ERASMUS 2016 – PROJECT "GREEN CAR"

EV charging infrastructure

Tehnička škola Čakovec

Čakovec ,28.05.2016

Recharging infrastructure for electric vehicles

A new mobility model

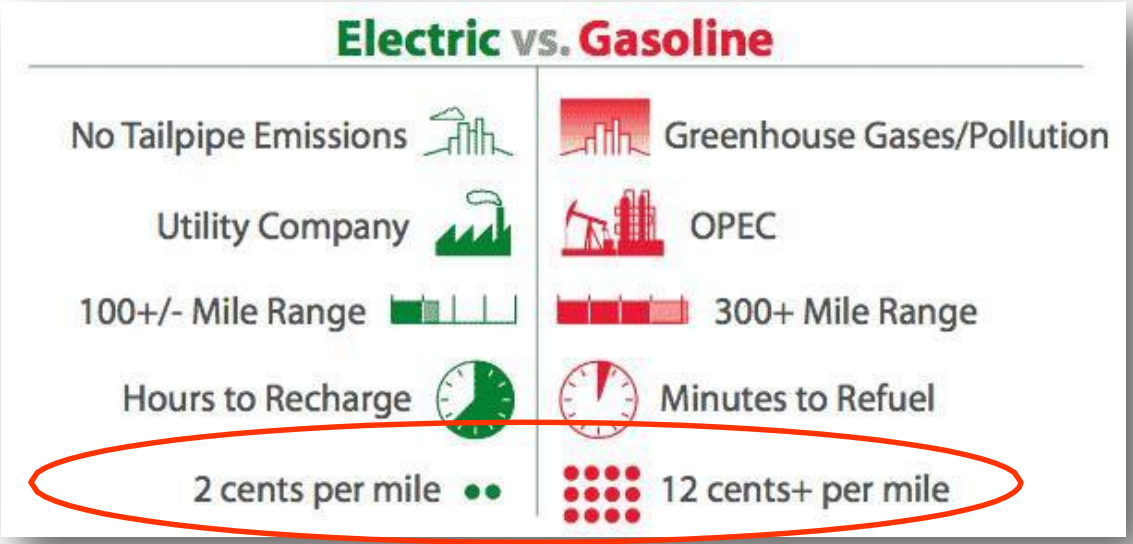
Urban traffic is partly responsible for the poorer quality of life in cities.
74 % of total dust emissions PM10 at a national level comes from traffic
(the remaining 10 % is from industry and 16 % from the gas heating systems)

1 liter of oil = 2.4 kg carbon dioxide (CO2)

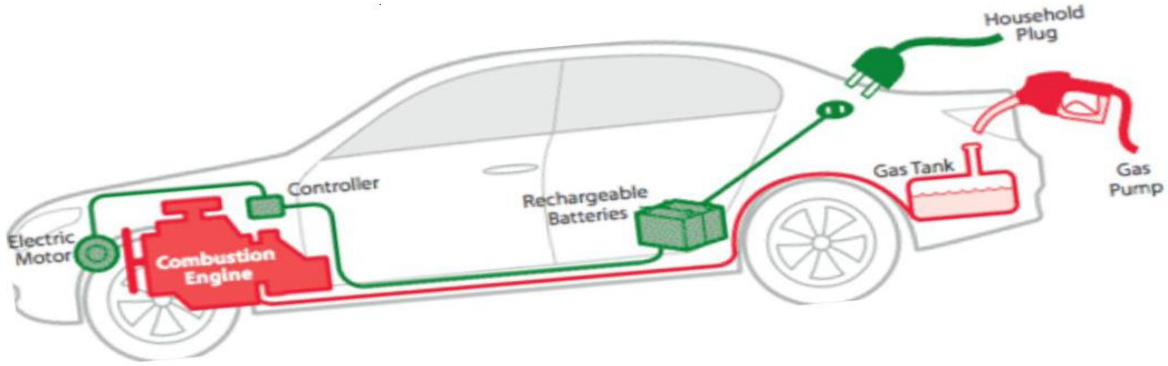
Electrical energy : why ?

In member states of the European Economic Community, energy consumption from traffic counts for 30% of total consumption, 70% of which comes from the consumption of petrol and diesel oil.

Reinventing the market: Cost fuel v.s. Electrical



On a monthly basis, an electric vehicle accounts for roughly 20 dollars of a monthly electric bill. Compared to a fuel dependent vehicle, in order to run the same distance, one would need to spend about 100 dollars a month for fuel!



