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IEP

EV (Electric Vehicle)

EVSE (EV Supply Equipment)



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Norms

- PN-EN 61851 – systemy przewodowego ładowania pojazdów elektrycznych – część 1, wymagania ogólne
- SAE J1772 – między innymi wtyczki i gniazda
- IEC 62752 -In-cable control and protection device for mode 2 charging of electric road vehicles
- GB/T 18487 -Electric vehicle conductive charging system - Part 1: General requirements
- ARTICLE 625, NEC ELECTRIC VEHICLE CHARGING SYSTEMS - modes
- FCC EMC
- Summary of references of harmonised standards published in the Official Journal – Directive 2014/30/EU



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References and source data for drawings:

- 1) Maximizing power for Level 3 EV charging stations, Sang Chon, Manish Bhardwaj, Hrishi Nene, Texas Instruments.
- 2) Power Electronics for Electric Vehicles and Energy Storage Emerging Technologies and Developments Edited by Dharavath Kishan, Ramani Kannan, B Dastagiri Reddy, and Prajof Prabhakaran, CRC Press.
- 3) PN-EN 61851 – systemy przewodowego ładowania pojazdów elektrycznych – część 1, wymagania ogólne
- 4) <https://deltrixchargers.com/about-emoility/charging-modes/> „Charging modes”

AC (DC not all)			
SAE J1772 Type 1	IEC 62196-2 Type 2	GB/T 20234 AC	Tesla Supercharger
			
5 2-AC lines2-Signal lines1-Protective earth pin	7 3-AC lines1-Neutral pin2-Signal lines1-Protective earth pin	7 3-AC lines1-Neutral pin2-Signal lines1-Protective earth pin	5 2-AC lines2-Signal lines1-Protective earth pin
750 V 7.68 kW AC	500 V 12.8 kW AC	600 V 12.16 kW DC and AC	1000 V 140 kW DC and 1- ϕ AC
22kW			

AC & DC plug			
GB/T 20234 DC	CHAdemo	CCS Combo 1	CCS Combo 2
			
9 2-DC lines2-Signal lines2-Connection checks2-Auxiliary circuit supply1-Protective earth pin	9 2-DC lines2-Signal lines2-Start/Stop pins1-Connection check1-Charging enable/disable1-Protective earth pin	7 2-AC lines2-DC lines2-Signal lines1-Protective earth pin	9 3-AC lines1-Neutral pin2-DC lines2-Signal lines1-Protective earth pin
120 or 240 V 187.5 kW DC	400 V 200 kW DC	380 V 75 kW DC and AC	480 V 200 kW DC and AC

Sockets					
Area	U.S.A.	Europe	China	Japan	
Standard	SAE	IEC	GB/T	CHAdemo	Tesla
AC	 J1772	 62196-2	 20234.2	 J1772	
DC	 J1772	 62196-3	 20234.3	 CHAdemo	 Tesla



Charging modes

- Mode 1: 1 or 3 phase grid 250/380V up to 16A; in US prohibited; Some counties RCD (Residual Current Device) require.

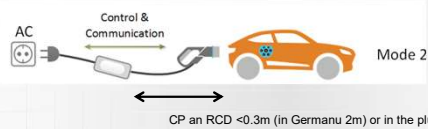


Mode 1



Charging modes

- Mode 2: 1 or 3 phase grid 250/380V up to 32A; in US prohibited; RCD (AC&DC) require; Controll Pilot

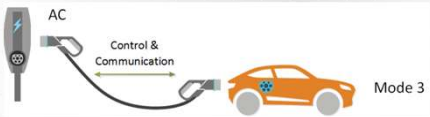


Mode 2



Charging modes

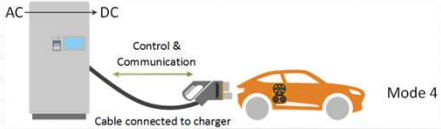
- Mode 3: 1 or 3 phase grid 250/380V up to 16A; special RCD (AC&DC) require.



