es:saar

es:mod

Open Signal Acquisition & Edge Processing

Modular by design. Yours to configure, not theirs to control.

Why we built es:mod

1. Why we built es:mod

Most engineering teams don’t work in clean, stable, perfectly defined test environments. They work in reality:

- Prototypes that misbehave
- Test rigs that are rebuilt every week
- Sensors that change from project to project
- Devices that speak a protocol nobody supports
- Legacy DAQs with license walls
- Closed toolchains blocking integration
- And pressure to deliver faster than the tools allow

Traditional DAQ systems weren’t built for this. They expect you to adapt to their ecosystem: Their backplanes, their drivers, their software, their licenses.

We wanted a system that respects how real engineers actually work.
So we built one.

A modular, Ethernet-native acquisition and processing platform **that adapts to your tests. Not the other way around.**

Open interfaces.
Open protocols.
Your frontends.
Your edge logic.
No lock-in.
No forced toolchain.

Just a platform you can reconfigure, extend, and rely on whether you’re validating a motor controller, debugging a sensor, or monitoring a production line.

es:mod exists because the tools we needed ourselves didn’t exist.
So we built the one we wished we had.

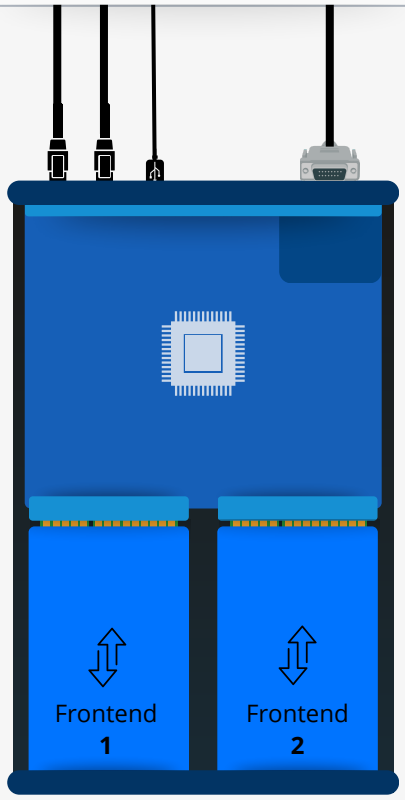
Your essaar Team

2. What es:mod is

DAQP

es:mod is an open signal acquisition and processing platform. With its various configurations it enables you to:

- Acquire, process and stream **sensor signals**
- Execute custom **edge logic** close to the DUT
- Drive **actuators** and **power supplies**



You can use frontends and software from our ecosystem. Or your own designs. Or mix them.

Every interface is open.
It's built for engineers, not to limit them.

DAQ problems we're killing

Mid-range is underserved. Often, products are either excessive or inadequate for the application. In contrast, es:mod is purpose-built for medium and dynamic testing requirements, offering a balance of economy and technology. It provides sufficient performance for test benches, condition monitoring, and in-line testing without the expense of a high-performance measurement device.

Flexibility is vendor-constrained. The DAQ market usually involves buying into vendor ecosystems with proprietary backplanes, closed modules, and enforced toolchains. es:mod challenges this. While flexibility through swappable interface modules is becoming the industry standard, es:mod also allows you to use your own interface designs and run your own software. There are no proprietary restrictions. There is no software-based vendor lock-in.

Synchronous extensibility is unnecessarily expensive. Typically, achieving synchronous acquisition across multiple modules requires specialized backplanes that are priced like medical equipment. However, es:mod enables synchronous extensibility through network-native synchronization. Rather than using expensive, specialized hardware infrastructure, it uses IEEE 1588 PTP over Ethernet.

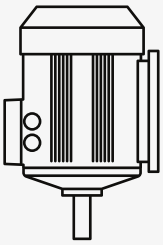
es:saar

3. Built for development.

Ready for production.

Development

Primary Application



Test & Validation

Motor testbenches
Sensor validation
Embedded controller testing
Rapid prototyping setups

Demonstration & Showcase

Sensor demos
Customer-facing prototypes
Feasibility displays

Debugging & Visualization

High-speed signal acquisition
Logic-level analysis
Bus & communication debugging

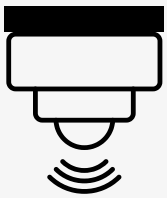
Production

Monitoring & Integration

Condition monitoring
Machine-data acquisition
PLC/SCADA integration
Energy & power analysis

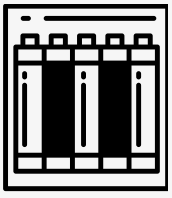
In-Line & End-of-Line Testing

Manufacturing test cells
Automated EOL testing
Repair test racks
Fast reconfiguration for product variants



Evaluation & Optimization

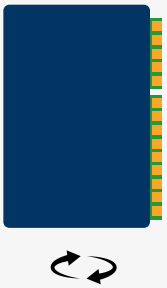
Battery lifecycle analysis
Remanufacturing checks
Anomaly/pre-failure detection



