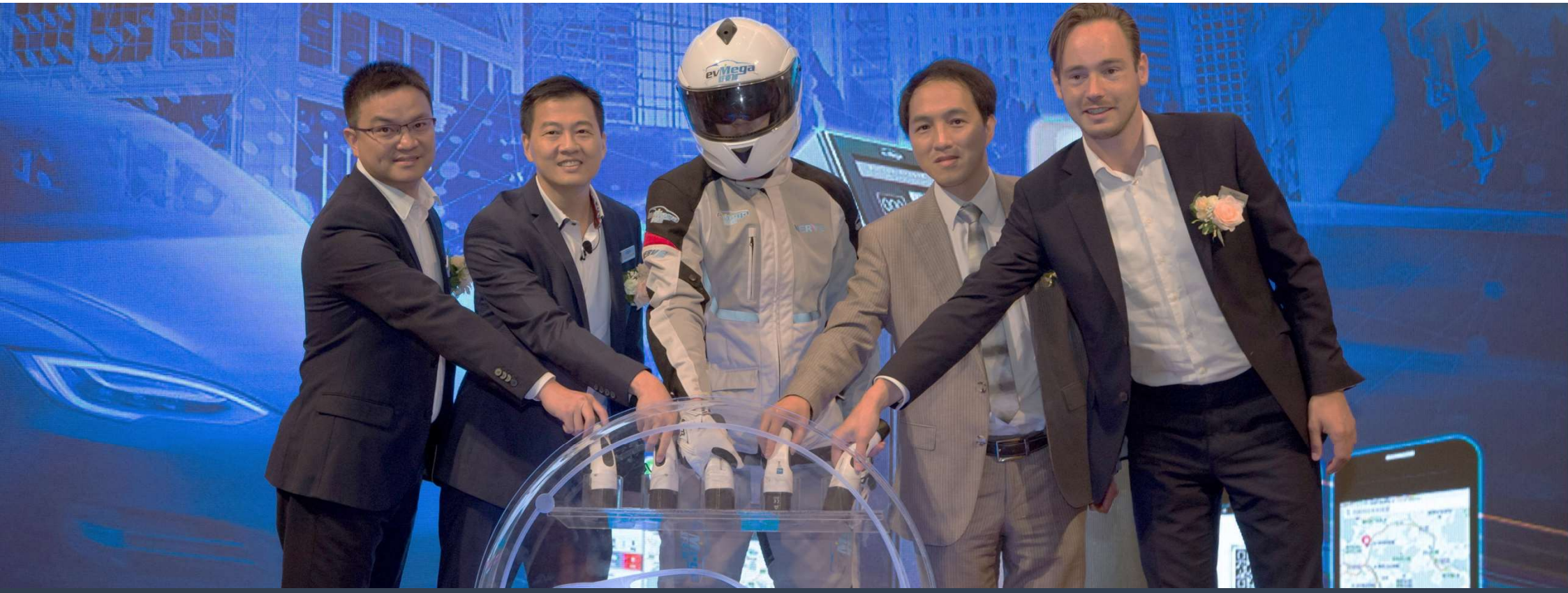

evMega 舒麥加

主題: 充電標準及高功率充電

講者: 劉國東先生 (Ir Chris Lau)

日期: 13 / 9 / 2022

CEO of evMega

Ir Chris Lau

- Bachelor of Manufacturing Engineering - BEng (Hon)
- Member of the Institute of Engineering and Technology (Electrical & Manufacturing Disciplines)
- Chartered Engineer (CEng) of Engineering Council UK
- Member of HKIE (Electrical Discipline)
- Registered Professional Engineer (RPE) – (Electrical Discipline)
- Registered Electrical Worker (REW)
- Committee Member of Hong Kong E-Vehicles Business General Association
- Managing Director of NLSE Group
- Awarded CEO of the Year 2017 (Capital Magazine)
- Former Member of the CPPCC Tianhe Guangzhou 廣州天河區政協委員(第四屆)
- Over 27 years Electrical & Manufacturing Engineering Experience

NLSE Group Organization Chart

NLSE Technology Group

100%	100%	100%	100%	100%
National Concord Engineering Limited (Hong Kong, China)	Laplace Electric Limited (Hong Kong, China)	Sinomation Electric Limited (China, Shenzhen)	evMega Technology Limited (Hong Kong, China)	國諾訊科技 (江門) 有限公司 (China, Jiangmen)
Principal Activities: Switch Board & Control Panel Manufacturer	Principal Activities E&M Solutions Sales	Principal Activities E&M Solutions Sales	Principal Activities EV Charging Solution	Principal Activities Production

** HK Government Headquarter*

** Ev chargers & solution*

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Content

1. Ir Chris Lau Biography
2. evMega introduction & HPC Job Reference
3. Common Charging Standards:
    i. Mode of Charging (AC & DC)
    ii. IEC62196
    iii. IEC61851
    iv. OCPP
    v. ISO15118
    vi. OPPCharge
    vii. Local Standards: EMSD COP & FSD
    viii. Ingress Protection (IP)
4. High Power Charging:
    i. High Power Charging (HPC)
    ii. Application of HPC
    iii. Charging Speed
    iv. Difference of AC and DC charging
    v. Factors affecting High Power Charging:
        a. Voltage & Current
        b. Charging Cables: Air and Liquid Cool Cables
        c. EV Battery Type and BMS
    vi. DC Load Management – Ring Circuit Operation
    vii. Battery Storage System for HPC

evMega
Job Reference

Power Company

Science Park

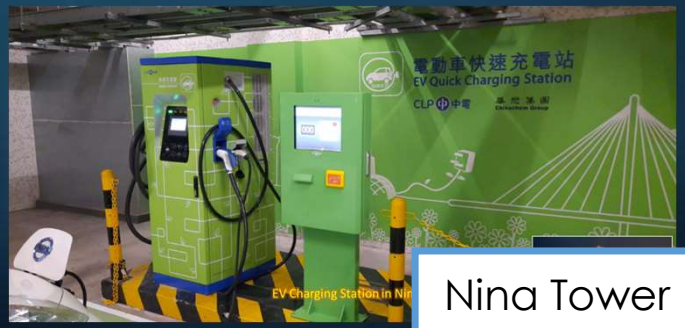
CLP Tsing Yi

CLP Hunghom

Choi Yuen Estate

Shui Pin Wai Estate

Kau Sai Chau



Nina Tower

Ocean Terminal

Hong Kong International Airport

香港國際機場 | HONG KONG INTERNATIONAL AIRPORT

Multi-Purpose Building

Terminal 1 (T1)

TRC 3303

ITT Building

Car Parking 4 (CP4)

7 Projects Awarded

- 502 no. of AC Chargers
- 50 no. of DC Chargers
- EV Charging Management System
- Load Management System
- Payment System
- Proximity Card System
- Mobile Apps

Terminal 2

Office Building

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DC Charger Job Reference

Lee Garden III

Hong Kong Jockey Club

Hyundai

Kerry Logistics

Bus Station: CITYBUS ELECTRIC BUS (160kW)

Public transportation company plays a key role to reduce the roadside air pollution. Being a social responsible corporation, Citybus has make the great contribution to our environment by the replacement of some old petrol-driven buses by electric model which can improve roadside air quality as there is no-tail pipeline emission of pollutant gases and particles. To implement, high power chargers are required to reduce the downtime for charging and increase the serviceability of the vehicles that makes the project viable and sustainable in the long run.

Project Highlights

- 3 No. Of 160kw DC Chargers
- Support CCS2/CHAdeMO/GBT (Optional)
- Modular in design
- IP65 for outdoor harsh weather environment
- OCPP 1.60

Photo Source: CableTV

1. Provide power to the first double deck electric bus in Hong Kong
2. Chargers for the largest charging station of Citybus at Central Bus Station

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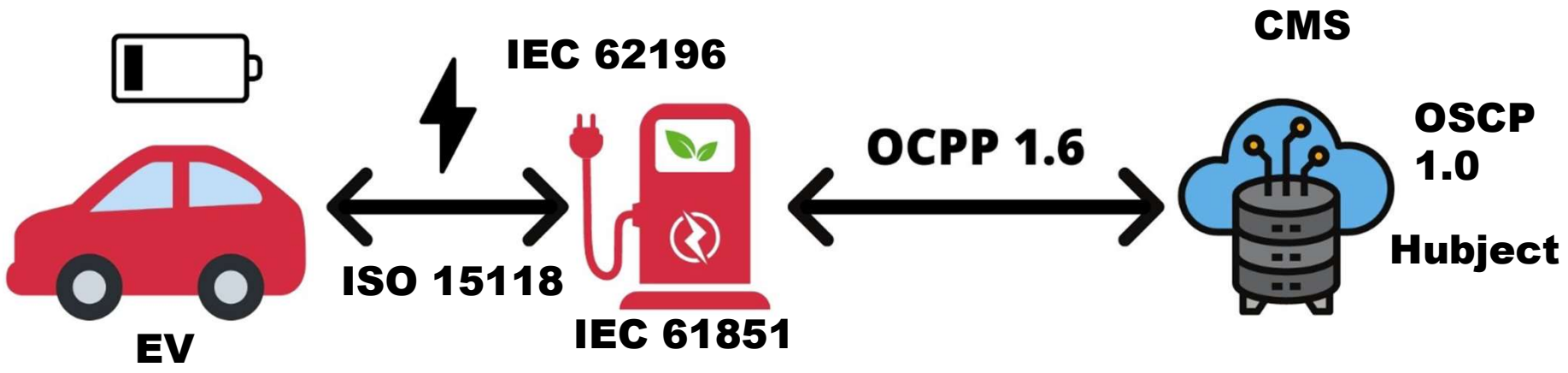
Common EV Standards

Common EV Standards



Local rules: EMSD COP, HKE and CLP Supply Rules....etc.

