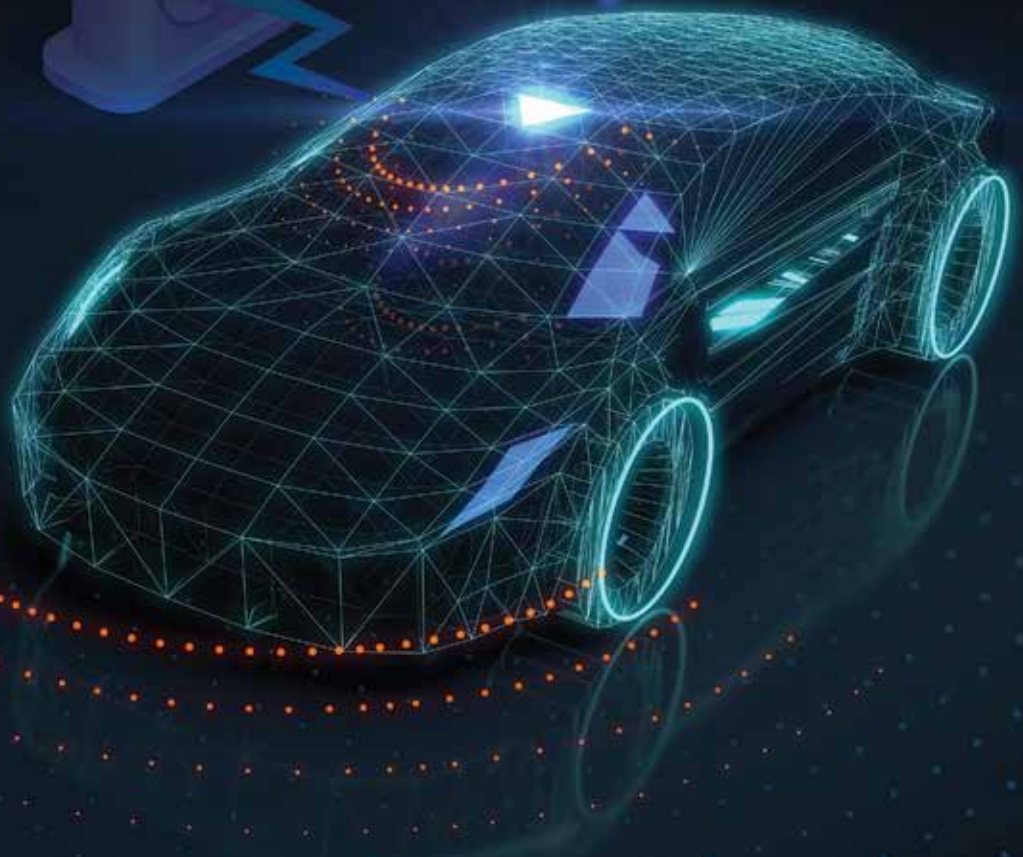


# EV charging: What to keep in mind?



**EATON**

*Powering Business Worldwide*

There are a lot of aspects in modern homes which make planning a safe electrical system much harder than what you're maybe used to. New technologies are introduced to your electrical system which often require a special treatment in regards of protection devices and regulatory knowledge.

Eaton is your strong partner in regards of electrical safety and protection devices for your maybe not so daily needs. But green and sustainable applications are on the rise and therefore we want you to have the right protection for your application needs.

## EV-Charging

Electric vehicles offer an exiting way of sustainable transportation, yet also require some knowledge about the standards. EV chargers need to adhere to strict product standards. The IEC/EN 61851 series covers the principles of electric vehicle charging and safety aspects in regards of different charging modes and charging technologies and is seen as the product standard charging devices. This standard series already takes caution about the possible effects a charging station can have on an electrical system, nevertheless, EV-charging is considered a special application according the IEC/EN 60364-7-722 which also mentions critical points to keep in mind when planning and establishing charge points.

### **What are key points for you to consider when you're faced with EV-charging applications:**

- 1.** Is it a new build or do I retrofit EV-charging into an existing system? .....
- 2.** Do I need to inform my grid provider about the charging station? .....
- 3.** Is the charge point accessible for the public? .....
- 4.** What nominal current will the charge point have? .....
- 5.** Is the end circuit capable of handling the charge current? .....
- 6.** What kind of RCD protection do I need? .....
- 7.** Is surge protection established? .....



**Expert Tip:** Always take care that qualified electricians pre-inspect the site to factor in site specific requirements!

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# FAQ for EV-Charging

Eaton wants to guide you through these questions and wants to help you with your safe and future proof installation.

## Q. What should I take care of when planning electrical charge points? (retrofit or new build)

EV-charge points shall have their own dedicated end circuit. With this rule a few things need to be considered:

- Can this end circuit handle the charging current for a prolonged time?
- Is my enclosure and incoming cable capable of handling this load additional load?
- Is my charging current in such a high level that my fault protection may be affected?

EV-charging often introduces a prolonged load into the electrical system and therefore a systematic approach needs to be taken when such loads are considered. Often EV- charging loads are defined by the grid provider as additional 11kW of load per charge point. Keeping that in mind, looking at heat dissipation and incoming cables becomes obvious. If you really need 11kW in your application is another topic, yet often this value is a rule of thumb for designers or recommendations from grid providers to establish a safety margin.



**Expert Tip:** Eaton offers the right protection devices to establish a safe and future proof installation, how to choose the right protection for your specific application is something you can ask your local Eaton expert.

## Q. Do I need to inform my grid provider about the charging station?

Maybe. It depends on the rated power of the charge point as well as external factors like the accessibility of the charge point as well as local regulations.

