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SOFTING AUTOMOTIVE

PRODUCTS & SOLUTIONS

DIAGNOSTICS | TESTING | ENGINEERING | TELEMATICS

AUTOMOTIVE
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Dear Readers, Customers and Partners,

For decades now, Softing Automotive has been synonymous with outstanding innovative products as well as services that are used in the entire value chain of our customers from engineering and development to manufacturing and after-sales service. We support our customers all over the world from the initial idea to after-sales support and beyond.

Alongside high-performing, tailor-made hardware and software products, we also offer individual system solutions, customized application support, expert training sessions as well as resident engineering at the relevant customer site. Our product and solution portfolio combines the best innovation and investment protection with maximum benefit and premium quality.

In particular, active participation in committees as well as the integration of the standards established on the market (such as ASAM, ISO, SOVD) makes it possible for Softing to offer both standardized and customized products.

Our product and service portfolio offers a wide range of combination and expansion options for your individual tasks to ensure optimal end-to-end solutions. As a reliable technology and solution partner, we open up a world of new potential for you.

Our motivated team will be happy to advise you.

We look forward to engaging in successful and pioneering projects with you!

Yours

René Schneider
Segment Leader & Managing Director
Softing Automotive

Haar near Munich

SOFTING

DIAGNOSTICS

TESTING

ENGINEERING

TELEMATICS

SERVICE

SOFTING AUTOMOTIVE

What We Stand For

Softing Automotive supports its customers with solutions which facilitate the testing, diagnosis and monitoring of mechatronic systems, vehicles and entire fleets. We see our task starts with communication with the vehicle but also includes data preprocessing, visualization and storage – locally or in the cloud. We create the connection to the electronic systems of our customers worldwide!

Leading manufacturers of cars, motorcycles, commercial vehicles and their suppliers all rely on tried and tested tools and scalable solutions from Softing. But fleet operators and service suppliers also opt for Softing's secure solutions and flexible services.

The internationally binding standards implemented by Softing for programming interfaces, data descriptions, protocols and bus systems guarantee our customers the long-term safeguarding of their projects thanks to the reusability of data with consistently high quality. Softing implements marketrelevant, international automotive standards – from CAN through UDS to ODX and OTX.

Softing is an active member of numerous committees and associations (incl. ASAM, ISO, SAE) and plays a leading role in defining industry standards. Our aim is to provide our customers with the appropriate products and solutions for their particular tasks. Moreover, Softing is able to offer 4G/5G and campus network capabilities worldwide through its subsidiary GlobalmatiX as a virtual MVNO (Mobile Virtual Network Operator). The patented telematic solutions from GlobalmatiX are "secure by design" and fulfill all common communication standards.

Tailored to suit the individual infrastructure in each case, our solutions offer all important certified key technologies to obtain valid and high-quality diagnostics, test and telematic results – even under extreme conditions.

Whether a product solution or customized solution, from classical purchase and rental models to the solution "as a service"– we support our customers in all phases of the value chain with the right offer.

Decades of Experience in Automotive Electronics

From the outset, Softing has always consistently implemented the knowledge gained both from customer projects and from the company's active participation in standardization committees in its products. In doing so, Softing works on the ongoing development and continuous integration of all relevant standards. In implementation, the company supports its customers with:

- intensive advisory services and concept development
- the planning of international roll-out of products and solutions
- practical tutorials and on-site services
- training sessions
- support and continuous further development

Our tried-and-tested product portfolio is supplemented by custom-fit solutions from our long-standing partners. Likewise, our products are integrated into our partners' solutions, whether engineering tools, measuring and calibration systems, test benches, HiL testers or repair-shop testers.

TEST SYSTEMS AND ENGINEERING TOOLS

Major OEMs and international tier1 suppliers rely on Softing's future-proof test systems and engineering tools – for a good reason. A well-established team ensures that reliable software is exactly tuned to user expectations and that suppliers worldwide are provided with the right version in each case.

VEHICLE COMMUNICATION INTERFACES (VCI)

Softing VCIs always set the standard and are used by various OEMs and suppliers in large numbers. Naturally, only the latest technologies are used, for example for wired, wireless and mobile communication. The product range is further developed consistently and adapted to market requirements. We have extensive experience in device updates, handling repairs and exchange processes so that customers are always able to work whatever the circumstances.

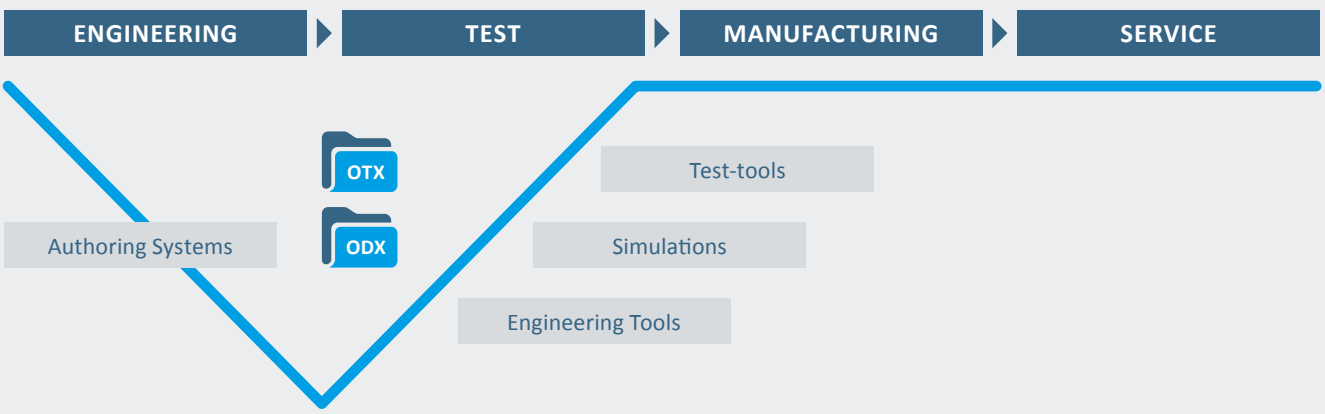
TECHNOLOGIES

The Leader in Key Technologies

As a clear source of inspiration, Softing does not just follow new technological developments. The company's aspirations are far more directed at proactively developing trends and technologies in its core areas of expertise (diagnostics, measurement, testing). Alongside trusting collaboration with the sector's innovation drivers, our active participation in all important associations and standardization committees is extremely helpful. This means that we incorporate standards at an early stage of product development and often implement them parallel to the specification phase. An advantage in terms of time, cost and expertise that we are more than happy to pass on to our customers.

EXTENDED V-MODEL

For decades now, engineering has – more or less – been based on the V-Model. But diagnostic users mainly focus on manufacturing and after-sales. After all, today's vehicles could neither be produced nor repaired without diagnostics. This is why Softing has extended the original V-Model and introduced the extended V-Model. Within the extended V-Model, Softing provides consistent tool suites which are used in ECU development, system tests, vehicle integration, road tests as well as tests in manufacturing and in repair shops. Wherever possible, the solutions are based on standard systems which are implemented in all tools: a key advantage for customers because the uniform behavior of tools and functions ensures maximum reliability in use. Furthermore, the reusability of description formats and configurations leads to significant savings in terms of time and money in all phases of the V-Model and has a positive effect on the term of processes and project phases.



▲ *Fig.: Extended V-Model – Project and Process Phases as seen by Softing*

AREAS OF APPLICATION

Regardless of whether it is diagnostics, measurement or testing – within the extended V-Model, Softing addresses the most important areas of application. These are supported by different tools, each perfectly tailored to the particular case.

- Fault memory operations and OBD
- Measuring over diagnostics, over bus messages, sensors
- ECU programming
- Variant coding
- Simulation of ECUs and their environment
- Execution of ECU functions

PROGRAMMING INTERFACES

Often, the areas of application described are also required in tools and test systems that originally had a completely different focus. We ensure access to Softing expertise in these cases by providing relevant functions via APIs. Depending on the area of application and required technology, we support not only the programming languages C#.Net WPF, C++, COM and JAVA but also LabView VIs for test systems and OPC for the integration of diagnostic functions in manufacturing environments. Furthermore, we also specialize in implementing graphically separated, decentral solutions using remote access.

EXCHANGE FORMATS

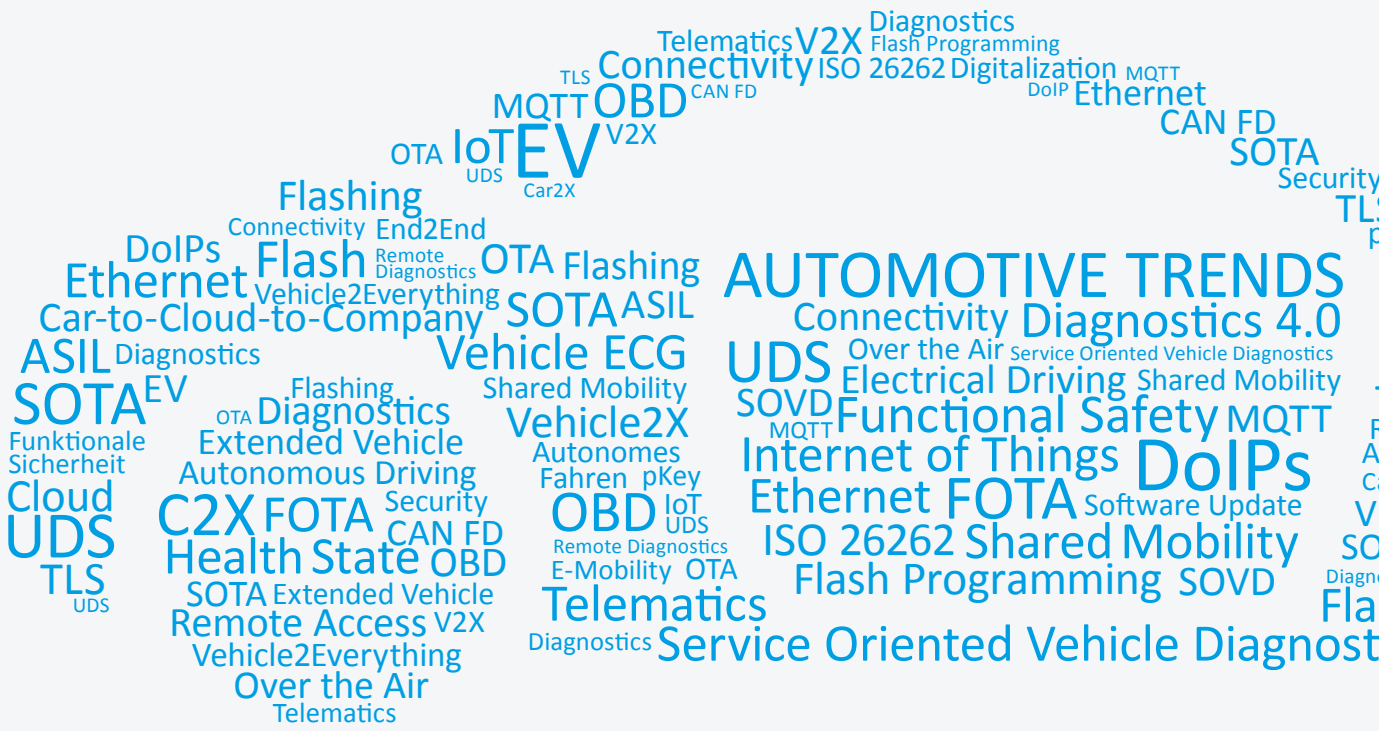
Regardless of whether a customer implements the entire Softing tool suite or uses a subset, the reusability of configurations and results is always the basis for fruitful collaboration and predictable project costs. Softing thus consistently relies on standardized data formats, whether for describing ECUs and test sequences (ODX/OTX) or for storing measurement data (MDF).

PROTOCOLS

The basis of most ECU functions is communication. And for communication to work, it needs a set of rules: protocols. It is irrelevant whether an exchange is taking place between ECUs or between a tester and an ECU. The same applies to whether communication takes place on a CAN bus, a K-line, a LIN bus or via modern high-performance buses such as MOST, FlexRay or Ethernet. Just as it is of no relevance whether low-level protocols or high-level protocols (such as UDS or J1939) are used. Because Softing's technologies precisely implement, analyze and test the corresponding protocols. Incidentally: Communication between systems, for example between mainframes and test systems, is also one of Softing's domains.

Trends

Currently most vehicles are still built on classic lines: A combustion engine drives four wheels, the numerous convenience and safety functions have mostly been packed into software and are controlled by individual ECUs. Testing and diagnostics are also carried out in traditional and conventional ways: First of all, ECUs are tested with and without mechanics; this is followed by the release of the integrated network with diagnostics subsequently being carried out in manufacturing and after-sales service using the OBD jack for verification and to localize any irregularities. But numerous trends are already indicating that there are going to be massive changes to this procedure in the future.

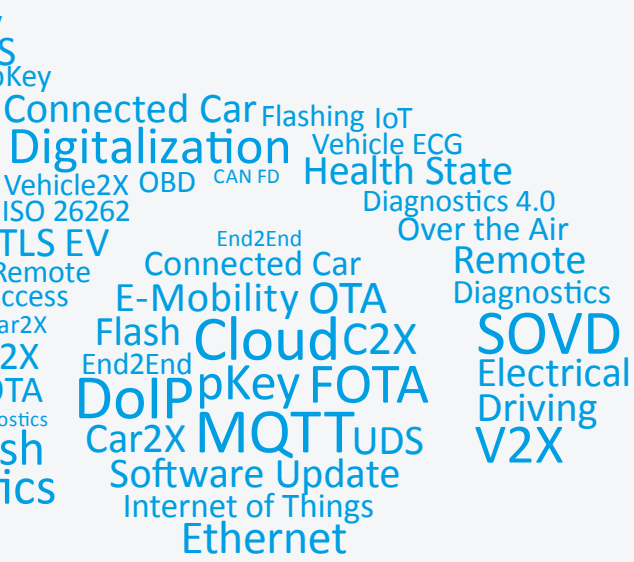


REMOTE ACCESS OTA

A trip to the repair shop is never pleasant, regardless of whether a fault has to be rectified or new software installed. If a repair shop can access the vehicle from a distance, the time spent in the repair shop is something that can be optimized, if nothing else. But remote access is also something often desired during the engineering and development process simply from an efficiency point of view, whether as part of a test drive or to be able to share rare test objects. The Softing technology enables remote access for diagnostics and programming throughout the entire life cycle.

EXTENDED VEHICLE

Accessing vehicle data remotely can already play a part in numerous value-added services. Today, however, proprietary solutions are often implemented which cannot be used together, e.g. because they use dongles at the OBD jack. Standardized access using a cloud application in compliance with ISO 20078 makes it possible for various stakeholders to access vehicle data – with full access control in the hands of the vehicle owner. Softing's remote access technology makes it possible to create such solutions.



ELECTRICAL DRIVING

Whether partial electrification, as is the case in a hybrid vehicle, or pure electric drive: New challenges are going to have to be mastered. In testing, this initially concerns safety requirements for the high-voltage area. But both in testing and diagnostics, entirely new components such as the electric engine and the battery are going to have to be processed. Overall functions are gradually being spread over several components: Take the brake for example which consists of a mechanical and electric brake (recuperation) and which has to be taken into consideration as a whole.

AUTONOMOUS DRIVING

What today is sometimes already reality in “deserted” high bay warehouses, is something we will be witnessing on the streets in future. Vehicles will drive from A to B themselves, taking people with them as passengers. With the transition from advanced driver assistance systems (autonomy level 1) to partial automation (autonomy level 2) through to full automation (autonomy level 5), the E/E architecture is becoming more and more centralized, with testing becoming significantly more elaborate. This inevitably has to feature in the communication paths between vehicles and the vehicle environment as these are part of the infrastructure necessary for autonomous driving. Diagnostics too is increasing in significance because defective functions in (distributed) systems have to be detected at an early stage.

SHARED VEHICLES

New mobility concepts are being introduced – and used – with increasing momentum, especially in metropolitan regions. The flexible, needs-oriented and temporary use of a vehicle is thus becoming increasingly important. The trend toward sharing is one of the major game changers of the coming decade! Softing helps vehicle manufacturers, fleet operators and service providers to keep vehicles under control at all times and to monitor, maintain and manage them efficiently. The spectrum ranges from diagnostic and flash solutions to fully integrated mobility solutions.

DIGITALIZATION

Digitalization touches all dimensions and is rapidly changing many established processes and long-held habits. For the automotive industry, this means fundamental changes to the processes involved in developing, testing and manufacturing vehicles. But the services that can be offered in connection with the vehicle are changing even more radically. Softing offers on-board and cloud solutions for secure and scalable access to vehicle electronics and software – from development to the end of the life cycle.

DIAGNOSTICS

DIAGNOSTICS

New software developments are making vehicles more and more powerful, safer and more environmentally-friendly all the time. To accommodate the growing complexity of ECUs and their multilayered communication levels, an in-depth understanding of communication sequences is absolutely essential. The direct access to ECUs and the precise evaluation of ECU information, even when installed, is thus one of the central tasks of diagnostic processes in engineering, testing, manufacturing and after-sales service.

RANGE OF FEATURES

Softing provides an extensive portfolio of applications used for developing diagnostic processes and executing diagnostics. Typical areas of application are accessing fault memories, flash programming, evaluating measurement data, parameterizations, the control of system components and the actual "diagnostics" itself. Whether it is a question of implementing ODX/MVCI processes, migration strategies for legacy data, the use of high-performance VCIs, the creation of authoring systems or the provision of complete manufacturing or service systems: Together with our clients, we define customized solutions that are tailor-made to suit their particular project requirements.

- Authoring systems
- Runtime system
- Universal development tester and repair shop tester
- Vehicle communication interfaces (VCIs)
- Simulation, diagnostics and residual bus simulation
- Test automation

TESTING

TESTING

From the control of common automotive test solutions through manually configurable test environments to specialized automation solutions and simulations – Softing reliably covers all test requirements and offers comprehensive software and test solutions, electronic testware and scalable test systems that can be flexibly and modularly tuned to individual test requirements. With our individual test solutions, we offer comprehensive expertise in all aspects of automated testing and functional testing of electronic components and ECUs.

RANGE OF FEATURES

We offer solutions for executing systematic, structured, reproducible verification and test processes and their documentation. Turnkey solutions for diagnostic and function tests (including ECU access and hardware structure as well as training sessions).

- Development tester (software)
- Simulation, diagnostics and residual bus simulation
- Test automation
- Measurement data acquisition, signal conditioning and data processing
- Test setups and verification systems (hardware)
  • High-voltage equipment • Test systems • Test boards and functional mock-ups (FMU) • Test equipment

ENGINEERING

ENGINEERING

In the engineering area, we implement system and software solutions for a wide variety of our customers' applications. In the automotive diagnostics and testing fields, we implement solutions that are not available "off the peg" – often on the basis of established product components and standards that have already been launched. Our engineering and development teams enthusiastically develop custom-fit system solutions for demanding technical tasks. Whether in-house development or on-site engineering support in specialist departments – the expertise and competence of our employees always make a significant contribution to the desired development result.

RANGE OF FEATURES

- Engineering
- Software systems
- Tester and EOL solutions
- Testing and validation

TELEMATICS

TELEMATICS

The Softing-subsidiary GlobalmatiX offers mobile data communication for vehicles and machines of all kinds as needed for applications in the areas of Connected Car, Connected Machine, (partially) autonomous driving and Shared Mobility. With its mobile network license, GlobalmatiX operates its own telecommunication and telematics platform. Mobile data communication is enabled with the company's own eSIM (embedded SIM chip). This is how diagnostic data from mixed-brand fleets is made available in real time to the fleet manager over secure cloud systems.

RANGE OF FEATURES

We supply vehicle manufacturers, fleet operators and telematics service providers all over the world with an innovative telematics interface for GPS positioning, tracking and remote vehicle diagnostics. The smart Car-to-Cloud-to-Company approach is the underlying technology for a wide range of telematics services and applications. Each individual transaction is protected against unauthorized access by "security by design" using a patented encryption procedure.

- Telematics interface
- Concept and implementation of innovative telematics services in the cloud

DIAGNOSTICS

Softing DTS	The Diagnostic Tool Set makes it possible for developers, engineers and technicians to create consistent diagnostic functions and sequences on the basis of international standards and to ensure that diagnostic communication works reliably over the entire value chain.
Softing OTX.studio	All-in-one development environment for complex diagnostic and test sequences.
Softing TDX	Ideal tool support for OEMs and component manufacturers for creating and maintaining an individual, modular repair shop tester with integrated role and user management.
Softing SDE	Platform-independent runtime system for diagnostic functions, sequences and services over the entire life cycle.
Softing DTS.venice	Powerful authoring system for ODX 2.2 and 2.0.1 for diagnostic experts and developers of vehicle ECUs.
Softing VCF	The Vehicle Communication Framework is highly efficient middleware for all areas of implementation in vehicle communication.
Vehicle Communication Interfaces	As the link between the application and the physical interface to the vehicle, vehicle communication interfaces (VCIs) are the basis of all kinds of communication and diagnostic applications.
Softing TCS	Configurable diagnostic simulation for cases where no ECU is available.

TESTING

Test Systems	Function and HiL testers in a modular system – for (almost) all ECU types, data acquisition systems and test automation platforms.
High-Voltage Equipment (e-Mobility)	Test and verification systems for electronic modules, ECUs and vehicle components in the HV range for working safely in the lab, on the test bench and on the vehicle (electric and hybrid vehicles).
Test Boards & Breadboards	For convenient attachment and networking of original components depending on the target arrangement in the vehicle.
Functional Mock-Up (FMU)	Three-dimensional test boards, vehicle size, for simulations and complex tests with original components.
Test Equipment	Simple connecting cables, breakout boxes (BOB) and complex ECU adaptations: Individual solutions for maximum reliability in engineering and testing.

ENGINEERING

Diagnostic Solutions, Data (ODX) and Sequences (OTX)	Concepts and solution development for diagnostic systems, diagnostic sequences and diagnostic data based on established diagnostic standards such as ODX, OTX and MVCI.
Diagnostic Tester	Flexible diagnostic system solutions for the operation and service of vehicles and components.
Flash Programming	Scalable, high-performance solutions for flash programming of vehicles and ECUs in production and vehicle delivery.
Test Solutions	End-of-line and QA test systems, test concepts, test automation, test development, manual and automated testing for vehicles and ECUs.
Software Solutions	Individual software solutions for technical systems in engineering, manufacturing and after-sales service.

TELEMATICS

xTCU	Telematics interface for recording and transmitting all data measured by the vehicle ECUs, supplemented by state-of-the-art GPS tracking.
xCloud	Telematics cloud for aggregating, processing, analyzing and preparing vehicle and GPS data for further use by our customers and for implementing various telematics use cases and services.

DIAGNOSTICS

Innovations in vehicles today are largely based on software. Increased engine performance, enhanced safety, the ever greater sustainability of mobility, increased convenience and comfort – programmers are now involved in everything, and ECUs are being installed in vehicles in large numbers. Without much exaggeration, vehicles can today be described as a network on wheels and without diagnostics, it is virtually impossible for a vehicle manufacturer to have it under control. As early as the engineering stage, testers are used to check the actual function; in production, they verify that the status matches the respective line section, and in the repair shop, they support repair and inspection. Furthermore, diagnostics is still central in the task it was originally designed for: a technology prescribed by the legislator to check that legal emissions are being adhered to.

TYPICAL DIAGNOSTIC STANDARDS

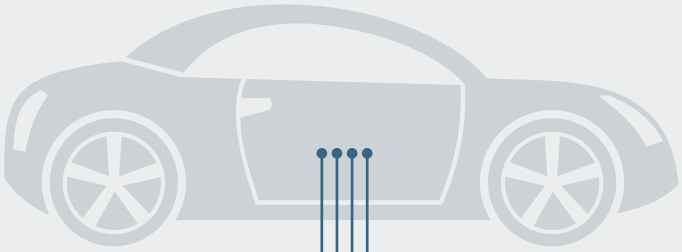
In all cases today, an external, usually PC-based application is used to read out information from the ECUs in the vehicle, process that information, and then give the user the most accurate instructions possible – diagnostics! Today, the core functionalities are largely standardized – starting with the bus systems, where CAN and Ethernet have emerged as the main applications, through UDS (Unified Diagnostic Services, ISO 14229) and SAE J1939 as the most important diagnostic protocols, to ODX (Diagnostic Services, ISO 22901-1) and OTX (Diagnostic Sequences, ISO 13209) as data descriptions.

Today, runtime systems are accessed using standardized APIs – low-level at hexadecimal level via D-PDU API (ISO 22900-2) and SAE J2534 (PassThru), in an interpreted, human-readable form via the MVCI Server API (ISO 22900-3).

ADVANTAGES OF USING STANDARDS

Data descriptions in particular have advanced diagnostics significantly in recent years. This is because their formal description in XML enables the specification of diagnostic content and its execution in a runtime system from a single source – a significant efficiency gain. The exchange between vehicle manufacturers and suppliers is also made considerably simpler. The advantage is not only on the side of the OEMs; after all, the standards allow suppliers to develop software and hardware that at least in part works on a cross-manufacturer basis.