CL1 Chris Lau, 7/9/2022

Mode of Charging (AC & DC)

Mode of Charging

Different Modes of charging-	
Mode-1  	• AC Charging • Regular household outlet • Un-safe - Not recommended to use
Mode-2  	• AC Charging • In-cable control and protection (IC-CPD) • Limited to 3.7kW (16A) in residential use or 7.4kW (32A) for industrial
Mode-3  	• AC charging • Control, communications and protection functions incorporated in the charge point (EVSE) • Wide range of charging : 3.7KW to 43KW
Mode-4  	• DC charging • Option of either CHAdeMO or CCS • For public and commercial charging applications • Wide range of charging capabilities – over 150kW

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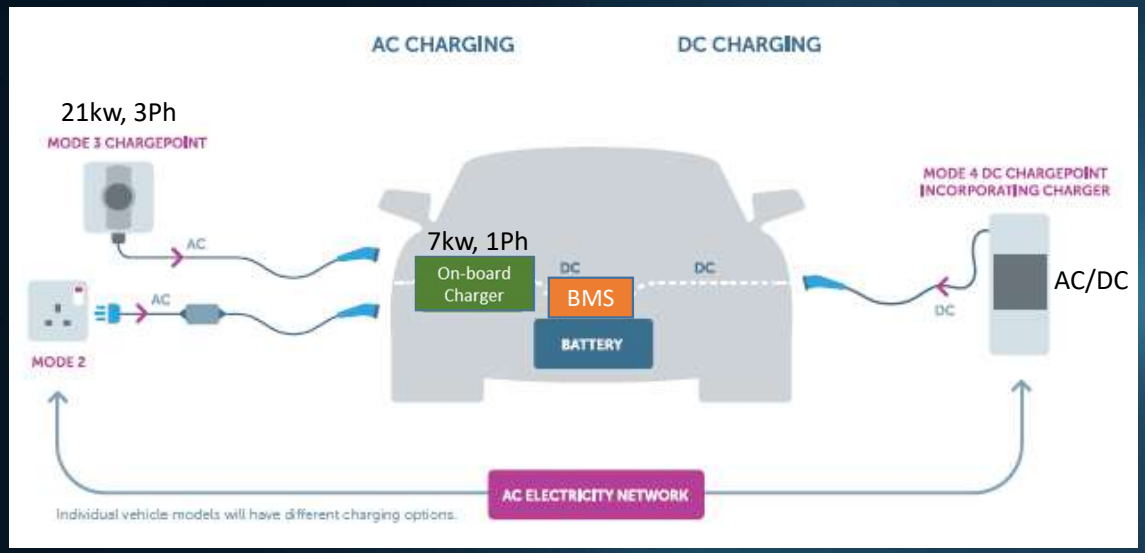
Difference of AC & DC Charging

AC versus DC Charging

- EMSD “Technical Guidelines on Charging Facilities for Electric Vehicles” defines four modes of charging.
- Mode 1 (*), 2 & 3 are AC Charging (onboard charging) whilst mode 4 is DC Charging (offboard charging)



AC Charging DC Charging

DC uses off-board charger and bypass the on-board charger inside the EV and so the charging speed is faster in general

AC Charging	DC Charging
AC outlets are ubiquitous.	special grid hookups to get and convert far more power
Every vehicle needs to have its own on-board charger	Infrastructure Investment is shared among hundreds of users
Slower than DC charging in general (**)	Large power rating, fast charging
Lower cost and weight. Size constraints reduce charge	Big, expensive and have a lot of cooling

(*) Mode 1 is not common as this kind of charging is not safety

(**) Technically possible to convert more power but the equipment would be bulky, heavy, expensive and hot

(***) At higher cost, the grid could supply even more power; but these limits are largely set to avoid harming the car batteries while charging. Many factors determine how fast batteries can charge. All else being equal, larger batteries can accept more power without harm.

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IEC 62196

IEC 62196 *Plugs, socket-outlets, vehicle connectors and vehicle inlets*

Charger Types	IEC		GB/T 20234 China	CHAdeMO	Tesla (Old Model S & X)
	Type1 / SAE J1772 (US/JP)	Type 2 / IEC 62196 (EU)			
Mode 2 (AC) 				N/A	N/A
Mode 3 (AC) 				N/A	
Mode 4 (DC) 					

Remark:

1. *Mode 1 is primarily used for LEV (Light Electric Vehicle, e.g. Scooter) and so is not included in the table*
2. *For mode 2 charging, IC-CPD {In Cable – Control and Protection Device) is incorporated into the charging cable assembly.*
3. *Tesla can be fast charged in Tesla superfast charging station, abt. 120kw, or use CHAdeMO adapter for DC fast charging. {* Tesla does not provide CCS Adapter at this moment}*

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IEC 61851

IEC 61851 *Electric vehicle conductive charging system*

HPC

IEC 61851-1:2017
Electric vehicle conductive charging system - Part 1: General requirements

IEC 61851-21-1:2017
Electric vehicle conductive charging system - Part 21-1 Electric vehicle on-board charger EMC requirements for conductive connection to AC/DC supply

IEC 61851-21-2:2018
Electric vehicle conductive charging system - Part 21-2: Electric vehicle requirements for conductive connection to an AC/DC supply - EMC requirements for off board electric vehicle charging systems

IEC 61851-23:2014
Electric vehicle conductive charging system - Part 23: DC electric vehicle charging station

IEC 61851-24:2014
Electric vehicle conductive charging system - Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging

IEC 61851-25:2020
Electric vehicle conductive charging system - Part 25: DC EV supply equipment where protection relies on electrical separation

OCPP
Open Charge Point Protocol

Open Charge Alliance (OCA)

GLOBAL PLATFORM FOR OPEN PROTOCOLS

The Open Charge Alliance (OCA) is a global consortium of public and private electric vehicle infrastructure leaders that have come together to promote open standards through the adoption of the Open Charge Point Protocol (OCPP) and the Open Smart Charging Protocol (OSCP).

OCPP (OPEN CHARGE POINT PROTOCOL)

- OCPP 1.5, 1.6 & 2.0. OCPP 1.6 is the most popular
- Both SOAP and JSON versions
- Smart Charging support for load balancing and use of charge profiles
- (Local) list management support
- Additional status
- Message sending requests such as CP time or status at the CP
- Some minor improvements in specifications
- OCPP 1.6 version is supported by a compliance testing tool for self-testing and the tool will be used in the OCPP Certification Program

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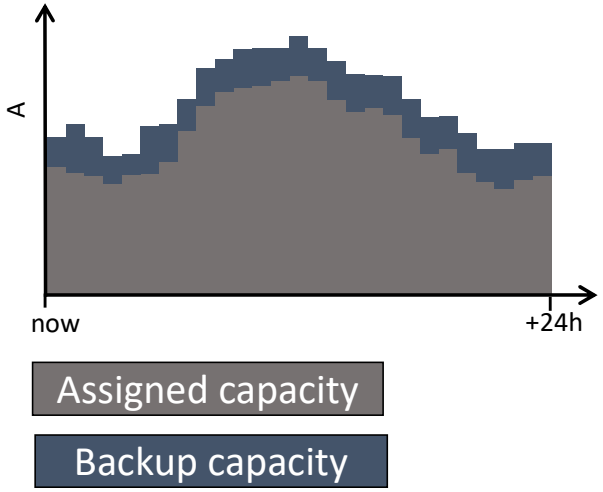
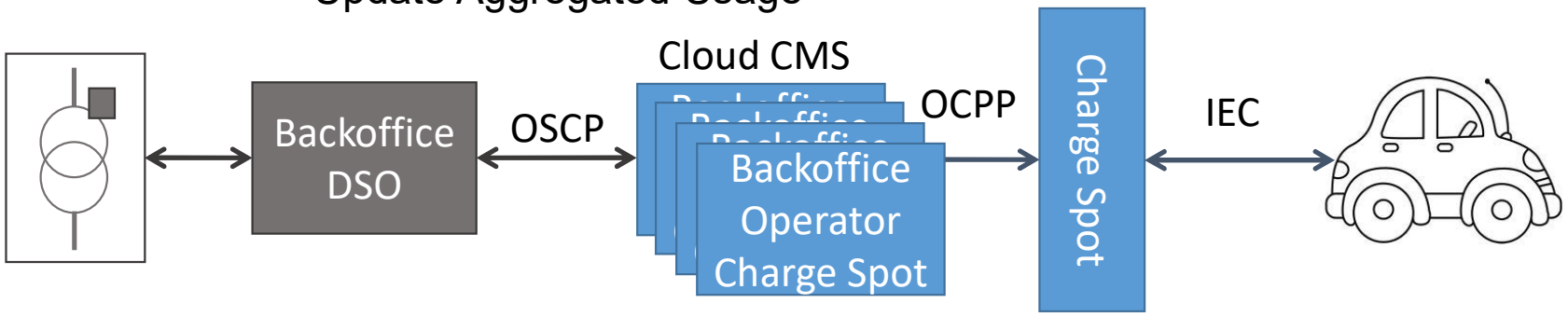
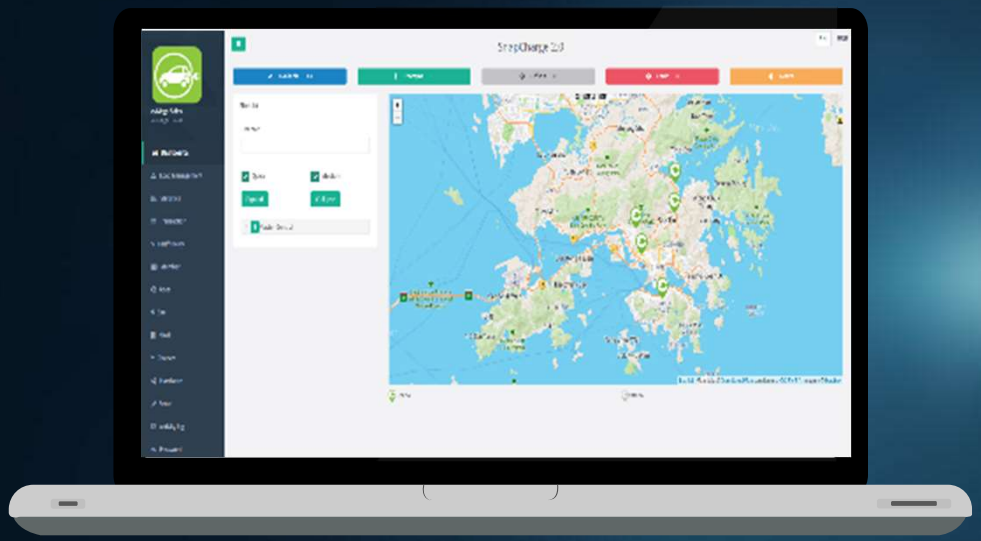
OSCP & OCPP

- Basically three messages in OSCP:
  - - Update Cable Capacity
  - → Capacity for the operator
  - → Available backup capacity
  - - Request adjusted capacity
  - → Extra capacity
  - → Less capacity
  - - Update Aggregated Usage





EV Central Management System (CMS)



What is it?

Snapcharge 2.0 is the latest version of EV AC/DC Charger Control and Management Platform. Based on OCPP 1.60, the system keeps real time monitoring of the charger status, enables better remote control, records charging data, and other useful and valuable activity information for charger facilities management. .

Other Features

Snapcharge 2.0 is a very powerful multi-functional platform with easy-to-use user interface. It supports both English and Chinese (Traditional), and can be accessed through web at any place where internet is accessible. Other optional features include pricing policy control after payment gateway integration, load management real-time monitoring and control, API for data exchange with third-party system, associated equipment setting and etc. .

Snapcharge 2.0 is developed and maintained by evMega's inhouse development team.
It is currently deployed in Hong Kong International Airport and China Light Power Station, which enable remote monitoring of the EV charging services to the EV fleet and facilitate the overall management intelligently.

