# Snelladen van elektrische voertuigen met tot wel 0,5 MW

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14 juni 2018
1931 Congrescentrum Den Bosch
POWER ELECTRONICS 2018

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Jan Nieuwhart

Branche Manager Energie

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- Ontwikkeling elektrische voertuigen Nederland
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- Batterijen / Opkomst E-mobility
- Voertuigen / Opkomst E-mobility
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- Applicatie
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- Cable gland and strain relief
- Customer Design of the system

# Opkomst E-mobility

New York  +/- 1905

# Opkomst E-mobility

New York +/- 1915

# Opkomst E-mobility

New York +/- 1925

# Opkomst E-mobility

New York  1950

# Opkomst E-mobility

New York  1970

# Opkomst E-mobility

Waarneming?

# Opkomst E-mobility

Traditie van 200 jaar

paard en wagen

verdwenen in 15 jaar tijd

# Opkomst E-mobility

Welke traditie
gaan
wij
doorbreken ?

# Opkomst E-mobility

- Toekomst ‘vloeistof’ aangedreven voertuigen?
- Hoeveel elektrische voertuigen in 2030?
- Groei e-mobility in elektrische energie?

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# Ontwikkeling elektrische voertuigen Nederland

**Number of registered electric vehicles on the road in The Netherlands**[2]

| Type of vehicle / Number as of | 31-12-2015 | 31-12-2016 | 31-12-2017 | 28-02-2018 | 31-03-2018 |
|---|---|---|---|---|---|
| Passenger car – BEV | 9,368 | 13,105 | 21,115 | 23,431 | 25,134 |
| Passenger car – E-REV, PHEV | 78,163 | 98,903 | 98,217 | 98,193 | 98,098 |
| Passenger car – FCEV | 21 | 30 | 41 | 40 | 41 |
| **Subtotal** | **87,552** | **112,038** | **119,373** | **121,664** | **123,273** |
| Commercial car ≤ 3.5 tons | 1,456 | 1,628 | 2,208 | 2,312 | 2,365 |
| Commercial car > 3.5 tons | 50 | 66 | 81 | 80 | 84 |
| Bus | 94 | 168 | 296 | 312 | 322 |
| Trike / Quadricycle | 872 | 1,007 | 1,134 | 1,474 | 1,173 |
| Motorbike | 268 | 316 | 446 | 506 | 530 |
| **Subtotal** | **90,296** | **115,223** | **123,538** | **126,048** | **127,747** |
| Light moped 45 km/h | 3,610 | 3,775 | 4,376 | 4,576 | 4,727 |
| Light moped 25 km/h | 28,459 | 32,496 | 37,652 | 38,252 | 38,574 |
| Microcar 45 km/h | 219 | 258 | 316 | 324 | 329 |
| **Total** | **122,584** | **151,752** | **165,882** | **169,200** | **171,377** |

Bron: Rijksdienst voor ondernemend Nederland

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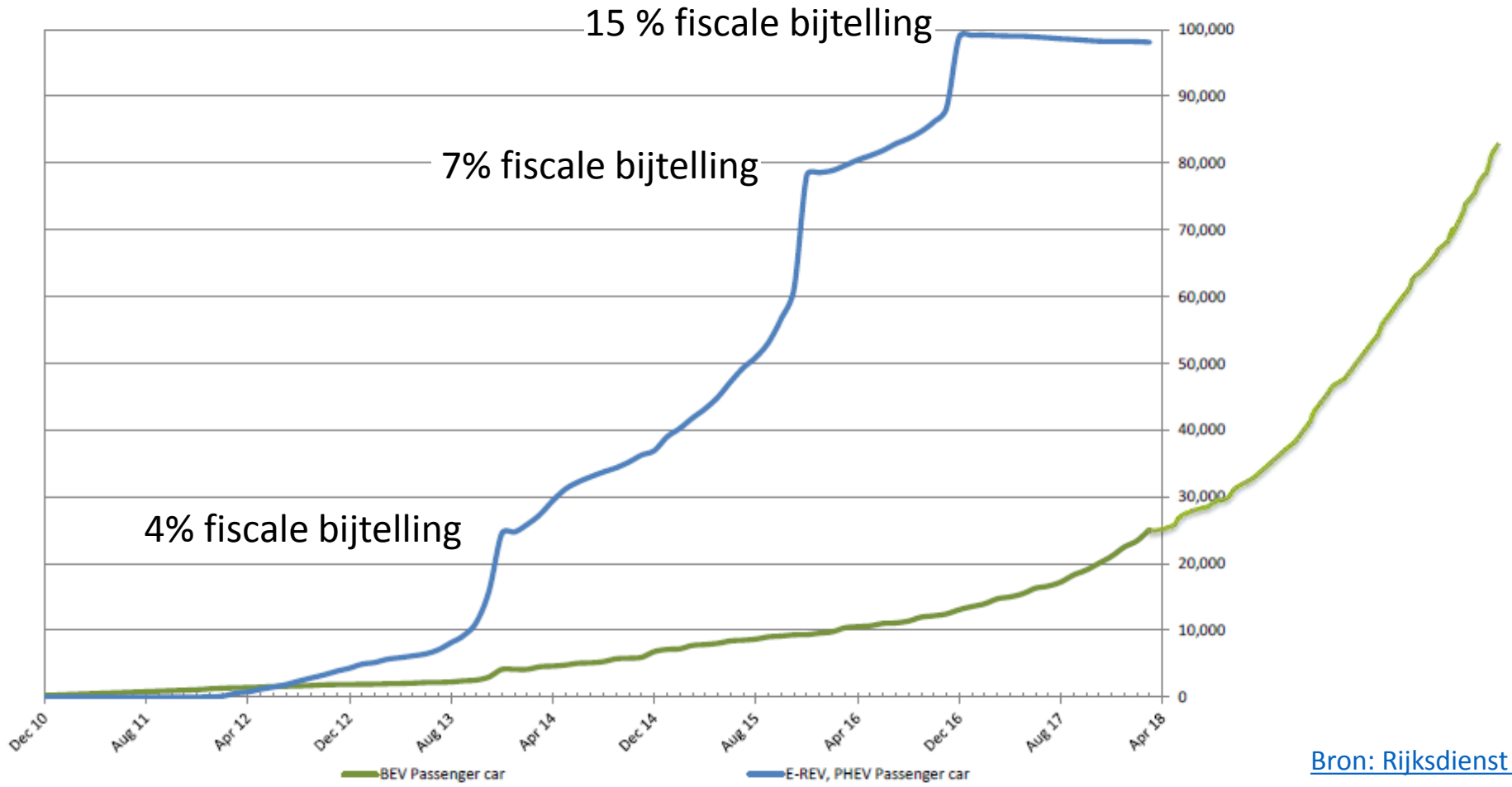
# Ontwikkeling elektrische voertuigen Nederland

