



**EMBEDDED SYSTEMS SOLUTIONS**

www.embeddedindia.com

**LEADING ONE STOP PROVIDER FOR EMBEDDED SYSTEMS**

## ESS AUTOMOTIVE PRODUCT PORTFOLIO

ESS's synergetic Automotive Product Portfolio holistically supports design, development and debugging of High Performing Mission and Safety Critical Automotive Solutions.

Multicore Development Qualification ToolKits

Functional Safety Driver Monitoring Static Code Analysis

Model Based Development Tools EV Test Solutions SafeTPack

**AUTOSAR AUTOMOTIVE** Safety RTOS  
LV 123, LV 124, LV 148

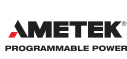
**HYPERVISOR SOLUTIONS** CAN/CAN-FD

Automotive Electrical Test Solutions JTAG Debuggers

High Speed Data Acquisition MCAL ISO 26262 ADAS

Automotive Ethernet TESTING (MIL, SIL, PIL, HIL)

High Performance Power Supplies Automotive Stacks



## Multi-Core Multi-Architecture



**COMPILER**  
BUILD TOOL



**PXROS-HR**  
REAL-TIME OS



**QKIT**  
TOOL QUALIFICATION



**B2B**  
CONSULTING & SUPPORT



### TC4x/TC3x

**TC4x/TC3x**  
C/C++ compiler for  
TriCore

**Rust compiler** for  
TriCore

**C/C++ MetaWare tool**  
and libraries for PPU /  
CDSP

**C compiler** for  
GTM/MCS, HSM, SC



### ARM

**C/C++ compiler** for  
Cortex Mx/Rx/Ax

**Rust compiler** for  
Cortex Mx/Rx/Ax



### RISC-V

**C/C++ compiler** for  
RISC-V

**Rust compiler** for  
RISC-V

### RH850

**C/C++ compiler** for  
RH850

**Rust compiler** for  
RH850

**U2A/U2B/U2C/U2E**



### ISO26262 ASIL D and ISO 21434 Qualification & Automotive-Grade Services

- Industry Shortest Compile-Link Build Times
- Continuous Compiler optimization improvements through active benchmarking with semiconductor vendors
- Compiler developments for next generation microcontrollers (ahead of market availability)
- Preferred Design House by Infineon & Preferred Compiler Partner by STMicroelectronics
- Infineon and ST AUTOSAR MCAL
- Infineon SafeTLlib

**SDV**  
READY<sup>with</sup>

**LAUTERBACH**  
DEVELOPMENT TOOLS

## Market Leading Development Tools for Debugging & Profiling Automotive System



**TRACE32® covers the Entire Product Life Cycle from Cloud Development to Real Chips to ECUs in the Field.**

**Broadest Support for Automotive Chips including Nvidia, Qualcomm, NXP, Infineon, Renesas and Texas Instruments.**

**Ready for Virtualized Software Defined Vehicle (SDV) Architectures including High-Performance-Computing.**



- > **Broadest Debug and Trace Support**
  - Supporting > 150 Architectures including
    - Arm® Cortex-A/R/X, Neoverse, Cortex-M
    - RISC-V 32/64 bit, RH850, TriCore,
    - Xtensa®, Arc, C2000/6000/7000
  - Supporting > 15,000 Chips & VDKs including
    - Infineon AURIX™ TC2x/3x/4x, RISC-V Prototype
    - NXP S32 (including S32N55, S32N7)
    - Renesas R-Car Gen.3/4/5, RH850, U2B
    - Qualcomm Snapdragon Automotive
    - Nvidia Drive Orin/Thor
    - Texas Instruments TDA4/TDA5
- > **AMP/SMP Multicore Debug & Trace**
- > **Hypervisor Awareness**
  - Microsar, L4Re, QNX, EB Corbos, Xen, VxWorks,...
- > **OS Awareness**
  - Android, Linux, Microsar,...
  - FreeRTOS, QNX, Zephyr OS, Nucleus,...
- > **Broadest Support for Emulators, Simulators and virtual Targets including**
  - Synopsys VDK, Cadence VLAB
  - Arm® FastModels/FVP, QEMU
  - Corellium Arm Virtual Hardware
- > **ISO 26262 Tool Qualification Kit**
- > **XCP/USB Debugging**
- > **Integration into CI/CD Pipelines**
- > **PIL Simulation – MathWorks Simulink**
- > **Non-Intrusive Code Coverage**

# AUTOSAR solutions from ETAS

Tools, basic software, and services

## AUTOSAR Classic Platform RTA-CAR

### Complete solution ready-to-go

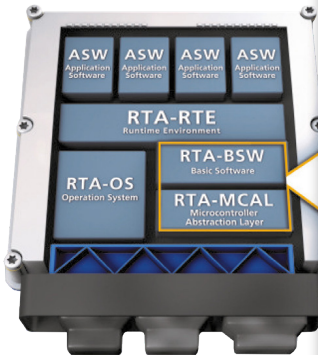
- Comprehensive AUTOSAR solution
- One development framework for multiple OEM platforms
- Wide range of hardware support across many components like OS, HSM, MCAL, transceivers and switches
- World's smallest and fastest AUTOSAR OS
- OEM extensions and flash bootloaders
- Enhanced solutions by non-AUTOSAR extensions

### Market leading state of the art security

- Cutting edge AUTOSAR security stack combined with CyclicHSM
- Functional safety and ISO26262 certified up to ASIL-D

### Proven and reliable

- More than 3 billion ECUs on the road
- Qualified by several OEMs
- Proven at hundreds of customers



