AUTOMOTIVE CAMPUS

Test Facilities on the campus

July 2023

TNO
European Electric Mobility Center

The European Electric Mobility Center (EEMC) focuses on supporting developers and manufacturers of electric vehicles and components. With a wide range of facilities the EEMC provides development, engineering and testing of battery safety & performance and vehicle performance & efficiency.

A key element is the vehicle & battery climate chamber providing automated cycling of charge/discharge, temperature and humidity. By that, the driving cycle of a vehicle can be tested in this facility. For safe testing of electric vehicles & batteries, this chamber can be filled with an inert gas.

Contact:

Jack Bloem

T: +31 88 866 7034

E: Jack.Bloem@tno.nl

TNO innovation for life

TNO
Powertrain Test Center

Future powertrain requirements ask for enormous commitment. To meet these requirements related to pollutants and CO2 emissions, exploiting the synergy between engine, drive train and after-treatment subsystems has become increasingly important.

TNO's focus is on automotive powertrain control systems that optimize overall system performance. This is achieved by using (virtual) sensors and model predictive control strategies based on combined emission and energy management concepts.

Our technical developments concentrate on truck and bus applications for city distribution as well as long haul transportation.

Contact:
Jack Bloem
T: +31 88 866 7034
E: Jack.Bloem@tno.nl

TNO innovation for life

Powertrain testing

Climate Altitude Chamber

TASS International
Passive Safety

Accurate data, fast results and controlled development costs. These are the most important aims in crash testing vehicles, components and safety systems. TASS International is able to meet these goals for you. With our fully equipped facilities we perform tests on a whole range of automotive and non-automotive applications, both indoor and outdoor. From vehicle components to even aircraft parts via passenger cars to heavy duty vehicles. With our equipment and experienced staff, we can handle nearly every kind of impact in standard or customer specific conditions, all under ISO 17025 accreditation.

Contact: Erik Scheurkogel

T: +31 888 277 200

E: info@tassinternational.com

tass international

A Siemens Business

Full scale crash testing
This facility offers the entire range of testing capabilities necessary to cover all existing legal, consumer, customer and insurance-specific requirements.

Inverse crash sled
Our inverse crash sled is a crash simulator designed to test occupant restraint systems, vehicle and aircraft seats and all other interior vehicle components, either in subcomponent- or full body-in-white-testing.

Laboratory for pedestrian & interior protection and components
This testing resource is dedicated to both vehicle front structure impact tests with head, lower- and upper-leg-forms and to impact tests within the vehicle interior.

Road furniture
Adequate performance of road furniture is one of the key elements to ensure overall road safety. On our outdoor proving ground we test guardrail systems. Lighting columns and sign posts are tested from our lab in Helmond. We are one of the accredited test centers.

Vehicle Dynamics
Vehicle dynamics boils down to mastering the lateral, longitudinal and vertical forces acting on the vehicle. OEMs use an increasing number of subsystems to enhance driving stability, safety and comfort under all driving conditions.

Homologation
TASS provides the final and independent verification and compliance against worldwide standards for seat belts, child restraint systems and helmets.. Time is money. Rejection is bad news. Outstanding test procedures and expert consultancy make the difference.

TASS International
Active Safety

The demand for Advanced Driver Assistance Systems (ADAS) in the automotive industry is greater than ever and will continue to grow rapidly. Vehicle Integrated safety systems are becoming more and more sophisticated to be able to cope with scenarios with increased complexity. At TASS International we are fully accredited to assess the performance of these systems according to the globally recognized testing procedures, which are devised by consumer group Euro NCAP for passenger vehicles.

We are also fully equipped to perform all ADAS tests conforming to current UN regulations.