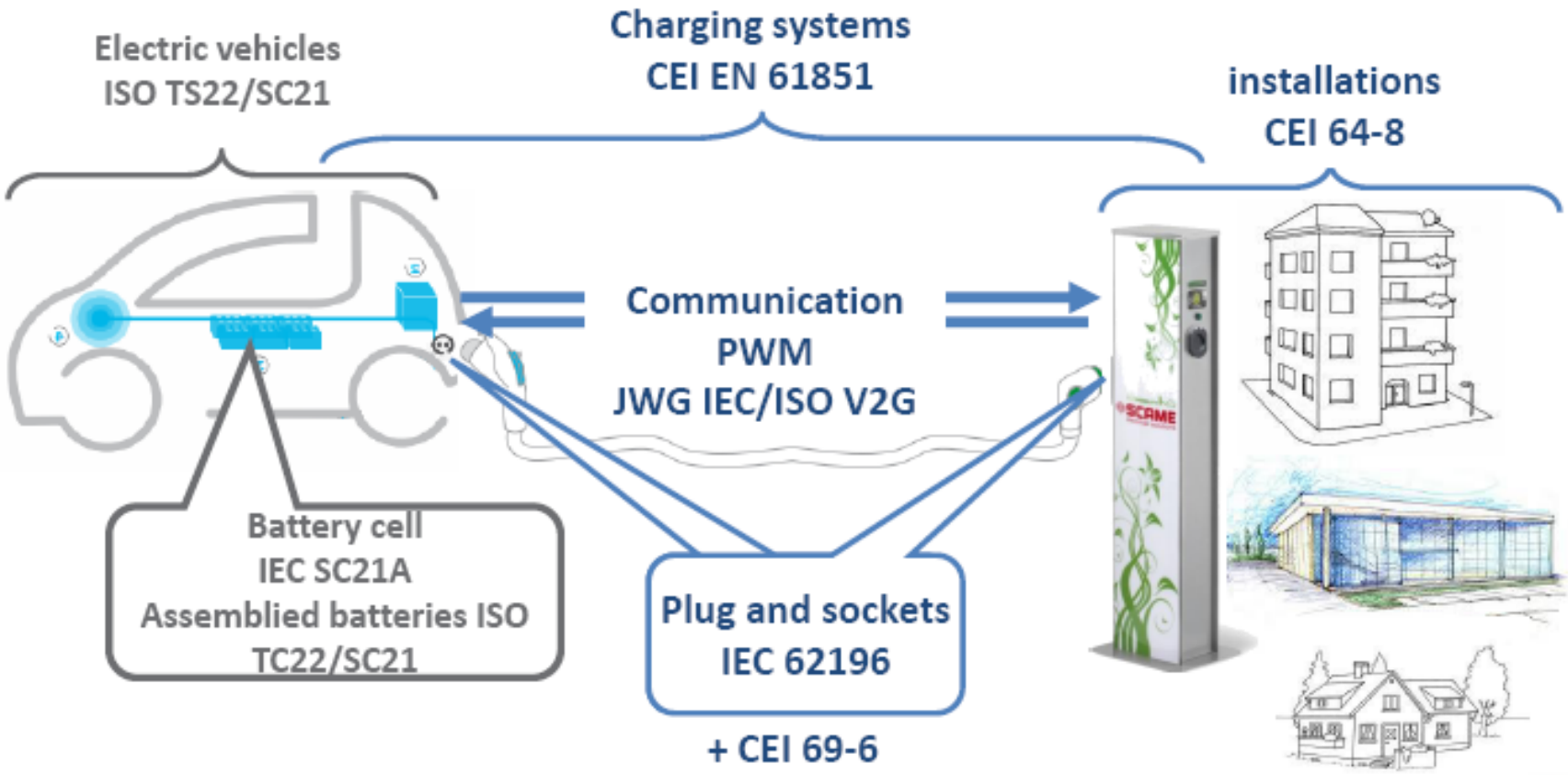
Reinventing the market: A new mobility model

For an electric car that covers **15000 km per year**, **20 square metres** of **photovoltaic panels** would be sufficient against the **300 square metres of crops** needed to produce enough bio-ethanol required for the same distance with a car running on internal combustion.

