Test Systems for a Clean and Safe Environment

AiP automotive

Innovative Test Systems for the E-Mobility Challenge

aip-automotive.de

New Groundbreaking Test Systems for E-Mobility

AIP designs and manufactures individual customized test systems for development- (RND) and production centers for many of the well-known vehicle manufacturers in Germany and abroad. Our goal is technology- and service leadership in the field of vehicle testing technology.

Get first-hand information about our innovations:

- **Battery Fast Charging Stations**
- **Torque Wheel Dynamometers**
- **Powertrain 4x4 Dynamometers (Road to Rig)**
- **ADAS Testing Systems**
- **Battery Simulator / Cell Tester / Shaker**
- **Charging and Supplying Electric Vehicles on EMC Chassis Dynos**
- **Fuel Cell Testing Systems**
- **E-Axle Test Stands**

State-of-the-art, environmentally friendly production techniques and the constant further development of our products and services, create since decades a sustainable level of customer satisfaction and trust. We are in demand and valued internationally for this.

The recent development of many new products increasingly includes the areas of measurement technology and software development / automation, in addition to classic mechanical and electrical engineering.

In particular, AIP supplies vehicle test stands (for complete vehicles and vehicle components) for the realistic, reproducible simulation of road trips in laboratory operation, e.g. in the areas of emission measurement, endurance testing, measurement of electromagnetic compatibility / compliance, acoustic and harshness (“squeeze and raddle”) vibration measurement.

AIP’s innovative testing technologies are also used in the areas of E-Mobility, fuel cell technology, autonomous driving and in the development and quality assurance of driver assistance systems (ADAS).

In addition to the vehicle test stands for road driving simulation, AIP has developed an extremely high level of awareness in the areas of measurement technology and flexible customized test stand automation (MCS / HOST), worldwide.

Innovative projects for e.g. VW Group, Porsche, BMW, Mercedes, AUDI, TESLA as well as for leading suppliers from France, Sweden, and Asia emphasize our high-ranking expertise in this important future section.

High-Performance Solutions for a Wide Range of Applications

The AIP comprehensive system solutions are modular in design / budget and easily adaptable to various vehicle types and customer requirements.

- Mobile and stationary charging stations for E-Mobility
- Range determination
- Energy consumption measurement
- Acoustic measurement (NVH)
- Endurance testing, COP
- Performance measurement, e.g. in a wind tunnel
- Functional testing, e.g., in climatic- and altitude chambers
- Verification electro-magnetic compliance (EMC)
- Hydraulic-/electric road simulation testing (shaker)
- Emission measurement systems (NVH, EMC)
- Test automation (MCS Master Control Sytem / HOST)
- Robot driver / Throttle actuator
- Vehicle cooling fans
- Test Stand Accessories
- Drivers aid systems

TISAX®
RESULT AVAILABLE

ISO 9001
Certification of Quality Management
AIP automotive

ISO 14001
Certification of Environmental Management
AIP automotive

ISO 45001
Certified Management for Security and Health
AIP automotive

DIN EN ISO/IEC 17025:2018
DAkkS German Accreditation Office
AIP automotive

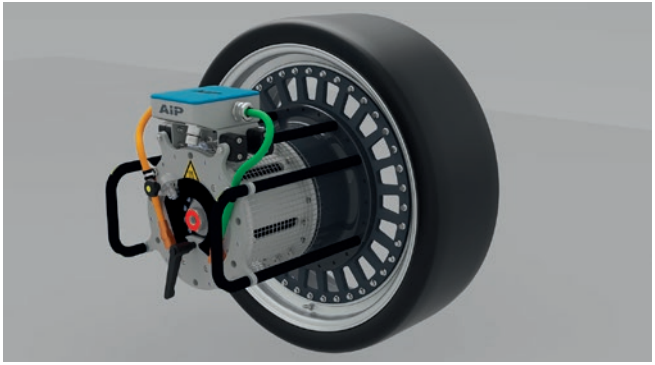
Torque Wheel Dynamometer TWDM

Four Wheels, Each with Integrated Torque Motor in Combination with an Optional Electromechanical Swivel Plate

The ViL platform is based on an innovative and patented concept for a Torque-Wheel DynamoMeter (TWDM) consisting of four wheels with integrated torque motor in combination with an electromechanical swivel plate. The wheel hub of the TWDM can be rotated relative to the rim when the wheel is in a standing position.

In contrast to existing test benches with external machines or roller dynamometers, no structural measures are necessary for the TWDM. By using optional electromechanical swivel plate, different steering angles can be set, which also allows speed-dependent steering counterforces to be taken into account. Accordingly, the steering of the vehicle remains in its original

TWDM Air Cooled
(Base Version)



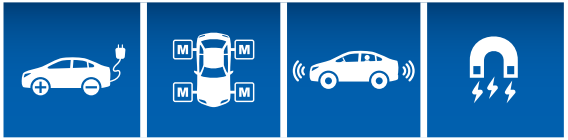
TWDM High Speed / TWDM High Torque
(Optional Customized)

state with the TWDM and does not need to be readjusted, which is a huge advantage compared to the state of the art. Even incline, decline, tyre slip on ice or snow, can be replicated by using the TWDM in combination with a powerful real-time environment simulation. The resulting ViL platform is therefore particularly well suited for the evaluation of automated driving functions. Optionally in combination with ADAS hard- and software.

Advantages

- Easy installation, no consturctural measures necessary
- Free accessibility for stimulation of ADAS sensors such as radar, lidar and cameras, GPS, G5 ... communication systems
- Simulation of cornering, lane change, automatic parking/unparking, distance warning. Emergency braking behavior, etc.
- Can also be used optionally for EMC testing
- Sensors for speed measurement and torque measurement are included

Applications



Torque Wheel Dynamometer TWDM

Four Wheels, Each with Integrated Torque Motor in Combination with an Optional Electromechanical Swivel Plate

Variants of the TWDM (Extracts)

Tyre sizes 205/35 R18 (Outside diameter ca. 600 mm) or 215/30 R20 (Outside diameter ca. 640 mm) are available for all variants.