Contact: Marco van de Polder
T: +31 888 277 200
E: info@tassinternational.com

Autonomous Emergency Braking System (AEBS)
- Pre-test vehicle conditioning
- Car-to-Car tests
- Car-to-Pedestrian / bicycle tests
- Car to motorcycle tests
- System robustness check

Lane Departure Warning and (emergency) Lane Keeping Assist Systems (LDWS, LKAS, ELKS)
- Pre-test vehicle conditioning
- Lane departure
- Warning indication test
- Steering override test

Assisted driving (L2) and Automated Lane Keeping Systems (L3)
- Lane keeping tests
- Collision avoidance tests
- Cut-in / Cut-out tests
- Adaptive cruise control tests

Blind Spot Monitoring / Moving off Information System (BSM/MOIS)
- Dynamic tests
- Static tests

tass international
A Siemens Business

TASS International
Automated Driving

Cooperative Connected Automated Mobility (CCAM) systems are being developed for large scale deployment. Validation of the performance of cooperative systems, and evaluation of the impact of cooperative applications is crucial before large scale deployment can proceed. TASS International facilitates testing, evaluation, and validation of cooperative systems from desktop simulation to indoor laboratory testing as well as outdoor testing on public roads.

Contact: Alfred Hamstra
T: +31 888 277 200
E: info@tassinternational.com

tass international
A Siemens Business

Simulation tool suite
- Detailed simulation of connected vehicle and automated driving systems
- Microscopic traffic simulation of intelligent systems on city-sized road networks
- Scenario-based V2X simulation
- Traffic, environment and communication channel modelling
- Support of standards (ETSI CAM/DENM and other message sets, SAE J2735 BSM)
- Sensor fusion between V2x, Radar, Lidar, Camera, Ultrasonic, GPS etc.

SMRC (Smart Mobility Research Center) test site
- 6 km highway, 2km urban road & 2 traffic light controllers
- 20 ITS G5 roadside units (802.11p)
- 56 cameras for real-time vehicle detection and tracking
- 11 dome cameras
- 4G Communication
- Integration of 3rd party hardware and software for testing

SMRC control room
- Test control and monitoring
- Logging, on-line analysis and evaluation
- Control and test third party communication and application units
- Emulation of “Here I am” messages of non-equipped vehicles to increase the penetration rate of cooperative vehicles
- Measurement of PDR and signal strength (RSSI)

SMRC CarLabs
- Instrumented vehicles with extendable in-car platforms
- Vehicles are equipped with radar, camera, lidar, DSRC, GPS, 4G/5G
- Software toolkit to rapidly create and test application software
- SCAPTOR: Event-triggered data-logging system for raw sensor data and vehicle dynamics sensors

Siemens
Automated Driving Validation

Autonomous vehicles and features can be deployed successfully only when they are safe, secure, and certified. However, we've discovered that teaching a computer to drive as safe or safer than humans is more complex than anyone predicted. As you venture deeper into the realm of advanced driver assistance systems (ADAS) and autonomous vehicles (AVs), Siemens provides a customized solution to help you innovate, optimize, and validate designs. With our powerful tools, you can leverage the functional digital twin, simulation, real-world recordings and our patented critical scenario methodology to accelerate the delivery of safe, secure, high-performing and compliant autonomous driving.

Contact: Gwen van Vugt

T: +31 888 277 200

E: gwen.vanvugt@siemens.com

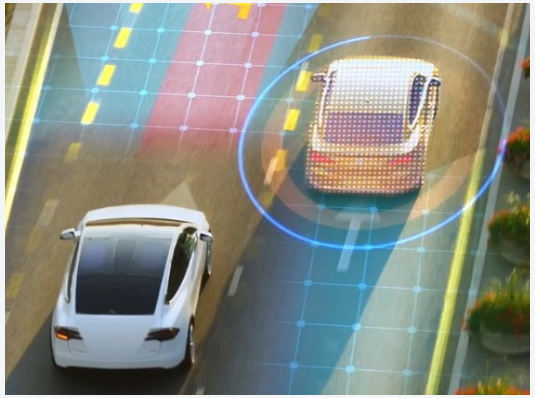
SIEMENS

Maximize the value of your ADAS and AVs

To determine which ADAS and autonomous driving features will add the most value, you need to understand early in the development cycle if they can be incorporated safely, securely and efficiently without violating system constraints. By frontloading the design and optimization with the functional digital twin, you can assess risk and make decisions before the cost of engineering changes becomes prohibitive. The trustworthy models establish traceability and enable you to virtually validate requirements coverage.