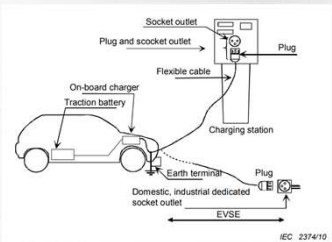
Mode 3

Charging modes

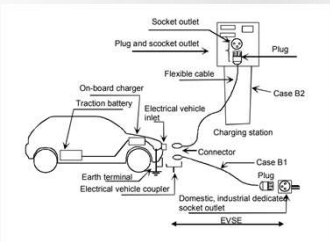
- Mode 4: off board charger usually DC fast charger;

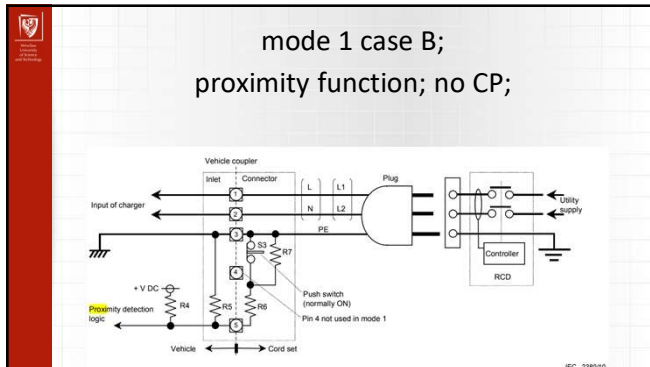


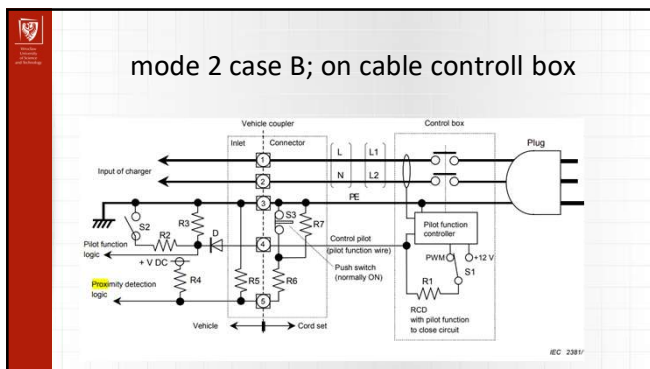
Case A – cable permanently connected to car