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# Ontwikkeling geregistreerde elektrische voertuigen

| Brand/Model | Type of vehicle | Number | Change since last month |
|---|---|---|---|
| Mitsubishi Outlander | Passenger car (PHEV) | 24,989 | -49 |
| Volvo V60 | Passenger car (PHEV) | 15,615 | -53 |
| Volkswagen Golf | Passenger car (PHEV) | 10,900 | 4 |
| Volkswagen Passat | Passenger car (PHEV) | 7,934 | 10 |
| Audi A3 | Passenger car (PHEV) | 6,245 | 26 |

**Top 10 registered models of battery electric vehicles on the road in The Netherlands** [2]

| Brand/Model | Type of vehicle | Number | Change since last month |
|---|---|---|---|
| Tesla Model S | Passenger car (BEV) | 8,796 | 565 |
| Renault ZOE | Passenger car (BEV) | 2,620 | 110 |
| Nissan Leaf | Passenger car (BEV) | 2,584 | 295 |
| BMW I3 | Passenger car (BEV) | 2,106 | 84 |
| Tesla Model X | Passenger car (BEV) | 2,032 | 281 |
| Volkswagen Golf | Passenger car (BEV) | 2,024 | 154 |
| Hyundai Ioniq | Passenger car (BEV) | 1,521 | 97 |
| Nissan E-NV200 | Commercial car ≤ 3.5 tons (BEV) | 814 | 1 |
| Renault Kangoo | Commercial car ≤ 3.5 tons (BEV) | 783 | 6 |
| Opel Ampera | Passenger car (BEV) | 535 | 62 |

Bron: Rijksdienst voor ondernemend Nederland

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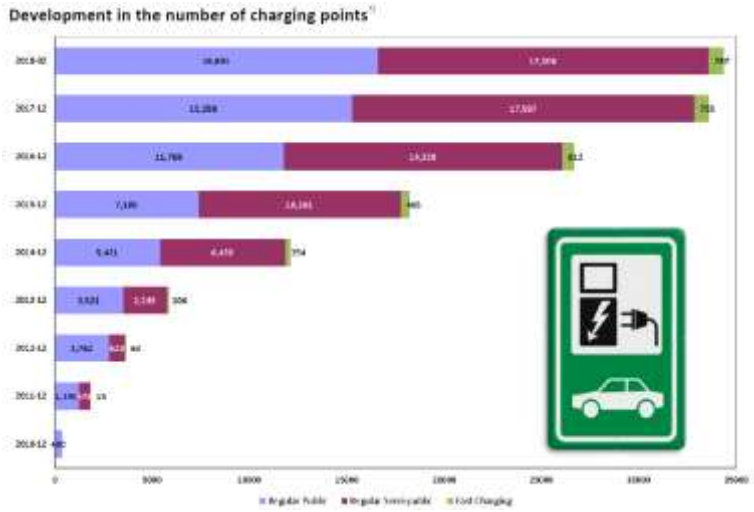
# Laadoplossingen

# Opkomst E-mobility

# Laadoplossingen

# Opkomst E-mobility

- **Wereldwijd: 12% van alle (Semi) publieke laadpunten staan in Nederland**
- **NL status Quo AC (langzaam) laadpunten:**
  - 16.601x Publiek 24/7
  - 17.006x Semi Publiek
  - 80.000 privaat, laadpas/'dom'
- **NL status Quo DC (snel) laadpunten:**
  - 787 (semi)publiek
  - 181 locaties met 1 of meer
- **Waterstof**
  - 3 publiek, Rhoon, Helmond, Arnhem

