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Ready to Recharge

A specification guide for designing electric vehicle charging stations



ENCLOSURES

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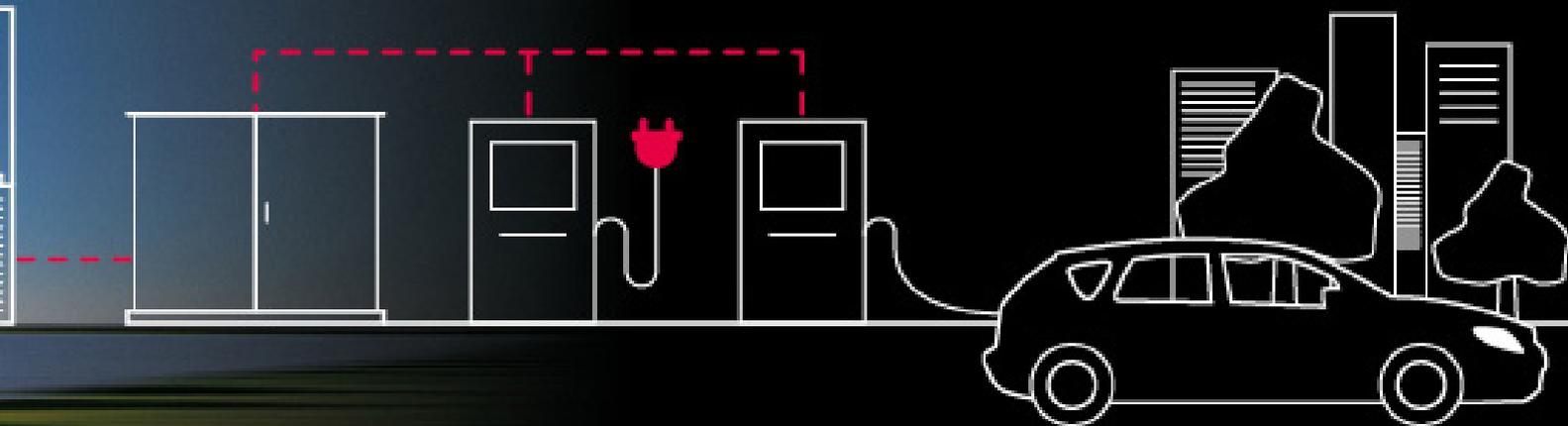


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The race is on

The global evolution and progression to electric vehicles has gained significant momentum during the last five years. And while electric vehicle (EV) manufacturers like Tesla and others have grown beyond niche status, most car and van manufacturers that have a presence in Europe have not only gotten on board with EVs, but some of them are actually leading a more mainstream charge toward the adoption of EVs on a mass scale.

All car manufacturers are gradually switching to electric cars. Mercedes Benz, for example, wants to produce electric options for half of its cars by 2025 and be able to build only electric cars from 2030. Audi, for example, will launch only electric new cars from 2026. Production of internal combustion engines will end in 2033. By 2025, the Ingolstadt-based group wants to introduce more than 20 pure all-electric models. Ultimately, according to a decision by the European Union, only electric cars will be produced in Europe from 2035.

With the influx of EVs on our roads, the automotive industry must also address the infrastructure required to power these vehicles. While the demand for EV charging stations — both current and future — is driven by consumer demand for increased EV production, it's also being advanced by government initiatives and programs designed to curb the use of fossil fuels and reduce the nation's carbon footprint.

The German government, for example, is supporting the expansion of a fast-charging infrastructure for electric vehicles with 1.8 billion euros. This is to create the so-called "Germany Network" — a fast-charging network for electric vehicles in urban, suburban, and rural areas in Germany. A fast-charging infrastructure created in this manner is intended to not only facilitate but also accelerate the transition to electromobility. The money will be used to create 8,500 fast-charging points where an electric vehicle can be charged within 15 to 30 minutes. This will involve around 900 locations in Germany where there are currently no fast-charging points or where the existing charging points are insufficient to meet the expected demand.

A white Tesla Model S is shown from a rear three-quarter view, driving on a road. The background features a landscape with green hills, a metal guardrail, and several wind turbines under a blue sky with light clouds. The car is in motion, as indicated by the blurred background.

