Electric Vehicle (EV) Charging Station Solutions

The OEM and Installers Guide to Control Components for Electric Vehicle Supply Equipment (EVSE)



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Everything under control.

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About c3controls

Since 1976 c3controls (c3controls.com) has provided OEMs and electrical equip-ment builders a comprehensive portfolio of industrial control products that meet the most demanding applications. By maintaining strict control over the development and manufacturing of all products, c3 can provide customers extraordinary value through unmatched quality, competitive pricing, same-day shipping and a 36-month product warranty. This vertically integrated approach coupled with a direct sales model brings c3 closer to the end-user, fostering a degree of innovation that leads the industry.



Glossary of EV Terms

Bidirectional Charging:
EV charging that goes two ways - from the electric grid to the vehicle and vice versa. Associated terms include V2G (vehicle-to-grid) and V2X (vehicle-to-everything).

Combined Charging System (CCS):
The North American fast-charging standard, this connector combines the J1772 charging inlet with high speed charging pins to deliver up to 350 kW of direct current.

Connector:
A plug on a power cord that connects the supply device to the EV charging outlet.

Electric Vehicle Supply Equipment (EVSE):
Devices that help provide power to an electric vehicle in order to recharge the vehicle's battery.

Infrastructure Investment and Jobs Act (IIJA):
Also known as the Bipartisan Infrastructure Bill, this law was approved in November 2021 and allocates a total of $7.5 billion to build out a nationwide network of over 500,000 EV charging stations.

ISO 15118:
An international standard that outlines the communication protocol between an EV and EVSE to enable a seamless plug & charge experience.

Kilowatts (kW):
A measure of power - the higher the kW the faster an EV charging station can charge the vehicle.

Kilowatt-hours (kWh):
A measure of energy or battery capacity - the higher the kWh the greater the EV driving range.

Level 1 Charger:
The slowest method of EV charging, this charging accessory plugs into a standard 120VAC household outlet.

Level 2 Charger:
The most common method of EV charging, this 208/240VAC charging unit is an excellent solution for both residential and commercial applications.

Level 3 Charger:
Also known as 'Direct Current Fast Chargers' (DCFC), these charging stations supply direct current directly to the EV battery for the fastest method of EV charging.

NEC Article 625:
The National Electric Code is the United States adoptable standard for safe electrical design, installation and inspection. Article 625 covers electric vehicle charging.

Open Charge Point Protocol (OCPP):
A standard developed to provide a central management system, or charging station network, for communication between EV charging infrastructure companies.

SAE J1772:
Set by the Society of Automotive Engineers, this connector is the North American standard for Level 1 and Level 2 alternating current EV charging.

Smart Charging:
Real-time communication between an electric vehicle, a charging station and a charging operator in order to monitor, forecast, schedule and completely control the EV charging process.

Solar + Storage:
A method of charging an EV with solar panels and an energy storage system for added energy cost savings, convenience, government incentives and credits, and increased property value.

UL:
Underwriters Laboratories is the largest component and product testing lab in the world. UL has certifications for EV charging such as UL 2594 (AC charging), UL 2202 / UL 2231 (DC charging) and UL 9741 (bidirectional charging).



Accelerating EV Adoption

Today there are well over 2 million EVs on the road in the United States alone. A number that will shortly double and continue to rise at an extraordinary rate. However, at c3controls we believe that good isn't good enough. There is much work to be done to support and accelerate the growth of the EV industry and a more sustainable future.

We must start by overcoming the concept of range anxiety — a driver's fear that their electric vehicle will run out of power before they are able to reach a suitable charging point. This concern is being alleviated through a significant ($7.5 billion!) investment in electric vehicle supply equipment (EVSE) to improve the availability and reliability of EV charging stations.

If consumers know they will have a place to charge, they will be more likely to make the switch to an electric vehicle. Therefore, the EV industry is dependent on the EVSE market and the availability and quality of the components used to manufacture and support all types of EV charging stations, such as:

- Level 1 AC Chargers
- Level 2 AC Chargers
- Level 3 DC Fast Chargers
- Wireless Chargers
- Solar Panel Systems
- Energy Storage Systems

A variety of charging options creates opportunities for manufacturers and equipment builders. With the right components, reliable supply, and responsive support, your EV charging application can be built to meet the demands of a rapidly evolving market.