RTA-SAFE	RTA-SEC	RTA-DIAG	RTA-M939	RTA-COM	RTA-MEM	RTA-IDAE
WdgM	CSM	Dem	J11939Tp	Com	Num	Ecu_JA
WdgM	CAL	Dec	J1939Dcm	PduR	Memif	Ecu_ID
EZE	CRY	Fim	J1939Rm	IpduM	Fec	Ecu_PWM
CAC	CycurHSM		J1939Nm	ComM	EsS	Ecu_PM
				Nm		Ecu_PO

RTA-BASE	RTA-CAN	RTA-FRAY	RTA-LIN	RTA-ETH	RTA-XCP	RTA-HwD
WdgM	CanTp	FrTp	LinTp	EthIf	XCP	Ecu_JA
WdgM	CanSM	FrSM	LinSM	EthSM	XCPW	Ecu_ID
EZE	CanNM	FrNM	LinNM	SoAd		Ecu_PWM
CAC	CanIf	FrIf	LinIf	UDPNm		Ecu_PM
				TcPlp		Ecu_PO
				Sd	RTA-CD	
					CD	

RTA-MCAL									
WDG	ICU	ADC	OCU			CAN	LIM	FRAY	ETH
MCU	PORT	DIO	PMW	SPI	FLS				

Hardware-department modules available today for a wide range of microcon combinations with further ports available on request

Hardware-department modules

# AUTOSAR solutions from ETAS

Tools, basic software, and services

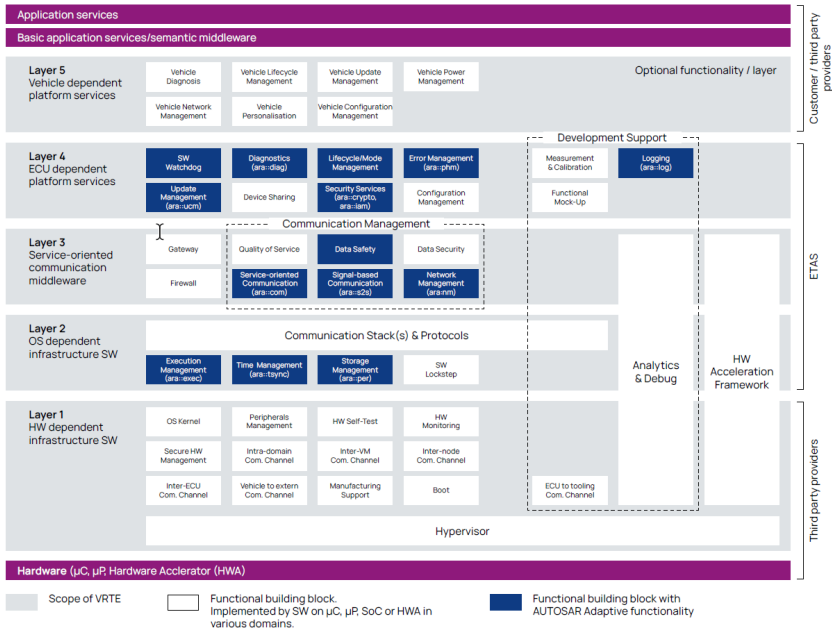
## AUTOSAR Adaptive Platform RTA-VRTE

### Off the shelf solution

- Cloud development ready
- Integrates with a wide range of 3rd party software solutions
- Runs on POSIX OS (Linux and QNX out of the box)
- Easy and user-friendly configuration
- Nominated by various customers for upcoming series cars
- Supporting the newest standards
- Starter kit, which gets you running immediately

### Safety & security from the inside out

- Ready for integration in safety related ECUs up to ISO26262 and ASIL-B (up to ASIL-D on request)
- Cutting edge security extensions in combination with ETAS security solutions



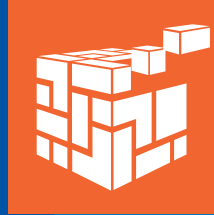
# Embedded development tools by SEGGER



**Debug & Trace probes**



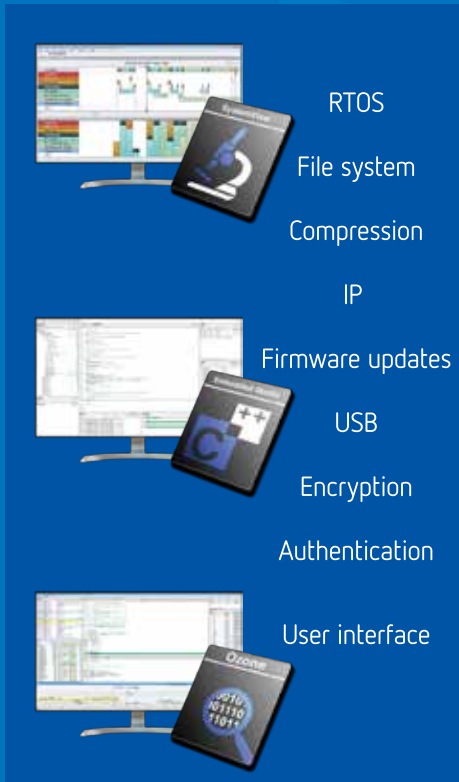
**Software Tools**



**Embedded Software**



**Production Tools**



# FOUNDATIONAL SOFTWARE SOLUTIONS FOR THE MODERN VEHICLE



BlackBerry QNX eases the challenges of building ISO 26262 compliant automotive systems through its solutions

## BLACKBERRY QNX FUNCTIONAL SAFETY SOLUTIONS



### OPERATING SYSTEM

Provides a reliable RTOS foundation that is pre-certified to the highest level of ISO 26262 - ASIL D

### VEHICLE INSTRUMENT CLUSTERS

Delivers an ISO 26262 ASIL B pre-certified graphics solution

### ADVANCED DRIVER ASSISTANCE

Provides a foundation on which to build safe and reliable autonomous driving software

### HYPERVERSOR

Isolates safety-critical systems from non-safety critical systems

### SYSTEM SAFETY DETECTION

A fault tolerant technique to address hardware and software errors in safety-critical systems

BlackBerry QNX's safety solutions mitigate risk of non-compliance and reduce development and certification costs.