With these factors in play, EV charging station producers are now off to the races to design and engineer EV charging stations in the most efficient way possible. But global factors like supply chain disruption, scarcity of component parts, and rising shipping costs have become important challenges for designers and engineers to overcome when specifying the products for electric charging station installation, renovation, and upgrades.

One solution to these challenges is partnering with an enclosure solution provider BEFORE you design your charging station, and a second solution is

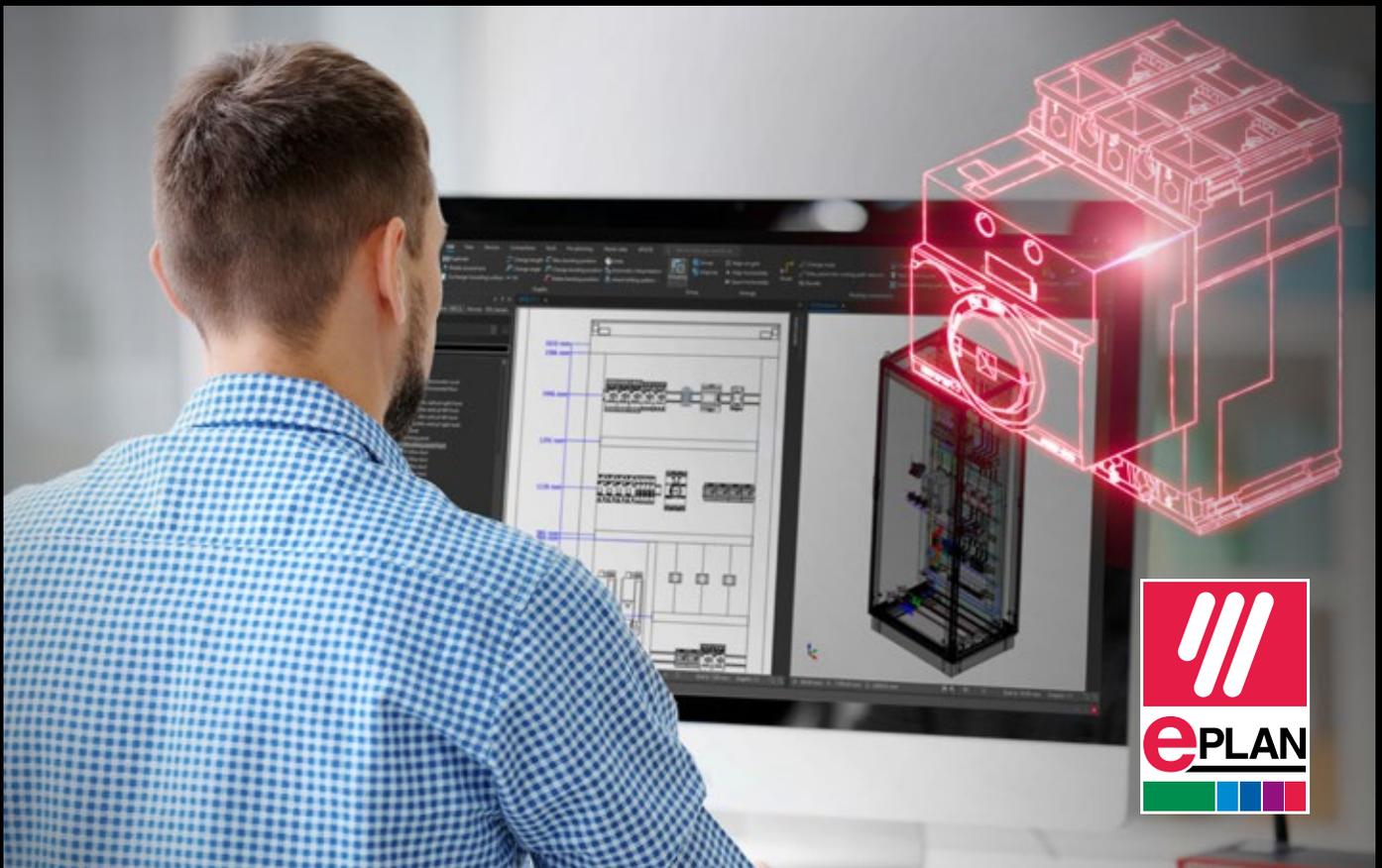
sourcing standardised enclosures and accessories that provide superior flexibility and capability for customisation. Both of these strategies help reduce costs, decrease lead time, and streamline the entire EV charging station design and engineering process.