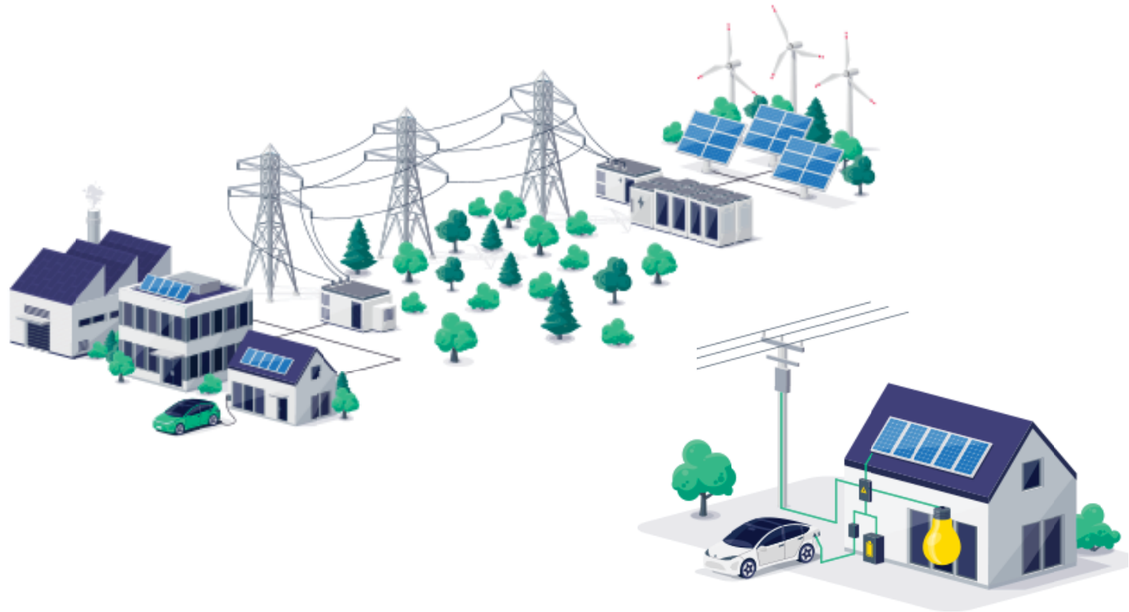
This is where c3controls can help. With more than 50 years of experience manufacturing quality electrical controls, we maintain strict control over our manufacturing processes to deliver reliable products for demanding applications. Our vertically integrated approach allows us to operate efficiently, respond quickly to changing market conditions, and provide the electrical control products you need with fast delivery.

With over seventeen million product configurations from c3controls and custom UL 508A-certified panel solutions from Covenant Panelworks (CPW), you have a trusted source for complete electrical control solutions. Contact us today and discover how our expertise can help you build reliable, efficient EV charging solutions and capitalize on opportunities in this growing market.

