Electric Vehicle Chargers

2023

VESTEL

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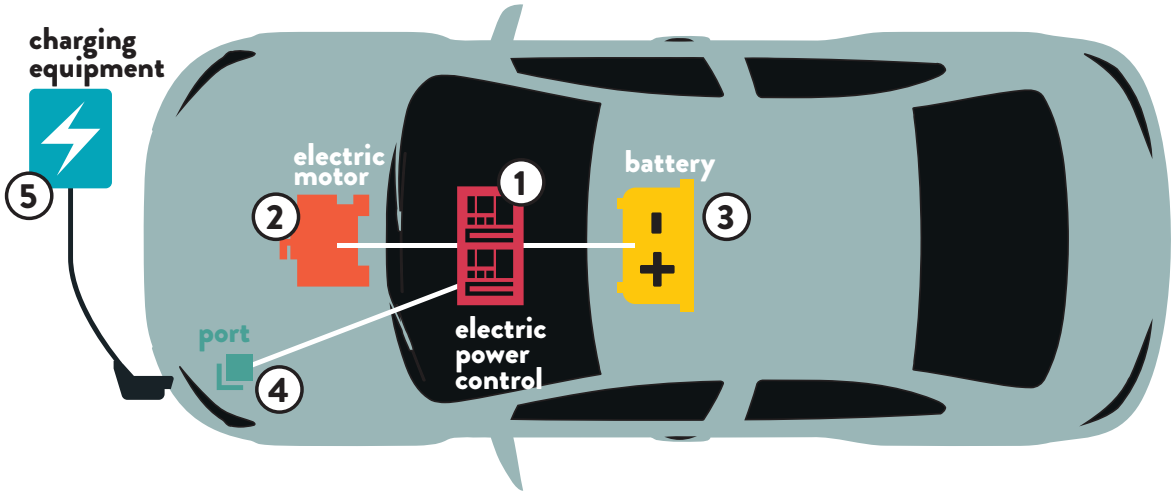
Electric Vehicle Chargers


EVC04
Waiting for Eco Charge
Remaining Time
2 h
Charge Duration
2 h
Charge
OFF
20 A
VESTEL

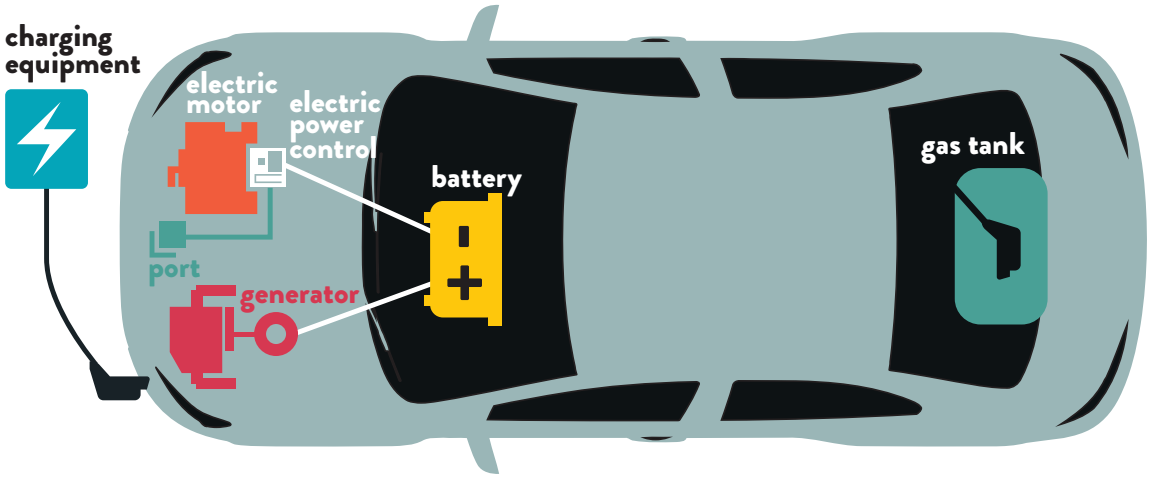
1. EVC Basics

1.1 What is an EV?

Battery Electric Vehicle (BEV)



Plug-In Hybrid Electric Vehicle (PHEV)



1

On board charger and Battery Management System

On board charger and the BMS define the EV's maximum charging power and also manage the charging sequence of the batteries.

2

Electric motor(s)

BEVs may have 1 or more electric motors depending on manufacturers decisions.