To help today's engineers accelerate their EV charging station design, this guidebook will examine why standardisation is so important in designing EV charging stations and which standard products design engineers should be spec'ing if they want to be the first one across the finish line.

Why design with standard products in mind

Competition in the EV charging arena means that there is a need for customisation in order for station manufacturers to differentiate themselves. This can take the form of proprietary internal panel mounting and wiring, door and side panel customisation, and branding on the exterior of the enclosure in the form of paint or decals.

In addition, one of the biggest challenges for the automotive industry in facilitating electric vehicle charging stations is the sheer number of application variables, and the exacting specifications for each one. This requires industrial enclosures that offer flexibility in assembly, ease of integration, and environmental adaptability for use in any application.





Too many designers and engineers still believe they need custom industrial enclosures and accessories to meet the needs of individual conditions and overcome the challenges in electric vehicle charging station design. However, designing with standardised enclosures and parts actually provides several key benefits in helping engineers spec the right solutions for EV charging stations:

1 Interchangeability of panels and parts.

Modular enclosures — like the Rittal VX25 or CS Toptec — offer a standardised enclosure solution with interchangeable panels and parts to accommodate a variety of applications. The variety of mounting options allows for more varied wiring structures and increased capacity within the enclosure to house more complicated panel wiring. Plus, standard modular enclosures optimise efficiency by streamlining tedious, time-wasting manual processes that once required high degrees of human involvement and labour. Where space is at a premium and a reduced footprint is key, the VX25 and CS Toptec enclosures allow engineers to efficiently design while reducing overall footprint.

2 Same superior protection as unibody enclosures.

While unibody enclosures have long been considered the pinnacle of protection and durability, standard modular enclosures provide the same superior level of protection without sacrificing design and configuration flexibility. Double walled enclosures with IP and IK rating help EV charging station equipment to withstand common environmental elements. Additionally, modular enclosures are designed with strength in mind to combat the ingress of potentially harmful airborne agents, unauthorised access to the inside of the enclosure, and general wear and tear from long-term use.

3 Reduced lead time and cost.

Two of the biggest hurdles designers and engineers face in specifying enclosures for EV charging stations is long lead times due to complicated customisation tasks and increased expenditures stemming from labour shortages and rising material costs.

Designing around off-the-shelf products helps reduce your lead time by eliminating special modifications and the associated costs. Rittal's vast global manufacturing, distribution, and modification network includes over 65 subsidiaries and more than 8 production sites worldwide for local support helping to bring your supply chain to where it's needed — making it easier to get the right product quickly and efficiently. Speed-to-market is also increased as designers and engineers will be less reliant on the need for additional labour required to customise parts and products.

Designed and engineered applying Industry 4.0 and IIoT principles, standard modular enclosures, like the VX25 or CS Toptec, offer customisation via flexibility of configuration and part interchangeability without the complexity, cost, or hassle of a fully customised enclosure.