## QNX OFFERS SAFETY-CERTIFIED AND SECURE SOFTWARE SOLUTIONS TO BUILD AUTOMOTIVE SUBSYSTEMS AND ECUS.



### ADAS & AUTOMATED DRIVE

BlackBerry QNX powers advanced driver assistance systems (ADAS) with an OS certified to ISO 26262 ASIL D, as well as frameworks and middleware to enable automated drive features.

**Products:** QNX OS for Safety, QNX Hypervisor for Safety, QNX® Sensor Framework



### DIGITAL COCKPIT

BlackBerry QNX enables digital cockpits that integrate multiple in-car systems while separating safety-critical systems from non-safety critical systems.

**Products:** QNX Hypervisor, QNX Hypervisor for Safety, QNX® Advanced Virtualization Frameworks, QNX® Acoustics Management Platform, QNX® Sensor Framework, QNX® Multimedia Suite, QNX® Speech Framework, QNX® SDK for Smartphone Connectivity



### INSTRUMENT CLUSTERS

BlackBerry QNX offers a reliable, functionally safe solution for digital instrument clusters. Its one-of-a-kind ISO 26262 ASIL B pre-certified graphics solution and ISO 26262 ASIL D pre-certified RTOS

**Products:** QNX® Graphics for Safety, QNX OS for Safety



### INFOTAINMENT

BlackBerry QNX offers market-leading technologies for the development of connected, safe and secure infotainment systems.

**Products:** QNX Acoustics Management Platform, QNX Sensor Framework, QNX Multimedia Suite, QNX Speech Framework, QNX SDK for Smartphone Connectivity

# CODESonar

## Static Application Security Testing

CodeSonar is a static application security testing solution (SAST) that helps you find and understand security and quality defects in your source code or binaries.

**Security:** CodeSonar checks for the use of tainted data, buffer issues, dangerous memory access, integer and floating-point overflow, and other common security coding errors.

**Code Quality:** CodeSonar detects memory leaks, dangerous memory access, and other common causes of low-quality code.

**Code Performance:** CodeSonar detects code that negatively affects performance, such as unnecessary tests for nullness, the creation of redundant objects, or superfluous memory writes.

**Reporting:** CodeSonar provides built-in reports for standards, such as MISRA, OWASP, and CWE. CodeSonar also includes a custom report builder your organization can use to develop a better understanding of the quality and security of your software projects. Export in CSV, PDF, HTML, or XML so you can work the way you want to.

### Safety and Security Standards

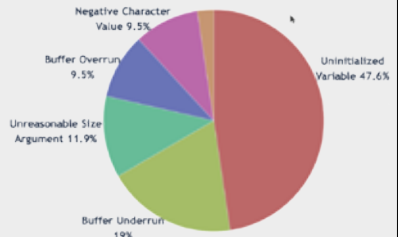
- **Safety Critical:** MISRA C 2023, MISRA C++, AUTOSAR C++ 14, JSF++
- **Security:** CERT, DISA STIG, OWASP, CWE

### Functional Safety

- Pre-qualified for the highest levels of safety for the IEC 61508, ISO 26262, and CENELEC EN 50128 standards.
- Artifacts for qualification according to DO-178C/DO-330 are also available.

### Deep Insights

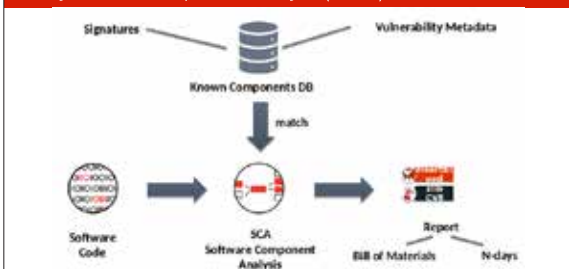
Buffer over-and under-runs  
Copy-paste error  
Memory leak  
Dangerous function  
Cast and conversion  
Concurrency problems  
Unused parameter  
Tainted data value  
Command injection  
Ignored return value  
Null pointer dereference  
And hundreds more



# CODESentry

## Enhancing Automotive Cybersecurity Through Software Transparency

### Binary Software Composition Analysis (BSCA)



### Binary Composition Analysis (BCA)

Identify Vulnerable Open-Source Software (OSS) in Third-Party Components | Create SBOMS

### Software Bill of Materials (SBOM) without Source Code

- Identifies open-source components and shared library dependencies in binaries, including firmware and containers
- Generates component inventory in SBOM with Annotation support
- SBOM mapped to VulnDB, the industry's most complete database of software vulnerabilities.
- Vulnerability Analysis and Software Supply Chain Security (SSCS) Risk Mitigation

# Testwell CTC++ Code Coverage Analyzer

Code Coverage compliant to highest safety requirements



## Code Coverage with Testwell CTC++

- ▶ Fulfill requirements of standards
- ▶ Write better test cases
- ▶ Avoid redundant test cases
- ▶ Find dead code
- ▶ Prove code coverage to your customers
- ▶ Demand proof of code coverage from your suppliers
- ▶ Find bottlenecks by examining runtime behavior