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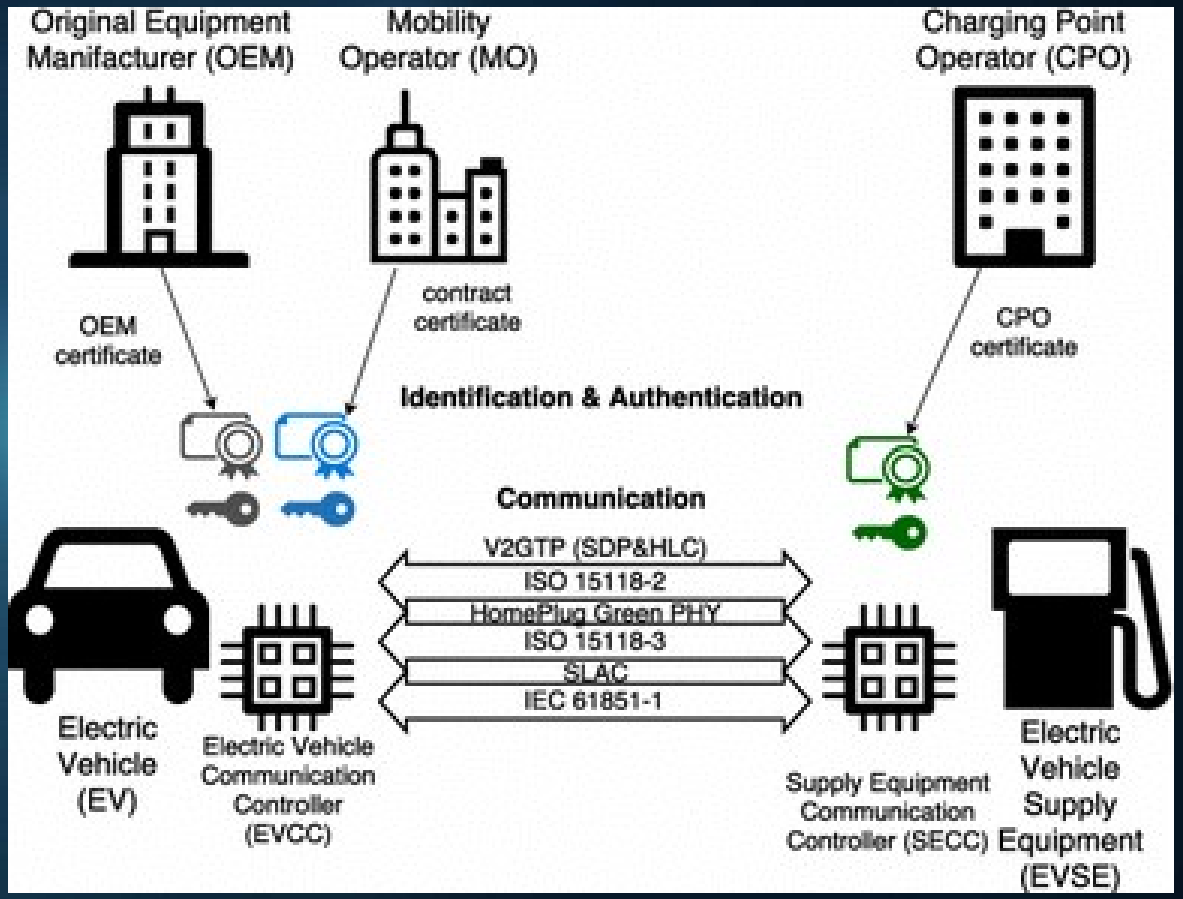
ISO 15118

What is ISO 15118?

ISO 15118 *Road vehicles -- Vehicle to grid communication interface* is an international standard defining a vehicle to grid (V2G) communication interface for bi-directional charging/discharging of electric vehicles.[1] The standard provides multiple use cases like secure communication, smart charging and the **Plug & Charge** feature used by some electric vehicle networks.

- a vehicle to grid (V2G) communication interface for bi-directional charging/discharging of electric vehicles.
- provides multiple use cases like secure communication, smart charging and the Plug & Charge feature used by some electric vehicle networks.



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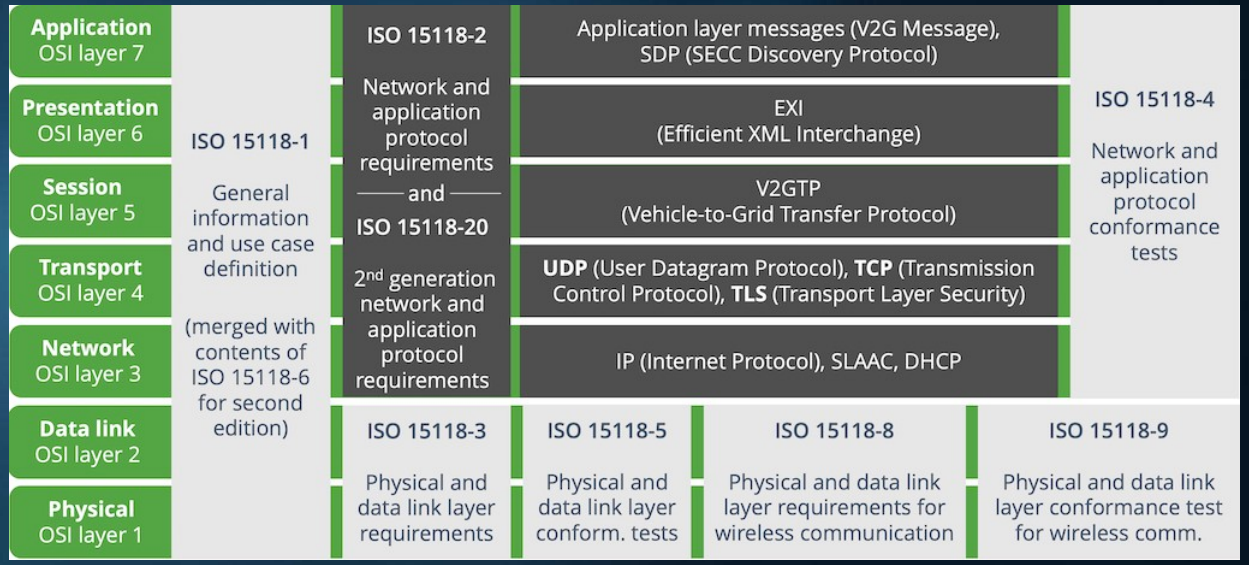
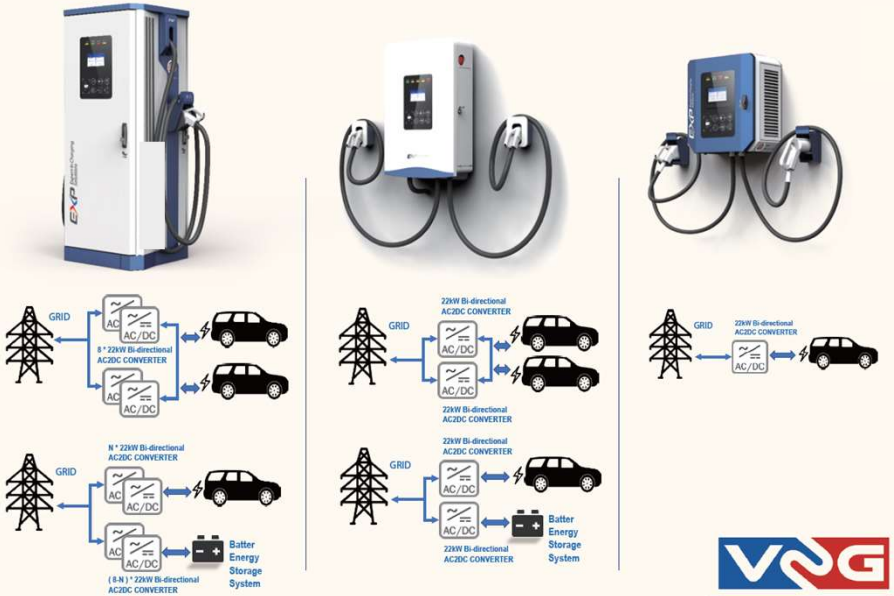
Standards Documents of ISO 15118

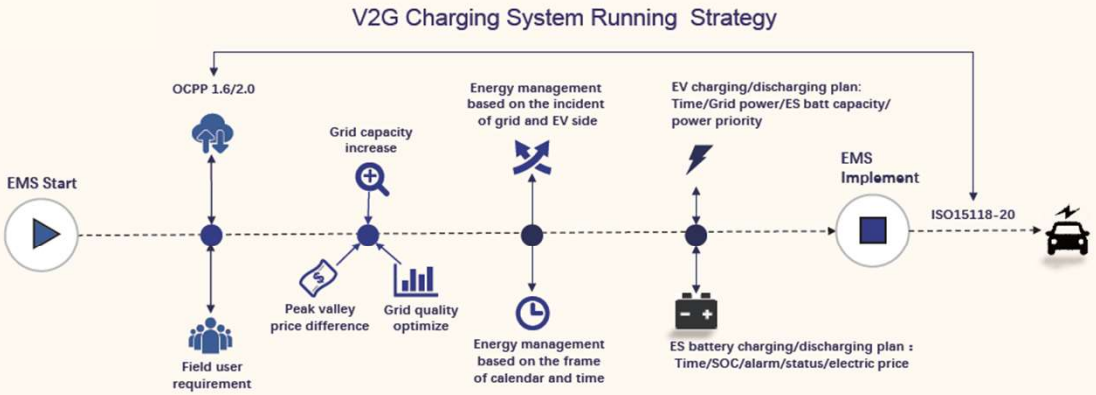
ISO 15118-1	General information and use-case definition
ISO 15118-2	Network and application protocol requirements
ISO 15118-3	Physical and data link layer requirements
ISO 15118-4	Network and application protocol conformance test
ISO 15118-5	Physical and data link layer conformance test
ISO/DIS 15118-6	General information and use-case definition for wireless communication (out of commission, merged with 2nd edition of ISO 15118-1)
ISO/CD 15118-7	Network and application protocol requirements for wireless communication (out of commission, moved to ISO/DIS 15118–20)
ISO 15118-8	Physical layer and data link layer requirements for wireless communication
ISO 15118-20	2nd generation network and application protocol requirements



V2G Charging Solution – 22kW/44kW/176kW DC V2G Charger

- EXP180K4E-FD 176kW V2G charger
- EXP60K4E-FDW 44kW V2G charger
- EXP30K4E-FDW 22kW V2G charger





Solution Value

- Grid peak valley electricity using
- Grid capacity supplement
- Grid quality and safety improvement
- Supplement in the User side Energy storage

Solution Feature

- Total electric insolation between the grid, battery and EV
- Full compatible between different system configuration
- Flexible change the system configuration, capacity and power direction, Flexible customizations
- Unify EMS strategy
- Global V2G standard support

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OPPCharge

OPPCharge Introduction

- Common charging interface for Automated Charging of Hybrid Electric and Electric Commercial Vehicles
- Technical Solution for charging batteries in electrically powered vehicles at reduced system costs, lower vehicle weight and impact on power grid
- Defined and Identified by
  - Automatic Connecting System (ACS)
  - Electric Vehicle Supply Equipment (EVSE)
  - Fixed Conductive Rails
  - 4 Connective Poles
  - Wi-Fi Communication & Control

OppCharge interface is a solution driven by Volvo Bus Corporation (reg. no. 556197-3826, reg. office in Göteborg, Sweden) and several other stakeholders.