Ideally, photovoltaic panels installed on rooftops could provide a good amount of the energetic needs of electrical mobility.

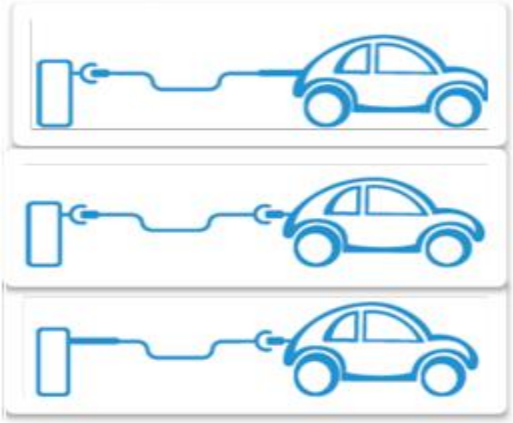
EV international standards: Overview

- Standards for **connectors**
- Standards for **communication systems** between vehicle and charging station and between charging station and the electrical network (Smart Grid)
- Standards for the **safety for recharging systems**



EV international standards: recharging modes

There are three cases for how the connecting cable can be attached to the vehicle: (IEC 61851-1)



CASE A: the cable is connected directly to the vehicle

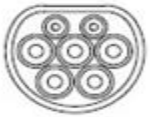
CASE B: the cable is disconnected from both the vehicle and the base column (cord-set)

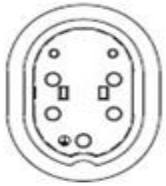
CASE C: the cable is connected to the charging column

IEC 62196-1 (FDIS) AND 62196-2 (FDIS): MODE 3 CONNECTORS

The reference standards for Mode 3 connectors are the IEC 62196-1 and 2, and they envisage three different types of system:

TYPE 1	TYPE 2	TYPE 3A - *for light vehicles*	TYPE 3C - *for all vehicles*
Single-phase, 2 pilot contacts, 32A, 250V~, IPXXB, accessories for vehicle-side only.	single/three-phase, 2 pilot contacts, 63A, 500V~, IPXXB, mandatory interlock to avoid disconnection under load.	single-phase, 1 pilot contact, 16A, 250V~, IPXXD socket, IPXXB plug disconnectable under load.	single/three-phase, 2 pilot contacts, 63A, 500V~, IPXXD socket, IPXXD plug disconnectable under load up to 32A.



EV international standards : Connectors (a.c.)

IEC 62196-1-2

TYPE 1

TYPE 2

TYPE 3 A

TYPE 3 C

EV international standards:
Fast charge infrastructure in public places (d.c.)

IEC 62196-3 (plug and sockets)- IEC 61851-23 and IEC 61851-24 (Mode 4)

CHADEMO
Rapid charge in d.c

CCS tipe 2 (COMBO 2)
Rapid charge in d.c

CCS tipe1 (COMBO 1)
Rapid charge in d.c

Connector standardization - EU

European Commission

EUROPEAN COMMISSION

Brussels, 24.1.2013
COM(2013) 18 final

2013/0012 (COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the deployment of alternative fuels infrastructure

(Text with EEA relevance)

{SWD(2013) 5 final}
{SWD(2013) 6 final}

Connector standardization - EU

Charging in A.C.

TYPE 2

TYPE 2 with/without shutters

TYPE 3 A

TYPE 3 A with/without shutters

Charging in D.C.

ChaDeMo

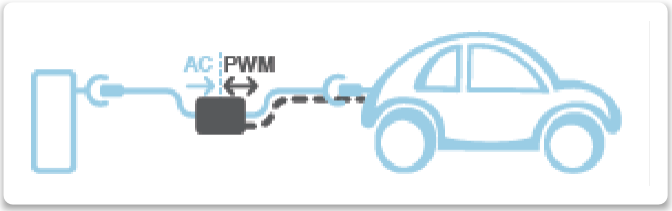
CCS Type 2 (COMBO 2)

EV international standards: recharging modes

According to the IEC 61851-1 standard for charging columns, 4 recharging modes are possible for vehicles :

MODE 1: Slow recharging in a domestic environment (6-8 hours)
This is possible only in private locations using a maximum current of 16A. A simple domestic socket or industrial socket of 16 amps can be used.

MODE 2: Slow recharging in domestic and public environments (6-8 hours)
On the connecting cable of the vehicle there is a device called Control Box (safety system PWM) that guarantees safe recharging and the use of domestic and industrial sockets up to 16 A.