3

Batteries

Batteries may have different technologies. Most common type is Li-ion batteries which we are using almost in every daily used devices such as mobiles and laptops. Battery capacity has an important effect on range.

4

AC or DC connectors

There are different types of connectors depending on car manufacturers and also geographical place of the vehicle. (same car model have different connector type depending on country)

5

AC or DC charging equipment

All BEVs needs to be plugged to electrical power supply. Depending on availability and compatibility of the vehicles this charging equipment can be an AC or a DC charger.

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1.2 What defines an EV's range?

Weight

Increase in weight reduces the range.

Performance need

Quick accelerations and high speeds consumes more energy and shortens the range.

Battery Capacity

Battery capacity is shown by kWh and determines the total deliverable electric power to the cars engine. Higher capacity provides higher range.

Weather conditions

The general range information shared by car manufacturers is valid for mild weathers (~23C). Extreme cold and hot weathers have an important effect on range. Cold weather has bigger effect on reducing the range".

1.3 Where to charge EVs?

Home charging

Private Home
Charger installed in the garage.

Condominium
Charger installed in the private parking place indoor or outdoor.

Workplace charging

Workplaces started to offer charging facilities to their employees and visitors (free or paid). Also company EV fleets require charging points for them.

Destination charging

Private or public parking places have started to offer charging services. These facilities may require membership or can be accessible by all EV drivers. Shopping malls, hotels, restaurants are also offering charging services to their customers.

En-route charging

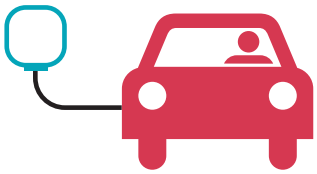
These are generally fast DC chargers which allow EV drivers to charge their cars for an important range in a considerably short time (app. 30 min.)

1. EVC Basics

1.4 Charging EV

Effective charging capacity is determined by the least powerful equipment in the charging system.

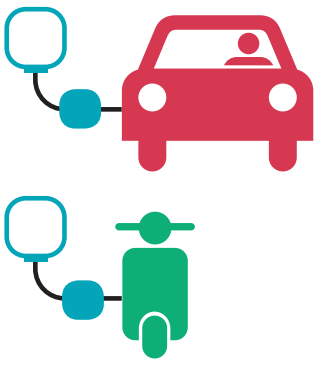
Charging system components are charger, cable and onboard charger of the vehicle.



MODE 1

Domestic socket and extension cord

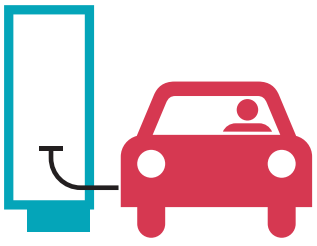
This an AC charging method generally used by small e-bikes, mopeds. Domestic socket and simple cable used. Prohibited in some countries including USA.



MODE 2

Domestic socket and special cable with control device

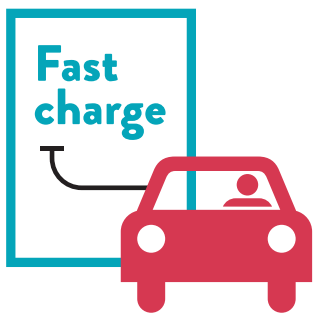
This is an AC charging method where the charge monitoring device placed on the special charging cable.



MODE 3

Specific socket on a dedicated circuit

This is an AC charging method which is recommanded for everyday charging. Dedicated charging socket with charge monitoring functions. Dedicated charging cable is used.



MODE 4

Direct current (DC) connection for fast charging

This is a DC charging method where the off-board charger used to charge the batteries fastly. There are different connector types. Most commonly used connectors are CHAdeMO and CCS2 (Combo).

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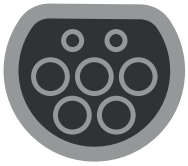
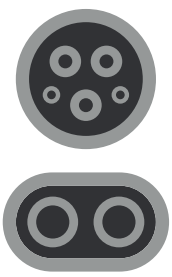
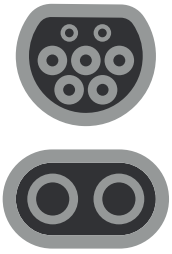
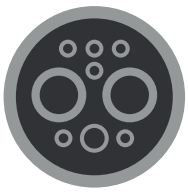
On board charger	Cable	Chargepoint	Effective charging cap.
11 kW	22 kW (Mode 3)	22 kW	11 kW
22 kW	7,4 kW (mode 3)	22 kW	7,4 kW