Easy, efficient charging station design

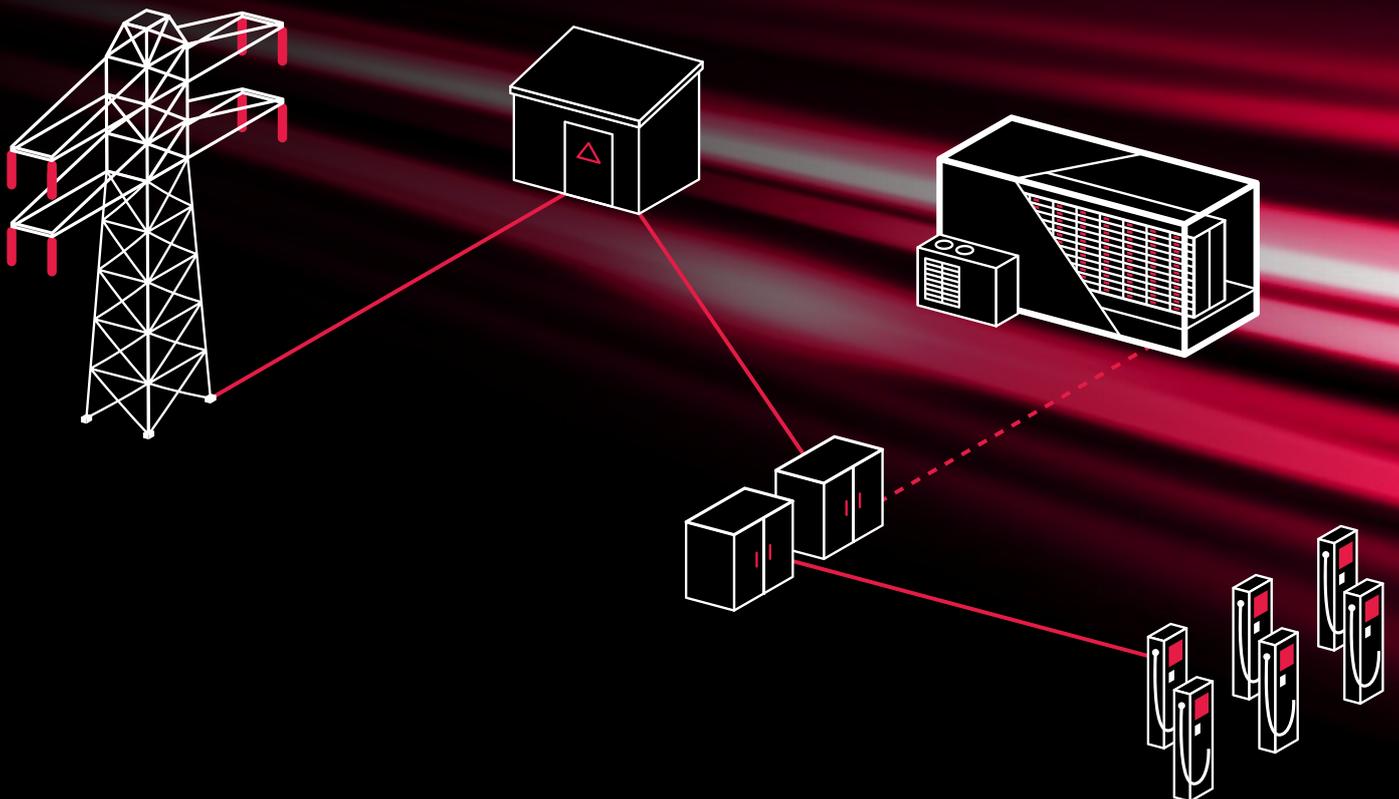
To understand the right solutions to spec when designing EV charging station equipment, you need to understand the different zones commonly found in today's charging stations. While there can be some differences in physical layout and infrastructure based on geographic, environmental, or regulatory standards, EV charging stations can generally be divided into three distinct zones

- **Front End** (charging point)
- **Infrastructure**
- **Low-Voltage** (main distribution)



Infrastructure

Considered the backbone of EV charging stations, the Infrastructure zone consists primarily of indoor and outdoor industrial enclosure solutions that protect mission-critical panels and wiring for the charging station to operate properly. The products required for this zone are large enclosure systems like the VX25, the VX SE free-standing enclosure system, and CS Toptec, though this zone can also include accessories like climate control units and power distribution systems.



Ideal solutions for **Infrastructure**

VX25 baying enclosure system

The VX25 baying enclosure system is ideal as a large enclosure for EV charging stations. The VX25 sets the standard in enclosure manufacturing: an enclosure frame with one or two front doors, rear panel, mounting plate, roof panel, and divided base panels. Bayability makes it perfectly suited for efficient expansion, and ease of assembly leads to time savings and increased safety.

VX25 with C4 coating and rain canopy

Engineered for outdoor use, the VX25 with C4 coating offers high durability and is suitable for environmental conditions classified as C4 (high corrosivity). The VX25 range offers a number of accessories to suit a variety of applications and environments.