TWDM Air Cooled (Standard / Base Configuration)

	Model 1	Model 2	Model 3
Max. power [kW]	6	10	19
Max. torque [Nm]	65	123	226
Max. speed [min^{-1}]	1860	1770	1830
Nominal torque [Nm]	14	22	28,5
Nominal speed [min^{-1}]	400	400	400

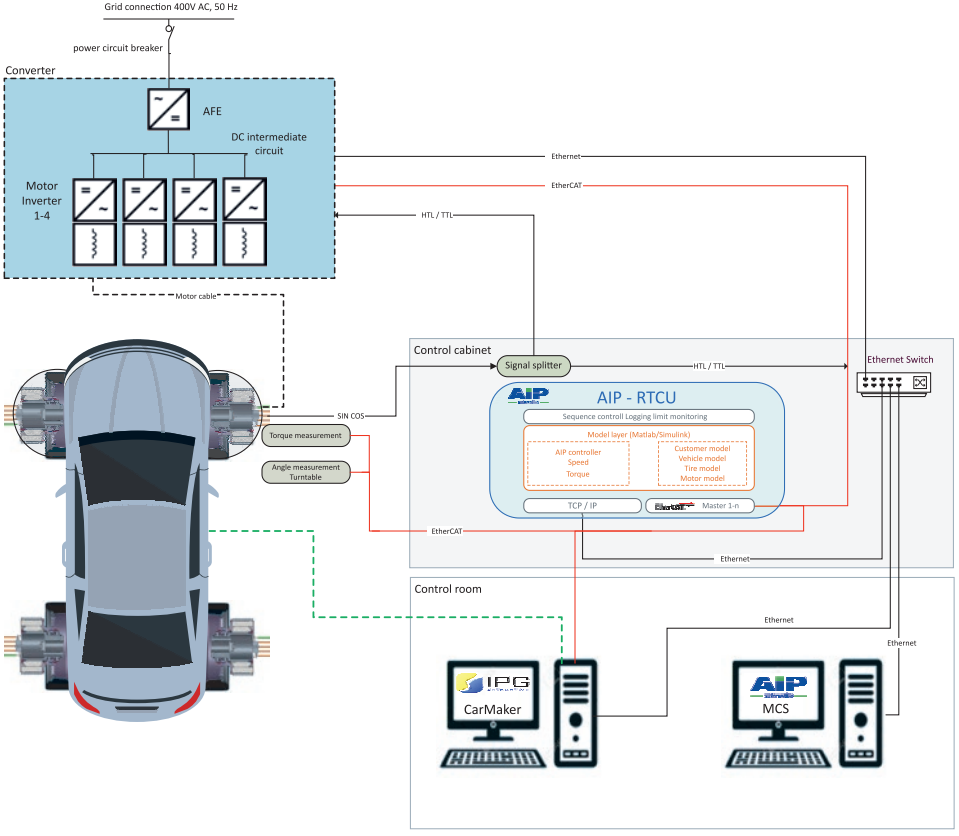
TWDM High Speed (Customized on Request)

	Model 1	Model 2	Model 3
Max. power [kW]	41	80	93
Max. torque [Nm]	432	864	1300
Max. speed [min^{-1}]	3000	3000	2400
Nominal torque [Nm]	260	519	792
Nominal speed [min^{-1}]	1050	1060	777

TQDM High Torque (Customized on Request)

	Model 1	Model 2	Model 3
Max. power [kW]	39	74	89
Max. torque [Nm]	800	1600	2400
Max. speed [min^{-1}]	1800	1800	1350
Nominal torque [Nm]	525	1050	1590
Nominal speed [min^{-1}]	460	467	343

Design of Control

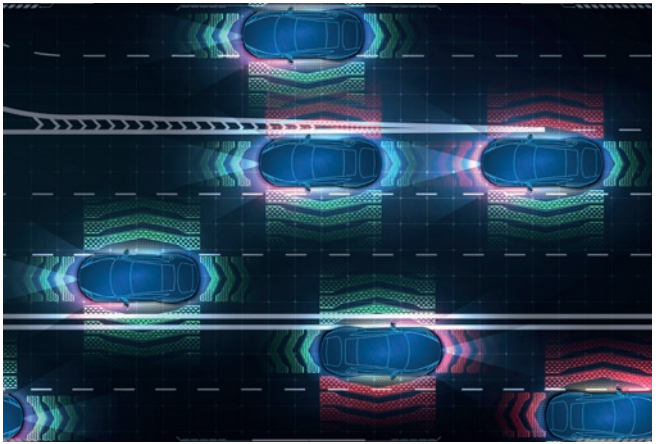


Applications, e.g.:

- R2R testing
- ADAS testing
- EMC testing
- E-Mobility testing

ADAS Testing Systems

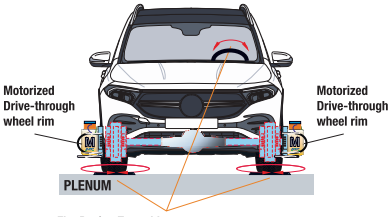
Torque Wheel Dynamometer

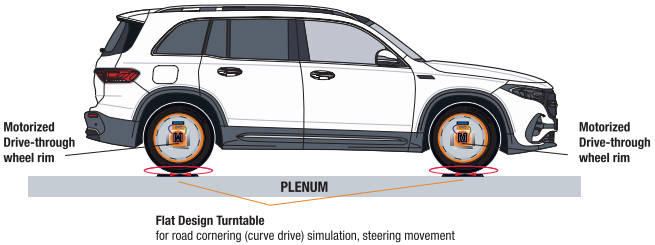


The test vehicle stands with motorized drive-through rims on turntables, integrated on the floor (plenum) e.g. of a EMC test cell. This setup allows steering movements during the driving simulation, with the vehicle stationary. Simulation of cornering, lane change, automatic parking/unparking, distance warning. Emergency braking behavior, etc.