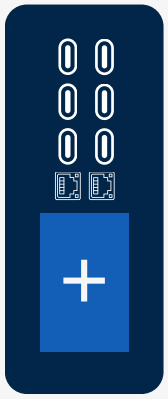
4. What makes es:mod unique

Open architecture for modular test setups

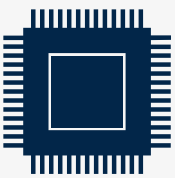
Build Your Own Extensions



Build your own front-end interfaces



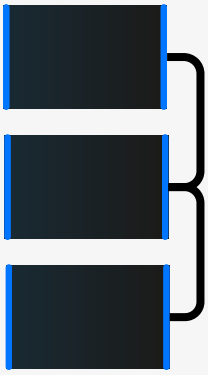
Add your own system interfaces via the back-side expansion



Run your own edge logic directly on the device

Modular & Scalable

Choose from ready-made interfaces for sensors and actuators



Scale multiple es:mod devices with IEEE 1588 PTP sync

Real-time visualization with es:scope (optional)

5. es:mod

Purpose-built for medium and dynamic testing requirements

Pricing starting at €€€€

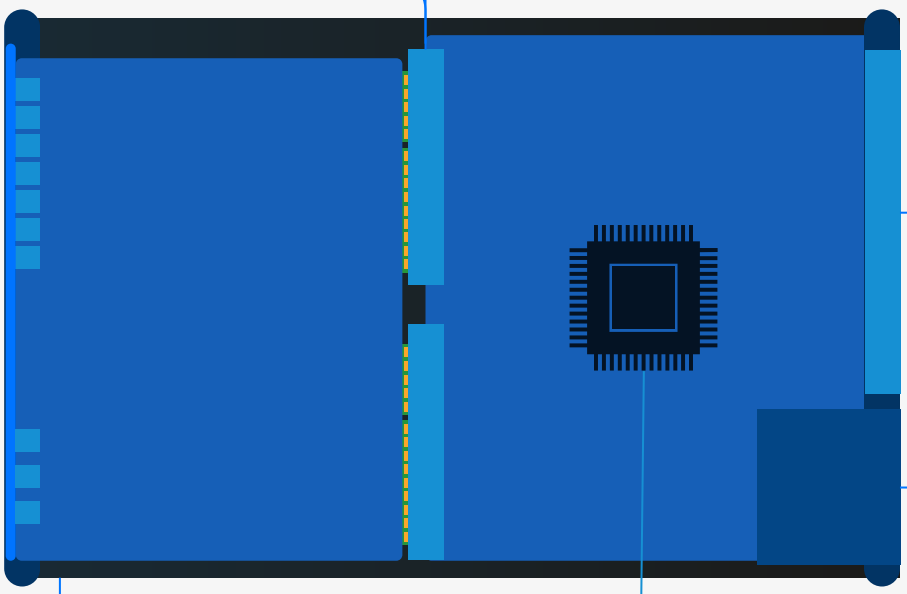
es:mod-max fills the gap between low-end DAQs and high-cost systems with the performance needed for **testbenches**, **condition monitoring**, and fast-changing setups, without the overhead of large DAQ platforms.

- ST STM32MP257D Microprocessor
  - Dual ARM Cortex-A35 (1.5GHz)
  - Cortex-M33 (400MHz)
- Neural Processing Unit (NPU) (1.35 TOPS) + 3D GPU
- 1GB/2GB LPDDR4, 8GB eMMC, 256Kbit E2PROM

Edge-Connector
High data rates, numerous signals, high flexibility

Two Interface Slots
For one high performance dual interface or two single interfaces