VX SE free-standing enclosure system

This free-standing enclosure system consists of a stable enclosure body, two integral mounting levels, and screw-fastened rear panel and door. Fully compatible with the VX25 baying system, VX SE enclosure widths range from 600 to 1800 mm and offer space-saving depths of 300 mm for flexible configurations.

Ideal solutions for **Infrastructure**



CS Toptec enclosure

Stainless steel and aluminium construction with a powder-coated, UV-resistant pure polyester finish uniquely position the CS Toptec enclosure as the product of choice for EV charging station equipment. An aluminium rain canopy with an overhang on all sides of the enclosure and fully doubled-walled doors, side panels, and rear panels offer IP55 protection for components housed inside the enclosure. From a mobility standpoint, the CS Toptec comes standard with 100 mm transport base/plinth to help charging stations adapt to changes in physical footprint.

The CS Toptec is available as a free-standing enclosure that can easily be equipped using interior installation rails or punched sections to fully optimise both durability and flexibility of configuration.



RiLine busbar system

RiLine busbar power distribution allows for tool-free, plug-and-play capability for rapid, globally-approved use. Our RiLine busbar systems are available in standard models with options with rated currents up to 1600 A that meet or exceed the required short circuit withstand current ratings (i.e. up to 65 kA according to UL 508A). Standard components are UL Listed and compatible for optimised use with both AC and DC applications.

From a user and equipment safety standpoint, RiLine systems provide mission-critical all-around contact protection for a safer environment on the charging station floor and help to prevent unnecessary downtime or disruption due to electrical fault or arcing. Our busbar solutions also provide enhanced safety via a full-contact hazard protection system.





Climate Control Units

Efficient climate control units that promote sustainability and decrease costs through reductions in energy usage are a key ingredient that cannot be overlooked when spec'ing products for EV charging stations. Keeping enclosures and their interior components at optimal operating temperatures will help ensure a longer service life of the charging station and the equipment that enable the station to work.

Rittal cooling units like the Blue e+ S use innovative cooling technology via a hybrid cooling process that increases airflow throughout the enclosure. A combination of active and passive cooling mechanisms provides precise, consistent cooling outputs that can reduce energy usage by up to 75%. Plus, our innovative range of climate solutions including air/air or air/water heat exchangers, chillers, and fan-and-filter units help EV charging stations create consistent, reliable enclosure cooling for long-term production and energy savings.

It's also important to consider enclosure heating units for EV charging stations that operate in winter conditions. The modular design and engineering of Rittal's enclosure heating solutions provide a variety of fan integration options, continuous thermal output with a variety of power categories, dynamic thermostat interfaces, and aluminum construction for ease of installation.

Additionally, Rittal's enclosure heaters combine state-of-the-art targeted heating with the ability to scale your heating solution no matter the application to regulate relative humidity, prevent temperatures from dropping below optimal dewpoints, and help eliminate corrosion and other electrical failures from condensation buildup.



Front End (charging point)

Also referred to as the charging point of the EV station, the Front End is essentially the point of contact between the customer and the charging station. As a result, the Front End includes small and compact industrial enclosures such as the Rittal AX and KX. The layout of the Front End can be

centralised or decentralised with the main difference between the two being the physical location of the charging point. Because the Front End is the area nearest the end user, security of the enclosure is a top priority to prevent unauthorised access to the components contained within the enclosure.





Ideal solutions for Front End

Because the Rittal AX compact enclosure is designed and engineered based on Industry 4.0 and IIoT principles, the AX allows for configuration and location versatility as well as flexibility to help manufacturers seamlessly integrate the enclosure into nearly any automation infrastructure. Tool-free cam and door locks make safe, secure installation a breeze, and the AX also ensures application flexibility through:

- **A variety of mounting capabilities without the need for tooling or machining**
- **33% larger gland plates for more flexible cable entry and wiring**
- **Easy door and hinge assembly reversal, even with double-door enclosures**

Available in sheet steel and stainless steel as well as fibreglass reinforced polyester, the AX can be deployed in both indoor and outdoor environments with IP66 and IK 10 protections for superior durability and reliability.