DIAGNOSTICS – STANDARDS AT VARIOUS LEVELS



BENEFITS

- Low implementation risk with reduced effort
- Easier exchange of information, fewer misunderstandings
- Simpler interaction of components

DESCRIPTIONS	BUS SYSTEMS	PROTOCOLS	APIs
OTX (ISO 13209)	**CAN/FD**	**UDS** (ISO 14229)	**MVCI Server** (ASAM MCD-3D/ISO 22900-3)
ODX (ASAM MCD-2D/ISO 22901-1)	**ETHERNET**	**WWH-OBD** (ISO 27145)	**D-PDU API** (ISO 22900-2)
Autosar	**K-line**	**SAE J1939**	**PassThru** (SAE J2534)

DIAGNOSTIC SYSTEMS

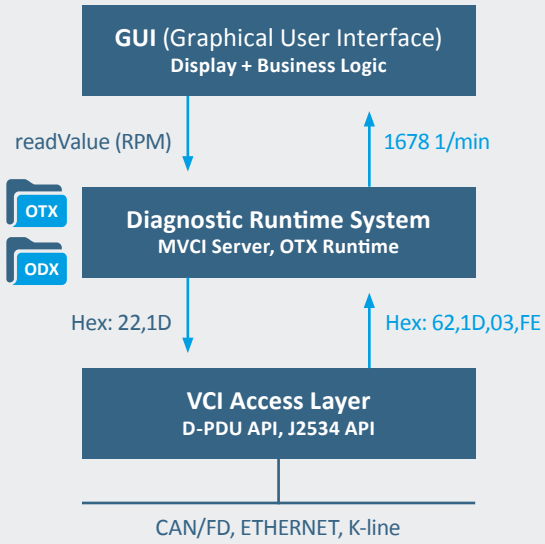
STRUCTURE OF MODERN DIAGNOSTIC SYSTEMS

Anyone working with diagnostics always has to be able to consult the right data. Depending on the task and diagnostic knowledge, this is done in very different ways – for example, in engineering, road tests, or the repair shop. Those responsible for specific processes also want to ensure that existing information can be reused and that diagnostics reacts in exactly the same way in all applications.

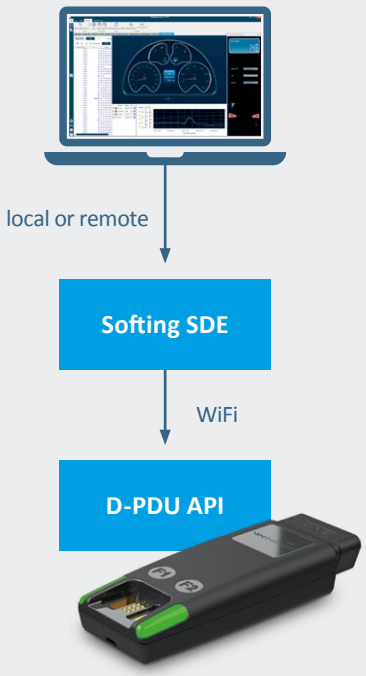
This is achieved by using a standardized diagnostic runtime system that processes the diagnostic services and sequences described in ODX and OTX. Via APIs, it makes the implemented diagnostic functions available to software applications on a symbolic level. The applications process these in accordance with the specific application and display them accordingly. The protocols are processed transparently under the VCI access interface (Vehicle Communication Interface), via which corresponding VCIs that enable access to the vehicle in the first place can be integrated into the diagnostic runtime system.

SCALABILITY WITH SOFTING COMPONENTS

With Softing testers, the Softing SDE takes on the role of a diagnostic runtime system. It provides an MVCI Server API and a function-oriented API to applications regardless of the operating system. Applications such as Softing DTS and Softing TDX can integrate the runtime environment directly or access it remotely. VCIs always have a D-PDU API as the integration interface. Standardized protocols are usually included in the delivery scope. What is more, VIN|ING 2000 can run a Softing SDE so that efficient remote or stand-alone applications are possible over it.



▲ *Fig.: General Operating Principle of a Diagnostic Tester*



▲ *Fig.: Setup of a Typical Diagnostic Tester*

DIAGNOSTIC TOOL SET

System Overview

The Diagnostic Tool Set makes it possible for developers, engineers and technicians to create consistent diagnostic functions and sequences on the basis of international standards and to ensure that vehicle diagnostics works reliably over the entire value chain.

SUCCESSFULLY MASTERING CHALLENGES

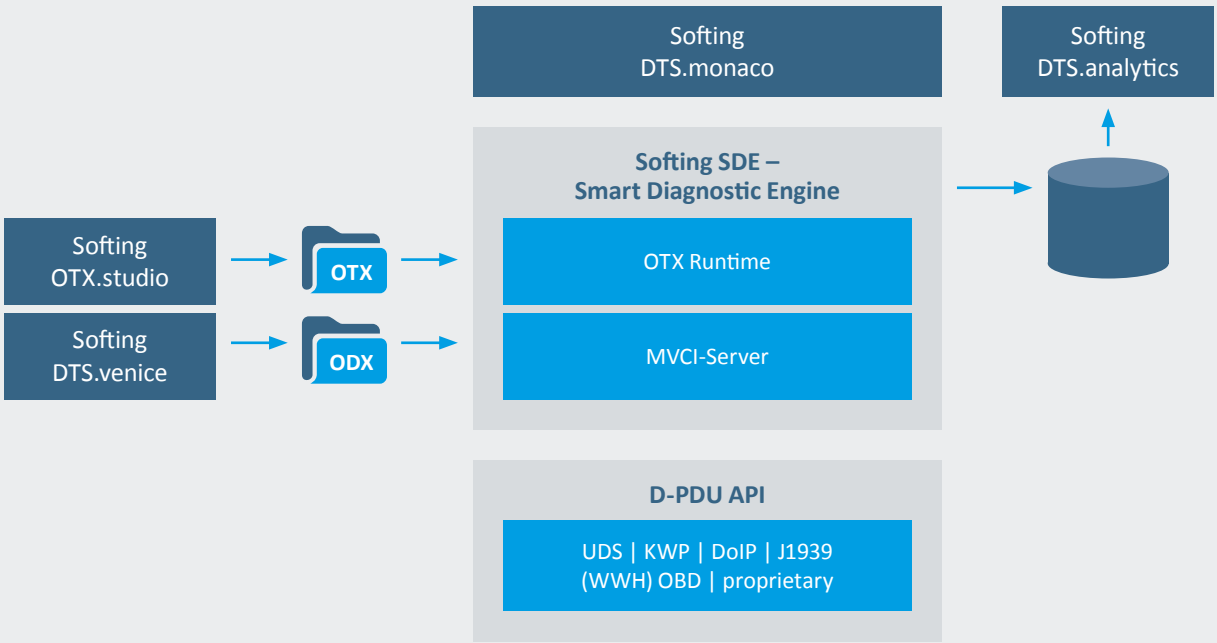
Increased competition, frequent model changes and the electrification of vehicles are major challenges for the manufacturers of cars and commercial vehicles as well as for system suppliers. Vehicles are becoming more and more powerful, safe and environmentally- friendly all the time. These innovations nearly always entail new software developments. The number of ECUs and the complexity of networking are thus continually increasing. The growing complexity must be mastered over the entire lifetime of the vehicles not only in terms of the control functions but also the diagnostic functions.

DEFINING DIAGNOSTIC FUNCTIONS RELIABLY

To ensure that diagnostic functions are understood and used in a uniform manner from engineering through manufacturing right into the repair shop, ODX (Open Diagnostic Data Exchange) and OTX (Open Test Sequence Exchange) were specified as standards which can simultaneously be deployed as an executable specification and exchange format. The ODX data, which specifies the communication between tester and ECU, is created using the Softing DTS.venice tool. Diagnostic and test sequences are developed with Softing OTX.studio with adapted access available for different user groups. A standardized runtime behavior is offered uniformly in all applications via the Softing SDE. In addition to the standardized MVCI server, this offers an OTX runtime environment and a functional API and is also remote-capable.

DEVELOPING AND RELEASING DIAGNOSTICS

Softing DTS.automation is a massively simplified API which is made available specially for the often limited use of diagnostics in automation systems. All diagnostics to be operated manually are made available to users in Softing DTS.monaco – from ECU engineering through diagnostic release to test drives. All traces and reports created using the applications and runtime systems can then be evaluated offline with the help of Softing DTS.analytics. This makes it easy to detect and document irregularities.



▲ *Fig.: Softing Diagnostic Tool Set*

SOFTING DTS.MONACO

The Off-Board Diagnostic Tool for Professional Vehicle Engineering.

AREAS OF APPLICATION

- Engineering of diagnostics and control functions for vehicle ECUs
- Function test and validation
- Integration and system test
- Preparation of test sequences for manufacturing and after-sales service
- Analysis of returns and quality assurance
- Commissioning of test benches and HiL systems
- Preparation and update of vehicles for endurance testing
- Execution of diagnostic tests for safeguarding functional safety in compliance with ISO 26262

BENEFITS

- Cost reduction and shorter familiarization time as Softing DTS.monaco covers the functionality of several tools that were separate to date
- Fast results due to intuitive operation and preconfigured templates
- Top quality thanks to early detection and remedy of communication problems and function errors
- Highly effective as it can be flexibly adapted to suit a range of tasks
- Complete documentation of communication data and test results
- Plug and play of vehicle communication interfaces

Softing DTS.monaco is an extensive offboard diagnostic tool for the engineering sector which covers the entire range of application cases from ECU testing through to vehicle release. It is easily integrated into the test sequences and corporate processes, not least because of its flexible interfaces which can be configured to suit the relevant test step.

OUR EXTENSIVE EXPERIENCE PAYS OFF FOR THE USER

Softing DTS.monaco is the flagship of the Diagnostic Tool Set, the expert tool for professional diagnostics that has grown over the decades. It is based on the Softing Diagnostic Base System and thus benefits from cross-manufacturer experience in off-board diagnostics throughout the entire vehicle life cycle. New solutions are continuously being integrated into the stable and scalable tool base for the latest E/E architectures and security mechanisms.

PROCESS-ORIENTED AND FLEXIBLY ADJUSTABLE FOR EVERY WORKING STEP

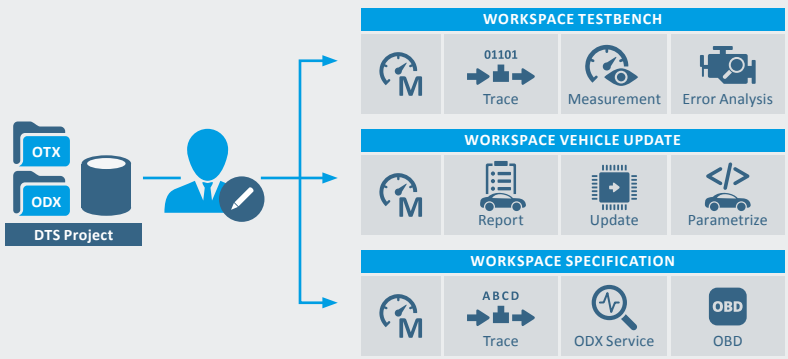
The name MONACO – Modular Analyzer for Vehicle Communication – already clearly indicates one advantage of the application: modularity. Thanks to the division of the interfaces into fixed and flexibly configurable parts, it is possible to arrange working steps required for the testing process logically and efficiently. What are referred to as layouts in the Monaco workspace help the user to sort the topics. In turn, the specially developed diagnostic control elements can be placed within these freely configurableinterfaces. The delivery scope also includes a few examples of widely-used application cases (OBD, WWH-OBD, J1939-73), thus considerably facilitating getting started with Softing DTS.monaco.

THE RIGHT CONTROL ELEMENT FOR EVERY DIAGNOSTIC FUNCTION

Monaco Controls are available for typical application cases. Users without in-depth knowledge can take advantage of these intuitively. The diagnostic commands and communication parameter behind those controls are preconfigured by experts at diagnostic service or diagnostic job level. Furthermore, diagnostic sequences can be directly incorporated in OTX (ISO 13209) and started. These are created using Softing OTX.studio.

FUNCTIONS

- Testing communication
- Analyzing data on the bus
- Testing ODX data against ECU
- Reading/clearing error memory
- Identifying variants
- Programming flash memory
- Displaying measurement values
- Testing actuators
- Parameterizing ECUs
- Coding variants
- Running ECU routines
- Testing OBD functions
- Creating/executing test sequences



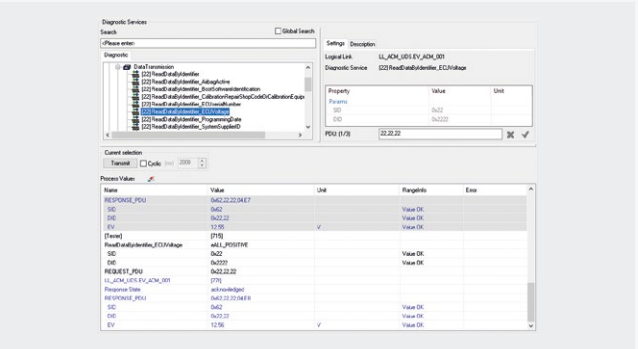
▲ *Fig.: Can be Flexibly Adapted to the Application Case – Workspaces, Layouts and Control Units*

COMMUNICATION	CONTROL	FUNCTION	MEASUREMENT
Bus Trace 01101 Fundamental analysis of diagnostic and on-board communication at bus level in hexadecimal notation.	**Annotation** Visualizing tests with pictures, text or link to RTF/PDF/CHM files.	**DTC *** Reading out and clearing the ECU error memory.	**Graphical Instrument** Visualizing and modifying ECU variables using various graphic elements. (Measuring, parameterizing and actuator diagnostics)
Diagnostic Services Data verification and communication test with full access to functions and sequences of the database for experts.	**Communication Control** Automated setup and tear-down of communication to ECUs.	**ECU Identification *** Reading out the identification information of individual ECUs or an entire vehicle.	**Recorder** Recording/saving ECU variables (list, instruments or oscilloscope) and modifying them (actuator).
Symbolic Trace ABCD Analysis of diagnostic communication at the application level in symbolic notation.	**Logical Link List** Monitoring and influencing the communication state of ECUs.	**Flash** Programming of individual or multiple memory areas of ECUs.	
Service Table One-off or cyclical execution of list control for diagnostic services in service or parameter notation.	**Toggle** Activation/deactivation of a switch, each starts a sequence of services (e.g. change ECU state).	**OBD** Validation and release of OBD self-diagnosis and the different modes for K-line and CAN protocols..	
OTX Execution of complex diagnostic or test sequences in compliance with ISO 13209 (OTX).		**Soft Key** Running sequences of services, jobs or sequences using buttons.	
		Tool Quick Test* Fast determination of vehicle status as regards ECU identification and error memory.	
		Variant Coding * Powerful expert tool for coding individual ECUs.	

* Configuration must be adapted to relevant ODX authoring guideline!

Using DTS.monaco

Softing DTS.monaco is used in numerous engineering departments all over the world to take care of diagnostic tasks. The range of ODX and expert application cases extends through ECU release to the commissioning of HiL systems and test benches. The tool is also regularly used for updating and validating vehicles during on-road tests.



▲ *Fig.: Testing Diagnostic Communication*

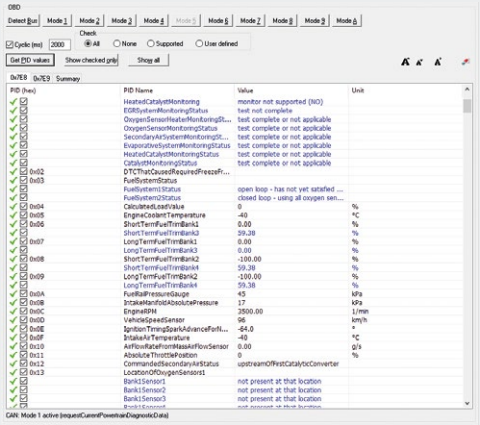
TESTING AND DEBUGGING THE ESTABLISHING OF TESTER ECU COMMUNICATION

Regardless of the integration level of software and ECUs, communication problems along the OSI communication layers result in specific challenges for diagnostic experts. These problems are critical for the remaining life cycle of the vehicle because, for example, in manufacturing, this behavior can lead to delays in or an entire absence of vehicle programming. The debugging of this kind of defective communication behavior thus necessitates an interface which both sends out services and jobs individually or cyclically to the test system and interprets information from offboard communication in detail and records on-board messages.

The complexity of this kind of analysis is growing increasingly in the latest E/E architectures and their security measures against undesired external tampering attempts. Softing DTS.monaco is always up to date here and reliably supports corresponding protocols and mechanisms. This is supported in particular by the control units “Diagnostic Service”, “Symbolic Trace”, “Bus Trace” as well as the “Logical Link List” with reliable information on the status of the connection and the representation of the relevant services and bus communication. The DoIP monitor integrated in the new DTS9 generation is particularly helpful in this respect!

VALIDATING ECU OR FUNCTIONAL DIAGNOSTIC SPECIFICATION (EXAMPLE ISO 15031)

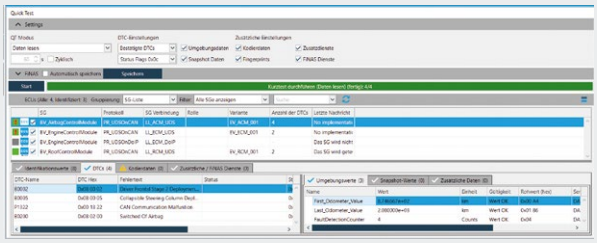
During the life cycle of an ECU/vehicle, various diagnostic services and functions specified by the OEM or legislator have to be supported. Softing DTS.monaco can be used for a first step in this partly approval-relevant validation. With the “Diagnostic Service” control (see figure above), it is possible to test the relevant services and responses for their correct implementation in detail in the diagnostic database (ODX 2.0.1 or ODX 2.2). The tool also offers a special control unit with underlying ISO-compatible database for OBD validation. Here it is possible to reliably test the different modes and functional command groups of the OBD specification. No expert knowledge is necessary for this as the procedure is determined by the user interface. This simplification means that a result can be quickly and efficiently determined with the HiL system or vehicle.



▲ *Fig.: OBD Diagnostics*

IDENTIFYING AND TESTING ERRORS WITH DOCUMENTATION

The identification of a test unit as well as the reading out of the error memory are activities which are repeated throughout the product life cycle. Regardless of whether HiL, test bench or vehicle – the versions as well as any error memory entries which might occur must be acquired and documented in every test sequence. The most important aspect here is a simple and intuitive operation as well as reliable documentation (in part with a direct central link to IT systems). This kind of identification and error report can be generated and stored by Softing DTS.monaco. An XML file format for reports is expedient here. This is supported in particular by the control units “ECU Identification”, “DTC” and “Tool Quicktest”.



▲ *Fig.: ECU Quick Test*

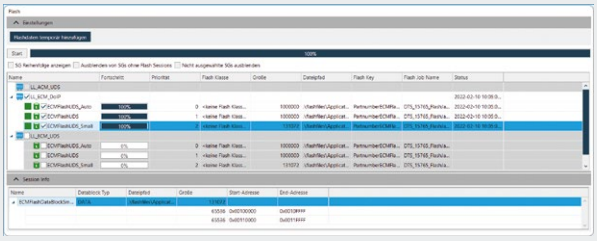
VISUALIZING MEASUREMENTS AND ACTUATOR INTERACTION

The visually meaningful representation of measurement parameters and their thresholds is necessary particularly at the test bench and in vehicle validation. Softing DTS.monaco helps visualize various states regardless of whether a NOx sensor has to fulfill its values within a certain time or if it has to be indicated that pressure or temperature has reached a threshold value. Corresponding services and parameters can be configured for this in a data server and reused. Naturally interaction with actuators is also possible. To ensure this is all documented, Softing DTS.monaco contains a recorder which records and can reproduce data reliably.

▲ *Fig.: Graphical Instruments*

UPDATING ECUS – FLASH PROGRAMMING

ECU and vehicle updating is an important application area for Softing DTS.monaco, as an accompanying measure in the engineering process to validate various software versions, but also to prepare the automated flash procedure for manufacturing and after-sales service. The compatibility to all kinds of methods and file formats is just as important here as simple and reliable operation. A process usually consists of several substeps as well as an initialization routine – now often additionally safeguarded with the Seed & Key procedure. Naturally, with its “flash” control element and numerous configuration possibilities, Softing DTS.monaco offers sufficient flexibility to be able to support complex procedures. In other words: ODX-D + Flash Job (with reference in ODX-F), External Flash Files (HEX, MOT, BIN, S3 and S19), Flash Sequences, Security Access, Latebound Flash Files, Flash Files > 4GB (“64-bit Flashing”), among others, are supported.



▲ *Fig.: Flash Programming*

Highlights in Use with Latest System Architectures

Softing DTS9 is continuing the journey and extending the product with new, innovative functions to support our customers in their engineering work in the future.

SETTING NEW ACCENTS WITHOUT LOSING THE BASE

New application cases and the growing significance of diagnostics for vehicle engineering are demanding completely new approaches in collaboration, for example as regards the licensing, packet assembling and distribution of our software package. Furthermore, the necessity for new features outside the diagnostics core competency sector has also grown steadily. This is why we have re-engineered DTS9 from scratch – as a future-oriented platform for diagnostics, analysis and simulation in local and remote application cases. To ensure DTS8 customers can continue to work seamlessly, projects already created are migrated in entirety including interface configurations.

DTS9 IMPRESSES WITH NEW FEATURES AND TECHNOLOGY IN ALL AREAS

DTS still stands for Diagnostic Tool Set, but in the future will continue to see extensive growth in the areas measuring, analysis and simulation. Particularly important aspects are the functionalities OTX support and functional diagnostics (please also refer to Softing SDE). Measurement values and parameters are provided simply with both functionalities. During runtime, the user can search for these measurement values directly and select them. In-depth knowledge of diagnostic data is not necessary.

AUTOMOTIVE ETHERNET AND DIAGNOSTICS OVER IP AS NEW CORE TECHNOLOGY FOR DIAGNOSTICS

The subject of Automotive Ethernet with the DoIP diagnostic protocol is also particularly worthy of mention in the new product generation. Considerable focus was placed on the aspect of tracing to be able to analyze DoIP communication.

INCREASED EFFICIENCY WITH USE OF THE ENGINEERING NETWORK – SOFTING DIAGNOSTICS 4.0

As ECUs and vehicles as well as test benches are rare and sought-after resources in the early stages of engineering, commissioning and access regulations are often a critical point. To structure this more efficiently and create more synergies between experts within a company, Softing DTS.monaco makes it possible to run diagnostic functions remotely over the engineering network. Initially identification, error memory acquisition, measuring and monitoring will support this scenario; in the future, support will also be provided by the familiar Monaco workspaces and their control elements.

▲ *Fig.: Softing DTS.monaco (Generation 9) – New Platform, Graphical Instruments and DoIP Monitor*

HIGHLIGHTS – AT A GLANCE

- Multitest (1-8 vehicles)
- Remote diagnostic support in the engineering network
- Representation and recording of Ethernet communication (DoIP)
- New functions in the area of OTX support (new OTX standard) as well as functional diagnostics (see also Softing SDE)
- Extended functions in the areas of measurement and analysis
- Revised security concept
- 64-bit software with multilingual interface
- New graphical instruments for measurement and actuator diagnostics
- Intuitive, touch-enabled navigation and program structure
- Recording of measurement data in .csv
- New licensing options via activation key and server licensing
- Migration and conversion of interfaces and projects of the previous version (Softing DTS 8)

▲ *Fig.: Softing DTS.monaco in Remote Use*

Delivery Packages

PRODUCTS

		DTS 9 Framework			Add-on Tools	
		Softing DTS.monaco			Softing OTX.studio	
	PACKAGES	BASE	PROFESSIONAL	TESTBENCH	BASE	PROFESSIONAL
Engineering Tester	ODX, OTX, Protocol, DiagService, OBD, Measurement	●	●	●		
	Flash, VarCode, DTC, ECU Ident		●	●		
	Testbench (API Interface Usage)			●		
Add-on	OTX editor/debugger, FCE, admin, comfort mode				●	●
	GUI, guided diagnostics, TCE, templates, signatures					●

INCLUDED IN THE SCOPE OF DELIVERY

Templates	Communication and analysis, error memory, measuring and parameterizing, on-board diagnostics, flash programming, test sequences.
Sample Workspace	Extensive Monaco sample workspace as introduction to the main functions based on the sample database in the delivery scope.

SOFTING OTX.STUDIO

All-in-One development environment for complex diagnostic and test sequences.

