

The Siemens logo is displayed in a bold, teal, sans-serif font. It is positioned in the upper right corner of the image, which shows a complex industrial test stand with various cables and mechanical components.

**SIEMENS**

*Ingenuity for life*

# Test stands for the automotive industry

Precise, efficient and flexible

[siemens.com/teststands](https://www.siemens.com/teststands)

# Flexible and energy efficient solutions for test stands

The more flexible, faster and more precise they are, the higher the competitive advantages that can be created: Test stands are an essential component of precise quality assurance procedures in the automotive industry. Research achievements must be rigorously checked and tested, and new functions meticulously verified to ensure that they are effective. And by the way, they must have outstanding efficiency when it comes to energy, time and costs – and safety for persons must be guaranteed in compliance with the applicable standard (according to C Standard EN 528). As complete supplier of electronic components and application-specific concepts we have the answer to all of these challenges.

We are more than willing to help you implement your innovative concepts for test stands that are fit for the future.



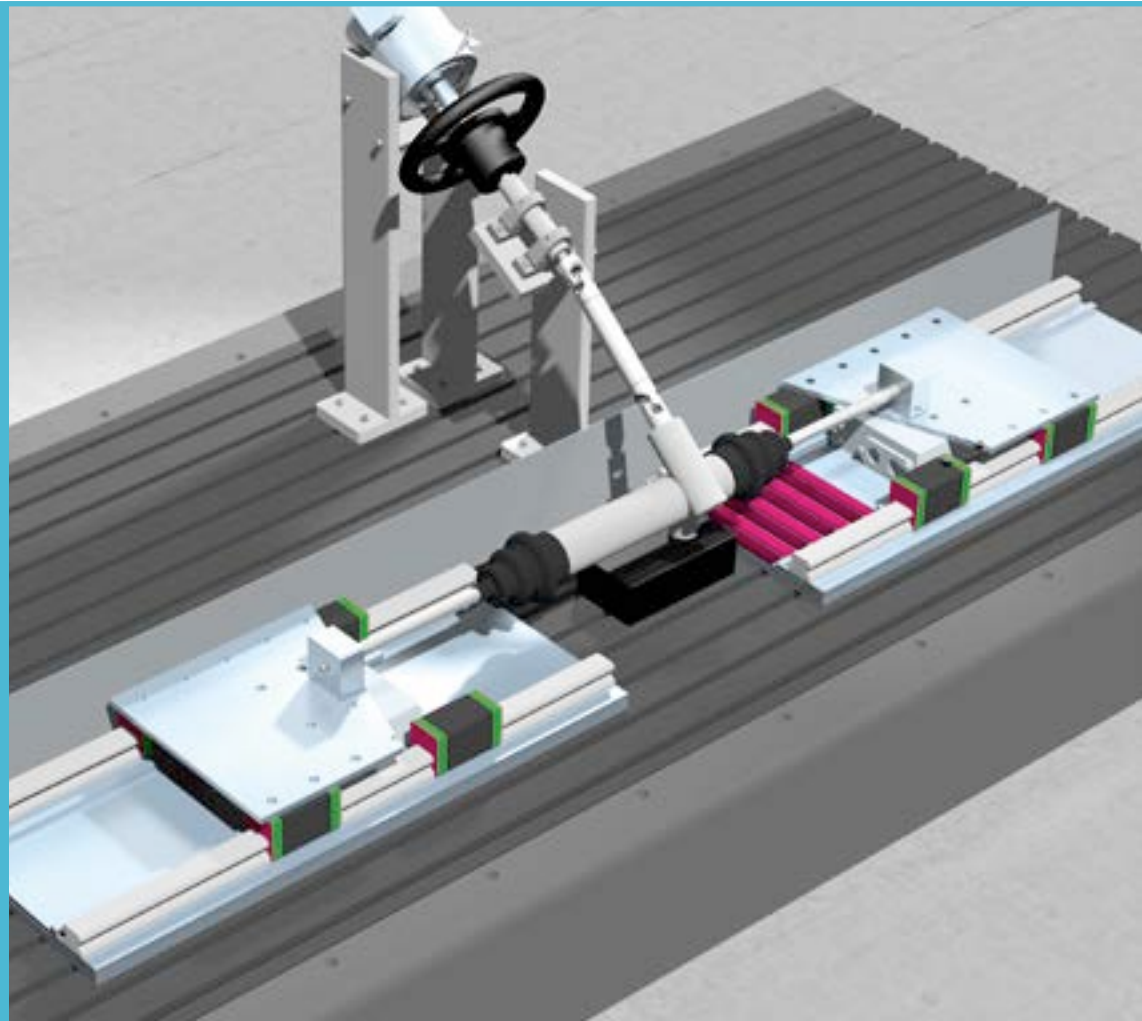
## Roller test stand

- Simple handling
- High degree of availability: The test stand can continue to operate even if individual stator segments fail
- Stiff mechanical design: Direct drive system instead of a two-mass oscillating system assembly
- Improved control characteristics
- Space-saving as a result of the overall compact design



