charging), Unit of Measure (kWh), Quantity (amount of kWh capacity being purchased), Unit Cost (cents/kWh), Gross Fuel Price (cost for amount of charge)

- Charging Electric Vehicle Provides information about the level of charging used
- **Carbon Footprint** Provides the Carbon Footprint avoidance (how much you saved from this charge) measurement for the purchase on the transaction measured in grams of carbon dioxide equivalent (CO2e)
- Maximum Power Dispensed Contains the maximum power dispensed during that specific charge session from that charging station. This could be different from the power output capacity of the station based on power management by the Site Operator
- Connector Type Contains a Visa defined code for a specific connector type to identify the connection/ Electric Vehicle for the charge session, used in Fleet Data Reporting by Fleet Managers

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