AREAS OF APPLICATION

- Graphic specification of diagnostic sequences
- Creation of test sequences in ECU development
- Creation of test sequences for EOL tester in manufacturing
- Guided diagnosis

BENEFITS

- Easy exchange of sequences between ECU, system and vehicle manufacturers
- Diagnostic data is supported in compliance with ODX 2.0.1 as well as 2.2.0
- User oriented editor concepts: Line oriented, Flow chart, modular “Comfort Mode” or via statecharts
- Can be implemented universally as as the entire diagnostic scope of OTX is available
- Long-term protection of investments due to use of an international standard
- Expertise protection and prevention of unauthorized changes by saving OTX scripts in binary format

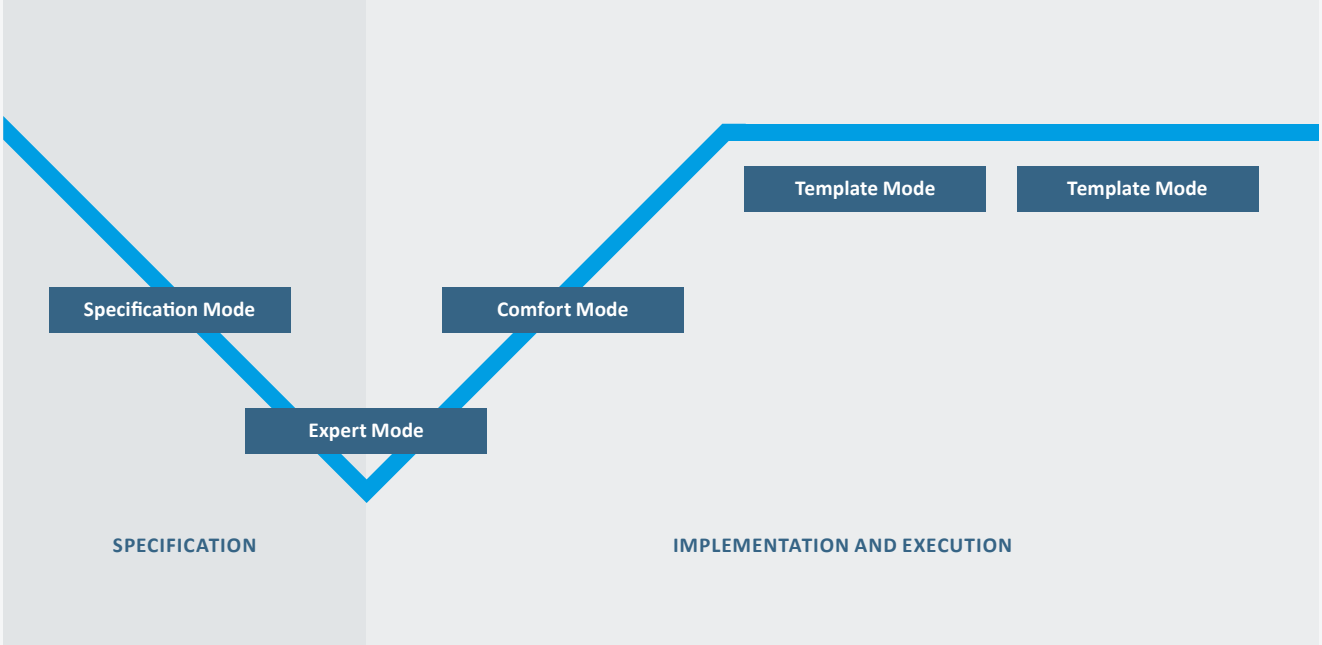
Softing OTX.studio is a tool for creating, commissioning and debugging diagnostic and test sequences based on the OTX standard ISO 13209. Graphical user interfaces can be conveniently generated and linked to the created sequences.

SPECIFYING AND IMPLEMENTING DIAGNOSTIC SEQUENCES

The OTX standard (Open Test sequence eXchange) compliant with ISO 13209 enables users to describe diagnostic sequences from basic function tests up to complete tester applications. Softing OTX.studio provides support in the early specification phase as well as in downstream implementation. The tool makes it easy to create graphic diagrams with a clear representation of the sequence logic. The integrated OTX-Differ allows easy comparing and merging of sequences in different development stages.

SUITABLE FOR BOTH FIRST-TIME USERS AND EXPERIENCED DEVELOPERS

Softing OTX.studio provides all the necessary input assistants which guide the user when learning to use the product. IntelliSense allows users to create sequences without having in-depth knowledge of the OTX language elements. Comprehensive project administration with integrated version management for subversions ensures structured overviews even in large projects. The library concept that many users are familiar with from standard programming languages supports users in the modular creation of their diagnostic OTX sequences.



▲ *Fig.: User and Use-Case-Related Creation Views in the Extended V-Model with Softing OTX.studio*

FROM FLASH SEQUENCE TO REPAIR SHOP TESTER

Typical areas of application are, for example, the creation of flash or test sequences. Particularly test planners benefit from the variety of integrated tools. The GUI editor allows the designing of the entire user interface as well as the simple connection of the GUI elements to the OTX script. OTX function libraries can be defined to allow reuse of generic OTX procedures. For recurring tasks, the developer is supported by the integrated templates, but also by the foreign language editor and the document viewer and browser for repair instructions and technical drawings. The full debugging possibilities are indispensable for all users.

MULTIPLATFORM APPLICATION

Softing OTX.runtime enables the execution of OTX sequences on all operating systems such as Android, iOS, Linux and Windows. This means that an OTX sequence created with Softing OTX.studio can be executed on all target platforms with the same range of functions and the same GUI interface. With QML, the GUI interfaces can be designed to support different screen resolutions and display orientations of end devices.

USER- AND USE-CASE-RELATED CREATION VIEWS

In the life cycle of a vehicle, from planning through engineering, testing, manufacture and after-sales service, there are all kinds of users, for example diagnostic specialists, testing specialists, test engineers and repair shop technicians. Each of these groups has its own tasks, knowledge and requirements regarding the creating and use of diagnostic sequences. These tasks and tool requirements have to be covered appropriately in their entirety in one development environment. Softing OTX.studio targets exactly this issue with its flexible creation concept. You can conveniently toggle between four different operating modes in the creation process:

- **Specification mode**
  Vehicle experts sketch the diagnostic flows with the Flowchart Editor and OTX programmers fill-in the necessary OTX code. This approach facilitates the specification of the diagnostic sequences without any programming knowledge.

- **Expert mode**
  OTX programmers develop pure OTX code and library functions with fast access to all OTX language elements.

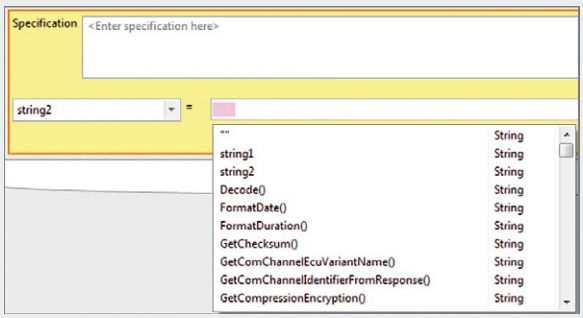
- **Comfort mode**
  Vehicle experts create sequences as modules in which they can access libraries predefined by experts or special wizards. Report function and fault handling can be configured with just a few clicks of the mouse.

- **Template mode**
  Authors for ECU validation, guided fault search (GFS) and measurement data readout combine completed templates to form complete sequences. Template-based OTX projects can be converted into expert projects at any time and can be extended as users require without any limitations. This saves considerable time in the development of typical diagnostic tasks because users can very quickly create the basic setup for their sequences. Authors can concentrate on specific solutions for the current ECU.

Use Cases of Softing OTX.studio

EASY CREATION OF DIAGNOSTIC SEQUENCES

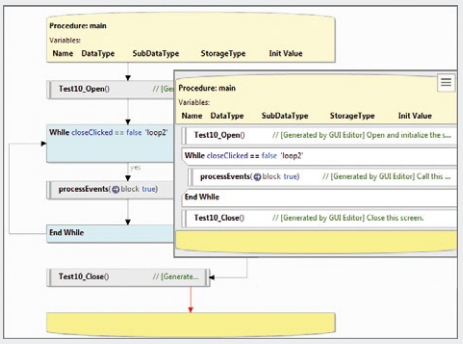
Softing OTX.studio provides all the necessary input assistants which guide the user when working with the product. The user is given support with simple diagnostic sequence creation and timesaving workflows. The input assistant allows users to create diagnostic sequences without having in-depth knowledge of the OTX language elements. Comprehensive project administration with integrated version management for subversions along with a tool that checks for differences in OTX scripts and allows merging, ensures structured overviews and easy file handling even in large projects. The library concept supports users in the modular creation and reuse of their diagnostic sequences. Experienced users can use advanced features of Softing OTX.studio, such as direct execution of diagnostic sequences and raw data bus access for handling all possible diagnostic scenarios. Integrated debugger allows single step, step over and step into execution, breakpoint setting, variable monitoring and variable content change during the execution.



▲ *Fig.: Auto-Complete in Softing OTX.studio*

DIFFERENT VIEWS FOR DIFFERENT USERS

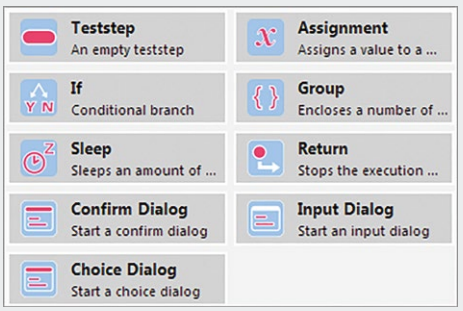
For vehicle troubleshooting and validation experts it is important to concentrate on diagnostic tasks and logical flows and leave the implementation of the required diagnostic scripts to the programming experts. However, diagnostic scripts implemented by the programming experts need to be checked and validated by the vehicle experts on an abstraction level understandable to them. In Softing OTX.studio, views are available that are aligned to the respective area of application as well as according to the preferences of the respective user, e.g., line-oriented or as a flow chart.



▲ *Fig.: Different Abstraction Levels for Editing*

CONFIGURING INSTEAD OF PROGRAMMING

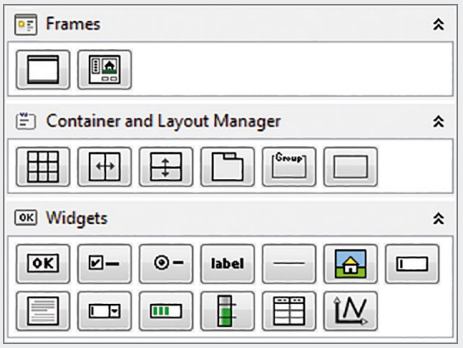
In the OTX Wizard (convenient) mode, the user can easily create OTX scripts with preprogrammed standard or custom (library) OTX modules simply by configuring them instead of programming. OTX–Wizard-based configuration saves time and allows maximum re-use of OTX modules. Configuration via the OTX wizard saves time and ensures maximum reusability of OTX modules; the user can concentrate on the logical flow. The OTX code generated by the OTX wizard can subsequently be edited and adapted at any time.



▲ *Fig.: Easy Creation with Prepared Elements*

EASY CREATION OF THE HMI INTERFACES

The extension for the graphical editor of the Softing OTX.studio supports the design of entire HMI interfaces to the associated variables of the OTX script. OTX function libraries can be defined to allow the re-use of generic OTX procedures, with no limitation to the number of these libraries. Application developers can easily create complex interactive GUI interfaces which guide the user through the required diagnostic steps or display the vehicle data.



▲ *Fig.: Graphical Editor in Softing OTX.studio*

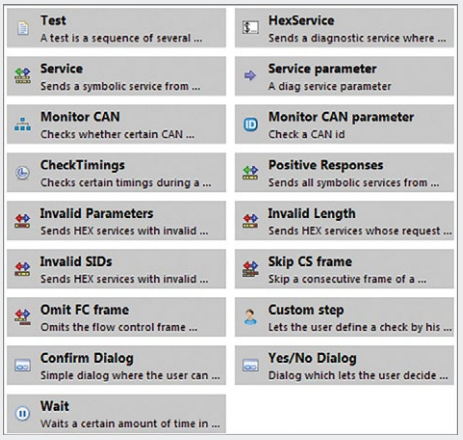
AUTOMATED TEST AND VALIDATION

The Softing OTX.studio Test Case Editor (TCE) extension provides a number of functions to create tests for the comprehensive and automated validation of ECU diagnostic services. Such comprehensive validation is typically required for acceptance and regression tests. For this purpose all available diagnostic services along with their various parametrizations have to be systematically tested and documented. Tests created with the Test Case Editor are based on pre-configured OTX scripts, which are parametrized accordingly, and used for the creation of automated, OTX script based validation tests.

The created tests can contain:

- validation of positive and negative ECU responses
- validation of communication parameters
- response pattern matching
- robustness check of the diagnostic implementation

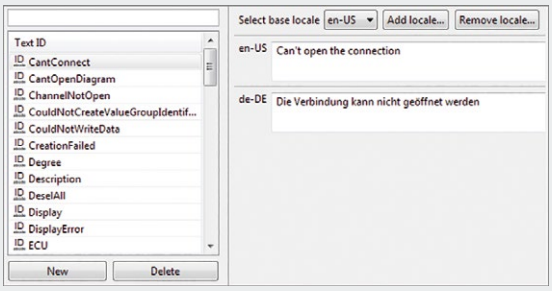
The test results can be presented in XML or HTML format. For the test campaigns, test run statistics can be displayed.



▲ *Fig.: Testcase Editor*

LOCALIZATION OF THE OTX SCRIPTS

For easy localization of the OTX scripts, Softing OTX.studio provides automatic string externalization, which users need to translate all texts. The collected strings and their translation keys can be edited with the editor. The strings and keys can be exported into or imported from the XLIFF file, which is the standard format for exchange with translation agencies. The OTX scripts created can be tested with individual localization settings independent of the test system's local settings.



▲ *Fig.: Easy Translation of Character Strings*

TEMPLATES

Recurring diagnostic tasks require a significant effort in the implementation of user interface and the underlying diagnostic sequence. For this reason, templates consisting of a predefined GUI and an OTX sequence are integrated in Softing OTX.studio, through which standard tasks such as reading identification, fault memory operations or ECU programming can be implemented in just a few steps. The templates are easily adaptable, e.g. to the corporate design (CD).

Delivery Packages Softing OTX.studio

	Softing OTX.studio	
FUNCTIONS	OTX.studio **BASE**	OTX.studio **PRO**
Script Editor, debugger, interpreter, differ	●	●
Execution of OTX sequences and diagnostic services	●	●
Vision management (SVN + Git)	●	●
Flow-Chart view	●	●
Comfort mode	●	●
ISO compatibility checker	●	●
ODX service name mapping	●	●
Encryption and signing of OTX scripts	●	●
GUI editor		●
Guided functions/state chart editor		●
Test case editor		●
Design templates		●

SOFTING TDX

Intuitive toolbox for designing and maintaining a repair shop tester.

AREAS OF APPLICATION

- Service repair shops of vehicle manufacturers
- Service repair shops of system manufacturers, e.g. in the retrofit market
- Mobile diagnostic systems for service technicians
- Repair shops in the engineering sector, e.g. road tests
- Testers in manufacturing, e.g.EoL testers

BENEFITS

- High-performance diagnostic software as plug and play solution with hardware interfaces (VCI)
- High-end graphical user interface (GUI), fully adaptable to individual requirements (processes, CI, language)
- Future-proof due to the use of international standards (e.g. OTX, ODX, UDS)
- Highly efficient and fast “Go Live” thanks to the use of GUI templates incl. diagnostic function
- Comprehensive report functionalities
- Security through integrated user management
- Highly convenient thanks to automated software updates
- Connection to backend/logistics databases
- Flexible with regard to diagnostic methodology (symptom-/ECU-based)

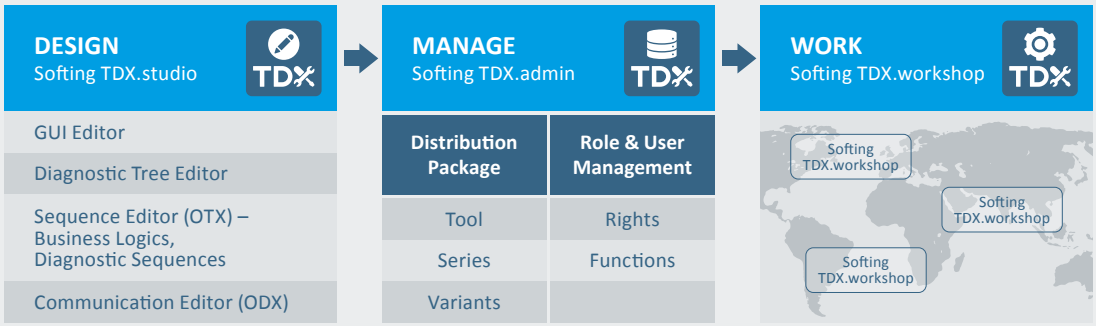
Softing TDX is the ideal tool support for OEMs and component manufacturers for creating and maintaining an individual, modular repair shop tester with integrated role and user management. Manufacturers of vehicles, mobile working machinery as well as their ECUs can thus provide ECU- and problem-specific repair and maintenance procedures within their worldwide service network while taking security aspects into account. This makes it possible for technicians on site to carry out efficient maintenance and repairs. All necessary diagnostic functions for error localization, troubleshooting and the commissioning of individual components or entire vehicles are supported.

THREE TOOLS, ONE GOAL: FAST, EFFICIENT DIAGNOSTICS IN AFTER-SALES SERVICE

With the aim of making diagnostics as efficient as possible and thus saving time, the Softing TDX toolbox enables optimal tool support for the independent creation and maintenance of a diagnostic tester in all phases of the DESIGN - MANAGE - WORK workflow. The development environment Softing TDX.studio makes it possible to create repair shop testers independently and completely freely in terms of the look & feel as well as user guidance.

The interface for Softing TDX.workshop is created, processes and diagnostic data stored, additional information, such as repair instructions, exploded drawings, videos and web content integrated and languages defined in Softing TDX.studio. The diagnostic data and processes initially created during engineering can be reused.

Softing TDX.admin is the administrator tool for the implementation of integrated user management. This is done userspecifically based on certificates. Mandatory release management can also be controlled centrally using the Manage components of Softing TDX.



▲ *Fig.: Authoring System (Softing TDX.studio) – Distribution of Diagnostic Projects (Softing TDX.admin) to Individual Diagnostic Testers (Softing TDX.workshop)*

The repair shop tester itself is based on the Softing TDX.workshop framework which is parameterized via Softing TDX.studio. The result is from one source and can be completely designed to suit individual corporate designs (CD). Softing TDX.workshop optimally supports mechanics and service technicians during the commissioning as well as error localization and troubleshooting of individual components or entire vehicles. Depending on the error symptom, the approach to diagnostics can be ECU-, symptom- or function-based. The efficient report functionality enables the central replay and documentation of activities and completes the whole picture.

YOUR OWN AFTER-SALES TESTER IN NEXT TO NO TIME

Like the creation and administration tools and the framework for the after-sales tester, GUI templates are an integral part of the whole after-sales solution These templates cover the most common use scenarios such as:

- the identification of the vehicle or ECU,
- access to the error memory,
- the display of measurement values and
- the updating of the ECU software.

Both the user interface and the underlying operating logic and diagnostic processes are implemented and serve as the basis for further development of a company's own after-sales tester. Simultaneously, the ideal implementation of further diagnostic use cases can be derived on the basis of the templates.

DEFINING AND ADAPTING TESTER CONTENT

With Softing TDX, the highly individual content in the Softing TDX.workshop repair shop tester is very easy to configure and the display of the functions can be defined user specifically. The configuration of the repair shop tester takes place using Softing TDX.studio during the DESIGN phase.

Softing TDX.studio makes it possible to design the user interface completely freely with entire functions being separated. This is a definite advantage, particularly for companies that unite several brands under one roof. Modern technologies and an intuitive editor tool considerably facilitate the design of the interface and let a modern look & feel emerge, as is standard in today's web applications and also something familiar from vehicle dashboards of concept cars. The workflows for the repair shop tester, which are also freely definable in terms of structure and hierarchy, make it possible to implement a unique operating concept. Additional information, such as repair instructions, exploded drawings, videos and external web content, which support the mechanic during maintenance and the repair of vehicles and working machinery, are easy to integrate in the repair shop tester. It is also possible to assign different language IDs to the content of the distribution packages so that the packages are available in the required languages. In particular, the final specific encryption of the projects provides an extremely high level of security and protects the intellectual property. Once all the components of the project have been compiled in terms of diagnostic data, diagnostic sequences, interface, language and other documents for the service technicians, Softing.TDX provides optimal support for roll-out and release management with the connection to existing backend systems.

Templates and wizards support the Softing TDX.studio operator perfectly here. The result of working with the design tool is a consistent distribution package that can be made available for each diagnostic tester in worldwide use via the customer backend and released separately.

▲ *Fig.: Softing TDX.workshop*

▲ *Fig.: Softing TDX.studio*

USER MANAGEMENT INCLUDED

When it comes to an end-to-end solution, user management is mandatory for applications in after-sales. This includes all activities of administrators concerning the management of users and functions of the entire after-sales solution. In particular, the assignment of access rights to systems, functions, services and applications plays a major role.

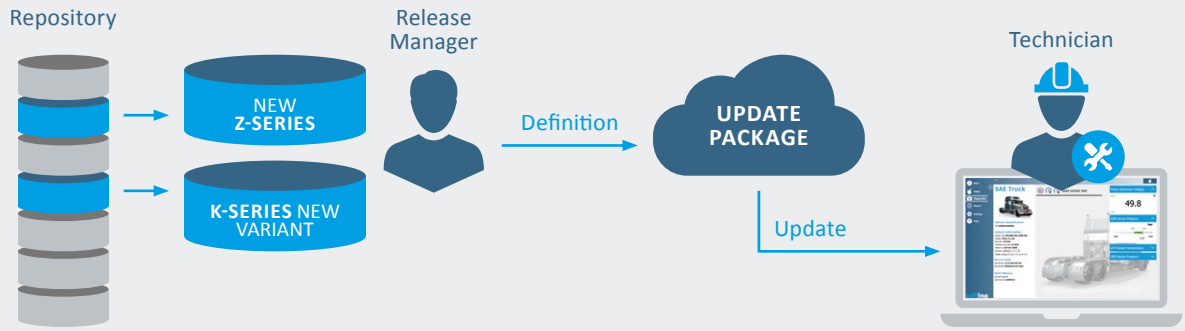
Among other things, Softing TDX.admin makes it possible to define roles and user-specific rights of the operators of the Softing TDX.workshop repair shop tester. A high degree of flexibility is ensured by the distinction between program functions and project functions, which are activated user-specifically and regulate the user rights in the repair shop tester using role keys. Management is taken care of by a central database (role and user database, RUDB), with which the role keys and certificates can be automatically distributed and maintained in the field. The database is also responsible for the update of software and content.

▲ *Fig.: Softing TDX.admin*

Additional functions, such as saving vehicle data (vehicle history) in the backend, are taken care of using the Softing TDX server component. Based on a dedicated platform, it seamlessly integrates into existing IT infrastructures and can be deployed either on the premises or in the cloud under both Microsoft Azure and AWS.

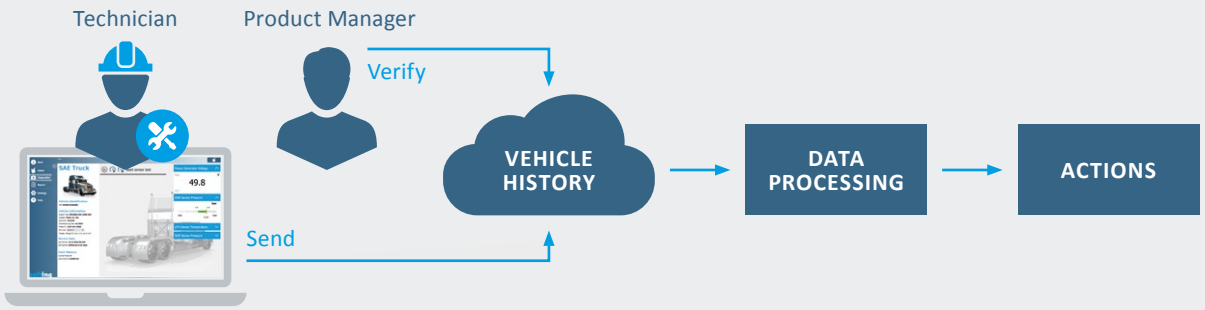
USE CASES

CONTROL OF MANDATORY OR OPTIONAL SOFTWARE UPDATES



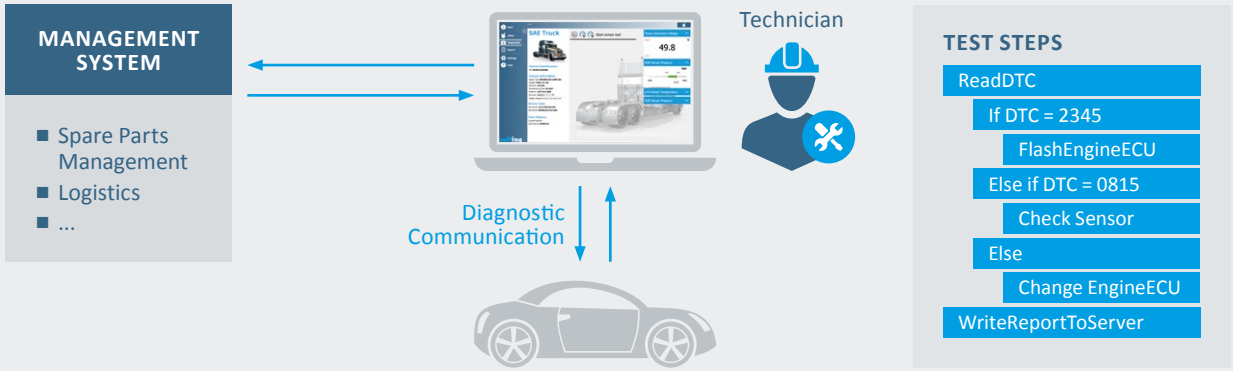
- The release manager defines and controls software update packages and indicates whether these are mandatory (e.g. service pack) or optional
- Softing TDX.workshop automatically calls up updates in the backend

CREATION OF A VEHICLE HISTORY



- Softing TDX.workshop transmits the vehicle data to the backend
- The data contains all diagnostic steps carried out by the technician
- The vehicle data is saved in a database
- Further data processing and analysis are possible

GUIDED DIAGNOSIS FOR FASTER REPAIR AND MAINTENANCE PROCESSES



- Softing TDX.workshop contains instructions and guidelines for technicians
- Helps with fast maintenance and repairs
- Reproducible sequences
- Clear documentation

PRODUCTS

Softing TDX.studio	Design tool for creating the user application Softing TDX.workshop incl. user interface, user guidance and diagnostic methodology.
Softing TDX.workshop	Service application for technicians for swift execution of repairs and maintenance of vehicles.
Softing TDX.admin	Backend administrator tool for managing roles and user rights, and for controlling international deployment.
Consulting and training	We offer support in the subjects of diagnostics, ODX, OTX and on using Softing TDX – all available as general training sessions or alternatively specially adapted to suit customer requirements.