## Linear motor test stand

- High dynamic performance
- Low wear of the mechanical system
- Simple mechanical design
- Constant-force applications without damage to the mechanical system
- Hydraulic axes replaced by electric drive technology



## Roller test stands – the segment motor is in full control

Classic roller test stands generally have a design based on a two-mass oscillating system assembly – a somewhat unfavorable concept. Using a SIMOTICS segment motor is an efficient way of improving the dynamic response of roller test stands. The direct drive technology allows the test stand design to be radically changed and innovated.

- The coupling between the roll and the motor must have a maximum degree stiffness to be able to efficiently control the high moment of inertia of the load that is coupled to the motor. This is why the SIMOTICS segment motor is directly integrated in the roll. The system can be precisely adapted to customer requirements as the motor diameter can be scaled.

- High power ratings require increasingly larger motors, which can only be installed with high associated costs as a result of the significant weight involved. Handling is simplified as the SIMOTICS segment motor comprises compact rotor and stator segments.
- The test stand can continue to operate with reduced power even if individual motor segments or motor modules fail. This is because compact Booksize motor modules can be used as the stator segments are separately controlled.

High degree  
of availability

High dynamic  
performance

## Linear motor test stands – as dynamic as they get

Test stands are becoming increasingly faster and more dynamic. Efficient drive technology is a fundamental precondition in order to achieve the high demands on test stands based on linear motion. Completely new possibilities are created by integrating a SIMOTICS 1FN3 linear motor directly into the mechanical system of the test stand.

- Low motion amplitudes place high demands on the mechanical system. Punctiform loads that occur when converting rotary into translatory motion and force automatically result in high wear levels. SIMOTICS linear motors allow translatory force to be directly generated – therefore eliminating mechanical systems that are prone to wear and tear.

- Drive systems with a high dynamic performance with the lowest mass to be moved are required in order to handle the very high acceleration levels that occur in shaker test stands. As built-in motor, SIMOTICS linear motors allow the moving part of the motor to be directly integrated into the mechanical assembly of the test stand. This makes them admirably suited for use in systems to test vehicle components – seats, shock absorbers, interior equipment – as well as the complete vehicle to ensure that they are resistant to vibration.
- Testing heavy vehicles on shaker test stands means that these stands have to handle high static holding forces. Being able to flexibly dimension and combine several primary sections for each axis makes SIMOTICS linear motors ideally scalable, also when it comes to generating high holding forces.

## E mobility test stands – these are the future

The fast advance of electromobility and the development of new technologies means that the automotive industry has to embark on some significant capital investments. While classic internal combustion engines are essentially autonomous or externally driven, electric drive systems must be supplied with electric power – which requires new test stands. Efficiently providing the required DC power represents a considerable challenge when planning and designing test stands for electric vehicles.

A variable DC voltage can be generated in two different ways. The DC link voltage of a SINAMICS S120 converter system serves as basis to achieve this.

Can be used in:

### End-of-line test stands for vehicle motors

Producing an electric motor involves a workflow comprising various consecutive steps. After the stator and rotor have been produced, the motor function must first be tested before the assembly process can continue – a time-consuming procedure. With the SINAMICS S120 and the SIMOTICS motor portfolio, we are well equipped when it comes to checking the function of electric motors.

### End-of-line test stands for batteries

In addition to the traction system itself, an electric vehicle also requires a battery. Batteries must be subject to charge and discharge cycles in order to reliably test them. In conjunction with the DCDCCONV\* Technology Extension, SINAMICS S120 Motor Modules can be used as DC source with a high dynamic response. Filters can be flexibly dimensioned so the system can be perfectly adapted to the specific application requirements.