## Optimal Solution

- ▶ Very small instrumentation overhead
- ▶ Analyses code coverage on all targets
- ▶ Works with even the smallest targets
- ▶ Works with any compiler/cross compiler
- ▶ No modifications necessary for existing code
- ▶ Support of existing make files
- ▶ Very fast execution speed
- ▶ Seamless integration into common IDEs
- ▶ Support for C and C++



## Coverage Levels

- ▶ Statement Coverage
- ▶ Function Coverage
- ▶ Decision Coverage/Branch Coverage
- ▶ Condition Coverage
- ▶ Modified Condition/Decision Coverage (MC/DC)
- ▶ Multicondition Coverage (MCC)



## Code Coverage Results

- ▶ Summary Coverage Reports
- ▶ Directory
- ▶ Files
- ▶ Functions
- ▶ Execution Profile Listing
- ▶ Untested Code Listing
- ▶ Coverage Summary Listing
- ▶ Execution Time Listing

## Meet the Code Coverage Requirements of ISO 26262 and IEC 61508

In order to evaluate the completeness of test cases, ISO 26262 requires the measurement of structural coverage. Depending on the Automotive Safety Integrity Level statement coverage, branch coverage and/or MC/DC (Modified Condition/Decision Coverage) is required (see 8.4.5 of 26262-6).

Coverage Level	ASIL A	ASIL B	ASIL C	ASIL D
Statement Coverage	++	++	+	+
Branch Coverage	+	++	++	++
MC/DC (Modified Condition/Decision Coverage)	+	+	+	++

++ + stands for "highly recommended", + stands for "recommended"

Qualification Kit for Standards:

DO-178C - IEC 61508 - EN 50128 - ISO 26262-IEC 60880



# MES MODEL EXAMINER®

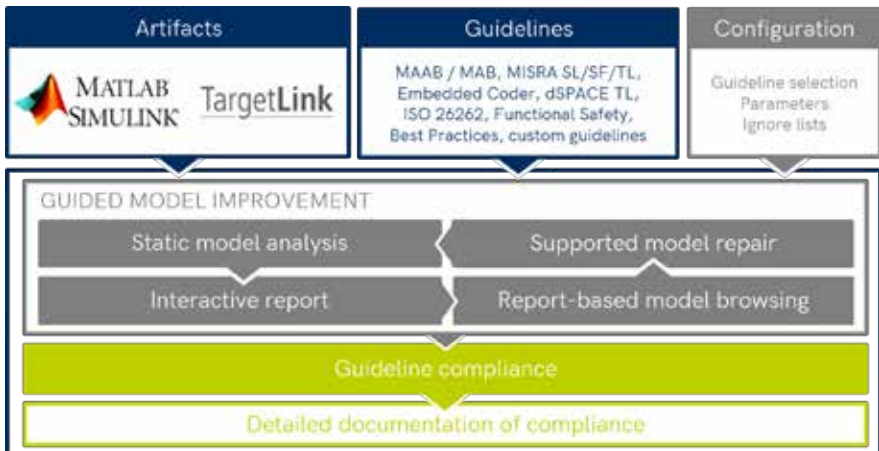
*The first choice for static model analysis*

## Easy Checking of Modeling Guidelines

The Model Examiner (MXAM) is your first choice for a comprehensive static model analysis. MXAM offers an easy way to check modeling guidelines, analyze model structure, and evaluate model metrics, all in a single tool. Comprehensive user guidance through analysis results as well as the repair and improvement process effectively ensures ISO 26262 standard compliance for your software models.

## Ensuring ISO 26262 Compliance

MES Model Examiner® is certified by TÜV SÜD as a T2 Offline Support Tool for use in safety-relevant software development in compliance with ISO 26262, IEC 61508 & ISO 25119.



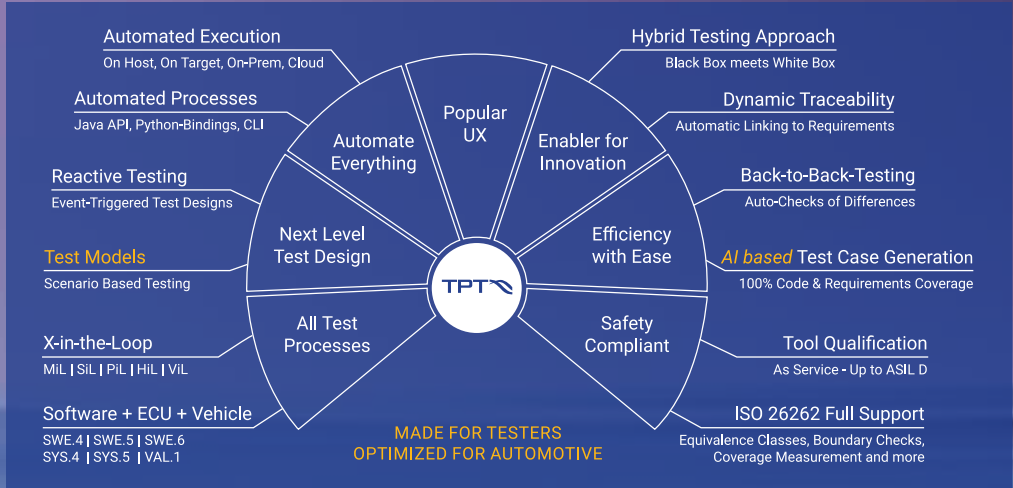
MES Model Examiner® analyzes software models for guideline compliance and guides the user through the repair and improvement process.