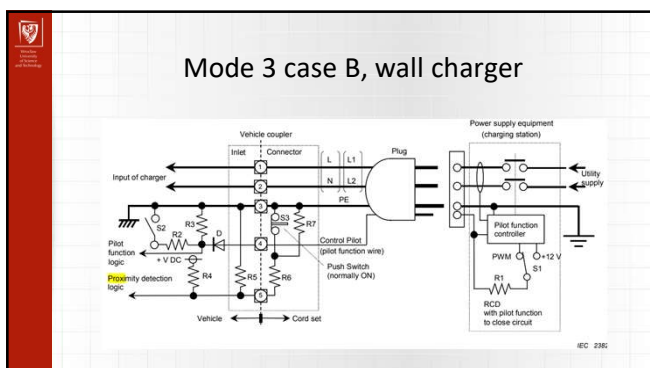


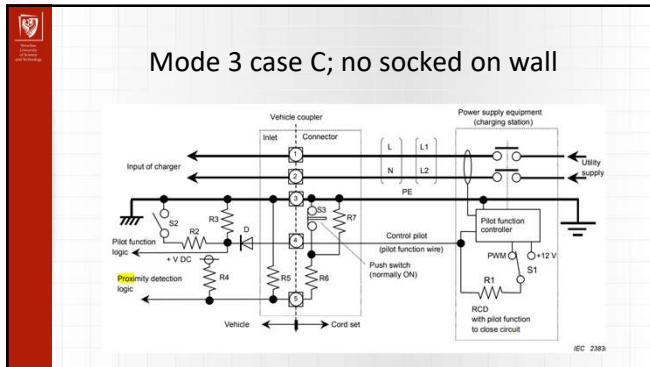
Case B – cable have plug

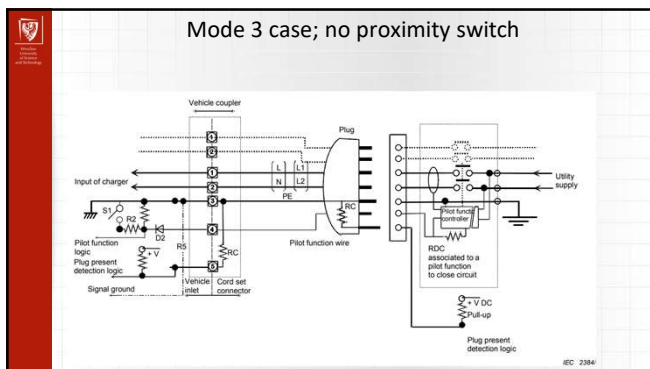


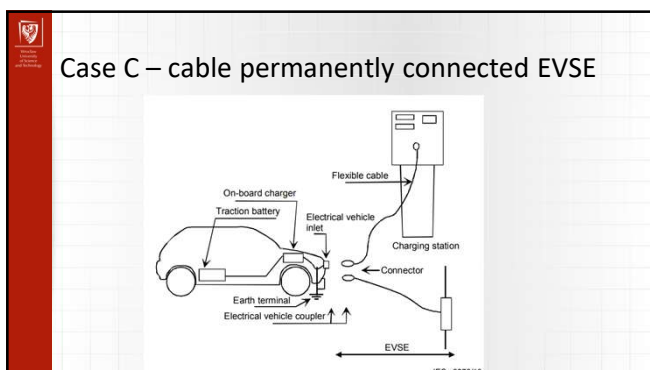


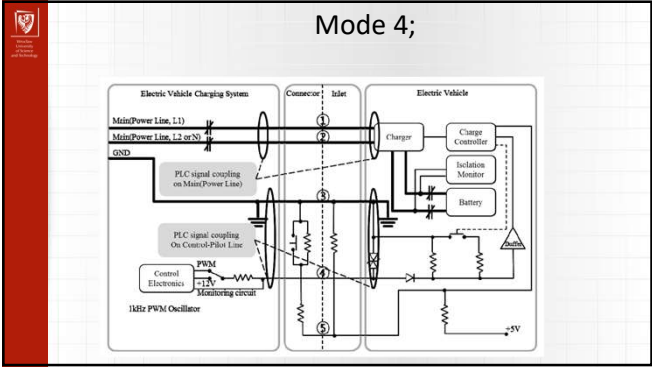






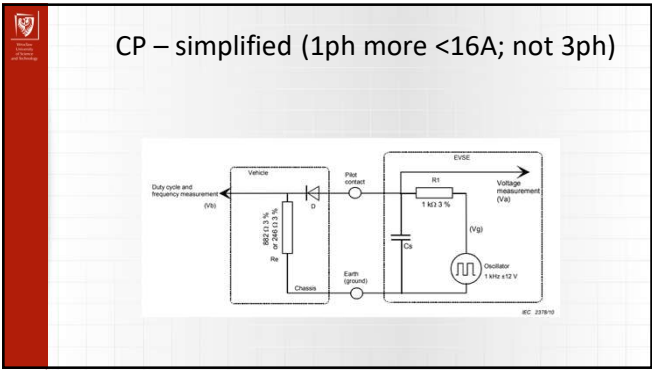


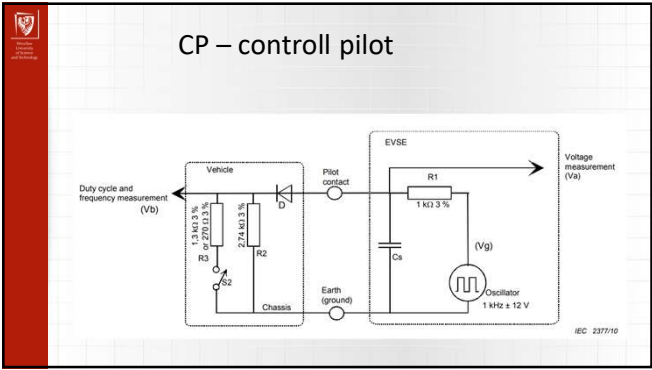




Proximity signal

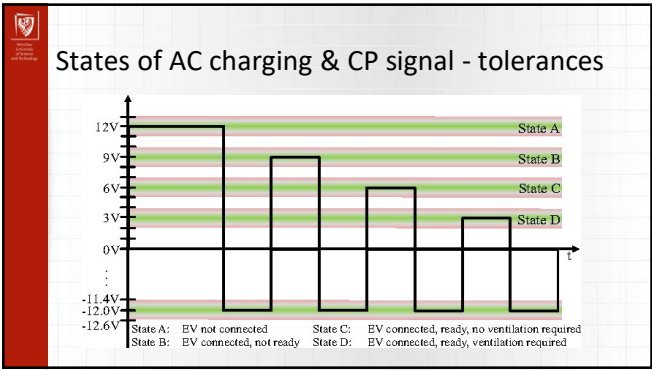
Current capability of the cable assembly	Equivalent resistance of R_c Tolerance $\pm 3\%$
13 A	$1.5 \text{ k}\Omega \pm 0.5 \text{ W}^{\pm 1}$
20 A	$680 \Omega \pm 0.5 \text{ W}^{\pm 1}$
32 A	$220 \Omega \pm 0.5 \text{ W}^{\pm 1}$
63 A (3 phase) / 70 A (1 phase)	$100 \Omega \pm 0.5 \text{ W}^{\pm 1}$





CP parameters

Parameter ^a	Symbol	Value	Units
Generator open circuit positive voltage ^b	Voch	12.00 (± 0.6)	V
Generator open circuit negative voltage ^b	Vocl	- 12.00 (± 0.6)	V
Frequency	Fo	1 000 (± 0.5 %)	Hz
Pulse width ^{b, c}	Pwo	Per Table A.4 (± 25 μs)	μs
Maximum rise time (10 % to 90 %) ^c	Trg	2	μs
Maximum fall time (80 % to 10 %) ^c	Tfg	2	μs
Minimum settling time to 95 % steady state ^c	Tsg	3	μs
Equivalent source resistance ^c	R1	1 000 ± 3 %	Ω
Recommended EMI suppression	Cs	300	pF