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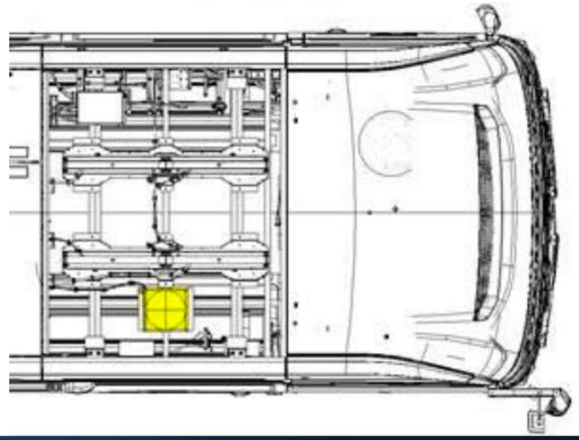
OPPCharge Standard

Electrical interfaces defined in detail in IEC 68151 standards
Isolation resistance monitoring according to IEC 61851-23

Output Requirements	
Power levels (kW)	150, 300, & 450 kW
DC Voltage (V DC)	450 – 750
Frequency (Hz)	50/60 ± 2 [1]
Output Current (A)	Sufficient for output power 0 to 200 @ 750 V – 150 kW 0 to 400 @ 750 V – 300 kW 0 to 600 @ 750 V – 450 kW



6.5. Wi-Fi Communication

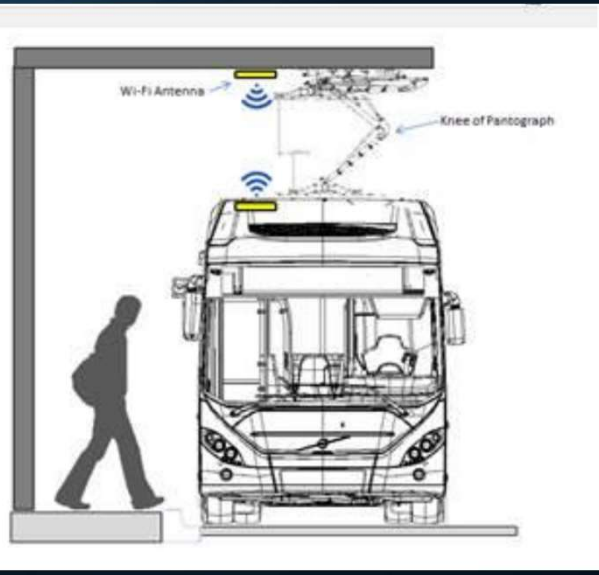
OPPCharge uses Wi-Fi as the communication method between the vehicle and EVSE. Directional antennas are used for communication and association.

IEEE 802.11a specifications are implemented for Wi-Fi communication.

OPPCharge Wi-Fi operates using 5GHz channels.

ISO/IEC 15118 is used as High-level protocol for charging communication with the modification listed within OPPCharge.org.

IEC 61851-1 is used as Low-level protocol for charging communication.
Control Pilot states are implemented.



OPPCharge Application in HK

政府擬撥8000萬推電動小巴　業界試行新充電設施

撰文：陳晶琦
出版：2020-04-13 07:00　更新：2020-04-13 10:21

> 財政司司長陳茂波在今年2月公布新一份《財政預算案》，當中提及會預留8,000萬元推行「電動公共小巴試驗計劃」，目標是2023年已有40輛電動小巴在路面試行。

Local Standards
EMSD COP & FSD

主要修訂內容 守則26S 電動車輛的充電設施

充電模式	插座的種類	所需的漏電斷路器及其符號
模式 1	  標準 BS 1363 插座 (連接至交流電供電網絡)	 A 型電流式 漏電斷路器
模式 2	  標準 IEC 60309 插座 (連接至交流電供電網絡)	
模式 3 / 4	   標準 IEC 62196 插座 (連接到充電設備)	 B 型電流式 漏電斷路器 備註 2

備註 2: 參考 IEC 61851-1，A 型電流式漏電斷路器及同時裝有當直流故障電流超過 6mA 時可將電源截斷的合適設備可被接受，該等合適設備包括符合 IEC 62955 的剩餘直流漏電檢測裝置 (RDC-DD)。

EMSD COP 2020 26S – Type A, B and EV RCD Requirement

EMSD COP 2020
26S Charging Facilities for Electric Vehicles
(4) Protection for Safety, P. 241

(d) Fault protection

(i) Except for circuits using the protective measure of electrical separation, each charging point shall be protected by its own RCD of at least Type A, having the characteristic specified in Code 11J.

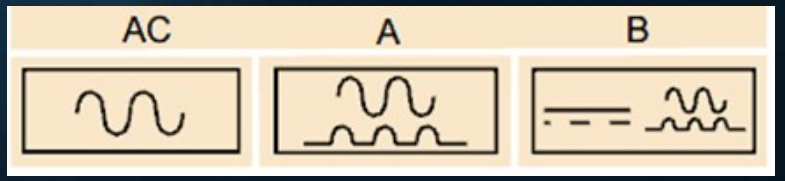
(ii) Each charging point incorporating a socket outlet or connector complying with the IEC 62196 series, protective measures against DC fault current shall be taken, except where provided by the EV charging equipment. The appropriate measures, for each connection point, shall be as follows:

- RCD Type B; or
- RCD Type A and appropriate equipment that provides disconnection of the supply in case of DC fault current above 6mA.

This table summarises the various types of RCD referred to in the 18th Edition

RCCB Type	Residual / Leakage current components				Transient Resistant
	AC 50Hz	AC 50Hz Pulse	Smooth DC	AC>50HZ<kHz	3kA/20μS Current Wave
AC	✓	X	X	X	X
A	✓	✓	< 6mA (1)	X	X
AKV	✓	✓	< 6mA (1)	X	✓
F	✓	✓	< 10mA (1)	✓	✓
B	✓	✓	✓ (1)	✓	✓
EV	✓	✓	< 6mA (2)	✓	✓

1. **Type B** RCCBs detect DC residual currents and trip if the smooth DC current exceeds the trip threshold.
Note: Type A, AKV and **F** will function safely with smooth DC residual currents present up to the levels indicated but they do not detect smooth DC. Therefore they must not be installed upstream of Type B RCCBs.
2. **Type EV RCCBs trip if the smooth DC current > 6mA** i.e. They must only be used for protecting a single ECVP.



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主要修訂內容

守則26S 電動車輛的充電設施

- 電動車輛充電裝置應按照IEC 61851 或等效標準設計及安裝。
- 如果電動車輛充電裝置是為戶外使用而設計的話，則應選擇符合 IEC 60529 而防護等級至少為IP44 的設備，以防止濺起的水（AD4）或極細小的物體（AE3）進入裝置內。
- 充電裝置應盡可能安裝在不會遭到車輛撞擊的地方。安裝在公共場所及停車場的電動車輛充電裝置應設有最少能承受中強度（AG2）碰撞的保護。

IK code	Impact energy (In joules)	AG Code
00	0	
01	≤ 0.14	
02	≤ 0.20	AG1
03	≤ 0.35	
04	≤ 0.50	
05	≤ 0.70	
06	≤ 1	
07	≤ 2	AG2
08	≤ 5	AG3

Fire Service Department on EV Charging Facilities from 1st Sept., 2020 and our solution

消 防 處
消 防 安 全 總 區
香港九龍尖沙咀東部歷荷李道一號
消防處總部大廈七樓

FIRE SERVICES DEPARTMENT
FIRE SAFETY COMMAND
7/F, Fire Services Headquarters Building,
No. 1 Hong Chong Road, Tsim Sha Tsui East, Kowloon.
Hong Kong.

本處檔號 OUR REF.: (48) in FP(FS) 314/07 IV
來函檔號 YOUR REF.:
圖文傳真 FAX: 852-2312 0376
電 話 TEL. NO.: 852-2170 9595
電子郵件 E-MAIL: fschq@hkfsd.gov.hk

31 July 2020

To: Recipients of FSD Circular Letters

Dear Sirs/Madams,

FSD Circular Letter No. 4/2020
Additional Fire Safety Requirements for
Car Parking Facilities installed with Electric Vehicle Charging Facilities

This Circular Letter serves to announce the additional fire safety requirements for car parking facilities, installed with electric vehicle (EV) charging facilities to the Code of Practice for Minimum Fire Service Installations and Equipment, 2012 (FSI Code).

2. Due to the increasing trend on popularity of EVs and related fire incidents worldwide, FSD has taken the initiative to conduct a study on the potential fire hazard in connection with EVs, especially during battery charging of EVs. Having considered that the car parking facilities, where EV charging facilities are installed, may have inherent risks to both the general public and firefighters, additional fire safety requirements for those car parking facilities installed with EV charging facilities have to be imposed as follows:

(a) Fire detection system with heat or multi-sensor detecting type, shall be provided as follows (except those provided with sprinkler system) :
   i. For those with a total floor area not exceeding 230m^2, the entire car parking facilities shall be covered by the fire detection system.
   ii. For those with a total floor area exceeding 230m^2, the areas installed with EV charging facilities shall be covered by the fire detection system.
   iii. The fire detection system shall be installed in accordance with British Standard 5839: Part 1 or other standards acceptable to the Director of Fire Services and linked to the fire alarm system.

Ref. number and date should be quoted in reference to this letter
凡提及本信時請引述編號及日期

iv. A direct line connection to the Fire Services Communications Centre is not required if the car parking facilities are situated in domestic buildings where the provision of direct line connection is not mandatorily required.

(b) A dry powder or carbon dioxide type fire extinguisher shall be provided at each hose reel point.

(c) Fireman's emergency switch shall be provided at vehicle entrance(s), fire control centre or other locations as considered acceptable by the Director of Fire Services. Details of the switch are provided in the Appendix.

3. The requirements as stipulated in paragraph 2 above shall not be applicable to the car parking facility of a single-family domestic building up to and including three storeys in height, except a car parking facility situated in basement.

4. The additional requirements will take effect from 1 September 2020 for all initial building plan submissions. Building plans submitted before 1 September 2020 and all existing buildings planned with the EV charging facilities are advised to enhance the fire safety provisions as stated in the foregoing paragraph for the sake of fire safety. For those recent submissions, you are encouraged to voluntarily incorporate the additional requirements for EV charging facilities in your amendment submissions.

5. For enquiries, please contact our Senior Divisional Officer (New Projects) at 3971 4600.

Additional fire safety requirements for car parking facilities with EV charging facilities from 1st Sept 2020

Yours faithfully,

(CHUI Man-tsung)
for Director of Fire Services

Encl.