## Key Benefits

- Automated checks and repairs for Simulink®, Stateflow®, Embedded Coder®, TargetLink®, ASCET® and Excel® guideline violations
- Efficiently ensure ISO 26262-, ASPICE-, and MISRA®-compliant software models
- API for developing and integrating company-specific checks
- Simple integration into existing development environments
- Support system for guideline and check development

# TPT Test Automation Framework

TPT a leading Automotive Test Automation Platform for Software-In-Loop, Model-In-Loop (Simulink Models), Processor-In-Loop. Vehicle-In-Loop testing and even AUTOSAR SWC testing. Most automotive OEMs and TIER 1s have been using TPT to build comprehensive test automation suites quickly and effortlessly for different test environments.



FEATURES	DESCRIPTION
Test Automation	Automates unit, integration, and system-level testing for embedded software.
Model-Based Testing	Supports MATLAB/Simulink, dSPACE TargetLink, ASCET, and AUTOSAR.
Model Coverage Analysis	Targets model coverage goals like MC/DC or branch coverage
Automatic Test Case Generation	Automatic Test Case Generation <ul style="list-style-type: none"> <li>• For 100% Model &amp; Code Coverage</li> <li>• For 100% Requirements Coverage</li> <li>• Based on Formal Requirements</li> <li>• Based on test data/equivalence classes/variants/value rangesTT</li> </ul>
ECU Testing	Runs tests on real ECUs, HIL, PIL, MIL and SIL platforms.
Back-to-Back Testing	Compares MIL, SIL, PIL, and HIL test results for consistency.
Requirements-Based Testing	Ensures traceability with requirements captured in all popular Requirement Management Tools/PLM tools (DOORS, Polarion, Codebeamer)
Code Coverage Analysis	Measures MC/DC, condition, decision, and statement coverage.
ISO 26262 Compliance	Certified tool for safety-critical automotive software testing.

# THE NEXT GENERATION OF 2-IN-1 HIGH PRECISION POWER MONITORING HARDWARE AND BENCHTOP POWER SUPPLY IS HERE

Eliminate the need to buy a separate power supply and power monitoring device. Save space and test setup cost using the highly scalable solution of Monsoon High Voltage Power Monitor (HVPM).

## POWERFUL SOFTWARE

Full featured Windows GUI-PowerTool. Multiple APIs support for Linux, Mac and Windows platforms which allow for fully-automated testing

## WIDE VOLTAGE AND CURRENT RANGE

Main Channel- Output Voltage Range 0.8-13.5 V  
USB- Up to 5.5 V  
Aux Channel- Up to 13 V supplied externally  
0.01 V Increments  
Continuous Current 6 A

## PORTABLE MODULAR DESIGN

Very flexible; Can be deployed individually at a single workstation or scaled up to rack mount style configurations for large scale testing

## HIGH ACCURACY

Main Channel- Fine Current Range 50µA-60 mA; Resolution 0.9 µA (+/- 50µA) in low current measurements  
Coarse Current Range 60mA-6A; Resolution 125 µA

## WIDE APPLICATIONS

Development and testing of Smartphones, Tablets, Software App, Automotive, IOT devices with respect to Battery drain

## APPLICATION HIGHLIGHTS



## INDUSTRY LEADING CERTIFICATIONS

UL, FCC and CE certified

## AFFORDABLE

## BRIEF SPECIFICATIONS

- Size: 8 in x 6 in x 2 in (20 cm x 15 cm x 5 cm)
- Weight: 1.1 lb (0.5kg)
- Input power 115V to 240V, 47-63Hz
- Main channel 0.8V to 13.5V range
- USB channel 2.1V to 5.4V
- Aux channel input 0.5V to 13V
- UL, CE, FCC certified

## TYPICAL USE CASES

- Smartphones, Tablets or Laptops
- Smartphone Apps
- Internet of Things (IoT) Devices, Medical Devices
- USB Devices
- Automotive Sub-circuits
- Prototype Designs
- Power measurement of Arduinos, Raspberry Pi and Microcontrollers
- Burn in testing

## WHAT'S INCLUDED?

- High Voltage Power Monitor (HVPM)
- Power supply
- 2 alligator clips
- 2 USB cables
- Information card with links to PowerTool software and support documentation

The moreph software defined radio at the core of our products offers a new perspective for signal measurement, analysis, and generation. A two second boot time, compact footprints, and futureproofing via the use of applications to provide defined feature sets. This allows moreph to evolve from a packet sniffer to a PHY layer tester, to a real-time spectrum analyser with a simple download, you only purchase what you need when you need it!

**mini-m•rephc.**  
capture



**Everything, Anywhere, at Any time!**

Industry's first Android application for capture of the entire 2.4GHz ISM band. Ultimate portability in the palm of your hand! Simple way to make a capture and share the file to others or a PC to perform detailed analysis in blueSPY.

**m•rephcs.**  
channel sounding



Channel Sounding Physical Layer RF Tester. Validate your implementation now! Used at the BT SIG Channel Sounding IOP Sessions

**mini-m•reph.**



The world's smallest USB powered wideband Protocol Analyser.



**m•reph30.**

A wideband 2.4 GHz signal analyser and generator. Includes a full bandwidth, high dynamic range transmitter, wideband CW source. The moreph30's ultra linear receive and transmit chain will ensure that you never miss a packet!



**m•rephE.**  
etherstore

A RF record/playback option for the moreph30, adds the capability to record and playback the entire 2.4GHz ISM band. Exactly what you need for RF site surveys, spectrum planning, interoperability, and receiver testing.



