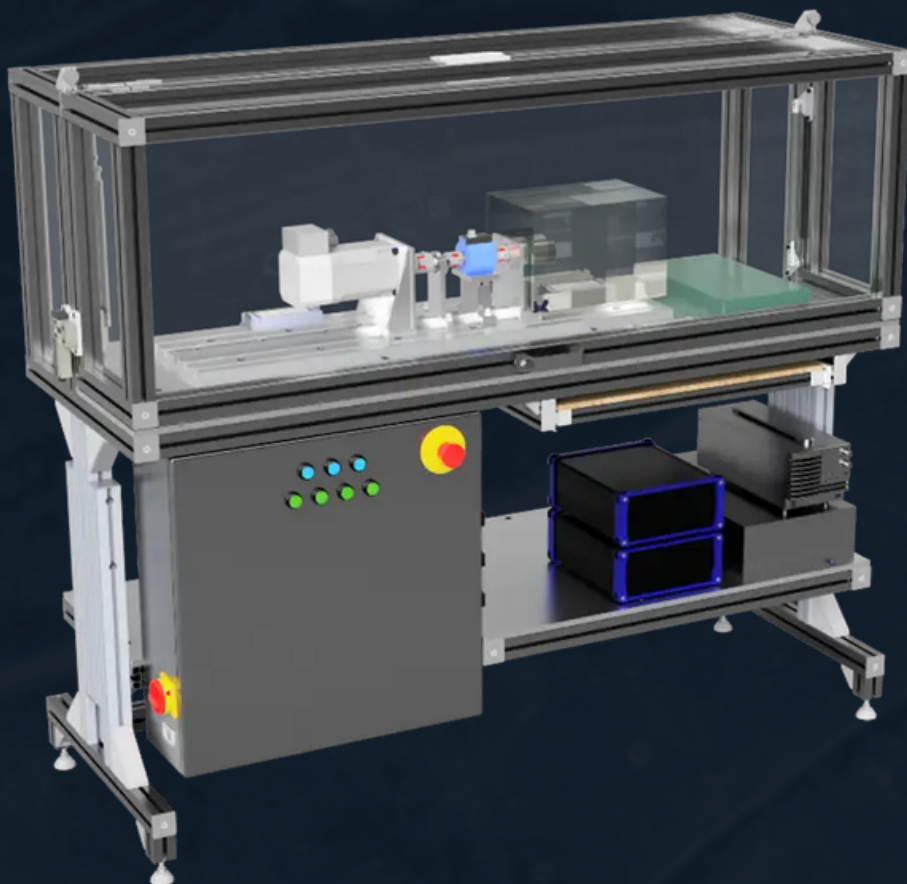




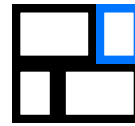
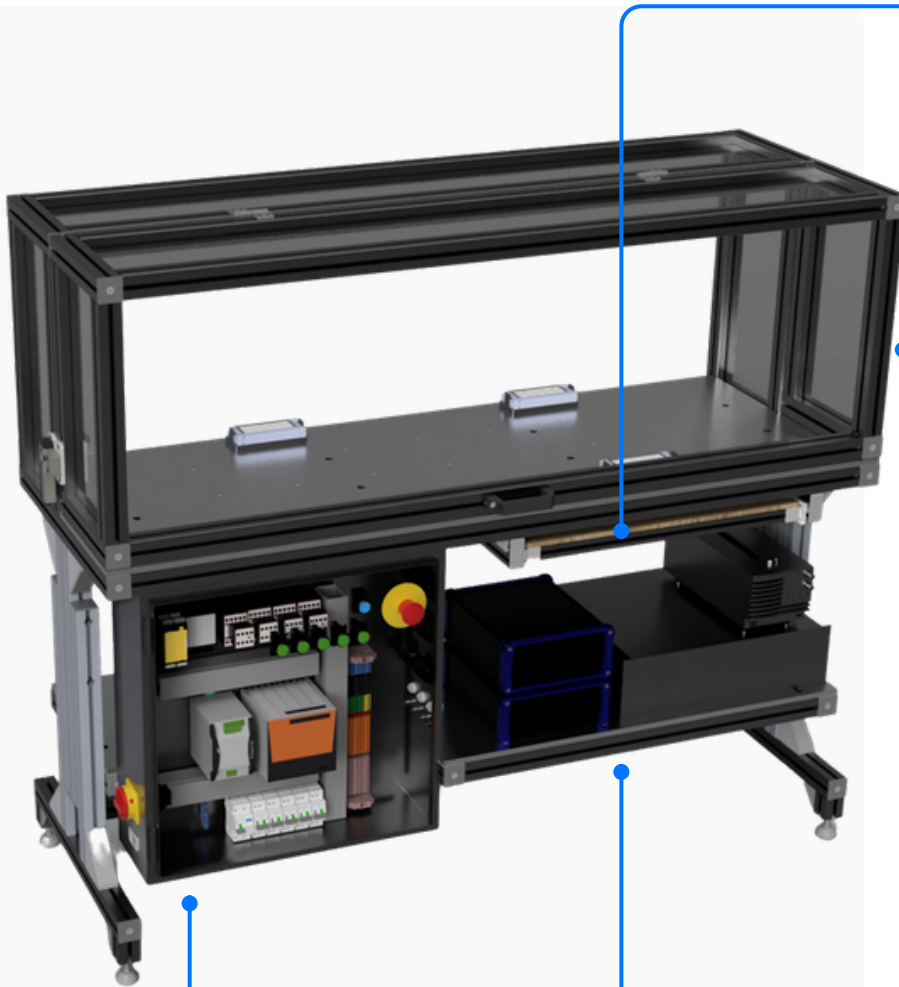
Modular Test Bench System

Tailored to Electric Drives



Overview

Built for (re)configuration



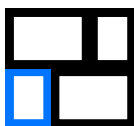
User Area

This area is used to place the test engineer's laptop.