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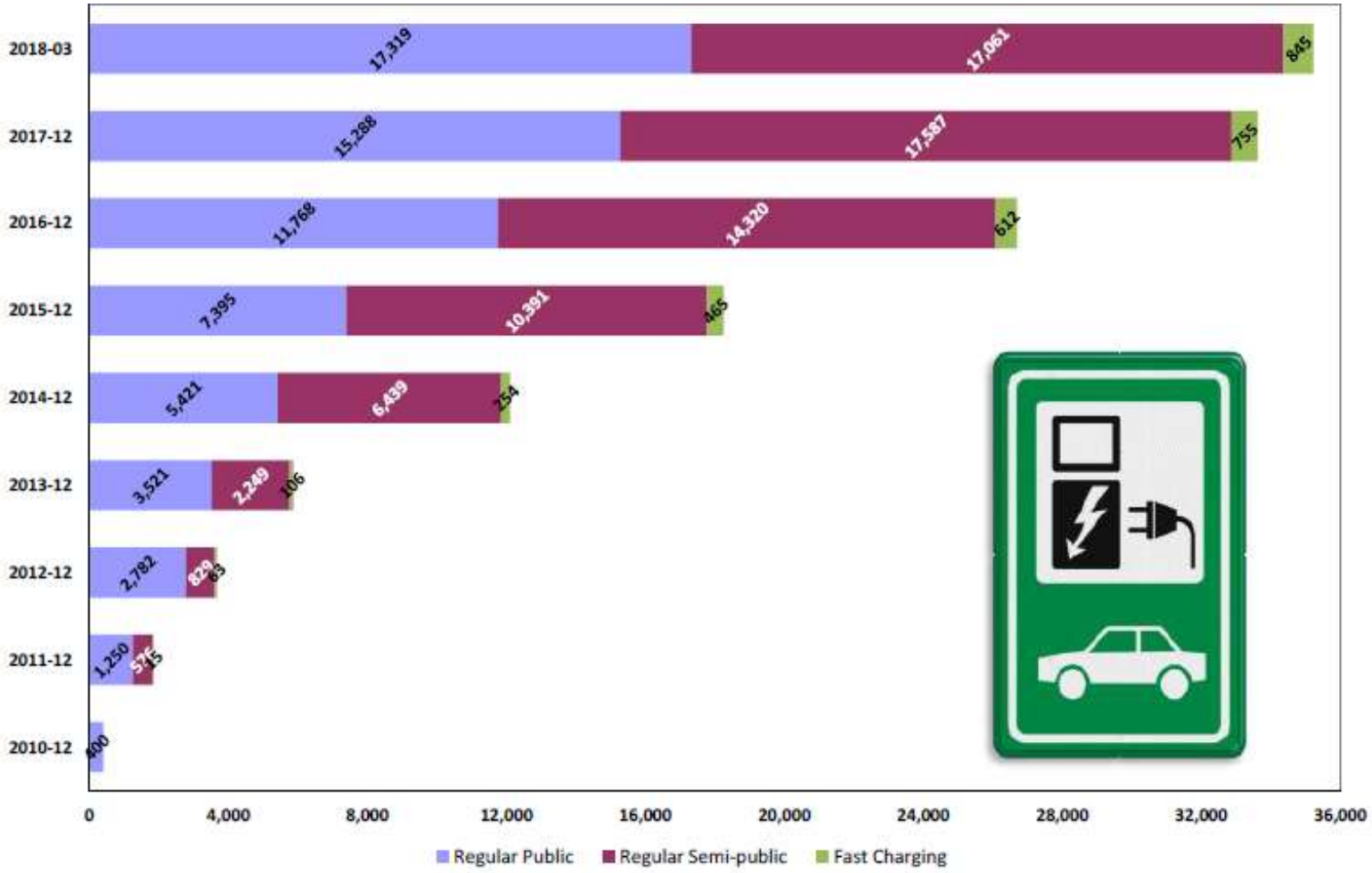
# Laadoplossingen