**mini-m•reph.**

The smallest USB powered protocol analyser on the market! 90mm x 78mm x 20mm and only 110g! Wideband capture of the entire 2.4GHz ISM band. Truly portable sniffing with autonomous capture mode, put it in your pocket today!



**blueSPY.**

The world's ONLY concurrent multi-standard wideband protocol analyser, blueSPY can be used on both the moreph30 and mini-moreph hardware platforms. With a simple to use UI and support for Windows, macOS and Linux it is the only protocol analyser that you will ever need!

## EV Battery and Charging Station Testing Solutions



### RBS Series

Regenerative Bidirectional DC Source

Max. Voltage: 2250V, Max. Output Current: 510A, Auto Ranging  
 Max Power 15kW (Single Unit), Max Power -150kW (parallel mode)  
 Battery Simulation, Battery charge /discharge tests



### PHU -Series

Auto Ranging High Power DC Source

Power: 5kW/10kW/15kW, Current Max 510A  
 CC/ CV priority mode, Parallel- 10 Units  
 Battery Charger/Motor/Converter Testing



### AEL-5000/PEL-5000 Series

Programmable AC/DC Electronic Load

Built-in tests for Battery Discharge, BMS, Short circuit, OCP, OPP test modes

## Automotive Test Waveforms for ISO16750-2 & ISO7637 Included



### ASR-6000 High

Performance AC/DC Power Source

ASR-6000 Series AC/DC 4.5kVA/KW to 24kV/KW Single/Three Phase, 10 Perfect Output Modes, Dual Current Convergence



### PSW-Series

Programmable Switching D.C. Power Supply

Broad range (e.g., 30V/36A, 160V/7.2A, 800V/1.44 A),  
 2 channel (720W), 3 channel (1080W), High Efficiency,  
 High Power, 2U, USB & LAN  
 Applications: LED Driver Testing, EV Battery Testing & Simulation



### GDS- 3102A/3104A

Digital Storage Oscilloscopes

1GHz (Max), 2, 4 channels  
 Max Sampling Rate: 5GS/s,  
 200MPts Memory  
 Spectrum Analysis, Power Analysis, AFG-25MHz

## Automotive Wiring Harness, Electronics Burn in & Aging Tests



### GPT-15000 Series

Electrical Safety Analyzer

500VA AC/DC/Insulation Resistance/ Ground Bond/Continuity Test  
 Comply with IEC 61010-2-034



### DAQ-9600

Data Acquisition System

450 channel/s Scan Rate – Temperature, DC/AC volts/current;  
 Resistance, Capacitance; Frequency & Period



### GDM-906x Dual

Measurement Multimeter

12 measurement functions (DC VIA, ACV/A,  
 2-wire/4-wire  $\Omega$ , frequency, period, diode, continuity beeper, temperature, capacitance)

# HOW TO ANALYZE AN EV CHARGER

EV charging is a complex process. With many different vehicles and chargers, we would expect to see a range of compatibility issues and charging speeds. Understanding and solving problems requires data, and this is where the 3-phase AC PAM (Power Analysis Module) comes in.



## 3-PHASE MAINS POWER ANALYSIS MODULE



### FEATURES

- Measure 3-phase supplies
- Monitor voltage, current and power
- Capture data in Power Studio or direct to your own files
- Powerful automation option for capture and analysis

This device can capture high resolution AC traces for long periods of time:

- 8,000 Samples per second
- 16, 32 and 63 Amp versions
- Plug-and-play setup
- Manual and fully automated capture options
- PoE powered
- USB and LAN connectivity
- Supports upto 400v AC

### QUARCH POWER STUDIO

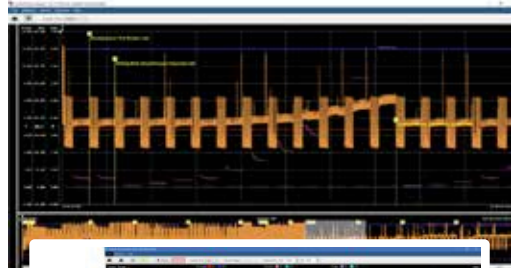
QPS (Quarch Power Studio) allows you to view and capture power data over extended periods of time, and easily analyze the power performance

### FEATURES

- Record any length of power trace
- High resolution capture for detailed analysis
- Annotate traces
- Export screenshots and trace sections
- Measure detailed features and view area statistics

### TECHNICAL

- Server (QIS)
- Handles multi-gigabyte files Java based application
- Built on Quarch Instrument
- No additional drivers needed



## Arbitrary 4-Quadrant Voltage and Current Amplifiers

### Electric Vehicle Test Systems

BOLAB Systems provides unique solutions for electrical tests both for LV and HV standards.

- Low voltage Test Systems For 12, 24 and 48V electrical systems addressing LV 124, VW 80000, VDA 320, ISO 16750, GMW 3172.
- High voltage Test systems for electric vehicles with up to 1,500V electrical systems standards addressing LV 123, VW 80300, ISO 21498, MBN 11123, ISO 7637-4

For testing to these standards, a high voltage power supply, a 4-Quadrant Amplifier System and an Artificial Network are the main elements. All these components are part of BOLAB's portfolio.

### WaveMaster Software

BOLAB WaveMaster Software allows to generate analog signals for the power supplies and 4-Quadrant Amplifiers as well as for recording data for both voltage and current measurements.