	Level 1 (AC)	*Level 2 (AC)*	*Fast Charging (DC)*	*Ultra Fast charging (DC)*
	Up to 3,7 kW	7-22 kW	60 kW	120+ kW
	5-16 hrs	1-5 hrs	20-75 mins	10-45 mins
	10-20 km range per hour	30-120 km range per hour	250-500 km range per hour	~1000 km range per hour

Connector Types

Connectors varies by region, by charging current and also by car manufacturer

	N. America	Japan	EU *and the rest of markets*	China
AC	 J1772(TYPE1)	 J1772(TYPE1)	 TYPE2	 GB/T
DC	 CCS1	 CHAdeMO	 CCS2	 GB/T

2.1 EVC 04

Highlights

Best in Class Flame Retardant 5VA Plastic Housing

Remote control
via Drive Green app

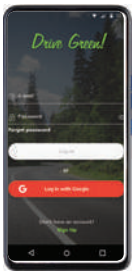
Remote Diagnostics
over OCPP

Remote SW update
via OCPP or web interface

Dynamic Load Management
via Ethernet, Wi-Fi, RS485 or OCPP

E.V.READY

Z.E. READY



Control your charging station via Drive Green App. You can remotely start, stop or delay your charging session via home network. (see details in drive green section)

Linky

EVC 04 series can manage the TIC signal from Linky electric meters in order to manage on-peak, off-peak hours charging automatically. This helps to reduce the charging cost.

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Main Features

Part	Type	EVC04-AC7	EVC04-AC22
Electrical	Power	7.4 kW max	22 kW max
	Voltage	230V AC, 50/60 Hz, 1-Phase	400V AC, 50/60 Hz, 3-Phase
	Current	1 x 32A max	3 x 32A max
	Power Level Control	10-13-16-20-25-30-32A	
	Socket Type	IEC 62196 Type 2 EU	
	Authorization	Built-in RFID Reader (ISO 14443 A/B and ISO 15693)	
	Protection	Built-in DC 6mA RCD function	
	Certification	UL, CE, IEC 61851-1, IEC 61851-22, IEC 60950-1, IEC 60950-22	
Mechanical	Material	PC Plastic, 5VA Flame Retardant	
	Dimension (HxWxD) mm	460x315x135	
	Weight (Net)	4.8 Kg	5.0 Kg
Enviromental	IP Rating	IP54, NEMA 3S	
	IK Rating	IK10*	
	Operating Temperature	-35°C to +55°C	
	Storage Temperature	-40°C to +80°C	
	Humidity	5%-95% Relative Humidity, non-condensing	
	Altitude	0-4000m	

Optional Features

Part	Option	Type
Connectivity	Ethernet	RJ45 - 10/100 Mbps
	Serial Interface	Modbus / M-Bus over RS485
	Wi-Fi	802.11 a/b/g/n/ac
	LTE	4G/3G/2G
	Network Protocol	OCPP 1.6 JSON
Authorization	Multi-standard RFID	ISO-14443A/B and ISO-15693
	NFC	ISO/IEC 18092 – ISO / IEC 21481
Safety	Built-in RCCB	Type-A High Immunity
Interface	Shuttered Socket	Type 2
	Built-in Cable	J1772 Type 1 / Type 2 Tethered Plug
	Display	4.3" TFT LCD Display
	Measurement	Built-in MID Meter (Eichrecht Conformity)
Stand	Pole Mount	Rectangular or Oval

** IK08 for display*

2.2 EVC 05

Highlights

Vandal-proof metal body

Easy Installation & Service

Remote Diagnostics
over OCPP

Remote SW update
over OCPP

Dynamic Load Management
via Ethernet, Wi-Fi, RS485 or OCPP

10.1" Touchscreen Display

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Main Features

Part	Type	EVC05-AC22
Electrical	Power	Dual 22kW output (Total 44kW)
	Voltage	400V AC, 50/60 Hz, 3-Phase
	Current	Dual 3x32A
	Power Level Control	10-13-16-20-25-30-32A
	Socket Type	2 x IEC 62196 Type 2 EU
	Authorization	Built-in RFID Reader (ISO 14443 A/B and ISO 15693)
	Connectivity	Ethernet: RJ45 - 10/100 Mbps
		Serial: Modbus / M-Bus over RS485
		Internal USB 2.0 port
	Protection	Built-in DC 6mA RCD function
		Built-in RCCB Type A High Immunity
		Built-in MCB 40A Type C
	Measurement	Built-in Class B MID Meter
	Certification	CE, IEC 61851-1, IEC 61851-22, IEC 60950-1, IEC 60950-22
Mechanical	Material	Full Metal Body
	Dimension (HxWxD) mm	1530x575x200
	Weight (Net)	65 kg
Environmental	IP Rating	IP54
	IK Rating	IK10*
	Operating Temperature	-25°C to +50°C
	Storage Temperature	-40°C to +80°C
	Humidity	5%-95% Relative Humidity, non-condensing
	Altitude	0-3000m