# Opkomst E-mobility



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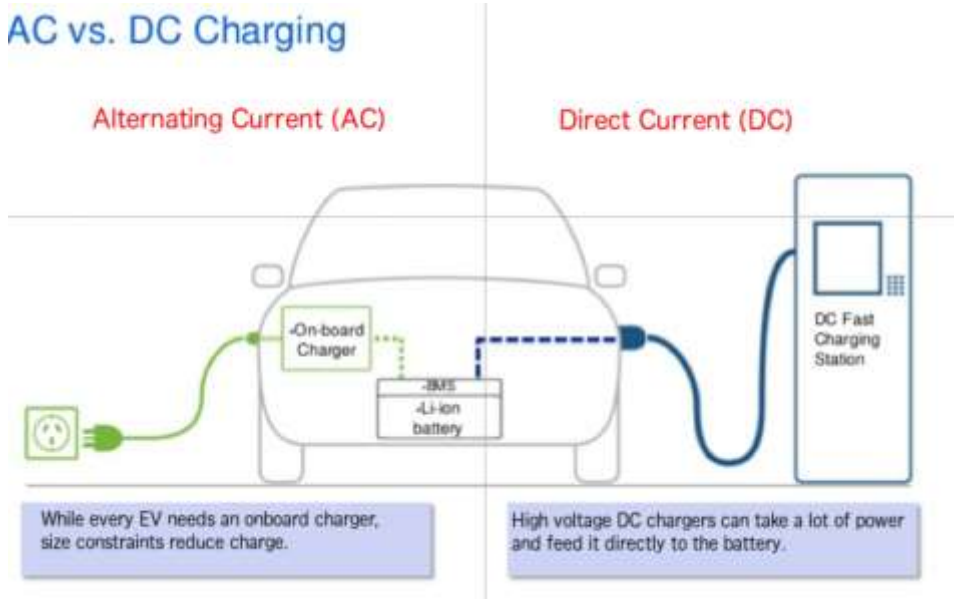
# Batterijen

# Opkomst E-mobility

- **Li-ion accu**
  - 200 dollar /kWh in 2020,
  - 150 dollar /kWh in 2025.
  - Break even in 2023, EV vs fossiel
- 60% consumenten afhankelijk van laadinfra
  - Zo snel mogelijk laden, 10-15min
- Invloed op energienet bescheiden
  - 5% EV’s (400k) leid tot 1% E-verbruik op net

- **Full Electric Vehicle of B(att)EV**
- Groter bereik, (+/- 400km)
- Grotere Accu (80-100kWh)
- Géén langere laadduur, dus (DC) snelladen
- Geen lader in auto, extern.



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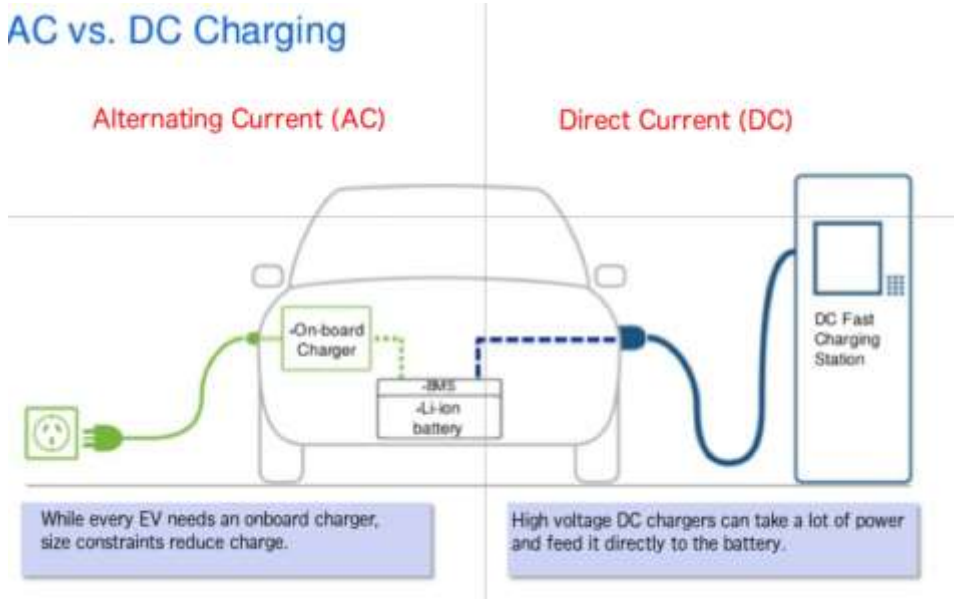