SOFTING SDE

Softing Smart Diagnostic Engine – platform-independent runtime system for diagnostic functions, sequences and services over the entire life cycle.

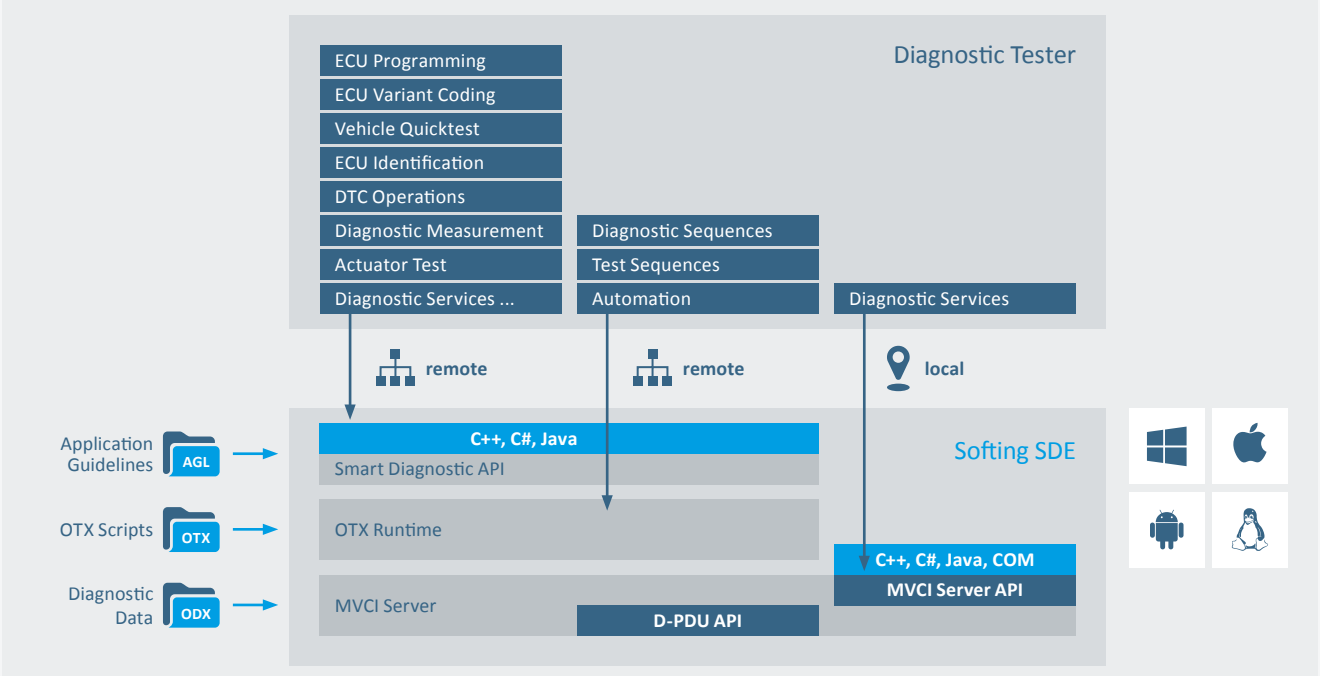
AREAS OF APPLICATION

- **Engineering:** as the basis for diagnostics or programming for test systems in the lab, at test assemblies or in engineering fleets
- **Testing:** as an independent automation component integrated in test benches or HiL test systems
- **Manufacturing:** as an end-of-line update and test system, for automated programming stations or in independent flash applications during vehicle shipping
- **After Sales:** integrated in the repair shop tester or as a component for diagnostics in the back end

BENEFITS

- Accelerated implementation of proprietary engineering or repair shop testers thanks to simplified API and reduced familiarization time
- Platform-independent use of the SDE under Windows, Linux, Android and iOS throughout the life cycle
- A single component for diverse requirements of today's diagnostic tasks
- Remote access and thus future-proof use for, e.g., SOTA use cases
- Depending on the degree of automation, can be used with or without user interface
- Continuous reuse of diagnoses, projects and sequences already created
- Integration of components already available, even external ones, such as Java Jobs
- Performant diagnostics through special runtime format

Softing´s Smart Diagnostic Engine (SDE) is a high-performance runtime system which interprets and runs simple diagnostic services and even complex and automated diagnostic sequences. It is based on the Softing Diagnostic Base System and uses the standardized diagnostic formats ODX and OTX and extends these with a simple to operate API. The SDE, which can be used modularly and independently of the platform, is implementing a paradigm shift in diagnostics. The additional Smart Diagnostic API focuses on the function-oriented application of diagnostics without requiring in-depth diagnostic knowledge. Simultaneously the SDE makes it possible to access the API interface 'remotely'. At the same time it continues to support all relevant diagnostic protocols and bus systems. The fact that it does not depend on a specific platform results in continuous reusability in the product life cycle.



▲ *Fig.: Setup and Components of the Smart Diagnostic Engine (SDE)*

ODX/OTX RUNTIME SYSTEM

Incredibly High-Performance, Low System Requirements, with UDS, OBD and J1939 Sample Templates.

The SDE is based on the Diagnostic Base System and is a high-performance runtime system which serves both diagnostic communication over individual services (ODX) and complex diagnostic sequences (OTX) extremely efficiently. The support of all standard diagnostic protocols and standards, such as UDS, DoIP, J1939, KWP, OBD and D-PDU API, as well as the bus systems CAN/FD, Ethernet and LIN over Vehicle Communication Interfaces (VCI) is part of the basic scope of the SDE. Simulated communication over a virtual interface is also available for first tests. Depending on the VCI used, the SDE enables parallel communication with several ECUs. This facilitates the simple parallel flashing of ECUs, for example.

Thanks to its low system requirements and high performance, the Softing SDE is not only suitable for PC use but also for embedded systems. The runtime formats also contribute to this. These are used depending on the required data process and also have extreme data reduction to offer. The delivery scope includes templates and examples for an even simpler and faster use of diagnostics. These templates include a sample project for UDS on CAN and UDS on IP each with 3 sample ECUs as well as templates for OBD and J1939 equipped with the current services defined in the standards. If required, these are very easy to adapt and extend.

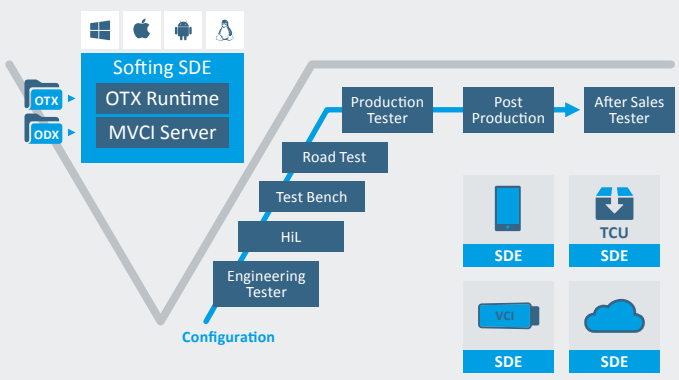
OTX (ISO 13209)

Automates Diagnostic Sequences and Tests.

OTX compliant with ISO 13209 is a fixed component of the Softing Diagnostic Base System and the Smart Diagnostic Engine. Even complex OTX sequences can be run very efficiently with the Softing SDE as runtime environment. The SDE is suitable both for complex diagnostics and for generic test cases in test systems. Additionally, Softing-specific extensions simplify the handling of methods and the use of diagnostic sequences. When using automated test environments (e.g. Hardware in the Loop - HiL), full access to the API is not always necessary. The SDE can be accessed efficiently and precisely via the command line for this purpose.

DIAGNOSTICS WITH HIGH DATA SECURITY

The ODX data used can be processed securely with the Smart Diagnostic Engine. If required, the ODX database can be encrypted for a specific client so that only approved users can use this data. This is safeguarded with additional licensing information and protects corporate knowledge from unauthorized access. The same is true of the OTX scripts which can also be encrypted.



▲ *Fig.: Using Softing SDE in the Life Cycle – Flexible, Mobile, Automated, Platform-Independent*

FUNCTIONS

- Vehicle quick test incl. status report
- ECU variant identification
- Reading out and clearing the error memory (DTC)
- Exchange and (re-)programming of ECUs
- ECU coding
- Reading out and saving measurement values using diagnostic services
- Setting and evaluating actuators
- Automating flash processes and function tests (with and without UI)

SHORT ENGINEERING TIMES THANKS TO FUNCTIONAL API ACCESS

With the help of the reduced and thus very easy to use Smart Diagnostic API (SDA), diagnostic functions can be integrated extremely efficiently into any test system. The SDA intelligently encapsulates several diagnostic service calls or entire sequences into proprietary functions and thus considerably reduces the complexity of the actual test. It is no longer necessary to have complete knowledge of the diagnostic implementation, something that avoids long familiarization times. At the same time, error-proneness is also considerably reduced as the diagnostic functions are always defined identically. In addition, the maintenance of the test is much less expensive as the test does not have to be changed for new ECUs or variants.

The runtime system is usually accessed via the SDA which is available in C++, C# and Java. An alternative for expert systems is that programming can take place directly on the ASAM MCD-3D/ MVCI Server API in compliance with ISO 22900-3.

MONITORING FOR DOIP AND PARALLEL REMOTE ACCESS

Softing SDE is ready for the increasing use of Ethernet in vehicle communication. It is not only possible to record communication on tried and tested vehicle buses (trace); the DoIP communication can also be monitored and recorded. The monitor at PDU level incl. an efficient message filter also improves user handling.

The possibility of establishing connections remotely has been taken into account in the Smart Diagnostic API functionality from the outset and is available for corresponding areas of implementation. The application is based on common standards from network technology. One key requirement is the multi-client scenario for simultaneously accessing several applications. Softing SDE detects and manages simultaneous calls without disturbing or interrupting important communication with a client.

VARIOUS TARGET PLATFORMS IN THE LIFE CYCLE

The SDE is implemented in C++ and can thus be made available for all platforms relevant today (Windows, Linux, Android and iOS). It is therefore not just an integral part of the DTS9 Windows applications (engineering tester) or Softing TDX (repair tester in After Sales), but also implements diagnostics in the test bench or as an embedded version in vehicle TCUs, in data loggers or in Vehicle Communication Interfaces (VCI). Even mobile diagnostic applications can be implemented consistently with Softing SDE and as an extension to existing applications and configurations.

Delivery Packages Softing SDE

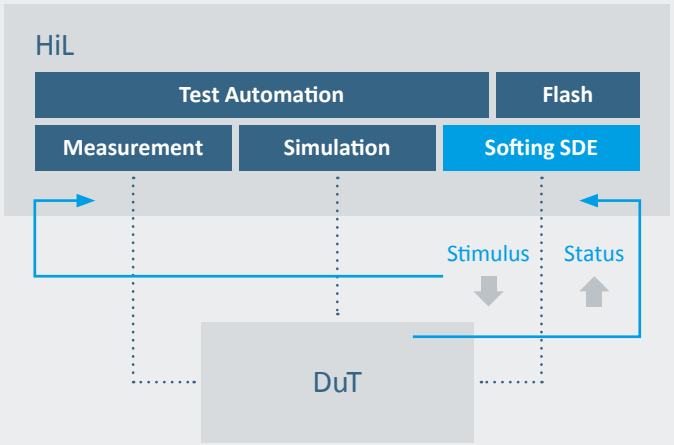
PRODUCTS			
SCOPE AND FUNCTIONS	Softing SDE		
	Softing SDE.**mvci**	Softing SDE.**base**	Softing SDE.**professional**
ODX runtime system and MVCI-Server incl. access to the MVCI Server API	•	•	•
OTX runtime system incl. API access, automation functional API: Flashing, coding variants, identification, DTC, vehicle quick test, measurement values (diagnostics), OBD, actuators *		•	•
Remote capability via access of the functional API, thus also remote execution of OTX scripts			•

* implementation of diagnostic functions is OEM specific

USE CASES

HIL-INTEGRATION

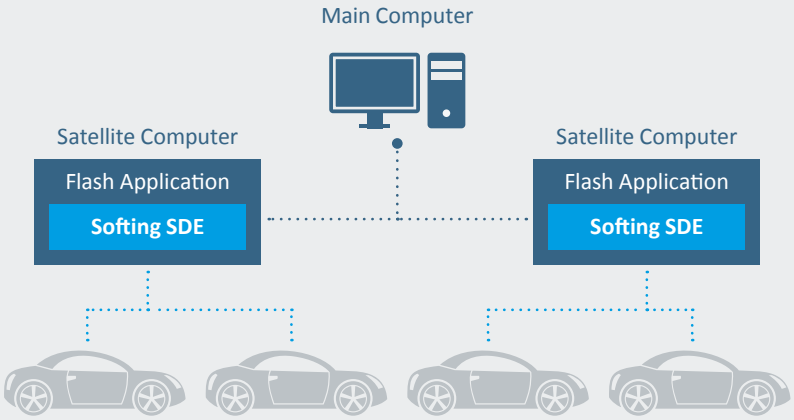
- Simple integration, even in existing assemblies: selfexplaining API, multiple operating systems
- Execute stimulus to trigger device under test
- Request status (internal variable, DTC, DTC status, etc.
- Update DuT via flash programming: one device for all diagnostic functions



▲ *Fig.: Use of the Softing SDE in HiL integration*

USE IN MANUFACTURING

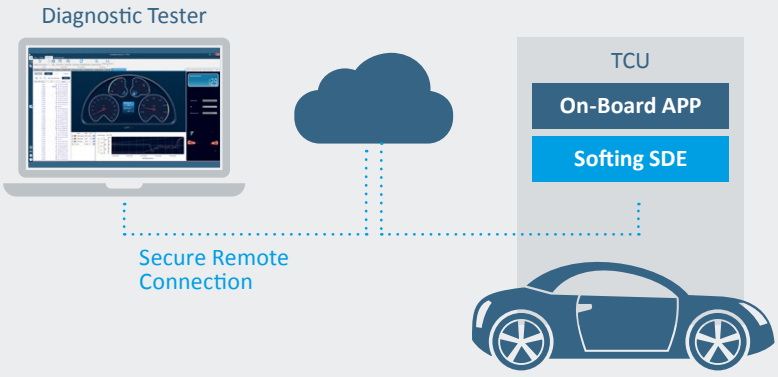
- Remote control of diagnostic functions via main computer
- Inline diagnostics: flash programming, check out, etc.
- Multiple vehicles in parallel
- Platform independence



▲ *Fig.: Use of the Softing SDE in production*

INVEHICLE

- For onboard testers and remote control
- Small footprint allows integration into vehicle
- One data process from engineering to series
- All diagnostic functions available



▲ *Fig.: Softing SDE integrated in the vehicle*

SOFTING DTS.VENICE

Powerful authoring system for ODX 2.2 and 2.0.1 for diagnostic experts and developers of vehicle ECUs.

AREAS OF APPLICATION

- Description and validation of diagnostic functions and ECU communication
- Data interoperability test
- Provision of test data for integration and system test
- Data adaptation in production preparation and for use in repair shop testers

BENEFITS

- Efficient creation of the diagnostic specification thanks to assistant support in data entry
- Greater data quality thanks to testing of both syntax and semantics
- Data consistency over the entire process chain thanks to standard tool with central database (single source)
- Considerable cost saving thanks to the possibility of importing existing data descriptions and early error detection
- Shorter approval process as suppliers can test conformity with the OEM regulations themselves

Softing DTS.venice enables the convenient creation, testing, management and maintenance of diagnostic specifications over the entire process chain for OEMs, system and ECU suppliers.

SIMPLE CREATION OF ODX DATABASES

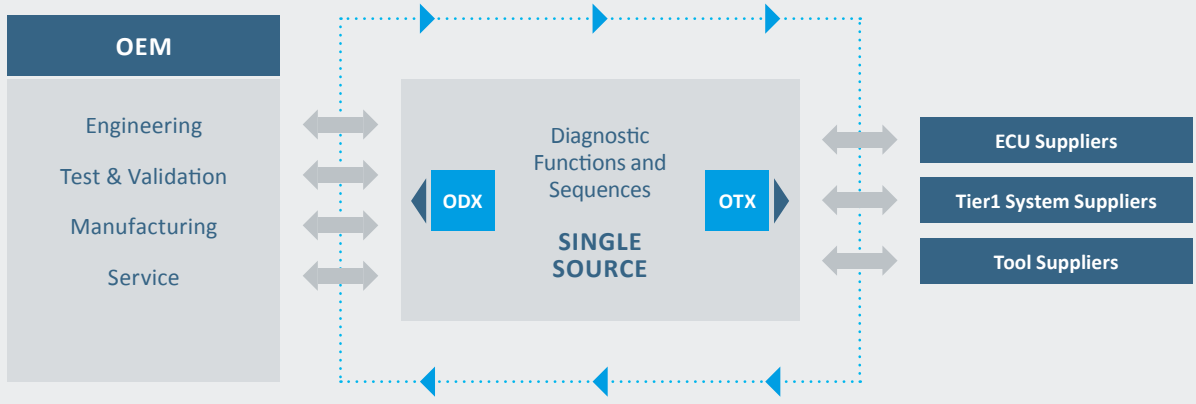
Softing DTS.venice is part of the Diagnostic Tool Set product family and is based on the Diagnostic Base System. Venice stands for Vehicle Communication Database Editor. New databases can be created both on the basis of existing ODX/PDX files and of supplied protocol templates. The delivery scope still includes sample authoring with three ECUs, detailed documentation and a tutorial.

CONVENIENT PROCESSING OF ODX DATA

A start page enables fast and simple access to the functions required most frequently. The entire ODX data model can be edited in the editor's expert view. The ECU view provides a simplified view of the most important data of a single ECU as well as its variants. Diagnostic description inheritance is visualized graphically. Assistants are available to help with data input. Both working with ECU shared data and the simultaneous editing of several databases are supported. The diagnostic specifications created can be issued as RTF files for documentation purposes. In Demonstration mode, ODX databases can be viewed without a license.

TOP DATA QUALITY FROM THE OUTSET

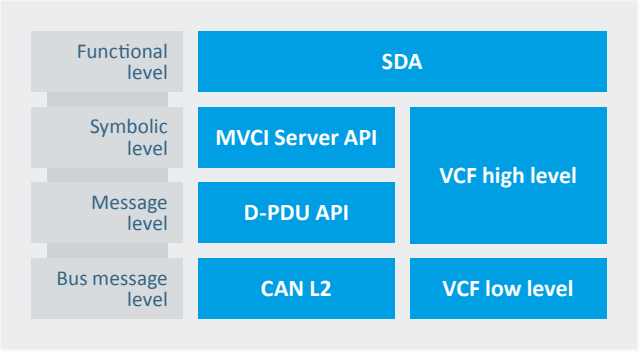
The ODX databases of modern vehicles are highly complex and become more so during their lifetime due to additional variants, maintenance measures and function extensions. Softing DTS.venice ensures the consistency and completeness of the database at all times. Formal checks ensure basic compliance with the ODX standard and optionally with the ASAM ODX Recommended Style. Extensions by user-specific authoring guidelines are possible. Diagnostic Functions and Sequences SINGLE SOURCE Engineering Test & Validation Manufacturing Service OEM ODX OTX



▲ *Fig.: Softing DTS.venice Authoring System for Creating, Testing, Managing and Maintenance of Diagnostic Specifications*

PROGRAMMING INTERFACES

Depending on the particular use case, as well as customer-specific and country-specific regulations and conditions, different programming interfaces are deployed to access diagnostic systems. While the standardized D-PDU API is used with an MVCI Server compliant with ISO 22900, a PassThru interface compliant with SAE J2534 is often required for applications on the open market. A CAN-API on Layer 2 is also the right choice for pure CAN communication. For a large number of measurement tasks, bus analysis as well as residual bus simulation, highperformance middleware is available in the form of the API of the Vehicle Communication Framework VCF. The SDA enables functional access – also via remote routes.



SDA

The Smart Diagnostic API provides functional access to vehicle information. In the context of a service-oriented architecture, this means that information can be accessed regardless of the source. This – usually diagnostic – information is processed in a self-contained manner by the Softing SDE and can thus also be called up with remote access even in the case of poor network connections.

MVCI SERVER-API

The MVCI Server API (ASAM MCD-3D, ISO 22900-3) provides a symbolic interface to diagnostic content. It can be used to access diagnostic services specifically for individual ECUs or ECU networks. The results are returned as values in human-readable form. ECUs can be accessed in parallel, also via several ECUs and several VCIs.

VCF API

For VCIs of the VIN|ING family, there is an API for the Vehicle Communication Framework (VCF) which makes it possible for an application to communicate in parallel with several vehicle buses. This enables the execution of diagnostic and onboard communication on a VCI with a range of focuses. This includes residual bus simulation for one or more ECUs and extensive possibilities for measuring tasks, data logging and bus analysis. The cross-platform VCF API can be used with Windows, Linux, Android and iOS.

D-PDU API

The MVCI concept includes not only the API for the diagnostic server and a modular VCI, but also the software interface for VCIs. In addition to the modularity, advantages of using a VCI with the D-PDU API are the simple integration into the application (or into an MVCI Server), which is then relieved of complex protocolspecific mechanisms (e.g. FlowControl, segmenting). The handling of communication parameters and bus properties is fully encapsulated in the D-PDU API. Diagnostic functions are implemented using LogicalLinks with the sending and receiving of messages. This enables communication with several ECUs even when using various bus systems. What are referred to as IO control functions make it possible to access the extended functionality of the VCI (e.g. ignition verification or other inputs and outputs).

SAE J2534 API

The SAE J2534 API (or PassThru for short) is a standardized interface for diagnostic communication and for programming ECUs in the car sector. In conjunction with a corresponding hardware interface, the manufacturerindependent API enables ECUs to be accessed. The applications to be made available by the OEMs and a PassThru device will enable independent repair shops to reprogram ECUs regardless of the manufacturer. OBD user acceptance tests are a further use case.

CAN LAYER 2

The CAN Layer2 API is a software interface which enables the sending and receiving of CAN telegrams on Layer 2 of the OSI Model. The application can access the CAN Layer2 API directly as a low-level interface. Alternatively, the CAN Layer2 API can be used in combination with the Softing D-PDU API. This means that all diagnostic protocols supported by the D-PDU API can be used for diagnostic communication over the CAN bus.

SOFTING VCF

Vehicle Communication Framework.
Highly efficient middleware for all areas of implementation in vehicle communication.

AREAS OF APPLICATION

- ECU engineering
- Test environment
- Test benches
- Production tester
- Service tester

BENEFITS

- Cost saving – one VCI for several functions
- Diagnostics and on-board functionality in parallel
- Suitable for multiple operating systems: Windows, Linux, Android, iOS
- The most important buses and protocols are already available as a standard
- VCI standalone – multiple functions available independent of the PC

EXTENSIVE RANGE OF FUNCTIONS

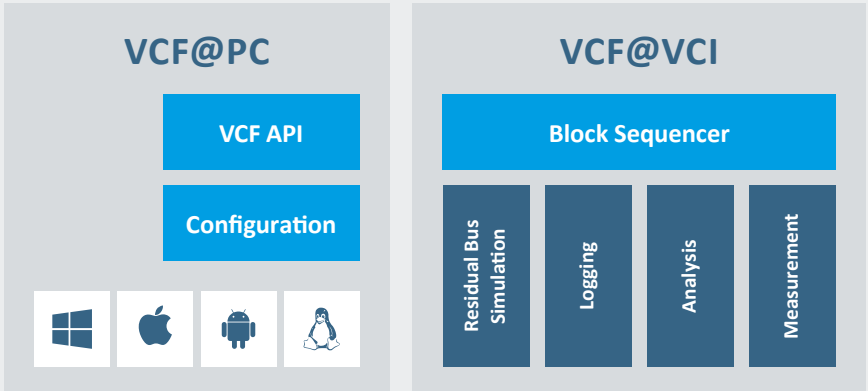
Softing VCF enables (virtually) all functions required in vehicle and ECU communication. This is how residual bus simulation can be implemented for one or more ECUs for ECU communication in the test environment. The product also offers numerous functions for the analysis of bus communication. Measuring using bus communication enables the acquisition of the messages and signals available on the bus. Furthermore internal ECU measurement data can be acquired via the mechanisms defined in the XCP and CCP protocols. Additionally it is possible to record values acquired as well as the communication data. The block sequencer ensures cross-functional performance control with the possibility of responding to results. The only requirement is that an appropriate script be developed in „C“ and loaded into VCF.

WIDE RANGE OF CONFIGURATION POSSIBILITIES

Conventional configuration methods can be used depending on the communication function and bus system. This means A2L files in accordance with the ASAM standard ASAM MCD2-MC are usually used for measuring via XCP. Measuring and bus analysis use the LDF or FIBEX format on the LIN bus; AUTOSAR is also used for FlexRay or Ethernet. The wellknown DBC format (CANdb) can also be used on the CAN.

NUMEROUS PLATFORMS

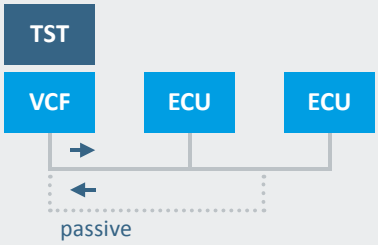
VCF is currently supplied with support for the VCIs of the HS family, in particular the HSX in its various housing variants as well as the HSC with integrated OBD connector. Forthcoming VIN|ING VCIs with product numbers from 1000 will also be available with VCF support from the outset. Operating system support is provided as a standard for Windows, Android, Linux and iOS.