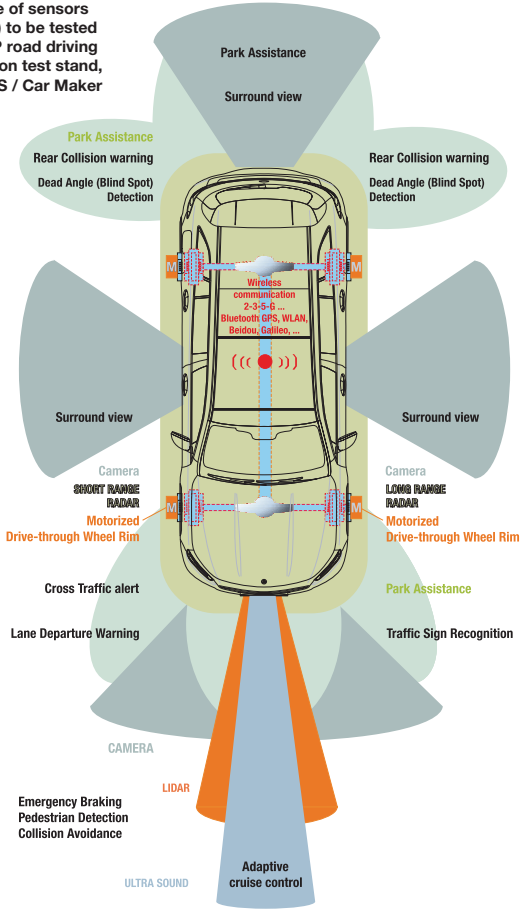
While the wheels are stationary, the motorized, specially mounted drive-through rims drive the vehicle drivetrain in a synchronized manner, simulating behavior similar to real road driving.

An embedded video system and radar target simulator integrated in the test cell floor in front of the vehicle projects a realistic roadway with different vehicles, obstacles, etc.





Example of sensors (extract) to be tested on a AIP road driving simulation test stand, e.g. MCS / Car Maker



Torque wheel application allows simulation of driving turns, e.g. lane changes.

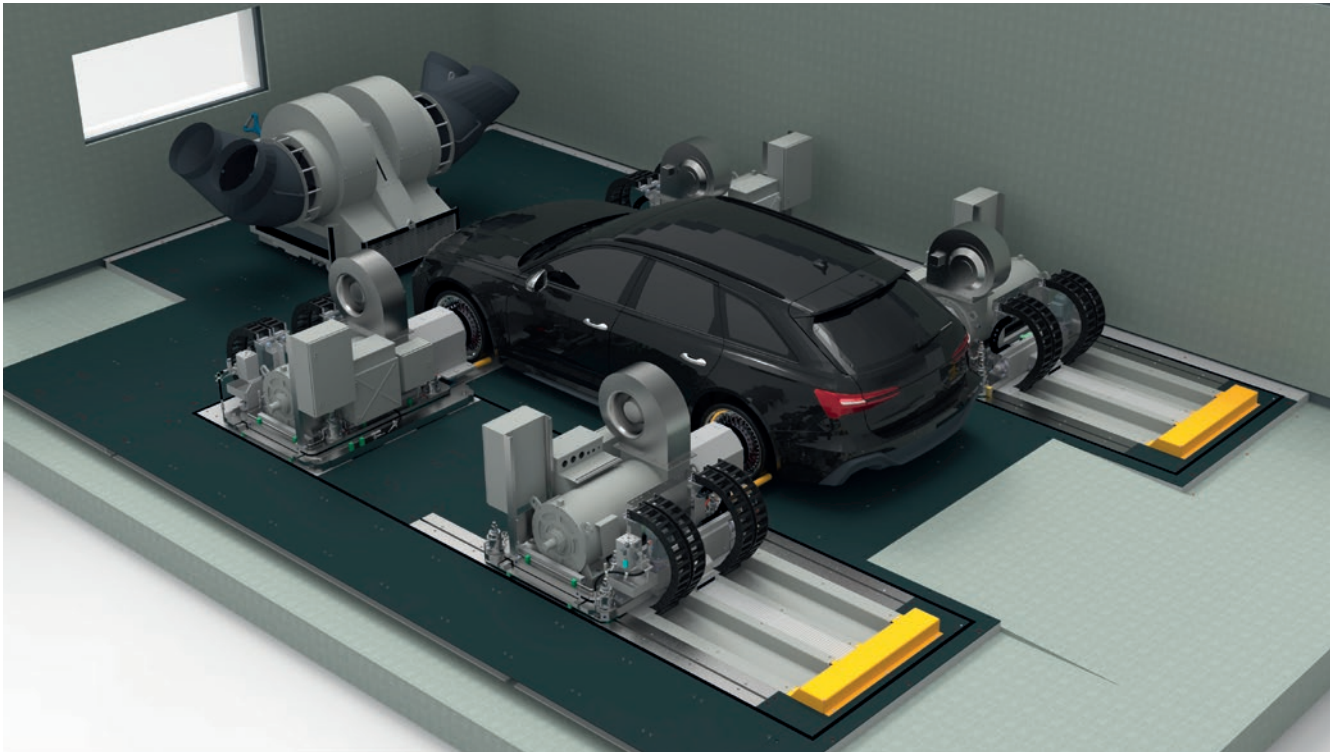
Applications

E-Mobility

EMC

Powertrain 4x4 Dynamometer

HUB Mounted Test Stand (Road to Rig)



Test configurations are possible on the R2R test bench stand, which cannot be mapped on standard powertrain test benches, such as real powertrains in combination with virtual bodies, i.e. with changed driving resistances. The result is vehicle testing and application under real driving conditions with the integration of models for the vehicle, road surface and tires. A test and adjustment of driver assistance systems can be easily displayed on the R2R, since the software for the "road vehicle" can already be used here.