Ref. number and date should be quoted in reference to this letter
凡提及本信時請引述編號及日期

KEF 440A (40A) Switch (Aluminum)

KEF 440M (40A) Switch (Polycarbonate)

- Available in grey/black, yellow/red or fireman red
- Good resistance against UV and many chemicals
- Fully rated Load Break Switch breaking capacity of 8 x AC23 rating
- Withstands high impact and has wide operating temperature (KEF 440A) or Self-extinguishing material and excellent insulting properties (KEF 440M)
- Cable entries: 2 x M20 or 25 as standard on the top and bottom
- Padlockable handle in 0-position and also available in 1-position
- KE handle on right side, KEF handle on left side
- Tested according to IEC 60947-3

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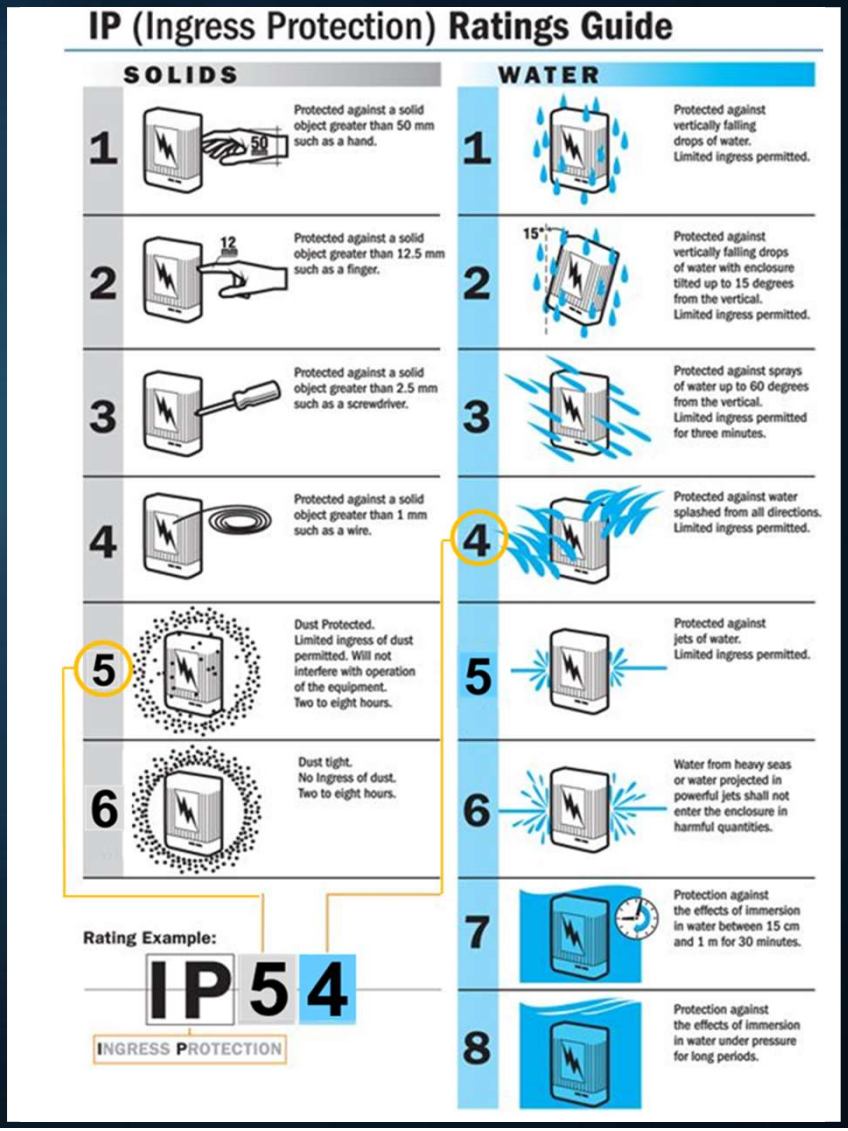
Ingress Protection (IP)

IP Standard for EV Charger

- Based on IEC 61851 & EMSD “Technical Guidelines on Charging Facilities for Electric Vehicles”
  - Indoor use: at least IP41
  - Outdoor use: at least IP44
- IP54 Ingress Protection Rating has been good enough for general indoor and outdoor environment IP65 is the standard for potential extremely harsh outdoor environment, such as AAT1 Apron

IP54 IP55 IP65



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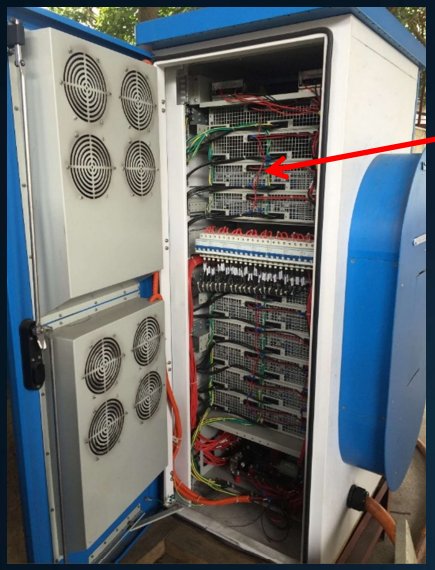
Advantages of Heat Exchanger over Conventional Ventilation (IP65)

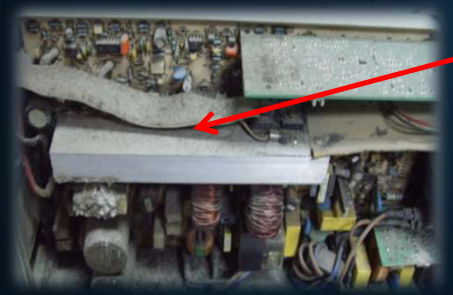
Direct Ventilation (Low IP)



Popular Design:

Air flow blows directly to the power module and brings heat out.

- Most EV charger is using direct ventilation
- Heavy dust and humidity is the high failure main reason



Dust deposition on the PCB of Power Module

In high humid environment, PCB will be damaged easily.

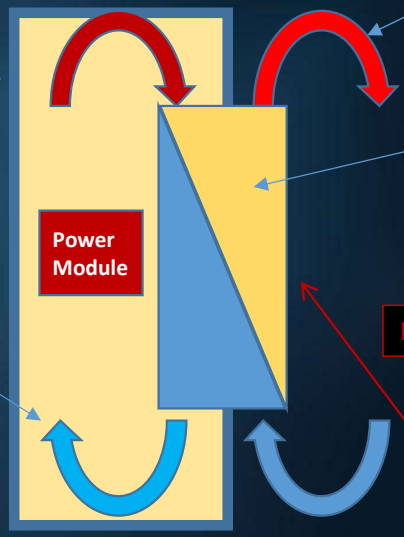
Heat Exchanger (IP65)

IP65 make
A sealed environment
To protect the
Power module

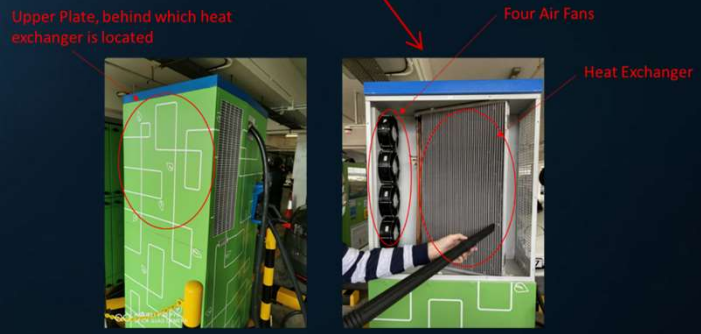
Outside air flow
To cooling the
Heat exchanger

Use a high
Efficiency
Heat exchanger
To bring the
Heat out

Internal air
Flow to cooling
The power
module



- Heat exchanger works in high efficiency and insulates the Power Module from dust
- Less likelihood of service downtime. Also, product life time will be longer



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High Power Charging

DC Charger Power is increasing

30kW | 60kW | 120kW | 160kW | 240kW | 480kW | 640kW

Split Type Ultra Fast High Power Charger

Power Cube

240kW, 1000VDC
480kW, 1000VDC
640kW, 1000VDC

Dispensers

CHAdeMo 125A at 500V: 62.5kW
CCS 200A at 1000V: 200kW
GBT 250A at 1000V: 250kW
CCS 500A at 1000V: 480kW

Power Cube Size: *1000mm (W) x 2000mm (H) x 800mm (D)*
Dispenser: *500mm (W) x 1750mm (H) x 350mm (D)*

- CCS1/CCS/CHAdeMO/GBT
- IP55 for the dispenser and IP54 for the power cube with high protection and liability for harsh environment
- Optional one CCS/GBT standard 500A liquid cooling charging connector support with AnyCooling liquid cooling solution
- OCPP 1.60J support and smart charge support
- CoolRing ring net power transfer between the 2 dispensers' each 4 connectors to improve the charging operation efficiency
- Easily configure the output power up to 480kw and the output voltage up to 1000V
- Full safety function with output contactor and fuse, EPO, SPD, leakage protection switch, insulation detect protection
- User friendly interface with tempered glass protective 7" TFT capacitive touch screen LCD
- Internal high precision AC and DC energy meter, optional VDE and PTB certification type
- LAN and LTE wireless support, RFID authorization and Mobile App payment support

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High Power Charging Applications

Bus Station in 上海, 放鶴路 (120kW)

Project Highlights

- EXP120K1-HD
- 60/90/120kw
- GBT
- 110 no. installed

120kW HPC

Bus Station in ZhengZhou 鄭洲 (120kW)

Project Highlights

- EXP120K1-HD
- 120kw
- GBT
- 100 no. installed

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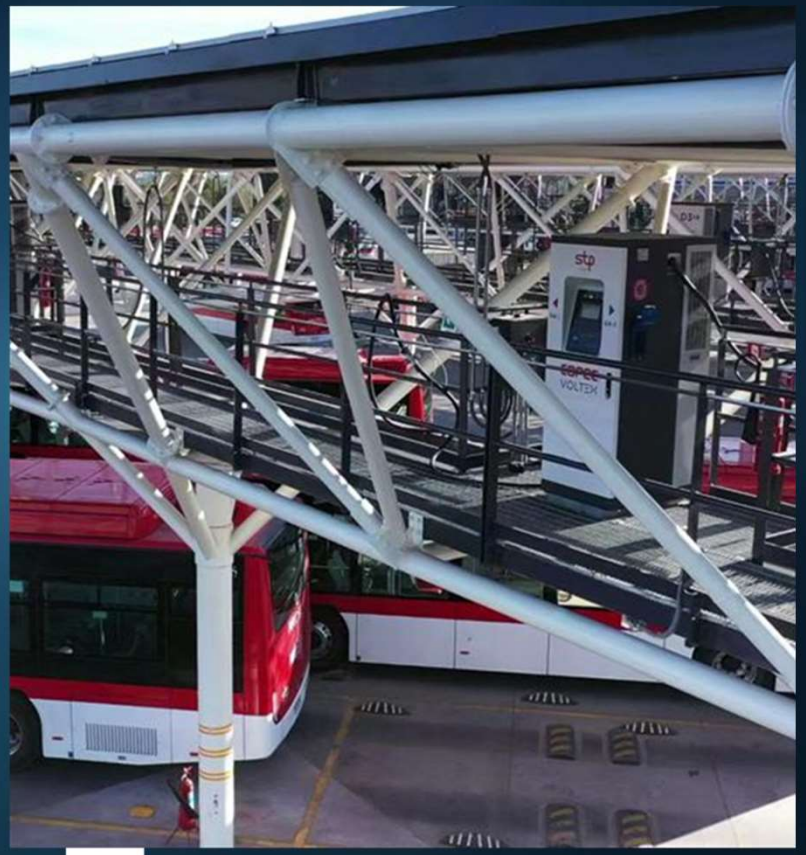
Largest Public Transportation Station in Chile (150kW)



150kW HPC

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HPC Charger for Trucks (180kW)

Project Highlights

- 180kW-240kW for BYD Trucks

180kW HPC

Power Company Depot (240kW)

Project Highlights

- 1 No. of 240kw split-type High Power Charger (HPC) which is comprised of 1 no. of Power Cube & 1 no. of Power Dispenser
- Connector's type: CCS2 & CHAdeMO
- Maximum Output of Power Cube could be 480kw after expansion
- One Power Cube could support max. 3 dispenser