## Hoe lossen we dat op?

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# High Power Charging

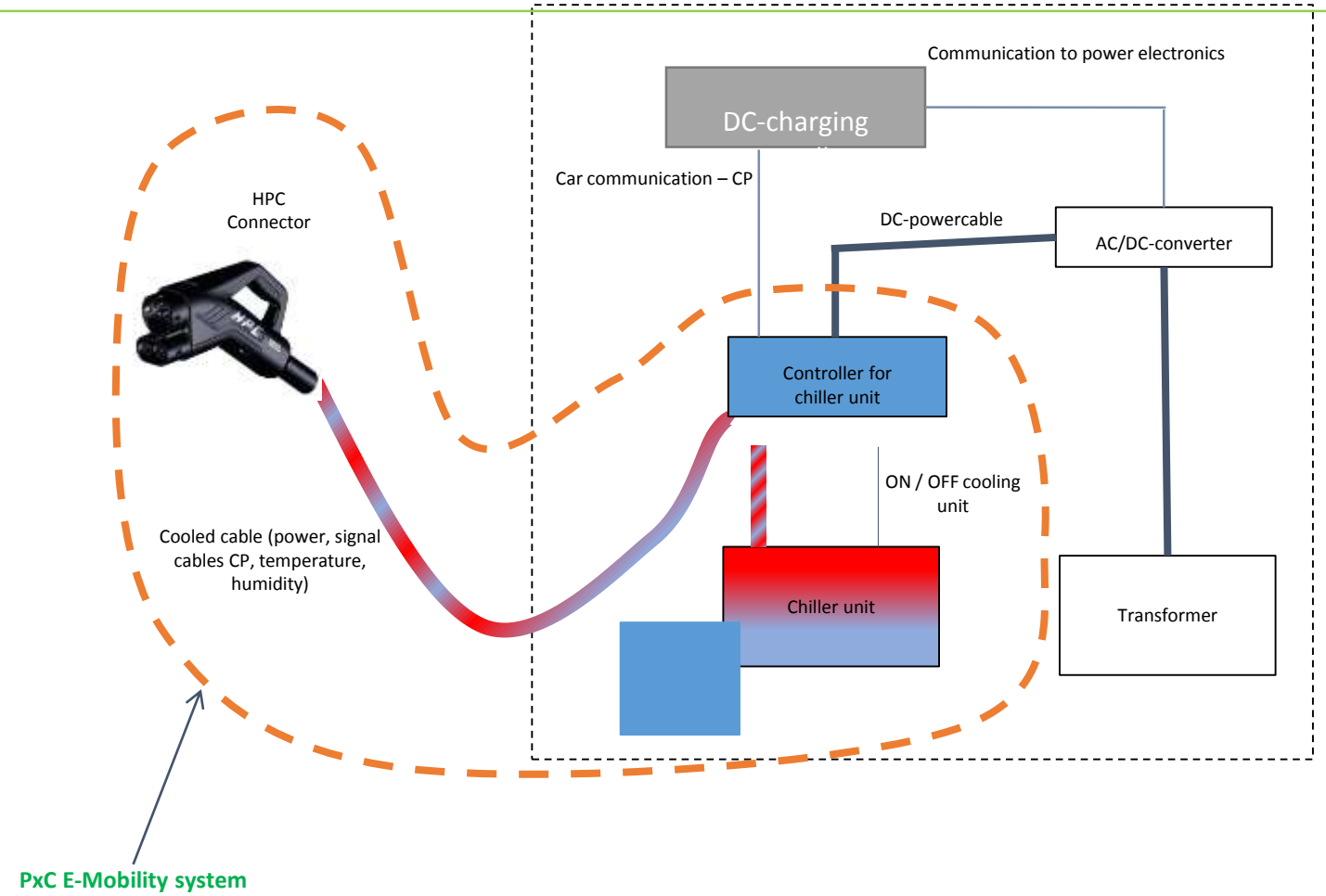
# Opkomst E-mobility



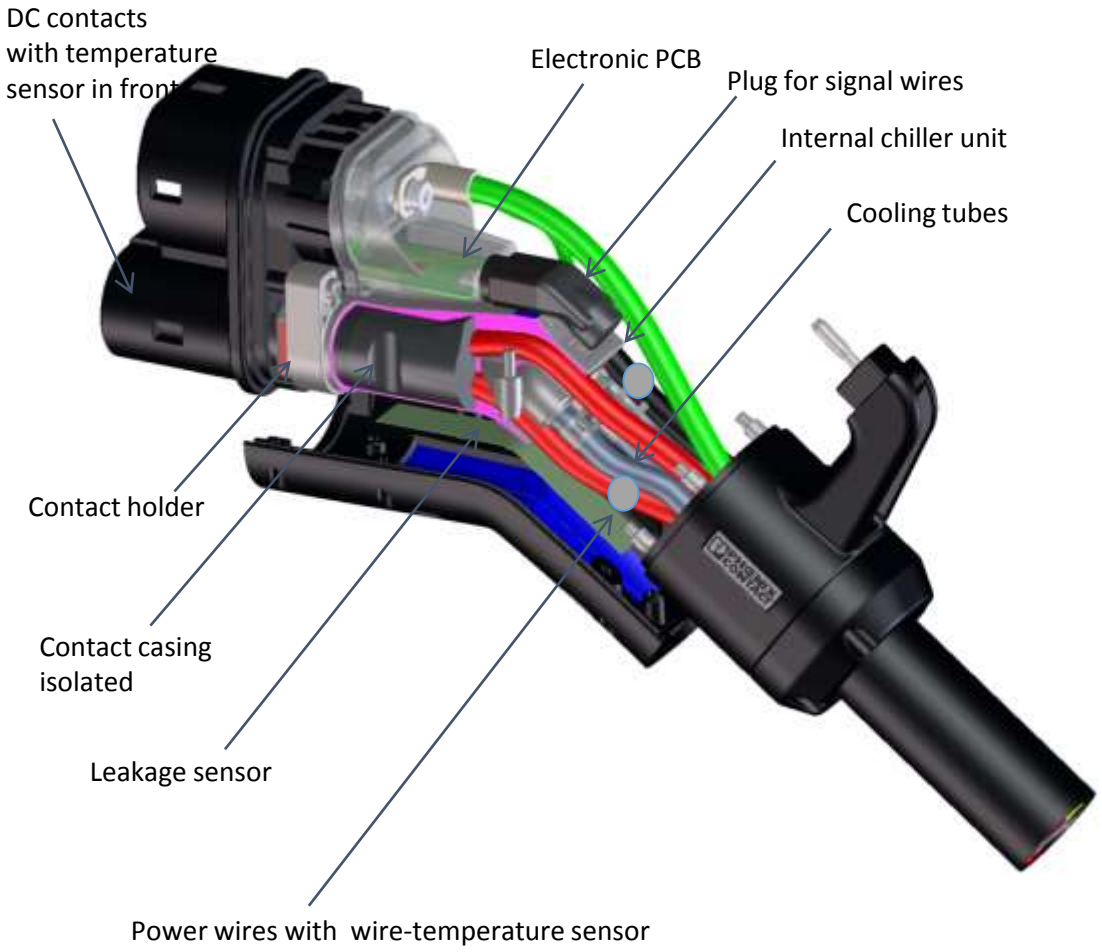
Bron: Rijksdienst voor ondernemend Nederland