Often EV- charges as small as 3,7kW need to be approved form a grid provider due to possible negative effects on the supplying grid. In addition, the need to meter this end circuit or even to control it is something a grid provider may want to introduce to EV-charging applications.

Retrofitting EV-charging into existing installations is often considered a major change in an electrical system and therefore requires a check-up from a qualified electrician, nevertheless.



**Expert Tip:** Local regulations require special local knowledge. Ask your local Eaton Expert for your specific country regulations and expertise.

## Q. What should I consider when the charge point is accessible from the public?

Often special local regulations come into place which force application specific requirements. One special requirement could be a dedicated meter or special requirement for protection devices or enclosures.

Charge points on office grounds can be seen as semi-public and therefore require additional meters. Additional authorization methods can be necessary like NFC or RFID chips.



**Expert Tip:** In cases where charge points are accessible from the public, local regulations and grid providers can force special regulations upon your application. Always consider contacting your local Eaton Expert when confronted with special applications.

## Q. What kind of RCD shall I use for my application?

This depends on various application specific factors as well as the mode of charging used. Overall, there are some key facts which need to be kept in mind:

- EV charging is considered a special application which is covered by IEC/EN 60364-7-722
- Every charge point needs to be RCD protected.
- Choosing the right RCD depends on your charge point and your specific application.

EV charging can cause DC fault currents which can negatively affect your electrical safety of your installation, especially the protection which is established by RCDs.

In TN-Networks the RCD can fulfil part of fault protection but is used for additional protection with a 30mA rated RCD. In TT-Networks the RCD has a protective function in both protection levels and therefore for each mode of protection an RCD will be required. (Fault protection in TT networks could be established with overcurrent circuit protection devices OCPD, yet the fault loop would be very low resistive which is often not applicable)

Additional protection needs to be established for socket outlets up to 32A (in dependence of the location) in form of 30mA RCDs in both types of network.

Since the RCD has such a crucial role in electrical safety, the IEC/EN 61851-1 as well as the IEC/EN 60364-7-722 has established following rules for RCDs in charging applications:

- Usage of an RCD Type B
- Usage of a Type A or F with additional protection for fault currents up to 6mA DC. This protection can come from additional devices also called RDC-DDs

RDC-DDs are already often built in in charging stations which offer a few benefits for your installation:

- A DC fault will result in an aborted charging session, yet the charge point is still available for further usage, if this specific fault is no longer present.
- The charge point can identify different states of the current charging session and react accordingly.

In the past, protection devices had also the RCD-DD functionality included, yet these devices will trip an affected circuit without any other logic behind and need to be rearmed manually after a fault occurred, diminishing any availability of the charge point.

**Caution:** Wallbox manufacturers often state their charge point does not need additional RCD protection since the functionality should be included. This is only the case if they explicitly adhere to following standards, since these are product standards which can provide RCD functionality defined by IEC/EN 60364:

- IEC/EN 61008
- IEC/EN 61009
- IEC/EN 62423



**Expert Tip:** Eaton offers wallboxes with RDC-DD protection built in. Contact your local Eaton expert to get to know our EV-charging portfolio and suitable protection devices.

**For a futureproof installation with the highest availability Eaton offers Type B RCCBs for residential and commercial use as well as for system integrators:**



## Q. Is surge protection something I need to take care of for charge points?

Surge protection is already mandatory for new installations with at least a test class 2 tested surge protective device (SPD). Nevertheless, the protection range of the SPD is also limited, and it is either required or in your best interest to establish further points of protection against overvoltage events.

The IEC/EN 60364-5-53 states that new installations without an external lightning protection system or buildings that are not fed over a longer distance through overhead power lines need to have at least a test class 2 tested SPD placed as soon as possible where the incoming connection enters your building. Often charge points will be placed outside of the building or decentral, where the chance of external influences and overvoltage events are higher.

Some local regulation state that sufficient surge protection must be in place for every charge point. This should be also in your interest, since overvoltage events can cause damage to an EV which can be very costly.

It depends on the manufacturer of the wallbox or charge point if and what kind of surge protection is deployed, yet Eaton offers a comprehensive solution for retrofit applications as well as system integrators: SPCT2 range of surge protection which also fulfils for UC 280V and 335V devices test class 3 for powerful but sensitive protection of your charging electronic.

Test class 3 tested SPDs fulfill additional requirements to offer comprehensive protection for sensitive electronics and loads. Since SPDs need to be coordinated with each other, having one protection device which covers both needs is offering a simple solution for a complicated topic. The SPCT2 280V and 335V offer through both connection types comprehensive safety for your charging application.



**Expert Tip:** Don't be overwhelmed by surge protection. It can be quite easy if you have someone to guide you through it. Ask your local Eaton expert to clarify any special needs your application may require

# What's next?

As you can see, EV charging applications can be quite overwhelming at first, yet if you have someone to guide you through it there's nothing you need to worry about. Eaton has local expertise to assist you with your application needs. With us you can rely on a strong partner with a long history in protection devices and electrical distribution.

The next step for you is to design a safe and reliable charge point with your expertise and knowledge gathered through your local Eaton Sales Advisor and application notes such as this one.



Full suit of circuit protection from your trusted brand

## Eaton recommends following products for EV-charging applications:

FRCmM and FRCdM RCCBs for highest availability of your application:

Type A



Type F



Type B



FRBm and FRBd RCBOs when space is limited, and comprehensive safety is needed:

Type A



Type F



SPBT12 and SPCT2 to offer a best-in-class surge protection for your green application:

Test Class 2 (3)



Test Class 12 combined





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