Standardized Connectivity
Ethernet & USB



STM MP2 Microprozessor
Optimal usage for mid-range applications

Rear Side Interface Card / Piggyback
Extensible communication architecture

Interface Cards
Select a standard or build your own

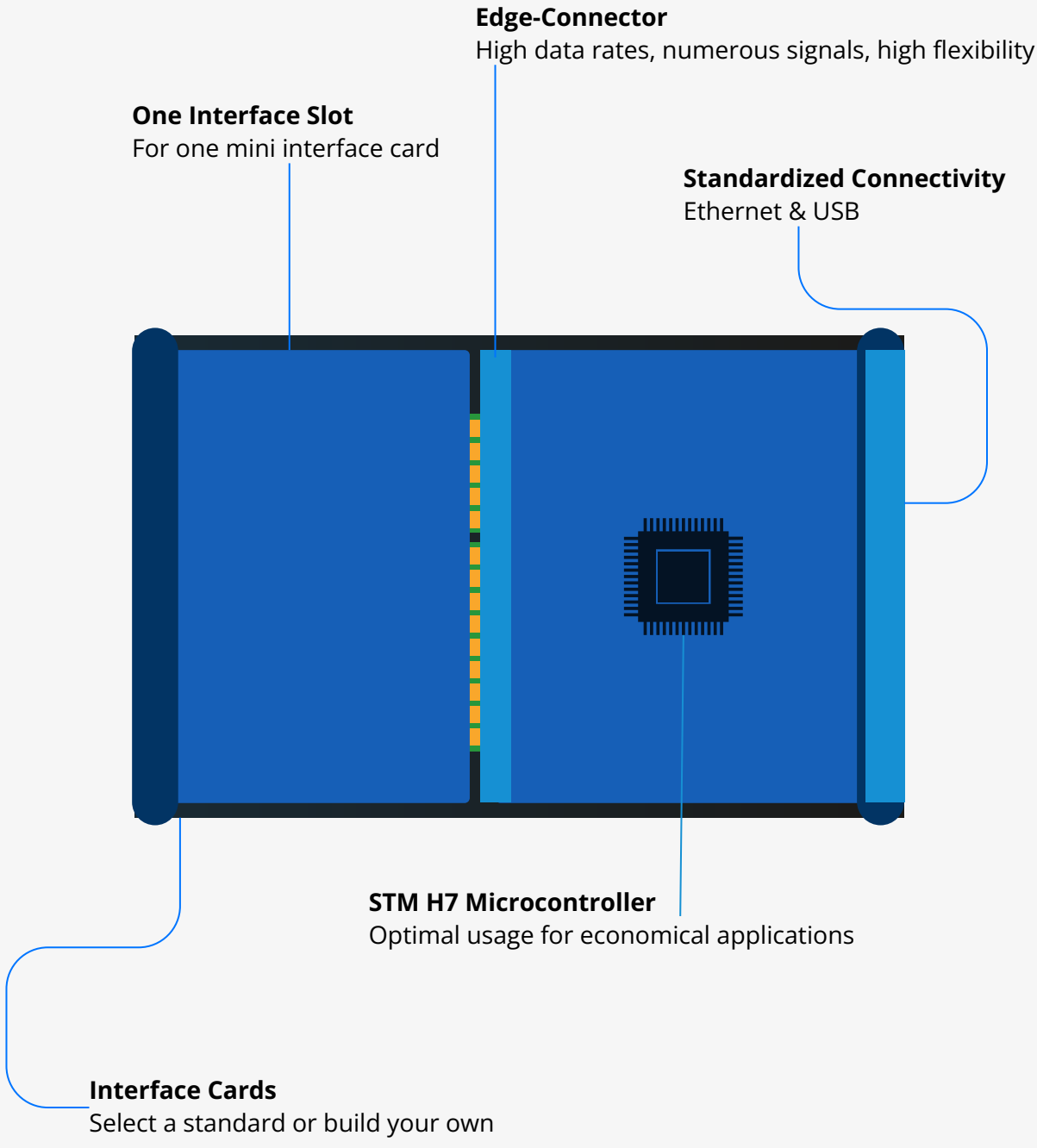
6. es:mod-mini

Purpose-built for economical extension and standalone use

Pricing starting at €€€

The es:mod-mini is a microcontroller-based gateway and lightweight data acquisition device designed for smaller measurement tasks or for connecting sensors to the network. Use it as a standalone device, or scale multiple minis across your setup for flexible, economical expansion.

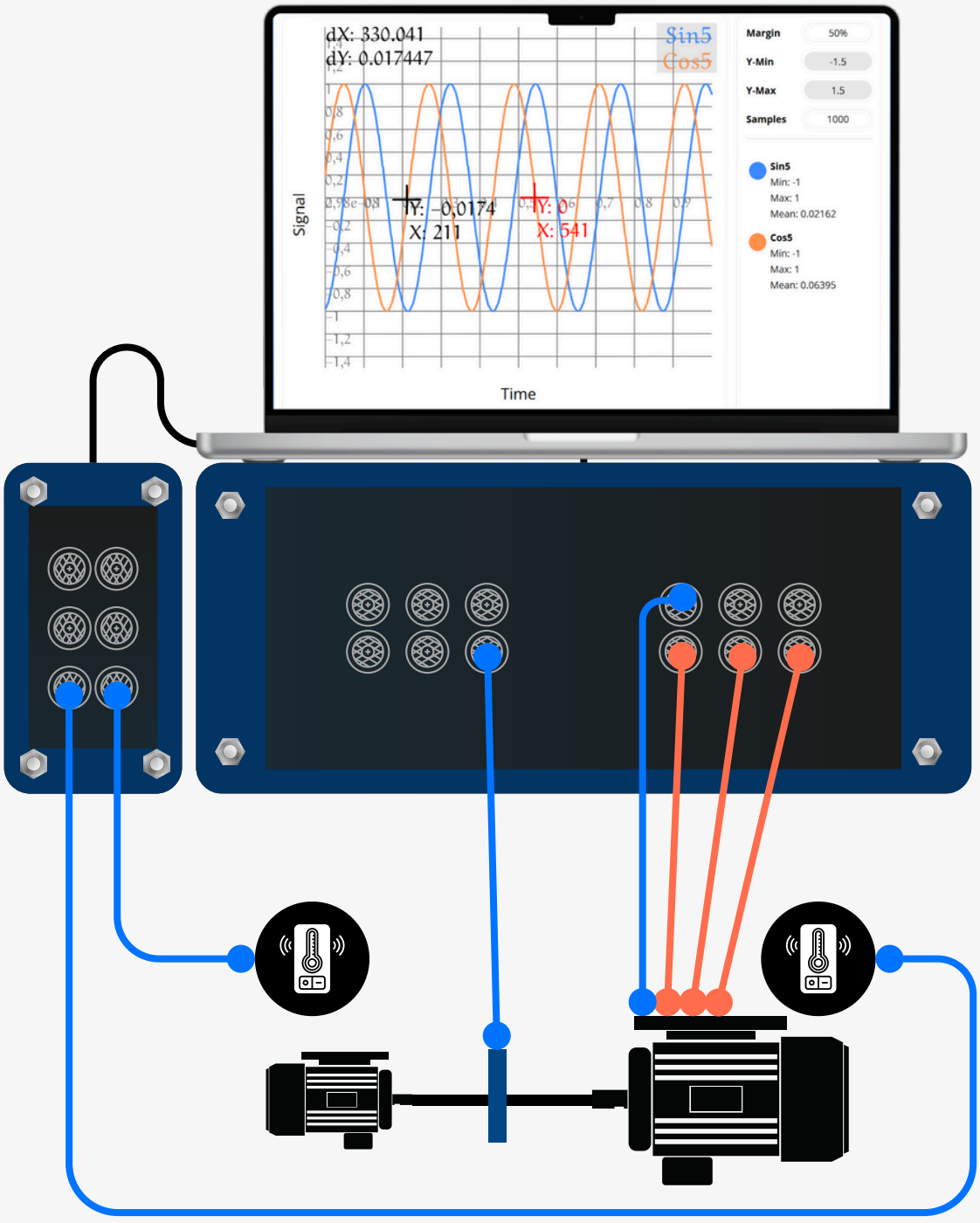
- ST STM32H7 Microcontroller
- 32-bit Arm Cortex®-M7 core (600 MHz)