# Applicatie

# Opkomst E-mobility



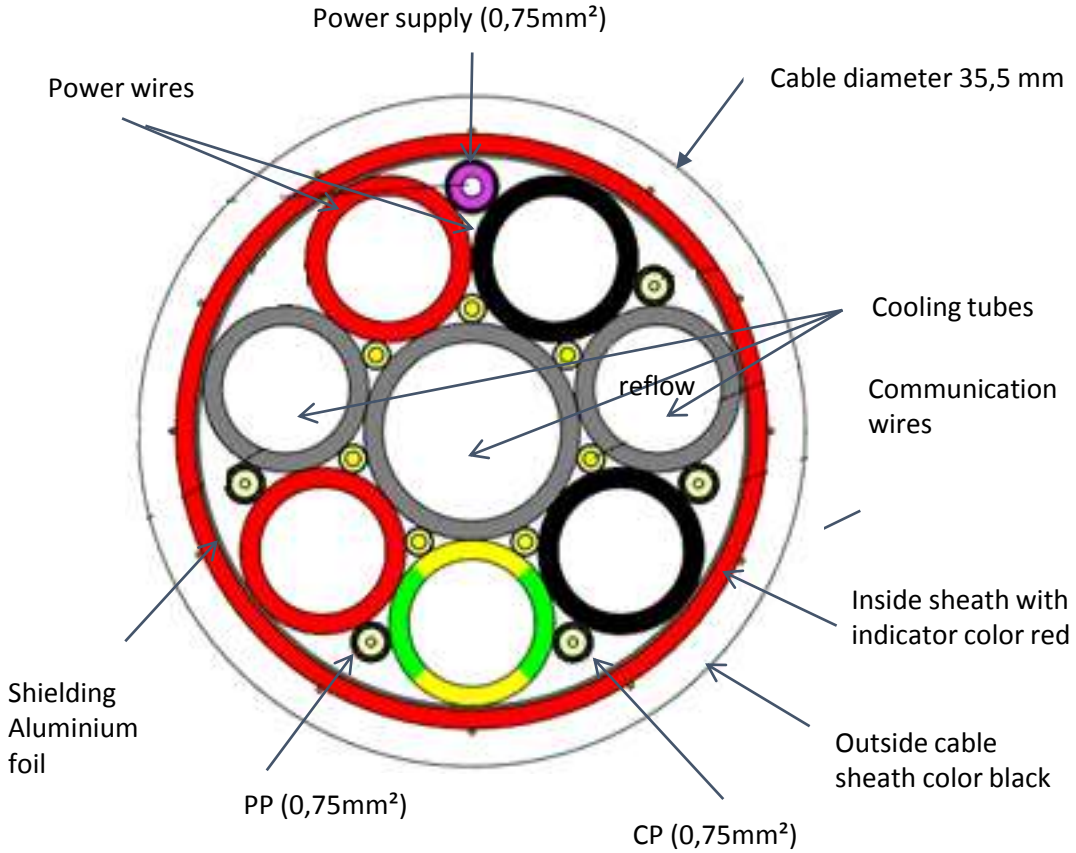
# HPC Connector – detailed technical information




**Detailed technical information:**

- **Internal chiller unit:** Cooling of the contacts and the wires into the connector, one unit made of aluminum material, robust and compact. Contact holder of thermally conductive and electrically isolating material
- **4 temperature sensors:** One in front of each DC contacts and two on the power wires inside
- **Contact casing:** isolated and thermal encapsulation / potting of the contacts
- **Electronic PCB:** The electronic board records and stores all information: Temperatures at the contacts, inside the cable and inside in the connector, leakage-sensor, shock-detection, charging cycles monitoring (interesting for maintenance and service).
- **Customer Interface**: Realization of the output of the signals via CAN communication and status control (digital signal).
- **Cooling tubes:** One flow-in and two reflow tubes.
- **Leakage sensors**: For detection of a leakage in the case if the cooling liquid will be escape (Damage to the tube connections)