Deliver confidence in unknown and unsafe critical scenarios

With our smart recording solution, you can capture, organize, and store real-world driving, including sensor readings, vehicle dynamics, and the environment. Through our data analysis solution you can rapidly identify standard scenarios and assess which fail and need improvement. Consequently, you can also use this data to discover unknown, unsafe scenarios using Siemens' patented methodology to meet SOTIF requirements.



Validate ADAS and AV designs virtually at every level

Autonomous vehicles need to perceive and connect with the environment to ensure safety. Our autonomous engineering software enables a complex web of validation that spans all internal and external systems interacting with the vehicle. You can run a selection of tests in real-time across multiple levels of simulated environments, each aimed at testing specific vehicle systems. Our ADAS and AV development solution delivers compliance and safety by empowering you to verify that your design meets requirements and goals and validate that your final product works as designed.

VDL ETS

Enabling transport sulutions

The VDL ETS location at the Automotive Campus offers its clients special automotive engineering expertise in the areas of sustainable driveline integration, ADAS and V2X, defence technologies, prototype building and testing.

Having experienced engineering professionals and state of the art testing facilities under the same roof enable us to find the best solutions which reduce customers' time, cost and warranty problems.

That is why OEMs worldwide find their way to VDL ETS in Helmond.

Contact: info@vdlets.nl

Kracht door samenwerking

TESTING FACILITIES AND SERVICES

Special measuring equipment

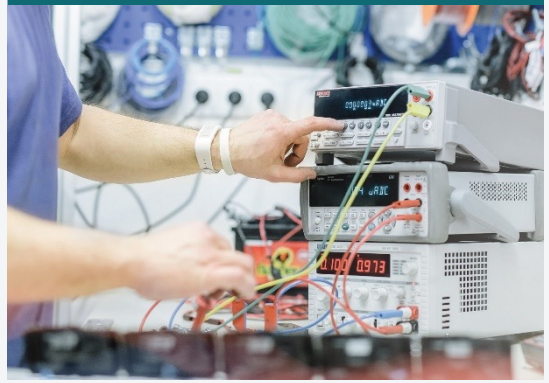
Material testing

Corrosion & Environental test

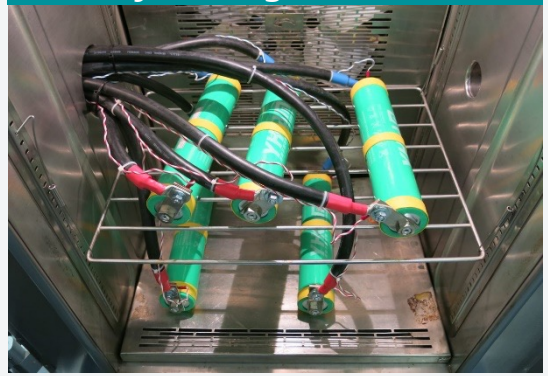