MODE 3: Slow Recharging (6-8 hours) or relatively faster (30 minutes to 1 hour) in domestic or public environments
This method is obligatory in public places and recharging must be carried out using a specially made connecting system with specific connectors. Recharging can also be done with the relatively fast method (63 A, 400V),

MODE 4: Fast recharging in public places (5-10 minutes)
This is rapid recharging using continuous current (up to 200 A, 400V). By this system it is possible to recharge vehicles in just a few minutes using an external battery charging device.

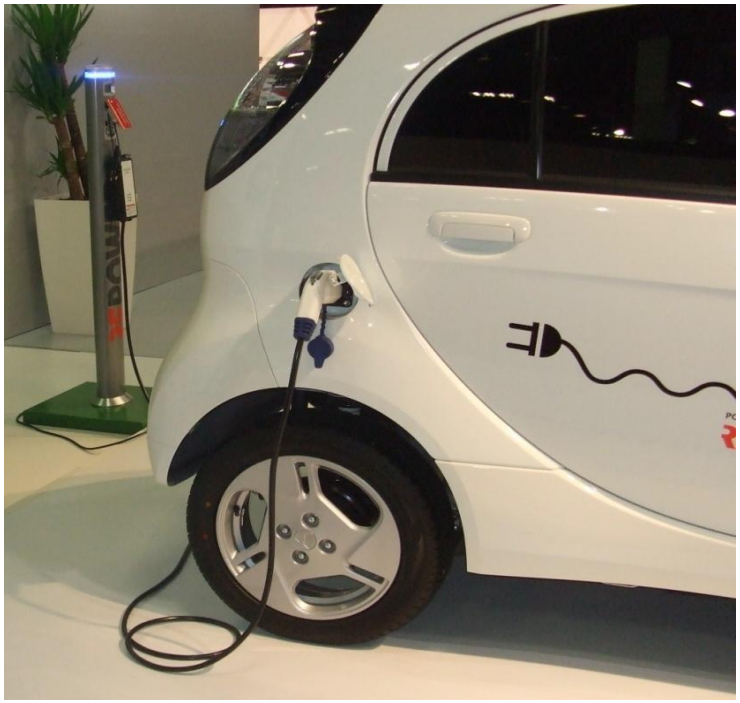
EV international standards: Mode 1 Domestic places charge

WALL BOX

MODE3

Domestic Place recharge
using a simple **domestic socket**
MODE 1 (IEC 61851-1, IEC 69-6) 16 A 220 V ac

EV international standards: Mode 2 Infrastructure in public places



There are light electric vehicles like scooters and quad using a plug for charging domestic (schuko) and therefore may require you to recharge from a pillar using the public way in Mode 2 (IEC 61851-1)

EV international standards: Mode 3 Public places recharge

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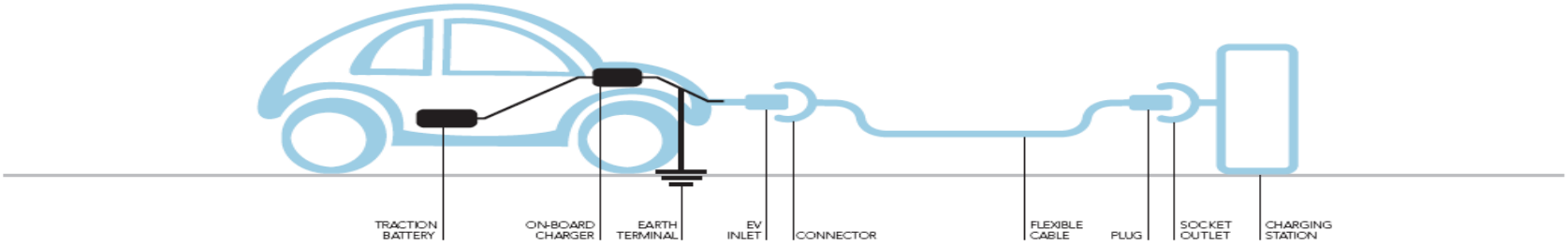
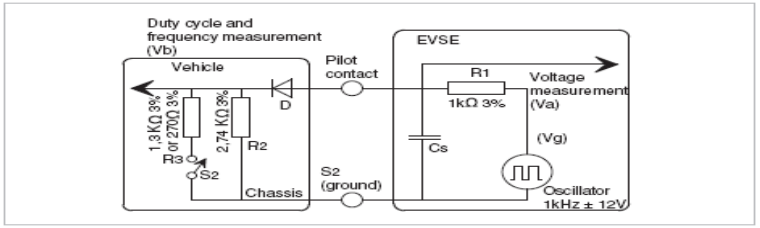