# HPC cable assembly / sketch

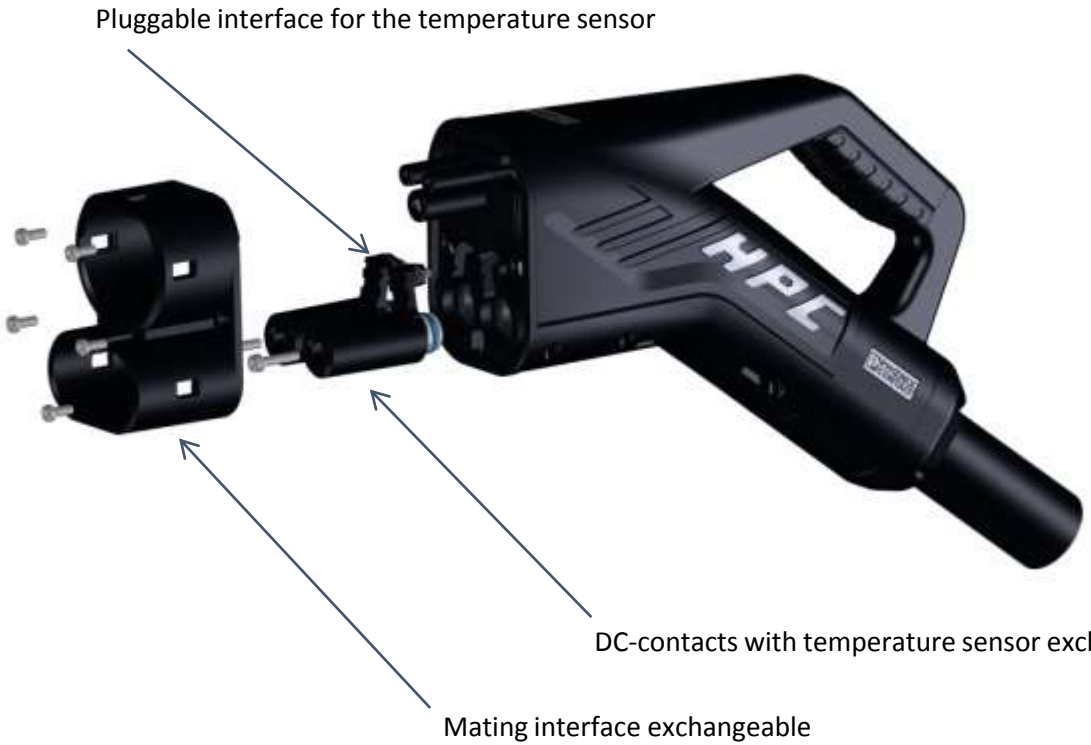



Cable weight: app. 1,8kg/m

**Explanation:**

- **Power wires:** 5 x 25 mm² divided into 2 x 25 mm² per contact + 1 x PE
- **Cooling Tubes:**
  Diameter „flow in“ → outer 11,5 mm / inner 9,5 mm
  Diameter „reflow“ → outer 8,8 mm / inner 6,8 mm
- **Power supply**: 9 – 36V DC supply (2-pole) for the PCB
- **Communication wires:**
  CAN communication for more detailed information:
  CAN low / CAN high / GND → 3 wires
  Digital Status control: Simple communication (Feedback signal)
  with one digital signal. e.g. 12V = high → system ok / 0V = low → error (e.g. temperature to high)
- **Inside sheath**: Indicator for changing the cable if the outer sheath material is abraded
- **Outer shielding**: Special aluminium foil for a better thermal distribution and EMC topics

# HPC Connector – easy maintenance and service




**Maintenance an service:**

- In a case of a damage or a abrasion, the mating interface and the DC contacts can be exchange
- The connector does not have to be replaced completely (cost reduction)
- All parts can be changed by a trained staff (electrician) at the front side (simple). Without emptying of the cooling medium.
- The front components are secured with special screws (e.g. security torx)
- The connector does not need to be opened completely (time reduction)