Methodical validation and evaluation of mechanical and electrical hardware components and overall systems (performance, NVH) as well as control and regulation software. The method development leads to a shifting of development steps and evaluation processes to an earlier development stage (frontloading). In this way, three main strategic goals can be pursued:

Advantages

- Quality increasing of development services
- Significant reduction in development costs
- Significant saving in development time
- Quick setup

Application

- Durability tests, COP, Milage accumulaton tests
- Range determination
- Energy consumption measurement
- Performance, NVH

Applications

Fast Charging Station HPDC 1000 / 600 / Mobile

DC Fast Charging of Electric Vehicles on a Vehicle Test Stand or During the Preconditioning

The DC charging station serves as a high speed charging station for electric vehicles with a DC voltage connection directly at a already existing stationary road drive simulation test bench.

The HPDC charging station can be equipped with the international charging standards CCS1, CCS2, CHAdeMO, GB/T and ChaoJi. It is possible, to use the two combined charging systems (CCS1+2) as uncooled charging lines or as liquid cooled charging lines for the High Power Charging (HPC) with current to realize up to 600 kW charging power.

Advantages of the HPDC 1000 Charging Technology

- Easy integration into existing test bench safety chains
- No additional energy supply necessary
- Compact, flexible system structure
- Energy recovery capability (controlled energy return into the network, if supported by the test vehicle). This enables, for example:
  - the preparation of the transport for relocation by means of a transport vehicle
  - automated charging / discharging cycles with plugged-in charging plugs (optional)

- Optimized cable lengths, thereby
  - reduced risk of accidents due to tripping hazards
  - improved handling in tight spaces and
  - Improved handling with different positions of the charging sockets on the test vehicles
  - reduced acquisition and maintenance costs
- Direct coupling with the electrical feed of the test stand
- Can be implemented modularly from 100 kW … 600 kW
- High-performance charging up to 600 kW
- Implementation of several charging points with just one power electronics
- Optional extended operating temperature range for use in air conditioning cells / wind tunnels
- Future-proof retrofittable, e.g. for:
  - power expansions
  - new charging connector standards, e.g. ChaoJi
- Integration into the existing software environment / automation of the test bench
- Software for setting performance parameters
- Implementation of all current charging standards in just one product
- Vehicle communication data logging
- Loading of defined SOCs
- Supply of up to 5 charging points in 100 kW steps
- High quality charging plug (from the market leader), can be repaired by the customer if necessary

Technical Specifications

Power range	100 ... 600	kW
Max. charging power per charging point	600	kW
Output voltage range	50 ... 1,000	V
Charging current max.	600	A
Efficiency	94	%
Plug types	CCS1, CCS2, CHAdeMO, GB/T, ChaoJi	
Number of charging options	up to 5	
Temperature range	-35 ... +60	°C
Protection class	IP 54	
Operation	Control via test bench computer	
Optional	7" touch display	
Dimensions charging station (W x D x H)	500 x 500 x 1,600	mm
Dimensions charging unit (W x D x H)	on request	mm
Weight of charging station	ca. 240	kg
Material	Powder-coated sheet steel	
Housing of power electronics (W x D x H)	2,200 x 600 x 2,400	mm

Applications

Mobile Charger R2DC

DC Fast Charging of Electric Vehicles on CEE Connections or Directly on the Test Stand / During the Preconditioning

The DC charging station is used to charge e-vehicles with a DC voltage connection to a CEE connection. It consists of a charging column, which is set up in the immediate vicinity of the vehicle to be charged, the power unit is built into the charging column.

The CEE connection side is variable from CEE 125 to CEE 32.
Depending on the available input power, there is a maximum output power.
The charging station can be equipped with the four international charging standards CCS1, CCS2, CHAdeMO, GB/T and ChaoJi (comming soon without changeable), which are changeable.

Charging Times

BMW IX3 80 kWh **46 minutes**	VW ID3 77 kWh **50 minutes**	Audi e-tron 95 kWh **48 minutes**
Mercedes EQS 580 108 kWh **54 minutes**	Porsche Taycan 93,4 kWh **50 minutes**	Tesla Model 3 75 kWh **40 minutes**

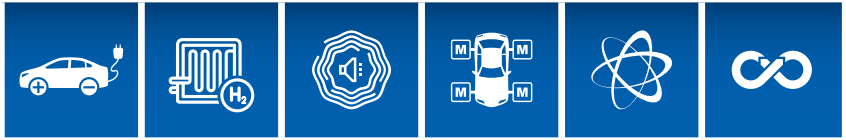
All charging times relate to a charge of 10% to 80% of the battery capacity.

Technical Specifications

Dimensions (D x W x H)	1,000 x 700 x 950	mm
Weight	approx. 160	kg
Ambient temperature	-20 ... +40	°C
Degree of protection	IP54	

AC input data	3 x 125	A
	400 ± 10 %	V
	50 ... 60 ± 10 %	Hz
DC output data	90	kW
	max. 250	A
	150 ... 1,000	V
AC connector type	CEE125, CEE63 and CEE32	
DC connector type	CCS Type 2, CCS Type 1, CHAdeMO, GB/T, ChaoJi	
Power factor	0.99	
Charging standard	DIN70121, ISO15118 CHAdeMO Ver. 2.0 GB/T-27930-2015	
Conformity and safety	CE, 2014/30/EU 2014/35/EU IEC 61851-1, -23 IEC 61000-6-1, -2, -3, -4 IEC 61000-3-12 EN 60529	
Operation	7" touch display	

Applications



EMC Universal DC Charging Box

Battery Charging in Compound with an EMC Test Stand

With the AIP EMC charging box, tests are carried out in accordance with the requirements of **ECE R10** and **GB/T18387**. This describes the testing of electrical and electronic components that are intended for installation in vehicles. A distinction is made between 2 types of tests:

1. Requirements relating to immunity to radiated and conducted interference in functions related to direct control of the vehicle, to the protection of the driver, passengers and other road users and to interference that could confuse the driver or other road users.
2. Requirements relating to the control of unwanted radiated and conducted emissions to protect the intended use of electrical or electronic equipment in your own or in neighboring vehicles or in their vicinity and the control of malfunctions caused by accessories that may have been retrofitted in the vehicle.