7. Bundle and Extend

Simply add additional es:mod or es:mod-mini devices and synchronize them over the network using IEEE 1588 PTP. This enables multi-device setups with precise, hardware-level timestamp alignment without needing a chassis or proprietary backplane.

es:scope can visualize and tune signals from multiple es:mod instances in real time. You can also integrate the data into any other visualization or analysis software.



8. es:mod in the platform

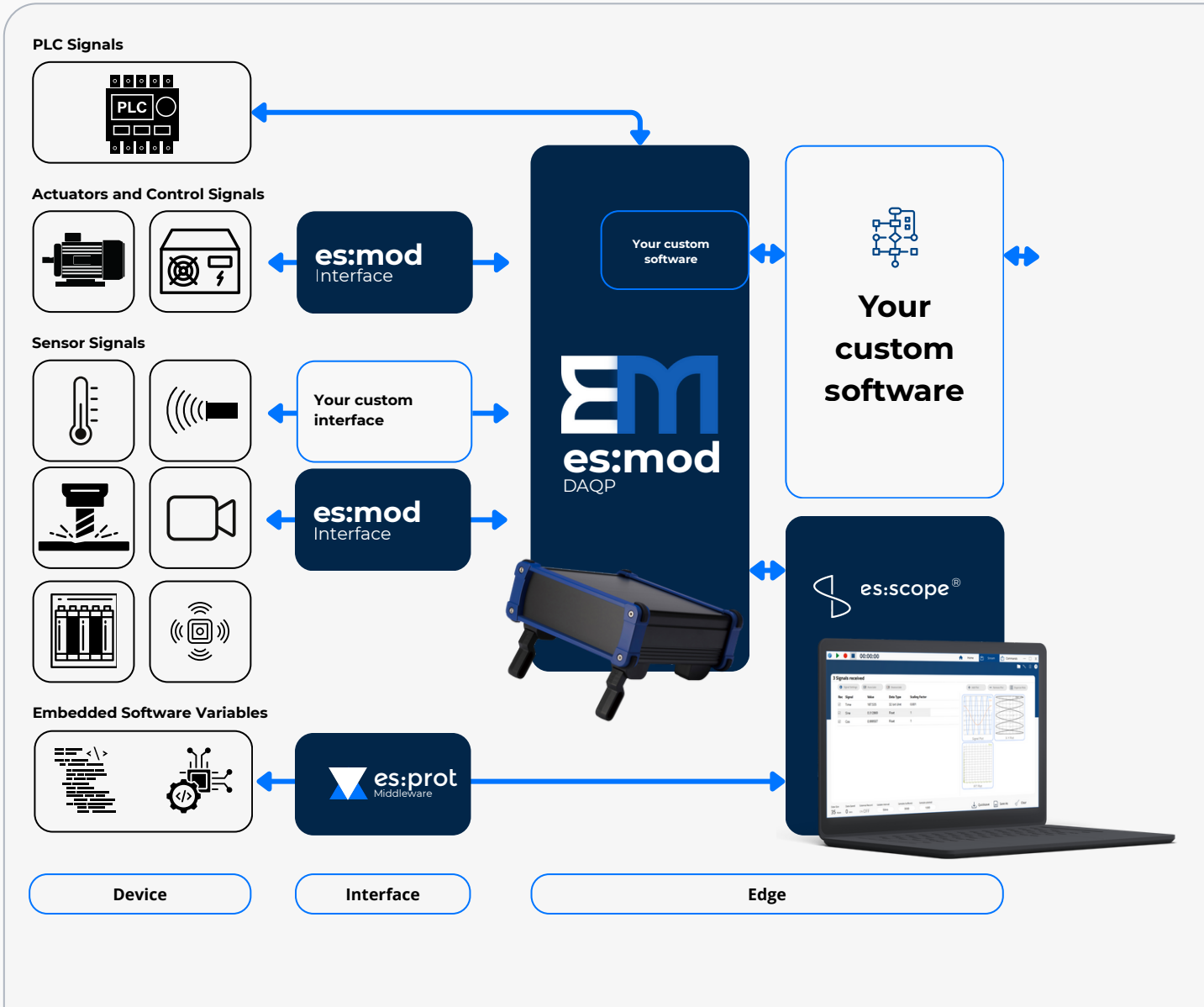
The es:saar platform connects actuators, sensors, embedded devices and PLCs through a unified and open toolchain.