Ideal solutions for **Front End**



CS Toptec Enclosure

The double-walled design of the CS Toptec's side panels, doors, and rear panels not only provides superior durability in outdoor locations, but the stability and rigidity of the design helps increase protection for the sensitive components housed inside the enclosure. Plus, a 3-point latching lock brings an additional level of security for the Front End area, and a base and plinth with screw-fastened gland plates allow for increased mobility and simplified earthing to safeguard against accidental electrical faults.

Thanks to the extensive range of system accessories, all Rittal enclosures offer the advantages of our modular system. The entire interior design, from mechanical components to power distribution and climate control, can be installed in them.

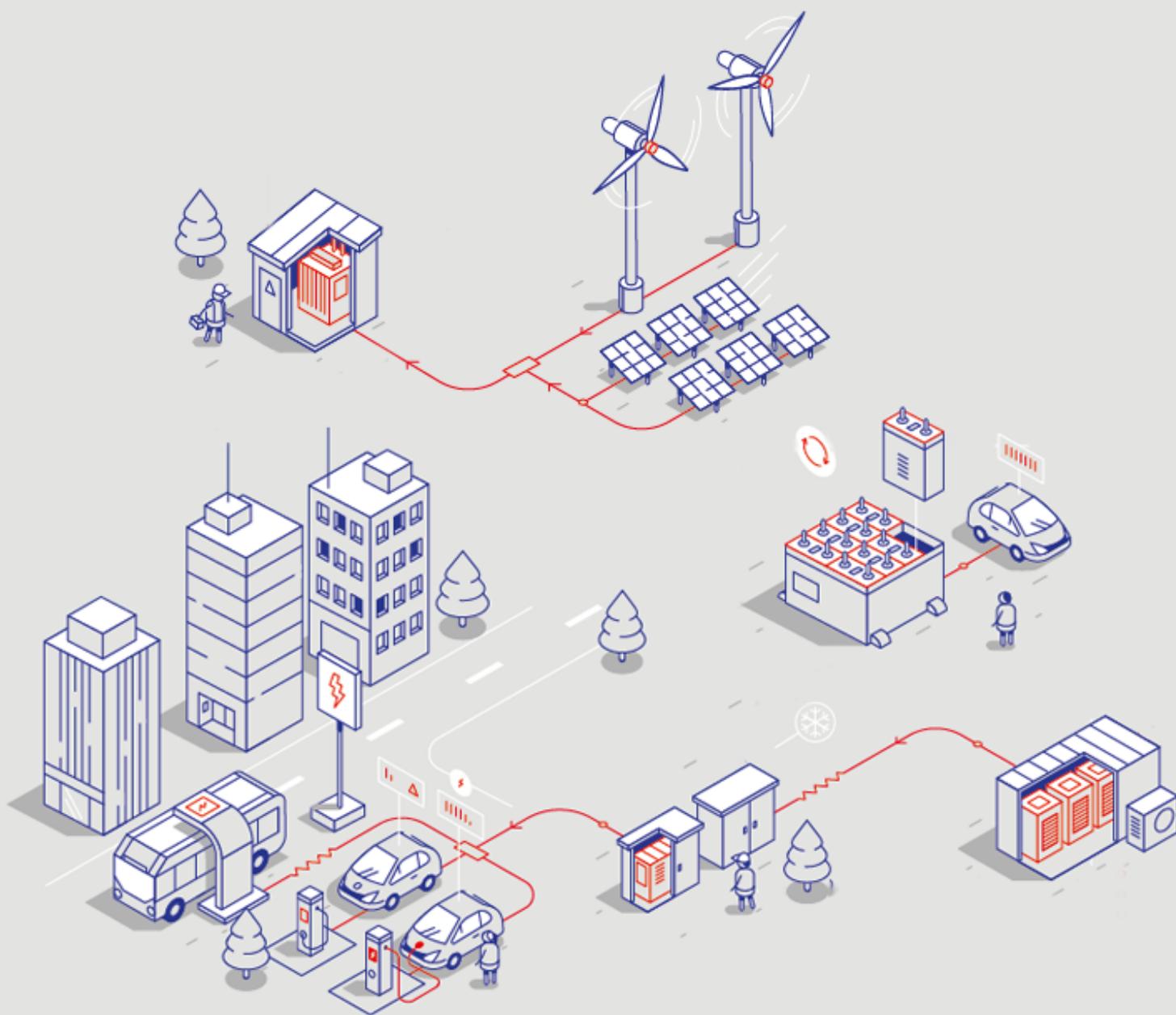


According to the International Energy Agency, **EVs will represent more than**

60%

of cars sold globally by 2030 — and will require a **significant boost in charging infrastructure.**