#### LV 123/VW 80300 Test Systems

- ✓ 15 KW - 200 KW systems
- ✓ 15A ... 1500 A
- ✓ Ripple Generator DC ... 500kHz Including Load Dump tests!
- ✓ Automated Tests
- ✓ Prepared for future waveforms due to individual waveform design graphically and tabular
- ✓ Integration via DLL's into programming languages

#### LV 124/LV 148/VDA 320 Test Systems

- ✓ 500 W - 18.000 W systems
- ✓ 15 A ... 660 A
- ✓ Up to 100 V /  $\mu$ e
- ✓ Starting with 1 kW, modularly extendable up to 18 kW
- ✓ Automated Tests
- ✓ Additional hardware components for E-16, E-18, E-19, E-20, E-21, E-22

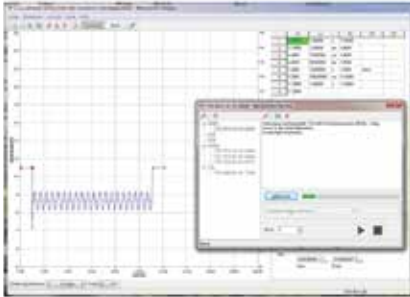


## DC and Arbitrary Power Supplies Arbitrary & Function Generators 4-Quadrant and Broadband Amplifiers Special Instruments

### Comprehensive Test Bench For Automotive Testing

TOELLNER offers flexible solutions for on-board network simulation and testing of components, e.g. for the automotive and avionics industries. The Software WaveControl provides waveforms and controls the TOELLNER system components at the test station, which can be individually tailored to your requirements. Using a DAQ-Card, any signal waveform can be provided with Arbitrary Power Supplies or 4-Quadrant Amplifiers with outputs from 160 W to 5200 W. For fast interruptions, TOELLNER offers electronic switches with switching times below 500 ns.

WaveControl Software includes a comprehensive library of waveforms supporting these standardized automotive industry tests:



The Software WaveControl provides

- ✓ Extensive Waveform Libraries for Normative Tests, e.g.
  - LV 124, LV 148
  - VDA 320
  - VW 80000-1
  - VW 82148
  - GMW 3172
  - MBN 10615
  - ISO 16750-2
  - BMW GS 95024-2-1
  - BMW GS 95026
- ✓ Import & Export of recorded Data
- ✓ Visual Generation of individual Waveforms
- ✓ Sequence Controlling and Timing



- Electronic Switch for short interruptions up to 60V / 100A; tr / tf < 500 ns
- 4-Quadrant-Power-Supply up to  $\pm 100$  V /  $\pm 40$ A; > 100 kHz, 320W / 1KW, modularly expandable up to 6,4 kW / 20 kW
- Arbitrary Power Supply up to 100 V / 320 A, AC-superimposition up to 70 kHz, 320 W / 1 kW up to 5,2 kW / 16 kW
- Software to create arbitrary waveforms, an extensive library of normative waveforms included
- All instruments can also be used individually

# HARDWARE AND SOFTWARE TOOLS FOR TESTING AND VALIDATING AUTOMOTIVE NETWORKS



## CAPTURE MODULES

Capture and log messages from a variety of bus topologies are captured, timestamped (the same timestamp across different bus systems) offers five variants to cover Automotive Ethernet (100BASE-T1, 1000BASE-T1 and 2.5/5/10/10GBASE-T1), as well as common IVN technologies (CAN, CAN-FD, FlexRay, LIN)

### CM MULTIGIGABIT

CAPTURE YOUR AUTOMOTIVE MULTIGIGABIT TRAFFIC IN THE CAR WITHOUT INTERFERING THE ORIGINAL NETWORK



The **CM MultiGigabit**, enabled through new PHY technology, can be set to log three different data rates:

- 2.5 Gbit/s (2.5 GBASE-T1)
- 5 Gbit/s (5 GBASE-T1)
- 10 Gbit/s (10 GBASE-T1)

### CM CAN COMBO

CAPTURE RELIABLY ALL RELEVANT IN-VEHICLE-NETWORK (IVN) TRAFFIC FROM DIFFERENT COMMUNICATION TECHNOLOGIES INSIDE THE VEHICLE



The **CM CAN COMBO** can capture traffic from the conventional CAN buses, as well as CAN-FD, FlexRay, and RS-232 can be captured without interfering with the original networks

6x CAN/ CAN-FD	1x FLEXRAY 2x RS232/TTL	1x GIGABIT ETHERNET (RJ-45)	1x SYSTEM CONNECTOR
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## MEDIA CONVERTORS

Establish a physical layer conversion between Automotive Ethernet connections (100BASE-T1, 1000BASE-T1, 2.5/5/10GBASE-T1, 10BASE-T1S) and any device with a standard Ethernet Network Interface Card (NIC) with an RJ-45 connector

### MEDIA CONVERTOR 1000BASE-T1 MATENET/H-MTD



Converts between 100/1000BASE-T1 Automotive Ethernet and 100BASE-TX /1000BASE-T Standard Ethernet

### NETWORK INTERFACER 10BASE-T1S



Acts as a communication hub, seamlessly routing data between 10BASE-T1S and point-to-point ports

## SWITCH-BASED PRODUCTS

Allow for a managed, multi-directional exchange of Ethernet messages

### ENHANCED ETHERNET SWITCH MACSEC HYBRID

AUTOMOTIVE ETHERNET SWITCH WITH AVB/TSN CAPABILITIES TO TEST AND ANALYZE VEHICLE NETWORKS



- 4x 100/1000BASE-T1, 4x 10/100/1000BASE-T, 2x SFP+ slots supporting up to 10 Gbits
- Provides a reliable gPTP/802.1AS-2011 automotive profile stack
- MACsec Feature Package supports the MKA (MACsec Key Agreement) protocol
- Selectable connector interface between MATenet, H-MTD, or RJ-45 connector, depending on the intended customer use case