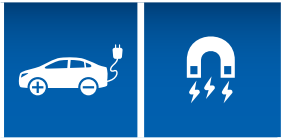
Features

- All-in-one box, compact design, movable
- Dimension of housing: 1,330 x 875 x 408 mm (L x W x H)
- Connection possibility for all common uncooled charging cables
- incl. integrated EMC filter technology
- incl. integrated charge control
- incl. possibility to integrate a optional power grid simulation (Line impedance stabilisation network) LISN (800 A)
- The compact AIP charging technology can be used in conjunction with AIP RMV (EMC) test stands, as well as with test stands from other manufacturers
- Automatic full-surface contact to the base plate by its own weight

Technical Specifications

Output voltage range	50 ... 1,100	V
Current carrying capacity	500	A
Max. Current carrying capacity for vehicle outlet 1		
CCS Typ 1	200	A
CCS Typ 2	200	A
GB/T	250	A
CHAdeMO	250	A
Max. Current carrying capacity for vehicle outlet 2		
CCS Typ 1	500	A
CCS Typ 2	500	A
Current accuracy	0.05	% MW
CAN and Pilot ISN	can be easily installed if required (Space and coupling interface provided)	
2x DC LISN	up to 800 can be integrated (designed for Schwarzbeck)	A
LISN	can be easily removed for calibration	

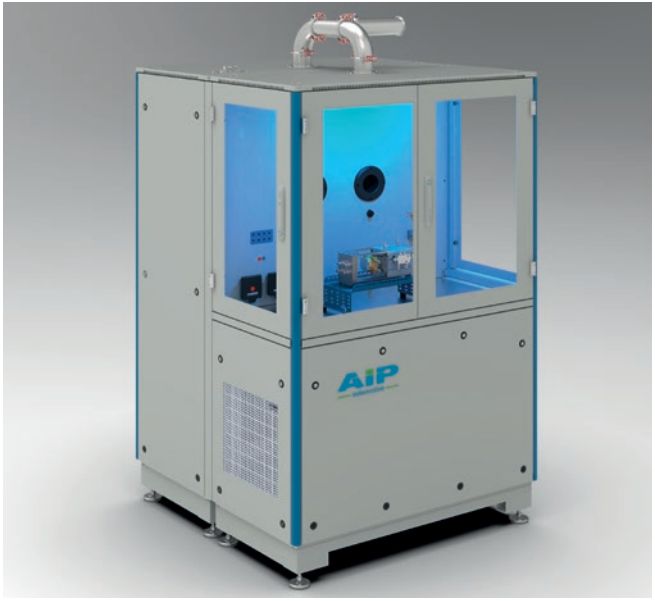
Applications



E-Mobility EMC

H_2FC - MEA

Hydrogen Fuel Cell Testing for Membrane Electrode Assembly



With H_2FC-MEA, tests and characterizations are carried out on Fuel Cell Membrane Electrode Assemblys (MEA) under defined operating conditions. With H_2FC-MEA iis based on a modular system and is designed to be self-sufficent and flexible. The test sequences parameterized with a sequence editor run directly on a real-time computer, which guarantees the uninterrupted execution and recording of long test sequences.

Features

- Gas dosing via mass flow controller (Anode: H_2/N_2; Cathode: O_2/N_2/Air)
- Humidification of the gases by a bubble column reactor with active thermal regulation to achieve high dynamics
- Adjustable operating points at cathode and anode (Gas flow rate, temperature, pressure, humidification (dew point and relative humidity), temperature)
- Inerting with nitrogen at the cathode and anode in the event of a fault
- Plausibility and monitoring functions (H_2-warning unit, flow-monitoring, exhaust system, leak check, door monitoring of customer-side media)
- Automated, unmanned operation
- Measurement protocol and data export
- Possibility of connection to the customer‘s ATEX exhaust air system

Applications

- Bypass Anode/Kathode
- Dosing of contamination gases in anode and cathode processing
- Separate dosing of O_2/N_2 or air in cathode preparation
- Automatic level control of the bubble column reactors for unmanned operation
- Cooling circuit for tempering the fuel cell (Delta p, Delta T or T regulation)
- Impedance spectroscopy to characterize the cells, including Cyclovoltammetry and linear sweep voltammetry
- Electronic load (sink) for simulating load profiles

Technical Specifications

Gas conditioning		
MFC accuracy	±0.1	% FS
	±0.5	% RD
Humidification method	Bubble coloumn reactor	
Dewpoint control accuracy	±1	°C
Gas temperature range	until 0 - 120	°C
Gas temperature control accuracy	±2	°C
Temperature sensors	PT100	
Pressure control range	1.1 - 4	bar
Pressure control accuracy	< 25	mbar
Pressure sensor accuracy	±0.25	% FS

Cooling unit		
Temperature control accuracy	±1	°C
Regulation modes	Δp, ΔT, T	
Pressure control range	0 - 4	bar
Temperature control range	-30 … -90 (with ext. Cryostat)	°C
Electric conduct. cooling medium	< 5 (optional: bypass ion exchanger)	µS/cm
Cooling Media	DI Water or Glycole	
Electronic load		
Maximum input voltage	12	V
Minimum input voltage	0	V
Maximum current	400	A
Continuos power	600	W
Voltage measurement accuracy	±0.05 % RD I ±0.02% FS	
Current measurement accuracy	±0.2 % RD I ±0.05% FS	
Impedance spectroscopy		
Frequency range	10 µHz – 8 MHz	
Controlled voltage	±5 / ±15	V
Compliance voltage	±16	V
Maximum current	±1 - ±3	A

H_2FC - STACK

Hydrogen Fuel Cell Testing for PEM Fuel Cell Stacks

With H_2FC-STACK, tests and characterizations are carried out on PEM fuel cell stacks under defined operating conditions.

