

The logo for Elaadnl, featuring the company name in a blue sans-serif font with a yellow lightning bolt icon to the right, all contained within a white circular speech bubble.

Elaadnl

ElaadNL, Testlab & Power Quality research

A portrait of Thijs van Wijk, a man with short brown hair and a light beard, wearing a light blue button-down shirt, smiling at the camera. The portrait is set against a white background and is framed by a rounded white border.

Thijs van Wijk
Manager Elaad Testlab

Huishoudelijk

Elaad.nl



Let op!



Akoestiek



Veiligheid



Sanitair



- Knowledge & innovation centre
- Non profit foundation
- Cooperation of grid operators



Our goal:

Integrating electric transportation in the electricity grid

ElaadNL

Elaadnl

2028



Klimaat-akkoord



Opening Elaad Testlab 2022

Elaadnl

Start knowledge- and innovation centre Elaad



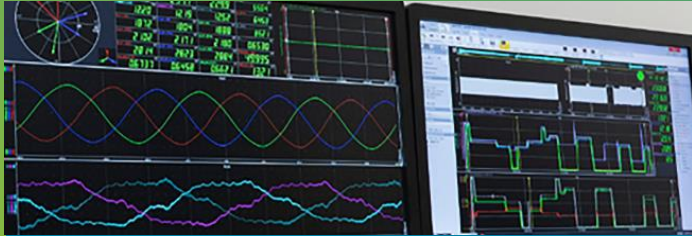
3.000 public charging stations in 350 municipalities

2009



stichting e-laad

Our activities (2024)



1. Predict

- Data-analyses & Outlooks
- Grid impact analyses
- Logistic sector analysis
- Behavioral research



2. Innovate

- Smart charging
- Protocols & standards
- Home energy systems
- Cybersecurity
- V2G



3. Implement

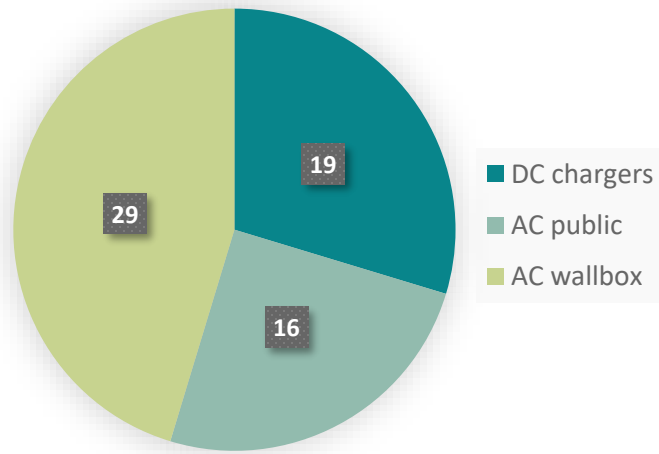
- Smart charging
- Power quality awareness
- Grid connection checks
- Improve processes
- Tender support
- Human Capital
- Charging logistics
- **Testlab**

The Elaad Testlab

- Research Test Lab to improve grid integration of EV charging
- Pre-certification and pre-normative testing
- Helping OEMs to improve grid integration
- Learn to adept standards and the grid
- Open & free
- Suitable for all kinds of electric vehicles including busses and trucks
- Different types of public and home AC chargers and DC chargers
- Highly accurate measurement equipment
- Automated test and analysis
- 360 kW bidirectional test system from Keysight