Optional Features

Part	Option	Type
Connectivity	Wi-Fi	802.11 a/b/g/n/ac
	LTE	4G/3G/2G
	PLC HLC	ISO 15118
	Network Protocol	OCPP 1.6
Authorization	Multi-standard RFID	ISO 14443 A/B, ISO 15693, ISO 19092
Safety	RCCB reclosure unit	Auto / Remote Reclosure unit
Interface	Shuttered Socket	IEC 62196 Type 2
	Locked-Cover Socket	IEC 62196 Type 2
	Built-in cable	IEC 62196 Type 2 plug with coil cable (5m)
	Shuko Socket	Type E / F (with magnetic locked cover)
	Display	10.4" TFT LCD Display with touchscreen (IK08)
	Measurement	Built-in MID Meter (Eichrecht Conformity)

** IK08 for display*

2.3 EVC 03
High Power

Highlights

Vandal-proof metal body

Remote SW update
via OCPP or web interface

Easy Installation & Service

Remote Diagnostics
over OCPP

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Outlets

Type	CCS	CHAdeMO
Power	180 kW	100 kW
Voltage	200-920 Vdc	150-500 Vdc
Current	500A (Cooled or uncooled cable variants available, derating may be applied especially for uncooled cable.)	200A
Cable Length	4.5m	4.5m
Interface Type	IEC 62196-1 / 3 IEC 62196-3-1 IEC 61851-1 / 23 / 24 ISO 15118-1 / 2 / 3 DIN 70121	IEC62196-1 / 3 IEC 61851-1 / 23 / 24 CHAdeMO Rev. 1.2

Main Features

Part	Type	
Electrical	Authorization	Built-in RFID reader(ISO-14443A/B and ISO-15693)
	Connectivity	Ethernet, WLAN(802.11ac), GSM 900/1800 UMTS 900/2100 LTE Band 1/3/7/8/20/28A
	Display	10.4" Color TFT LCD
	Protection	Emergency button optionally
		Residual current sensing, Insulation monitoring, Overcurrent / Over voltage / Under voltage / Short circuit /Over Temperature / Surge Protection
Mechanical	Material	Full Metal Panel Body
	Cooling	Forced Air Cooling Fan
	Dimension (HxWxD) mm	2100 x 840 x 858
	Weight (Net)	550kg, 680 kg with packing
Environmental	IP Rating	IP54
	IK Rating	IK10
	Operating Temperature	-35°C to +50°C
	Storage Temperature	-40°C to +80°C
	Humidity	5 % - 95 % (Relative humidity, non-condensing)
	Altitude	0 - 2000m

** IK08 for display*

2.4 EVC 06

Outlets

Type	CCS	CHAdeMO	Type 2 Socket (Option)
Power	60 kW	60 kW	22 Kw
Voltage	200 – 500Vdc 200 – 920Vdc (optional)	150 – 500 Vdc	400 Vac
Current	125A Max	125A Max	32A/phase
Cable Length	3,5 m	3,5 m	
Interface Type	IEC62196-1 / 3 IEC 61851-1 / 23 / 24 ISO 15118-1 / 2 / 3 DIN 70121	IEC62196-1 / 3 IEC 61851-1 / 23 / 24 CHAdeMO Rev. 2.0	IEC62196-1/2 IEC61851-1

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Main Features

Part	Type	
Electrical	Authorization	RFID Reader Module (ISO/IEC 14443A/B and ISO/IEC15693)
	Connectivity	Ethernet,802.11ac,GSM 900/1800,UMTS 900/2100, LTE Band 1/3/7/8/20/28A, OCPP 1.6 J
	Display	10.4" Color TFT LCD (4:3)
	Protection	Residual current sensing, Insulation monitoring, Over current / Over voltage / Under voltage / Short circuit / Over Temperature / Surge Protection
Mechanical	Material	Metal Panel
	Cooling	Forced Air Cooling Fan
	Dimensions (HxWxD)mm	1750*650*350 mm
	Weight (Net)	210 kg, 310 kg with packing
Environmental	IP Rating	IP 54
	IK Rating	IK 10
	Operating Temperature	-35°C to + 50 °C (Derating is applied over + 40 °C)
	Humidity	5 % - 95 % (Relative humidity, non-condensing)
	Altitude	0-2000m