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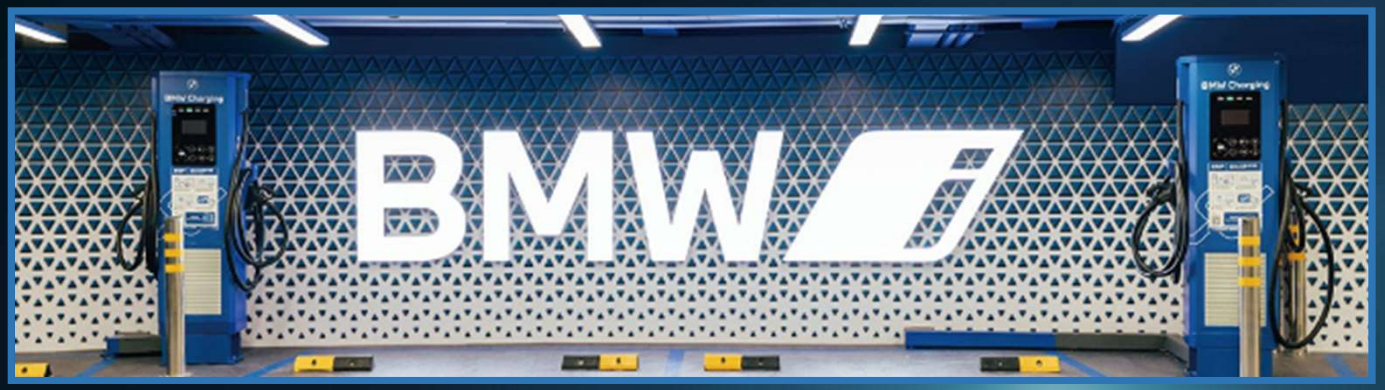
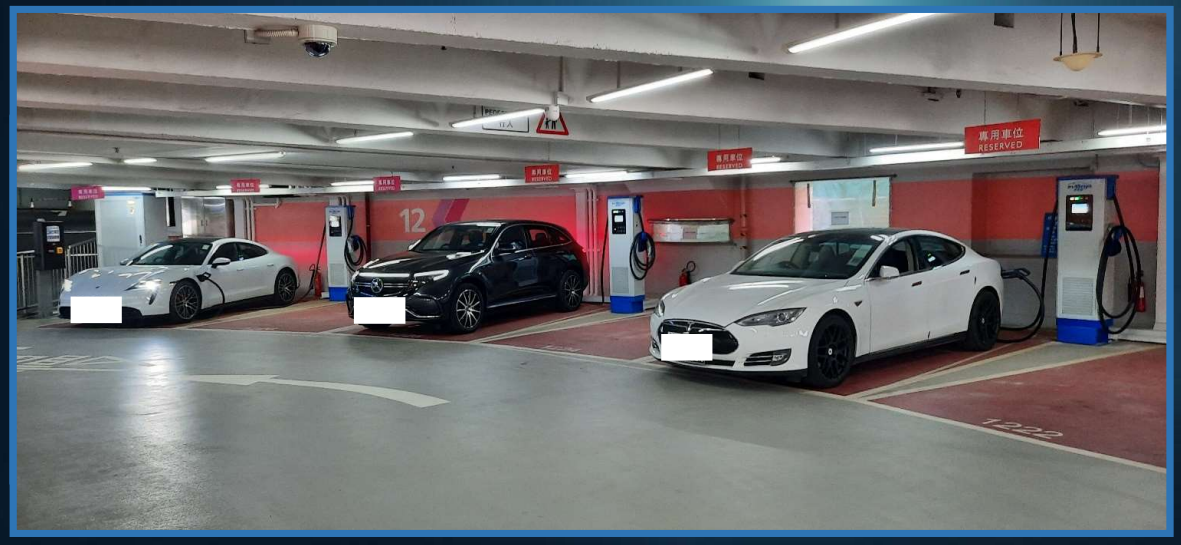
Private Car Charging Station (480kW)





Project Highlights

- 1 set of split type High Power EV Chargers
  - 1 x 480kw Power Cube
  - 3 x Power Dispensers
  - 2 x CCS2 Guns per each Dispenser
- 6 x 32kw AC Chargers (set to 16A 3 Phases)
- Payment System: different tariff rate for different classes of membership
- Snapcharge EV Charger Management and Control Platform by subscription
- Highlighted features
  - Max 480kw power output from Power Cube to any gun
  - Max output from dispenser's gun: 200kw (200A, 1000V)(Air Cool) (*)
  - Support simultaneous charging at 75kw (min. max) – the current setting

1. For split-type HPC, air cool dispenser is installed in the site. It can be changed to liquid cool dispenser and the power output of the dispenser's gun could then reach 480kw.
2. The power output of the gun will be set at a lower rating as requested by the client.

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Tesla Mega Site (V2 120kW)

Hyatt Regency Hotel

- 20 supercharge posts will be erected in Hyatt regency hotel Shatin
- First of the same kind in Hong Kong
- Dedicated 1500KVA transformer and direct MV supply will be obtained from power company.
- All power will only be used for Superchargers.
- evMega will Supply the 2500A outdoor LV Switchboard and provide the related consultancy services for the installation.

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Tesla Supercharger V2 & V3

	Supercharger V2	Supercharger V3
Max Output Power	Up to 120kW	Up to 250kW
Cable	Air Cool	Liquid Cool
Charging Time	Model 3 120km / 10min 270km / 30min	Model 3 120km / 5min 270km / 15min
Charging Plug	Type 2	CCS Combo 2 CCS Combo 2 Adapter

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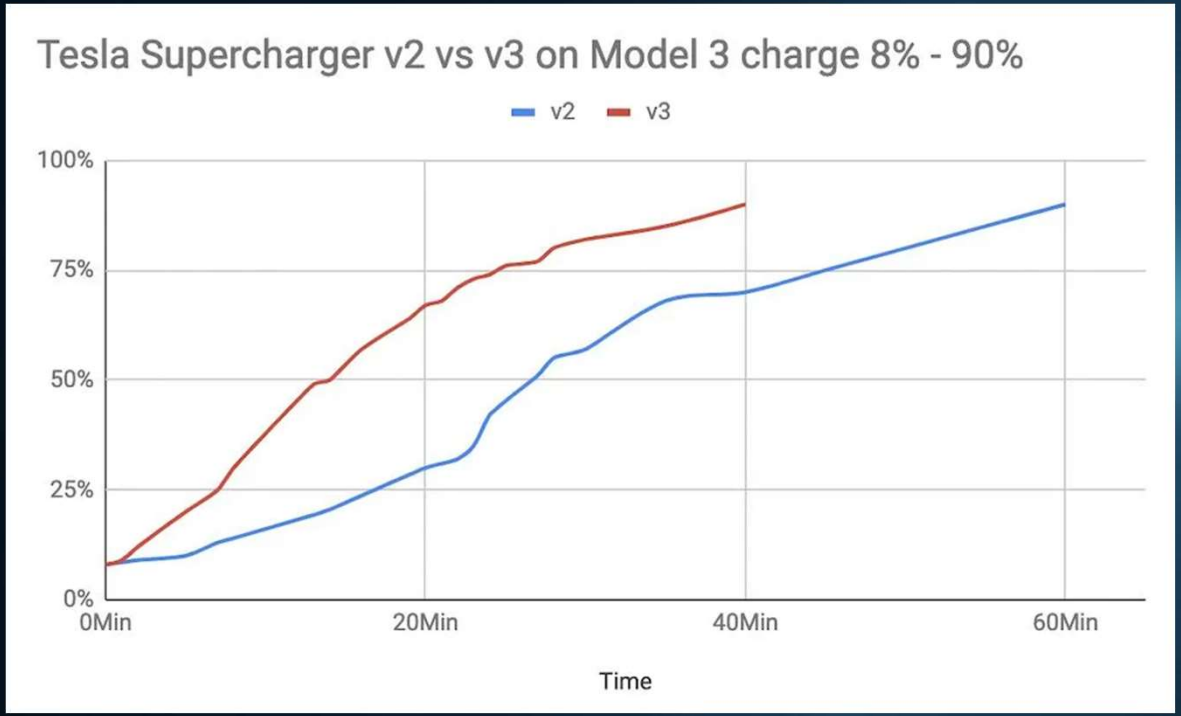
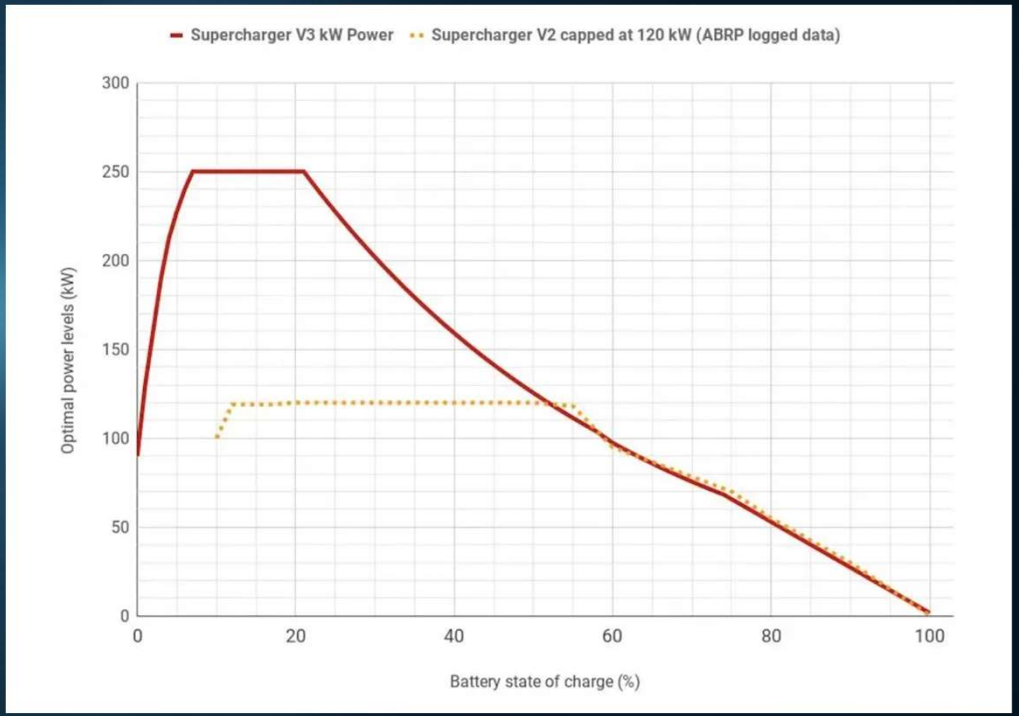
Charging Speed

Charging Speed Comparison (V2 vs V3)





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Factors affecting charging speed
a. Voltage and Current

Power Module 15~40kw (500V/750V/1000V)