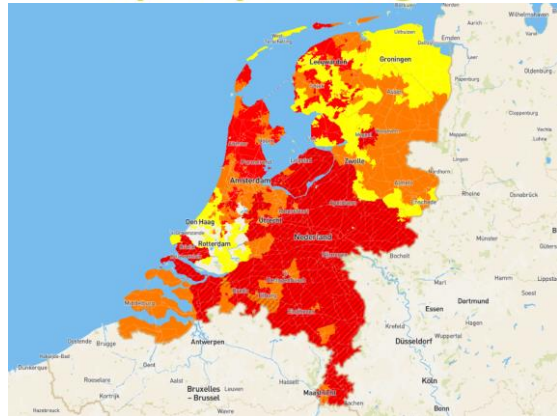


Charging stations

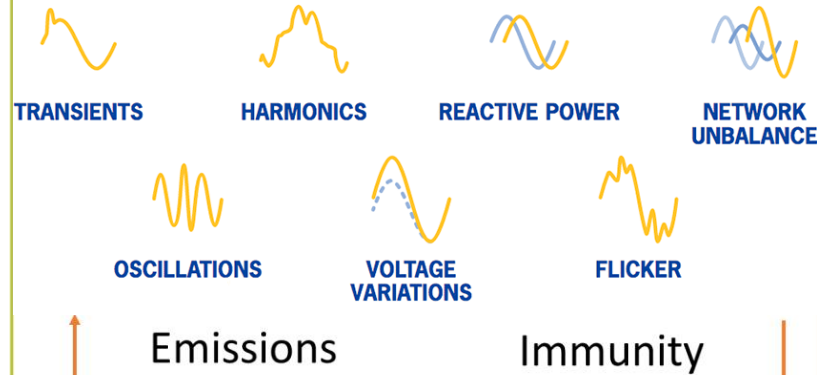


Why & what do we test

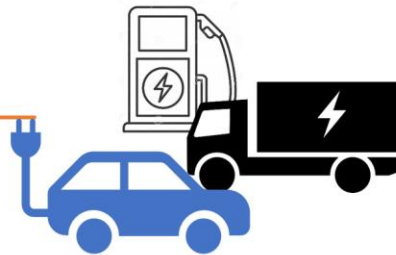
Capacity of the grid



Quality of the grid



Emissions Immunity



Pre-normative

Gaps in standards

Frequentiebereik					
Harmonische	Laagfrequent bereik	Radiofrequenties door geleiding	Radiofrequenties door geleiding	Radiofrequenties door straling	Radiofrequenties door straling
50Hz - 2/2.5kHz 60Hz - 2.4/3kHz	2/2.5Hz - 9kHz 2.4/3kHz - 9kHz	9kHz - 150kHz	150kHz - 30MHz	30MHz - 1/2/3GHz	Boven 3GHz