2.5 EVC 10

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Main Features

Part	Type	EVC10-2x7.4 kW	EVC10-2x11 kW	EVC10-2x22 kW
Electrical	Power	2x7.4 kW	2x11 kW	2x22 Kw
	Voltage	230 VAC 50/60 Hz	400VAC 50/60 Hz	400VAC 50/60 Hz
	Current	For double AC Mains input cable construction; 3-Phase 32A (for each outlet) 1-Phase 32A (for each outlet) For single AC Mains input cable construction; 3-Phase 32A (dynamic between outlets) 3-Phase 16A (dynamic between outlets) 1-Phase 32A (dynamic between outlets)		
	Power Level Control	Current level controls and 3-P models are down gradable to 1-P via rotary switch 10-13-16-20-25-30-32A (AC14 and AC44 series), 10-13-16A (AC22 series) For Smart variants, power level control is also possible from Web Configuration Interface		
	Socket Type	2 x Socket Outlet IEC 62196 Type-2 2 x Shutter Socket (optional)		
	Authorization	RFID Reader (ISO 14443A/B and ISO 15693)		
	Connectivity	Ethernet: 100 Mbps (Standard with smart options) Serial: Modbus over RS485 P1 Slimmemeter Port TIC Interface for Linky Smartmeter		
	Protection	Built-in DC 6mA RCD function Default on single AC Mains input only; built in 2x RCCB Type A		
Mechanical	Material	Plastic	Plastic	Plastic
	Dimensions (HxWxD)mm	580 x400 x235		
	Weight (Net)	13,5 kg		
Environmental	IP Rating	IP 54		
	IK Rating	IK 10 (Display has IK08 protection)		
	Operating Temperature	-35 °C to +55 ° (-25 °C to +50 ° (RCCB Equipped models)		
	Storage Temperature	-40 °C to + 80 °C		
	Humidity	5 % - 95 % (Relative humidity, non-condensing)		
	Altitude	0 - 4000m		

Optional Features

Part	Option	Type
Connectivity	Wi-Fi	802.11 a/b/g/n
	Bluetooth	BT 5.0 ; BT 4.2 low energy
	Mobile Connectivity	LTE / 3G / 2G
	PLC HLC	ISO 15118
Authorization	Multi-standard RFID	ISO 14443A/B and ISO 15693
Safety	Built-in RCCB(For double AC mains)	Type-A High Immunity
Interface	Shuttered Socket	IEC 62196 Type 2
	Built-in cable	IEC 62196 Type 2 plug with coil cable (5m)
	Display	Color 7" TFT LCD
	Measurement	2x Accuracy Class B MID meter with Crypto Engine
Body	Pole Mount	Rectangular or Oval

2.6 Drive Green

Configuration

Based on your device properties you can select bluetooth or Wi-Fi configuration.

Charging

You can start, pause or stop your charging session via Drive Green.

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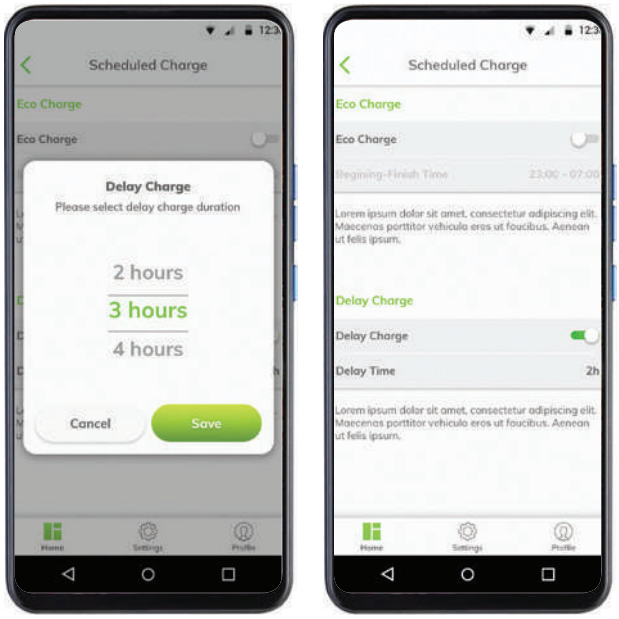
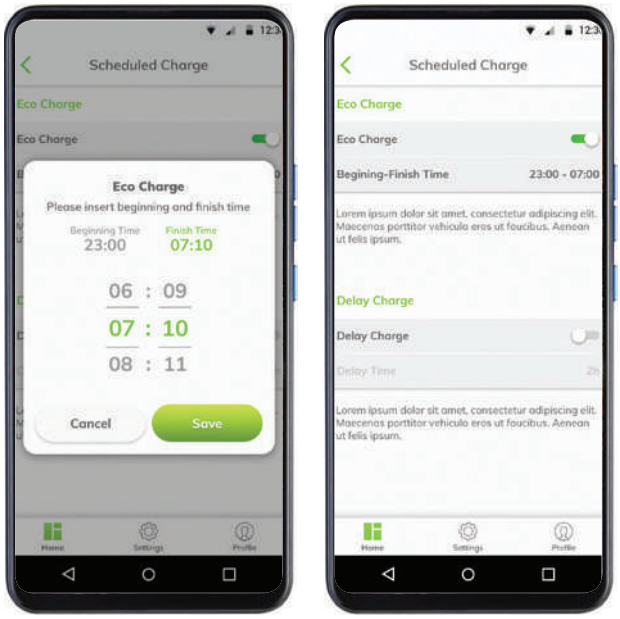