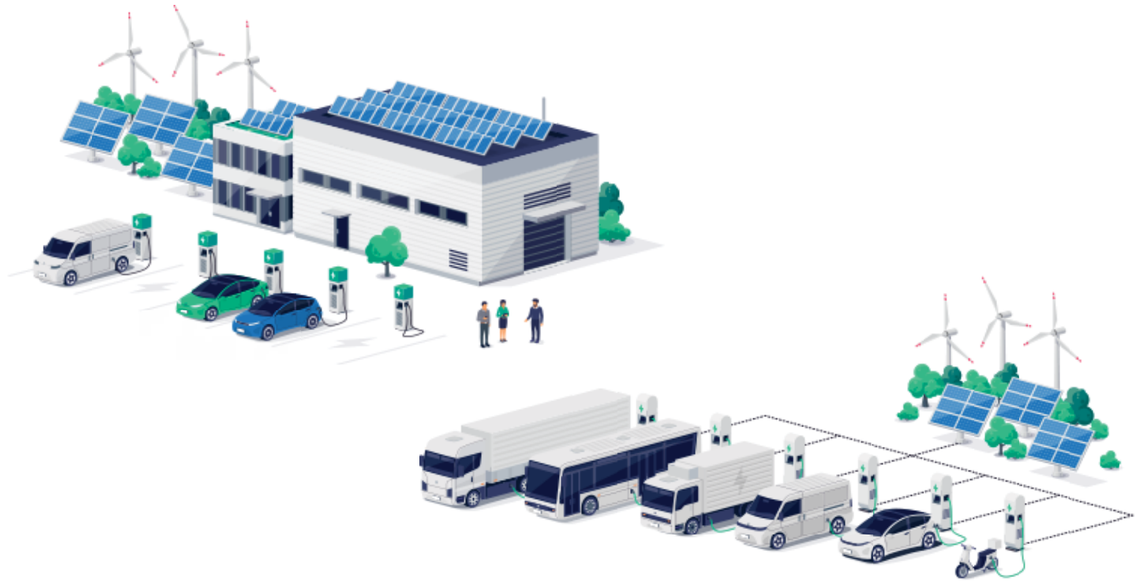
EV Isometrics

c3controls has component solutions for AC charging stations, DC charging stations, solar panels and energy storage systems in both residential and commercial applications!

Residential

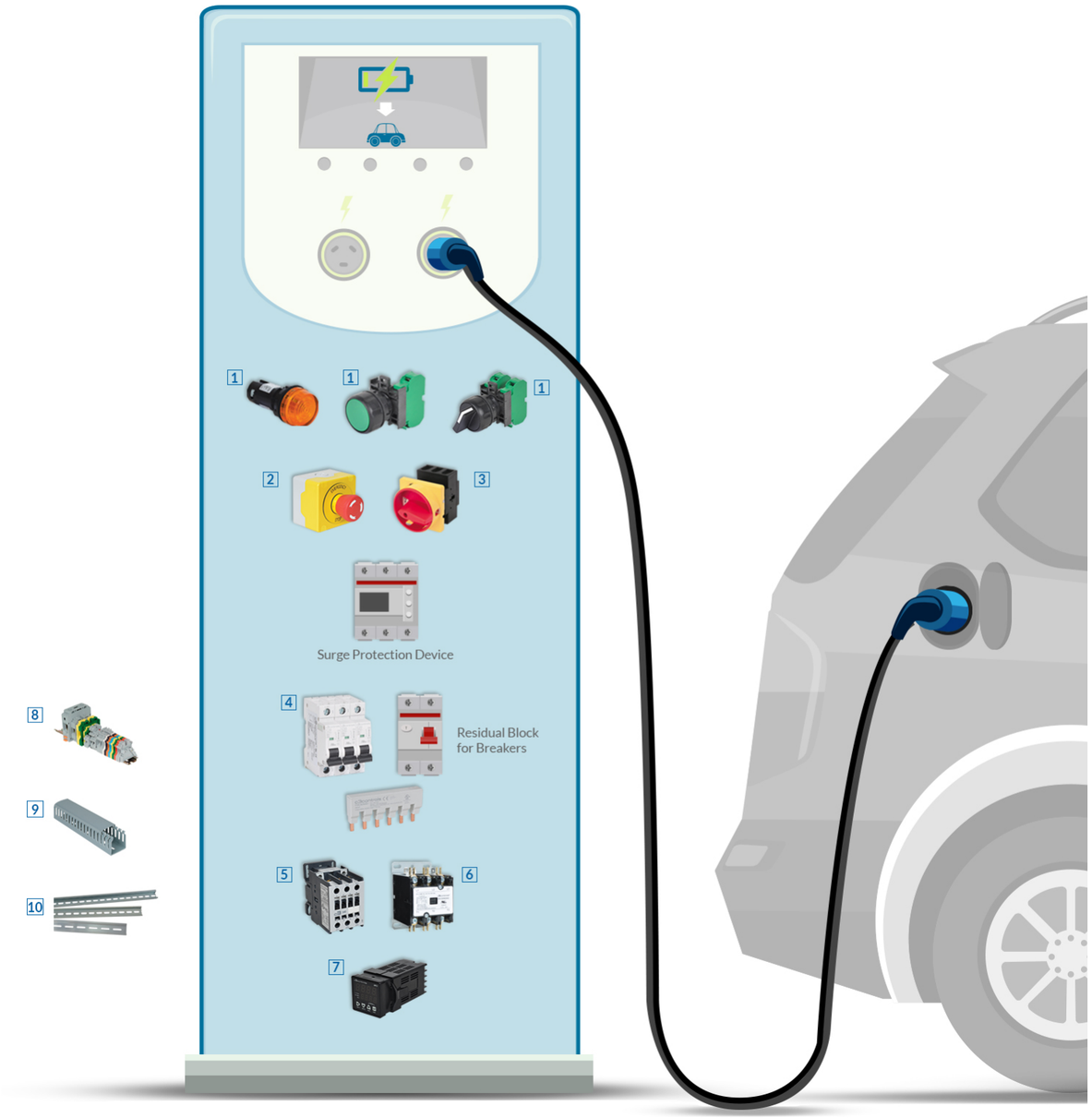


Commercial



Charging Application Overview and Control Components

c3controls has the component solutions for all your EV charging needs.