▲ *Fig.: Softing VCF*

Use Cases for Softing VCF

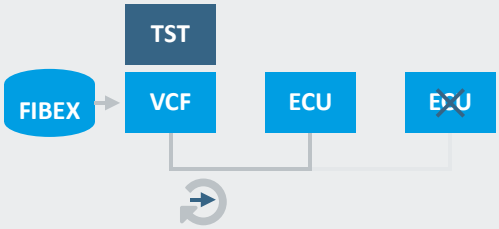
There are various communication tasks within test systems. Softing VCF, in combination with a suitable VC, is the universal partner. It is used both for simple communication tasks at message level as well as for residual bus simulation and various measurement tasks.



Bus communication: monitor, stimulation

BUS COMMUNICATION

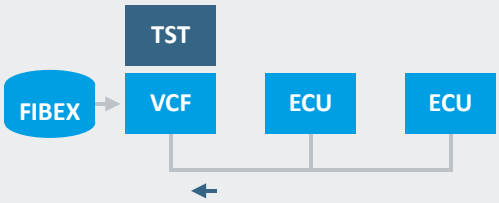
Work is often carried out directly with hex messages on bus layer 2. Monitoring takes place for example to validate communication or record data (data logging). Furthermore, sending (stimulation) triggers dedicated ECU behavior.



Residual bus simulation – ECU replaced by tester

RESIDUAL BUS SIMULATION

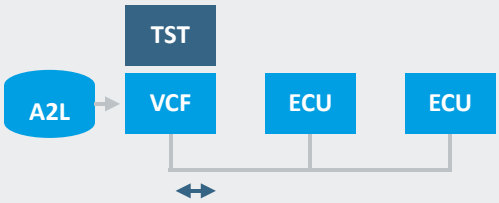
It is often the case in engineering that relevant ECUs are not available for correct system functioning. These have to be simulated in terms of their bus behavior. This is achieved by the cyclical sending of a message on the bus without changing a signal (static residual bus simulation) or as dynamic residual bus simulation with automatically changing values.



Direct measuring

MEASURING (1)

In many cases, individual physical variables can be used in the test system exactly as they come from ECU communication. Conversion takes place using formal data descriptions such as CANdb, FIBEX or Autosar System XML.



XCP

MEASURING (2)

If ECU-internal or time-synchronous variables are to be evaluated, this usually takes place using the XCP protocol (eXtended Calibration Protocol). The physical variables are parameterized and interpreted using the A2L format (ASAM MCD-2MC).

HARDWARE INTERFACES

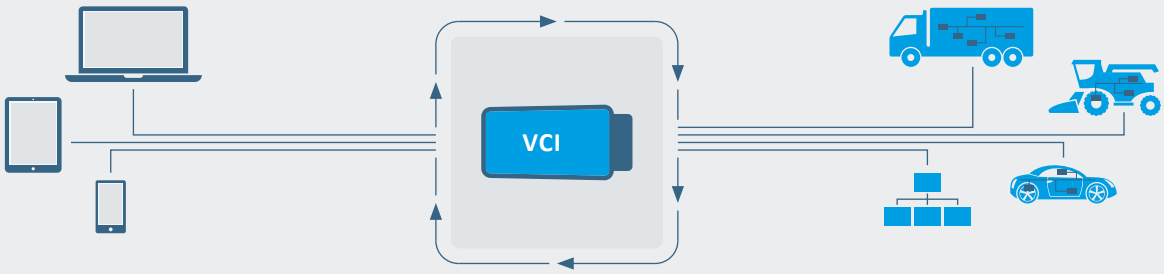
Wide Range of Vehicle Communication Interfaces for all Applications across the Entire Process Chain.

As the link between an application and the physical interface to the vehicle, vehicle communication interfaces (VCIs) are the basis of all kinds of communication and diagnostic applications. The VCIs from four product families are made available in different performance classes and with specific features and interfaces for the use cases. The wellestablished programming interfaces (APIs) are made available to users for access via customer-specific or third-party applications.

The interfaces of the VIN|ING family are oriented toward the latest trends. Innovative vehicle communication concepts are easy to implement with a hardware design tailored exactly to the tasks. The diagnostic interfaces of the EDIC family are based on a 16-bit microcontroller platform and are predestined for use in the medium performance range for diagnostic tasks and flash applications with a range of ECUs. The communication interfaces of the CAN family make it possible to integrate send and receive tasks in all kinds of applications. Alternatively, the VCIs can also be operated with the D-PDU API for simple diagnostic tasks.

		ENGINEERING		
HIGH END		VIN|ING 3000 / 6000 (on project request)		
	Vehicle Interface	2-8 x CAN/FD, 1-4 x K-line, DoIP, IOs		
	PC Interface	USB / LAN		
	Housing	Ruggedized		
MID RANGE		VIN|ING 1000		
	Vehicle Interface	1-2 x CAN, 1-2 x K-line		
	PC Interface	USB		
	Housing	Ruggedized		
STANDARD		CANpro USB	USBcanPro2 xHS	USBcan II HS/LS
	Vehicle Interface	1 x CAN	2 x CAN/FD	2 x CAN (HS/LS)
	PC Interface	USB	USB	USB
	Housing	Ruggedized	Standard	Standard

VEHICLE COMMUNICATION INTERFACE



Application

Test System / Vehicle

MANUFACTURING	AFTERSALES SERVICE
VIN|ING 2000	**VIN|ING 2000**
2 x CAN/FD, 1 x K-line, DoIP	2 x CAN/FD, 1 x K-line, DoIP
USB / LAN / WLAN	USB / LAN / WLAN
Standard	Standard

VIN|ING 2000	**VIN|ING 1000**
2 x CAN/FD, 1 x K-line, DoIP	1-2 x CAN, 1-2 x K-line
USB / LAN / WLAN	USB
Standard	Ruggedized

CANpro USB	**U100**	**CANpro USB**	**U100**
1 x CAN	1 x CAN/FD	1 x CAN	1 x CAN/FD
USB	USB	USB	USB
Ruggedized	Ruggedized	Ruggedized	Ruggedized

Find the VCI that fits your use case by using our „**VCI Finder**“ and filtering by application area, application and vehicle interface, and communication protocol.

EDIC-INTERFACES

EDIC family for use in the medium performance range.

AREAS OF APPLICATION

- Diagnostic applications
- Test and validation
- Fast and reliable flash programming
- Functional ECU tests and communication tests
- Suitable for cars and commercial vehicles

BENEFITS

- VCIs tailored to the different areas of application
- Data preprocessing and protocol handling in the interface
- Several independent communication channels for CAN and K-line
- Intelligent data buffering for parallel communication channels
- Large number of standardized and OEM-specific vehicle protocols available
- Galvanic isolation

The diagnostic interfaces of the EDIC family are based on a 16-bit microcontroller platform and are predestined for use in the medium performance range for diagnostic tasks and flash applications with ECUs over CAN and K-line. The EDIC platform has proved itself over time and is characterized by its stable runtime behavior and the implementation of a large number of standardized and customerspecific diagnostic protocols.

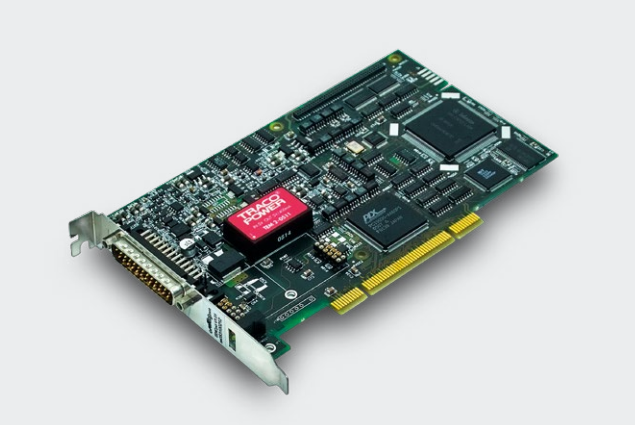
THE RIGHT VCI FOR EVERY USE CASE

The Multibus VCI EDICusb is particularly suitable for using heterogeneous on-board electrical systems with CAN bus, K-line and LIN bus, and enables universal implementation in engineering and testing. EDICpci is a versatile interface and is primarily used in stationary applications thanks to its highperforming internal link via the PCI bus.

STANDARDIZED AND POWERFUL PROGRAMMING INTERFACES

The diagnostic protocols are handled directly in the interface. This ensures fast response times and reliable real-time behavior regardless of the PC operating system.Extensive buffer mechanisms make parallel operation of several communication channels possible. By combining several diagnostic interfaces, the number of communication channels available on the PC system can quickly be adapted to the relevant application. The VCIs can be updated with software upgrades and are thus always equipped for future applications. This is also the way to realize customer-specific software solutions. With many VCIs, the CAN bus physics can be varied by using piggybacks or by switching the CAN bus physics. Based on the D-PDU API as a standardized programming interface, the Diagnostic Tool Set DTS from Softing can deliver a complete solution compliant with the MCD-3D standard (ISO 22900-3) and ODX technology.

▲ *Fig.: EDICusb, Multibus VCI with USB interface for use in engineering and testing*



▲ *Fig.: EDICpci, High-performance VCI with PCI interface for stationary applications*

CAN-INTERFACES

Communication interfaces for simple send and receive tasks.

AREAS OF APPLICATION

- Ordinary communication tasks
- Diagnostic applications for manufacturing and after-sales service

BENEFITS

- Active card with its own microcontroller
- Local data buffering and preprocessing in the interface
- Galvanic isolation
- Stable runtime behavior due to well established use

The communication interfaces of the CAN family make it possible to integrate send and receive tasks in all kinds of applications. Alternatively, the VCIs can also be operated with the D-PDU API for simple diagnostic tasks.

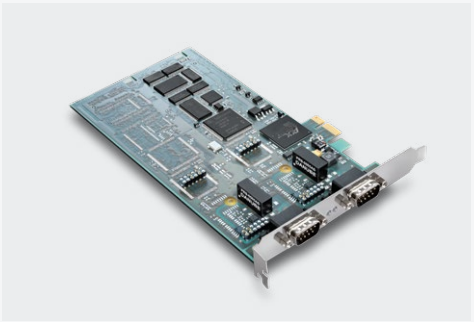
DIFFERENT VCI DESIGNS

CAN communication interfaces are an inexpensive alternative to diagnostic interfaces. The devices are available with different interfaces to the host PC and are equipped with one or two CAN channels. CANpro USB is the successor to the tried and tested CANusb and is suitable for all kinds of use cases as a universal VCI with USB high-speed interface. CANAC2- PCI and CANpro PCIe are available as PC plug-in cards for stationary use cases with one or two CAN channels both with CAN high-speed and CAN low-speed. The CAN interfaces of our cooperation partner Kvaser complement the product range with cost-effective CAN interfaces with one or more CAN/FD channels.

POWERFUL PROGRAMMING INTERFACES

The communication software of the CAN API provides highly efficient communication mechanisms for CAN applications. Local data buffering and preprocessing on the VCI result in high performance and a reduction of time-critical tasks for the PC. Combining one of the CAN communication interfaces with the appropriate API software enables compact solutions for all kinds of communication applications. The CAN API thus supports reliable CAN communication on layer 2 in a simple way. For real-time applications, the very comprehensive and flexible CAN Layer2 API supports different object buffer modes and an FIFO mode, which is particularly suitable for linking higher protocol layers. The optional D-PDU API software makes communication channels with higher diagnostic protocols available to applications via the standardized API and thus relieves the application of standard tasks.

▲ *CANpro USB: One-channel CAN interface with sturdy aluminum housing and USB port*



▲ *CANpro PCI Express: One/two channel CAN interface as PCIexpress plug-in card, optionally CAN low-speed*

▲ *U100: Single channel CAN/FD interface in robust design with USB connection*

▲ *Leaf Light HS v2: One-channel CAN interface*
Leaf Pro HS v2: One-channel CAN/FD interface

▲ *USBcan II HS/LS: Two-channel CAN interface HS/LS*
USBcan Pro 2xHS v2: Two-channel CAN/FD interface

VIN|ING-INTERFACES

Interfaces for innovative communication concepts.

VIN|ING 1000

AREAS OF APPLICATION

- Universal use in manufacturing and after-sales service
- Fast and reliable flash programming
- Test and validation
- Simulation

BENEFITS

- Reliable protocol handling in the interface
- State-of-the-art, cost-effective standard VCI
- Multiple vehicle interfaces with a compact design
- Sturdy aluminum housing with protective caps
- Flexible expansion thanks to USB host interface

VIN|ING 1000 is a compact and universal VCI with a USB interface. The combination of sturdiness, compact design and attractive price makes this VCI the perfect choice for use in the manufacturing and after-sales service environment.

RELIABLE PROTOCOL HANDLING

Data preprocessing and protocol handling in the interface ensure fast response times and reliable real-time behavior. The most important communication protocols UDS (ISO 14229) and KWP 2000 (ISO 14230, ISO 15765) are supported via the standardized D-PDU API (ISO 22900-2). The VCI can also be used as a PassThru device compliant with SAE J2534. Together with our Diagnostic Tool Set DTS, an integral solution compliant with the MCD-3D standard ISO 22900-3 can be realized with ODX technology.

FUTURE-PROOF AND FLEXIBLE

The VIN|ING 1000 can be updated with a software upgrade and can be extended for a range of application scenarios via its USB host interface. If required, versions with only one CAN highspeed interface or with a sturdy, lockable USB cable are made available.

EXCELLENT VALUE FOR MONEY

The implementation of 2 x CAN highspeed as well as one ISO9141 interface in the compact and sturdy design mean VIN|ING 1000 represents unique value for money. Vehicle cables with different types of diagnostic connector are on offer for the D-SUB port.

▲ *Fig.: VIN|ING 1000*

VIN|ING 2000

AREAS OF APPLICATION

- Mobile applications in engineering, manufacturing and after-sales service
- Fast and reliable ECU programming
- Diagnostic tests and data logging in road tests
- Future-proof diagnostic solutions with DoIP (Diagnostics over IP)

BENEFITS

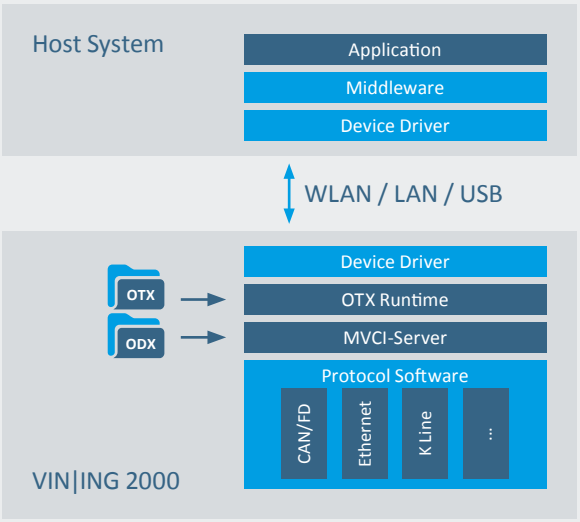
- Reliable time response thanks to data preprocessing and protocol handling in the interface
- Compact design with integrated diagnostic connector
- Maximum WiFi security thanks to enterprise authentication with certificates
- Flexible USB and LAN cables with magnetic fastening
- Option for remote applications with the integration of a diagnostic runtime system

VIN|ING 2000 is a further powerful VCI for the VIN|ING product family. With a compact design and WiFi, LAN and USB as interfaces to the host system as well as CAN and Ethernet to the vehicle, VIN|ING 2000 is particularly well suited for future-proof manufacturing and after-sales service applications.

MOBILE USE IN MANUFACTURING AND AFTER-SALES SERVICE

The WiFi interface of the VIN|ING 2000 is equipped with two separate communication channels and with IEEE 802.11 a/b/g/h/n supports the 2.4 and 5 GHz band. Current encryption technologies such as WPA2/PSK and WPA2/RADIUS as well as high-performance roaming characteristics are the prerequisite for use on the production line or in after-sales service. Furthermore the device has various Sleep/WakeUp modes and programmable function keys for interaction in diagnostic sequences. When communicating with the host PC over USB or LAN, the Mag- Code connection is a predetermined breaking point, which separates the cable connection in the case of a considerable mechanical load.

▲ *Fig.: VIN|ING 2000*



▲ *Fig.: MVCI Server on the VIN|ING 2000*

REMOTE APPLICATIONS WITH MVCI SERVER

Thanks to significant modifications of its predecessor the HSC, VIN|ING 2000 is equipped for innovative and contemporary application scenarios.High-density integrated components and a modular software architecture make it possible to run an MVCI Server on the VCI and process the stored ODX data. This makes it possible for a tester system to access vehicles remotely in a whole range of mobile applications. STANDALONE USE With OTX sequences being run on VIN|ING 2000, entire diagnostic tasks can be processed independently without a connection to a host system. This makes it possible to realize applications, such as independent programming solutions, actuator diagnostics and other control tasks, simply and at an affordable price.

VIN|ING 3000/6000 (on project basis)

AREAS OF APPLICATION

- Universal VCI for engineering, the test environment and manufacturing
- Diagnostic tests and data logging in road tests
- Diagnostics and residual bus simulation
- Measurement tasks and bus analysis with the Vehicle Communication Framework VCF
- Integration of customer applications in the interfacen with VCF

BENEFITS

- Modular communication platform for up to 2 or alternatively 6 plug-in modules
- Flexible combination of all standard vehicle interfaces
- Integration of new functions and interfaces with FPGA „software“
- Sturdy aluminum housing

The two premium VCIs VIN|ING 3000 and VIN|ING 6000 are the ideal equipment for all diagnostic and measurement tasks on vehicle bus systems in engineering and in the test environment. The modular system means the device can be configured to suit the particular use case, resulting in maximum flexibility and low costs.

HIGH-PERFORMANCE AND FUTURE-PROOF

A powerful dual core processor with 800 MHz and a large programmable logic module (FPGA) are the core for communicating with the vehicle bus systems and the associated data processing. In the FPGA, IP cores, for example for CAN/ FD and FlexRay, can be implemented which also permit future adaptations or extensions of vehicle interfaces. Furthermore additional modules, such as a graphic touch display, can be adapted using standardized interfaces. Alongside D-PDU API, the software framework VCF (Vehicle Communication Framework) makes an extensive library available for applications such as diagnostics, data logging, residual bus simulation and bus analysis.

MODULAR AND FLEXIBLE

The devices are designed for 2 or alternatively a maximum of 6 slide-in modules and permit (virtually) any combination of vehicle interfaces such as Classic CAN, CAN FD, K-Line, LIN, SENT, FlexRay and BroadR-Reach. There is a 1 GBit-Ethernet and a USB high-speed interface for communicating with the host PC. Furthermore the devices can be equipped with WiFi, GPS or additional memory via four USB host interfaces. If required, extensive Sleep/WakeUp functions, a motion sensor and the real-time clock (RTC) can be used.

SLIDE-IN MODULES

Module 1:
2 x Classic CAN/FD, 2 x K-Line/LIN/SENT, 2 x universal IOs
Module 2:
2 x Ethernet for DoIP, 2 x BroadR-Reach, 2 x universal IOs

▲ *Fig.: VIN|ING 3000*

▲ *Fig.: VIN|ING 6000*

SOFTING PDX

Pocket Diagnostics: Stand-Alone Diagnostic Solution for Your Pocket.

AREAS OF APPLICATION

- Status check on the integration board
- Vehicle programming in postproduction
- Diagnostic test during road test
- ECU update in road tests

BENEFITS

- Easy to manage, even for semi-skilled workers
- Compact solution you can always have with you
- Reuse of existing functions and data
- Automatic execution of specified sequences
- Total freedom in terms of the diagnostic tests thanks to OTX sequences

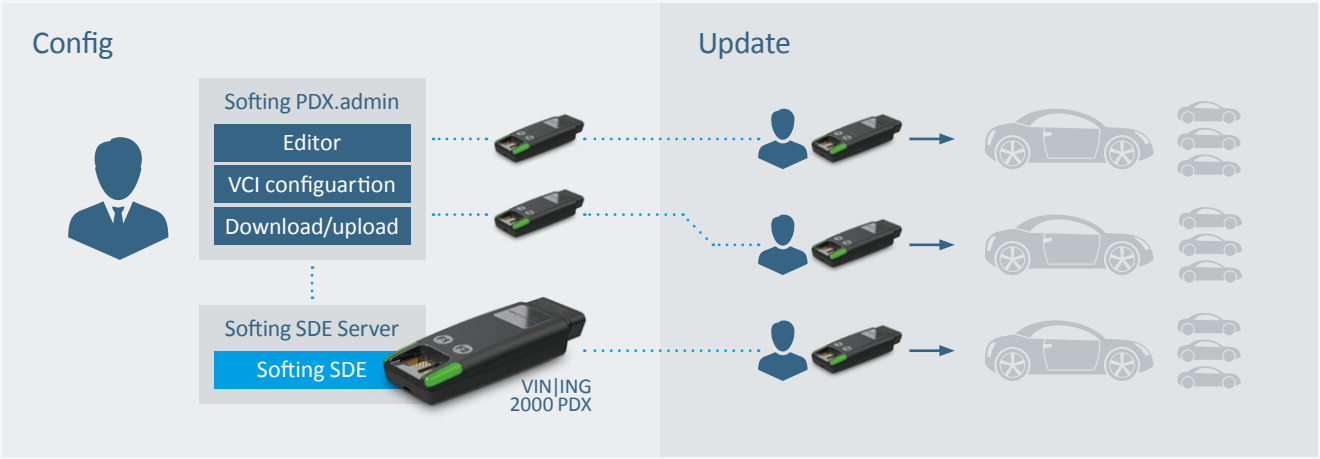
Softing PDX is a VCI with an integrated diagnostic tester which is easy to use anywhere without a PC and which applies the functions integrated in the Softing SDE.

ECU PROGRAMMING WITHOUT PRIOR KNOWLEDGE

Softing PDX makes it possible even for inexperienced users to program vehicles. All they have to do is plug the VCI into the OBD jack and the predefined programming sequence starts. The process can be controlled via RGB LEDs. A typical example of use is in parking lot flash actions where a large number of vehicles need to be updated. But the solution also proves efficient in road tests, when test drivers can automatically load new software versions into the ECUs during their breaks. Along the value chain, new software often has to be loaded onto the vehicle or individual ECUs. The normal procedure of running the diagnostic software on the PC and using a VCI – with a cable, wireless or remote connection – to initiate a software update is usually a hindrance. In these cases, the software is then too complicated, the PC too prone to repair, or the overall setting simply too expensive.

READING OUT VEHICLE STATUS – ON THE FLY

In road tests, Softing PDX shows its second strength: the execution of the predefined quick test. This can be executed, for example, during the road test with the VCI plugged in to run a cyclical check on error memory entries. However, it can also be explicitly called up before and after a test drive to document error memories and the ECU software contained. In addition to the quick test, freely implementable diagnostic tests can also be run. All you need to do is integrate an OTX sequence into the diagnostic project and link it to one of the function keys. This can then be triggered at any time as required. Results can then simply be downloaded and archived via the PC application.



▲ *Fig.: Typical Use of Softing PDX in Flash Actions*

PRODUCTS

VIN|ING 2000 PDX	Powerful stand-alone diagnostic device with integrated diagnostic server
Softing PDX.admin	PC tool for configuring diagnostic or flash operations with VIN|ING 2000 PDX

SOFTING TCS

The Configurable Diagnostic Simulation Without an ECU.

AREAS OF APPLICATION

- Test preparation in engineering, testing and manufacturing
- Tester and production system release tests
- Tester regression tests
- Recording of bus traces

BENEFITS

- Development of tests even before the ECU is available
- Clear management of variants with archiving of simulation files
- Verification of the entire communication path
- High test quality thanks to various configuration possibilities
- Best-case and worst-case tests
- Modification and exchange of the simulation via programming interface

FRONTLOADING IN TEST PREPARATION

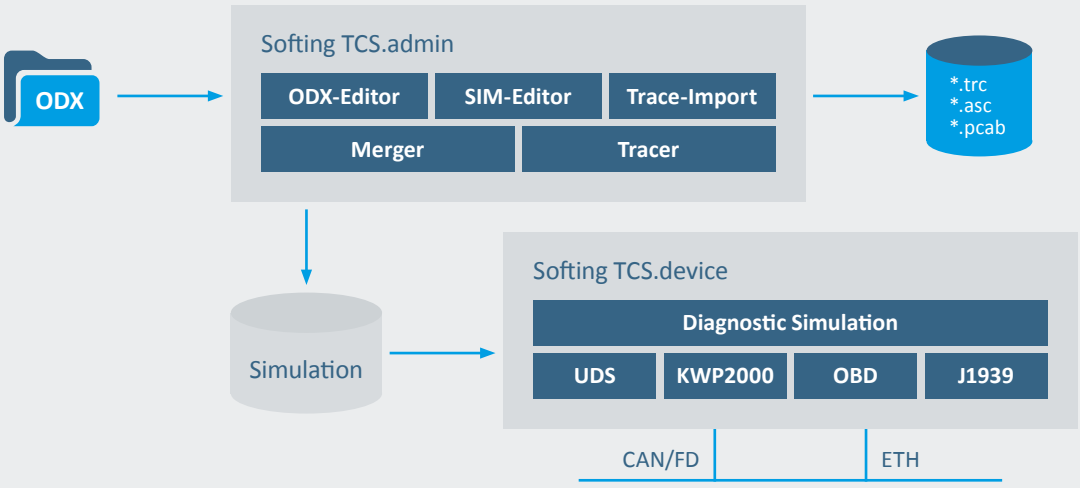
Creating test sequences is often challenging along the entire value chain: The ECU required as a test counterpart is missing. But particularly in the test environment, the test methodology should be developed at an early stage to run function tests as soon as the ECUs are available. Which means it is useful if the test sequences are already available and tested. This is simple with Softing TCS because test sequences can already be verified during ECU development. The entire communication path, including VCI and cabling, is tested to exclude all sources of error.