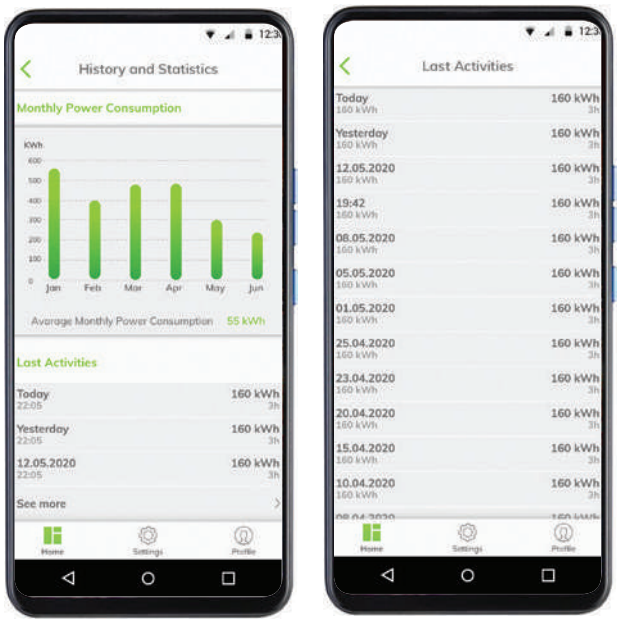
Delay charging

It is possible to delay the charging session by setting the delay time. Even you plug your car to the charger, the charging starts after the delay period. It is always possible to start charging whenever you want.



Eco charge

It is possible to set Eco Charge hours in order to charge the EV while the electricity costs are less. You can set the off-peak hours and your EV will be charged only during off-peak.



Charging history

It is possible to monitor last 10 charging sessions and also brief data on daily, monthly and yearly usages.

Drive Green!

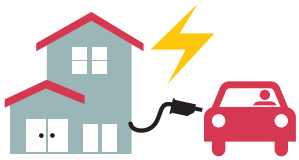
Drive Green is the mobile application designed to configure, control and monitor Vestel smart charger.

3. Load Management

Why do we need load management?
Load management is important in order to;

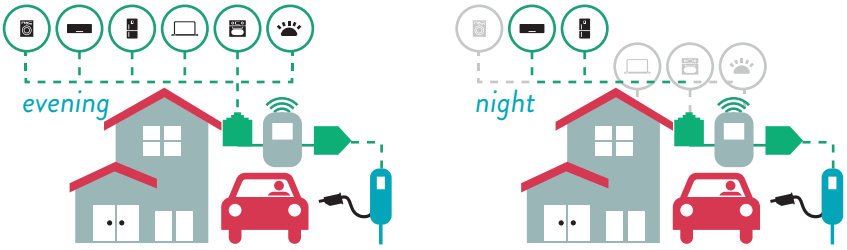
- » Reduce installation and operation cost
- » Increase charging network efficiency
- » Prevent network overloading and blackouts

3.1. Individual Installations



Static management

A power limit can be set and the charger won't go above the power limit.