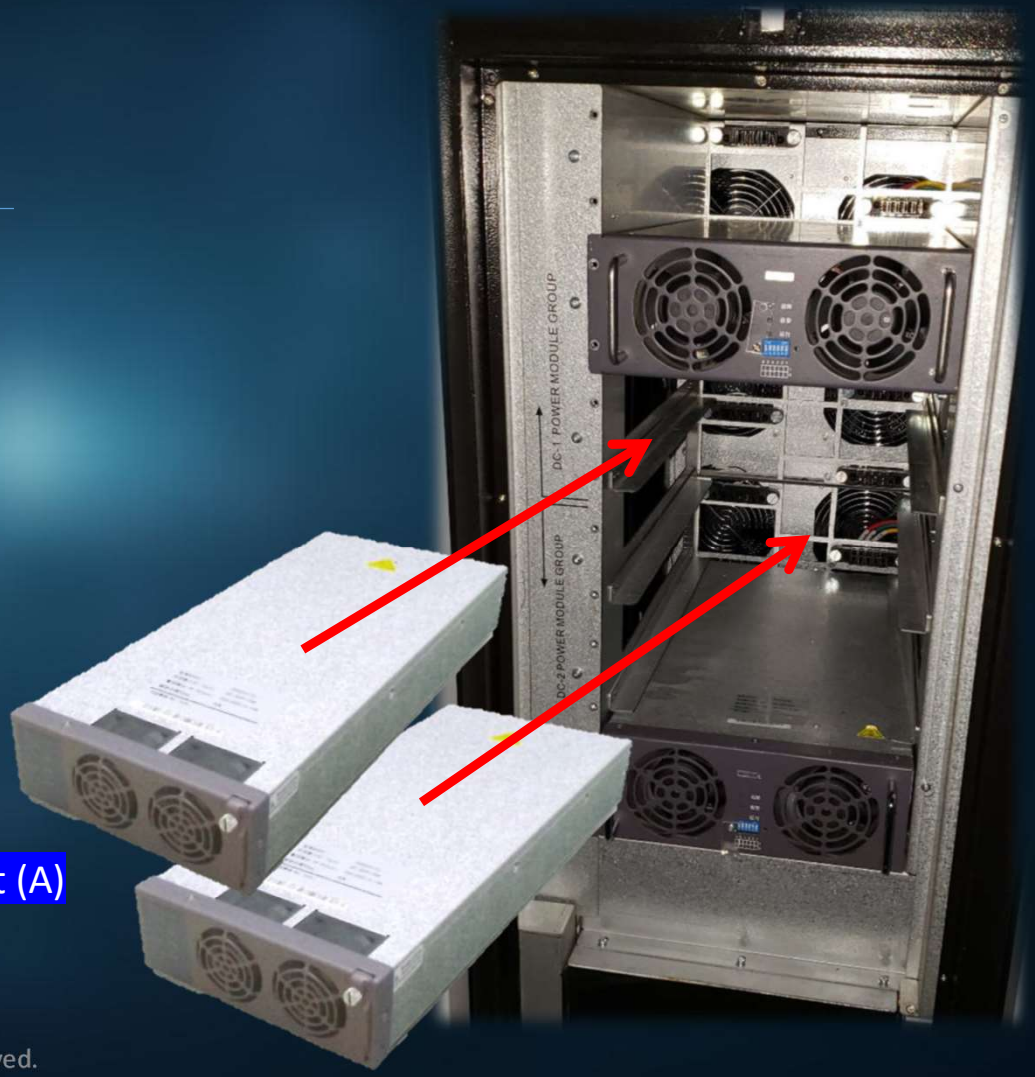
DC Power Module (Plug-in)

500V | 750V | 1000V {Various Voltage}

- REG50040G – 500V Charger Module
- REG75030G – 750V Charger Module
- REG1K025 – 1000V Charger Module

Main Features

- 95.5% High Efficiency
- 3 Phase
- Dual DSP
- Hot Pluggable
- CAN Interface
- CE Certificate
- Max. Output Power: 120kW (20kW*6 Modules)



Output Power (kW) = Output Voltage (VDC) x Output Current (A)

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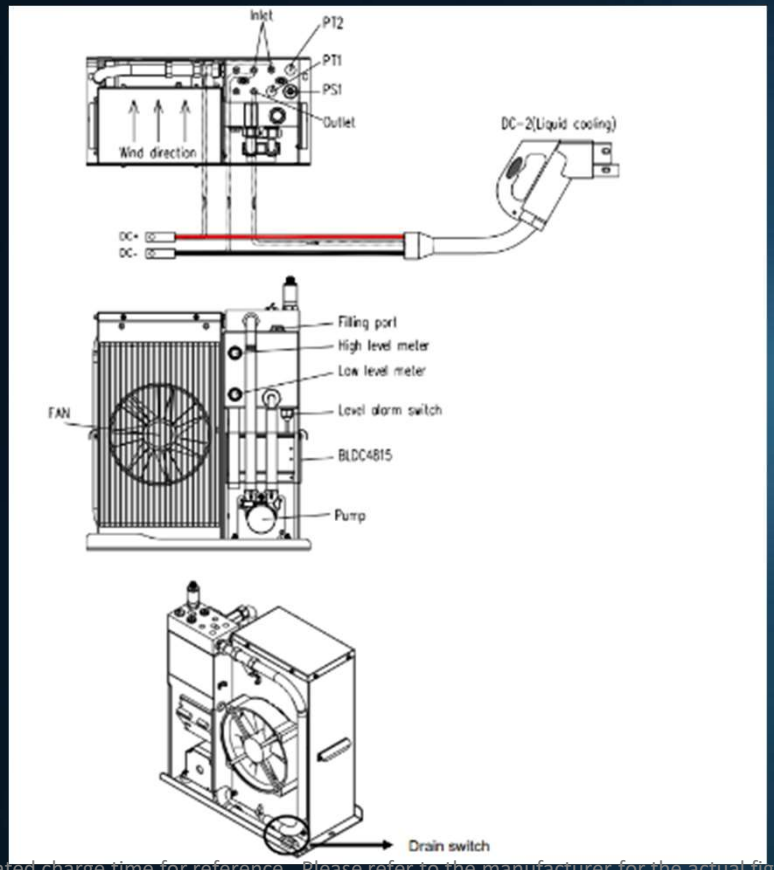
Factors affecting charging speed
b. Charging Cables

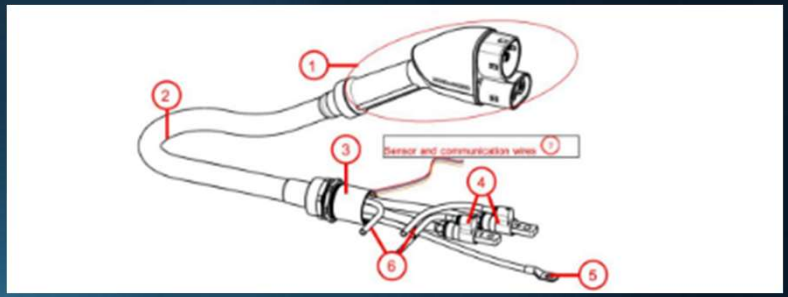

AIR COOL CABLE
CCS2, CHAdeMO, Type 2 Connectors

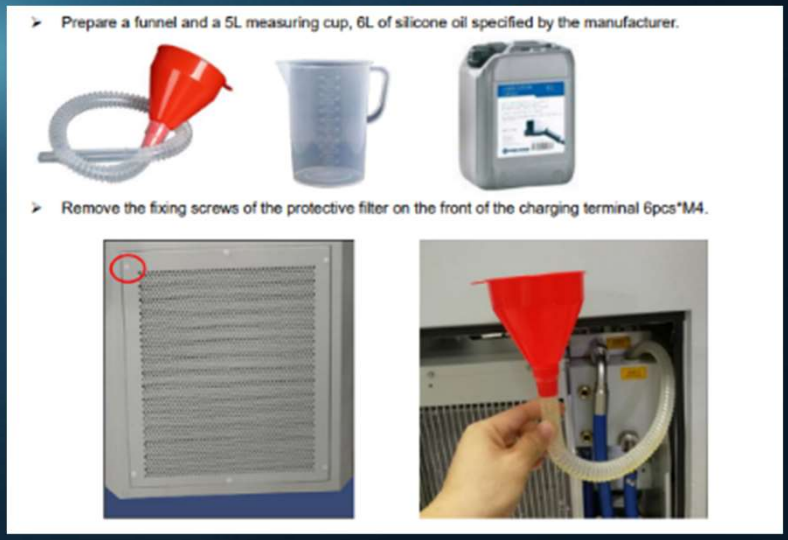
LIQUID COOL CABLE

HUBER + SUNHER HPC 500 Connector

Cooling Unit and Maintenance







(1) Estimated charge time for reference. Please refer to the manufacturer for the actual figures.
(2) High power charging requires several conditions, including i) liquid cool cable; ii) Connector Type; 3) Highest Supporting Charging Voltage of EV

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Capacity of Charging Cables

IEC DC Charging Systems

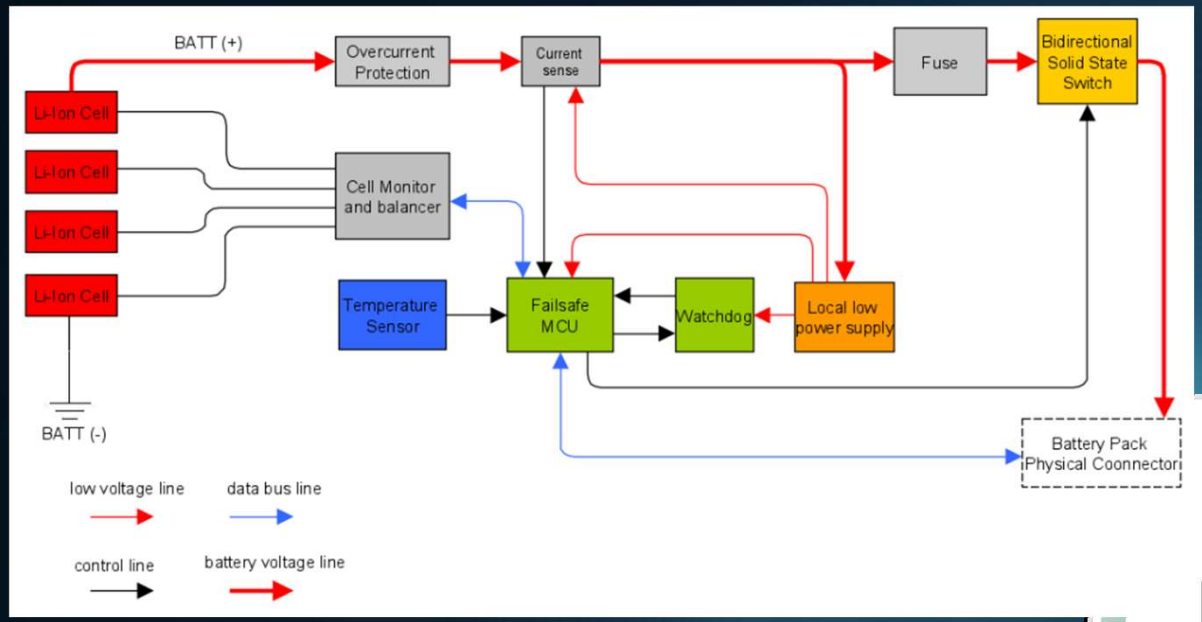
	System A CHAdeMO (Japan)	System B GB/T (PRC)	System C COMBO1 (US)	System C COMBO2 (DE)
Connector				
Vehicle Inlet				
Communication Protocol	CAN		PLC	