- **es:mod** captures and processes signals at the edge.
- **es:prot** handles data transport inside embedded software.
- **es:scope** visualizes and tunes system behavior in real time.
- **Your own software and hardware** can integrate at any point in this chain.

With es:scope® you can stream, inspect, and adjust system variables during runtime. Likewise, you can run automated procedures that trigger recordings and detect anomalies. If you prefer your own tools, es:mod can stream data using open protocols that integrate easily into third-party software or custom UIs.

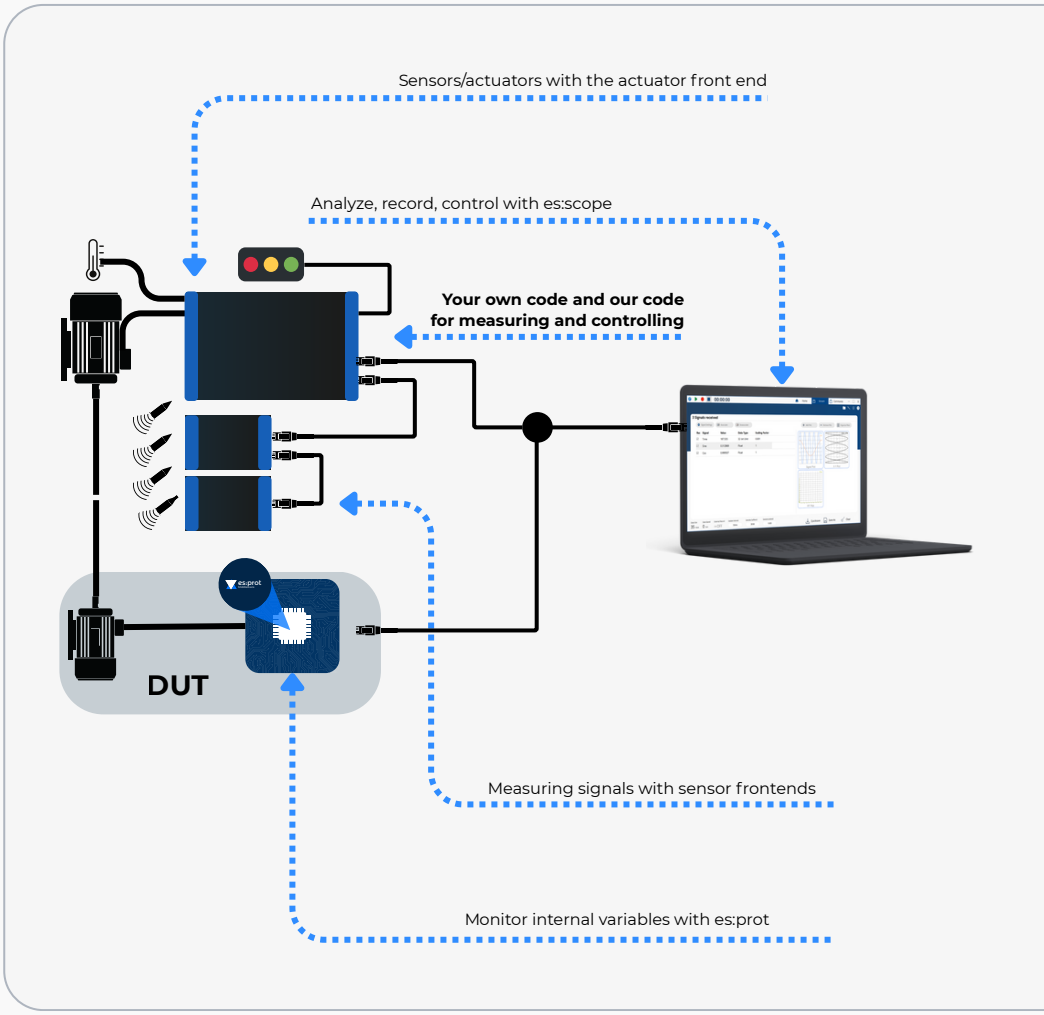
The platform is modular: Use es:mod for acquisition, es:prot for communication, es:scope for visualization or replace any component with your own implementation.