1 	**Pilot Devices**	Modular range of 30mm, 22mm, 16mm, and 13mm	Type 1, 2, 3, 3R, 4/4X, 12, and 13	Non-Illuminated, Illuminated and Keyed Operators in both maintained and momentary operations	Color-coded snap-on contact blocks with angled captive screws and pressure plates	Full voltage, multi-voltage, resistor, and dual input light units in a wide range of voltages up to 600VAC/VDC
2 	**22mm IEC E-Stops**	Non-Illuminated and Illuminated versions	UL Listed Polycarbonate enclosure rated for Type 1, 2, 3, 3R, 4/4X, 12, 13, and IP66	Meets EN418 Safety of Machinery global compliance standards	Operating temperatures from -40 to +55° C (-40 to + 131° F)	UV and corrosion resistant
3 	**UL 508 Disconnect Switches**	Door mount, panel-base mount, and panel mount with integral operator	Certified for use in Manual Motor Controller applications suitable as Motor Disconnects	16 - 125 Amps in 3-, 4-, and 5-pole configurations	Motor loads up to 40HP @ 480V (55kW @ 400V)	Operating handles rated for Type 1, 2, 3, 3R, 4/4X, 12, 13, IP55, and IP65
4 	**Miniature Circuit Breakers**	UL 489 & UL 1077	1, 2 and 3 Pole combinations	10kA SCCR @ 480Y/277VAC	Current ratings up to 63 Amps	B, C and D curve ratings
5 	**IEC Contactors**	9 to 105 Amps	100kA SCCR @ 480V and 600V with Class J fuses	AC and DC - electronic coil control on DC devices	Integral auxiliary	Up to 75 HP @ 400V (55kW @ 400V)
6 	**Definite Purpose Contactors**	20 to 90 Amps	1, 2 and 3 Pole combinations	FLA up to 600VAC	24VAC, 120VAC, 208-240VAC, and 277VAC	Quick connect and box lug wire terminals
7 	**Electronic Timing Relays**	Compact design, sizes in 17.5mm, 22.5mm, and 45mm wide	Single, dual and multi-functions	Timing ranges from 0.01 seconds to 9,999 hours	DIN Rail, Panel, Socket, and enclosure door mountings	Voltage inputs 20-240 VAC and 12-240 VDC
8 	**IEC Terminal Blocks**	Screw Clamp, Spring Clamp, and Miniature	5mm to 25mm widths	25 to 230 Amps	Feed Through, Ground, Multi-Conductor, Double & Triple Level, Fuse holder, Power Distribution, and more	DIN Rail mounting; snap-on, snap-off assembly
9 	**Wire / Cable Duct**	13 Selectable dimensions from 25mm wide up to 80mm, and up to 2m in length	Narrow and Wide Slot	Rigid “U” shaped duct with non-slip cover in gray or white	Optional adhesive backing	
10 	**DIN Rail**	35mm rails in steel and aluminum	1m (3.28ft) or 2m (6.56ft) lengths	Each simply fasten by screws to the mounting surface	Standard package quantities, or pallet options available	

*For illustration purposes only. Other **c3controls** solutions may be applicable depending on your application design requirements.*

EV White Papers

Product professionals AND subject experts! Check out c3controls' extensive library of EV white papers:



EV Charging Guide

Charging your electric vehicle is super easy with this complete step-by-step guide that covers all key things related to electric vehicle charging. Learn the basics, including what you should know before you charge and which chargers work with your type of car.

READ WHITEPAPER



Understanding the Design and Manufacture of Electric Vehicles - New Trends in Technology

Read our paper on EV Design & Manufacture to learn how today's EVs are designed & manufactured and how everyone will play a part in the ever-growing EV market.

READ WHITEPAPER



Top 10 FAQs for EV Charging at Home

Looking for a home EV charger but you've got big questions? Don't worry, we answer 10 frequently asked questions about home EV charging.

READ WHITEPAPER



Top 10 FAQ's for Public EV Charging

If you own an electric car, public EV charging is important to know, but it can also be an overwhelming and confusing experience for the uninitiated. Here's a list of FAQs to help you out!