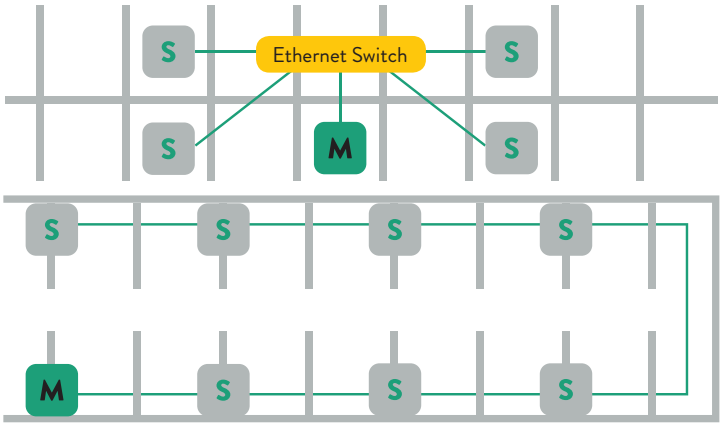


Dynamic Load management

Thanks to dedicated power optimizer option our chargers can manage the power limit based on the available power. When the household appliances consumes more the charger consumes less and don't overload the main switch.

3.2. Cluster Installations

2 different Master/Slave clusters



Star

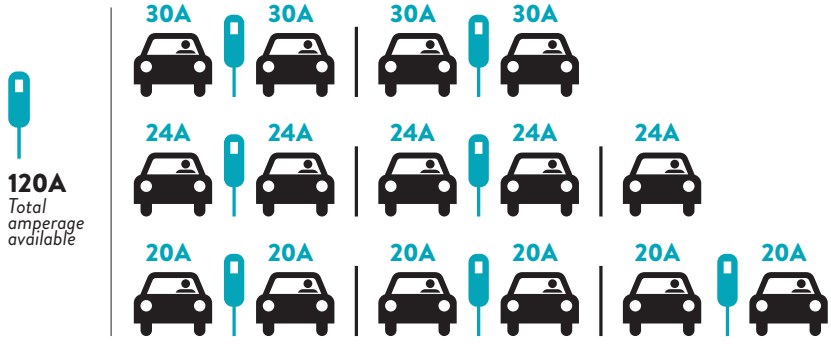
In star network topology all chargers connected to the master via a switch.

Daisy Chain (Serial)

In case of an in-line network topology all chargers connected to each other with in-out connections. The master station is positionned at one end of the line.

Different scenarios

Equally shared : All available power is distributed equally to all EVs connected. This is more suitable for workplace or condominium chargings where the cars are parked for a considerable period of time.



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First-In, First-Out (FiFo)

This type of load management is more oriented for fleets in order to let them have more fully charged EVs when they need. The available power is redistributed and when a new EV arrives it waits until an EV finishes its charge or leaves the charging point.

			G_M=120A				G_M=80A
EVSE\T_P	T_1	T_2	T_3	T_4	T_5	T_6	
1	32A	32A	32A	32A	16A ↓	6A	6A
2	32A	32A	32A	32A	32A	32A	32A
3	32A	32A	32A	32A	32A	32A	32A
4	32A	24A	24A	18A	32A	32A	6A
5	32A	24A	6A	6A	8A	24A	6A

** T_P: Time Period, G_M = Maximum Grid allocated for the chargers. Available maximum current for each EVSE in a certain Tp is indicated in black color. Charging current which is drawn by EV is indicated in Blue color. An EV drawing less current is indicated by "↓" symbol.*

Combined load management

Combined load management is a combination of FiFo and Equally shared methods. A percentage of total power allocated for EV charging cluster can be set and this percentage of total power distributed to all EVs according to FiFo and the remaining power will be delivered as equally shared principal to all EVs.

F%=50				G_M=120A				G_M=80A		G_M=29A	G_M=30A
EVSE\T_P	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	
1	32A	32A	32A	32A	20A ↓	6A ↓	6A	8A		6A	
2	32A	32A	32A	32A	32A	32A	32A	32A	11A	6A	
3	32A	32A	32A	32A	32A	32A	26A	28A	6A	6A	
4	32A	24A	24A	12A	24A	32A	8A	10A	6A	6A	
5	32A	24A	12A	12A	12A	18A	8A	10A	6A	6A	

** T_P: Time Period, G_M = Maximum Grid allocated for the chargers. Available maximum current for each EVSE in a certain Tp is indicated in black color. Charging current which is drawn by EV is indicated in Blue color. A EV drawing less current is indicated by "↓" symbol.*

Load management via OCPP

A Charge Point Management Platform (Backend) can also be used to use load management. Depending on the dynamic load management support on backend system, different use case scenarios can be realized. Vestel EVC products support OCPP 1.6J and can work with different backend platforms.