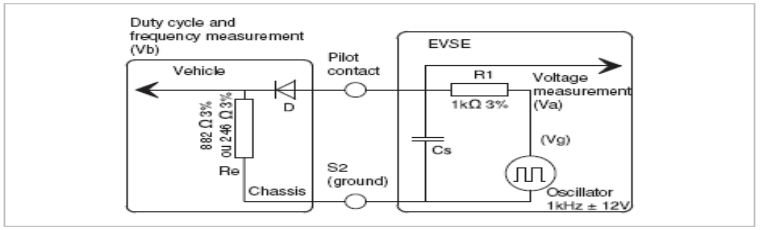
MODE 3 PWM CIRCUIT (PULSE WIDTH MODULATION)

PWM circuit operation is described in Annex A of standard IEC/EN 61851-1. This circuit arranges for communication between charging station and electric vehicle: the station communicates the supply network availability to the vehicle through a frequency-modulated signal, the vehicle adjusts the load returning its status through a voltage value.



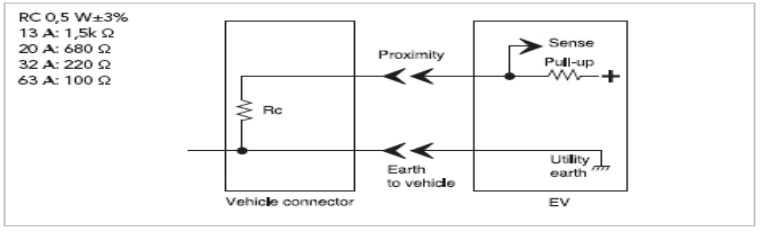
"SIMPLIFIED" MODE 3

In the case of vehicles without PWM, the circuit operates in "simplified mode", measuring the earth resistance value only and limiting the charging current to 16 A (10 A in the future).



RESISTOR CODING

Resistor Coding operation is described in Annex B.5 of standard IEC / EN 61851-1 and it is mandatory in the case of 3C type connectors, type 1 and type 2, when it is possible to wire the plug using cables with different cross-sections and current carrying capability. Depending on the max charging current, a resistance is positioned between the PP contact and the earth, with a value that identifies cable size. The PWM circuit then checks that the charging current does not exceed the maximum drawable current.



EV international standards: Mode 4 Fast charge infrastructure in public places

CHAdeMO

Type 2 CCS (COMBO 2)