\* DC-DC converter / not UL-certified

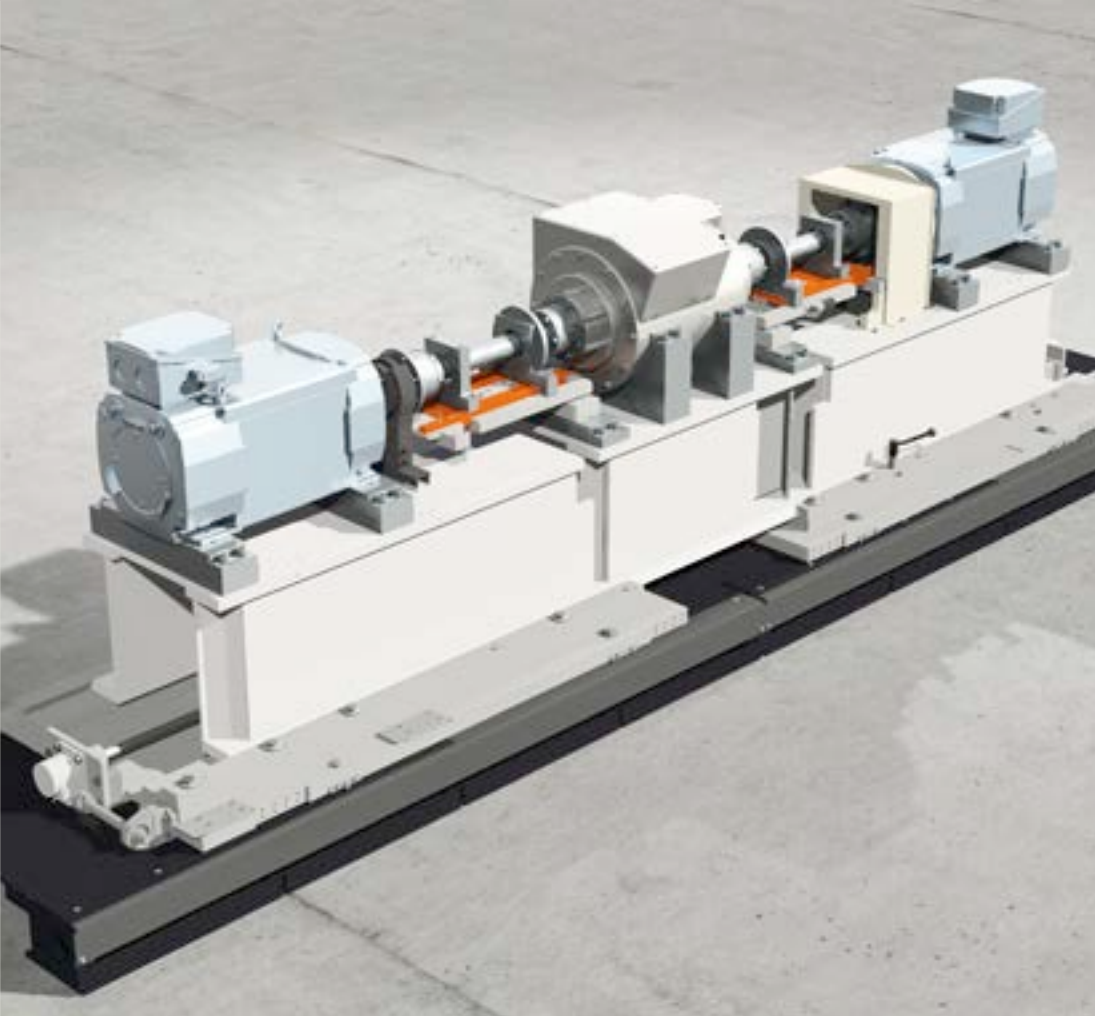
## Energy efficiency

Can be used in:

### End-of-line test stands for the complete vehicle drive system

Testing the complete vehicle drive system – vehicle converter, vehicle motor, differential gearbox – means that the converter must be supplied with power and a load must be simultaneously applied to the vehicle motor. Today, energy efficiency plays a huge role. Energy can be efficiently exchanged between the various loads in the DC link by combining SINAMICS S120, SINAMICS DCP and SIMOTICS 1PH8 products. Only the energy required for acceleration has to be drawn from the line supply. This facilitates a low line connection power. The ability to generate different voltage levels is ensured as a result of the buck-boost functionality of the SINAMICS DCP converter.