Working Area

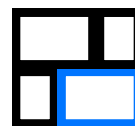
The upper section houses the test string within a see-through enclosure. The enclosure is secured by a safety interlock that prevents access during operation. The mounting plate provides the mechanical interface for DUT, coupling, torque sensor, load motor, and encoders.



Control Cabinet

The control cabinet contains the electrical connections, DC voltages, and safety circuit components including safety relay, mains contactor, and circuit breakers.

This area must only be accessed by a qualified electrician.



Electronics Area

This area houses the es:mod modules (Inverter Interface and DUT I/O Interface), at least one electronic load, and additional user instruments such as a laboratory power supply.

Overview

es:bench™ Test Bench System

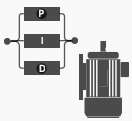
es:bench™ is a test bench platform built for two main criteria:



Modularity

Tailored to specific test requirements.

Easily reconfigured to meet new test requirements.



Cross-Domain Testability

Bridge signals from both the software and physical domain.

Ideal for testing and optimizing embedded systems.

Working Area



Sensors



Actuators
and Brakes



Accessories



Mechanical
Components

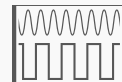
User Area



Control



Automation



Visualization

Control Cabinet



Electrical
Power

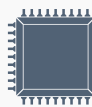


Safety
System



Sensors &
Interlocks

Electronics Area



Compute
and Control



Commu-
nication



Data
Acquisition



Power
Electronics

Test-Setup Modularity

Optimized for (re)configuration

Test benches must adapt if requirements, protocols, or test subjects change.

Rebuilding them wastes time and money.

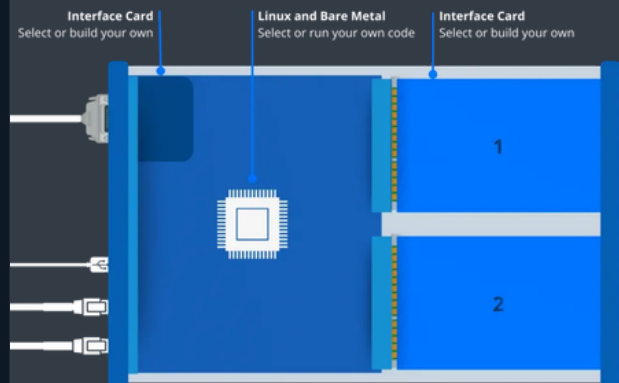
Modularity optimizes for that.



Leveraging the DAQ

es:bench™ is designed around the open, modular data acquisition and control system es:mod™, where interfaces can be swapped for our modules or developed in-house.

They form a highly scalable system, as modules can interact with each other while sharing a common time base.



No lock-in

Every component is interchangeable: electronics, mechanics, and software.

You are not tied to a specific platform.

Use software, modules, or electronics that you are already familiar with.

(Re)configuration

In many test setups, such as e-drive test benches, the requirements, protocols, and test specimens change regularly. The test setup must be adjusted accordingly.

This platform is designed for this very purpose.

Cross-Domain Testability

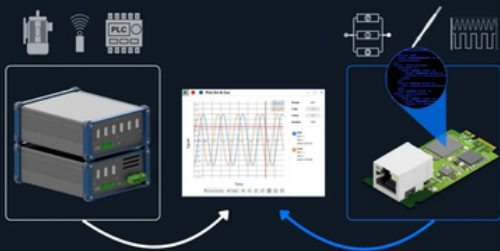
Earlier tests using actual hardware



At Physical Interfaces

Measurement setup requirements change regularly.

es:mod is an open hardware platform for signal acquisition, processing, and control, designed for specific and evolving test requirements. The configurable system enables synchronized acquisition, processing, and streaming of sensor signals, actuator and power supply control, and execution of user-defined edge logic. Users can use existing frontends and software or integrate their own designs.



Cross-Domain Testing (CDT)

Software and hardware are tightly coupled but typically tested separately.

Cross Domain Testing (CDT) aligns runtime variables and physical measurement signals on a shared timeline, providing full insight into system behavior. This makes it possible to identify and resolve interdependencies across software and hardware at runtime.

Which software behavior caused which physical issue? How does a parameter change affect the system?



Within Embedded Software

The variable behavior of embedded systems is difficult to trace.

Our open middleware es:prot can be integrated into the C code of any microcontroller, making runtime variables visible as measured values in real time and writable as control values.

This software-based test and configuration approach eliminates the need for external debug or trace probes, symbol files, or execution stops for data access.

Your es:bench™ Project

From Idea to Delivery