TESTER REGRESSION TESTS – WITHOUT CHANGING ECUS

Software updates at regular intervals ensure that diagnostic testers are assigned all the latest functions. The ECUs required for a regression test must be available in entirety and in all variants to be able to ensure sufficient test coverage. As this is usually impossible, a simulation is the required solution. With the simulation, it is easy to select ECUs and ECU variants: All you have to do is exchange simulation files in the unit. You can take care of this manually using the intuitively operable graphic user interface or conveniently in test automation with the automation interface.

TEACHING RESOURCES

Training employees is important – within the setup at OEMs, but also and especially for repair shop employees. Various vehicles of different brands are regularly required for this purpose. A simulation is a great help when it is difficult to obtain such vehicles or keep them on hand. A simulation file matching the desired model is simply imported into the simulation and the diagnosis can then be studied – in the training room and without having to use a car hoist.



▲ *Fig.: Softing TCS Function Overview*

MANUAL CREATION

For all use cases, there are suitable methods for creating simulation files fast and easily. The full range of functions can be accessed via manual creation with the help of the integrated simulation editor. Expected tester requests are assigned the correct (simulated) responses in each case. Wildcards can be used in the request to be able to deal more easily with structurally identical requests. The timing of the respective replies can be set for the responses.

In addition, simple chains of reaction are possible. For example, responses can be sent multiple times to represent cyclic services. It is also possible to send the first set response when sending a request for the first time, the second one when sending the second request, and so on. This makes it possible to simulate many special cases of diagnostic communication, even with negative responses, in a simple way.

CREATION FROM ODX

In test preparation, creation using ODX data has proven to be an efficient way to simulate. ODX represents the diagnostic specification so that matching pairs of request and response can easily be compiled using service parameter values. Input errors are thus prevented. However, in Expert mode, the input of non-specified variables is allowed in order to be able to test how the tester reacts to incorrect responses from the ECU.

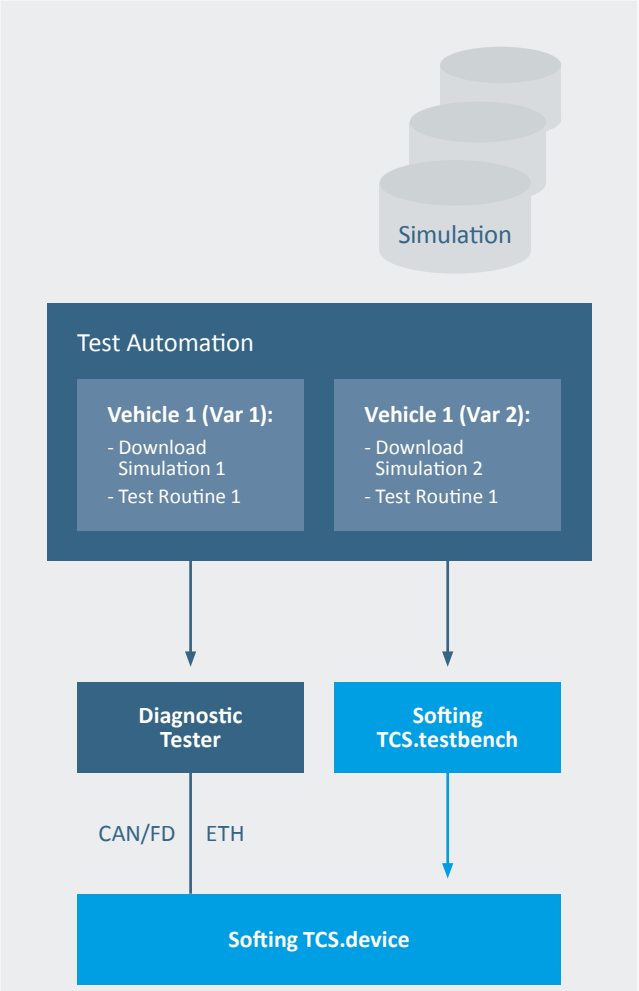
The automatic creation of simulations from ODX data is also possible. The services to be simulated are selected and the way in which the simulation is to be created is specified for requests and responses. Generation then takes place at the touch of a button.

IMPORTING TRACES

For regression tests, it has proven useful to record the real communication between the tester and the ECU or vehicle whenever you have access. It is then simple to generate the simulation from the stored traces using Softing TCS.admin. The generated simulation files can be activated manually via the user interface as well as via the automation interface in the simulation. The trace can be recorded with an external application – such as Softing DTS or Softing TDX. It is also possible directly in the TCS user interface.

MERGERS

All creation methods can be combined and flow into a simulation. This is how it is possible, for example, to take an existing simulation from TestCUBE as a basis, integrate the trace of a diagnostic session and then add the diagnostic services not used in the process via the ODX Editor.



▲ *Fig.: Use of Softing TCS in Automations*

PRODUCTS

Softing TCS.admin	Configuration and management application for diagnostic simulation
Softing TCS.device	Hardware for diagnostic simulation as a replacement for real ECUs or vehicles
Softing TCS.testbench	Programming interface for integrating Softing TCS.device into automation solutions

BASIC INFORMATION DIAGNOSTIC SYSTEMS

The following information provides an overview of protocol availability in Softing's diagnostic systems. This depends on the implementation in the D-PDU API and on the underlying ODX data, which is part of the scope of delivery for the supported protocols.

HARDWARE INTERFACES VS. VCI ACCESS INTERFACE/ APPLICATION-/TRANSPORT PROTOCOLS	DIAGNOSTIC INTERFACES							
	Softing VIN|ING 1000	Softing VIN|ING 2000	Softing EDICusb [1]	Softing EDICblue [1]	Softing EDICpci [1]	Softing HSX [1] nur im exkl. USB-Betrieb, [2]	Softing HSC [1] nur im exkl. USB-Betrieb, [2]	I+ME Actia eCOM Box [2]
ISO 22900-2/D-PDU API over CAN								
UDS/ISO14229: ISO 15765-3 on 15765-2	●	●	●	●	●	●	●	●
OBD/ISO15031: ISO 15031-5 on 15765-4	●	○	●	●	●	●	●	●
KWP2000/ISO15765: ISO14230-3 on 15765-2	●	●	●	●	●	●	●	●
KWP2000/ISO15765: ISO 11898 RAW	●	●	●	●	●	●	●	●
KW1281 over VW TP1.6		○	○	○	○			
KWP2000 light plus over VW TP1.6/2.0		○	○	○	○			
ISO 22900-2/D-PDU API over K-Leitung								
OBD/ISO15031: ISO15031-5 on 14230-4	●	○	●	●	●	●	●	
KWP2000/ISO14230: ISO 14230-3 on 14230-2	●	○	●	●	●	●	●	
KW1281	○	○	●	●	●	●		
ISO 22900-2/D-PDU API over Ethernet								
UDS over ISO 13400 (DoIP)		●					●	●

● available ○ on request

DIAGNOSTIC BASE SYSTEM

Standard conformity	■ ISO 229011/ASAM MCD2D,ODX V2.2.0 and V2.0.1 (Open Diagnostic Data Exchange) ■ ISO 229003/ ASAM MCD3D V3.0.0 application interface ■ ISO 229002/ DPDU API over CAN, Kline and Ethernet (ISO 13400 DoIP/Tester Gateway) ■ ISO 13209/OTX V2.0.0 and V1.0.0 (Open Test Sequence Exchange)
Hardware-Interfaces	Approved interfaces: see table Parallel communication: depending on type and combination ≤ eight diagnostic interfaces (more on request)
Simulated interface	Enables the diagnostic functions to be tested even without an ECU.
Protocol templates (included from basic package	As the basis for protocol tests and creating ECU authoring compliant with ISO 229002/DPDU API: ISO_14230_3_on_ISO_15765_2, ISO_14230_3_on_ISO_14230_2, ISO_OBD for Kline and CAN, ISO_15765_3_on_ISO_15765_2, ISO_14229_5_on_ISO_13400_2, WWHOBD_on_CAN (ISO_27145_3_on_ISO_15765_2)

CAN-INTERFACES [3]															PASS-THRU [3]					
Softing CANpro USB [1,2]	Softing CAN-AC2-PCI [1,2]	Softing CANpro PCI Express [1,2]	KVASER Leaf Lite/Pro HS v2 [2]	KVASER U100 [2]	KVASER Memorator Pro HS/HS [2]	KVASER USBcanII HS/LS [2]	KVASER USBcan Pro 2xHS v2 [2]	KVASER PCIcanx HS/HS [2]	KVASER PCIEcan HS/HS [2]	Vector CANcase XL/CANborad XL [2]	Vector VN 1530/1610/1611/1630(A)/1640 [1,2]	Vector VN 5610/5610A/5640 [2]	Vector VN 7600/7610/7640 [2]	Vector VN8900/IPClient Interface [2]	DG Tech DPA 5	DrewTech CarDAQ+ v1.9.13 [2]	ETAS ES 581.4	Peak PCAN	DearBorn VSI-2423 v2.04.16 [2]	BlueStreak iFlash v4.20/2.13 [2]
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[1] alternative to dongle for licensing [2] driver from supplier necessary [3] support of further interfaces on request

DIAGNOSTIC BASE SYSTEM

Editable sample database (included from basic package)	■ OBD authoring compliant with ISO 150315/SAE J1979 for gasoline/diesel vehicles ■ Sample authoring with three ECUs and detailed documentation as well as tutorial
Available operating systems (Softing VCIs)	■ Windows 7 SP 13, 8.1, 10 (WIN 10 the version tested to code freeze) (everything under 32and 64bit) ■ Linux (on request) ■ Android (on request)
General system recommendations	■ Processor: type and clock (≥ 1.5 GHz) depending on the system configuration and complexity of data ■ RAM: ≥ 2 GB – depending on ODX data ■ For hardware interface(s): PCI/PCMCIA slot, USB/LAN port, wireless LAN or Bluetooth ■ For optional dongle: USB port

TESTING

When developing vehicle components and integrating them into the entire vehicle, development engineers require a large number of electronic testing and verification systems. They also need a large number of accessories such as special cables, breakout boxes, adaptations and lots more.

These are not usually standard solutions but are the implementation of customized specifications. Due to our extensive experience in these sectors, we have built up a kind of modular system at our site in Kirchentellinsfurt. This means that even relatively specific small units and adaptations can be offered at attractive prices.

HIGH-VOLTAGE EQUIPMENT

Working Safely in the Lab, on the Testbench and on the Vehicle

PORTFOLIO

- HV measuring adapters and breakout boxes
- HV insulation fault simulations
- HV capacity decades
- Passive HV cell simulations
- Complex HiL test adapter for HV components
- HV changeover switches with liquid-cooled components
- HV supply systems with energy recovery
- HiL test systems for HV components

TEST SYSTEMS

Measuring Test Complexity – Benefiting from the Test Kit

PORTFOLIO

- Function tester
- Component and integration HiLs

COMPONENT TEST KIT

- Contacting
- Fault simulation
- Signal conditioning
- Complex simulationen (driver, environment and mechatronic simulation)
- Other test equipment (connecting cables and distributors, breakout boxes, test adapters)

TEST BOARDS

Working as if you Were Working on a Vehicle but with Full Comfort

PORTFOLIO

- Test boards
- Breadboards, component carriers
- Diagnostic assemblies
- Test tables
- Real load cabinets
- 2&3-dimensional test boards
- Functional models, demonstrators
- Funktional Mock Up Units (FMU)
- CAN Mobile
- Master jigs
- Lab Cars
- Test and simulation technology

TEST EQUIPMENT

Cables – Adapters – Simulators

PORTFOLIO

- Connecting Cables
- Contacts
- Breakout boxes
- Test adapter
- Connection distributors
- Lab cars
- IO simulations

HIGH-VOLTAGE EQUIPMENT

Testing and verification systems for electronic modules,
ECUs and vehicle components in the HV range.

AREAS OF APPLICATION

- Component development for electric and hybrid vehicles
- Testing and validation (HiL testing, Functional Mock-up Units (FMU))
- Component and vehicle testing
- Product release
- Quality assurance

BENEFITS

- Greatest possible occupational safety in all use cases
- Greatest reliability and long-term usability thanks to outstanding quality
- High-grade, robust versions designed to suit the particular area of use (dirt, climate, …)
- Permanent labeling and identification
- At least compliance with and mostly overfulfillment of relevant standards

When developing vehicle components and integrating them into the vehicle, a large number of electronic testing and verification systems are required. The development and manufacture of electric and hybrid vehicles place particularly high and diverse demands on test systems and components. As is the case when handling complex control units, the safe measuring, testing, verifying and applying in the high-voltage range require transparent and reproducible test procedures.

In an ideal case scenario, tests and verifications should take place automatically, sequences and test results must be able to be documented automatically for proof of performance and certification. All this requires not only highly reliable and automatable test systems, but also simulations suitable for complex control units – for example to simulate real battery cells – and HV-compatible accessories, such as special cables, breakout boxes and adaptations.

For your high-voltage applications, we design and develop individual adapters, supply systems as well as measurement and simulation technology – for safe handling in the laboratory, on the test bench and on the vehicle (up to 1000 V / 1000 A).

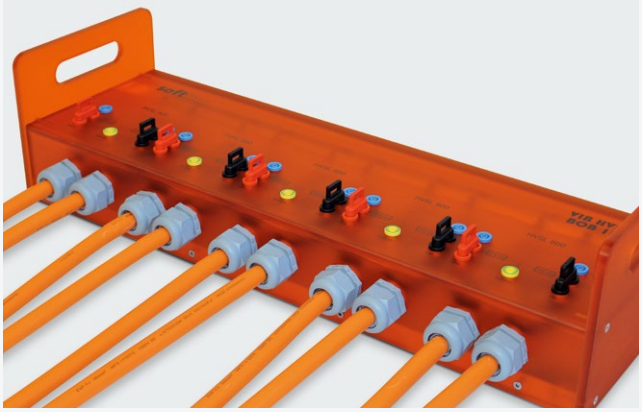
HV Measuring Adapters and HV Breakout Boxes

HV measuring adapters and HV breakout boxes (BOB) are used to safely and reliably perform measurements on high-voltage systems which are normally closed. Alongside interfaces for tapping individual I/O signals, HV measuring adapters also provide possible access to the HV power supply. In the case of HV breakout boxes, I/O signals and supply lines can be specifically manipulated by using suitable jumpers. Equipped with the original vehicle plug connections, this means that signals at the control unit plug can be measured without any contact or can be specifically influenced by interruption, short-circuit or connection of a bleeder and transfer resistor.

TYPICAL AREAS OF APPLICATION ARE:

- Engineering and development departments
- Test benches
- Service areas

at OEMs, system and modul suppliers (Tier1), in test companies as well as in repair shops.



HV Insulation Fault Simulations

For testing safety relevant functions

HV insulation fault simulations are used to test and validate safety-relevant system functions, either during the engineering process or also after repairs carried out by after-sales service or the repair shop, or directly on the vehicle. This enables the testing and verification of correct system responses in a (safety-critical) fault case. The occurrence of insulation faults in the HV wiring harness has to be detected immediately and reliably during vehicle operation and, once detected, the complete HV on-board electrical system must be switched off immediately. Faults such as short circuits, leakage currents or even line interruptions in the HV connection area must be permanently monitored by battery management systems – typically by cyclically measuring the insulation resistance of HV+ and HV- against KL-31 (chassis). With our high-voltage error simulations, error states in the area of HV connections and lines can be specifically generated. This can be either manually or automatically, depending on the application.

TYPICAL AREAS OF APPLICATION ARE:

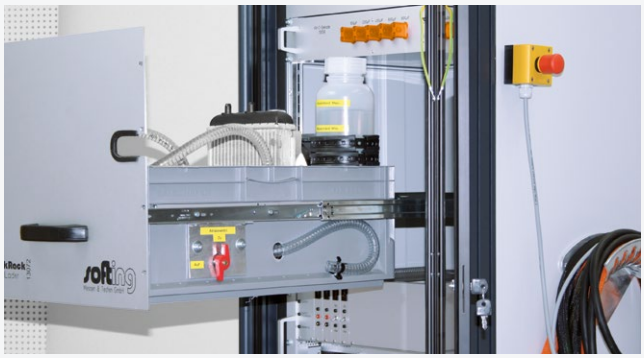
- HiL- and function testers (automated error simulations)
- Labs, test benches and engineering workshops (manually operated error simulations)

at OEMs, system and modul suppliers (Tier1), in test companies as well as in repair shops.

High-Voltage Capacity Decades

HV-C-Decades

During the development of electric and hybrid vehicles, high-voltage capacity decades (HV-C decades) are used to replace the DC link capacity in the vehicle. Thus, they simulate one of the most important energy storage devices of the power electronic vehicle system. With the HV-C decades realized by Softing to date, capacity values can be set in steps of 100uF up to a total capacity of 21mF. In this context, Softing offers both automated solutions and manually operated devices for laboratory operation.



TYPICAL AREAS OF APPLICATION ARE:

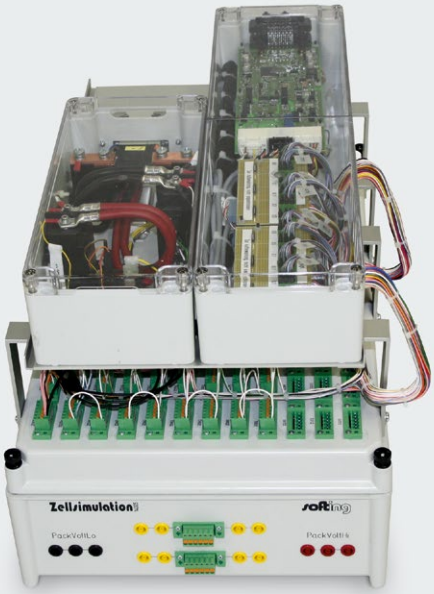
- HiL and function testers (automated HV-C decades)
- Labs, tests benches and engineering workshops (manually operated HV-C decades)

at OEMs, system and modul suppliers (Tier 1) as well as in test companies.

Passive Cell Simulation

ECU tests without real cells

During acceleration, the batteries of electric vehicles must provide particularly high performance. In order to keep the necessary currents and line cross-sections small, up to 200 individual cells are connected in series. During operation, the permissible voltage range of all battery cells must always be adhered to in every operating state to exclude danger, which can range from damage to fire and even explosion. Passive cell simulations are used to avoid being permanently dependent on real batteries or very complex and expensive active cell simulations during the development of Cell Supervision Electronics (CSE). These simulate the complete cell stack in a balanced state of charge, the individual cell controllers detect suitably charged cells and thus a fully functional battery system. Passive cell simulations thus make it possible to test and protect all functions of CSE control units which are not directly battery relevant without having to implement real cells or active cell simulations.



TYPICAL AREAS OF APPLICATION ARE:

- Software development for electric and hybrid vehicles
- OBD tests
- Labs, test benches and engineering workshops

at OEMs, system and modul suppliers (Tier 1)
as well as in test companies..

Complex Test Adapters

For the safe testing of HV components on the HiL tester

If high-voltage components or subsystems of electric and hybrid vehicles are to be tested, the highest safety standards must be ensured for the persons testing and the operating personnel. For this purpose, HV components must be constructed so that they are safe to touch and all queries to be measured or influenced must be fed to the test system galvanically isolated from the high voltage. For this purpose, Softing realizes test adapters for HV control units, in other words for Battery Management Controllers (BMC) as well as for Cell Supervision Electronics (CSE).

TYPICAL AREAS OF APPLICATION ARE:

- HiL and function testers
- OBD test
- Labs, test benches and engineering workshops

at OEMs, system and module suppliers (Tier 1)
as well as in test companies.

Charge Changeover Switches

With liquid cooled components for High Power Charging (HPC)

High Power Charging (HPC) enables fast charging with charging performances of up to 400 kW. This makes it possible to quickly charge electric vehicles with power for distances of up to 600 kilometers – in the time it takes for a coffee! But fast power charging is not totally unproblematic. Charging voltages of up to 1000 V and charging currents of up to 400 A continuous current generate a lot of power loss and thus heat. In order to reduce the thermal load on the affected components, the energy transfer systems must be cooled efficiently. Furthermore, it is sensible to equip HPC fast charging stations with interfaces for the Combined Charging System. This is how it can be ensured that the charging stations remain compatible with older electric vehicles (downward compatibility). Softing has planned and developed technically sophisticated high-voltage charge changeover switches for DC fast charging systems. Charging cables and charging plugs are cooled with a special liquid. There are two versions of the cooling unit integrated in the charge changeover switch: as an air cooling system or with a connection to an existing house cooling system. It is also possible to switch between the charging plug variants CCS1 (COMBO 1) and CCS2 (COMBO 2).

TYPICAL AREAS OF APPLICATION ARE:

- Test benches
- Labs
- Engineering workshops
- Environmental simulations (e.g. wind tunnel)

at OEMs and system suppliers.

HV Supply Systems

With energy recovery

Testing battery management systems (Battery Management Controllers, BMC) and high-voltage components requires the reliable supply of sufficient electrical power to these systems. Currents and voltages must be applied to the device under test in compliance with the highest safety measures, and measured and controlled precisely during operation. In order not to uselessly convert many kilowatts of electrical power into heat loss, the energy from loaded systems must be fed back into the supply network. Softing plans and develops customized individual high-voltage supply systems with integrated energy recovery up to 1000 VDC / 1000 ADC.

TYPICAL AREAS OF APPLICATION ARE:

- HiL and function testers
- Labs and test benches
- Engineering workshops

at OEMs, system and module suppliers (Tier 1)
as well as in test companies.

HiL Test Systems

For HV components

Softing develops and designs individual high-voltage test setups for the development of electric and hybrid vehicles in the laboratory and on the test bench. We realize HiL test systems for testing and protecting Cell Supervision Electronics (CSE), Battery Management Systems (Battery Management Controllers, BMC) and On-board Chargers, which is converting mains alternating current (AC) to direct current (DC) while filling up.

When using HiL test systems in the high-voltage range, permanent monitoring of insulation safety is essential in order to be able to guarantee the highest safety standards. All HV components are constructed so that they are safe to touch and all queries to be measured or influenced are fed to the test system galvanically isolated from the high voltage.

In our HV HiL test systems, different HV components are used for the ECU test depending on the specific requirements:

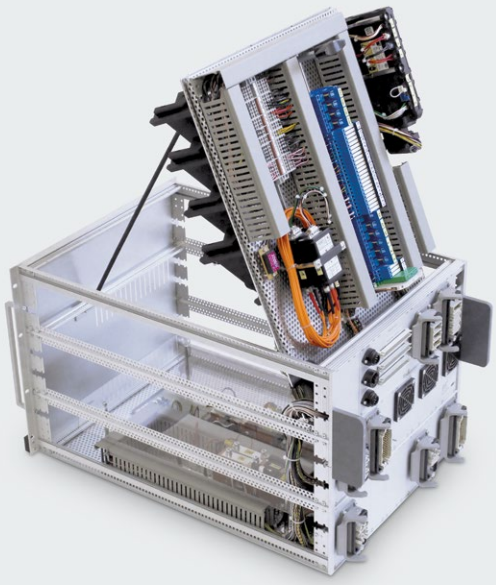
- HV test adapters
- HV cell simulations
- HV insulation fault simulations
- High-voltage capacity decades
- Controllable NTC/PTC temperature sensor simulation decades for simulating temperature progressions of a battery

Alongside the outstanding quality of the systems, an essential feature of our test systems is their high flexibility. Thanks to the modular plug-in technology in the test setups, the test modules can be changed quickly and thus different ECU variants can be tested on just one test setup with minimal conversion effort.

TYPICAL AREAS OF APPLICATION ARE:

- Component tests
- Function testss

at OEMs, system and module suppliers (Tier 1)
as well as in test companies.



TEST SYSTEMS

Function and HiL tester in a modular system – for (almost) all ECU types, data acquisition systems and test automation platforms.

AREAS OF APPLICATION

- ECU and function tests in engineering
- Manufacturing and endurance test
- Testing and approval

BENEFITS

- Modular, scalable and extendible complete solutions
- Top quality thanks to comprehensive knowhow and many years of experience
- Fast, flexible realization and support on site by qualified employees

It is a long journey from the start of engineering to the installation of all vehicle components and ECUs in the production vehicle. Comprehensive testing of the electronic components during the entire engineering process is essential. This is the only way to thoroughly safeguard and optimize hardware and software functions. Errors can be detected and remedied quickly – the earlier the better.