Specific Products for EV Charging

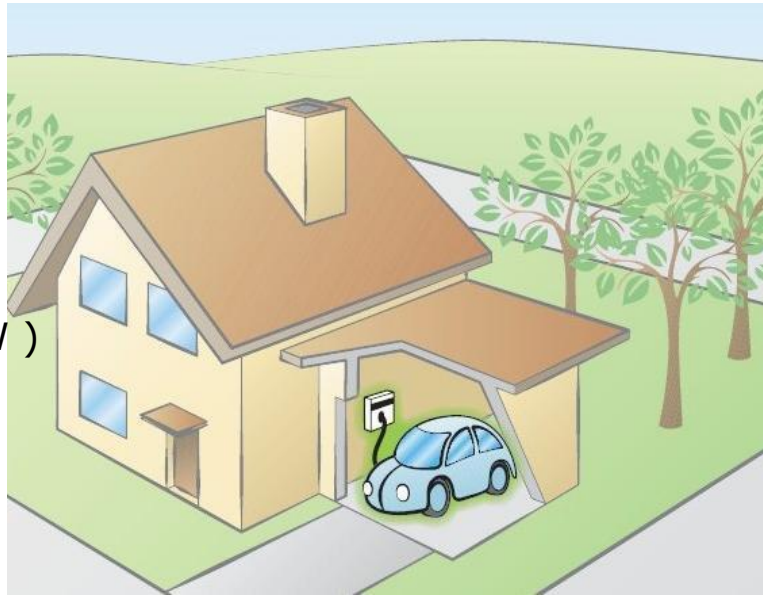
WALL BOX

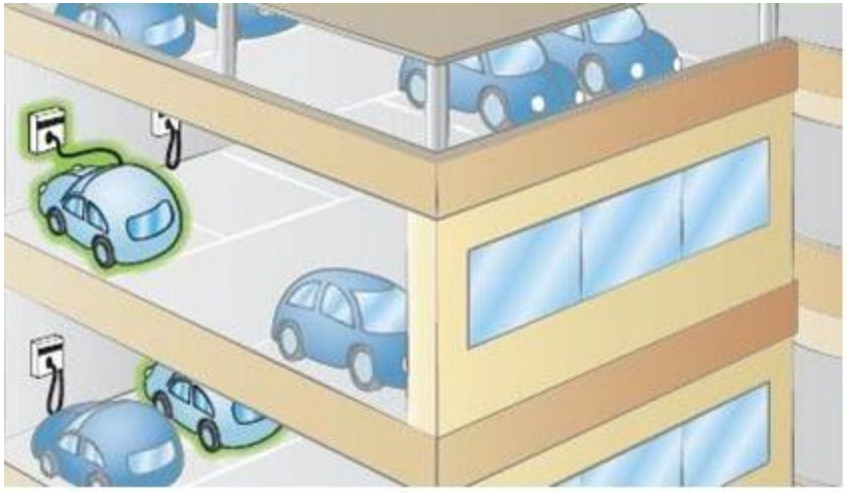
PILLAR

CORD SET

EV Product Presentation – WALL BOX

WALL BOX
- Domestic use: garage
- Public parking ; garage
- 16 A 220 V / 32 A 380 V (up to 22 kW)
- Type 2 socket
- RFID system



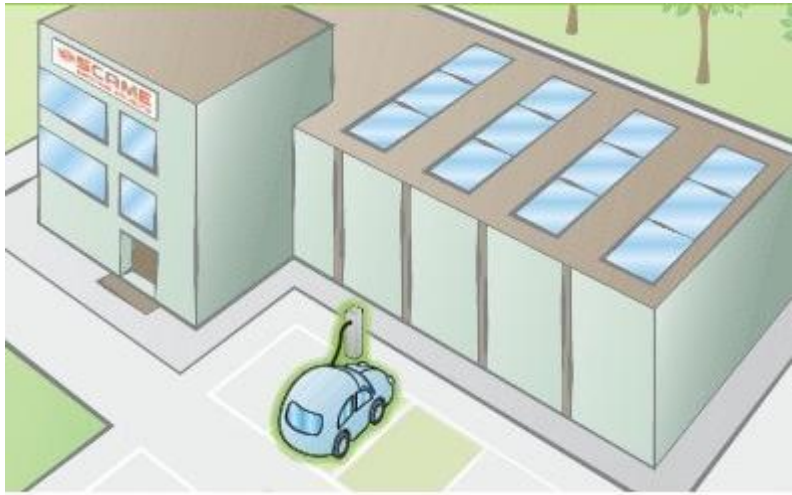


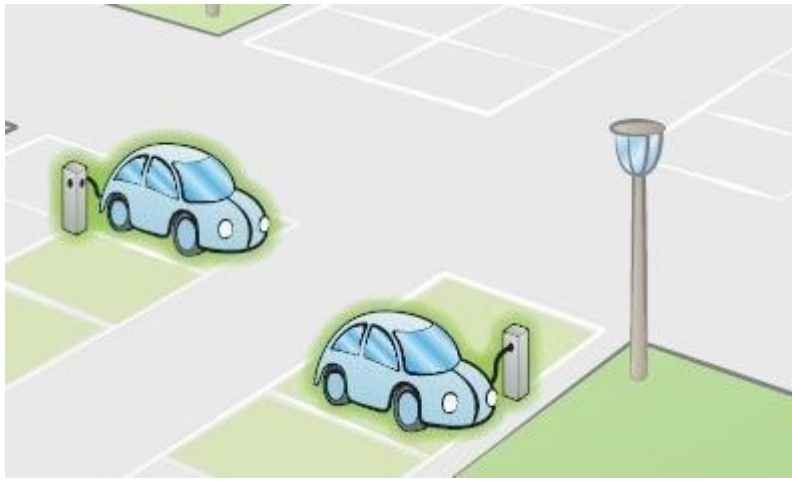
EV Product Presentation - PILLAR

PILLAR
- public parking
- companies parking
- airport , public station ...
- 16 A 220 V ; 32 A 400 V (up to 22 kW)
- TYPE 2 socket
- RFID system