The H_2FC-STACK is based on a modular system and is designed to be self-sufficent and flexible. The test sequences parameterized with a sequence editor run directly on a real-time computer, which guarantees the uninterrupted execution and recording of long test sequences.

Features

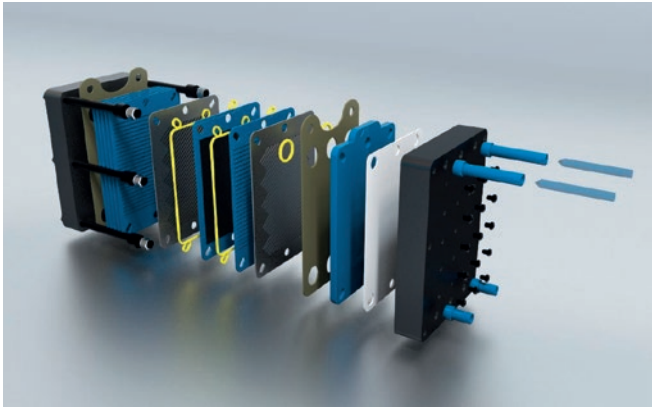
- Gas dosing via mass flow controller (Anode: H_2 / N_2; Cathode: O_2 / N_2 / Air)
- Humidification of the gases by a bubble column
- Anode H_2 recirculation cycle
- Adjustable operating points at the cathode and anode (Gas flow rate, temperature, pressure, humidification (dew point and relative humidity), temperature)
- Inerting with nitrogen at cathode and anode in the event of a fault
- Plausibility and monitoring functions (H_2-warning unit, flow-monitoring, exhaust system, leak check, door monitoring of customer-side media)
- Automated, unmanned operation
- Measurement protocol and data export
- Possibility of connection to the customer‘s ATEX exhaust air system

Applications

- Bypass Anode / Kathode
- Dosing of contamination gases in anode and cathode processing
- Separate dosing of O_2 / N_2 or air in cathode preparation
- Cooling circuit for tempering the fuel cell (Delta p, Delta T or T regulation)
- Impedance spectroscopy to characterize the cells, including Cyclovoltammetry and linear sweep voltammetry
- Electronic load (sink) for simulating load profiles

Technical Specifications

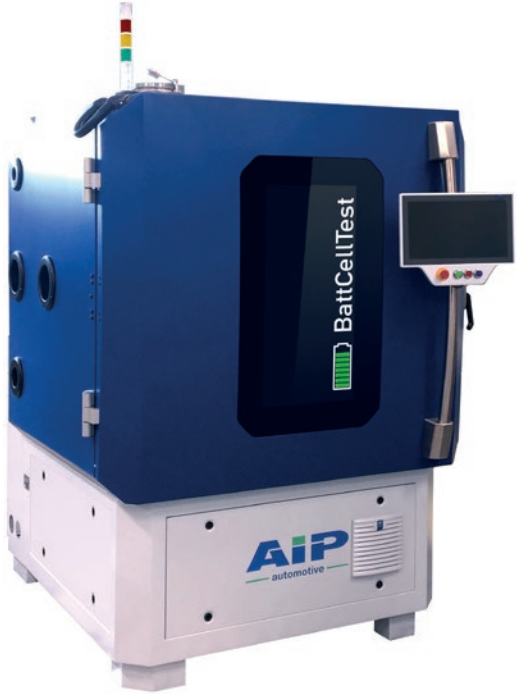
Gas conditioning		
MFC accuracy	±0.1	% FS
	±0.5	% RD
Humidification method	Humidifier coloumn	
Dewpoint control accuracy	±1	°C
Gas temperature range	until 0 - 120	°C
Gas temperature control accuracy	±2	°C
Temperature sensors	PT100	
Pressure control range	1.1 - 4	bar
Pressure control accuracy	< 25	mbar
Pressure sensor accuracy	±0.25	% FS



Cooling unit		
Temperature control accuracy	±1	°C
Regulation modes	Δp, ΔT, T	
Pressure control range	0 - 4	bar
Temperature control range	-30 … -90 (with ext. Cryostat)	°C
Electric conduct. cooling medium	< 5 (optional: bypass ion exchanger)	µS/cm
Cooling Media	DI Water or Glycole	
Electronic load		
Maximum input voltage	60	V
Minimum input voltage	0	V
Maximum current	1,050	A
Continuos power	11,200	W
Voltage measurement accuracy	±0.05 % RD I ±0.02% FS	
Current measurement accuracy	±0.2 % RD I ±0.05% FS	
Impedance spectroscopy		
Frequency range	10 µHz – 8 MHz	
Controlled voltage	±5 / ±15	V
Compliance voltage	±16	V
Maximum current	±1 - ±3	A
Cell voltage monitoring		
Number of measuring channels	up to 800	
Voltage range	-1 to +5 or -3 to +3	V
Accuracy	±0.1	%

Battery Cell Tester BCT

Quality Assurance in the Development of Battery Modules or Battery Packs



The compact battery cell test system consists of a combined, dual cabinet system, consisting of a temperature test cabinet with cooling/heating unit and an LE cabinet (power electronics). The LE cabinet is attached to the rear of the temperature test cabinet. An intermediate zone is used for thermal separation and for routing cables up to the through-hole plating in the temperature chamber. The system is suitable for battery cells up to 1,000 mm and a maximum weight of 80 kg/layer.

The temperature control cabinet is equipped with 5 layers, whereby the layers can be individually removed for external equipment. The contact with the power electronics takes place automatically at the end position of the layer.