Visit *https://esscope.com* for more information



9.1 Testing actuator systems

Actuator-Testbenches

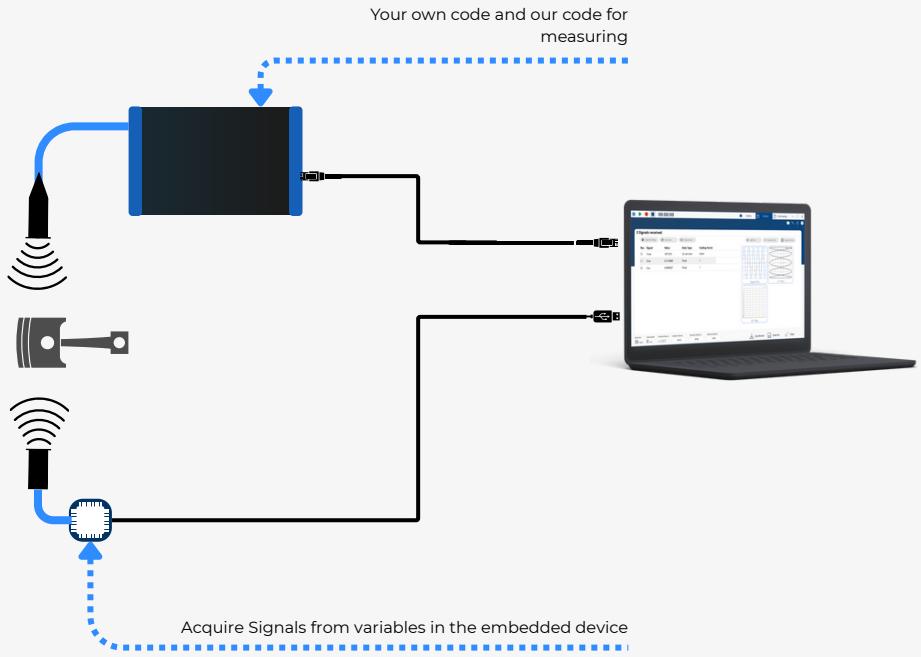


Testing and calibrating drive trains and electric motors

Real-time acquisition of voltage, current, torque, speed, and communication signals through modular I/O channels and PTP-synchronized measurement modules. This enables precise, time-aligned data for efficiency analysis, shorter test cycles, and faster control optimization.
Interfaces and test routines can be customized directly by test engineers.

9.2 Testing sensor systems

Sensor-Testbenches

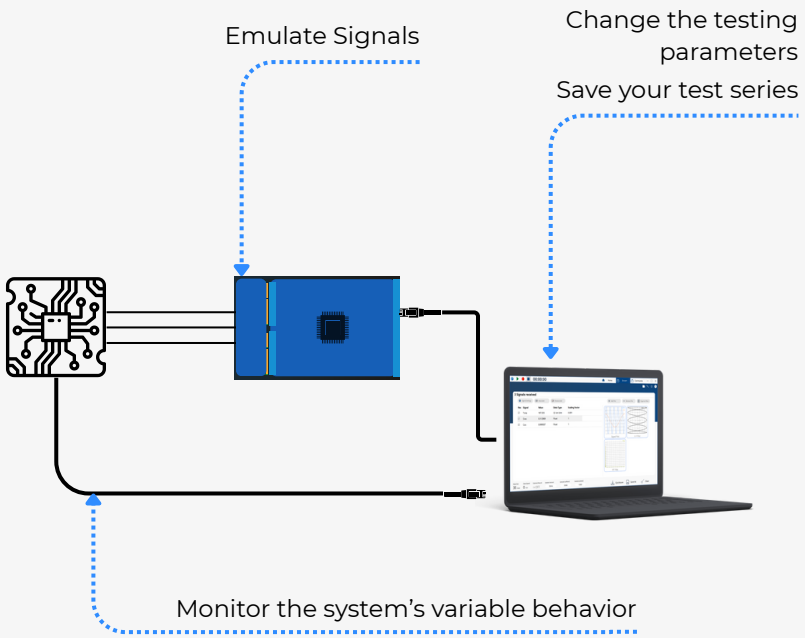


Test and calibrate sensors and multi-sensor systems.

Acquire sensor signals in via modular input/output channels with PTP-synchronized measurement.
With es:scope, data can be exported directly to MATLAB or other analysis tools. Multiple protocols, interfaces, and sampling rates can be combined to test signal processing and feedback algorithms under realistic conditions.