Safety & Homologation

Functional tests of assemblies

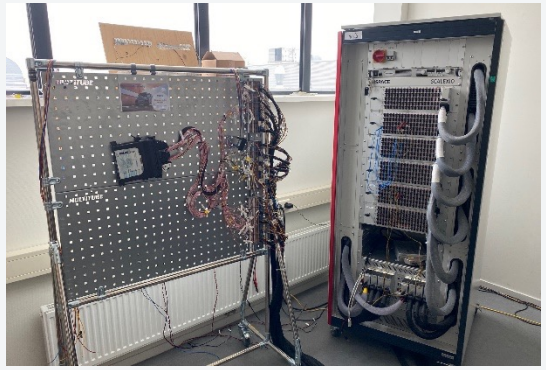
Electric tests



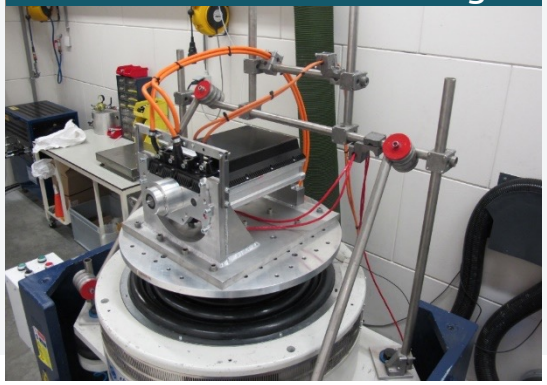
Battery testing



HIL Testing

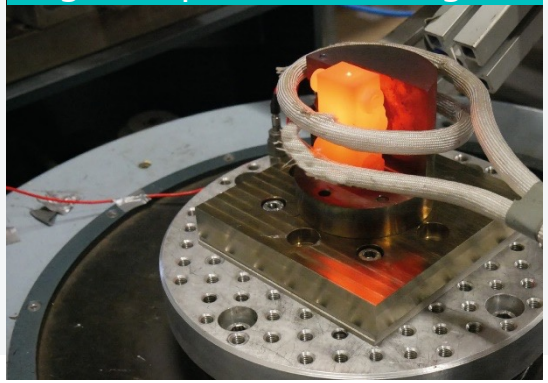


Vibration and noise testing



Mechanic and lifetime testing

High temperature testing



ADAS/V2x

TESTING FACILITY OVERVIEW, TEST CENTER HELMOND, NL

- 46x cylinders, 5kN – 100kN
- 2D hydraulic shaker
- 10x MTS controllers
- meccano building blocks
- Salt and mud spray installations
- 2x climate cabins
- calibration equipment
- 200 kN special testrig
- 500 bar fuelrail testrig
- 700 bar fuelrail testrig

- 1x 40kN shaker + table
- 1x 10kN shaker
- 1x 3kN shaker
- 2x LDS controllers
- 1x ETS controller
- heatsources (turbo test)
- final inspection lab
- Pressure pulsation endurance
- hydraulic press + force
- Testing up to 7.000 bar

- seatbelt testrig
- intrusion testrig
- seat test rigs
- dashboard impact testrig
- Stiefelmayer CMM
- 2x Krypton visual MS
- high speed camera
- doorslam closure testrig

- chemical corrosion rig
- saltspray corrosion rig
- 5x climate cupboards
- Airtest 3,5x3,1x2,5m climate cabin
- Weiss 6x4x2,5m climate cabin
- temperature shock equipment
- Helium leak test

- 2 x HIL dSpace Scalexio
- Electric Lab
- Calibration Lab
- 3D measuring systems (FARO, Krypto)

Expansion Battery testing (Phase 1)
Scheduled 2023
- Cell
- Module
- Pack

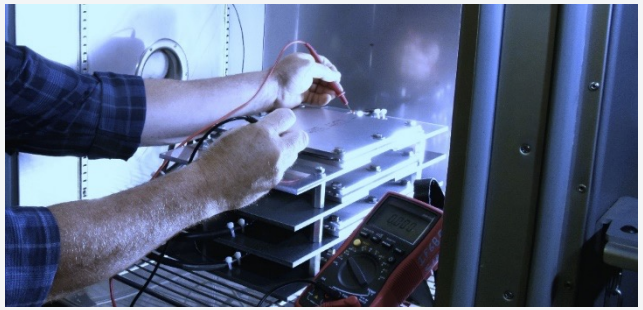
TESTING FACILITIES| BATTERY TESTING*

Central lab control software
20 ft for calendric ageing and 20 ft for safety storage

Cell Testing

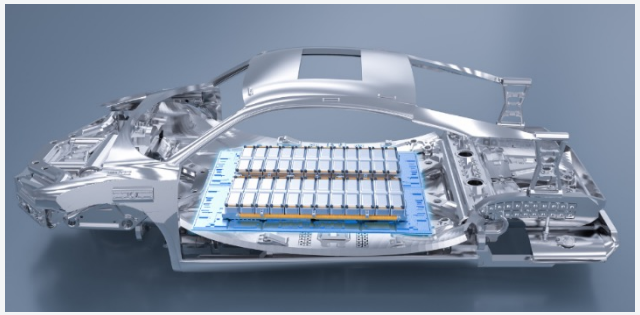
- 560 Channels / 50A / 5V
- Max combined 4000A/5V
- 14 Standard climate -10 to +60 C, 700l, stability 0,5 K
- 4 High spec climate chambers, 700l, -40 °C to +180 °C, 10 % to 98 % RH
- Hazard level 4 and 5
- 4 calibrated ranges
- Rise Time Current 10-90% fs ohmic load << 1 ms