	CHAdeMO	GB/T	CCS (Air Cool)	CCS (Liquid Cool)
Max. Current	125A	250A	200A	500A
Output Power at 400VDC	50kW	100kW	80kW	200kW
Output Power at 800VDC	100kW	200kW	160kW	400kW
Output Power at 1000VDC	125kW	250kW	200kW	500kW

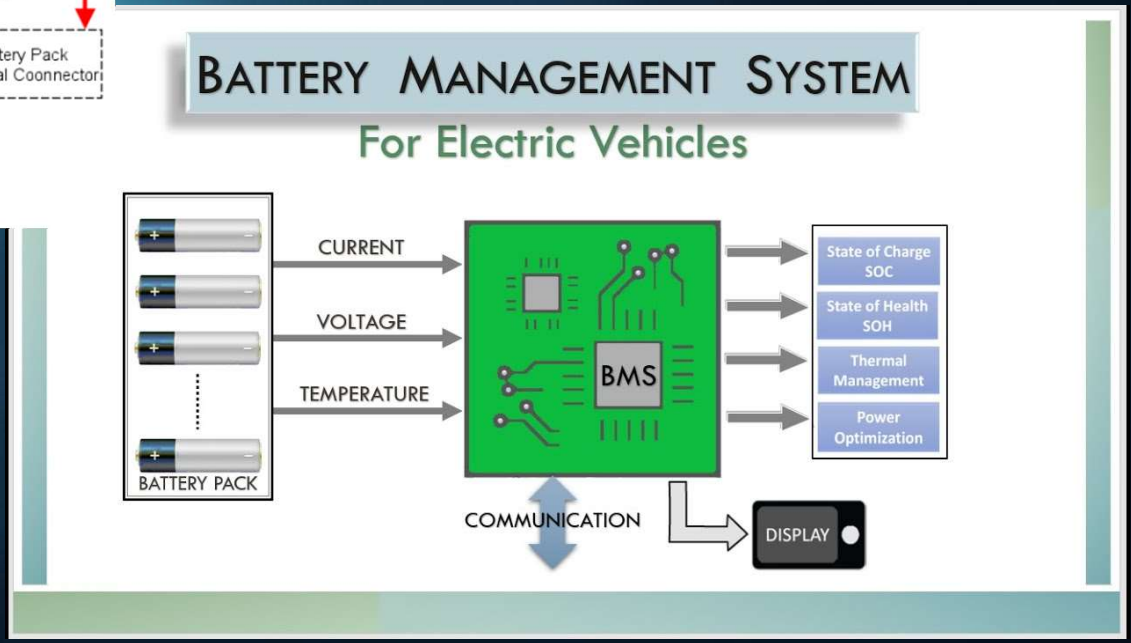
Remark: Info from Insideev.com

Factors affecting charging speed
c. Battery Type and BMS

Battery Management System (BMS)

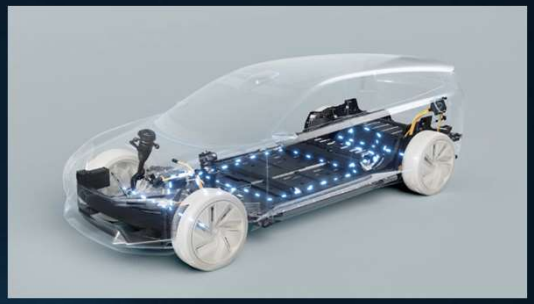


Roles: detection of battery type, voltages, temperature, capacity, state of charge, power consumption, remaining operational time, charging cycles, and other parameters in electric vehicles.



The BMS must communicate with a variety of different on-board systems, work in real time in quickly changing charge/discharge circumstances as the vehicle accelerates and brakes, and operate in severe and uncontrolled settings.

Various EV Battery Type



Lithium-ion Battery Chemistry Comparison Chart

LI-ION BATTERY CHEMISTRY	NOMINAL VOLTAGE (V)	CYCLE (LIFE)	CHARGE CURRENT RATE (C)	DISCHARGE CURRENT RATE (C)	THERMAL RUNAWAY (°C)	PACKAGING (TYPICAL)	SPECIFIC ENERGY (Wh/Kg)	APPLICATIONS	REMARKS	COMPATIBLE WITH ION's BMS
Nickel Manganese Cobalt Oxide (NMC)	3.6 (3.0-4.2) range	1000+	0.7-1C	1-2C	210°C (410°F)	18650, 21700	150-220	E-Bikes, Medical Devices, EVs, Industrial	High-specific energy, Low self-heating rate	Yes
Lithium Iron Phosphate (LFP)	3.2 (2.5-3.65) range	2000+	1C	1C	270 °C (518°F)	18650, 32650, prismatic	90-120	Stationary Applications with high capacity, EV	Flat discharge voltage, high power, low capacity, safe	Yes
Lithium Nickel Cobalt Aluminium Oxide (NCA)	3.6 (3.0-4.2) range	500-1000	0.7C	1C	150 °C (302°F)	18650	200-260	Medical, Industrial, Electric Powertrain	Long life, fast charge, wide temperature range, safe & expensive	Yes
Lithium Titanate Oxide (LTO)	2.4 (1.8-2.85) range	3000-7000	1C	10C	Highest	Prismatic	50-80	Electric Vehicle and Energy Storage Systems	Highest capacity with moderate power	Yes
Lithium Cobalt Oxide (LCO)	3.6 (3.0-4.2) range	500-1000	0.7- 1C	1C	150 °C (302°F)	18650 Prismatic & pouch cell	150-200	Laptops, Mobile Phones, Tablets, Cameras	High energy, limited power	Yes
Lithium Manganese Oxide (LMO)	3.7 (3.0-4.2) range	300-700	0.7-1C	1C	250 °C (482 °F)	Prismatic	100-150	Medical Devices, Electric Powertrains, Power Tools	High power, less capacity; safer than LCO	Yes

Source from: https://www.ionenergy.co/resources/blogs/lithium-ion-battery-types/

DC Load Management
Ring Circuit

DC Load Management - Ring Circuit Operation

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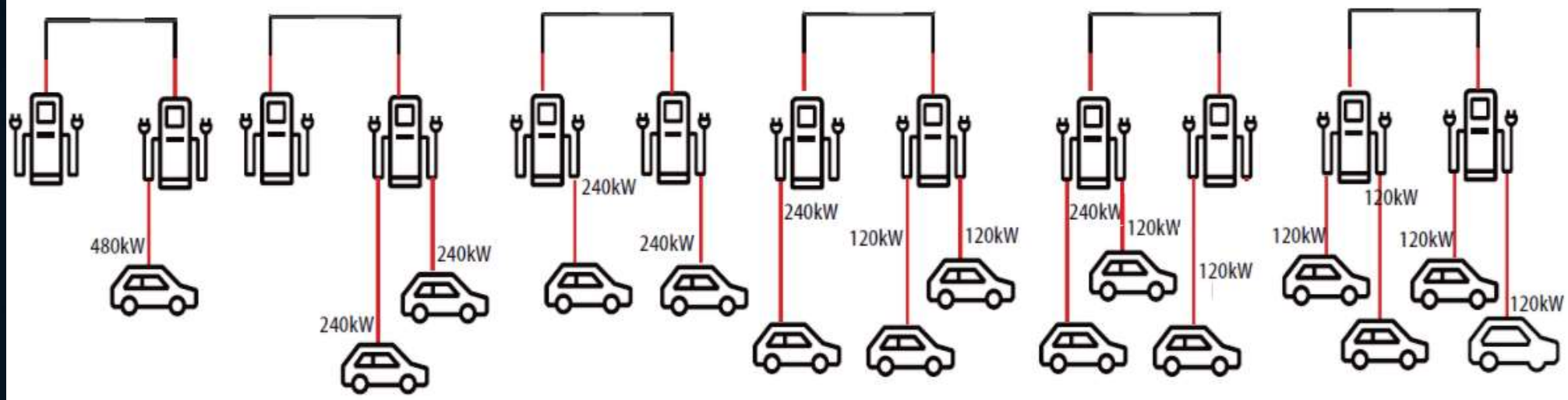
High Power Charging HPC for Commercial EV

How is power shared in the solution?



Day time with current mode for the power focus and high speed charging at any connector

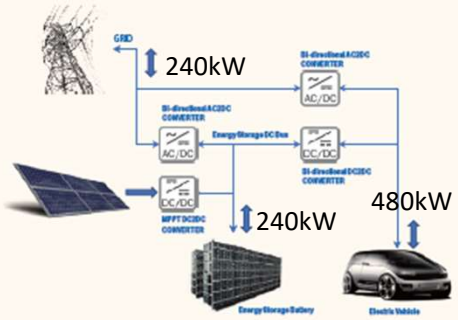
Night time with plugging mode for the power dispense and average speed charging at every connector

Alone Car with current mode for the power focus and high speed charging at any connector

Multi Car with plugging mode for the power dispense and average speed charging at every connector

Battery Storage System For HPC

Energy Storage Charging Solution - 480kW/ 6 Charging Points/ 200kWh Battery Energy Storage Charger



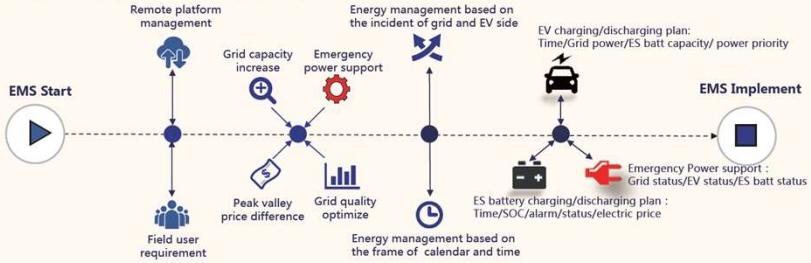
Solution Value

- Grid peak load shaving
- Grid capacity expansion
- Grid quality and reliability improvement
- Emergency power supply
- New energy convenient access
- User side energy storage B2G integration
- V2G/V2X realize

Solution Feature

- Total electric insolation between the grid, battery, EV and new energy input
- Full compatible between different system configuration
- Flexible change the system configuration, capacity and power direction
- Differentiation battery group configuration and access
- Unify EMS stragety
- HPC 500A charging support

Energy Storage Charging System Running Strategy



- EXP480K2-LDC 480kW Charging Dispenser
- IBS215K1KC 200kWh Battery Cube
- IES480K1K 480kW Power Cube

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IBS215K1KC Energy Storage Battery Cube (215W/280Ah)

- Max480kW/640kW/1000V output, easily configure the output power from 240kW to 480kW/640kW with 30kW/40kW step
- Support max 3 DC Sources parallel work to get max 1.44MW/1.92MW DC bus
- Constant power output from 1000V to 300V and get low to 150V output with constant current
- IP54
- Optional one for four output DC bus with easy configure by copper bar in the field
- Front/Back door maintenance to fit multi DC source parallel installation
- Full safety function with output contactor and fuse, EPO, SPD, leakage protection switch, insulation detect protection
- User friendly interface with 4.3” TFT touch screen LCD & RGB LED
- Internal high precision energy meter
- CE and UL certification

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~The END~

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