4. Electric Vehicle Glossary of Terms

EV (Electric Vehicle): A broad category that includes all vehicles that are fully powered by Electricity or an Electric Motor.

BEV (Battery Electric Vehicle): Also known as an "All-electric" vehicle BEV's utilize energy that is stored in rechargeable battery packs. BEV's sustain their power through the batteries and therefore must be plugged into an external electricity source in order to recharge.

EVD: Electric Vehicle Driver

Regenerative Braking: A method of breaking used by EV in which energy from the braking of the vehicle is stored and used.

ICE (Internal Combustion Engine): An ICE is powered by combustible fuel, often petroleum or natural gas products.

ICEV (Internal Combustion Engine Vehicle): All vehicles that are powered by Fossil Fuels are ICEVs.

HEV (Hybrid Electric Vehicles): An HEV utilizes a dual system of electric propulsion and an internal combustion engine.

PHEV (Plug-in Hybrid Electric Vehicles): PHEVs contain a battery that is able to be charged with an external electric power source, PHEV's are a mixture of all electric vehicles and ICEV's.

NEV (Neighborhood Electric Vehicle): BEV's that are limited to streets with lower speed limits, typically around 45mph. NEV's are all-electric and can be recharged using a standard outlet.

EREV (Extended-range electric vehicles): Vehicles that have the ability to run on a gasoline engine if the battery gets low

EVB (Electric Vehicle Battery): A battery that is used to power the movement of a BEV.

AC (Alternating Current): A charge of electricity that regularly changes direction, which is the kind of power that comes from the power plant to homes and businesses.

DC (Direct Current): A charge of electricity that flows in one direction and is the type of power that comes from a battery.

AER (All-Electric Range): The range any EV is able to reach solely using electricity.

Range Anxiety: Worry or stress that is caused due to the fear that an electric car will run out of battery power before the destination is reached.

kW (Kilowatt): A unit of electric power.

EVC (Electric Vehicle Charger): Infrastructure designed to supply power to EVs. EVC can charge a wide variety of EVs including BEVs and PHEVs.

Level 1 Charging: Charging your EV using a common household outlet up to 120v. Level 1 is the slowest method of charging and can take up to 24 hours or more to full charge your EV.

Level 2 Charging: Charges your EV at 240v using an installed outlet. Level 2 chargers are the most recommended chargers to EV owners. Depending on your EV model and charger, Level 2 can give you vehicle 5x as quickly as Level 1 which translates to up to 26 miles per hour of charging.

Level 3 Charging: Also known as DC charging, the fastest method of charging for all EVs. It can fully charge an EV battery in about half an hour. Level three chargers are currently rare as they're very expensive and require more power.

JEVS G105-1993: Also known as CHAdeMO, it is a method developed to quickly charge Electric Vehicles through the use of a special adapter that delivers up to 100 kW. This is used in Japan.

IEC62196: is a series of international standards that define requirements and tests for plugs, socket-outlets, vehicle connectors and vehicle inlets for conductive charging of electric vehicles.

SAE J1772: The standard North American electrical connection for Electric Vehicles. Generally works with Level 1 and Level 2 systems.

IEC 62196: it is a type of connectors that is used to charge Electric Vehicles in Europe.

Combined Charging System: is a standard for charging electric vehicles. It uses the Combo 1 and Combo 2 connectors to provide power at up to 350 kW. These two connectors are extensions of the IEC 62196 Type 1 and Type 2 connectors, with two additional direct current (DC) contacts to allow high-power DC fast charging.

Residual Current Circuit Breaker (RCCB): A safety protection device within an EVC that reduces the chance of a person getting an electric shock.

Charge Circuit Interrupting Device (CCID): A safety protection component within an EVSE that reduces the chance of a person getting an electric shock.

V2G (Vehicle-to-grid): A system that allows Electric Vehicles to communicate with the power grid to manage the flow of electricity in either direction.

GHG (Green House Gas): A gas such as Carbon Dioxide that contributes to global warming through the absorption of infrared radiation.

Off Peak Charging: Charging your electrical vehicle at certain lowest cost off-peak hours.

Battery Management System: An electronic system within the Vehicle that manages and protects the battery.

LIB (Lithium-ion battery): Also known as a Li-ion, it is a common rechargeable battery.

VRLA battery (valve-regulated lead-acid battery): A rechargeable lead-acid battery.

NiMH (Nickel Metal Hydride): A less reliable rechargeable battery.

Molten Salt Battery: A type of battery that utilizes molten salts as an electrolyte.

VESTEL

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