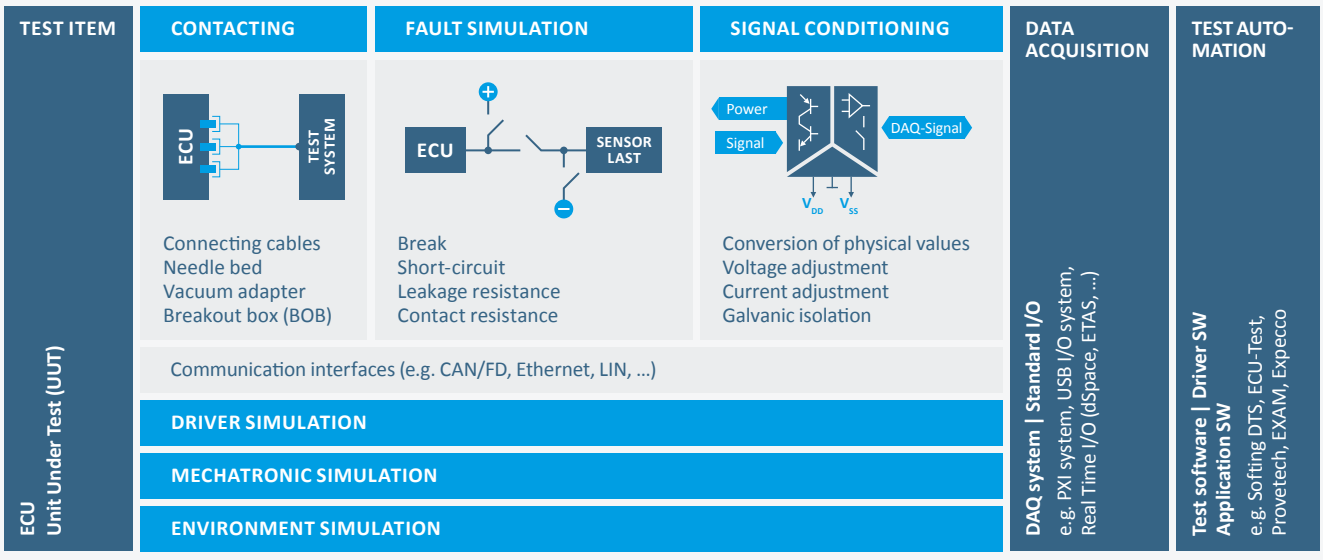
But for a long time during engineering, there is no real ECU environment available for the necessary testing – much less a complete vehicle. To solve this test problem, function and hardware-in-the-loop (HiL) test systems are used. These are set up with simulated and partially real vehicle environments. This allows (almost) all expected scenarios to be simulated, the ECU response to be tested, and the effect on the subsystem or vehicle to be recorded and documented.

The requirements made of these test systems are as diverse as they are complex. In the search for the right solution, it quickly becomes apparent that standard products are often just as poorly suited to the specific requirements as the interfaces of the specific ECU to the I/O channels of measurement technology.

This is why here at Softing we always design and implement our test systems individually to suit your specific ECU. In doing so, we combine the established hardware and software components you specify with our own solutions – building on our sound know-how and using our extensive test kit.

In order to be able to cover as many conceivable test scenarios as possible, we rely on individually tailored solutions for contacting, error simulation, signal conditioning, as well as driver, environment, and mechatronic simulation. Together with the appropriate test automation software, the required test scenarios can thus be mapped with automated tests and documented results. All tests are easy to perform in the lab – on virtual test tracks in the desert or at the Arctic Circle; they can be reproduced at any time, without real vehicles and without risking the life and limb of test drivers.

TEST SYSTEM SETUP



Contacting

Connection cable with original connectors for laboratory or climate chamber, complex needle bed contacting for series tests or hand contacting – we will manufacture these and many more items to completely satisfy your requirements. For the highly reliable connection of your Unit-Under-Test (UUT) with the test system, in best quality and durable design!

PORTFOLIO

- ECU connection cable
- Needle bed contacting
- PCB adaptions
- HV ECU adaptions

▲ *Fig.: Sample contacting*

Fault Simulations

Safeguarding the on-board diagnostic capability is a key part of the ECU test. "Short circuit to UBatt", "Short circuit to ground" and "Open load" all have to be tested individually for every ECU pin. Naturally neither the fault simulation nor the connected measurement technology may be damaged in the process. Our error simulations are easy and flexible to integrate in all kinds of testers via CAN. The range of tests can also be extended by connecting cascadable leakage resistors. Our fault simulations have been working reliably for many years in a large number of test systems of all kinds of ECUs!

PORTFOLIO

- Fault simulation (integrated in test system)
- Autonomous fault simulation (for ECU OBD tests in the lab, on the test board or in the vehicle)

▲ *Fig.: OBD fault simulation box (OBD-FSIM-Box)*

Signal Conditioning

The signals from the ECU sensors and actuators cannot be connected directly to measurement and data acquisition (DAQ) systems – the signal always has to be adapted. Depending on the signal type, our signal conditioning offers all the necessary functionalities: Adjustment of current and voltage levels, galvanic isolation, protective circuitry and signal filtering. Our test kit contains the appropriate signal conditioning modules for all common ECU signals – easy to scale and highly reliable.

PORTFOLIO

- Sensor simulations, for all common ECU inputs and sensor types such as temperature, speed, pressure, resistance, etc.
- Real load connections and load simulations, with integrated current/voltage measurement and signal conditioning for lamps, valves, engines, etc.

▲ *Fig.: Signal conditioning modules*

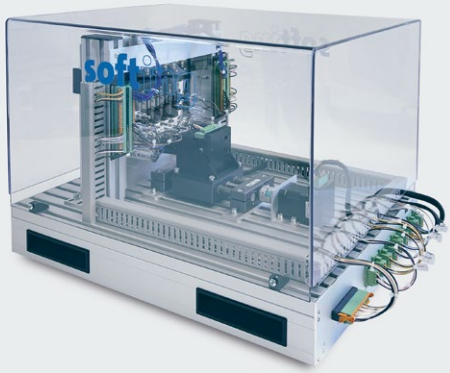
Driver Simulations

The interaction between the driver and the vehicle is extremely complex. Modern vehicle cockpits have a considerable number of controls that can and must be used by the driver. Even simple cockpit elements, such as indicator levers, have a considerable range of functions: movement up, down, forward and backward – in different steps and/or time-dependent – rotation in different steps as well as a pushbutton at the end of the lever. Infotainment control elements are even more complex: various mechanical switches, touch elements, swipe and wipe functions, pressure-sensitive switches and much more.

In order to implement an automated, reproducible test system, it must be possible to simulate these operating processes in a suitable manner and to control them from the test system. We design and develop the corresponding driver simulations, suitable for a wide range of requirements and applications. Our “test drivers” are “on duty” 24/7 and reliably and persistently deliver reproducible results.

SAMPLE SOLUTIONS

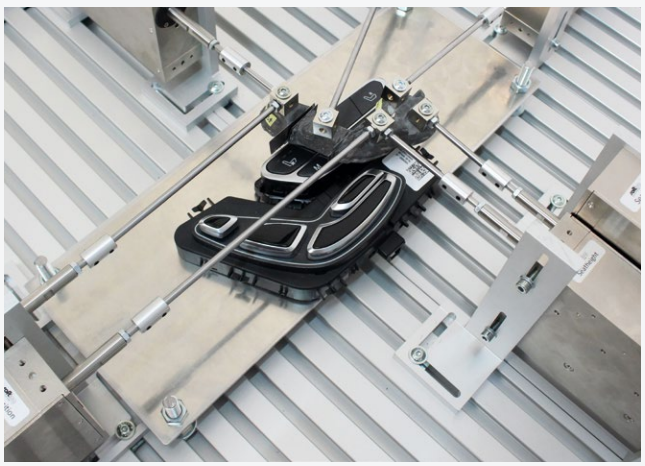
- Simulation for column tube module and steering column switch
- Simulations for control units with finger/press simulation, among other things:
  - Switch control panels
  - Pressure-sensitive switches
  - Touchscreens
- Simulation with articulated-arm robot for controlling vehicle functions by smartphones (test of motion sensors when smartphone approaches door handle, placing smartphone in vehicle charging tray, etc.)



▲ *Fig.: Robotics for a climate control panel*

▲ *Fig.: Finger simulation*

▲ *Fig.: Driver simulation through articulated-arm robot*



▲ *Fig.: Driver simulation for pressure-sensitive switches*

Environment Simulations

Even if the scope and complexity of the simulations used in testing continue to increase at the current rate – many components, such as highly integrated sensors, are already used as production parts in composite tests. As a result, it is now not only a case of simulating electrical signals; physical quantities for sensor stimulation must also be generated. With suitable environment simulations, such sensors can be specifically impacted with

- warmth (temperature sensors),
- light intensity (environment, tunnel),
- refraction of light (rain),
- forces (e.g. torsional forces on the steering wheel, weight on the seat occupancy mat and vehicle load for the chassis),
- pneumatic pressure (door crash sensors, tire pressure)
- hydraulic pressure (chassis),
- rotational movements (wheel speed),
- accelerations (parking bumps),
- ultrasound (interior monitoring)

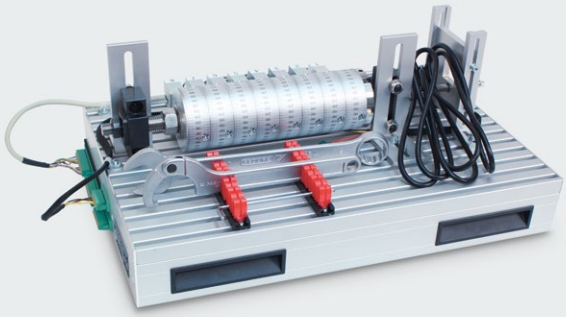
SAMPLE SOLUTIONS

- Rain simulation
- Light simulation
- PTC electric auxiliary heater
- Belt carrier
- Tilt/slide sunroof
- Motor controller for air conditioner box
- Wheel speed simulation

In this way, different events can be simulated and the corresponding ECU response or control behavior tested.

The requirements in terms of the structure, function and interfaces of an environment simulation are extremely diverse. We are happy to accept the resulting challenges and – with creativity and our many years of experience – develop suitable solutions for your individual test scenarios.

▲ *Fig.: Tests on PTC electric auxiliary heaters*



▲ *Fig.: Simulation of engine stops due to blocking*

▲ *Fig.: Rain/light simulation*

▲ *Fig.: Simulations on a sliding sunroof (referencing stops, blocking on normal travel)*

▲ *Fig.: Wheel speed simulation*

Mechatronic Simulations

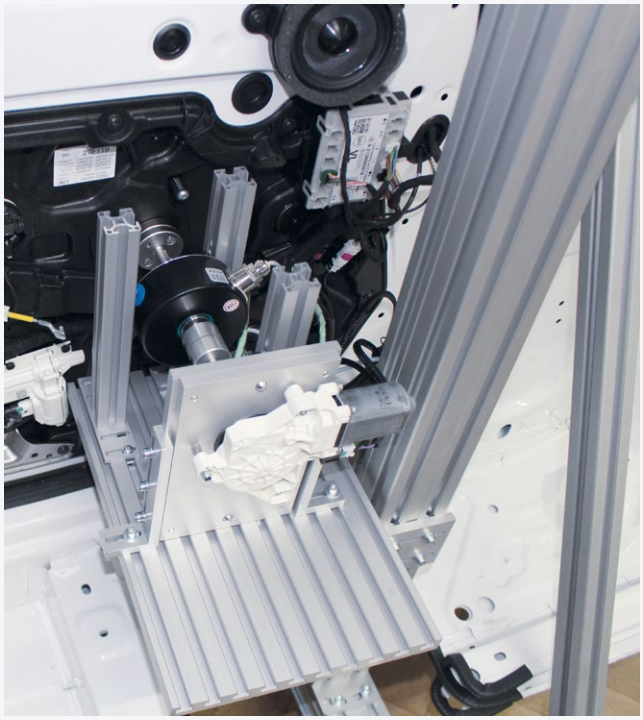
In many modern control units, the electronics form a closed unit with actuators and sensors. Test systems thus only have partial access to electrical interfaces and must also access these components mechanically. For example, an electric steering system now only has electrical connections for voltage supply and communication interfaces (e.g. CAN, Flex-Ray). All other connections and links are made mechanically: the connection of the steering wheel via a column tube and the connection of the steering motor axle to the steering gear and wheels. For simulation, suitable pressure must now be applied and recorded by the test system on both sides: on the driver's side, the steering movement and the haptic feedback from the chassis, and on the steering side, the resistance that the chassis and road offer the steering.

If mechanical interfaces of mechatronic components have to be connected to test systems, we design and develop custom-fit solutions. Whether actuator control by the test system (e.g. with rotary or stroke movements) or conversion of sensor signals into electrically measurable variables (speed, force, pressure, heat, light → U,I) - we realize mechatronic simulations for a wide variety of applications.

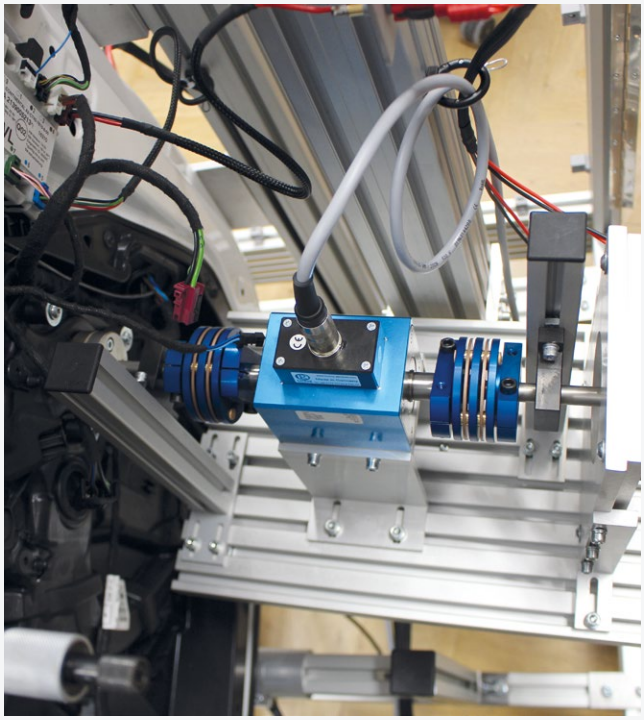
SAMPLE SOLUTIONS

- Simulation for electric steering
- Simulation for electric hand brake
- Simulation for electric rear axle steering
- Simulation for electric brake power assist unit
- and many more

▲ *Fig.: Simulation of seat adjusting motors*



▲ *Fig.: Pressure measurement and influence on the window regulator*



▲ *Fig.: Traveling distance on window regulator*

TEST BOARDS

From a compact test board at your desk to a functional mock-up unit (FMU) – individual breadboard assemblies for maximum reliability in engineering and testing.

AREAS OF APPLICATION

- ECU and component engineering
- Testing and validation (HiL testing, FMUs)
- Test benches
- Testing and approval
- Repair shop and manufacturing
- Quality assurance

ADVANTAGES

- Top quality through comprehensive know-how and many years of experience
- Highly flexible, individual assemblies with T-slot profiles, drilled boards and special designs
- Space for additional components
- Ergonomic support for display ECUs
- Simple cable routing with full pull-outs using drag chains on drawers
- High-quality, permanently engraved/printed lettering
- Fast, flexible implementation and on-site support

A range of original components can be conveniently attached and connected to each other on test boards according to their target arrangement in the vehicle. This is the perfect way to subject, in particular, the cable harness and ECUs to complex networking and function tests in conjunction with real sensors, actuators and other subsystems. Test boards thus enable flexible tests for series validation – long before tests are possible on real vehicles.

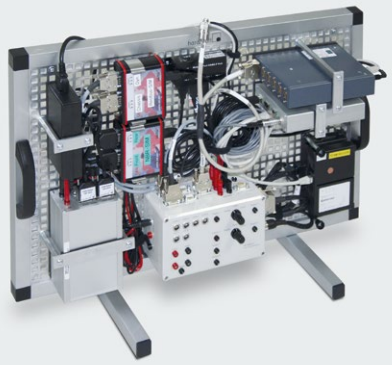
Due to the suitable mechanical construction with variable T-slot profiles, all essential parts of a test board are easily accessible for engineers and testers at any time. Drilled boards allow for the simple, fast and structured mounting of all components. This is how original parts can very easily be substituted by spare parts or simulations at any time – and vice versa.

From test boards for individual control units to function clusters and complete vehicle FMUs – we would be glad to advise you in accordance with your individual tasks, and engineer and design the appropriate test setup.

Test Boards for the Workplace

Board setup for tests directly at the des kor workplace

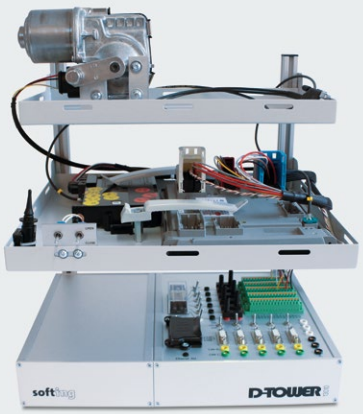
- Small, compact and clearly arranged
- Can be used reliably long term
- Stackable versions
- Lying, standing - universal



ECUs Diagnostic Tower

Compact design with minimum space requirement

- Freely assignable compartments (variable number)
- Clear device and component structure with structured cable routing
- Integrated power supply
- Tapping for ECU communication interfaces: LIN, CAN, CANFD, FlexRay, BroadR-Reach 100 MBit and 1 GBit Ethernet



Real Load Cabinets

Cabinets and shelving for component storage with individual and 19-inch mounts

- Freely assignable drawers and shelves
- Soundproofed load chambers
- Cooling circuits for real loads
- Touch-proof high temperature chambers for heating elements
- Ergonomic display instruments

Test Tables

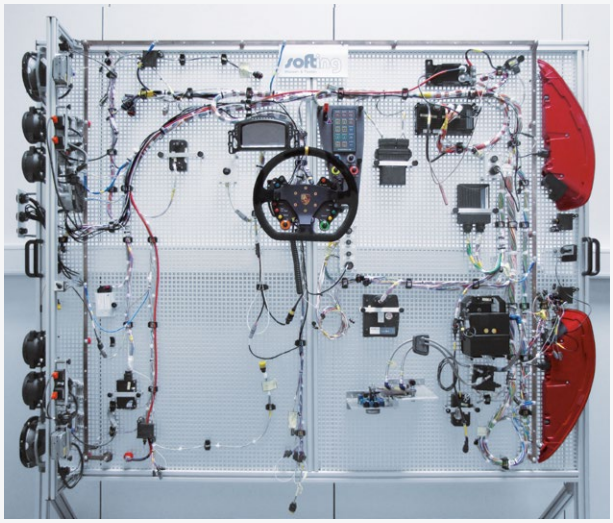
Mobile board assembly with integrated work table – among other things for networking and diagnostic tests

- Space-saving
- Ergonomic
- Designed and manufactured for reliable and long-term use
- Individually adapted to customer wishes and requirements

2-&3-Dimensional Test Boards

Component carriers consisting of vertical test boards with full extensions to accommodate control units, actuators, sensors

- Vehicle-similar assemblies
- If desired, with original cable harness
- Individual, according to your wishes – with our experience
- High clarity with 2-dimensional assembly
- Compact and space-saving with 3-dimensional assembly



Function Models Demonstrators

System assemblies with focus on the visibility of functionality with an attractive appearance

- Functional models for the presentation of the components and their functionality
- Focus on visualization and clarity
- For presentations, fairs, training sessions and courses

Fuctional Mock Up (FMU) – Setup For Complete Vehicle Tests

Three-dimensional test boards in vehicle size for simulations and complex networking tests with original components

In functional mock up systems, test boards are arranged three-dimensionally in the characteristic shape and size of a vehicle. In this way, up to 200 control units and original components, such as seats, steering wheel, center console, interior and exterior lighting as well as the entire wiring harness, can be tested in combination. FMUs enable high-quality flexible tests for series validation long before the test is possible within real vehicles.

TEST EQUIPMENT

Simple connecting cables, Breakout Boxes (BOB) and complex ECU adaptions:
Individual solutions for maximum reliability in engineering and tests.

AREAS OF APPLICATION

- ECU and component engineering
- Testing and validation (HiL testing, FMUs)
- Test benches
- Component testing and release
- Repair shop and manufacturing
- Quality assurance

ADVANTAGES

- Top quality thanks to comprehensive know-how and many years of experience
- Top quality execution by qualified employees
- Fast, flexible realization and on-site support

A large number of different cables, adapters and peripheral simulations are used in the engineering of vehicle electronics, the testing of electronic and electrical components and in component integration into the complete vehicle. The use of standard products is rarely possible here. Test equipment specially adapted to the control unit, vehicle series or test environment is nearly always required. Nevertheless, the modular system established and introduced at Softing makes it possible for cables, adapters and other test equipment to be realized extremely flexibly and at the same time cost-effectively – always tailored to the specific requirements and the concrete application. Our many years of experience in engineering and setting up test equipment pays off. Our solutions are compelling thanks to their durability, quality and maximum reliability.

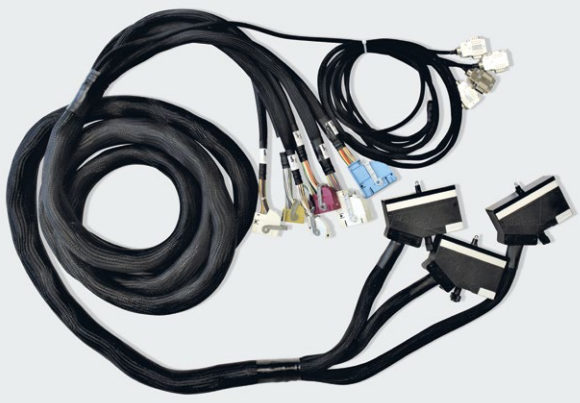
Connecting Cables

For ECU connections

Long before connecting cables from series production are available, vehicle ECUs must be reliably and flexibly connected to engineering and test systems. Whether with a vehicle connector, with connectors for measuring, load or supply lines – the variety of required designs is enormous. We supply connecting cables for practically every application.

SOLUTIONS

- Optionally, flexible or highly flexible
- Suitable for use in climate chambers, with low or high temperatures
- Special cables and connectors for special signals (including high frequency, high voltage)
- With integrated data lines for ECU communication: LIN, CAN, CAN-FD, FlexRay, BroadR-Reach 100 Mbit/1 Gbit Ethernet



▲ *Fig.: Hypertac ECU adapter cable with CAN FD Breakout*

▲ *Fig.: OBD adapter cable*

Tester Adaptions

for quality assurance

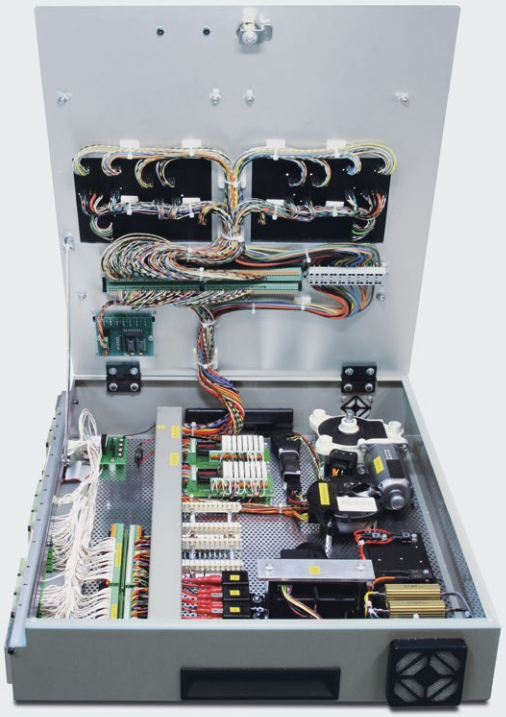
In the areas manufacturing and quality assurance, vehicle electronics and ECUs often have to be connected to test systems in a partially assembled state – without housing and connectors. We design and realize suitable test adapters for this purpose. Our adapters guarantee safe contact between the electronics and the tester. On request, the adapters can also be designed for a very high number of contact cycles at any time.

SOLUTIONS

- All-in-one solutions from one source
  - Construction
  - Mechanical manufacturing
  - Setup and wiring
  - Testing and commissioning
  - Support on site
- Needle-bed insert contacts
- Hand contacts
- Passive or active signal conditioning in the test adapter
- Realization for different test systems: VPC, ODU, Teradyn / GenRad, and others

▲ *Fig.: Needle bed contacting for circuit boards*

▲ *Fig.: Manual fault simulation*



▲ *Fig.: Test adapter for door control units*

▲ *Fig.: Test adapter for parktronic*

BOB

Breakout Boxes

In the course of vehicle engineering it is often necessary to directly access IO signals, communication or supply lines of an ECU. Breakout boxes make it possible to disconnect practically all cables connected to the control unit connector individually or to connect them to measuring systems for measuring purposes.

SOLUTIONS

- Different variants for jumpers, grid or connection type possible
- Robust housing, modular setup
- Connectors and jacks with original parts from ECUs or cable harnesses – or individual manual contacts
- Exchangeable fronts for different connector labeling
- Variably modifiable thanks to magnetic labeling fields

▲ *Fig.: BOB for pixel light ECUs*

▲ *Fig.: Universal BOB for signal sonnectors*

▲ *Fig.: Measuring adapter for door control units*

▲ *Fig.: Universal adapter for Hypertac plug*

Distribution-Box

Variable „ECU Connectors“ with lots of possibilities

In early engineering phases, direct and immediate access to IO signals or communication interfaces of an ECU is necessary. With a distribution box, individual IO signals as well as ECU data traffic can be reliably measured, recorded or connected to suitable remote stations. Power supplies or displays can be flexibly integrated to suit the particular use.