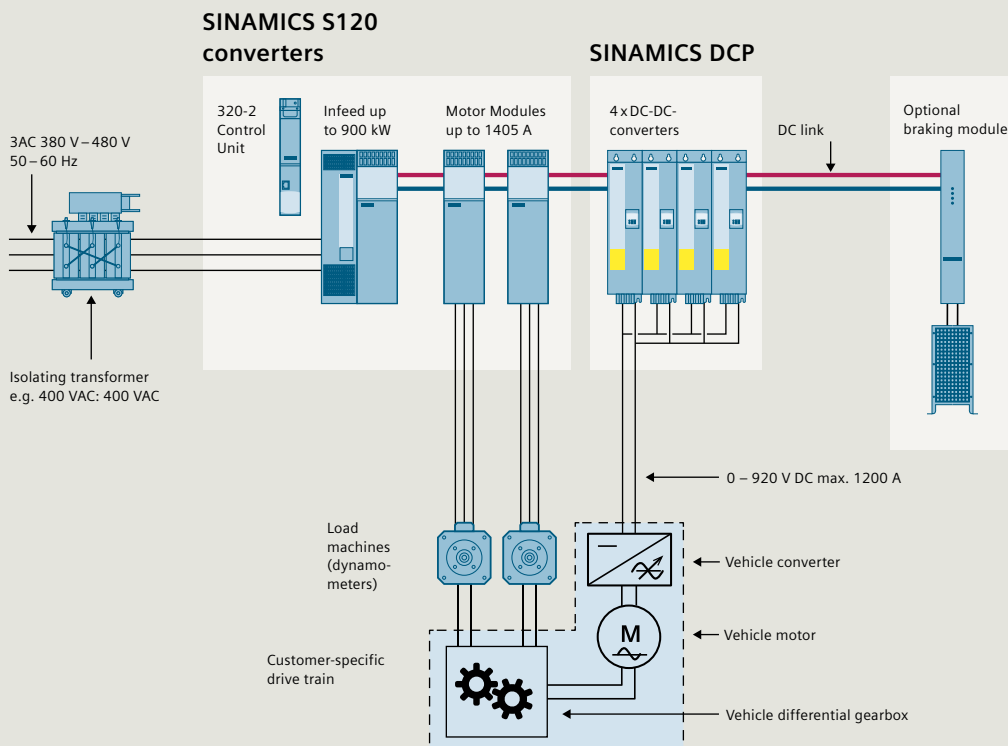
- The DC link voltage can be stepped-up and stepped-down using the SINAMICS DCP converter – resulting in a very wide voltage control range. The high clock frequency facilitates a low current ripple and a high voltage quality.
- In conjunction with the DCDCCONV\* Technology Extension, SINAMICS Motor Modules allow voltages to be generated up to the amplitude of the DC link voltage (max. of 720 V when connected to a 400 V line supply). A filter at the Motor Module output means that the solution can be flexibly deployed. The fast communication and current controller clock cycle means that high dynamic setpoints can be entered and a control with high dynamic performance can be achieved.



## E-mobility test stand

- Solution for a variable DC source
- Solution for the battery test
- All components for the complete system from a single source
- The 380 V – 480 V voltage level can be kept, even for higher DC output voltages

### Concept to test vehicle drive systems based on standard SINAMICS components



### Energy exchange in the DC link

- Low line connection power
- Lower rating line supply in the test stand area
- Controlled stopping when the power fails

## Optimum drive technology for the different test stand system tasks:

**SINAMICS S120 converters**  
[www.siemens.com/sinamics-s120](http://www.siemens.com/sinamics-s120)



- High speed and torque precision
- Active infeed unit for a constant DC link voltage
- Control system with a high dynamic performance
- Firmware extensions for application-specific functions

**SINAMICS DCP**  
[www.siemens.com/sinamics-dcp](http://www.siemens.com/sinamics-dcp)



- Bidirectional buck-boost converter in a single device
- High switching frequency
- Can be connected in parallel
- Can be connected to an Active Line Module

**SIMOTICS M-1PH8 main motors**  
[www.siemens.com/simotics-m-1ph8](http://www.siemens.com/simotics-m-1ph8)



- High torque precision
- High dynamic performance
- Safety-related encoder
- High power density
- Low noise levels

<b>Maximum diameter of the rotor mechanical</b>	Increased stiffness	▶ Improved controllability
<b>Segmented motor design</b>	Can continue to operate even if individual stator segments fail	▶ High degree of availability
<b>Lower moved mass</b>	The motor is integrated in the mechanical system of the machine	▶ High dynamic performance
<b>Directly generated linear forces</b>	Mechanics are not required to convert from rotary to translatory motion	▶ Lower wear
<b>DC source</b>	Variable DC volages are generated	▶ Can be used for various vehicle types
<b>Energy efficiency</b>	Energy exchange in the DC link	▶ Lower infeed power and costs

**SIMOTICS T-1FW6 segment motors**  
[www.siemens.com/simotics-t-1fw6](http://www.siemens.com/simotics-t-1fw6)



- Modular design
- Large rotor diameter
- High torque levels
- Low torque ripple

**SIMOTICS L-1FN3 linear motors**  
[www.siemens.com/simotics-l-1fn3](http://www.siemens.com/simotics-l-1fn3)



- High dynamic performance
- High precision
- Constant linear force
- Wear-free force transmission

**SIMOTICS T-1FW3 torque motors**  
[www.siemens.com/simotics-t-1fw3](http://www.siemens.com/simotics-t-1fw3)



- Direct drive – mechanical transmission elements are not required
- High torque levels
- Wide speed range
- High control quality

Please contact your local partners for mechatronic support and help when engineering the application and commissioning it.

**Find out more:**

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