READ WHITEPAPER



Understanding Electric Vehicles Infrastructure - New Trends in Technology

While they seem recent, electric cars are not a new invention. Some of the first motorized vehicles used electric motors and batteries to power them. The movement away from fossil fuels has fostered innovation in battery technology. EV's today are going to require significant investment in charging technology and infrastructure.

READ WHITEPAPER



PHEV and EV are the Future

Electric Vehicles are changing the transportation industry. There are no less than fifteen EV models available for sale in the US today, and more are coming. Add to that the growing number of PHEV's (Plug-in Hybrid Electric Vehicles) and the market opportunity for charging stations is exploding. If you are an OEM looking to get a basic understanding of this industry, or just someone with an inquisitive mind, this paper is for you.

READ WHITEPAPER

Infrastructure Investment & Jobs Act (IIJA)

The IIJA invests $7.5 billion in the development of EV chargers. Public or private sector, your business could meet the criteria or explore a public-private partnership needed to access a portion of these federal funds. Here is a funding breakdown:

- **$5 billion** in state allocated funds to strategically deploy an interconnected network of EV charging stations.
- **$2.5 billion** in discretionary grants for states, counties and other public authorities.
  - $1.25 billion to build EVSE along designated alternative fuel corridors.
  - $1.25 billion to provide community grants for more convenient charging.

With a goal of initiating charging port installations by early 2023, make sure you stay on top of IIJA applications and implementation!



Product Portfolio

Our 17 million+ product configurations deliver durability and reliability—even in the most punishing environments—meeting and exceeding global standards for quality and safety.



DISCONNECT SWITCHES
NON-FUSED & ENCLOSED



MINIATURE CIRCUIT BREAKERS



CONTACTORS & CONTROL RELAYS



OVERLOAD RELAYS



DIRECT-ON-LINE STARTERS
CONTACTOR + OVERLOAD RELAY



ENCLOSED DIRECT-ON-LINE STARTERS
CONTACTOR + OVERLOAD RELAY

MOTOR PROTECTION CIRCUIT BREAKERS
OPEN & ENCLOSED



DIRECT-ON-LINE STARTERS
MOTOR PROTECTION CIRCUIT BREAKER + CONTACTOR



ENCLOSED DIRECT-ON-LINE STARTERS
MOTOR PROTECTION CIRCUIT BREAKER + CONTACTOR



30MM PILOT DEVICES
FOR INDUSTRIAL & HAZARDOUS LOCATION



22MM PILOT DEVICES
IEC & NEMA



WORLD TOWER LIGHTS



CAM SWITCHES



16MM PILOT LIGHTS



13MM PILOT LIGHTS



CONTROL STATION ENCLOSURES



ENCLOSED UL508A COMBINATION MOTOR STARTERS



ENCLOSED POWER SUPPLIES



VFD BYPASS PANELS



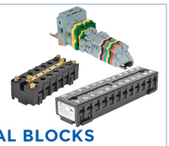
INDUSTRIAL POWER SUPPLIES



CONTROL CIRCUIT TRANSFORMERS



CONTROL POWER TRANSFORMERS



TERMINAL BLOCKS



TERMINAL BLOCK RELAYS



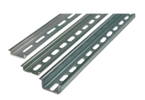
ELECTRONIC TIMING RELAYS



GENERAL PURPOSE RELAYS



WIRING DUCT



DIN RAIL

Why choose c3controls



Integrated Manufacturing

Vertical integration is the cornerstone of c3controls as it places innovation, development, design, manufacturing, testing, and shipping all within our control. With Everything Under Control, we can ensure the highest quality and customer satisfaction.

Innovation

Product innovation is in our DNA. We approach our products as solutions. Unlike our competition, our business model allows us to provide customers with premium controls without the premium price.





Same-Day Shipping

Reduce inventory. Improve cash-flow. Save money. Our customers enjoy peace of mind knowing they'll get what they need, when they need it. Our promise, guaranteed!

36-Month Warranty

With total control over engineering and manufacturing, we are able to guarantee the highest quality products on the market—products free of defects in material, workmanship, and design.





Advantage Pricing

Total control means lower overhead and direct sales. For our customers, this translates to savings of up to 40+% on c3controls premium products.

Customer First

Commitment to the success of our customers is a core value and the driving force behind all we do. We promise concierge style service that makes doing business easy, personalized, and responsive.



724.775.7926
www.c3controls.com





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