▲ *Fig.: Communication interface distributor*

▲ *Fig.: Measuring tap for 157 ZIF*

SOLUTIONS

- Different variants of jacks and connectors possible
- Robust housing, modular setup
- Switchable and fused power supplies
- Connectors and jacks for special signals (including HF, HV)
- Connections for control unit communication:
  LIN, CAN, CAN-FD, FlexRay,
  BroadR-Reach 100 Mbit/1 Gbit Ethernet
- Variably modifiable thanks to magnetic labeling fields

▲ *Fig.: OBD distribution box*

Lab Cars

„ECU Connectors“ with Integrated Peripherals

Similar to the distribution box, lab cars offer direct access to IO signals and ECU communication – although extended by integrated load simulations, sensor or actuator equivalent circuits or communication counterparts. Optionally, load simulations or equivalent circuits can be manipulated by the operator and influenced directly on the lab car.

▲ *Fig.: Lab car for a radio (HeadUnit)*

SOLUTIONS

- Different variants of jacks, connectors, controllers and displays possible
- Robust housing, modular setup
- Switchable and fused power supplies
- Connectors and jacks for special signals (including HF, HV)
- Connections for control unit communication:
  LIN, CAN, CAN-FD, FlexRay,
  BroadR-Reach 100 Mbit/1 Gbit Ethernet
- Variably modifiable thanks to magnetic labeling fields

▲ *Fig.: Adapter for on-board power supply units*

ENGINEERING

OVERVIEW ENGINEERING	
Diagnostics	Concepts and solution development for diagnostic systems, sequences and data on the basis of established diagnostic standards (ODX, OTX, MVCI, among others)
Diagnostic Tester	Flexible diagnostic system solutions for the operation and service of vehicles and equipment
Flash Programming	Scalable, high-performance solutions for flash programming of vehicles and ECUs in production and vehicle delivery
Test Solutions	End-of-line and QA test systems, test concepts, test automation, test development, manual and automated testing for vehicles and ECUs
Software Solutions	Individual software solutions for technical systems in engineering, manufacturing and after-sales service

DIAGNOSTICS

OUR PORTFOLIO

- Diagnostic concepts
- Authoring guidelines
- Diagnostic authoring (ODX)
- Diagnostic and test sequences (OTX)
- Diagnostic migration
- Testing and validation of diagnostic architectures and protocols

YOUR ADVANTAGE

- Flexible and use-oriented range of services
- In-depth and extensive diagnostic know-how
- High-grade diagnostic products

Today, well established and standardized technologies can be used to create modern diagnostic architectures. Softing offers a wide range of top-quality products for these standards, for example the MVCI Diagnostic Server as a central system component and the D-PDU-API as an interface to the vehicle (interface).

Standards for diagnostic data formats and protocols are also established and technically mature:

- UDS and DoIP as the protocol standard for ECU communication
- ODX as the format for diagnostic data
- OTX for describing diagnostic and test sequences

However, both the design and engineering of new diagnostic architectures remain complex and costly. This is especially true if existing systems and data are to be migrated or to continue to be used. In-depth know-how and many years of experience allow us to bring together current diagnostic trends, established diagnostic standards and specific system requirements to create optimal diagnostic solutions. We offer comprehensive diagnostic know-how – from legacy systems to modern cloud solutions.

SERVICES

Diagnostic concepts	We develop system concepts – from component selection to optimal diagnostic data structure.
Diagnostic authoring (ODX)	We create and develop ODX diagnostic authoring, to suit requirements and specifications of third parties or on the basis of proprietary data architectures.
Functional sequences (OTX)	We realize universally deployable diagnostic functions, flash sequences and test sequences with all the advantages of the OTX standard.
Diagnostic migration	We take care of data and system migration from legacy and old systems toward standardized diagnostic solutions.
Testing and validation	We test and verify diagnostic implementations, validate performance requirements and safeguard new developments.

DIAGNOSTIC TESTER

OUR PORTFOLIO

- Customized tester implementation based on the product Softing TDX
- Realization for a wide variety of tasks in engineering, manufacturing and after-sales service
- Integrated role/rights update management
- Tester licensing possible
- Tester connection to IT infrastructure

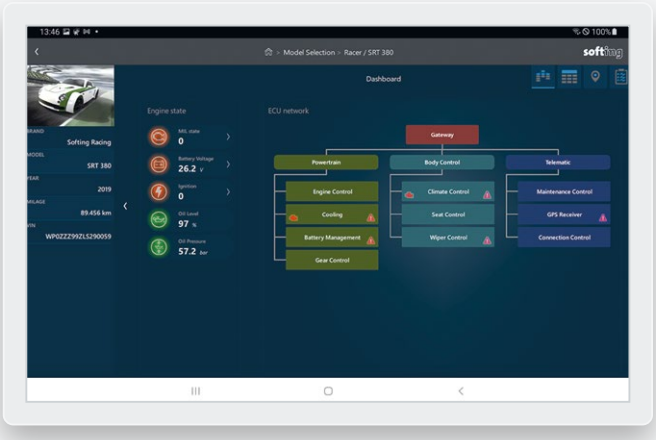
YOUR ADVANTAGE

- Scalable tester solution – based on established product toolkit
- Future-proof due to the use of international standards (e.g. OTX, ODX)
- Full, unlimited diagnostic functionality
- Modern look and feel
- Comprehensive report functionalities

Diagnostic testers – i.e. systems that communicate with ECUs and electronic units in the vehicle via diagnostic communication – decisively determine how efficiently and flexibly users can access electronic functionality.

In Softing TDX, we offer a toolkit for the creation and maintenance of an individual, modular diagnostic tester. Whether flash programming, error queries, ECU configuration or status analysis – our tester solutions based on the product Softing TDX and the ODX and OTX diagnostic standards offer all necessary tester functions in an attractive, straightforward design. Different diagnostic strategies (ECU-, symptom-, function-based) can be easily implemented for error localization and commissioning. The integrated role and user management and the licensing mechanisms provide extensive protective mechanisms to prevent unauthorized use.

The modular concept allows the integration of any specific images, logos and layouts – creating a tester that is 100% in line with the desired design.



SERVICES

Concept and UI design	We develop the tester architecture, determine the operating concept and design the tester interfaces so that the tester corresponds 100% to the customer's corporate design.
Tester implementation	We create sequences and data sets, or adopt existing ones, and develop all the necessary tester functions, interfaces and GUIs. We implement the desired error search strategies and integrate necessary documentation.
Role/rights update management	We integrate role/rights update management so that tester functions can be enabled on a user-specific basis and updates for the tester software or diagnostic data can be controlled centrally.
Tester connection to IT infrastructure	We connect the components necessary for the operational use of the tester to the IT infrastructure so that efficient access to required information and data is possible.

FLASH PROGRAMMING

OUR PORTFOLIO

- Ready-to-use solutions for flash programming
- Optimized for engineering, manufacturing and aftersales service
- Wired or over-the-air – local or remote
- Creation of ODX flash configurations
- Development of OTX flash sequences
- Powerful security features
- Integration in existing environments

YOUR ADVANTAGE

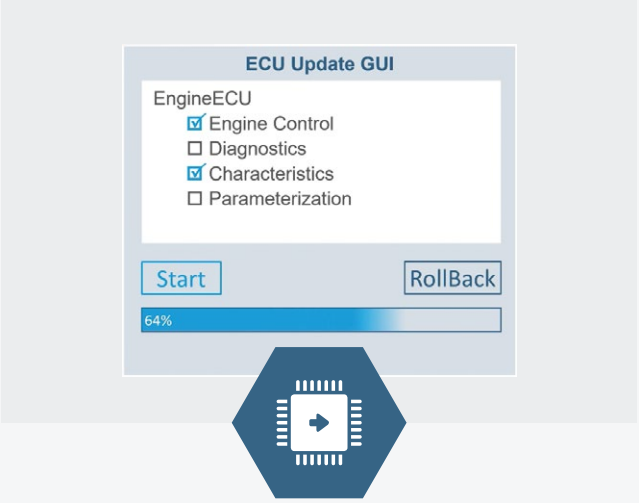
- High-performance, flexible solutions
- Mature product components
- Optimal integration into in-house processes and systems
- Use of specialist know-how for automotive diagnostics

The flash programming of ECUs, established in a wide variety of areas today, offers an enormous degree of freedom and high flexibility. At the same time, the requirements for programming solutions are extremely diverse, depending on whether they involve development-related tasks, production topics or solutions in the vehicle delivery environment.

With ODX and OTX, modern technologies required for flash programming have been introduced and are thus available. Based on these diagnostic standards, Softing offers a mature range of products and components for ECU programming.

This makes it possible to realize a wide range of programming applications – simple tools for flashing on the board assembly in engineering, solutions for ECU programming in the vehicle test or engineering workshop, and manufacturing solutions with multiple parallel programming and integration into production processes and infrastructure.

Our product portfolio and the sound diagnostic expertise of our development teams are always the basis for the realization of bespoke, customer-specific programming solutions for a wide variety of applications.



SERVICES

Programming concepts	We develop concepts for flash programming – from component selection to optimal system architecture and integration into processes and infrastructure.
Flash authoring (ODX)	We create ODX flash authoring to suit requirements and specifications of third parties or on the basis of proprietary data architectures.
Programming sequences (OTX)	We develop the necessary flash sequences, including security access and protocol functions.
Integration in infrastructure	We integrate the programming solution into the processes and IT infrastructure to enable optimal sequences and the simplest possible usability.

SOFTWARE SOLUTIONS

OUR PORTFOLIO

- Comprehensive requirements analysis
- Scalable system architectures
- Individual problem solutions
- Agile engineering methods

YOUR ADVANTAGE

- Custom tools for technically complex tasks
- Operational support
- In-depth expertise
- Taking the pressure off your own engineering teams

Modern vehicle technologies continue to be subjected to rapid development. The increasing networking of vehicles with the environment, the development toward autonomous driving and the increase of e-mobility entail extensive and fundamental changes – from vehicle development and engineering through to vehicle operation.

All these developments simply would not be possible without the use of suitable, mostly software-based systems. This can be seen and experienced directly in modern vehicles. But vehicle engineering and manufacturing are also shaped by a high speed of innovation with the corresponding effects on the tools and processes used.

To ensure that the ever shorter engineering cycles, increasing complexity and growing safety requirements can continue to be mastered reliably in the future, the use of high-grade software tools is indispensable. This is where custom software solutions are required which are not available “off the peg”.

The development of individually tailored software solutions is a focus of our engineering and development teams. With expertise and commitment, we implement software tools for a wide range of technical tasks in engineering, manufacturing and after-sales service.

WE OFFER YOU:

- Modern, scalable software solutions
- Agile engineering methods, from comprehensive requirements analysis to validation and roll-out
- Focus on modularization, abstraction and reusability
- Development for desktop and mobile platforms
- Software prototypes for evaluation and concept validation

WHAT YOU CAN COUNT ON:

- Modern software technologies and flexible engineering methods
- In-depth automotive know-how
- Outstanding system understanding for complex problems
- Highly qualified, expert engineering teams

TEST SOLUTIONS

OUR PORTFOLIO

- EOL and QS test systems
- Test concepts and test strategies
- Solutions for test automation
- Test development
- Manual tests and validation
- Test evaluation and results analysis

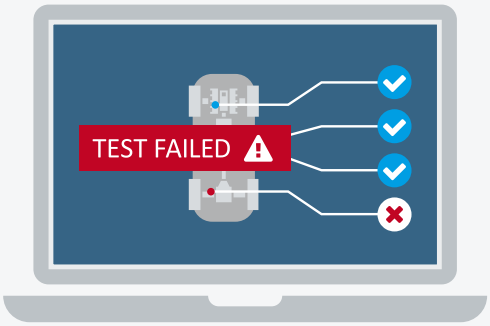
YOUR ADVANTAGE

- Custom solutions for test and validation
- Wide range of solutions
- Taking the strain off proprietary capacities

Vehicle systems have to be tested comprehensively and systematically to be able to continue to satisfy top safety and quality requirements permanently. But the full testing of complex systems with all possible input values and system states is virtually impossible. Suitable test strategies and a high degree of test automation are indispensable when trying to keep test costs under control long term and at the same time increase product quality.

Whether system or component test, whether a test of ECUs or software functionality, whether UI test or API test: The demands made of test solutions are complex, the possible variants of suitable test solutions manifold.

We use our wide range of services and our product portfolio to realize the optimal test solution for you – from pure software solutions to ready-for-connection ECU test systems. We will help you find the perfect balance between maximum test coverage and minimal error risk.

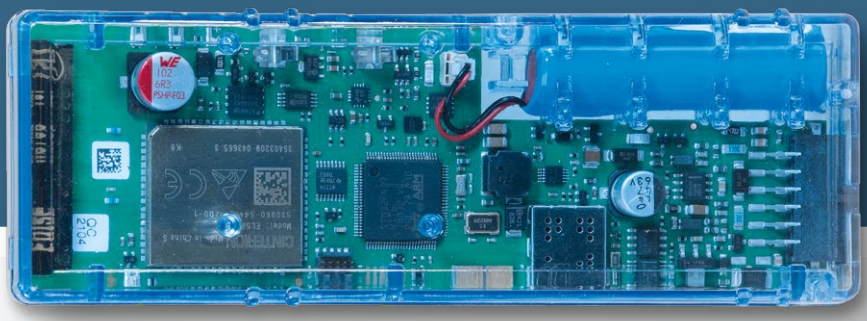


SERVICES

EOL and QS test systems	We design and develop exactly the test systems needed in production and quality assurance for reproducible system and component testing integrated into manufacturing.
Test concept and test strategy	We develop the test strategy that fits the specific requirements and work out the optimal test concept from this.
Test automation	We implement test automation solutions – for pure software systems as well as for ECUs and electronic components – based on the appropriate automation technology in each case.
Test development	We design suitable test plans for automated or manual testing and safeguarding scenarios and develop the necessary test cases.
Manual tests and validation	We develop manual tests and take over the operational execution of all necessary test and validation activities.
Test evaluation and results analysis	We create the necessary test evaluations, analyze error cases and pass the evaluated errors on to the process partners responsible for troubleshooting.

CONNECTED CAR TELEMATICS by GlobalmatiX

We offer an innovative telematics solution for the new dimension of digital mixed-brand fleet management of the future.



AREAS OF APPLICATION

- Car rental, subscription and car sharing companies
- Leasing companies
- Insurance companies
- Mobility application operators
- Passenger cars, small utility vehicles and both light and heavy commercial vehicles
- Cars with a combustion engine, hybrid and electric cars

BENEFITS

- Plug & play solution for 4G GPS telematics with a CAN data logger
- Vehicle installation in just a few minutes, programming and control over the air (OTA)
- Just one box for all applications
- Agile firmware for the fast integration of existing and new use cases
- Decades of experience in vehicle diagnostics
- Support of all vehicle brands and models
- Maximum data transfer security through patented, transaction-based Security by Design

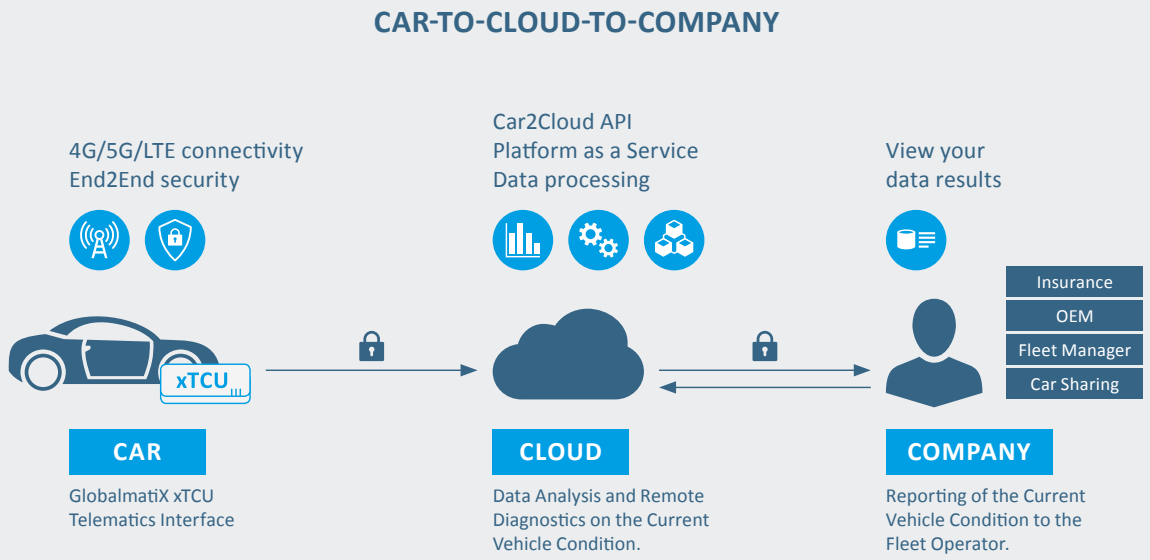
"Connected Car" and "Shared Mobility" are two of the biggest trends in the automotive industry. The hidden potential of these two sectors is enormous. The provision of innovative and smart features is increasingly enhancing the driver's user experience. For fleet managers, there are countless opportunities to manage and operate commercial fleets even more efficiently and cost-effectively.

The Softing subsidiary GlobalmatiX has developed an innovative telematics solution precisely for this purpose. It enables all conceivable "Car-to-Cloud-to-Company" use cases of digital, mixed-brand fleet management today and in the future. Regardless of the vehicle brand, the GlobalmatiX telematics interface is capable of measuring and collecting all data from the ECUs installed in the vehicle, supplemented by precise location and movement information. This data is transmitted in real time and with the highest quality and resolution "over the air" from any location and worldwide to the cloud databases of our business customers for their further analysis, decisions and presentations.

In the process, GlobalmatiX offers an unprecedented level of security against unauthorized access by third parties through a patented, transaction-based security procedure between vehicle diagnostic networks and the connected cloud database. A qualified analysis of events and changes to the ideal state is possible with the help of high-resolution vehicle data and artificial intelligence in the cloud. This results in applications that to date have not been possible.

The telematics solution covers multiple use cases. These include:

- Comprehensive remote vehicle diagnostics, maintenance and upkeep
- Early detection of impending defects, e.g. in the case of battery and engine defects (predictive maintenance)
- Reporting impending service intervals
- Detection, reporting and analysis of minor accidents, which are often not immediately visible, even in the lowest speed range, including damage report and the associated cost calculation in just a few seconds
- Detection of minor accidents, where damage is not visible at first glance, even in the lowest km/h range incl. damage report and cost calculation
- Provision of a comprehensive electronic vehicle résumé (Car CV)
- Vehicle GPS tracking with geofencing
- Powering on vehicle components to avoid continued journey in the case of theft
- Keyless vehicle access for station-free, no-contact collection/return of vehicle
- Complete vehicle documentation (Car CV) with determination of current value for improved vehicle sale
- Creation of a digital logbook with separation of private and business trips
- Usage-based insurance models (UBI) for classification according to risk, km- or time-based insurance tariffs



▲ *Fig.: GlobalmatiX Car-to-Cloud-to-Company*

The GlobalmatiX telematics solution is used for all fleet sizes in the areas of passenger cars, light utility vehicles, commercial vehicles, buses and construction equipment as a telematics and data logger interface. The xTCU can process all the desired data in the cloud and provide it to the customer for optimized fleet management. The data can be accessed worldwide using a smartphone or web app.

The telematics interface xTCU delivers the following in real time:

- Vehicle diagnostic data incl. remote vehicle maintenance using OBD/UDS
- Information on, among other things, fuel consumption, current kilometer reading, driver's safety belt, tire pressure, tachograph
- Highly sensitive 3-axle accelerometer for monitoring abrupt acceleration and deceleration, including accident detection for low-speed collisions and driver profiling based on driver behavior
- GPS location detection, geofencing for all use cases requiring precise positions and routes

CAR-TO-CLOUD-TO-COMPANY

The telematics solution from GlobalmatiX offers the widest spectrum of data density and transfer security on the market. The "Car-to-Cloud-to-Company" approach is the decisive technology for efficient and cost-effective fleet operation. The telematics box from GlobalmatiX can quickly and easily be installed in a vehicle as a data logger. The data signals from the vehicle are acquired at extremely high sampling rates and supplemented with telematics data. Data is transmitted in real time to the analysis cloud. In the cloud, the collected data is aggregated, processed and analyzed, and prepared for further use by our customers.

The evaluations are then sent all round the world over 4G/5G. The high volume of the detailed vehicle data acquired enables almost limitless coverage of digital analysis and use cases, as well as services for end customers that were previously not possible, such as:

- Remote vehicle diagnostics with predictive maintenance
- Keyless door opening, journey approval and door closing
- Detection of accidents in real time and allocation of the damage to the party responsible, e.g. in the case of a parking bump
- Settlement of minor damages which to date have gone unnoticed
- Creation of a digital vehicle résumé and acceleration of the used vehicle marketing process
- As well as other cases for Connected Car applications

Further information:
globalmatix.com

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TRAINING AND SEMINARS

In spite of standardization and the implementation of user-friendly tools, the complexity of vehicle diagnostics requires comprehensive in-depth specialist knowledge depending on the particular area of application and requirements.

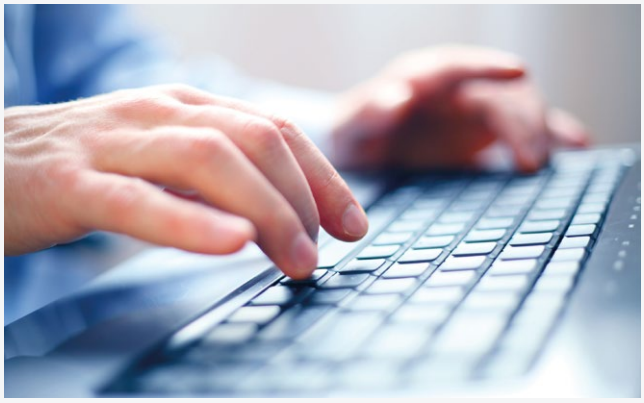
OUR PORTFOLIO

- Basic training
- Tool training
- Customized training

YOUR ADVANTAGE

- Efficient familiarization and training on topics from all areas of diagnostics and vehicle communication
- Theory with practical exercises
- Inexpensive standard training
- Individual customized training possible

You want to know all about diagnostics, flash programming, OTX, ODX and ECU communication fast - without having to spend lots of time studying relatively “dry” specifications and technical documentation? Our training team will provide you with the necessary knowledge and bring you completely up to date with all the latest technological details. We have put our knowledge and long years of experience into a compact and modular training program for you. It is divided into practice-oriented user workshops and indepth theoretical training seminars.



BASICS AND TECHNOLOGIES

Basics of vehicle diagnostics	Basic training on systems, sequences and definitions of vehicle diagnostics
ODX introductory course	Basic training on diagnostic configurations and concepts with ODX (Open Diagnostic Data Exchange, compliant with ISO 22901)
OTX – the basics	Basic training on diagnostic and test sequences with ODX (Open Diagnostic Data Exchange, compliant with ISO 13209)
OTX – advanced	Advanced training on complex diagnostic and test sequences as well as OTX add-ons, compliant with the OTX standard

TRAINING FOR SOFTING DTS.MONACO

User seminar	Training on target-oriented use of Softing DTS.monaco, based on predefined system configurations
Administrator seminar	Training on how to use Softing DTS.monaco to create configurations and user interfaces

CUSTOMIZED TRAINING

Individual training sessions	Seminars and training sessions, tailored to and compiled in line with your specific requirements

We offer seminars and training sessions on fixed dates in our training center in Haar (near Munich).
On request, we can conduct seminars on your premises at your convenience.
We would be happy to provide you with dates and information. Just give us a call!

APPLICATION SUPPORT

Qualified support services for all specific tasks related to vehicle diagnostics, testing and safeguarding.

OUR PORTFOLIO

- Authoring support
- Engineering support
- Integration support

YOUR ADVANTAGE

- Fast implementation of technically complex tasks
- Flexible supplement for proprietary engineering teams
- Efficient compilation of know-how by training your own employees on-the-job

Modern diagnostic systems are characterized by a large number of different system components, interfaces and configuration information, particularly protocol parameterizations and diagnostic data.

This is an area in which many companies are often missing the combination of appropriate qualifications and available development capacities necessary for system engineering, configuration and data creation. We offer our services flexibly and tailored to suit needs, i.e. in the desired volume and in delivery milestones agreed jointly. This means that you can take advantage of expert support services to relieve the pressure on your team in exactly those areas in which you have little expertise and in which few free capacities are available – while still adhering to your scheduling and budget goals.

Based on our in-depth know-how and many years of practical experience, Softing offers support services

- in the drafting and conceptual design of diagnostic systems and architectures
- in diagnostic authoring to optimally suit the related applications
- in the engineering of diagnostic and test sequences
- In the drafting and engineering of custom software solutions, test systems and repair shop testers

GLOSSARY

A2L	ASAM MCD-2 MC language
API	Application Programming Interface
ASAM	Association for Standardisation of Automation and Measuring Systems
CAN/FD	Controller Area Network/Flexible Data Rate
DTC	Diagnostic Trouble Code
DoIP	Diagnostics over Internet Protocol
D-PDU API	Diagnostic Protocol Data Unit Application Programming Interface
ECU	Electronic Control Unit
GUI	Graphical User Interface
HMI	Human Machine Interface
ISO	International Organization for Standardization
LIN	Local Interconnect Network
MVCI	Modular Vehicle Communication Interface
OBD	On Board Diagnose
ODX	Open Diagnostic Data Exchange
OTX	Open Test Sequence Exchange Format
SAE	Society of Automotive Engineers
TST	Tester, external test equipment
UDS	Unified Diagnostic Services
VCI	Vehicle Communication Interface
WWH-OBD	World-Wide Harmonized On-Board Diagnostics
XML	Extensible Mark-up Language

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