9.3 Testing embedded systems

Hardware in the Loop Testing

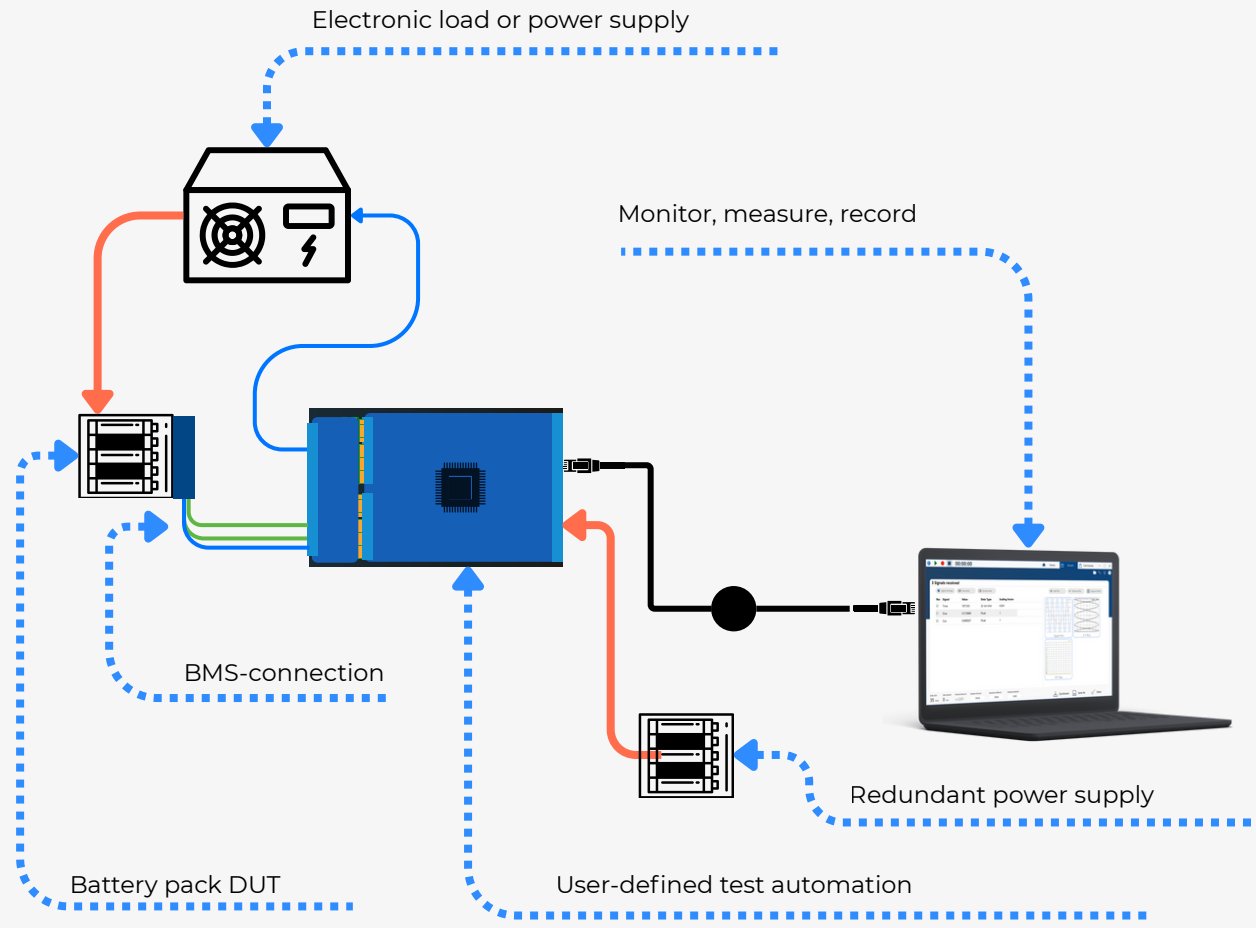


Testing embedded systems inside and outside the loop

Send and receive signals to emulate the environment of your embedded device.
Monitor and acquire its internal variables and external I/O to gain complete insight into runtime behavior.
Ideal for controller testing, firmware development, and regression testing in model-in-the-loop or hardware-in-the-loop scenarios.