Maximum total cable ^c capacity + Cs	Cs + Cc	3 100	pF



CP duty cycle

Nominal duty cycle interpretation by vehicle	Maximum current to be drawn by vehicle
Duty cycle < 3 %	Charging not allowed
3 % ≤ duty cycle ≤ 7 %	Indicates that digital communication will be used to control an off-board DC charger or communicate available line current for an on-board charger. Digital communication may also be used with other duty cycles. Charging is not allowed without digital communication. 5 % duty cycle shall be used if the pilot function wire is used for digital communication
7 % < duty cycle ≤ 8 %	Charging not allowed
8 % ≤ duty cycle ≤ 10 %	6 A
10 % ≤ duty cycle ≤ 85 %	Available current = (% duty cycle) × 0.6 A
85 % < duty cycle ≤ 96 %	Available current = (% duty cycle - 64) × 2.5 A
96 % < duty cycle ≤ 97 %	80 A
Duty cycle > 97 %	charging not allowed

If the PWM signal is between 8 % and 97 %, the maximum current may not exceed the values indicated by the PWM even if the digital signal indicates a higher current.

Mode 3/ case B (socket-socket)

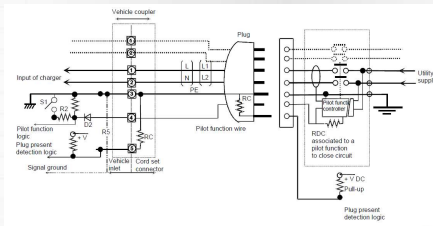
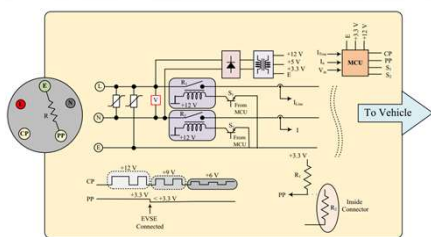
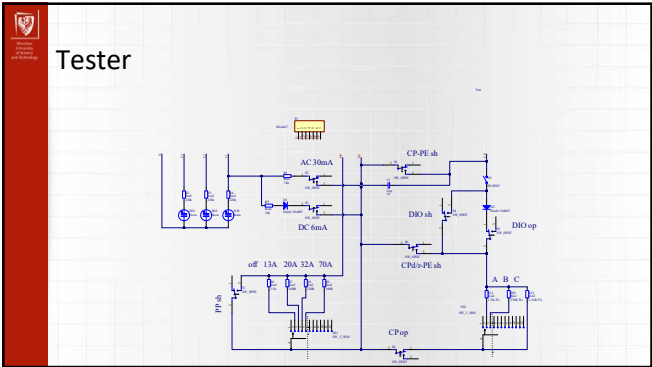
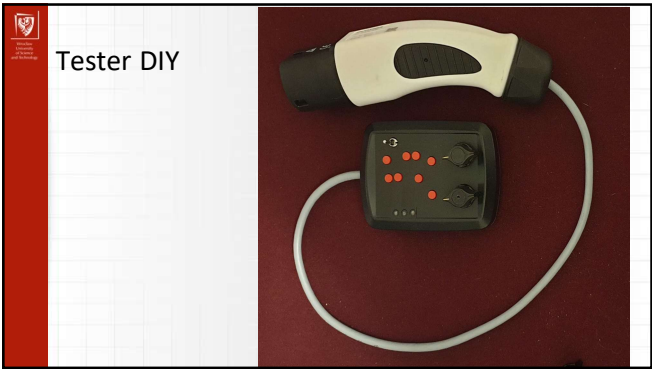