Low-Voltage (main distribution)



The Low-Voltage Main Distribution zone helps protect the downstream components against the feeding network — in essence, this section acts as a buffer zone between the charging station itself and the main power source providing electricity to the individual charging units. As such,

the enclosures and accessories within this area must adhere to a variety of global certifications for low-voltage electrical currents, and they must also be compatible with the required busbar power systems used in the Infrastructure zone.

Ideal solutions for the **Low-Voltage** zone



Ri4Power VX25 Enclosure

Designed and engineered to IEC 61 439-1/-3 and DIN EN 61 439-1/-2 compliance, Rittal's Ri4Power VX25 enclosure can easily accommodate a variety of Rittal busbar power solutions such as the RiLine, Maxi-PLS busbar system, and Flat-PLS busbar system for efficient low-voltage power distribution and protection to the other two charging station zones. Additionally, the Ri4Power VX25 is ideal for use as a control system and energy distribution device up to 5500 A for superior flexibility and scalability in charging stations.



Ri4Power ISV Distribution Enclosure

Rittal's Ri4Power ISV distribution enclosure is connected behind the Low-Voltage Main Distribution Zone and helps to mitigate the flow of electrical current to downstream supply based on demand and protection from accidental faults. For flexibility in configuration and the ability to scale on demand, the Ri4Power ISV can be bayed similarly to the VX25 and features many of the same modular enclosure design features such as easily removable and reversible doors and panels.

Designed to IEC 61 439-1/-2 compliance, the Ri4Power ISV includes a contact hazard protection frame for quick streamlined installation of ISV assembly modules. With NEMA 12 and IP55 ratings, the Rittal Ri4Power ISV is the ideal distribution enclosure for today's EV charging stations.

Next steps

Partnering with Rittal on the equipment
for your EV charging station solution



 Learn more at www.rittal.com

It's clear that the future of the automotive industry is coming around the bend fast. While many of the federal incentive programs or grants for the widespread adoption of electric vehicles have deadlines that are still 5 or even 10 years away, the time is now to build an efficient, powerful network of EV charging stations to help drive the continued growth and expansion of the electric vehicle market.

In order to achieve this, designers and engineers charged with spec'ing the products and solutions for these stations need enclosure manufacturing partners that can provide standard products engineered around flexibility, efficiency, and speed-to-market.

Plus, today's designers and engineers need partners who can help guide them from the very beginning of the design process in order to help ensure the right products are being spec'd based on the needs of the EV charging station company — and those needs can vary from customisation in branding to unique environmental challenges that must be overcome.

With more than 60 years' experience of manufacturing enclosures in Europe and around the world, Rittal has the field-proven expertise and knowledge to help EV charging station designers and engineers work more efficiently than ever before. Rittal's commitment to innovation has helped drive the ongoing evolution of the modern industrial enclosure and changed the perception of what the right enclosure can do to help companies achieve in today's manufacturing landscape.

Partner with Rittal on the enclosures, climate control units, busbar power systems, and accessories needed to bring an EV charging station online with speed, precision, and efficiency. With Rittal, you'll have the user-friendly tools and products to help get the job done.



Rittal worldwide

Rittal is on your doorstep, wherever you are in the world: From Herborn in Hesse, Germany, to Valeggio in Italy, to Bangalore in India.

More than half of our 9,200 employees work outside of Germany. Our more than 65 subsidiaries are in close proximity to our customers, true to the company motto: Faster – Better – Everywhere.

Rittal provides innovative, high-quality solutions for practically any industrial or IT infrastructure application, from single enclosures to comprehensive, mission-critical systems. Products are tested and certified to the appropriate standards that apply, including UL, CSA, ATEX, NEMA, and more. For more information, visit rittal.com or follow us on [LinkedIn](#), [Twitter](#), [Facebook](#), and [Instagram](#).



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