# Cable gland and strain relief

# Cable gland and strain relief (two versions)

angled execution

straight execution

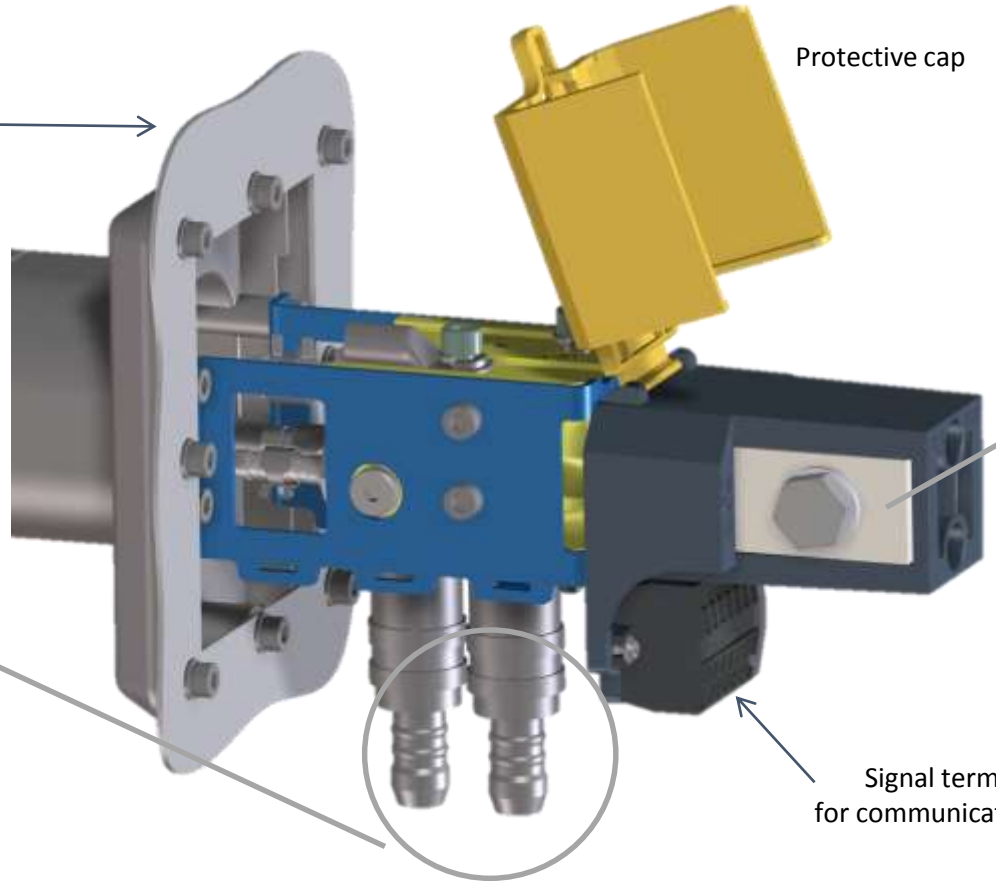
**Explanation:**

- **Pre-assembled unit**
  - The unit will be completely installed through the assembly opening (app. 100x100mm) of the charging station
  - The customer has to fixed the screws on the inside of the charging station only
- **Defined interface**
  - One defined transfer interface of the electrical and thermal connections
  - The customer has to connect the power and communication wires and the cooling tubes - that's all

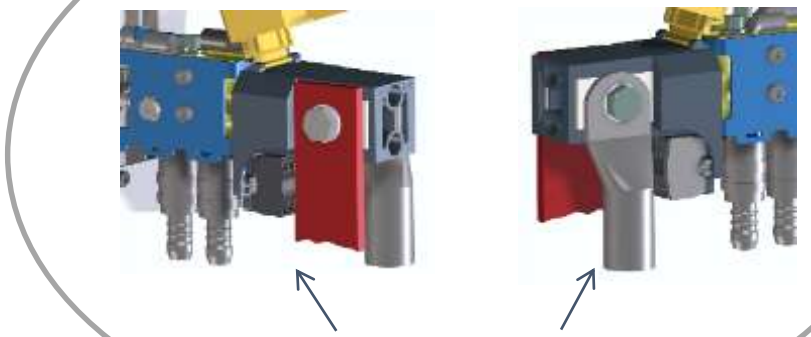
# Cable gland and strain relief in detail

Housing of the charging station

Protective cap



bolt connection for the power wires



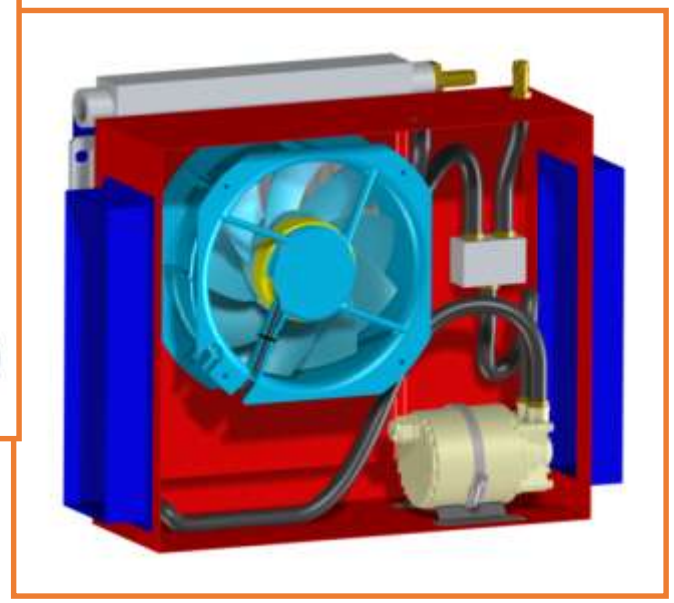
for power rails or for cable lug solution

Quick connection (plug and play)

Signal terminals for communication wires

Flow in and reflow cooling tubes connection with standard hydraulic fittings

# Customer design of the system – fluid-air cooling unit





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# Thanks for your attention

**Benefits**

- Complete sealed system - inside contacts with potting compound
- Fluid not in touch with conducting parts
- Simple and inexpensive cooling systems possible
- Fluid environmentally safe
- Temperature monitoring sensors
- Leakage monitoring sensors
- Easy maintenance and service

# Bron vermelding

- *Rapport: De elektrische auto: a convenient truth, De visie van de Rabobank op de elektrische auto.*