9.4 Testing battery systems

Battery Testbenches

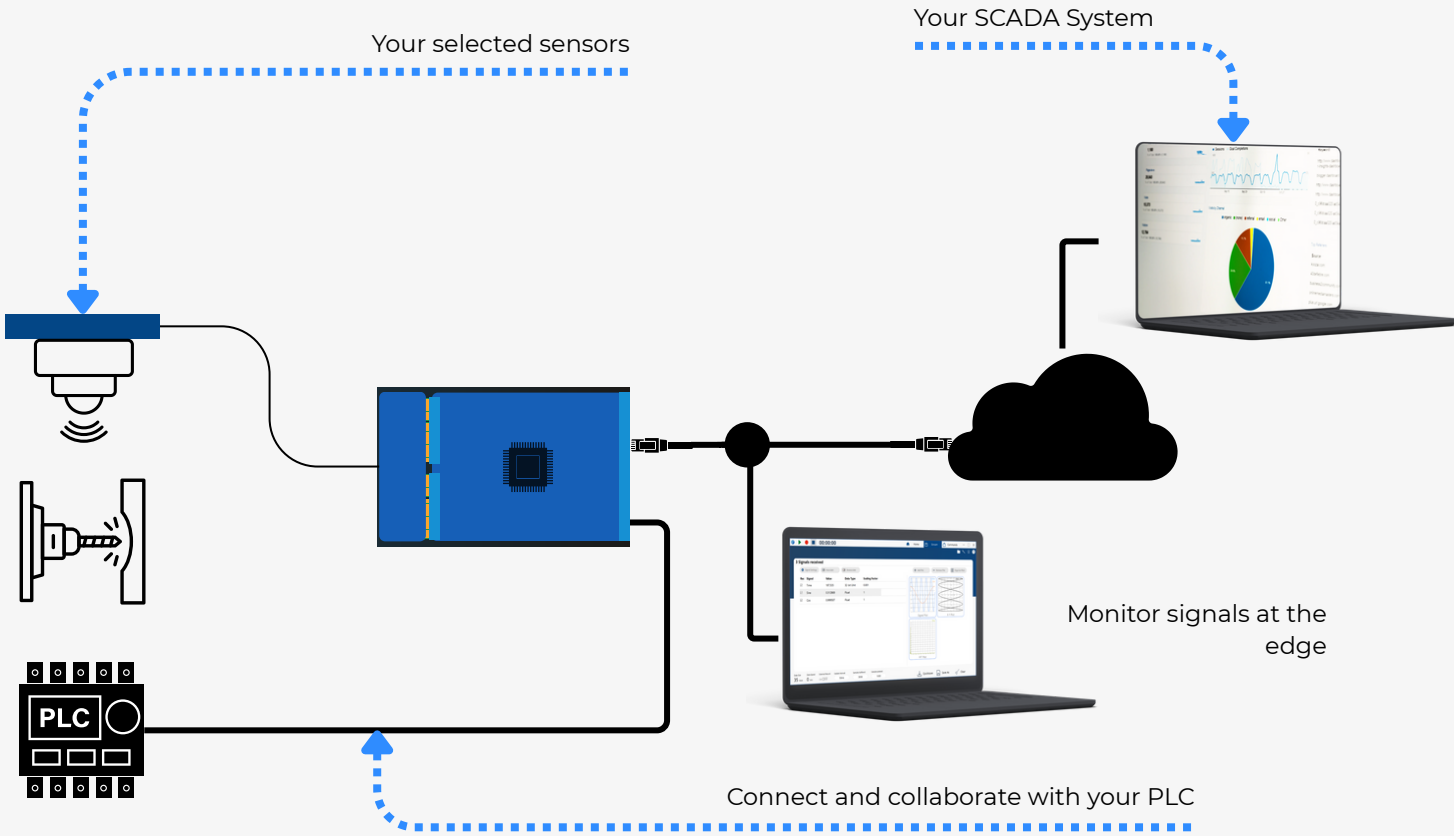


Evaluating and characterizing battery systems

es:mod enables the characterization and testing of battery modules and packs by integrating current, voltage, and temperature measurements. It can communicate with the BMS, control power supplies or electronic loads, and automate complete test procedures.
It is suitable for second-life evaluation, end-of-line testing, and lifecycle analysis.

9.5 Industrial monitoring

(Retrofit) Inline-, End-of-Line-Testing and Condition Monitoring



Monitor industrial systems and their output

es:mod enables condition monitoring of machines, systems, or components by recording high-frequency vibration, current, or pressure signals. It can process this data at the edge and transmit aggregated data to a PLC or cloud. This facilitates an early detection of anomalies, fewer failures, lower maintenance costs, and integration into existing quality monitoring systems.

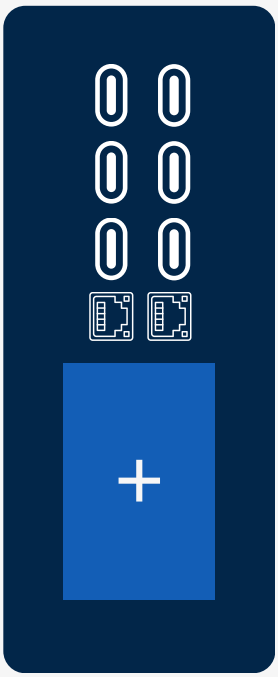
10. Interface specifications

Front Side Interface

Data
- 1 x I2C
- 2 x I3C
- 4 x SPI + CS
- 1x TIM + 2x PWM
- 2x 2 Channel PWM
- 2 x UART
- 2 x USART + RS232
- 6 x GPIO
- Octal xSPI (up to ~X MHz)
- 1 x ADD

Power
- V_var (>= 3A)
- 5V0 (1A)
- 3V3 (1A)

TE SLIVER 2.0 Technology



Rear Side Interface

Ethernet:
- 2x Ethernet Base-T
- 2x Ethernet Base-X
- Timestamping on PHY/MAC level with PTP
- PoE

USB
- 1x FTDI USB
- 1x SWD
- 1x USB 3
- 1x USB 2
- 1x USB PD

Rear Side Interface Card
2x CAN
2x UART
4x GPIO
1x SPI

This is a work in progress.
Further specifications will be published once they have been finalized and verified.