Advantages

- Very compact design
  - power unit and temperature control cabinet from a single source
- Suitable for battery cells with a length of up to 1,000 mm
- Tests of several large cells per layer
  - max. Weight 80 kg/layer
- High-current tests per test item of 960 A duration and 1500 A peak
- Modular configurable channels
  - Adaptation to changing requirements is possible at any time

Applications

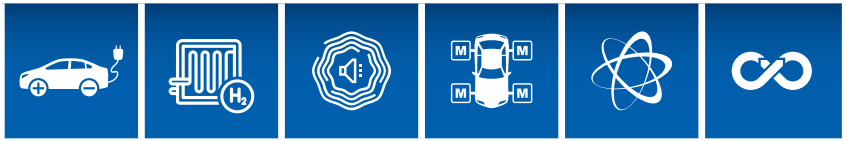
- Exact testing of battery cells to ensure quality and performance
- Reproducible, realistic function, performance and aging tests

Technical Specifications

Temperature Control Cabinet		
Temperature range	-30 … +60	°C
Outside dimensions W x H x D	on request	mm
Inside dimensions W x H x D	1,200 x 1,000 x 600	mm
Layer for test item	5 (individually removable for external equipping)	layer
Loading per layer	80	kg
Test item dimensions W x H x D	1,125 x 160 x 560 (Standard layer for max. 6 test items)	mm
Heating speed (IEC 60068-3-5)	3 (empty cell)	K/min
	2 (200 kg DUT)	
Cooling speed (IEC 60068-3-5)	2 (empty cell)	K/min
	1 (200 kg DUT)	
Heat compensation	2 (at -30°C)	kW
	5 (at +20°C)	
Ambient temperature	+10 … +35	°C

LE Cabinet		
Outside dimensions W x H x D	on request	mm
DC Power channels	30	channels
Channels per layer	6 (suitable for series and parallel operation)	channels
Current per channel	I nominal ± 160	A
	Overload ± 250 – S6 (60s)	
Voltage	0 ... ±10	V

Applications



Battery Simulator HPDC 1000 BattSim

As a Replacement for High-voltage Vehicle Batteries. For the Operation of Vehicles under Almost Real Conditions.

The DC battery simulator serves as a replacement for the high-voltage vehicle battery for operating the vehicle under almost real conditions on vehicle test benches (reproducible road driving simulation). The system is operated in 2-quadrant operation (source / sink).

The DC battery simulator is preferably connected to the AFE converter (energy control cabinet) of an existing test bench system. By integrating (expanding) the DC battery simulator into the existing test bench infrastructure, costs can be saved accordingly. If the connection to an existing system is not possible, an extra DC link feed unit can also be supplied.

Applications

- Simulation of the vehicle battery, e.g. for
  - Endurance tests
  - Performance tests for the entire vehicle
- Highly dynamic performance / load tests of electric drive systems

Advantages

- Modular, expandable power range from 200… 1,200 kW
- Connection to the existing intermediate circuit of the motor converter of the test bench
  - no additional feed necessary
- Highly dynamic and precisely regulated power electronics
- High efficiency
- Very compact design (300 kW per power field)
- Integration into the existing security matrix

Technical Specifications

Performance classes	200 ... 1,200	kW
Output voltage range	20 ... 1,200	V
Current	300 ... 1,800	A
Overload capacity for 30 s	150	%
Real-time control system	10	kHz
Current rise time	<1 (with setpoint jump 0% ... 90%)	ms
Current accuracy	0.05	% MW
Voltage rise time	<5 (with setpoint jump 10% ... 90% with 500 uF load)	ms
Voltage accuracy	0.05	% MW
Dimensions (W x D x H)	2,200 ... 5,400 x 2,200 x 600	mm

Applications

E-Mobility | Fuel Cell | NVH | Powertrain | R&D Application | Durability, COP, BSR

Battery Shaker

Stress Tests of Vehicle Battery Systems

The shaker test stand essentially consists of the following components:

- Wingblock – air spring mounted < 2 Hz
- Shaker actuator system with preload compensation
- Additional lateral guides with preload compensation
- One test object fixation – according to customer specifications
- Control cabinet for controlling the test stand, measured value processing and shaker regulation

The test object is excited by simulating noise profiles or artificially generated vibration profiles, such as sine, rectangular, triangular or other excitation profiles.

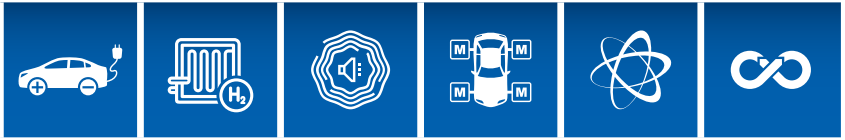
Applications

- Stress tests of vehicle battery systems

Technical Specifications

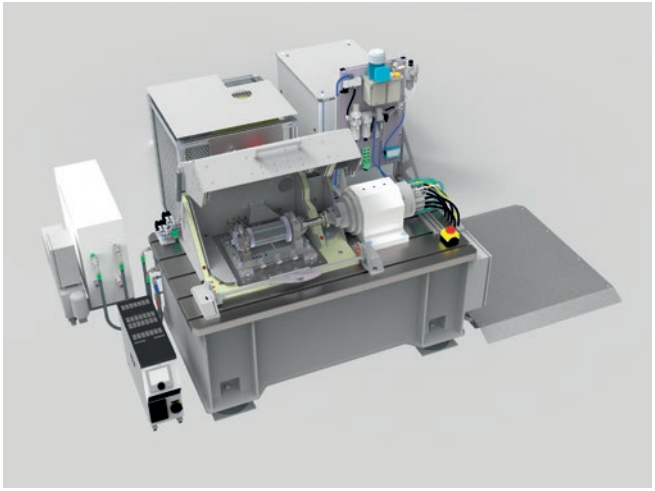
Test object dimensions max. (L x W)	2,300 x 1,600	mm
Shaker hub pk-pk (SIN / Random)	63.5	mm
Frequency range shaker (without clamping)	5 ... 3,000	Hz
Shaker force static	15 (preload compensation)	kN
Shaker force dynamic	22	kN

Applications



High Speed E-Motor-Rotor Tester (Component Testing)

Variable AC Voltage for Variable Motor Test Speed up to 25,000 rpm



The AIP high speed test bench for rotors and components enables the user to drive their DUTs within and also outside their respective operation specifications. With a speed of up to 25,000 rpm and different application patterns such as sawtooth or rectangle e-components can be tested within extremely challenging conditions for stability as well as durability.