Figure B.6 – Mode 3 case B using the basic single phase vehicle coupler without proximity push button switch S3

EVSE





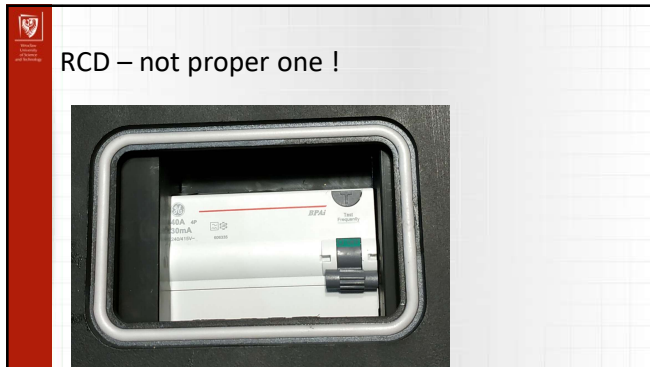


RCD

W tabeli poniżej zostały zebrane trzy najczęściej spotykane typy RCD:

Oznaczenie graficzne	Oznaczenie tekstowe	Rodzaj prądu na jaki dany wyłącznik reaguje
	AC	Prąd przemienny.
	A	Jak powyżej oraz prąd wyprostowany jednopółkowo (pulsujący).
	B	Jak powyżej oraz prąd stały.

lub:









RCD by LEM



Applications

- Leakage current measurement in an IC-CPD in-cable (mode 2) and for wall boxes (mode 3) contact and protection device
- Single phase nominal current up to ± 32 A RMS.



Wyłącznik różnicowoprądowy 4P 40A 30mA 10kA typ B+ CDB640D



Producent: HAGER POLO
Indeksu producenta: CDB640B
Indeksu TSN: 0001-00015-06478
Kategoria: Wyłączniki i bloki różnicowoprądowe
Dochodzi: Dostępny

Cena: 2966,98 zł brutto

[Znajdź w tej kategorii produkty](#)

7 lat

Wysokość: 240 mm

Do Schowka

1 szt.

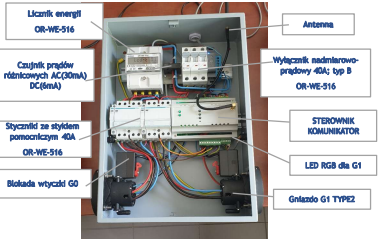
500 KOSZYK

[Znajdź w produkcie](#)

[Dodaj](#)



2 Socket charger



Licznik energii OR-WE-916

Czujnik prądów różnicowych AC(30mA) DC(5mA)