Control system/  
Logger

1000BASE-T Ethernet  
(RJ-45)  
10Gigabit Ethernet  
(SFP+)

Enhanced Ethernet Switch  
MATenet, H-MTD or RJ-45

IEEE regular 1000BASE-T  
100/1000BASE-T1

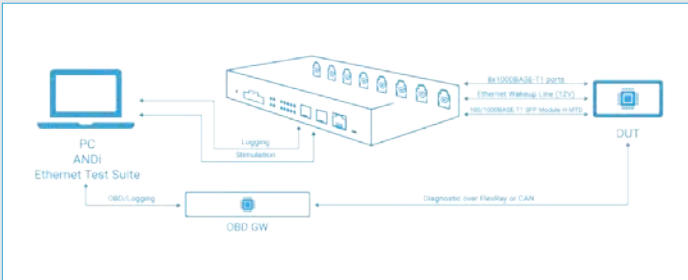
Vehicle Ethernet  
Devices

# HARDWARE AND SOFTWARE TOOLS FOR TESTING AND VALIDATING AUTOMOTIVE NETWORKS



## ANDI PREMIUM

ANDI (Automotive Network Diagnoser) is a testing and analysis tool which is used for Automotive software in every development phase. The tool is designed to simulate electronic networks, test components, and to analyze test results effortlessly. The major strength of the ANDI tool, is in depth network analysis and testing activities of Automotive Networks.



**SUPPORTED HARDWARE**  
**TECHNICA'S HARDWARE**  
Captures Modules:

- CAN COMBO
  - CM LIN COMBO
  - CM Ethernet COMBO
  - CM 100 High
  - CM 1000 High
- MediaGateway
- Enhanced Ethernet Switches (EES)
- BTS EVO

**3RD PARTY HARDWARE**

## MAIN FUNCTIONALITIES

### CREATING TEST CASES

- Easy-to-learn test case creation in Python
- Large number of convenience functions and extensions
- High data rates supported for load tests
- Extensive and efficient API interfaces to import any .NET extensions

### RESIDUAL BUS SIMULATION (RBS)

- User-friendly drag and drop functions for creating simulation nodes
- Extending and customizing of the generated simulation nodes with Python Scripts

### TRAFFIC VIEWER

- Advanced Filtering
- Fixed functionality
- Database Mapping

### MULTIPLE CHANNELS

- Specify several channels and record all the traffic they receive in one window, respecting time synchronization

### MATH FUNCTION

- Display signals by a simple specification of its mathematical equation, automatically completed by the Rest Bus Simulation and Traffic Generator

### IMPROVED PCAP RECORDER

- Record the entire traffic or just a part of it by defining one or multiple Start/Stop conditions
- Scroll back to view and capture past packets

### GRAPHICAL PANELS

- Create your own design with use cases and test scenarios
- Visualize and modify signals and global variables by using a set of toolbox items
- Show a different image for each value of the signal by triggering messages and scripts via the transmit button

### SCRIPT DEBUGGING

- Enable debugging of the test scripts and setting of breakpoints in the test script editor

### SIGNAL GRAPHICS

- Generate a time-correlated graphical representation of different signals on multiple buses
- Analyze data logging into trace files

### PCAP PLAYER

- Replay data from a PCAP file as live traffic to a chosen adaptertime synchronization

### FILE CONVERTER

- Convert a PCAP or PCAPNG file with a gateway header to a new PCAP or PCAPNG file without a gateway header

Leading provider of hardware, software, and services for automotive and industrial communication with emphasis on the fieldbuses CAN, CAN FD, CAN XL & LIN.

**PCAN-Router Pro FD**



**Ixxat Mobilizer**  
Flexible Automotive Gateway Solution



**PCAN-MicroMod FD ECU**



**PCAN-USB X6**



**CAN & CAN FD Interfaces**



**PCAN-GPS Pro FD**



**CAN/CAN FD/CAN XL/LIN Interfaces**

- Single, Dual and Six channels interfaces for CAN/CAN FD/CAN XL/J1939/J1939 FD/LIN Protocols
- Complies with CAN specifications 2.0 A/B and FD, XL
- CAN/CAN FD bit rates for the data field (64 bytes max.) up to 12 Mbit/s
- CAN XL supports transmission of up to 2048 bytes payload data per message and data bit rates of up to 20 Mbit/s
- LIN interfaces are compliant with all LIN specifications (up to version 2.2) and can be used as a LIN master or slave

**CAN Analyser: PCAN Explorer 7**

- Recording and Playback of CAN/ CAN FD/CAN XL/J1939/J1939 FD traffic
- Improved, Scalable UI based on Vector Graphics
- Enhanced Trace Handling with Single Step Playback and Break Points
- New Database Creation, support for several Data bases per CAN connection
- Import/Export existing DBC & ARXML files
- Plotter, Instruments Panel Analysis Support
- J1939 Add-in enhanced with J1939 FD support
- Automation with Python
- Cost effective with flexible Licensing Models

**Diagnostic Tools: CanEasy Professional**

- Protocols: CAN/CAN FD, LIN, J1939
- Diagnostic functions: UDS, KWP2000, XCP/CCP
- ECU Simulation & Analysis
- Graphical Interface: Rich Panels and Database Editors (ARXML, DBC, LDF, CDD, ODX, PDX & A2L/ELF files)
- Plug & Play: Supports all PCAN, Ixxat and other Third-Party Hardware
- Automated Testing: Supports Python, CAPL, JavaScript, VB, C# scripting

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