An especially designed housing provides protection from bursting as well as the possibility to include an environmental simulation for temperatures between -40 °F up to 392 °F to test the load patterns not only under normal conditions but also within extreme weather and humidity.

The test bench also comes with a test bed suitable for the dynamic test cycles which the bench can provide.

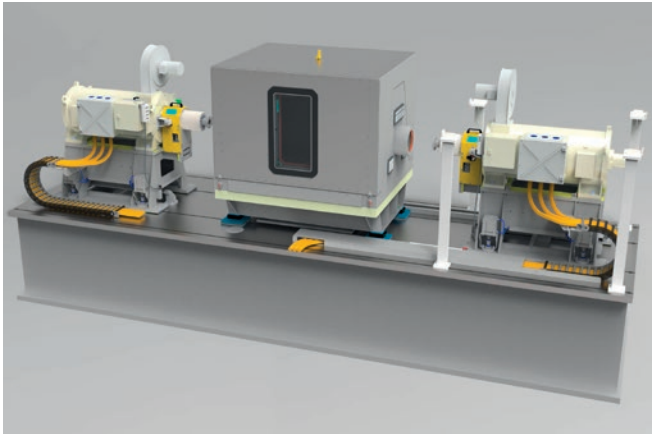
The bench is individually designed for the different types of rotors and components the applicator wants to have tested.

Applications

E-Mobility

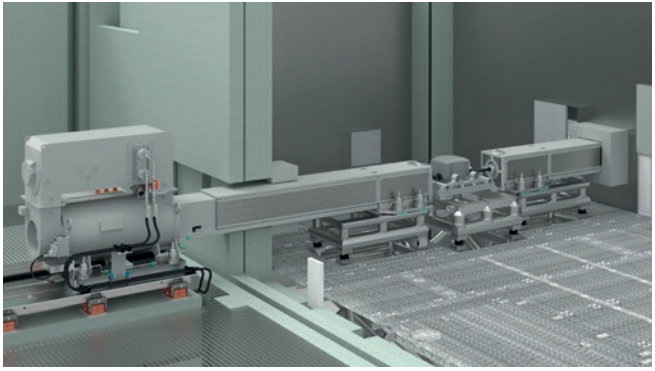
E-Axle Test Stand (Component Testing)

Function Test Bench for E-Axles (AMP Test Stand)



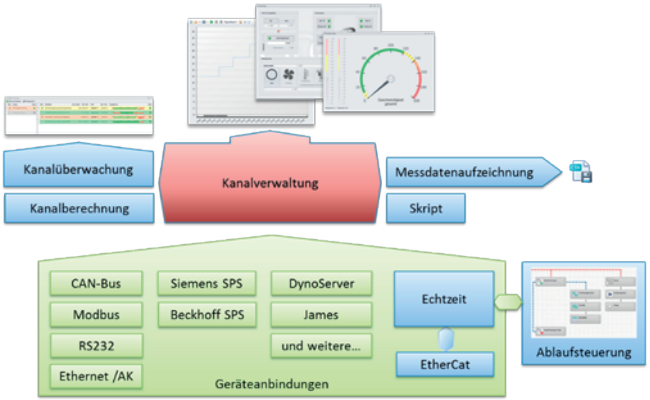
The AIP E-Axle Portfolio contains test systems for several different applications. In an environmental simulation setup (picture left) the DUT is set up with highly dynamic load machines designed according to the applicators demands. A climatic chamber simulates temperatures from -40 °F to +248 °F whereas the drive unit makes it possible to simulate different driving patterns from uphill to race track. High precision measurement equipment makes it possible to surveil every relevant piece of data concerning the DUT.
Special applications like the EMC axle test bench make it possible to examine the DUT for electromagnetic noise. Especially designed for the EMC chamber, the hydraulic test bench provides a load of up to 500 kW total whereas especially developed equipment for the EMC chamber enable the user to test every aspect of their axle or motor within absorber chambers. Together with our partners a package of test equipment, chamber and EMC measuring technology will be designed according to individual testing requirements.

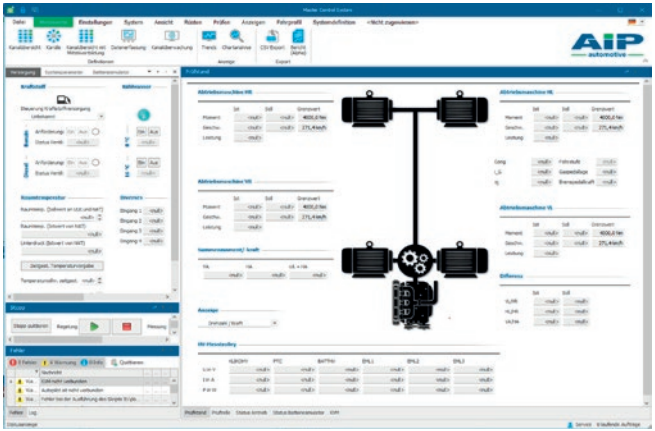
Further possible setups include acoustic applications where the E-Drive can be tested against load machines for noise development and optimization. AIP provides solutions for the complete chamber designs with different options for application, loads and setups.



E-axle test bench in combination with NVH: Measurement and analysis of exterior and interior noise

Master Control System MCS (HOST)
Test Stand Animation





Applications

E-Mobility | Fuel Cell | NVH | Powertrain | R&D Application | Durability, COP, BSR

Our Headquarters in the Beautiful Allgäu

Our headquarters are located in Haldenwang in the heart of the Allgäu region, approx. 120 km southwest of Munich.

For more than 25 years, AIP has been developing, testing, and manufacturing future oriented automotive testing technologies to promote a clean and safe environment.

The Allgäu is the southern region of Germany and one of the most popular tourist areas in the country. It is especially known for its intact and charming nature.

The famous Neuschwanstein Castle in the heart of the Allgäu region

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