Module testing



- 8 Channels / 500A / 150-750V
- 2 Standard climate -10 to +60 C, 700l, stability 0,5 K
- 3 High spec climate chambers, 700l, -40 °C to +180 °C, 10 % to 98 % RH
- Hazard level 4 and 5
- VDL Coolant cycler
- 2 calibrated ranges
- Measurement accuracy:
  - 0,04% FSR for U and I
  - Resolution 15 bit

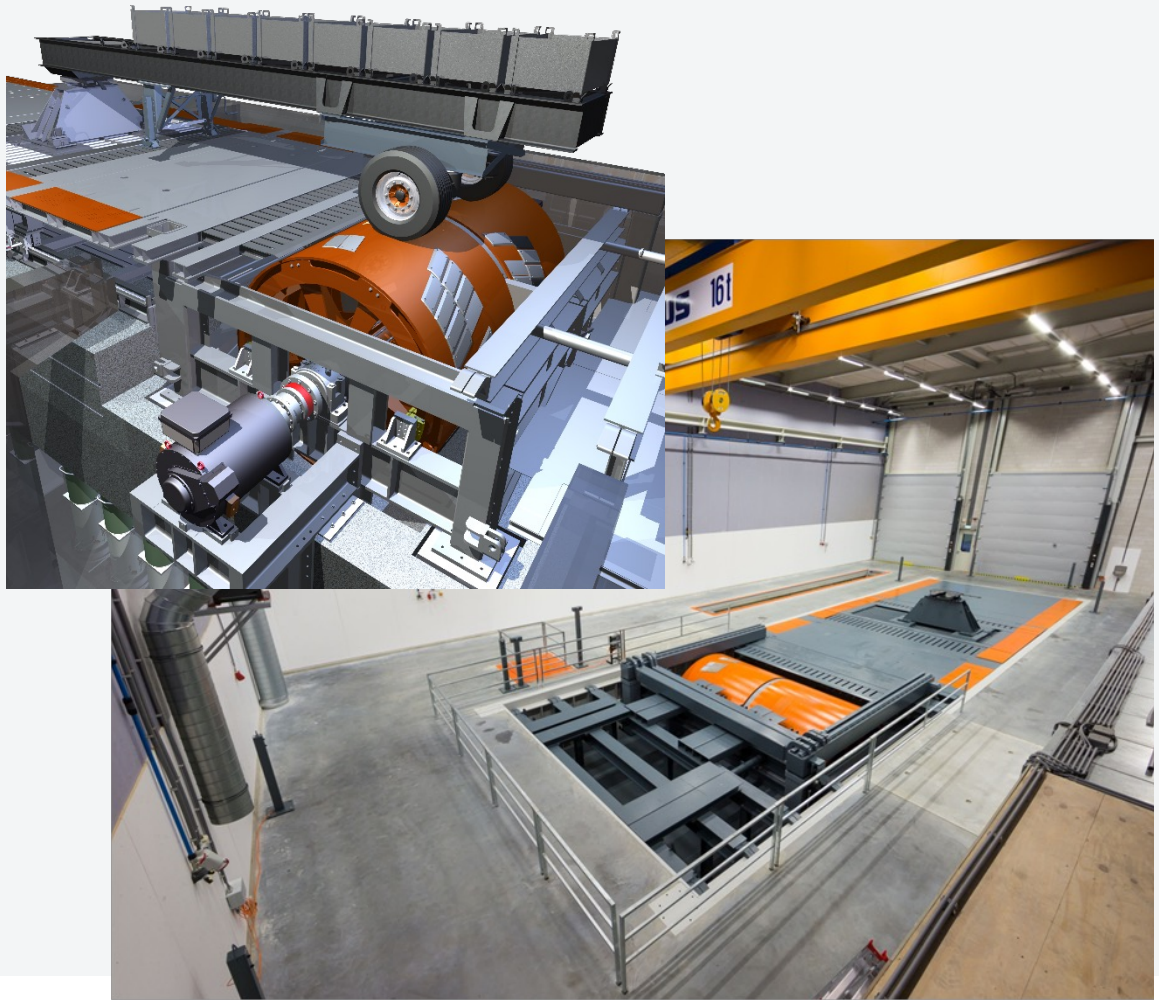
Pack testing



- 4 Channels / 500A / 125kW / 750V (S+P)
- Max 2000A/1500V/640 kW
- 2 containers 20 ft, -30 to +80 °C stability 1K
- Outdoor solution
- VDL Coolant cycler
- Rise Time Current 10-90% fs ohmic load < 10 ms
- 2 calibrated ranges
- Setpoint accuracy:
  - 0,04% FSR for U and I
  - Resolution 20 mA, 40 mV (15 bit)

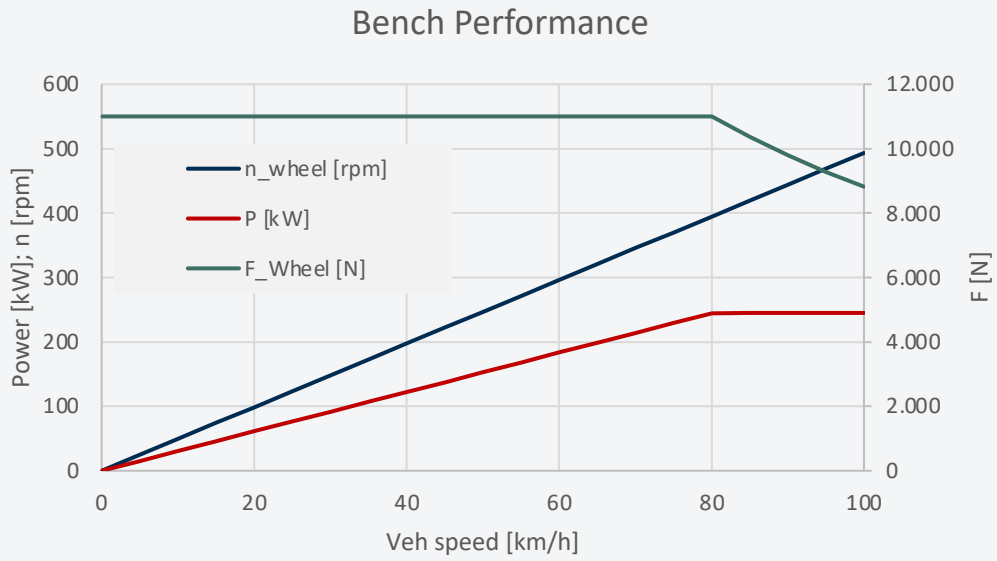
*Available from 12/2023

Rolling Road Chassis Dyno



Spec data

- ✓ Wheel force 11 kN powered and braking
- ✓ Power 245 kW Speed 100 km/h
- ✓ Max axle load 13t, max vehicle weight 30t
- ✓ Bad road simulation by clates
- ✓ Different control modes
- ✓ ICE and BEV capable



AUTOMATED HIL TESTING

Validation & Verification of ECU's and Electronic subsystems. With our Breadboard approach we can switch between different projects very rapidly. In combination with our test automation, we can run up to 4 projects on one system in parallel.

Our solution

Physical testing of ECU hardware and subsystems using a Hardware-in-the-Loop machine. Manual testing and debugging or automated scripting for repetitive rests, for example release tests.
Extremely high coverage "milage accumulation" in short time using automated overnight testing. This builds confidence in the system and prevents bugs from happening in real life.

Key benefits

Possibility to test scenarios that are too complex or dangerous to test in real life. Testing a fast number of scenarios overnight. Reduction of costs and accelerated Verification & Validation lead times. Turnkey solution for ECU systems.