Test proces/certification does not include everything

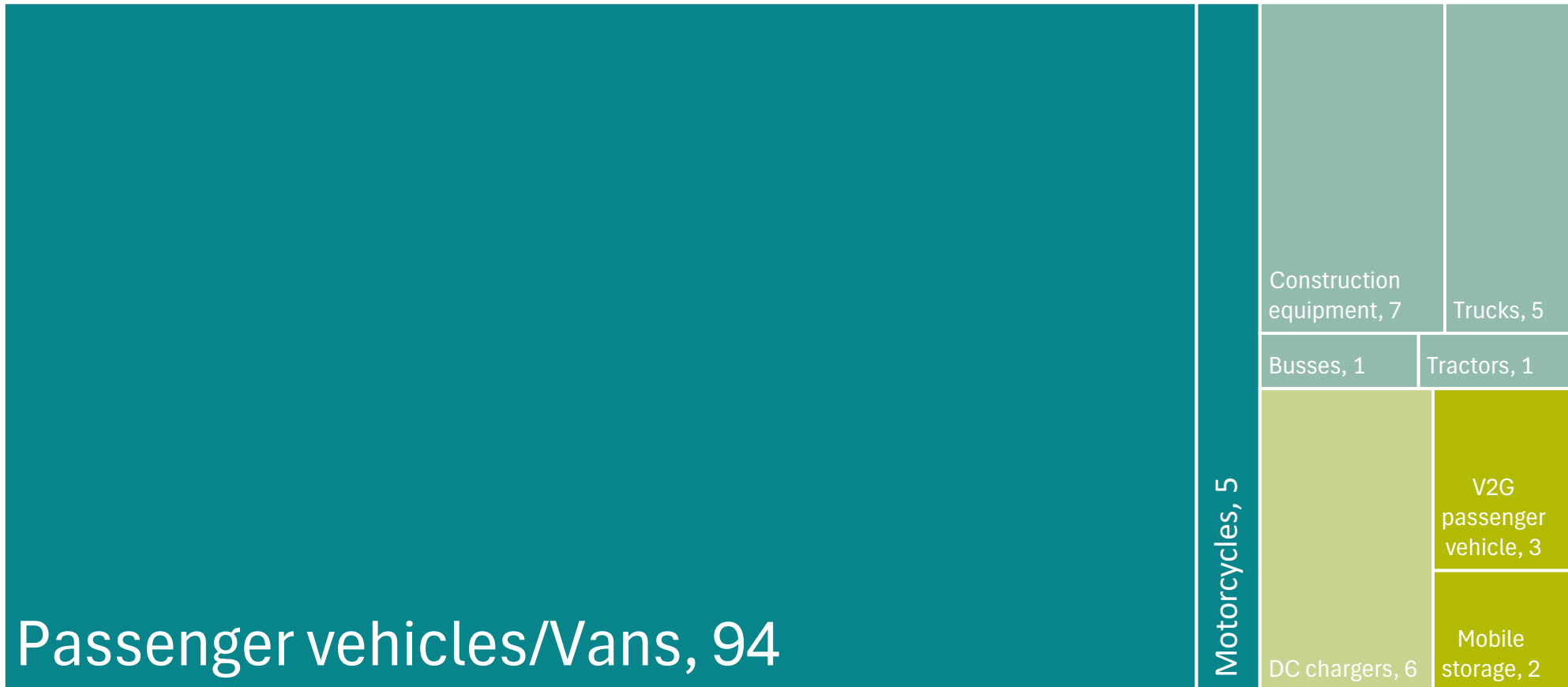




Year in numbers



114 Tested Devices



- Light vehicles
- Heavy vehicles
- Chargers
- Specials

Our six tests

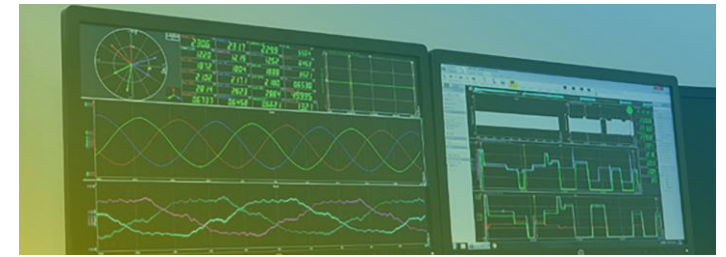
Available in AC/DC Normal, fast and heavy-duty charging



Interoperability Test



Smart Charging Test



Power Quality emission & immunity Test



Cyber Security Test



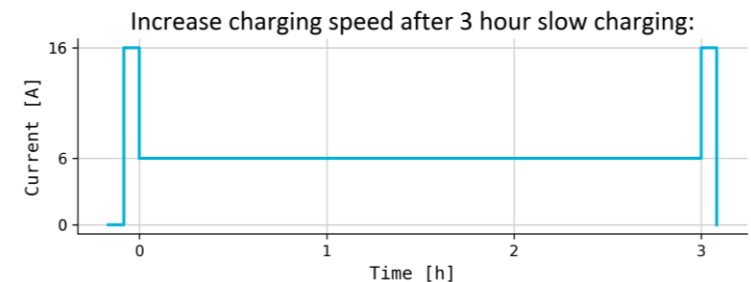
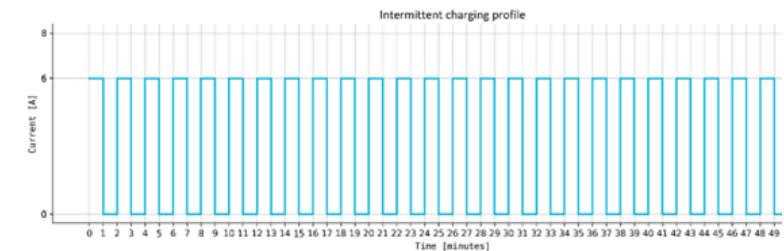
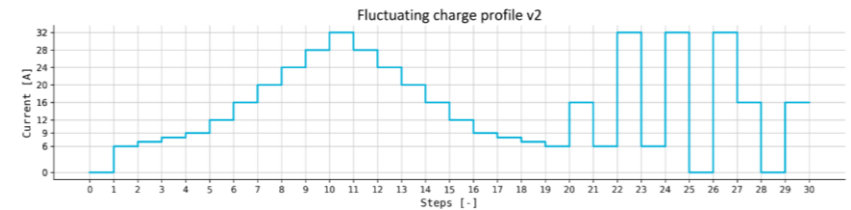
V2G Test



Grid Operator Test

Smart charging tests

- Fluctuating
- Intermittent 25x
- Delayed and paused 20 min and 6 hours
- Change after 3 hours



Power Quality tests

EV and DC EVSE Emissions on different charging speeds:

- Harmonics and THD
- Power factor
- Supraharmonics*

Immunity (ride through and influence on current intake) to

- Voltage variations, sags
- Voltage harmonics
- Upcoming: supraharmonics*



360kW test system

* Gathered data used for further research on Supraharmonics

Cyber security tests



Cyber security tests of charging stations

Method:

- Virtual vehicle connected to charging station which sends a charge request
- A testscript is run which performs a
 - IP-Scan; identify any communicating devices
 - Portscan; identify any running services
- The found services are checked for any known exploitable vulnerabilities

Cyber security requirements for charging stations are available at the website from the European Network for Cyber Security (ENCS)



V2G RfG test

V2G: testing compliance to grid code Requirements for Generators (2.0)

- Requirements how to act when voltage or frequency gets out of defined limits
- Pre-certification testing of grid code compliance (RfG (2.0)/EN50549-1)
- Setting of new RfG setpoints via OCPP 2.1 and 15118-20