Szyfrowanie ze stykiem pomocniczym 40A OR-WE-916

Blockady wtyczki G0

Antena

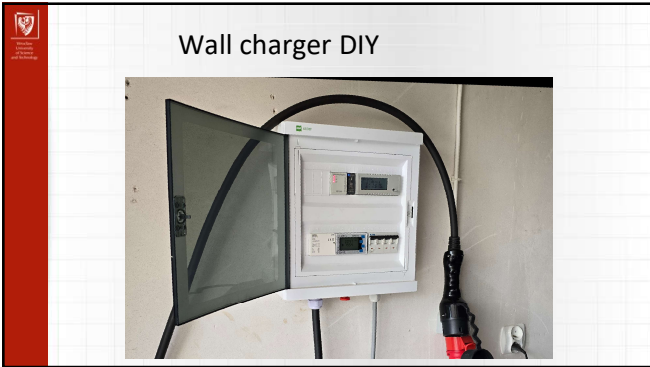
Wyłącznik nadmiarowo-prądowy 40A typ B OR-WE-916

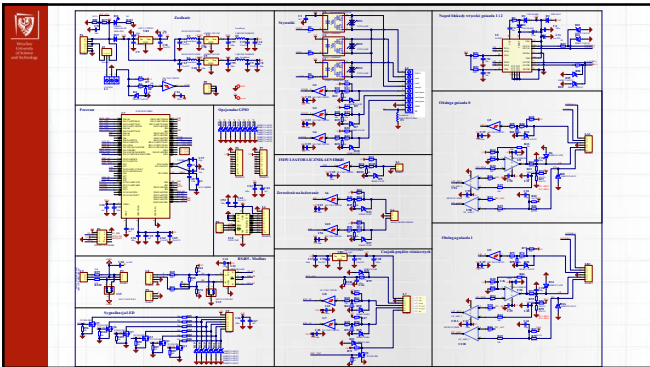
STEROWNIK KOMUNIKATOR

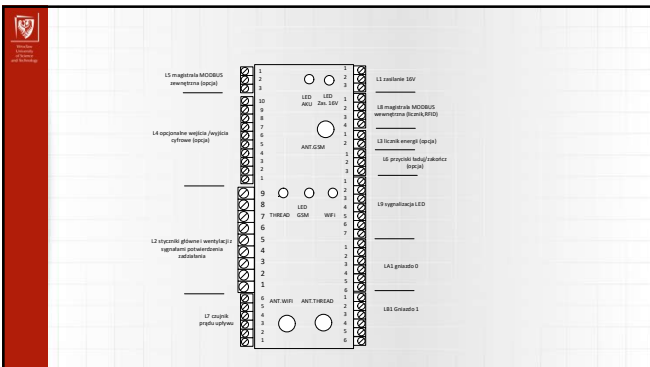
LED RGB dla G1

Gniazdo G1 TYPE2

Odblokowanie wtyczki przy zaniku zasilania !!!
Licznik MDI & MODBUS !!!









Open Charge Point Protocol (OCPP)

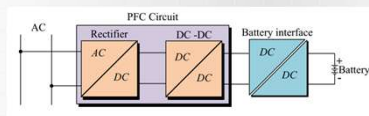
OCPP-J = OCPP communication over WebSockets using JSON.

OCPP-S = OCPP communication over SOAP and HTTP(s).

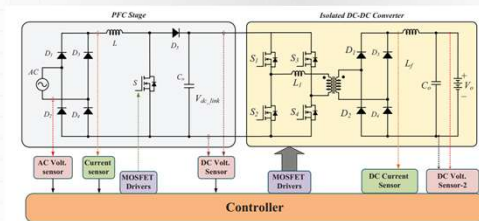
42



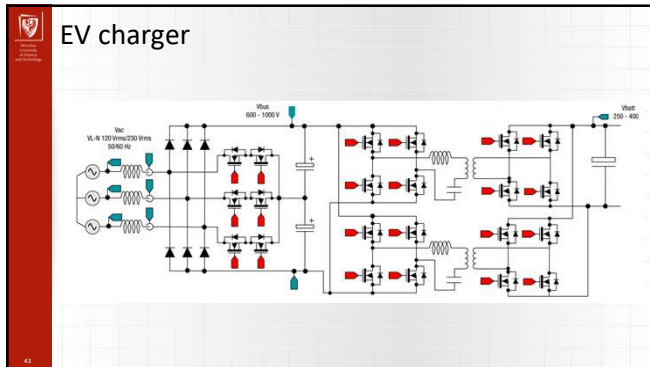
EV charger



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Test question

What 4 states can be distinguish connecting EV (Electric Vehicle) to EVSE (Electric Vehicle Supply Equipment) ?