EV Product Presentation - 63 A , 400 V a.c. Fast Charging

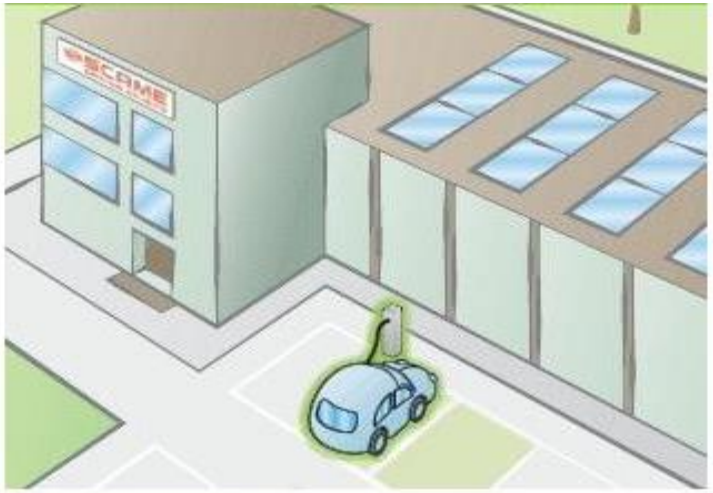
PILLAR
- public parking
- companies parking
- airport , public stations
- 63 A , 400 V
- TYPE 2 connector
- RFID system





EV Product Presentation - ChaDeMo d.c. fast charging

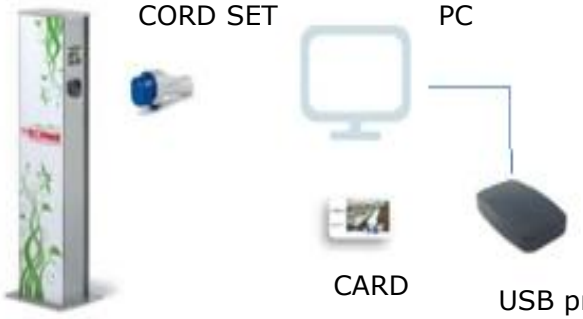
PILLAR
- public parkings
- companies parking
- airport , public stations ...
- 20 – 50 kW d.c.
- ChaDeMo connector
- COMBO CCS 2



Managing system for Mode 3 charging stations

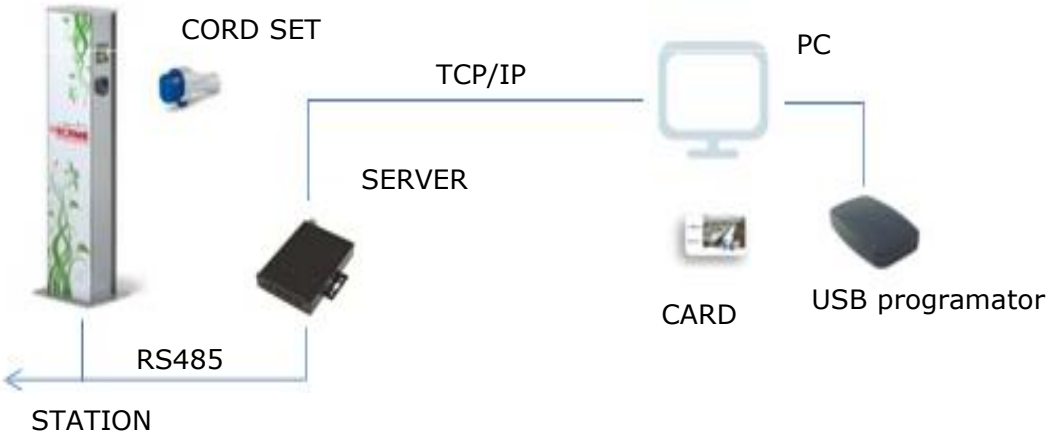
1. FREE

2. PERSONAL



SOFTWARE FOR CARD CONFIGURATION

3. NET



SOFTWARE FOR STATION MANAGEMENT


IKEA
Entrata
In IKEA
il pieno
di energia
è gratis!


Ricarica qui
la tua
auto elettrica
IKEA
SCAME

Thank You !